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Foreword

Dear Guests;

Welcome to International Science and Technology Conference, ISTEC, International Distance Education Conference, IDEC, International Trends and Issues in Communication & Media Conference, ITICAM & International Teacher Education Conference, ITEC.

Every year conferences are held at different locations around the world. This year we are in St. Petersburg/Russia. Here is the content of each one of conferences:

International Science and Technology Conference, ISTEC, is a multidisciplinary meeting in fields of science and technology. The talks range from historical restoration projects to frontiers of science.

International Distance Education Conference, IDEC, is about distance education and multitude of ways to improve the structure and quality of learning process.

International Trends and Issues in Communication & Media Conference, ITICAM, hosts a multitude of contributions as regards latest trends in communication and media.

International Teacher Education Conference, ITEC, is a platform where attendees can discuss latest trends in education.

These conference are now well-known events and the number of paper submissions and attendees are increasing every year. During the sessions, the participants will share their knowledge, research and experiences with us. They also talk about the recents developments in these fields.

We hope that we will meet again.

Thank you for your participations and contributions for the success of this conference.

Prof. Dr. Aytekin İŞMAN

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Prof. Dr. Robert G. Doyle
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Developing Causal Evidence using Different Research Methods: Applications in Education

Prof. Dr. John Hitchcock
University of Indiana, United States



Applied Geometry: Foldings and Unfoldings

Prof. Dr. Hellmuth STACHEL
Vienna University of Technology, Austria



The Future of Education: Bring Your Own Device (BYOD) in the Classroom

Prof. Dr. Buket AKKOYUNLU
Hacettepe University, Turkey



Philosophical Foundatıons of Science and Technology The Historical Context

Prof. Dr. Durmus GÜNAY

Maltepe University, Turkey

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TABLE OF CONTENT

[2]-ROTAXANE & [2]-CATENANE FORMATION FROM ARENE RUTHENIUM COMPLEXES 1
Benan Kilbaş
9TH GRADE STUDENTS' AWARENESS AND MISCONCEPTIONS ABOUT THE ENVIRONMENTAL RELATED CONCEPTS 2
Uçal Özel, Ayşe Yalçın Çelik, Nejla Gültepe, Ziya Kılıç
A CASE STUDY OF SHE (SOLAR-HYDROELECTRIC) IN TURKEY 3
Mahir DURSUN, M. Fatih SALTUK
A COMPARATIVE PERSPECTIVE ON WOMEN IN THE 19TH CENTURY THROUGH LITERATURE 10
Zuhal Eroğlu
A COMPARATIVE STUDY ON THE OPTICAL PARAMETERS OF SOL GEL DERIVED DIFFERENT DOPED ZNO FILMS 14
Saliha Ilican
A CONTROL STRATEGY OF A TENDON DRIVEN MECHANISM BASED ON THE HUMAN LIKE DISCRETE/CONTINUOUS TIME CONTROLLER 15
Ryota ISHIBASHI
A FUZZY COGNITIVE MAP APPROACH TO PREDICT THE CHROMOSOMAL ABNORMALITIES BY USING THE TRIPLE TEST MARKERS AND DEMOGRAPHIC FACTORS 19
Tacettin Arıcı, Alptekin Durmuşoğlu
A NEW IMPLICIT TIME INTEGRATION METHOD FOR NONLINEAR STRUCTURAL DYNAMICS PROBLEMS 20
Kamil AYDIN
A NEW METHOD IN NDT OF WOOD: THERMAL CONDUCTIVITY 31
Şeref KURT, Mustafa KORKMAZ, Cemal ÖZCAN, Türker DÜNDAR, Mustafa AKTAŞ
A NEW MICROWAVE ASSISTED SYNTHETIC METHOD FOR THE SYNTHESIS OF 2-(1H-BENZO[D]IMIDAZOL-1-YL)-1-PHENYLETHAN-1-ONE OXIMES: AN EXPERIMENTAL AND COMPUTATIONAL STUDY 36
Taner ERDOĞAN
A NEW RP-HPLC METHOD FOR SIMULTANEOUS DETERMINATION AND VALIDATION OF ETODOLAC AND THIOCOLCHICOSIDE IN HUMAN PLASMA 45
Aysel Küçük Tunca, Neşe Şirin
A NEW SINGLE-PHASE PLL STRUCTURE FOR GRID-CONNECTED CONVERTERS 46
Hasan Dirik
A QUALITATIVE ANALYSIS OF EFL WRITTEN CORRECTIVE FEEDBACK 52
İhsan Ünaldı
A RELATIONSHIP BETWEEN BASIN AREA AND AVERAGE DISCHARGE A CASE STUDY FOR TURKEY 53
Mehmet Ishak Yuce, Musa Esit, Abdullah Muratoglu
A SERIES OF TWO DIMENSIONAL CD(II) COORDINATION POLYMERS CONSTRUCTED FROM 1,4-PHENYLENEDIACETATE AND BIS(IMIDAZOLE) DERIVATIVE COLIGANDS 63
Güneş Günay Sezer, Okan Zafer Yeşilel, Onur Şahin
A SHOCK DAMPER BASED ON A SYSTEM NANOPOROUS MEDIUM – NON-WETTING LIQUID 64
Anton Belogorlov, Danil Paryohin
A SHOT IN THE ARM FOR HANDLING CONSUMER DISPUTES ACROSS THE EU: ALTERNATIVE DISPUTE RESOLUTION SYSTEM 65
Yildiz Sekban
A STUDY OF TECHNICAL HIGH SCHOOL EVALUATION BENEFIT IN TAIWAN 70
Tsai-Feng Cheng, Huei-Chun Wu, Shi-Jer Lou, Shu-Fen Tseng, Vincent Ru-Chu Shih

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A TENDON DRIVEN MECHANISM USING PARALLELOGRAM LINKAGE WITH BALL JOINTS 71
Ryota ISHIBASHI
A THEORETICAL SYNTHESIS AND ASSESSMENT STUDY ON THE MATH USAGE SKILLS 75
Hayal Yavuz Mumcu
ACCOUNTING-BASED ANOMALIES IN THE BOND MARKET 76
Pietro Perotti, Steve Crawford, Richard Price, Christopher Skousen
ADANA İLİNDE ÇİFTÇİLERİN PÜLVERİZATÖR DOLUMU, TEMİZLİĞİ VE BİOBED KULLANIMI KONUSUNDAKİ ALIŞKANLIKLARININ BELİRLENMESİ 77
Ali Musa Bozdogan, Tülin Dağlıoğlu
ADAPAZARI-KARASU YÖRESİNDEKİ SAF DOĞU KAYINI (Fagus orientalis Lipsky.) ORMANLARINDA SIKLIK BAKIMININ ÇAP VE BOY GELİŞİMİ ÜZERİNDEKİ ETKİLERİ 78
Halil Barış ÖZEL, Erdal ÖZBAY, Nebi BİLİR
ADIYAMAN İLİNDE YABAN KEÇİSİ AV TURİZMİ 93
Abdulkadir GÜZEL, Mehmet ÖZCANLI
ADIYAMAN ÜNIVERSITESI MEVCUT AMBALAJ ATIĞI TOPLAMA SISTEMININ İNCELENMESI VE İYILEŞTIRILMESININ ARAŞTIRILMASI 99
Ceyda Çay, Abdurrahman Akkuş, Kamil B. Varinca, Mustafa Talha Gönüllü
AĞIZ ÇALIŞMALARINDA ARAŞTIRMACI VE KAYNAK KİŞİ İLE İLGİLİ SORUNLAR 101
Gönül ERDEM NAS
AKADEMİSYENLERİN SOSYAL HAYATLARI: ÖĞRETİM ÜYESİ GÖRÜŞLERİ 104
Yusuf TOLA, Sinan AYDIN
ALİYA İZZET BEGOVİÇ'İN EĞİTİM ANLAYILIŞI ÜZERİNE DEĞERLENDİRMELER 109
Asım Yapıcı, Mehmet Özcan
AN ACTUATOR SENSOR NODE PROTOTYPE FOR INTERNET OF THINGS APPLICATIONS 111
Ismail Kirbas
AN INVESTIGATION OF MALATHION TREATABILITY BY O3 AND O3/UV PROCESSES FROM AQUEOUS SOLUTIONS 112
Melike ISGOREN, Ayla ARSLAN, Eylem TOPKAYA, Sevil VELİ
ANADOLU KENT YAPISINDA GÖÇEBENİN YERLEŞME SÜRECİNE ETKİSİ 117
Süheyla Birlik, Fuat Fidan
ANALYSES OF ABA RESPONSES GENES IN ARABIDOPSIS THALIANA sos5 MUTANT UNDER NaCI STRESS 123
Tuba ACET
ANALYSIS OF CUTTABILITY OF METAL MATERIALS BY USING ABRASIVE WATERJET 127
Lutfiye Dahil, Ismet Dahil, Abdurrahman Karabulut
ANALYZING CPU SCHEDULING ALGORITHMS ACCORDING TO WAITING TIMES - A CASE STUDY 128
Ruya SAMLI
ANDROID TABANLI MOBIL TELEFON VE SMART CIHAZLAR ILE BLUETOOTH DÜŞÜK ENERJI ETKILEŞIMLI SINAV UYGULAMA VE DEĞERLENDIRME SISTEMI 135
Muhammer Ilkucar
ANTI-SCALE MAGNETIC METHOD AS A PREVENTION METHOD FOR CALCIUM CARBONATE SCALING 136
M. A. Salman, G. Al-Nuwaibit
ANTIBACTERIAL THIN FILM COATING BY SOL-GEL PROCESS 160
Ahmet Helvacı, Erol Goksu, Gökhan Akarca
ARCHITECTURE STUDENTS' PREFERENCES ON ARCHITECTURAL DESIGN STUDIO: IN TERMS OF BUILDING PHYSICS 161
Yasemin ERBİL, Filiz ŞENKAL SEZER
AVRUPA'DA OSMANLI GERİLEMESİ VE BALKANLAR ÜZERİNE SOSYOLOJİK BİR ANALİZ 167
Yüksel YILDIRIM

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BASEMENT MODELLING AND EVALUATION OF THE STRUCTURAL ELEMENTS USING GRAVITY DATA AT ISPARTA BASIN 171
Emrah BUDAKOĞLU, Ali SİLAHTAR, Günay BEYHAN
BAŞSAĞLIĞI İLANLARININ DİL VE İÇERİK ÖZELLİKLERİ ÜZERİNE BİR DEĞERLENDİRME 177
Zahide PARLAR
BENTONİT – ZEOLİT KARIŞIMLARININ SU EMME KARAKTERİSTİKLERİNE ZAMAN ETKİSİ 181
Gül Akıncı, Seda Durukan
BIBLIOMETRIC ANALYSIS ON SCIENTIFIC RESEARCH ON INNOVATION DIFFUSION 182
Zeynep D. UNUTMAZ DURMUŞOĞLU, Pınar KOCABEY ÇİFTÇİ
BIG DATA OVERVIEW WITH OPEN CHALLENGES AND RESEARCH AREAS 189
Talha Oktay, Adnan Kavak
BILGISAYAR DESTEKLI TASARIM SUNUM ÇALIŞMALARINDA YAZILIM PROGRAMLARININ KULLANIMI VE EĞITIMININ DEĞERLENDIRILMESI 190
Selen Yaman, Selma Buyukgoze, Nadir Subasi
BIM LIBRARY DEVELOPMENT CUSTOMIZED FOR THE ELDERLY HOUSING 191
Chansoon Choi, Jaehee Chung, Dongan Shin
BIODIESEL FUEL OBTAINED FROM SUNFLOWER OIL AS AN ALTERNATIVE FUEL FOR DIESEL ENGINES 192
Cumali ILKILIC, Cengiz ÖNER
BIQUATERNIONIC UNIFICATION OF THE GENERALIZED FIELD EQUATIONS IN GRAVITY AND ELECTROMAGNETISM 200
Murat Tanışlı, Süleyman Demir
BOR KATKILI ALÇILARIN TERMOMEKANIK ÖZELLIKLERI 201
Hakan Sarıkaya, Raşit Altındağ
CANONICAL MAP IN THE STABILITY OF CONTINUOUS TIME SYSTEMS 209
Vakıf Cafer, Taner Büyükköroğlu, Gökhan Çelebi
CARBON FOOTPRINT DETERMINATION OF A TURKISH CEMENT FACTORY 210
Betül ÖZER
CFD STUDY ON HEAT TRANSFER ENHANCEMENT IN A CIRCULAR TUBE EQUIPPED WITH TWISTED TAPE INSERT 213
Hakan Bucak, Fuat Yilmaz
CHARACTERIZATION OF NPS AND PUF BY SCANNING ELECTRONIC MICROSCOPY AND X-RAY DIFFRACTION AND RAMAN MICROSCOPY IN THE WORKPLACE. 221
Benlatreche Med Salah, Slimane Kahina
CHARACTERIZATION OF PBS FILMS PRODUCED BY CHEMICAL BATH DEPOSITION METHOD 222
Metin Kul
CHOOSING THE BEST TRAINING AIRCRAFT FOR A FLIGHT TRAINING ORGANIZATION BY MULTI CRITERIA DECISION MAKING METHODS 223
Ece YURDUSEVİMLİ, Asuman ÖZGER
CLONING AND EXPRESSION OF KERATINASE GENE IN E. COLI ROSETTA (DE3) PLYSS FROM NATIVE STRAIN BACILLUS LICHENIFORMIS C11 AND OPTIMIZATION OF FERMENTATION CONDITIONS FOR THE PRODUCTION OF KERATINASE BY RECOMBINANT STRAIN 228
Yasemin Caf, Burhan Arikan
CMAS BASED CERAMICS PRODUCTION USING DOLOMITE, KAOLIN AND ZIRCONIA 229
Nil Toplan, H. Özkan Toplan
COMBUSTION OF SILOPI COAL IN A ROTATING HEAD COMBUSTOR 236
Cengiz ÖNER, Cumali İLKILIÇ
COMPARATIVE EVALUATION OF REPLACEMENT FOUNDRY SAND WITH MINERAL FINE AGGREGATES ON HMA PROPERTIES 243
Bekir AKTAŞ, Şevket ASLAN

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COMPARATIVELY USE OF TIME SERIES AND ARTIFICIAL INTELLIGENCE METHODS IN THE PREDICTION OF AIR POLLUTANTS 249
Fatih TAŞPINAR, Kamran ABDOLLAHI
COMPARISON OF CONVENTIONAL AND MICROWAVE METHOD FOR THE DETERMINATION OF ACTIVATED CARBON PRODUCTION CHARACTERISTICS FROM WILD CHESTNUT SHELL 269
Esra Altintig
COMPARISON OF DIFFERENT TEMPORAL DATA WAREHOUSES APPROACHES 261
Georgia GARANI, Canan Eren ATAY
COMPARISON OF STATIC AND DYNAMIC STIFFNESS VALUE CHANGES FOR EMBEDDED AND SWALLOW FOUNDATIONS 272
Yüsa Gokhan Durgun
COMPARISON OF SUGAR AND ORGANIC ACID CONTENTS OF TURKISH ORANGES JUICES 273
Serkan SELLI
COMPARISONS OF POLYPROPYLENE COMPOSITES: THE EFFECT OF COUPLING AGENT ON MECHANICAL PROPERTIES 277
Umit HUNER
COMPUTERIZED ASSESSMENT OF THE ANNUAL GRADE POINTS OF SECONDARY SCHOOL SEVENTH GRADE STUDENTS IN THE COURSE OF ALGEBRA 289
Novruz Bashirov
CONSTRUCTION AND ANALYTICAL APPLICATIONS OF THREE DIFFERENT PVC MEMBRANE PH ELECTRODES 290
H.Elif Kormali Erturun, Ayca Demirel Ozel, Esma Kilic
CONTRIBUTION OF PRESCHOOL EDUCATION TO SOCIAL CAPITAL GAINS 292
Helin Erim Çetin, Eray Çetin
CRITICAL SUCCESS FACTORS IN INFORMATION TECHNOLOGY PROJECTS 297
İbrahim GUNDAK, Hakan ÇETİN
CYTOTOXIC AND APOPTOTIC EFFECT OF CHALCONE DERIVATIVE WITH BROMO SUBSTITUENT ON T47D BREAST CANCER CELLS 305
Retno Arianingrum, Indyah Sulistyo Arty
ÇEVİK YAZILIM GELİŞTİRME YÖNTEMLERİNDE ETKİLİ TEST ARAÇLARI 306
Ahmet BARAN, Funda AKAR, Fulya ASLAY
ÇİMENTO ESASLI TAMİR HARÇLARININ FİZİKSEL VE MEKANİK ÖZELLİKLERİNİ MALİYET AÇISINDAN İNCELENMESİ 314
Mücteba UYSAL, Yasin Ramazan SEZER
DEMİR ÇELİK ÜRETİCİSİ İLK ON ÜLKENİN DEMİR ÇELİK İHRACATININ GRİ TAHMİN YÖNTEMİYLE TAHMİNİ 319
Ahmet Ziyaeddin BULUM, Muharrem ÜNVER, Selçuk ÖZCAN
DESIGN AND SIMULATION OF AN ELECTRIC VEHICLE DRIVEN BY SERIES DC MOTOR USING THE EUDC CITY CYCLE 325
Hakan Suvak, Kemal Erşan
DESIGN OF FCL USING CORE WITH LOW INITIAL PERMEABILITY 326
Onur GUNEY, Ahmet CANSIZ
DESIGNING AND IMPLEMENTATION OF OUTDOOR TRANSFORMER SECURITY SYSTEM 327
Uğur Fidan, Naim Karasekreter
DETECTING CELLS USING IMAGE SEGMENTATION OF THE CERVICAL CANCER IMAGES TAKEN FROM SCANNING ELECTRON MICROSCOPE 334
Sevcan AYTAÇ KORKMAZ

DETECTİNG OF A PERSON'S FALLING MOMENT WITH MEAN SHIFT ALGORITHM 341
Yasemin POYRAZ KOÇAK, Selçuk SEVGEN
DETECTION THE CERVICAL CANCER 347

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Sevcan Aytac Korkmaz
DETERMINATION OF BORON IN HAZELNUT VARIETIES WITH THE ADDITION OF SORBITOL BY USING ICP-OES AND ULTRASONIC NEBULIZATION AFTER MICROWAVE DIGESTION SYSTEM 348
Mustafa Şahin DUNDAR, Huseyin ALTUNDAG, Gulsah Tunca
DETERMINATION OF CONTROL LIMITS FOR ASH CONTENT OF CLEAN COARSE COAL PROCESSED BY HEAVY MEDIUM DRUM 349
Adem TAŞDEMİR
DETERMINATION OF NATURAL REGENERATION SUCCESS OF BLACK PINE (PINUS NIGRA ARNOLD. SUBSP. PALLASIANA (LAMB.) HOLMBOE) AND ECONOMIC ANALYSES IN THE YENICE FOREST DISTRICT IN TURKEY 359
Ersin Güngör
DETERMINATION OF PLATINUM LEVELS IN FOOD SAMPLES BY ICP-MS AFTER PRE-CONCENTRATION 360
Uyan Yuksel
DETERMINATION OF SURFACE CHARACTERISTIC OF ATMOSPHERIC PRESSURE PLASMA MODIFIED POLYMERIC ULTRAFILTRATION MEMBRANE VIA CONTACT ANGLE MEASUREMENTS 361
Irem Damar Huner, Hacı Ali Gulec
DEVELOPING AN RESILIENT MODULUS ESTIMATION MODEL FOR GRANULAR ROAD MATERIALS 368
Altan Yilmaz
DEVELOPMENT AND EVALUATION OF WEB-BASED PRECONCEPTION HEALTH PROMOTION PROGRAM FOR COUPLE TO BE MARRIED 369
Nam Joo Je, So Yeong Choe
DEVELOPMENT OF THE MOBILE SERVICE ROBOT EQUIPPED WITH MULTIPLE SENSORS FOR HUMAN DETECTION AND TRACKING 370
Chantri Polprasert, Soravit Premanan
DİN VE TOPLUMSAL CİNSİYET KISKACINDA DEĞİŞEN KADIN ALGILARI: BIR TİPOLOJİ DENEMESİ 371
Asım Yapıcı
DÜZCE KENT ATMOSFERİNDE PM10 FRAKSİYONLARINDA ELEMENTAL KARBON SEVİYELERİNİN İNCELENMESİ 378
Seda ASLAN KILAVUZ, Zehra BOZKURT, Melek KELEŞ, Fatma ÖZTÜRK
DÜZCE YÖRESİ DOĞU KAYINI MEŞCERELERİNDE ARALAMA ŞİDDETİNİN ÖLÜ ÖRTÜ DİNAMİĞİNE KISA SÜRELİ ETKİLERİ 385
Ali Kemal ÖZBAYRAM
EFFECT OF Al CONTENT ON STRUCTURE AND WEAR BEHAVIOR OF AlCoCrFeMoNi HIGH ENTROPY ALLOYS 391
Hakan GAŞAN, Ersu LÖKÇÜ
EFFECT OF GROWTH RATE ON MICROSTRUCTURE AND MECHANICAL PROPERTIES OF AL-MN-SI TERNARY ALLOY 396
Hasan Kaya, Uğur Büyük, Emin Çadırlı, İzzettin Yılmazer
EFFECT OF LIMITING CURRENT DENSITY (LCD) IN HEAVY METAL REMOVAL BY ELECTRODIALYSIS SYSTEMS 397
Elif Oztekin, Sureyya Altin
EFFECT OF LITHIUM DOPING ON THE STRUCTURAL AND OPTICAL PROPERTIES OF CDS FILMS USED AS WINDOW LAYER IN SOLAR CELLS 406
Tülay Hurma
EFFECT OF THINNING INTENSITY ON THE STEM FORM OF NARROW-LEAVED ASH 407
Ali Kemal Özbayram

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EFFECT ON THE CORNEAL STRUCTURE OF THE METAL PARTICLES SCATTERED FROM CUTTING AND GRINDING 408
Tanju Teker, Ali Şimşek, Eyyüp Murat Karakurt
EFFECTS OF CHEMICAL MODIFICATION ON WOOD PROPERTIES 412
Suat ALTUN
EFFECTS OF COPPER CONTENT ON MICROSTRUCTURE AND MECHANICAL PROPERTIES OF AL–MN EUTECTIC ALLOYS 419
Uğur Büyük, İzzettin Yılmazer, Hasan Kaya, Emin Çadırlı
EFFECTS OF THE COUNT OF HIDDEN NEURONS ON ARTIFICIAL NEURAL NETWORKS 420
Serkan Sezer, Can Bülent Fidan
EĞİTİLEBİLİR ZİHİN ENGELLİ ÇOCUKLARDA DRAMA YOLUYLA YAPILAN EĞİTİM PROGRAMIN ZİHİN KURAMI BECERİLERİ ÜZERİNE ETKİLERİ 421
Oktay Taymaz Sarı
EĞİTİM ÖRGÜTLERİNDEKİ DEĞİŞİM SÜRECİNCE YAŞANAN SORUNLARIN İNCELENMESİ 430
Yaşar Adıgüzelli
ELECTRICAL AND THERMAL PROPERTIES AL-2MN-5FE TERNARY ALLOY 431
İzzettin Yılmazer, Emin Çadırlı, Uğur Büyük, Hasan Kaya
ELECTRONIC FLIGHT BAG IN THE OPERATION OF AIRLINE COMPANIES: APPLICATION IN TURKEY 432
Savaş Ateş
ELEMENTS TO BE CONSIDERED IN MUSIC AND COLOUR RELATION FOR EFFECTIVE EDUCATIONAL SOFTWARE 433
Gamze Sarmaşık Abur, Hande Sarmaşik, Özden Işiktaş
EMPIRICAL MODELING OF EXCHANGE RATE RETURNS 434
Rozana Liko, Artion Kashuri, Miftar Ramosaco
ENVIRONMENTAL EDUCATION AND EDUCATIONAL BEHAVIOR 443
Turana NASIBOVA
ENVIRONMENTAL MANAGEMENT SYSTEMS FOR PORT AREAS 446
Veysel TATAR
EVALUATION OF ARASTAS AND BAZAARS OF OTTOMAN CITIES WITHIN THE CONTEXT OF CONSTRUCTION MATERIALS AND ARCHITECTURAL TYPOLOGIES 453
Özlem ATALAN, Hasan Şahan AREL
EVALUATION OF THE EFFECTS OF SOME COMPOUNDS ON DILL CATALASE ACTIVITY 463
Gulnur Arabaci
EVALUATION OF THE ENVIRONMENTAL IMPACTS OF RENEWABLE ENERGY SOURCED ELECTRIC PRODUCTION FOR THE PROVINCE OF SINOP/ TURKEY 464
Yalçın ALCAN
EVALUATION OF VIRTUAL REALITY APPLICATIONS IN THE FIELD OF SPECIAL EDUCATION 472
Onur Özdemir, Dilek Erbaş, Şerife Yücesoy Özkan
EXPERIMENTAL AND COMPUTATIONAL STUDIES (DENSITY FUNCTIONAL THEORY) ON 2,5-BIS(1-NAPHTHYL)-1,3,4-OXADIAZOLE MOLECULE 473
Mustafa Kurt, Mustafa Çevik
EXPLORING DYNAMICS OF MULTIGRADE TEACHING IN PRIMARY SCHOOLS IN RURAL PAKISTAN 474
Zahida Mansoor, Summaira Sarfraz, Raheela Tariq
F TİPİ UÇUCU KÜL KULLANILARAK ÜRETİLEN ALKALİ AKTİVE EDİLMİŞ HARÇLARIN YÜKSEK SICAKLIK DİRENÇLERİ 477
M. Uysal, M. Kaya, K. Yılmaz

FACTORS PROMOTING STAPHYLOCOCCUS AUERUS DISINFECTION BY TiO2, SiO2 AND AG NANOPARTICLES 483
Merve ÖZKALELİ, Ayça ERDEM

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FAILURE CHARACTERISTICS OF GLASS-FIBER / EPOXY COMPOSITE JOINT STRUCTURES EXPOSED TO ACCELERATED AGING PROCESS 487
İbrahim Fadıl Soykök, Ahmet Murat Pınar, Ibrahim Aydın
FARKLI GEOMETRİLERE SAHİP AÇIK KANAL KESİTLERİNİN OPTİMİZASYONU 488
Mustafa Erkan TURAN
FARKLI ORANLARDA UÇUCU KÜL KULLANIMININ BETONARME DAVRANIŞA ETKİLERİ 498
Seda COSKAN, Murat Emre KARTAL, Murat CAVUSLI, Muhammet KARABULUT
FEN BİLGİSİ ÖĞRETMEN ADAYLARININ BİLİMSEL HİPOTEZ, TEORİ VE YASAYA YÖNELİK GÖRÜŞLERİ 508
Bülent AYDOĞDU, İlkay ERSÖZ
FEN BİLİMLERİ ÖĞRETMENLERİNİN BAKIŞ AÇISIYLA SOSYO-BİLİMSEL KONULAR 509
Bülent AYDOĞDU, Filiz KILIÇ
FRICTION AND WEAR BEHAVIOR OF PLASMA TRANSFERRED ARC COATING ON AISI 4140 STEEL OF BORON CARBIDE AND NICKEL POWDER MIXTURE 510
Gökçe Mehmet AY, Osman Nuri ÇELİK
FRICTION WELDING OF AL 7075 ALLOY AND 316 L STAINLESS STEEL 520
Osman TORUN
FRICTION WELDING OF THE AISI316 STAINLESS STEEL TO COMMERCIALLY PURE COPPER 524
İbrahim Çelikyürek
FUTURE APPLICATION OF THE MOTION THREADED MECHANISM 525
Vladimír Andrlík, Lucie Drahorádová
GEOGRİD DONATILI ŞEV DOLGUSUNUN STABİLİTE ANALİZİ 526
Zülküf KAYA, Erdal UNCUOĞLU, Hacı Bekir KARA, Aykut EROL
GÖRME ENGELLİLER İÇİN BİLİŞİM DÜNYASININ YETERLİLİĞİ VE KULLANILABİLİRLİĞİ; DÜNYADA VE TÜRKİYE'DE YAPILAN ÇALIŞMALAR 533
Ümmühan AKHİSAR
GÖRÜNTÜ İŞLEME TEKNİKLERİ KULLANILARAK ÇOKTAN SEÇMELİ SINAVLARI DEĞERLENDİRME SİSTEMİ 537
Hüseyin ESKİ, Ümit KOCABIÇAK
GRAPH-BASED SERVICE COMPOSITION: SOLUTION TO WEB SERVICES STANDARDS LIMITATIONS 542
Yousra Chtouki, Hamid Harroud, Mohammed khalidi Samir Bennani
HARD SURFACE COATİNG TiC (0.9C%) METAL POWDERS TO SURFACE OF THE AISI 1020 LOW CARBON STEEL WİTH PLASMA TRANSFERRED ARC METHOD 548
Ahmet BALIN, İlyas SOMUNKIRAN
HARRAN OVASI'NIN KURAKLIK KARAKTERİSTİKLERİ 559
Hurşit YETMEN, Adnan SEMENDEROĞLU, Ahmet Serdar AYTAÇ
HASTA ODALARININ MİMARİ MEKÂN VE YAPI ELEMANLARININ İŞLEVSEL PERFORMANSLARINDAN KULLANICI MEMNUNİYET DURUMUNUN İNCELENMESİNE YÖNELİK ÖRNEK ÇALIŞMA: ERÜ GEVHER NESİBE HASTANESİ 561
Z. Özlem PARLAK BİÇER, Nurselcen KARAASLAN, Murat ŞAHİN, Emine YILDIRIM, Cihangir BİÇER
HASTA VE ÇALIŞAN GÜVENLİĞİ BAĞLAMINDA C13 VE C14 ÜRE NEFES TESTLERİNİN KARŞILAŞTIRILMASI 573
Selahattin Tuncer, Ozcan Altinel, Yusuf Ziya Turk, Fatih Orhan, Semsettin Varol
HAVA TÜREVLERİ VE GELİŞMEKTE OLAN ÜLKELERDE KULLANIMINA YÖNELİK BİR UYGULAMA 574
Gülsen ALKAÇ ÖZDEMİR
HAVACILIK SEKTÖRÜNDE TOPLAM VERİMLİ BAKIM UYGULAMASI: CESSNA UÇAĞI PERVANE ÇATLAK ÇENTİK KONTROLÜ 587
Muharrem ÜNVER, Selçuk ÖZCAN, Ahmet Ziyaeddin BULUM

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HERMITE-HADAMARD-FEJER TYPE INEQUALITIES FOR CONFORMABLE FRACTIONAL INTEGRALS 594
Ilker Mumcu, Erhan Set
HİBRİT ARAÇLARDA DC/DC KIYICI İLE AKÜ ŞARJ DEVRESİNİN TASARIMI VE UYGULANMASI 595
Üzeyir Kuzu, Mustafa Nil
HİDROMEKANİK DERİN ÇEKME İŞLEMİNDE BASKI YASTIĞI/KALIP AÇISI DEĞIŞİMİNİN DERİN ÇEKME ORANINA ETKİLERİNİN SONLU ELEMANLAR YÖNTEMİ İLE ANALİZİ 596
Osman Anket, İbrahim Karaağaç, Tuncer Koruvatan
HM-CFRP İLE GÜÇLENDİRİLMİŞ KOMPOZİT KİRİŞLERİN YÜKLEMEDEN BAĞIMSIZ KAPASİTE ANALİZİNDE YENİ BİR YAKLAŞIM 603
Elif AĞCAKOCA, Zehra Şule GARİP
HYBRID IMPRINTED MEMBRANES AS TOOLS FOR SELECTIVE RECOGNITION OF QUERCETIN 609
I. Iben Nasser, C. Algieri, A. Garofalo, E. Drioli, C. Ahme1, L. Donato
HYBRID MATERIALS OF TRANSITION METAL DICHALCOGENIDES AND REDUCED GRAPHENE OXIDE 611
Hyeon Suk Shin
HYDROGEN ADSORPTION PROPERTIES ON NATURAL ZEOLITES FROM BIGADIC AND GORDES REGIONS 612
Meryem Sakızcı
IEEE 802.11 KABLOSUZ AĞLARDA MULTİMEDYA UYGULAMALARI İÇİN KULLANICI-TARAFLI GERİ-BİLDİRİMLİ HIZLI ÇERÇEVE İLETIMİ 613
Mehmet Fatih TÜYSÜZ
İMALAT SANAYİNDE FABRİKASYON METAL ÜRÜNLERİ İMALATININ (MAKİNE VE TECHİZAT HARİÇ) VE METALİK OLMAYAN DİĞER MİNERAL ÜRÜNLERİN İMALATININ İNCELENMESİ 617
Ece SİMOOĞLU SARI
IMPLEMENTATION OF BERNSEN'S LOCALLY ADAPTIVE BINARIZATION METHOD FOR GRAY SCALE IMAGES 621
Can EYUPOGLU
IMPORTANCE OF SKETCHING IN THE DESIGN PROCESS AND EDUCATION 626
Serpil Özker, Elif Süyük Makaklı
IMPROVED PI CONTROLLER FOR DC-DC BUCK CONVERTER 631
Faruk YALÇIN, Metin VARAN
INFLUENCE OF MICA CONTENT ON DYNAMIC SHEAR MODULUS OF SANDY SOILS 639
Seda DURUKAN , Ender BAŞARI
INFLUENCE OF TEACHER'S PERSONAL FACTORS AND ORGANIZATIONAL CHANGE STRATEGY ON TEACHER EVALUATION FOR PROFESSIONAL DEVELOPMENT IN ELEMENTARY SCHOOLS 645
Yang-Che Chen, Shi-Jer Lou, Ping-Feng Chao, Tsai-Feng Cheng
INFLUENCES OF PROCESS PARAMETERS ON THE QUALITY OF HYDROXYAPATITE COATING ON AZ91 MAGNESIUM ALLOY 660
Sevda ALBAYRAK, Henifi ÇİNİCİ, Recep ÇALIN, Canser CÖMERT

INFLUENCING FACTORS ON THE COGNITION OF FEMALE SENIORS LIVING IN FISHING VILLAGES 668
Mi-Yang Jeon, Yeong-Mi Seo
INTERNET OF THINGS AND THE END OF OFFSHORING 669
Isaac Minian, Ángel Martínez Monroy
INTERNET RESEARCH METHODOLOGIES 670
Cem Sefa Sütcü

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INVESTIGATION OF 2-ACETYLPYRIDINE IN A LOW TEMPERATURE NITROGEN MATRIX 671
Nihal Kuş
INVESTIGATION OF CARBON PREPREG DISC SPRINGS AT DIFFERENT ANGLES OF ORIENTATION 672
Haşim Fırat Karasu, Melih Belevi
INVESTIGATION OF CONCRETE GRAVITY DAM BEHAVIOUR CONSIDERING DAM–FOUNDATION–RESERVOIR INTERACTION 673
Muhammet KARABULUT, Murat Emre KARTAL, Murat CAVUSLI, Seda COSKAN, Oguzhan DURSUN
INVESTIGATION OF CORROSION BEHAVIOR OF HOISTING ROPES 681
Haşim Fırat KARASU, Mine DEMİRSOY
INVESTIGATION OF INHIBITORY EFFECTS OF TRIAZOLE DERIVATIVES ON THE PROTEASE ENZYMES 682
Neslihan Saki, Mustafa Akin, Gulnur Arabaci
INVESTIGATION OF SINGLE AND MULTI-LAYER NONWOVENS THERMAL INSULATION AND AIR PERMEABILITY BEHAVIORS 683
Seyda EYUPOGLU, Nigar MERDAN, Habip DAYIOGLU, Mehmet KILINC
INVESTIGATION OF SLOSHING IN A PRISMATIC TANK FILLED WITH DIFFERENT LIQUID LEVEL 688
Elif ERZAN TOPÇU, Eyüp KILIÇ, Kadir ÇAVDAR, İlker KUZUCU
INVESTIGATION OF TENSILE STRENGTH AND ELONGATION PROPERTIES OF BASALT FIBER-PUMICE REINFORCED POLYPROPYLENE COMPOSITES 694
Sabih OVALI, Süleyman İlker MISTIK
INVESTIGATION OF WIND POWER IN THE REGION OF SAKARYA PROVINCE (TURKEY) 699
Mehmet Coban, Hasan Kucuk, Mehmet Gunduz
INVESTIGATION ON ENDURANCE, SPEED AND VERTICAL JUMP PARAMETERS OF SOCCERS 700
Salih ERDEN
İPEK YOLUNUN ŞANLIURFA İNANÇ TURİZMİNE ETKİSİ: ŞEYH MESUD ÖRNEĞİ 704
Mehmet AKBIYIK
İŞKOLİZM VE MÜKEMMELLİYETÇİLİK 713
Okan ŞENELDİR, Sinan AYDIN
İZMİR ALİAĞA BÖLGESİNDE RÜZGAR TÜRBİNLERİNİN YÜKSEKLİĞE BAĞLI ENERJİ DEĞİŞİMLERİNİN İNCELENMESİ 720
Ibrahim Aydın, Ahmet Murat Pınar, Ibrahim Fadıl Soykök
KALMAN FILTER OFFLINE PARAMETER TUNING VIA GENETIC ALGORITHM AND A PASSENGER JET AIRCRAFT STATE ESTIMATION EXAMPLE 721
Aziz Kaba, Emre Kiyak
KARESEL KESİTLİ BORU HATTI ETRAFINDAKİ AKIMIN SAYISAL İNCELENMESİ 722
Alper ÖNER
KEY POINT EXTRACTION AND TRACKING OF TWO TARGETS WITH SIFT AND SURF METHODS 733
Yasemin POYRAZ KOÇAK, Selcuk SEVGEN
KOMPOZİT PANELLERDE CTP LEVHA VE ÇEKİRDEK KALINLIĞININ MEKANİK ÖZELLİKLERE ETKİSİ 740
Serkan Subaşı, Volkan Çetin, Ayhan Şamandar
KONUM BILGISI VE HAYATI SINYALLERIN APRS TABANLI TELSIZ HABERLEŞME SISTEMI ILE YAYINLANMASI 741
Tuna Göksu, Sinan Uğuz
KURUMSAL MİMARİLERDE NESNELERİN İNTERNETİ İÇİN GELİŞİME AÇIK YENİ BİR GÖREV VE ROL YÖNETİM SİSTEMİ TASARIMI 742

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Özgür ÇİFTÇİ, Ümit KOCABIÇAK, Hüseyin ESKİ
KÜRLEŞTİRİCİ MİKTARININ KOMPOZİT MALZEME ÜRETİMİNDE KULLANILAN FARKLI POLYESTER REÇİNELERİNİN MEKANİK VE FİZİKSEL ÖZELLİKLERİNE ETKİSİ 743
Serkan Subaşı, Şevki Eren, Ayhan Şamandar
LEAN PRODUCTION IN TERMS OF CUSTOMER VALUE 744
Zeynep TÜRK, Eray ÇETİN
LEO STRAUSS'TA MODERNİTENİN KRİZİ VE KRİZİN ÇÖZÜMÜ 751
Yasin PARLAR
LIDAR DATA ANALYSIS WITH DIGITAL IMAGE CORRELATION (DIC) IN OBTAINING LANDSLIDE DISPLACEMENT FIELDS: A CASE OF GSCHLIEFGRABEN LANDSLIDE-AUSTRIA 755
Abdurrahim AYDIN, Remzi EKER, Helmut FUCHS
LIQUEFACTION POTENTIAL AND POST-LIQUEFACTION SETTLEMENT OF SOMA WASTEWATER TREATMENT PLANT 762
Erdal UNCUOĞLU, Zülküf KAYA, Aykut EROL, Hacı Bekir KARA
LOCAL SOIL CLASSIFICATION AND SEISMIC ZONATION STUDY BY UTILIZING ReMi METHOD AND BOREHOLE DATA IN ISPARTA BASIN 771
Ali SİLAHTAR, Günay BEYHAN, Mehmet Zakir KANBUR
LUMINESCENT DETECTION OF BACTERIAL ENDOSPORES VIA FUNCTIONAL HYBRID NANOMATERIALS 776
Benan Kilbaş
MARDİN'DE BİYOKLİMATİK KONFOR KOŞULLARI AÇISINDAN İDEAL TURİZM DÖNEMLERİNİN BELİRLENMESİ 777
Ahmet Serdar AYTAÇ, Hurşit YETMEN, Adnan SEMENDEROĞLU, Mesut KOLBÜKEN
MARKA SADAKATİNİN DEMOGRAFİK FAKTÖRLER BAĞLAMINDA DEĞERLENDİRİLMESİ (EVALUATION OF BRAND LOYALTY IN THE CONTEXT OF DEMOGRAPHICAL FACTORS) 778
Tolga Dursun, Baran Arslan
MDS CODES FROM POLYCYCLIC CODES OVER FINITE FIELDS 779
Mehmet Özen, Halit İnce
MECHANICAL PROPERTIES OF TI-18NB ALLOY FABRICATED BY POWDER METALLURGY 783
Mehmet Kaya, Abdurrahman Yolun, Omer Çakmak
MERKEZİ ORTAK SINAVDA (TEOG) SORU SORULAN VE SORULMAYAN FEN BİLİMLERİ KONULARINI ÖĞRENME-ÖĞRETME SÜRECİNE İLİŞKİN ÖĞRETMEN GÖRÜŞLERİ 784
Melek Karaca, Sibel Saracoglu, Oktay Bektaş
MESLEK YÜKSEKOKULU İNŞAAT BÖLÜMÜ ÖĞRENCİLERİNİN MATEMATİKSEL YETERLİLİK ANALİZİ: KOCAELİ MYO ÖRNEĞİ 785
Bülent KOPARAN, Sinan AYDIN
METAL HİDRÜR ESASLI HİDROJEN DEPOLAMA SİSTEMLERİNDE REAKTÖR TASARIMI VE OPTİMİZASYONU 789
Muhammet Kayfeci, Fevzi Bedir, Engin Gedik
METEOROLOJİK VERİLERİN YÜK PROFİLLERİ HESABI ÜZERİNDEKİ ETKİLERİNİN İNCELENMESİ 795
Ali ÖZTÜRK, Salih TOSUN, Hasan ÇELİK, Ender ALTINIŞIK, Gizem MADENCİ
METHODOLOGY OF OPTICAL SPECTRAL ANALYSIS BY LIGHT EMISSION AND DETECTION 806
Manallah Aissa, Bouafia Mohamed
MICROSTRUCTURE AND MECHANICAL PROPERTIES OF FRICTION WELDED IRON ALUMINIDES 807
O. Torun
MİKRONİZE KALSİT VE PUZOLAN İÇEREN KENDİLİĞİNDEN YERLEŞEN BETONLARDA BASINÇ DAYANIMI TAHMİNİ 811
Ahmet BEYCİOĞLU, Adil GÜLTEKİN, Ayhan ŞAMANDAR, Yılmaz ARUNTAŞ, Serkan SUBAŞI

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MİMARİ BÜROLARDAN HİZMET ALAN MÜŞTERİLERİN KARŞILAŞTIKLARI MİMARİ BÜRODAN KAYNAKLANAN SORUNLARA YÖNELİK ALAN ÇALIŞMASI; KAYSERİ 817
Z. Özlem PARLAK BİÇER, Ayşe DEMİREL, Tuba ÖZDEMİR, Hürmet ÇOPUROĞLU, Burcu ULUTÜRK, Hümeyra DURSUN, Müzeyyen Merve HANCI, Rukiye YAVİLİOĞLU, Edem MURAKHAS
MİMARİ PROJELERDE MALZEME SEÇİMİNİN MALİYETE ETKİSİNİN SEDAD HAKKI ELDEM YAPILARI ÜZERİNDEN İNCELENMESİ 826
Z. Özlem PARLAK BİÇER, Zehra AKSOY, Merve HANCI, Emine YILDIRIM, Ayşe GÜN, Gülsüm ÖZATA, Merve BAŞHOROZ
MINIMIZING THE ENERGY OF THE VELOCITY VECTOR FIELD OF CURVE IIN R^3 836
Ayşe ALTIN
MOBİL MÜŞTERİ İLİŞKİLERİ YÖNETİMİ 840
Ela Sibel Bayrak Meydanoglu
MODEL OF ARCHITECTURAL LANDSCAPE CONFORMS TO ENVIRONMENT FOR AIR TEMPERATURE REDUCTION OF BUILDING ENVELOPE IN THAILAND 844
Thanawuth Khunthong
MODELLING APPROACHES OF PERFORMANCE EVALUATION OF HIGH QoS OF KERBEROS SERVER WITH DYNAMICALLY RENEWING KEYS UNDER PSEUDO CONDITIONS 845
Yoney K. EVER, Eser GEMIKONAKLI, Kamil DIMILILER
MODELLING HYDRAULIC CONDUCTIVIY OF SOIL MIXTURES 850
Ender Başarı, Seda Durukan
MODERN ARAP ŞİİRİNDE SEMBOLİZM AKIMI 857
Salih Tur
MULTI-WALLED CARBON NANOTUBES MODIFIED POLY(VINYL CHLORIDE) MEMBRANE COATED GLASSY CARBON ELECTRODE FOR IODIDE DETERMINATION 858
Semra Muratoglu, H.Elif Kormali Erturun, Esma Kilic, Ayca Demirel Ozel
NÂMIK EKREM'İN BAHÂR-I EDEB'İNDE EDEBÎ TENKİT 859
Ekrem BEKTAŞ
NEAR-FAULT, FAR-FIELD GROUND MOTION EFFECTS ON THE EARTHQUAKE PERFORMANCE OF RC BUILDINGS CONSIDERING VARIOUS CONCRETE STRENGTHS 868
Seda COŞKAN, Murat Emre KARTAL, Muhammet KARABULUT, Murat ÇAVUŞLİ
NEIGHBOR INTEGRITY OF HARARY GRAPHS 874
Goksen BACAK-TURAN, Ferhan Nihan ALTUNDAG
NEW CUFF BLADDER DESIGN USING A FEM 3D MODEL 878
Rinaldo Vallascas, Mariangela Usai
NOVEL PHTHALOCYANINES BEARING 2-(BENZYLTHIO)ETHOXY POLY(E-CAPROLACTONE) UNITS: SYNTHESIS AND CHARACTERIZATION 885
Murat MISIR, Nagihan ACIERİK, ÇiğdemYAĞCI, Ahmet BİLGİN
ON THE HİSTORY OF SOME LINEAR ALGEBRA CONCEPTS: FROM BABYLON TO PRE-TECHNOLOGY 887
Sinan Aydın
OPEN GREEN SPACES FUNCTION IN DESTINATION BRANDING: THE CASE OF BARTIN 891
Deniz ÇELİK
OPTIMAL HYDRAULIC DESIGN OF SEWER NETWORKS USING GENETIC ALGORITHM 902
Tulin Cetin, Mehmet Ali Yurdusev
OPTIMIZATION OF EFFECTS OF CUTTING PARAMETERS AND CUTTING TOOL PATH WIHT TAGUCHI GREY BASED 910
Mustafa Ay, Gültekin Basmacı
ORTADOĞU BÖLGESİNİN JEOEKONOMİK AÇIDAN İKİ STRATEJİK ENERJİ KAYNAĞI: PETROL VE DOĞALGAZ 917
Necmettin ELMASTAŞ, Veysi GÜNAL, M.Sait ŞAHİNALP
ORTADOĞU'DAKİ ENERJİ KAYNAKLARININ JEOEKONOMİK AÇIDAN DEĞERLENDİRİLMESİ 930

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Necmettin Elmastaş, Veysi Günal, Mehmet Sait Şahinalp
ORTAÖĞRETİMDE MATEMATİK EV ÖDEVLERİ: ÖĞRENCİ GÖRÜŞLERİ 931
Sinan AYDIN
OSMANLI DEVLETİNDE ARAPÇILIK VE TÜRKÇÜLÜK DÜŞÜNCESİNİN ORTAYA ÇIKIŞI 935
Fethi NAS
OTIZM SPEKTRUM BOZUKLUĞU OLAN ÇOCUKLARDA GÖZLEYEREK ÖĞRENME 940
Serhat Odluyurt, Melih Cattik
OTOMOBİL KLİMALARINDA PCB SEVİYELERİNİN BELİRLENMESİ 941
Demet ARSLANBAŞ, Ebru KOCASLAN NARCI
ÖĞRENCİLERİN KİŞİSEL BİLGİ GÜVENLİĞİ DAVRANIŞININ ANALİZİ 946
Bora ASLAN, Füsun YAVUZER ASLAN
ÖĞRETMEN ADAYLARINDA BİYOLOJİK RİTİM VE UYKU KALİTESİNİN AKADEMİK BAŞARIYA ETKİSİ 952
Selcen Süheyla Ergün, Ertuğrul Ergün
ÖĞRETMEN ADAYLARININ GÖZÜYLE ÇOCUK HAKLARI 959
Nuray Kurtdede Fidan
ÖĞÜTÜLMÜŞ ATIK PETLER İLE ISLAH EDİLEN ZEMİNLERDE SERBEST ŞİŞME POTANSİYELİNİN DEĞİŞİMİ 960
Mehmet SÖYLEMEZ, Osman GÜNAYDIN
PERCEPTIONS OF BUSINESS PROFESSIONALS TOWARDS MOBILE DEVICE USAGE 967
Süphan Nasır, Bengi Kurtuluş
PESTİSİT UYGULAMALARINDA KİŞİSEL KORUYUCU EKİPMANLARIN ÖNEMİ 973
Nigar Yarpuz-Bozdogan
PHENOLIC COMPOUNDS IN POMEGRANATE VINEGARS 974
Serkan SELLİ
PHYSICAL AND ECONOMIC ANALYSIS OF THE POTENTIAL WIND ENERGY PLANT IN SINOP/ TURKEY 980
Yalçın ALCAN
PHYTOCHEMICAL STUDY OF KAEMPFERIA ROTUNDA: FROM ETHNOMEDICINE TO DRUG DISCOVERY 987
Sri Atun, Retno Arianingrum
POLLEN MORPHOLOGY OF TWO MONOTYPIC SPECIES FROM APIACEAE GROWING IN TURKEY 988
Nagehan Saltan, Ayla Kaya
POLY (LINOLEIC ACID) GRAFT COPOLYMER IN METAL/POLYMER/SEMICONDUCTOR DIODE APPLICATIONS 989
Muharrem Gökçen
POSTAL MARKET LIBERALISATION AND ITS IMPACT ON THE MAIL SUPPLY CHAIN: THE CASE OF TURKEY 990
Mehmet Yiğit TÜRKMEN
PRECONCENTRATION AND DETECTION OF SOME METALS WITH CLOUD POINT EXTRACTION VIA 5,7-DIIODO-8-HYDROXYQUINOLINE LIGAND BY USING USN- ICP-OES AND INTERNAL STANDARD TECHNIQUE 994
Huseyin Altundag, Mustafa Şahin Dundar, Celal Caner, Ferhat Kaptan
PREDICTION OF ASH CONTENT FOR COARSE CLEAN COAL PREPARED WITH HEAVY MEDIUM DRUM BY ARIMA(1,0,1) MODEL 995
Adem TAŞDEMİR
PREPARATION OF ACTIVATED CARBON FROM APRICOT STONES WASTE AS LOW-COST ADSORBENT FOR REMOVAL OF FOOD DYE FROM AQUEOUS SOLUTION 1003
Fatma OGUZ ERDOGAN, Taner ERDOGAN
PROJE YÖNETİMİ STRATEJİ OLUŞTURMA ETKİNLİĞİNİ ARTTIRACAK BİR MODEL ÖNERİSİ 1012
İlker DOĞAN

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PROPERTIES OF MORTARS USED IN OTTOMAN PERIOD HISTORICAL BUILDINGS; AN EXAMPLE OF DENIZLI İLBADE CEMETRY 1017
Adem Solak
QUANTUM SHAPE KINEMATICS 1018
Furkan Semih Dündar, Barış Tamer Tonguç
RANDOMIZED RESPONSE TECHNIQUES AND ITS APPLICATION 1021
Nilgün Özgül, Hülya Çıngı
REAL ESTATE VALUE CHANGES ACCORDING TO FACTOR OF URBAN TRANSFORMATION 1022
Şükran Yalpir, Aslı Bozdag
RELATIONSHIP BETWEEN STOCK MARKET INDICES AND GOOGLE TRENDS 1023
Aysun Bozanta, Mustafa Coskun, Birgul Kutlu, Meltem Ozturan
RELEVANT TERMS AND XML DOCUMENTS RELEVANT: RESEARCH AND EXTRACTION. 1028
Abdeslem Dennai
ROBUST NETWORK FLOW PROBLEM WITH TWO MULIPLICATIVE OBJECTIVE COEFFICIENT 1029
Taehan Lee, Keunho Lee
RSSI BASED CLUSTERING ALGORITHM FOR WIRELESS SENSOR NETWORKS 1030
Naim Karasekreter, Fatih Başçiftçi, Uğur Fidan
SCALE-UP OF ZEOLITE MEMBRANES FOR DESALINATION 1037
C. Algieri, A. Garofalo, M. C. Carnevale, L. Donato, E. Drioli, O. Alharbi, S. A. Aljlil, A. Criscuoli
SCREENING OF PKS/NRPS GENE REGIONS ON MARINE DERIVED ACTINOBACTERIA 1038
Kadriye ÖZCAN
SEISMIC BEHAVIOR OF MULTI-STORY REINFORCED CONCRETE BUILDINGS WITH SHEAR WALLS ALONG THE PERIMETER OF BUILDING 1042
Nihat Cetinkaya, Mohamad Kinan Othman
SENSÖR TABANLI YERLEŞKE OTOMASYON SİSTEMİ: İBEACON TEKNOLOJİLERİ YARDIMI İLE PERSONEL BİLGİ MOBİL UYGULAMASI 1043
Muhammer İLKUÇAR
SERAMİK SEKTÖRÜNDE İŞ ANALİZİ VE İŞ DEĞERLEMESİ 1051
Selçuk ÖZCAN, Ahmet Ziyaeddin BULUM, Muharrem ÜNVER
SHEAR WAVE VELOCITY DETERMINATION FOR SILTY SAND SOILS 1059
Mehmet İnanç Onur
SHORT-TERM MULTI-STEP WIND SPEED PREDICTION USING STATISTICAL METHODS AND ARTIFICIAL NEURAL NETWORKS 1064
İsmail Kırbaş
SIMILAR AND DIFFERENT FEATURES OF SELF-SIMILAR GROUPS IN THE SENSE OF IFS AND TREE AUTOMORPHISM 1065
Mustafa Saltan, Bünyamin Demir
SOME NOTES ON THE PERIODICITY OF A NON-LINEAR DIFFERENCE EQUATION 1066
Erkan Taşdemir, Yüksel Soykan
SOME PROPERTIES OF THE HOMOTETIC MOTION: CHRACTERISTIC POINT AND MINIMAL ACTION 1067
Ayhan Tutar, Serdar Soylu
SOSYAL SORUMLULUK PROJELERİNDE BİR ARAŞTIRMA; ENGELLİ, ENGELSİZ BİRLİKTE YAŞIYABİLİYOR MUYUZ? 1068
Ümmühan AKHİSAR, Hüseyin AKHİSAR, Furkan Uğur EŞİTTİ
SOURCES, RISKS AND REMEDIATION TECHNIQUES OF HEAVY METALS IN CONTAMINATED SOILS 1071
Aslı Kurnaz
STABILISING ELASTIC NETWORKS WITH MULTI-AGENT SYSTEMS 1072
Anthony Lucas Smith, Joseph Webber

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STAJ EŞLEŞTIRMEYE YÖNELIK KARAR DESTEK SISTEMI KAPSAMINDA GELIŞTIRILEN HAVACILIK STAJ YAZILIMI İNTERNET SITESI KULLANILABILIRLIĞINE İLIŞKIN BIR ARAŞTIRMA 1073
Savaş Ateş, Kadriye Yaman
STANDART YAĞIŞ İNDEKSİ İLE KURAK DÖNEMLER ANALİZİ: MANİSA ÖRNEĞİ 1074
Barış Yılmaz
STATİK YÜK ALTINDA DEMONTE TİPİ KİTAPLIK RAFLARIN RİJİTLİK ANALİZİ 1075
Ali Naci TANKUT, Abdurrahman KARAMAN
STRATEGIC DECISION SUPPORT SYSTEM BASED HYBRID MODELS FOR COLLEGES ENROLLMENT CAPACITY PLANNING: DESIGN & IMPLEMENTATION 1088
Said Ali I El-Qulit, Abdul Hamid Mohamed Ragab, Abdulfattah Suliman Mashat, Reda Abdelaal, Ali Wagdy Mohamed, Amin Yousef Noaman, Abdulrahman Helal Altalhi
STUDY ON TRIBOLOGICAL BEHAVIOR FOR NANO POWDER POLYMER BLENDS 1099
Sezgin ERSOY
SÜSPANSİYON PARAMETRELERİNİN DEĞİŞİMİNİN ARAÇ YOL TUTUŞUNA ETKİLERİNİN İNCELENMESİ 1103
Emre İsa ALBAK, Erol SOLMAZ, Necmettin KAYA, Ferruh ÖZTÜRK
SYNCHRONIZATION AND ANTI-SYNCHRONIZATION OF SPROTT J CHAOTIC FLOWS USING ONE STATE SLIDING MODE CONTROLLER 1112
Yılmaz Uyaroğlu, Uğur Erkin Kocamaz
SYNTHESIS AND CHARACTERIZATION OF DOPAMINE SUBSTITUE TRIPODAL TRINUCLEAR S-TRIAZINE COMPLEXES 1120
Şaban Uysal, Ziya Erdem Koç
SYNTHESIS AND CHARACTERIZATION OF SNO2 THIN FILMS DEPOSITED BY SPRAY PYROLYSIS TECHNIQUE 1121
Evren Turan, Seçkin Akın
SYNTHESİS AND CRYSTAL STRUCTURE OF HG(II) COORDİNATİON POLYMER WİTH THE RİGİD 4,4'-ABPY 1122
Figen Arslan Biçer, Semiha Yıldırım, Martina Bubrinc
SYNTHESIS AND THEORETICAL STUDY OF 2,4-DIOXOPENTANOIC ACID DERIVATIVES (3A-C) 1126
Murat Saracoglu, Fatma Kandemirli, Zulbiye Kökbudak, Ayhan Özalp
SYNTHESIS, CHARACTERİZATİON AND GLUTATHIONE REDUCTASE INHIBITORS STUDIES OF DINUCLEAR COPPER (II) COMPLEXES 1127
Turgay TUNÇ
SYNTHESIS, IN VITRO INHIBITION EFFECT AND STRUCTURE-ACTIVITY RELATIONSHIP OF NEW THYMOL DERIVATIVES ON CHOLINESTERASES 1128
Fatih SONMEZ
SYNTHESIS OF NAPHTHALENE DERIVATIVE LIGAND CONTAINING THE AZOMETHINE GROUP, AND ITS MN (II) AND ZN (II) COMPLEX AND INVESTIGATION OF FLUORESCENCE PROPERTIES 1132
Murat Tuna, Seçkin Derin, Salih Zeki Yıldız
SYNTHETIC FIBER DYEING WITH SYNTHESIZED NOVEL DISPERSE DISAZO DYES CONTAINING METHYL (-CH3) GROUP AS AN AUXOCHROME AND THEIR COLOR PROPERTIES 1133
Emine Bakan, Fikret Karci, Ozan Avinç
TACTİLE SENSOR DESIGN FOR LUMP DETECTION IN BREAST TISSUE 1134
Mustafa Zahid Yıldız, Hamid Asadi Dereshgi, Ali Furkan Kamanlı
TEACHERS' VIEWS ON THE USE OF INTERACTIVE EDUCATION WEBSITES IN SOCIAL STUDIES CLASSES 1147
Nuray Kurtdede Fidan

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TECHNOLOGICAL SUSTAINABILITY OF MOBILE LEARNING 1156
Abide Coskun-Setirek, Zuhal Tanrikulu
TECHNOLOGY FOR PLANETARY SCIENCE AND EDUCATION 1165
Emily Law
TESTS TO INCREASE RETENTION IN FIR WOOD 1166
Şeref KURT, Muhammed Nuri GÜNAY, Kadir KAYAHAN, Hüseyin YÖRÜR
THE CHARACTERISATION OF BIMETAL DISKS USED FOR THERMOSTATIC CONTROL AND OVER-TEMPERATURE PROTECTION 1169
Adem CALISKAN, Adem ONAT
THE COLOR PREFERENCES OF CONSUMERS ON FURNITURE SURFACES 1177
Hasan Huseyin CIRITCIOĞLU, Abdullah Cemil İLCE, Erol BURDURLU
THE COMPARISON OF ROBUST PARTIAL LEAST SQUARES REGRESSION METHODS (RSIMPLS, PRM) WITH ROBUST PRINCIPAL COMPONENT REGRESSION FOR PREDICTING TOURIST ARRIVALS TO TURKEY 1188
Esra Polat
THE COMPLEMENTARY ROLE OF BIOINFORMATICS IN ANALYZING THE FUNCTIONAL ASSOCIATION BETWEEN GTPASE ACTIVATING PROTEINS (GAPS) AND RAB GTPASES 1189
Silviu Faitar, Jeremiah Davie
THE DISPENDED OF DRUG SET WITH STEROIDS FOR RELIEF ASTHMA SYMPTOM IN THE RATCHATHEWI DISTRICT, BANGKOK, THAILAND 1190
Pimporn Thongmuang
THE ECAT SOFTWARE PACKAGE TO ANALYZE EARTHQUAKE CATALOGUES 1197
Tuba Eroğlu Azak
THE EFFECT OF COLD PLASMA TECHNIQUE ON SOME PATHOGEN MICROORGANISMS FOR MEAT PRODUCTS 1205
Veli GÖK, Simge AKTOP, Recep KARA, Mehmet ÖZKAN
THE EFFECT OF GEOMETRICAL (RADIATION) DAMPING ON SOIL-STRUCTURE INTERACTION PROBLEMS 1206
Yeşim TUMSEK, Erkan CELEBI
THE EFFECT OF HEAT TREATMENT ON MAGNETIC PROPERTIES OF RAPIDLY SOLIDIFIED MNAL ALLOY RIBBONS 1213
Bedri BAKSAN
THE EFFECT OF METAKAOLIN ADDITIVE ON FLY ASH – BASED GEOPOLYMER FOAM PROPERTIES 1217
Gökhan Görhan, Gökhan Kürklü
THE EFFECT OF RESERVOIR LENGTH ON THE EARTHQUAKE BEHAVIOR OF ROLLER COMPACTED CONCRETE DAMS 1223
Murat CAVUSLI, Ismail Hakki OZOLCER, Murat Emre KARTAL, Muhammet KARABULUT, Seda COSKAN
THE EFFECTS OF DENSIFICATION AND HEAT TREATMENT ON THERMAL CONDUCTIVITY OF FIR WOOD 1231
Hüseyin Pelit, Mustafa Korkmaz, Mehmet Budakçı, Rasit Esen
THE EFFECTS OF EDUCATIONAL DRAMA ON THEORY OF MIND SKILLS IN EDUCABLE INTELLECTUAL DISABILITY STUDENTS 1237
Oktay Taymaz Sari
THE EFFECTS OF SOCIAL MARKETING EFFORTS ON CONSUMERS: THE ICE BUCKET CHALLENGE 1238
Selay ILGAZ SÜMER
THE EFFECTS OF THE CONSTITUENTS ON THE MECHANICAL PROPERTIES OF THE POLYESTER MATRIX COMPOSITES REINFORCED WITH CALCITE PARTICULATES 1243
İbrahim ÇELİKYÜREK

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THE EFFECTS OF WORKPLACE FRIENDSHIP ON JOB INVOLVEMENT 1247
Can BİÇER, Ozan BÜYÜKYILMAZ
THE EVALUATION OF ENVIRONMENTAL ENGINEERING EDUCATION PROGRAMME -A CASE STUDY OF BURSA ULUDAG UNIVERSITY FROM TURKEY 1254
Berrak EROL NALBUR, Arzu TEKSOY, Seval Kutlu AKAL SOLMAZ
THE IMPORTANCE AND ESTABLISHMENT OF THE INDICATORS FOR ENERGY SAVING AND CARBON REDUCTION FOR AUTOMOBILE AND MOTORCYCLES 1261
Cheng-Lung Tsai, Chih-Chao Chung, Hsu-neng Chen, Shi-Jer Lou
THE IMPORTANCE OF ONTOLOGY IN SOFTWARE ENGINEERING EDUCATION PROGRAMS 1269
Zeynep Altan
THE IMPORTANT COMPONENT OF VOCATIONAL AND TECHNICAL EDUCATION: VOCATIONAL SCHOOLS 1277
Tümay Atakan, Ozdemir Ay
THE INTERACTIVE LEARNING OF INTEGRATING ANIMATION GAME WITH KINECT SYSTEM FOR SENIOR WITH MILD ALZHEIMER 1278
Hui-Ying Chang, Shi-Jer Lou, Tsai-Feng Cheng
THE INTERPRETATION OF THE SKILLS OF THE STUDENTS IN MATH DEPARTMENT FOR USING MATH IN REAL LIFE: A CROSS – AGE STUDY 1286
Hayal Yavuz Mumcu, Meral Cansiz Aktaş
THE LABORATORY IMPLICATIONS BASED ON ARGUMENTATION OF PRE-SERVICE SCIENCE TEACHERS 1288
Bülent AYDOĞDU, Nil DUBAN
THE LENGTH-WEIGHT RELATIONSHIP AND CONDITION FACTOR OF ANGORA LOACH, OXYNOEMACHEILUS ANGORAE (STEINDACHNER, 1897) INHABITING KILIÇÖZÜ STREAM IN KIZILIRMAK RIVER BASIN (CENTRAL ANATOLIA-TURKEY) 1297
Okan Yazicioğlu, Ramazan Yazıcı
THE NEUTRON MACROSCOPIC CROSS SECTIONS CALCULATION OF SOME MINERALS BY USING FLUKA MONTE CARLO METHOD 1298
Aybaba HANÇERLİOĞULLARI, Turgay KORKUT, Yosef G Ali Madee
THE RECENT INCREASE IN THE USE OF MORNING-AFTER PILL AND THE DECREASE IN THE AGE OF THE FEMALE CONSUMERS IN IRAN 1307
Nicole Jafari, Saghar Janamian, Naghmeh Taghavi
THE REFLECTION OF URBAN POVERTY ON CHILD POVERTY 1317
Tahir Emre GENCER
THE RELATIONSHIP BETWEEN CHILD AND URBAN SAFETY: CHILD-FRIENDLY SAFE CITIES 1319
Tahir Emre GENCER, Damla KARAGÖZ
THE RELATIONSHIP BETWEEN LANGUAGE LEARNING STRATEGY, L2 PROFICIENCY AND LEARNING VARIABLES OF KOREAN HIGH SCHOOL STUDENTS 1325
Hyun-Kyu Choi, Sue-Jeong Shin, Hee-Kyung Lee, Myunghwan Hwang
THE RELATIONSHIP BETWEEN WATER QUALITY AND SOCIO-ECONOMIC DEVELOPMENT 1326
Ekrem Mutlu, Telat Yanik
THE RELATIONSHIP OF PERCEPTION OF PREGNANCY RISK, ANXIETY, AND SPOUSAL SUPPORT IN PRIMIGRAVIDAS 1327
Mi Hye, Kim So Yeong, Choe
THE USE OF WEB 2.0 PLATFORM AS A COURSE SCHEDULE: THE EXAMPLE OF YOUTUBE 1335
Selma BÜYÜKGÖZE, Selen YAMAN, Nadir SUBAŞI
THEORETICAL AND EXPERIMENTAL VIBRATION ANALYSES OF BRIDGE WINGS ON LARGE SHIPS 1340
Adil Yücel, Alaeddin Arpaci
TİCARİ ARAÇ SÜRÜCÜ KOLTUĞUNUN DİNAMİK KONFOR ANALİZİ İÇİN BİR SONLU ELEMAN MODELİNİN OLUŞTURULMASI 1341
E.Samet ERGÜN, Sevda TELLİ ÇETİN

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TIYOFEN HALKASI İÇEREN YENI SÜBSTITÜE İMIDAZO[2,1-B][1,3,4]TIYADIAZOL TÜREVLERININ SENTEZI, KARAKTERIZASYONLARI, ANTIFUNGAL AKTIVITELERININ DEĞERLENDIRILMESI VE MOLEKÜLER DOCKING ÇALIŞMASI 1347
Mustafa Er, Buğracan Ergüven, Hakan Tahtaci, Abdurrahman Onaran, Tuncay Karakurt
TOKAT – RESTORATION OF THE CARAVANSARAY OF PAZAR MAHPERI HATUN 1348
Serdar Kasap, Başak Zengin
TORNALAMADA MEYDANA GELEN TIRLAMA TİTREŞİMLERİN YÜZEY PÜRÜZLÜLÜĞÜNE ETKİSİNİN İNCELENMESİ 1358
Selim BACAK, Serkan AYDIN
TORQUE AND FLUX RIPPLE MINIMIZATION OF DTC CONTROLLED IM BY USING FUZZY LOGIC DUTY-RATIO ESTIMATOR AND HYBRID FLUX OBSERVER 1364
Yavuz USER
TORSIONAL BEHAVIOURS OF HOLLOW CIRCULAR GLASS/EPOXY COMPOSITE SHAFTS WITH DIFFERENT ORIENTATION ANGLES 1368
Hayri Yildirim, Haşim Pihtili, Şükrü Çetinkaya
TOZ METALURJİSİ ve SICAK EKSTRÜZYON PROSESLERİ İLE ÜRETİLEN AA7075-SİCP KOMPOZİTLERİN AŞINMA ve KOROZYON DAYANIMINA T73 ISIL İŞLEMİNİN ETKİSİ 1374
Kübra TANATTI, Ulaş MATİK
TREATABILITY OF FOOD INDUSTRY WASTEWATER BY O3/UV/H2O2 ADVANCED OXIDATION PROCESSES 1380
Eylem Topkaya, Ayla Arslan, Bilge Özbay, İsmail Özbay, Sevil Veli
TUMOR DETECTION ON CT LUNG IMAGES USING IMAGE ENHANCEMENT 1390
Kamil DIMILILER, Buse UGUR, Yoney K. EVER
TURIZM ÖN LISANS PROGRAMLARINDA MESLEK AMAÇLI İNGILIZCENIN (EOP) KARŞILAŞTIRMALI İHTIYAÇ DEĞERLENDIRMESI 1396
Akif Gökçe, Orhan Batman
TURİZM PAZARLAMASINDA BİLGİ TEKNOLOJİLERİNİN KULLANIMI: AKILLI OTEL ODASI OTOMASYON SİSTEMİ 1397
Selay ILGAZ SÜMER, Mehmet UĞUR, Emre SÜMER
TURİZM SEKTÖRÜ İÇİNDE AŞÇILIK MESLEĞİNİN KADIN İSTİHDAMINDAKİ ROLÜ 1402
Mutlu DOĞAN
TÜKETİCİLERİN TEKNOLOJİK YENİLİKLERİ BENİMSEMESİ: BULUT TEKNOLOJİSİNİN BENİMSENMESİNİN UTAUT MODELİYLE ARAŞTIRILMASI 1408
Can Efecan AKHAN, Erkan ÖZDEMİR
TÜKETİCİLERİN YERLİ VE YABANCI ÜRÜNLERE YÖNELİK TUTUMLARI: KOZMOPOLİT TÜKETİCİ TUTUMUNUN YÜKSEKÖĞRENİM GÖRMÜŞ BİREYLER ÜZERİNDE ARAŞTIRILMASI 1415
Can Efecan AKHAN, Murat Hakan ALTINTAŞ
TÜRK SİVİL HAVACILIK ALANINDA EĞİTİM VEREN YÜKSEKÖĞRETİM KURUMLARININ MEVCUT DURUM ANALİZİ 1423
Savaş S. ATEŞ, Hasan LİK
TÜRKİYE'DE SIĞINMA EVLERİNDE KALAN KADINLARIN İSTİHDAMA KAZANDIRILMA ÇALIŞMALARI VE MARMARA BÖLGESİ ÖRNEĞİ 1432
Öğr.Gör. Ayşegül HANCI, Öğr.Gör. Ferda BOZKURT, Yrd.Doç.Dr. Tijen ÖVER ÖZÇELİK, ŞÖNİM Müdürü Yadigâr EKERBİÇER
TÜRKİYE'DEKİ ADLİ HİZMETLERİN DİJİTALLEŞMESİNDE KARŞILAŞILAN SORUNLAR VE ÇÖZÜM ÖNERİLERİ 1439
Özlem OKTAL
TÜRKİYE VE İTALYA ARASINDAKİ TİCARETİN DURUMU VE GELİŞTİRİLMESİNE YÖNELİK ÖNERİLER 1443
Mehmet ÖZCANLI

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TÜRKİYE' DE KÜRESELLEŞMENİN ÇEVRESEL KALİTE ÜZERİNDEKİ ETKİSİ: EKONOMETRİK BİR ANALİZ 1451
Emrah KOÇAK
TÜRKİYE'DE NÜFUSUN DOĞDUĞU İLE GÖRE ANALİZİ: ORANSAL DEĞİŞİMLER (1950-2014) 1457
Veysİ Günal, Mehmet Sait Şahinalp, Necmettin Elmastaş
TÜRKİYE'DE ŞEHİRLEŞME HAREKETLERİ-TERÖR OLAYLARI İLİŞKİSİ 1459
Mehmet Sait ŞAHİNALP, Veysi GÜNAL
TÜRKİYE' DE YAŞAYAN İNSANLARIN YAŞAM DÜZEYİ MEMNUNİYETİ ÜZERİNE BİR ÇALIŞMA 1468
Hale Bütün Bayram, Aysen Şimşek Kandemir
TÜRKİYE'DEKİ YAZILIM MÜHENDİSLİĞİ LİSANS MÜFREDAT PROGRAMLARININ KARŞILAŞTIRILMALI OLARAK İNCELENMESİ 1472
Tuncay Aydoğan, Sinan Uğuz, Y. Erkan Görgülü, Fatih Gençtürk
ULTRASOUND ASSISTED SYNTHESIS OF ZINC BORATE 1481
Tuğçe Songür, Hikmet Okkay
UNICEF ÜLKELER RAPORU IŞIĞINDA TÜRKİYE'NİN ÇOCUK GÜVENLİĞİ BAKIMINDAN DÜNYADAKİ YERİ 1482
Tuğrul BAYRAKTAR, Turgay TÜRKER, Yasemin ALTUN TÜRKER
URLA-ÇEŞME YARIMADASININ MORFOTEKTONİK ÖZELLİKLERİ 1486
Adnan SEMENDEROĞLU, Ahmet Serdar Aytaç, Hurşit Yetmen
USE OF MOLTEN SALT METHOD IN THE SYNTHESIS OF METAL HYDRIDE ELECTRODE MATERIALS 1487
Mustafa ANIK
ÜÇGEN VEYA SINÜZOİDAL DİNAMİK YÜK İLE YÜKLENMİŞ DİK TABAKALI VİSKOELASTİK SIĞ KÜRESEL KALIN KABUKLARIN DİNAMİK DAVRANIŞLARI 1492
Mehmet Fatih ŞAHAN, Kazım Ahmet HAŞİM
ÜLKEMİZDE ÜNİVERSİTE SANAYİ İŞBİRLİĞİNİN ÖNEMİ 1499
İbrahim Aydın, Hasan Zeki Diril
VACATIONING AT A DESTINATION UNDER TERORISM RISK: TOURISTS' DESTINATION IMAGE PERCEPTIONS ABOUT ISTANBUL 1500
Prof. Dr. Süphan NASIR, M.Talha YILMAZ, MBA, Ph.D. Student
VARDİYALAR ARASI ALGILANAN İŞ YÜKÜNÜN NASA-TLX METOTU İLE ARAŞTIRILMASI 1507
Turgay TÜRKER, Yasemin ALTUN TÜRKER, Tuğrul BAYRAKTAR
VARIATION OF DRIVING CONCENTRATION WITH DRIVER PERCEPTION THROUGH IN-CAR VIEW ROAD SCENE AS VISUAL STIMULANT 1515
Sevcan AYTAÇ KORKMAZ
WEAR BEHAVIOR OPTIMIZATION OF MULTI DIRECTIONAL CUTTING TOOLS IN THE ROUGH TURNING OF AISI 4140 1522
Ahmet Murat PİNAR, İbrahim AYDIN, Fadıl SOYKÖK
WOLLASTONİT, ALÜMİNA VE SİLİKA TUĞLA HARCINDAN ÜRETİLEN CAS SERAMİKLER 1523
Sena BALLICAOĞLU, Şeyda GEDİK, Utku Kıvanç KURTKAPMAZ, H. Özkan TOPLAN Nil TOPLAN
YAPAY SİNİR AĞLARI İLE KISA DÖNEM YÜK TAHMİNİ 1530
Salih TOSUN, Ali ÖZTÜRK, Hasan ÇELİK, Gökmen HASANÇEBİ, Halit YILMAZ
YAZILIM MÜHENDİSLİĞİ LİSANS PROGRAMLARINDA ONTOLOJİNİN ÖNEMİ 1539
Zeynep Altan
YENI SÜBSTITÜE 2-AMINO-1,3,4-TIYADIAZOL TÜREVLERININ SCHIFF BAZLARINI İÇEREN BILEŞIKLERIN SENTEZI VE KARAKTERIZASYONU 1540
Hakan Tahtacı, Mustafa Er

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YEREL SİYASET ve SİYASAL KÜLTÜR: ŞANLIURFA BÜYÜKŞEHİR BELEDİYE MECLİS ÜYELERİ ÖRNEK OLAY İNCELEMESİ 1541
A. Vahap ULUÇ, Abdullah ÇELİK
YEREL ZEMİN KOŞULLARININ EN BÜYÜK İVME DEĞERİNE ETKİSİ 1552
Ercan IŞIK
ZİHİNSEL VE RUHSAL ENGELLİLERE YÖNELİK TERAPİ BAHÇELERİ: ÖZEL BAKIM MERKEZLERİ ÖRNEĞİ 1558
Sebahat Açıksöz, Pınar Bollukcu, Gizem Cengiz Gökçe, Z. Setenay Yar
ZONGULDAK İLİ EMNİYET KEMERİ KULLANIM DURUMUNUN DEĞERLENDİRİLMESİ 1566
Mine Polat, Mustafa Tanış
EXPOSURE ASSESSMENT OF HALOGENATED POPS IN STREET DUST IN AN INDUSTRIALIZED CITY 1567
Merve Kara, Bilgehan Başaran, Mihriban Civan
EXPOSURE ASSESSMENT OF URBAN SURFACE DUST CONTAMINATED WITH PAH IN A HEAVILIY INDUSTRIALIZED PROVIANCE 1574
Mihriban Civan, Merve Kara
ADSORPTION OF METHYLENE BLUE FROM AQUEOUS SOLUTION BY USING SURFACTANT MODIFIED POMELO PEEL 1581
Chakkrit Umpuch, Pariwat Namduang
ÇAĞDAŞ ARAP ŞİİRİNDE SEMBOLİZM AKIMI ÜZERİNE BİR İNCELEME 1588
Salih TUR
FARKLI KOŞULLARDA DÖKÜLEN KOLONLARIN DÜŞEY YÖNDE ULTRASES DEĞİŞİMİNİN İNCELENMESİ 1599
Osman GÜNAYDIN, Kadir GÜÇLÜER, Ömer Faruk TEKİN, Mustafa EZİCİ
HEAVY METAL REMOVAL BY POLYMER – ZEOLITE BASED ADSORBENT 1608
Hasan Emre ASLAN, Barış ŞEKER, Çiğdem KIVILCIMDAN MORAL
SAMAN VE KURU OT BALYALARI İÇIN SICAKLIK VE NEM ÖLÇÜM CIHAZI TASARIMI VE GERÇEKLEŞTIRIMI 1613
Serkan Aydin, Selim Bacak, Neşe Baysal
A STUDY ON MICROSTRUCTURE AND FABRICATION OF TI-NB ALLOY BY CONVENTIONAL SINTERING 1619
Mehmet Kaya, Abdurrahman Yolun
HIGH RISE BUILDINGS IN HISTORIC CITIES 1620
Elif Süyük Makaklı, Serpil Özker

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[2]-ROTAXANE & [2]-CATENANE FORMATION FROM ARENE RUTHENIUM COMPLEXES

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Supramolecules formed by intermolecular interactions of covalently bonded molecules are thermodynamically stable compounds. Traditionally, supramolecules have been mostly generated by organic receptors. More recently, coordination directed self-assembly of transition metal and multi-topic ligands have been well established for the formation of metallasupramolecules due to the predetermined shapes and geometries. Catenane is a type of ring in ring system whereas rotaxane is formed by an axle and rod. Adressed herein, [2]-rotaxane and [2]-catenane supramolecules were successfully exhibited by arene ruthenium complexes.

Keywords: Arene ruthenium complexes, catenane, rotaxane.

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9TH GRADE STUDENTS' AWARENESS AND MISCONCEPTIONS ABOUT THE ENVIRONMENTAL RELATED CONCEPTS

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Students generally get scientific knowledge about environmental issues from the curriculum courses in schools, teachers and books, and their environment1, and from the printed and visual media2,3 in recent years. Their influence is great on the development of students' own concepts and unfortunately these concepts usually differ from scientific view4,5.The awareness and misconceptions of students about the environmental related concepts such as greenhouse effect and global warming, acid rain, ozone layer depletion and factors destroying our habitat were investigated in this study. 340 students in a high school located in Ankara were subjected to a 27 question Likert type survey and a 20- questioned five choice test. The evaluation of the answers revealed that the students were aware of these environmental concepts however they had non-scientific rumor type opinions. But, after being taught with constructivist method, their opinions relating to the environmental issues changed in correct direction.

Keywords: greenhouse effect, global warming, acid rain, ozone layer depletion

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A CASE STUDY OF SHE (SOLAR-HYDROELECTRIC) IN TURKEY

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Abstract: Nowadays, energy and source requirements are significant issues, as in the past. Besides, renewable energy sources that especially hybrid energy systems and their usages have been very popular in recent years because of a lot of reasons. In this study, efficiency of solar-Hydro Electric (SHE) is compared with hydro energy and solar energy systems and a case situation is computed with real data and it is clarified the efficiency, generation, cost and available credibility items of system in Turkey. Energy efficiency, systems cost, investment repayment period, operation expenditures, available energy credibility and optimum energy costs are computed and shown in study. Electricity generation of solar is calculated by PVsyst program. Generation and capacity utilization rates of systems are shown in graphics.

Keywords: SHE (Solar-Hydroelectric), Energy Efficiency, Energy Credibility, Distributed Energy Systems

Introduction

Nowadays, energy and source requirements are significant issues, as in the past. It is a usual application that restriction of the transformer capacity as 30% for renewable energy in most countries. It has become a necessity for supplying system stability and quality. But this situation is limited for renewable energy investments. A new transformer building and its infrastructure costs are very expensive. So, productive usage of transformer is more effective than build a new one. Hybrid systems like SHE (Solar-Hydroelectric) is aim to provide this efficiency. Despite a lot of scientific studies can be finds about hybrid energy systems, there are a few studies about SHE (solar-Hydro Electric) in literature. Hybrid system applications are steadily increased in Turkey, but there is no SHE application. So, in this study, a case situation is computed with real data and it is clarified the efficiency, generation, cost and available credibility items of system in Turkey.

Most of the researches are about water pumping which using solar energy for irrigation. One of them was released by Dursun and Özden (2014). Also, most of them are about off grid systems and generally solar and wind energy is used as integrated system for hybrid systems. Some SHE (Solar-Hydroelectric) studies in recent years is started all over the World. It could not have done yet at any project in Turkey.

It is mentioned in many articles about solar and Hydro Electric, in recent years. Some of them are Glasnovic and Margeta (2009), called their Project as SHE (Solar-Hydroelectric) which is tested in Croatia. They have explained that the system is not only an applicable project but also a complementary system. Bekele and Tadesse (2012) studied hydro-wind-solar in 6 different area of Ethiopia and published their article. Glasnovic and Margeta (2010), studied about solar-hydroelectric system for Europe. They offered a mathematical model for finding the optimum point of system's installed capacity. It is stated in their study that solar-hydroelectric is a good approach for management of electric generation due to their generation time. Kusakana and Jimoh (2009) stated that solar-hydroelectric systems are low-cost type project and it is so useful for rural zone. And solar-hydroelectric systems are compared with other renewable energy systems. Meshram and et. al (2013), analyzed on grid solar-hydroelectric system performance. It is stated in study that solar-hydroelectric system is reducing the complexity and cost. Sirasani and Kamdi (2013), studied about hybrid system which is occurred wind, solar and hydroelectric. It is investigated multiple effects on systems like social, environmental, affordability and efficiency. It is offered in study that solar-hydroelectric systems should be extended. A solution is searched in Afify's (2014) study by using solar and hydroelectric system for Qattara zone of Egypt.

There are a lot of methods for supplying lack of energy. The solar-hydro is one of them and it has been examined since 2000. But, these studies are about separate energy system for hydro and solar. It is stated in these studies, solar and hydroelectric systems are located in different places, but use same infrastructure for on grid. There are

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a few applications which using hydro energy structures to establish SPP. Generally reservoir area of HEPP is used for SPP plants.

Materials and Methods

Turkey is not a rich country in term of water resources. Most of the water resources of Turkey are depended to rainfall. The capacity utilization rate of HEPP (hydroelectric power plant) is between 25-40% in Turkey. Generally, electric generation of HEPP is more than average in spring and less than average in summer time in Turkey. According to the January 2016 data, 559 HEPPs in operation and total installed capacity is 26,136 MW. Average electric generation of Hydro Electric is 70,000 GWh and capacity utilization rate is about 35%. Turkey is located in a relatively advantageous geographical situation about solar radiation. Capacity utilization rate of SPP (solar power plant) is between 15-20% in Turkey. Generally, electric generation of SPP is more than average in summer time. Approved and commissioned SPP projects by TEDAŞ-TEDC (Turkish Electricity Distribution Corporation-until January 2016) are given in Table 1.

Table 1: Approved and commissioned SPP projects by TEDAŞ-TEDC

	Quantity	**Installed Capacity (kW)**
Approved SPP	2,748	2,544,816
Commissioned SPP	384	259,748

Allocated transformer capacity is limited for renewable energy in Turkey. Individually capacities are allocated for hydro and solar energy. Most of the investors wanted to enterprise renewable energy. But they cannot do it, because there is no suitable transformer capacity. Indeed hydro energy and solar energy are complemented each other, because of natural generation time. HEPP is not generated more electricity in summer. On the contrary summer time is the highest electricity generation time of SPP. So, they are complemented each other naturally and they do not need to a separate transformer capacity. Same transformer utilization can be possible for SHE (Solar-Hydroelectric) systems. It is a natural compensation for electricity generation and it is an efficiency system. Generation, cost, efficiency and credibility items are examined in this study.

A HEPP project is chosen for case study which is located in Siirt province of Turkey. In this study, cost, generation, capacity utilization rate and credibility items of solar system, hydroelectric system and solar-hydroelectric system are compared with each other. It is shown that solar-hydroelectric system is the best offer for the matter in hand.

HEPP Project characteristics are given in Table 2.

Table 2: Project characteristics

Project Characteristics	
Installed Capacity	12.78 MW
Turbines Type	Francis–horizontal axis
Gross Height	41.26 m
Net Height	40.85 m
Drainage Area	1,077.6 km^2
Dam Volume	1 hm^3
Project Flow	36 m^3/s
Average Flow	12.42 m^3/s
Canal Type	Trapeze
Base-Width of Canal	5 m
Height of Canal	3 m
Long of Canal	8,200 m

HEPP project has 12.78 MW transformer capacities that had been given permission by authorities. So, a system is planned to design that under limit of transformer and used same infrastructure. 100 Wp First Solar FS-3100-PLUS model solar panel and SMA Sunny Central 850 CP XT model inverter are used in design. 14.80 MW SPP can be assembled on canal which is 8,200 m length and 11 m surface width. SPP and HEPP can be using same infrastructure of grid and transformer. This is the main aim of solar-hydroelectric system. So, solar-hydroelectric system offers energy efficiency and transformer capacity and do not need a new ones. 14.80 MWdc and 12.75

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MWac is planned to installed capacity of SPP. 12.75 MWac is preferred as installed capacity, because of HEPP's 12.78 MW transformer capacity. It is allocated to the HEPP by Electricity Distribution Corporation.

The credibility, cost, electric generation and capacity utilization rate of SPP, HEPP and SHE (solar-hydroelectric) was calculated in this study. HEPP's electric generation is calculated from formula and SPP's electric generation was calculated by PVsyst energy program. Acceptances of SPP, HEPP and SHE Project is given below;

- 1 USD = 3 Turkish Liras
- Ignore the promotion of deductible VAT, accounting ETL(energy transmission line) and the other promotions which are accepted by Turkish Government
- Same balance-sheet and financial data are accepted for SPP, HEPP and SHE projects
- Canal is covered by solar panels which is 8,200 m lengthy
- No land acquisition, ETL and on grid system infrastructure is accepted to solar part of SHE system. All infrastructure and land is common in SHE project
- SPP's electric generation is calculated by PVsyst program
- 39 years flow data are used in HEPP's electric generation calculation which is obtained in 1972-2010
- 0.073 USD is accepted for SPP and 0.133 USD is accepted for HEPP as unit price of revenue
- Annual 5% interest rate, 1.1 solvency, 2 years nonpayment and 10 years loan term are accepted as criteria of credibility for systems

Transform of Solar radiation to electric is termed as photovoltaic effect. Photovoltaic cell is the main equipment of SPP. The photovoltaic module is a form of cell series. And the photovoltaic array is a form of series-parallel combination (Ayyoubi, 2009, Said, 2003, İbrahim, 2009). A solar cell can be represented as a current model as simplified equivalent circuit of photovoltaic cell shown in Figure 1.

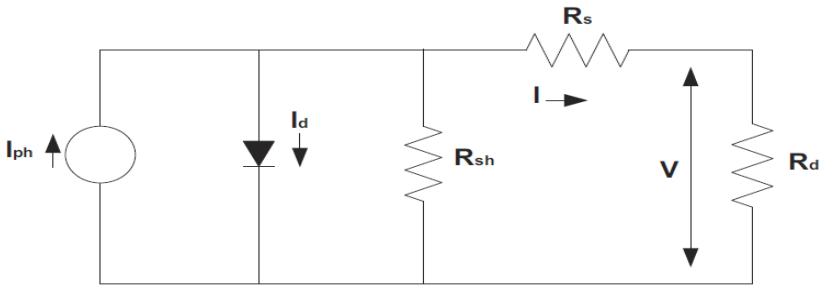

Figure 1. Simplified equivalent circuit of photovoltaic cell

The typical I-V characteristic of a PV array is given by the following in Equation 1. (Hussein, 1995);

$$I = Np.Iph - Np.Id.e^{\left(\frac{q}{kTA}X\frac{V}{Ns}\right)-1} \quad (1)$$

where, I is the photovoltaic array output current (A), Iph is the photo current, Np is the number of modules connected in parallel, Id is the cell reverse saturation current, q is the charge of an electron, V is the photovoltaic array output voltage (V), k is the Boltzman's constant, T is the cell temperature, A is the pn junction ideality factor, Ns is the number of cells connected in series, The factor 'A' determines the cell deviation from the ideal pn junction characteristic; it ranges from 1 to 5, 1 being the ideal value (Khallat, 1986).

The cell reverse saturation current I_d versus to temperature was given by in Equation 2. (Vachtsevanos, 1987);

$$Id = Ic.[\frac{T}{Tc}]^3.e^{(\frac{qEg}{kA}[\frac{1}{Tc}-\frac{1}{T}])} \quad (2)$$

where, Ic is the reverse saturation, Tc is the cell reference temperature, current at Tc, and Eg is the band gap energy of the semiconductor used in the cell. The photo current Iph depends on the solar radiation and the cell temperature as given by in Equation 3.

$$Iph = [Iscr + Ki.(T - Tc)].\frac{S}{100} \quad (3)$$

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where Iscr is the cell short circuit current at reference temperature and radiation, Ki is the short circuit current temperature coefficient, and S is the solar radiation in mW/cm^2. The PV array power can be calculated by Equation 4.

$$P = I \,.\, V \qquad (4)$$

$$P = V.Np.(Iph - Id).e^{\left(\frac{q}{kTA}X\frac{V}{Ns}\right)-1} \qquad (5)$$

Hydroelectric energy generation formulas are given in below Equation 6.

$$N = \varrho \,.\, g \,.\, \mu \,.\, Q \,.\, H \qquad (6)$$

where, N is the power (MW), ϱ is the water density (1000 kg/m^3), g is the gravity (9.81 m/s^2), μ is the efficiency of plant (multiplications of turbine, generator and transformer's efficiencies), Q is the project flow (m^3/s), H is the height of project (m).

Results and Discussion

HEPP transformer capacity (power) is 12.78 MW. Capacity Utilization Rate of HEPP is 33.37%. Capacity Utilization Rate of SPP is 22%. And Capacity Utilization Rate of SHE is 55.23%. So, most part of transformer capacity is useless in HEPP and SPP projects. SHE system is more effective than HEPP and SPP.

SPP and HEPP Projects have to use 2 separate transformer to connect grid. But a transformer is adequate in SHE system. New transformer investment is unnecessary in SHE systems. So, SHE systems can be called as efficient projects. Tables and graphics are obtained from studies is given below.

Table 3: Monthly electric generation summary table for three different position (kWh)

	Electric Generation (kWh)			
Months	**HEPP**	**SPP**	**SHE**	**Installed Cap.-12.78 MW**
Oct.	2,172,229	2,076,000	4,248,229	9,329,400
Nov.	2,177,983	1,679,000	3,856,983	9,329,400
Dec.	2,331,823	1,274,000	3,605,823	9,329,400
Jan.	2,328,107	1,351,000	3,679,107	9,329,400
Feb.	2,534,302	1,428,000	3,962,302	9,329,400
March	3,633,352	1,927,000	5,560,352	9,329,400
April	6,185,870	2,119,000	8,304,870	9,329,400
May	6,327,884	2,258,000	8,585,884	9,329,400
June	2,970,089	2,591,000	5,561,089	9,329,400
July	2,275,366	2,694,000	4,969,366	9,329,400
Aug.	2,176,311	2,687,000	4,863,311	9,329,400
Sept.	2,136,685	2,492,000	4,628,685	9,329,400

Table 4: Average capacity utilization of 3 different position obtained from electricity generation (MW)

	Average Capacity Utilization(MW)			
Months	**HEPP**	**SPP**	**SHE**	**Installed Cap.**
Oct	3.02	2.88	5.90	12.78
Nov.	3.02	2.33	5.36	12.78
Dec.	3.24	1.77	5.01	12.78
Jan.	3.23	1.88	5.11	12.78
Feb.	3.52	1.98	5.50	12.78
March	5.05	2.68	7.72	12.78
April	8.59	2.94	11.53	12.78
May	8.79	3.14	11.92	12.78
June	4.13	3.60	7.72	12.78
July	3.16	3.74	6.90	12.78
Aug.	3.02	3.73	6.75	12.78
Sept.	2.97	3.46	6.43	12.78

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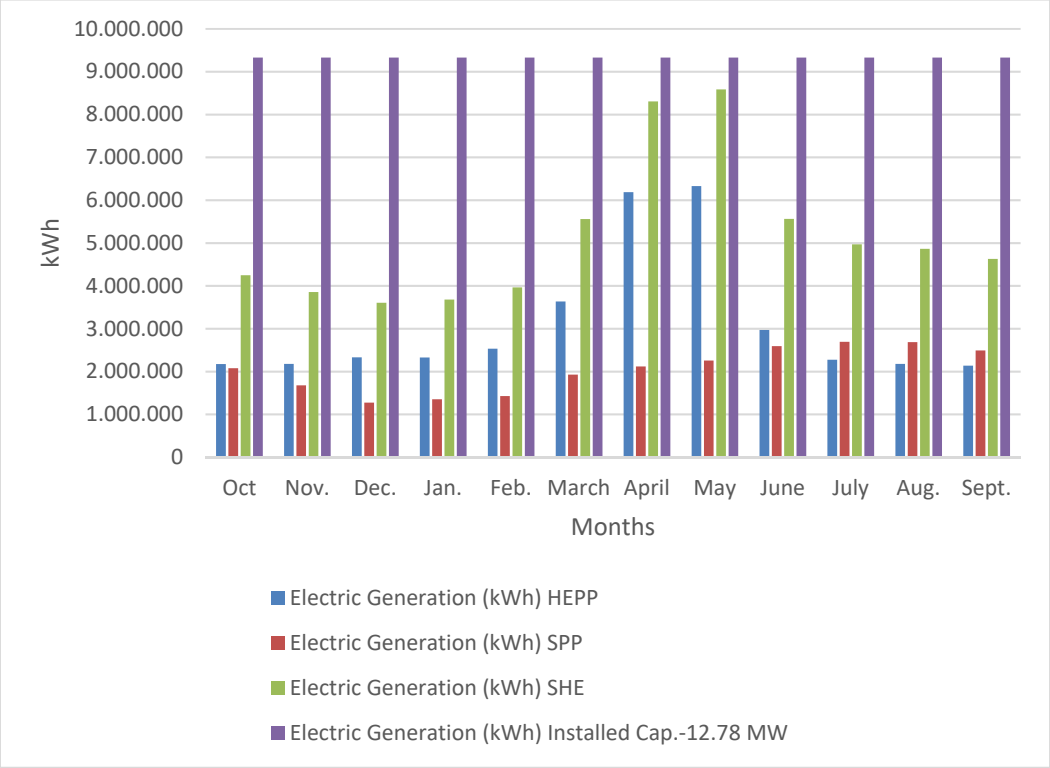

Figure 2: Monthly electric generation summary graphic of 3 different position (kWh)

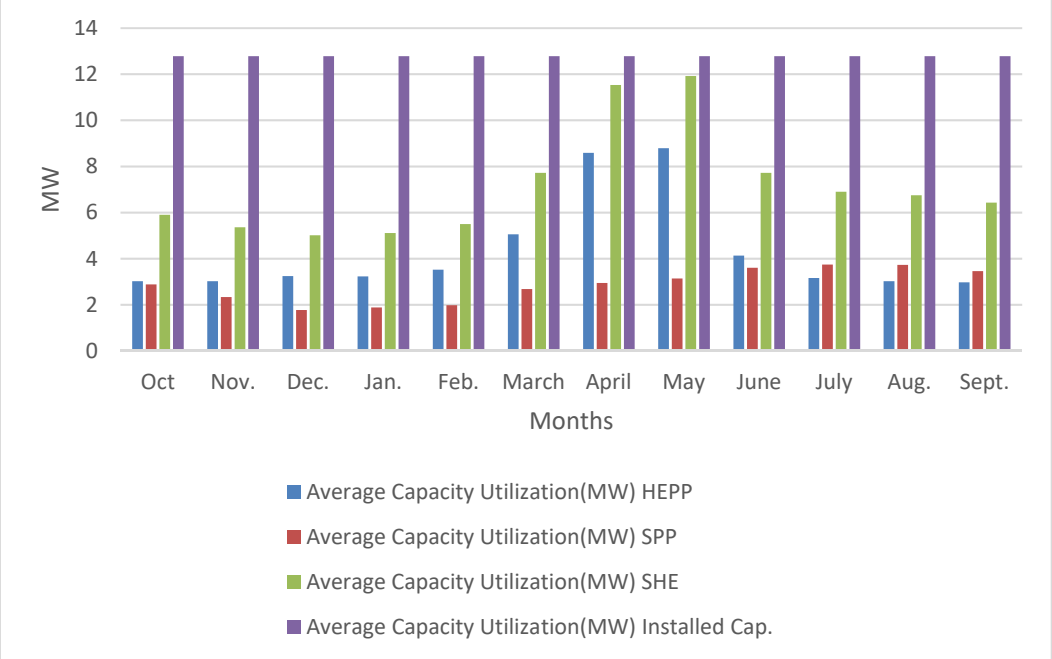

Figure 3: Average capacity utilization of 3 different position obtained from electricity generation (MW)

Reservoir area of HEPP and 8,200 m length storage capacity is about 8 hours in case study. Seasonal electricity generation discrepancy can be monitored in HEPP system because of rainfall dependence. Energy can be managed in SHE systems. Solar part of SHE system is generates electric only daytime. HEPP has enough storage capacity for interrupted electricity generation. The main idea of SHE system is efficiency usage of transformer capacity and interrupted electricity generation. A sample energy management of SHE system is given Figure 4 for a day.

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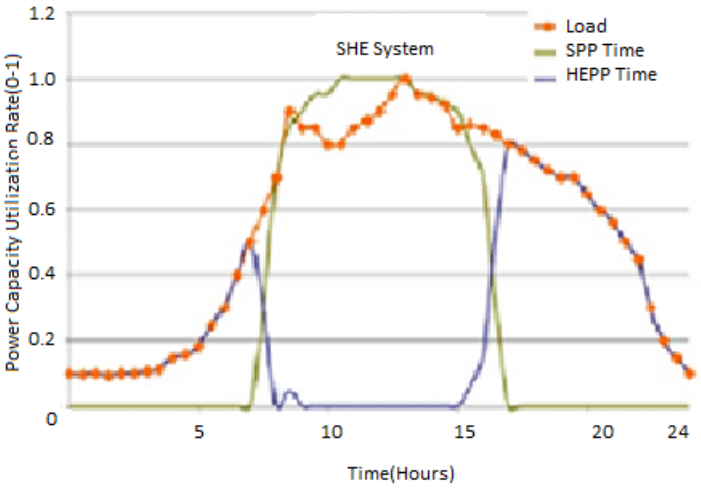

Figure 4: A Sample energy management of she for a day (Sunengy diagram)

Conclusion

Summary of SHE system is given in Table 5;

Table 5: Summary of case study

Items/Plants	HEPP	SPP	SHE
Electricity Generation (kWh)	37,250,000	24,576,000	61,826,000
Power Capacity Utilization Rate (%)	33.37	22	55.23
Total Fixed İnvestment Cost (USD)	16,600,000	17,750,000	33,460,000
General Investment Cost (USD)	17,781,072	18,324,991	35,170,538
Annual Operation Income (USD)	2,719,250	3,268,608	5,987,858
Annual Operation Expenditure (USD)	515,000	485,000	715,000
Project Credit Amount (USD)	10,750,000	15,750,000	31,000,000
Credibility - (%)	60.46	85.95	88.14
Recycling Period (years)	8.07	6.58	6.66

As a result of this study it can be concluded below;

- It is a usual application that restricts the transformer capacity as 30% for renewable energy in most countries. It has become a necessity for supplying system stability and quality. But this situation is limited the renewable investments. Transformer capacity is vital for renewable energy investments. An average capacity utilization rate of HEPP is 25-40% and capacity utilization rate of SPP is 15-20%. So, great part of transformer capacity is useless in single-handed energy transformer capacity like HEPP or SPP. HEPP and SPP are complementary systems actually, because of electricity generation time period. Solar part of SHE systems can be generated more energy in summer when hydroelectric generation is so limited and contrary to this hydroelectric part of SHE systems can be generated more energy in spring when SPP's electricity generation is so limited. And if a HEPP has got enough storage flow capacity, it can generate energy at night when generation is impossible for SPP. So, efficiency transformer capacity and interrupted energy generation can be supplied by SHE systems. With correct energy management capacity utilization rate of SHE can be between the ranges of 40-60%.
- SPP projects use 20,000 m^2 land for per 1 MW installed capacity. In addition, investor has to get dry marginal agricultural land permission. In SHE system, investors do not need to extra land and permission for activating the plant. It is time and Money saving part of SHE systems.
- Separately plants like HEPP or SPP is more expensive than SHE systems. SHE systems offered low-cost investment and operation expenditures because of common usages.
- There is a lot of credit loan about renewable energy. Generally International Banks like World Bank is evaluated this system with suitable lines. So, credibility of efficiency SHE system is higher than separately plants like HEPP or SPP.
- Equity is the most important part of investments. Many investors avoid from high equity investments. It is clear from table 5 that SHE systems offer minimum equity and maximum credibility. An investor can spend more money to HEPP, than SHE system. So, it is understood that SHE system is the smartest choice for investors.

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Acknowledgements

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A COMPARATIVE PERSPECTIVE ON WOMEN IN THE 19TH CENTURY THROUGH LITERATURE

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Abstract: 19th century is a very hot period in terms of scientific developments, economical and sociological transformations. Accordingly, the economic and social conditions of people were changing dramatically. Yet, no doubt that it was a patriarchal society and that the stage belonged to men even though women gradually started to appear on the stage as well. There were *Great Expectations*, hopes and fights for the future among men. Even after the fact that women's rights started to be advocated, the approach towards women did not really change easily. Although their existence in society was visible now, its limits were smartly drawn. Literature has a very interesting role here because it both helped women to enlarge their world and drew the line of the individuality at the same time. The depictions of women in the narratives of the male authors in this period show how it works. In this paper I am going to analyze two novels from two different cultures: *The Blue and the Black* (*Mai ve Siyah*) by Halid Ziya Uşaklıgil and *Great Expectations* by Charles Dickens. In these novels we can see both the world of women in this period vis-à-vis men and how literature works to draw the line for women socially and economically.

Keywords: 19th century, women, men, literature

19th century is a very hot period in terms of scientific developments, economical and sociological transformations. Although it has been a long process which has started long before, 19th century was the peak. The economic and social conditions of people were changing dramatically. Yet, no doubt that it was a patriarchal society and that the stage belonged to men even though women started to appear on the stage as well. There were *Great Expectations*, hopes and fights for the future among men. Anyone could come up in the world through education, hard work and passion. Nothing was stable now, as Karl Marx manifested for the era that "all that is solid melts into air."

Yet it cannot be ignored the fact that this is also the period that women are accepted as individuals who have some rights. Even after the fact that their rights started to be advocated, the approach towards women did not really change easily. Although their existence in society was visible now, its limits were smartly drawn. Literature has a very interesting role here because it both helped women to enlarge their world and drew the line of the individuality at the same time. The depictions of women in the narratives of the male authors in this period show how it works. In this paper I am going to analyze two novels from two different cultures: *The Blue and the Black* (*Mai ve Siyah*) by Halid Ziya Uşaklıgil and *Great Expectations* by Charles Dickens. The reason I chose these novels is to have a comparative perspective between different cultures, one of which is my country and the other is one of the representatives of the West, which is also one of the role models of Turkey at the time. Though French literature was more effective on Turkish writers at the time, what is more the protagonist in *The Blue and the Black* is fascinated by French poets, I preferred to compare the novel with one from English literature because of the analogy between the two novels regarding both the conditions and positions of characters and the external reality the novels depict. Analyzing these novels, I want to show the positions of women in society vis-a-vis men.

The Blue and the Black is a novel written in 1897. It depicts the era from Ahmet Cemil's point of view. Ahmet Cemil, the protagonist of the novel, is a student in The Military School. He has high expectations for the future: being a famous poet who has an eloquent and avant-garde style. After his father died, however, being the only man in the family he has no choice but to leave the school in order to put bread on the table for his family. He makes his living from translating books and tutoring children of wealthy families. Then he begins to work in a newspaper. Meanwhile, he works passionately for his masterwork which he believes that it will bring fame to him. One day the owner of the newspaper dies and his son, Vehbi Effendi starts to head it. Dreaming of being the owner of the newspaper and of being wealthy one day, Ahmet Cemil weds his sister to Vehbi Effendi. After then he believes that Lamia, sister of Ahmet Cemil's best friend Hüseyin Nazmi, would marry him. Yet his dreams and plans do not come true. First Vehbi Effendi starts to live with them and behaves badly to his sister

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and to all family. He runs into debt and mortgages the house inherited from his father. His sister, İkbal dies in misery. Furthermore, his masterpiece, contrary to his expectations, is mortified just in his own newspaper and he gets fired by Vehbi Effendi. Finally, he learns that Hüzeyin Nazmi, his idol in life moves to Europe as a principal officer and Lamia is engaged to a military officer. After his blue dreams turned into black realities, he decides to leave the city with his mother and heads for the east, on the contrary to his ideals.

Great Expectations, written in 1861, is also about a young man who has *Great Expectations* which he loses throughout the book. Pip, a seven-year-old orphan boy, lives with his sister who is always angry and hot tempered and with her husband Joe Gragery, a blacksmith. Sitting in a cemetery one evening he encounters an escaped convict. He orders some food and a file for his leg iron. The next day, he is recaptured with another escaped convict who came after him. One day his uncle Pumblechook takes Pip to Miss Havisham's Satis Hous to play with her adopted daughter Estella. Miss Havisham is a strange woman who lives in a strange house. She still wears her old wedding dress, the clocks stopped at the same time and the house is untouched since the wedding day on which her fiancé jilted her. Although Pip is always insulted by Miss Havisham and Estella being common and coarse, he continues to visit them because he falls in love with Estella. He begins to dream to be a gentleman admired by Estella. Miss Havisham, however, sends him back for his indenture as a blacksmith. Four years later in a pub a man whom Pip once saw in Miss Havisham's mansion, tells him that he is to be given monthly stipend by a secret benefactor. Thinking his benefactor is Miss Havisham he goes to London in order to be a gentleman. Years later, however, he learns the fact that his benefactor was the escaped convict, Magwitch. He is disappointed with the truth but at the end he acknowledges it and asks Joe and Biddy forgiveness, whom he ignored that much just because of thinking that they are common. His sister is already death and Joe is married now to Biddy who once fell in love with Pip. Estella also gets married to another man. Therefore, for many years Pip goes abroad to work. Coming back, he meets Estella in the Satis House, her husband is now dead. She was bitterly regretful of what she did to him. Finally, they leave the garden hand in hand.

What we see in these novels at first is nothing but a world of men. It is not only about protagonists' gender, but rather about their relationships with women and about the positions of women in general. It goes without saying that in a novel would be men and women; but the question here is how their positions in all respects, be it social, be it economic or political etc., are depicted. The crucial point for both novels is that their authors manifest that they present things as they are. In other worlds, the worlds in these novels are just representatives of the outside world they just live in. It does not necessarily mean that we should accept it as a mere reality. On the contrary, we should not forget that they are fiction, but we should also keep in mind that there is a different kind of reality there. It is different from history and documentary; yet it tells something about their era. It says a lot about gender relations, class differences and the institutions of society. On this basis, these novels give us some clue on how patriarchy works and what the positions of women in the late 19th century are.

The 19th century is the period marked by the collapse of the empires like Ottoman Empire and by the rise of British power all over the world with Russian Empire. Globalization and industrialization are the keywords. Science and technology are on the rise. There is a great belief in humanity and ability to progress. Vertical and horizontal social mobility was increasing incrementally. Man could move up social ladder. This is why the protagonists in these novels have *Great Expectations* for the future. They dream of a better position for themselves in terms of economic and social. Correspondingly they always dream of a beautiful, wealthy and noble woman whom they can only reach by belonging to the upper class.

Yet here comes the point: since this is the world of men, women do not have similar positions and expectations. For instance, the female main characters in other novels like *Aşk-ı Memnu* and *Tess of the D'Ubbervilles* which were written in the same century by Halid Ziya Uşaklıgil and Thomas Hardy respectively do not have such motives in their lives. Bihter in Aşk-ı Memnu wants to belong to high society and be in fashion. All Tess wants is just to survive and earn a living for he family. Bihter wants to fulfill her desires and Tess no to be condemned by something she is guilty of. What they suffer is patriarchal society which does not allow them to live as a woman. In this period woman are not depicted by male authors as individuals who are working for a better world like men, on the contrary depicted as subjects always related with men through sexual relationships[1]. Their lives are full of love and marriage, but no educational or career planning. They are always weak and sentimental. The only moment they are rational is the time they decide to marry to someone for his money and status.

Women who are not main characters in the novels aforesaid have similar positions, too; they are bound to male characters somehow. Lamia in *The Blue and the Black*, for example, is the woman of Ahmet Cemil's

[1] Female authors in this period may depict woman from a different perspective. For example, Fatma Aliye and Halide Edip from Turkish literature tell stories of strong women who are thirsty for a better world like men and struggle for it. This is why I emphasized authors' gender.

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dreams. Lamia is not a character in the novel as an individual, she is like a ghost. She is only there for her social status. With her house, her car, her piano etc. which represent her class, she stands where Ahmet Cemil just exactly wants to be. This is why Ahmet Cemil hopes to marry her one day until he burns his work with the thought of failure. When he learns that she is engaged to another man, he loses his last hope. Until then, he married her sister İkbal to Vehbi Efendi in the hope of being a printing house owner; but her sister died in misery because of this marriage. İkbal was a girl who never tells her brother her feelings and thoughts, who is submissive to her family. She is another ghost who is there to make Ahmet Cemil's desires come true. Yet, she cannot help him because she, like all her other family members, is weak and ineffective in the face of Vehbi Effendi. She has no voice in the novel. Ahmet Cemil exploits her as a capital. Vehbi Effendi abuses her mentally and physically.

There are two other women, Ahmet Cemil's mother Sabiha Hanım and the maid Seher, in *The Blue and the Black*, but they are all like İkbal. Seher is harassed by Vehbi Effendi. Although İkbal and Sabiha Hanım are aware of the fact, they say nothing. Seher cannot take action or leave the house. This is because she does not have social and economic freedom. Neither in this novel nor in others written by Uşaklıgil are there such powerful women who can support themselves. They are all dependent on men. In *The Blue and the Black* Ahmet Cemil is the only one to take care of his family after his father's death. No woman is supposed to work. This causes both Ahmet Cemil's whole world turning upside down and women's committing themselves totally to home and men. This leads Ahmet Cemil being the only authority at home, but eventually causes a total catastrophe. The novel tries to show the problematic here, but never offers a solution[2]. Here come some solutions by female authors. Fatma Aliye, for instance, depicts women who have economic and social difficulties and needs to earn her living like men. This brings to mind some questions like what difference makes the gender of the author of a narrative regarding the world portrayed, what kind of audience they address, how literature serves ideology even if the authors claim otherwise, how literary narratives shape our vision and vice versa.

Those questions are also valid for *Great Expectations*. Likewise, gender relations, social and economic relations, expectations for the future and future anxiety can be observed here, too. Estella is raised as a misandrist by Miss Havisham who is a woman left by her fiancé on the wedding day. She wants Estella take her revenge. Both are portrayed as that cruel, proud and shallow. They do not have any concerns, but to agonize to men. Estella, like Lamia, is there as a statue representing upper class. Pip is charmed by her elegant dresses and manners. He begins to be ashamed of his family and to dream of being a wealthy gentleman in order to get married to Estella who insults him being common. Yet neither Miss Havisham nor Estella is successful at the end. Miss Havisham makes amends at the end to Pip for everything she has done to him and Estella. And Estella tells Pip that she suffered from her husband and that she feels sorry for making him suffer. Therefore, both women are depicted here totally different from men who have economic and social concerns. They are isolated from society. One may claim that they are exceptional, but telling a story of someone exceptional is a preference and tells us also something. Dickens is known by his realist attitude, which makes his preferences important. Dickens describes women through their outward appearances which indicates their inner world. But this prevents us from hearing their voice and having empathy with female characters. In fact, as Gregory Jusdanis and Rita Felski point out in their books *Fiction Agonistes: In Defense of Literature* and *Uses of Literature* respectively, literature enlarges our vision, helps us to see the world from different perspectives and to understand others different from us. Dickens' women conform with the Victorian thought which assigns women to home. A woman must devote herself to her house, husband and children; that is to say a woman must be "the angel in the house". This is why Miss Havisham and Estella are depicted as outsider and regretful at the end. It should be noted here again that they are not outsider because they seek professional training and careers but because they are misandrists and refuse to obey social norms.

Dickens' women are usually not sympathetic. Mrs. Joe Gargery, Pip's older sister is one of them. She is from lower class. She is home all day and keeps cleaning the house. She is very ambitious. She wants to get higher economically but what she does is nothing but complaining about her economic conditions and about Pip whom she sees as a burden. Always angry and stern, she makes life miserable for Pip and Joe. This is a woman "in the house" but apparently not "angel". Therefore, she is not an idol for the reader to identify with, too. Then, who is the ideal woman? Or is there an ideal one whom the narrator appreciates and the readers pattern themselves on her?

Biddy, Pip's classmate, is a kind of ideal woman of the novel. She is from lower class, but she is at peace with herself. She improves herself, and what is more teaches Pip. She is also Pip's confident till he leaves home. After then, she helps Mrs. Joe after she is attacked by Orlick and become invalid. She is depicted as naïve, plain,

[2] Here it should be noted again that the sense of art of the author requires such an attitude. What I am trying to say is not that the novel should do it, but just to reveal the novel's position.

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decent and kind as opposed to Estella and Mrs. Joe. She is never selfish. As long as she stays with Gargery family she lives off there. Although she is cute and intelligent, her end is nothing but a happy marriage. Improving herself does not help her to build a career. At the end she gets married to Joe who is naive and decent as well, although she is into Pip at the beginning. This is a sort of reward for her. She becomes the lady of her own house and becomes happy.

Consequently, in *Great Expectations* and *The Blue and the Black* all women are somehow socially, economically and psychologically bound to men. None of them have desires and expectations from life and future, which are independent from men. If they are wealthy, they do not have economic concerns and do not need to work professionally. Otherwise, as opposed to men, they usually do housework or work as a maid. None of them have a chance to get education and do a career, unlike men. They find a place for themselves only next to men. Biddy's training only works to help a man, Pip. She has limited choices in life. She is appreciated just because of being the angel in the house. In *The Blue and the Black* there is no ideal woman. Women are just there for men to either as a symbol indicating men's social and economic position in society or as a capital for men to climb the social ladder or as a burden on men's shoulder. The depiction of women is important because literary narratives are not only shaped by outer reality but also shape the outer world. Here, the difference between female and male authors comes into prominence. Male authors, even they support women's rights and uprisings, are out of their depth in face of patriarchy. Patriarchy, as Ayşe Saraçgil manifests, "is a system which expresses the most intimate forms and structures of power relations in all kinds of unique historical, socio-economic and cultural settings" (Saraçgil, 2005, p. 10-11). Therefore, it penetrates everywhere and it is really hard to get out of it. Again as Saraçgil points out that "cultural history shows us that radical changings in politics, economy and institutional organizations do not automatically lead to changes in identity. When individual and social identities started to be threatened and lose their descriptions, various forces come into action in order to protect and redefine them firmly" (Saraçgil, 2005, p. 204). Here literature works two-way. According to Althusser, it is impossible to escape from ideology because all ideologies constitutes a subject through ideological state apparatuses which are family, media, schools etc. Literature, at this point works as one of them.

The Blue and the Black and *Great Expectations* at this point corroborate patriarchy; which can be observed in the characterization of women and men. The world they portray does not only reflect the outer world as their authors claim, but also limits and restructures it. The image of women in these novels shows us that a woman's place is her home. She is always bound to a man. Her education only helps her to be a better wife. The 19th century which is depicted as the period of hope and expectation ultimately is the era of men although it is also the period that women start to speak up. Male authors, however, do not hear their voices and project it into their novels which they claim that they reflect the outer world. It is particularly seen in comparison with other novels both by the same authors telling female protagonists' stories and by female authors wrote in the late 19th century.

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A COMPARATIVE STUDY ON THE OPTICAL PARAMETERS OF SOL GEL DERIVED DIFFERENT DOPED ZNO FILMS

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To further expand the area of optoelectronic applications, ZnO can be doped with different dopants. Therefore, researchers are making intensive research on the physical properties of the doped ZnO films. In order to investigate the influence of dopant such as magnesium (Mg) and sodium (Na) content on structural and optical properties of ZnO films, all the ZnO films were prepared by facile solgel method using spin coating technique. Zinc acetate dihydrate, 2-methoxyethanol and monoethanolamine were used as a starting material, solvent and stabilizer, respectively. The dopant sources are used in salt formed. The influence of different dopant elements on the crystalline structure and orientation of the ZnO films have been investigated by X-ray diffraction (XRD) study. The structural parameters of the films were determined and compared. A double beam UV-vis spectrophotometer with an integrating sphere was used for the optical transmittance and diffuse reflectance measurements, respectively. At the visible region, the average optical transmittance values of all the films are greater than 80%. The values of absorption band edge were determined different optical methods. The optical constants of the films were calculated using transmittance and diffuse reflectance spectra.

Keywords: Doped ZnO, Sol gel method, Optical parameters

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A CONTROL STRATEGY OF A TENDON DRIVEN MECHANISM BASED ON THE HUMAN LIKE DISCRETE/CONTINUOUS TIME CONTROLLER

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Abstract: This research proposes a control strategy of a tendon driven mechanism based on the analysis of human like motion. Based on the human like muscle activities, proposed controller uses both the discrete-time and the continuous-time controller. The continuous-time controller adjusts the stiffness of the muscle and the discrete-time controller changes the units of the active muscle. Then, based on the knowledge of the predictive and the learning control strategy of the human motion, proposed controller can realize a force control with high resolution in the low force range. In addition, the controller can select the number of the muscle units.
Key Words: Mixed discrete/continuous system, Force control, Artificial muscle model, SMA actuator, Tendon driven

INTRODUCTION

The understanding of the communication way of such as the injured peoples seems to be important to develop effective communication devices for these peoples. Examination of the human communication way, the knowledge of the human sensory-motor system must be the effective tool. This research proposes a control strategy of s tendon driven mechanism based on the analysis of human like motion.

About the muscle activity, it is well known that signals from the CNS make action to the motor units as shown in **Fig. 1**. The number of them will be selected that depending on the desired motion. Thus, the muscles will be activated by the number of units and the stimulus level such as the duration, the intensity, and also the frequency [6-8]. From this knowledge, muscles potentially have a capacity to make both the wide range and the high sensitivity of the output force fields. We usually training the muscles in order to make some special tasks such as craft worker, artists, and etc.. In order to study about these human activities and to apply to the other fields, the control theory of the muscle activity becomes important. In common case, we usually make separate controller about the discrete time and the continuous time. However, thinking about the actual human neuromuscular controller, it should be better to make a controller uses both the discrete-time and the continuous-time controller.

In the engineering fields, we usually make the Iterative Learning Controller, the Model Predictive Controller, or such as the Adaptive Controller [9, 10]. Here, we think about the high performance controller of the human. Then, from the previously section, it should be better to make these controller with the capability of the mixed analog-digital circuit model, or to make such a controller uses both the discrete-time and the continuous-time controller as previously described. If we think about a closed loop system as such a mixed analog-digital circuit model, we make assumptions about the human motion generate scheme from the engineering knowledge. It has a possibility that we can make various motions based on the wide range and the high sensitivity actuator output. The knowledge of the human sensory-motor system must be effective tools for the communication research area such as the human-to-human or the human-to-machine communications. And also, it becomes effective tools for the understanding of the communication way of the injured peoples and the development of the communication devices.

In this research, based on the human like muscle activities, proposed controller uses both the discrete-time and the continuous-time controller. Then, based on the knowledge of the predictive and the iterative learning control strategy of the human motion, proposed controller can realize a force control with high resolution in the low force range. To analyze the assumption, the experimental system consists of ball joints and parallelogram linkage was developed. At first, the proposed control system and the assumption will be described. Then, some experimental results show the effectiveness of them.

PROPOSED SYSTEM

From the skeletal system, neuromuscular system, and also total sensory-motor system of the human beings, here the assumption of this paper will be discussed. In order to discuss the assumption, this paper utilized an artificial model of the human like body structure robot arm. Proposed mechanism can realize slide and twist motion with simple structure. **Fig. 2** shows that the muscle for the twist motion and artificial model with artificial muscles and **Fig. 3** shows an artificial muscle structure SMA [1-5] and elastica. The system utilized ball joints and parallelogram linkage. The system becomes mixed analog-digital circuit models as shown in **Fig. 3(ii)**.

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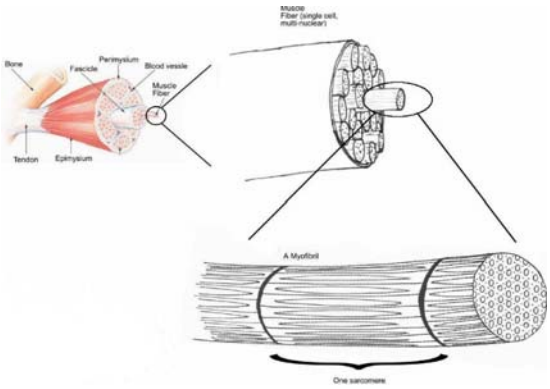


Figure 1 Muscle structure

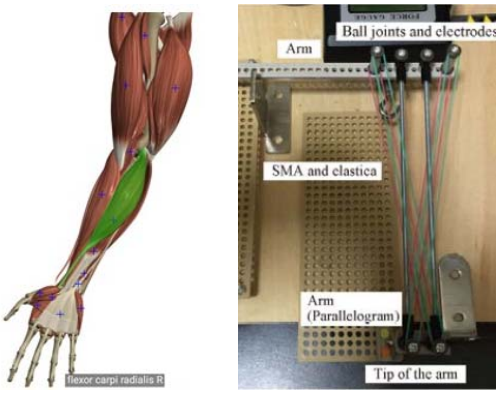


Figure 2 Muscle for the twist motion and Artificial model with SMA and Elastica

In the proposed artificial muscle model in **Fig. 3**, SMA will be controled by both the continuous and descrete input signals such as the PWM control. The elastica will be the passive stiffness elements and its stiffnes and position will be adjusted by SMA as shown in **Fig. 3(ii).** Thus, the proposed artificial muscle model can generate both the continuous and discrete contraction. **Fig. 4** shows that the experimental setups of the proposed model. The system in **Fig. 4(i)** can select the number of the motor units like a discrete controller as shown in **Fig. 5**. **Fig. 4(ii)** indicate that the concept of the isometric/isotonic contraction as shows in **Fig. 3(ii).**

The proposed artificial muscle model in **Fig. 3** and **Fig. 5** is similor to the Hill and Wilkie-based muscle model but different.

ASSUMPTION

Neuromusclar controller has both the discrete and the continuous time controller as described in the previopus section. It leads to following assumptions and properties:

- The continuous controller activete the muscle to controll the position and force and the discrete controller changes the number of the motor units.
- A motor unit model with SMA and elastica as shown in **Fig. 3** can be proposed.
- If these two assumptions are true in the industrial model, output force can be sensitive by using a motor unit model and it can realize a wide output range by using the proposed descrete motor unit controller.

Then, if these assumptions are true, we can arrange the constructions of the artificial muscles in the tendondriven robot arm with the artificial muscles. Then, in order to examine these assumptions, this paper shows an example case to satisfie the assumptions by using the experimentral system as shown in **Fig. 4.**

For the experiments, the artificial muscles consist of the SMA actuators and the elastica. The construction of them can be arranged. Thus, we can adjust the stiffness using not only the SMA actuators but also the nonlinear property of the elastica.

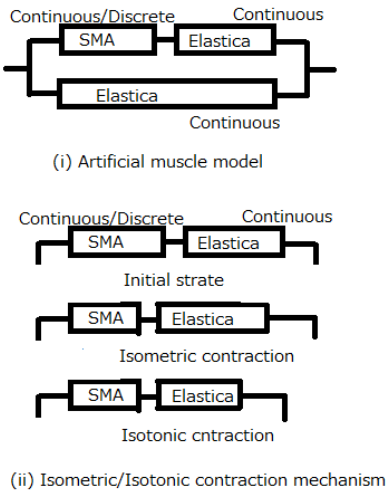


Figure 3 Proposed motor unit model

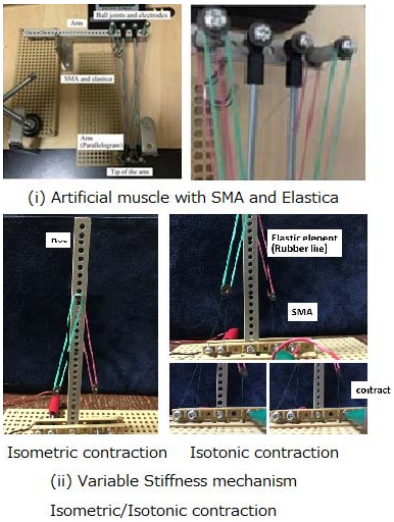
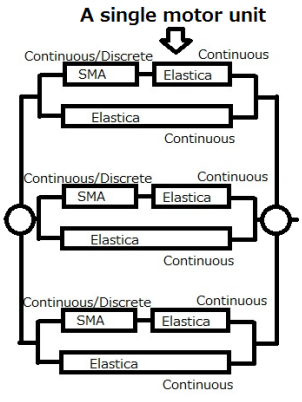


Figure 4 Experimental system



Controller select the motor units like a descrete controller for the desired motion.

Figure 5 Proposed muscle model

RESULTS AND DISCUSSION

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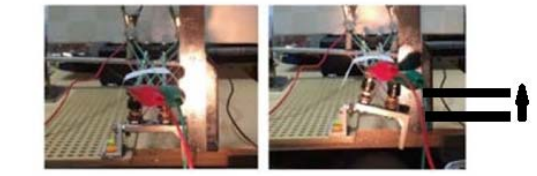
To examine the above assumptions and properties, the experimental system in **Fig. 4** was utilized. **Fig. 6(i)** shows that the tip displacement of the system when the tip twist motion. In this condition, upper side two SMA was heated by 1.5[V] to make a gravitational compensation term. Internal force was supplied by the elastica. Here, we can see that the system was well actuated and it had been accomplished under the bias initial force the elastica. **Fig. 6(ii)** shows that stiffness control of the isometric contraction condition. The external force had been affected and measured the displacements of the tip of arm. **Fig. 7(i)** shows the tip displacement under the external force. Results are average of 5 trials and external force affected at 65[mm] point from the base joint of arm. Input voltage 1.9[V] was affected for the each two SMA. Here, we can see that the stiffness was changed by the isometric contraction of **Fig. 3(ii).** In this case, on the other hand, external force made isotonic contraction. **Fig. 7(ii)** shows the difference of the displacement between 0[V] and 1.9[V] input for the SMA. Results are average of 5 trials and external force affected at 65[mm], 115[mm] points from the base joint of arm. Here, the difference between the isometric contraction and non-activated was changed depend on the Jacobean matrix of the base joint of arm to the force affected point.

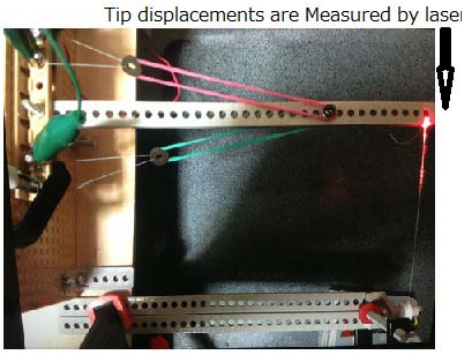
In the results of **Fig. 6 (i)**, the twist motion was actuated by the heated SMA with elastica. The elastica made bias initial force. Thus, the continuous controller activete the muscle to controll the position and force and the discrete controller changes the number of the motor units as shown in **Fig. 5** was examined. In the results of **Fig. 6 (ii) and Fig. 7**, a motor unit model with SMA and elastica as shown in **Fig. 3** can be examined and an example of the isometric contraction was verified. Thus, about thsese two assumptions,results showed an example case to satisfie the assumptions by using the experimentral system as shown in **Fig. 4.** Then, it seems that the previously discribed two assumptions are true in the industrial model case of the proposed system. In this case, output force can be sensitive by using a motor unit model and it can realize a wide output range by using the proposed descrete motor unit controller. More examination seems to be made the knowledge of the human sensory-motor system must be the effective tool for the future communication tools.

CONCLUSIONS

This research proposes a control strategy of a tendon driven mechanism based on the analysis of human like motion. Based on the human like muscle activities, proposed controller uses both the discrete and continuous controller. The continuous controller adjusts the stiffness of the muscle and the discrete controller changes the units of the active muscles. Then, based on the knowledge of the predictive and the iterative learning control strategy of the human motion, proposed controller can realize a force control with high resolution with wide output range. And also, the controller can select the number of the motor units. The controller and the mechanism can be applied to various applications for the communication way of such as the injured peoples.

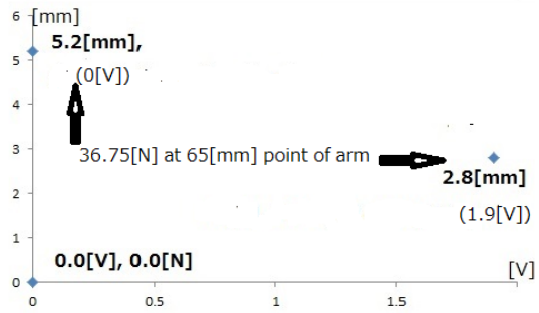


(i) Tip of the arm and its twist motion.
(0[mm] at 1.5[V], 9[mm] at 3[V], 10[mm] at 4.5[V])

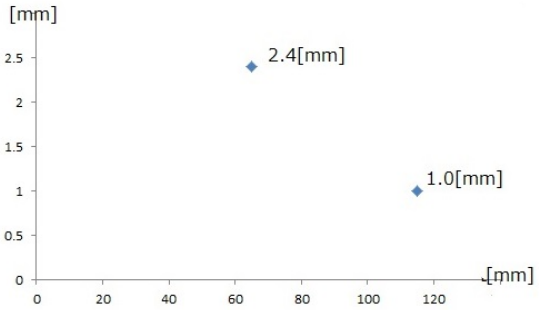


(ii) Stiffness control of the isometric contraction condition.
External force was affected and measure the displacement.

Figure 6 Motion of the experimental system



(i) Tip displacement under the external force.
Average of 5 trials and 36.75[N] at 65[mm] point of arm.



(ii) Difference of the displacement between 0[V] and 1.9[V].
Average of 5 trials.
External force were added at 65[mm] and 115[mm] poit.

Figure 7 Results of the isometric condition

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A FUZZY COGNITIVE MAP APPROACH TO PREDICT THE CHROMOSOMAL ABNORMALITIES BY USING THE TRIPLE TEST MARKERS AND DEMOGRAPHIC FACTORS

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Chromosomal abnormalities are the major defects that effect babies and their parents during and after the gestation. These defects, such as Trisomy 21 (Down Syndrome), Trisomy 18 (Edward's Syndrome) and Trisomy 13 (Patau Syndrome) that are most commonly faced abnormalities, can be detected by prenatal invasive and non-invasive tests. Although invasive tests have higher accuracy of prediction, their higher risk of pregnancy loss makes non-invasive tests more preferable. Triple Test is one of these non-invasive tests, but its estimated accuracy does not satisfy parents since false positive and false negative rates are too high. Fuzzy Cognitive Maps (FCMs) are analytical and supportive tools which are capable to express the behavior of a system by using the accumulated knowledge obtained via the observations. In this study, a Two Level of Fuzzy Cognitive Map will be constructed which is expected to produce relatively less false positive and false negative predictions. The level-1 FCM will model the demographic risk profile while the level-2 will model the parameters of the blood screening. Subsequently, an overall risk grade will be calculated by an accurate combination of those results obtained in level-1 and level-2.

Keywords: Fuzzy cognitive maps, Chromosomal abnormalities, Triple test markers, Demographic factors

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A NEW IMPLICIT TIME INTEGRATION METHOD FOR NONLINEAR STRUCTURAL DYNAMICS PROBLEMS

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Abstract: A new time integration method is suggested for solving equation of motion of structural dynamics problems. The method is established upon the principle of impulse-momentum, leading to a lesser number of assumed fields. The algorithmic properties of the procedure are determined by stability and accuracy analyses. Overshooting tendency and order of accuracy are also examined. It is shown that the proposed method is unconditionally stable and non-dissipative. Its numerical dispersion appears to be much less than the commonly used integration methods. The method has no tendency to overshoot both the displacement and velocity response solutions. Its order of accuracy is around four as compared to two of the other methods considered in the study. A few numerical examples consisting of both linear and nonlinear single and multi-degree of freedom systems are carried out to see the overall behavior of the method in various practical problems.

Keywords: Time Integration, Implicit Procedure, Numerical Stability and Accuracy, Overshooting

Introduction

Many methods have been proposed in the last fifty years (Katsikadelis, 2013) for the numerical solution of equations of motion encountered in seismic and structural dynamic problems. These methods can fundamentally be classified as either explicit or implicit methods (Wood, 1990; Chung and Lee, 1994; Bathe, 1996). In explicit integration, the equation of motion of the current time step is not employed in determining the displacement of the current time step. The great advantage of explicit integration is that it does not require solving a set of algebraic equations at each time step (Rio et al., 2005) leading to less computation. Yet, according to the second barrier of Dahlquist (Dahlquist, 1963), all explicit methods are conditionally stable with respect to the size of time step. On the other hand, most implicit integration methods are unconditionally stable. Unconditional stability is an important property to be considered when selecting the proper integration algorithm for analysis of structures with a large number of degrees of freedom. The disadvantage of implicit integration methods is that they require the solution of a system of equations at each time step (Hulbert and Chung, 1996; Chang and Liao, 2005). This makes them computationally more expensive per time step. Apparently, each type of integration has its own advantages and disadvantages. It would be instrumental for an integration method to possess the advantages of explicit and implicit procedures simultaneously. For this purpose, several explicit algorithms with unconditional stability have recently been proposed (Chang and Huang, 2010; Chang, 2002, Chang, 2007; Kolay and Ricles, 2014).

It has been suggested that a desirable time integration method should possess the following criteria (Dokainish and Subbaraj, 1989; Hughes, 1987; Hilber and Hughes, 1978): unconditional stability for application to both linear and nonlinear problems, at least a second order accuracy, self-starting and one step scheme, no more than one set of implicit equations to be solved at each time step, controllable algorithmic damping in higher modes and no overshooting. Many methods have been developed in the last few decades to satisfy these criteria such as the Newmark family methods (Newmark, 1959), Houbolt method (Houbolt, 1950), Wilson-θ method (Bathe and Wilson, 1973), Park method (Park, 1975), HHT-α method (Hilber et al., 1977), WBZ-α method (Wood et al., 1981), generalized-α method (Chung and Hulbert, 1993), and collocation method (Hilber and Hughes, 1978). These algorithms differ from each other mainly with respect to their numerical dissipation and overshooting characteristic. None of them fully satisfies all the criteria. It seems that the development of an effective and accurate integration scheme that satisfies the aforementioned criteria will still be the aim of future research studies in the respective field.

The experience has shown that single-step implicit and unconditionally stable methods are the most preferred methods for the solution of dynamic response of structural systems (Wilson, 2002). Implicit methods use the equation of motion of a dynamic system at the end of each time step to determine the response variables. Direct time integration methods assume a specific type of variation of displacement u, velocity $\dot{u}$ and acceleration $\ddot{u}$ within each time increment (Dukkipati, 2009). Instead of equation of motion, equation of impulse-momentum is utilized in this study to relate the unknown parameters. Hence, the proposed method is based upon employing

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displacement and velocity fields as the unknowns. This results in a decrease in the order of assumed quantities. Eventually, this decrease is expected to lead to smaller errors in comparison with the existing integration schemes. Numerical stability, dispersion, dissipation are investigated to evaluate the accuracy of the proposed method. Overshooting effect, which is not related to the stability and accuracy characteristics of an integration algorithm, is also examined. Finally, a selection of numerical examples comprising both linear and nonlinear single and multiple degree of freedom systems are studied in order to readily observe and practically evaluate the characteristics of the proposed scheme.

Proposed Method

The general equation of a viscously damped and linear single degree of freedom dynamical system can be expressed as

$$m\ddot{u} + c\dot{u} + ku = p(t) \tag{1}$$

where m, c and k are the mass, damping and stiffness of the system; $p(t)$ is the externally applied force, and u, $\dot{u}$ and $\ddot{u}$ are the displacement, velocity and acceleration response. The numeric integration procedure involves discretization of both the response and excitation into small time increments Δt. Therefore, by replacing continuous variable t by the discrete variable t_i, the differential equation changes to

$$m\ddot{u}_i + c\dot{u}_i + ku_i = p_i \tag{2}$$

This is equation is solved progressively in time increments Δt starting from the known initial conditions. Integration of Eq. (2) yields

$$m\dot{u}_i + cu_i + kq_i + \int p_i d\tau = m\dot{u}_{i+1} + cu_{i+1} + kq_{i+1} \tag{3}$$

This equation indicates that the sum of linear momentum of the system at ith time step and linear impulse of the excitation over Δt is equal to momentum of the dynamic system at $(i+1)$th time step. In this equation, variable τ changes from 0 to Δt and q is the integration of displacement response over Δt. Eqs. (2) and (3) can be reformulated in an incremental form:

$$m\Delta\dot{u}_i + c\Delta u_i + k\Delta q_i = I_i \tag{4}$$

$$m\Delta\ddot{u}_i + c\Delta\dot{u}_i + k\Delta u_i = \Delta p_i \tag{5}$$

where I_i is the impulse of the applied force and $\Delta p_i = p_{i+1} - p_i$. The derivative of acceleration response is assumed to be linear in the proposed study. This yields a second order acceleration and fourth order displacement function as follows:

$$\ddot{u}(\tau) = \ddot{u}_i + \frac{\tau}{\Delta t}\Delta\ddot{u}_i \tag{6}$$

$$\Delta\dot{u}(\tau) = \ddot{u}_i\tau + \frac{\tau^2}{2\Delta t}\Delta\ddot{u}_i \tag{7}$$

$$\Delta u(\tau) = \dot{u}_i\tau + \frac{\ddot{u}_i\tau^2}{2} + \frac{\tau^3}{6\Delta t}\Delta\ddot{u}_i \tag{8}$$

$$\Delta q(\tau) = u_i\tau + \frac{\dot{u}_i\tau^2}{2} + \frac{\ddot{u}_i\tau^3}{6} + \frac{\tau^4}{24\Delta t}\Delta\ddot{u}_i \tag{9}$$

$$\Delta q(\tau) = u_i\tau + \frac{\dot{u}_i\tau^2}{2} + \frac{\ddot{u}_i\tau^3}{6} + \frac{\ddot{u}_i\tau^4}{24} + \beta\frac{\tau^5}{\Delta t}\Delta\ddot{u}_i \tag{10}$$

From Eq. (9), $\Delta\ddot{u}$ is obtained as

$$\Delta\ddot{u}_i = \frac{24\Delta u_i}{\Delta t^3} - \frac{24\dot{u}_i}{\Delta t^2} - \frac{12\ddot{u}_i}{\Delta t} - 4\ddot{u}_i \tag{11}$$

Based on this equation, the expressions for acceleration, velocity and q_i can be rewritten in incremental form:

$$\Delta\ddot{u}_i = \frac{12\Delta u_i}{\Delta t^2} - \frac{12\dot{u}_i}{\Delta t} - 6\ddot{u}_i - \ddot{u}_i\Delta t \tag{12}$$

$$\Delta\dot{u}_i = -\frac{\ddot{u}_i\Delta t^2}{6} + \frac{4\Delta u_i}{\Delta t} - 4\dot{u}_i - \ddot{u}_i\Delta t \tag{13}$$

$$\Delta q_i = u_i\Delta t + \frac{\dot{u}_i\Delta t^2}{2} + \frac{\ddot{u}_i\Delta t^3}{6} + \frac{\ddot{u}_i\Delta t^4}{24} + 24\beta\Delta t\Delta u - 24\dot{u}\beta\Delta t^2 - 12\ddot{u}\beta\Delta t^3 - 4\ddot{u}_i\beta\Delta t^4 \tag{14}$$

Substituting the above equalities in Eq. (4), one determines $\ddot{u}$ as

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$$\dddot{u}_i = \frac{1}{a_1}\left\{\begin{array}{c}\ddot{u}_i\left(-m\Delta t+\frac{k\Delta t^3}{6}-12k\beta\Delta t^3\right)+\dot{u}_i\left(-4m+\frac{k\Delta t^2}{2}-24k\beta\Delta t^2\right)+u_i k\Delta t \\ +\Delta u\left(\frac{4m}{\Delta t}+c+24k\beta\Delta t\right)-I_i\end{array}\right\} \tag{15}$$

with

$$a_1 = -\left(-\frac{m\Delta t^2}{6}+\frac{k\Delta t^3}{24}-4k\beta\Delta t^4\right) \tag{16}$$

Once $\dddot{u}$ has been determined, it can be substituted in Eqs. (12) and (13) to give

$$\begin{array}{l}\Delta\ddot{u}_i = -\frac{\Delta t}{a_1}\ddot{u}_i\left(-m\Delta t+\frac{k\Delta t^3}{6}-12k\beta\Delta t^3\right)-\frac{\Delta t}{a_1}\dot{u}_i\left(-4m+\frac{k\Delta t^2}{2}-24k\beta\Delta t^2\right)-\frac{\Delta t^2}{a_1}ku_i \\ -\frac{\Delta t}{a_1}\Delta u_i\left(\frac{4m}{\Delta t}+c+24k\beta\Delta t\right)-4\ddot{u}_i-\frac{12\dot{u}_i}{\Delta t}+\frac{12\Delta u_i}{\Delta t^2}+\frac{I_i\Delta t}{a_1}\end{array} \tag{17}$$

$$\begin{array}{l}\Delta\dot{u}_i = -\frac{\Delta t^2}{6a_1}\ddot{u}_i\left(-m\Delta t+\frac{k\Delta t^3}{6}-12k\beta\Delta t^3\right)-\frac{\Delta t^2}{6a_1}\dot{u}_i\left(-4m+\frac{k\Delta t^2}{2}-24k\beta\Delta t^2\right)-\frac{\Delta t^3}{6a_1}ku_i \\ -\frac{\Delta t^2}{6a_1}\Delta u_i\left(\frac{4m}{\Delta t}+c+24k\beta\Delta t\right)-\ddot{u}_i\Delta t-4\dot{u}_i+\frac{4\Delta u_i}{\Delta t}+\frac{I_i\Delta t^2}{6a_1}\end{array} \tag{18}$$

where

$$I_i = \frac{1}{2}(p_i + p_{i+1})\Delta t \tag{19}$$

Substituting Eqs. (17) and (18) into Eq. (9) yields

$$\begin{array}{c}m\left\{\begin{array}{l}-\frac{\Delta t}{a_1}\ddot{u}_i\left(-m\Delta t+\frac{k\Delta t^3}{6}-12k\beta\Delta t^3\right)-\frac{\Delta t}{a_1}\dot{u}_i\left(-4m+\frac{k\Delta t^2}{2}-24k\beta\Delta t^2\right) \\ -\frac{\Delta t^2}{a_1}ku_i-\frac{\Delta t}{a_1}\Delta u_i\left(\frac{4m}{\Delta t}+c+24k\beta\Delta t\right)-4\ddot{u}_i-\frac{12\dot{u}_i}{\Delta t}+\frac{12\Delta u_i}{\Delta t^2}+\frac{I\Delta t}{a_1}\end{array}\right\} \\ + \\ c\left\{\begin{array}{l}-\frac{\Delta t^2}{6a_1}\ddot{u}_i\left(-m\Delta t+\frac{k\Delta t^3}{6}-12k\beta\Delta t^3\right)-\frac{\Delta t^2}{6a_1}\dot{u}_i\left(-4m+\frac{k\Delta t^2}{2}-24k\beta\Delta t^2\right) \\ -\frac{\Delta t^3}{6a_1}ku_i-\frac{\Delta t^2}{6a_1}\Delta u_i\left(\frac{4m}{\Delta t}+c+24k\beta\Delta t\right)-\ddot{u}_i\Delta t-4\dot{u}_i+\frac{4\Delta u_i}{\Delta t}+\frac{I\Delta t^2}{a_1}\end{array}\right\} \\ + \\ +k\Delta u_i = \Delta p_i\end{array} \tag{20}$$

from which Δu_i value can be determined as

$$\Delta u_i = \frac{\Delta p_x}{k_x} \tag{21}$$

where

$$k_x = 12\frac{m}{\Delta t^2}-m\frac{\Delta t}{a_1}\left(\frac{4m}{\Delta t}+c+24k\beta\Delta t\right)+\frac{4c}{\Delta t}-\frac{c\Delta t^2}{6a_1}\left(\frac{4m}{\Delta t}+c+24k\beta\Delta t\right)+k \tag{22}$$

and

$$\begin{array}{l}\Delta p_x = \Delta p_i-\ddot{u}_i\left(-6m-m\frac{\Delta t}{a_1}\left(-m\Delta t+k\frac{\Delta t^3}{6}-12k\beta\Delta t^3\right)\right)-c\Delta t-c\frac{\Delta t^2}{6a_1}\left(-m\Delta t+k\frac{\Delta t^3}{6}-12k\beta\Delta t^3\right) \\ -\dot{u}_i\left(-12\frac{m}{\Delta t}-m\frac{\Delta t}{a_1}\left(-4m+\frac{1}{2}k\Delta t^2-24k\beta\Delta t^2\right)\right)-4c-c\frac{\Delta t^2}{6a_1}\left(-4m+\frac{1}{2}k\Delta t^2-24k\beta\Delta t^2\right) \\ +u_i\left(mk\frac{\Delta t^2}{a_1}+kc\frac{\Delta t^3}{6a_1}\right)-I_i\left(m\frac{\Delta t}{a_1}\Delta+c\frac{\Delta t^2}{6a_1}\right)\end{array} \tag{23}$$

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In the above equations, k_x represents the effective stiffness and Δp_x the effective external loading. Once Δu_i is known, $\Delta \dot{u}_i$ and $\Delta \ddot{u}_i$ can be computed from Eqs. (17) and (18), respectively; and the displacement, velocity and acceleration at time i+1 can be calculated from the following equations:

$$u_i + \Delta u_i = u_{i+1} \tag{24}$$

$$\Delta \dot{u}_i + \dot{u}_i = \dot{u}_{i+1} \tag{25}$$

$$\Delta \ddot{u}_i + \ddot{u}_i = \ddot{u}_{i+1} \tag{26}$$

Performance of the Proposed Method

Numerical Stability

In a general discussion of the stability of an integration algorithm, it is common practice to apply the algorithm to a single degree of freedom system governed by

$$\ddot{u}(t) + 2\xi\omega\dot{u}(t) + \omega^2 u(t) = p(t) \tag{27}$$

where ξ, ω and p are the damping ratio, natural cyclic frequency of the system and (modal) external excitation. Most one-step integration methods recursively relate the displacement u_{i+1} and velocity $\dot{u}_{i+1}$ at the end of any arbitrary ith step to the u_i and $\dot{u}_i$ at the beginning of that step as

$$\begin{Bmatrix} u_{i+1} \\ \dot{u}_{i+1} \\ \ddot{u}_{i+1} \end{Bmatrix} = \begin{bmatrix} A_{11}(\Delta t) & A_{12}(\Delta t) & A_{13}(\Delta t) \\ A_{21}(\Delta t) & A_{22}(\Delta t) & A_{23}(\Delta t) \\ A_{31}(\Delta t) & A_{32}(\Delta t) & A_{33}(\Delta t) \end{bmatrix} \begin{Bmatrix} u_i \\ \dot{u}_i \\ \ddot{u}_i \end{Bmatrix} = [A] \begin{Bmatrix} u_i \\ \dot{u}_i \\ \ddot{u}_i \end{Bmatrix} \tag{28}$$

where $[A]$ is referred to as numerical amplification matrix. The algorithmic characteristics of an integration method are determined from the numerical amplification matrix $[A]$. The particular solution of the forced vibration in Eq. (28) is generally omitted in the investigation of stability conditions since any integration method that is unstable under complementary solution will already be unstable under the addition of particular integral.

The amplification matrix for the proposed method is obtained from

$$\begin{bmatrix} k & 0 & m \\ -\frac{4}{\Delta t} + \frac{\Delta t^2}{6a_1}\left(\frac{4m}{\Delta t} + 24k\beta\Delta t\right) & 1 & 0 \\ -\frac{12}{\Delta t^2} + \frac{\Delta t}{a_1}\left(\frac{4m}{\Delta t} + 24k\beta\Delta t\right) & 0 & 1 \end{bmatrix} \begin{Bmatrix} u_{i+1} \\ \dot{u}_{i+1} \\ \ddot{u}_{i+1} \end{Bmatrix} = \begin{bmatrix} 0 & 0 & 0 \\ -\frac{4}{\Delta t} + \frac{\Delta t^2}{6a_1}\left(\frac{4m}{\Delta t} + 24k\beta\Delta t\right) & -3 - \frac{\Delta t^2}{6a_1}\left(-4m + 0.5k\Delta t^2 - 24k\beta\Delta t^2\right) & -\Delta t - \frac{\Delta t^2}{6a_1}\left(-m\Delta t + \frac{k\Delta t^3}{6} - 12k\beta\Delta t^3\right) \\ -\frac{12}{\Delta t^2} + \frac{\Delta t}{a_1}\left(\frac{4m}{\Delta t} + 24k\beta\Delta t\right) & -\frac{12}{\Delta t} - \frac{\Delta t}{a_1}\left(-4m + 0.5k\Delta t^2 - 24k\beta\Delta t^2\right) & -5 - \frac{\Delta t}{a_1}\left(-m\Delta t + k\frac{\Delta t^3}{6} - 12k\beta\Delta t^3\right) \end{bmatrix} \begin{Bmatrix} u_i \\ \dot{u}_i \\ \ddot{u}_i \end{Bmatrix} \tag{29}$$

for the case of zero damping. The components of the amplification matrix can be obtained from this equation, but due to shortage of space, they are not provided herein.

The characteristic equation of amplification matrix can be obtained from the following relationship:

$$\left\| [A] - \lambda [I] \right\| = 0 \tag{30}$$

in which λ and $[I]$ are eigenvalues of square matrix $[A]$ and unit matrix, respectively. Expansion of Eq. (30) gives

$$\lambda^3 - 2\alpha_1\lambda^2 + \alpha_2\lambda - \alpha_3 = 0 \tag{31}$$

where α_1 is the half-trace, α_2 is the sum of principal minors, and α_3 is the determinant of $[A]$. Solution of Eq. (31) will give three different eigenvalues denoted by λ_1, λ_2 and λ_3. The maximum of the eigenvalues is called the spectral radius:

$$\rho([A]) = \max\left\{|\lambda_1|,\ |\lambda_2|,\ |\lambda_3|\right\} \tag{32}$$

Eq. (31) has three roots whereas the general equation of free vibration for a single degree of freedom system provides two roots. Therefore, the solution of Eq. (31) gives an extra root called the spurious root. The other two roots are referred to as the principal roots. The roots of the proposed method are given as follows:

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$$\alpha_1 = \frac{(\Delta t^4 - 192\beta\Delta t^4)\omega^4 + (576\beta\Delta t^2 + 16\Delta t^2 - 16\Delta t^2\xi^2)\omega^2 - 48}{(96\beta\Delta t^4 - \Delta t^4)\omega^4 + (576\beta\Delta t^3\xi - 8\Delta t^3\xi)\omega^3 + (576\beta\Delta t^2 - 8\Delta t^2 - 16\Delta t^2\xi^2)\omega^2 - ((-48)\Delta t\xi)\omega - 48} \quad (33)$$

$$\alpha_2 = 1 - \frac{\xi(96\Delta t\omega - \Delta t^3\omega^3(1152\beta - 16))}{\Delta t^4\omega^4 - 96\beta\Delta t^4\omega^4 + 8\Delta t^3\xi\omega^3 - 576\beta\Delta t^3\xi\omega^3 + 8\Delta t^2\omega^2 - 576\beta\Delta t^2\omega^2 + 16\Delta t^2\xi^2\omega^2 + 48\Delta t\xi\omega + 48} \quad (34)$$

$$\alpha_3 = 0 \quad (35)$$

It is noted that the proposed method produces no spurious root. The stability of an algorithm can be investigated by examining the two roots. A plot of the spectral radius against $\Delta t/T$ (or $\omega\Delta t$ in some cases) shows the stability properties of the algorithm. For an integration procedure to have a stable solution the spectral radius should be less than or equal to 1 for all values of $\Delta t/T$. This condition is satisfied if β=1/144 for the proposed method. Figure 1 presents the spectral radius of the proposed method along with those of the central difference, Newmark average acceleration, Newmark linear acceleration, and Wilson-θ methods. This plot is obtained for ξ=0. It is observed that the central difference method with $\Delta t > 0.31T$ and linear acceleration method with $\Delta t > 0.55T$ becomes unstable. The spectral radii for the remaining methods are always less than or equal to 1 for all $\Delta t/T$; thus, they are unconditionally stable.

It is well known that the condition of stability may be affected by the presence of physical damping in the system. To study this effect, the spectral radii of the mentioned algorithms are determined using a damping ratio of 5%. Figure 2 shows that the damping causes a downward shift in the low-frequency region of vibration modes but does not influence the critical time of instability for the conditionally stable methods. It is observed that the cusp point of Wilson-θ method is delayed from $\Delta t/T$=2.3 to $\Delta t/T$=2.7 in the case of physical damping. Hence, it can be said that the inclusion of damping in the numeric integration algorithms makes the stability condition less restrictive.

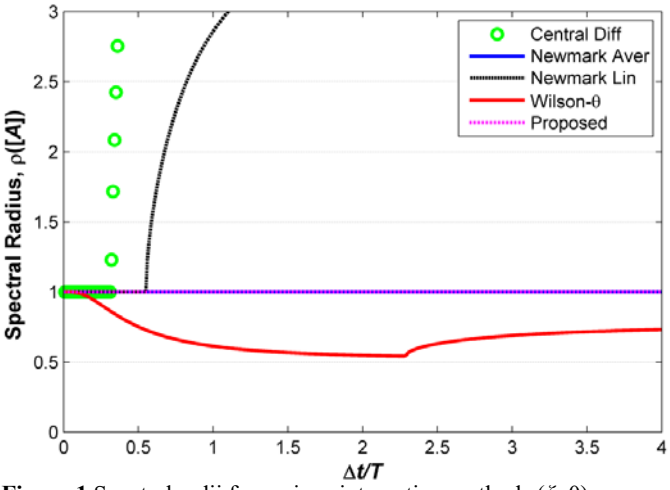

Figure 1 Spectral radii for various integration methods (ξ=0).

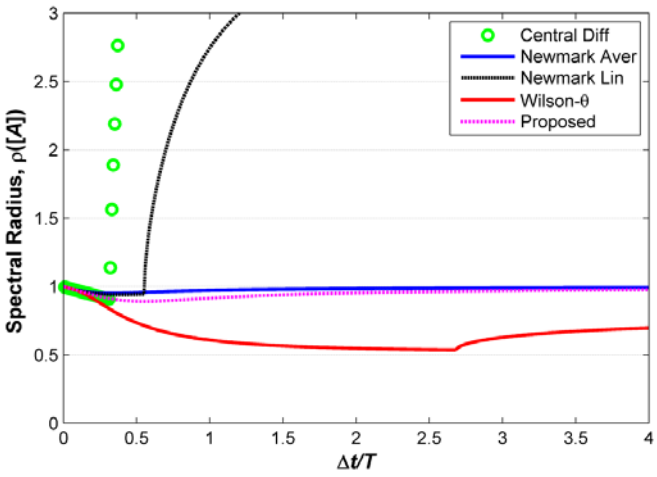

Figure 2 Spectral radii for various integration methods (ξ=5%).

Numerical Accuracy

The accuracy of a time integration procedure is investigated by assessing two types of errors (i.e., numerical dissipation and numerical dispersion) and the order of accuracy of the procedure. Eq. (28) can be rewritten in terms of finite difference equation upon the elimination of velocity and acceleration terms in the equation:

$$u_{i+1} - \alpha_1 u_i + \alpha_2 u_{i-1} - \alpha_3 u_{i-2} = 0, \qquad i \in \{2, 3, \ldots, M-1\} \quad (35)$$

where, as defined earlier, α_1 is the half-trace of $[A]$, α_2 is the sum of principal minors of $[A]$, α_3 is the determinant of $[A]$, and M is the number of steps utilized in the numeric integration. The solution to this equation in terms of the ith displacement function can be given as

$$u_i = e^{-\bar{\xi}\bar{\omega}t_i}\left\{c_1\cos\left(\bar{\omega}t_i\right) + c_2\sin\left(\bar{\omega}t_i\right)\right\} + c_3\lambda_3^i \quad (36)$$

The spurious root λ_3 is determined to be zero for all the time steps considered in this study. The principal roots are given by

$$\lambda_{1,2} = a \pm bj = e^{\bar{\Omega}\left(-\bar{\xi}\pm j\right)} \quad (37)$$

which indicates that the principal roots are complex conjugates of each other and are of the form $a+bj$ and $a-bj$ with j being the complex number. In Eq. (37), $\bar{\Omega} = \bar{\omega}\Delta t$ is referred to as phase of the numeric solution, $\bar{\xi}$ is the numeric viscous damping, and $\bar{\omega}$ is the numeric frequency. The numeric frequency value nominally must be

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equal to theoretical frequency ω but, in general, this condition is not satisfied. The numeric phase and damping coefficient are given in the following based on the principal roots:

$$\bar{\Omega} = \tan^{-1}\left(\frac{b}{a}\right) \tag{38}$$

$$\bar{\xi} = -\frac{\ln\sqrt{a^2+b^2}}{2\bar{\Omega}} \tag{39}$$

If the quantity $\sqrt{a^2+b^2}$ is less than unity, the time integration procedure provides a positive damping; if it is greater than unity, the numerical damping is negative; and it is equal to unity, then there will be no damping in the solution. As an alternative to numeric damping, an amplitude decay (AD) can also be defined as

$$\text{AD} = 1 - \left(\sqrt{a^2+b^2}\right)^{\frac{2\pi}{\bar{\Omega}}} \tag{40}$$

A second type of error for measuring the relative accuracy of an integration procedure can be provided by

$$\text{PE} = \frac{\bar{T}-T}{T} = \frac{\omega\Delta t - \bar{\Omega}}{\bar{\Omega}} \tag{41}$$

This equation is expressed with regard to period elongation, where $T=2\pi/\omega$ is the actual period of vibration. The period elongation for the previously-examined integration methods is plotted in Figure 3 as a function of $\Delta t/T$. It is seen that the proposed method will elongate the true period like the Newmark average acceleration, linear acceleration and Wilson-θ methods. But, the amount of numerical dispersion in the proposed method is much less than those of the other methods. From the figure, it is evident that the central difference method would shorten the actual period.

Figure 4 compares the numerical damping ratio of the proposed method to those of the other methods. It is observed that Newmark average acceleration and the proposed method yield almost no damping. The Newmark linear acceleration method produces numerical damping once it has reached the critical value for stability. The Wilson-θ method has a positive numerical damping while the central difference has negative damping. It can be said that the proposed method is non-dissipative. The data in Figure 4 can also be presented in terms of amplitude decay (AD) in Figure 5, from which it is again noted that the Newmark average acceleration and the proposed method show no amplitude decay in displacement response. The Wilson-θ method would decrease the amplitude of actual oscillation gradually as the frequency of oscillation increases. The amount of amplitude decay in the central difference method and Newmark linear acceleration methods decreases without bound once the value of $\Delta t/T$ becomes equal to the critical time step of the respective method. It indicates that the solutions of these two methods would be meaningless after this point on.

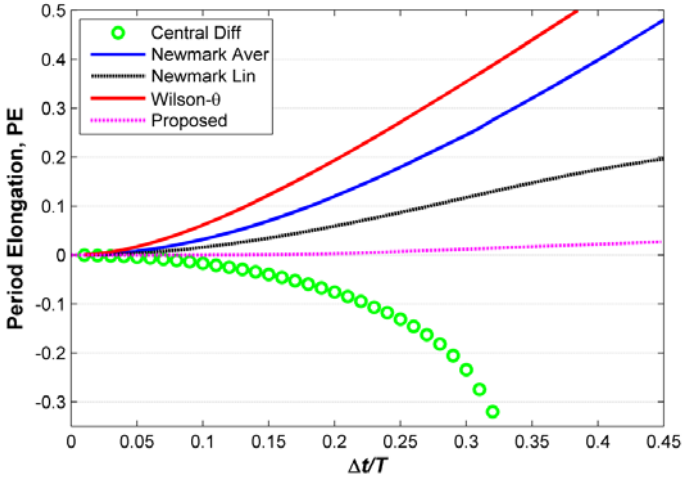

Figure 3 Period elongations (dispersion) of various integration methods.

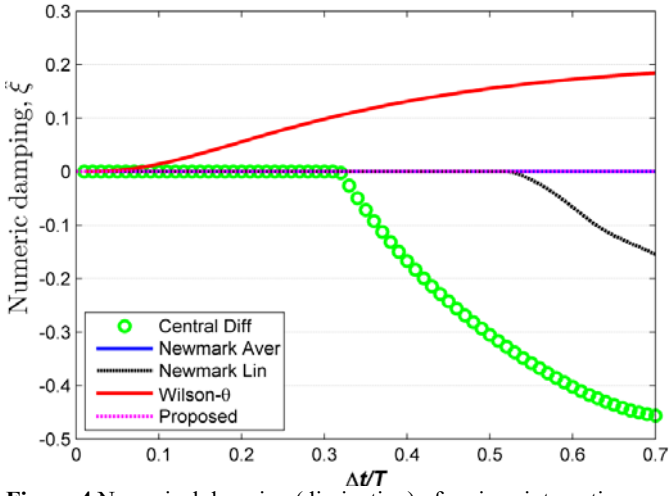

Figure 4 Numerical damping (dissipation) of various integration methods.

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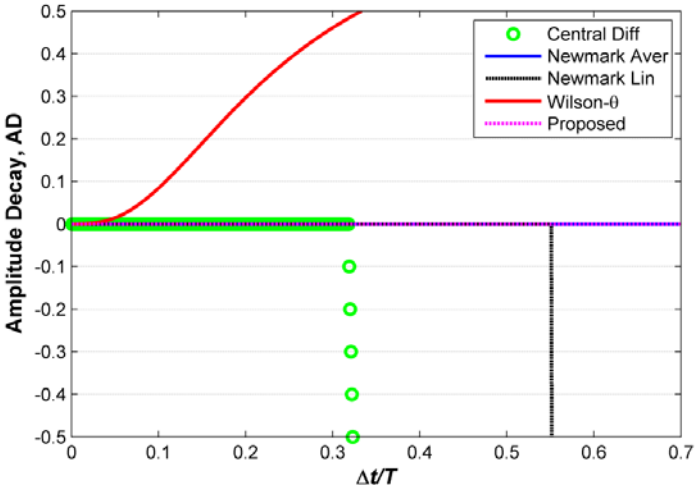

Figure 5 Amplitude decay of various integration methods

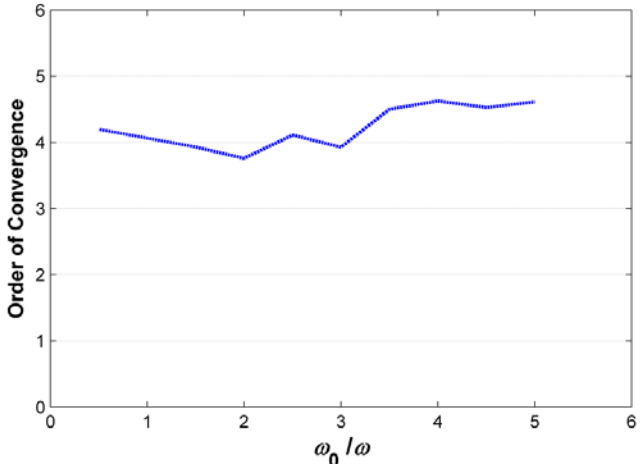

Figure 6 Order of accuracy for the proposed method

Order of Accuracy

The order of convergence is determined by evaluating the local truncation error in displacement response (Kavetski et al., 2004; Razavi et al., 2007; Gholampour and Ghassemieh, 2013). Varying the time step size and keeping the time instant of computation fixed, the displacement error can be determined from the following equation:

$$\left|u - u^{\text{exact}}\right| = \gamma \left(\frac{\Delta t}{T}\right)^{\alpha} \tag{42}$$

where u and u^{exact} are the numerical and exact displacement solutions of the system under harmonic excitation, γ and α are coefficients that would be determined from a regression analysis. α is referred to as the order of accuracy of the numeric procedure. The results of the regression analysis are shown in Figure 6 in terms of order of accuracy against the ratio of ω_0/ω, where ω_0 and ω are the cyclic frequencies of the external excitation and system, respectively. It is observed that the proposed method has an order of convergence of about 4. Note that the Newmark's methods has an order of around 2 (Gholampour and Ghassemieh, 2013), the central difference method has an order of slightly higher than 2 (Razavi et al., 2007), and the Wilson-θ method has an order of accuracy of 1 (Soroushian et al., 2012). The fourth order convergence of the proposed method means that if the time step size is halved, the error in displacement response will then be sixteen times smaller.

Overshooting effect

This specific phenomenon was first realized by Goudreau and Taylor (1972) as a property of the Wilson-θ method. Despite being unconditionally stable, the method showed a tendency to overshoot substantially the displacement and velocity solution during the first few time steps of calculation. This effect is not related to the stability and accuracy of properties of an integration procedure. Therefore, the tendency of an implicit method to overshoot should be considered in the evaluation of an integration method. In order to study the overshooting behavior of a method, the free vibration of a single degree of freedom system can be considered under non-zero values of initial displacement u_i and/or velocity $\dot{u}_i$ at the ith time step (Hilber and Hughes, 1978; Hulbert and Chung, 1994). Then, the responses u_{i+1} and $\dot{u}_{i+1}$ must be calculated at the end of time step as a function of $\Omega_i = \omega_i \Delta t$. The status of the phase approaching to infinity ($\Omega_i \to \infty$) provides an indication of tendency to overshoot.

The displacement and velocity responses at the end of any arbitrary time step for the proposed method are obtained upon the elimination of acceleration terms in Eq. (28) as:

$$u_{i+1} = u_i - \frac{24u_i\Omega_i^3 + (72u_i + 12\Delta t\dot{u}_i)\Omega_i^2 - 144\Delta t\dot{u}_i}{(\Omega_i^2 + 6\Omega_i + 12)^2} \tag{43}$$

$$\dot{u}_{i+1} = \frac{12u_i + \Delta t\dot{u}_i}{\Delta t} - \frac{144u_i\Omega_i^3 + (864u_i + 72\Delta t\dot{u}_i)\Omega_i^2 + (1728u_i + 228\Delta t\dot{u}_i)\Omega_i + 1728u_i}{\Delta t(\Omega_i^2 + 6\Omega_i + 12)^2} \tag{44}$$

In order for the proposed method to avoid overshooting phenomenon, the powers of Ω_i in the numerators of Eqs. (43) and (44) should be less than or equal to the powers of Ω_i in their denominators (Chung & Hulbert, 1993). The above equations reveal that there is no overshoot in both displacement and velocity responses of the proposed

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method. The Newmark's average acceleration method exhibits no overshoot in displacement but it has a tendency to overshoot quadratically in the velocity solution (Hughes, 2000). The Wilson-θ method shows overshooting quadratically both in displacement and velocity solutions (Gholampour and Ghassemieh, 2013).

Numerical Examples

In order to confirm the numerical properties and evaluate the overall behavior of the proposed method, two examples are formed. The selection of example problems includes nonlinear single and multi-degree of freedom systems. Results of the study are compared to those of the Newmark's methods, central difference method and Wilson-θ method.

Example 1: Nonlinear single degree of freedom system

The second-order nonlinear equation of motion of a dynamic system is given by

$$10\ddot{u} + 5\dot{u} + 3u^2 + 200u = 500\cos(25t) - 200\sin(10t) \tag{54}$$

which is subjected to initial conditions of $u(0) = 0$ and $\dot{u}(0) = 0$. The displacement response for the first five seconds of time history is obtained using the five mentioned integration methods. The response of the Newmark's linear acceleration method with a time step increment of 0.001 sec is considered to be exact (Chang and Huang, 2010). In the rest of integration procedures a time step of 0.02 sec is utilized. The obtained time histories are plotted in Figure 7. In order to see clearly the performance of the methods, an error metric is defined at each time instant t as

$$\text{error}^t = \left| u^t - u^t_{\text{exact}} \right| \tag{55}$$

The values of error versus time parameter are shown in Figure 8. It is observed that the errors of the proposed method are the smallest among the considered methods.

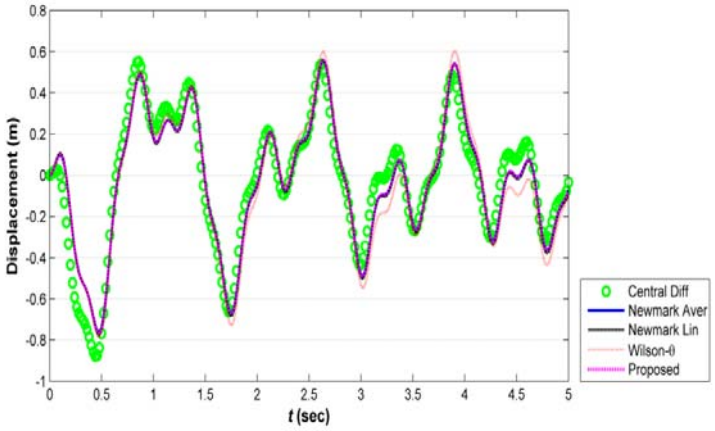

Figure 7 Displacement response of nonlinear SDOF system using the considered methods

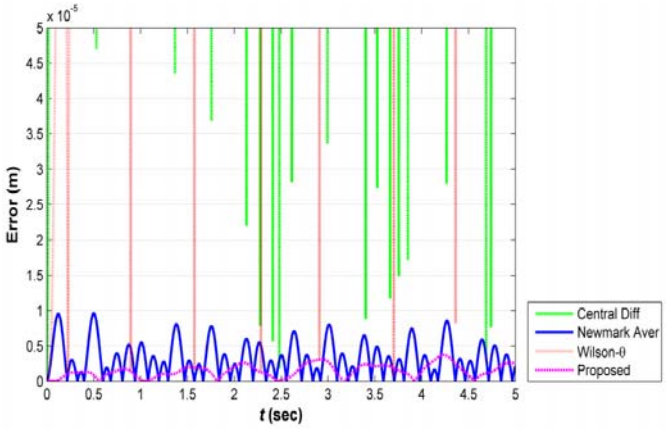

Figure 8 Comparison of error in displacement response of the nonlinear SDOF system

Example 2: Two-story shear building

In this example, a two-story shear building is considered with initial conditions of $\{u(0)\} = [0 \quad 0]^T$ and $\{\dot{u}(0)\} = [0 \quad 0]^T$. The columns of the system have nonlinear stiffness as described in Figure 9. The beams are assumed to infinitely stiff and the total mass of the system is concentrated at the floor levels. The building is subjected to external forces at floor levels that have two distinct frequencies of oscillation. The system has also damping and the damping coefficients are indicated in the figure. Story displacement responses are determined through the five methods. Again, the solution of the Newmark's linear acceleration with Δt=0.001 sec is assumed to be "exact". Figures 10 and 11 show the computed story displacements and Figure 12 displays the error quantities in the displacement response of the second story. It is observed that the proposed method with Δt=0.02 sec closely follows the solution of the Newmark's linear acceleration with Δt=0.001 sec. The error in the central difference method appears to be the largest, followed by that of the Wilson-θ method.

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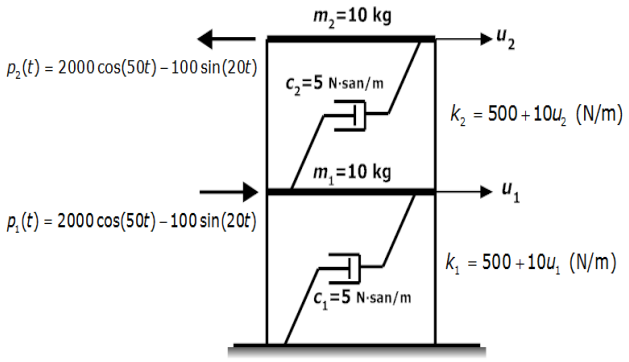

Figure 9 Two story shear building model of Example 2

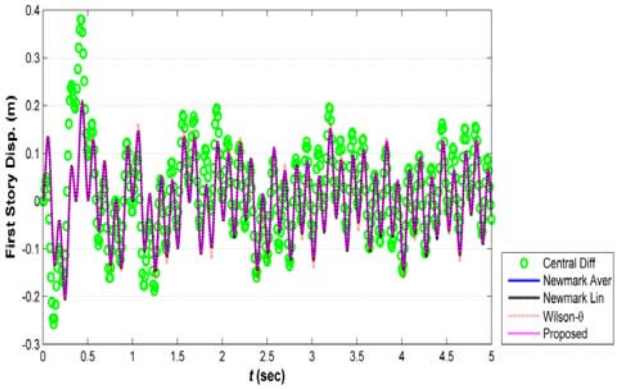

Figure 10 First story displacement of two story shear building using the five methods

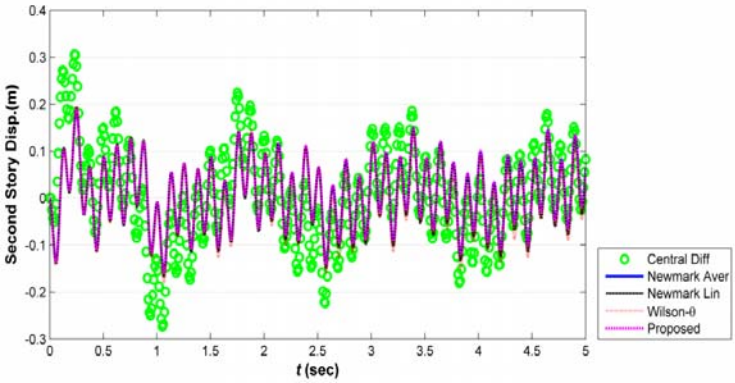

Figure 11 Second story displacement of two story shear building using the five methods

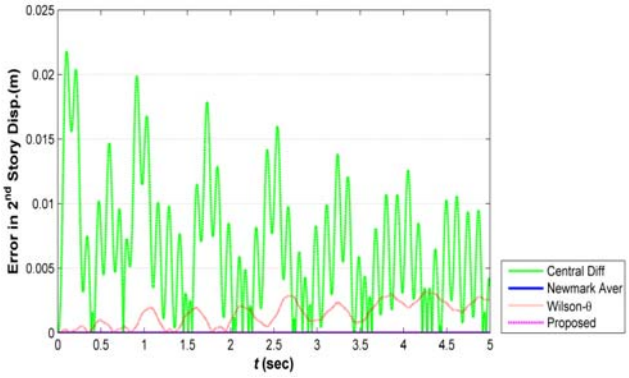

Figure 12 Error in the second story displacement

Conclusions

A new implicit step-by-step integration algorithm is proposed in this study for the solution of nonlinear problems in structural dynamics. The algorithmic characteristics of the proposed method are determined through stability and accuracy analyses. Also, to observe the general behavior of the proposed scheme in various dynamics problems, numerical tests are carried out in comparison with frequently used integration procedures such as the Newmark's family methods, central difference method and Wilson-θ method. Based on these studies, the following conclusions can be reached:

- With the use of β=1/144, the proposed method becomes unconditionally stable.
- The inclusion of physical damping in the system does not influence the unconditional stability of the method. However, it makes the stability conditions of the Newmark's linear acceleration and the central difference methods less restrictive.
- The numerical dispersion error of the proposed method is much smaller in comparison with the other methods considered in the study.
- The proposed method does not generate any numerical damping; hence, it is non-dissipative.
- This conclusion may be put it differently to state that the proposed scheme shows no amplitude decay regardless of the time step size used.
- The order of accuracy is about 4 for the proposed scheme. It is about 2 for Newmark's family methods and the central difference method, and 1 for the Wilson-θ method.
- Overshooting analysis reveals that the proposed method has no tendency to overshoot both the displacement and velocity solutions.
- The numerical example problems show that the displacement solutions of the proposed algorithm closely follow the exact solution of the Newmark's linear acceleration method, where a rather small time increment is employed to simulate the true displacement response.

The behavior of the proposed numerical integration scheme in the solution of large and sophisticated structures comprising both very stiff and flexible components and structures that exhibit spurious high mode responses arising due to inaccuracies and inadequacies in the finite element assemblages may be investigated as a further study.

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A NEW METHOD IN NDT OF WOOD: THERMAL CONDUCTIVITY

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Abstract: NDT (Non-Destructive Testing) is a analysis technique of materials without causing damage. Common techniques of NDT are ultrasonic, acoustic emission, penetrometer, radiography etc. This methods depends on distinctive features of materials. NDT is used in a variety of settings that covers a wide range of industrial activity, with new NDT methods and applications, being continuously developed. Non-destructive testing methods are routinely applied in industries where a failure of a component would cause significant hazard or economic loss, such as in transportation, pressure vessels, building structures, piping, and hoisting equipment. Thermal conductivity is a inherit feature of wood material and it is related with density. In this study, a developed thermal conductivity based NDT device will be introduced and it's reliability will be exhibited.

Keywords: Non-Destructive Testing, Wood Material, Thermal Conductivity

Introduction

Wood is an engineering material with these known properties; lightweight, durable, easily worked, ecological, stylish, natural, versatile, low-density, cellular, hygroscopic, polymeric, and composite. Thanks to this excellent properties, woodcan potentially be used for a large variety of applications such as traditional buildings, earthquake resistant buildings, flooring, roofing, utensils, indoor and outdoor furniture, boat and shipbuilding, bridges, sport equipment, etc.

The using of wood as construction material is nearly as old as the history of mankind. In addition, wooden houses are already in existence. Wooden houses still subsist and widely preferred especially in many countries in Europe and United States. Turkey has wooden and half-masonry structures built especially during the times of Ottoman Empire. However, only a part of these structures remain standing from past to the present as cultural heritages reflecting the related period. Maintenances and restorations of this structures have a critical importance for their transfer to the next generations. Today, the tests of these structures are performed with visual inspection by the relevant institutions. Recently, in parallel with technological developments, some non-destructive testing methods have been developed for testing the durability of historical wooden house's constructions. The most important methods among them are penetrate, acoustic, microwave, electricity and magnetic assessment methods.

Wood has an historical impact on the life and cultural development process of human (Erdin, 2003). The using of wood material as a construction material has started too many years ago and this process has extended until today with the technological developments (Korkmaz, 2012). In America, especially in California, which is located on the seismic zone, approximately 90% of houses were made of wood (Mcrea et al, 2001). However, some disadvantages of wood, for example, bad dimensional steadiness, relatively low strength,easy worm-eaten and decay, and bad fire resistance, prevent wood extensive usages. These disadvantages limits to expected life of the wood material (Yalınkılıç, 1992).

Non Destructive Testing (NDT) covers a wide group of examination methods used to assess the properties of a material, part, product, weld, or system without causing harm. It is a commonly-used instrument in mechanical engineering, forensic engineering, civil engineering, mechanical engineering, aerospace and aeronautical engineering and medical applications. This term can also be used as Non Destructive Inspection (NDI), and Non Destructive Evaluation (NDE) in literature. Visual assessment and classification of wood which is one of the oldest forms of non-destructive testing needs another method to verify reliability of findings. Visual assessment is totally subjective and directed by the performer. Non-destructive testing methods provide an opportunity to get more reliable results (Bodig and Jayne, 1982). According to Youngquist and Hamilton (1999), NDT is a method which is needed to focus on in the 21 century.

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Heat is the total energy of molecular motion in a substance while temperature is a measure of the average energy of molecular motion in a substance. Heat energy relies on the speed of the particles, the quantity of particles (the size or mass), and the kind of particles in an object. Temperature does not rely on the size or type of object. Heat exchange is the transfer of thermal energy between physical systems. The rate of heat exchange is reliant on the temperatures of the systems. The direction of heat exchange is from a region of high temperature to another region of lower temperature. On a microscopic scale, heat conduction occurs as hot, rapidly moving or vibrating atoms and molecules interact with neighboring atoms and molecules, transferring some of their energy (heat) to these neighboring particles. In other words, heat is transferred by conduction when adjacent atoms vibrate against one another, or as electrons move from one atom to another. Conduction is the most significant means of heat transfer within a solid or between solid objects in thermal contact.

Thermal conductivity can be expressed in terms of a coefficient of thermal conductivity (k). According to Fourier's law, in steady state condition, this is the measure of the rate of heat flow through one unit thickness of a material subjected to a temperature gradient, i.e., k is measured in W·m−1·K−1 (Kollmann and Cote 1968; Lienhard IV znd Lienhard V 2011). When heat is applied to a body, the vibratory energy of its molecules in that vicinity is increased. These molecules collide with neighboring molecules and, in so doing, transmit to them a part of their newly acquired energy. These neighboring molecules then in turn transmit a part of their newly acquired energy to still other molecules farther from the center of the disturbance (Brown et al. 1952).Due to the connections between atoms, the displacement of one or more atoms from their equilibrium positions will give rise to a set of vibration waves propagating through the lattice, and heat transfer in a dielectric solid occurs through elastic vibrations of the lattice.

The solid may be a crystal or it may be amorphous, but each atom has afixed equilibrium position, and the thermal vibrations can thus be resolved into normal modes. For a perfect crystal, these normal modes are plane travelling waves. Departures from the perfect lattice result in interactions, which are responsible for the statistical equilibrium between the normal modes. The thermal conductivity at liquid helium temperatures is due solely to phonons of the longitudinal mode of vibration (Debye 1912;Pomeranchuk 1941; Klemens 1951; Stephens 1973; Pohl et al. 1999).Jayne (1959) proposed in his well-known hypothesis for NDE of wood-based materials that energy storage and dissipation properties of wood-based materials are controlled by the same mechanisms that determine static behavior of such materials.

The above differential equation, when integrated for homogeneous material of 1-D geometry between two endpoints at constant temperature, gives the heat flow rate as:

$$\frac{\Delta Q}{\Delta T} = -kA \frac{\Delta T}{\Delta x}$$

Where
A is the cross-sectional surface area,
ΔT is the temperature difference between the surfaces,
Δx is the distance between the surfaces.

Density one of the major factor of the thermal conductivity with material's atoms and molecules are bonded together and their arrangement.

Materials and Methods

In this study, a portable machine which gives an idea about the strength of the wooden material depending on it's the rate of thermal conductivity was used. With the help of this machine, it is aimed to manufacture an alternative portable testing machine to acoustic and microwave testing systems. With this machine, especially in historical wooden houses, acceptable strength values of column-row systems will be determined through thermal conductivity coefficient without damaging the structure. Also, by using this machine it will be provide that defining the thermal conductivity values of facade systems of houses that are being used or ongoing construction. For the determination of strength values, thermal conductivity was defined on same test samples via new designed portable machine.

This machine consists of a terminal board, a heater and a thermo probe. Terminal board communicates with computer by USB serial. Also, the software was developed which process data comes from terminal board. A

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plate type sensor board was developed as probe with dimension of 50 mm * 70 mm. This sensor board was connected to terminal board with 3.5 mm jack and supplied with 3.5 V (DC). On the terminal board, Atmega 328 microcontroller was used. Because this microcontroller was used in arduino systems, the software of microcontroller was developed on Arduino platform.

A plate type resistance was used as heater with dimension of 100 mm * 70 mm. This resistance was supplied with 24V (DC) constant supply by a transformator. The surface of heater resistance was packaged with insulation materials to prevent heat escape and to provide reliability in experiments. The surface of sensor board was packaged with insulation materials to provide reliability. In order to measure the heat flow on the wood material, the temperature data were carried to the computer via USB bus using two meter sensor cable. Software of device takes data from sensors placed on the sensor board. This data processed in background and showed on the interface as a curve chart. When the test was finished, the results saved into the CSV file. The testing assembly shown in figure 1.



Figure 1: The testing assembly

In this study, 30 samples with a dimension of 2x5x10 cm obtained from Uludağ fir (*Abies bornmulleriana Mattf.*) wood were used. These samples separated into 3 equal groups. One of these groups was undensified, the others were densified at 25% and %50 ratio. Timbers were supplied as logs from a lumber yard in Düzce, Turkey. The sapwood was cut from the logs with an automatically controlled band saw. Rough-scale planks were formed, the cuts being determined by considering the annual rings parallel to the surface (tangent section) and the sample dimensions. Attention was paid to ensure that no rot, knot, crack, color, or density differences were present in the samples (TS 2470, 1976). The samples were initially subjected to natural drying to approximately 12% moisture content. Before the densification process, the samples were held in a conditioning cabin with a relative humidity of 65 ± 3%, and a temperature of 20 ± 2 °C until they reached a stable weight (TS 2471, 1976).

Results and Discussion

The air-dry density values of samples were determined. The average oven-dry density and air-dry density of Uludağ fir samples were given in Table 1.

Table 1. Oven-dry densities of Uludağ fir samples

Densification	Sample Number									
	1	2	3	4	5	6	7	8	9	10
Undensified	0,4103	0,3952	0,4214	0,4242	0,3856	0,3696	0,4263	0,4010	0,4123	0,4413
25% Densified	0.5715	0,5521	0.5817	0.5762	0.5561	0.5427	0.5884	0.5587	0.5709	0.6123
50% Densified	0.6689	0.5721	0.8121	0.7123	0.7434	0.7929	0.7672	0.8550	0.7659	0.8120

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The air-dry thermal conductivity values of samples were determined. The average oven-dry density and air-dry density of Uludağ fir samples were given in Table 1.

According to Table 1, it can be said that the density values of samples increase with densification. It is expected that this situation affects the thermal conductivity values of samples. For that reason, the thermal conductivity values of samples were measured with designed thermal conductivity testing machine. These results were given in Table 1.

Table 1. Thermal conductivity values of Uludağ fir samples

Densification	Sample Number									
	1	2	3	4	5	6	7	8	9	10
Undensified	0.1216	0.1152	0.1274	0.1282	0.1137	0.1114	0.1238	0.1196	0.1203	0.1312
25% Densified	0.1417	0.1377	0.1521	0.1532	0.1503	0.1522	0.1604	0.1531	0.1590	0.1612
50% Densified	0.1689	0.1621	0.1772	0.1782	0.1743	0.1739	0.1912	0.1735	0.1765	0.1942

According to this results, as would be expected, it can be said that there is a significant interaction between thermal conductivity and density of wood. And this values can be determined with designed device. In the next step of study, obtained data will compare with data will be obtained from QTM 500 Quick Thermal Conductivity Meter.
CTC tests have a good potential to be used as an alternative in situ NDE method to assess density and residual strength of wood. CTC test have a good potential to be used as an alternative NDT method to assess density and residual strengt of wood.

Acknowledgements

We would like to thank the Scientific and Technological Research Council of Turkey (TÜBİTAK-1001-114O644) for its financial support.

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A NEW MICROWAVE ASSISTED SYNTHETIC METHOD FOR THE SYNTHESIS OF 2-(1H-BENZO[D]IMIDAZOL-1-YL)-1-PHENYLETHAN-1-ONE OXIMES: AN EXPERIMENTAL AND COMPUTATIONAL STUDY

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Abstract: This study consists of two parts. In the first part, we have studied on a new microwave assisted synthetic method for the synthesis of 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one oximes from corresponding ketones. The results showed that the proposed microwave assisted method is efficient and time and energy saving. In the second part of our study some density functional theory (DFT) calculations have been performed on the selected molecules and compared with the experimental results. In the computational part of the study; single point energy calculations, geometry optimizations, frequency analysis, NMR spectral analysis, molecular electrostatic potential map calculations, frontier molecular orbital calculations, determination of some global reactivity descriptors and Mulliken atomic charge calculations have been performed. All DFT calculations were carried out at the B3LYP/6-31G(d), B3LYP/6-311G(d,p) and B3LYP/6-311+G(2d,p) level of theories.

Keywords: Microwave synthesis, oximes, benzimidazole, DFT calculation, computational chemistry

Introduction

Oximes and related compounds are important compounds in organic chemistry. This type of organic compounds can be very useful for the synthesis of wide range of organic molecules. Additionally, especially with the integration of some certain groups, like imidazole, benzimidazole, triazole, benzotriazole etc. this organic compounds exhibit broad spectrum of biological activities (Jiang, 2011). They can act as antibacterial (Kaplancikli, 2004), antifungal (Madkour, 2006) and antiviral (Beaulieu, 2006) agents etc. Figure 1 represents a typical 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one and its oxime form.

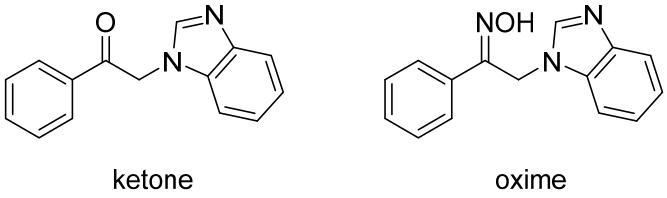

Figure 1. A typical 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one and its oxime form.

Miconazole is an important antifungal agent. It is the active ingredient of some commercially available pharmaceuticals. Oxiconazole is the oxime ether form of miconazole and it is also an important commercially available antifungal agent.

Literature contains various methods for the synthesis of oximes. Oximes can be prepared by the addition of hydroxylamine to aldehydes or ketones (Smith, 2007). This reaction is generally carried out in the presence of bases, and ethyl alcohol is commonly used as solvent. But some other methods also can be used, for example, refluxing in pyridine without using additional base (Abdel-Megid, 2002). Phase transfer reactions also can be used in this type of conversion and PEG-600 and high carbon number phenols, for example, nonyl phenol or dodecylphenol, can increase reaction rate as phase transfer catalysts (Liu, 1997; Krbechek, 1994). Microwave energy can also be used in the transformation of ketones to the corresponding oximes (Puciova, 1992; Mitra, 1999; Hajipour, 1999).

Oxime can be obtained either (E)- or (Z)- isomers. It is related to the relative stability of the isomers which will be the major product. In some cases (E)- isomer is more stable and becomes the major product but in some cases the (Z)- isomer is the major one. Figure 2 represents (E)- and (Z)- forms of 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one oxime.

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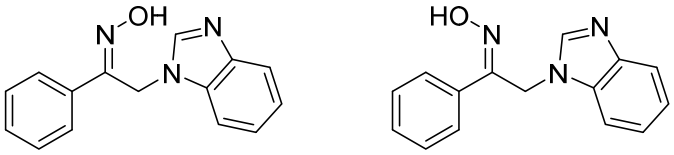

(Z)-oxime (E)-oxime

Figure 2. (E)- and (Z)- forms of 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one oxime.

One of the methods for the synthesis of 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one oxime is reported by Abdel-Megid (2002). In this method ketone was refluxed in pyridine for 6 hours in the presence of hydroxylamine. The yield was reported as 55%. Another method is reported by Özel Güven (2007). In this method, the reaction was carried out at room temperature in 24 hours. Methanol and water were used as solvents. The reported yield is 65%.

Materials and Methods

This study consists of two parts. In the first part, we have studied on a new microwave assisted synthetic method for the synthesis of 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one oxime from corresponding ketone. However the literature contains various methods for the conversion of this type of ketones to their oxime forms (Abdel-Megid, 2002, Ozel Guven, 2007, Rad, 2009, Roeintan, 2015), the results showed that the proposed microwave assisted method is efficient and time and energy saving. Microwave assisted ketone to oxime conversion reactions was carried out in pyridine in the presence of hydroxylamine hydrogenchloride under 200 W of microwave energy in 30 minutes. Prior to ketone to oxime conversion reaction we have used a two step literature method for the synthesis of ketone (Özel Güven, 2007).

In the second part of our study some density functional theory (DFT) calculations have been performed on the synthesized molecules and compared with the experimental results. In the study; single point energy calculations, geometry optimizations, frequency analysis, NMR spectral analysis, molecular electrostatic potential map calculations, frontier molecular orbital calculations, determination of some global reactivity descriptors and Mulliken atomic charge calculations have been performed. All DFT calculations were carried out at the B3LYP/6-31G(d), B3LYP/6-311G(d,p) and B3LYP/6-311+G(2d,p) level of theories using Gaussian 09W Rev.D.01 Program Package (Frisch, 2013). GaussView 5 Program Package (Dennington, 2009) was used for the visualization of the computational results.

Results and Discussion

In the synthesis of oxime from corresponding ketone, optimal ketone to hydroxylamine hydrogenchloride molar ratio was found to be 1:1.5. The reaction yield was found to be nearly 65%. The optimal microwave energy and microwave irradiation time was found to be 200W and 30 minutes, respectively.

In computational studies, firstly, calculations on the relative stability of the (E)- and (Z)- isomers of 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one oxime was carried out. Energies for the (Z)- and (E)- isomers and the energy differences between two isomers are given in Table 1. Results showed that the (Z)-isomer is more stable than the (E)- isomer.

Table 1: Relative stability of the (E)- and (Z)- isomers of 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one oxime.

Isomer	6-311G(d,p) (hartree)	6-311+G(2d,p) (hartree)	6-311G(d,p) (eV)	6-311+G(2d,p) (ev)
Z	-819.05482657	-819.08865299	-22287.62533962	-22288.54580374
E	-819.05307601	-819.08814267	-22287.57770444	-22288.53191722
ΔE	0.00175056	0.00051032	0.04763518	0.01388652

For a comparison, the same calculation was carried out on the imidazole substituted oxime. Results for the calculations on the relative stability of the (E)- and (Z)- isomers of 2-(1H-imidazol-1-yl)-1-phenylethan-1-one oxime are given in Table 2. It can be seen that the energy differences between (E)- and (Z)- isomers for the imidazole substituted oxime is bigger than the benzimidazole substituted oxime. The (Z)- isomer is again the more stable isomer.

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Table 2: Relative stability of the (E)- and (Z)- isomers of 2-(1H-imidazol-1-yl)-1-phenylethan-1-one oxime.

Isomer	6-311G(d,p) (hartree)	6-311+G(2d,p) (hartree)	6-311G(d,p) (eV)	6-311+G(2d,p) (ev)
Z	-665.37104241	-665.39952978	-18105.67500978	-18106.45019089
E	-665.36881286	-665.39858609	-18105.61434061	-18106.42451177
ΔE	0.00000941	0.00094369	0.06066917	0.02567912

Calculated and experimentally obtained selected geometric parameters for the 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one oxime was given in Figure 3 and Table 3. Calculated values were obtained at the B3LYP/6-311+G(2d,p) level of theory. Experimental geometric parameters are literature values (Özel Güven, 2007). The results show that there is a good agreement between the experimental and computational results.

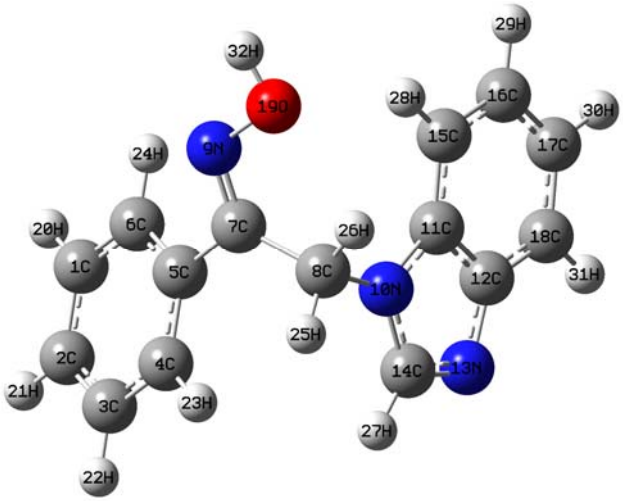

Figure 3. Calculated molecular structure for 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one oxime at the B3LYP/6-311+G(2d,p) level of theory.

Table 3: Calculated and experimental geometric parameters for the 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one oxime.

Bond Angle	Calculated	Literature	Bond Length	Calculated	Literature
6C-5C-7C	120.2	120.2	**19O-32H**	0.964	0.870
5C-7C-9N	116.0	115.3	**9N-19O**	1.407	1.383
7C-9N-19O	113.7	111.4	**9N-7C**	1.279	1.300
9N-19O-32H	102.2	107.0	**7C-5C**	1.484	1.491
9N-7C-8C	124.0	124.0	**7C-8C**	1.521	1.478
7C-8C-10N	112.9	111.5	**8C-10N**	1.454	1.479
7C-8C-10N	127.1	127.5			

Molecular electrostatic potential maps for the 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one and 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one oxime were given in Figure 4 and Figure 5, respectively.

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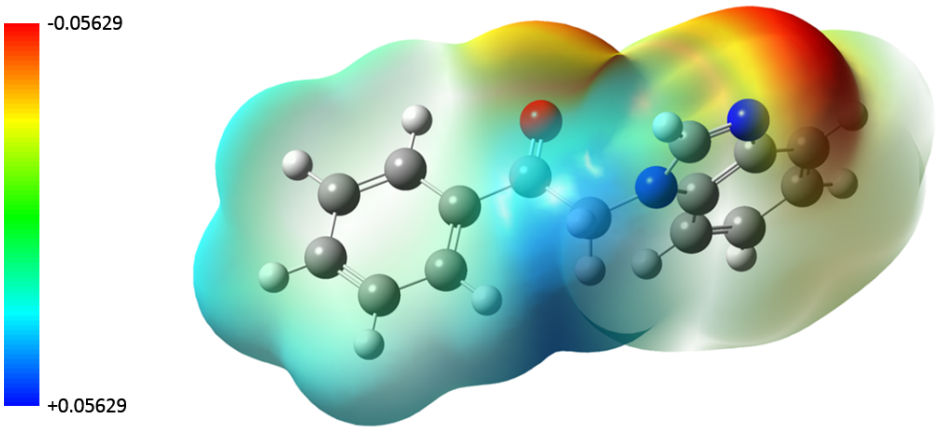

Figure 4. Molecular electrostratic potential map for 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one.

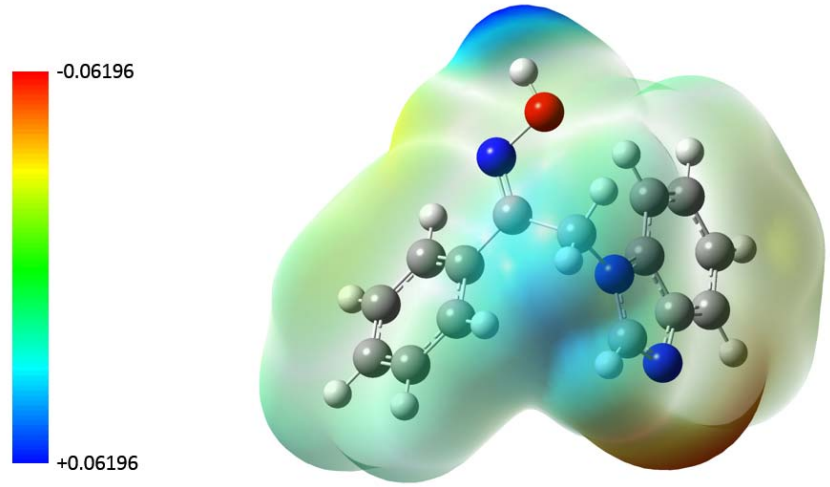

Figure 5. Molecular electrostatic potential map for 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one oxime.

In computational studies, NMR shielding tensor prediction calculations also have been performed. Calculated ^{1}H NMR chemical shifts at the B3LYP/6-31G(d), 6-311G(d,p) and 6-311+G(2d,p) level of theories using both CSGT and GIAO methods and for 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one were given in Table 4 and for 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one oxime were given in Table 5. Table 4 and Table 5 also includes experimental ^{1}H NMR chemical shifts obtained from the literature (Wen-lin, 2013; Abdel-Megid, 2002). In Table 4 and Table 5, Exp. denotes experimental values obtained from literature, csgt1 denotes B3LYP/6-31G(d) CSGT, csgt2 denotes B3LYP/6-311G(d,p) CSGT, csgt3 denotes B3LYP/6-311+G(2d,p) CSGT, giao1 denotes B3LYP/6-31G(d) GIAO, giao2 denotes B3LYP/6-311G(d,p) GIAO, giao3 denotes B3LYP/6-311+G(2d,p) GIAO.

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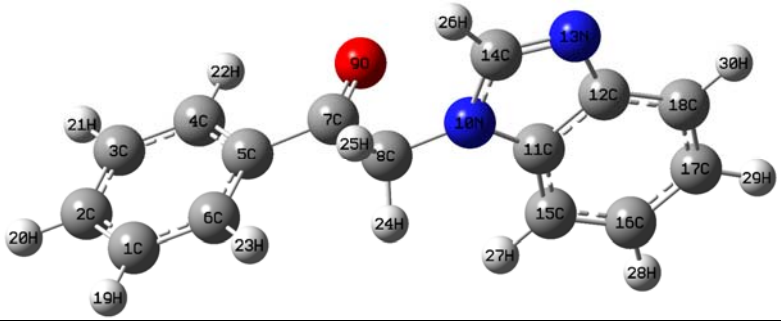
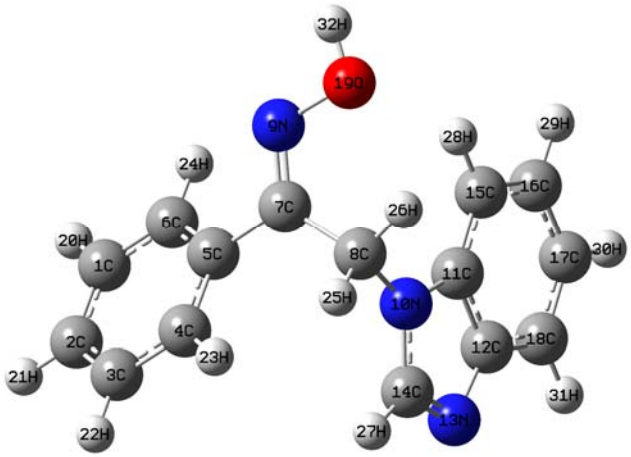
Table 4: ^{1}H NMR Chemical Shifts for 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one.



	Exp.	csgt1	csgt2	csgt3	giao1	giao2	giao3
22-H	7.94-7.97	4.77	6.82	8.10	7.70	8.51	8.74
23-H	7.94-7.97	4.77	6.82	8.10	7.70	8.51	8.74
30-H	7.79-7.83	4.73	6.83	7.82	7.36	8.25	8.33
20-H	7.56-7.61	4.65	6.57	7.58	7.23	7.98	8.17
19-H	7.43-7.48	4.59	6.52	7.47	7.18	7.90	8.06
21-H	7.43-7.48	4.59	6.52	7.47	7.18	7.90	8.06
26-H	8.15	3.80	6.45	7.40	6.85	7.74	8.05
29-H	7.32-7.37	4.31	6.18	7.16	6.90	7.65	7.75
28-H	7.25-7.28	4.25	6.12	7.08	6.84	7.58	7.68
27-H	7.25-7.28	3.96	6.01	6.94	6.55	7.33	7.47
24-H	6.08	2.61	4.12	5.34	4.73	5.49	5.85
25-H	6.08	2.61	4.12	5.34	4.73	5.49	5.85

Table 5: ^{1}H NMR Chemical Shifts for 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one oxime.



	Exp.	csgt1	csgt2	csgt3	giao1	giao2	giao3
28-H	6.8-7.6	4.60	6.78	7.61	7.16	7.87	7.99
31-H	6.8-7.6	4.57	6.68	7.60	7.15	7.84	7.88
23-H	6.8-7.6	4.29	6.48	7.47	6.91	7.73	7.77
24-H	6.8-7.6	4.29	6.48	7.47	6.91	7.73	7.77
27-H	6.8-7.6	3.59	6.41	7.38	6.65	7.59	7.73
21-H	6.8-7.6	4.47	6.31	7.24	6.92	7.46	7.55
20-H	6.8-7.6	4.46	6.33	7.22	6.91	7.46	7.53
22-H	6.8-7.6	4.46	6.33	7.22	6.91	7.46	7.53
29-H	6.8-7.6	4.32	6.15	7.11	6.86	7.38	7.47
30-H	6.8-7.6	4.29	6.14	7.08	6.85	7.36	7.43
32-H	11.0	2.74	5.91	6.98	6.09	6.96	7.15
25-H	5.6	2.55	4.16	5.27	4.75	5.42	5.60
26-H	5.6	2.55	4.16	5.27	4.75	5.42	5.60

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Results show that calculated ^{1}H NMR chemical shifts at the B3LYP/6-311G(d,p) GIAO (giao2) and especially B3LYP/6-311+G(2d,p) CSGT (csgt3) level of theories show good agreement with the experimental results.

Figure 6 represents the vibrational spectra calculated at the B3LYP/6-311+G(2d,p) level of theory for 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one and 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one oxime.

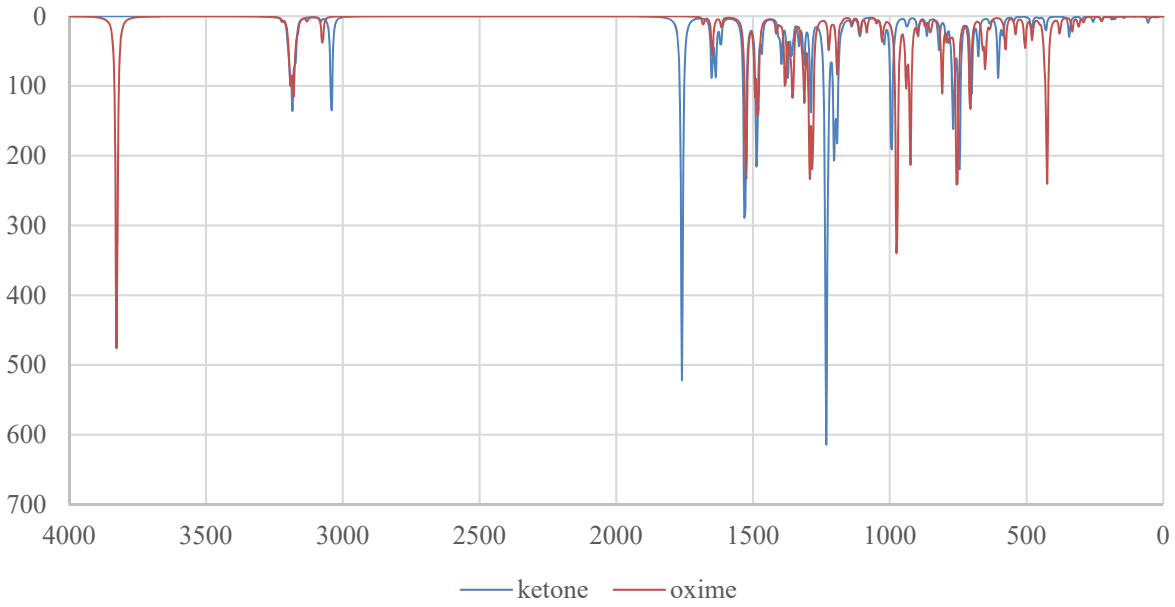

Figure 6. Calculated vibrational spectra for 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one and 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one oxime at the B3LYP/6-311+G(2d,p) level of theory.

Figure 7 represent HOMO and LUMOs of 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one and 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one oxime calculated at the B3LYP/6-311+G(2d,p) level of theory.

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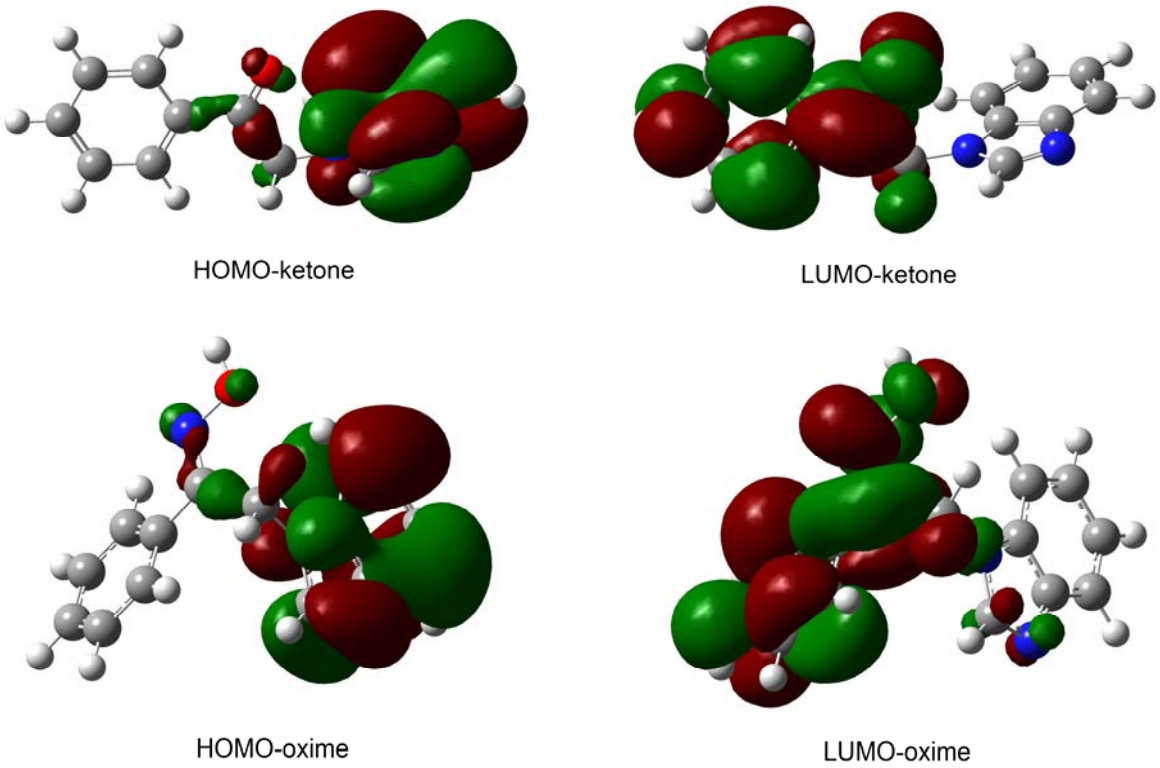

Figure 7.Highest Occupied and Lowest Unoccupied Molecular Orbitals for 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one and 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one oxime.

Table 6: Calculated global reactivity descriptors for 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one and 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one oxime at the 6-311+G(2d,p) level of theory.

	ketone		oxime	
	6-311+G(2d,p)	6-311+G(2d,p)	6-311+G(2d,p)	6-311+G(2d,p)
LUMO	-0.08601	-2.32227	-0.05937	-1.60299
HOMO	-0.22951	-6.19677	-0.22959	-6.19893
HOMO-LUMO Gap	0.14350	3.87450	0.17022	4.59594
I	0.22951	6.19677	0.22959	6.19893
A	0.08601	2.32227	0.05937	1.60299
χ	0.15776	4.25952	0.14448	3.90096
η	0.07175	1.93725	0.08511	2.29797
S	6.96864	0.25810	5.874750323	0.217583345
μ	-0.15776	-4.25952	-0.14448	-3.90096
ω	0.17344	4.68280	0.122632302	3.311072147

Figure 8 represents Mulliken atomic charges for 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one and Figure 9 represents for 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one oxime.

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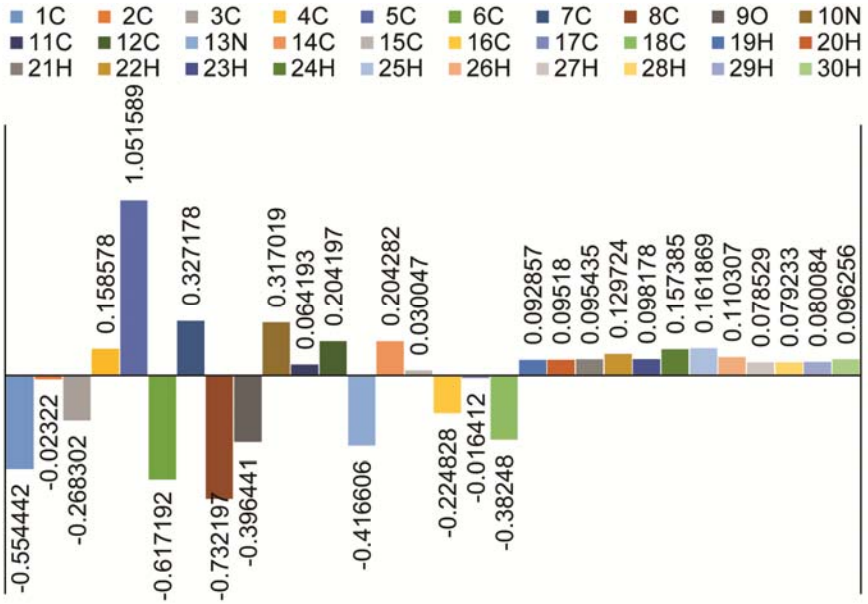

Figure 8. Mulliken atomic charges for 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one calculated at the B3LYP/6-311+G(2d,p) level of theory.

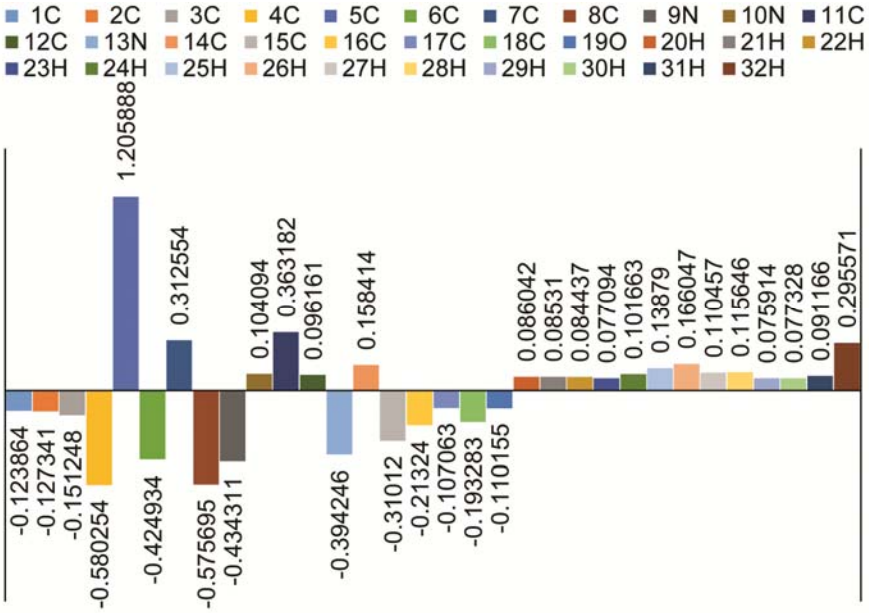

Figure 9. Mulliken atomic charges for 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one oxime calculated at the B3LYP/6-311+G(2d,p) level of theory.

Conclusion

As a result, in this study we have been studied on 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one oxime. The study consist of two parts. In the first part we have been studied on a new microwave assisted synthetic method for the conversion of 2-(1H-benzo[d]imidazol-1-yl)-1-phenylethan-1-one to its oxime form. The results showed that the proposed microwave assisted method is efficient and time and energy saving. In the second part of our study we have performed some density functional theory calculations on the selected molecules and compared them with the experimental results obtained from the literature. In the synthesis of oxime from corresponding ketone, the major product is the (Z)- isomer. This is not a surprising result because of the more stable structure of the (Z)-isomer than the (E)- isomer. Computational results also support this experimental results. There is a considerable energy difference between the (E)- and (Z)- isomers and the (Z)- isomer is the more stable one. In ^{1}H NMR chemical shift calculations there is a good agreement between the calculated values and the experimental values obtained from the literature. The best results have been obtained from the calculations performed at the B3LYP/6-311+G(2d,p) CSGT and B3LYP/6-311G(d,p) GIAO.

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A NEW RP-HPLC METHOD FOR SIMULTANEOUS DETERMINATION AND VALIDATION OF ETODOLAC AND THIOCOLCHICOSIDE IN HUMAN PLASMA

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In this work, an easy, fast, economical, repeatable, sensitive and new RP-HPLC (Reverse Phase-High Performance Liquid Chromatography) method been developed for the simultaneous quantitative estimation of Etodolac (ETD) and Thiocolchicoside (THC) combination (Etotio tablet containing 400 mg ETO and 8 mg TIO) in human plasma (in-vitro). Determination of ETD and THC without without any need for extraction process in human plasma was carried out at 259 nm by using Photo Diode Array Detector (DAD), on Tosoh Bioscience TSKgel ODS-80TM column (150×4.6mm, 5 µm). A mobile phase mixture consisting of Methanol: Phosphate Buffer (pH 3.5) were applied into the system as gradient elution and in flow rate of 1.0 ml/min. ETD and THC retention times were detected as 6.4 and 4.1 min, respectively. Validation parameters such as sensitivity, linearity, accuracy and precision were applied to the method in compliance with ICH validation guidelines (ICH Harmonized Tripartite Guideline, 2005). Calibration working range was 20-500 µg mL^{-1} for ETD and 0.4-10 µg mL^{-1} for THC and good linearities were obtained. Very high recovery values as 97.50-100.24% for ETD and 97.21-100.68% for THC was obtained.In contrary with the other methods encountered in the literature, the best separation was obtained between these two active ingredients thanks to the changes on mobile phase, flow rate and column type (Alagar, R. M., 2012-Sujatha, K., 2014). Furthermore, an environmental friendly and more economical method was developed by decreasing the methanol rate within the mobile phase mixture. This method also applied in human plasma media and it was seen that it can be easily and successfully applied in routine quantity analysis processes.

Keywords: Etodolac, Thiocolchicoside, Reverse Phase-High Performance Liquid Chromatography method, human plasma.

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A NEW SINGLE-PHASE PLL STRUCTURE FOR GRID-CONNECTED CONVERTERS

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Abstract: In grid connected-converters, switching signals are produced by using phase and frequency of grid voltages. Conventionally, these variables are computed by making use of PLL (Phase Locked Loop) structures in real time. The most important factor that affects the performance of a PLL is generally harmonic components of voltages. Thus, design of these structures is a difficult task. In the design of these structures, another difficulty is met in the case of single-voltages. In three-phase systems, orthogonal components of voltages can be obtained by using Park or Clarke transforms and these components provide to reach phase and frequency of voltages easily. In despite of this, reaching the orthogonal components from single-phase voltages is more difficult. In this paper, a new single-phase PLL structure that is developed for grid-connected converters is presented. New PLL structure is not affected by harmonics and captures the phase and frequency of single-phase voltage very well. This PLL structure has been tested by using both real and synthetic voltage signals and its superior performance has been verified.

Keywords: PLL, Single-Phase, phase angle, Orthogonal Components, Grid-Connected Converters

Introduction

Phase angle of grid voltages are the basic signal required for the synchronization of grid-connected converters. The major structures that include grid-connected converters are parallel and series APFs, uninterruptible power supplies and flexible alternative current transmission systems. In these structures, it is important determining the phase angle of grid voltage quickly and accurately in terms of obtaining reference signals properly (Arruda et al., 2001).

In literature, there are many works related to the obtaining synchronization signal for grid-connected converters. These structures are referred to phase locked loops (PLL). In almost all of these works, synchronization angle is reached over a closed control loop (Arruda et al., 2001; Ciobotaru et al., 2006; Ghoshal and John 2007; Timbus et al. 2005;Kaura and Blasko, 1997; Chung, 2000). With the use of a PLL, not only the instantaneous phase angle of reference voltage signal is obtained but also its frequency and amplitude values are computed (Ciobotaru et al., 2006). The most important feature expected from a PLL structure is to compute phase angle quickly and accurately even in the case of highly distorted voltages and to work stably in transient conditions. PLL structures are one of the important parts of the reference current methods such as synchronous reference frame and direct current control methods that are able to compensate reactive power compensation.

General form of these structures is given in Figure 1. Here, the PLL captures the phase angle of alternative voltage with the help of a low pass filter (LPF) and a voltage controlled oscillator (VCO) (Kaura and Blasko, 1997).

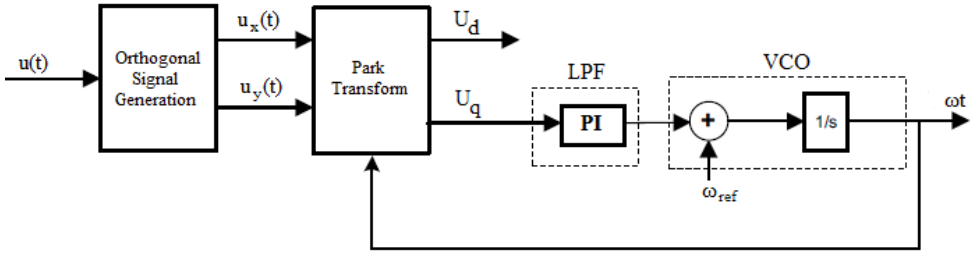

Figure 1: General form of PLLs

The primary problem faced in the designing a single-phase PLLs is the difficulty of computing orthogonal components from single-phase signal differing from the designing of three-phase PLLs. In order to achieve this,

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usually, a quarter-period phase shifting is applied to voltage signal then orthogonal components are reached. In non-fixed frequency conditions, due the period that is taken as base is variable, some errors occur.
In this paper, a new PLL structure that provides to obtain orthogonal components without using any phase shifting method and thus, does not contain these errors is presented. As the used method for the computation of orthogonal components eliminates the harmonics of single phase voltage due to its nature, the suggested PLL structure is irresponsive to harmonics. Below, firstly the suggested PLL structure is described and then simulations that have been done in the Matlab/Simulink environment using both a synthetic signal and a real voltage signals measured from a distribution system is given. Lastly, some discussion on the results is given.

Proposed PLL Structure

In this paper, the suggested single-phase PLL structure uses a method computing orthogonal components of voltage directly. In order to obtain the orthogonal components of voltage, a method is derived from differential equation algorithm (DEA). G and H (G=1/R, H=1/L) parameters of an equivalent parallel R-L load can be computed by using successive 3 samples of voltage and current samples that are sampled with a sampling period of T_s by the use of DEA as in the following equations.

$$G = \frac{(u_3+u_2)\cdot(i_2-i_1)-(u_2+u_1)\cdot(i_3-i_2)}{(u_3+u_2)\cdot(u_2-u_1)-(u_2+u_1)\cdot(u_3-u_2)} \quad \textbf{(1)}$$

$$H = \frac{2}{T_S}\frac{(u_2-u_1)\cdot(i_3-i_2)-(u_3-u_2)\cdot(i_2-i_1)}{(u_3+u_2)\cdot(u_2-u_1)-(u_2+u_1)\cdot(u_3-u_2)} \quad \textbf{(2)}$$

In the approach of this paper, values of orthogonal components (U_x ve U_y) of voltage on a reference axis rotating with an angular velocity of ω are computed instead of G and H parameters by using unit sine (*sin(ωt)*) and voltage (*u(t)*) signals instead of voltage (*u(t)*) and current (*i(t)*) signal respectively. That is, by representing unit sine signal with S as in the following equation,

$$S = \sin(\omega t) \quad \textbf{(3)}$$

orthogonal components of a voltage are

$$U_x = \frac{(S_3+S_2)\cdot(u_2-u_1)-(S_2+S_1)\cdot(u_3-u_2)}{(S_3+S_2)\cdot(S_2-S_1)-(S_2+S_1)\cdot(S_3-S_2)} \quad \textbf{(4)}$$

$$U_y = \frac{2}{\omega T_s}\cdot\frac{(S_2-S_1)\cdot(u_3-u_2)-(S_3-S_2)\cdot(u_2-u_1)}{(S_3+S_2)\cdot(S_2-S_1)-(S_2+S_1)\cdot(S_3-S_2)} \quad \textbf{(5)}$$

Here, U_x and U_y denote in phase and quadrature components. U_y can be also computed by using (5) instead of (4) and by taking cosine instead of sine in this equation. It means by the use of cosine signal:

$$C = \cos(\omega t) \quad \textbf{(6)}$$

U_y can be also obtained by the following equation.

$$U_y = \frac{(C_3+C_2)\cdot(u_2-u_1)-(C_2+C_1)\cdot(u_3-u_2)}{(C_3+C_2)\cdot(C_2-C_1)-(C_2+C_1)\cdot(C_3-C_2)} \quad \textbf{(7)}$$

In the case of voltages containing harmonics, quadrature components obtained by (7) will consist of a dc signal and oscillating signals representing harmonics. This means quadrature component that is computed by (7) in the form of (8).

$$U_y = \bar{U}_y + \tilde{U}_y \quad \textbf{(8)}$$

Here, $\bar{U}_y$ will be the quadrature component of voltage at the interested frequency. This value can be reached by applying a LPF to U_y.

In this work, the suggested PLL structure computes the phase angle (ωt) and angular frequency (ω) of voltages by using the method mentioned above providing to obtain orthogonal components. General form of the suggested

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PLL is given in the Figure 2. According to this figure, U_y component of voltage is computed by using last 3 samples of voltage signal (u_1, u_2, u_3) and cosine of the last 3 phase angle values obtained by the PLL loop in (7). This component, then, purified from the effects of harmonics by applying a LPF and thus U_y component of voltage at fundamental frequency is reached. Instantaneous angle value (ωt) that makes U_y zero (0) gives real phase angle of voltage. So the value of ωt is tried to be obtained by using a PI controller that makes this component zero. Output of the PI controller is the deviation of angular frequency from its reference value. Thus, real angular frequency (ω) is gained by summing this deviation with its reference value. Discrete time integral of real angular frequency is also gives the desired instantaneous value of phase angle.

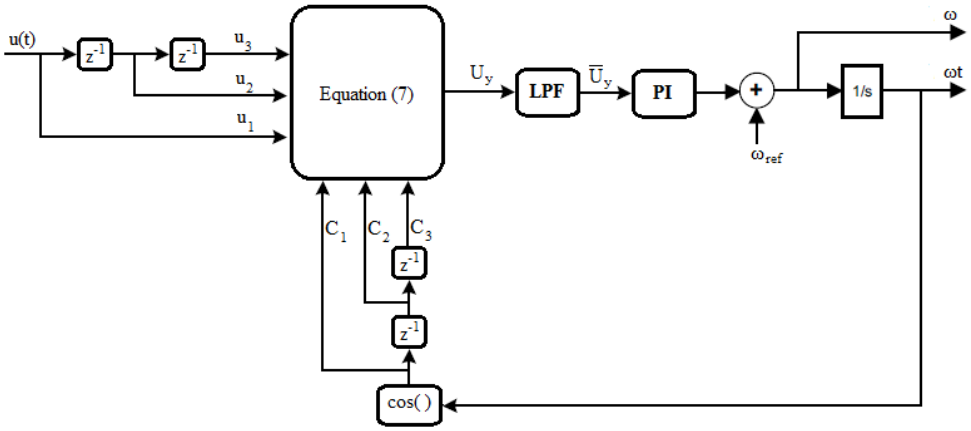

Figure 2: Block scheme of the suggested PLL

Simulations

In this section, simulations of the suggested PLL structure that have been done in the Matlab/Simulink environment using both synthetic and real voltage signals are presented. Real voltage signal has been measured from a real distribution system by a power quality analyzer (PQA). In the simulation of synthetic voltage signal, response of the PLL structure against pure sinusoidal voltage, voltage containing harmonics, sudden phase jumps, sudden frequency and amplitude deviation has been investigated respectively. Time dependent equation of the voltage signal used for this aim has been given in (9). Graph of this voltage signal has been also given in Figure 3.

$$u(t)=\begin{cases} 200\sin(100\pi t) & t\le 0.1s \\ 200\sin(100\pi t)+70\sin(300\pi t)+20\sin(500\pi t) & 0.1s<t\le 0.2s \\ 200\sin\left(100\pi t+\frac{\pi}{2}\right)+70\sin(300\pi t)+20\sin(500\pi t) & 0.2s<t\le 0.3s \\ 200\sin\left(99,8\pi t+\frac{\pi}{2}\right)+70\sin(299,4\pi t)+20\sin(499\pi t) & 0.3s<t\le 0.4s \\ 100\sin\left(99,8\pi t+\frac{\pi}{2}\right)+35\sin(299,4\pi t)+10\sin(499\pi t) & 0.4s<t\le 0.5s \end{cases} \quad \textbf{(9)}$$

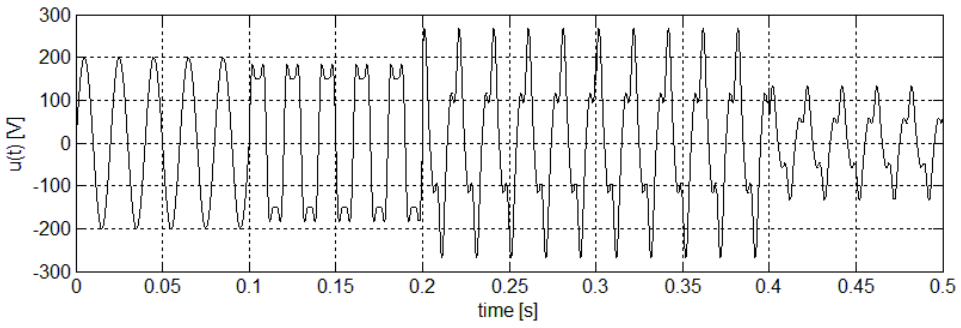

Figure 3: Waveform of the synthetic voltage signal used in the simulations

As voltage has a pure sinusoidal waveform during first 0,1 second of the simulation that totally lasted 0,5 second, this voltage has been changed to be with harmonics at the time of 0,2 second. At the 0,2 second of the simulation, phase angle of the fundamental component has been suddenly changed from 0 radian to π/2 radian. Fundamental frequency of the voltage has been suddenly decreased from 50 Hz to 49,9 Hz at the 0,3 of the simulation. At the 0,4

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second of the simulation, all amplitudes of the harmonic components have been also halved. With sudden changes, it is aimed to reveal the response of the designed PLL against transient conditions.

For this input voltage, output of the PLL with the output that must be has been given in Figures 4-8. Simulation results show the suggested PLL structure captures phase angle of the voltage correctly and quickly in the both of steady state and transient conditions. After sudden changes, this time takes 2 or 3 periods at most. THD value of the voltage used for the test is about 36% and phase angle of the voltage with harmonics even at this rate could be computed very accurately as can be seen in the Figure 5. This demonstrates robustness of the suggested PLL structure against harmonics. Sudden change in the phase angle is one of the best ways to test performance of a PLL. Here, as can be seen from Figure 6, a sudden phase angle change with an amount of $\pi/2$ radian caused to sudden change in the output of the PLL and PLL structure has been captured the actual value in approximately 2 or 3 fundamental periods. In real grid conditions, the deviation in the frequency is not to be expected very much. Thus, a frequency change rate at a 0,2% has been applied to test signal in order to see the response of the proposed PLL against frequency deviation. For the limited deviation in the frequency of the test signal has been caused a limited change in the phase angle at the PLL output as can be seen from Figure 7. The effect of the sudden amplitude change at a rate of 50% on the output of the proposed PLL is given in Figure 8. Since changes in the voltage amplitude are not a factor affecting phase angle, it has limitedly affected the PLL output.

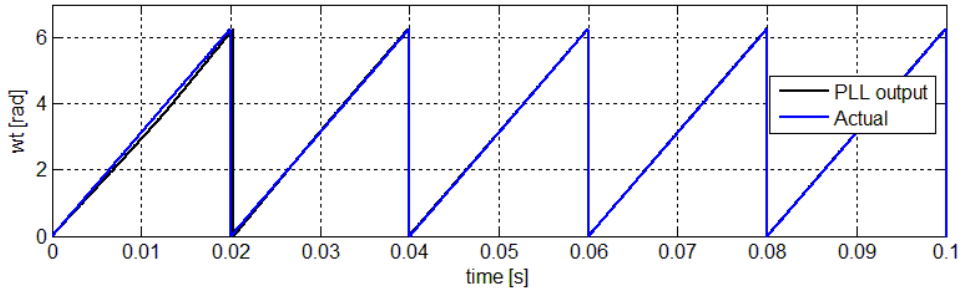

Figure 4: PLL output and actual output for the case of pure sinusoidal input voltage

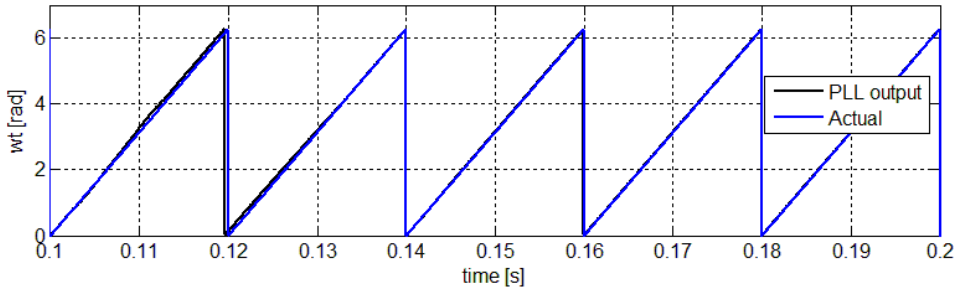

Figure 5: PLL output and actual output for the case of harmonic voltage input

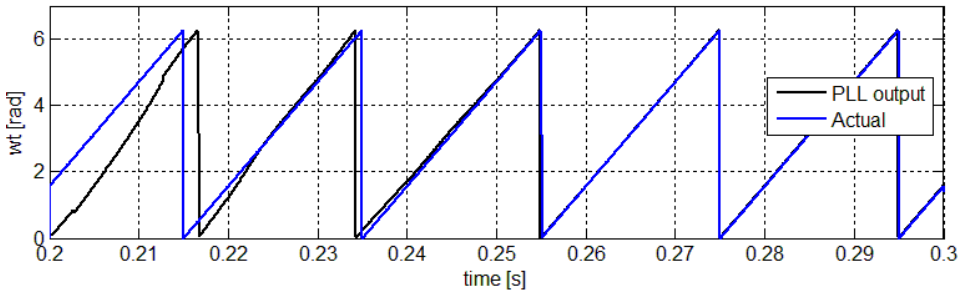

Figure 6: PLL output and actual output for the case of sudden phase angle jump

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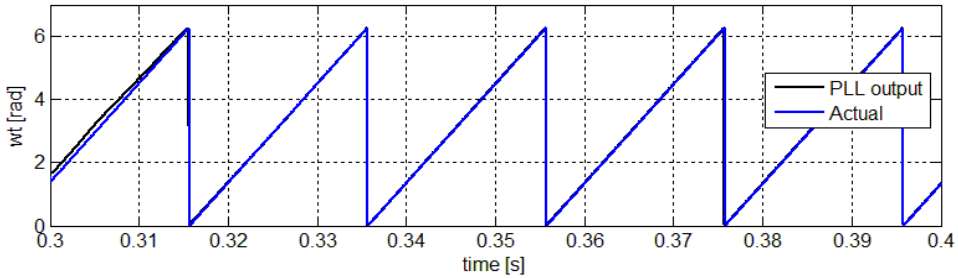

Figure 7: PLL output and actual output after sudden frequency change

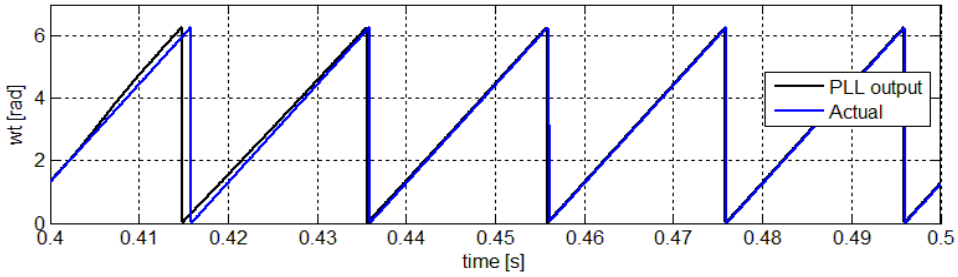

Figure 8: PLL output and actual output after sudden amplitude change

Suggested PLL structure has been also tested with a real voltage signal that measured from a real distribution system by a PQA. THD value of this voltage is about 7%. Waveform of this voltage is given in Figure 9. In the Figure 10, output of the PLL and its actual values is also shown. Result in the Figure 10 demonstrates that the suggested PLL can compute phase angle of a real voltage signal very accurately and very quickly.

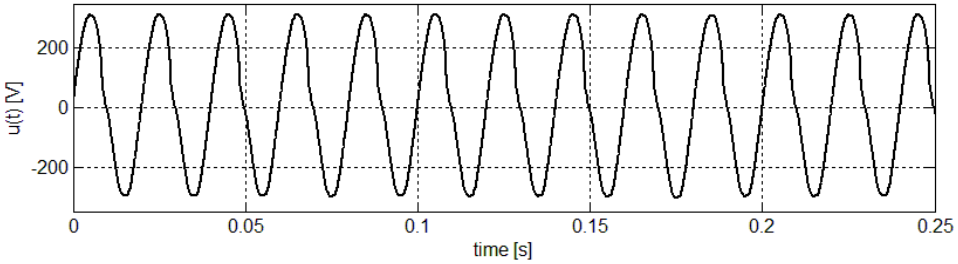

Figure 9: Waveform of the real voltage signal measured from a real distribution system

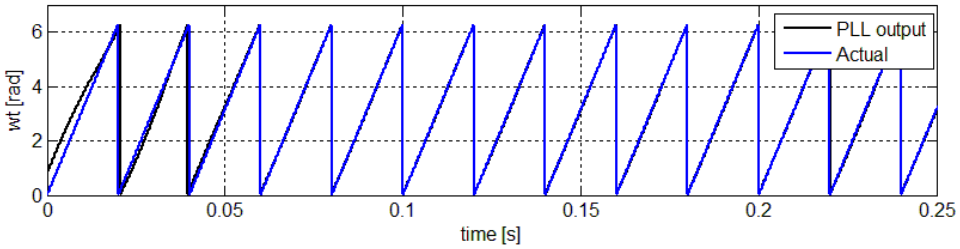

Figure 10: PLL output obtained by real voltage signal input and actual output

Conclusions

In this work, a new form of PLLs that provides fundamental synchronization signal for grid-connected converters such as APFs and FACTS is suggested. Suggested structure is a single-phase PLL and its operation principle is based on the obtaining orthogonal components directly by using sampled values of voltage. Computation of orthogonal components is done by a new method derived from DEA. Dc part of orthogonal components obtained by new method represents the fundamental frequency component of input voltage. With this way, it has been possible to obtain phase angle and frequency of fundamental frequency component of input voltage without using any phase shifting method. Suggested structure has been tested with both synthetic voltage signal and real voltage signal. Test results have shown that performance of the suggested PLL is satisfactory under various conditions. In simulations, it has been observed that output of the suggested PLL reaches to its actual value in a very short duration (2 or 3 period at most) even in the cases of voltages with harmonics, sudden frequency, phase angle jump and amplitude changes.

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A QUALITATIVE ANALYSIS OF EFL WRITTEN CORRECTIVE FEEDBACK

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This study focuses on the qualitative aspects of inter-rater reliability in foreign language teachers' written corrective feedbacks. The participants were 171 Turkish EFL teachers working at state schools in Turkey. The participants were provided with an essay written by a B1 level 20-year-old Turkish EFL learner. They were asked to evaluate the essay holistically and write feedbacks to the learner. The results were analyzed through an inductive approach; the themes and recurring ideas were watched for without any predetermined concepts or categories. The results revealed that the feedbacks given to the learner varied to certain extents; several categories emerged during the analysis. However, it was concluded that the expectations of EFL teachers from a written text in English focused dominantly on grammatical accuracy.

Keywords: Written corrective feedback, interrater reliability

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A RELATIONSHIP BETWEEN BASIN AREA AND AVERAGE DISCHARGE: A CASE STUDY FOR TURKEY

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ABSTRACT: Precipitation area is of great importance for water works such as irrigation, canal design and hydropower production etc. Due to change of basins' topographic, geologic and climate characteristics, the annual average discharge values differ from each other. Turkey is divided into 26 hydrological basins. Average annual discharge data has been obtained from 293 gaging stations and some of them have at least 50 years of observation. The aim of this study is to predict a function between the precipitation area and annual average discharge for all main basins of Turkey. The relationship between basin areas and discharge has been set up by using fundamental statistic linear regression analyses. The best fitted linear line between a basin's precipitation area and the average discharge has been generated in order to predict the aforementioned function. The results of this study were interpreted according to different characteristics of the basins.

Keywords: Basin, Annual discharge, Linear regression, Precipitation area

Introduction

Due to climate change, global average temperature has increased over the past century. Managing the water resources gained a great importance, globally. In many parts of the world, water scarcity is taken into consideration as a priority. Causes of water scarcity include overuse related to numerous fields such as land, people and recreational activities; pollution of water because of poorly designed sewage system and contaminating materials such as oil, chemicals and fecal matter; conflict between people over an area of land; distance to water sources; drought because of lack of rainfall; and finally governmental access. Effects of water scarcity are proposed as lack of access to drinking water which is the biggest problem, hunger, lack of education, diseases, sanitation issues and poverty. For the solutions, numerous studies have been applied by researches. Primarily the main solution is based on education, water recycle, technological development related to water conversation, improving practices related to farming, improving sewage systems and supporting clean water initiatives (CEF, 2016). Water is a valuable resource that is gradually getting scarcer due to rapid population growth in the world affecting water consumption, urbanization, industrialization etc. Contrary to general belief, Turkey is not a freshwater resources rich country and it is not the richest country in the region (RTMFA, 2016). The average total amount of water per person per year for different regions is shown in Table 1. Freshwater resources seem to be much lower than the world average in Turkey (Table 1). According to this data, the total amount of water per capita in South America appears to be the most and the lowest rate is observed in Syria.

Turkey is a country on the edge of the water shortage. Average annual precipitation of Turkey is approximately 643 mm which is below the world average of 800 mm. This amount corresponds to 501 km^3 average annual water. Turkey's consumable surface and underground water potential is 112 km^3 per year (Muluk, 2013). Turkey aims to use all available water potential by 2023 (DSI, 2009). The water resources potential of Turkey is given Table 2. The given water potential values are calculated as a result of 73 years by states water works (DSI). Consumable surface water potential of rivers in Turkey is 95 km^3 and including 3 km^3 of rivers from neighboring countries. In total, usable surface water is approximately 98 km^3 per year.

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Table 1: According to region, the amount of water per person (yearly)

Country	The amount of water per person (yearly)
Syria	1.200 m³
Lebanon	1.300 m³
Turkey	**1.430 m³**
Iraq	2.020 m³
Asian Avg.	3.000 m³
Western European Avg.	5.000 m³
Africa Avg.	7.000 m³
South America	23.000 m³
World Average	**7.6000 m³**

Table 2: The water resources potential of Turkey (DSI, 2009)

Annual Average Precipitation	643 mm/year
Annual Rainfall	501 km³
Evaporation	274 km³
Groundwater Seepage	41 km³
Disused Water	88 km³
Useable Surface Water	98 km³
Potable Groundwater	14 km³
Total Useable Water	112 km³

In this paper, in view of Turkey's water shortages, a relationship between basins area and their discharge have been determined by using statistical analyses. Long term hydrologic data shows variation according to basins topographic characteristics.

Material and Methods

Location Data

Turkey is located in Eurasia, mainly on the Anatolian Peninsula in the Western Asia (97%) and a smaller portion on the Balkan Peninsula (3%) in the Southeast Europe. Turkey's land extends less than 800 km from north to south and more than 1600 km from west to east. The area of Turkey is approximately 783 562 km^2, of which 770 760 km^2 is land the rest is inland waters. Turkey consists of 26 large hydrological basins, which show great differences in terms of average annual rainfall, precipitation, evaporation and surface flow. Dry period takes place about every 30 year. This dry period continues usually one year and sometimes can continue up to two or three years (Akkemik, 2005). However, it has been observed that the prolonged dry period of the 1960s. and the drought lasted 5 years in 1994 (Kömüşcü, 2005). Water basins in Turkey are shown in Figure 1. Basin characteristics in terms of precipitation area, average annual flow and selected gaging stations for this study are given in Table 3.

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Figure 1. The watershed areas in Turkey (Erdoğan, 2013)

Table 3: Basin characteristics of Turkey

Watershed name	Precipitation area (km^2)	Water potential (billion, m^3)	Average annual discharge (m^3/s)	Station Number
Meric-Ergene	14,56	1,33	9,30	13
Marmara	24,1	8,33	5,95	11
Susurluk	22,399	5,43	26,65	12
North Aegean	10,003	2,09	8,45	5
Gediz	18	1,95	7,34	10
Buyuk Menderes	24,976	3,03	19,94	14
West Mediterranean	20,953	8,93	20,46	6
Antalya	19,577	11,06	56	10
Burdur Lake	6,374	0,5	1,28	2
Akarcay	7,605	0,49	2,82	5
Sakarya	58,16	6,4	30,088	21
West Blacksea	29,598	9,93	19,31	16
Yesilırmak	36,114	5,8	34,1	15
Kızılırmak	78,18	6,48	45,5117	14
Konya	53,85	4,52	11,62	9
East Mediterranean	22,048	11,07	30,38	14
Seyhan	20,45	8,01	28,015	14
Asi	7,796	1,17	34,4	4
Ceyhan	21,982	7,18	66,63	11
Fırat	184,918	31,61	49,33	22
East Blacksea	24,077	14,9	38,12	18
Coruh	19,872	6,3	12,25	14
Aras	27,548	4,63	23,25	9
Van Lake	19,405	2,39	6,4	7
Dicle	184,918	21,33	68,8	17

Due to different annual precipitation amount, the basins' yield and water potential vary. Fırat basin has the highest water yield with 31.61 billion m^3 of water and The Dicle basin ranks second with 21.33 billion m^3. The Fırat and Dicle basins provide approximately 28.5% of the country's total water potential. Akarcay and Burdur basins have the lowest water potential with 0.49 and 0.5 billion m^3 respectively. Burdur and Kucuk Menderes basins are not included in this study due to lack of available data. Many river basins in the Mediterranean Region will be faced with water stress problem in the near future. More than 40% of Turkey in the central and western regions of the country is expected to experience water stress by 2030. This ratio is between 20% and 40% in the southeast and eastern regions (DSI, 2009). Climate change projections indicate that increase in the temperature and decrease in precipitation will affect Turkey seriously. In this study, determining a relation between basin area and their

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discharge has been obtained employing regression analysis. The main aim of this paper is to understand and interpret the relationships between two variables which are expressed in Equation 1.

$$A = aQ + c \quad (1)$$

Where, A is basin area, Q is discharge, a, b and c are numerical constant coefficients.

Gaging Stations

The flow measuring stations (FMS) provide information about channel characteristics such as surface width, depth, velocity and channel discharge. In this study, totally 293 stations were taken into consideration. Each basin in Turkey has numerous stations according to their sizes. Burdur and Kucuk Menderes basins have not been taken into account due to limited number of flow measuring stations installed. Some of FMS have a dataset of at least 50 years of observation. For the majority of the basins, the long term data is available in which the generation of the proposed model is suitable. Some specific information for Buyuk Menderes basin is given in Table 4 as an example.

Table 4: Information gaging station of Buyuk Menderes basin

Station Code	Station Name	Location		Elevation (m)	Precipitation Area (km²)	Average Annual Discharge (m³/s)	Observation Year
701	Çine Çayı - Kayırlı	28º 07'50"	37º 25'16"	262	948	6,55	1938-2005
704	Akçay - Amasya	28º 28' 49"	37º 36' 27"	155	3138	20	1940-2005
706	Büyükmenderes - Aydın Köprüsü	27º 50'25"	37º 47' 00"	25	19595.5	57,3	1950-2005
707	Büyükmenderes - Söke	27º28' 33"	37º 42' 30"	10	23889	93,1	1951-1983
712	Büyükmenderes - Burhaniye	28º 44' 37"	37º 56'54"	120	12798.8	36,10	1951-2005
713	Büyükmenderes - Çıtak Köprüsü	29º 38'24"	38º 09' 25"	802	3945.6	12,70	1952-2005
725	Banaz Çayı -Azizler	29º 36' 12"	38º 30' 15"	762	1277.6	2,93	1972-2005
726	Büyükmenderes - Güney	29º 03' 34"	38º 07' 19"	215	9633.6	19,80	1972-2005
728	Gökpınar Çayı- Akhan	29º 08' 11"	37º 49'06"	237	256	2,12	1975-2005
730	Yenidere - Çalıköy	28º 55' 25"	37º 35' 41"	855	668.8	1,31	1981-2005
732	Akçay - Değirmenalanı	28º 43' 28"	37º 20' 08"	409	854.8	9,37	1981-2005
733	Sarhoş Çayı - Göktepe	28º 33' 39"	37º 25' 50"	384	236	1,61	1981-2005
734	Çine Çayı - Çakırbeyli	27º 50' 04"	37º 45' 50"	26	2839.6	10,80	1984-2005
735	Banaz Çayı - Dörtdeğirmenliler	29º 14' 19"	38º 20' 11"	467	3226	5,39	1988-2005

Data and Analysis

Precipitation area is an important factor in order to determine basin's water potential. Basin topographies play an important role in the amount of precipitation because of variation in the elevation. Totally 293 gaging stations' precipitation area data were obtained. Precipitation area versus annual average discharge is expressed graphically. These relations are shown for each basin in Turkey below.

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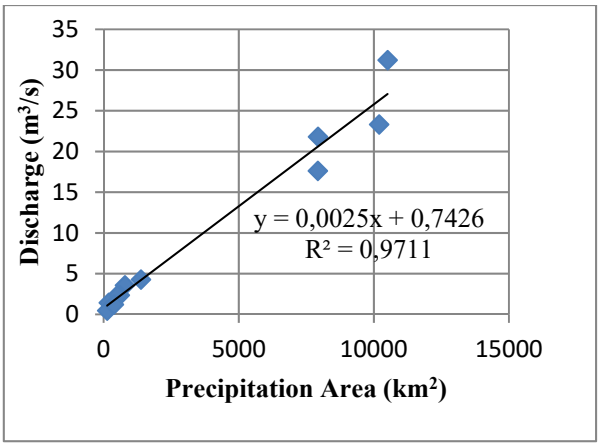
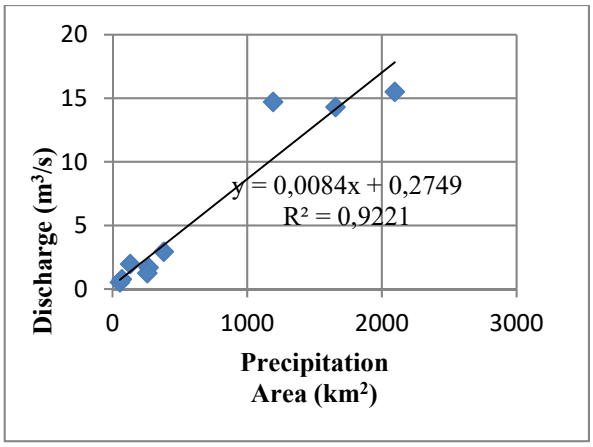
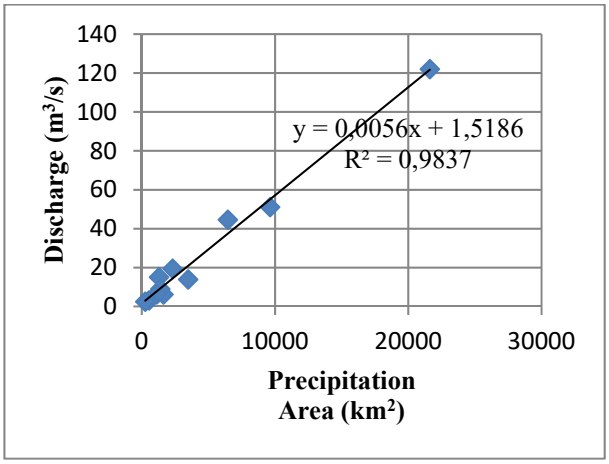


Meriç Watershed



Marmara Watershed



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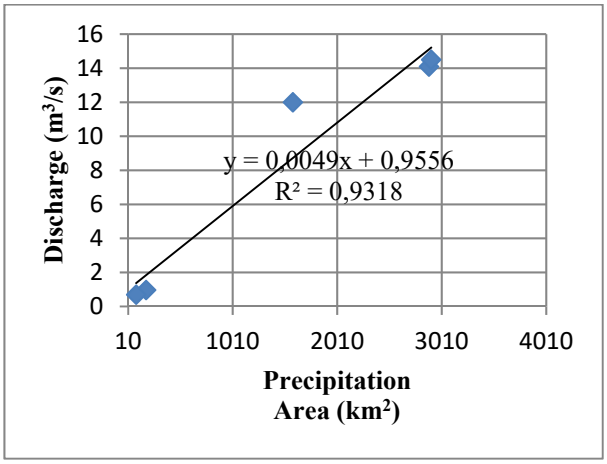
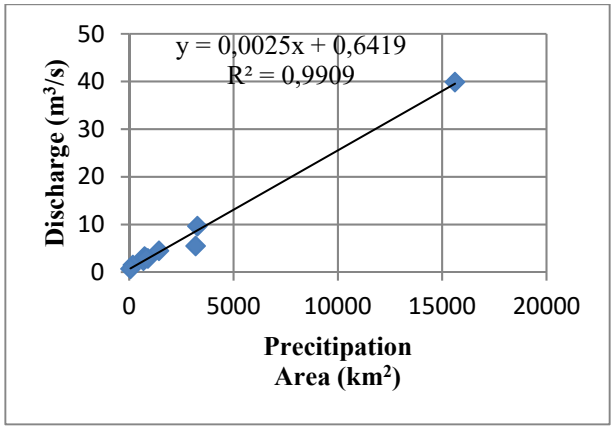
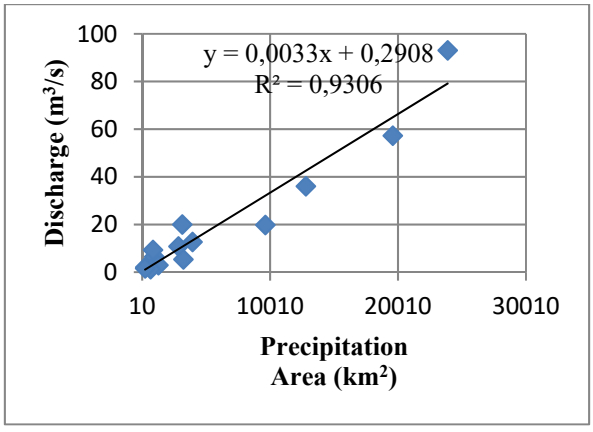


North Aegean Watershed



Gediz Watershed



Büyük Menderes Watershed

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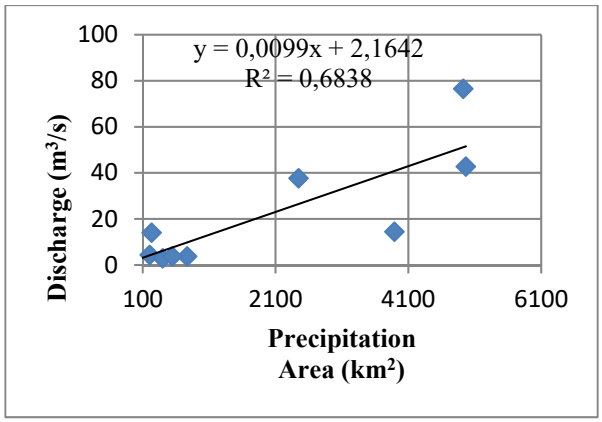
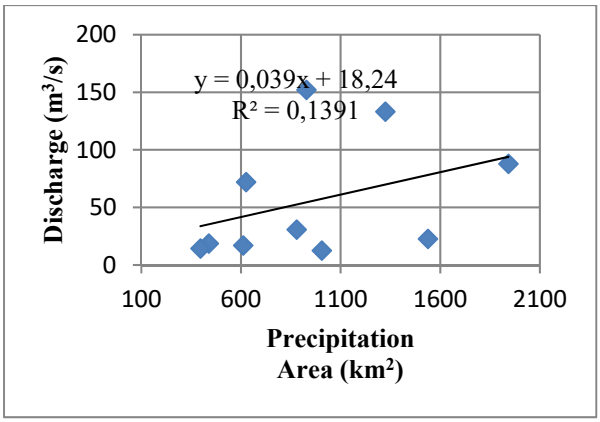
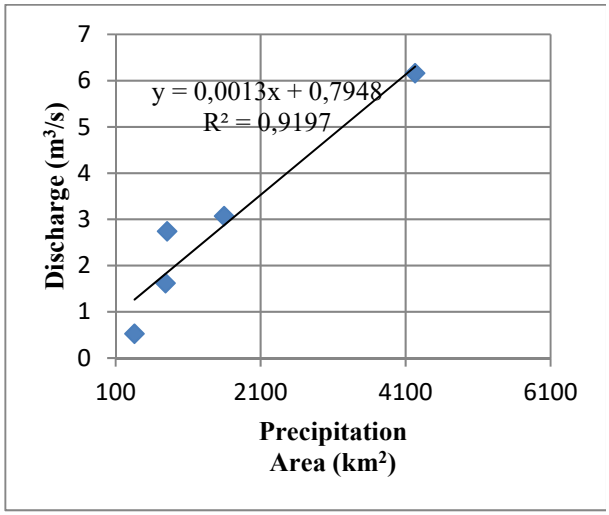


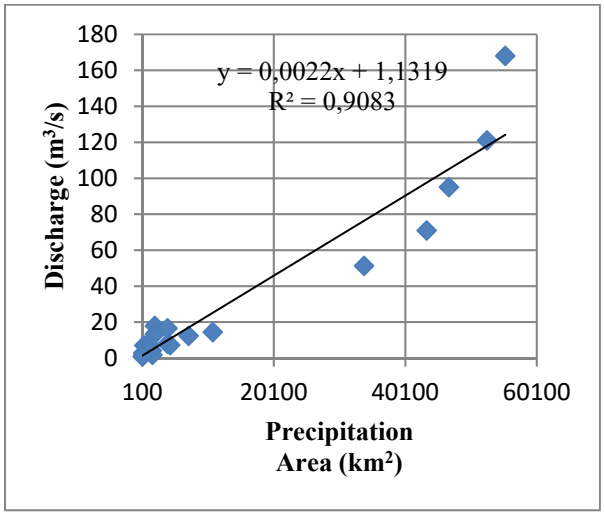
West Mediterranean Watershed



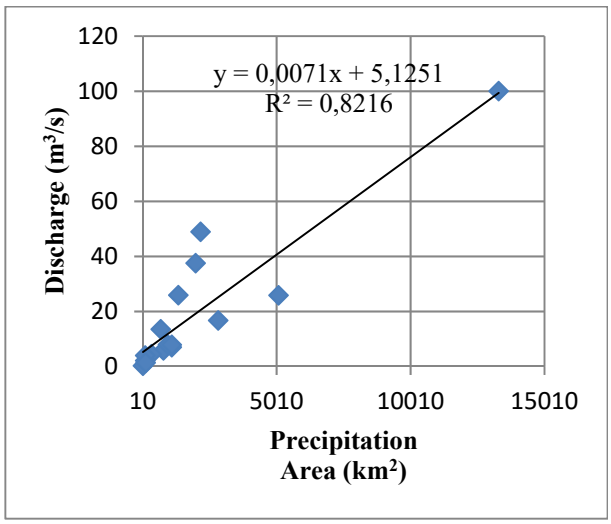
Antalya Watershed



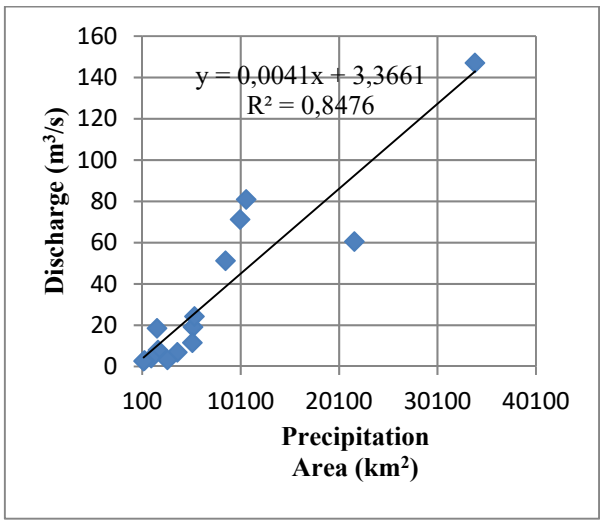
Akarçay Watershed



Sakarya Watershed



West Blaksea Watershed



Yeşilırmak Watershed

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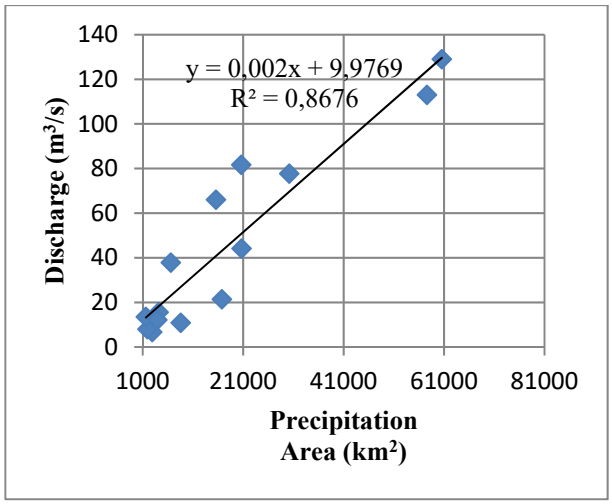
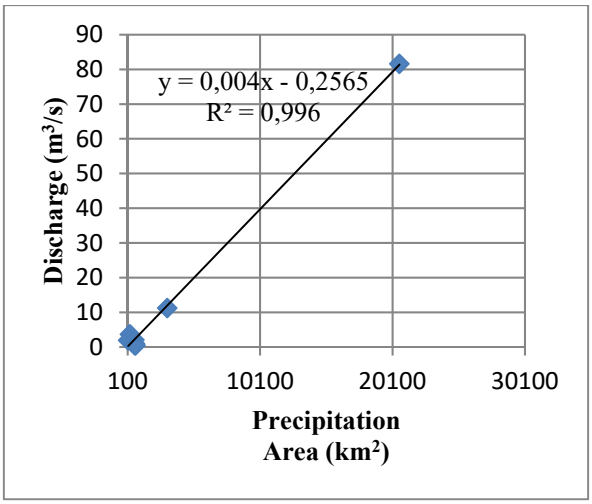
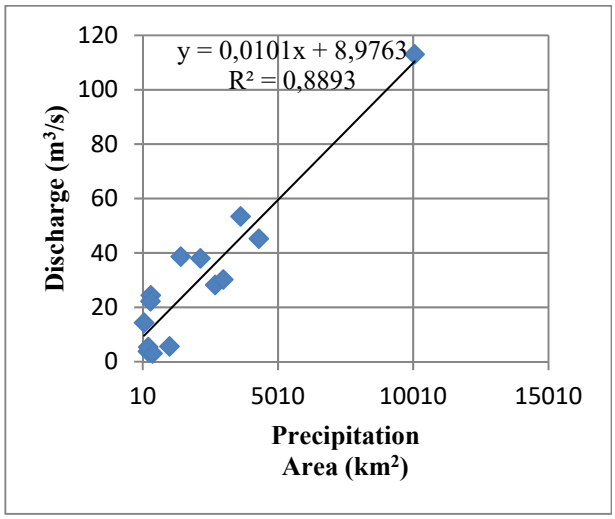


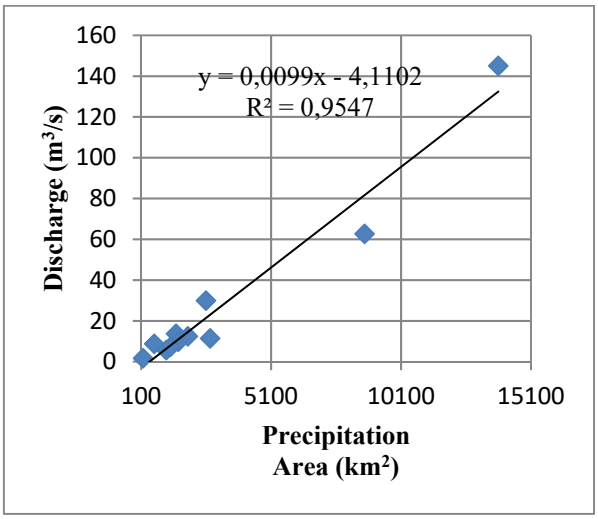
Kızılırmak Watershed



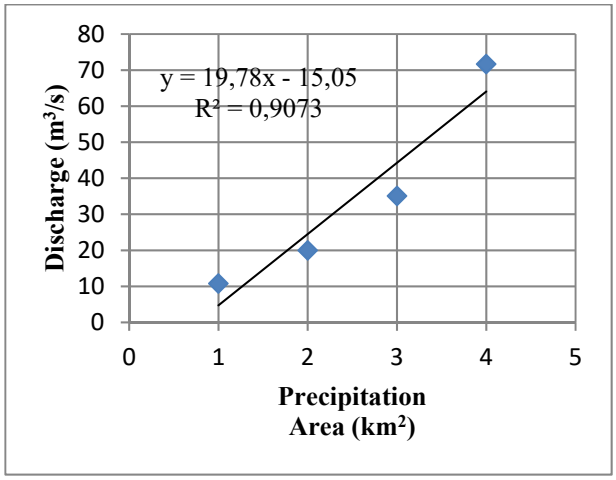
Konya Watershed



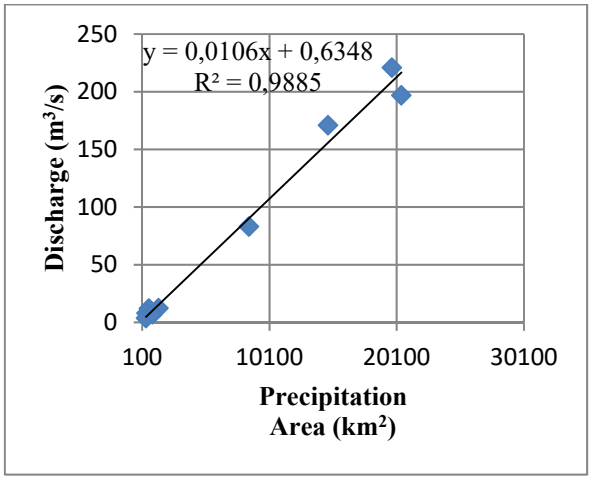
East Mediterranean Watershed



Seyhan Watershed



Asi Watershed



Ceyhan Watershed

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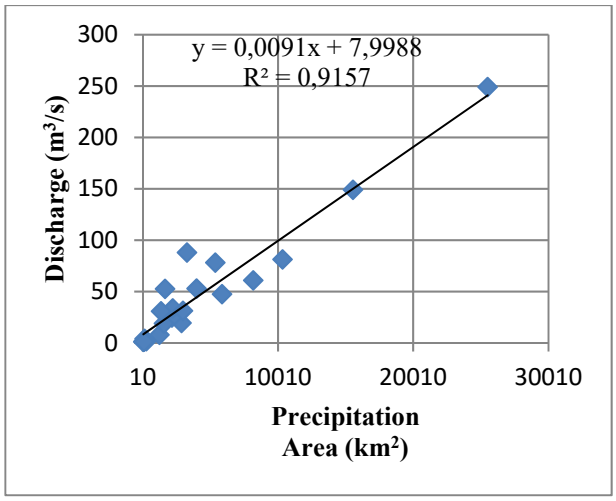
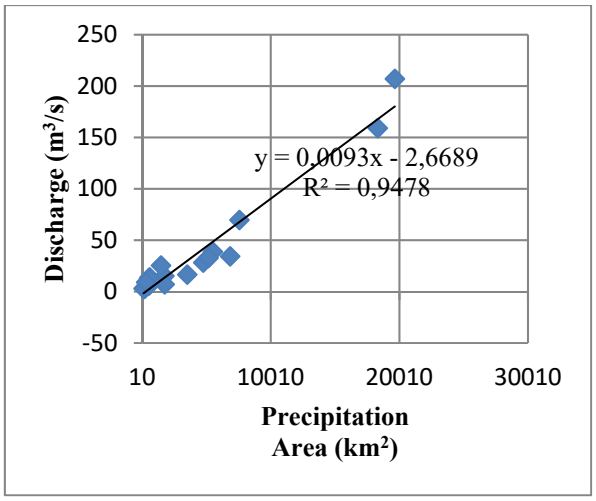
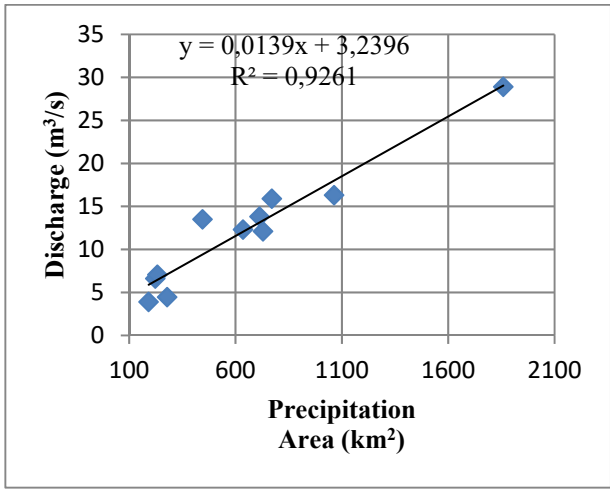


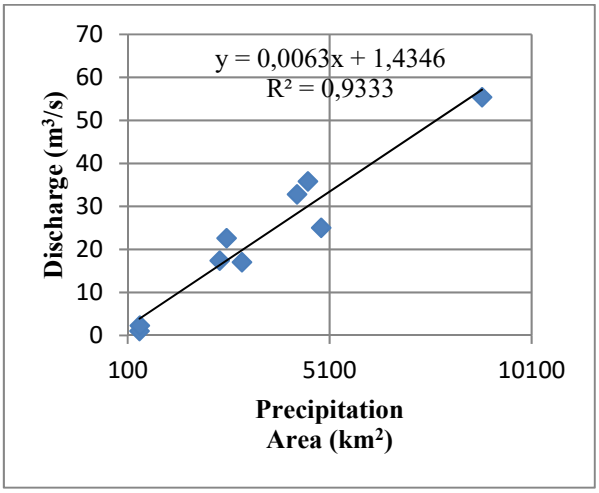
Fırat Watershed



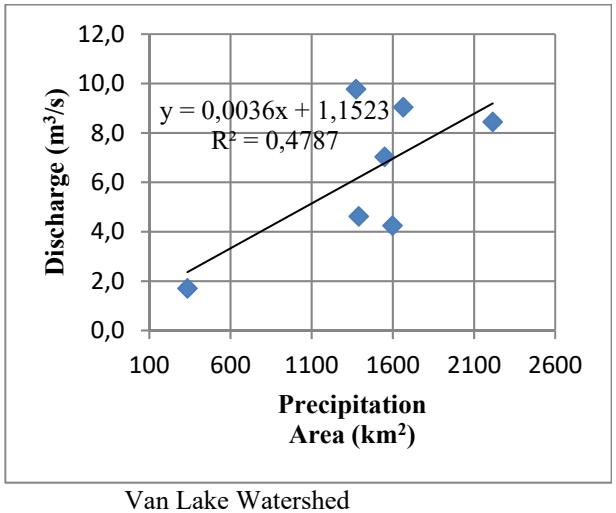
East Blacksea Watershed



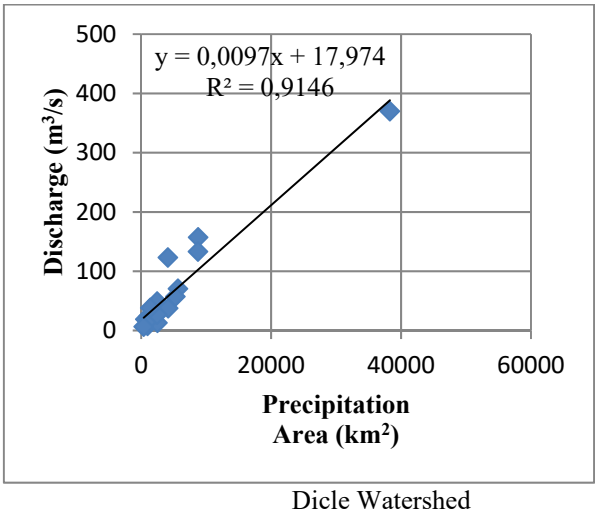
Çoruh Watershed



Aras Watershed



Van Lake Watershed



Dicle Watershed

Results

In this study, each of 26 basins in Turkey is analyzed in order to establish a relationship between the precipitation area of all these basins and their average annual discharge. However, due to lacking number of stations and the measurement period, Burdur and Kucuk Menderes basin were not taken into account. The relationship between the precipitation area and the average annual discharge of the remaining 24 basins were analyzed by linear regression. Reasonable values of R^2 for majority of basins have been obtained. Unexpected results for R^2 were

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found in West Mediterranean and Antalya basins due to lack of data. Although coefficients of *a* and *b* of Equation 1 for 24 basin vary within a specified range, b values are observed highly in Antalya watershed. For Asi watershed, coefficient *a* has been found great value as different from others because of the lack of observing station number. Coefficients *a, b* and R^2 values are given in Table 5 for all basins.

Table 5: Coefficients and R^2 values of all basins in Turkey

	Coefficient		
Watershed Name	a	b	R^2
Meric-Ergene	0,0025	0,7426	0,9711
Marmara	0,0084	0,2749	0,9221
Susurluk	0,0056	1,5186	0,9837
North Aegean	0,0049	0,9556	0,9318
Gediz	0,0025	0,6419	0,9909
Buyuk Menderes	0,0033	0,2908	0,9306
West Mediterranean	0,0099	2,16423	0,6838
Antalya	0,0390	18,24	0,1391
Akarcay	0,0013	0,7948	0,9197
Sakarya	0,0022	1,1319	0,9083
West Blacksea	0,0071	5,1251	0,8216
Yesilırmak	0,0041	3,3661	0,8476
Kizılırmak	0,0020	9,9769	0,8676
Konya	0,0040	-0,2565	0,996
East Mediterranean	0,0101	8,9763	0,8863
Seyhan	0,0099	-4,1102	0,9547
Asi	19,780	-15,05	0,9073
Ceyhan	0,0106	0,6348	0,9885
Fırat	0,0091	7,9988	0,9157
East Blacksea	0,0093	-2,6689	0,9478
Coruh	0,0139	3,2396	0,9261
Aras	0,0063	1,4346	0,9333
Van Lake	0,0036	1,1523	0,4787
Dicle	0,0097	17,974	0,9146

Discussion and Conclusion

Water gained a great importance, globally due to the increasing number of population, industrialization and globalization. This paper aims to set up a relationship between precipitation area and the average annual discharge of all watersheds in Turkey. In most of the basins, functional parameters were found to have a good consistency except a number of watersheds. The result of this study is expected to shed light for hydrologic and hydraulic works, in the future. Coefficients and R^2 values can be helpful to understand watershed characteristic. Further studies can be developed by adding runoff, evaporation, moisture and temperature.

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A SERIES OF TWO DIMENSIONAL CD(II) COORDINATION POLYMERS CONSTRUCTED FROM 1,4-PHENYLENEDIACETATE AND BIS(IMIDAZOLE) DERIVATIVE COLIGANDS

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In recent years, the studies of the synthesis of coordination polymers constructed from semi-flexible ligands which possess both aromatic and aliphatic groups have been increased due to the fact that they used for many different technologies such as gas storage, purification, separation, catalysis and drug delivery [1, 2].

This work presents a systematic investigation of the reactions of semi-flexible 1,4-phenylenediacetate (ppda) with Cd(II) salts in the presence of different semi-flexible bis(imidazol-1-ylmethyl)benzene co-ligands (o/m/pbix=1,2/1,3/1,4-bis(imidazol-1-ylmethyl)benzene). According to the results of X-ray single-crystal analysis, $[Cd(\mu_3\text{-ppda})(\mu\text{-obix})]_n$ **(1)**, $[Cd(\mu_3\text{-ppda})(\mu\text{-mbix})]_n$ **(2)** and$[Cd(\mu_3\text{-ppda})(\mu\text{-pbix})]_n$ **(3)** were found to be two-dimensional (2D). The structures of complexes were characterized by elemental analysis, IR and X-ray single crystal and X-ray powder diffraction analyses. The asymmetric units of **1**–**3** contain one Cd(II) ion, one ppda and one bix ligands (obix for **1**, mbix for **2** and pbix for **3**). Each Cd(II) ion is coordinated by two nitrogen atoms from two different bix ligands and five oxygen atoms from three different ppda ligands. The Cd(II) ions and ppdaligands produce $[Cd_2(ppda)_2]$metalloligand. The combination of $[Cd_2(ppda)_2]$ and Cd_2O_2 rings produces 2D coordination polymer. Moreover, thermal stabilities and luminescent properties of **1**–**3**were also investigated.

Keywords: Cadmium(II) complexes, 1,4-phenylenediacetate complexes, Coordination polymer.

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A SHOCK DAMPER BASED ON A SYSTEM NANOPOROUS MEDIUM – NON-WETTING LIQUID

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Over the past ten years in the world the interest for the properties of systems nanoporous medium –non-wetting liquid was increased. Such systems investigate in the USA, France and Japan. Interest forthe systems nanoporous medium – non-wetting liquid is primarily related to the prospects for their use in power engineering in parts of the machinery of accumulation and dissipation of mechanical energy. In this work the method of system nanoporous medium – non-wetting liquid testing for damping devices presented. The method was tested for four systems nanoporous medium – non-wetting liquid. As a nanoporous medium was used industrially produced hydrophobic silicas Fluka 60 C8, Fluka 100 C8, Fluka 100 C18 and Fluka 90 C18. As a non-wetting liquid was used distilled water. These systems have been investigated in the temperature range 20 - 60° C, the maximum energy of impact was 100 J. According to the method, time, power and energy characteristics of the process of non-wetting liquid intrusion - extrusion was determined. Also presented the dependences of impact processes characteristics on temperature and energy of impact.

Keywords: shock damper; nanoporous medium; non-wetting liquid

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A SHOT IN THE ARM FOR HANDLING CONSUMER DISPUTES ACROSS THE EU: ALTERNATIVE DISPUTE RESOLUTION SYSTEM

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Abstract: The handling of disputes between consumers and traders is now evolving on a more consumer-friendly ground across Europe. Following the steadily stronger consumer protection laws, the growth of online mechanisms for alternative dispute resolution (ADR) bodies is further swinging the legal pendulum from the judicial protection to developing out-of-court structures that provide cheaper and effective relief. In this regard, the recent launch of a new online dispute resolution (ODR) platform by the European Commission is quite likely to contribute to the effort to avoid disputes reaching court, providing settlement of the millions of both domestic and cross-border e-commerce disputes using online technologies, as well as strengthening the EU's Digital Single Market Strategy. The disputes will be channelled to national ADR bodies in each Member State that are related to the platform of which online traders are required to provide notice. In this study,
Keywords: Alternative dispute resolution (ADR), Online dispute resolution (ODR), Consumer disputes, E-commerce

1. INTRODUCTION

Due to the growing use of the Internet across the Europe, the number of disputes arising from the Internet has increased exponentially. Becoming a new realm of commerce, the Internet has enabled businesses to expand their markets and offer a vast selection of products and services to cross-border customers. Geographical distance, time and language ceased to prevent trade, and, as a result, gave rise to e-disputes. In this regard, ensuring a safer participation of all parties in e-commerce transactions requires e-disputes be resolved in sufficiently certain ways. The reason is that the lack of legal certainty and online consumer trust may prevent consumers from entering into online transactions, as well as companies from participating in the electronic markets (Morris et. al., 2000).

Online dispute resolution (ODR) refers to the Alternative Dispute Resolution (ADR) mechanisms that use technology to facilitate the resolution of disputes between the parties. It mainly involves negotiation, mediation or arbitration, as well as a combination of all these alternative methods. Thus, it can be concluded that the ODR corresponds to the online version of the ADR. It can, however, expand these traditional ADR methods by using various online technologies during the process.
ODR covers vast fields of law, ranging from the disputes between private parties involving consumer to consumer (C2C) and business to consumer (B2C) disputes or marital separation, to court disputes and interstate conflicts (National Centre for Technology and Dispute Resolution, 2011). Without prejudice to having such a wide scope of application, the ODR is most importantly tailor-made for the resolution of B2C online transactions. The reason for the suitability of the ODR in the resolution of e-commerce disputes is that, the use of the Internet which is the same medium giving rise to disputes is ideal when parties reside in different countries (Bygrave, 2002).

2. ONLINE DISPUTE RESOLUTION

As abovementioned, ODR represents an innovative means for handling disputes, particularly those with the underlying contracts concluded between consumers and businesses in virtual space. Lacking the expertise and resources for the resolution of cross-border disputes, traditional courts may not be suitable in e-commerce. Moreover, where transactions are of low value and the parties are located in different countries, litigation is quite an unattractive option with disproportional costs and long proceedings.

As a collective term, the ODR covers different combinations of online dispute settlements by using the ADR methods. To put it simply, the ODR refers to the assistance of certain computer networks and applications to the settlement of disputes with the ADR methods. Depending on the extent of control over the process and outcome the parties and/or Information and Communication Technology (ICT) have, dispute resolution techniques vary

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(Cortes, 2009). Based on the cooperation of the ADR and ICT, the ODR requires the resolution process to be conducted mainly online.

Information management in the ODR is carried out by physical persons as well as computers and software. The complementation of the traditional ADR methods with the ICT was referred to as the so-called "fourth party", since the ODR was considered as an additional party in the resolution process (Katsh and Rifkin, 2001). In addition to the two disputants and the neutral third party, addressing technology as the fourth party emphasizes its growing importance in a traditional trilateral dispute. Despite having the entitlements and capabilities of the third party, the fourth party will rather serve as a tool for assisting the process. Nevertheless, the fourth party may replace the third party as in automated negotiation. The fourth party may also manage information, send automatic responses, reorganize written communications in a politer manner, monitor performance, and organize meetings. The more technology enhances, the more the fourth party stands out, thereby diminishing the significance of the neutral third party (Gaitenby, 2006; Katsh and Wing, 2006).

Similar to the ADR, companies involved in the ODR process agree upon the out-of-court settlement with the difference of using the Internet. To contribute to this settlement process on the Internet, professionals lead the way by utilizing their ADR experiences. In order to best suit the needs of the Internet, the ADR rules and practices are adjusted when necessary. To this end, software tools are utilized and enhanced. Moreover, new web-based services have been developed to enable parties and arbitrators to meet online and work in secure, joint workspaces, access precedents, attain and manage important documents, and organize meetings with the services of voice and video conferencing, and with translation services as well (Katsh and Rifkin, 2001).

3. ONLINE DISPUTE RESOLUTION METHODS

3.1. Consensual Online Dispute Resolution

3.1.1. Automated Negotiation

Also known as the so-called "blind-bidding" method, automated negotiation involves the methods mostly used for the claims of monetary value, i.e. personal injury or a worker's compensation claim. It is based on a software program to which the parties submit their offers and demands for settlement and determine a percentage range. The program organizes the communications between the parties. However, the offers, demands, and percentages concerned are not revealed to the other party. The offering party refers to the party who makes the offer or the party who is going to pay, whereas the demanding party makes the demand or seeks for the relief as the payment of a sum of money. The ODR algorithm calculates a settlement amount between the offer and demand ranges of the parties. When offer and demand match or fall within the determined range, the dispute is settled at the defined amount and the parties are informed. Parties are allowed to try to settle until their offers and demands match (Kaufmann-Kohler and Schultz, 2004).

3.1.2. Assisted Negotiation

Assisted negotiation is a dispute resolution process to which technology assists in an evaluative manner, i.e. providing communication facilities. The role of technology here is similar to that of the mediator in mediation, with the difference that the former is based on only technological tools while the latter may also use different electronic communication tools, ranging from e-mail and chat rooms to video conferencing. Unlike arbitration, the third party maintains its neutrality and does not give a binding decision on the parties through an enforceable award. Using information management skills and enabling more efficient communication by paraphrasing the arguments concerned, mediators help the parties reach an amicable settlement. Though the procedural similarity of conciliation to mediation, councillors can provide solutions for the parties before reaching a settlement. The primary objective of assisted negotiation is to enhance the communications of the parties with the assistance of a third party or software technology (Jacobs, 2007). When used online, these processes are informal, simple and user-friendly (Motion, 2005).

3.1.3. Mediation with Online Technologies

In order to facilitate the resolution of disputes, some websites such as Internet Neutral or SquareTrade have been established. These websites are equipped with online technologies, i.e. e-mail, instant messaging, chat rooms, as well as traditional communication methods. First, a party goes to the website and fills in an online form including the problem and potential resolutions. After reviewing this form, a mediator asks the other party

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whether or not he will participate in the mediation. If the response is affirmative, the other party can fill in a new form or answer the former form through e-mail. Thus, parties are more likely to grasp the dispute and reach a settlement.

3.2. Adjudicative Online Dispute Resolution

3.2.1. Online Arbitration

Arbitration is referred to the dispute resolution mechanism whereby parties agree to submit their disputes to an independent third party (arbitrator or arbitral tribunal), who in turn delivers a final and binding award on both parties. Arbitration relies on party autonomy, beginning as a private agreement and continuing with private proceedings as planned by the parties. Nevertheless, it is still characterized as a quasi-judicial process as the arbitral award substitutes for a judicial decision. Arbitration is less formal than litigation, yet it includes the most formal process compared to all other ADR methods. Confidentiality and fastness are key features of arbitration that attract especially business parties in choosing arbitration over litigation. Another advantage of arbitration is the easy enforceability on the ground of the 1958 New York Convention on the Recognition and Enforcement of Foreign Arbitral Awards.

In order to limit the scope of application, online arbitration is assumed to cover only disputes that arise online. For a more efficient and broader resolution mechanism, however, disputes that arise offline may also be submitted to online arbitration with diverse online techniques, ranging from e-mail, chat groups or video conferencing. This wider approach relies on the qualification of online arbitration on the ground that submissions to the arbitral tribunal and the conduct of all proceedings takes place over the Internet, regardless of partly covering offline disputes. In doing so, disputes both in virtual and online medium can be handled efficiently via online arbitration (Piers, 2014).

4. ONLINE DISPUTE RESOLUTION IN THE EUROPEAN UNION

After the Recommendation 12/1986 of the Committee of Ministers at the Council of Europe on Measures to Prevent and Reduce the Workload of the Courts, the EU attempted to introduce the out-of-court dispute resolution mechanisms concerning civil matters. The European Commission Communication on Consumer Redress in 1985 and the Supplementary Communication from the Commission on Consumer Redress in 1987 illustrate these attempts. Publishing the Green Paper on Consumer Access to Justice and Dispute Resolution in Consumer within the Single Market in 1993, the EU Commission urged the Member States for collaboration to improve the settlement of disputes in cross-border commerce. The following enactments of various action plans, communications, and the Stockholm Program contributed to the current position of alternative dispute resolution mechanisms concerning consumer law in the EU.

Moving on, the EU has issued Directive 2013/11 of 21 May 2013 on Alternative Dispute Resolution for Consumer Disputes (the ADR Directive) and Regulation No 524/2013 of 21 May 2013 on Online Dispute Resolution for Consumer Disputes (the ODR Regulation), which is applicable since 15 February 2016.

The ODR Regulation is to be read in conjunction with the ADR Directive, which functions as a complement to the Regulation. It is, thus, appropriate to touch upon the main features of the ADR Directive. Laying down minimum standards, it does not impede the consumers to apply for a more extensive consumer protection. The scope of application of the Directive is both domestic and cross-border disputes arising from the contracts concluded between a trader established in the EU and a consumer resident in the EU. On the other hand, it does not stipulate an enforcement mechanism for recognition and enforcement of binding ADR decisions in the other Member States. The Directive requires the Member States to ensure that consumer disputes with a trader established in their countries can be submitted to an “ADR entity” that meets the conditions in the Directive, i.e. sufficient accessibility, effectiveness, fairness, transparency, impartiality, and expertise.

Moreover, each Member State is required to designate a “competent authority” that will determine, on the ground of the information received from entities wishing to become an ADR entity, whether they meet the abovementioned conditions in the Directive. Then approved entities are notified to the Commission, which in turn will publish and keep updated the list of them with their contact details, fees, languages they use, the disputes they handle. Each competent authority in the Member States will demonstrate in its website the link to this list of entities.

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Building on the structure of the ADR Directive, the ODR Regulation is related to the out-of-court settlement of disputes based on contractual obligations arising from online sales or service contracts concluded between a consumer resident in the EU and a trader established in the EU. Such settlement is conducted through the intervention of an ADR entity approved and listed according to the criteria in the ADR Directive. Similar to the ADR Directive, the ODR Regulation covers cross-border e-commerce disputes. However, the Regulation applies only to the disputes arising from the contracts concluded online, where the trader or the trader's intermediary offers the goods or services on a website or other electronic means by which the consumer makes an order. Therefore, whether the Regulation covers certain disputes depends on the online conclusion of the contract, but not the online performance.

The key feature of the Regulation is the establishment of an online platform, which is an interactive website to provide access to the consumers and traders free of charge, and to facilitate contacting with an approved ADR entity under the ADR Directive. The Commission will be in charge of the establishment and development of the platform, which will in turn provide an electronic complaint form to be filled and submitted online, inform the other party of the complaint, assist the parties to determine the competent ADR entities and transmit the complaint to the agreed entity, and offer a free of charge electronic case managing tool that enables the parties and the ADR entity to conduct the dispute resolution online. The platform will give assistance in all official languages of the EU, including the electronic translation of the exchanged information required for the settlement of the dispute. The relative link about the platform is to be provided in the general terms and conditions and on the websites of all traders established in the EU and dealing with online sales of goods and services. This requirement is also sought for the contract offers made by e-mails.

The Regulation stipulates, among the detailed provisions on the submission, transmission, and processing of a complaint, that "only data which are accurate, relevant and not excessive in relation to the purpose for which they are collected shall be processed through the electronic complaint form and its attachments." As parties are disputants, they are likely to have different views on the relevance and accuracy of the submitted data. Therefore, leaving the decision of whether the submitted data meet the abovementioned criteria to the electronic ODR platform would not serve to the purpose of this provision. Another interesting point is that, after determining the competent ADR entity, the ADR procedure does not necessarily have to be conducted through the online ODR platform. In other words, the ADR entity can proceed with traditional methods under its national law. Nevertheless, it would undermine the online nature of the procedure if it requires the physical presence of the parties. The Regulation also highlights the significance of a user-friendly platform appealing to everyone, particularly the vulnerable consumers. In line with this approach, the Member States are required to provide an "ODR contact point" with at least two advisors giving assistance to the parties who are resident in different countries and wish to use the platform.

5. CONCLUSION

The ICT has recently transformed traditional trade, leading to new terminology, actors and innovative ODR techniques. Equally important is ensuring confidence in e-commerce and the ODRs. The use of out-of-court means of settlement does not necessarily diminish legal certainty or protection. Contrary to litigation, these alternative methods provide more effective, fast, and generally free of charge resolutions to consumers. In order to promote the use of these extra-judicial means, the European legislators have been undertaking many initiatives, including the ADR Directive and the ODR Regulation. The assistance of technology to the ADR proceedings as a fourth party in the ODR Regulation diminishes the burden of secretarial management and facilitates the submission, transmission, and processing of a complaint. Furthermore, the ODR contact points will make the platform more user-friendly.

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A STUDY OF TECHNICAL HIGH SCHOOL EVALUATION BENEFIT IN TAIWAN

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The purpose of this study is to understand the benefits which were produced after school evaluation by conducting questionnaire on educators related to technical high school. The research tool is “the assessingindicators of technical high school evaluation benefit” which were built in the pilot study. The main result is: The importance and current situation of the assessing indicators for technical high school evaluation benefit both achieve the high level; besides, there are statistically significant differences between each dimension. Also, there are statistically significant differences between the importance of each dimension and the actual performance of the assessing indicators for technical high school evaluation benefit. Several suggestions in accordance with the result in this study are presented and could be provided for the practical promotion.

Keywords: evaluation benefit, school evaluation, school affair evaluation, technical high school

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A TENDON DRIVEN MECHANISM USING PARALLELOGRAM LINKAGE WITH BALL JOINTS

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Abstract: This paper proposes a tendon driven robot arm using artificial muscles. The proposed system consists of ball joints and parallelogram linkage. The mechanism can realize slide and twist motion with simple structure. The artificial muscles consist of the SMA actuators and the elastica. The construction of them can be arranged. Thus, we can adjust the stiffness using not only the SMA actuators but also the nonlinear property of the elastica. Based on the analysis of the human motion as the cascade control strategy, the mechanism can realize a force controller that uses both the discrete-time and the continuous-time controller.
Key Words: Tendon driven, Parallelogram linkage with ball joints, Force control, Variable stiffness mechanism

INTRODUCTION

Recently, knowledge of the human sensory-motor system must be effective tools for the communication research area such as the human-to-human or the human-to-machine communications. In the communication research area, understanding of the communication way of the injured peoples as the **Fig. 1**, the development of the communication devices becomes important as the **Fig. 2**. For these research areas, the analysis of human motion has been considered both the engineering fields and the scientific fields. Especially, about the neuromuscular and skeletal system, mathematical modeling, controller analysis and experimental verification with the physiological assumptions had been conducted.

For the future development of the previous fields, it becomes important to analyze the human motion with its dynamics. Actually, in the human body, muscular controller is similar to both the discrete-time and the continuous-time controller [6-7]. Then, such as the slide and twist motions are realized with simple tendon driven structure. This research proposes a control strategy of a tendon driven mechanism based on the analysis of human like motion [8-10].

This paper proposes a tendon driven robot arm using artificial muscles [1-5]. For the development, we analyzed the human sensory motor system. Control strategies of the human motion were analyzed in order to apply to the various applications for the human-to-human or the human-to-machine communication. Especially, in this paper, the controller of the neuromuscular and skeletal system was analyzed based on the structural properties of the human body.

Proposed system consists of ball joints and parallelogram linkage. Proposed mechanism can realize slide and twist motion with simple structure. The concepts of the controller were based on the analysis of the human motion as the cascade control strategy. The proposed mechanism can realize a force controller of the muscles that uses both the discrete-time and the continuous time controller.

At first, concepts of this paper will be explained. Then, sensory motor controller and the proposed controller will be described. Experimental model with artificial muscles and parallelogram linkage mechanism will be indicated and how will it make a motion will be explained. The experimental system utilizes shape memory alloy as the artificial muscles of the system and the elastica. The stiffness control strategies and the assumptions of this paper will be explained. Then, some results were explained to verify the effectiveness of the proposed system and assumptions of this paper.

BACK GROUNDS AND PROBLEMS

Back grounds of this research are that the development of the communication methods for the human-to-human or the human-to-machine communications. Thus, understanding of the communication way of the injured peoples, the development of the communication devices becomes important as shown in the **Fig. 1 and 2**. If some peoples who want to communicate other persons, the cell-phones becomes a communication devices. If some peoples who are injured but want to communicate other persons, various kinds of tools will assist their communication. Then, control strategies of the human motion were analyzed in order to apply to these industrial applications as the communication devices. Skeletal system, neuromuscular system, and also total sensory-motor

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system were well discussed and there are many outstanding assumptions.



Figure 1 The communication of the injured peoples.



Figure 2 The human-to-human or the human-to-machine communications.

HUMAN MOTION MODEL AND PROPOSED SYSTEM

The proposed system as shown in **Fig. 3, 4** consists of ball joints and parallelogram linkage. This mechanism can realize the tip of manipulator as the linear motion and the twist motion with simple structure as shown in **Fig. 5**. The concept of the controller was based on the analysis of the human motion as the cascade control strategy. The proposed mechanism can realize a force controller of the muscles that uses both the discrete-time and the continuous-time controller.

In the biomimetic fields, integrated system of the skeletal system and the neuromuscular system as we often call sensory-motor system of the human beings were studied. Animals have both the skeletal and the exoskeltal properties. This research focused on the joint structure with neuromuscular system. The system constructs a tendon driven mechanism with parallelogram linkage and ball joints. The skeletal and neuromuscular system has a sensory-motor control system. Then, it becomes important to construct the controller of the proposed tendon driven mechanism. Key points of the controller are as follows:

- Control strategy of the human motion has the cascade control property by such as the CNS and etc..
- Neuromuscular controller has both the discrete and the continuous time controller based on the muscle activities.

From these key points, assumptions of this paper will be described.

PROPOSED SENSORY MOTOR CONTROLLER AND THE VARIABLE STIFFNESS MECHANISM

Proposed tendon driven system uses artificial muscle consists of the SMA (Shape Memory Alloy) and the elastica. To control the system, feed forward controller uses internal force was utilized.

$$\boldsymbol{u} = \boldsymbol{k}_e(\mathbf{I}-\boldsymbol{W}\boldsymbol{W}^{+}) \quad (1)$$

where, $\boldsymbol{k}_e$ means gain, $\boldsymbol{W}$ means Jacobean matrix of the system. Construction of the SMA actuator has various ways. As the proposed system, we can control the artificial muscles for the position and the force control. **Fig. 6** shows a variable stiffness mechanism with SMA and elastica. In the system, length of the elastic elements and SMA are contracted and position and stiffness will be adjusted. Neuromuscular controller has both the discrete and the continuous time controller. Then, it leads to following assumptions and properties.

- **Sensitive in the low region**
- **Realize a wide force output range**

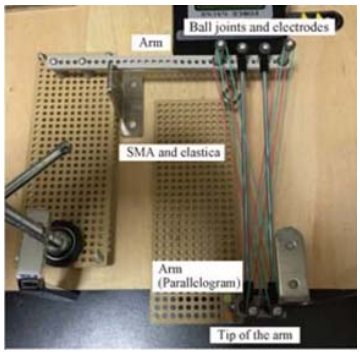

Figure 3 The proposed system consists of ball Joints, artificial muscle as the SMA and the elastica, and parallelogram linkage.



Figure 4 Joints and the artificial muscles.

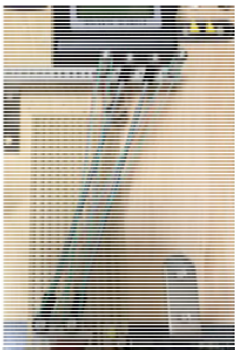

Figure 5 the linear motion and the twist motion.

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On the other hand, some of the skeletal system constructs a tendon driven mechanism with parallelogram linkage and ball joints. Then, the mechanism has a possibility to realize various motions such as liner and twist motion of the tip. It leads to such a variable stiffness mechanism consists of the actuators and the elastic elements.

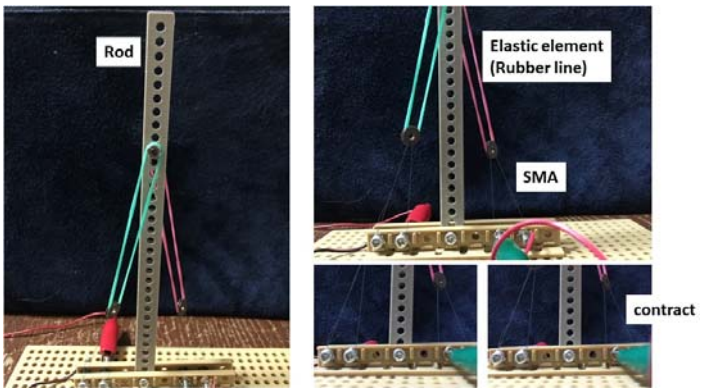
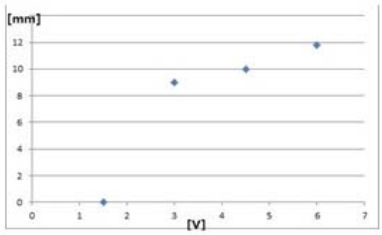


Figure 6 Variable stiffness mechanisms. Lengths of the elastic and SMA are contracted and position and stiffness are adjusted.



(i) Tip twist motion



(ii) Displacement of the tip twist motion

Figure 7 Twist motion of the system as shown in the Fig. 3.

RESULTS AND DISCUSSION

To examine the above assumptions and properties, the system as shown in **Fig. 3-5** was developed. The artificial muscles consist of the SMA actuators and the elastic. The construction of them can be arranged. Thus, we can adjust the stiffness using not only the SMA actuators but also the nonlinear property of the elastica.

Fig. 7(i) shows a twist motion of the system as shown in the **Fig. 3**. This system uses four SMA actuator and elastica. The elastica make an internal force field at the initial position. So, this means that the controller uses both the discrete-time and the continuous-time controller. **Fig. 7(ii)** shows displacement of the tip twist motion of the system. Vertical line means the displacement of the tip of the arm at the point of the **Fig. 7(i).** In the experimental condition, upper side two SMA was heated by 1.5[V] to make a gravitational compensation term. Then, a single SMA was heated to make a twist motion. In the results, we can see that the displacement was increase and to be saturated.

CONCLUSION

This paper proposes a tendon driven robot arm using artificial muscles. The proposed system consists of ball joints and parallelogram linkage. The mechanism can realize slide and twist motion with simple structure. The artificial muscles consist of the SMA actuators and the elastica. The construction of them can be arranged. Thus, the stiffness can be adjusted not only the SMA actuators but also the nonlinear property of the elastic. Then, based on the analysis of the human motion as the cascade control strategy, the mechanism can realize a force controller that uses both the discrete-time and the continuous-time controller.

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A THEORETICAL SYNTHESIS AND ASSESSMENT STUDY ON THE MATH USAGE SKILLS

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The reason for the fact that math is the only and the greatest educational phenomenon of the world is the fact that it is used in lots of non-mathematical areas and in various ways. Significant amounts of time of the curriculum programs in most countries have been spared for the teaching of math. The reasons for this is both its help for understanding the courses of other curriculums and the indisputable benefits it provides to the solution of the problems encountered in life. We learn math for the purpose of learning the mathematical concepts, skills and strategies and using these tools in solving the problems we encounter in the real world. In accordance with this understanding; today, the purpose of teaching math has become to provide mathematical aptitude and form the skill of being able to use math in necessary conditions conveniently.

Then, what are the mathematical skills that are necessary for an individual who is able to efficiently make use of math and how are we going to be able to assess these skills? The purpose of this study is to find the answers for these questions and to contribute to the literature in theoretical meaning. Within the scope of the study; the studies conducted regarding the issue have been examined, the indicators of using math have been studied and a synthesis has been tried to be formed according to the scanned studies. At the end of the process, it has been decided that the theoretical frame that shall be formed for the math using skills shall consist of problem solving, reasoning, regression and modeling. Afterwards, graded scoring scales (DPAs) have been formed for each skill type regarding the assessment of these skills. Therefore; a total of 4 DPAs consisting of Graded Scoring Scale for Reasoning Skills (MBDPA), Graded Scoring Scale for Problem Solving Skills (PÇDPA), Graded Scoring Scale for Regression Skills (İBDPA) and Graded Scoring Scale for Modeling Skills (MoBDPA) have been formed. The opinions of 4 different researchers who are experts in their area have been taken for the graded scoring scales (DPAs) having been formed and the assessment of the mentioned DPAs by the experts have been ensured. In this process; the expert researchers have commented as “completely convenient” (2), “partly convenient” (1), “not convenient” (0) for each one of the mentioned DPAs and their sub-dimensions. In this way; the averages of the comments attained from the sub-dimensions have been taken for each skill and the assessment scores have been attained. At the end of the mentioned expert assessment process, the assessment score average for PÇBDPA has been calculated as 1.57, the assessment score average for MBDPA has been calculated as 1.68, the assessment score average for İBDPA has been calculated as 1.72 and the assessment score average for MoBDPA has been calculated as 1.68. In addition; In the light of the categories formed as dependent on the mentioned frame; for the purpose of realizing the reliability of the study, the analyses conducted independently by the researchers for the math usage skills have been compared with the use of the formula P (Negotiation Percentage) = [Na (Consensus) / Na (Consensus) + Nd (Dissensus)] X 100 (Miles and Huberman, 1994). As a result of this calculation; the mentioned values have been calculated as respectively P1= %81, P2= %79, P3= %79 and P4= %82 for the graded scoring scales for problem solving, reasoning, regression and modeling skills. Therefore; it has been decided that the developed DPAs are convenient for usage in the study.

Keywords: using mathematics, math usage skills

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ACCOUNTING-BASED ANOMALIES IN THE BOND MARKET

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We examine the relation between future bond returns and seven groups of accounting-based fundamental measures shown by other researchers to be related to future stock returns. Findings indicate that the frequency of significant returns to trading strategies based on these anomalies is similar in both the bond and stock markets. The magnitude of returns is generally lower with bonds, but the significance and Sharpe ratios of these returns are comparable to those observed with stocks. We show that returns in the bond market are concentrated in bonds where investors are less sophisticated and where accounting information is more relevant for bondholders. Specifically, the anomalies are driven by speculative bonds, bonds without credit default swaps, bonds with a low intensity of institutional trading, bonds with low investor attention, bonds with high uncertainty regarding the ability of the firm to service and repay debt, bonds whose issuer have negative unexpected earnings, and bonds with strict covenants.

Keywords: bond returns; market efficiency; accounting anomalies

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ADANA İLİNDE ÇİFTÇİLERİN PÜLVERİZATÖR DOLUMU, TEMİZLİĞİ VE BİOBED KULLANIMI KONUSUNDAKİ ALIŞKANLIKLARININ BELİRLENMESİ

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Bu çalışmada, bitkisel üretim yapan çiftçilerle bireysel görüşme yapılarak çiftçilerin pülverizatör dolumu, temizliği ve biobed kullanımı konusundaki alışkanlıkları incelenmiştir. Çalışmada, Adana ili merkez olmak üzere Yüreğir ve Seyhan İlçe Tarım Müdürlüklerine gelen çiftçiler arasından rastgele seçilmek suretiyle bireysel görüşme yapılmıştır. Çiftçilere öğrenim durumları, yaşları, ilaçlama öncesi pülverizatör dolumlarını nerede yaptıkları, her ilaçlama sonrasında pülverizatör temizliği yapıp-yapmadıkları, temizliği ne ile yaptıkları gibi sorular sorulmuştur. Bireysel görüşmeye katılan çiftçilerin ortalama yaşlarının 50.5 yaş, %37.6'sının ilkokul mezunu ve eğitim ortalamalarının 8.8 yıl olduğu belirlenmiştir. Pülverizatör sahipliği incelendiğinde; çiftçilerin %93'ünün kendilerine ait pülverizatörleri olduğu görülmektedir. Kullanılan pülverizatörlerin %58.4'ünün tarla pülverizatörü olduğu belirlenmiştir. Çiftçiler pülverizatörlerini en fazla çiftlik avlusunda doldurmakta (%41.6) ve temizlemektedir (%57.4). Çiftçilerin çevre kirliliğinin azaltılması konusunda %82.2'sinin ekipman ve yapı yatırımı konusunda devletten destekleme beklediği sonucuna varılmaktadır. Biobedi %7.9'unun daha once duyduğu ve %35.6'sının biobedi kendi avlusunda kullanmak istediği görülmektedir. Tarım alanlarında pülverizatör dolumu ve temizliği sırasında pestisitlere bağlı çevre kirliliğini en aza indirmek için çiftçilere biobed hakkında görsel bilgilendirme ve seminer etkinlikleri düzenlenmesinin önemli katkı sağlayacağı düşünülmektedir.

Keywords: Biobed, Pülverizatör, Çiftçi, Pestisit, Bireysel Görüşme.

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ADAPAZARI-KARASU YÖRESİNDEKİ SAF DOĞU KAYINI (*Fagus orientalis* Lipsky.) ORMANLARINDA SIKLIK BAKIMININ ÇAP VE BOY GELİŞİMİ ÜZERİNDEKİ ETKİLERİ

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Özet: Adapazarı-Karasu yöresinde gerçekleştirilen bu çalışmada farklı şiddetlerde uygulanan sıklık bakımı çalışmalarının doğu kayını (*Fagus orientalis* Lipsky.) bireylerinin çap ve boy gelişimi üzerindeki etkileri incelenmiştir. Yapılan varyans analizi ve Duncan testi sonuçlarına göre ılımlı (13,41 m) ve kuvvetli (13,76 m) olarak gerçekleştirilen sıklık bakımı çalışmalarının çap gelişimi (18,45 cm) üzerinde ve kuvvetli sıklık bakımı müdahalesinin de boy büyümesi üzerinde olumlu etkileri olmuştur. Ayrıca mutedil ve kuvvetli yoğunluklarda yapılan sıklık bakımı müdahalelerinin hacim, hacim artımı, birey sayısı, gövde düzgünlüğü ve meşcere dayanışması (k(f)=1,48) üzerinde de olumlu etkileri tespit edilmiştir. Doğu kayını meşcerelerinin gelişimi ve dayanıklılığı üzerinde sıklık bakımı önemli etkilere sahiptir. Bu nedenle araştırma alanı ile benzer yetişme ortamı koşullarına sahip kayın ormanlarında mutedil ve zaman zaman kuvvetli şiddette sıklık bakımı teknikleri yararlı sonuçlar verebilir.

Keywords: Doğu kayını, sıklık bakımı, çap, boy, hacim, stabilite, vitalite

Giriş

Toplum yaşamına çok yönlü ekolojik ve ekonomik faydalar sağlayan orman kaynaklarının, çeşitli nedenlerle (aşırı yararlanma, yangınlar, tarım ve yerleşim alanı kazanımı amacıyla yapılan açmalar, asit yağmurları, fırtına ve kar zararları v.b.) tahrip edilmesi yeryüzünde çok daha büyük çevre sorunlarının meydana gelmesine neden olmuştur. Bu çevre sorunlarının başında; erozyon, sel ve çığ felaketleri, hava kirliliği, olumsuz iklim değişiklikleri, biyolojik ve genetik çeşitliliğin azalması gelmektedir (Çepel, 2003). Nitekim, atmosferdeki zararlı maddelerin ve gazların artması özellikle son 40 yıl içinde Orta Avrupa'daki canlı ekosistemlerinin önemli ölçüde tahrip olmasına neden olmuştur (Çolak ve Pitterle, 1999). Ortaya çıkan bu çevre sorunları, doğal yetişme ortamı koşullarını da önemli ölçüde değiştirmiştir. Bu değişime bağlı olarak, başta bitkiler olmak üzere tüm canlı populasyonlarında biyolojik çeşitlilik zamanla azalmıştır. Buna göre, geçmişe oranla doğal bitki türlerinin toplam sayısında Danimarka'da %20, Fransa'da %12, Yunanistan'da %15 ve İrlanda'da %13 azalma olduğu belirlenmiştir (Emborg, 1999; Falcone, 1999; Kassioumis vd., 1999).

Ülkemiz, çok çeşitli iklim ve fizyografik koşulların varlığına bağlı olarak ortaya çıkan farklı yetişme ortamı koşulları nedeniyle gerek ağaç türü, gerekse meşcere kuruluşları bakımından biyolojik ve ekonomik değeri yüksek saf ve karışık doğal orman kaynaklarına sahiptir. 2004 yılı verilerine göre ülkemizin toplam orman alanı 21.188.747 hektardır. Bu rakam, ülke yüzölçümünün %27,2'si gibi önemli bir kısmını kapsamaktadır. Nitelikleri bakımından ise, sahip olduğumuz orman kaynaklarının, %50'si (10.621.221 ha) normal koru ve normal baltalık, %50'si (10.567.526 ha) ise bozuk koru ve bozuk baltalık niteliğindedir (Anon., 2014). Bu rakamlardan da anlaşılacağı üzere, ülkemiz ormanlarının büyük bir bölümünün doğal yapısı yapılan aşırı faydalanmalar, hatalı teknik müdahaleler, yangınlar, kar ve fırtına zararları gibi çeşitli biyotik ve abiyotik faktörler nedeniyle bozulmuş ve verimlilikleri azalmıştır. Doğal orman kaynaklarımızın verimliliğinde yaşanan bu düşüşe bağlı olarak, bu kaynaklardan elde edilen ürün miktarı da her geçen yıl azalmıştır. Nitekim, son verilere göre ülkemiz ormanlarından 15-16 milyon m^3 eta alınabilmektedir. Bu değer ortalama yılda 0,750-0,800 m^3/ha'lık bir artıma karşılık gelmektedir. Bu miktar, Romanya (2,6 m^3/ha), Yunanistan (2,1 m^3/ha) ve eski Yugoslavya (2,7 m^3/ha) gibi ülkelerle karşılaştırıldığında oldukça düşüktür (Ürgenç, 1998).

Ormanlardan istenilen ürün verimliliğinin elde edilmesi için yapılması gereken en önemli hususların başında, meşcere bakımının zamanında ve tekniğine uygun olarak yapılması gelmektedir. Meşcere bakımları ile hem

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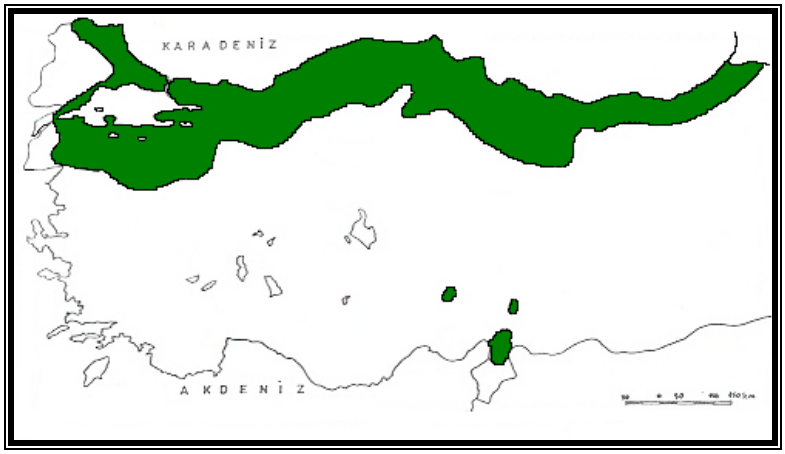
meşcerenin sağlığı ve kalitesi artırılmakta hem de ürün çeşitliliğine önemli katkılar sağlanmaktadır. Nitekim günümüzde ormanların büyük bir çoğunluğu fonksiyonel amaçlara yönelik olarak işletilmektedir. Bu itibarla ormanların fonksiyonel amaçları yerine getirmesi için genleştirme ve ağaçlandırma çalışmalarından daha ziyade bakım çalışmaları ön plana çıkmaktadır. Meşcere bakımının ilk aşamasını gençlik ve sıklık bakımı çalışmaları oluşturmaktadır. Gençlik bakımı tedbirleri doğal veya yapay yolla alana getirilen gençlik ve kültürler alanda tutunmasını sağlamak açısından önemli rol oynamaktadır. Yeni generasyonun kapalılığının oluşmasından itibaren ise sıklık bakımı çalışmaları başlamaktadır. Sıklık bakımı çalışmaları meşcerenin gelecekteki şekillenmesi, kalitesi ve sağlık durumu açısından büyük bir önem taşımaktadır. Bu konuda sıklık bakımının, istikbal bireylerinin belirlenmesinde dahi aralama çalışmalarına önemli bir alt yapı oluşturduğu, bireyler arasındaki dayanışmayı ve vitaliteyi artırdığı belirtilmektedir (Genç, 2004). Ancak bu şekilde önemli etkilere sahip olan sıklık bakımı çalışmaları konusunda ülkemizde yeterli sayıda araştırmanın yer aldığından söz etmek oldukça güçtür. Özellikle yetişme ortamı çeşitliliğine bağlı olarak ortaya çıkan asli tür zenginliğimiz yönünden orman ağaçlarımızda değişik ekolojik koşullarda bakım çalışmalarının farklı boyutlardan incelenmesi ve değerlendirilmesi gerekmektedir.

Adapazarı-Karasu yöresinde gerçekleştirilen bu araştırmada, doğal doğu kayını (*Fagus orientalis* Lipsky.) meşceresinde farklı şiddetlerde gerçekleştirilen sıklık bakımı müdahalelerinin kayın bireylerinin gelişimi ve büyümesi üzerinde etkileri incelenmiştir. Bu amaçla alınan deneme alanlarında çeşitli ölçü ve tespitlerde bulunulmuştur (Şekil 1).



Şekil 1: Doğu kayınının Türkiye'deki doğal yayılışı (Alemdağ, 1963).

Material ve Metotlar

Araştırma Alanının Genel Tanıtımı

Adapazarı-Karasu ilçesi sınırları içinde bulunan ve idari açıdan Karasu Orman İşletme Müdürlüğü'ne bağlı olan Karasu Orman İşletme Şefliğinin denize olan yatay mesafesi 3 km'dir. Genel olarak düze yakın ve orta engebeli bir arazi yapısına sahip olan Karasu Orman İşletme Şefliğinin ortalama rakımı 100 m'dir (Anon., 2015). Araştırma alanı, orman toplumları bakımından, euxin orman kuşağının, kuzeybatı euxin alt orman kuşağında kalmaktadır (Mayer ve Aksoy, 1998). Karasu plan ünitesinde, 2014 yılında gerçekleştirilen envanter çalışmaları sonucunda elde edilen bilgilere göre, toplam 7459 ha orman alanı bulunmaktadır. Bu orman alanın; %86,7'si normal, %13,3'ü ise, bozuk orman niteliğindedir. Uygulanmakta olan model amenajman planına göre, işletme şefliği ormanları dört işlem ünitesine ayrılmıştır. Karasu bölgesi, Türkiye makroiklim tipleri sınıflandırmasına göre, Batı Karadeniz alt iklim tipinin (IIc) etkisi altında bulunmaktadır (Saatçioğlu, 1969; Özyuvacı, 1999). Araştırma alanında meteoroloji istasyonu bulunmamaktadır. Çepel (1995) ve Özyuvacı (1999)'da, denizden ortalama yükseltisi bilinen fakat meteoroloji istasyonu bulunmayan bir yörenin iklimi hakkında genel bir bilgi sahibi olabilmek için, denizden ortalama yüksekliği bilinen bir meteoroloji istasyonundan elde edilen yağış ve sıcaklık değerlerinin, Schreiber ve Lapse-Rate formülleri kullanılarak enterpole edilmesini önermektedirler. Bu nedenle, araştırma alanının Walter yöntemine göre iklim diyagramının çizilmesinde, bölgeye en yakın meteoroloji istasyonu olan 18 m yükseklikteki Adapazarı Meteoroloji İstasyonu'nun uzun yıllar ortalama verilerinden faydalanılmıştır. Bu değerlere göre, Karasu bölgesinde yıllık ortalama sıcaklık 14.3°C olup, en düşük olduğu ay Ocak, en yüksek olduğu aylar ise Temmuz ve Ağustos'dur. Ayrıca, yörede vejetasyon süresi 8 aydır. Araştırma alanının, Walter yöntemine göre düzenlenmiş olan iklim diyagramı ise Şekil 2'de gösterildiği gibidir.

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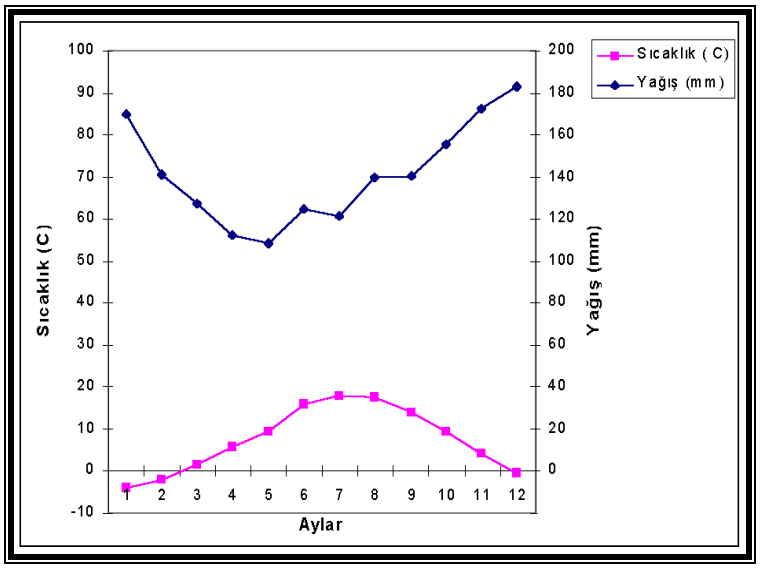

Şekil 2: Walter yöntemine göre Karasu'nun iklim diyagramı.

Karasu yöresinde jeolojik yapı; II. Zamanın (Mesozoik) kretase döneminde oluşmuştur. Bu nedenle, bölgedeki anakayalar sedimanter yapıdadır. Yörenin, özellikle sarp ve dik eğimli kısımlarında kalker, kil, marn, şist, konglomera ve filiş oluşumları bulunmaktadır. Düz ve daha az eğimli kısımlarında ise, kumtaşı formasyonları vardır (MTA, 2014). Ayrıca uygulanmakta olan amenajman planında ve detay silvikültür planında, plan ünitesindeki genel toprak yapısının; az taşlı, orta derinlikte, alkalen, kumlu balçık ve kumlu killi balçık tekstüründe olduğu bildirilmektedir (Anon., 2015).

Deneme Alanlarının Özellikleri

Karasu yöresinde gerçekleştirilen bu araştırmada da, araştırmanın amacı, süresi, çalışma imkanları ve arazi koşulları göz önünde tutularak deneme alanlarının 25x40 m (1000 m^2) büyüklüğünde alınması uygun görülmüştür. Deneme alanlarının şekli, sınırlarının kolay ve sağlıklı bir şekilde araziye uygulanması açısından önem taşımaktadır (Kalıpsız, 1993; Atıcı, 1998; Carus, 1998). Araştırma süresince çeşitli ölçü ve tespitlerin gerçekleştirildiği bu deneme alanlarının sayılarının belirlenmesinde, 1000 m^2 büyüklüğünde 3 tekrarlı ve her bir yoğunlukta 1 adet kontrol olmak üzere topla 12 adet deneme alanı alınmıştır.

Karasu 130c nolu bölmecik; II. bonitet sınıfında olup, aktüel meşcere tipi Knb_3'dir. Bölmecik; kuzeybatı bakılı olup, rakımı 253 m ve arazi eğimi %30-35 arasında değişmektedir. Bu bölmecikte, 2005 yılında 20,4 ha büyüklüğünde alanda sıklık bakımı çalışması yapılmıştır. 130c bölmeciğinde yapılan sıklık bakımı çalışmasında, yapılan kesimler aynı yılın Eylül ayında tamamlanmıştır. Yapılan sıklık bakımı kesimlerinden kayında toplam 18,203 m^3 ara hasılat etası alınmıştır. Yapılan sıklık bakımı çalışmalarında toplam birey sayısının %20'si, %50'si ve %70'i alınmıştır. Bartın ve Devrek yörelerinde, kayın doğal grup gençleştirme alanlarından alınan, 25x40 m büyüklüğündeki deneme alanlarında bulunan tohum ağaçlarında; yaş, ağaç sayısı, çap, boy, göğüs yüzeyi alanı, hacim, ortalama yıllık hacim artımı, sıklık, karışım oranı, tepe formu, gövde durumu, tepe genişliği ve tepe projeksiyonu alanı yönünden ölçü ve tespitler yapılmıştır. Araştırmada, deneme alanlarında bulunan tohum ağaçlarında tespit edilen önemli bir değişken de, göğüs yüksekliği çapıdır ($d_{1.30}$). Bu amaçla, 25x40 m büyüklüğündeki deneme alanlarına giren tüm ağaçların göğüs yüksekliği çapları, mm hassasiyetindeki bir çap ölçer ile ölçülmüştür. Ölçülen göğüs yüksekliği çap değerlerinin, aşağıdaki formülde belirtildiği gibi aritmetik ortalaması alınarak, deneme alanları düzeyinde kayın ağaçlarının ortalama çapları bulunmuştur.

Dayanıklı ve sağlıklı yaşlı meşcere kuruluşları, gençleştirme çalışmalarında her zaman önemli avantajlar sağlamaktadır. Bunların başında ise, kar ve fırtına devriklerinin azalması gelmektedir. Çünkü, yaşlı meşcere oluşturan ağaçların devrilmesi sonucunda, alt tabakada bulunan ve gelişim evrelerinin henüz başında olan genç fidanlar önemli zararlar görmekte ve çoğunlukla elimine olmaktadırlar (Nyland, 2002). Bu bilgiler çerçevesinde, deneme alanlarında bulunan ağaçların göğüs yüksekliği çaplarının, gençlik üzerinde dolaylı etkileri söz konusudur. Bu nedenle, deneme alanlarında bulunan kayın ağaçlarının ortalama çaplarının istatistik analizlere bir değişken olarak katılması uygun görülmüştür. Deneme alanı ortalama göğüs yüksekliği çapına ($d_{1.30}$) göre belirlenen orta ağaçların boyları, cm hassasiyetindeki dijital boy ölçer ile ölçülmüş ve ölçülen boy değerlerinin aşağıda belirtilen formülde gösterildiği gibi aritmetik ortalaması alınarak, kayın ağaçlarının deneme alanlarındaki ortalama boyları m olarak belirlenmiştir.

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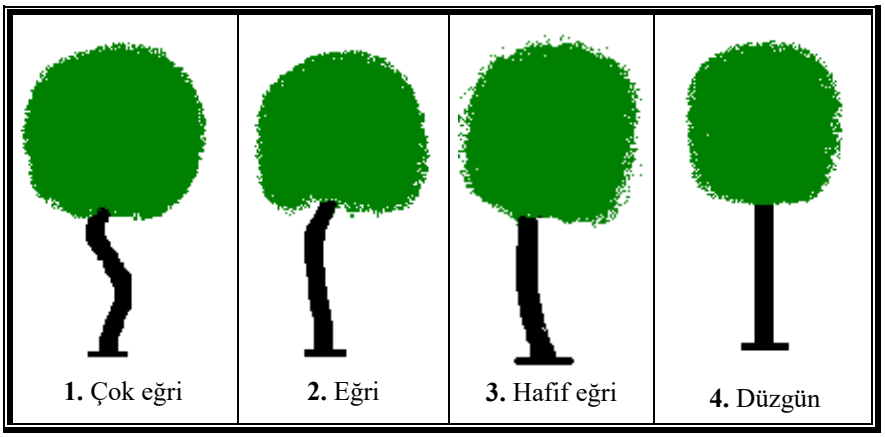
Deneme alanlarında bulunan kayın ağaçlarına ait ortalama boy, çap ve yaş değişkenlerinin belirlenmesinden sonra, bu ağaçların aktüel hacim durumlarının da tespit edilmesinde yarar görülmüştür. Bu itibarla, deneme alanlarındaki kayın ağaçlarının ortalama hacim değerleri aşağıda belirtilen formüle göre hesaplanmıştır. Ortalama ağaç hacimlerinin belirlenmesinde kullanılan tek ağaç hacim değerleri, Carus (1998) tarafından yapılan, "Aynıyaşlı Doğu Kayını (*Fagus orientalis* Lipsky.) Ormanlarında Artım ve Büyüme" isimli doktora çalışması kapsamında bonitete göre hazırlanan hacim tablolarından alınmıştır.

Araştırmada, deneme alanları itibarıyla tohum ağaçlarında hesaplanan bir başka değişken ise, ortalama yıllık hacim artımıdır. Bu itibarla, deneme alanlarına göre kayın ağaçları için ayrı ayrı belirlenen ve hektara dönüştürülen ortalama hacim değerleri, yine deneme alanlarında türlere göre tespit edilen yaş değerlerine oranlanmak suretiyle ortalama yıllık hacim artımı, m^3/ha/yıl olarak hesaplanmıştır. Bu amaçla, aşağıda belirtilen Eşitlik 4'den yararlanılmıştır.

Kayın bireylerinde hacim artımının belirlenmesi amacıyla gövde analizleri gerçekleştirilmiştir. Bu amaçla 10 cm'lik seksiyonlar şeklinde alınan disklerde çift taraflı olmak üzere çap artımı ve boy büyüme değerleri belirlenmiş ve bu değerlerden yararlanılarak hacim artım miktarları tespit edilmiştir. Bu amaçla 3 farklı şiddette gerçekleştirilen sıklık bakımı alanlarından 5 tekrarlı olacak şekilde toplam 15 birey ve yine herbir sıklık bakımı uygulama alanından 3 tekrarlı olacak şekilde toplam 9 adet kontrol bireyi kesilmiş ve tüm gövde analizi uygulamaları toplam 24 ağaç üzerinde gerçekleştirilmiştir.

Kayın ağaçlarının seçiminde dikkat edilen diğer bir kriter de gövde formudur. Genel olarak kayın ağaçlarının, düzgün ve dolgun gövde formuna sahip bireylerden seçilmesi önerilmektedir (Saatçioğlu, 1979; Ürgenç, 1982, 1998; Tunçtaner, 2007; Nyland, 2002). Ağaçlarda meydana gelen böcek ve mantar zararlarından, biyolojik bağımsızlığını kazanmamış olan gençlikler önemli ölçüde zarar görebilmektedir. Ayrıca gövde formu, erken yaşlardan itibaren öz çürüklüğü meydana gelen kayında daha da büyük bir önem arz etmektedir. Nitekim Alemdağ (1963) tarafından yapılan bir araştırmada, Tokat yöresindeki kayın ormanlarında, öz çürüklüğünün erken yaşlardan itibaren meydana geldiği ve bu ormanlar için idare süresinin belirlenmesinde bu durumun göz önünde bulundurulması gerektiği bildirilmektedir. Bu bilgiler ışığında, araştırma alanlarından alınan deneme alanlarında bulunan kayın ağaçlarında gövde formuna yönelik tespitlerde bulunulmuştur. Bu amaçla, gövde formuna yönelik tespitlerin yapıldığı bazı araştırmalarda olduğu gibi, deneme alanlarında bulunan kayın ağaçlarında gözlemlenen gövde formlarına göre belirlenen ve dört kategoriden oluşan bir gövde formu indeksi kullanılmıştır (Şekil 3).



Şekil 3: Kayın ağaçlarında gövde formunu.

Şekil 3'deki gövde formu indeks değerlerine (1-4) göre, kayın tohum ağaçlarına ait gövde formu değişkeni istatistik analizlere dahil edilmiştir.

Araştırmadan elde edilen verilerin istatistiki değerlendirmeleri için, SPSS (Statistical Package for Social Science) 9.0 paket programından yararlanılmıştır. İstatistik analizlerde kullanılan verilerin normal dağılım gösterip göstermediğini belirlemek için, Kolmogoraf Simirnov testi uygulanmıştır. 2005 yılında 3 farklı şiddette gerçekleştirilen sıklık bakımı müdahaleleri sonucunda kayın bireyleri arasında istatistiki bakımdan anlamlı farklılığın bulunup bulunmadığını belirlemek için varyans analizi uygulanmıştır. Varyans analizinde belirgin bir farklılığın çıkması durumunda, gruplandırmalar Duncan testi ile yapılmıştır (Kalıpsız, 1994; Batu, 1995; Ercan, 1997; Özdamar, 2004). Araştırmada komşuluk ilişkileri de belirlenmiştir. Bu amaçla deneme alanlarında kalan serveti oluşturan kayın bireylerinin hepsinin bulunduğu konuma gidilerek ayrı ayrı GPS yardımıyla koordinat

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tespiti gerçekleştirilmiş ve daha sonra bu koordinatlar Arc.GIS programının 3D analiz setinde özel analizler menüsü kullanılarak analiz edilmiş ve k(f) fonksiyonuna ait katsayı değerleri belirlenmiştir.

Sonuçlar ve Tartışma

2005 yılında 3 farklı yoğunlukta gerçekleştirilen sıklık bakımı çalışmaları sonucunda bu bakım uygulamalarının gerçekleştirildiği alanlardan alınan kayın bireylerine ilişkin ortalama boy değerlerine uygulanan varyans analizi ve Duncan testinin sonuçları Tablo 1'de verilmiştir.

Tablo 1: Farklı şiddetlerde uygulanan sıklık bakımı sonucu kayın bireylerine ait 10. yıldaki ortalama boy değerleri, varyans analizi ve Duncan testi sonuçları.

Sıklık Bakımı Şiddeti	**F=13,48** Ort. Boy (m)**	**Homojen Gruplar**
Hafif (%20)	10,54	*a*†
Mutedil (%50)	13,41	*b*
Kuvvetli (%70)	13,76	*b*
Kontrol	9,67	*a*

**: *P<0.01* güven düzeyinde anlamlı farklılık
†: Aynı harfler benzer grupları göstermektedir.

Gerçekleştirilen varyans analizi sonucunda 3 farklı şiddette uygulanan sıklık bakımı uygulamaları sonrasında kayın bireylerinin ortalama boy büyümesi arasında P<0,01 güven düzeyinde anlamlı farklılığın olduğu tespit edilmiştir. Bu kapsamda homojen gruplandırmayı gerçekleştirmek amacıyla uygulanan Duncan testi sonucunda 2 farklı homojen grubun olduğu belirlenmiştir. Buna göre ortalama boy büyümesi en düşük hafif şiddetli sıklık bakımı uygulamasının gerçekleştirildiği kısımda gerçekleşirken, mutedil ve şiddetli sıklık bakımı uygulaması gerçekleştirilen alanlarda ortalama boy büyümesi birbirine oldukça yakın değerler göstermiş ve aynı grupta yer almışlardır (Tablo 1). Buna göre farklı şiddetlerde sıklık bakımının uygulandığı kayın meşceresinde 10. yıl sonunda ortalama boy büyümesi 10,54-13,76 m arasında değişmektedir. Bu durum kontrol alanında 9,67 m olarak tespit edilmiştir. Bu konuda İran'da yapılan benzer bir araştırmada mutedil ve şiddetli sıklık bakımı çalışmaları sonrasında doğu kayını bireylerinde ortalama boy büyümesinin 10. yaşta 8,96-17,48m arasında değiştiği tespit edilmiştir (Tabari vd., 2005). Diğer taraftan her 3 şiddet derecesinde de sıklık bakımı müdahalelerinin gerçekleştirildiği alandaki kayın bireylerinin ortalama boy büyümesi yönünden kontrol parselinden daha yüksek değerlere sahip olduğu saptanmıştır. Nitekim Saatçioğlu (1971) ve Atay (1989) tarafından sıklık bakımı müdahalelerinin hemen hemen tüm asli orman ağacı türlerinde gelişim ve büyüme yönünde pozitif etkiler meydana getirdiği bildirilmektedir. Diğer taraftan ortalama boy büyümesinin ve meşcere üst boyunun doğrudan doğruya meşcere kapalılığını da etkilediği bilinen bir gerçektir (Avşar, 2004; Yücesan vd., 2015). Bu kapsamda söz konusu bu araştırmada da kayında yapılan farklı şiddetlerdeki sıklık bakımı tedbirlerinin meşcere dinamikleri ve boy gelişimi açısından olumlu etkiler meydana getirdiğini söylemek mümkündür.

Araştırmanın gerçekleştirildiği bölmecikte farklı şiddetle sıklık bakımının uygulandığı kayın alanlarından 10. yaşta 3 tekrarlı olarak kesilen deneme ağaçlarında yapılan gövde analizleri sonucunda elde edilen ortalama çap değerlerine uygulanan varyans analizi ve Duncan testinin sonuçları Tablo 2'de belirtilmiştir.

Tablo 2: Farklı şiddetlerde uygulanan sıklık bakımı sonucu kayın bireylerine ait 10. yıldaki ortalama çap değerleri, varyans analizi ve Duncan testi sonuçları.

Sıklık Bakımı Şiddeti	**F=28,45* Ort. Çap (cm)**	**Homojen Gruplar**
Hafif (%20)	14,37	a†
Mutedil (%50)	16,56	b
Kuvvetli (%70)	18,45	c
Kontrol	11,43	d

*: P<0.05 güven düzeyinde anlamlı farklılık
†: Aynı harfler benzer grupları göstermektedir.

Yapılan varyans analizi sonucunda 10 yaşındaki kayın bireylerinin çap gelişimi açısından P<0,05 güven düzeyinde anlamlı farklılık bulunmuştur. Bu kapsamda uygulana Duncan testi sonucunda aynı güvenlik düzeyinde 4 farklı homojen grup ortaya çıkmıştır. Buna göre en düşük çap gelişimi hafif düzeyde gerçekleştirilen sıklık bakımında elde edilirken, en yüksek çap gelişimi en geniş yaşam alanına sahip olan kuvvetli düzeydeki sıklık bakımı alanında tespit edilmiştir (Tablo 2). Doğu kayınında yapılan benzer bir çalışmada da yapılan sıklık bakımı tedbirlerinin

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meşcerede kalan kayın gövdelerinin çap gelişimi üzerinde olumlu etkiler meydana getirdiği belirlenmiştir (Yücesan vd., 2015). Çünkü tekniğine uygun olarak gerçekleştirilen gövde ayrılması sonucunda meşcere kalan bireyler daha geniş bir yaşama alanına kavuşmakta ve daha fazla ışıktan yararlanarak çap artımı gerçekleştirmektedirler (Atay, 1989).

Araştırma kapsamında sıklık bakımı uygulamalarının 10 yılında kayın bireylerinin yaptıkları artım miktarları kesilen deneme ağaçlarında yapılan gövde analizleri sonucunda tespit edilmiştir. Gövde analizleri sonucunda elde edilen çap artımı değerlerine uygulanan varyans analizi ve Duncan testinin sonuçları Tablo 3'de gösterilmiştir.

Tablo 3: Farklı şiddetlerde uygulanan sıklık bakımı sonucu kayın bireylerine ait yıllık ortalama çap artımı değerleri, varyans analizi ve Duncan testi sonuçları.

Sıklık Bakımı Şiddeti	**F=3,556*** **Ort. Çap Artımı(cm/yıl)**	**Homojen Gruplar**
Hafif (%20)	1,356	*a*†
Mutedil (%50)	2,145	*b*
Kuvvetli (%70)	4,563	*c*
Kontrol	1,016	*d*

*: *P<0.05* güven düzeyinde anlamlı farklılık
†: Aynı harfler benzer grupları göstermektedir.

Kayın bireylerinde gövde analizi ile tespit edilen ortalama yıllık çap artımı değerlerine uygulanan varyans analizi sonucunda 3 farklı şiddetteki sıklık bakımı alanları arasında P<0,05 güven düzeyinde anlamlı farklılık tespit edilmiştir. Bu itibarla yapılan Duncan testi sonucunda 4 farklı homojen grup belirlenmiştir. Buna göre ortalama yıllık çap artımı değeri en düşük hafif şiddette gerçekleştirilen sıklık bakımı alanlarında belirlenirken, en yüksek ortalama yıllık çap artımı değeri kuvvetli sıklık bakımı tedbirlerinin uygulandığı kayın meşcere mıntıkalarında saptanmıştır (Tablo 3). Bu bulgular ışığında çap gelişiminde olduğu gibi yapılan farklı şiddetteki sıklık bakımı uygulamalarının meşcerede kalan serveti oluşturan kayın bireylerinin çap artımı üzerinde olumlu etkiler meydana getirdiği ortaya çıkmaktadır. Nitekim sıklık bakımı uygulamaları sonucunda elde edilen çap artım değerlerinin tamamının kontrol alanındakilerden daha yüksek olması da bu durumu desteklemektedir. Ayrıca gerek Avrupa kayının da gerekse doğu kayınında yapılan bazı çalışmalarda sıklık bakımı tedbirlerinin çap artımı üzerinde % 12,8-% 23,6 arasında değişen oranlarda artış sağladığı tespit edilmiştir (Wang vd., 1998; Wilson ve Oliver, 2000; Tabari vd., 2005).

Sıklık bakımı tedbirlerinin odun hacmi yönünden etkileri konusunda elde bulunan bilgiler oldukça sınırlıdır. Özellikle doğu kayını türünde bu bilgilere ilişkin araştırma çalışmaları ülkemizde yetersiz düzeydedir. Bu anlamda söz konusu bu araştırma kapsamında farklı yoğunluklarda uygulanan sıklık bakımı tedbirlerinin hacim üzerindeki etkileri de incelenmiş ve gövde analizleri sonucunda ortaya çıkan çap ve çap artımı değerlerinden yararlanılarak kayın bireylerinin hacim değerleri de hesaplanmıştır. Hesaplanan hacim değerlerine uygulanan varyans analizi ve Duncan testinin sonuçları Tablo 4'de belirtilmiştir.

Tablo 4: Farklı şiddetlerde uygulanan sıklık bakımı sonucu kayın bireylerine ait ortalama hacim değerleri, varyans analizi ve Duncan testi sonuçları.

Sıklık Bakımı Şiddeti	**F=2,536** **Ort. Hacim(m^3/ha)**	**Homojen Gruplar**
Hafif (%20)	0,986	*a*†
Mutedil (%50)	1,113	*a*
Kuvvetli (%70)	5,447	*b*
Kontrol	0,563	*c*

**: P<0.01 güven düzeyinde anlamlı farklılık
†: Aynı harfler benzer grupları göstermektedir.

Tablo 4'te yer alan değerler incelendiğinde, 3 farklı şiddette uygulanan sıklık bakımları sonucunda ortalama hacim değişkeni yönünden varyans analizine göre P<0,01 güven düzeyinde farklılık bulunmuştur. Bu kapsamda uygulanan Duncan testi sonucunda 3 farklı grup ortaya çıkmıştır. Bu itibarla hafif ve mutedil olarak uygulanan sıklık bakımı tedbirlerinin yapıldığı alanlardaki kayın bireylerinde ortalama hacim değerleri birbirine oldukça yakın olup, bu iki sıklık bakımı tedbirlerinin yapıldığı alanlardaki bireyler aynı grupta yer almışlardır. Diğer taraftan kuvvetli sıklık bakımı tedbirlerinin uygulandığı alandaki bireylerin ortalama hacim değeri hafif ve mutedil

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şiddetteki alanlarda bulunan bireylere göre oldukça yüksek çıkmıştır (Tablo 4). Ülkemizdeki kayın ormanları tohum ve sürgün kökenli olup olmamaları durumuna göre farklı büyüme ve meşcere parametresi değerlerine sahip olabilmektedir (Saatçioğlu, 1969). Bu itibarla sıklık bakımı müdahaleleri sonrasında alanda kalan kayın bireylerinin II. ve III. bonitet sınıflarında uygulamaların 10. yılında ortalama tek ağaç hacminin 4,56-13,65m^3/ha arasında değiştiği belirlenmiştir (Carus, 1998). Nitekim yapılan farklı şiddetteki sıklık bakımı uygulamaları sonrasında kayın bireylerinde ortaya çıkan hacmin sayısal değer bakımından, kontrol alanındakinden yüksek olması bunun en önemli göstergesi olmaktadır.

Araştırmada gerçekleştirilen boy ölçümleri ile gövde analizlerinden elde edilen çap artımı ve çap değerleri kullanılarak gerçekleştirilen hesaplamalar sonucunda kayın bireylerine ait ortalama yıllık hacim artımı değerleri tespit edilmiştir. Ortalama yıllık hacim artım değerlerine uygulanan varyans analizi ve Duncan testine ilişkin sonuçlar Tablo 5'de verilmiştir.

Tablo 5: Farklı şiddetlerde uygulanan sıklık bakımı sonucu kayın bireylerine ait yıllık ortalama hacim artımı değerleri, varyans analizi ve Duncan testi sonuçları.

Sıklık Bakımı Şiddeti	**F=124,563**** **Ort. Yıllık Hacim Artımı (m^3/ha/yıl)**	**Homojen Gruplar**
Hafif (%20)	0,763	*a*†
Mutedil (%50)	0,942	*a*
Kuvvetli (%70)	1,816	*b*
Kontrol	0,445	*c*

**: P<0.01 güven düzeyinde anlamlı farklılık
†: Aynı harf benzer grupları göstermektedir.

Yıllık ortalama hacim artımı değişkeni yönünden 3 farklı şiddette uygulanan sıklık bakımı alanlarında P<0,01 güven düzeyinde anlamlı farklılık bulunmuştur. Bu kapsamda gerçekleştirilen Duncan testi sonucunda 3 farklı homojen grup ortaya çıkmıştır. Buna göre ortalama hacim değişkeninde olduğu gibi ortalama yıllık hacim artımı değişkeninde de hafif ve mutedil şiddette sıklık bakımı yapılan alanlardaki kayın bireyleri aynı grupta yer alırken, kuvvetli sıklık bakımı gerçekleştirilen alanlardaki kayın bireylerinde ortalama yıllık hacim artımı daha yüksek olarak tespit edilmiştir (Tablo 5). Yıllık ortalama hacim artım değeri de meşcerenin verimliliğinin belirlenmesinde ve yapılan silvikültürel müdahalelere ilişkin sonuçların değerlendirilmesinde kullanılan önemli bir değişkendir (Genç, 2004). Bu kapsamda araştırmada yıllık ortalama hacim artım değişkeni de incelenmiştir ve yapılan incelemeler sonucunda bu değişkenin de uygulanan farklı şiddetteki sıklık bakımı tedbirlerinden etkilendiği yapılan varyans analizi ve Duncan testi sonucunda ortaya çıkmıştır. Bu durum doğu kayınında yapılan ve özellikle araştırma alanı ile benzer ekolojik koşullara sahip olan alanlarda gerçekleştirilen bir araştırmada da, sıklık bakımı müdahalelerinin uygulandığı alanlarda kalan serveti oluşturan kayın bireylerinin ortalama yıllık hacim artımının II. ve III. bonitet alanlarda 0,982-4,562m^3/ha/yıl arasında değiştiği belirlenmiştir (Carus, 1998). Bu konuda Bartın ve Devrek yörelerindeki doğu kayını ormanlarında gerçekleştirilen kapsamlı bir araştırmada da genç kayın meşcerelerinde ortalama cari artımın tek ağaç gövdesi üzerinden 0,775-6,323 m^3/ha/yıl arasında değiştiği belirlenmiştir (Özel, 2007).

Sıklık bakımı tedbirleri bireylerin kantitatif karakterlerinin yanı sıra kalitatif karakterleri üzerinde de etkili olan bir orman bakımı uygulamasıdır. Bu anlamda ekonomik değerin artmasında belirleyici rol oynayan gövde düzgünlüğü değişkeni sıklık bakımı uygulanan bu alanlarda bir indeks yardımıyla araştırma kapsamında değerlendirilmiştir. Bu amaca yönelik olarak Şekil 4'te yer alan gövde düzgünlüğü indeksinden yararlanılarak sıklık bakımı yapılan alanlardaki kayın bireylerinin ortalama gövde düzgünlükleri değerlendirilmiştir. Bu noktada elde edilen ortalama indeks değerlerine uygulanan varyans analiz ve Duncan testi değerleri Tablo 6'da gösterilmiştir.

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Tablo 6: Farklı şiddetlerde uygulanan sıklık bakımı sonucu ortalama gövde düzgünlüğü indeks değerleri, varyans analizi ve Duncan testi sonuçları.

Sıklık Bakımı Şiddeti	**F=34,52^{NS}** **Ort. Gövde Düzgünlüğü**	**Homojen Gruplar**
Hafif (%20)	3,2	*a†*
Mutedil (%50)	3,3	*a*
Kuvvetli (%70)	3,5	*a*
Kontrol	3,0	*a*

NS: İstatistiki açıdan anlamlı farklılık yok
†: Aynı harf benzer grupları göstermektedir.

Ortalama gövde düzgünlüğü değişkenine uygulanan varyans analizi sonucunda 3 farklı şiddette gerçekleştirilen sıklık bakımı alanlarında istatistiki açıdan anlamlı farklılık belirlenmemiştir. Ancak her 3 sıklık bakımı derecesi sonrasında yani 10. yaşta ortaya çıkan ortalama gövde düzgünlüğü değeri kontrol alanından daha iyi bulunmuştur. Bu itibarla sıklık bakımının kayın bireylerinin ortalama gövde düzgünlüğü üzerinde pozitif bir etkisinin olduğunu söylemek mümkündür. Geniş yapraklı türlerin gövde düzgünlüğü konusunda yapılan çalışmaların sayısı ve içeriği oldukça zayıftır.

Birey sayısı sıklık bakımı tedbirlerinin sonuçlarının değerlendirilmesinde önemli bir değişkendir. Çünkü bakım tedbirleri sağlıklı ve kaliteli meşcerelerin tesis edilmesinde ve özellikle gelecekte genç generasyonun oluşmasını sağlayacak tohum ağaçlarının belirlenmesinde önemli rol oynamaktadır. Bu nedenle başarı doğal gençleştirme çalışmalarının yapılmasında alanda yeterli sayıda ve homojen dağılışta tohum ağacının alanda bulunması gerekmektedir. Bu meşcere stabilitesinin sağlanmasında ilk temeller sıklık bakımı ile atılmaktadır. Bu kapsamda araştırma kapsamında 3 farklı şiddette uygulanan sıklık bakımı tedbirlerinin birey sayısı ve dağılımı üzerindeki etkileri de incelenmiştir. Bu amaçla, deneme alanlarında tespit edilen birey sayıları hektara dönüştürülmüş ve bu değerlere varyans analizi ve Duncan testi uygulanmıştır (Tablo 7).

Tablo 7: Farklı şiddetlerde uygulanan sıklık bakımı sonucu kayın bireylerine ait ortalama birey sayısı değerleri, varyans analizi ve Duncan Testi sonuçları.

Sıklık Bakımı Şiddeti	**F=1226,23*** **Ort. Birey Sayısı (adet/ha)**	**Homojen Gruplar**
Hafif (%20)	2216	*a†*
Mutedil (%50)	1980	*a*
Kuvvetli (%70)	1420	*b*
Kontrol	3128	*c*

***:** *P<0.05* güven düzeyinde anlamlı farklılık
†: Aynı harf benzer grupları göstermektedir.

Birey sayısı sıklık bakımı tedbirlerinin etkilerini yansıtması ve değerlendirme açısından önemli bir değişkendir (Saatçioğlu, 1971). Nitekim bu konuda ülkemiz ormancılığında çok önemli eksikliklerin bulunduğu orman bakımı disiplinine ait araştırmalarda ayrıntılı olarak yer almaktadır (Odabaşı vd., 2004). 3 farklı şiddette uygulanan sıklık bakımı müdahalelerinin etkilerini belirlemek amacıyla 10 yaşındaki kayın bireylerinden alınan 3 tekrarlı deneme alanlarında tespit edilen birey sayısının hektara uyarlanmış değerlerine uygulanan varyans analizi sonucunda P<0,05 güven düzeyinde istatistik açıdan anlamlı farklılık bulunmuştur. Bu kapsamda uygulanan Duncan testi sonucunda 3 farklı homojen grup tespit edilmiştir (Tablo 7). Bu sonuca göre hafif ve mutedil şiddetteki sıklık bakımı müdahaleleri ortalama birey sayısı yönünden aynı grupta yer alırken, kuvvetli derecede gerçekleştirilen sıklık bakımı müdahalesi yapılan alan tek başına bir grup oluşturmuştur. Diğer taraftan her üç sıklık bakımı müdahalesi de ortalama birey sayısı yönünden kontrol alanındaki kayın birey sayısından istatistiki açıdan anlamlı farklılık ortaya koymuştur. Nitekim İran'da yapılan bir araştırmada sıklık bakımı tedbirlerinin birey sayısı üzerinde negatif bir etki yaratmakla beraber, bireylerin dağılımı yönünden pozitif bir etki meydana getirdiği belirlenmiştir. Ayrıca aynı çalışmada sıklık bakımı sonrası optimum birey sayısının 1145 adet/ha olduğu belirlenmiştir (Tabari vd., 2005). Diğer taraftan aynıyaşlı kayın meşcerelerinde gerçekleştirilen hasılat çalışmasında sıklık bakımı sonrası alanda kalması gereken doğu kayını birey sayısının 10. yıl sonunda 1174-1678 adet/ha arasında olması gerektiği vurgulanmıştır (Carus, 1998). Bu sonuçlar ile söz konusu bu araştırma sonucunda elde edilen bulgular değerlendirildiğinde hektardaki ortalama birey sayısı yönünden özellikle mutedil

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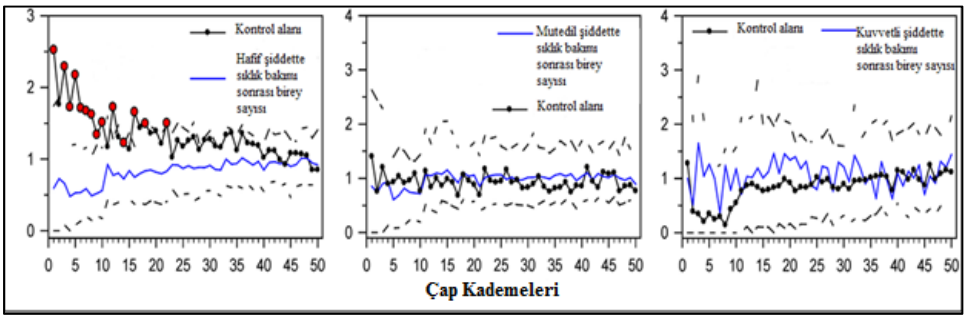
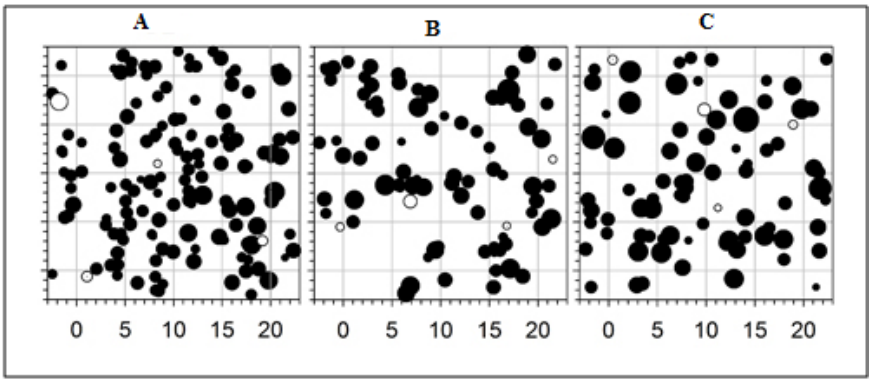
şiddetteki sıklık bakımı müdahalelerinin yerinde olduğunu söylemek mümkündür. Araştırma kapsamında birey sayısının 3 farklı şiddette uygulanan sıklık bakımı alanlarındaki dağılımı da incelenmiştir. Buna göre hafif ve mutedil şiddetteki sıklık bakımı çalışmalarında birey sayısının çap kademeleri bakımından dağılımı düzgün olmakla birlikte, kuvvetli derecede gerçekleştirilen sıklık bakımı uygulamalarında birey sayısının çap kademelerine dağılımı düzensiz olarak tespit edilmiştir (Şekil 4). Buna göre Karasu Orman İşletme Şefliğindeki doğu kayını meşcerelerinde yapılacak sıklık bakımı müdahalelerinde hektardaki birey sayısının düzenli ve optimum seviyede sağlanması mutedil şiddetteki sıklık bakımı uygulamaları ile gerçekleştirilebilmektedir.



Şekil 4: Farklı şiddetteki sıklık bakımı uygulamalarında birey sayısının çap kademelerine dağılımı.

Meşcere Komşuluk İlişkilerine İlişkin Bulgular

Bakım çalışmalarının en önemli etkilerinin başında meşceredeki galip bireyler arasındaki komşuluk ilişkilerini ve dayanışmayı artırmasıdır (Odabaşı vd., 2004). Bu nedenle araştırmada farklı şiddetlerde sıklık bakımı uygulanan alanlarda meşcere komşuluk ilişkileri Arc.GIS programı yardımıyla incelenmiştir. Yapılan komşuluk analizleri sonucunda farklı şiddette sıklık bakımı tedbirlerinin uygulandığı alanlarda bireylerin dağılımı ve düzeni Şekil 5'de gösterilmiştir.



Şekil 5: Farklı şiddette (A: Hafif, B: Mutedil ve C: Kuvvetli) uygulanan sıklık bakımı alanlarında kayın bireyleri arasındaki komşuluk ilişkileri.

Yapılan bu analiz sonucunda komşuluk ilişkisini gösteren k(f) katsayısı en fazla (2,34) mutedil şiddetteki sıklık bakımı uygulanan doğu kayını meşcere kısmında tespit edilmiştir. Bu konuda doğu kayınında yapılan bir çalışmada da ılımlı sıklık bakımı tedbirlerinin komşuluk ve yardımlaşma ilişkileri açısından oldukça olumlu etkiler meydana getirdiği belirlenmiştir (Yücesan vd., 2015). Diğer taraftan benzer silvikültürel özelliklere sahip olan Avrupa kayınında yapılan araştırmalarda da komşuluk ilişkilerinin optimum düzeyde gerçekleştiği sıklık bakımı şiddetinin hafif ve mutedil şiddetteki sıklık bakımı müdahalelerinde olduğu belirlenmiştir (Chapeck, 1996; Madsen, 1999).

Öneriler

Araştırmadan elde edilen bu sonuçlar ışığında Karasu Orman İşletme Şefliği ve benzer ekolojik koşullara sahip tek tabakalı ve aynıyaşlı saf doğu kayını meşcerelerinde gerçekleştirilecek sıklık bakımı müdahalelerine ilişkin olarak aşağıdaki silvikültürel önerilerde bulunmak mümkündür;

- Meşcerede bakım tedbirleri her gelişim çağında ve tekniğine uygun olarak yapılmalıdır.
- Sıklık bakımı tedbirlerinde geç kalınmamalı ve meşcerede primer kapalılık meydana gelir gelmez sıklık bakımı uygulamaları gerçekleştirilmelidir.
- Sıklık bakımı uygulamalarında yapılacak kesimlerin şiddeti yöresel koşullar ve meşcere kuruluş özellikleri dikkate alınarak belirlenmelidir.

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- Karasu yöresinde ve benzer yetişme ortamı koşullarına sahip doğu kayını meşcerelerinde sıklık bakımı tedbirleri uygulanırken meşcere parametreleri dikkate alınmalı ve özellikle hektardaki birey sayısı ve dağılımı yakından incelenmelidir. Bu kapsamda hektarda 850-1200 adet bireyin alanda bırakılması uygun olacaktır.
- Araştırma alanında ve benzer ekolojik koşullara sahip alanlarda bulunan saf doğu kayını meşcerelerinde boy, çap, hacim ve artım gibi meşvere gelişim parametrelerinin optimum düzeyde tutulması açısından mutedil veya kuvvetli derecede sıklık bakımı tedbirleri uygulanmalı ve alanda kalan kayın bireylerinin azman yapma eğilimleri kontrol altında tutulmalıdır.
- Araştırma alanındaki doğu kayını meşcerelerinde sıklık bakımı tedbirleri sonrası mutlaka en az 10 yıllık adaptasyon ve gelişim performansları izlenmelidir. Bu itibarla söz konusu bu araştırmadan elde edilen sonuçların uygulamaya aktarılması oldukça yararlı olacaktır.
- Araştırma alanında incelenen sıklık bakımı müdahaleleri sonrası doğu kayını meşcerelerinde özellikle eşit siper durumunun, sıklığın ve kapalılığın korunması ile optimum birey sayısı ve dağılımının sağlanması açısından mutedil şiddette sıklık bakımının uygulanması önerilebilir. Bu kapsamda söz konusu doğu kayını meşcerelerinde sıklık bakımı tedbirleri gerçekleştirilirken alandaki birey sayısının %50'sinin alınması meşcere dinamiklerinin korunması ve vitalitesi yüksek kayın meşcerelerinin sağlanması açısından yeterli olabilecektir.
- Sıklık bakımı sonrası doğu kayını meşcerelerinde kalan ağaç servetini oluşturan kayın istikbal bireyleri arasındaki komşuluk ilişkileri ve dayanışma performansları incelenmelidir. Bu kapsamda Karasu Orman İşletme Şefliğindeki gibi ılıman ve verimli yetişme ortamı koşullarına sahip kayın meşcerelerinde optimum dayanışma ve komşuluk ilişkileri için ve stabilitesi yüksek kayın meşcerelerinin tesisi açısından mutedil şiddette sıklık bakımı tedbirleri uygulanmalıdır.

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ADIYAMAN İLİNDE YABAN KEÇİSİ AV TURİZMİ

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Özet: Av turizmi; turizmin değişik bir uygulama şekli olup avcı niteliğine sahip kişilerin avlanma amaçlarını gerçekleştirmek üzere belirlenmiş ilkelerle yaptıkları etkinliklerdir. Avcılar, av turizmi faaliyetleri ile yaban hayvanlarının boynuz, diş, post benzeri hatıra değeri taşıyan kısımlarına sahip olmakla birlikte, değişik kültürleri tanıma ve değişik yerleri görme olanağı elde etmektedirler. Av turizmi kırsal alanlardaki insanların sosyo-ekonomik ve kültürel açıdan yapısını değiştirecek biçimde gelir ve refah seviyesinin iyileştirilmesi, dengesizliklerin giderilmesi ve yörede üretilen ürünlerin değerlendirilmesi, bakımından önemlidir.

7614 km²'lik yüz ölçüme sahip olan Adıyaman İlin arazi yapısı kuzeyden güneye doğru alçalan engebeli bir görünüm arz etmektedir. Çok farklı jemorfolojik ünitelere sahip Adıyaman havzasında ilk bakışta göze çarpan ana jeomorfolojik birimler dağlık alanlar, platolar ve bu her iki üniteyi parçalayan vadilerdir. Genel hatlarıyla en kuzeyde 800 metrelerden başlayıp 2000 metrelere kadar devam eden dağlık alanlar ve yüksek platolar yer alırken güneye doğru alçak platolara ve havza tabanına, daha sonra da Fırat ve kollarının oluşturduğu vadi ve seki sistemlerine geçilir.

Yukarıda ifade edildiği gibi birçok farklı yer şekillerinin görüldüğü Adıyaman ilinin özellikle Güneydoğu Torosların hakim olduğu alanlardaki çok engebeli alanlarda yabani hayvanların kolayca saklanabilecekleri gerek yer şekilleri gerekse bitki örtüsünün varlığına bağlı olarak yaban hayatı gelişmiştir. Özellikle bu sahada gün gittikçe sayıları artan yabani keçilere bağlı olarak yabani av hayatına uygundur.

Anahtar Kelimeler: Turizm, Ekonomi, Türkiye, Adıyaman

Adıyaman Wıld Goat Huntıng Tourısm

Abstract: Hunting tourism; a variant form of tourism is determined to achieve the objectives of the people who have the qualifications hunter hunting are activities they do with principles. Hunters, hunting tourism activities of wild animals with horns, teeth, albeit with parts carrying value of the post-like memories, know different cultures and gain the ability to see different places. Hunting tourism and income of people in rural areas so as to change the socio-economic structure and improving the cultural level of welfare, the elimination of imbalances and evaluation of products produced in the region in terms is important.

7614 square kilometers of Adiyaman province with the area's terrain poses a rugged appearance descending from north to South. Jemorfolojik unit in very different at first glance to have Adiyaman basin main geomorphological units outstanding mountainous areas, plateaus and valleys that are degrading both units. In general terms the north, starting from 800 meters to 2000 meters to up ongoing mountainous areas and high plateaus, while to the south the low plateau and basin base, then the Euphrates and passed the valley, and bench system formed by the arm.

Many different places, especially in a very hilly area in areas dominated by the Southeastern Taurus of Adiyaman seen the way the province need can easily be stored wild animals landforms, as stated above, depending on the presence of both vegetation has developed wildlife. In particular, numbers growing days in this area is suitable for hunting wild life due to increased wild goats.

Keywords: Geography of Trade, Import and Export, Italy, Economic Geography

1. ÇALIŞMA ALANININ DOĞAL COĞRAFYA ÖZELLİKLERİ

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Güneydoğu Anadolu bölgesinin yukarı Fırat bölümündeki Adıyaman ilinin bir bölümü Güneydoğu Anadolu bölgesinin dışına taşar, Güneydoğu Torosların hakim olduğu Sincik ve Çelikhan ilçeleri değişen yerşekilleri, yükselti, iklim özellikleri, doğal bitki örtüsünün yanında değişen beşeri faaliyetlere bağlı olarak doğu Anadolu bölgesi içinde kalırlar.

Adıyaman ili Akdeniz Bölgesi'ne yakınlığı nedeniyle 800 m' ye kadar olan sahalarda yarı kurak Akdeniz iklimi, yüksek kesimlerde ise karasal dağ iklimi hüküm sürmektedir. Yaz mevsiminde güneyden gelen kuru tropikal (sıcak) hava kütlesi etkisini göstermektedir. Nisan ayından itibaren yöreyi etkisine alan bu hava kütlesi, haziran sonundan itibaren güneş radyasyonunun da artması ile temmuz ve ağustos aylarında şiddetli sıcaklara neden olur. Ekim sonu ve kasım başından itibaren yöre Akdeniz Bölgesi'ni etkilemeye başlayan ve Doğu Anadolu'dan güneye doğru ilerleyen polar hava kütlesinin etkisi altına girer. Özellikle tropikal ve polar hava kütlelerinin karşılaşması ile cephe faaliyetleri ve bunun sonucu olarak yağışlar başlar. Toros dağ kuşağının ön silsilesini oluşturan Nemrut Dağı ve çevresindeki dağlar, güneyden sokulan cephelerin iç kısımlara geçmesini engeller, bu nedenle güneye bakan yamaçlar fazla miktarda yağış alır. Yörede yükseltiye bağlı olarak sıcaklık düşer, güneş radyasyonu artar ve özellikle güneye bakan yamaçlar aşırı derecede ısınır (Atalay v.d., 2002:352).Sözü edilen bu iki ilçede yüksek dağlık ve engebelik alanlara bağlı olarak yaban hayatı gelişmiştir, bu yaban hayatından biri de yaban keçisi avcılığıdır. Yaban keçileri sarp alanlar ile bitki örtüsünün hem beslenme hem e korunmaya imkan verdiği alanlarda gelişip çoğalma imkanı bulabilirler.

Tablo 1: Adıyaman İli Arazi Kullanım oranları(2013)

Arazilerin Kullanım Türü	Alan (Ha)	%
Tarım Alanı	251.580	33
Çayır ve Mera	225.775	30
Orman ve Fundalık	177.701	23
Tarım Dışı Arazi	60.155	8.5
Su Yüzeyi	31.962	4
Turizm (Milli Park Alanı)	13.827	1.5
Toplam	761.000	100.00

Adıyaman ilinin arazi kullanma özelliklerine baktığımızda yaban hayatının gelişine uygun olduğunu görebilmekteyiz. İl dağlık, engebeli akarsularla yarılmış derin vadiler geniş alanlar kaplamaktadır.

Adıyaman ilinde 7'si memeli, 31'i kuş, 6'sı sürüngen ve 104'ü omurgasız olmak üzere toplam 148 hayvan türü tespit edilmiştir. Bu türlerin hepsi geniş yayılış alanına sahip olup endemik değillerdir. Böyle olmakla birlikte, yer şekillerinin ve iklimin getirdiği avantaj sayesinde araştırma sahası av hayvanları açısından zengin sayılabilecek bir potansiyele sahiptir. Özellikle ilin kuzey kesiminde yer alan Toros Dağları'nın uzantısında bulunan Şengil-Hisar Dağı, Bezar Dağı, Hallof (Yarlıca) Dağı, Akdağ, Zivar Dağı, Çetirge, Koru ve Ulubaba Dağı yaban keçisi avlanma alanları olarak önemli avlak alanlarıdır. Bu alanlar da avlanma kotaları da belirlenmiştir. Av turizmine uygun olan il de şu anda yaban keçisi ve melez yaban keçisi avı yapılmaktadır.

2. AV TURİZMİ

Prideaux göre; ''Dünya ülkelerinin birçoğunda yapılmış olan anketlerde, ortaya çıkan sonuç turizmin yeni gözdelerinin doğal, tarihi ve kültürel çekicilikler olduğu yönündedir. Deniz, güneş ve kum üçlüsüne bağlı olarak gelişen ve kitleleri etkileyen turizm olgusu, günümüzdeki turizm eğilimleri doğrultusunda, alternatif arayışlar içine yönelmişlerdir.

Av turizmi; turizmin değişik bir uygulama şekli olup avcı niteliğine sahip kişilerin avlanma amaçlarını gerçekleştirmek üzere belirlenmiş ilkelerle yaptıkları etkinliklerdir. Avcılar, av turizmi faaliyetleri ile yaban hayvanlarının boynuz, diş, post benzeri hatıra değeri taşıyan kısımlarına sahip olmakla birlikte, değişik kültürleri

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tanıma ve değişik yerleri görme olanağı elde etmektedirler. Kırsal alanlarda yaşayan insanların sosyo-ekonomik ve kültürel açıdan yapısını değiştirecek biçimde gelir ve refah seviyesinin iyileştirilmesi, dengesizliklerin giderilmesi ve yörede üretilen ürünlerin değerlendirilmesi, av turizmi ile söz konusu olabilmektedir

Adıyaman coğrafi yapısı, iklimi, bitki örtüsü ve yaban hayatı yönünden av turizmine en uygun illerimizden birisidir. Son yıllarda yapılan düzenlemeler sonucu av turizminde büyük bir hareketlilik yaşanmaktadır. Her geçen yıl bilinçli koruma sayesinde yaban keçisi sayısında artışlar görülmektedir. Önümüzdeki yıllarda yaban keçisi popülasyonunda Adıyaman'ın önemli bir potansiyele ulaşacağı anlaşılmaktadır. Buna paralel olarak avlanabilecek dağ keçisi sayısında da artışlar olacaktır. Adıyaman'da 9 adet devlet avlak alanı bulunmaktadır. Yöre bu yönüyle yabancı avcılar açısından bir çekim merkezi niteliği taşımaktadır. Adıyaman'a başta ABD ve Alman vatandaşları olmak üzere Avusturyalı, Danimarkalı, Hollandalı, Meksikalı, Rus ve Fransız avcılar avlanmak üzere gelmektedir (Ukav, 2012:4-16).

Tablo 2: Adıyaman İli'nde Bulunan Devlet Avlak Alanları

Devlet Avlağı Adı	Hektar	Tescil Tarihi
Ulubaba-Bezar Devlet Avlağı	13.834	2012
Akdağ Devlet Avlağı	11.346	2010
Sincik Devlet Avlağı	36.231	2015
Tut Devlet Avlağı	31.671	2015
Kuzey Gerger Devlet Avlağı	30.364	2015
Harmanlı Devlet Avlağı	34.851	2015
Güney Besni Devlet Avlağı	28.402	2015
Gilisi Besni Devlet Avlağı	26.287	2015
Gerger Devlet Avlağı	29.847	2015

Kaynak: Orman ve Su İşleri Bakanlığı 15. Bölge Müd. Adıyaman Şube Müdürlüğü (2015)

Adıyaman'da her yıl düzenli olarak av turizmi kapsamında yerli ve yabancı avcılara 8 yaş ve üzeri erkek yaban keçisi avlattırılmaktadır. 2013-2014 av yılı, av turizmi kapsamında Adıyaman genelinde 3191 adet yaban keçisi bulunmakta olup, 27 adet yaban keçisi, 13 adet melez yaban keçisi ve 7 adet hatalı boynuz/şelek yaban keçisi olmak üzere toplam 47 adet yaban keçisi kotası tahsis edilmiştir. Tahsis edilen kotalar yabancı avcıya ihale yoluyla, yerli avcıya bakanlık tarafından tahsis yoluyla verilmiştir. İhale yoluyla yabancı avcıya verilen kotalardan 99.485 TL, yerli avcılardan ise 36.650 TL olmak üzere toplam 136.135 TL gelir elde edilmiştir (Adıyaman Doğa Turizm Master Planı, 2013-2023:126-127). Adıyaman'da yıllar itibariyle yaban keçisi envanter bilgilerine baktığımızda, av turizmi açısından yeterli sayıda yaban keçisinin bulunduğu görülmektedir (Tablo 36).

Tablo 3: Adıyaman İli'nde Yıllar İtibariyle Yaban Keçisi Envanter Bilgileri

Yılı	Yaban Keçisi	Melez	Toplam
2012-2013	2785	232	3017
2013-2014	2913	277	3191
2014-2015	3023	250	3273
2015-2016	3115	285	2800

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Kaynak: Orman ve Su İşleri Bakanlığı 15. Bölge Müd. Adıyaman Şube Müdürlüğü (2015)



3. SONUÇ

Toplam alanının %63 çayır mera, orman, fundalık milli park vb. sahalardan oluşan Adıyaman ili doğal hayat bakımından yabani keçilerin gelişimine uygundur. Özellikle güneydoğu Torosların kireç taşından oluşmasıyla meydana gelen erimler sonucu oluşan mağaralarda hayvanların korunma imkanları ortaya çıkmıştır. Yine sözü edilen alandaki çalılıklar dışarıdan gelebilecek tehlikelere karşı korunma imkanı sağlamıştır.

Yıllar itibariyle keçi sayısındaki artışların olması dikkat çekicidir. Bu artışlar sözü edilen alanların korunmasıyla doğru orantılıdır. Adıyaman'da turizm faaliyetleri nisan ve ekim ayları arasında gerçekleşmektedir. Av turizminin ise ağustos-mart ayları arasında yapılması turizmin sezonluk özelliğinin getirmiş olduğu bazı olumsuzlukları ortadan kaldırmasına yardımcı olacaktır.

Ayrıca, av turizmine katılan turistler harcama eğilimi yüksek olan kişilerdir ve alışverişlerde yüksek oranlarda harcama yapabilmektedirler. Araştırma sahasındaki yerleşim birimlerinde turistlere hitap eden köy konakları yapıldığı takdirde, avcıların hizmetine sunularak konaklama ücreti ile birlikte, üretilen ürünler ve köylü kadınların yaptıkları yemekler yöre için önemli gelir kaynağı oluşturabilecektir.

Sözü edilen alana yakın köy ve mahallerde yaşayan ve bilinçsize avlanan insanların eğitimle bilinçlendirilmesi, avlanma sezonuna ve yasaklara uymayanların caydırıcı cezalarla cezalandırılmasıyla buradaki yabani keçi hayatı daha da geliştirilebilir. Özellikle kaçak avlanan avcılar anaçların hamile olduğu dönemde yaptıkları avlarla buradaki yaban hayatına zarar vermektedirler. Ayrıca bu turizm şekli diğer turizm faaliyetlerinden bağımsız olmadığından bu sahaya gelecek insan sayısının çoğalmasına etki ederek ülkemize daha fazla girdi sağlayacaktır

Yabani hayvan avcılık türü olan teke avcılığı bir tek insanla yapılmayıp grupça yapılan bir faaliyettir. Ayrıca yüksek dağlık alanlara günübirlik gidilip gelinemediğinden bazı ekipmanlara da ihtiyaç vardır. Ayrıca sağlıklı tırmana bilen insanların yapabileceği bir faaliyettir.

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ADIYAMAN ÜNİVERSITESI MEVCUT AMBALAJ ATIĞI TOPLAMA SISTEMININ İNCELENMESI VE İYILEŞTIRILMESININ ARAŞTIRILMASI

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Üniversitelerde üniversitenin büyüklüğüne göre diğer atık türlerinin yanında ciddi miktarlarda kâğıt, karton, plastik, cam ve metal gibi geri dönüştürülebilir atıklar üretilmektedir. Bu atık türleri hem yürürlükteki mevzuat hükümleri gereğince hem düzenli depo sahasına gidecek olan atık miktarının azaltılması için hem de geri dönüştürülebilmelerinden dolayı doğal kaynakların korunması ve ekonomik sebeplerden dolayı diğer atıklardan ayrı olarak biriktirilmesi ve toplanması gereken atık türleridir. Bu atıkların kaynağında etkin ve ayrı olarak biriktirilmesi ve toplanması için de bir yönetim sistemine/stratejisine/planına ihtiyaç duyulmaktadır. Bu çalışmada, Adıyaman Üniversitesinde kurulmuş olan geri dönüştürülebilir atık yönetim sistemi incelenmiş, sistemin işletilmesi esnasında karşılaşılan sorunlar tespit edilmeye çalışılmış ve sonuçta sistemin iyileştirilmesine yönelik olarak önerilerde bulunulmuştur.

Keywords: Adıyaman Üniversitesi, geri dönüştürülebilir atık, ambalaj atığı, geri dönüşüm

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AĞIZ ÇALIŞMALARINDA ARAŞTIRMACI VE KAYNAK KİŞİ İLE İLGİLİ SORUNLAR

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Özet: Türkiye Türkçesi ağız çalışmaları son yıllara kadar yaşadığı yavaş ilerlemeyi araştırıcıların yoğun merakı sayesinde hızlandırarak oldukça geliştirmiştir. Bu alanda birçok çalışma yapılmış ve yapılmaya da devam etmektedir. Bununla birlikte istenilen düzeye ulaşıldığı pek söylenilemez. Bilindiği üzere ağız çalışmaları dilin saha çalışmasının birkaç basamakta şekillenmiş halini oluşturmaktadır. Belli bir Türkoloji bilgisine sahip araştırmacı (derleyici) belirlediği sahada ağız özelliklerinin daha çok korunduğu yörelere giderek daha çok eğitim görmemiş, yöresinden ayrılmamış bireylerle düzenlediği mülakatları ses kayıt cihazı yardımıyla kayıt altına alarak bu kayıtları transkibe etmektedir. Böylelikle yöreye ait ses, şekil ve söz dizim özellikleriyle ilgili bilgi sahibi olmak amaçlanmaktadır. Temelde yapılan bu uygulama, içerisinde özellikle araştırıcı ve kaynak kişi bakımından sorunlar da taşıyabilmektedir. Bu sorunlar kısaca araştırıcının cinsiyeti, Türkoloji bilgisi, ağız çalışması yapacağı yöreye hâkimiyeti gibi başlıklarda toplanabilirken benzer sorunlar derleme yapılacak kaynak kişiler için de geçerlilik göstermektedir. Kaynak kişinin cinsiyeti, eğitim durumu, akıl ve beden sağlığı, konuşma bozukluğunun olup olmayışı, yörede yaşama süresi (Yöreden ayrılmaması) gibi başlıklar da kaynak kişi ile ilgili sorunları yansıtabilmektedir. Tüm bu sorunlar bir araya geldiğinde istenilen çalışmanın amaçlanan düzeylere ulaşamaması ise en büyük sorundur. Bu çalışmada karşılaşılan bu sorunlara uygulama esnasında ve sonrasında üretilmeye çalışılan çözümler ele alınmaya çalışılmıştır. Çalışmanın var olan ve yapılacak benzer ağız çalışmalarında araştırmacılara fikirler sunacağı düşünülmektedir.

Anahtar Kelimeler: Ağız, derleme, kaynak kişi.

Ağız terimi ile ilgili birçok tanım bulunmaktadır. Bunlardan kısaca söz edilecek olunursa "*Bir dilin veya bir lehçenin yazı diline oranla ve çoğunlukla ses, bazen de şekil, anlam ve söz varlığı bakımından birbirinden az çok ayrılan konuşma biçimleri*." (Korkmaz, 2003, s. 4) olarak ifade edilebilir. Bununla birlikte dil coğrafyası incelemeleri çerçevesinde kullanılabilecek bir terim olarak *ağız,* aynı kökenden geldiği üst sistem durum undaki bir standart dile bağlı, doğal olarak ortaya çıkmış; aile ve dost çevresinde, iş yerlerinde; okuryazarlığı az, bulunduğu bölgeden uzun süre ayrı kalmamış insanlarca sözlü iletişimde dilin başka türleriyle karşı karşıya gelme oranına göre değişen biçimde kullanılan, resmi ortamlarda kullanılmasından kaçınılan, azılı bir gelenek oluşturamamış, iletişim alanı sınırlı, bağlı olduğu üst sistemden dilin her alanında karşılıklı anlaşmanın korunacağı oranda ayrılabilen, prestiji standart dile göre daha az yerel konuşma biçimleridir. Sınıflandırmaya esas alınacak ölçütlere göre ağızların sınırları genişleyip daralabilir. Bir ağız, birden fazla alt ağzı içerisinde barındırabilir. Bu yüzden *geniş bölge ağızları* ve *dar bölge ağızlarından* söz edilebilir. Daha prestijli görülen bir konuşma biçimi yaygın değil ise, standart varyantın beklendiği durumlarda da kullanılabilirler (Demir, 2002, s.105-116). Aynı dili konuşan bir milletin farklı coğrafyalara yerleşmiş farklı boyları, eskiden kalma söyleyiş şekillerini de beraberlerinde getirirler. Ağızlar üzerindeki çalışmalar, hem bu ses, şekil ve anlamların tespitinde hem de bunlardaki değişimlerin boyalara göre seyrinin gözlemlenmesinde önem arz eder. Bu tespitlerin tarih, coğrafya, toplumbilim gibi diğer disiplinlerdeki bilgilerle birleştirilerek, teyit edilmiş bilgilere dönüşmesi ve toplumsal, kültürel değişmelerin izahında "dayanaklara sahip bilgi olarak" kayıt altına alınması sağlanabilmektedir (Öçalan, 2006, s. 169-188).

Ağız çalışmaları bir dilin çalışması en zor alanlarından biridir. Bu zorluk temelde çalışan kişinin konuya hâkimiyeti ile başlayıp sahaya yabancı olmayışı, bulacağı kaynak kişilerin özellikleri, konuşmaların kayıt altına alındıktan sonra doğru bir şekilde transkiribe edilerek yazıya geçirilmesi olarak devam etmektedir. Bu alanda uzun yıllardır çalışma yapan araştırıcılara göre de bunlar bazı başlıklar altında toplanmıştır. En başta adlandırmanın Anadolu ve Rumeli Ağızları olarak kullanılmasının sakıncasını belirten adlandırmadaki *terim*

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sorunu, çok geniş bir coğrafi alanda konuşulan Türkçenin ağız derlemelerinin yapılması sürecindeki *derleme bölgelerinin tespiti sorunu*, içerisinde üç başlık bulunan (1. Derleyici, 2. Kaynak kişi, 3. Malzeme) *derleme ile ilgili sorunlar*, temeli ses bilgisine dayanan ve yapılan çalışmanın doğru, bilinçli bir şekilde *işaretlendirilme sorunu*, derlenen dil malzemesinin başka başka gramerlerle incelenmesinden kaynaklanan bu sebeple de ortak bir gramerin zorunluluğunu gösteren *inceleme yöntemi sorunu*, birçok boy ve etnik yapının oluşturduğu ağız özelliklerinin incelenmesinde karşılaşılan *ağız-etnik yapı ilişkisi sorunu*, bu alanda toplanılan bilgi ve belgelerin düzenlenmesinden kaynaklanan *bilgi ve belge yönetimi sorunları* alandaki başlıca sorunlardır denilebilir (Akar, 2006, s. 43-51).

Söz konusu sorunlara birçok araştırıcının önerileri birbirine benzer nitelikler taşımaktadır. Genel anlamda derleyicinin öncelikle yeterli Türkoloji bilgisine sahip olması ardından mutlaka yaşadığı yeri çalışma sahası olarak belirlemesidir. Bu çalışma sahası mutlaka derleyicinin yabancısı olmadığı bir saha olmalı, konuşulan ağzı derlerken ve çözümlerken oluşabilecek dinleme hatalarının önüne böylelikle geçilmelidir. Derleyici sahaya çıkarken birçok yöntem belirleyebilir. Bununla birlikte sahada en fazla işe yarayan yöntem ise kaynak kişilere ulaşırken kullanılan aracı kimseler olduğu gerçeğidir. Geleneksel yapının çok sıkı korunduğu kırsal yörelerde yaşayan bireyler, yabancı kimselere konuşmaktan çekinmekte mutlaka arada tanıdık bir kimse olmasını tercih etmektedirler. Bireylerle bu yoldan kurulan bağda derleyicinin cinsiyeti de çok önem taşımaktadır. Derleyicin kadın olması saha çalışmasında kaynak kişilerin temelini oluşturan eğitimsiz yaşlı kadınlar için çok önemli bir özelliktir.

Görüşmeler diğer seslerin birbirine karışmayacağı bir ortamda rahat bir soru tekniği ile yapılmalıdır. Çalışmayı derleyicinin doktora tezi olan Anamur ve yöresi ağızlarını derlerken karşılaştığı temel sorunlar oluşturmaktadır. Uzun yıllardır yaşanılan bu coğrafyada sahaya çıkıldığında birkaç köye aracı kimse olmaksızın gidilmiş bu sebeple kaynak kişileri bulmadan, kişilerle görüşmeye kadar birçok sorunla karşılaşıldığı görülmüştür. Bu sorunlardan karşımıza engel olmayan tek sorun ise derleyicinin cinsiyetidir. Birçok çalışmada da belirtildiği gibi derleyicinin cinsiyeti oldukça önemlidir. Kaynak kişilerin çoğunluğu eğitimsiz yaşlı kadın bireylerden oluşmaktadır. Derleyicinin kadın olması kaynak kişilerce olumlu karşılanarak görüşmeler çekinilmeden yapılabilmiştir. Kaynak kişilerin erkek olduğu durumlarda bu durum sorun olmazken derleyicinin yanında olan yabancı erkek varlığından bile rahatsız olan kadın görüşmeciler ancak ve tek şartla derleyici ile yalnız görüşmeyi kabul etmişlerdir. Kartopu yöntemiyle belirlenen kaynak kişiler öncelikle derleyicinin kim olduğu ile ciddi anlamda ilgilenmektedirler. Bu sebeple ilk kaynak kişiye ulaşmada mutlaka derleyicinin kaynak kişinin akrabasıyla veya onu tanıyan biriyle gitmesi gerekmektedir. Köydeki ilk kaynak kişiden sağlanan güvenle diğer kaynak kişiler ilk kaynak kişice önerilerek yönlendirilmekte böylelikle diğer kaynak kişiler de derleyiciye güvenerek her soruya oldukça rahat cevap vermektedir.

Derleyicinin bu aşamada karşılaştığı diğer bir sorun ise eğer o yörenin insanı değilse o ağızdan konuşamamasıdır. Standart Türkiye Türkçesi (İstanbul ağzı) ile konuşmak zorunda kalan derleyici ile iletişime geçemeyeceğini düşünen kaynak kişi kendini zorlayarak Standart Türkiye Türkçesi ile konuşma çabası içerisine girebilmektedir. Bu durum, her yönüyle başarılı bir derlemeyi etkileyen bir durumdur. Bu durumun önüne iki aşamada geçilebilmektedir. İlki mutlaka kaynak kişinin derleyici ile birlikte gelen tanıdığı ile derleyiciden önce görüşmesidir. Sonra kısa sorularla kaynak kişinin daha çok konuşması sağlanmalıdır böylelikle kısa cevaplarla derleyicinin kendisini anladığı gören kaynak kişi rahatlayarak Standart Türkiye Türkçesi konuşma çabasından vazgeçmektedir.

Buraya kadar derleyicinin sahada karşılaşabileceği sorunlardan bahsedilmiştir. Derleyicinin karşılaşacağı diğer bir sorun ise kayıtların metin haline getirilmesi sürecidir. Bunun için derleyicinin bu ses kayıtlarını mümkünse teknolojiyi kullanarak metin haline getirmesi ve transkribe etmesi önerilebilir. Bunu yapabilmesi için teknolojinin el verdiği en iyi ses kayıt cihazlarını kullanması daha sonrasında yapılacak dinlemelerdeki pürüzlerin de önüne geçebilmektedir. Derleyicinin fonetik laboratuarında kayıtları incelemesi ona büyük kolaylık sağlayabileceği gibi kayıtların en az hatayla transkribe edilmesine de olanak sağlayacaktır. Eğer derleyicinin laboratuara ulaşımı mümkün değilse bilgisayar ortamında bu konudaki ses programları kullanılarak ses kayıtları incelenmelidir (nero, cool edit pro gibi).

Derleme sürecinde diğer bir sorun ise kaynak kişidir. Genel veriler ışığında kaynak kişilerin ileri yaşlı, akıl sağlığı ve konuşma becerisi yerinde olan, çoğunlukla kadın, yaşadığı yerden çıkmamış, eğitimsiz bireyler olması tercih edilmektedir. Yalnız sahaya çıkıldığında bu şartları taşıyan bireyleri bulmak oldukça zor olabilmektedir. Bu sebeple derleyici birçok görüşme yapmak zorunda kalabilmekte çalışma için uzun bir sürede dinleyerek elemeleri yapabilmektedir. Kaynak kişilere tüm bu şartlarla ulaşıldığında bile genelde karşılaşılan sorun kişinin yaşlılığa bağlı unutkanlık ve bu sebeple bitirilmemiş birçok anlamsız cümle kurmasıdır. Bu soruna da çözüm genelde yine kaynak kişi ile derleyici buluşturan aracı bireydir. Derleyici kaynak kişide olması gereken

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özellikleri –kaynak kişinin yaşlı olması, akıl sağlığının yerinde olması, ağzında konuşmasını engellemeyecek şekilde dişsizlik gibi bir sorunun olmaması vb.- aracı olan bu kişilere söylemelidir. Yöreye hâkim olan bu kişi ya da kişiler söz konusu kaynak kişileri bu bilgiler ışığında daha rahat bulabilmektedir. Kaynak kişinin derleyiciye güvenmesi de önemli bir sorundur. Derleyicinin kadın olması bu sorunu büyük ölçüde ortadan kaldırabilmektedir.

Sonuç olarak Türkiye Türkçesi Ağızları incelemesinde alanında yeterli bilgiye sahip, insan ilişkileri iyi, yaşadığı yöreyi bilen o yörenin ağız özelliklerine hâkim ve özelikle kadın araştırmacıların eksikliği giderilmelidir. Daha sonra derlenen bu çalışmalar titizlikle incelenmeli, bu anlamda Türk Dil Kurumu'nda bir komisyon oluşturulmalıdır. Oluşturulan bu komisyon tarafından uygun görülen nitelikli çalışmalardan elde edilen verilerle Türkiye Türkçesi Ağızları atlası oluşturulmalıdır.

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AKADEMİSYENLERİN SOSYAL HAYATLARI: ÖĞRETİM ÜYESİ GÖRÜŞLERİ

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ÖZET

Modern Türkiye'nin kuruluşundan bu yana toplumsal ve kurumsal bazda önemli sorunlu alanlarından biri akademik çevreler olmuştur. Akademik faaliyetlerin (master & doktora) uzun süreli ve yorucu bir uğraş olduğu söylenebilir. Akademik hayatla sosyal hayatın birbirinin tamamlayıcısı olduğu ve her hangi birinin ihmal edilmemesinin mutlu olmanın önemli bir şartı olduğu göz önüne bulundurulduğunda, birini diğeri üzerine olumlu ya da olumsuz etkileri önemli bir araştırma konusu olarak ortaya çıkmaktadır. Bu çalışmada, Kocaeli üniversitesinde görev yapan 94 öğretim üyesinin master ve doktora eğitimleri döneminde yaşadıkları sorunların, görüşlerinden faydalanılarak belirlenmesi hedeflenmektedir. Öğretim üyesi görüşlerine göre, ertelenmiş evlilikler ve ekonomik yetersizlikler akademik hayatın sosyal hayat üzerindeki en önemli olumsuz etkileridir.

Anahtar Kelimeler: akademik kariyer, öğretim üyesi, sosyal hayat

GİRİŞ

Gerek akademik hayatta gerekse serbest piyasa çalışma alanında, kariyer yapmak, çalışma hayatının temel kavramlarından biri haline gelmiştir. Meslek tercihlerinde belirleyici olan temel unsurlardan bir tanesi de kariyer olanaklarıdır. Akademik kariyer, üniversitelerdeki öğretim elemanlarının akademik unvanlardan (Dr. & Yrd. doç. dr. & Doç. Dr. & Prof. Dr.) her hangi birisine sahip olması olarak ifade edilebilir. Akademik kariyer süreci ise akademik hayatın başlangıç düzeyinden en üst düzey akademik dereceye kadar olan "yükseltme ve atamalar" ı ifade etmektedir. Üniversite ve akademik camiadaki tartışmalar yoğunluk olarak yükseltme ve atama kriterleri üzerinde yapılmaktadır. Lisansüstü eğitim ise yükselme ve atama sürecinin yüksek lisans ve doktora eğitim ve araştırmalarını ifade eder. Bu fonksiyonuyla yüksek lisans ve doktora araştırmaları, toplumsal, ekonomik, siyasal, kültürel, bilimsel ve teknolojik gelişmelerde belirleyici etkiye sahiptir (İnandı, Tunç, & Uslu, 2013).

Bütün bilim alanlarındaki akademisyenlerin, çalışma alanı ne olursa olsun, özgür bilim insanı, en yeni ve orijinal bilgilere ulaşma veya üretme ayrıca bunları insanlığın hizmetine sunma sorumluluğu vardır. Bununla birlikte, her sektörde olduğu gibi akademik hayat veya lisansüstü eğitim sürecinin kendine has sorunları vardır. Akademisyenlerin zaman zaman mesleki yorgunluk ya da mesleki tükenmişlik boyutlarına varan sosyolojik sorunları olabilmektedir. Akademik doyumsuzluk olarak ta ifade edilen bu sorunlar, kişileri ruhsal ve duygusal anlamda olumsuz etkilediğinden bu durumdan kendileri, aileleri dolayısıyla akademik çalışmalarda ki verimliliği de olumsuz etkilenmektedir. Bu olumsuzluk bedensel, ruhsal ve sosyal yapıya zarar vererek, bireyde işten uzaklaşma, isteksizlik ve geleceğe ilişkin umutsuz olma düşüncelerine kapılma gibi doyumsuzluk belirtilerine sebep olmaktadır.

Öğretim üyelerinin, öğrencilerle aktif iletişim içinde olduklarından ve alanlarıyla ilgili dünyadaki gelişmelerin yakından ve sürekli takip etmeleri gerektiğinden ve aynı zamanda akademik kariyerlerini zaman kaybına

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uğramadan ileri düzeylere taşımaları gerektiğinden sürekli stresli ve gergin bir yaşam tarzları olduğu söylenebilir. Bu yoğunluk ve hedeflerde sapmalar ileri düzeylerde yaşandığında tükenmişlik yaşanmasına sebep olmaktadır. Ülkemizdeki üniversitelerde öğretim elemanı başına düşen öğrenci sayısını fazlalığı ve birçok bölümde sınıfların aşırı kalabalık oluşuna bağlı olarak hoca öğrenci arasında verimli iletişimin olamayışı da olumsuz faktörler olarak değerlendirilebilir. Bu çalışmada, öğretim elemanlarının akademik kariyer yaptıkları dönemler de dâhil olmak üzere mesleki hayatları hakkındaki görüşlerini belirlemektir.

YÖNTEM

Bu çalışmada veriler tarama modeli kullanılarak toplanmıştır. Tarama modelinde, bir durumu ya da bir olayı aynen olduğu biçimde üzerinde her hangi bir değişiklik yapmadan betimlemeyi amaçlayan bir araştırma modelidir. (Karasar, 2005). Araştırmanın evreni Kocaeli üniversitesinde öğretim üyesi olarak çalışan öğretim üyeleri oluşturmaktadır. Veriler, Dilci ve Gürol (2012), tarafından geliştirilen veri toplama ölçeği kullanılarak toplanmıştır. Dilci ve Gürol, ölçeğin geçerlilik analizi için uzman görüşlerine başvurmuşlar, güvenirlik analizi için ise Cronbach Alpha testi uygulanmış ve güvenirlik katsayısını 0,79 olarak belirlemişlerdir. Verilerin analizinde SPSS programı kullanılarak betimsel istatistikler yapılmıştır.

Çalışmada öğretim üyelerinin görüşlerinin belirlenmesi genel amacı çerçevesinde aşağıdaki sorulara cevap aranmıştır;

- Öğretim üyelerinin unvanlara göre medeni durumları nasıldır?
- Öğretim üyelerinin cinsiyet değişkenine göre medeni durumları nasıldır?
- Öğretim Üyelerinin Lisansüstü Eğitimin Hayata Getirilerine İlişkin Görüşleri nelerdir?
- Öğretim Üyelerinin lisansüstü eğitimden psikolojik sağlıkları etkilenmiş midir?

BULGULAR

- **Öğretim Üyelerinin Unvan ve Medeni Durumlarının Karşılaştırılması**

Öğretim üyelerinin verdikleri yanıtlar, "öğretim üyelerinin unvan ve medeni durumları arasındaki ilişki nedir?" araştırma sorusuna göre sınıflandırıldığında, elde edilen bulgular Tablo 1' de sınıflandırılmıştır.

	Yrd. Doç.		Doçent		Prof		Toplam	
	f	%	f	%	f	%	f	%
Bekâr	7	7,4	3	3,1	1	1,0	11	11,7
Evli	32	34,0	30	31,9	21	22,3	83	88,3
Öğretmen ile Evli	8	8,5	3	3,1	5	5,3	16	17,0
Akademisyen ile Evli	5	5,3	9	9,5	7	7,4	21	22,3
Sağlık çalışanı ile Evli	4	4,2	2	2,1	2	2,1	8	8,5
Memur ile Evli	11	11,7	7	7,4	8	8,5	26	27,6
Diğer ile Evli	4	4,2	5	5,3	3	3,1	12	12,7

Tablo 1. Öğretim Üyelerinin Unvan ve Medeni Durumuna İlişkin Verilerin Dağılımı

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Tablo 1'e göre, araştırmaya katılan öğretim üyelerinin %11,7' sinin bekâr, %88,3' nünde ise evli olduğu görülmektedir. %22,3 oranla, evli öğretim üyelerinin daha çok akademisyenle evlenmeyi tercih ettikleri görülmektedir. Bekâr öğretim üyeleri içerisinde %7,4' lük oranla en yüksek orana sahip oldukları görülmektedir. Bu tabloda öğretim üyelerinin kendi meslek grubundan insanlarla evlenmeyi tercih ettikleri söylenebilir.

- **Öğretim Üyelerinin Cinsiyete Göre Medeni Durumları**

Öğretim üyelerinin verdikleri yanıtlar, "öğretim üyelerinin cinsiyet ve medeni durumları arasındaki ilişki nedir?" araştırma sorusuna göre sınıflandırıldığında, elde edilen bulgular Tablo 2' de sınıflandırılmıştır.

Medeni Durum		**Bekâr**		**Öğretmen ile evli**		**Akademisyen ile evli**		**Sağlıkçı ile evli**		**Memur ile evli**		**Diğer ile evli**		**Toplam**	
		f	%	f	%	f	%	f	%	f	%	f	%	f	%
Cinsiyet	**Kadın**	6	6,3	6	6,3	9	9,5	3	3,1	10	10,6	7	7,4	41	43,7
	Erkek	**5**	5,3	10	10,6	12	12,7	5	5,3	16	17,0	5	5,3	53	56,3
Toplam		11	11,7	16	17,0	21	22,3	8	8,5	26	27,6	12	12,7	94	100

Tablo 2. Öğretim Üyelerinin cinsiyet ve Medeni Durumuna İlişkin Verilerin Dağılımı

Araştırmaya katılan öğretim üyelerinin 41 tanesinin (%43,7) kadın, 53 tanesinin ise erke (%56,3) olduğu Tablo 2' den anlaşılmaktadır. Bekâr kadınların örneklem içindeki oranı %6,3 ve evli kadınların örneklem içindeki oranının ise %37,4 olduğu görülmektedir. Bekâr erkelerin örneklem içindeki oranı %5,3 ve evli erkeklerin örneklem içindeki oranının ise %51 olduğu görülmektedir. Genel olarak kadın ve erkek öğretim üyelerinin cinsiyete bağlı medeni durumlarının bir birine yakın olduğu söylenebilir.

- **Öğretim Üyelerinin Lisansüstü Eğitimin Hayata Getirilerine İlişkin Görüşleri**

"Lisansüstü eğitimin hayata getirisi nedir?" sorusuyla bağlantılı öğretim üyesi görüşleri gruplandırıldığında, ortaya çıkan durum Tablo 3'te görülmektedir.

Lisansüstü Eğitimin Hayatınıza Getirileri nedir?	**Yrd. Doç.**		**Doçent**		**Prof**		**Toplam**	
	f	%	f	%	f	%	f	%
Kariyerimde yükselme sağladı	39	100	33	100	22	100	94	100
Maddi kazancım arttı	8	20,5	21	63,6	20	90,9	49	52,1
Sosyal yönüm gelişti	12	30,7	10	30,3	13	59,0	35	37,2
Aile yaşamım renklendi	5	12,8	6	18,1	12	54,5	23	24,4
Yaşam doyumum arttı	17	43,5	20	60,6	19	86,3	56	59,5
Toplam	80	100	90	100	84	100		100

Tablo 3. Öğretim Üyelerinin Lisansüstü Eğitimin Hayata Getirilerine İlişkin Görüşleri

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Yukarıdaki tablo incelendiğinde, Öğretim üyelerinin tamamı (%100), lisansüstü eğitimin kendilerine akademik kariyer sağladığını ifade ettikleri görülmektedir. Lisansüstü eğitimin yardımcı doçentler için pek kazan sağlamadığı, daha çok profesörlük unvanında maddi getirisi olduğu düşünülmektedir. Lisansüstü eğitim –yaşam doyumu ilişkisine bakıldığında ise tatmin edici doyumu yine profesörlerin yaşadığı anlaşılmaktadır. Bununla birlikte lisansüstü eğitimin gerek sosyal yönü geliştirmesi gerekse aile yaşamını renklendirmesi konularında akademisyenlerin olumlu düşünmedikleri söylenebilir.

- **Öğretim Üyelerinin "Lisansüstü Eğitim Psikolojik Sağlığınızı Olumsuz Etkiledi mi?" Sorusuna İlişkin Görüşleri**

Öğretim üyelerinin verdikleri yanıtlar, **"Lisansüstü Eğitim Psikolojik Sağlığınızı Olumsuz Etkiledi mi?"** araştırma sorusuna göre sınıflandırıldığında, elde edilen bulgular Tablo 4' de sınıflandırılmıştır.

Lisansüstü Eğitim Psikolojik Sağlığınızı Olumsuz Etkiledi mi?	**Yrd. Doç.**		**Doçent**		**Prof**		**Toplam**	
	f	%	f	%	f	%	f	%
Hayır	28	71,7	22	66,6	16	72,7	66	70,2
Tedavi gördüm	0	0	1	3,0	0	0	1	1,0
Psikolojim bozuldu	1	2,5	2	6,0	1	4,5	4	4,2
Sosyal ilişkilerim zedelendi	5	12,8	3	9,0	2	9,0	10	10,6
Aile yaşamımım zedelendi	4	10,2	5	15,1	2	9,0	11	11,7
Diğer	1	2,5	0	0	1	4,5	2	2,1
Toplam	39	100	33	100	22	100	94	100

Tablo 4. Öğretim Üyelerinin "Lisansüstü Eğitim Psikolojik Sağlığınızı Olumsuz Etkiledi mi?" Sorusuna İlişkin Görüşleri

Tablo 4 incelendiğinde, öğretim üyelerinin yarıdan biraz fazlasının lisansüstü çalışmalardan psikolojik olarak olumsuz etkilenmediği görülmektedir. Lisansüstü faaliyetlerin psikolojiye olumsuz etkileri daha çok sosyal ilişkileri zedeleme veya aile yaşamını olumsuz etkileme şeklinde ortaya çıktığı anlaşılmaktadır. Akademik kariyerin, tedavi gerektirecek düzeyde veya psikolojiyi bozacak düzeyde olumsuz etkisi yok denecek kadar az olduğu görülmektedir.

SONUÇ VE ÖNERİLER

Akademik hayatın sosyal hayat üzerindeki etkilerinin araştırıldığı bu çalışmada temel olarak elde edilen sonuçlar; Akademisyenler daha çok ya akademisyenle ya da farklı bir eğitimci grubu olan öğretmenlerle evlenmeyi tercih ediyorlar. Akademisyenlerin cinsiyet dağılımında kadın ile erkek arasında belirgin bir farklılık olmadığı söylenebilir. Örneklem seçiminde kadın ve erkek öğretim elemanları homojenlik anlamında her iki gruptan eşit oranda seçilmiştir. Bu durum Türkiye geneli düşünüldüğünde erkek öğretim üyelerinin sayısının kadınlardan daha fazla olduğu bilinmektedir. Lisansüstü eğitimin en önemli getirisinin akademik kariyer olduğu çok net bir şekilde söylenebilir. Öğretim üyeleri lisansüstü eğitimleri süresince aile yaşamlarının olumsuz etkilenmesini ve sosyal ilişkilerinin zayıflamasını sorun olarak gördükleri sonucuna varılmıştır.

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Lisansüstü eğitimin akademik kariyer dışında daha cazip hale gelmesi için neler yapılabilir sorusu üzerine çalışılmalıdır. Özellikle maddi anlamda daha iyi bir düzeye gelme akademisyenliği daha cazip hale getirebilir. Uzun süren master ve doktora çalışmaları sosyal ilişkileri azalttığından bu süreç içerisinde olanlar evlenmeyi genellikle ertelemektedirler. Uzun sayılabilecek bu süreç akademik hayatı tercih edenlerin genelde geç sayılabilecek bir yaşa evlenmelerine sebep olmaktadır. Bu durum bu işin doğası olarak değerlendirilmelidir.

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ALİYA İZZET BEGOVİÇ'İN EĞİTİM ANLAYILIŞI ÜZERİNE DEĞERLENDİRMELER

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Özet: İnsan ,ahlak ve hayat bağlamında ortaya konulan medeniyet anlayışı nihai olarak ifadesini bütünlüklü bir eğitim anlayışında bulur. Eğitim modern dünyada teknik endüstriyel toplumun ihtiyaçlarını karşılayan fonksiyonel bir alan olarak görülmez. Eğitim insana özgürlüğe giden yolun ipuçlarını farkettiren bir metodolojik alan olarak ortaya konulur.

Anahtar Kelimeler: Aliya İzzet Begoviç,Medeniyet,İslam ve Eğitim

Giriş

Begoviç tarihsel ve toplumsal sorunlara bütüncül bir bakış açısıyla ele alarak eğitim konusunuda bu be zeminde kavramaya çalışır. Genel teorik perspektif içerisinde eğitim bu temel felsefi temel üzerinde ele alınır. Begoviç'in genel felsefi değerlendirmesinde eğitim;insan,ahlak ve hayat kavramları bağlamında bir karşılık bulur.

1.Begoviç'in İnsan ve Ahlak Anlayışı

Begoviç'in düşünce dünyasında medeniyet anlayışının temelinde belirli bir insan anlayışı yatar. Ne insanı akıllı hayvan ne de ekonomik insan düşüncesinden uzakta bir değerlendirme zemininde bu insan anlayışı ortaya konulur. Düşünce tarihi bağlamında birçok düşünce tasavvuru bu anlamda insanı anlamakta yetersiz kalmıştır. Bu insan anlayışı ontolojik bağlanış ve varoluşsal bir düzlemdedir. İnsan irade sahibi ve özgürlüğün ikametgahıdır. Ahlak bu özgürlük zeminin de ontolojik bağlanış ve ilahi olanın bir ifadesidir. İnsan dinin dışında anlaşılamaz.Sanat belki bu mevziye yaklaşabilir. Sanat ve din bu bağlamda ortak bir dilin dünyasına mahsus alanlardır. Dini düşünce insanın ve ahlakın ontolojik değeri konusunda temel yaklaşımların adresidir. Begoviç'in düşünce dünyasında "semadaki prolog" kavramı merkezi bir tutar (Begoviç:2012,25). Bu kavram din ve insanın ontolojik kökeni ve bunun anlamı arasındaki temel bağı ortaya koyar. Din insanın nihai anlamına ilişkin temel referanstır. İnsanın dünya tarihi bu arkapılana ilişkin bir mücadele alanıdır. Ahlak teorisi bu bu mücadele dizlemininde iyi ve kötünün karşılaşmasında semadaki prologun sürecidir. İnsan iyi ve kötü karşılaşmasında semadaki prolog ile düşüş arasında kendi varoluşsal geriliminde özgürlük ve köleliğin alanıdır. İnsan ve ahlak bu düzlemde bir hayat kavrayışı içerisinde ele alınır. Hayat insanın ontolojik kökeniyle bağ kurmasıyla bir özgürlük iadeli ortaya koyabilir. Hayat, modernist düşüncenin öne çıkardığı iktisadi içerik olan ne ekonomik refah ne hazcı geleneğin anlam dünyasında çerçevesinde ele alınmaz. Hayat ontolojik kökene yani semadaki prolog ile bağ kurmak olarak değerlendirilir. Bunun dışındaki hayat telakkileri özgürlüğün reddidir.

2.Eğitim Anlayışı ve Eğitim Konusundaki Eleştirileri

Müslüman toplumların son yüzyılda yaşadıkları çöküşü ve bundan kurtulmamalarının temel sebebi olarak eğitimi gösterir. Bu eğitim kurumsal olarak mevcur sorunlara cevap vermekten uzaktır (Begoviç:2014,27). Mevcut eğitim anlayışı bireylerin İslam anlayışlarının doğru bir biçimde oluşmasını engelleyen bir dinamik ortaya koyarak, müslüman toplumların gelişmesi ve temel varoluş sorunlarını kavramaları ertelenmiş olur. Burada dinin temel ontolojik ve ahlaki değerlerinin anlaşılmasının sistematik bir çarpıtılması olarak sonuçlar ortaya konulması ele alınır. Burada itaat kavramına yüklenilen anlam bunladan bir tanesidir. Kötü tarühsel durumun meşrulaştırılması bile bu anlayış üzerinden bir karşılık bulduğu dile getirilir. Bu yanlış eğitim toplumun ve bireyin öz varoluş sorunlarını kavramalarını da çarpıtarak kötülüğün eğemenliğini kurumsallaştırır. Eğitim kişiye ve topluma özgürlük ve kendi olmayı hedef olarak vermelidir. Özgürlük kendi olmak ve kendini bilmektir. Mevcut eğitim sistemleri kendinden uzaklaşma ve kendi tarihsel ve toplumsal meselelerinini kavramaktan da acizdir. İslam toplumlarının temel sorununu bu bağlamda eğitimsiz ve yanlış eğitim almış olanlar olarak ortaya koyar. Müslüman toplumlar kendi toplumlarının temel sorunlarını kavrayacak ve ona

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çözümler üretecek eğitim sistemerine sahip olmadıklarını ileri sürer. Eğitim kurumları ve genel olarak eğitim ihmal edilmiş ya da özgün olmayan etkiler çerçevesindedir. Yabancı etkiler de eğitimin gelişimini engellemiştir. Bu bağlamda eğitim sistemleri kendi dışındaki güç merkezlerine hayranlığı öğreterek toplumun ve bireylerin zayıf kalmasını sağlamıştır. Müslüman toplumların bu eğitimi de pasif bir biçimde reddettiklerini de dile getirir. Eğitime uzak durarak adeta kendilerini koruduklarını dile getirir. Maneviyatı reddeden eğitimi kabul etmeyerek dönemsel olarak okula da bu sebeble uzak durması da bu bağlamda değerlendirir. Modern bir eğitim kurumu olarak okul, modern toplumun teknik beklentilerine cevap veren bir işlev düzeyinde bir karşılık bulur . Bu bağlamda modern eğitim kurumlarına dönük eleştiriler eğitimin kadim ve gelneksel boyutunun paranteze alınarak bir varlık ortaya koyması eğitim pratiğinde bir kırılmaya da işaret eder. İslam toplumlarında öncelikle ele alınarak bir değişim yaşaması gereken kurumun eğitim kurumu oduğunu dile getirir (Begoviç:2015,45). Cami ve okul arasında eğitim zemininde tekrar bir ilişkinin kurularak ,müslüman toplumlarda caminin yeniden tarihsel bir rol oynayacağını belirtir. Eğitim temelde bireye eleştirel düşünmeyi öğtermelidir. Eğitim kurumunun temel hedefi toplumsal düzlemde bu yönelimin kazanmasıdır. Bu durum toplumsal değişimin temel gücü olarak ele alınır. Modern okul sisteminin pek az manevi ve hümanistik olduğunu vurgulayarak, teknik dünyaya dönük pratik bir işlevinin önplanda olmasını eleştirir. Batıda eğitim fonksiyon ve pratik ihtiyaçları öne çıkaran bir anlayışla düzenlenmiştir. Modern bilimlerin; sayılar,hesaplar ve ölçümlerden oluşan oluşan niceliği, niteliği yani ahlak ve hayat ya da özgürlük temalarını bir anlamda gündem dışı bırakarak bir kurumsallaşma ortaya koyar. Teorik ve pratik düzeyde "insan ne ile yaşar " sorusu marjinal bir soru ve sınırlı bir akademik-eğitim alanının gündemi olarak kalır. Günümüzde mühendislik bilimlerinin önceliği bu manada insanın düşüşünün bir penceresi olarak görülür.

Begoviç birçok yerde eğitim yerine terbiye kavramını kullanır. Terbiye eğitimden ziyade özgür bir yönelimle üretilebilir. İyilik ve kötülüğün yurdu insandadır. İnsan zor ve baskıya dayalı olarak değişmez ,buna dayalı olarak sadece davranışlar değişebilir fakat özünde aynı kalır. Eğitimin sahih amacı insanı zorla değiştirmek olmamalı, diyaloga dayalı bir süreçle insanın içsel motivasyonları harekete geçirilerek sahih sonuçlara ulaşılarak. "Terbiye, insan için ; zorla alıştırma ise hayvan içindir." Eğitim insanı daha iyi yapmaz, sadace daha verimli ve ekonomik üretim paradigmasına uygun topluma faydalı yapar (Begoviç:2007;56). Eğitim insanı tek başına iyi yapmaz. Tarihin akışı içerinde büyük toplumsal çöküşler eğitimli insanların aldıkları kararlara dayalı olarak gerçekleşmiştir.

İnsanın tarihsel düşüşü semadaki prolog sonrası süreçtir. Uygarlık tarihi teknik olarak göreli birçok başarıya imza atsa da, buna karşılık insanın ahlaki kimliği tersi duraklarla düşüş içerisinde olmuştur.

Sonuç

Begoviç'in düşüncesinde insanın merkeziliği dinin merkeziliği anlamına gelir. Modernite paradigma olarak içsel olana karşılık dışsal olanı önpalana çıkarmıştır. Eğitim de dışsal öğelerin geliştirilmesine yönelirken, Begoviç'in düşüncesinde içsel olanın geliştirilmesine odaklanılmıştır. İçsel olan ruha karşılık gelirken ,dışsal olana maddi dünyanın teknik pratik serüvenlerine karşılık gelir. İçsel olan insanın ontolojik kökenine tanıklık edecek bir alandır. Bu bağlamda terbiye odaklı eğitimde insanın kabiliyetleri de gelişirken,yeteneği ve maddi dünyanın ihtiyaçlarına dönük eğitimden terbiyenin çıkamayacağını ifade eder.

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AN ACTUATOR SENSOR NODE PROTOTYPE FOR INTERNET OF THINGS APPLICATIONS

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Internet of Things (IoT) systems are realized through data sharing system on the internet in order to ensure the needs of people from interacting with the objects that are connected to the Internet. The rapid development of the Internet and internet connected objects have become hot research topics for both academic and industrial researchers. Today's IoT devices can detect the needs of the users and communicate each other thanks to the integration with the Internet to meet the users' necessities.

The basic idea of this concept is to make objects interact with each other using a unique addressing systems. For example, Radio Frequency Identification (RFID) technology using mobile phones, sensors, tags and so on. This is a collaboration of the objects to reach a common goal. "Internet of Things" that can communicate with each other using different communication protocols, objects capable of exchanging data among themselves (devices) can be defined as a community. "Object" is defined as the sensor element, cameras, phones, cars, clocks, refrigerator, curtains, boilers, etc. In this presentation we offer a new actuator sensor node prototype to accomplish secure communication over internet for IoT requirements.

Keywords: internet of things, actuator, sensor node design, secure communication

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AN INVESTIGATION OF MALATHION TREATABILITY BY O_3 AND O_3/UV PROCESSES FROM AQUEOUS SOLUTIONS

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Abstract: In this study, treatability of malathion aqueous solution by O_3 and O_3/UV processes, which is a highly accumulated insecticide in environment and food chain due to its extensive usage in agricultural areas, was investigated. Effects of initial malathion concentration (20-60 mg/l), existence of UV (2x8 Watt) and reaction time (5-60 minutes) on malathion removal efficiency was evaluated. In ozone oxidation, at first 15 minutes of the study, 100 percent of removal was obtained for 20 mg/l initial malathion concentrations. By increasing the initial concentration, complete removal of malathion couldn't be achieved. To enhance the process efficiency, UV oxidation was integrated to the system. In O_3/UV oxidation, at first 45 minutes of the study, 100 percent of removal was obtained for 40-60 mg/l initial malathion concentrations. For 60 mg/l of initial concentration, at the end of 30 minutes of reaction time, removal efficiencies of ozone oxidation and O_3/UV processes were 75% and 90%, respectively.

Keywords: Malathion, Ozone oxidation, UV, Advanced treatment.

1. INTRODUCTION

The usage of pesticides without control in agricultural activities leads to the contamination of surface water and to the accumulation of pesticides in the groundwater. The most important sources of pesticide pollution are drainage waters and liquid wastes which come from agricultural industries, pesticide-producing plants. In 2001, organophosphorus insecticides represented 70% of the total insecticide usage in the United States and malathion was the most widely used of all (32–44% of total organophosphorus insecticide usage)(Zhang and Pagilla 2010). Malathion (diethyl dimethoxythiophosphorylthio succinate) is a highly toxic organophosphorous insecticide, registered in 1956, and it is abundantly used in agricultural, industrial and public health areas to kill insects, ants, aphids, bagworm, beetle, cotton leaf worm, mosquito, lice etc. by inhibiting cholinesterase enzyme (Kumar et al. 2014). On the other hand, the experiments of embryo development and in vitro fertilization indicated that malathion was an endocrine disruptor and could interfere with reproductive functions. Pesticides are generally toxic and non-biodegradable compounds. Treatment of organophosphorus pesticide containing wastewaters by using biodegradation is difficult due to they have a low biodegradability. There are a few research reports in the literature that aimed elimination of malathion with advanced treatment systems like photocatalytic degradation (Kralj et al. 2007; Yu et al. 2010; Kadam et al. 2014), O_3/UV/TiO_2 treatment (Lin et al. 2012), nanofiltration and photo-Fenton oxidation (Zhang and Pagilla 2010), ultrasonic treatment (Zhang et al. 2010), adsorption (Naushad et al. 2013) etc. advanced oxidation processes seem more effective and have the advantage of not to cause any other secondary pollution and other toxic by-products.

Chemical oxidation, especially ozone-based homogeneous processes including O_3, O_3/UV and O_3/UV/H_2O_2 have already been demonstrated to be an effective means of removing refractory and/or toxic chemicals from water and wastewater (Arslan et al. 2014). Typically, ozonation does not yield complete mineralization to CO_2 and H_2O but leads to formation of partial oxidation products such as organic acids, aldehydes and ketones. Applicability of ozone directly in its gaseous state, not causing any increase of neither waste water nor sludge volume and shortage of the reaction time are the advantages of using ozone oxidation.. Lin et al, studied the degradation of cypermethrin, malathion and dichlorovos in water and on tea leaves with O_3/UV/TiO_2 treatment and they concluded that the treatment resulted in an 80% removal rate for cypermethrin and 78% for malathion.

In the present paper we reported the study of malathion aqueous solution treatment by using O_3 and O_3/UV processes. And also effects of initial malathion concentration (20-60 ppm), UV strength (2x8 Watt) and reaction time (5-60 minutes) evaluated.

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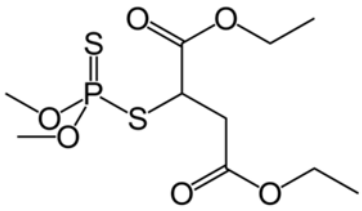
2. MATERIAL AND METHODS

2.1. Material and samples

Malathion solution (technical grade; >96% purity) was obtained from Shenzhen Longshine Chemical Co. Ltd. Specifications of malathion solution are given in the Table 1. Ultra pure water was used to make the synthetic samples. pH adjusted at 5.5 for all samples for the elimination possibility of malathion degradation, at higher values of pH. adjustments were done with 0.1 M NaOH and 0.1 M H_3PO_4 and measured by pH meter (WTW Inolab pH 720 model). Acetone and acetonitrile (ACN) that are used to prepare malathion sample solution were HPLC grade. Malathion standards (>99% purity), that used to set the method with HPLC-UV for the determination of malathion purchased from Dr. Ehrenstorfer Reference Materials. **Table 1** shows the specifications of malathion solution.

Table 1. Specifications of malathion solution

General name	Malathion
Chemical name	S-1,2-bis(ethoxycarbonyl) O, O-dimethyl phosphorothioate
Chemical formula	$C_{10}H_{19}O_6PS_2$
Chemical structure	
Malathion content	minimum 96 %
Molecular weight	330.3 g/mol
Density	1.23 g/cm^3 (20 ºC)
Solubility	solubility in water: 145 mg/l (at room temperature)

2.2. Ozonation System

The experimental set-up for ozone treatment consisted of ozone generator, ozone monitor and reaction tank, as detailed in our previous study (Fig.1). The ozonation experiments were conducted in a batch reactor (2L) with the concentration 5 ppm ozon dose . At the beginning of the reaction, 1.5L malathion solution at chosen concentration was added into the reactor. Liquid samples were periodically taken from the reactor to determine the concentration of the malathion. The O_3/UV experiments were carried out by activating different number of UV lamps. All samples were analyzed as soon as possible with HPLC-UV.

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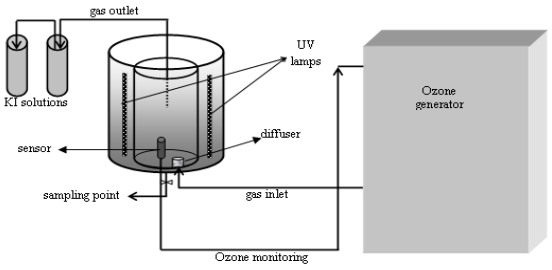

Figure 1. Experimental set up of ozonation system

2.3. Analysis Techniques

Residue concentration of malathion after treatment were measured by an Agilent 1260 Infinity HPLC with a UV detector. A 250 mm long C-18 capillary column (Eclipse XDB, Agilent) with an internal diameter of 4.6 mm was used to separate compounds. A 50:50 v/v mixture of ultra pure water: acetonitrile was used as a mobil phase. Flow rate was set to 1 ml/min.

3. Results and Discussion

According to the differences of processes in insecticide manufacturing industry, wastewaters of these industries show varied characteristics. In this study, for the purpose of malathion treatment with ozon oxidation and O_3/UV, synthetic malathion solution was prepared with the concentrations of 20-60mg/L, representing mean concentration of value existing plants (Zhang and Pagilla 2010). The influence of malathion concentration investigated for the concentrations of, 20, 25, 30, 40, 50, 60 mg/l in the time internal of 15-30 min. Ozone dose optimized at 5mg/l according to experiments done at the beginning of the study. In the concentrations of ozone higher than 5 mg/l, a rapid degradation of malathion occurred in a short time (as 5 min). So the minimum concentration of ozone was chosen from the perspective of cost benefit. It is known that in the acidic conditions ozone oxidation is limited because of the low formation of free radical and direct molecular ozonolysis should be predominant and oxidation of aromatic rings seems to be provided by ozonolysis (Usharani et al. 2010). By the way sufficient malathion degradation supplied for the low concentrations. As seen from the Figure 2 and 3, for the 20 mg/l malathion concentration 100% removal was achieved in 15 min. But when the concentration got higher the removal efficiency became low. Especially for the concentrations higher than 40 mg/l a limited degradation occurred and only 75% removal realized in 30 min for the 60mg/l malathion concentration. While the removal efficiency in 15 min for the concentrations of 25, 30, 40, 50, 60 mg/l were 43%, 29%, 20%, 15%, 10% respectively, for 30 min reaction time efficiencies were 89%, 84%, 80%, 79%, 75%. Figure 2 shows the malathion removal efficiency for different concentrations in O_3 treatment and Figure 3 shows the C/Co vs. reaction time for O_3 treatment.

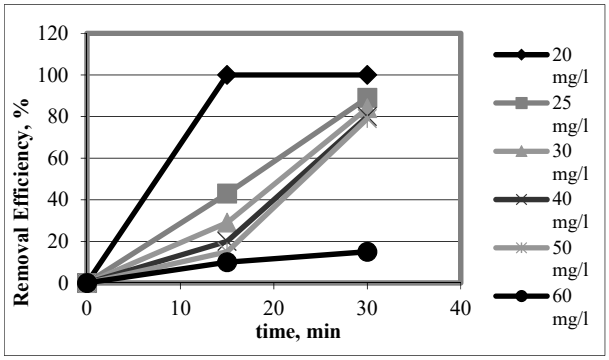

Figure 2. Malathion removal efficiency for different concentrations in O_3 treatment

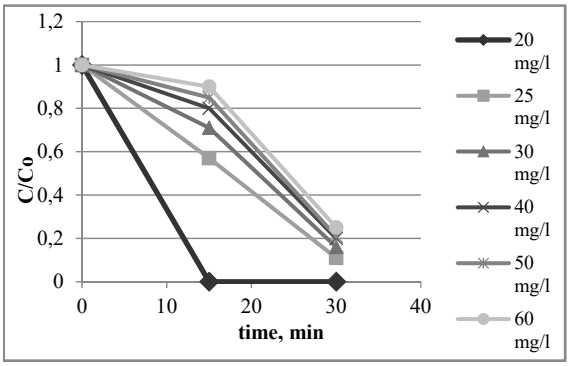

Figure 3. C/Co vs. reaction time for O_3 treatment

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To improve the oxidation efficiency for higher malathion concentrations pH have to be get higher level to provide free radical (OH) oxidation reactions. But as it is mentioned before at higher pH values of solution malathion degraded to izomalathion and malaoxon. These compounds are by products of the malathion degradation which are more toxic and resistant environmental polluters. Than another alternative was tried for the concentrations higher than 40 mg/l and the UV irradiation was (2 lamp) added to the system. Removal efficiency well effected from the UV irradiation with O_3. For the malathion concentrations of 40, 50, 60 mg/l, removal efficiency got the level of 56%, 45%, 47% from the 20%, 15%, 10% respectively, in 15 min reaction time. And 100% removal efficiency was achieved for all concentrations at the end of the 45 min. as seen in Figure 4 and Figure 5. Figure 4. show the malathion removal efficiency for 40, 50 and 60 mg/l concentrations in O_3/UV treatment and Figure 5 shows the C/Co vs. reaction time for O_3/UV treatment.

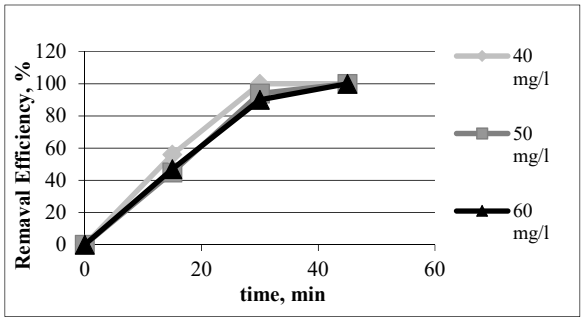

Figure 4. Removal efficiency for 40, 50 and 60 mg/l concentrations in O_3/UV

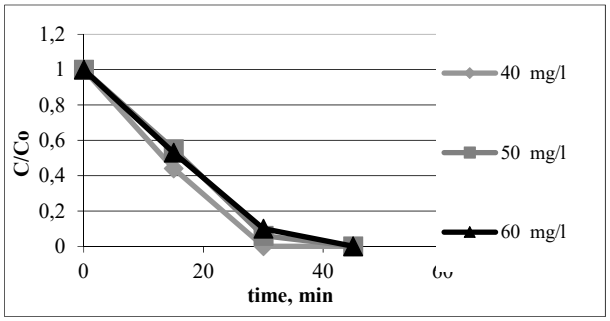

Figure 5. C/Co vs. reaction time for O_3/UV treatment

This improvement of the oxidation level can explain by the UV adsorption of ozone. Ozone degradation follows many ways while there is a UV light. One of them is getting reaction with OH^- ions, the other is photolysis with UV light and the last one is reaction with the OH radical which formed in the first step. Especially when the solution is in acidic conditions UV absorbance is more dominate and when the pH increases the effect of the UV decreases. In other word, ozon degradation is very low while there is no UV light in acidic conditions.

Conclusion

As a result, sufficient malathion degradation was supplied for the low concentrations, but concentrations higher than 40 mg/l and the UV irradiation was added to the system and removal efficiency well effected from the UV irradiation with O_3. We can clearly concluded that the degradation of malathion is more prone to take place with O_3/UV processes especially at high concentrations. But for lower concentrations only ozone oxidation is efficient. And these methods are applicable for malathion and the other organophosphorus pesticides removal.

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ANADOLU KENT YAPISINDA GÖÇEBENİN YERLEŞME SÜRECİNE ETKİSİ

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Özet: Büyük insan kaynağı Asya'dan geri dönüşü olmayan yolları kat ederek batıya göç eden Türklerin tarih öncesi dönemlerden başlayarak en eski uygarlıkların vatanı olmuş Anadolu ile karşılaşması, kültürümüzün özellikli ve ilgi çekici bir yanıdır. Orta Asya kültürünün sahipleri ve taşıyıcıları olarak kimliğini yitirmeden Asya'dan Avrupa'ya çeşitli coğrafyalara yerleşerek devlet strüktürleri kuran Türkler, geleneksel Türk kültür sanatının var olması ve gelişmesinde etkili olmuşlardır. Göçebe kültürü yüzyıllarca süren bir yerleşme süreci içinde yerleşik kültür ile birlikte Anadolu'da yeniden biçimlenmiştir. Göçer-yerleşik toplumların genel özelliklerini ve ilişkilerini, Anadolu'yu Türkleştiren göçebelerin yerleşik düzene geçişini, yaşam biçimleri-gelenekleri ve İslam dünyası içinde gözledikleri, özümsedikleri ve yarattıkları ile birlikte yeni bir kültür ortamının doğuşunu ve bu ortamın niteliklerini... kısacası göçebelerin yapılı çevrede yer alan özelde konut tasarımlarına genelde yerleşime etkisini araştırmak bu çalışmanın amacı olmuştur.

Anahtar Kelimeler: Göçebe Kültürü, Yurt, Kara Çadır, Sofasız Ev, Dış Sofalı Ev

Orta Asya Türkleri ve göç

Orta Asya steplerinden kopup gelen göçebe Türk topluluklarının/Oğuzlar kitleler halinde yurt peşinde koşmaları sonucu, Anadolu -11. yy.dan itibaren- iki yüzyıl süren ve kesintisiz devam eden müthiş bir göç hareketine sahne olmuştur. Bizans İmparatoru I. Aleksios Komnenos'un (1081-1118 yılları arasında hükümdar) büyük kızı, tarihçi Anna Komnena'nın 11. yy. Anadolu'suna tanıklığı şöyledir: "Türklerin bahtının, Rumların bahtına üstün geldiği ve Rum hakimiyetinin pek sarsıldığı bir zamanda, Türkler ayaklar altında çıtırdayan kum taneleri kadar kalabalık sayıda sökün etmişti." İlk Haçlı Seferi'ni anlatanlar da, yürüyüşleri esnasında sürekli onları izleyen bu kadar çok Türkün nereden çıktığını anlayamıyor, "Bütün bayırlar, tepeler, çataklar ve ovalar bu aforoz edilmiş halk ile dolu idi." diyorlardı (Tayfur, 1998).

Göçerler-Yerleşikler

Erken dönem Anadolu Türk kültürünü anlayabilmek için, bölgede iki farklı toplumsal grubun yaşadığı gerçeğini dikkate almak gerekir.

Göçerler-yerleşikler ikilemine bağlı olarak, her iki grup insanının yaşam biçimlerinin genel özellikleri şu şekilde ele alınabilir (Güvenç, 1997, Tayfur, 1998, Kuban, 1995, Kuban, 2009):

- Göçebelik (hayvancılık, avcılık, tüccarlık) yerleşiklik (tarımcılık, çiftçilik) kadar saygın bir yaşam biçimi ya da kültürdür.
- Doğal çevre özellikleri ya hayvancılığa ya da tarımcılığa daha elverişlidir. Fakat insanoğlu hem etobur hem de otobur olduğu için; göçebe ihtiyaçlarına yetecek kadar ziraat ile uğraşsa da çiftçinin otuna ve otlağına, çiftçi de göçebe evcil hayvanının çekim gücüne, gübresine, etine ve sütüne muhtaçtır.
- Yerleşikler üretim alanlarını muhafaza etmek zorunda iken, göçerler -düzenli olarak- hayvanları için yaylak ve kışlak bulmak çabasındadırlar. Bu mevsimlik hareketler, göçebelerin çevredeki köylüler ile sürtüşmelerine yol açmaktadır.
- Seyyar (gezgin) olan atlı göçebe kültüründe ayrı bir savaş gücüne ihtiyaç yoktur; çünkü Orta Asya steplerinde olduğu gibi topluluğun kendisi ordudur. Göçebe ordu bütün yaşam ve savaş gereçlerini yanında taşıyarak hızla yer değiştirebilir. İhtiyaç duydukları malları yerleşikler gibi değişmeleri ya da para ile satın almaları mümkün olmadığından köylere ve şehirlere çapul düzenlemekten geri kalmaz; fırsat buldukça uygun bir yer ve zamanda düşman topraklarına akınlar yaparak hedefini vurur, geçimlerini karşılamaya çalışırlar. Topraklarını savunmak durumunda kalan yerleşikler de, düşmana karşı ilk savaşlarını belki kaybederler; ama zamanla onu çeker, içine alır, özümser... ve kültür savaşımını kazanırlar.
- Göçebeler toprağın kişi malı olmasını anlamazlar; üzerinde yaşadığı yeri ve sürüsünü otlattığı çayırı bölünmez sayar, dağınık ve bağımsız yaşarlar. Yerleşikler ise toprağı özel mülk olarak görürler, bölüşmeye razı olmazlar.

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- Yerleşikler üretim teknolojisi ve artık ürün/verimlilik açısından göçebelerden üstündürler; göçebe avcılar aynı nüfusu besleyebilmek için yerleşik tarımcılardan 5-10 kat daha fazla toprağa ihtiyaç duyarlar.
- Doğal çevre ile iç içe yaşayan göçebe, kendisini doğanın bir parçası olarak görür ve doğa ile uzlaşmaya çalışır. Bu yüzden göçebe toplumlar için uygun bir din olan Şamanlık, doğa güçlerine egemen olmaya çalışan yerleşik toplumlar için uygun değildir.
- Yerleşik toplumlara ait bazı eserler günümüze kadar kalabilmiştir; çünkü göçerler yapay çevresini dayanıksız/ yok olan malzemeden, yerleşikler ise uzun ömürlü malzemeden oluşturmuşlardır.
- Göçebe toplumlar dokumacılıkta (halı, kilim vb.), dülgerlikte (ahşap işleri), debbağlıkta (dericilik), metalürjide (madencilik) gelişmiş olup yerleşik toplumlar ile boy ölçüşebilen nitelikte bir üretim gerçekleştirmişlerdir.

Yerleşik Düzene Geçiş

Şamanizm'e inanan Türklerin Anadolu'da İslam dini ile tanışmaları, yerleşik düzene geçişlerini hızlandırmıştır. İslamiyet'i kabul eden Türkler, kimi zaman uzlaşıp kimi zaman çatışarak bir kısmı hemen bir kısmı aşama aşama bir kısmı da zorunlu olarak -eski yaşantılarını yeni ortam ile kaynaştıracak şekilde- yerleşik hayata geçmişlerdir. Böylece Anadolu'da yeni bir yaşam biçimi gelişmiştir.

Türkler göçerlikten yerleşikliğe geçerken mevcut yapısal oluşumlardan pek az yararlanabilmişlerdir:

- Doğal çevreyi yeğlemiş göçerler kırsal alanlarda yaşayabilecekleri sağlam konstrüksiyonlara sahip konutlar ile karşılaşmadıklarından, bölgenin otokton mimarisi yerine kendi çadır kültürlerini devam ettirmişlerdir.
- Kent çevrelerinde bırakılmış tarım alanlarına yerleşen göçerler doğa ile uyumlu bir düzen kurmuşlar ve nüfus artışına bağlı olarak toprak parçalarının bölünmesi sonucu yeni mahalleler oluşturmuşlardır. Bu mahalleleri ya bir çeşme ya bir meydan ya da bir dini merkez etrafında geliştirmişler; özellikle mekân organizasyonunu çadır mimarisine benzeterek tasarladıkları sabit meskenleri çıkmaz yol aksları ile merkeze bağlamışlardır.
- Yerleşik alanlara gelen göçerler ya kent merkezlerine ya da terk edilmiş mahallelerine konumlanmışlar; kentin sağlam yapılaşmalarını kullanarak mevcut mimarisini korumuşlar ve güzelleştirmişlerdir.

Yurt→Kara Çadır→Sofasız Ev→Dış Sofalı Ev

Anadolu'nun yapılı çevresini biçimlendiren bazı konut oluşumlarında (kara çadır, sofasız ev, dış sofalı ev) göçer çadır kültürünün (yurt) sınırlı bir katkısı olduğu söylenebilir:

yurt (topak ev)

Rus etnolog/budun bilimci Lev Nikolaevič Gumilëv (Duru, 2010); Orta Asya steplerinde göçebe hayatı yaşayan insan topluluklarının sıcak ve kurak yaz aylarında serin hava ve yeşil ot için yaylalarda konumlandıklarını, soğuk ve kar yağışlı kış aylarında da kar otları kapattığı için bulundukları yerleri terk ettiklerini hatırlatarak... Türklerin -olumsuz- iklim koşulları yüzünden sabit mekânlar kurmadıklarını (çadırlarda yaşadıklarını) ve bağ-bahçelerinin olmadığını söyler.

Yurt, eski Türklerin Orta Asya'da ev olarak kullandıkları çadırlardır (Şekil 1). Ahşap iskeleti silindir biçimli bir gövde ile kubbe ya da koni biçimli bir çatıdan oluşmuş olup üzeri beyaz veya boz bir keçe ile kaplanmıştır.



Şekil 1. Yurt, genel görünüm (Luckydoris, 2015).

Kadınlar tarafından erkeklerin yardımı ile kurulan (Bammer, 1996) ve dışarıdan bakıldığında içinde tek göz/oda olduğu düşünülen yurt'lar, gerektiğinde ihtiyaçlar özelinde hasır perdeler ile bölünüp şekillendirilirdi (Şekil 2).

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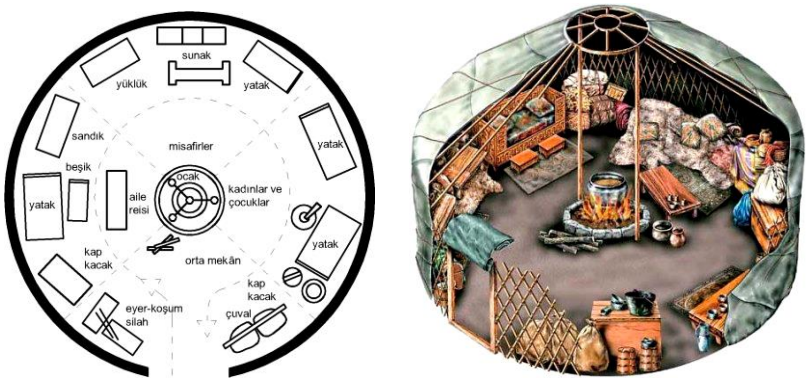
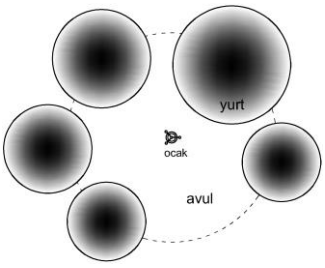


Şekil 2. Yurt, iç düzen (Khishigdorj, 2012, http://hrenovina.net/1289, 2008).

Göçebe yurt'larında en önemli alan orta mekân'dır . Bu mekânın merkezinde ısınma ve yemek pişirme amacıyla kullanılan bir ocak bulunur. Çadırın tepesindeki kasnak, yanan ateşin dumanının dışarı çıkması ve temiz hava ile ışığın içeri girmesi için açık bırakılır; geceleri ve yağmurlu havalarda keçe ile örtülür (Bozkurt, 1993). Aile reisi girişi görecek konumda girişin solunda, misafirler ocağın başında -aile reisinin solunda-, kadınlar ve çocuklar ise girişin sağında -aile reisinin karşısında- otururlar. Şamanizm inancına göre ateş kutsal sayıldığından, çadır içinde ve önünde yanan ocak iç/kapalı ve dış/açık mekânların düzenlenmesinde ve biçimlenmesinde etkili olmuştur.

Orta mekânın dışında (çevresinde) kalan bölüm, oturma ve uyuma amaçlı olarak taşınabilir ahşap malzemeler ile zeminden 20 cm. kadar yükseltilmiştir (Duru, 2010). Girişin hemen sağında -kadınlar bölümünün arkasında- kap kacak/mutfak eşyaları ve yiyecek deposu, az ilerisinde çadır sahibinin/aile reisinin yatağı; solunda binek ve araba hayvanlarının eyerleri, koşum takımları ve silahlar, ilerisinde oğul-gelinin yatağı yer alır. Güneşin doğduğu yönü yani doğuyu görecek biçimde çatılan kapının tam karşısında -ocağın arkasında- bir sunak, hemen solunda yatak, yorgan, yastık ve çarşafların istiflendiği keçe, kilim veya halı gibi örtüler ile kapatılmış bir yüklük ve takı, elbise vb. değerli ve mahrem eşyaların muhafaza edildiği bir sandık vardır.

Yurt'lar, mekân geometrisine göre şekillendirilmiş strüktürel yapısı belirli bir boyutu (çap: 5-6 m.) aşmadığından geniş bir ailenin yaşaması için pek uygun barınaklar değillerdir... Ailelerin erkek çocuklarını evlendirdiklerinde veya kız çocuklarını gelin edip iç güveyi aldıklarında bir arada yaşamaları zorlaşır. Yoksul ailelerde, aile reisinin karşısındaki bölme gelin ya da damada ayrılır. Bu düzen, mekânların özelleşmesi anlamına gelmemekle birlikte, mahremiyetin korunması açısından önem taşır; ikinci aileye paylaştırılan bölüm gerektiğinde çit, keçe veya kilim ile perdelenir. Ailenin ekonomik durumu yeterli ise genç evli çiftlere baba ocağının hemen yanında yeni bir çadır kurulur (Duru, 2010). Birbirleri ile bağlantıları avul ile sağlanan ve aralarında kan bağı bulunan en az üç en fazla on hanenin çadırlarının oluşturduğu topluluğa da 'oba' denir (Şekil 3).



Şekil 3. Oba.

kara çadır (kıl çadır)

Araplar ile temas kuran Türkmenler (Müslüman Oğuzlar) tarafından kullanılmış bir göçebe meskenidir (Gürbüz, 1997). Siyah keçi kılından örülmüş iplikler ile tezgâhlarda gevşek bir şekilde dokunmuş dar (~1 m.) ve uzun (10-15 m.) kanatların (5-6 adet) yan yana dikilmesi ile üretilmiş su sızdırmaz ve ısı geçirmez bir çulun birbirlerinden bağımsız ana/orta ve tali/yan ahşap direkler üzerine yayılması, uçlarına bağlanan kalın ipler ile kenarlarda yeterli uzaklığa çakılmış kazıklara gerilerek sıkıca bağlanması, çul ile toprak arasındaki açıklığın su, kuvvetli rüzgâr ve hayvanların içeri girmelerini engellemek için giriş hariç hasır (sitil) ile çevrelenerek ya da taşlar ile doldurularak kapatılması sonucu oluşturulan, gerektiğinde yeni kanatlar ve direkler eklenerek genişletilebilen bir çadır tipidir (Gürbüz, 1997, Bozkurt, 1993) (Şekil 4).

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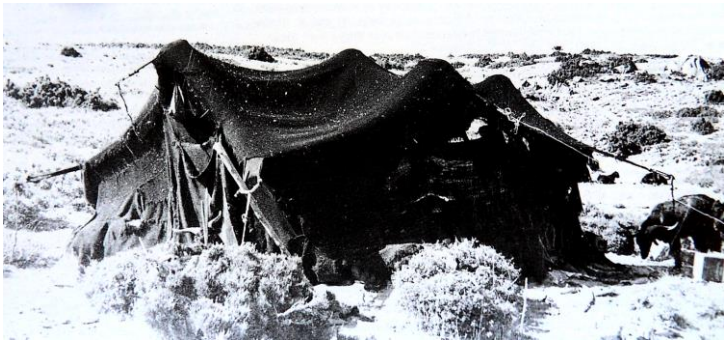
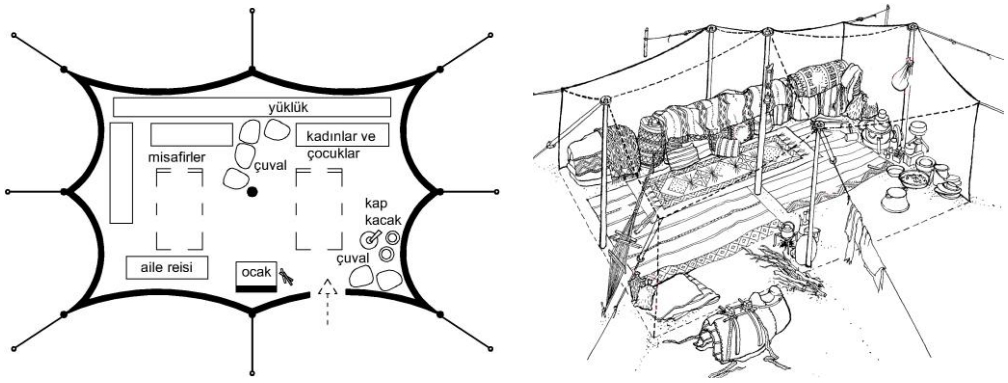


Şekil 4. Kara çadır, genel görünüm (Bammer, 1996).

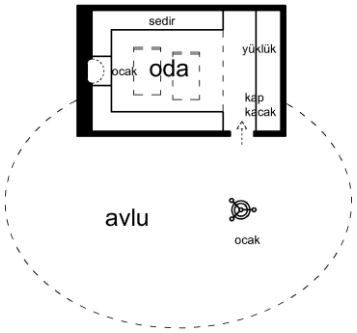
Kara çadır da, kadınlar tarafından dokunur, kurulur ve sökülür. Mekân organizasyonu yurt ile hemen hemen aynı olmasına rağmen, malzeme ve strüktürü farklıdır (Şekil 5). Yapılı çevre koşulları göz önüne alındığında, yurt'un dikdörtgen planlı ve beşik çatılı olarak Anadolu'da yeniden biçimlenmiş halidir; Toros Yörükleri tarafından hâlâ kullanılmaktadır.



Şekil 5. Kara çadır, iç düzen (perspektif: My Favorite Rugs and Kilims, 2013)

sofasız ev
Yerleşik düzene geçişi simgeleyen ve Osmanlı mimarisi içinde yer alan 'Türk evi' plan tipinin ilk aşamasıdır.

Doğan Kuban, Ayda Arel, Cengiz Eruzun, Önder Küçükerman (Çevrimli, 2014) göçebe çadırı ile oda arasındaki işlevsel benzerliklerden yola çıkarak, geleneksel Türk evinin oluşumunun Orta Asya Türklerinin yaşam biçimine dayandığını ileri sürmüşlerdir. Yurt'un oturma, yemek pişirme ve yeme, toplanma, ibadet etme, uyuma, yıkanma gibi eylemlerin gerçekleştirildiği çok amaçlı kullanım pratiği, sofasız evde de devam etmiş; sadece Anadolu'daki kara çadır ve yerleşik konut kültürüne bağlı olarak mekân geometrisi dikdörtgene dönüşmüş ve ocak da anlamsal özelliğini kaybetmeden duvar içerisine gömülmüştür (Şekil 6).



Şekil 6. Sofasız ev, yerleşim ve iç düzen

Bu ilkel/basit evlere büyükbaş ve küçükbaş hayvancılığın yapıldığı dağlık alanlarda (köylerde seyrek, yaylalarda sıkça) rastlanmaktadır.

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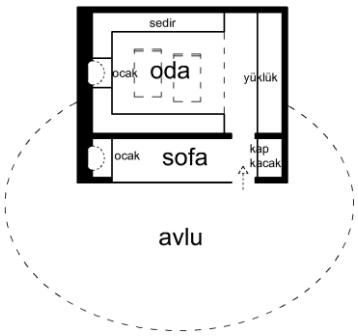
dış sofalı ev

'Türk evi' plan tipinin ikinci aşamasıdır. Bu plan tipinde, bir önceki modelden farklı olarak 'sofa' birimi gelişmiş; oda önündeki avlu sofa'ya dönüştürülmüştür. Burada; oda sadece oturma ve uyuma amaçlı kullanılan bir mekân iken... sofa ilk zamanlar oda ile avlu arasında ve iki ya da üç odalı evlerde odalar arasında dolaşımın sağlandığı, giderek yemek pişirme ve yeme, toplanma amaçlı günlük uğraşların gerçekleştirildiği ve hayatın paylaşıldığı bir diğer mekân/ortak mekân durumundadır (Şekil 7). Olumsuz iklim koşullarından korunmak için üstü kapalı olup, yine dışarıda kalma olanağı sağlayacak şekilde ya bir ya iki ya da üç yüzü açıktır; bu yönüyle dışa dönük yaşam biçiminden içe dönük yaşam biçimine geçiş trendinin ilk somut işaretidir.



Şekil 7. Dış sofalı ev, yerleşim ve iç düzen

Bu evler yaylak-kışlak hayatı yaşayan Türkmenler/Yörükler tarafından hâlâ kullanılmaktadır.

Sonuç

-İklim ve bitki örtüsü bağlamında- su ve verimli otlak peşinde yer değiştiren göçebeler konumlandıkları Anadolu coğrafyasında kültürlerini devam ettirebilmişlerdir.

Kurulup sökülebilir ve taşınabilir 'çadır', bağımsız hareket eden göçerlerin mimari açıdan ürettikleri tek birimdir; etkilerini ev oluşumlarında aramak gerekir. Bu bağlamda... Orta Asya kökenli Türk-Moğol yurt'ları, Anadolu'da çevresel etkileşim ara kesitinde zamanla kara çadırın ve sonraki süreçte de Türk evi prototipinin ana kaynağıdır.

Kara çadır -yurt gibi- geçici bir barınak iken, ev kalıcı barınağa geçişin ilk modelidir ve her iki yaşama birimi de hem göçebe kültürün hem de yerleşik kültürün izlerini taşımaktadır: Göçer kültürün iç mekân düzenlenmesinde, yerleşik kültürün mekân geometrisinde (dikdörtgen) etkili olduğu gözlemlenmektedir.

Kara çadır ve sofasız ev'de tüm eylemler yine tek bir mekânda gerçekleştirilirken; dış sofalı ev'de oda önündeki avlunun sofaya dönüştürülmesi sonucu mekân sayısı artmış, işlevler de bu mekânlar içinde ayrıştırılmıştır.

Nüfus artışa bağlı olarak, zamanla; çadırlar avulları ile birlikte obaların, evler de avluları ile birlikte mahallelerin oluşumuna katkı sağlamıştır.

... ve günümüz Türkiye'sinde değişen yaşam koşulları gereği göçebe hayatı yok olsa da kültürünün izleri devam etmektedir; bu nedenle maddi ve manevi değerlerinin korunması, tanınması ve gelecek kuşaklara aktarılabilmesi açısından önemlidir.

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ANALYSES OF ABA RESPONSES GENES IN *ARABIDOPSIS THALIANA sos5* MUTANT UNDER NaCI STRESS

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Abstract: Abscisic acid (ABA) is an important phytohormone that regulates a lot of physiological, biochemical and molecular processes during plants life and response stress conditions. In this paper, *Arabidopsis thaliana salt overly sensitive* (*sos5*) mutant which known hyper sensitive to NaCI stress was used to investigate ABA regulation. Because of this, ABA depended genes determined by q-RT PCR method under 2h. 100 mM NaCI stress. Findings indicated that RD29A, RD 29B and RD22 which ABA dependent gene expressions were highly lower than *Col-gl* (wild type); however ERD1 which ABA in depended gene expression was higher than WT. Based on these results, we suggest that defect of ABA responses gene regulation might be responsible for hypersensitivity to Arabidopsis *sos5* mutant under salt stress.

Keywords: ABA, *Arabidopsis thaliana*, *sos5* mutant, salt stress

Introduction

Salinity is one of the most serious problems limiting the productivity of agricultural crops, with adverse effects on germination, plant defense system and crop yield (Munns & Tester, 2008). More than 45 million hectares of irrigated land have been damaged by salt, and 1.5 million hectares are taken out of production each year as a result of high salinity levels in the soil around the world (Munns & Tester, 2008). High salinity affects plants in several ways: water stress, ion toxicity, nutritional disorders, oxidative stress, alteration of metabolic processes, membrane disorganization, reduction of cell division and expansion, genotoxicity (Hasegawa, Bressan, Zhu, & Bohnert, 2000; Munns, 2002; Zhu, 2007). According to them, plant growth, development and survival highly reduced. Plants effected from salt stress in some different aspects such as osmotic, ionic and toxic. Meanwhile, plants have evolved several mechanisms to cope with salt stress. One of the most related defense mechanism is that produce ABA and express ABA related genes under salinity. For example, some researches showed that ABA-deficient mutants perform poorly under salinity stress (Xiong, Gong, Rock, Subramanian, Guo, Xu, et al., 2001). On the other hand, it has been shown that ABA-dependent and -independent transcription factors may also cross talk to each other in a synergistic way to amplify the response and improve stress tolerance (Shinozaki & Yamaguchi-Shinozaki, 2000).

There are some mutants characterized related to ABA and these are giving clues about ABA's role under stresses. But, we have very few ideas about Arabidopsis *sos5* mutant related to ABA. Shi et. al., (2003) has been shown firstly the *sos5* mutant of *A. thaliana* by root growth under salt stress. The root of *sos5* shows a drastic reduction of elongation growth combined with radial swelling of the elongation zone. Cell walls appear abnormally thin in *sos5*, apparently lacking the middle lamella (Shi et al., 2003).

To better understand the ABA related genetic pathway linking *sos5* mutant with salt tolerance and root growth, we exposed 2 hour 100 mM NaCI both WT and mutant. Then, we compared some ABA dependent and independent gene expression levels. We found that abscisic acid (ABA) dependent genes lower on *sos5* mutant compared to WT. We propose that Arabidopsis *sos5* mutant is hypersensitive to salt stress because of does not able to expressed ABA dependent genes enough and seem very sensitive.

Materials and Methods

Growth conditions

Arabidopsis thaliana ecotype *Col gl* wild type and the mutant (*sos5-1*) were kindly provided by Jian-Kang Zhu (University of California, Riverside, CA, USA). Growth conditions were as previously described (Blaukopf et al.,

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2011). For phenotypic observation, ten seedlings were manually transferred to test media containing standard medium alone or also including the NaCI, and were examined using a dissecting microscope (Leica EZ4 HD). Stock ABA solution was prepared that was dissolved in 0.01 M NaOH.

Quantitative real-time PCR (qRT-PCR)

Samples were treated in biological triplicates. For each biological replicate, 150 seedlings were grown on a nylon mesh (20 mmmesh size; Prosep, Belgium) for 4 d and were transferred to standard medium with or without 100 mM NaCl and incubated for 120 min. Roots were removed from the seedlings, frozen in liquid nitrogen, ground in a ball mill (Retsch, Germany) for 2 min and RNA was extracted using peqGOLD Trifast (Peqlab, Germany) according to the manufacturer's instructions. The RNA concentration was measured using a Nano Drop 2000c Spectrophotometer (Thermo Scientific, USA). For each sample, 1 mg of total RNA was reverse-transcribed with oligo(dT) primers using a first-strand cDNA synthesis kit (Thermo Scientific, USA) according to the manufacturer's instructions.
Real-time PCR was performed using Solis BioDyne 5 × HOT FIREPol EvaGreen qPCR Mix Plus (no ROX) (Medibena, Austria), and a CFX96 TM Real-Time PCR Detection System (Bio-Rad, USA) was used for detection. Information on the oligonucleotides used can be found in Data Table 1. For real-time PCR, the following program was used: 95.0 8C for 15 min, 40 cycles of 95.0 8C for 10 s, 55.0 8C for 30 s, 72.0 8C for 30 s. Each biological replicatewas analysed in technical duplicates. The average technical error was 0.5 (+1) Ct values. Technical outliers were identified when the DCt between technical replicates was 2.5, and the higher Ct value was removed. The remaining technical replicates were averaged and the DCt (Ct test – CtUBQ5) was calculated.The effect of genotypes and treatments was tested by subjecting the DCt values of three biological replicates to a two-sided t-test.
For this study, the relative mRNA levels of three ABA dependent genes and one independent gene were analysed.

Results and Discussion

The mechanisms of genetic control of salt tolerance in plants have not yet fully understood. Because, salt stress sensed by different sensors. For instance, when plants exposed to salt stress, cell wall, cell surface and vacuole affected immediately and then triggered genes that over come to this case. One of the significant sensors that cell surface proteoglycans have been implicated in many aspects of plant growth and development, but genetic evidence supporting their function has been lacking. Shi et. al., (2003), reported in their paper that the Salt Overly Sensitive5 (SOS5) gene encodes a putative cell surface adhesion protein and is required for normal cell expansion. They isolated *sos5* mutant in a screen for Arabidopsis salt-hypersensitive mutants. According to them, under salt stress, the root tips of *sos5*mutant plants swell and root growth is arrested. The root-swelling phenotype is caused by abnormal expansion of epidermal, cortical, and endodermal cells. So, it means SOS5 gene is responsible for plant growth and development. Even under salt stress, the roots of the wild-type plants exhibit highly organized and defined cell shapes. Cell wall architecture, cytoskeleton, wall–membrane interactions and interaction between neighboring cells play a vital role in the control of cell expansion (Darley et. al., 2001). When this gene function knock out, in response to salt stress, the root tips of *sos5* plants swell and the root growth and elongation was arrested. We hypothesized that the certain phenotypic abnormalities of *sos5* related to ABA regulation.
According to our qRT-PCR results (**Figure 1.**), *At*-RD29A, *At*-RD29B and *At*-RD22 which are ABA dependent genes were highly expressed in WT plants, compare to *sos5* mutants. On the other hand, when we checked *At*-ERD1 which is ABA independent gene was higher in *sos5* mutants than WT under 100 mM NaCI. These results suggested that SOS5 gene have a synergistic function with ABA gene regulation. If there is no SOS5, in other word *sos5* mutant plants, there is a problem with ABA regulation and plants do not able to handle with salt stress affects. Based on this, Seifert et., al., (2014) pointed out that application of ABA suppresses the non-redundant role of *At*-SOS5 in the salt response and Salt oversensitivity in *At-sos5* is suppressed by the exogenous ABA applications. All tested ABA-dependent genes displayed a significant repression in *At-sos5*, suggesting that the effect of *At*-SOS5 on stress signaling might be specific for ABA.

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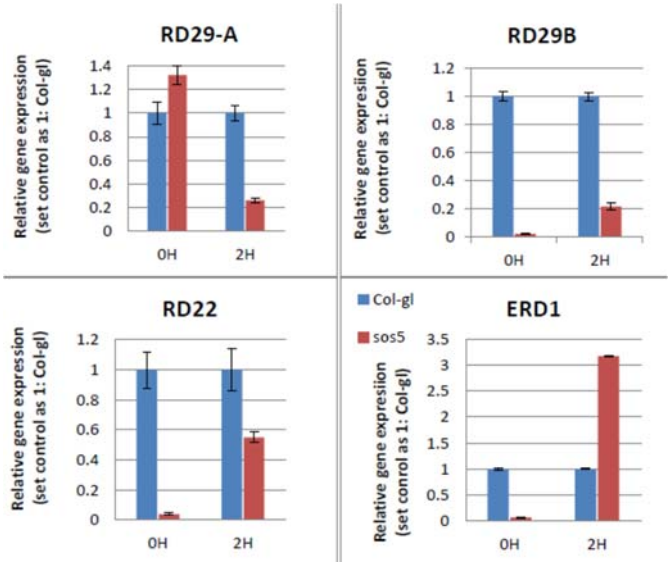
Table 1: Oligonucleotides used for qRT-PCR.

1-) RD29A: At5g52310.1	RD29A-F: AAGTTACTGATCCCACCAAAGAAGAAAC
	RD29A-R: TTTCCTCCCAACGGAGCTCCTAAAC
2-) RD29B: At5g52300.1	RD29B-F: TCCGGTTTACGAAAAAGTCAAAGAAAC
	RD29B-R: AATCCGAAAACCCCATAGTCCCAAC
3-) RD22: At5g25610	RD22-F: ACGTCAGGGCTGTTTCCACTGAGGTG
	RD22-R: TAGTAGCTGAACCACACAACATGAG
4-) ERD1: At5g51070	ERD1-F: ACTTGGAAGGGGTGAACTTCAGTG
	ERD1-R: AGGTCCCACCAGTATAGGCTCATCG

Figure 1. Expression level of ABA related genes during under 100 mM NaCI. Error bars on each point indicate ±SE from three independent replicates.



Conclusion

The predicted lipid-anchored glycoprotein *At*-SOS5 positively regulates cell wall biosynthesis and root growth by modulating ABA signalling. Taken together, we suggest that *At*-SOS5 and ABA signalling act in genetic synergy, leading to suppression of At-sos5 by ABA. Overall, we conclude that *At*-SOS5 regulates normal root growth via an ABA-depedent signalling pathway that might be upstream of cell wall biosynthesis.

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ANALYSIS OF CUTTABILITY OF METAL MATERIALS BY USING ABRASIVE WATERJET

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The method of cutting with corrosive waterjet, which is an advanced technology that is widely used in any production domain throughout the world, involves too many parameters. For this reason, the optimization of these parameters is very important. In order to ensure this optimization, it is necessary to consider many factors such as equipment capacity, processing parameters, and various physical factors.

In this study, it was aimed to analyze the abrasive waterjet cutting method in details and to promote its superiorities to other cutting methods. St37 and St50 alloy steel samples, which are widely used in machinery manufacturing industry, were used in this experimental study. The changes that the used cutting method created in micro structure of the particle were investigated. Since all the methods other than waterjet involve heat treatment, significant changes in hardness of material were observed.

Keywords: Abrasive waterjet, metal cutting, waterjet technology, advanced corrosive waterjet implementations

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ANALYZING CPU SCHEDULING ALGORITHMS ACCORDING TO WAITING TIMES - A CASE STUDY

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Abstract: In multiprocessing operating systems, maximum CPU utilization is one of the most important goals. To obtain the maximum rate, the processes in the CPU queue must be scheduled properly. There are several scheduling algorithms to decide this process order as First-Come First-Served Scheduling, Last-Come First-Served Scheduling, Shortest Job Scheduling, Random Scheduling etc. This paper presents a case study to examine which of these scheduling methods is the most efficient one between these policies according to total waiting times.

Keywords: CPU scheduling, waiting time, First-Come First-Served Scheduling, Last-Come First-Served Scheduling, Shortest Job Scheduling, Priority Scheduling, Random Scheduling.

Introduction

In multiprocessing operating systems, the system need a method to decide the order of processes. This process is called CPU scheduling. In the literature there are lots of CPU scheduling policies such as First-Come First-Served Scheduling, Last-Come First-Served Scheduling, Shortest Job Scheduling, Random Scheduling and lots of criteria used for examining the efficiency of the algorithms such as waiting time, response time, turnaround time (Beru, 2015; Carithers and Duncan 2013; Singhoff, 2012; Kohout, 2012; Baskiyar and Meghanathan, 2005). Because most of the examinations about CPU scheduling used total waiting times in the literature, we also use this criteria in this study. The explanations of the methods are given below.

First-Come First-Served Scheduling : The first executed process is the first one in the waiting queue (Kumar et. Al, 2014; Rogiest. et al,2015; Huang, 2014).
Last-Come First-Served Scheduling : The first executed process is the last one in the waiting queue (Harchol-Balter, 2013; Jouini, 2012; Lister, 1993).
Shortest Job First : The first executed process is the shortest one in the waiting queue (Ru and Keung, 2013).
Random Scheduling : The first executed process is a random one in the waiting queue (Tsichritzis and Bernstein, 2012).

In this paper, the CPU scheduling algorithms are analyzed according to total waiting times of the processes. For this reason, 30 process set who has 10 processes and whose burst times are randomly generated (less than or equal to 50ms) are used. The arrival times are accepted as 0. The CPU scheduling algorithms are applied to these process sets and the total waiting times are calculated. This study aims to find the most efficient CPU scheduling method for this case-study. To form more general solutions about the policies, these 30 × 10 sets are chosen as different characteristics. For example in some sets, all of the processes have equal burst times, in some cases, some of them are equal and in the remaining ones, there are no equal burst times in the processes.

Materials and Methods

The CPU scheduling policies can be seperated as preemptive methods and non-preemptive methods. First Come First Served, Last Come First Served, Priority Scheduling, Shortest Job First and Random Scheduling are non-preemptive methods while Round Robin, Shortest Remaining Time are preemptive. In this study the non-preemptive policies are handled because preemptive policies need different types of inputs. The policies that are compared to eachother in this study are First Come First Served, Last Come First Served, Shortest Job First and Random Scheduling. As mentioned above, 10 processes are produced with random burst times in his study. This random burst times are shown in Table 1 which also shows the First Come First Served policy order. Table 1 also shows the processes according to First Come Firs Served Scheduling. Table 2, Table 3, and Table 4 are formed by using the same burst values with Last Come First Served, Shortest Job First and Random Scheduling.

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Table 1 : Burst times of processes (FCFS)

Case Number	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
1	1	4	10	8	2	7	13	24	11	4
2	5	5	5	5	5	5	5	5	5	5
3	10	12	5	27	30	30	30	2	2	2
4	4	8	12	16	20	24	28	32	36	40
5	24	1	1	1	12	30	2	7	30	30
6	37	30	33	5	45	30	5	5	24	24
7	37	24	30	10	40	24	30	30	10	10
8	30	10	24	4	15	10	20	24	5	22
9	40	10	10	24	10	10	5	10	10	10
10	24	11	4	14	4	14	12	4	7	30
11	5	5	5	21	18	8	8	20	9	24
12	2	2	2	40	30	10	8	30	10	10
13	2	2	30	33	40	50	8	13	11	7
14	10	2	24	2	7	13	8	5	4	7
15	30	20	10	5	5	5	8	30	5	7
16	17	20	44	30	30	30	8	28	10	14
17	22	22	15	20	24	28	8	14	5	6
18	10	10	10	10	10	10	10	10	10	10
19	12	24	12	24	12	24	12	24	12	24
20	15	13	12	24	49	17	30	2	14	37
21	21	5	15	13	30	34	28	32	33	37
22	22	30	21	5	49	50	2	7	40	30
23	3	28	22	30	30	50	5	5	28	40
24	24	24	3	28	24	24	24	24	24	24
25	17	40	13	34	28	32	10	8	25	9
26	20	41	5	50	2	7	48	12	12	50
27	28	42	30	50	5	5	5	5	5	12
28	13	43	28	50	30	2	2	2	2	17
29	15	20	10	50	28	4	17	17	10	17
30	15	11	22	33	24	24	24	24	50	40

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Table 2 : Processes according to Last Come First Served Policy

Case Number	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
1	4	11	24	13	7	2	8	10	4	1
2	5	5	5	5	5	5	5	5	5	5
3	2	2	2	30	30	30	27	5	12	10
4	40	36	32	28	24	20	16	12	8	4
5	30	30	7	2	30	12	1	1	1	24
6	24	24	5	5	30	45	5	33	30	37
7	10	10	30	30	24	40	10	30	24	37
8	22	5	24	20	10	15	4	24	10	30
9	10	10	10	5	10	10	24	10	10	40
10	30	7	4	12	14	4	14	4	11	24
11	24	9	20	8	8	18	21	5	5	5
12	10	10	30	8	10	30	40	2	2	2
13	7	11	13	8	50	40	33	30	2	2
14	7	4	5	8	13	7	2	24	2	10
15	7	5	30	8	5	5	5	10	20	30
16	14	10	28	8	30	30	30	44	20	17
17	6	5	14	8	28	24	20	15	22	22
18	10	10	10	10	10	10	10	10	10	10
19	24	12	24	12	24	12	24	12	24	12
20	37	14	2	30	17	49	24	12	13	15
21	37	33	32	28	34	30	13	15	5	21
22	30	40	7	2	50	49	5	21	30	22
23	40	28	5	5	50	30	30	22	28	3
24	24	24	24	24	24	24	28	3	24	24
25	9	25	8	10	32	28	34	13	40	17
26	50	12	12	48	7	2	50	5	41	20
27	12	5	5	5	5	5	50	30	42	28
28	17	2	2	2	2	30	50	28	43	13
29	17	10	17	17	4	28	50	10	20	15
30	40	50	24	24	24	24	33	22	11	15

As it can be seen from the table, the processes are organized according to their order in the waiting queue, but the first process becomes the last and the last process become the first. This policy is called Last Come First Served scheduling policy.

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Table 3 : Processes according to Shortest Job First

Case Number	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
1	1	2	4	4	7	8	10	11	13	24
2	5	5	5	5	5	5	5	5	5	5
3	2	2	2	5	10	12	27	30	30	30
4	4	8	12	16	20	24	28	32	36	40
5	1	1	1	2	7	12	24	30	30	30
6	5	5	5	5	24	24	30	30	37	45
7	10	10	10	24	24	30	30	30	37	40
8	4	5	10	10	15	20	22	24	24	30
9	5	10	10	10	10	10	10	10	24	40
10	4	4	4	4	7	11	12	14	24	30
11	5	5	5	8	8	9	18	20	21	24
12	2	2	2	8	10	10	10	30	30	40
13	2	2	7	8	11	13	30	33	40	50
14	2	2	4	5	7	7	8	10	13	24
15	5	5	5	5	7	8	10	20	30	30
16	8	10	14	17	20	28	30	30	30	44
17	5	6	8	14	15	20	22	22	24	28
18	10	10	10	10	10	10	10	10	10	10
19	12	12	12	12	12	24	24	24	24	24
20	2	12	13	14	15	17	24	30	37	49
21	5	13	15	21	38	30	32	33	34	37
22	2	5	7	21	22	30	30	40	49	50
23	3	5	5	22	28	28	30	30	40	50
24	3	24	24	24	24	24	24	24	24	28
25	8	9	10	13	17	25	28	32	34	40
26	2	5	7	12	12	20	41	48	50	50
27	5	5	5	5	5	12	28	30	42	50
28	2	2	2	2	13	17	28	30	43	50
29	4	10	10	15	17	17	17	20	28	20
30	11	15	22	24	24	24	24	33	40	50

In this table the proceses are ordered according to their burst times in the ascending order. This means the shortest job becomes the first and the longest jobe becomes the last. Finally, another policy called Random Scheduling Policy is applied to the processes. Random Scheduling Policy choses processes randomly as the name implies.

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Table 4 : Processes according to Random Scheduling Policy

Case Number	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
1	24	1	10	11	2	7	8	13	4	4
2	5	5	5	5	5	5	5	5	5	5
3	27	2	30	2	30	10	30	12	5	2
4	28	4	40	8	32	20	36	24	16	12
5	24	1	30	1	30	7	30	12	2	1
6	30	5	45	5	30	24	37	24	5	5
7	30	10	40	10	30	24	37	30	24	10
8	22	4	30	5	24	15	24	20	10	10
9	10	5	40	10	10	10	24	10	10	10
10	12	4	30	4	14	7	24	11	4	4
11	18	5	24	5	20	8	21	9	8	5
12	10	2	40	2	30	10	30	10	8	2
13	30	2	50	2	33	11	40	13	8	7
14	8	2	24	2	10	7	13	7	5	4
15	10	5	30	5	20	7	30	8	5	5
16	28	17	14	10	30	20	30	30	8	44
17	22	5	28	6	22	15	24	20	14	8
18	10	10	10	10	10	10	10	10	10	10
19	24	12	24	12	24	12	24	24	12	12
20	24	2	49	12	30	15	37	17	14	13
21	32	5	37	13	30	21	15	33	38	34
22	30	2	50	5	40	22	49	30	21	7
23	30	3	50	5	30	28	40	28	22	5
24	24	3	28	24	24	24	24	24	24	24
25	28	8	40	9	32	17	34	25	13	10
26	41	2	50	5	48	12	50	20	12	7
27	28	5	50	5	12	5	5	30	5	42
28	28	2	50	2	30	13	43	17	2	2
29	17	4	20	10	20	17	28	17	15	10
30	33	24	50	15	11	24	40	24	24	22

Results and Discussion

We constituted computer programs by using MATLAB simulation program and calculated the total waiting times of First Come First Served (FCFS), Last Come First Served (LCFS), Shortest Job First (SJF) and Random Scheduling (RS).

The total waiting times for each process set are calculated according to the algorithms and the results are given below :

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Table 5 : Total waiting times

Case Number	FCFS	LCFS	SJF	RS
1	295	461	209	452
2	225	225	225	225
3	749	601	347	790
4	660	1320	660	1024
5	467	775	281	734
6	1228	914	553	1065
7	1251	954	811	1131
8	770	706	499	772
9	789	462	419	662
10	543	573	287	570
11	441	666	359	621
12	572	724	306	706
13	903	861	434	1011
14	411	327	212	404
15	664	461	317	609
16	1161	918	744	934
17	888	588	522	766
18	450	450	450	450
19	780	840	660	852
20	888	1029	601	1016
21	879	1353	886	1048
22	1120	1184	682	1182
23	988	1181	676	1134
24	957	1050	891	940
25	1107	837	659	1043
26	1061	1162	588	1255
27	1173	510	409	832
28	1127	574	380	997
29	916	776	548	686
30	961	1442	911	1272
AVERAGE	814,13	797,46	517,53	839,43

Conclusion

This paper presents a case study to examine which one of the scheduling methods is the most efficient one between First-Come First-Served Scheduling, Last-Come First-Served Scheduling, Shortest Job Scheduling, Random Scheduling according to total waiting times.

As it can be seen easily from the tables, in all the situations Shortest Job First policy is the most efficient one. Because the total waiting time is of course will be the smallest one in all the other policies. Also, when we look at the average times, SJF has the smallest one. The order of the other policies can be changed according to policy but SJF will be the best one in all the cases.

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ANDROID TABANLI MOBIL TELEFON VE SMART CIHAZLAR ILE BLUETOOTH DÜŞÜK ENERJI ETKILEŞIMLI SINAV UYGULAMA VE DEĞERLENDIRME SISTEMI

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Akıllı telefonlarının gelişmesi ve yaygınlaşması ile uygulama alanları da artmıştır. Günümüzde akıllı cep telefonları, telefon özelliğinin yanında, fotoğraf makinesi, kamera, hız ölçer, ivme ölçer, not defteri, ajanda, oyun konsolu, el feneri, harita, navigasyon, adım sayar, e-kitap okuyucu, gibi bir çok amaç için kullanılabilecek donanıma sahiptir. Eğitim alanında cep telefonları ile ders notu, sınav olma, eğitim videoları, hatta canlı yayın dahi yapmak mümkündür. Yapılan çalışmada Android tabanlı akıllı cep telefonları üzerinde uygulanabilen sınav yapma ve değerlendirme sistemi geliştirilmiştir. Sistem belirli bir derse ait önceden oluşturulmuş sınav bilgileri (sorular, sınav tarihi ve saati, sınav süresi, katılımcılar vb.) öğretmen tarafından sunucu üzerinde belirlenir. Sınav ancak öğretmen gözetiminde belirli bir salonda yapılması mümkündür. Sorular aynı salondaki (birbirleri ile Bluetooth mesafesinde) katılımcılara, karıştırılarak birbirinin aynı olmayacak şekilde yöneltilir. Katılımcıların cep telefonlarının bluetooth ile birbirinin etkileşimleri tespit edilir. Böylece öğrencilerin birbirinden yardım alma imkanı minimize edilmiştir. Her katılımcı sınav sonuçlarını, sınava giren tüm katılımcıların sınavı bittikten sonra görülebilecektir. Sınav skorları ve yanlışları ile birlikte hangi konularda eksik oldukları rapor olarak öğrenciye bildirilecektir. Mobil sınav uygulaması ile, daha ekonomik, daha hızlı ve daha çok sınav olma imkanı olacaktır. Bu tür sınavların öğrencinin derse olan ilgi ve motivasyonu ile başarıya olan katkısı araştırılacaktır. Sistem mobil uygulama, soru bankası oluşturma, soru yöneltme uygulaması ve veri tabanından oluşmaktadır.

Keywords: Andrid, sınav uygulaması, web servis, bluetooth LE, BLE, akıllı cihaz.

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ANTI-SCALE MAGNETIC METHOD AS A PREVENTION METHOD FOR CALCIUM CARBONATE SCALING

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Abstract

The effect of anti-scale magnetic method (AMM) in retarding scaling deposition is confirmed by many researchers, to result in new crystal morphology, crystal which has the tendency to remain suspended more than precipitated. AMM is considered as an economic method when compared to other common methods used for scale prevention in desalination plant as acid treatment and addition of antiscalant. The current project was initiated to evaluate the effectiveness of AMM in preventing calcium carbonate scaling. The AMM was tested at different flow velocities (1.0, 0.5, 0.3, 0.1, and 0.003 m/s), different operating temperatures (50, 70, and 90°C), different feed pH and different magnetic field strength. The results showed that AMM was effective in retarding calcium carbonate scaling deposition, and the performance of AMM depends strongly on the flow velocity. The scaling retention time was found to be affected by the operating temperatures, flow velocity, and magnetic strength (MS), and in general, it was found that as the operating temperatures increased the effectiveness of the AMM in retarding calcium carbonate ($CaCO_3$) scaling increased.

Key Words: Magnetic field strength, flow velocity, scale retention time.

Introduction

Scaling is considered to be the biggest operating problem in desalination plants. The deposition of scales can lead to a decrease in the operating efficiency, and equipment life, as well as increase in the maintenance cost and energy consumption. Calcium carbonate ($CaCO_3$) scaling is considered as the most common scale in all desalination plants especially in reverse osmosis plant and in multistage flashing desalination plants. Therefore, it has received since special attention in desalination plant and at different operating temperatures (Segnit et al., 1962; ;Langmuir, 1968; Brecevic and Nielsen, 1989; Cubillas et al., 2005; Tarek et al., 2012; Chaussemier et al., 2015). $CaCO_3$ can be precipitated at three different polymorphs such as calcite, vaterite, and aragonite. Aragonite is considered as the easiest form of $CaCO_3$ and can be removed by flushing with water, because it is a soft scale; while calcite is a hard scale and it could usually be avoided by using antiscant or addition of acid. Aragonite is known with a unique morphology or crystal shape, which makes it be suspended more time than calcite scale. Furthermore, the solubility of aragonite is more than the solubility of calcite at the same temperature and condition (Morse et. al., 1980).

Acid addition is considered as a reliable method to prevent calcite scaling in desalination plants, where acid was added to the feed water, to consume part of the bicarbonate in feed water and convert it to a carbon dioxide.

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$$H^+ + HCO_3^- \longleftrightarrow CO_2 + H_2O \quad (1)$$

This type of treatment method will result in shifting reaction 2, which is responsible in the precipitation of $CaCO_3$ to the left side, and prevents precipitation of $CaCO_3$.

$$Ca^{+2} + HCO_3^- \longleftrightarrow H^+ + \uparrow CaCO_3 \downarrow \quad (2)$$

However, acid addition treatment method is always accompanied with corrosion problems and requires special care and precautions. Furthermore, acid cleaning forces the operators to shut down the plant, which could lead to less productivity and low availability. Antiscalant is also considered as a reliable method to prevent calcite precipitation inside desalination plants.

Scale inhibitor can also be considered as a reliable method used for a long time in desalination plant to control $CaCO_3$ scaling. Antiscalant is a chemical impurity that could modify or change the shape, size, and morphology of crystal formed during crystallization or scale formation processes (Greenlee et. al., 2011). Polyelectrolytes as polycarboxylate, polyacrylates and polyphosphate have been reported as efficient inhibitors that could control $CaCO_3$ precipitation, by reacting with mineral nuclei to disrupt the crystallization process and keep the crystal particles dispersed in the scaling solution (Chauhan et. al., 2012). Other types of antiscalant have the ability to retard the crystal growth rate to suppress the scale formation, and then control the scaling processes. The threshold inhibitors are special additives, where threshold inhibitors can retard scale precipitation for a sufficiently long period of time, and the scale will precipitate outside the desalination system. The influence of antiscalant on the precipitation of $CaCO_3$ was investigated by many authors at different operating pH, and the result confirmed the relation between the functional group in the Antiscalant and increasing the induction time (ß), which is the time required for precipitation of $CaCO_3$(Amjad et al., 1994; Tarek et al., 2012).

Phosphonate antiscalant additives can be classified to be protonated phosphonate group (PO_3H^-) and fully dissociated group (PO_3^{2-}) that work according to adsorption model, where it can inhibit the growth of crystal by adsorption of the reactive surface site. At present, there are various types of phosphonate antiscalant chemicals, such as condensed polyphosphate, organo phosphate, and polyelectrolyte phosphate; however under neutral pH and low temperatures, linear polyphosphonates undergo relatively slow hydrolysis, and the rate of hydrolysis will increase as the operating temperature increases (Gryta, 2012). Furthermore, it is well-known, that special care must be taken to avoid hydrolysis of sodium hexameta phosphate (SHMP) antiscalant in dosing tank, where the hydrolysis process can be described in the following equation.

$$PO_3^- + H_2O \longrightarrow H_2PO_4^{2-} \longrightarrow PO_4^{3-} \quad (3)$$

the hydrolysis will result to losing the effectiveness of the antiscalant in preventing scaling deposition. Furthermore, hydrolysis process can create a phosphonate scaling risk as illustrated in the following equation

$$3Ca^{2+} + 2\,PO_4^{3-} \longrightarrow Ca_3(PO_4)_2 \quad (4)$$

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However, high cost is a problem. It has been calculated that the cost of antiscalant chemicals accounts for about 10% in the production of freshwater in Dalian (Li Hai Yan et. al., 2006). In Kuwait, the annual cost for using a low concentration (not exceeding 3 mg/l) of antiscalant chemicals, is about KD0.95 million (MEW, 2010). This annual cost is expected to increase as the production of desalination plant increases.

Even so, Antiscalant chemicals play an important role in preventing $CaCO_3$ precipitation in reverse osmosis system; they are prone to enhance biofilm growth on reverse osmosis membrane by either altering the membrane surface properties or by serving as nutritional source for microorganisms (Sweity et. al., 2013). In addition, many types of chemical antiscalants on the market are harmful to the environment, and could result to serious environmental influence (Chauhan et. al., 2012). Because of this, researchers have looked for a new promising treatment method referred to as anti-scale magnetic treatment method, which is a nonchemical treatment method, and it is expected to reduce the operating cost of desalination plant. Anti-scale magnetic method (AMM) is a physical pretreatment method, which has been applied as a controlling and/or preventing tool for several decades for the deposition of scale in the domestic and industrial water systems.

Although the operating cost of AMM is very low when compared to that of chemical antiscalant method, the AMM is still not totally accepted by the scientific research community. The main reason for that is the lack of repeatable data, where the AMM was reported to work in some applications and not in the others. Furthermore, until now a few and limited researchers have proposed a scientific theory, explaining the work of AMM. In the last few years, the attention to AMM had increased as an attractive, low cost, treatment method, to prevent scaling deposition in desalination plant. A literature survey has been conducted at KISR on the effectiveness of AMM in preventing $CaCO_3$ scaling. It was concluded that the AMM can be considered as an effective method in controlling $CaCO_3$ scaling (Ben Salah, 2015; Cefalas et. al., 2010; Alimi et. al., 2009; Eliassen et al. 1985; Hasson and Bramson, 1985; Baker et. al., 1997; Sohnel and Mullin, 1988; Barrett and Barsons, 1998). Moreover, the result of literature survey confirmed that the AMM cannot totally prevent the formation of $CaCO_3$ crystals, but it can affect the scale formation process by increasing the retention or conducting time, producing crystals with different morphology (aragonite morphology), higher tendency for suspension and smaller in sizes, which can be carried out away with the brine water flow without Antiscalant treatment. Furthermore, it was found that the effectiveness of the AMM method in preventing precipitation of $CaCO_3$ was strongly affected by the chemical properties of the scaling solution, magnetic field strength (MFS), water temperature, and flow velocity (Busch et. al., 1986; Biochenko et. al., 1977; Gryta, 2011; Cai et. al., 2009; Gabrielli et al., 2000). Because of the lower operating cost of AMM and the encouraging results obtained from the literature survey, AMM was tested at desalination research plant (DRP), to assess the effectiveness of the AMM in retarding CaCO3 scaling deposition or increasing the induction time ((ß) at different operating temperatures, different feed water pH and different MFS to identify favorable operating conditions for effective $CaCO_3$ scale prevention. The chemical composition of Kuwait seawater used in the experiments is shown in Table 1, where about 51% of Kuwait seawater showed chloride ions and 29.4% sodium ions. Sulfate ions also compose a high percentage of Kuwait seawater. Scaling of $CaCO_3$ is the dominated scale expected to precipitate when Kuwait seawater is concentrated to one or more concentration factor, as expected by Staff and Davis saturation index, followed by scaling of calcium sulfate, barium sulfate, and strontium sulfate, but with less amount than $CaCO_3$ scaling.

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Table 1. The Chemical Composition of Seawater at Doha Site

Parameter	Concentration (mg/l)	% of TDS
pH	8.28	
Temp (°C)	27.38	
Conductivity (ms/cm)	61.8	
TDS (mg/l)	48529	
Turbidity	0.54	
Na^+ (mg/l)	16353	29.408
Ca^{2+}(mg/l)	1030	1.25
HCO_3^- (mg/l)	130	0.327
Cl^-(mg/l)	25208	50.8
Mg^{2+}(mg/l)	1536	3.53
SO_4^{2-}(mg/l)	4429	9.49
Ba^{2+}(mg/l)	0.38	
K^+ (mg/l)	589	1.08
Sr^{2+}(mg/l)	13	0.0308
PO_4^{3-}(mg/l)	0.23	0.0005

Experimental Procedures Description

The AMM testing unit was shown in Fig. 1. The test unit primarily consists of two tanks, A and B, fabricated from glass sheets and located inside two water baths to control the temperature of the tested solution. The testing unit also contained a variable speed pump, needle valves to control the flow, thermometers, a pH adjustment section, and a magnetic field section. The magnetic field section contains a permanent antiscalant magnets treatment unit (AMT)) as shown in Fig. 1 with north and south facing each other, as a source for the magnetic treatment around the pipe. The magnets were positioned orthogonally to the direction of the flow of fluid inside the pipe. Pairs were changed according to the magnetic field strength required. A Tesla meter was used to measure the strength of the magnetic field in each experiment. An automatic titrator, ion chromatography, spectrophotometer DRL/2000, and other instruments were used for analyzing scaling ions such as Ca^{2+} and HCO_3^- ions at the Doha Research Plant (DRP).

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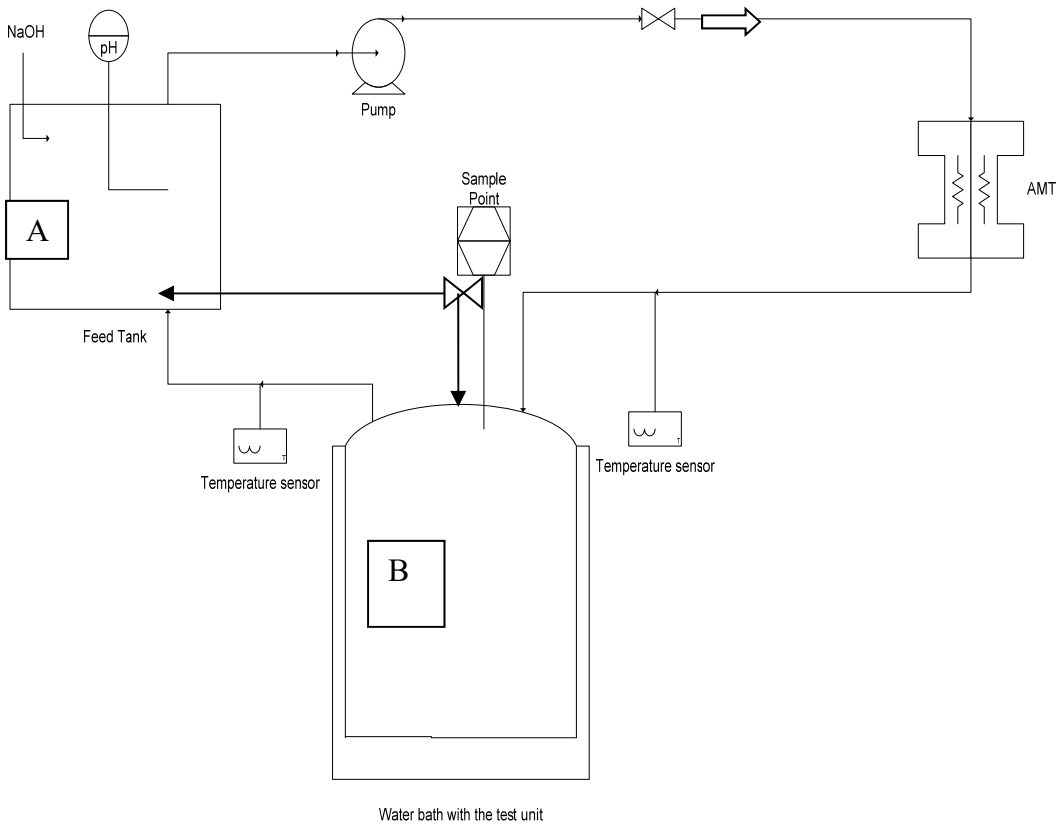

Fig.1. The antiscalant magnetic treatment testing unit.

The two tanks, A and B, are connected to each by a valve and a variable speed pump, which was used to pump the test solution from tank A to tank B, and to circulate the test solution through the magnetic fields at a controlled flow velocity. Both tanks A and B were installed inside a water bath to enable temperature controlling during the tests. Two types of solutions were mixed to prepare the required precipitated salt. Calcium carbonate precipitated scaling ($CaCO_3$) was prepared by mixing two solutions, which are 0.5 M of $CaCl_2$ and 0.5 M of Na_2CO_3. Na_2CO_3 solution was considered as the base solution for preparing $CaCO_3$ scaling. Hence, the base solution was prepared at tank A; while $CaCl_2$ was prepared at tank B. First, the pHs of both tested solutions were adjusted to a desirable value using acid. Then, the temperatures were heated to a required testing temperature before mixing the two solutions, using the water baths at both tanks A and B separately. Then, the base solution was circulated through the AMT unit to be magnetically treated without mixing with $CaCl_2$ solution in Tank B, using a controlled valve and variable speed pump, for almost one hour. Then, the solutions were mixed, and the mixing time was considered as time zero for scale formation, and then, the samples were drawn from tank B every minute for bicarbonate analysis to test the effectiveness of the AMT unit in retarding scale deposition and increasing ß. Thus, three MSF were tested (0T,0.48T and 0.96T) , three operating temperature (50, 70 and 90 ºC), two PH values (8.3 and 9.5) and different flow velocities (1.0, 0.5, 0.3, 0.1 and 0.03 m/s)

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Results and Discussions

Calcium Carbonate Scaling

The performance of AMM in retarding $CaCO_3$ at a pH of 8.3 and variable magnetic field and operating temperatures, are shown in figs. 2 to 13. Figures 2, 3, and 4 shows the performance of AMM at 0.5 m/s flow velocity, while Figs. 5, 6 and 7 show the performance of AMM at a flow velocity of 0.3 m/s. However, the flow velocity of 0.1 and 0.03 is shown in Figs. 8 to 10 and Figs. 11 to 13 respectively.

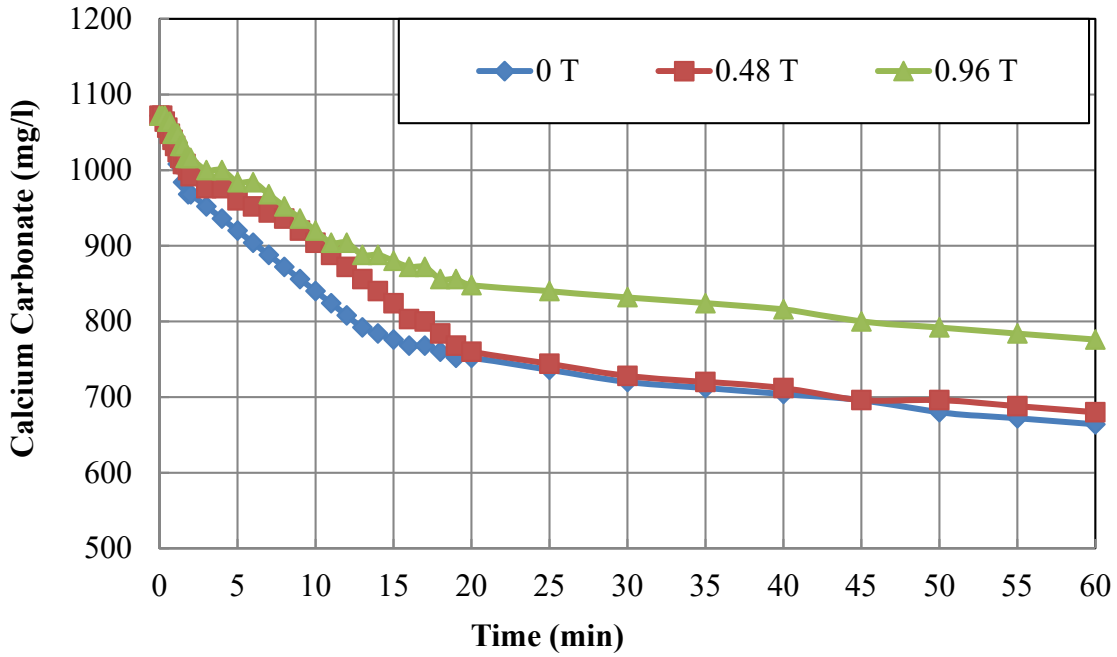

Fig. 2. Calcium carbonate concentration at 0.5 m/s velocity, pH 8.3 and 50°C at different magnetic field.

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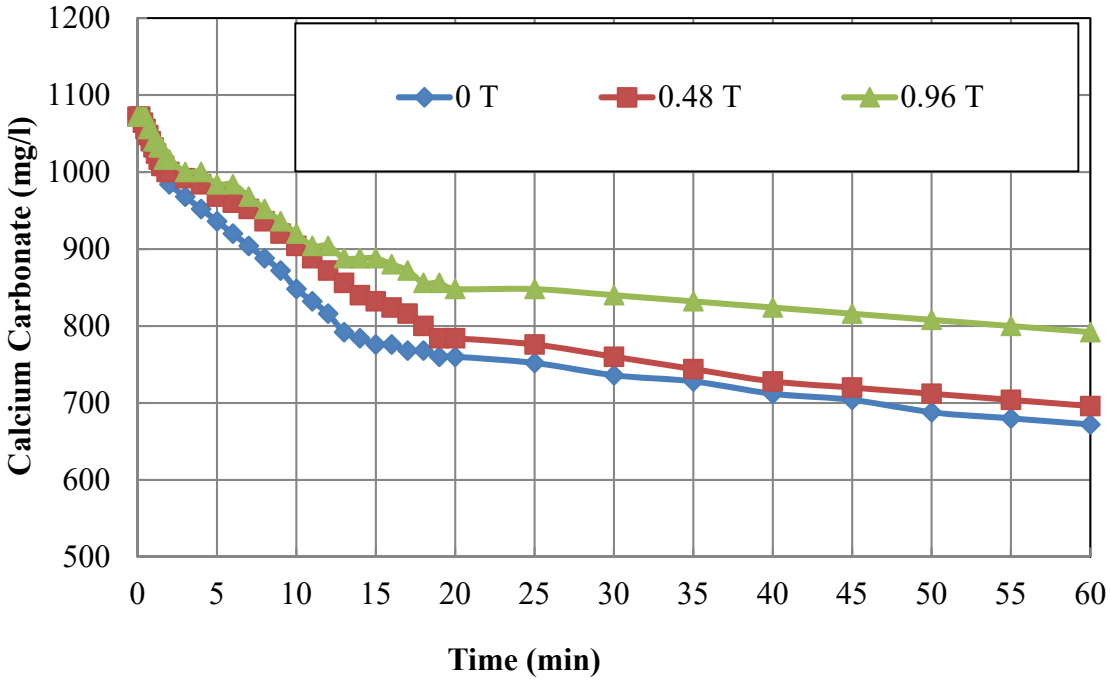

Fig. 3. Calcium carbonate concentration at 0.5 m/s velocity, pH 8.3 and 70°C at different magnetic field.

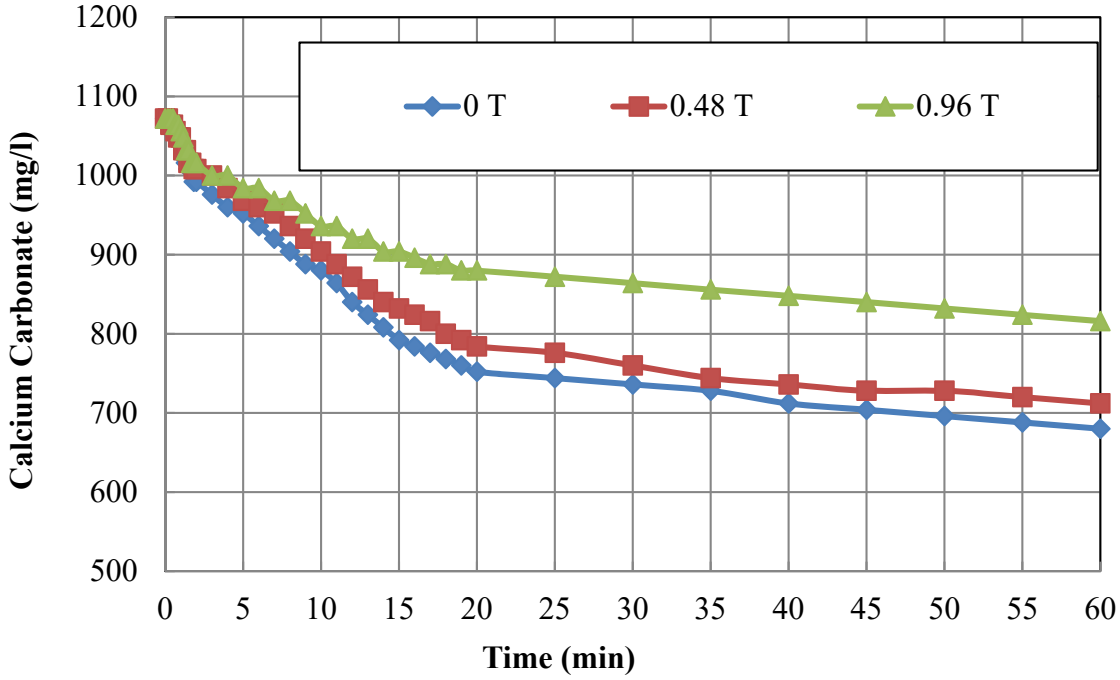

Fig. 4. Calcium carbonate concentration at 0.5 m/s velocity, pH 8.3 and 90°C at different magnetic field.

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Performance of Magnetic Treatment Method in Retarding Calcium Carbonate at a Flow Velocity of 0.5 m/s. The AMM was tested at three magnetic field strength which are 0 Tesla, (without magnetic treatment method), 0.48 Tesla and 0.96 Tesla. Although the differences between the three magnetic field is not too much clear in Figures 2 to 4. However, it is clear that the ATM decreased the potential for calcium carbonate scaling, and the power for retarding calcium carbonate by AMM can be increased when the applied magnetic field strength (MFS) is increased.

The AMM increased ß for calcium carbonate scaling at a concentration of 1000 mg/l of HCO_3^- from less than 3 min to 5 min at 0.96 T magnetic fields. Moreover, it can retard the carbonate scaling at a concentration of 800 mg/l of HCO_3^- for about 45 min as shown in Fig. 2, when compared to 12 min without applying AMM with increment equal to 2.75 times. The increment in ß is calculated as follows:

$$\text{Increment in ß} = \frac{\text{The retention time ß under AMM} - \text{retention time ß without AMM}}{\text{Retention time ß without AMM}}$$

Thus, it is clear that AMM is a selective treatment. However, knowing that the bicarbonate concentration in Kuwait seawater does not exceed 200 mg/l (Salman et. al., 2013), this implies that the AMM could be effective in retarding calcium carbonate scaling. Figs. 3 and 4 show the performance of AMM in retarding calcium carbonate concentration under pH 8.3 and flow velocity of 0.5 m/s and a temperature of 70°C and 90°C. Both figures show that the AMM could increase ß for about 50 min instead of 12 min without AMM at a concentration of 800 mg/l of calcium carbonate scaling, which represent an increment of 3.16 fold as shown in Figs 3 and 4 under 0.96 T. ß was increased to 60 min when the operating temperature was increased from 70°C to 90°C as shown in Fig. 4.

Performance of Magnetic Treatment Method in Retarding Calcium Carbonate at a Flow Velocity of 0.3 m/s. Figs. 5, 6, and 7 show the performance of AMM at different operating temperatures and different magnetic fields under 0.3 m/s of flow velocity.

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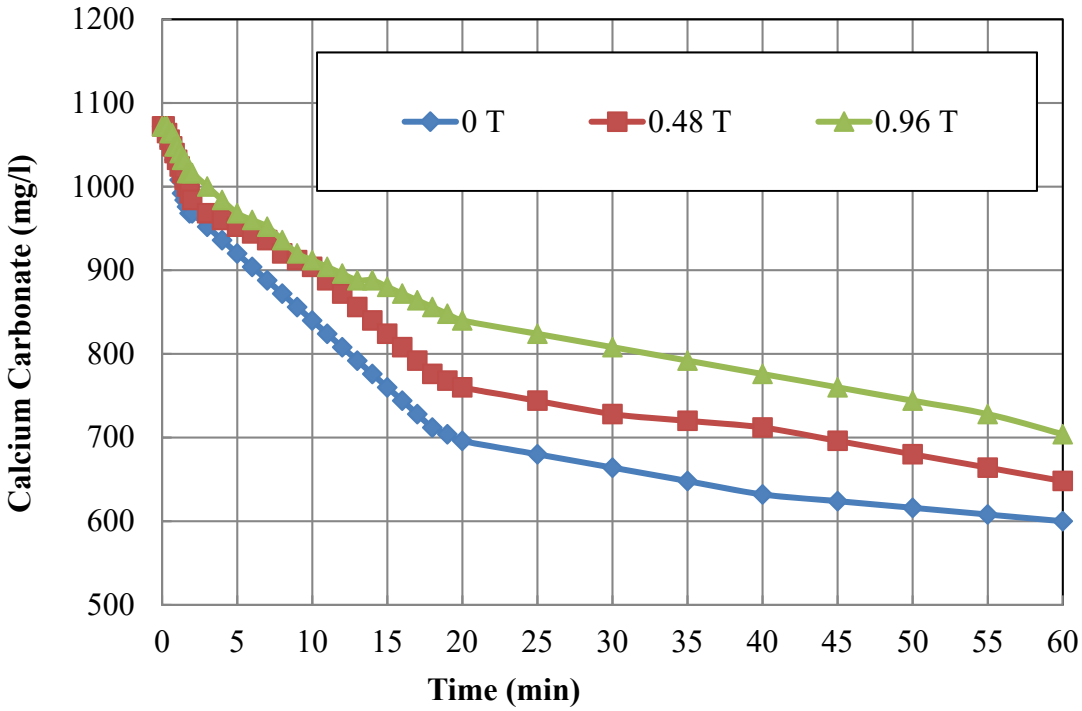

Fig. 5. Calcium carbonate concentration at 0.3 m/s velocity, pH 8.3, and 50°C at different magnetic field.

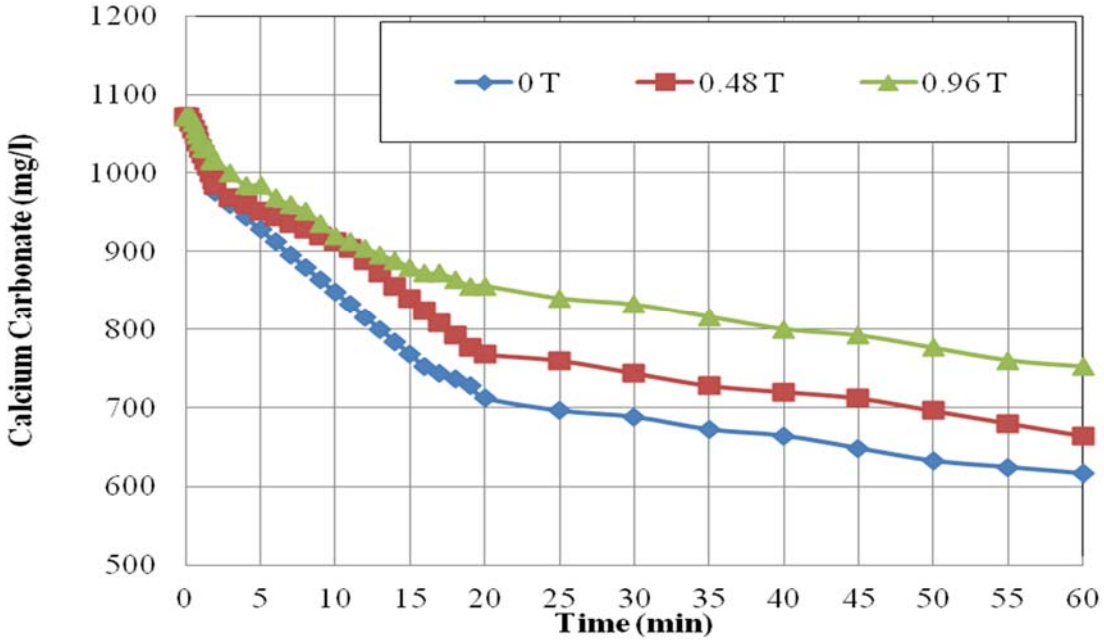

Fig.6. Calcium carbonate concentration at 0.3 m/s velocity, pH 8.3 and 70°C at different magnetic field.

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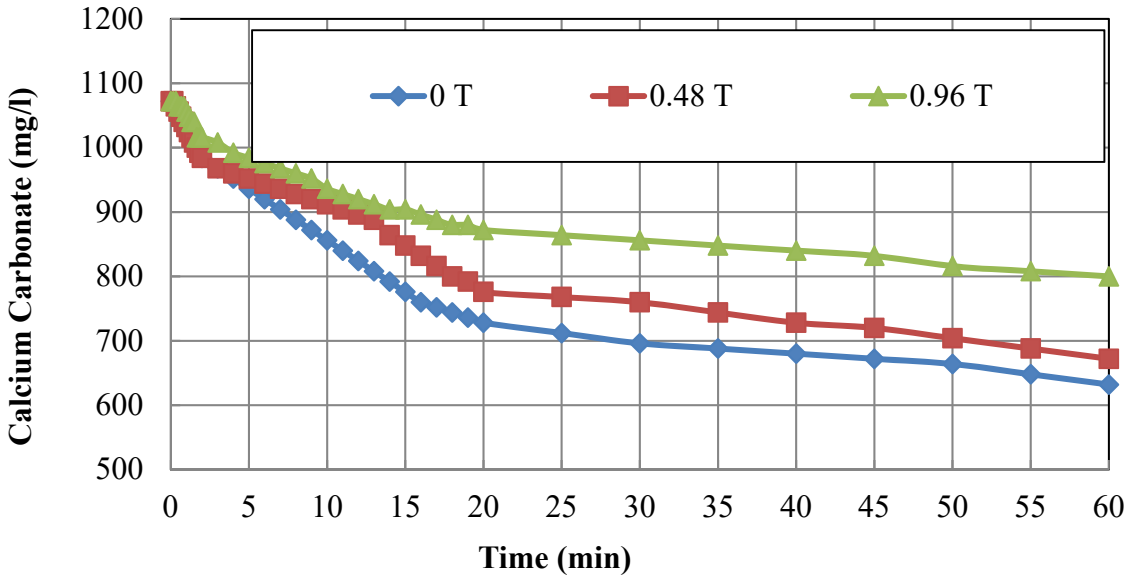

Fig.7. Calcium carbonate concentration at 0.3 m/s velocity, pH 8.3 and 90°C at different magnetic field.

From Figs 5, 6, and 7, it is clear that the AMM succeeded in increasing the retention time from 11 min at 800 mg/l of calcium carbonate concentration to about 35 min at 0.96 T and an operating temperature of 50° C as shown in Fig. 5. Moreover, ß was increased from 12 min without AMM to about 40 min at an operating temperature of 70°C and 0.96 T as shown in Fig. 6. The ß at 800 mg/l of calcium carbonate concentration was increased from 14 min to 55 min as shown in Fig. 7.

Performance of Magnetic Treatment Method in Retarding Calcium Carbonate At a Flow Velocity of 0.1 m/s. Figs. 8, 9, and 10 show the performance of AMM at different operating temperatures and different magnetic fields under 0.1 m/s flow velocity.

From Figs. 8, 9, and 10, it is clear that the effective concentration level was decreased from 800 mg/l to about 700 mg/l, where noticeable rice in retention time can be found. The increment in ß at 800 mg/l was almost small and did not exceed 7 min at 0.96 T and an operating temperature of 90° C. However, at a concentration of 700 mg/l, marked rise in retention time ß was noticed. This implies that the performance of AMM decreased strongly, with a decrease in flow velocity, than that of a reduction in operating temperatures.

The AMM succeeded in increasing the ß from 17 min at 700 mg/l of calcium carbonate concentration to about 35 min at 0.96 T and an operating temperature of 50° C as shown in Fig. 8. Moreover, the retention time ß increased from 19 min. without AMM to about 35 min. at an operating temperature of 70°C and 0.96 T as shown in Fig. 9 at the same level of calcium carbonate concentration. However, at 90°C as shown in Fig. 10, the retention time ß at 700 mg/l of calcium carbonate concentration increased from 19 min to 40 min, which is an increase of 110.5 %.

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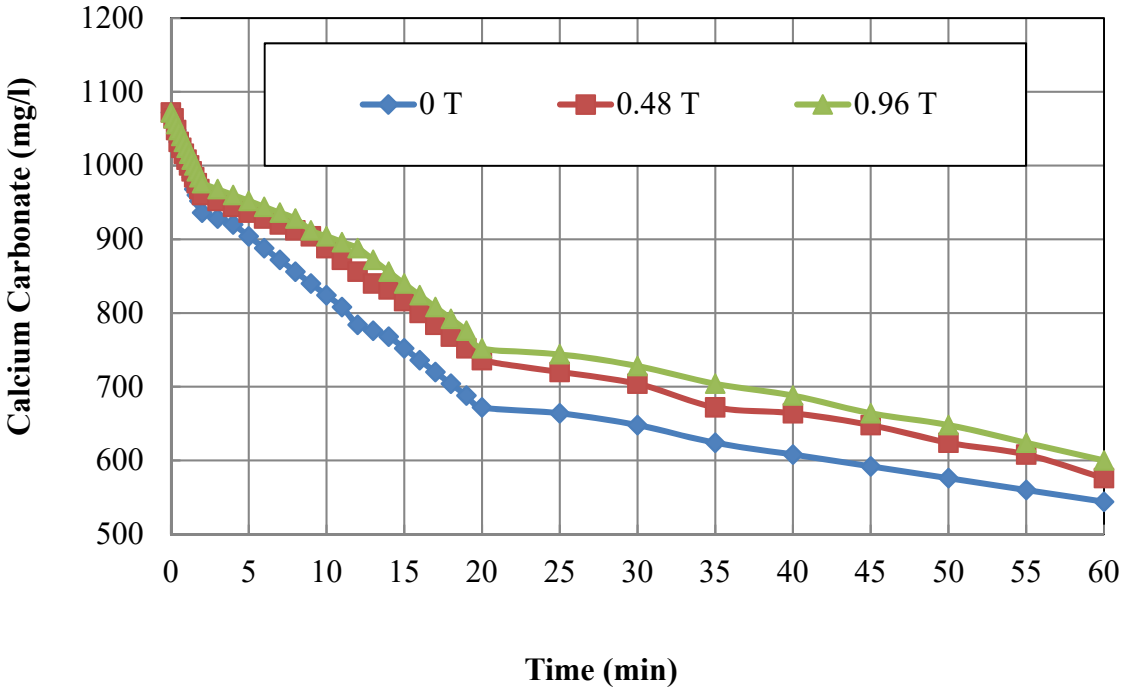

Fig.8 . Calcium carbonate concentration at 0.1 m/s velocity, pH 8.3 and 50°C at different magnetic field.

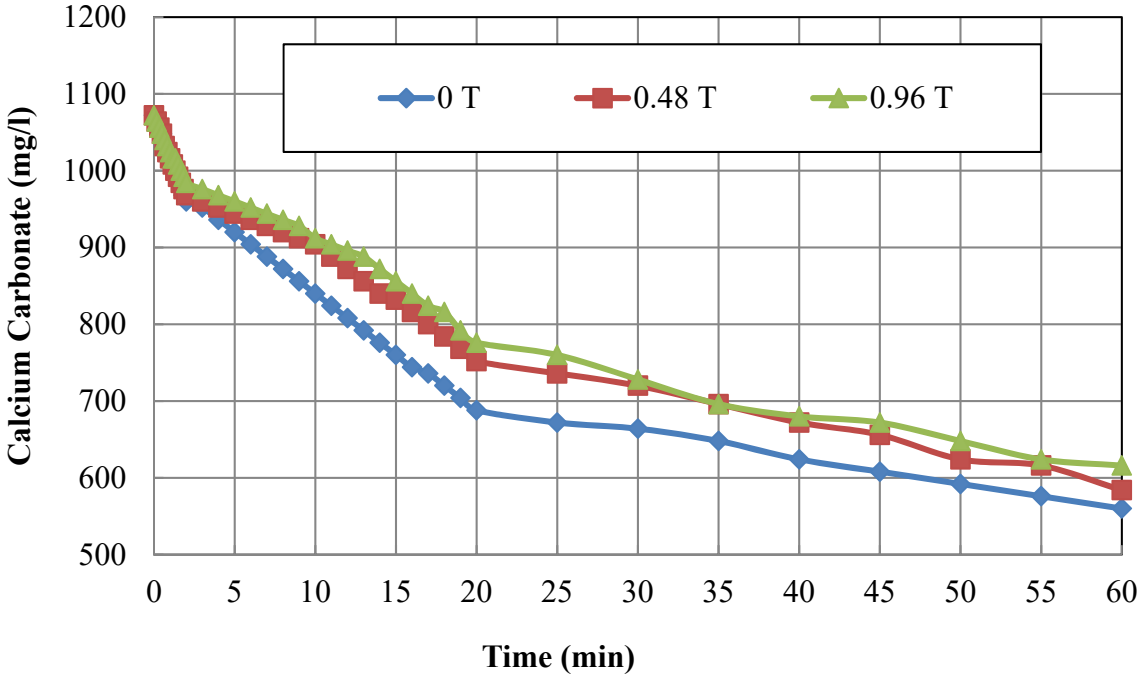

Fig.9. Calcium carbonate concentration at 0.1 m/s velocity, pH 8.3 and 70°C at different magnetic field.

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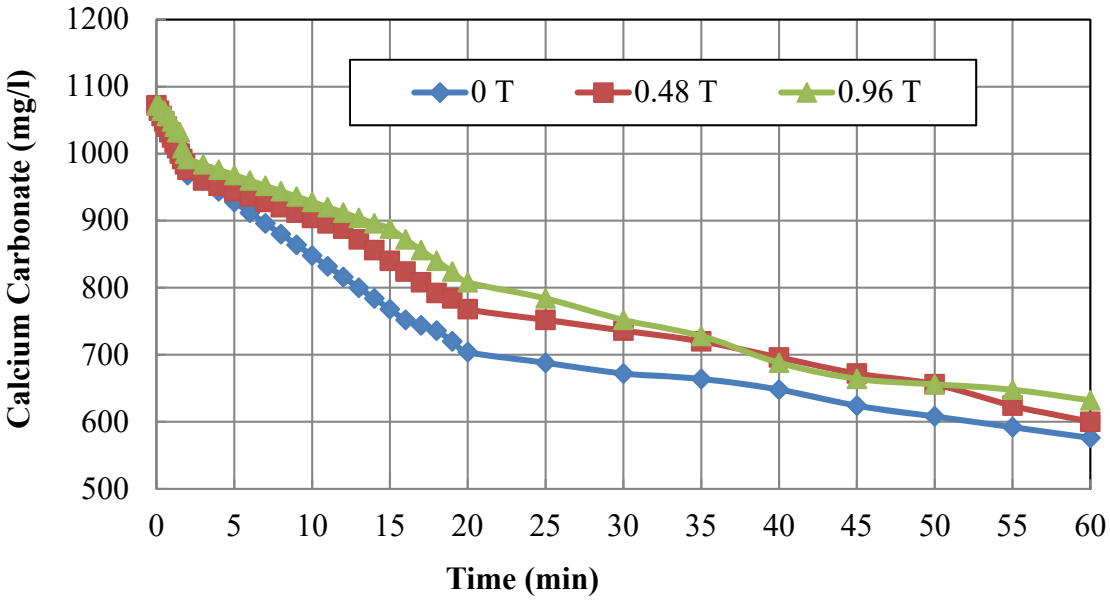

Fig.10 . Calcium carbonate concentration at 0.1 m/s velocity, pH 8.3, and 90°C at different magnetic field.

Performance of Anti-Scale Magnetic Treatment Method in Retarding Calcium Carbonate at a Flow Velocity of 0.03 m/s. Figs. 11, و12 and 13 show the performance of AMM at different operating temperatures and at different magnetic fields under 0.03 m/s flow velocity.

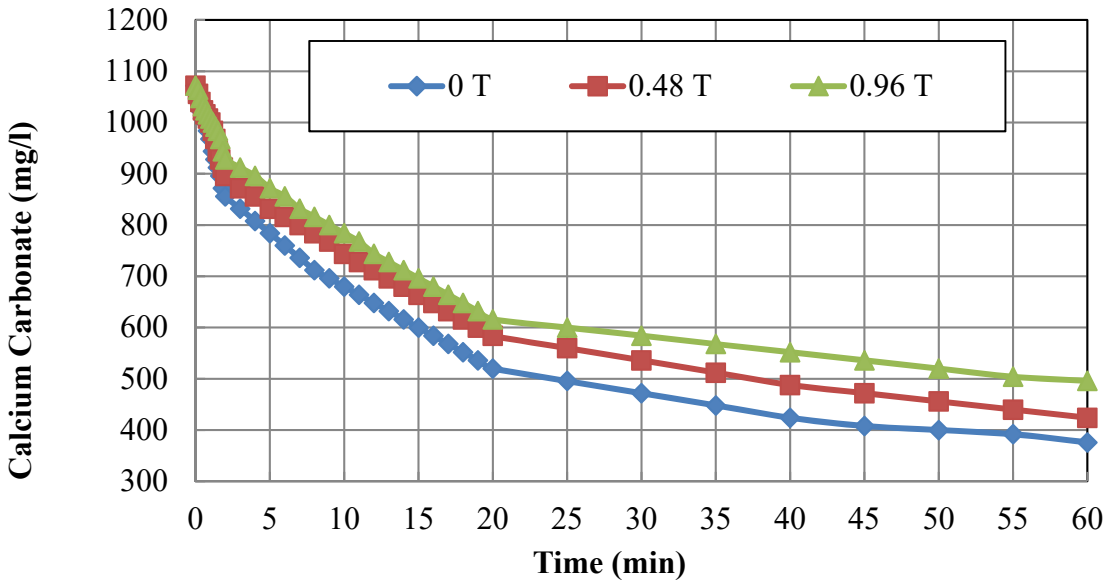

Fig.11. Calcium carbonate concentration at 0.03 m/s velocity, pH 8.3 and 50° C at different magnetic field.

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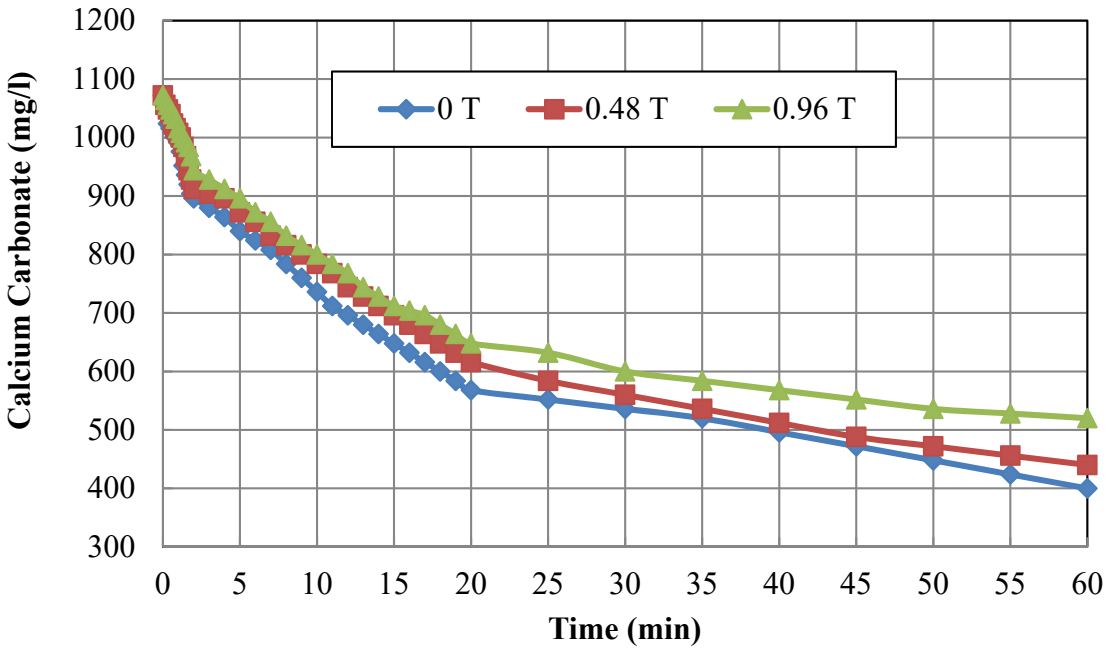

Fig. 12. Calcium carbonate concentration at 0.03 m/s velocity, pH 8.3 and 70° C at different magnetic field.

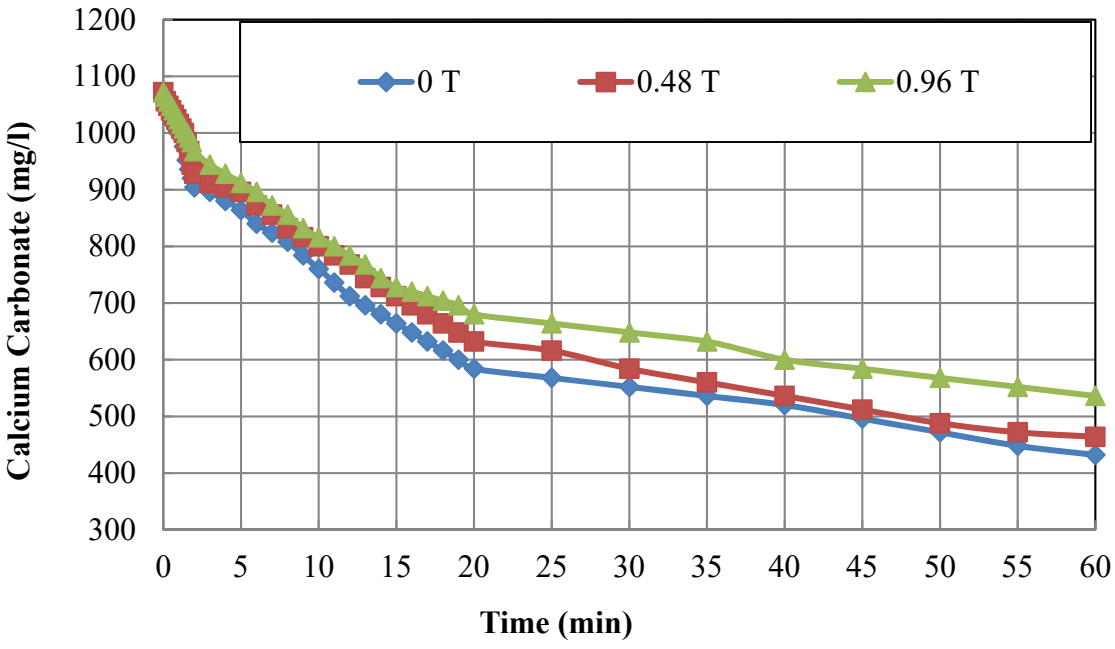

Fig.13 . Calcium carbonate concentration at 0.03 m/s velocity, pH 8.3 and 90° C at different magnetic field.

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From Figs. 11, 12, and 13 it is clear that the effective concentration level reduced from 700 mg/l at flow velocity of 0.1 m/s to about 500 mg/l at a flow velocity of 0.03 m/s, where a noticeable increment in the retention time can be found. Thus, the increment in ß at 700 mg/l was almost small and did not exceed 7 min at 0.96 T and operating temperature of 90°C. However, at a concentration of 500 mg/l, a big increment in retention time can be noticed. This confirms the fact concluded before, where the performance of AMM decreased more strongly with a decrease in flow velocity, than that of the decrease in operating temperatures or a decrease in magnetic field strength.

The AMM succeeded in increasing the retention time from 20 min at 500 mg/l of bicarbonate concentration to about 55 min at 0.96 T and an operating temperature of 50°C as shown in Fig. 11. Moreover, the retention time increased from 20 min without AMM to about 55 min. at an operating temperature of 70°C and 0.96 T as shown in Fig. 12 at a concentration level of 550 mg/l of bicarbonate. However, at 90°C as shown in Fig. 13, the retention time at 700 mg/l of bicarbonate concentration increased from 19 min to 40 min, which represents an increment of 110.5 %.

Performance of Magnetic Treatment Method in Retarding Calcium Carbonate at pH of 9.5. Figures 14 to 16 show the performance of the AMM at a flow velocity of 0.5 m/s at different operating temperatures at different magnetic field strengths and a higher pH of 9.5.

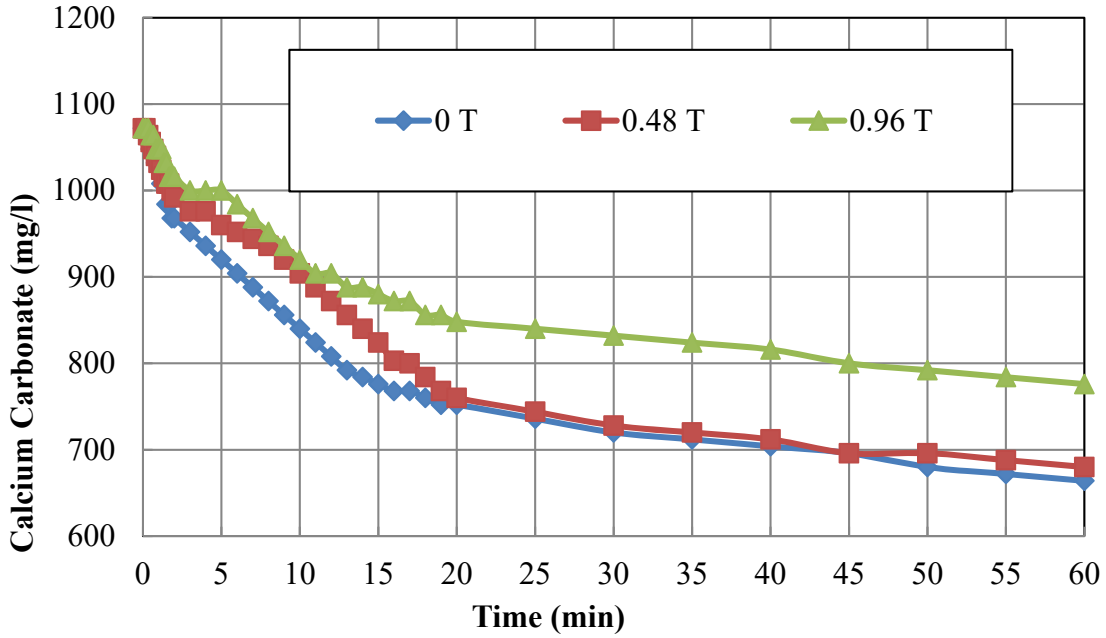

Fig.14. Calcium carbonate concentration at 0.5 m/s velocity, pH 9.5, and 50°C at different magnetic fields.

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ARCHITECTURE STUDENTS' PREFERENCES ON ARCHITECTURAL DESIGN STUDIO: IN TERMS OF BUILDING PHYSICS

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Abstract: This research was designed to see how much importance is given by architecture students to building physics in the process of architectural project development. In this scope heat-moisture, air circulation (wind control/natural ventilation), solar power (usage/protection), indoor air quality, natural and artificial lighting, building acoustics and noise control, building biology, ecology and fire insulation were defined as criteria related to building physics. In the scope of the study, 100 students out of the 217 volunteers from Bursa Orhangazi University, Architecture and Design Faculty, Architecture Department during the 2015-2016 education year, were asked to rate each criteria. At the end of the study it has been understood that students were highly sensitive and had a high level of awareness and sensitivity on this subject.

Keywords: Architectural Design Studio, Architecture Students' Preferences, Building Physics

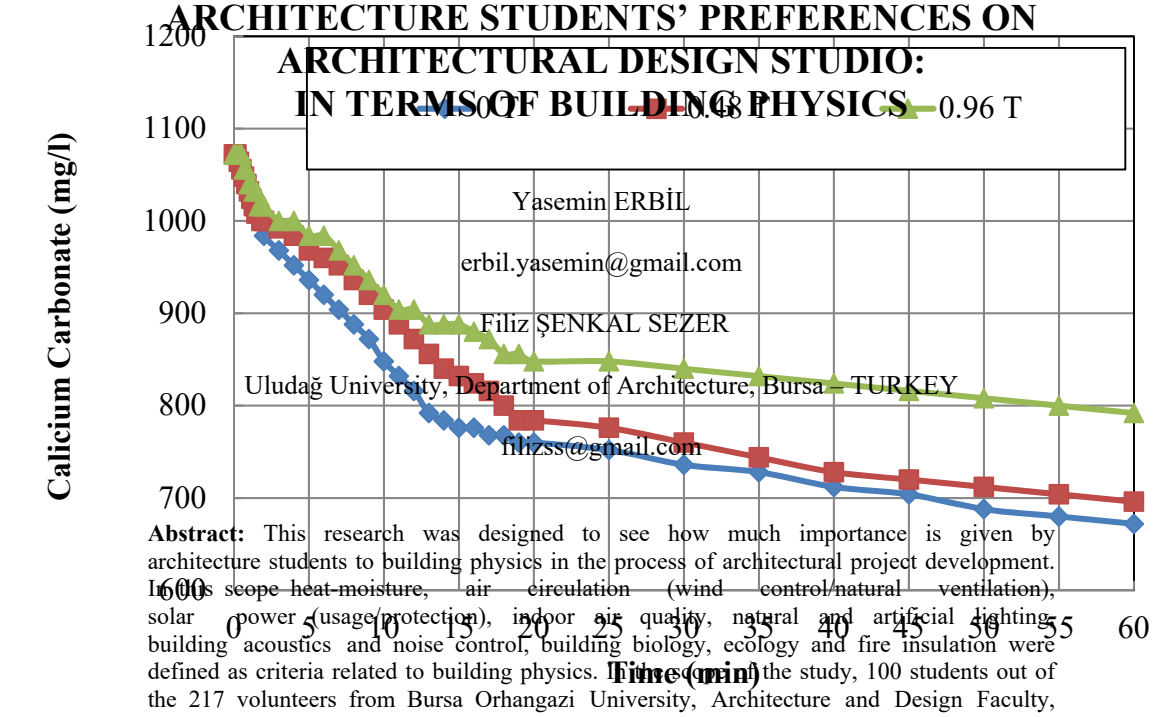

Fig.15. Calcium carbonate concentration at 0.5 m/s velocity, pH 9.5, and 70°C at different magnetic fields.

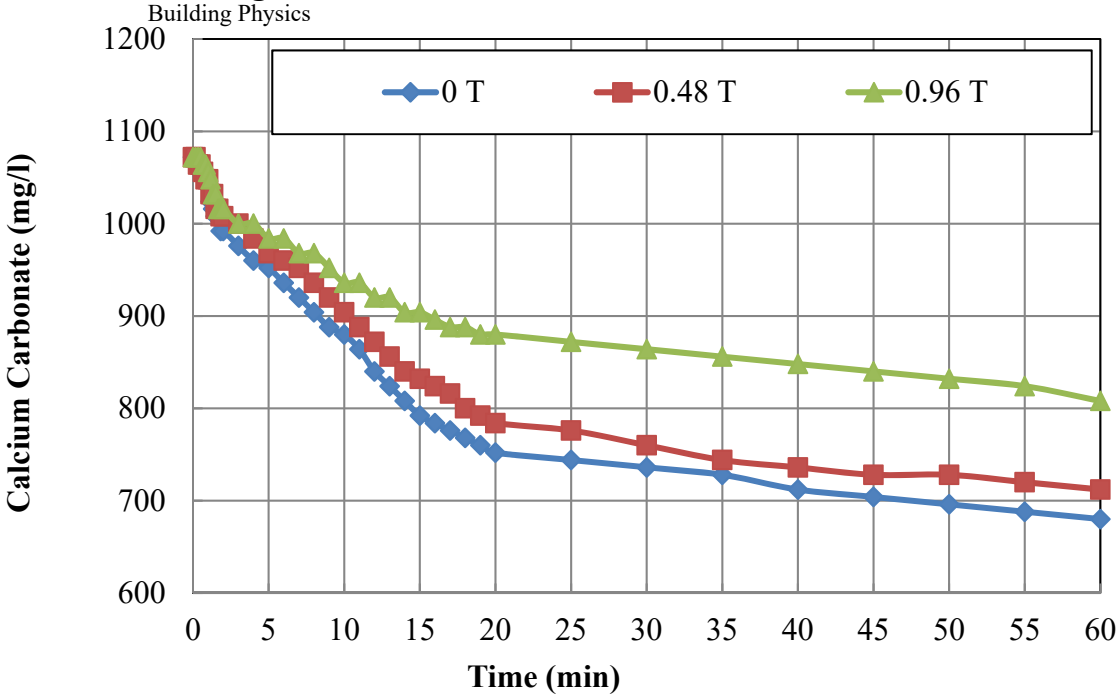

Fig.16. Calcium carbonate concentration at 0.5 m/s velocity, pH 9.5, and 90°C at different magnetic field.

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The result showed a similar performance of AMM at 9.5 to that at pH 8.3. At pH of 9.5, the AMM effectiveness was found to be increasing with increasing magnetic field from 0.48 T to 0.96 T as shown in Fig. 14. This trend was observed also at 70 and 90°C (Figs. 15 and 16).

It is clear from Fig. 14that the AMM at a pH of 9.5 and flow velocity of 0.5 m/s increased the retention time at 800 mg/l from 12 min to about 45 min using 0.96 T magnetic fields with an increment of 2.75 equal to exactly the increment at a pH 8.3. On the other hand, the retention time increased from 12 to about 55 min at 800 mg/l concentration as shown in Fig. 15. However, the AMM could increase the retention time at 800 mg/l from 14 min to about more than 60 min, as shown in Fig 16. Hence, we can conclude that the AMM shows the same performance at a pH of 8.3 and 9.5.

Critical Flow Velocity Using Magnetic Treatment Method for Retarding Calcium Carbonate. Table 2 summarizes the performance of AMM at different flow velocities where it is clear that the critical velocity was 0.5 m/s for calcium carbonate scaling, and when the flow velocity exceeded this value, the AMM was not a more effective method in retarding carbonate scale as shown in Table 2.

Table 2. The Effect of Different Flow Velocity on the Performance of Magnetic Treatment Method for Retarding Calcium Carbonate Scaling Solution

Flow Velocity (m/s)	Effectiveness
1.0	No effect
0.5	Effective
0.3	Effective
0.1	Effective
0.03	Effective

The performance of AMM in retarding calcium carbonate at different flow velocities is presented in Figs. 17, 18, and 19 for four flow velocities (0.5, 0.3, 0.1, and 0.03) and the three operating temperatures as 50, 70, and 90°C.

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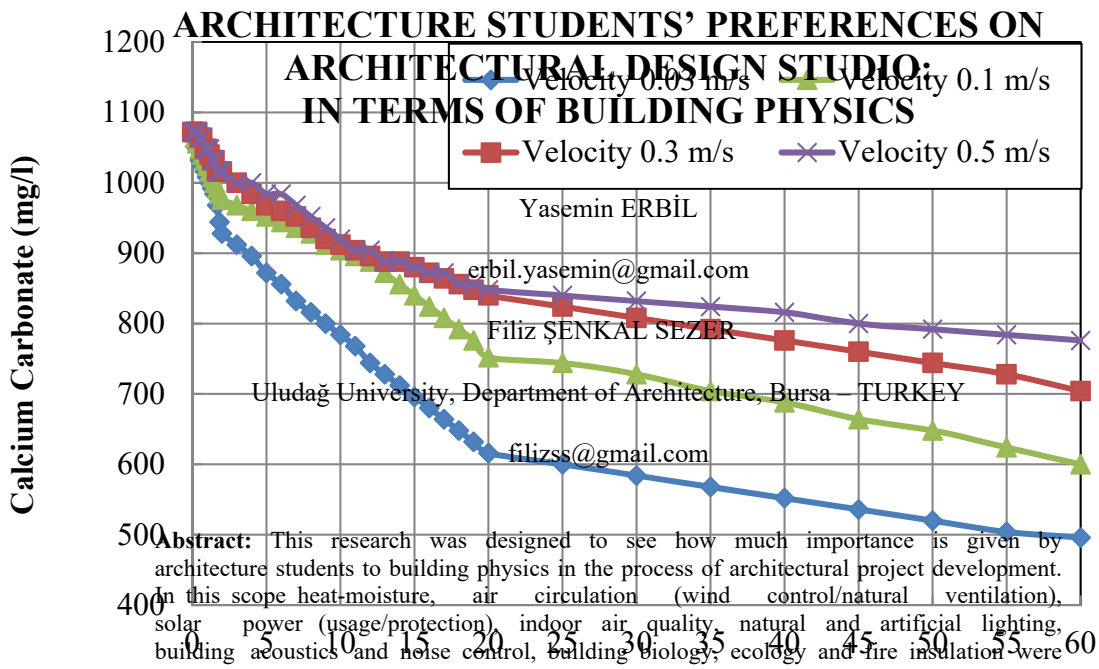

Fig. 17. Calcium carbonate concentration at pH 8.3, 50°C, and 0.96 T magnetic fields at different velocities.

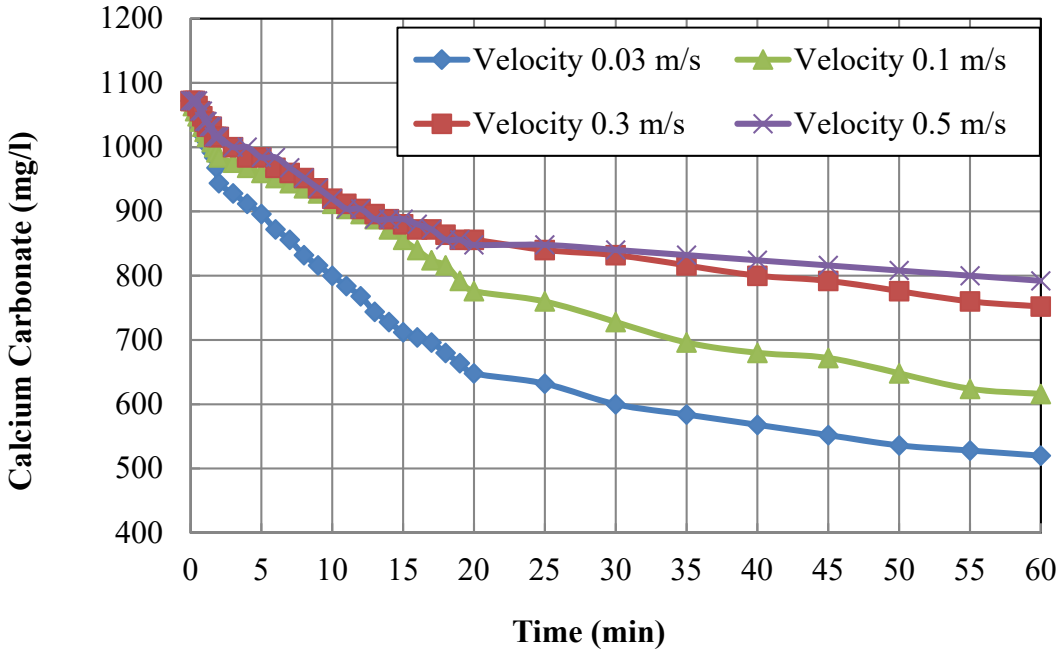

Fig. 18. Calcium carbonate concentration at pH 8.3, 70°C, and 0.96 T magnetic field at different velocities.

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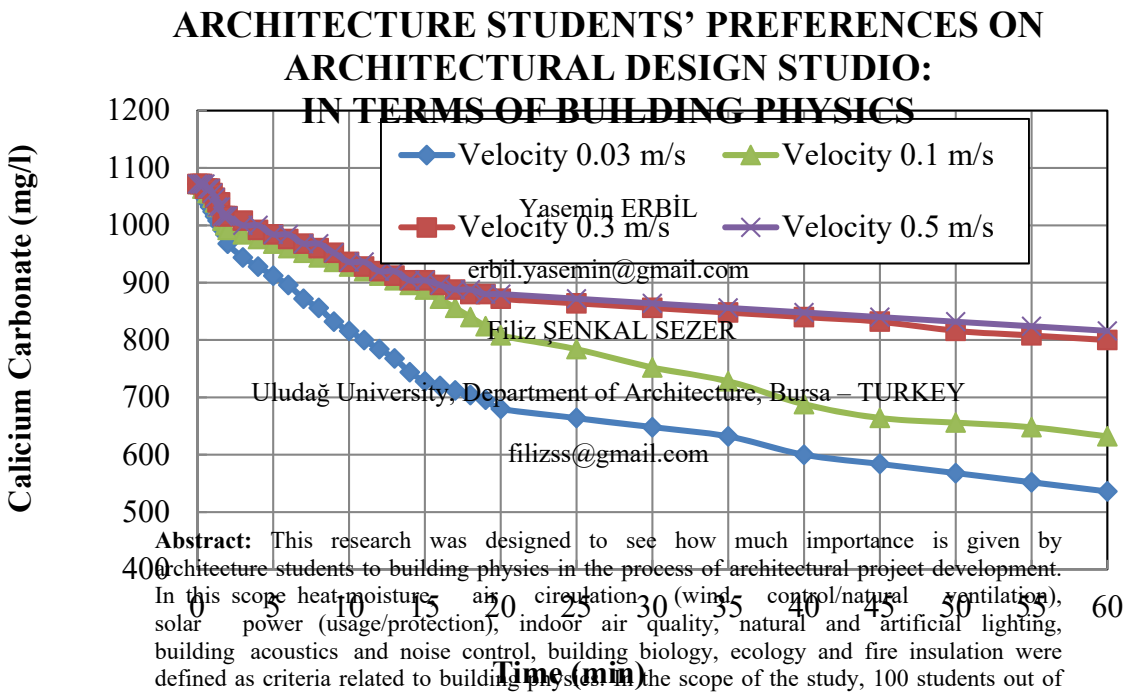

Fig. 19. Calcium carbonate concentration at pH 8.3, 90°C, and 0.96 T magnetic field at different velocities.

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Keywords: Architectural Design Studio, Architecture Students' Preferences, Building Physics

Fig. 17 shows the performance of AMM at 50°C; while Figs. 18 and 19 show the performance of AMM in retarding calcium carbonate at 70 and 90°C, respectively.

It is clear from Fig. 17 that the effective concentration decreased as the flow velocity decreased, where at 0.5 m/s, the effective concentration was 800 mg/l which decreased to 500 mg/l at a flow velocity of 0.03 m/s.

It can be concluded from Fig. 17 that the performance of AMM improved when the flow velocity increased from 0.03 m/s to 0.1, then to 0.3, until a critical flow velocity, equal to 0.5 m/s was reached. After the critical flow velocity, the effect of AMM would be demolished.

Figures. 18 and 19 confirm the fact that as the flow velocity increased, the effectiveness of AMM in retarding calcium carbonate increased. Furthermore, Figs. 18 and 19 confirm the effect of temperatures, where, as the operating temperature increases, the performance of AMM improved.

Performance of Magnetic Treatment Method in Retarding Calcium Carbonate at Different Operating Temperatures. Figures. 20, 21, 22, and 23 show the effect of different operating temperatures on the performance of AMM under the highest magnetic field strength at 0.96 T and a pH of 8.3, and different operating temperature.

It can be concluded from Fig. 20 that when the flow velocity was low at 0.03 m/s, the calcium carbonate scaling can be retarded for about 20 min at 50°C and a concentration of 600 mg/l, the retention time increased to 30 min when the operating temperature increased to 70°C. However, the retention time increased to 40 min when the temperature increased to 90°C.

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ARCHITECTURE STUDENTS' PREFERENCES ON ARCHITECTURAL DESIGN STUDIO: IN TERMS OF BUILDING PHYSICS

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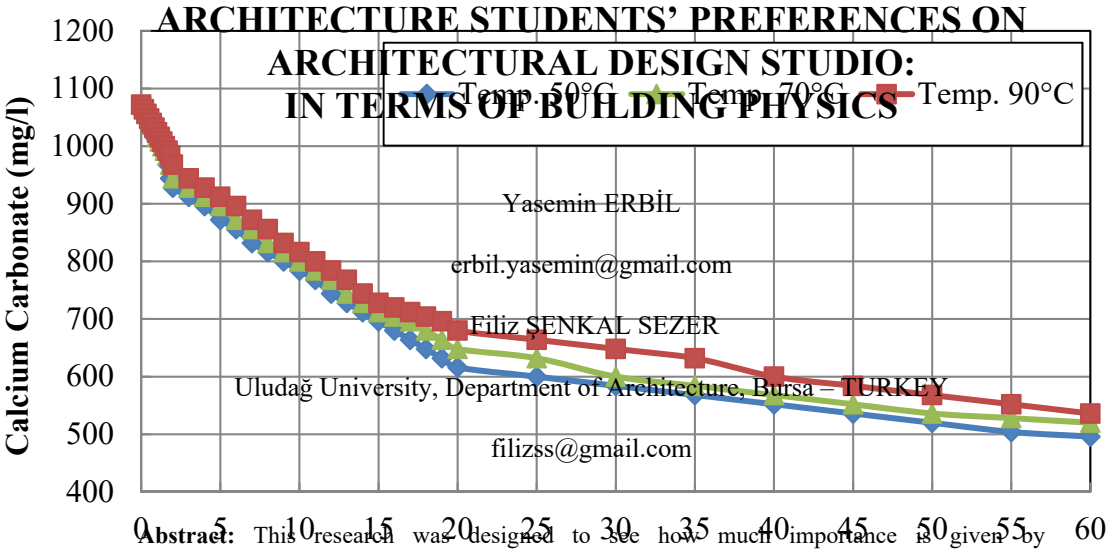

Fig. 20. Calcium carbonate concentration at 0.03 m/s velocity, pH 8.3, and 0.96 T magnetic field at different temperatures.

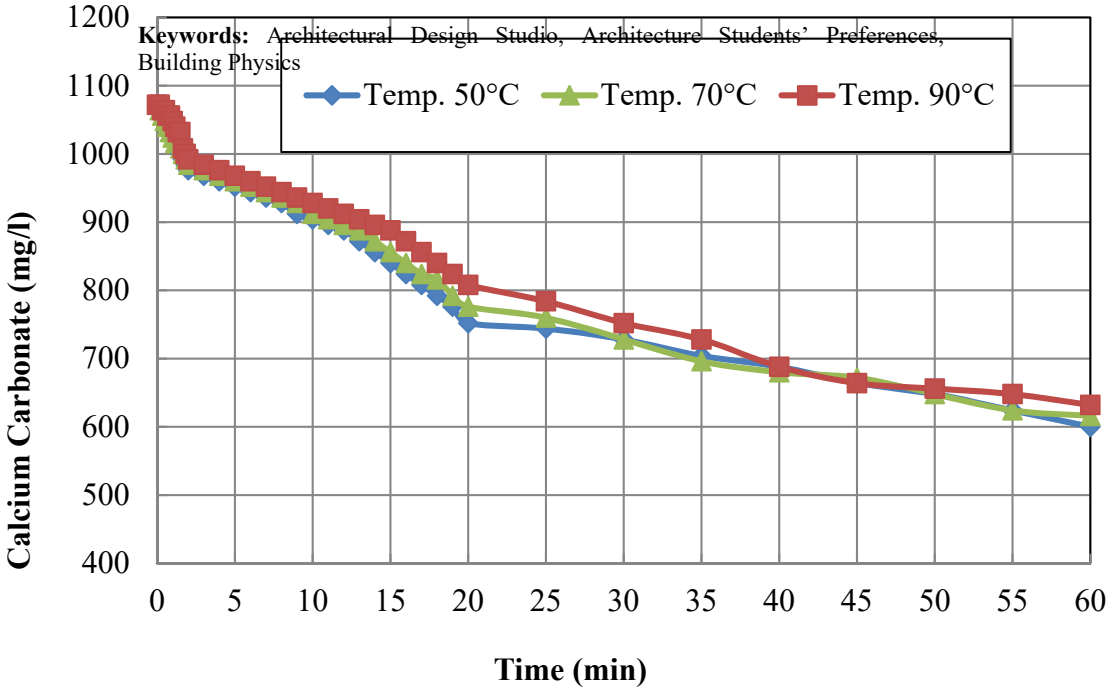

Fig. 21. Calcium carbonate concentration at 0.1 m/s velocity, pH 8.3, and 0.96 T magnetic field at different temperatures.

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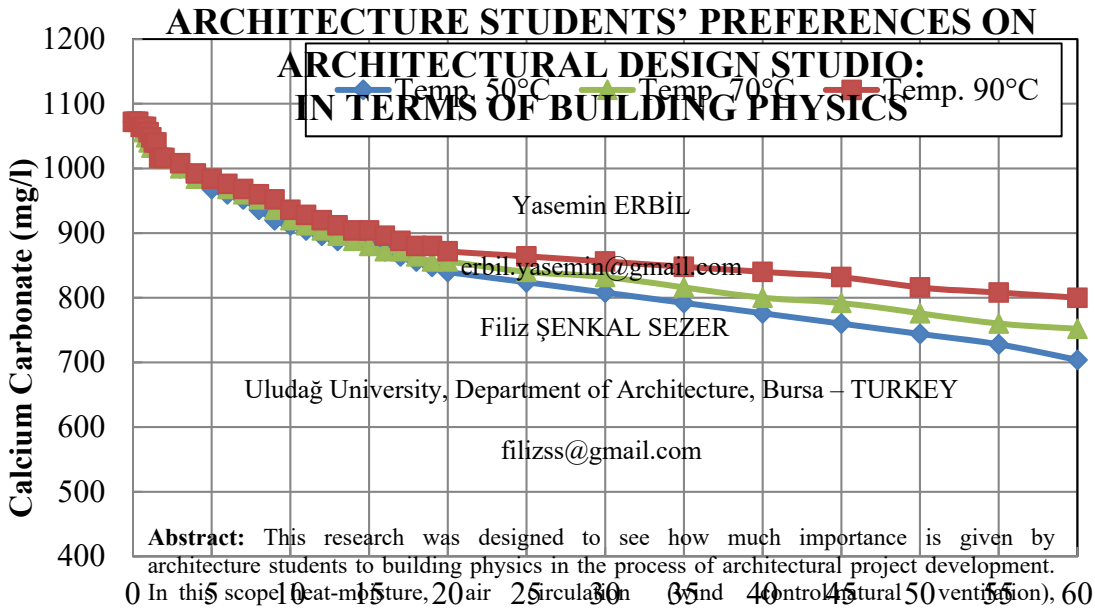

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Fig. 22. Calcium carbonate concentration at 0.3 m/s velocity, pH 8.3, and 0.96 T magnetic field at different temperatures.

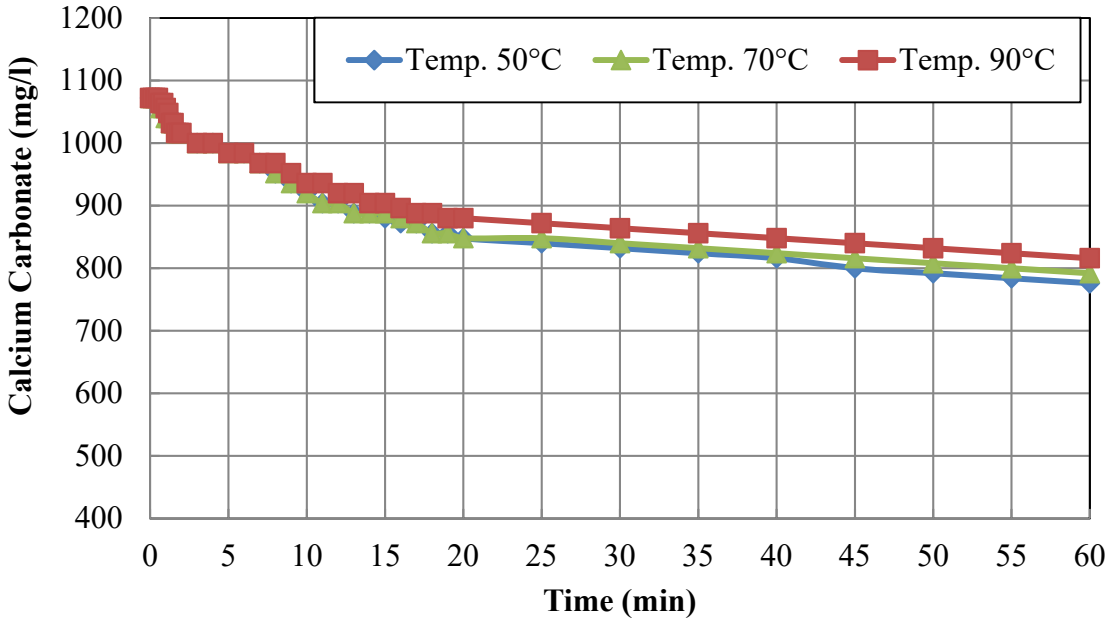

Fig. 23. Calcium carbonate concentration at 0.5 m/s velocity, pH 8.3, and 0.96 T magnetic field at different temperatures.

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The same trend in Fig. 20 was observed within Figs. 21, 22, and 23 as the temperature increased and the retention time increased, which implies that as the operating temperature increased, the performance of AMM in retarding the calcium carbonate scale improved.

Effect of pH on the Performance of Magnetic Treatment Method in Retarding Calcium Carbonate. Figures 24 to 26 show the effect of different pH on the performance of AMM under 0.5 m/s flow velocity and a variable operating temperature and magnetic field.

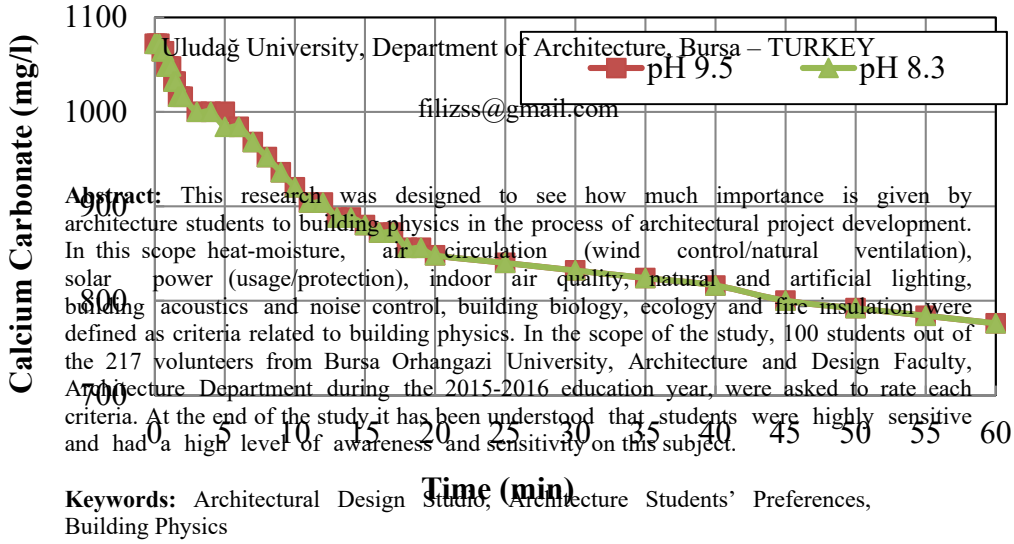

Fig. 24. Calcium carbonate concentration at 0.5 m/s velocity, 50°C, and 0.96 T magnetic field at different pH.

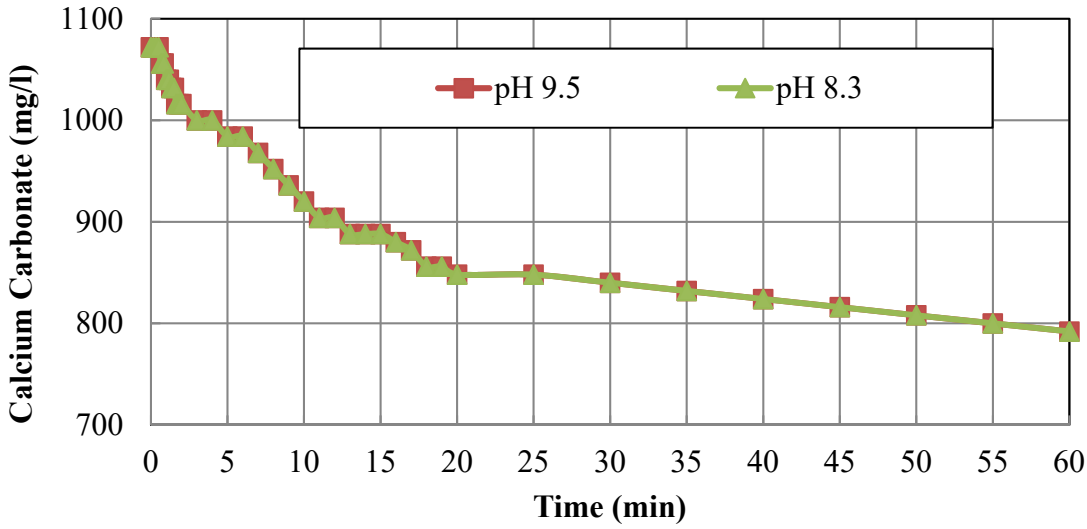

Fig. 25. Calcium carbonate concentration at 0.5 m/s velocity, 70°C, and 0.96 T MFS and different pHs.

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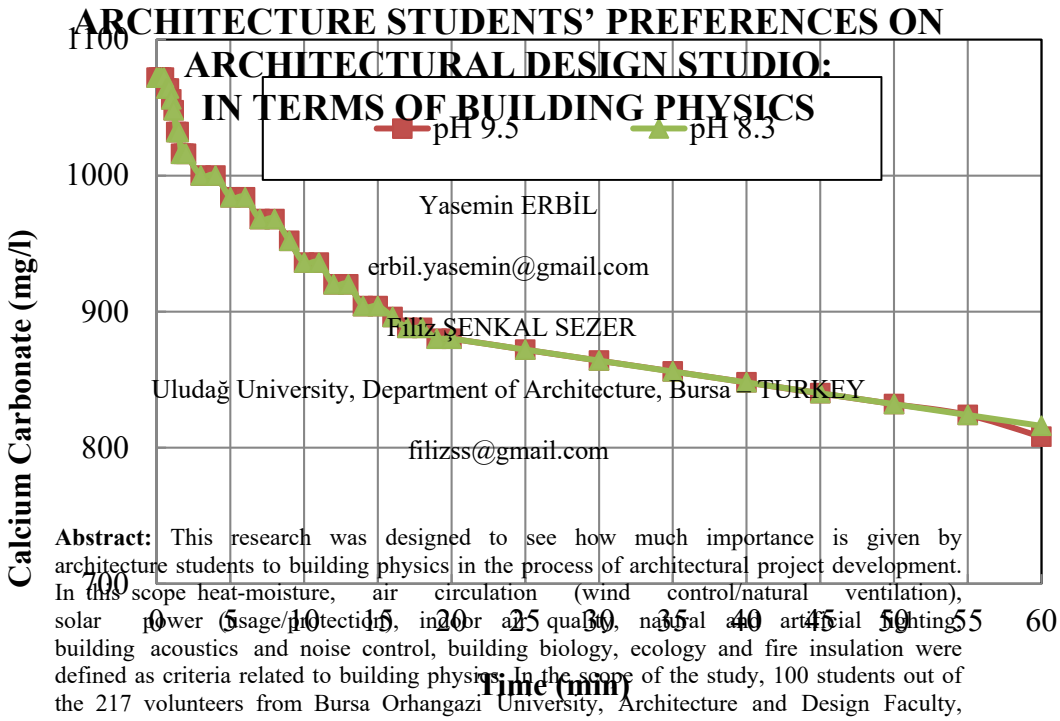

Fig. 26. Calcium carbonate concentration at 0.5 m/s velocity, 90°C, and 0.96 T MFS at different pHs.

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It was found that from previous Figs. 23, 24, 25, and 26, the effect of pH on the performance of AMM in retarding calcium carbonate at high flow velocity (0.5 m/s) was negligible, where a similar effect was found in Figs. 24, 25, and 26. Hence, pH cannot be considered an effective parameter on the performance of AMM in retarding calcium carbonate scaling.

Conclusions

Based on the test results and data analysis, the following conclusions have been derived.

- It was confirmed that the effectiveness of AMM increased as the magnetic field strength increased.
- The performance of AMM in retarding calcium carbonate could depend on different parameters as flow velocity, operating temperatures, and magnetic strength.
- AMM decreased the potential of calcium carbonate scaling, at a concentration of 800 mg/s of calcium carbonate and at a flow velocity of 0.5 m/s by a three-fold increase.
- The power to retard calcium carbonate using AMM increased when the applied magnetic field was increased.
- The power to retard calcium carbonate using AMM increased when the operating temperatures were increased.

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- AMM was effective in retarding calcium carbonate at a concentration level of 700 mg/l when the flow velocity was 0.1. However, the effective concentration level decreased to 500 mg/l as the flow velocity decreased to 0.03 m/s.
- The flow velocity is the key parameter of the performance of AMM in retarding calcium carbonate, while other effecting parameters had lower effect on the performance of AMM in retarding calcium carbonate.
- The performance of AMM in retarding calcium carbonate scaling at pH 8.3 and 9.5 was found to be similar, and the pH cannot be considered an effective parameter on the performance of AMM in retarding calcium carbonate scaling.

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ANTIBACTERIAL THIN FILM COATING BY SOL-GEL PROCESS

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Sol-gel process is one of methods of manufacturing inorganic and hybrid organic-inorganic material. Hybrid material comprises two different substances at the molecular scale. Sol-gel method begins processing with a solution containing components for the desired source material. Initially, the solution upon the formation of polymers and fine colloidal particles (sol) is obtained and then sol is converted to a gel. Solution was cooling physics in the process of appropriate, then given the desired shape with the mounting, coating and fiber drawing methods. Then to get the desired product is obtained by heating at high temperature from dried gel.

Copper, silver, zinc and metals and their ions are known to antibacterial. Especially silver has a broad antibacterial spectrum of these substances. Silver shows high levels of toxic properties against bacteria, but less toxic to humans. Silver has been a material known to be used for sanitary and medical purposes since ancient times. In recent years, there have been many research on the antibacterial silver-doped materials.

In this study, silicate-based thin films containing Ag + contribution were prepared by sol-gel method and the antibacterial properties of films have been investigated. For this purpose, non-Ag contribution and rates varying between 1% and 5% Ag + doped antibacterial films were prepared by spin coating method on the glass surfaces. The prepared samples were cultivated bacteria Staphylococcusaureus and bacterial colony counts were performed at 0., 6.,12., and 24. hours. As a result of antibacterial tests, when silver ions increase in the samples, numbers of bacterial colonies were observed to have disappeared quickly. In addition, crystallographic structure of thin coatings were examined by XRD instrument, also the thin films microstructures were determined by SEM instrument.

Keywords: sol-gel, antibacterial, coating

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Introduction

Architectural design studios aim to create a connection between theory and implementation in the architecture education programs. Architectural design studios are central parts of and create the foundation of architecture education programs (Schön, 1985; Kuhn, 2001; Oh, Ishizaki, Gross, Yi-Luen, 2013). Architectural Design classes contain many fields, which are integrated to architecture training throughout the education process. Architectural designs not only depend upon context, topography, information of the physical environment, construction, materials and details, but also on features that can be considered as a part of the building physics such as heat-humidity, air circulation (control of wind/natural ventilation), solar power (usage/protection), indoor air quality, natural and artificial lighting, building acoustics and noise control, building biology and ecology, and fire insulation. But when observed from the point of view of an architectural design class administrator, the general belief during the education process is that technical matters related to buildings and building physics remain in the background when compared with the architectural design process, and that there are some difficulties in integrating information related to building physics to architectural design project (Erbil Y., 2009). In order to overcome this difficulty, approaches that are based on performance come to the forefront in which technical information is considered together with the design problem. In this approach a building is examined as a system and students are thought that even small decisions can have an impact on the whole building. This way the building physics, which cause performance deficiencies, are brought to the agenda and evaluated during taking design decisions. This aims to provide the students the ability to integrate all the information students gather with their designs (Altun et al., 2006). This study will examine the importance given by architectural design studio students to buildings physics.

Materials and Methods

This study was designed to understand how much importance is given to building physics criteria by architecture students during architectural project development process. In the scope of this research a survey was implemented, which was prepared by the authors. There were 18 questions in the survey. The questions were related to heat-humidity, air circulation (control of wind/natural ventilation), solar power (usage/protection),

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indoor air quality, natural and artificial lighting, building acoustics and noise control, building biology and ecology, and fire insulation criteria and students were required to present how much they value each statement.

The sample of the survey is composed of students that were receiving education in the Bursa Orhangazi University Architecture and Design Faculty during the 2015-2016 academic year. The population of the study is composed of 217 active students. The main portion of the study is composed of first, second and third year students (there were no fourth year students). 24 of the students that participated in the survey were 1st year students, whereas 46 were second year, and 30 were third year students. The questionnaire was answered 100 times. The responses to the questionnaire were received between 1st 03, 2016 and 11th 03, 2016. The responses were assessed on a 5 level Likert type scale.

Results and Discussion

When the demographic findings of the survey are examined it has been seen that 74% of the students are women and 26% of the students are men. When the demographic findings of the survey are examined it has been seen that 24% of the students are 18 years old, 46% are 19 years old and 30% of the students are 20 years old.

Within the scope of the questionnaire, architecture students were asked to rate the importance of building physics criteria they encounter while designing their architectural design projects. According to the questionnaire, the building physics criteria of architecture students could be followed under the eight sections. These criteria were related to heat-humidity, air circulation (control of wind/natural ventilation), solar power (usage/protection), indoor air quality, natural and artificial lighting, building acoustics and noise control, building biology and ecology, and fire insulation criteria and students were required to present how much they value each statement related to the criteria.

Heat-humidity: Related to the heat-humidity criteria the following answers were given to the following statements: "I care about integrating heat insulation in my projects"; 16% very great importance, 38% great importance, 31% moderate, 15% little importance and 0% very little importance. "I care about profiles' and glass' heat performance"; 18% very great importance, 26% great importance, 36% moderate, 12% ü little importance and 8% very little importance. "I care about the heat performance of building structures such as walls, tiling, doors and windows"; 18% very great importance, 26% great importance, 36% moderate, 23% little importance and 8% very little importance. "I care about designing my projects with simple plans and compact form to reduce heat dissipation and energy consumption"; 11% very great importance, 20% great importance, 29% moderate, 34% ü little importance and 6% very little importance (Figure 1).

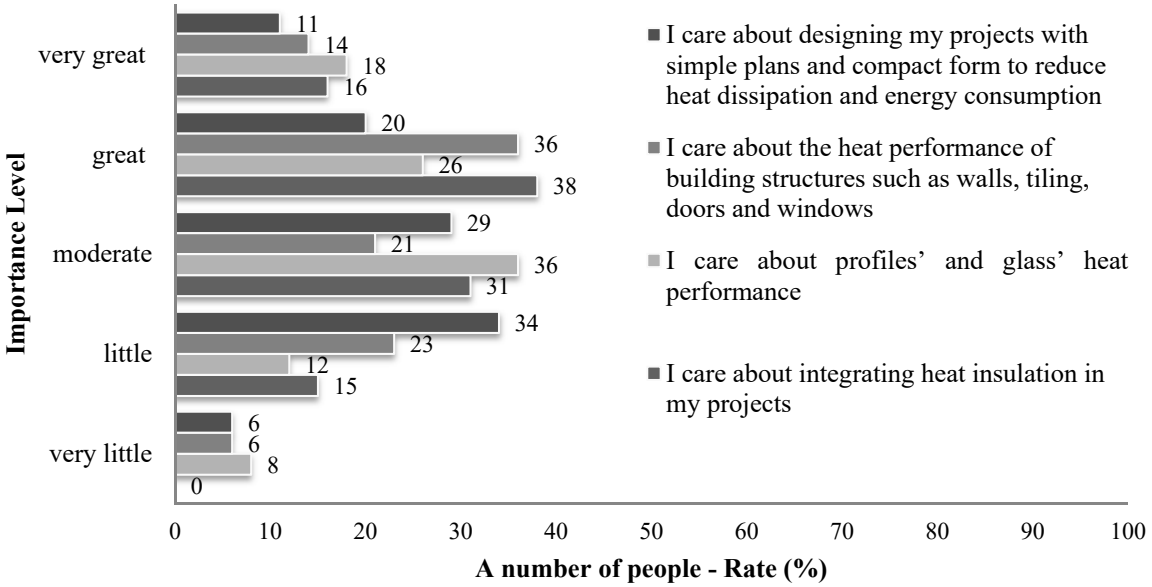

Figure 1. Architecture students' preference on "heat-humidity insulation" in percentages

Air circulation (wind control/natural ventilation): Related to the air circulation (wind control/natural ventilation) criteria the following answers were given to the following statements: "I care about creating adequate natural ventilation in my projects"; 25% very great importance, 45% great importance, 19% moderate, 9% little importance and 2% very little importance (Figure 2).

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ARCHITECTURE STUDENTS' PREFERENCES ON ARCHITECTURAL DESIGN STUDIO: IN TERMS OF BUILDING PHYSICS

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Abstract: This research was designed to see how much importance is given by architecture students to building physics in the process of architectural project development. In this scope heat-moisture, air circulation (wind control/natural ventilation), solar power (usage/protection), indoor air quality, natural and artificial lighting, building acoustics and noise control, building biology, ecology and fire insulation were defined as criteria related to building physics. In the scope of the study, 100 students out of the 217 volunteers from Bursa Orhangazi University, Architecture and Design Faculty, Architecture Department during the 2015-2016 education year, were asked to rate each criteria. At the end of the study it has been understood that students were highly sensitive and had a high level of awareness and sensitivity on this subject.

Keywords: Architectural Design Studio, Architecture Students' Preferences, Building Physics



Figure 2. Architecture students' preference on air circulation in percentages

Solar Power (usage/protection); Related to the solar power (usage/protection) criteria the following answers were given to the following statements: "I care about designing buildings where I can use solar power": 13% very great importance, 43% great importance, 24% moderate, 17% little importance and 3% very little importance. "I care about placing the buildings that I design in a way that enables the building to use sun for heating and wind for cooling and ventilation": 25% very great importance, 45% great importance, 13% moderate,12% little importance and 5% very little importance (Figure 3).

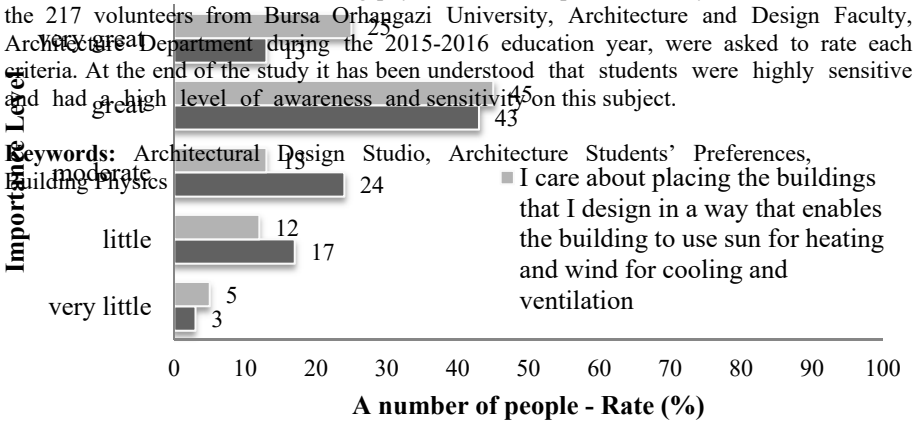

Figure 3. Architecture students' preference on solar power in percentages

Indoor air quality: Related to the indoor air quality criteria the following answers were given to the following statement: "I care about ensuring adequate natural ventilation when I decide on the windows areas in my projects"; 17% very great importance, 30% great importance, 30% moderate, 19% little importance and 4% very little importance (Figure 4).

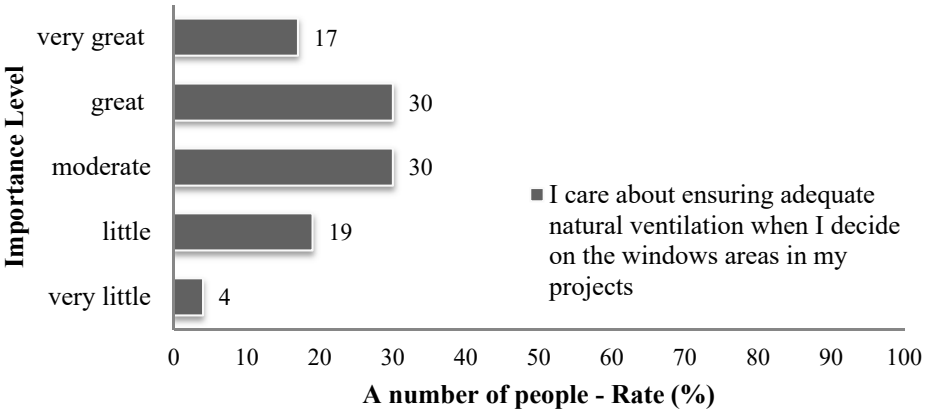

Figure 4. Architecture students' preference on indoor air quality in percentages

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Keywords: Architectural Design Studio, Architecture Students' Preferences, Building Physics

Natural and artificial lighting: Related to the natural and artificial lighting criteria the following answers were given to the following statement: "I care about natural and artificial lighting in my designs to provide the conditions for visual comfort"; 25% very great importance, 47% great importance, 16% moderate, 10% little importance and 2% very little importance. (Figure 5)

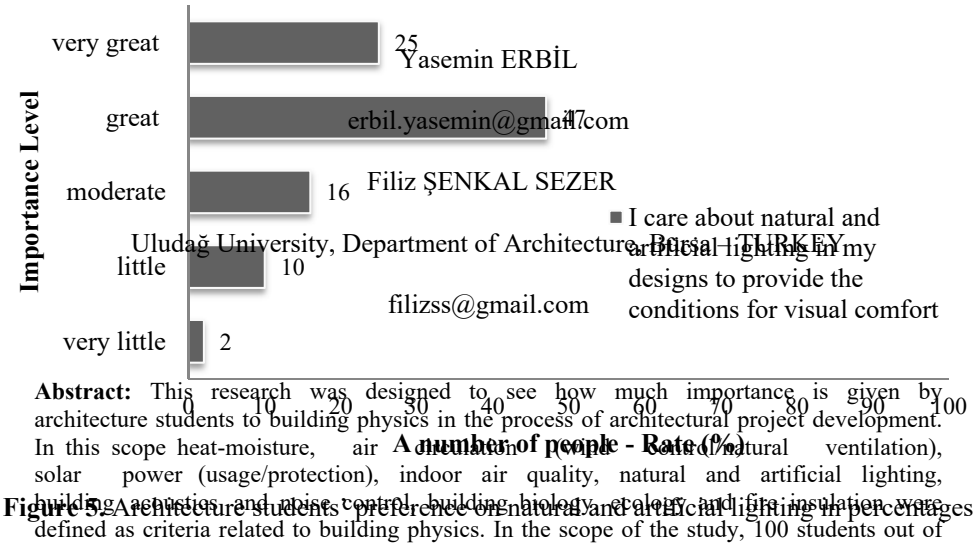

Figure 5. Architecture students' preference on natural and artificial lighting in percentages

Building acoustics and noise control: Related to the building acoustics and noise control criteria the following answers were given to the following statement: "I care about creating designs that create audial comfort conditions"; 21% very great importance, 39% great importance, 32% moderate, 6% little importance and 2% very little importance. (Figure 6)

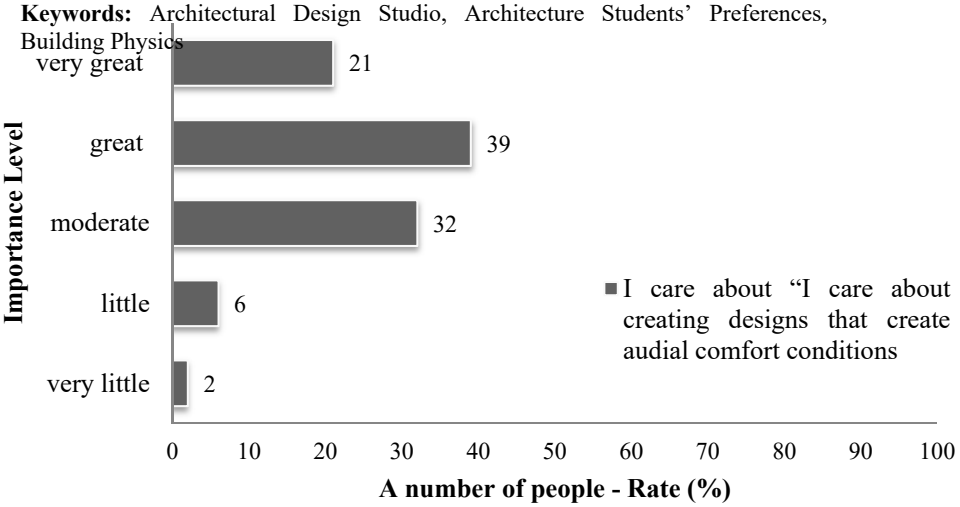

Figure 6. Architecture students' preference on building acoustics and noise control in percentages

Building biology and ecology: Related to the building biology and ecology criteria the following answers were given to the following statement: "I care about designs that preserve the land's natural contours and that harms the soil to the least amount"; 22% very great importance, 48% great importance, 22% moderate, 8% little importance and 0% very little importance. "I care about collecting and using rainwater"; 17% very great importance, 26% great importance, 36% moderate, 16% little importance and 5% very little importance. "I care about using botanical natural materials (wood, straw, fungi, etc.) in designs"; 14% very great importance, 36% great importance, 35% moderate, 14% little importance and 1% very little importance. "I care about using local materials in my design"; 17% very great importance, 35% great importance, 30% moderate, 18% little importance and 0% very little importance. "I care about using materials with less embodied energy"; 11% very great importance, 26% great importance, 43% moderate, 16% little importance and 4% very little importance. "I care about reusing recycled or recovered building materials or components"; 12% very great importance, 28% great importance, 45% moderate, 14% little importance and 1% very little importance (Figure 7).

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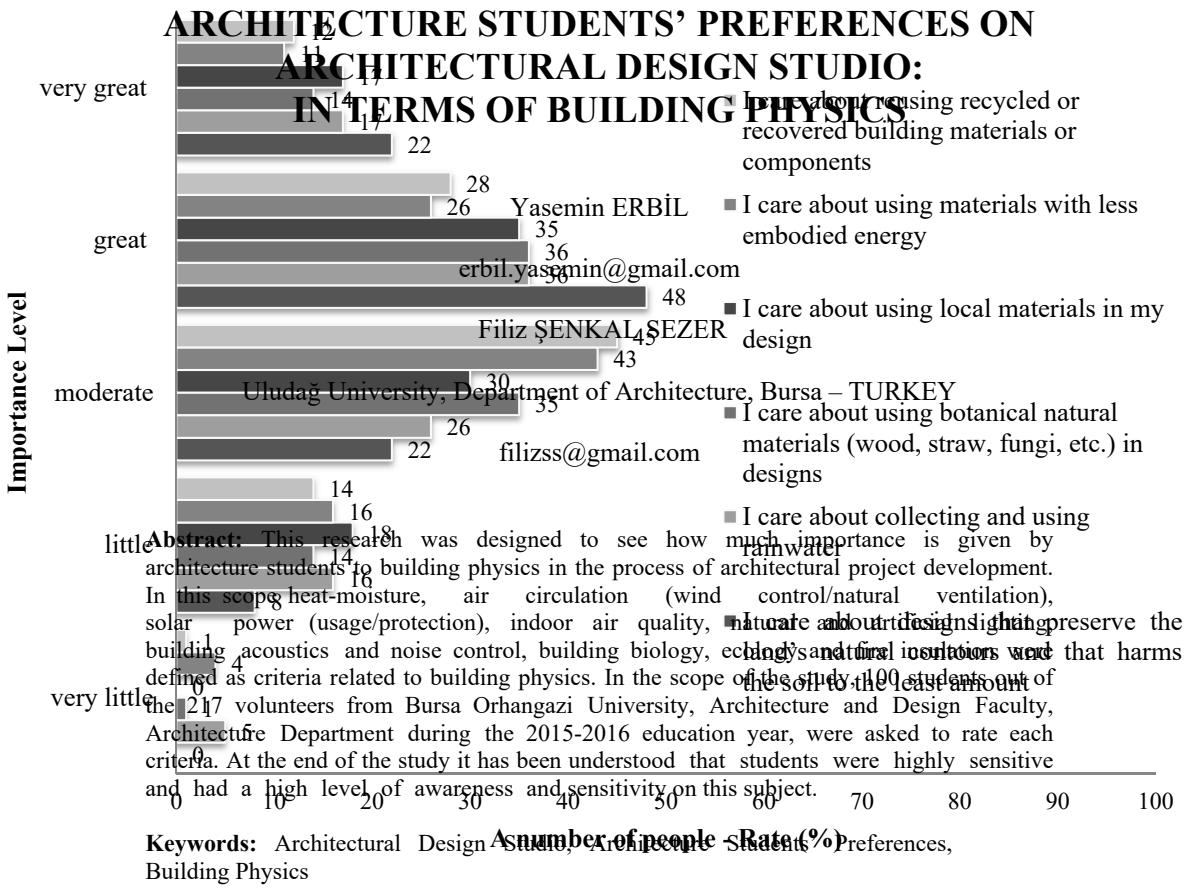

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Keywords: Architectural Design Studio, Architecture Students, Preferences, Building Physics

Figure 7. Architecture students' preference on building biology and ecology in percentages

Fire insulation: Related to the fire insulation criteria the following answers were given to the following statement; "I care about taking precautions related to fire insulation in my designs"; 19% very great importance, 35% great importance, 24% moderate, 19% little importance and 3% very little importance (Figure 8).

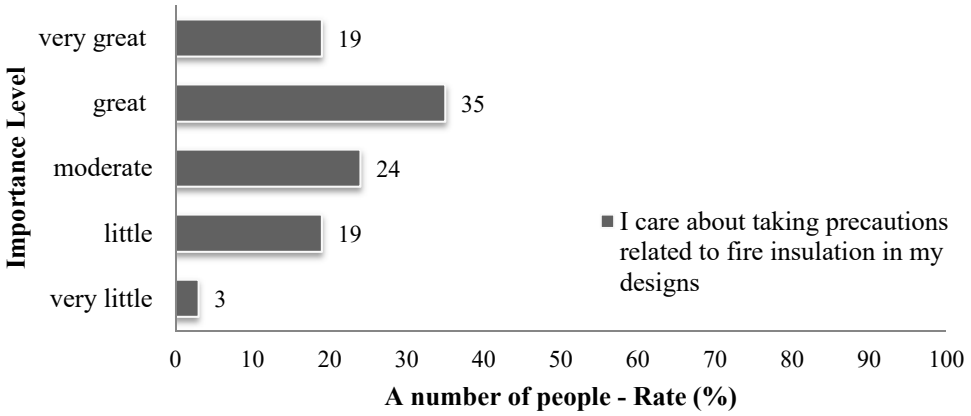

Figure 8. Architecture students' preference on fire insulation in percentages

Conclusion

The building physics lessons in the scope of the architecture curriculum in Turkey aims to establish the required comfort conditions that enable people to be healthy and productive. In Turkey, building physics lessons are imperative in undergraduate programs. Also there are selective classes related to this subject. In accordance with these data the level of significance score was voted within -2 and +2. In this regard the findings from this study are summarized below (Table 1). The findings indicate that all the building physics criteria were highly valued by the students. However even though building physics lessons are in the curriculum as elective and imperative classes they are mostly not adequate and students find it hard to integrate their building physics knowledge to architectural projects.

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Keywords: Architectural Design Studio, Architecture Students' Preferences, Building Physics

Table 1. Evaluation results of level of significance

BUILDING PHYSICS CRITERIA	STATEMENTS	LEVEL OF SIGNIFICANCE Positive	Negative
Heat-humidity	I care about integrating heat and humidity insulation into my project	+55	
	I care about the insulation performance of joineries and glasses	+50	
	I care about the heat performance of building components such as walls, tiling, windows, doors, etc.	+29	
	I care about designing simple and compact projects to reduce heat dissipation and energy consumption	+7	
Air circulation	I care about creating adequate natural ventilation when I determine the windows in my projects	+82	
Solar power	I care about designing buildings in which I can use renewable energy sources	+46	
	I care about placing the buildings that I design in a way that enables the building to use sun for heating and wind for cooling and ventilation	+73	
Indoor air quality	I care about creating adequate natural ventilation when I decide on window areas in my projects	+37	
Natural and artificial lighting	I care about natural and artificial lighting in my designs to ensure visual comfort conditions	+83	
Building acoustics and noise control	I care about creating designs that create audial comfort conditions	+71	
Building biology and ecology	I care about designs that preserve the land's natural contours and that harms the soil to the least amount	+84	
	I care about collecting and using rainwater	+34	
	I care about using botanical natural materials (wood, straw, fungi etc.) in my designs	+48	
	I care about using local materials in my designs	+51	
	I care about using materials that have low embodied energy in my designs	+24	
	I care about reusing recycled or recovered building materials or components in my designs	+14	
Fire insulation	I care about taking fire insulation precautions in my designs	+71	

Level of significance: very great importance 2, great importance 1, moderate 0, little importance -1, very little importance -2

When the results of the survey are taken into consideration, it has been seen that the level of awareness and the sensitivity of the students on this subject is high on the subject. In order to increase this level, approaches that help architecture students to understand building physics and that encourage them to increase their knowledge in this area should be employed when project subjects are selected in design studios.

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AVRUPA'DAKİ MİMARLIK ÖĞRENCİLERİNİN TERCİHLERİ ÜZERİNE BİNA FİZİĞİ AÇISINDAN BİR ARAŞTIRMA

ARCHITECTURE STUDENTS' PREFERENCES IN EUROPE: A RESEARCH ON ARCHITECTURAL DESIGN STUDIO IN TERMS OF BUILDING PHYSICS

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Öz: Çalışmamızın konusu Osmanlı İmparatorluğu'nun Balkanlardaki gerilemesinin sosyolojik analizini yapmaktır. Osmanlı İmparatorluğu kısa sürede Balkanlara yerleşmiş, ancak bu bölgeden tamamen çıkması çok uzun sürmüştür. Tarihte imparatorluklara bakıldığında genellikle en geniş sınırlarına ulaşmalarına kadar geçen zaman ile gerilemenin gerçekleştiği zaman arasında ilkinin ağır bastığı bir oran görülür. Ancak Osmanlı İmparatorluğu'nda durum aksi bir oluşum görülecektir. Özellikle Balkanlar'da bu oran çok daha belirgindir. Bu çalışma bu problemden hareketle, devşirme sistemi, Balkanlardaki şehirleşme, yapı, sokak ve tasavvufi oluşumlar bütününde bu duruma açıklama getirmektedir.

Anahtar Kelimeler: Osmanlı, Balkanlar, devşirme sistemi, vakıflar, tasavvuf.

Abstract: This research aims to analyze the sociological decline of Ottoman Empire in the Balkans. Although Ottoman Empire settled in the Balkans in a short time, it took a very long time to withdraw from there completely. In the history, the ratio between the time when empires reached their widest borders and the time when they started to decline is usually in favor of the former. However, the Ottoman Empire is an exception to this rule. This is especially true for the Balkans. This study aims to explain this situation by examining the devshirme system, urbanization in the Balkans, and architectural, mystical and social formations in general.

Keywords: Ottoman, Balkans, devshirme system, vakıfs, mysticism.

Giriş

Osmanlı Devleti ile ilgili her alanda yapılan çalışmalar tasnif edildiğinde kuruluş ve yükselme devri üzerine çalışmaların belirgin bir üstünlük taşıdığı görülecektir. Tarihimizle ilgili ilk akla gelen ve duymak istediklerimiz genelde fütuhat olmuştur. Gerek lise tarih derslerimizde, gerek küçüklere tarih hikayelerinde genellikle büyük zaferlerden bahsedilir, ancak yenilgiler üstünkörü anlatılır, geçiştirilir. Kanunî'ye kadar olan sultanlar bir çırpıda sayılabilirken, duraklama devri sonrasında bu sıra çok kimsede şaşmaktadır.

Söz konusu refleksler toplum psikolojisi açısından anlaşılır bir durum kabul edilebilir. Eşyanın tabiatı gereği üstünlük, zaferler, olumlu yönler görülür, aksi durumlar bastırılır. Bu nedenle bir Osmanlı refleksi olarak gerileme döneminde yaşananlar psikolojik bir savunma mekanizması olarak bastırılmaya tabi tutulmuştur. Osmanlı'nın kuruluş ve yükselme devri gerçekten takdire şayan zaferlerle doludur. Gerek İstanbul'un Fethi'ne kadarki Balkanlar'da gerçekleşen başarılar, gerekse Fetih sonrası birbirinden parlak yükselme devri padişahları dönemleri, milli duyguları kabaracak zaferlerle doludur. Bunun yanı sıra Sokollu'nun ölümünden sonra girilen duraklama dönemi sürecinden itibaren aynı hislerle moral bozucu süreçler yaşanmıştır. Ancak Osmanlı İmparatorluğu'nun gerileme ve çöküş dönemi tabir ettiğimiz tarih aralıkları gerçek anlamıyla incelendiğinde, yaşanan sürecin bir yenilginin aksine kendine özgü bir başarı süreci olduğu görülecektir. Ve Osmanlı'nın gerileme dönemi gerçekte bir açıdan bakıldığında sanıldığının aksine farklı bir zafer niteliği taşımaktadır. Bu çalışmamızda söz konusu zaferin anlamını ortaya koymaya ve Osmanlı İmparatorluğu'nun Balkanlardaki gerileyişinin sosyolojik analizini yapmaya çalışacağız. Belli bir perspektifle bakıldığında bir devlet için olumsuz bir durum olan gerileme ve çöküş süreci, kendi içinde nasıl bir başarı öyküsü olarak kabul edilebilir ve bu durumun siyasal ve sosyal nedenleri nelerdir sorunsalı çalışmamızın ana eksenini oluşturacaktır.

Osmanlı'nın Avrupa'daki Görüntüsü

Bilindiği üzere Osmanlı bir beylik olarak Anadolu'nun Bitinya ucu tabir edilen bölgesinde kurulmuş ve ilerlemesini kuruluş döneminde sürekli batıya doğru gerçekleştirmiştir. Ve denilebilir ki Osmanlı'nın hızlı ilerlemesinin en önemli sebebi, diğer beyliklerden farklı olarak Bizans sınırında yerleşmiş olması ve nedenle beylikler arası mücadele yerine "gaza" fikriyle "küffara karşı" bir mücadeleye girmiş olmasıdır. (Kemal Tahir, 1967) Bu durum Anadolu içinden birçok unsurun da Osmanlı Beyliği'ne katılmasını ve giderek büyüyen bir kitle ile beyliğin kuruluş dönenimde bir "gaziler birliği" haline gelmesini sağlamıştır. (Wittek, 2000) Bu nedenle hızlı bir ilerleme sağlanacaktır. Osmanlı'nın Rumeli'ye geçişi 1352 yılında Çimpe Kalesi'nin alınması ile başlar. Kuruluşundan 50 yıl sonra Osmanlı Beyliği bu şekilde Balkanlara geçişin toprak kazancı anlamında ilk adımını atmıştır. Balkan fütuhatını sırasıyla Sırpsındığı (1364), I. Kosova (1389), Niğbolu (1396), Varna (1444) ve II. Kosova (1448) savaşları izler. Bu son savaşla birlikte Balkanlarda Osmanlı egemenliği tam anlamıyla tesis edilmiştir ve II. Viyana Kuşatması'na kadar da bölgede diğer dönemlere oranla daha sakin ve huzurlu bir ortam söz konusudur. Viyana ile başlayan duraklama ve ardından gelen yenilgiler serisi ve toprak kaybı çöküş sürecine kadar devam etmiştir. Bu süreç sonunda Avrupa'daki topraklar tamamen elden çıkmış, 1912-1913 Balkan Savaşları sonucunda Balkanlar kaybedilmiş ve Osmanlı İmparatorluğu'nun Rumeli'deki toprakları önce Midye-

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Enez hattı sonra bir miktar daha ötesi dâhil edilerek Edirne, Tekirdağ ve Kırklareli sancakları ile sınırlı kalmıştır. Yükselme Devri'nde Balkanlardaki toprakları Anadolu'dan daha fazla olan ve bir *"Balkan İmparatorluğu"* olarak nitelendirilebilecek Devlet'in elinde 1913 sonrasında bu bölgede üç vilayetlik bir toprak parçası kalmıştır. Birinci Dünya Savaşı sonunda da Balkan Değu Eden çıkacak ve Osmanlı İmparatorluğu yeniden Anadolu'ya sıkışacaktır.

Yukarıdaki kısa Balkanlar kronolojisi üzerinden basit bir matematik hesabı yapacak olursak sözünü ettiğimiz Osmanlı gerilemesinin aslında bir başarı hikâyesi olduğu daha net ortaya çıkacaktır. Kuruluşundan en geniş sınırlara ulaşmasına kadar geçen süre yaklaşık 300 yıl olan İmparatorluk, bu noktadan yıkılışa gene 300 yılda gelmiştir. Kendinden önceki özellikle Orta Asya Türk devletleri tarihine bakıldığında aradaki fark belirgin şekilde görülecektir. Çok kısa sürede çok geniş topraklara yayılan devletler, genellikle en parlak hükümdarlarından sonra çok kısa sürede çöküş sürecine girmişlerdir. Ki, biz bu hesabı 1299 tarihinden bakarak yapmaktayız. Bilindiği gibi 1402 tarihinde Ankara Savaşı'nda Devlet dağılmış, Fetret Devri'nin ardından yeniden kurulmuştur. Bu tarihten baz alınırsa 1402-1595 arası gerileme, 1595-1922 arası ise toprak kaybetme dönemi olacaktır ki, 200 yıla 300 yıllık bir oran ortaya çıkacaktır. İlaveten söylenecek çok önemli bir gerçek de şudur ki, 1402 bozgunundan sonra Osmanlı'dan bağımsızlığını kazanarak Anadolu'da beylikler yeniden kurulurken Balkan toprakları hiçbir şekilde elden çıkmamış, fethedilen bölge halkları bağımsızlık telaşına düşmemişlerdir. Bir devletin gerileme ve çöküşünün 300 yıl sürdüğü tarihte başka çok az sayıda örnek bulunmaktadır. Osmanlı'nın parçalanma dönemi olarak nitelendirilebilen 19. yüzyılda adına *"güneş batmayan imparatorluk"* denilen İngiliz İmparatorluğu doğmuş, büyümüş ve dağılmıştır. Bu anlamda Batı'da belli bir süre dünya egemenliğini temsil eden bir ülke bile Osmanlı'nın sadece çöküş dönemi kronolojisine sığabilmektedir.

Konunun bir diğer boyutu ve daha dikkat çekici yanı Balkanlar olacaktır. Matematik hesabını Balkanlar yönünden yapacak olursak daha çarpıcı bir sonuç ortaya çıkmaktadır. Osmanlı Devleti'nin Balkanlardaki hâkimiyetinin tam anlamı ile tesis edilmesi ve Avrupalıların Türkleri Avrupa dışına atma ümitlerinin tamamen kaybolması Varna (1444) ve II. Kosova (1448) Savaşları ile sağlanmıştır. Kronolojiyi 1299'dan başlatırsak yaklaşık 150 yıl içinde Balkanlar Osmanlı egemenliğine girmiş, ancak 450 yılda bu egemenlik son bulmuştur. Bu, büyük çoğunluğu farklı dinden olan ve fetihle ele geçirilen bir alanda idaresini tesis eden bir devlet için mucize kabilinden bir durumdur. 150 yılda ele geçen topraklar 450 yılda elden çıkmıştır. Hızlı bir fetih sürecine karşı, toprak kaybı üçte bir zaman oranında gerçekleşmiştir ki, bu oran tarihte hiçbir devlette yoktur.

Yukarıda belirttiğimiz kronolojik detaylar, *"Balkanlar sosyolojisi"* üzerine dikkatle eğilmemizi gerektirmektedir. Tarihte eşi benzeri görülmemiş bu çekilme öyküsü, yalnızca askeri bir direniş değil aynı zamanda derin bir sosyolojik analiz gerektiren bir durumdur. Balkanlardan daha büyük Orta Doğu toprakları tek bir savaş sonunda, yalnızca dört yıl içinde elden çıkarken dört yüz elli yıl süren direniş sürecinin hassasiyetle incelenmesi gerekir. Burada bunun nedenlerini ortaya koymaya çalışacağız.

Balkanlardaki uzun süreli Osmanlı varlığını açıklama girişimlerinde ilk akla gelen sebep engin Osmanlı hoşgörüsü olmaktadır. Fatih Sultan Mehmet'in İstanbul'u fethettiğinde Ayasofya ahalisine sözleri bu durumun simge örneklerinden biridir. Osmanlı'nın fethettiği yerlerdeki inançlara olan hoşgörüsü ve her türlü dinî ve etnik kimliğe duyduğu saygı, varlığının kalıcılığını sağlamadaki elbette en önemli unsurlardan biri olmuştur. Ancak tek başına yeterli bir açıklama değildir. Ayrıca bu hoşgörünün de sosyolojik temelli açıklamasının yapılası gerekmektedir. Hoşgörü, fethedilen yerlerde nasıl Devlet algısı oluşturmuştur? Nasıl bir Türk ve Osmanlı algısı, yüzyıllarca kaynaşık halklar profili yaratmıştır? Bunun üzerinde durulması kanımızca daha doğru olur.

Gerilemenin çok yavaş olması, ilerlemenin çok sağlam olması nedeniyledir. Sağlam bir kök salış, kısa sürede yok olmayı engellemiştir. Bu nedenle Osmanlı İmparatorluğu'nun bölgedeki hızlı ilerlemesinin askeri sebepler dışında kalan ve uzun süreli egemenlik imkânını sağlayan dinamiklerini ortaya koymak gerekecektir.

Yüzlerce yıllık Osmanlı damgasını açıklayabilmek için ilk olarak Osmanlı devlet teşkilatının analiz edilmesi ve özellikle "devşirme" yönteminin konu ile bağlantısı ortaya konabilir. Devlete onlarca vezir, sayısız bürokrat veren bir bölgedeki sürekliliğin kaynağını açıklamak için bu durum önemli bir unsurdur. Bu nedenle Osmanlı sınıfsal yapısının ve yönetici sınıf unsurlarının Balkan halkları ile ilişkisi ciddi bir araştırma konusudur. Bilindiği üzer Osmanlı yönetici sınıfı padişahın altında İlmiye, Kalemiye ve Seyfiye adı verilen sacayağı biçiminde üçlü bir yapıdan oluşmaktadır. Bu yapının İlmiye sınıfı hariç diğer ikisinde devşirme sistemi ile yetiştirilen yöneticilerin ağırlığı önemlidir. Ve denilebilir ki Osmanlı devşirme sisteminin en önemli insan kaynağı Balkan Hıristiyan halkları olmuştur. Bu bölgelerden devşirilen çocuklar bürokraside görev alarak devletin en üst kademelerine kadar yükselebilmişledir. Osmanlı'da Balkan kökenli çok sayıda sadrazam bulunmaktadır. Bölge halklarının devlet bürokrasisine girebilmeleri, başka deyişle sınıf atlama olanaklarının bulunması ve devlette kimliğe dayalı bir temsil imkânı olmasa dahi şahsen yer tutabilme imkânlarının olması, devlet ile bağlarının daha güçlü olmasını sağlamıştır. Osmanlı kapıkulu sınıfının uzun dönem büyük çoğunluğu devşirme kökenli yöneticilerden oluşmaktadır. Kuruluş döneminde Anadolu kökenli devlet adamlarını rahatsız eden ve belli bir süre yerli-devşirme çekişmesini ortaya çıkaran bu durum, yer yer Anadolu'da ortaya çıkan ayaklanmaların da nedenleri arasında gösterilebilir. Osmanlı'da "kapıda yer tutabilme" her zaman ön planda olmuş ve devlet içi

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ARCHITECTURE STUDENTS' PREFERENCES ON ARCHITECTURAL DESIGN STUDIO: IN TERMS OF BUILDING PHYSICS

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Abstract: This research was designed to determine the opinions of architecture students to building physics in the process of architectural project development. In this scope heat-moisture, air circulation (wind control/natural ventilation), solar power (usage/protection), indoor air quality, natural and artificial lighting, building acoustics and noise control, building biology, ecology and fire insulation were defined as criteria related to building physics. In the scope of the study, 100 students out of the 217 volunteers from Bursa Orhangazi University, Architecture and Design Faculty, Architecture Department during the 2015-2016 education year, were asked to rate each criteria. At the end of the study it has been understood that students were highly sensitive and had a high level of awareness and sensitivity on this subject.

Keywords: Architectural Design Studio, Architecture Students' Preferences, Building Physics.

çekişmelerin de başlıca nedeni olarak yorumlanır. Balkan halkları için devletlerarasında yer alabilme ihtimal ve imkânlarının bulunması bir açıdan bakıldığında kendi kontrollerindeki devletin uzun süre ayakta kalması için çabalamalarını sağlamıştır. Devşirme sistemi bu anlamda Balkan egemenliğinin sürekliliği açısından önemli unsurlardan bir olmuştur.

Bunun yanı sıra Balkanlardaki üretim ilişkileri ve sınıfsal yapı da önemlidir. Tarih sahnesine çıktığı dönemde Batı'ya doğru uzanan feodal bir dünya ile mücadele eden beylik, sürekli fetihler sonucunda bu feodal dünyanın sınırına kadar dayanmıştır. Bizans'ın Balkanlardaki egemenlik sınırlarına bakıldığında Osmanlı İmparatorluğu ile yaklaşık olarak aynı alanlarda egemenlik sürdüğünü söylemek mümkündür. Balkanlardaki Bizans haritası yaklaşık, aşağı yukarı Osmanlı haritasıdır. Bu durumun Gibbons'un Osmanlı'nın din değiştirmiş bir Bizans olduğu tezine de kaynaklık ettiğini söylemek mümkündür. (Gibbons, 1998) Bu tarihsel gerçeklik Gibbons'un tezinin dayanağını oluşturmuş olabilir. Daha sonra Köprülü de buna antitez olarak Osmanlı'nın kuruluşu ile ilgili farklı bir tez ortaya atacaktır. (Köprülü, 1999)

Bilindiği üzere Roma İmparatorluğu 395 yılında ikiye ayrılmış ve çöken Batı kısmı feodal bir örgütlenme biçimine girmiştir. Avrupa tarihi Roma'nın yıkılışından itibaren feodalizm adı verilen küçük birimler halinde örgütlenmeye dayalı bir askeri/dini örgütlenme biçiminin tarihidir. Doğu Roma ise küçük birimler yerine cephe örgütlenmesine dayalı büyük ölçekli merkezi bir devlet şeklinde biçimlenmiştir ve Batı sınırları günümüz Balkanlarını içine alacak şekilde (Sezer, 1990) Osmanlının 15. yüzyılda dayandığı Balkanlar hattına kadar bu anlamda gerçekte feodal Avrupa'nın ve eski Bizans'ın sınırıdır. Bu süre zarfında Avrupa'nın geri kalan kısmında feodal ilişkiler çözülmeye başlamış ve yeni bir iktisadi düzen kurulmaya başlanmıştır. Osmanlı, Balkanlardaki bu sosyal ve iktisadi yapıya karşı kendi düzen önerisini götürmüş ve Osmanlı sistemi bölge halkları tarafından kısa sürede özümsenmiştir. Balkan halkları feodal ilişkiler yerine merkezi devletlerden yana olmuşlar, Balkan fethi süresince bölgedeki yöneticı unsurlar da Osmanlı saflarına katılmakta tereddüt etmemişlerdir. Doğu Avrupa aristokrat sınıfı ve feodalleri mevcut sistem yerine Osmanlı siyaseti etrafında bütünleşmeyi tercih etmişlerdir. Bu tercihin görüntüsü yalnızca egemenlik kabulü olmamış, başlangıçtan sona kadar çok uzun süre Devlet'in yanında yer almaları ile belirgin şekilde kendini göstermiştir. Örneğin Ankara Savaşı'nda bazı Anadolu Türkmen beyleri Timur saflarına katılırken Sırplar son ana kadar Yıldırım Beyazıt'ın yanında kalmışlardır. Bu sadakati fethedilen bölgelerin Devlet'e asker gönderme zorunluluğundan başka nedenlerle açıklamak gerekmektedir. Balkanların Osmanlılık siyaseti etrafında bütünleştiğini söylemek daha doğru olur.

Osmanlı İmparatorluğu'nun Balkan egemenliğinin diğer bir boyutunu da gerek fetih hareketleri öncesinde, gerekse fetih süreci sırası ve sonrasında bölgeye yönlenen tasavvufî unsurlar oluşturmaktadır. Sadece Balkanlar'da değil Anadolu'nun Türkleşmesi sürecinde de rol oynayan "dervişler" (Barkan, no date), bölgenin sadece askeri bir fethine değil sosyo-kültürel bir yerleşim alanı olmasına zemin hazırlamışlardır. Osmanlı devletinin genişleme sürecinde üç temel politikası bulunmaktaydı: Fetih, imar ve iskân… Kuruluş devrinde Anadolu'daki Ahi teşkilatı ve Balkanlardaki genişleme sürecinde bu bölgedeki tekkeler ve dervişler özellikle iskân siyaseti bağlamında yerleşen Türk ve Müslüman ailelerin gerek dinî temelde organizasyonun gerekse bir siyaset etrafında örgütlenilmesinin önemli bir destekleyici unsuru olmuşlardır.

Balkanlardaki iskân siyaseti sonucunda Anadolu'dan Türk ailelerin bölgeye yerleştirildiği bilinmektedir. Ancak bir o kadar da bölgede Müslüman olan kitle mevcuttur. Boşnaklar en bilinen örnekleridir. Kendilerine Evlad-ı Fatihan denilmektedir. Gene Pomaklar başka bir örnektir. Bu halkların İslamiyet'e yönelmesinde söz konusu dervişlerin rolü önemlidir. Meselenin başka bir boyutu bölgede günümüzde de kimi durumlarda ve kimi yerlerde Müslümanlık kimliği ile Türklük kimliğinin eş anlamlı kullanılır olmasıdır. Her iki kimlik tanımlaması dini ve etnik anlamından sıyrılarak siyaset kavramı adı altında kavramsallaştırılmakta ve "Osmanlılık" siyaseti altında yer almaktadır. Bölge halkı kendini Türk kökenli olmamasına rağmen Müslüman kimliği ile Türklüğü özdeşleştirir ve kendini Türk olarak tanımlar. Bu durum günlük hayatta da kendini göstermektedir. (Taşkıran, 2010) Bu bağlamda bu tasavvufi unsurların bölgede tesis edilecek Osmanlı siyasetinin işlevsel bir parçası olduğunu söylemek mümkündür. Egemenlik altına alınan bölgenin yalnızca askeri bir denetim değil sosyolojik temelleri olan bir hâkimiyet projesi altında değerlendirilmesi, sözünü ettiğimiz çekilme sürecinin neden bu kadar uzun sürdüğünü de açıklamaktadır. Olaya bu açıdan bakıldığında I. Dünya Savaşı ile birlikte Orta Doğu'nun neden çok kısa sürede elden çıktığını da daha iyi anlamak mümkündür. Balkanlardaki iskan siyaseti Arap Yarımadası'nda gerçekleştirilmemiş, bu nedenle bir bölge 400 yılda ancak kaybedilirken, diğer 4 yılın sonunda bir anda ve bütünüyle egemenlik alanı dışına çıkmıştır.

Osmanlı İmparatorluğu'nun Balkan hâkimiyetinin sosyolojik altyapısında karşımıza çıkan önemli bir unsur da bölgedeki vakıf örgütlenmesidir. Vakıflar, sadece bir yardımlaşma kurumu olarak kalmamış, sözünü ettiğimiz fetih, imar ve iskan sacayağının imar boyutunda önemli roller üstlenmişlerdir. Balkan fethi sürecinde askeri ve idari alanda gerçekleşen egemenlik devri yanında bölgenin sosyal meselelerine de el atılmış, bu alandaki imar faaliyetleri vakıflar tarafından finanse edilmiştir. Vakıflar bu boyutu ile sürdürülebilir yardımlaşmanın ve sosyal dayanışmanın önemli bir unsuru olduğu kadar, şehir kültürünün ve Osmanlı mimarisinin tesis edilmesi açısından da çok önemli işlevlere sahip olmuşlardır. Bir bölgede mimari damganın vurulması, başka deyişle şehrin

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imarının sağlanması bölgede yüzyıllarca sürecek kültürel bir etkileşimin başlamasına yol açmıştır. Bu nedenle Balkan vakıfları yalnızca kültürel bir miras değil, somut anlamda da Osmanlı damgasını ve mirasını sağlama noktasında önemli işlevler görmüştür denilebilir.

Sonuç

Balkanlar, kelimenin tam anlamıyla bir Osmanlı toprağı haline gelmiş ve Osmanlı Devleti, yüzyıllar süren bu çekilme sürecinde askeri işgal altında olan bir sömürgeden değil çekilme değil, kendi toprağını kaybetmeme mücadelesi vermiştir. "Balkanlardaki Türk istilasını yalnız maharetli kumandanlar ve askeri kahramanlıklar sayesinde, bir sıra mesud tesadüflerin zoruyla yapılmış ve sadece askeri mahiyette kalmış bir işgal ve istila gibi görmek katiyen doğru değildir. Türklerin imparatorluk kurmak teşebbüsü, büyük ölçüde bir *kolonizasyon hareketi*ydi ve bu iş için Türk soyunun ne kadar, bol ve bereketli olduğu, istladan sonra Rumeli'ne dökülen yüzbinlerce Türk kolonunun imparatorluğun askeri ve idari emniyeti için lazım gelen büyük yolları, geniş vadileri ve önemli bölgeleri daima ve süratle hakimiyet altına alacak bir şekilde Türkleşmesiyle ispat edilmiştir." (Barkan, 1980) Bu nedenlerle Balkanların elden çıkması çetin bir direnme sürecinin sonunda ancak 400 yıla yakın bir zamanda gerçekleşmiştir.

Denilebilir ki, Osmanlı'nın ilerlemesi kadar, gerilemesi de muhteşem olmuştur. Osmanlı İmparatorluğu'nun gerilemesi metre metre, adım adım gerçekleşmiştir. Ve belki de asıl muhteşem yüzyıl Osmanlı'nın son yüzyıllıdır. Balkanlardaki Osmanlı gerilemesinin önemi büyüktür. Bu kısa çerçeve içinde biz yalnızca konunun önemine dikkat çekmeye çalıştık. Meselenin statik olarak alınması Osmanlılık siyasetinin de gerçek anlamıyla ortaya konmasını sağlayacak önemli bir adım olacaktır. Bu adımı, ulus devlet sınırlarını zorlayan günümüz Türkiye'nin yeni bir hayata geçmesine giden yolda önemli bir aşama olacaktır. Balkanların sosyolojisini anlamak yeni Türkiye sosyolojisini anlamakla eş anlamlıdır.

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ARCHITECTURE STUDENTS' PREFERENCES ON ARCHITECTURAL DESIGN STUDIO: IN TERMS OF BUILDING PHYSICS

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Abstract: This research was designed to see how much importance is given by architecture students to building physics in the process of architectural project development. In this scope heat insulation, air circulation (wind control, natural ventilation), solar control (usage/protection), indoor air quality, natural and artificial light, building acoustics and noise control, building biology, ecology and fire insulation were defined as criteria related to building physics. In the scope of the study, 100 students out of the 217 volunteers from Bursa Orhangazi University, Architecture and Design Faculty, Architecture Department during the 2015-2016 education year, were asked to rate each criteria. At the end of the study it has been understood that students were highly sensitive and had a high level of awareness and sensitivity on this subject.

Keywords: Architectural Design Studio, Architecture Students' Preferences, Building Physics

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BASIN MODELING AND EVALUATION OF THE STRUCTURAL ELEMENTS USING GRAVITY DATA IN TERMS OF BUILDING PHYSICS

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Abstract: Isparta angle is one of the major tectonic elements of Turkey which is a region of intensity seismic activity. Such areas as more of the earthquake activity, depth knowledge of the basin is very important. Isparta basin selected as the study area in the southwest of Isparta angle has an area of about 12 x 15 km. In order to determine the depth of the basin, 108 points gravity values were measured. In this study, survey is used widely in determining of bedrock depth to use in the building physics. According to the gravity analysis, the maximum depth of Isparta basin was found to be about 550 m. In the study area, bedrock depth values obtained from the previous geophysical data and the gravity data are compatible with each other. Basin sedimentary thickness and bedrock depth distribution map are to be used in building physics as prismatic. The thickness of the sedimentary in the basin from northwest to southeast increases which is related to the city Bursa. The amount of this increase between 200-550 m. This change in the depth distribution was observed to be very evident in each profile. The cross section profiles. Thus, the results obtained from this study are expected to contribute to the earthquake simulations studies for the region.

Abstract: This research was designed to see how much importance is given by architectural students to building physics in the process of architectural project development. In this scope, the study was carried out in the city of Bursa. The amount of this increase between 200-550 m. This change in the Department during the 2015-2016 education year, were asked to state their criteria. At the end of this study, it has been understood that students are highly perceptive and have a high level of awareness about issues related to building physics.

Keywords: Isparta basin, Gravity, Bedrock depth, Architectural Design Studio, Architecture Students' Preferences, Building Physics

Giriş

Türkiye tektonik yönden son derece aktif bir kuşak üzerindedir. Karmaşık bir yapıya sahip olan Isparta açısı da Türkiye'nin en önemli tektonik elemanlarının arasında yer almaktadır. Çalışma alanı olan Isparta şehir merkezi ve çevresini kapsayan Isparta havzası ters v şeklindeki bu bölgenin güneyinde yer almaktadır. Abbott ve Louie 2000 de yaptıkları çalışmada bu gibi tektonik yönden aktif alanlarda havza geometrisi ve sediman kalınlığının belirlenmesinin, deprem zararlarını en aza indirgeyecek çalışmalara önemli katkılar sağlayacağını belirtmiştir. Birçok araştırmacı da deprem simülasyon çalışmalarıyla ana kaya geometrisi ve üzerindeki malzemenin deprem hasarına etkilerini araştırmıştır (Olsen vd. 2003, Hallier vd. 2008, Frankel vd. 2009, Vuan vd. 2011).

Bu çalışmada 12x15 km'lik alan içerisinde 108 noktada gravite ölçümü gerçekleştirilerek havza geometrisinin üç boyutlu ortaya çıkarılması hedeflenmiştir. Elde edilen bouguer gravite verilerine sonsuz plaka yaklaşımı uygulanarak basen kalınlığı tespiti yapılmıştır. Hızlı bir şekilde sonuç veren bu yöntem havza geometrisini ortaya çıkarmada yaygın bir şekilde kullanılmaktadır(Işık ve Şenel 1997, Godoy vd. 1999, Chakravarthia ve Sundararajanb 2004, Özalaybey vd. 2008).

Havza içerisinde ana kaya ile kuvaterner yaşlı alüvyon malzeme ayrımı yapılmış ve havza modeli oluşturulmuştur. Şehir merkezinin kurulu olduğu alanda havza derinliğinin tespiti yapılmıştır. Buna ek olarak şehir merkezinin havzadaki konumu birbirine dik iki derinlik kesiti üzerinde net bir şekilde ortaya konulmuştur.

Çalışma Alanı ve Jeolojisi

İnceleme alanı Isparta havzası genel olarak otokton ve allokton jeolojik malzemelerden bir araya gelmektedir (Karaman 1994, Kanbur vd. 2008, Yılmaz 2010). Çalışma alanı ve çevresini kapsayan alanın Şekil 1 de verilen genel jeoloji haritası üzerinde; otokton Davraz kireçtaşı, Söbüdağ kireçtaşı, Çiğdemtepe formasyonu, Güneyce formasyonu, Kızılkırma formasyonu, Gölcük volkanitleri ve Volkanik filişlerinin Isparta şehir merkezini çevrelediği, allakton kuvaterner yaşlı alüvyon malzemenin ise ova düzlüğüne yayıldığı açıkça görülmektedir.

Havzanın genel olarak yaşları Miyosen ile Jura arasında değişen ince, orta ve kalın tabakalaşma yapısına sahip yer yer kırıntılı ve masif kireçtaşları tarafından çevrelendiği görülmektedir. Havzanın güneybatı kısmında ise pliyosen-kuvaterner yaşlı gölcük volkanikleri, volkanoklastikler ve prioklastik malzemelerin baskınlığı söz konusudur. Bunların içeriğinde volkanik kökenli yer yer blok şeklinde kum, kil, silt ve sertleşmiş veya sıkı dokulu tüf-tüfit yer alır(Karaman 1994). Havza içerisine uzanan kuvaterner alüvyon malzeme ise çakıl, kum, kil ve silt

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içermektedir(Karaman 1990).

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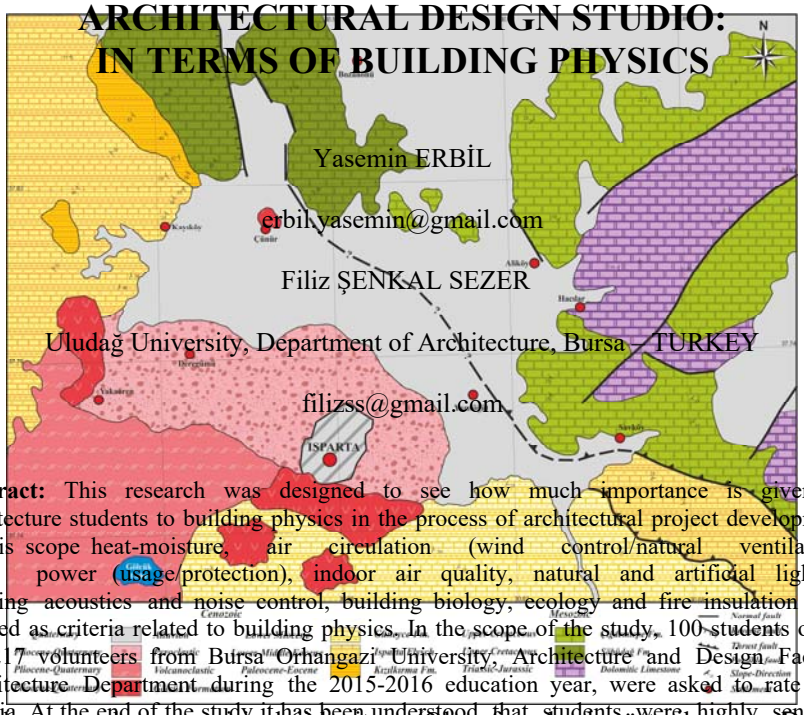

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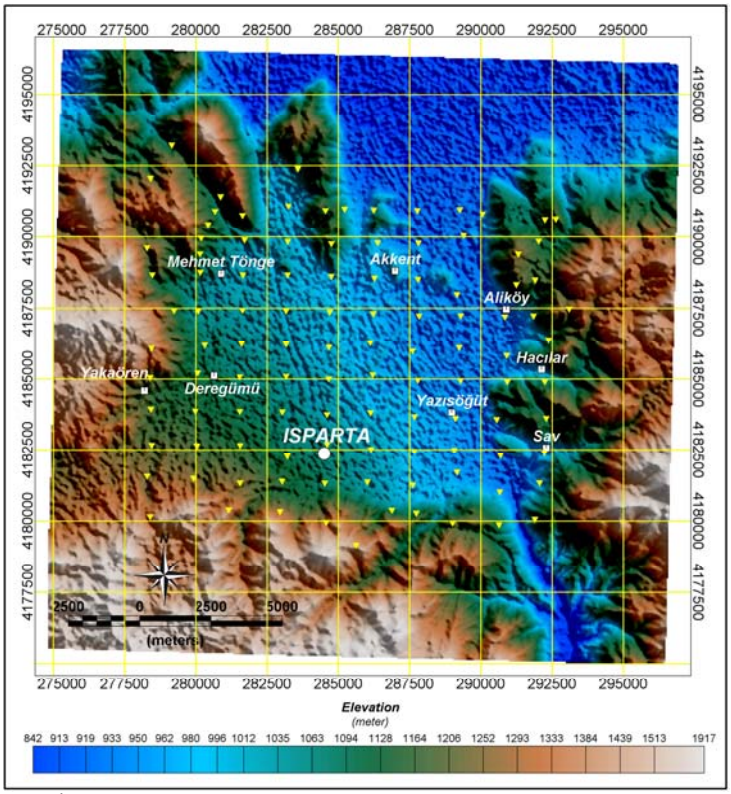
Keywords: Architectural Design Studio, Architecture Students' Preferences, Building Physics

Şekil 1. Çalışma alanı ve yakın çevresi jeoloji haritası. (Olası fay olarak gösterilen yapı Demer vd. 2010'dan düzenlenmiştir)

Materyal ve Metot

Bu çalışmada 12x15 km'lik Isparta şehir merkezi ve çevresini kapsayan alanda havza geometrisinin modellenmesinde jeofizik tekniklerden gravite yöntemi kullanılmıştır. Yöntem bu gibi çalışmalarda birçok araştırmacı tarafından tercih edilen bir tekniktir(Abbott ve Louie 2000, Özalaybey vd. 2011, Maden ve Dondurur 2012, Dossing vd. 2014).



Şekil 2. İnceleme alanı dijital yükseklik haritası ve gravite ölçüm noktaları

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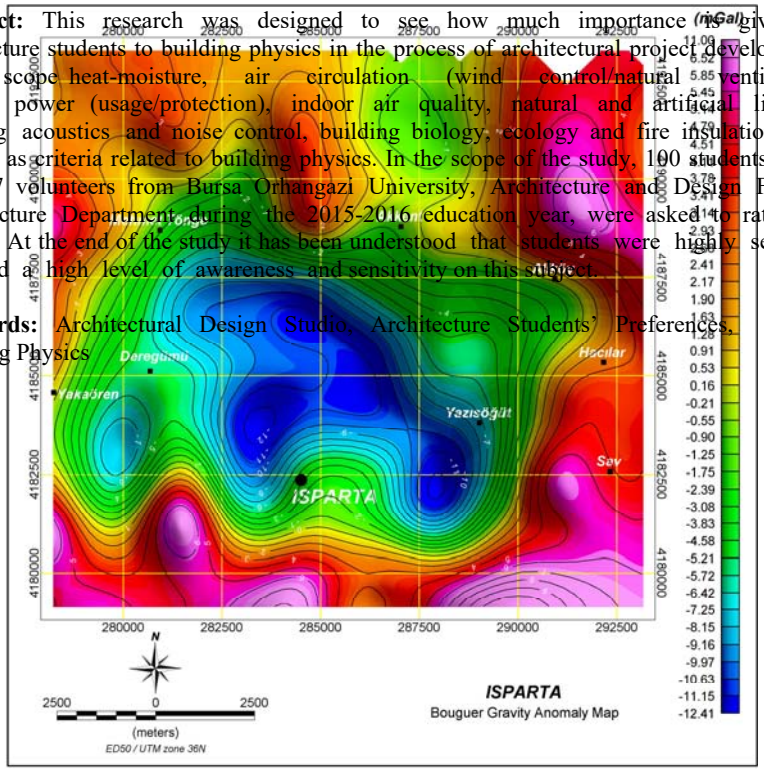
Çalışma kapsamında yaklaşık 1,3x1,3 km korelajlama yapılarak toplamda 108 ölçüm noktasında veri kazanı yapılmıştır (Şekil 2). Araştırma kapsamında planlanan bazı ölçüm noktalarının askeri alan içerisine girmesinden kaynaklı bu noktalarda ölçüm yapılamamıştır.

Çalışmanın arazi kısmında CG-5 AUTOGRAV gravimetresi kullanılarak ölçümler gerçekleştirilmiştir. Veri kazanımında sabit baz noktası kullanılarak her 6 saatte bir baz ölçümü yapılmıştır. Bouguer gravite anomalilerinin veri işlemde sırasıyla aşağıdaki adımlar Oasis Montaj paket programı kullanılarak gerçekleştirilmiştir.

- Drift düzeltmesi
- Yükseklik düzeltmesi
- Enlem düzeltmesi
- Serbest hava düzeltmesi
- Bouguer ve topoğrafya düzeltmesi(topoğrafa indirgeme yoğunluk değeri 2.4 gr/cm^3 alınmıştır)

Son olarak yüzeye yakın sığ kütlelerin bozucu etkilerini gidermek için rejyonal değerler rezidüel değerlerden ayrılmış ve havza geometrisini modellemede kullanılacak Bouguer gravite anomali haritası elde edilmiştir(Şekil 3).



Şekil 3. Isparta Bouguer Gravite haritası

Rejyonal Gravite anomali değerleri sonsuz slap yaklaşımı ve aşağıda verilen eşitlik kullanılarak ana kaya derinlik modellemesi yapılmıştır.

$$\Delta g = 0.04192 \times \Delta\rho \times \Delta h$$

Burada; Δg ölçülen gravite değeri, Δρ ana kaya ile alüvyon arasındaki yoğunluk farkı, Δh derinlik bilgisidir. Formülde ana kaya ile havza çökelleri arasındaki yoğunluk farkı 0,6 gr/cm^3 olarak alınmıştır. Bu değer bölgede Devlet Su İşleri tarafından açılan sondaj kuyu kütük bilgilerinden elde edilen ana kaya derinlik bilgisini sağlayacak şekilde belirlenmiştir.

Bulgular

Çalışma alanından toplamda 108 noktada gravite ölçümü gerçekleştirilerek şekil 3 de verilen gravite dağılım haritası elde edilmiştir. Gravite anomali değerleri -12,41 ile 11.00 mGal arasında değişen haritada; basen olarak düşünülen alanın negatif değerlerden oluştuğu, baseni çevreleyen alanın ise pozitif değerlere sahip olduğu görülmektedir. Bununla birlikte şekil 2 de verilen jeoloji haritası ile gravite anomali dağılım haritası birbiri ile yüksek uyumluluk göstermektedir.

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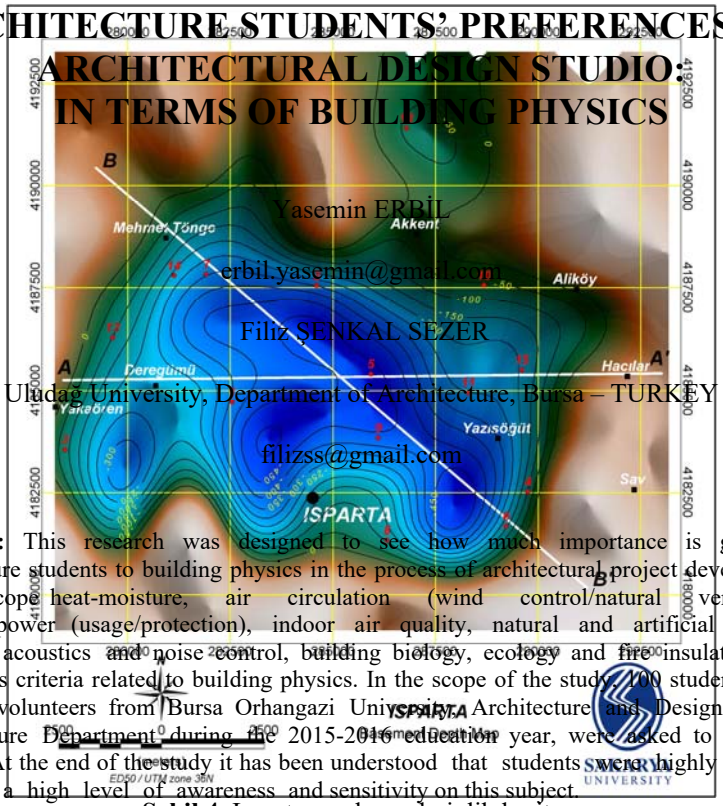
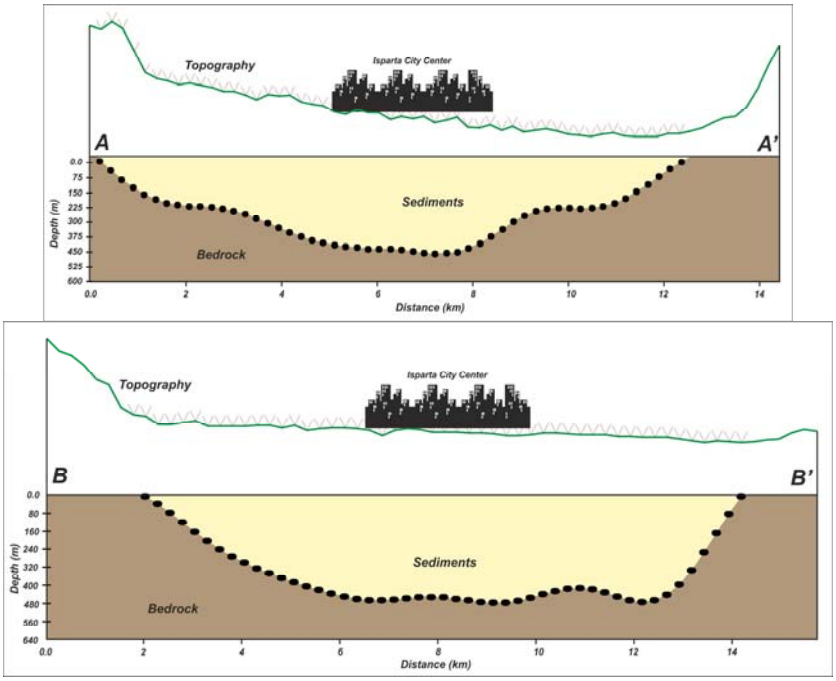
Rejyonal Bouguer Gravity değerlerinden yukarda verilen eşitlik kullanılarak hesaplanan ana kaya derinlik dağılım haritası incelendiği zaman, en derin yerin 550 m civarında olduğu ve şehir merkezinin basenin kalınlığının yaklaşık 450-500m civarında değişen bir alanda geliştiği görülmektedir(Şekil 4). Şekil 4 detaylı irdelendiği zaman havzanın üçgen prizmatik benzeri yapıda kuzeybatıdan güneydoğuya doğru jeolojik haritada verilen muhtemel fay dokanağı boyunca geliştiği gözlemlenmektedir.



Şekil 4. Isparta ana kaya derinlik haritası



Şekil 5. Şehir merkezinin havza içerisindeki konumunu gösteren derinlik kesitleri

Şehir merkezinin basen içerisindeki konumunu incelemek amacı ile oluşturulan derinlik kesitlerinde çanak şeklinde ortaya çıkan havzanın, Özalaybey vd. 2008 de tanımladı gibi deprem dalgalarını odaklama etkisine sahip bir yapıda olduğu gözlemlenmiştir.

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Sonuçlar

Isparta şehir merkezi ve çevresini kapsayan 12x15 km'lik alanda havza geometrisi ortaya çıkarmaya yönelik toplamda 108 noktada gravite ölçümleri alınmıştır. Oluşturulan Bouguer Gravite anomali haritası yorumlanmış ve bu harita kullanılarak basenin derinlik bilgisi ortaya çıkarılmıştır.

Baseni oluşturan düşük yoğunluklu alüvyon malzemenin negatif gravite değerlerine sahip olduğu, yüksek yoğunluktaki çevre kayaçların pozitif değere sahip olduğu gözlenmiştir. Elde edilen bu haritanın bölgenin jeolojisi ile son derece uyumlu olduğu ve basen içerisinde gelişen tektonik faaliyetlerden kaynaklı yapı sınırları net bir şekilde ayırt edilebilmiştir.

Oluşturulan havza geometrisi incelendiğinde, havzanın en derin yeri 550m civarında olmasına karşın, şehir merkezinin 450-500 m kalınlığa sahip alüvyon malzeme üzerinde kurulu olduğu saptanmıştır. Çökel malzemenin havza içerisindeki konumu, kuzeydoğu-güneybatı yönünde uzanım göstermesi, bu yapı şekilde gelişim gösterdiği düşüncesini doğurmuştur. Şehrin basen içerisindeki lokasyonunu daha net görebilmek için oluşturulan derinlik kesitlerinde çanak şeklinde ortaya çıkan basen, deprem anasında üreyen deprem dalgalarına odaklanma etkisi yapabilecek bir yapıda olduğu gözlenmiştir.

Senaryo deprem simülasyonu projesi kapsamında gerçekleştirilen bu araştırma, projenin ilk ayağını oluşturmaktadır. Isparta havzasının geometrisinin ortaya çıkarılması üzerine yapılan ilk jeofizik çalışma olması açısından elde edilen sonuçlar son derece önem arz etmektedir. Çalışmadan elde edilen verilerin gerek proje içerisinde gerçekleştirilecek olan deprem simülasyonu gerekse bölgede yapılacak diğer araştırmalara önemli katkılar sağlayacaktır.

Teşekkür

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BAŞSAĞLIĞI İLANLARINDA DİL VE İÇERİK ÖZELLİKLERİ ÜZERİNE BİR DEĞERLENDİRME: IN TERMS OF BUILDING PHYSICS

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Özet: İnsanların yaşamış olduğu ortak deneyimlerinden biri olan ölüm, insan hayatının tabii sonucu olması sebebiyle hem bireyler hem de toplum açısından önemli bir geçiş dönemidir. Bu geçiş döneminde kültürel, sosyal ve dinî bakımdan pek çok husus barındıran başsağlığı (taziye) ritüelleri gerçekleştirilmektedir. Pek çok kültür gibi Türk kültüründe de başsağlığı, acıyı paylaşmak ve kalanlara teselli verme amacını taşır. Ölümden sonra yapılan tören ve ritüller kadar bu süreç içerisinde söylenen sözler de hem kültürel hem de dil verileri olarak değer taşımaktadır. Kitle iletişim araçları, çağımızın gereği olarak insan hayatının her alanında kendisine yer edinmiştir. Toplumsal ve kültürel pek çok unsur da bu kitle iletişim araçlarında kendisini göstermektedir. Ticari olmayan kişisel ilanlardan biri olan başsağlığı ilanları da bu kitle iletişim araçlarında, özellikle de gazetelerde, haber verme işlevini yerine getirirken toplumsal ve psiko-sosyal işlevler de gerçekleştirmektedir. Bu çalışma kapsamında ülkemizde yayınlanan gazetelerde kullanılan başsağlığı ilanları incelenecektir. Bu ilanlar, biçim özellikleri yanında içerik ve dil özellikleri açısından değerlendirilecektir.

Anahtar Kelimeler: Başsağlığı ilanları, taziye, başsağlığı ilanlarında dil kullanımı

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Giriş

Ölüm insanlığın yaşamış olduğu ortak deneyimlerden biri olarak insan hayatının en önemli geçiş dönemlerinden birini oluşturur (Yıldız, 2012, s. 93). Bu bakımdan ölüm olgusu hem bireyler hem de toplumlar için son derece önemlidir. Ölüm olayını müteakip ölen kişinin yakınlarına ilgi ve yakınlık gösterme amacıyla başsağlığında (taziye) bulunulur. Başsağlığı içerisinde kültürel ve dinî unsurlar barındırması bakımından hem toplum hem de birey açısından oldukça önemli bir ritüeldir. Türk kültüründe, pek çok kültürde de olduğu gibi, başsağlığında bulunmanın amacı acıyı paylaşmak ve kalanlara teselli vermektir. Bu ritüel gerçekleştirilirken başvurulan kalıp ifadeler, toplumların sahip olduğu kültürel yapı ve inanç sistemlerinin dile yansımış halidir. Ölüm olayı gerçekleştiğinde veya gerçekleştikten sonraki süreçte eli olayın acısını aktarabilmek, dayanışma sağlamak, müteveffaya dua etmek, iyi dileklerde bulunmak ve onun yakınlarına başsağlığında bulunmak için çoğunlukla kalıplaşmış ifadeler kullanmaktadır. Bu ifadelerdeki anlatım, ölüm olayını tekrar tekrar hatırlatmamak için örtülü olarak ifade edilmektedir. Bu bakımdan "ölmek" olgusunu karşılamak için *vefat etmek, bu dünyadan ayrılmak, ahiret yolcusu olmak, günü dolmak, dünyaya gözlerini kapamak, toprak olmak* (Türkmen, 2009, s. 134) gibi deyimler kullanılmaktadır. Başsağlığı dilemek için de vefat eden kişiye dua etmek amacıyla *Allah rahmet eylesin, Mekânı cennet olsun, Allah taksiratını affetsin, Nur içinde yatsın* gibi ifadeler kullanılırken vefat eden kişini yakınlarına teselli vermek için *Başınız sağ olsun, Allah kalanlara sabır versin* gibi ifadeler kullanılmaktadır.

Başsağlığı İlanları

Yazılı ya da sözlü haber olarak tanımlanan *ilan*ların temel işlevi haber vermektir; bu ilanlar gelişen teknoloji ve sürekli yenilenen iletişim araçlarından dolayı toplumsal ve psiko-sosyal işlevler de üstlenmekle birlikte bazı mesajlar da taşır. Okuyucu kitlesinin algısına göre anlam kazanan bu mesajların hem toplumsal hem de kültürel olarak pek çok göndermeye sahip olduğu söylenebilir. Başsağlığı ilanları da toplumu bilgilendirme ve yaşanan acının paylaşılması amacıyla verilen ve ticari olmayan ilanlardır (Ergin, 2009-2010, s. 182). Günümüzde kitle iletişim araçlarının yaygın ve etkin kullanılmasından dolayı başsağlığı dilemek için gazetelere ilanlar verilmektedir. Gazetelerde yer alan başsağlığı (taziye) ilanları, "kültürel yapı içerisinde kalıplaşmış biçimleriyle, toplum içindeki gereksinimleri ve ideolojileri yansıtan birtakım mesajlar taşımaktadır. Bu ilanlar sosyal ve psikolojik göstergelerle bir semboller hiyerarşisi oluşturmaktadır." (Polat, 2011, s. 87).

Bu çalışmada Türkiye'deki gazeteler arasında en yüksek tiraja (Gazete Tirajları, 2016) (Gazeteciler, 2016) sahip olan *Hürriyet* gazetesinde yer alan başsağlığı ilanları ele alınmıştır. Çalışmanın kapsamını *http://www.hurriyetvefatilani.net/hurriyet-gazetesi-bassagligi-ilanlari (son erişim tarihi: 27.07.2016)* web adresinde yer alan toplam 44 başsağlığı ilanı oluşturmaktadır. Bu ilanlar arasından 22 tanesi kurum/kuruluşlar tarafından, 22 tanesi de ölen kişinin bir yakını (aile, akraba, tanıdık vb.) tarafından verilen ilanlardır. Çalışmada ilanların kimler/hangi kurum/kuruluşlar tarafından verildiği, ilanların biçim, içerik ve dil özellikleri

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Başsağlığı İlanlarının Biçimsel ve İçerik Özellikleri

Başsağlığı ilanları kısa ve birbirine çok benzeyen metinlerden oluşmaktadır; fakat metinlerin içerikleri detaylı olarak incelendiğinde başsağlığında bulunurken birey veya topluma ait pek çok kültür unsuru yanında gerek vefat eden kişinin veya yakınlarının gerekse ilan verenin kişinin din, meslek, toplumsal statüsünü tespit etmek mümkündür.

İlanlar genellikle gazetenin üç veya dört sütununu kaplayacak şekilde olup bir kutucuk içerisinde verilmektedir. İlanların tümünde siyah ve beyaz renk kullanılmıştır. Bu durumun matemin bu iki renk ile temsil edildiği şeklinde yorumlanabilir. Bu 44 ilandan sadece 2'sinde siyah renk fon olarak kullanılmış, metinler beyaz ile yazılmıştır. Fonda siyah renk kullanımı, karamsarlığa işaret etmektedir (Türkel, 2016, s. 13). Diğer ilanların tümünde beyaz fon üzerine siyah yazı tercih edilmiştir. İlanların sadece 3'ünde vefat eden kişinin fotoğrafı yer almaktadır. Bu fotoğraflara başlıktan hemen sonra yer verilmektedir.

Metinler genel olarak aynı biçim özelliklerine sahiptir. İlanın en başında başlık mahiyetinde koyu ve büyük harflerle ortalı şekilde "Başsağlığı" ifadesi yer almaktadır. Kurumlar ve kişiler tarafından verilen ilanlardan ikişer tanesinde "Vefat Ve Başsağlığı" başlık olarak kullanılmıştır. Kişiler tarafından verilen ilanların sadece 1 tanesinde "Tazziye" başlığı kullanılmıştır. 3 tanesinde herhangi bir başlık yer almamaktadır. Diğer ilanlarda başlıktan sonra yer alan vefat eden kişi ile ilan veren arasındaki yakınlık durumunu ifade eden cümlelerle ilana başlanmıştır. Bu 3 ilandan ikisinde "Canımız, Sevgili Kardeşimiz, Kuzenimiz", "Kıymetli Çalışma Arkadaşımız" ifadeleri yer alırken diğerinde "Çok Acı Kaybımız" ifadesine yer verilmiştir. Diğer ilanlarda başlıktan sonra ya vefat eden kişinin mesleğini/toplumsal statüsünü ya akrabalık/yakınlık durumunu ifade eden örnekteki gibi cümleler yer almaktadır: *"Büyüğümüz, dostumuz, eşimizin yüz ak'ı, Yargıtay Eski 6. Ceza Dairesi Başkanı Mustafa Aydın'ı", "Kültürümüzün kurucu üyesi Viktor BALI'yı", "Bankamız Emekli Müdürlerinden (Diyarbakır Şubesi) Ahmet Kadıoğlu'nu"*. 3 ilanda bu ifadeler olmadan vefat eden kişinin adı ve soyadı yazılmaktadır. Başlık ve bu ifadelerden sonra dikkat çekmesi amaçlayan metnin diğer yazılarının tümünden daha büyük puntoyla koyu ve büyük harflerle kutucuğun ortasına denk gelecek şekilde vefat eden kişinin adı ve soyadı yazılmaktadır. Bununa birlikte 1 ilanda bir saldırı sonucu hayatını kaybeden kişiler birden fazla olduğu için ad ve soyad kısmı yer almamaktadır. Ad ve soyadın arkasından yazılacak olan başsağlığı cümlesine uygun olarak gelen ek, 32 ilanda kesme işareti (') ile ayrılmaktadır. Diğer ilanlarda cümlenin tamamlanışından dolayı ad ve soyad kısmının herhangi bir ek almasına gerek yoktur: *"Hacı Nezahat Özdemir Hanım'ın vefatına çok üzüldüm.", "Mustafa Çağan'ı vakitsiz kaybetmenin büyük üzüntüsü içerisindeyiz."*

Çalışılan ilanlardan 34'ünde ad ve soyad kısmından önceki veya bazen sonraki bölümde vefat eden kişinin mesleği de yer almaktadır. İlanlardan 9 tanesinde ise vefat eden kişinin değil, onun yakınları içerisinde meslekî konumu önemli olan kişilerin meslekleri belirtilmektedir. *Özaltın Yönetim Kurulu Başkanı Hayrettin Özaltın, Nurettin Özaltın ve Öznur Özaltın'ın babaları Nuri Özaltın…* Bu durum sadece vefat eden kişinin değil aynı zamanda aile, arkadaş, tanıdık gibi onunla bağlantılı kişilerin de toplumsal statüsünü belirtmek açısından en önemli bir yoldur (Ergin 2009-2010, s. 189): "*Kurucu ortaklarından ve ilk Yönetim Kurulu Başkanı", "35 yıllık Avukatımız", "Türk İlaç sektörünün duayeni", "15.-16. Yasama Dönemi Afyonkarahisar Milletvekili, Sağlık ve Sosyal Yardım Bakanı", "Çankırı Ilgaz Eşrafından İstanbul Büyükşehir Belediyesi emekli din görevlilerinden Hafiz Mevlüthan"* örneklerinde görüldüğü gibi kişilerin konumu vurgulanmaktadır. Meslekî başarı ve itibar arasındaki bağlantı, ilanı veren ve ilanın boyutunu dikkate aldığımızda daha belirgin olmaktadır (Ergin, 2009-2010, s. 192). Kişi/kişilerin verdiği ilanlarda vefat eden kişinin daha çok kişilik özellikleri sevgi ve özlem duygularıyla birlikte öne çıkarılırken kurum/kuruluş veya meslekî bağlantıya sahip kişiler tarafından verilen ilanlarda mesleği, bulunduğu görevler ve meslekî başarı üzerinde durulmaktadır. Bunun yanı sıra bazı ilanlarda ilanı veren kişi merhum/merhumenin aile üyelerinden birinin arkadaşı olabilmektedir. Bu durumda ilanı veren kişi daima arkadaşının adını önceleyerek merhum/merhumeden söz etmektedir. Bu ilanlarda vefat eden kişinin değil, bu yakını ile ilgili övgü sözleri yer almaktadır: *Çok değerli dostum, sevgili kardeşim Aziz Yeniay'ın kıymetli babası Bekir Yeniay…* örneğinde olduğu gibi övgü sözcükleri önceliklidir.

İlanlarda metinler için çok kısa yer ayrılmış olmasına rağmen burada kişi hakkında önemli bilgiler verildiği görülmektedir. Vefat eden kişinin mesleği yanında onun övülecek kişilik özelliklerine de vurgu yapılmaktadır: *Kendini dinine adamış, iyi insan", Dürüstlüğü, iyilikseverliği ve sıcakkanlılığı ile herkesin sevgisini ve saygısını kazanan, hem başarılı bir işadamı hem de mükemmel bir aile babası olmayı başaran uzun yıllar beraber çalışma şansına eriştiğim çok değerli dostum", "Bizlerden kılavuzluğunu esirgemeyen, hayatıma yön vermekte büyük payı olan", "İyiliksever insan"* örneklerinde de görüldüğü üzere merhum/merhume aile ve iş hayatındaki başarısı yanında sevilen ve iyi bir insan olması hususları ön plana çıkarılmıştır.

İlan metinlerinin devamında yer alan başsağlığı ifadeleri birbirine çok benzemektedir. Bunlar, genel olarak yaşanan elim olaydan duyulan üzüntüyü ifade eden, aile/yakın/arkadaşlar vb. ile acıyı paylaşmayı amaçlarken vefat eden kişiye de dua edilen kalıplaşmış cümlelerden oluşmaktadır. Yaşanan derin acı ve üzüntü bu kalıp cümleler vasıtasıyla aktarılmaya çalışılmaktadır: *"Değerli merhumeye Allah'tan gani rahmet, tüm aileye sabır ve*

ARCHITECTURE STUDENTS' PREFERENCES ON ARCHITECTURAL DESIGN STUDIO: IN TERMS OF BUILDING PHYSICS

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Abstract: This research was designed to see how much importance is given by architecture students to building physics in the process of architectural project development. In this scope heat-moisture, air circulation (wind control/natural ventilation), solar power (usage/protection), indoor air quality, natural and artificial lighting, building acoustics and noise control, building biology, ecology and fire insulation were defined as criteria related to building physics. In the scope of the study, 100 students out of the 217 volunteers from Bursa Orhangazi University, Architecture and Design Faculty, Architecture Department during the 2015-2016 education year, were asked to rate each criteria. A three level of importance and likelihood scale was used.

Keywords: Architectural Design Studio, Architecture Students' Preferences, Building Physics

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ARCHITECTURE STUDENTS' PREFERENCES ON ARCHITECTURAL DESIGN STUDIO: IN TERMS OF BUILDING PHYSICS

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Abstract
This research is a part of a master thesis which is still in progress. The thesis aims to find out architecture students' preferences on architectural design studio in terms of building physics. In this scope heat-moisture, air circulation (wind control/natural ventilation), solar power (usage/protection), indoor air quality, natural and artificial lighting, building acoustics and noise control, building biology, egology and fire insulation were defined as criteria related to building physics. In the scope of the study, 100 students out of the 217 volunteers from Bursa Orhangazi University, Architecture and Design Faculty, Architecture Department during the 2015-2016 education year, were asked to rate each criteria. At the end of the study it has been understood that students were highly sensitive and had a high level of awareness and sensitivity on this subject.

Keywords: Architectural Design Studio, Architecture Students' Preferences, Building Physics

başsağlığı diliyoruz, Ailesine ve tüm sevenlerine başsağlığı dileriz.”

İncelenen ilanlardan pek çoğunda ilanlarında *Allah/Tanrı rahmet eylesin, Nur içinde yat, Işıklar içinde rahat uyusun* gibi dua sözleri barındıran kalıplaşmış dinî ifadeler yer almaktadır. İlanlardan 2 tanesinde dinî ifade ve duygu bulunmamakta ve bu ilanlarda ölüme yaklaşım daha mesafeli olup sadece “… vefat etmiştir.” ifadesi yer almaktadır. Diğer ilanlarda yaşanan acı ve duygular işin içine katılarak *Kaybetmenin derin üzüntüsü içerisindeyiz, Vefatını öğrenmenin derin üzüntüsü içindeyiz, Aramızdan ani ayrılışının derin üzüntüsü içindeyiz* cümleleri kullanılmıştır; vefat eden kişiden kopuş anlatılmak istenmiştir.

Allah ve Tanrı kelimelerinin kullanımına bakıldığında da incelenen ilanların 33'ünde *Merhuma/merhumeye Allah'tan rahmet*, 3'ünde de *Merhuma/Merhume'ye Tanrı'dan rahmet* ifadesi kullanılmaktadır. 8 ilanda ise buna benzer bir ifade söz konusu değildir. Allah'tan rahmet dileme cümlesinin de yer aldığı 2 ilanın devamında *Onu gönüllerimizin en derininde yaşatacağız, ışıklar içinde rahat uyusun* ile *Nur içinde yatsın* ifadeleri de bulunmaktadır. Rahmet ifadesi bulundurmayan 8 ilan diğer başsağlığı ilanlarından pek çok bakımdan da farklılık göstermektedir. Bu ilanlarda sevgi, özlem, övgü gibi duygular barındıran ifadelerin ön plana çıkarıldığı görülmektedir: *Seni özleyeceğiz., Acımız sonsuzdur., Ebediyete yürüdü., Umarız ki bu Anadolu yeni Mustafa Aydınlar çıkarır., Çelink, Memiş, Mini ve Bobiler seni çok seviyor*. Bir ilanda da vefat eden kişi için benzer duyguları ve bir kavuşulacağını belirten yazılmış şiir yer almaktadır: *Gidip gidip geliyoruz / Dünya denen bu yere / Melekler misafir bir / Sevdiğini tanıdıkça / Yeniden doğmak için / Ve her ilk bahar o vadide / Rengârenk çiçekler olup açarım / Seni sevenlerle ve meleklerle / Hep beraber kucaklaşalım / Ve öylece hep kalalım.*

İlan metnin son bölümünde ilanı veren kişi/kişilerin veya kurum/kuruluşun adı yer almaktadır. Kişi/kişilerin verdiği ilanların büyük çoğunluğu ya vefat eden kişinin ailesi/akrabası/arkadaşı ya da onlarla yakın ilişkileri bulunan farklı aile/kişiler tarafından verilmiştir. 2 ilanda ilanı veren kişinin mesleki statüsü (rektör, yönetim kurulu başkanı) belirtilmiştir. Kurum/kuruluşlar tarafından verilen ilanların banka, özel şirket, kamu kuruluşu, vakıf ve dernekler tarafından verildiği görülmektedir. Ölüm ve cenaze gerçekleştikten kısa bir zaman sonra verilen bu ilanlarda acıyı paylaşmak temel amaç olmakla birlikte kişi ya da kurum/kuruluşların kendi toplumsal statülerini de ortaya koyma amacını taşımaktadırlar. Bu ilanlar “esasen aile üyeleri, tanıdıklar, arkadaşlar, çalışma arkadaşları ve etnik, dinî ve politik gruplar arasında güçlü bir dayanışmaya hizmet etmektedir” (Ergin, 2009-2010, s. 1821).

Sonuç

Birey ve toplum için önemli bir geçiş devresi olan ölüm olayının arkasından başsağlığında bulunmak için günümüzde kitle iletişim araçlarının çok yaygın ve etkin olmasından dolayı gazete ilanları da kullanılmaktadır.

Bu ilanlar, temelde ölümü haber vermek ve kalanlarla acıyı paylaşmak amacını taşısa biçim ve içerikleri incelendiğinde pek çok kültürel, dinî, sosyal vb. göstergelere sahiptir. Bu ilanlar vasıtasıyla çeşitli mesajlar gönderilmekte ve bu yönüyle toplumsal bir işlevi de yüklenmektedir.

İncelenen ilanların tümünde matemi temsil eden iki renk olan siyah ve beyaz kullanılmıştır. İlanların çoğunda beyaz zemin üzerine siyah yazı tercih edilmiştir, her iki renk de karamsarlık ve yas ifadesi olarak değerlendirilebilir. İlanlarda fotoğraf kullanımın çok az olduğu görülmektedir. İlanın en başında başlık mahiyetinde “Başsağlığı” ifadesi yer almaktadır. Daha sonra genellikle vefat eden kişinin mesleğini/toplumsal statüsünü ya da akrabalık/yakınlık durumunu belirten ifadeler ile birlikte vefat eden kişini adı ve soyadı bulunmaktadır. Vefat eden kişinin veya onun yakın bir akrabasının mesleğini belirten ifadelerin bu küçük ilan metinlerinde yer alması hem vefat eden kişi ve akrabalarının hem de ilanı veren kişinin toplumsal statüsünü belirtmek açısından önemlidir. Kişi/kişilerin verdiği ilanlarda vefat eden kişinin daha çok övülecek kişilik özellikleri sevgi ve özlem duygularıyla birlikte öne çıkarılırken kurum/kuruluş veya meslekî bağlantıya sahip kişiler tarafından verilen ilanlarda mesleği, bulunduğu görevler ve meslekî başarı üzerinde durulmaktadır.

Başsağlığı ifadelerinin yer aldığı son kısımda ise vefattan dolayı duyulan üzüntüyü ifade etmekte zorlanan insanın dilin kalıplaşmış ifadelerinden yardım aldığı görülmektedir. Vefat eden kişiye iyi dileklerde bulunmak için de kalıplaşmış dua sözleri kullanılmaktadır. İncelenen ilanların 33'ünde *Allah,* 3'ünde *Tanrı ('dan rahmet*) ifadesi kullanılırken 8 ilanda ise buna benzer bir ifade söz konusu değildir. Bu durum ilanı veren kişi/kurumların düşünce ve inançlarının birer göstergesi olarak değerlendirilebilir.

İlan metnin son bölümünde ilanı veren kişi/kişilerin veya kurum/kuruluşun adı yer almaktadır. Kurum/kuruluşlar tarafından verilen ilanların çoğunluğu banka, özel şirket, kamu kuruluşu, vakıf ve dernekler tarafından verilmiştir. Bu ilanlar, temelde dayanışma amacına sahip olsa da toplumsal yapı içerisinde belli bir statü edinme ve var olan statüyü koruma amacı da kendisini hissettirmektedir.

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Tablo 1: Başsağlığı ilanları örnekleri

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ARCHITECTURE STUDENTS' PREFERENCES ON ARCHITECTURAL DESIGN STUDIO: IN TERMS OF BUILDING PHYSICS

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Abstract: This research was designed to see how much importance is given by architecture students to building physics in the process of architectural project development. In this scope heat-moisture, air circulation (wind control/natural ventilation), solar power (usage/protection), indoor air quality, natural and artificial lighting, building acoustics and noise control, building ecology, and fire insulation were defined as criteria related to building physics. 28 of the study, 100 students out of the 217 volunteers from Bursa Orhangazi University, Architecture and Design Faculty, Architecture Department during the 2015-2016 education year, were asked to rate each criteria. At the end of the study it has been understood that students were highly sensitive and had a high level of awareness and sensitivity on this subject.

Keywords: Architectural Design Studio, Architecture Students' Preferences, Building Physics

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BENTONİT-ZEOLİT KARIŞIMLARININ SU EMME KARAKTERİSTİKLERİNE ZAMAN ETKİSİ

ARCHITECTURE STUDENTS' PREFERENCES ON ARCHITECTURAL DESIGN STUDIO: IN TERMS OF BUILDING PHYSICS

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Zemin emme basıncı ölçülmesi en zor olan zemin özelliklerinden biridir. Zemin emme basıncı doymamış zeminlerin nem durumunu açıklamak için önemli parametrelerin başındadır ve ölçülmesi en zor olan zemin özelliklerinden biridir. Killi karışımların su emme basınçlarının belirlenmesine yönelik pek çok çalışma mevcuttur ancak bunların oldukça az bir kısmı bentonit-zeolit karışımları üzerinedir. Oysaki zeolitlerin kafes şeklindeki mikro boşluklu yapısı, iyon değişim ve kimyasal reaksiyonlar için geniş iç ve dış yüzey alanı bu malzemeyi su emme açısından uygun bir malzeme haline getirmektedir. Zeolit ve bentonitin bir karışım içerisinde olduğu zaman su emme konusunda bir yarış içinde olduğu düşünülebilir. Bu durum karışımdaki her zemin için su içeriği dağılımını da değiştirilebilir. Bu çalışmada, sıkıştırılmış zeolit ve bentonit karışımlarının, değişik su oranlarındaki su emme basınçlarına zamanın etkisi sunulmaktadır. Emme basıncının belirlenmesi için kullanılan yöntem filtre kâğıdı tekniğidir ve filtreler Whatman No 42 tip filtre olarak belirlenmiştir. Toplam kuru ağırlığın %10'u bentonit olacak olacak şekilde sıkıştırılmış karışımların, %20 ve %40 su içeriğine sahip hallerine zaman etkisi (1 haftalık ve 2 haftalık dengeye gelme süresi) hem matrik hem de total su emme açısından incelenmiş ve karşılaştırılmıştır. Sonuç olarak matrik emmelerin dengeye gelme süresinden etkilenmediği fakat toplam emmelerin etkilendiği görülmüştür. Toplam emme değerlerinde, 2 haftalık denge süresi sonunda 1 haftalık denge süresince elde edilen değerlere göre artış gözlenmiştir. Bu artış %5 ve %15 arasında değişmektedir.

Keywords: Anahtar Kelimeler: Bentonit, Su Emme, Zeolit , Filtre Kâğıdı Metodu.

Abstract: This research was designed to see how much importance is given by architecture students to building physics in the process of architectural project development. In this scope heat-moisture, air circulation (wind control/natural ventilation), solar power (usage/protection), indoor air quality, natural and artificial lighting, building materials, energy consumption and sustainability were defined as criteria related to building physics. In the scope of the study, 100 students out of the 217 volunteers from Bursa Orhangazi University, Architecture and Design Faculty, Architecture Department during the 2015-2016 education year, were asked to rate each criteria. At the end of the study it has been understood that students were highly sensitive and had a high level of awareness and sensitivity on this subject.

Keywords: Architectural Design Studio, Architecture Students' Preferences, Building Physics .

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BIBLIOMETRIC ANALYSIS ON INNOVATION DIFFUSION IN ARCHITECTURE: IN TERMS OF BUILDING PHYSICS

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Abstract: Innovation diffusion has become a large and growing field with considerable amount of publications as the pioneering studies have appeared in the literature. In this context, the main purpose of this paper is to analyze the scientific publications on innovation diffusion by providing basic statistics (distributions of publications by document types, publication years, authors' origins, and etc.) and distinct trends in publication topics. With this purpose, a bibliometric analysis will be performed for a total of 900 papers published between January 1, 1981 and December 5, 2013. The findings of the study are expected to be helpful and insightful for understanding the current state and trends of research on innovation diffusion and thereby guiding researchers for their future studies.

Keywords: Bibliometric Analysis, Innovation, Diffusion

Abstract: This research is designed to see how much importance is given by architecture students to building physics in the process of architectural project development. In this scope heat, moisture, air circulation (wind control/natural ventilation), solar power (usage/protection), indoor air quality, natural and artificial lighting, building acoustics, and noise control, building biology, ecology and fire insulation were defined as criteria related to building physics. In the scope of the study, 100 students out of the 217 volunteers from Bursa Orhangazi University, Architecture and Design Faculty, Architecture Department during the 2015-2016 education year, were asked to rate each criteria. At the end of the study it has been understood that students were highly sensitive and had a high level of awareness and sensitivity on this subject.

Keywords: Architectural Design Studio, Architecture Students, Interest, Building Physics

Introduction

Innovation diffusion has generally been defined as *the process by which an innovation is communicated through certain channels over time among members of a social system* (Rogers, 2003). The theory of innovation diffusion simply explains how new ideas, technologies, and practices spread within a social system (Bohlmann, Calantone, and Zhao, 2010; Mahajan, Muller, and Bass, 2010; Valente and Davis, 1999). This theory originates in anthropology and sociology ("The laws of imitation" 2016) with some principles adapted from epidemiology (Bailey, 1975, Valente and Davis, 1999). In time, it has spread to several different research areas.

The modeling and forecasting of the innovation diffusion introduced to marketing area when the pioneering studies of it started to appear in 1960s. After its introduction to marketing, the theory of innovation diffusion has sparked considerable research among consumer behavior, marketing management, and management and marketing scholars (Mahajan, Muller, and Bass, 1990). Several different models for innovation diffusion have been built in order to investigate the diffusion of new ideas, technologies and practices.

In 1969, Bass presented a diffusion model that is one of the most popular diffusion models, has been widely used for investigating the diffusion process of innovation in a social system (Cho and Koo, 2012). Since the publication of the Bass model, the researchers on the modeling of innovation diffusion has set a vast literature consisting of several dozens of articles, books, and assorted other publications (Mahajan, Muller, and Bass, 1990). Correspondingly, innovation diffusion has become a large and growing field by numerous researchers across multiple disciplines with the primary objective of understanding the mechanism that motivate the innovation and diffusion process (Rogers, 2003). In this context, the main objective of the present paper was to perform a bibliometric analysis on the vast bodies of literature of innovation diffusion in order to find the basic statistics (distributions of publications by document types, publication years, author numbers, authors' origins, and research areas) and examine hot topics and trends of them.

For this study, publications on innovation diffusion were collected from Web of Knowledge database. Also, the time period of the publications was restricted from January 1, 1981 through December 5, 2013.
The rest of this paper was structured as follows. Section 2 provided information for used methodology and the data collection process. Section 3 presented the results of the analysis by several dimensions. Lastly, section 4 concluded the present study

Materials and Methods

In this study, a bibliometric analysis was performed for investigating the publications on innovation diffusion. Bibliometric analysis (the quantitative analysis of publications) is particularly an applicable method for the fields with vast bodies of literature which are difficult to analyze by traditional review methods (Belter and Seidel, 2013). This method is a considerable part of reference and research services (Song and Zhao, 2013) and utilizes quantitative analysis and statistics to get the bibliographical works within a given area, topic, and etc. (Wallin,

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Abstract: This research was designed to see how much importance is given by architecture students to building physics in the process of architectural project development. In this scope heat-moisture, air circulation (wind control/natural ventilation), solar power (usage/protection), indoor air quality, natural and artificial lighting, building acoustics and noise control, building biology, ecology and fire insulation were defined as criteria related to building physics. In the scope of the study, 100 students out of the 217 volunteers from Bursa Orhangazi University, Architecture and Design Faculty, Architecture Department during the 2015-2016 education year, were asked to rate each criteria. At the end of the study it has been understood that students were highly sensitive and had a high level of awareness and sensitivity on this subject.

Keywords: Architectural Design Studio, Architecture Students' Preferences, Building Physics

2005, Jiang Tan, 2014; Zyoud, Al-Jabi, and Sweileh, 2014). It is also a useful method for getting a clear picture of the current state of the scientific researches in particular fields and allocates researchers to recognize and undertake new lines of researches (Battisti and Salimi, 2012; Zyoud, Al-Jabi, and Sweileh, 2014). Due to the practicability of the method, it has been used large amounts of publications in several different research topics. Some examples for these studies are given in table 1. In the present study, this method is applied for innovation diffusion topic.

The current analysis focused on the scientific publications in innovation diffusion. For this study, the term "*innovation diffusion*" was searched in the topics of the publications that exist in the Web of Knowledge database. More than 950 papers were found for this search key in the selected database. However, the search was restricted by some criteria. These are given below.

- The papers were restricted by document types. Only articles and proceeding papers were included for the study.
- Publication years of the papers were also limited from January 1, 1981 through December 5, 2013 due to the lack of access to full texts and abstracts for previous papers
- Lastly, the papers that did not have abstracts available, is not included in this study.

Table 1: Examples of bibliometric analysis studies in the literature.

Reference Number	*Title*	*Topic*
(Zyoud, Al-Jabi, and Sweileh, 2014)	Bibliometric analysis of scientific publications on waterpipe (narghile, shisha, hookah) tobacco smoking during the period 2003-2012	Tobacco smoking
(Belter and Seidel, 2013)	A bibliometric analysis of climate engineering research	Climate Engineering
(Fu etc., 2010)	A bibliometric analysis of solid waste research during the period 1993-2008	Solid Waste
(Kim and McMillan, 2008)	Evaluation of internet advertising research: a bibliometric analysis of citations from key sources	Internet Advertising
(Falagas, Karavasiou, and Bliziotis, 2006)	A bibliometric analysis of global trends of research productivity in tropical medicine	Productivity in Tropical Medicine
(Mela etc., 2003)	Radiological research in Europe: A bibliometric study	Radiology

After these arrangements, 900 articles were found and downloaded from the database to analyze for the present study. The document types, publication years, author numbers, countries of author(s), and research areas of the downloaded documents were collected.

Results

This section of the present paper stressed on the general findings of the analysis that was performed for chosen publications. The results of the analysis were presented under the titles of *document types, publication years, research areas, author number, countries of authors,* and *abstracts* respectively.

By Document Types

A total 900 publications were analyzed for document types in this study. The document types of the publications were restricted as only article and proceeding paper at data collection process. Correspondingly, there are only two different types of documents for this analysis. Figure 1 presents the distribution of the analyzed publications according to document types.

The 665 of all publications (74% of all papers) consists of articles while the remaining 235 of the all papers (26% of all papers) were the proceeding papers. As seen in the figure 1, the large amounts of the papers (74% of the analyzed papers) have been prepared as articles. This may show us that researchers generally focus on producing articles for innovation diffusion topic all over the world

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Figure 1. Distribution of the analyzed papers by document types.

Abstract: This research was designed to see how much importance is given by architecture students to building physics in the process of architectural project development. In this scope heat-moisture, air circulation (wind control/natural ventilation), solar power (usage/protection), indoor air quality, natural and artificial lighting, building acoustics and noise control, building biology, ecology and fire insulation were defined as criteria related to building physics. In the scope of the study, 100 students out of the 217 volunteers from Bursa Orhangazi University, Architecture and Design Faculty, 1990 the number of papers increased to 20. Among these papers, there was still no proceeding paper criteria. At the end of the study it has been understood that students were highly sensitive and had a high level of awareness and sensitivity on this subject.

Keywords: Architectural Design Studio, Architecture Students' Preferences, Building Physics

By Publication Years

The publication years of the papers were restricted from January 1, 1981 through December 5, 2013. Figure 2 shows the annual distributions of the analyzed publications and figure 3 represents the number of papers in five years ranges. As seen in figure 2, the number of papers published on innovation diffusion was really low at the beginning years of the research time period. For example; only 5 papers were published from the beginning of 1981 to the end of 1985. And all of them were prepared as articles.

From 1986 to 1990, the number of papers increased to 20. Among these papers, there was still no proceeding paper to our knowledge. 59 papers were published on innovation diffusion. One of them was a proceeding paper within the range 1991-1995.

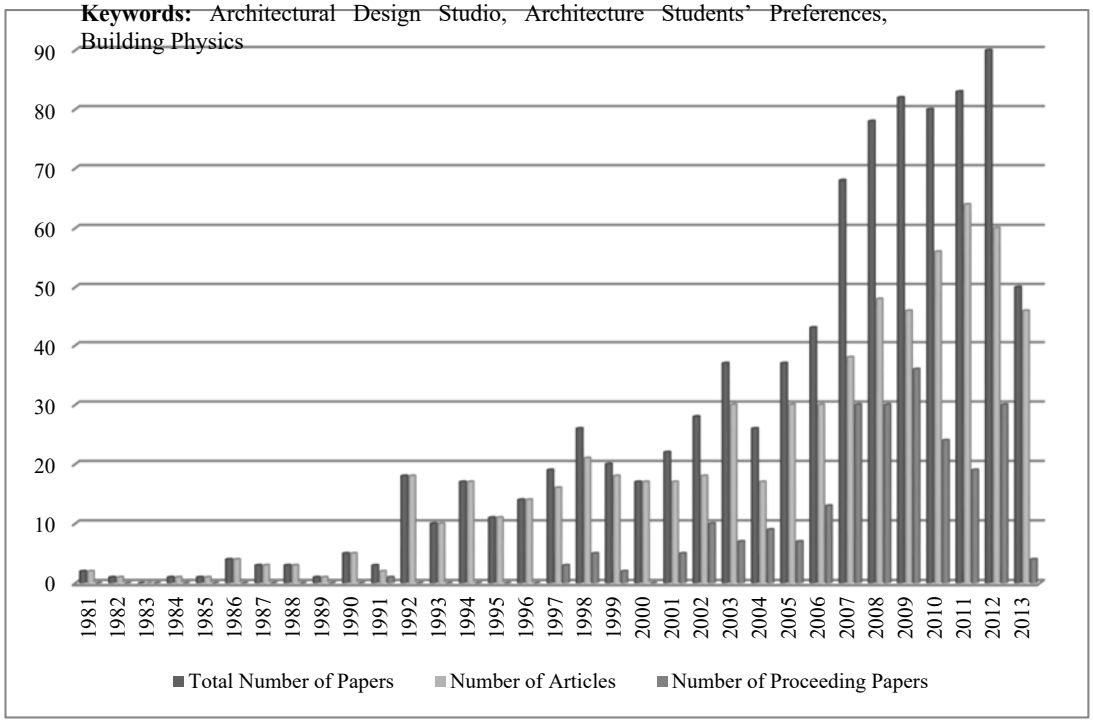

Figure 2. Annual distribution of the papers on innovation diffusion.

By Research Areas

The research areas were categorized in five main groups similar to the categorization of Web of Knowledge in this paper. The areas are: arts & humanities, life sciences & biomedicine, physical sciences, social sciences, technology.

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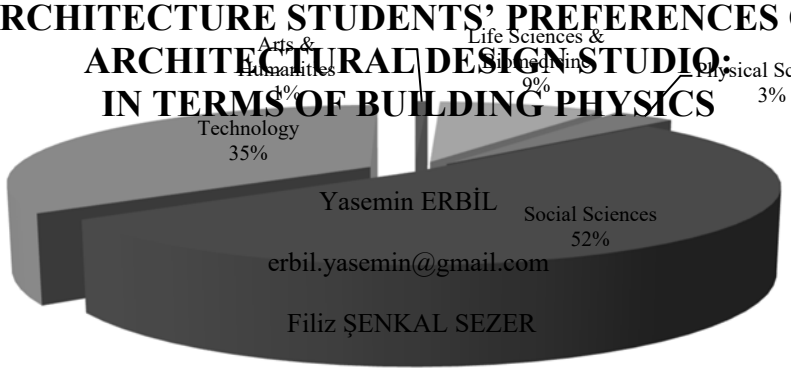

Figure 3. Distribution of the analyzed papers according to research areas

During data collection process, the research areas of each paper was also recorded from the searched database and analyzed for the given period of time.

Figure 3 presents the distribution of the papers by research areas. As seen in the figure 3, 52% of the analyzed papers were related with social sciences. The social sciences area includes topics like Business & Economics; Psychology; Public Administration; Education; etc. according to the categorization of the selected database. The percentage of the papers for social sciences may show that the innovation diffusion researchers mostly focused on the social sciences areas for the given period.

The researches about technology field followed the social sciences area with 35%. Thus, the largest amounts of the papers were related with social sciences and technology areas with 88%. Apart from these two areas, papers were distributed to life sciences & biomedicine with 9%, physical sciences with 3%, and arts & humanities research areas with 1% of all papers.

By Number of Authors

In this study, the papers were also analyzed for the number of authors. A total of 2136 authors participated in innovation diffusion related studies. The range of the authors was within 1 to 14. Average number of authors per paper is 2,373.

Figure 4 gives the distribution of the papers according to the number of authors. The 343 of the analyzed papers were prepared by two authors. The papers with three authors followed them with 225 of all papers. And, 214 of the papers were made by one author.

The remaining of the papers was prepared by four or more authors. However, the amount of papers with more than three authors showed considerable decrease. Correspondingly, the biggest amount of the papers (86% of all papers) was written one, two, or three author(s).

Abstract: This research was designed to see how much importance is given by architecture students to building physics in the process of architectural project development. In this scope heat-moisture, air circulation (wind control/natural ventilation), solar power (usage/protection), indoor air quality, natural and artificial lighting, building acoustics and noise control, building biology, ecology and fire insulation were defined as criteria related to building physics. In the scope of the study, 100 students out of the 217 volunteers from Bursa Orhangazi University, Architecture and Design Faculty, Architecture Department during the 2015-2016 education year, were asked to rate each criteria. At the end of the study it has been understood that students were highly sensitive and had a high level of awareness and sensitivity on this subject.

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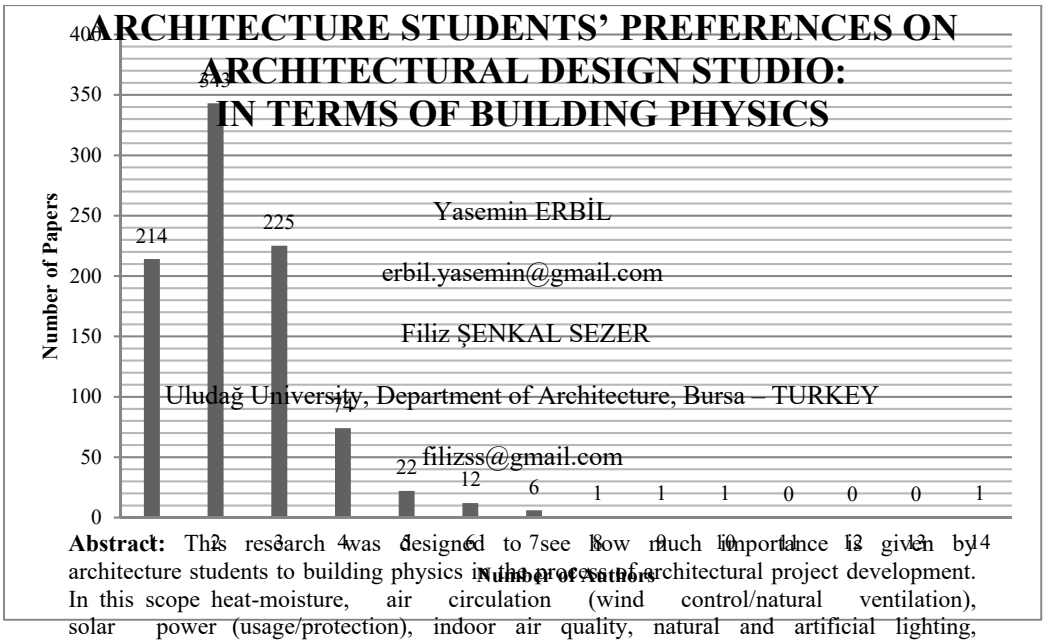

Figure 4. Distribution of the analyzed papers by number of authors.

Abstract: This research was designed to see how much importance is given by architecture students to building physics in the process of architectural project development. In this scope heat-moisture, air circulation (wind control/natural ventilation), solar power (usage/protection), indoor air quality, natural and artificial lighting, building acoustics and noise control, building biology, ecology and fire insulation were defined as criteria related to building physics. In the scope of the study, 100 students out of the 217 volunteers from Bursa Orhangazi University, Architecture and Design Faculty, Architecture Department during the 2015-2016 education year, were asked to rate each criteria. At the end of the study it has been understood that students were highly sensitive and had a good level of awareness and sensitivity on this subject.

Keywords: Architectural Design Studio, Architecture Students' Preferences, Building Physics

By Countries of Authors

The analyzed publications were written by a total of 2136 authors from 68 different countries. It should be noted that the country knowledge of the authors were based on the correspondence addresses of the papers. The authors who did not give information about the origin of themselves were accepted as *unknown* in the analysis.

Figure 5 shows the percentage distribution of countries of authors. Authors originating from USA (United States of America) had the largest amount of the publications with 26% (with 568 papers). Authors originating from China ranked as the second with 11% (with 233 papers). Taiwan (Republic of China) had the third place for authors' origins with 9% (with 201 papers). Taiwan was followed by England, Italy, and Australia with 6%, 5%, and 4% respectively. More than the half (52% of all authors) of all authors was from the first four countries: USA, China, Taiwan, and England.

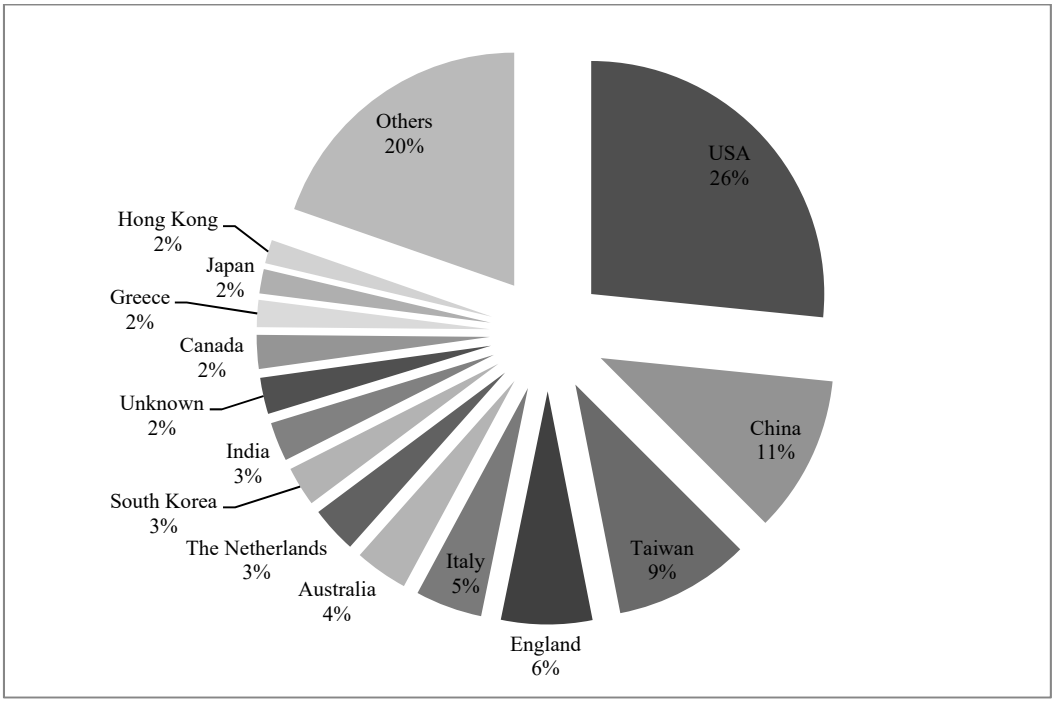

Figure 5. Percentage distribution of country origins of authors.

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Conclusion

This paper mainly investigated the statistical distribution of the papers published about innovation diffusion in Web of Knowledge database from January 1, 1981 through December 5, 2013.

A bibliometric analysis was performed in order to compute basic statistics and examining the current state, hot topics and trends of innovation diffusion researches. The main findings of the present work are given below.

- The 665 of all publications (74% of all papers) consisted of articles while the remaining 235 of the all papers (26% of all papers) were the proceeding papers.
- The number of papers published on innovation diffusion was really low at the beginning years of the research time period. It showed a considerable increase at 1992 and fluctuated until 2000. The largest amount of the analyzed papers (724 of 900 papers) was written after 2000. And it peaked at 2012 with 90 papers.
- The biggest amount of the papers (52% of all papers) was related with social sciences research area. The papers related with Technology research area followed it with 35%.
- The biggest amount of the papers (86% of all papers) was written one, two, or three author(s).
- 900 papers were written by 2136 authors from 68 different countries.
- Authors originating from USA (United States of America) ranked to the first place with 26% (568 of all papers). Authors originating from China had the second place with 11% (235 of all papers). Taiwan (Republic of China) had the third place for authors origins with 9% (201 of all papers). More than the half (52%) of all authors was from USA, China, Taiwan, and England respectively.

The findings given in this study present some basic statistics and trends obtained innovation diffusion papers for the given period. However, the analyses in this study were subject to certain limitations. First, the document types of the papers were restricted as articles and proceeding papers. Second, the papers that did not have abstracts available online were not included in this study. Consequently, future researches may perform a more detailed study taking these limitations of the present study into account.

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ARCHITECTURE STUDENTS' PREFERENCES ON ARCHITECTURAL DESIGN STUDIO: IN TERMS OF BUILDING PHYSICS

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Abstract: This research was conducted to determine which architecture students to building physics in the process of architectural project development. In this scope, heat, moisture, air, circulation (wind, control(natural), ventilation), solar, power, (usage/protection), indoor, air, quality, natural, and, artificial, lighting, building, acoustics and noise control, building biology, ecology and fire insulation were defined as criteria related to building physics. In the scope of the study, 100 students out of the 217 volunteers from Bursa Orhangazi University, Architecture and Design Faculty, Architecture Department during the 2015-2016 education year, were asked to rate each criteria. At the end of the study it has been understood that students were highly sensitive to the subject in the study. Consequently, this research

Keywords: Architectural Design Studio, Architecture Students' Preferences, Building Physics

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BIG DATA OVERVIEW WITH OPEN CHALLENGES AND RESEARCH AREAS

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This work intends to brief the reader about Big Data, its dimensions and its challenges in the context of Big Data Analytics. For that, Cloud

Computing is shortly introduced and then Big Data along with its characteristics are defined. The relationship between Big Data vs. Cloud Computing

pointed out. Big Big Data Analytic process is described along with its important aspects. Finally the challenges and the research areas are summarized.

Keywords: Cloud Computing, Big Data, Big Data Analytics, Data management

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BILGISAYAR DESTEKLI TASARIM –SUNUM ÇALIŞMALARINDA YAZILIM PROGRAMLARININ KULLANIMI VE EĞITIMININ DEĞERLENDIRILMESI

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Bilgisayar teknolojisinin ülkemizde oldukça takip edildiği göz önünde bulundurulduğunda bilgisayarın etkili kullanımının eğitim hayatımızı ne şekilde etkilediği önemli bir konudur. Ülkemizin temel hedefi kaliteli ve bilgili öğrenci yetiştirilmesidir. Sayıları gün geçtikçe artan öğrenci potansiyelinin; en iyi şekilde yetiştirilmesinde bilgisayar destekli eğitim en büyük yardımcı olarak düşünülmelidir. Bu amaçla Kırklareli Üniversitesi Teknik Bilimler Yüksek Okulunun Giyim Üretim Teknolojisi, Tekstil Teknolojisi programlarında okuyan 101 öğrenciye anket çalışması yapılmıştır. Bu çalışmanın sonucunda verilen bilgisayar destekli eğitiminin yeterli olup olmadığı ve daha etkin bir eğitim öğretimin sağlanabilmesi için neler yapılabileceği ortaya çıkarılmaya çalışılmıştır.

Computer-Assisted Design –Use of Software Programs on Presentation Studies and Evaluation of Its Education

The fact that how effective use of computer affects our educational life considering that computer technology is highly followed in our country is an important subject. Our country's main aim is to raise qualified and knowledgeable students. Computer- Assisted Education should be considered as the biggest help on raising student potential whose number is increasing day by day. For this purpose, a questionnaire has been conducted on 101 students who study in the programs of Vocational School of Technical Sciences Clothing Production Technology, and Textile Technology at University of Kırklareli. As a result of this study, whether the given Computer-Assisted Education is sufficient or not and what can be done in order to provide more active education has been attempted to be found out.

Keywords: Bilgisayar Destekli Tasarım, Desen Tasarımı, Sunum Hazırlama, Eğitim

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BIM LIBRARY DEVELOPMENT CUSTOMIZED FOR THE ELDERLY HOUSING

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The study intends to present a direction for BIM Library Development customized for the Elderly Housing, which can be used for modular housing by analyzing the behaviors of the elderly and the relevant researches on the elderly housing. The existing BIM library targets ordinary people as users, and the direction of the research tend to focus only on the system. The existing BIM library, in terms of practical and pragmatic point of view, is inappropriate for the elderly housing sincec it is not divided in detail to apply to space. Therefore, this research aims to develop the BIM library applicable for modular housing for the elderly. The spatial extent of the study is limited to the entrance, kitchen and bathroom, which have the biggest differentiation between the elderly housing and the public housing, and require the system customized for the elderly.

This study, through the precedent research and theoretical consideration, analyzes the behaviors of the elderly and residential design technique, modular housing, and BIM library, and the domestic standards relevant to the elderly. Then, the guidelines customized for the elderly housing are derived.. Also, analysis on the exisitng BIM library customized for the elderly housing are conducted. Finally, BIM library customized for the entrance, kitchen, and bathroom are proposed, based on the guidelines deduced from above.

Through this research, it is expected to present basic directions for modular-based BIM Library Development customized for the Elderly Housing and contribute to the supply and activation of the modular housing customized for the elderly.

Keywords: BIM, BIM Library, Elderly Housing, Modular

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BIODIESEL FUEL OBTAINED FROM SUNFLOWER OIL AS AN ALTERNATIVE FUEL FOR DIESEL ENGINES

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Abstract
In this study, an alternative diesel fuel, of which chemical modification was made by transesterification with short chain methyl alcohols, was produced from sunflower oil, a designated as B100. The modified products were then evaluated according to their fuel properties as compared to diesel fuel. The fuel properties considered were viscosity, pour point, calorific value, flash point, and cetane number in addition to some other properties. The effects of sunflower oil methyl ester (biodiesel) and diesel fuel on a direct injected, four strokes, single cylinder diesel engine performance were studied. The results showed that the performance of the engine using biodiesel fuel differed very little from the engine's using diesel fuel.
Keywords: diesel engine, alternative fuel, biodiesel fuel, performance.

1. Introduction

The prevalence of internal combustion engines and subsequent developments in engine technology have led to wide spread consumption of the petroleum fuels. Due to the shortage of petroleum products and its increasing cost, many efforts are put on the stage to develop alternative fuels, especially for fully or partial replacement of diesel oil. The high cost of petroleum and petroleum crises have brought much pressure on many countries to re-evaluate their national energy strategies. Thus energy conservation and alternative fuels research are given high priority in energy planning in some countries. Many studies have been performed in developed countries and elsewhere involving vegetable oils as a primary source of energy. Particularly, during the early 1980's, studies on the possibility of using unmodified vegetable oils as a diesel fuel were conducted.

Since the petroleum crises in 1970's and 1980's, rapidly increasing petroleum prices and uncertainties concerning petroleum availability, a growing concern of the environment, and the gases affecting global warming have attracted more interests in the use of vegetable oils as a substitute of diesel fuel. The acceptability of vegetable oils as diesel fuel has been evaluated for the first time in the 70th years because of the well known energy crises. Thus energy conservation and alternative fuel researches are given high priority in energy planning in some countries. Several studies conducted worldwide have shown that vegetable oil, without any modification on diesel engine, can give performances comparable with those of diesel fuels. The most important advantage of vegetable oils is that they are renewable energy sources compared to the limited resources of petroleum. Many of these studies are on vegetable oils to be used in diesel engines (Labeckas et al. 2005), (Ryu et al. 2004), (Rakopoulos et al 1992), (Lapuerta et al 2005), (Huzayyin et al 2004), (Hebbal et al 2006), (Geyer et al 1984), (Yoshimoto et al 2002). It has been found that the vegetable oils are promising fuels because their properties are similar to diesel and can be produced easily from the crops (Jung et al 2004), (Zou et al 2003), (Nagaraj et al 2002).

Vegetable oils are non-toxic renewable sources of energy, which do not contribute to the global CO_2 buildup. Vegetable fuels can be used as an emergency energy source in the event of any petroleum shortage. Extensive studies on alternative fuels for diesel engines have been carried out since the fossil based fuels are limited. Common vegetable oils are sunflower, cottonseed, olive, soybean, corn, nut, leenseed and sesame oils. The most produced ones in Turkey are sunflower, cottonseed, corn, soybean, olive and nut oils.
Sunflower and other vegetable seeds release oil on compression processes. During the processes of compression of these seeds and final storage, many fatty acids are formed (Gunstone et al 2003), (Bikou et al 2003), (Warner et al 1997), (Yücesu et al 2006). These are palmitic, stearic, oleic, lynoleic, arachidic and behenic acids. Sunflower oil also contains some fatty acids like other vegetable oils. The chemical formulations and the percentage of sunflower oil and some other oils fatty acids are given in Table 1.

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Table 1. Fatty acid composition of sunflower oil in comparison with other vegetable oils

Component	Chemical Bond	Chemical equation	Sunflower oil	Cottonseed oil	Soybean oil	Corn oil
Palmitic acid	16:0	C16H32O2	23	22	17	12
Stearic acid	18:0	C18H36O2	3	2	3	2
Oleic acid	18:1	C18H34O2	24	25	26	25
Linoleic acid	18:2	C18H32O2	49	50	54	60
Linolenic acid	18:3	C19H32O2	1	1	3	1

The melting point of fatty acids rises with the length of the structural chain of acid. Some vegetable oil contains high concentrations of less common fatty acids. Physical properties of sunflower oil used in this study in comparison with other some vegetable oils are given in Table 2. These oils are almost entirely consumed in foods. The excess of these could be used as diesel fuel besides consuming in foods.

Table 2. Physical properties of sunflower oil in comparison with other some vegetable oils

Properties	Sunflower oil	Cottonseed oil	Soybean oil	Corn oil
Density @ 26ºC (Kg/lt)	0.918	0.912	0.92	0.91
Viscosity(mm^2/s) at 26°C	34	35	34	36
Flash point (°C)	220	210	230	280
Calorific value (kJ/kg)	39500	39450	39600	39550
Setan number	36	42	38	37
Acid value	0.15	0.11	0.20	0.16
Sulphur value (%)	0.01	0.01	0.01	0.01

It has been shown that pure vegetable oils have harmful effects on engine parts and cause a starting up problem (Engler et al 1983), (Schlick et al 1988), (Ramadhas et al 2005), (Muñoz et al 2004), (Bari et al 2002), (Goodrum et al 2005), (Dorado et al 2002), (Krishna et al 2004). The problems due to the viscosity and density of the vegetable oils having different physical and chemical properties from the diesel fuel should be eliminated by making them less viscous. High viscosity of the vegetable oils and its tendency to polymerise within the cylinder are major chemical and physical problems encountered. With this aim, it is necessary to obtain either esters or emulsions of vegetable oils (Bhattacharyya et al 1994), (Agarwal et al 2001), (Barnwal et al 2005), (Schwab et al 1987). Vegetable oils can be used as material to produce methyl or ethyl ester. There are several methods for producing of ester; and the best method is known as transesterification (Freedman et al 1986), (Mittelbach et al 1999), (Schuchardt et al 1998), (Ramadhas et al 2005), (İlkılıç et al 2005), (Megahed et al 2004), (Dorado et al 2004), (Encinar et al 2002), (Noureddini et al 1997), (Ma et al 1999), (Harrington et al 1985).

2. Experimental procedure

Transesterification is the most frequently applied method of industrial ester production. A strong acid can be used in transesterification process. Vegetable oils' methyl or ethyl ester is considered as a promising alternative fuel for the reduction of pollutant from diesel engines. Biodiesel can be used in any diesel engine in pure form or blended with diesel fuel at any rate. Even a blend of 20% biodiesel and 80% diesel fuel will significantly reduce carcinogenic emissions by 27% and gases that may contribute to global warming up (Petrowski, 2002). Biodiesel fuel production from sunflower oil has been studied as an alternative fuel for compression ignition engines. Detailed reviews about biodiesel fuel production processes are available in the literature. In this study, crude sunflower oil was obtained from the oil processing factory of Karadeniz Birlik, Elazığ, Turkey. Diesel fuel was obtained from a commercial gas station in Elazığ, Turkey. The biodiesel fuel produced by a transesterification technique was further reacted by using a peroxidation process. Physical properties of crude sunflower oil (CSO), Biodiesel (B100) fuel, and diesel fuel are given Table 3.

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Table 3. Physical properties of crude sunflower oil (CSO), biodiesel fuel (B100) and diesel fuel

Properties	CSO	Biodiesel	Diesel fuel
Density @ 26ºC (Kg/lt)	0.918	0.89	0.84
Viscosity (mm^2/s)@ 26 °C	34	4.5	3.2
Flash point (°C)	220	85	59
Calorific value (kJ/kg)	39342	40565	42980
Setan number	36	74	56
Acid value	0.15	0.13	0.22
Percentage of H (%)	11.67	12.19	15.10
Percentage of C (%)	77.46	76.66	84.90
Percentage of O (%)	10.87	11.15	-

B100 fuel prepared in laboratory conditions was tested in an engine of which technical data is detailed in table 4.

Table 4. Lombardini Diesel Engine Details.

Type	6LD 400 Lombardini
Number of cylinder	1
Cylinder diameter	86 mm
Stroke	68 mm
Clearance volume	395 cm^3
Compression ratio	18:1
Maximum speed	3600 l/min
Maximum power	6.2 kW @ 3600 l/min
Maximum torque	20 N.m @ 2200 l/min
Fuel tank capacity	4.3 lt
Oil consumption	0.0115 kg/h
Cooling	air
Injection timing	30 BTDC
Injection opening pressure	200 kg/cm^2
Starting	by dynamometer
Dry weight	45 kg

Tests were held on a laboratory test bed which consisted of an electrical dynamometer, an exhaust gas analyzer, a data acquisition system and engine mounting elements, as shown in Fig. 1. Diesel fuel and biodiesel fuel were compared for their fuel properties and their engine performance.

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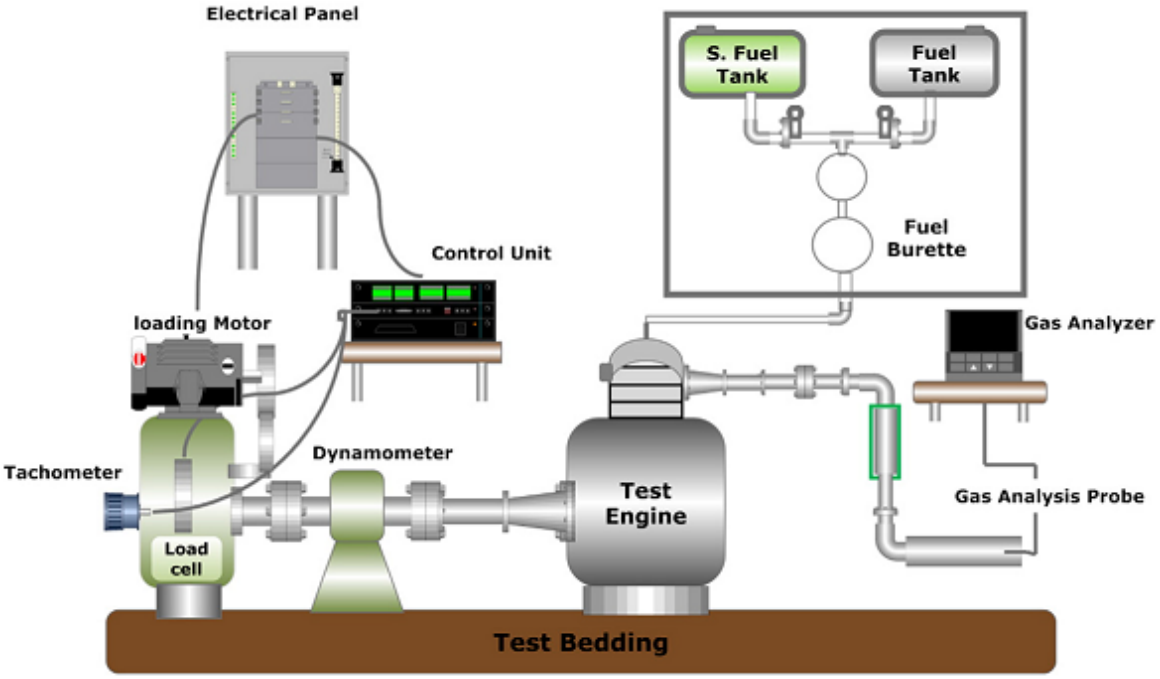

Figure 1. Schematic layout of the engine test system

3. Results and discussions

3.1. The engine power

During the injection period, the injection conditions such as injection pressure, nozzle size, and injection rate may vary. The droplet size distribution in the spray may also change with time during the injection period. The effect of injection pressure has been studied. The injected diesel fuel and B100 fuel are atomised into small drops near the nozzle exit to form a spray. Good atomisation requires high fuel injection pressure small injector nozzle size, optimum fuel viscosity and high cylinder air pressure at the time of injection. The variations of engine power values in relation with the various injection pressures are shown in Fig. 2. The maximum power for diesel fuel and B100 fuel occurred at 200 bar pressure injection. The power output of diesel engine using B100 fuel was lower than the power output using diesel fuel.

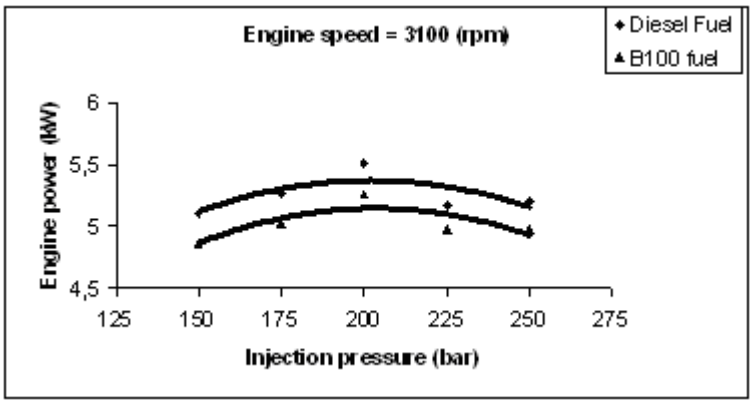

Figure 2. The variation of the engine power at the various injection pressure.

The maximum power obtained by diesel fuel was 5.51 kW while 5.26 kW by B100 fuel at 200 bar injection pressure. This was due to an increase in fuel consumption with an increase of injection pressure. The difference in power outputs was caused by the difference between the calorific values of the fuels. The power increases from 5.11 kW to about 5.51 kW when the injection pressure is increased from 150 bar to 200 bar for diesel fuel. From injection pressure of 150 to 200 bar the power increases from 4.86 kW to about 5.26 kW and then

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decreases slowly the other injection pressures for B100 fuel. From injection pressure of 200 to 250 bar the power decreases from 5.51 kW to 5.21 kW for diesel fuel and from injection pressure of 200 to 250 bar the power increases from 5.26 kW to 4.97 kW for B100 fuel. The maximum power between diesel fuel and B100 fuel represents a difference of 5% of the 200 bar injection pressure. The small difference was mainly a result of reduction at heating value of diesel fuel due to the lower heating value of B100 fuel.

3.2. Engine torque

The variation of engine torque by injection pressure for the two fuels was shown in Fig. 3.

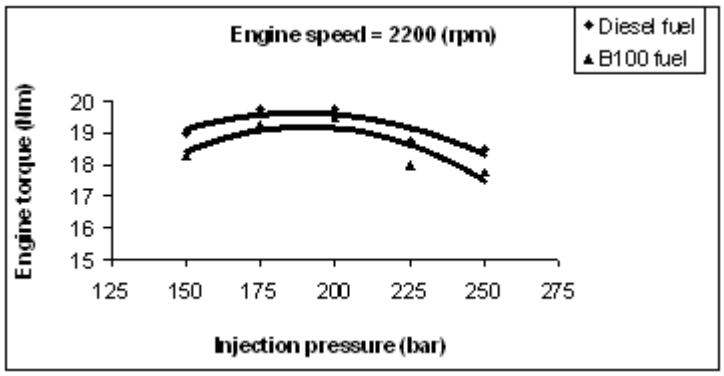

Figure 3. The variation of the engine torque at the various injection pressure

The torque decreased with increase of injection pressure for the two fuels. Up to a pressure of 200 bar the engine torque is about constant and then it is decrease slowly for diesel fuel and B100 fuel. The torque increases from 19 Nm to about 19.75 Nm when the injection pressure is increased from 150 bar to 200 bar for diesel fuel. From injection pressure of 150 bar to 200 bar the torque increases from 18.25 Nm to about 19.50 Nm and then decreases the other high injection pressures for B100 fuel. From injection pressure of 200 bar to 250 bar the power decreases from 19.75 Nm to 18.50 Nm for diesel fuel and from injection pressure 200 bar to 250 bar the power increases from 19.50 Nm to 17.50 Nm for B100 fuel.

3.3. Specific fuel consumption

Figure 4 showed the specific fuel consumption (SFC) for the two fuels. Specific fuel consumption increased with increase of injection pressure. The specific fuel consumption of B100 fuel was higher than of diesel fuel. This was due to the calorific value of B100 fuel being lower than that of diesel fuel. But the density of the B100 fuel was higher than that of diesel fuel so their calorific value by volume was relatively close. In addition, B100 fuel contains a certain amount of oxygen and the high viscosity. B100 fuel may also provide a good sealant between the piston rings and cylinder wall. The utilization ratio of energy can be raised so the fuel consumption rate was higher than diesel fuel. Because of the lower calorific value, with an increase in B100 fuel, the specific fuel consumption of B100 fuel was a little higher than that of diesel fuel.

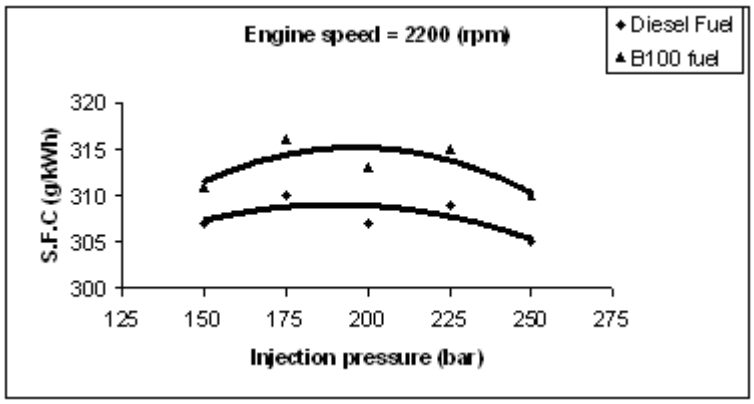

Figure 4. The variation of the engine specific fuel consumption (SFC) at the various injection pressure

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Up to a pressure of 225 bar SFC is increased and then it is decreased slowly for diesel fuel. The SFC increases from 307 g/kWh to about 309 g/kWh when the injection pressure is increased from 150 bar to 225 bar for diesel fuel. From injection pressure of 150 bar to 200 bar the SFC increases from 311 g/kWh to about 313 g/kWh and then decreases the other high injection pressures for B100 fuel. From injection pressure of 225 bar to 250 bar the SFC decreases from 309 g/kWh to 305 g/kWh for diesel fuel and from injection pressure 200 bar to 250 bar the specific fuel consumption decreases from 313 g/kWh to 310 g/kWh for B100 fuel. The largest effect of high injection pressure is the state of the fuel as it passes through the nozzle. The injection pressure can be reduced slightly leave the fuel emerging from the nozzle in mostly vapour state. The question that remains is the increase in the specific fuel consumption at the high engine injection pressure due to the deacrease in drop size and the calorific value or some other factors.

4. Conclusions

Engine tests have been conducted with the aim of obtaining comparative measures of torque, engine power, specific fuel consumption to evaluate and compare the behaviors of the direct injected diesel engine running by diesel fuel and B100 fuel. Diesel fuel and B100 fuel was compared and its physical and chemical characteristics were determined. Fuel characterization data showed some similarities and differences between diesel fuel and B100 fuel. From the results obtained in this study it can be concluded that;

The physical properties of diesel and B100 fuel are not very different. While the density and viscosity of B100 fuel decreased from 0.92 kg/lt to 0.88 kg/lt and from 33.98 mm^2/s to 4.5 mm^2/s respectively at 26°C, the heat capacity increased from 39342 kJ/kg up to 40565 kJ/kg. Viscosity considerably decreased as a result of esterification.

Flash point, density, cetane number and viscosity of B100 fuel were higher than those of diesel fuel. Calorific value of B100 fuel was lower about 6% than diesel fuel. Engine performance and exhaust gas emission of B100 fuel are comparable with diesel fuel. When the engine performance is considered, there are slight decreases in the engine torque and power with respect to diesel fuel. Thus B100 fuel is technically feasible in diesel engine.

The high fuel consumption of B100 fuel at all injection pressure will compensate for the lower heating values such that the engine consumes equal amount energy.

B100 fuel doesn't affect engine and bearing components seriously. It doesn't degrade lubricating oil and produces comparable amount of carbon deposit.

Vegetable oils and biodiesel hold great promise as substitutes of diesel in existing diesel engines without any modification. Edible and non-edible oil and animal fats can be used to produce biodiesel. Non-edible or crude oils offer great promise as biodiesel, and hence there is a need to grow high yielding non-edible oil seed crops.

Vegetable oils are renewable in nature and can be produced locally and environmentally friendly as well. They have no sulfur content and have excellent lubrication properties. Moreover, trees yielding vegetable oils absorb carbon dioxide from the atmosphere during their photosynthesis. Vegetable oil plants that produce oils used for making biodiesel draw CO_2 from the atmosphere to build stems, leaves, seeds and roots.

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BIQUATERNIONIC UNIFICATION OF THE GENERALIZED FIELD EQUATIONS IN GRAVITY AND ELECTROMAGNETISM

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In relevant literature, several noncommutative mathematical structures have been proposed in order to formulate the possible relations between linear gravity and electromagnetism. In this study, using the similarities between gravity and electromagnetism, an alternative formulation has been derived. As a member of noncommutative division algebra, the real quaternions are one of the four dimensional number systems and have many applications in mathematics and physics. Since the biquaternions are composed of two real quaternions, they can be used to represent up to the 8-dimensional physical structures. In this work, introducing a hyperbolic unit into biquaternion formalism, a sixteen dimensional mathematical structure has been obtained. By this way, the massive field equations including monopole terms in electromagnetism and linear gravitation have been combined in the single equation. The generalized wave equation with simultaneous existence of electric, magnetic, gravitoelectric, gravitomagnetic charge (mass) terms has been formulated in compact and elegant manner.

Keywords: Biquaternion, Gravity, Electromagnetism, Gravi-electromagnetism, Wave Equations

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BOR KATKILI ALÇILARIN TERMOMEKANİK ÖZELLİKLERİ

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Özet: Yapılarda kullanılacak malzemelerin seçiminde, enerji-malzeme üretim teknikleri dikkate alınmalı, karbondioksit ile hava ve çevre kirlenmesi dengeleri hesaba katılmalı ve alternatiflerden en az zararlısı seçilmelidir. Bu nedenle mimarlar, mühendisler ve tüketiciler yapı malzemelerini seçerken üretim aşamasında en az enerji kullanan, çevre ile uyumlu malzemeleri seçmek durumundadırlar. Alçının hazırlanmasında kullanılan temel hammadde alçıtaşıdır. Alçı taşı değişik yerlerde değişik saflıkta yataklanmış doğal oluşumlu bir kayaçtır. Bu çalışmada, alçı ağırlıkça farklı oranlarda kullanılarak 10×10×10 ebatlarında üretilmiştir. Üretilen numunelerde su ve alçı oranı sabit tutularak alçı yerine ağırlıkça % 2,5, 5, 7,5, ve 10 oranlarında bor (Üleksit-Konsantre ve Üleksit- Tüvenan) kullanılmıştır. Üretilen numunelerin yoğunlukları, ultrases hızları ve ısı iletkenlikleri belirlenmiştir. Bor oranı arttıkça numunelerin ısı iletkenlik katsayısının azaldığı görülmektedir. Isı iletkenlik katsayısının azalması ise ısı yalıtımına katkı sağlayacağı düşünülmektedir.

Anahtar Kelimeler: Alçı, Bor, Isı İletkenlik

THERMO-MECHANİCAL PROPERTİES OF BORON REİNFORCED GYPUMUS

Abstract: In the selection of materials to be used in buildings, energy-fabrication must be considered, carbon dioxide must be taken into account by air pollution and balances and least harmful to the alternative should be selected. For this reason, architects, engineers, and consumers use the least energy when selecting the building materials, during the production phase, to select materials compatible with the environment are required. The basic raw material used in the preparation of gypsum plaster. Supported in different places purity of gypsum is a naturally occurring rock. This rock within the body of around 20% chemically bound water it contains. In this study, different proportions by weight of gypsum using 10×10×10 sizes are manufactured. The produced water samples instead of plaster when plaster is held constant and the ratio of % by weight to 2.5, 5, 7.5 and 10 in a ratio of boron (Üleksit-Concentrate and Üleksit-Tuvenan) was used. The densities of the samples produced, the ultrasound velocity and the thermal conductivity was determined. The ratio of boron increases, it is observed that the coefficient of thermal conductivity of the samples is reduced. To reduce the coefficient of thermal conductivity is considered to contribute to thermal insulation.

Keywords: Gypumus, Boron, Thermal Conductivity

Giriş

İnsanoğlunun var oluşundan bu yana yeme içme ihtiyacından sonra ikincil temel ihtiyacı barınma olmuştur. Böylece yapı sektörü hep gündemde kalmış ve her an daha güzel, pratik yöntemler geliştirmeye yönelik çalışmalar devam etmiştir. Günümüz dünyasında ise her alanda olduğu gibi bu alanda da temel gaye, en kısa zamanda en az harcama ile çözüme ulaşmaktır. Günümüzde kullanımda ortaya çıkan ihtiyaçlar nedeni ile, çeşitli özelikleri geliştirilmiş veya üretim ve uygulama teknikleri farklı bazı özel betonlar yaygın biçimde kullanılmaktadır. Üretilen betonların kullanım amacına yönelik olarak tasarımının yapılması ve ekonomik olması çok önemlidir (Sarıkaya, 2014). Dünya nüfusunun artması nedeniyle, basit ve tek katlı yapılar yerine, karmaşık ve çok katlı yapılar son yıllarda yaygınlaşmıştır. Bina yüksekliği ve kat sayısı arttıkça, kullanılan malzemenin niteliği de önem kazanmaktadır (Erdem vd.,, 1997). Çok katlı yapılarda, yapısal güvenlik ve depremin etkisini azaltmak için beton performansı büyük önem taşır (Neville, 1981).

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Beton; çimento, su, agrega ve gerektiğinde katkı maddelerinin (mineral, kimyasal, fiber vb) belirli şartlar ve oranlarda karıştırılmasıyla elde edilen, başlangıçta şekil verilebilen plastik formda olup, zamanla çimento ve su arasındaki kimyasal reaksiyonun gelişmesiyle (hidratasyon) sertleşerek mukavemet kazanan, harç fazı ve agregadan oluşan kompozit bir yapı malzemesidir (Özel, 2007). Beton henüz yeni karıldığında taze beton adını alırken, katılaşıp sertleşince sertleşmiş beton adını alır (Neville, 1993). Betonda bileşime giren malzemeler özel olarak oranlandığı zaman karışım herhangi bir yere dökülebilir ve ebadı ile kalıpların şeklini alabilen plastik bir kütle meydana getirir (Baradan, 1997).

Bor madeni, periyodik tabloda B simgesiyle gösterilen, atom numarası 5, atom ağırlığı 10.81, yoğunluğu 2.84 gr/cm^3, ergime noktası 2300 °C, kaynama noktası 2550 °C olan, metalle ametal arası yarı iletken özelliklere sahip bir elementtir (Etimaden, 2016). Genellikle doğada tek başına değil, başka elementlerle bileşikler halinde bulunan bor madeni, çeşitli metal veya ametal elementlerle yaptığı bileşiklerin gösterdiği değişik özellikler nedeniyle, endüstrinin birçok alanında kullanılmaktadır. Doğadaki yaklaşık 150 mineralin bor elementi içerdiği bilinmesine rağmen, endüstriyel açıdan önemli ve ticari değeri olan bor bileşikleri arasında boraks, kolemanit, tinkal, üleksit, kernit, pandermit, probertit, szyabelit ve hidroborasit yer almaktadır. Bor mineraleri doğadaki halleriyle ticari önem taşımalarına rağmen, farklı tipteki rafine bor bileşiklerinin üretilmesi için bazen teknolojik işlemlere tabi tutulmaktadır. Öte yandan bu bor bileşikleri içerdikleri B_2O_3 (borik oksit) miktarına, taşıdıkları fiziksel veya kimyasal özelliklerine göre farklı alanlarda kullanılmaktadır (Boraxs, 2016).

Türkiye Dünya bor madeni rezervinin %72'sine sahiptir. Bu özelliği ile Dünya ham bor madeni üretiminde birinci sırada yer almaktadır. Öte yandan, tek başına dünya bor talebini 567 yıl karşılayabilmesi söz konusudur. Dünya bor madeni rezervinin %7'sine sahip olan ABD ise, yakın gelecekte bor rezervlerinin tükenmesi ile karşı karşıyadır. ABD'deki bor rezervlerinin dünya bor talebini karşılayabilme süresi ise yalnızca 53 yıldır (Etimaden, 2016).

Türkiye'de bulunan bor madenleri diğer ülke rezervlerine göre karşılaştırmalı üstünlüğe sahiptir. Ülkemizde bulunan bor madenlerinin yerleşim yerlerinin hemen yanında yer alması, rezervlerin kolaylıkla işletilebilmesini sağlamaktadır. Ayrıca Türkiye'deki bor madenlerinin içindeki borik oksit oranının yüksek olması, boraks ve borik asit üretilmesi için madenlerin ek işlemlerden geçirilme zorunluluğunu da ortadan kaldırmaktadır. Bütün bu özelliklere rağmen, Türkiye'nin bor ürünleri piyasasında aldığı pay ise yalnızca % 7'dir. Oysa ABD'nin aynı piyasadan aldığı pay yaklaşık % 60–70 civarındadır (Etimaden, 2016).

Yapılarda kullanılacak malzemelerin seçiminde ise enerji-malzeme üretim teknikleri dikkate alınmalı, karbondioksit ile hava ve çevre kirlenmesi dengeleri hesaba katılmalıdır. Alternatiflerden en az zararlısı seçilmelidir. Bu nedenle mimarlar, mühendisler ve tüketiciler yapı malzemelerini seçerken üretim aşamasında en az enerji kullanan, çevre ile uyumlu malzemeleri seçmek durumundadırlar. Alçının hazırlanmasında kullanılan temel hammadde alçıtaşıdır. Doğada bulunan jipsit veya anhidrit olarak rastlanan Ca^{+2}, SO^{-4} iyonlarının bileşiminden oluşan ve oluşum ortamına göre içeriğinde bazen su bulunan mineral topluluğuna, mineral farklılığına bakılmaksızın alçıtaşı denilmektedir. Malzeme bileşimleri, bağlayıcı olarak görev yapan %25-30 alçı, % 70-75 kuartz ve kristobalit formundaki silika karışımı ve düşük miktarlarda kontrol ilavelerinden oluşmaktadırlar (Ünlüer, 2001).

Alçı taşı değişik yerlerde değişik saflıkta yataklanmış doğal oluşumlu bir kayaçtır. Bu kayaç bünyesinde % 20 civarında kimyasal olarak bağlanmış su içerir. Bu öğütülüp ısıtıldığında bünyesinde suyun yaklaşık 3/4' ünü kaybeder ve genel adıyla kalsine alçı yada "plaster of paris" denilen bir yapıya dönüşür. Kalsine edilmiş olan bu alçı tekrar su ile karıştırıldığında plastik ve akışkan bir kütle halini alır ve isteğe göre kalıplanabilir veya şekillendirilir (Kaya, 2000).

Ülkemizde alçının inşaat malzemesi olarak üretimi 1990'lı yılların ortalarında yaygınlaşmıştır. 2000'li yılların başları ile birlikte alçı sektörü hızla büyümüştür. Ülke ekonomisine paralel olarak inşaat sektöründe görülen dönemsel yoğunluklar alçı sektöründeki talebi de doğrudan etkilemektedir. Alçının inşaat malzemesi olarak sağladığı avantajları son on yılda fark eden Türkiye, 2000' li yıllara girerken yılda bir milyon ton alçıyı yapılarda kullanır hale gelmiştir. Ancak ülkemizin çağdaş konut ihtiyacını rasyonel bir biçimde ve bir kuşakta karşılayabilmesi bundan çok daha fazlasını kullanmayı gerektirmektedir (Alçıder, 2016).

Bu çalışmada, ağırlıkça alçı oranı sabit tutularak alçı yerine ağırlıkça % 2,5, 5, 7,5 ve 10 oranlarında (Üleksit-Konsantrre ve Üleksit-Tüvenan) kullanılarak 10 x 10 x10 ebatlarında numuneler üretilmiştir.

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Materyaller

Bu çalışmada, ağırlıkça alçı oranı sabit tutularak alçı yerine ağırlıkça % 2,5, 5, 7,5 ve 10 oranlarında (Üleksit-Konsantrre ve Üleksit-Tüvenan) kullanılarak 10 x 10 x10 ebatlarında numuneler üretilmiştir. Kullanılan alçı ve borun kimyasal özellikleri Çizelge 1'de ve verilmiştir.

Çizelge 1. Alçı ve Borun kimyasal özellikleri

Kimyasal Bileşen	Alçı (%)	Üleksit (%)	
		Konsantre	Tüvenan
B_2O_3	-	38,88	32,25
SiO_2	0,1	2,02	5,21
CaO	29-32	16,67	20,84
MgO	0,3	1,01	2,76
SO_3	42-46	0,31	0,48
Sr	0,009	-	-
Fe	0,17	-	-
Cl	0,02	-	-
Mn	0,07	-	-
Pb	0,037	-	-
Biçim	Toz	-	-
pH	13	-	-

Numunelerin üretimi ile fiziksel ve mekanik özelliklerinin tespiti için yapılan deneyler Süleyman Demirel Üniversitesi Mühendislik Fakültesi Maden Mühendisliği Bölümü Kazı ve Doğal Taşlar Teknolojisi laboratuarında gerçekleştirilmiştir. Bu çalışmada 9 seri borlu alçı üretilmiştir. Üretilen borlu alçıların kodlar Çizelge 2' de, karışıma giren borlu betonların 1 m^3 içindeki bileşenleri ise Çizelge 3.' de verilmiştir. Karışıma giren alçı, bor, su ve çimento üretilecek beton numunesin koduna göre önceden tartılıp hazırlanmıştır. Karışım suyu için doğal kaynak suyu kullanılmıştır. Karılma işlemi düşey eksenli cebri karıştırmalı mikser yardımıyla yapılmıştır. Numunelerin kıvamını belirlemek amacıyla abrams konisi ile çökme miktarları, birim hacim ağırlıkları ölçülmüştür. Çeşitli deneylerde kullanılmak üzere sarsma tablası üzerindeki 100 mm × 100 mm × 100 mm boyutlu küp kalıplara harç üç aşamada konmuş ve her aşamada 10 saniye sarsma tablası aleti ile sarsılmıştır. Her seri için 10 adet küp numune üretilmiştir. Numunelerin 24 saat kalıp içinde bırakılmış, bu sürenin sonunda lastik takozlar yardımıyla kalıptan çıkarılmıştır. Numuneler deneylerin yapılacağı güne kadar saklanmıştır.

Çizelge 2. Üretilen numunelerin karışım yüzdeleri

Kodu	**Alçı(%)**	**Bor (%) (Üleksit-Konsantre)**	**Bor (%) (Üleksit-Tüvenan)**
A	100	-	-
BA1	97,5	2,5	-
BA2	95	5	-
BA3	92,5	7,5	-
BA4	90	10	-
BA5	97,5	-	2,5
BA6	95	-	5
BA7	92,5	-	7,5
BA8	90	-	10

Çizelge 3. Karışıma giren alçılı numunelerinin 1 m3 bileşenleri (kg/m^3)

Kodu	**Su**	**İnce Alçı**	**İnce Bor**
A	680	1250	-
BA1	680	1219	31
BA2	680	1188	62
BA3	680	1157	93
BA4	680	1125	125
BA5	680	1219	31
BA6	680	1188	62
BA7	680	1157	93
BA8	680	1125	125

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Üretilmiş olan alçı numunelerinin ısı iletkenlik katsayısını saptamak üzere yapılan deneyler Dokuz Eylül Üniversitesi Mühendislik Fakültesi Makine Mühendisliği Laboratuarı'nda 8 x 4 x 1 cm numuneler üzerinde gerçekleştirilmiştir. Homojen bir malzemenin ısı iletkenliği, dengeye ulaşmış şartlar altında, iki yüzey sıcaklığı arasındaki fark 1 °C olduğu zaman, birim zamanda, birim alan ve dik yöndeki birim kalınlıktan geçen ısı miktarıdır. Yapı ve çeşitli ısı yalıtım malzemesinin ısı iletkenliğinin ölçümü, kararlı durumda ve geçiş durumunda olmak üzere iki yöntemle yapılmaktadır. Alışılmış yöntem, kararlı durumda ısıtılmış plaka yöntemidir. Bu metodla ısıtılmış bir plakanın iki tarafına simetrik olarak yerleştirilen, levha biçiminde muayene örneğinin, ortalama ısı iletkenliği bulunur. Geçiş durumunda ölçüm yapan cihazlar, daha ufak boyutlardaki malzemenin ısı iletkenliğini daha kısa sürede saptayabilmektedir. Geçiş yöntemleri arasında Angstrom yöntemi, Flash yöntemi ve Hot Wire yöntemi başlıcalarıdır. Bu çalışmada numuneler üzerinde uygulanan ısı iletkenlik ölçme cihazı (Shoterm QTM-D2) "Hot Wire" yönteminden yararlanılarak geliştirilmiştir (Şekil 1).



Şekil 1. Isı iletkenlik ölçme cihazı

Ultrases geçiş hızlarını ölçmek için S.D.Ü. Mühendislik Fakültesi Maden Mühendisliği Bölümü Kazı Mekaniği ve Doğal Taşlar Teknolojisi Laboratuarında bulunan Ultrases ölçüm (Şekil 2.) cihazı kullanılmıştır. Ultrases hız ölçümü 12 voltluk akümülatör ile çalışan dijital göstergeli Ultrases ölçme aleti ile yapılmıştır. Aletin önce sıfır ayarı yapılmış sonra kalibre edilmiştir. Numunelerin her iki yanına gres yağı sürülerek proplar ile numune arasında boşluk oluşması önlenmiştir. Küp numuneler üzerinde yapılan deney ile ses dalgaları geçirme süreleri ölçülmüştür. Ultrases hızı deney sonuçlarının değerlendirilmesinde mikro saniye (µsn) olarak okunan Ultrases hızı geçiş süresi değerleri Eşitlik 1 ile hesaplanarak Ultrases hızı km/s cinsinden hesaplanmıştır.

$$V = \frac{L}{t} \qquad \textbf{(1)}$$

V: Ultrases hızı (km/s), L: Numune boyu (km), t: Ultrases geçiş süresi (s)



Şekil 2. Ultrases ölçüm cihazı

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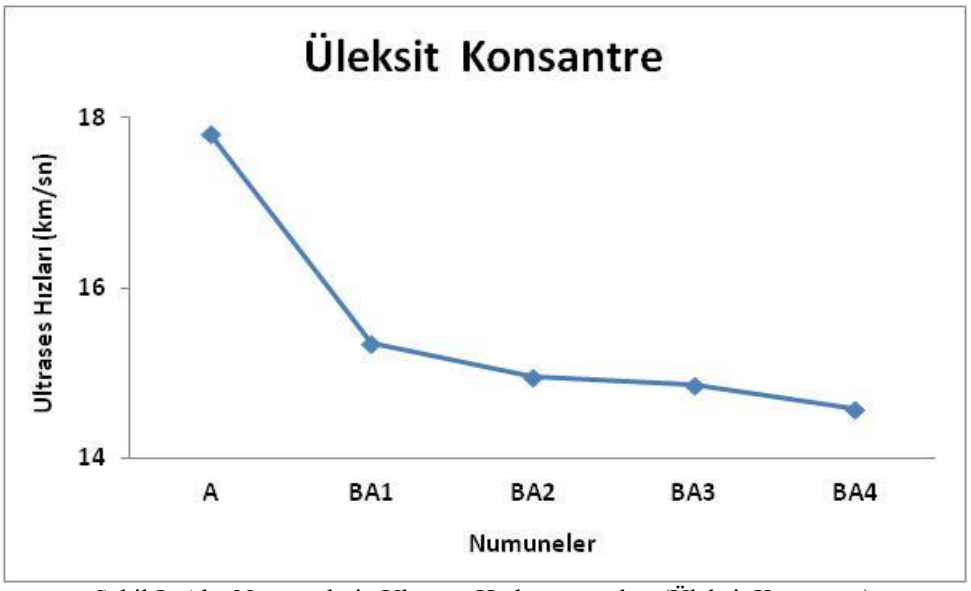
Bulgular

Bu çalışma kapsamında üretilen alçı numuneleri üzerinde ısı iletkenlik katsayısını saptamak üzere yapılan deneyler Dokuz Eylül Üniversitesi Mühendislik Fakültesi Makine Mühendisliği Laboratuarı'nda 8 x 4 x 1 cm numuneler üzerinde her bir numuneden 3 ölçüm alınmak suretiyle gerçekleştirilmiştir. Ayrıca Süleyman Demirel Üniversitesi Mühendislik Fakültesi Maden Mühendisliği Bölümü Kazı Mekaniği ve Doğal Taşlar Teknolojisi Laboratuarında yapılan Ultrases hızı deney sonuçları Çizelge 4.' de verilmiştir. Alçı numunelerin Ultrases hızları sonuçları ve Isı İletkenlik katsayısı sonuçları ise Şekil 3-8.' de verilmiştir.

Çizelge 4. Alçı numunelerinin fiziksel ve mekanik özellikleri

Numunenin Kodu	Kuru Birim Hacim Ağırlığı (kg/m^3)	Ultrases Hızları (km/sn)	Isı İletkenlik Katsayısı (W/mK)
A	1,026	17,82±0,18	0,430
BA1	0,974	15,36±0,06	0,425
BA2	1,001	14,96±0,07	0,415
BA3	1,026	14,87±0,24	0,403
BA4	1,089	14,59±0,14	0,388
BA5	1,034	14,52±0,01	0,425
BA6	1,004	14,68±0,24	0,414
BA7	1,005	14,53±0,11	0,404
BA8	1,071	14,47±0,20	0,390



Şekil 3. Alçı Numunelerin Ultrases Hızları sonuçları (Üleksit Konsantre)

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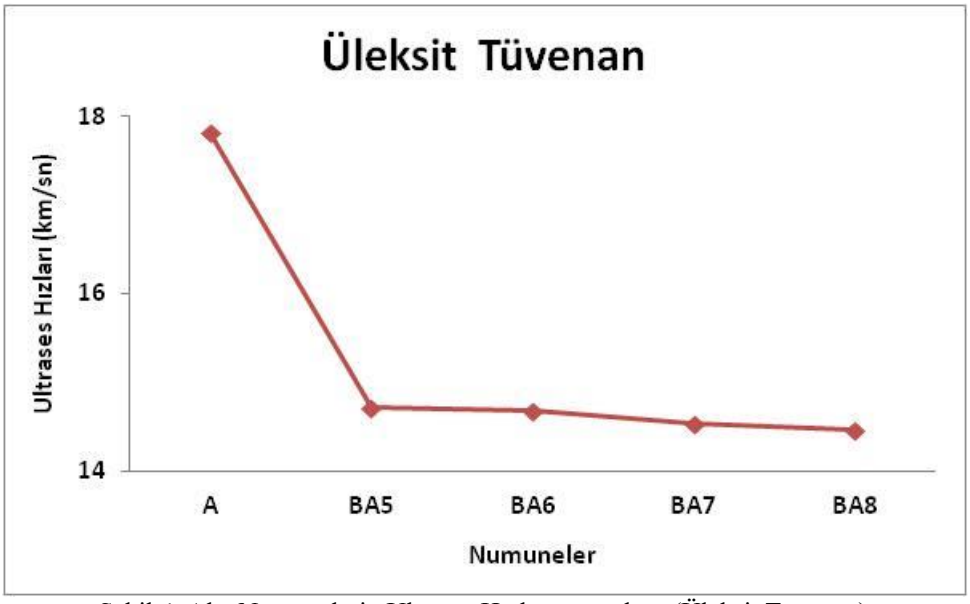
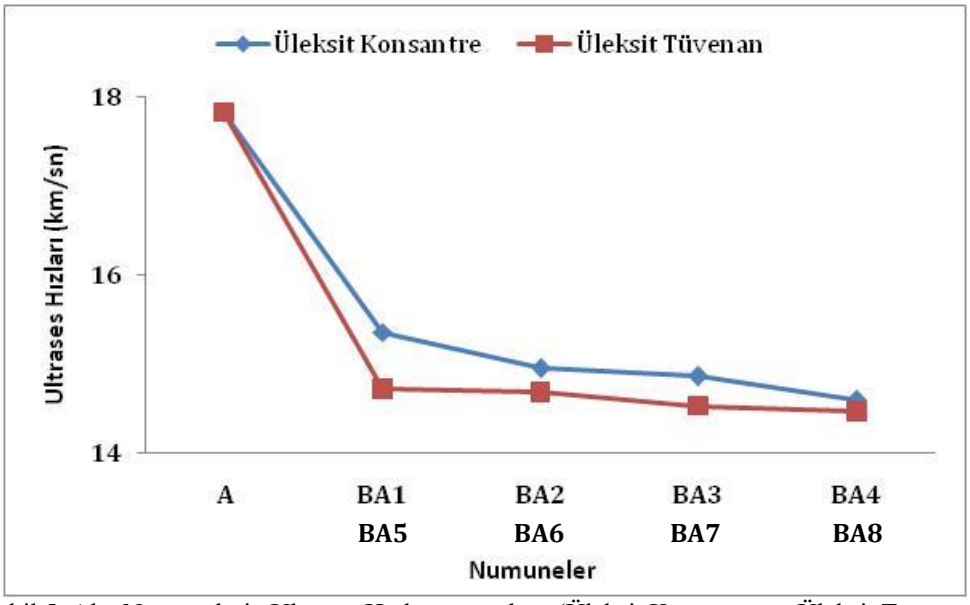


Şekil 4. Alçı Numunelerin Ultrases Hızları sonuçları (Üleksit Tüvenan)



Şekil 5. Alçı Numunelerin Ultrases Hızları sonuçları (Üleksit Konsantre ve Üleksit Tüvenan)

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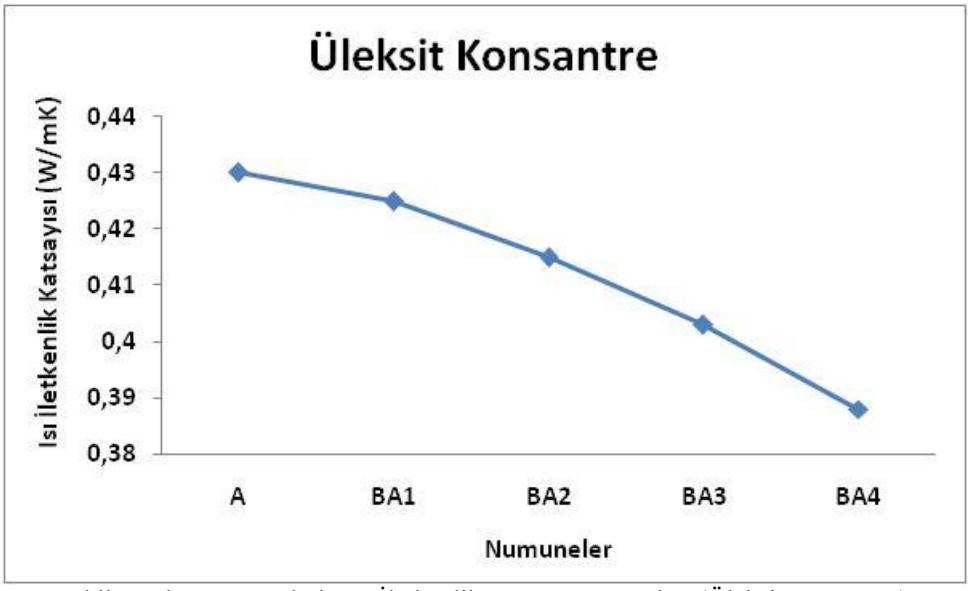
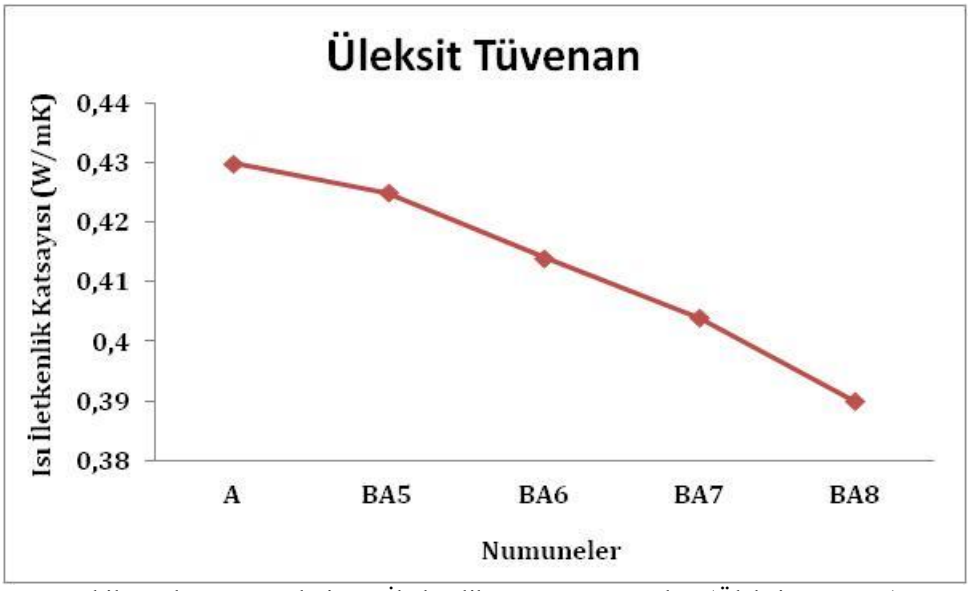


Şekil 6. Alçı Numunelerin Isı İletkenlik Katsayısı sonuçları (Üleksit Konsantre)



Şekil 7. Alçı Numunelerin Isı İletkenlik Katsayısı sonuçları (Üleksit Tüvenan)

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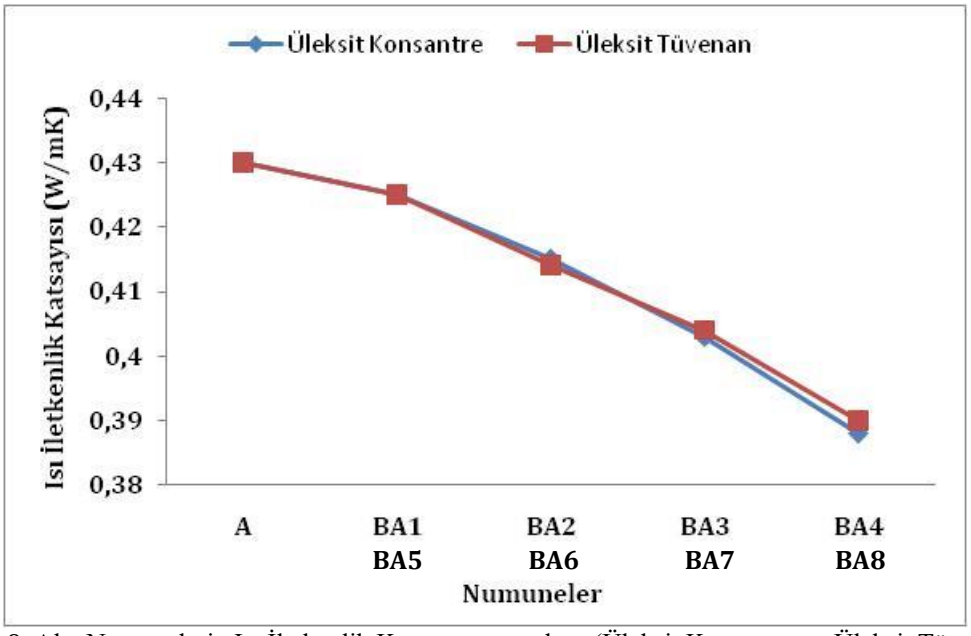

Şekil 8. Alçı Numunelerin Isı İletkenlik Katsayısı sonuçları (Üleksit Konsantre ve Üleksit Tüvenan)

Sonuçlar

Bu çalışma kapsamında üretilen alçı numunelerinde bor miktarı arttıkça ultrases hızlarında bir azalma görülmektedir. Ayrıca üretilen alçı numunelerinde bor miktarı arttıkça ısı iletkenlik katsayısı sonuçlarında olumlu yönde bir azalma görülmektedir. Elde edilen sonuçların Sarıkaya (2014)' nün yapmış olduğu çalışmaya paralel olduğu görülmüştür. Çalışmada kullanılan bor mineralleri % 28 ile % 39 oranları arasında B_2O_3 içermektedir. Bu borların çevreye vereceği zararlarda oldukça büyüktür. Bu zararlı etkileri ortadan kaldırmak ve ekonomiye yeniden kazandırmak amacıyla beton endüstrisinde bir katkı malzemesi olabileceği düşünülmektedir. Bor oranının artması ile ısı iletkenlik değerini azaltarak ısı yalıtımına katkı sağlayacağı düşünülmektedir.

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CANONICAL MAP IN THE STABILITY OF CONTINUOUS TIME SYSTEMS

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Stability of a control system is one of the main topic of control theory. If a given system is unstable, we can try to stabilize the system by low order controllers. Stabilization of single-input single-output systems by low order controllers is one of the challenging problems in control theory [1,2,3]. The stabilization problem can be formulated as follows: Given polynomials $p_0(s), p_1(s), \dots, p_l(s)$ consider the family $p(s,c)=p_0(s)+c_1p_1(s)+c_2p_2(s)+\cdots+c_lp_l(s)$, where $c_1, c_2, \dots, c_l$ are stabilizing parameter. The problem is as follows: Determine the values of the parameter $c=(c_1,c_2,\dots,c_l)^T$, for which the polynomial $p(s,c)$ is stable. Two types of stability can be considered: Hurwitz stability, in which all roots must be in the left half plane, and Schur stability, in which all roots must belong to the unit open disc.

In this report, we consider the stabilization problem for continuous time systems. For this purpose a canonical map $F(k)$ is determined. This map is defined on the set $(0,\infty)^n=\{(k_1,k_2,\dots,k_n)^T\in \mathbb{R}^n: \ k_i>0 \mbox{ for all } i=1,2,\dots,n \}$ and is one-to-one. The range of this map is the Hurwitz stability region in parameter space. By using this map, we obtain sufficient conditions for stabilizability of continuous time control systems.

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Keywords: Hurwitz stability, Schur stability, Canonical map

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CARBON FOOTPRINT DETERMINATION OF A TURKISH CEMENT FACTORY

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Abstract: Carbon footprint can be defined as the carbon dioxide (CO_2) equivalent of greenhouse gas (GHG) emissions caused by anthropogenic activities (such as transportation, energy generation, services or purchasable products, etc.). The carbon footprint of a facility can be determined due to reasons such as legal obligations, social responsibilities, customer demand, or reduction of GHG emissions. In this study carbon footprint of a cement factory is ascertained. The amount of greenhouse gas emissions from the factory is 1,64 million tons of CO_2 in 2014. 65% of them come from clinker production and the remaining comes from combustion, mainly petroleum coke which has the largest share of approximately 30% of contribution. It will be a good opportunity for the factory to use waste oil and end of life tires (ELT) as alternative fuels to mitigate its the carbon footprint.

Keywords: carbon footprint, cement industry, clinker production, greenhouse gas emission

Introduction

World's rapid industrialization is causing ecologically deterioration gradually. Correspondingly, global climate change has become a major threat to the environment and the economic development of the world (Zhang and Zhang, 2015). In this regard, Kyoto Protocol (KP) is the most important step taken in the worldwide. KP aims to mitigate GHG emissions by obligating developed countries to pay the price for their emissions.

Carbon footprint (CF) can be defined as a measure of total amount of carbon-dioxide (CO_2) released into the atmosphere in the given time frame that is directly or indirectly caused by any activity to provide service or a product. This approach has become a widely used concept in greenhouse gas emissions assessments recently (Andrić, et. Al., 2015).

Carbon footprint calculations are made due to reasons such as legal obligations, social responsibility, customer or investor demands, corporate image, voluntary or mandatory greenhouse gas emission reduction or the participation in the emissions trading mechanisms.

In Turkey calculation of carbon footprint is not an obligation, but it is significant to the facilities for their own emission inventory and to put forward strategies for prevention of climate change. The current legal regulation on the greenhouse gas emissions monitoring is entered into force in 2014 with the name of "Regulation on Monitoring of Greenhouse Gas Emissions (RMGHGE)" (Official Gazette 2014a). This regulation aims monitoring, reporting, and verification of the GHG emissions occurring from the listed activities in its Annex 1.

Turkey's CO_2 emissions were estimated at 363.5 million tons in 2013 and about 18% of it comes from industry. Cement sector is one of the major industrial greenhouse gas emission sources. The aim of this study is to calculate the carbon footprint of a cement factory in Turkey and give suggestions to decrease greenhouse gas emissions. The factory is producing clinker and cement since 2009 with 242,824 m^2 surface area, about 2 million ton/year clinker production capacity and exists in Annex 1 of the regulation (as its capacity exceeds 50 tons daily clinker production.) It is in the top 500 industrial enterprises of Turkey.

Besides Turkish cement sector is in the top 10 in the world and ranked third in Europe with about 71 million tons of production in 2014. Due to the increase of infrastructure and construction activities in Turkey in the last years, cement demand is increasing. Accordingly, the production is expected to be about 100 Mt in 2023 (Url-1)

There are varies international standards and regulations to help users for carbon footprint calculations. However most of the studies in the literature used IPCC Guideline 2006 (IPCC, 2006; Jiang et. Al., 2015; Xu and Lan 2015; Yaka and Güngör, 2015; Cai et al., 2008).

Materials and Methods

For the carbon footprint analysis, all the sources of emissions in the factory have been primarily defined. Emissions are categorized as combustion-sourced and process based. Fuels used for the combustion are domestic lignite, petroleum coke, steam coal, fuel oil, waste oil, end of life tires (ELT) contaminated waste.

Process-based emissions are come from clinker production, the non-carbonate carbon raw material. IPCC (2006) methodology with 2014data is used for the carbon footprint calculations.

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Energy balance diagram was set up and accordingly emission sources are defined for the CO_2 emission calculations.
CO_2 emission sources of the factory are given in Table 1.

Table 1: CO_2 emission factors (EF).

Item No	Source	EF	Source
1	Clinker production	0.51 tCO_2/t	IPCC 2006
2	Domestic lignite	99.27 tCO_2/TJ	TURKSTAT, 2014
3	Petroleum coke	92.79 tCO_2/TJ	TURKSTAT, 2014
4	Steam coal	92.79 tCO_2/TJ	TURKSTAT, 2014
5	Fuel oil	76.66 tCO_2/TJ	TURKSTAT, 2014
6	Waste oil	73.3 tCO_2/TJ	Official Gazette 2014b
7	ELT	85 tCO_2/TJ	Official Gazette 2014b
8	Contaminated waste	83 tCO_2/TJ	Personal info, 2016.
9	Raw material: cement clinker non-carbonate carbon	3.664 tCO_2/TJ	Personal info, 2016.

CO_2 emissions are calculated according to IPCC Guideline Tier methodology that is given by Eq. 1 [3].
CO_2 emission=Fuel consumption x emission factor x oxidation ratio

Eq.1

where, CO_2 emission, kg emission by fuel type
fuel consumption, consumed fuel, kg, l
emission factor, GHG emission factor by fuel type, kg/TJ
oxidation ratio is assumed 100%.

Results and Discussion

The calculations indicate that the factory released 1.64 M tons of CO2 emissions in 2014, which was %3 of the total industrial GHG emissions of Turkey in 2014. The distribution of the emission sources are given with Fig. 1. 65% of the total emissions come from the process that is clinker production and the remaining 35% comes from combustion, mainly petroleum coke which has the largest share of approximately 30% of contribution. Steam coal is the second important emission source from combustion which has 4% contribution to the total CO_2 emissions.

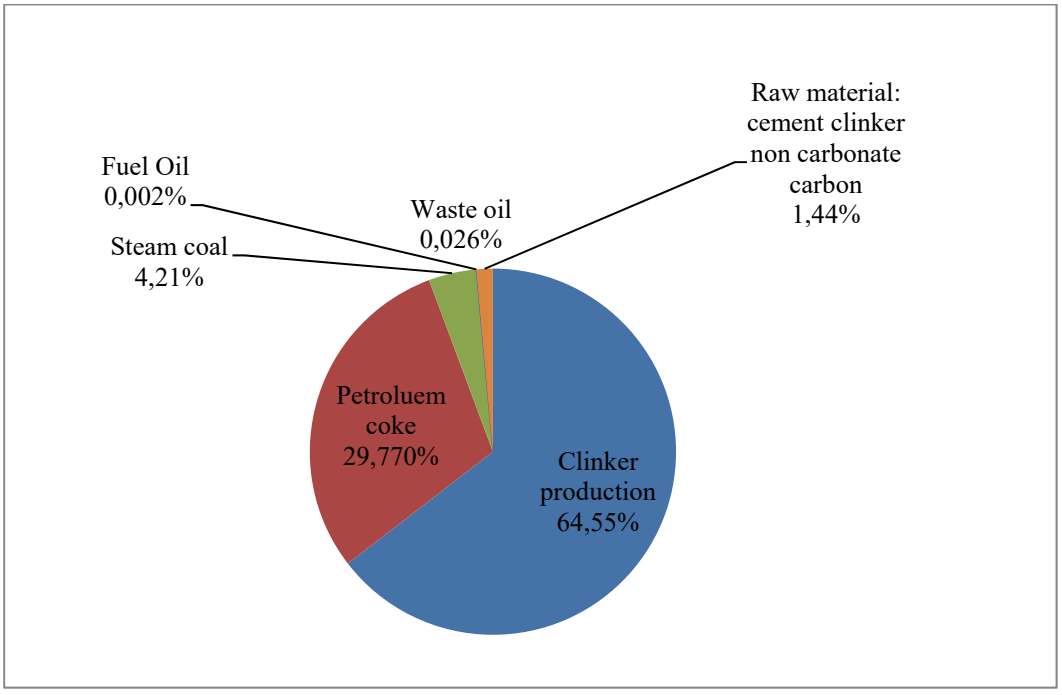

Fig.1: CO_2 Emission distribution of the cement factory.

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Conclusion

Cement industry is one of the major industries for mitigation of the GHG emissions since it is the main emission sources in Turkey, as in the world. In this study the emissions are calculated according to the Tier 1 approach of the IPCC methodology. Thus process emission factor of the factory is the default value. In the future study factory specific CO2 emission factor may be calculated to get more certain values to evaluate. Since the major combustion emissions come from petroleum coke and steam coke, it will be a good opportunity for the factory to use waste oil and ELT as alternative fuels to mitigate its the carbon footprint.

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CFD STUDY ON HEAT TRANSFER ENHANCEMENT IN A CIRCULAR TUBE EQUIPPED WITH TWISTED TAPE INSERT

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Abstract: Twisted tapes are swirl turbulators and one of the passive methods used for heat transfer enhancement. In this CFD study on heat transfer enhancement in a circular tube equipped with twisted tape insert, a bowed twisted tape in a circular tube is compared with plain tube by means of Nusselt, friction, and thermohydraulic performance. A comparative study was performed numerically in laminar tubular flows with Reynolds number between 404.8 and 1764.5. The numerical studies were carried out with three different twist ratios (H/w = 3, 4, and 5). By using bowed twisted tape in a plain tube, a good thermohydraulic performance than the plain tube was observed. It was also noticed that thermohyraulic performance increased with decreasing twist ratio, and increasing Re number.

Keywords: Twisted Tape, Heat Transfer Enhancement, Flow Turbulator, CFD

Introduction

In general, the techniques for heat transfer enhancement can be divided into two categories. One is the active method, which requires extra external power sources, for example, mechanical aids, surface-fluid vibration, injection and suction of the fluid, jet impingement, and use of electrostatic fields. The other is the passive method, which requires no direct employment of the external power. The passive method includes a surface coating, wavy surfaces, rough, and extended surfaces, convoluted (twisted) tube, additives for liquid and gases, turbulators (coil wire, conical ring, helical screw tape, axial/radial guide vane, tangential inlet nozzle and snail entrance). Swirl/vortex flow devices form an important group of passive augmentation techniques, and twisted tape is one of the most important members of this group, which is employed extensively in many heat exchanging systems such as solar water heater, refrigeration system and chemical process industry.

Here are some advantages of using twisted tape inserts in plane tubes. A flow in a plane tube has some temperature difference between core region and near the wall surface. Twisted tape insert gives swirling motion to the flow and enhances the fluid mixing of the near-wall and central regions (Rahimi, et al., 2009) (Guo et al., 2011). Twisted tape can partition and block the flow, reduce the hydraulic diameter, elongate the twisted flow path and generate fin effect (Guo et al., 2011). In addition to simple configuration and easy installation (Guo et al., 2011), as a general advantage of twisted tape, enhancement in heat transfer makes heat exchangers more compact and cheaper (Sivashanmugam and Suresh, 2006). Here are some disadvantages of using twisted tape inserts in plane tubes. All these advantages lead to additional heat transfer improvements. However, the thermal improvements are accompanied by increased pressure drop (Eiamsa-ard et al., 2013) (Guo et al., 2011).

Zhang et al. (2012) numerically studied in order to gain an understanding of physical behavior of the thermal and fluid flow in the tube fitted with triple and quadruple twisted tapes for the Reynolds number from 300 to 1800. The obtained results showed that a maximum increase of 171% and 182% are observed in the Nusselt number by using triple and quadruple twisted tapes. The friction factors of the tube fitted with triple and quadruple twisted tapes are around 4.06-7.02 times as that of the plain tube. Eiamsa-ard and Promvonge (2010) experimentally studied on turbulent heat transfer and flow friction characteristics in a circular tube equipped with two types of twisted tapes: (1) typical twisted tapes and (2) alternate clockwise and counterclockwise twisted tapes with three twist ratios, 3.0, 4.0 and 5.0, each with three twist angles, 30°, 60° and 90°, respectively. The Reynolds-number range is between 3000 and 27,000 under uniform heat flux conditions, using water as a working fluid. The obtained results revealed that the C–CC twisted-tapes provided higher heat transfer rate, friction factor and heat transfer enhancement index than the typical twisted-tapes at similar operating conditions. In addition, correlations of the Nusselt number and the friction factor for using the C–CC twisted tapes were also determined. Bhuiya et al. (2013) performed an experimental research on Nusselt number, friction factor and thermal performance factor in a circular tube equipped with perforated twisted tape inserts with four different porosities of Rp = 1.6, 4.5, 8.9 and 14.7% under Reynolds number ranging from 7200 to 49,800. Air is the working fluid. Uniform wall heat flux was selected as the boundary condition at walls. The experimental results revealed that both heat transfer rate and friction factor

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of the tube fitted with perforated twisted tapes were significantly higher than those of the plain tube. Over the range investigated, Nusselt number, friction factor, and thermal performance factor for the tube with perforated twisted tape inserts were found to be 110–340, 110–360 and 28–59% higher than those of the plain tube values, respectively. Empirical correlations of Nusselt number, friction factor and thermal performance factor were also formulated from their experimental results. Eiamsa-ard et al. (2009) studied a 3-D numerical investigation and found that SST k–ω turbulence models are better to use. They came up with a result that, twisted tape inserts for 2.5 with CR=0.0 (tight-fit), 0.1, 0.2, and 0.3 can enhance heat transfer rates up to 73.6%, 46.6%, 17.5% and 20%, respectively and increase friction factors up to 330%, 262%, 189%, and 160%, respectively, in comparison with those of the plain tube. The tube with loose-fit twisted tape inserts with CR=0.1, 0.2 and 0.3 provide heat transfer enhancement around 15.6%, 33.3% and 31.6% lower than those with CR=0.0. Shabanian et al. (2011) studied both experimentally and numerically on heat transfer, friction factor and thermal performance of an air-cooled heat exchanger equipped with three types of tube insert, including butterfly, classic, and jagged twisted tape. In their investigation, the maximum thermal performance factor was obtained by the butterfly insert with an inclined angle of 90°. They used the CFD predicted results to explain the observed results in terms of turbulence intensity.

Materials and Methods

The geometry of the bowed twisted tape is shown in Figure 1. The distances a, b, and c refer to 1.2mm, 50mm, and 50mm. Bowed twisted tape is fitted in the full length of tube having diameter and length of 50mm and 6000mm. Twist ratios (180-degree twist pitch/tape width) are set to 3, 4 and 5. The formulas used can also be found below.

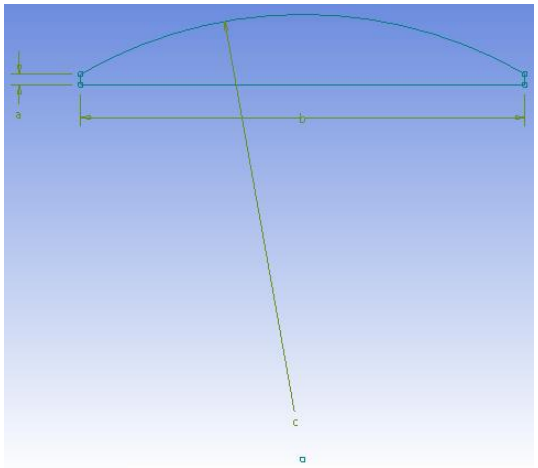

Figure 1.The Geometry of the bowed twisted tape.

$$Re = \frac{\rho u D}{\mu}$$

$$Nu = \frac{hD}{k}$$

$$f = \frac{\Delta p}{(\rho u^2/2)(L/D)}$$

$$\eta = \frac{Nu/Nu_0}{(f/f_0)^{(1/3)}}$$

Here, Nu_0 and f_0 are referring to the Nusselt number, and the friction factor of the plain tube. Air is selected as the working fluid. Thermophysical properties of the working fluid are temperature dependent. Values of thermophysical properties are taken from Çengel et al. (2011) and are used to make a fit equation to use it in the calculations except viscosity term (power law used for this term). Comparison of the original values and the values from the fit are shown in Figure 2. As seen from the figure, the (T, temperature-dependent 1st row in Kelvin, 2nd row in Celsius) fits given below, perfectly matches with the original values.

Density=
5.3119-0.0327084*T+0.000105453*T^2-1.87785*10^-7*T^3+1.75195*10^-10*T^4-6.69402*10^-14*T^5
1.29199-0.00471308*T+0.0000163594*T^2-4.63109*10^-8*T^3+8.37718*10^-11*T^4-6.69402*10^-14*T^5
Cp=
291.954+8.81945*T-0.0422726*T^2+0.0000978547*T^3-1.09108*10^-7*T^4+4.7432*10^-11*T^5
1006.01+0.0547434*T-0.00126291*T^2+0.0000140326*T^3-4.43278*10^-8*T^4+4.7432*10^-11*T^5
Conduction=
0.00142977+0.000085315*T-4.56976*10^-9*T^2-5.35938*10^-11*T^3+6.92967*10^-14*T^4-3.28848*10^-17*T^5
0.0236361+0.0000755562*T-2.41674*10^-8*T^2-2.41594*10^-12*T^3+2.43842*10^-14*T^4-3.28848*10^-17*T^5
Dyn. Vis.=
-0.246524+0.0112225*T-0.0000228522*T^2+3.95292*10^-8*T^3-3.83709*10^-11*T^4+1.54177*10^-14*T^5
1.72933+0.00488744*T-4.49515*10^-6*T^2+9.10847*10^-9*T^3-1.73142*10^-11*T^4+1.54177*10^-14*T^5
Kin. Vis.=
-0.202396+0.0023132*T+0.0000130531*T^2-2.74573*10^-9*T^3-2.14717*10^-12*T^4+1.65353*10^-15*T^5
1.33796+0.00870052*T+0.0000101789*T^2-3.85802*10^-9*T^3+1.11136*10^-13*T^4+1.65353*10^-15*T^5

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Pr=
0.491381+0.00377404*T-0.0000196274*T^2+4.51415*10^-8*T^3-4.90325*10^-11*T^4+2.06722*10^-14*T^5
0.736302-0.000266004*T-3.73371*10^-7*T^2+6.99233*10^-9*T^3-2.07994*10^-11*T^4+2.06722*10^-14*T^5

				10^-5							10^-5		
T	Density	Cp	Cond.(k)	Dyn. Vis	Kin. Vis	Pr	T	Density	Cp	Cond.(k)	Dyn. Vis	Kin. Vis	Pr
0	1,2920	1006	0,02364	1,7290	1,3380	0,7362	0	1,2920	1006	0,02364	1,7293	1,3380	0,7363
5	1,2690	1006	0,02401	1,7540	1,3820	0,7350	5	1,2688	1006	0,02401	1,7537	1,3817	0,7350
10	1,2460	1006	0,02439	1,7780	1,4260	0,7336	10	1,2464	1006	0,02439	1,7778	1,4260	0,7336
15	1,2250	1007	0,02476	1,8020	1,4700	0,7323	15	1,2248	1007	0,02476	1,8017	1,4707	0,7323
20	1,2040	1007	0,02514	1,8250	1,5160	0,7309	20	1,2039	1007	0,02514	1,8254	1,5160	0,7309
25	1,1840	1007	0,02551	1,8490	1,5620	0,7296	25	1,1837	1007	0,02551	1,8488	1,5618	0,7295
30	1,1640	1007	0,02588	1,8720	1,6080	0,7282	30	1,1641	1007	0,02588	1,8721	1,6080	0,7282
35	1,1450	1007	0,02625	1,8950	1,6550	0,7268	35	1,1452	1007	0,02625	1,8952	1,6548	0,7268
40	1,1270	1007	0,02662	1,9180	1,7020	0,7255	40	1,1269	1007	0,02662	1,9182	1,7020	0,7255
45	1,1090	1007	0,02699	1,9410	1,7500	0,7241	45	1,1091	1007	0,02699	1,9409	1,7497	0,7241
50	1,0920	1007	0,02735	1,9630	1,7980	0,7228	50	1,0919	1007	0,02735	1,9635	1,7980	0,7228
60	1,0590	1007	0,02808	2,0080	1,8960	0,7202	60	1,0591	1007	0,02808	2,0081	1,8958	0,7203
70	1,0280	1007	0,02881	2,0520	1,9950	0,7177	70	1,0282	1007	0,02881	2,0522	1,9956	0,7178
80	0,9994	1008	0,02953	2,0960	2,0970	0,7154	80	0,9991	1008	0,02953	2,0956	2,0972	0,7154
90	0,9718	1008	0,03024	2,1390	2,2010	0,7132	90	0,9717	1008	0,03024	2,1384	2,2007	0,7132
100	0,9458	1009	0,03095	2,1810	2,3060	0,7111	100	0,9457	1009	0,03095	2,1807	2,3060	0,7111
120	0,8977	1011	0,03235	2,2640	2,5220	0,7073	120	0,8977	1011	0,03235	2,2636	2,5220	0,7073
140	0,8542	1013	0,03374	2,3450	2,7450	0,7041	140	0,8543	1013	0,03374	2,3446	2,7451	0,7041
160	0,8148	1016	0,03511	2,4200	2,9750	0,7014	160	0,8149	1016	0,03511	2,4238	2,9751	0,7014
180	0,7788	1019	0,03646	2,5040	3,2120	0,6992	180	0,7789	1019	0,03646	2,5013	3,2118	0,6992
200	0,7459	1023	0,03779	2,5770	3,4550	0,6974	200	0,7459	1023	0,03779	2,5771	3,4551	0,6974
250	0,6746	1033	0,04104	2,7600	4,0910	0,6946	250	0,6744	1033	0,04104	2,7600	4,0910	0,6947
300	0,6158	1044	0,04418	2,9340	4,7650	0,6935	300	0,6159	1044	0,04418	2,9341	4,7650	0,6934
350	0,5664	1056	0,04721	3,1010	5,4750	0,6937	350	0,5664	1056	0,04721	3,1010	5,4750	0,6937

Figure 2. Comparison of the original values (left side) and the values from the fit (right side).*

*Temperature ^{0}C, Density kg/m^3, Specific Heat J/kg.K, Conduction W/m.K, Dynamic Viscosity kg/m.s, Kinematic Viscosity m^2/s.

Inlet velocity depends on Reynolds number that is between 404.8 and 1764.5 in the computations.

The problem is considered as steady, laminar, and 3D. While modeling the pipe and the bowed twisted tape, the tape was subtracted off from the pipe geometry to have the way of working fluid only. The walls at the side of bowed twisted tape are defined as “no heat generation” and all walls are defined as a no-slip condition. The heated walls (pipe inner walls) are set to constant heat flux changing with respect to inlet velocity between the values of 10W to 65W. Boundary conditions are constant velocity inlet, pressure outlet, no-slip conditions at the walls, no heat generation at the walls of the bowed twisted tape side, and constant heat flux at the inner walls of the pipe.

Continuity equation:

$$\frac{\partial(\rho u_i)}{\partial x_i} = 0$$

Momentum equations:

$$\frac{\partial}{\partial x_j}(\rho u_i u_j) = -\frac{\partial p}{\partial x_i} + \frac{\partial}{\partial x_j}\left[\mu\left(\frac{\partial u_i}{\partial x_j} + \frac{\partial u_j}{\partial x_i}\right)\right]$$

Energy equation:

$$\frac{\partial}{\partial x_j}\left(\rho u_j c_p T - k\frac{\partial T}{\partial x_j}\right) = 0$$

A commercial CFD tool, Ansys Fluent v17.1 was used for the calculations. The boundary conditions above were taken account by this CFD tool to solve the problem with the finite volume method. Solution methods; “SIMPLE” scheme, “least squares cell based” gradient, “second-order” pressure, “first-order upwind” momentum and energy

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are set for calculations. Convergence criteria of 10^-6 were used for all the residuals, and calculations are converged.

For bowed twisted tape, all thermophysical properties of air are calculated at bulk temperature. $T_b=(T_{inlet}+T_{outlet})/2$ and hydraulic diameter is used in the calculations.

Table 1. Grid independent check results (4*10^6 grids were chosen for the calculations for the bowed twisted tape.)

Grid Number	Re	Nu	f
2061284	404,862	7,98	0,333652
3055495	404,860	7,82	0,330237
4071815	404,860	7,72	0,330862

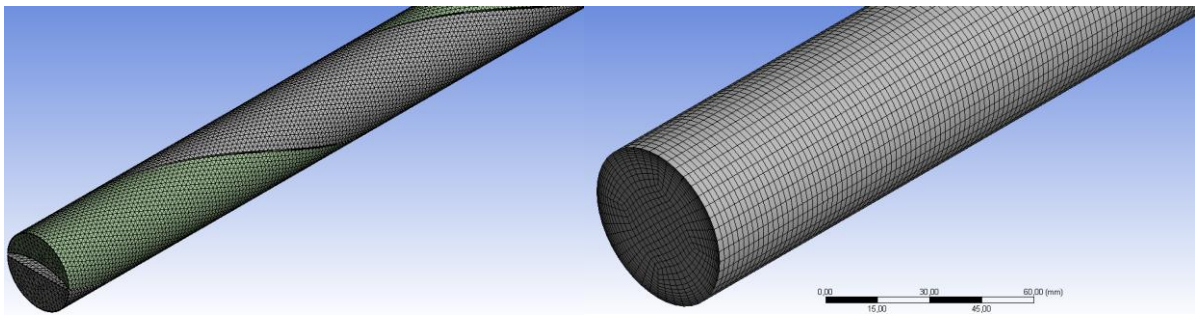

Figure 3. At left, 4*10^6 grids for bowed twisted tape with a twist ratio=4 and at right 2*10^6 grids for plain tube.

Table 2. Nu and f validation of plain tube, referring to fully developed flow Nu=48/11 and f=64/Re in laminar region.

Number of Elements	Maximum Orthogonal	Minimum Skewness	Aspect Ratio	Re	Nu	Friction	% Nu Error	% f Error	Inlet Velocity
1947000	0,839	0,161	15,509	246,761	4,36620	0,261383	-0,0588338	0,779746	0,085
1947000	0,839	0,161	15,509	486,762	4,35992	0,132628	0,0852456	0,872041	0,161
1947000	0,839	0,161	15,509	768,714	4,35776	0,084020	0,134769	0,917104	0,25
1947000	0,839	0,161	15,509	1022,390	4,35939	0,063203	0,0973642	0,966448	0,33
1947000	0,839	0,161	15,509	1244,450	4,36557	0,051971	-0,044333	1,054800	0,4
1947000	0,839	0,161	15,509	1530,060	4,38228	0,042357	-0,427266	1,263510	0,49
1947000	0,839	0,161	15,509	1784,02	4,40576	0,036429	-0,965424	1,54682	0,57

Results and Discussion

According to the grid independent test at Table 1, 4*10^6 grids were chosen for the calculations of the bowed twisted tape because changes in Nu and f are acceptable for this amount of grids. In Figure 3, it can be seen that mesh is getting concentrated near the walls. Theoretical values for Nu=48/11, and for f=64/Re for fully developed flow in laminar region and validation results are given in Table 2.

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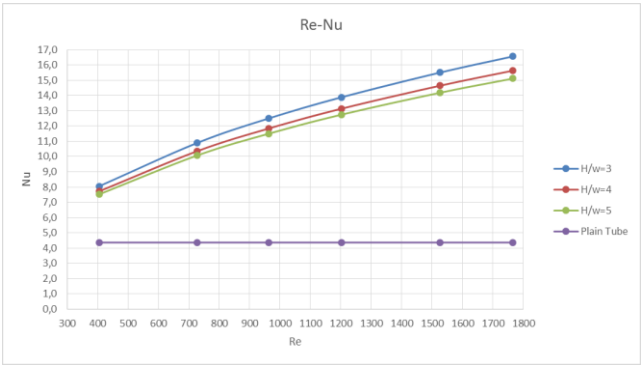

Figure 4. Re-Nu comparison between the plain tube and bowed twisted tape with different twist ratios.

In Figure 4, Re-Nu comparison between the plain tube and bowed twisted tape with different twist ratios is given. It is clear in this figure that,

- When Re is increased, Nu of bowed twisted tape is increased.
- When a twist ratio decreased 5 to 3, Nu of bowed twisted tape is increased.
- The bowed twisted tape has better Nu values than the plain tube with respect to this figure's ranges.

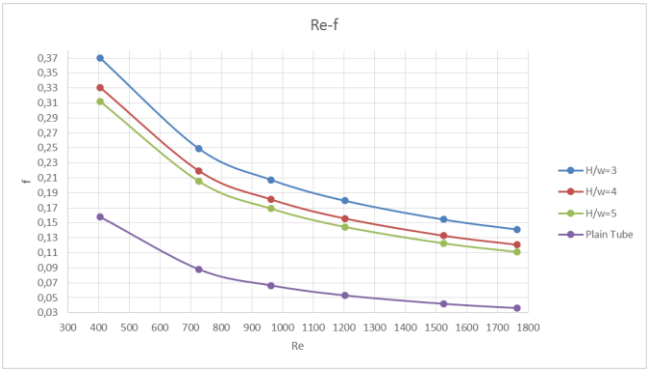

Figure 5. Re-f comparison between the plain tube and bowed twisted tape with different twist ratios.

In Figure 5, Re-f comparison between the plain tube and bowed twisted tape with different twist ratios is given. It is clear in this figure that,

- When Re is increased, f of bowed twisted tape is decreased.
- When a twist ratio decreased 5 to 3, f of bowed twisted tape is increased.
- Bowed twisted tape has higher f values than the plain tube with respect to this figure's ranges.

By judging the results in Figure 4 and Figure 5, It can be seen that the handicap of "increase in Nu comes with an increase in f". The highest Nu value belongs to bowed twisted tape with a twist ratio of 3. However, on the other hand, it has the highest f value. In order to make another comparison, thermal performance factors are given in Figure 6.

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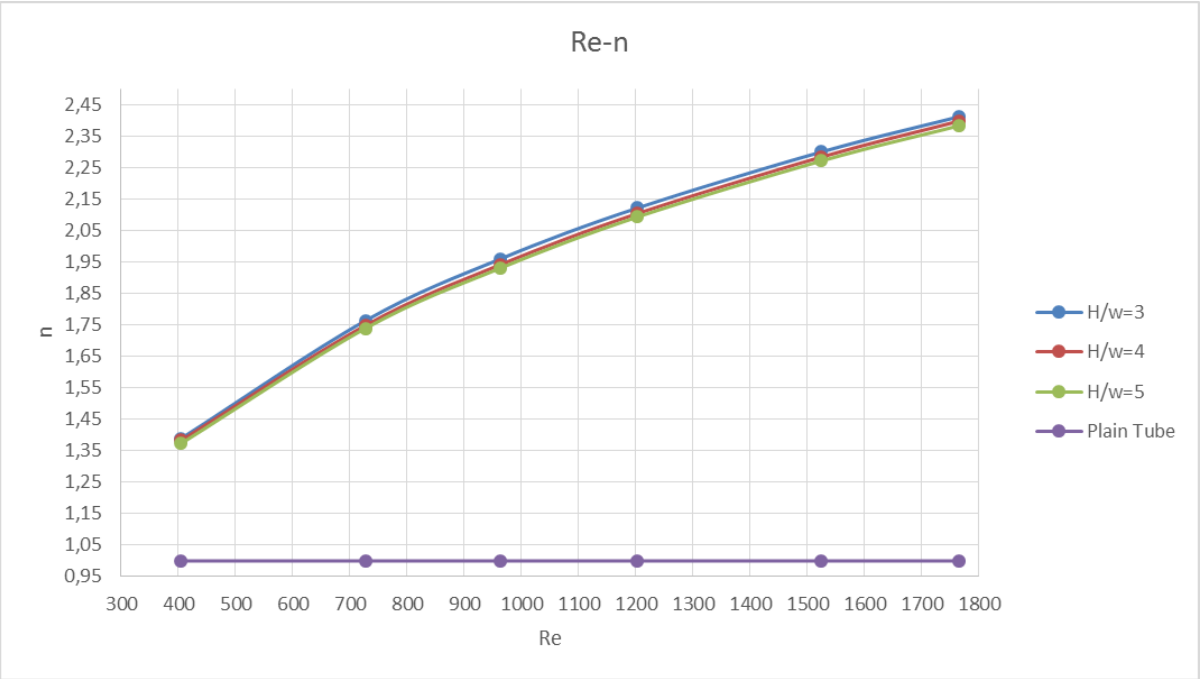
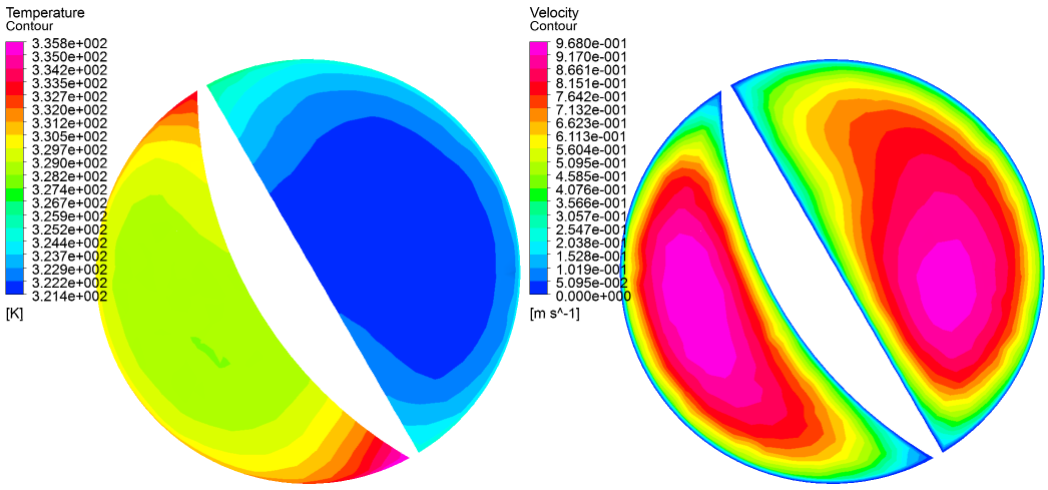


Figure 6. Re- η comparison for bowed twisted tape with different twist ratios.

In Figure 6, Re- η comparison between the plain tube and bowed twisted tape with different twist ratios is given. It is clear in this figure that,

- When Re is increased, n of bowed twisted tape is increased.
- When a twist ratio decreased 5 to 3, n of bowed twisted tape is increased slightly.
- Bowed twisted tape has higher η values than the plain tube with respect to this figure's ranges.



a) b)

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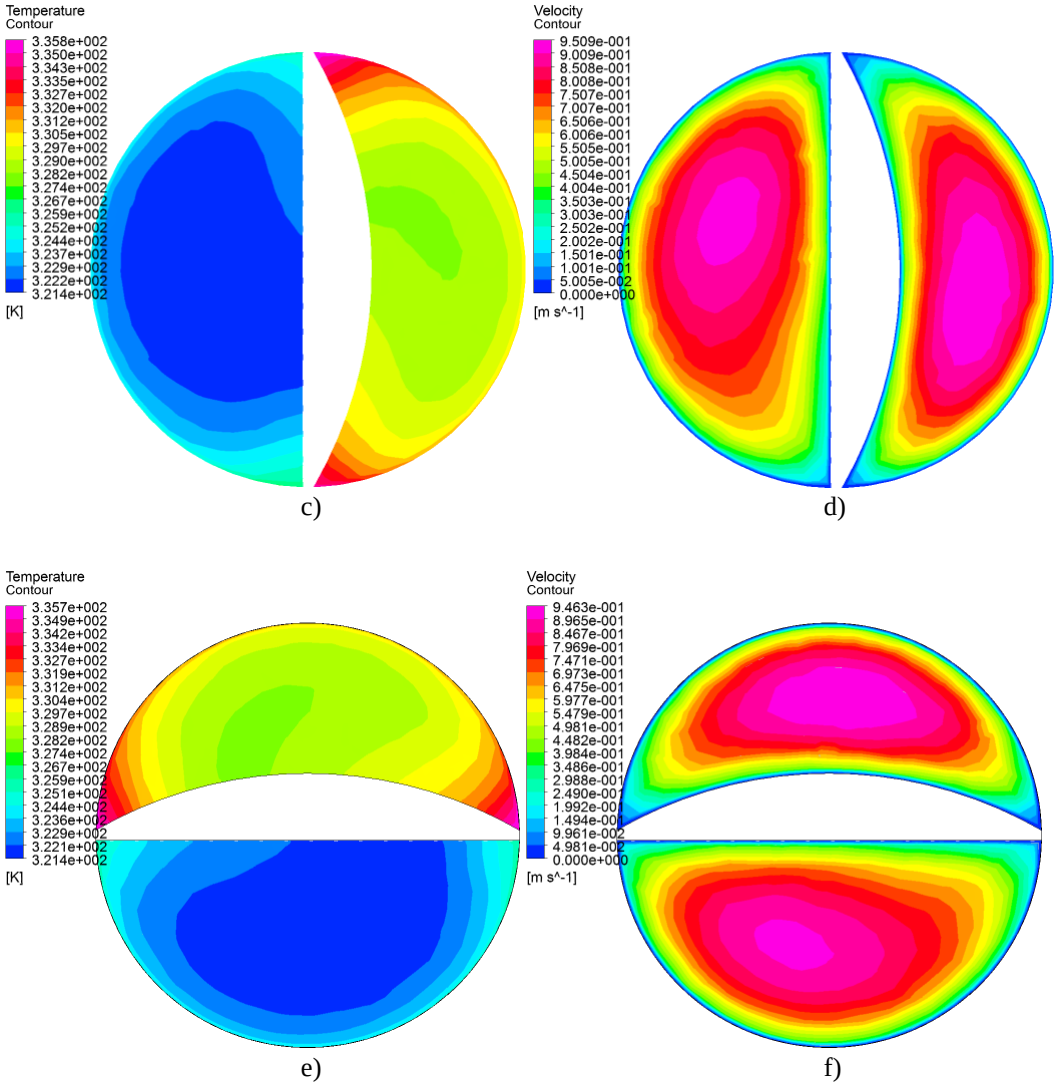

Figure 7. Temperature and velocity contours of bowed twisted tape at 5.5 meters: (a) and (b) for twist ratio 3, (c) and (d) for twist ratio 4, and (e) and (f) for twist ratio 5.

Conclusion

CFD study on heat transfer enhancement in a circular tube equipped with twisted tape insert has been investigated using a unique design named bowed twisted tape. As expected, calculations showed that a kind of twisted tape bowed twisted tape, increased the heat transfer and also friction. In total, by means of the thermal performance factor, although enhancement is observed the results are not satisfying as a kind of twisted tape.

For twist ratio 3, Nu increased by 84,5-279 %, f increased by 134,1-289 % and thermal performance factor increased by 38,9- 141,3 %. For twist ratio 4, Nu increased by 76,9-258,2 %, f increased by 109,3-232,9 % and thermal performance factor increased by 38,3-139,9 %. For twist ratio 5, Nu increased by 72,3-246,3 %, f increased by 97,6-206,4 % and thermal performance factor increased by 37,3-138,4 %.

Nomenclature

Cp : specific heat at constant pressure, J*kg-1*K-1
CR : Clearance ratio
C–CC : Clockwise-Counter clockwise
$Delta_p$: pressure drop between tube entry and exit, N*m-2
Dh : inner hydraulic diameter of the tube, m
f : friction factor
f_0 : friction factor of plain tube

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H : 180 deg twist pitch of the twisted tape, m
h : heat transfer coefficient, W*m-2*K-1
k : thermal conductivity of the fluid, W*m-1*K-1
L : length of the tube, m
Nu : Nusselt number
Nu0 : Nusselt number of plain tube
Pr : Prandtl number
q : heat flux, W*m-2
Re : Reynolds number
Rp : Porosity
T : temperature
Tb : Bulk temperature
u : flow velocity, m*s-1
w : width of the twisted tape, m
η : thermal performance factor
ρ : fluid density, kg*m-3
μ : fluid dynamic viscosity, kg*m-1*s-1

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CHARACTERIZATION OF NPS AND PUF BY SCANNING ELECTRONIC MICROSCOPY AND X-RAY DIFFRACTION AND RAMAN MICROSCOPY IN THE WORKPLACE.

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The last few years a growing interest in the development of applications implementing ultrafine powders as intermediate or finished products in industries as diverse as chemical, pharmaceutical , cosmetic , food , materials, industry , etc.

Human exposure to ultrafine particles (PUF <100 nm) and nanoparticle has become in recent years an important public health issue. These, in urban areas, can be formed by over 80% fines soot (<1 .mu.m) and ultrafine from combustion of fuels. These particles, emitted particularly by diesel vehicles in the short term gasoline vehicles and district heating, were quickly suspected cause of morbidity and mortality cardiorespiratory observed in epidemiological studies on the effects of the atmospheric pollution.They are mainly responsible for inflammatory responses can aggravate pulmonary diseases such as asthma and chronic obstructive pulmonary disease .

Our work's focuses on characterization of NPs and PUF by Scanning Electronic Microscopy and X-ray diffraction and Raman Microscopy, airborne nanosized particles and their importance to public health in the Workplacee.

Keywords: Nanoparticuls; Particles' ultra fine ; Scanning Electronic Microscopy ; Raman Microscopy

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CHARACTERIZATION OF PBS FILMS PRODUCED BY CHEMICAL BATH DEPOSITION METHOD

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Abstract

Lead sulfide (PbS) films have been deposited onto glass substrates by chemical bath deposition method using aqueous solutions of lead nitrate and thiourea. The deposition was carried out at 30˚C bath temperature. The thickness of the PbS film has been determined to be 874 nm by the weight difference method. The films have been examined to evaluate the structural, morphological and optical properties. X-ray diffraction spectrum showed that the sample was polycrystalline with face-centered cubic phase. The XRD pattern has revealed that there are shifts of the d values (interplanar spacing) for the sample with respect to standard values. The macro strain and dislocation density were estimated for the PbS film. The field emission scanning electron microscopy results confirmed that the sample is uniform and consists of homogenous distribution of cubic crystallites in nanometer dimensions. The band gap of the PbS film has been studied using the optical absorbance measurement as a function of wavelength between 200 and 3000 nm. The direct band gap of the sample is calculated to be 1.28 eV.

Keywords: Lead sulfide; Chemical bath deposition; Nanocrystallite; Structural properties, Optical band gap

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CHOOSING THE BEST TRAINING AIRCRAFT FOR A FLIGHT TRAINING ORGANIZATION BY MULTI CRITERIA DECISION MAKING METHODS

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Abstract: In today's world, now it is more important to make fair judgements and give right decisions for companies and organizations. The aim of this paper is to choose the best training aircraft for a flight training organization by using Analytic Hierarchy Process (AHP) and Technique Order Preference by Similarity to the Ideal Solution (TOPSIS). Sensitivity analysis is carried out to see possible consequences. Results show that the best aircraft among alternatives is the Daimond DA 42 VI for the flight training organization.
Keywords: Decision making, MCDM, aircraft.

Introduction

Airline companies and educational institutes are both organizations that should consider undergoing economic status, climate, potential benefits etc. when it comes to purchasing for the company, especially for purchasing on aircrafts. When purchasing for aircrafts, a flight training organization must consider its limited budget, safety of employee and students, technical parameters and specifications that they need and efficiency of the aircraft in general. For significant and reasonable decisions, flight training organizations should analyze these conflicting criteria such as budget and technological features carefully.

In literature search, Esposito et al. (2013), proposed a hybrid model for regional aircraft evaluation, based on the two main approaches, the Analytic Hierarchy Process (AHP) and the Fuzzy Set Theory (FST). They proposed a model that considers not only traditional characteristics (direct and indirect operative costs and technical performance such as the cruise speed) but also includes a variety of aspects whose importance is increasing, such as comfort. Dožić and Kalić (2014), proposed a solution for aircraft type(s) selection problem for known route network and forecasted air travel demand by using the Analytic Hierarchy Process (AHP). They have seen that sensitivity of *CI* and *CR* is significant to the changes of different judgements in the comparison matrix for the first level, while solution (rank of alternatives) sensitivity is almost insignificant to these changes.

Materials and Methods

In this study the best aircraft among alternatives is chosen based on flight training and organizational needs. In order to include basic and needed criteria, both qualitative and quantitative parameters are used. In this context evaluation of two methods proposed in literature the Analytic Hierarchy Process (AHP) and Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) are applied by using Expert Choice, Super Decisions and Microsoft Excel programs.

In AHP method, first, problem should be defined and hierarchical representation of decision system should be formed. This hierarchical form should include overall objective, criterias that will affect the decision and some predetermined alternatives. Second, alternatives and criteria should be pairwise compared. In this step, there are two kinds of pairwise comparisons. One is the pairwise comparison that one should compare the alternatives with respect to the criterias and the other kind of pairwise comparison is the one that one should compare the criterias with respect to the decision objective. After obtaining matrix A from pairwise comparisons between alternatives with respect to the criterias, normalized A matrix is computed. Next, the weight matrix W is computed. This procedure is repeated for criterias too. And than Consistency Ratio (CR) is computed to see if there is any inconsistency. CR≤0,1 is allowed. For further information one can study the papers performed by Thomas L Saaty titled "How to make a decision: The Analytic Hierarchy Process" (Saaty, 1990) and "Decision making with the analytic hierarchy process" (Saaty, 2008).

Saaty and Ozdemir (2003) stated that, when the number of the elements are more than seven, the resulting

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incostistency is too small for humans to obtain the element which causes the biggest inconsistency to fix it. So, for AHP method, elements no more than seven are used in this study. Saaty and Sağır Özdemir (2015) also stated that there can be even one judge to evaluate the criteria weights if he/she is experienced and efficient enough for the subject.

TOPSIS method is applied in six steps as follows:
Step 1: Calculate the normalized values r_{ij} and matrix N.

$$r_{ij=x_{ij}}\sqrt{\sum_{i-1}^{m} x_{ij}^2} \quad \text{i=1,…,m} \qquad \text{j=1,…,n}$$

Step 2: Calculate the weighted normalized decision matrix V. Here, w_j is the weight of the jth criteria.

$$V_{ij} = r_{ij} \times w_j \qquad \text{i=1,…,m} \qquad \text{j=1,…,n}$$

Step 3: Determine the ideal and negative ideal solutions, A^* and A^- respectively.

$$A^* = \left\{\left(max_{i\ V_{ij}} \middle| j \in C_b\right), min_{i\ V_{ij}} \middle| j \in C_c\right\} = \{V_j^* | j = 1,2,\dots,m\}$$

$$A^- = \left\{\left(min_{i\ V_{ij}} \middle| j \in C_b\right), max_{i\ V_{ij}} \middle| j \in C_c\right\} = \{V_j^- | j = 1,2,\dots,m\}$$

Step 4: Calculate the separation measures of each alternative from the positive ideal solution and the negative ideal solution.

$$S_i^* = \sqrt{\sum_{j=1}^{m} \left(V_{ij} - V_j^*\right)^2} \ , j = 1,\dots,m$$

$$S_i^- = \sqrt{\sum_{j=1}^{m} \left(V_{ij} - V_j^-\right)^2} \ , j = 1,\dots,m$$

Step 5: Calculate the relative closeness to the ideal solution.

$$C_i^* = \frac{S_i^- + S_i^*}{S_i^-}$$

Implementation

This study deals with giving the right decision to purchase an aircraft for a flight training organization. Within this context, 3 different types of aircraft, 5 main criteria and 16 sub-criteria are defined both by literature search and an expert's knowledge. In this study the expert is a well experienced aviation theoretical lesson teacher who is also the head of the ground education department in a private flight school.
After determining the goal, criteria and alternatives, the analytic hierarchy structure of the proposed system is set up as shown in Figure 1.

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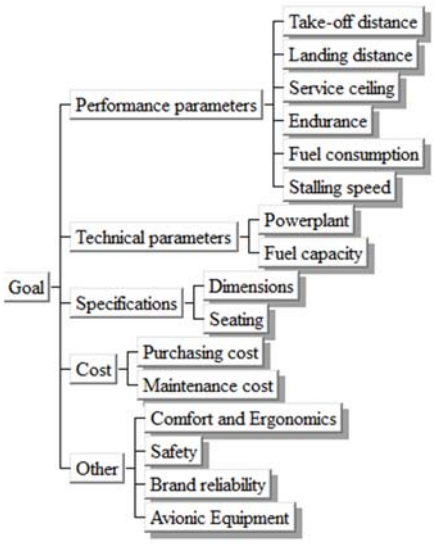
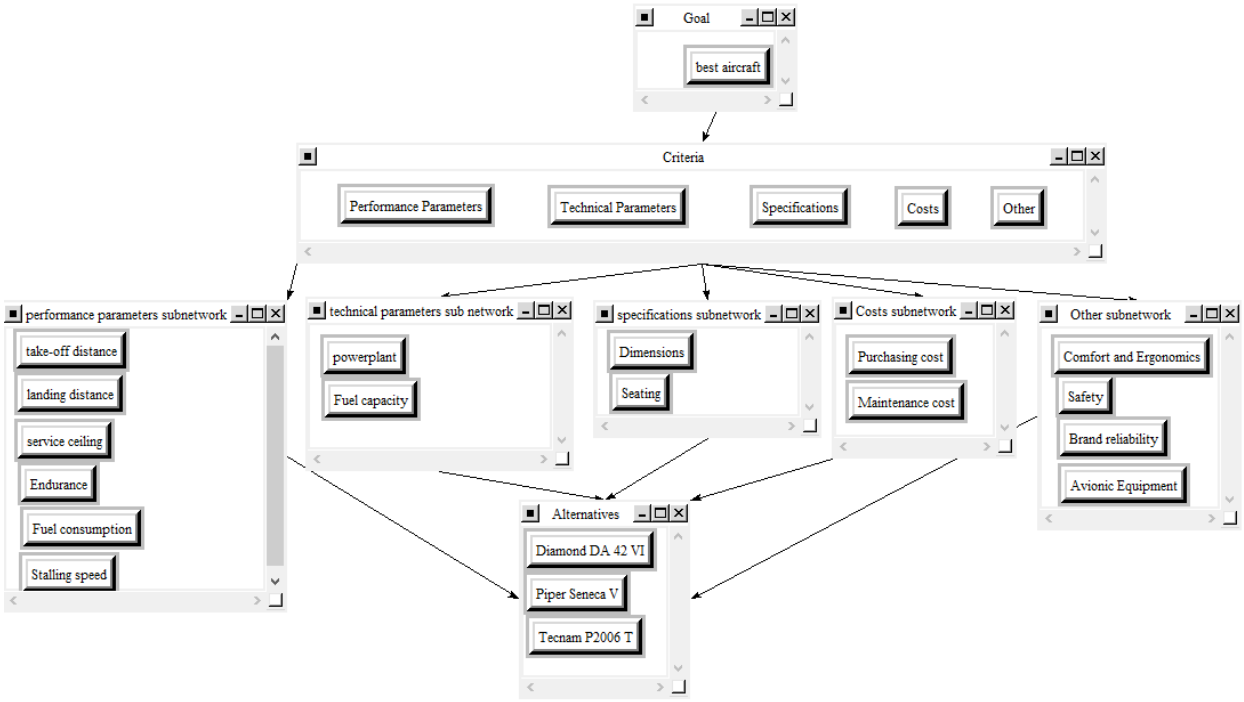
Figure 1. The analytic hierarchy structure of the system



One can also rebuild this hierarchy structure using Super Decisions program for a more relevant image as shown in Figure 2. Here one can see that 3 alternatives are Diamond DA 42 VI, Piper Seneca V and Tecnam P2006T.

Figure 2. Hierarchy structure of the system by Super Decisions program



After setting up the hierarchy structure, pairwise comparisons are made and final weights of the criteria are obtained as seen in Figure 3.

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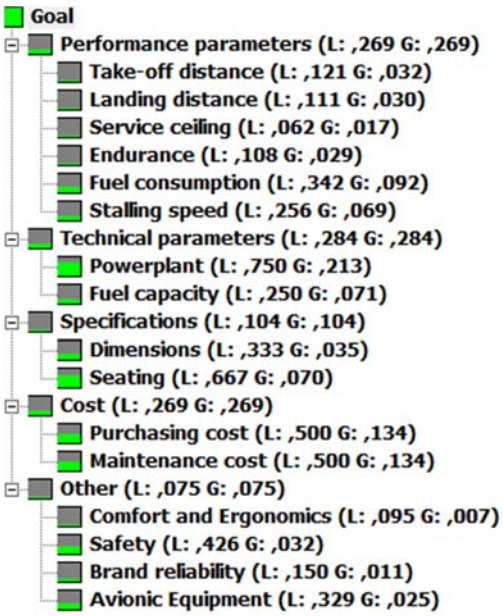
Figure 3. Final local and global weights of the crtieria



After determining the weights of the criteria by AHP, TOPSIS method is applied. For this purpose, the decision maker rated all alternatives with respect to all criteria using Saaty's fundamental scale. Standard decision matrix is formed and normalized as seen in Table 1.

Table 1: Normalized decision matrix (N)

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16
A1	0,625	0,514	0,647	0,873	0,436	0,226	0,780	0,408	0,577	0,485	0,588	0,588	0,376	0,577	0,436	0,588
A2	0,625	0,514	0,740	0,436	0,218	0,566	0,390	0,816	0,577	0,728	0,784	0,784	0,847	0,577	0,873	0,784
A3	0,468	0,686	0,185	0,218	0,873	0,793	0,488	0,408	0,577	0,485	0,196	0,196	0,376	0,577	0,218	0,196

Normalized decision matrix is multiplied by the weights of the criteria and positive, negative ideal solutions, separation measures are calculated.

Results and Discussion

At the final step, relative closeness to the ideal solution are calculated and alternatives are lined up with respect to their closeness to the ideal solution as seen in Table 2.

Table 2: Relative closeness of alternatives to the ideal solution.

A1	0,576514
A2	0,475493
A3	0,404159

Here, A1 refers to Diamond DA 42 VI, A2 refers to Piper Seneca V and A3 refers to Tecnam P2006 T. As one can see, the best aircraft is Diamond DA 42 VI among others.

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Conclusion

In this paper 2 multi-criteria decision making methods – AHP and MCDM – are applied to the problem titled "choosing the best training aircraft for a flight training organization." As a conclusion, both methods helped the decision maker to make a fair judgement and give the best decision. Here, the best alternative among others is the Diamond DA 42 VI aircraft.

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CLONING AND EXPRESSION OF KERATINASE GENE IN E. COLI ROSETTA (DE3) PLYSS FROM NATIVE STRAIN BACILLUS LICHENIFORMIS C11 AND OPTIMIZATION OF FERMENTATION CONDITIONS FOR THE PRODUCTION OF KERATINASE BY RECOMBINANT STRAIN

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Alkaline keratinases are widely used in several fields including leather processing, detergents, agricultural-animal industry, and production of protein hydrolysates, etc. Although, there are many researches on microbial alkalin keratinase, the studying about enhanced enzyme production with low cost substrat is still continues intensely.

In this study, natural *Bacillus* sp. strain which is the producer of alkali and thermo-stabile keratinase was isolated, identified and developed. Also, medium conditions, biochemical characterization of enzymes and their industrial usability was analyzed. In cloning studies, *Bacillus licheniformis* C11 keratinase gen was cloned into pET22b(+) vector system and transferred to the *E.coli* (*Rosetta-gami (DE3)pLysS*) cell. A 38.5 kDa fusion protein with keratinase activity was purified by affinity chromatography. It was detected that while the reproduction time of recombinant strain decreased, the enzyme yield increased 3.3 times (1728 U/ml). According to the obtained data, native and recombinant keratinases can be used in several industry area including leather, detergents, bioremediation, feed and agriculture etc.

Keywords: Bacillus sp., E.coli (Rosetta-gami (DE3)pLysS, Keratinase, Cloning

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CMAS BASED CERAMICS PRODUCTION USING DOLOMITE, KAOLIN AND ZIRCONIA

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Abstract: CMAS ($CaO-MgO-Al_2O_3-SiO_2$) based ceramics were fabricated by using dolomite, kaoline and zirconia as raw materials. Natural calcia and magnesia containing material (dolomite) and silica and alümina containing kaolin were used to develop a new ceramic of CMAS system. The calculated amounts of oxides for the indicated compositions were ball milled for 3 h using distilled water as the milling media. After drying, the powders pressed in cylindrical mould under the pressure of 300 MPa. The samples were fired in an electric furnace with a heating rate of $10^oC.minute^{-1}$ at 900ºC to 1200ºC for periods of 1, 3, and 5 hours. Then, the fired samples were cooled to room temperature in the furnace. Microstructure of produced CMAS ceramics were investigated and their phases analysis was determined. The effects of ZrO_2 oxide on microstructure and phase structure of CMAS ceramics were also investigated.

Keywords: CMAS ceramics, anorthite, diopside, dolomite, kaoline

Introduction

Glass-ceramic materials, prepared by the controlled crystallization of glasses, have a variety of established uses that depend on their uniform reproducible fine-grained microstructures, absence of porosity and other wide-range of properties, which can be tailored by an adjustment of composition and the heat treatment procedure applied. Recently, glass-ceramics based on chain silicate structures have been developed (Khater, 2010). The glass-ceramics based on CMAS quaternary system, which are mainly produced from inexpensive natural or synthetic materials, such as fly ash, blast furnace slag, basalt, oil shale, granite and tuff, lithium porcelain clay tailings have received increasing attention during the past few decades. Blast furnace (BF) slag is one of the most abundant solid by-products in steel plants. Currently most of BF slag in China has been used for cement manufacturing and civil engineering, and the remaining amount is deposited in landfill. BF slag, which is mainly composed of CaO, SiO_2, Al_2O_3 and MgO, is the excellent raw material for the production of glass-ceramics. Recycling these slags is necessarily beneficial not only for economy, but also for environmental friendly steel plants (Yang et al, 2015). CMAS ceramic is one of the most promising glass–ceramic systems, and has excellent mechanical properties, high abrasive resistance and good chemical resistance due to the precipitation of crystals like diopside [$CaMgSi_2O_6$], anorthite [$CaAl_2Si_2O_8$] and cordierite [$Mg_2Al_4Si_5O_{18}$]. CMAS ceramics have become good candidates for functional applications such as sealant for solid oxide fuel cells, architectural applications such as building materials for interior and exterior walls, and heavy industrial applications such as protective materials for bunker, funnel and chute. As well known, the crystallization of CMAS glass–ceramics is very difficult, and also hard to control, which largely restricts the preparation and application of CMAS glass–ceramics. Sintering process and body crystallization process are two main preparation methods of CMAS glass–ceramics. Sintering process is derived from the sintering of fine ceramics, consisting of glass melting, water quenching, particle molding and high-temperature sintering, while body crystallization process is similar to the production procedures of plate glass, including glass melting, molding, annealing, nucleation and crystallization. In comparison with body crystallization process, it is relatively easy to control the crystallization of CMAS glass, but it is too difficult to obtain the fully dense glass–ceramics, for sintering process. Recently improving the crystallization of CMAS glass by adding nucleation agent has received considerable attentions. However, the present researches mainly focus on the crystallization of CMAS glass–ceramics prepared by sintering process (Yang et al,2014)

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Controlled bulk crystallization is the method most frequently used for producing glass-ceramics through controlled crystallization. The study of the CMAS system was also important for understanding the reactions taking place in rocks, blast furnace slags and MgO refractories. In most cases, published phase diagrams are related to equilibrium conditions that are not usually encountered in glass-ceramic preparations. Therefore, it is necessary to determine the relationship between the compositions of glass-ceramics and the crystal phases developed under conditions in which such polycrystalline materials were actually produced. In a previous paper Khater (2006) managed to obtain a glass-ceramic material based on by-pass silica sand and magnesite. From cement kiln dust which made up about 57 wt.% of the batch constituents depending on the composition. Cement kiln dust is generated in the cement kiln and associated equipment. Dust from the raw mix and the surroundings of the plant is normally suppressed with closed systems and through water sprays. During the burning process, the gas flows entrain a substantial quantity of dust that forms part of the kiln exit gasses. The production of cement kiln dust strongly depends upon the chemistry of raw materials, type of process and the design of gas velocities in the kiln. Other factors such as kiln performance and dust collection systems also play vital roles in kiln dust generation. The production of alkaline-earth aluminosilicate glasses in the system CMAS has been broadly investigated in the past decade. Crystalline phases such as cordierite, diopside, wollastonite, mullite, etc., have been precipitated from glasses under controlled conditions resulting in glass-ceramics with attractive dielectric properties and high mechanical and chemical resistance (Khater, 2010).

The CMAS ceramic system has attracted much attention due to its low densification temperature, low thermal expansion coefficient (TCE < 5.10^6 /1C), low dielectric constant ($\varepsilon r<10$) and better chemical durability. To facilitate CMAS glass crystallization different nucleating agents, such as TiO_2, CaF_2, and ZrO_2 have been used. It is well known that the flexural strength and fracture toughness can be improved by precipitating nano-size tetragonal ZrO_2 particles into the bulk glass. However, the pure glass easily bloats or softens during firing, leading to distortion of the components and requires the addition of ceramic fillers (such as alumina, cordierite, and rutile etc.) to eliminate softening at 800–900°C (Wang et al, 2014). Hanning et al (2006) explained that the glass compositions, the kind and content of nucleating agent and the schedule of heat-treatment, all greatly affect the microstructure and properties of glass–ceramics. In this work, sintering behaviors and microstructural properties of CMAS ceramics in the presence of the ZrO_2 nucleation agent was investigated.

Experimental procedures

Kaolin, dolomite, and zirconia were used as starting materials for preparations of CMAS based ceramics. ZrO_2 was added as a nucleation agent after the heat treatment schedule was determined, in attempt to promote the crystallization and improve performance of ceramics. The method of preparation of CMAS ceramics in present study is illustrated in Fig. 1. As shown in Figure the calculated amounts of the starting oxides for the indicated compositions were ball milled for 3 h using distilled water as the milling media and dried than sintering different temperature and times. Table 1 presents the chemical analyses of the raw materials, and Table 2 presents the chemical composition of the two CMAS ceramics. ZrO_2 was added into the CMAS-D ceramics compositon for preparations of CMAS-DZ coded ceramics.

Scanning electron microscopy (SEM, Jeol 6060LV) and energy-dispersive X-ray spectroscopy (EDS) were used to characterization of produced CMAS ceramics microstructure. X-ray diffraction (XRD) analysis was performed with RIGAKU D/Max/2200/PC to determine the crystalline phases occured in the produced CMAS ceramics. The volume density was measured by Archimedes method. The Vickers hardness (H_V) of the samples were measured using a microhardness tester (LEICA VMHT MOT) with a 100 g load, its load time was 15 s along the whole cross-section. Chemical durability of CMAS ceramic specimens was analyzed by measuring weight loss after chemical attacked at 2h later in 10% NaOH solutions at 100ºC.

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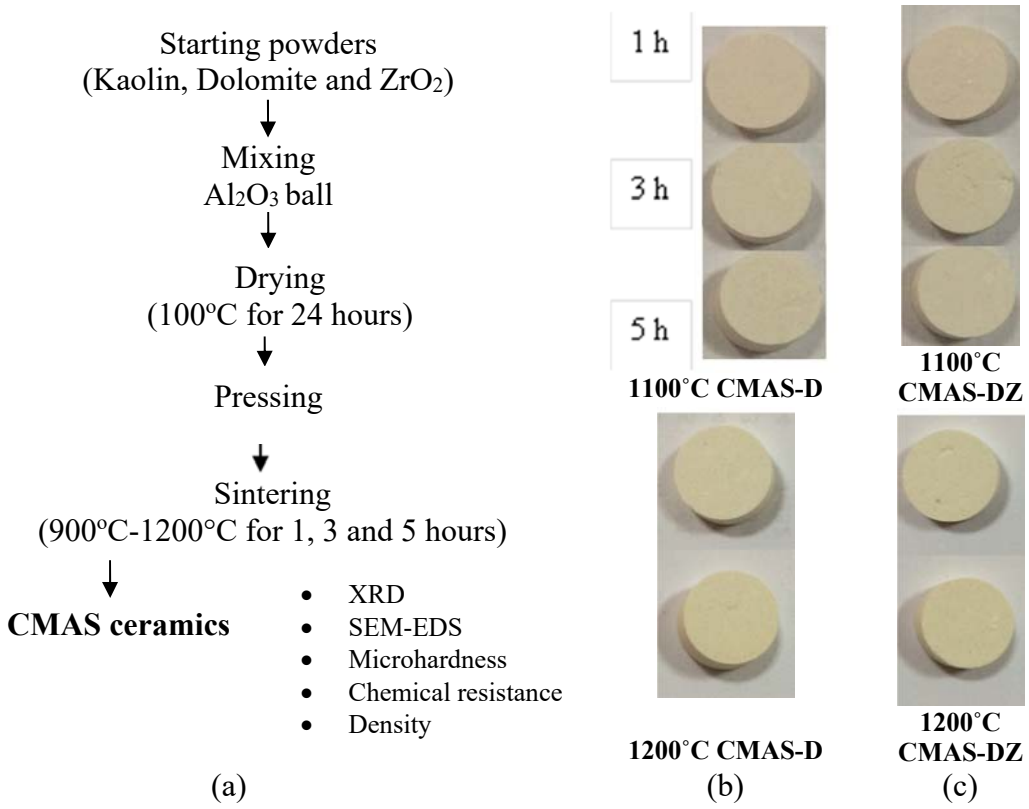

Figure 1. (a) Flow chart for the CMAS ceramics production, (b) and (c) macro structure of CMAS-D and CMAS-DZ coded ceramics

Table 1. Chemical analysis of the used raw materials (wt.%)

Raw Materials	CaO	MgO	Al_2O_3	SiO_2	H_2O	ZrO_2
Dolomite	50	50	-	-	-	-
Kaolin	-	-	39.5	46.54	13.96	-
Zirconia	-	-	-	-	-	100

Table 2. Chemical composition of the investigated CMAS ceramics (wt.%)

Composition (wt. %)	SiO_2	Al_2O_3	CaO and MgO	ZrO_2
	Kaolin		Dolomite	
CMAS-D	64		36	-
CMAS-DZ	64		36	5

Results and discussion

Fig. 2 shows the SEM micrographs of two coded ceramic samples crystallized at 1100 °C to 1200° C for 1 and 3 hours. It can be seen that the complex nucleation agents have an important role on the shape of crystals. With the addition of ZrO_2 (CMAS-DZ sample), the crystals irregularly arrange with sheet shape and low crystallinity (Khater, 2010). According to the SEM image of CMAS, a large number of granular crystals and a small quantity of lamellar shape crystal were distributed in the glass matrix after treated at 1100°C. S. Banijamali et al. (2009) explained that sintered CMAS ceramics reveals a coarser microstructure in which the needle-like crystals have been extended from the surface toward the center of glass particles. This behavior has led to the crack-like defects in the middle of particles.

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In Fig. 3, the columnar and small granular crystalline phases were distributed in CMAS specimen after crystallization at 1100 °C. It is well known diopside is a columnar crystal in ceramics. Furthermore, the EDS microanalyses were carried out on different areas of CMAS specimens. The magnesium content of 1 coded area is higher than other areas. The aluminium and oxygen content of 4 and 5 areas is apparently higher than 1, 2 and 3 coded areas, which showed that the columnar crystalline phases were diopside. The addition of zirconia which can enhance the heterogeneous nucleation of phases, and limit the growth of long anisotropic anorthite grains which will result in new voids where equiaxed grains are originally located.

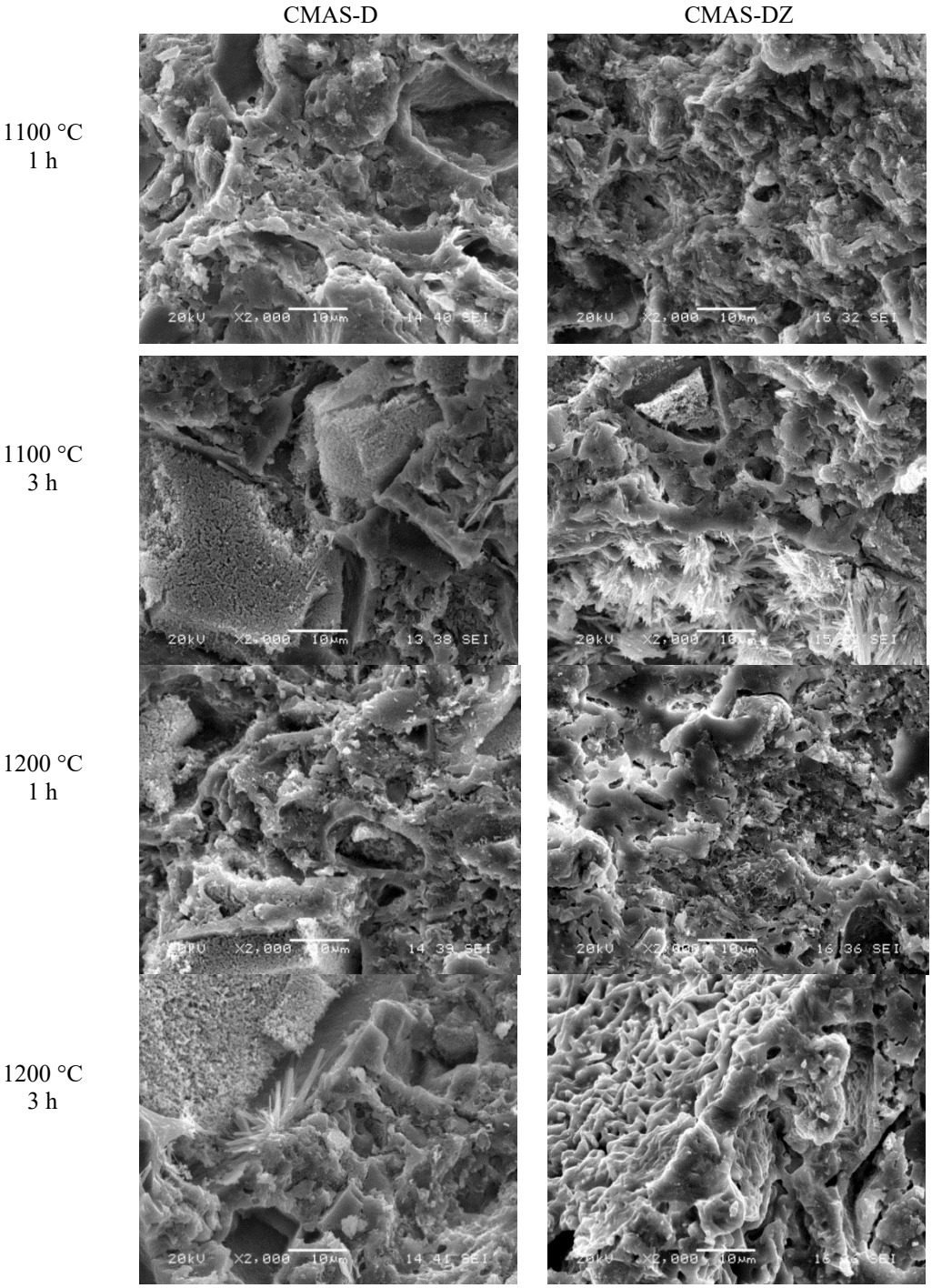

Figure 2. SEM images of the CMAS-D and DZ coded samples in the sintering of 1100 °C to 1200 °C for 1 and 3 hours

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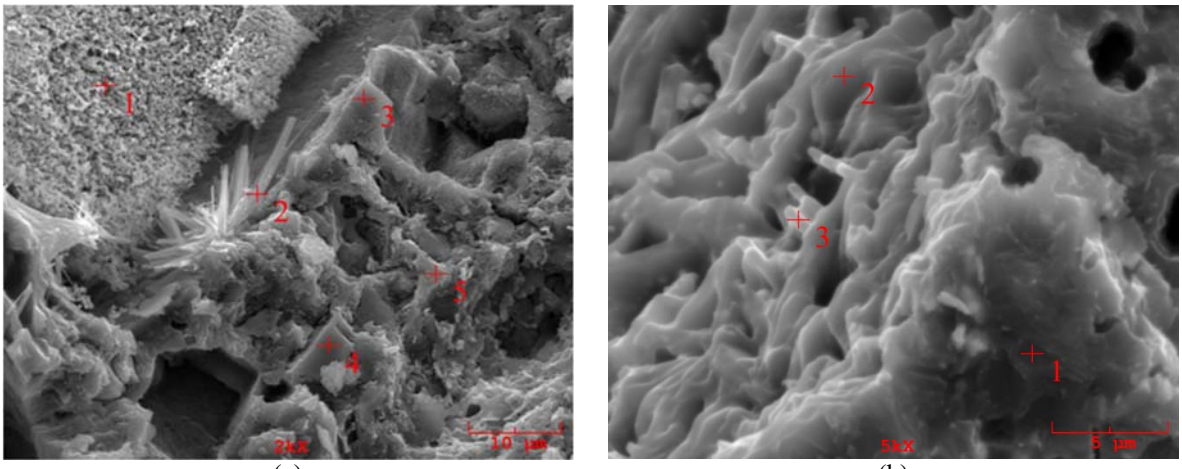

(a) (b)

Elementler	Miktar (%)				
	1	2	3	4	5
O	36.893	48.117	40.688	42.623	44.007
Mg	60.474	6.927	4.660	1.041	1.194
Al	0.704	12.893	14.711	25.653	21.825
Si	1.493	10.829	17.436	29.334	32.024
Ca	0.436	21.234	22.505	1.349	0.950

(c)

Elementler	Miktar(%)		
	1	2	3
O	28.393	30.556	43.716
Mg	0.728	1.729	3.251
Al	23.232	12.992	15.095
Si	27.582	20.047	19.157
Ca	17.194	32.147	14.937
Zr	2.871	2.530	3.844

(d)

Figure 3. SEM-EDS analysis of (a), (c) CMAS-D and (b), (d) CMAS-DZ samples sintered at 1200°C for 3h

Fig. 4 shows XRD patterns of the CMAS-D and CMAS-DZ coded samples crystallized at 900°C, 1000°C, 1100°C and 1200°C for 3 h. It can be seen that the CMAS-D, and CMAS-DZ samples have the same main crystalline phases, such as diopside and anorthite, their frequency depending largely on the base composition and crystallization parameters. It can be noticed that, with increasing the ZrO_2 content, the intensity of diopside becomes stronger gradually. In the Khater's (2014) X-ray diffraction showed that monoclinic or triclinic wollastonite ($CaSiO_3$), diopside ($CaMgSi_2O_6$) and anorthite ($CaAl_2Si_2O_8$) were the main crystalline phases developed in the CMAS ceramics.

CMAS-DZ ceramics exhibited slightly higher relative density and less porosity than CMAS-D ceramics, which is consistent with the results of Table 3. The corrosion resistance of CMAS ceramics is evaluated from the weight losses after leaching in alkali solution. The results are given in Table 3. Samples weight loss values for CMAS-D ceramics change between the ranges of 2.12 % to 3.73 % and for CMAS-DZ ceramics change between the ranges of 2.02% to 2.98%. It can be seen that, in general, the durability of CMAS ceramic is increased depend on crystallization temperature and adding ZrO_2 nucleating agent.

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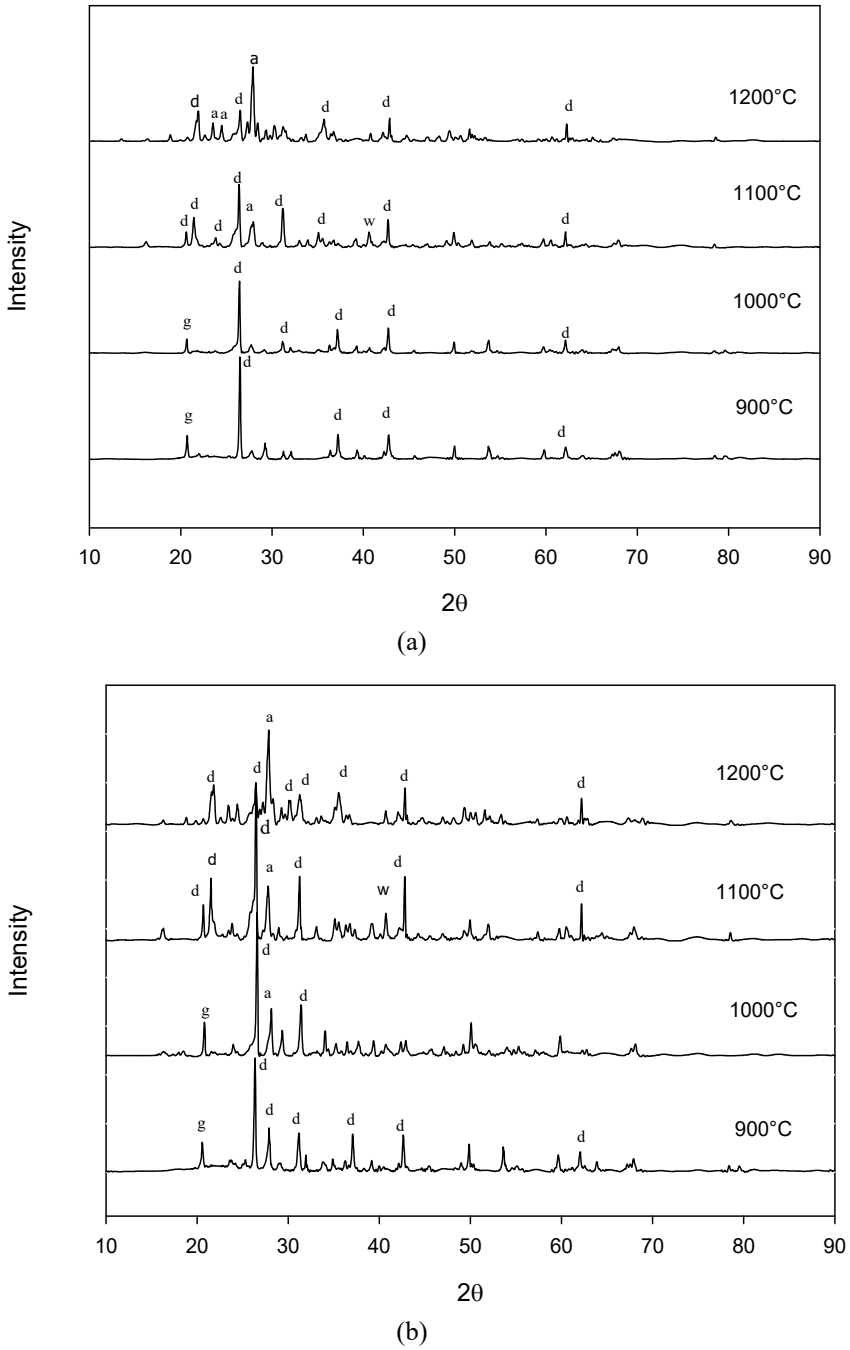

Figure 4. (a) XRD patterns of the CMAS-D and (b) CMAS-DZ samples crystallized at 900°C, 1000°C, 1100°C and 1200°C for 3 h (a:anorthite, d: diopsite, w: wollastonite, g:gehlenite)

Indentation microhardness measured for the obtained CMAS ceramic materials (Table 3) was found to lie in the range 522–844 HV, indicating high abrasion resistance of these materials and making them suitable for many applications under aggressive mechanical conditions. Samples hardness values for CMAS-D ceramics change between 522 HV to 787 HV and for CMAS-DZ ceramics change between 612 HV to 844 HV. The hardness of the samples drops from a value of about HV=844 for CMAS-DZ to about HV=522 for CMAS-D. Vickers hardness of CMAS ceramics were observed to increase with addition of ZrO_2. Average value of HV for the desert sand glass was found to be 6.37 GPa. This value of Vickers microhardness for desert sand glass falls is smaller than in this study results (Choi et al., 2015).

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S. Banijamali et al. (2009) chose raw materials from commercial grade calcium carbonate, corundum, silicon oxide, titanium oxide, zirconium oxide and calcium fluoride. The homogenized mixture of raw materials was transferred to a zircon crucible and melted at 1450 °C for 1 h in an electric furnace. The melts were water quenched and the obtained frits were dried and milled to the required particle sizes (<75μm). According to the obtained results, in spite of less crystallization in SZ6 (ZrO_2 containing specimens), this sample shows the highest Vickers hardness and improved chemical resistance rather than fluorine containing specimens.

Tablo 3. Various properties of the CMAS-D and CMAS-DZ ceramics

Sample name	Sintering temperature (°C)	Time (h)	Density (g/cm^3)	Hardness (HV)	Mass loss in NaOH (wt.%)
CMAS-D	1000	1	1.70	522	3.73
		3	-	532	-
		5	1.72	568	-
	1100	1	1.72	570	2.65
		3	1.73	582	-
		5	1.77	612	2.35
	1200	1	1.84	747	2.31
		3	1.92	787	2.12
CMAS-DZ	1000	1	-	612	2.98
		3	1.805	634	-
		5	1.825	673	-
	1100	1	1.845	705	2.5
		3	1.88	736	-
		5	1.95	765	2.33
	1200	1	1.97	827	2.27
		3	1.99	844	2.02

Marques et al. (2010) reported that, the glass-ceramics based on diopside, with excellent mechanical properties, high abrasive resistance and good chemical resistance, were good candidates for decorative materials in construction field.

Conclusions

In the present work, the reported results show that dolomite, kaoline and zirconia can be used to develop a new ceramic of CMAS system. For sintering temperature lower than 1100°C, the CMAS specimen were digested. Diopside and anorthite were found as major crystalline phases. With the raise of sintering temperature, the crystal shape changed from spherical to needle and the crystal size became much larger. Vickers hardness of CMAS ceramics were observed to increase with the addition of ZrO_2.

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COMBUSTION OF SILOPI COALS IN A ROTATING HEAD COMBUSTOR

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Abstract

In this work, a 40 kW coal combustion system with a rotary chamber, to burn Silopi and Tunçbilek'coal, which usually contain high level of ash, faster than fixed beds was designed and a prototype model was constructed. In the system, coal has been continuously carried by a screw conveyor from an hopper to the cylindrical burner head rotating continuously at a constant speed. As a difference among the previous systems, combustion air was supplied, by an axially-centred air tube carrying screw conveyor, into the air head in radial directions to the coal bed.

In order to evaluate the performance of the system, the effects of feed rates of coal and combustion air, angle of tilt and rotation speed of the burner head on the flue gas compositions and combustion efficiency were investigated.

The results of the experiments showed that Silopi and Tunçbilek coal could be burned with this kind of system in fast, efficient and practical and acceptable atmospheric pollutants levels. It was possible to increase the peak combustion efficiency over 80% by both improving the air supply and agitation of coalbed preventing coking during combustion. As a result, this system could be highly recommended to burn the coals with high swelling properties like asphaltite at a high efficiency.

Keywords: Coking Coal; Asphaltite; Combustion; Agitation; Rotary Chamber

1. Introduction

One of the most important fossil energy sources, coal is available abundantly on the earth and is expected to play a crucial role as a plentiful energy source in the future. When previous coal production and present production levels of visible reserves are taken into consideration, coal is an indispensable energy source with such properties as longer life compared to other fossil fuels, stable prices, and transportation facilities, storing opportunities; furthermore, it is secure in usage facility, easy to present it to consumers and it is continuous. These features will go on having the significant role in respect to sustainable development and confidence in energy in the future as in the past 1,2 as its reserves are larger than that of others such as petroleum and natural gas, as a matter of fact, there is a great deal of finding alternatives to these fuels (3,4). Although coal is mostly used for electric production in the world (approximately 65% of the world coal production), it is also used in domestic heating, iron-steel and cement sectors. Therefore, coal is the most commonly used fuel among all kinds of fuels.

Silopi coal, which are characterized by high sulphur and ash content together with high swelling properties,(5) make the great amount of coals which have over 60 Mt of reserves in South Eastern region of Turkey. Silopi coal being a petroleum originated substance is a hard, blackish material, with a relatively high softening point of about 200–315 ^{0}C and it is mainly composed of hydrocarbons (6,7). Despite asphaltites have the physical appearance of coal; they are derived from crude oil which leaked into inorganic formations. South Eastern region of Turkey has the largest asphaltite deposits, and it is used in domestic heating as the major alternative of lignite around the region (8).

Historically combustion in coal beds was the standard firing technique however, pulverised fuel and fluidised beds are now widely used. The earliest attempt to introduce mechanical stokers first appeard in 1816 (9). Up to the 1960s significant devolopments in stoker firing were carrier out. However, availability of other energy resources slowed down. In the smaller boiler size, as for example in the domestic and small commercial range, there is yet no established alternative to burning fuel in some form of fixed bed. As a result, coals with high swelling properties like asphaltites are not burnt at high efficiency in these coal combustion systems. Moreover, if the coal bed is mixed a lot to break up the coke blocks, the amount of unburnt coal loss falling through the grid becomes more.

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Quality of asphaltites is poor in terms of their high ash and sulfur contents, and this leads to form coke blocks when it is burnt in conventional stokers. The plastic layer which is formed on them prevents air to diffuse into the coal particle, thus the air provided for combustion of swollen and coked coal becomes insufficient (10,11,12,13). This problem is partially resolved by shaking the flame bed automatically or by mixing the burning material manually in order to provide continuous air for the surface of unburnt coal. However, these processes are generally not practical. The most influential way to supply a uniform and permeable fuel bed is a continuous fragmentation of coke blocks that have occurred. Nevertheless, very high amount of smog may occur during fragmentation.

Caking coals burning for their passivity, they are not practical shallow beds. Flame bed that problems such as continuous scanning or shaking relieved in a way not practical. During combustion, the coal ash surface prevents the diffusion of oxygen to the grain surfaces. These and strongly caking coal particles tend to agglomerate in a different solution to the problem in the United Kingdom by British Coal Board entitled rotary combustor was developed (10). Since Turkey coal reserves are abudant enough 200 years at the present rate of consuption. The utilisation of caking coals for gasification has declined, hence it is worth while investigating alternative uses of this type of coal. One potantial area is the efficient, enviromentallly clean combustion of coal to hat energy efficient buildings which has tremendous World widwe potential. Our country with a high percentage of ash quickly than fixed deposits of lignite burned to achieve the planned 40 kW rotary combustion chamber coal combustion systems and prototypes were made.

The system is designed to burn coal in a coal bunker to the rear of the hood by rotating worm is moved continuously. The combustion chamber is rotated continuously at a constant speed around its axis. Thus, the removal of coal ash from coal burning surface of the bed and with constant stirring of the coal supplied with air in a radial direction is intended to provide a better contact. In the experiments, the performance of rotary coal combustion chamber, such as combustion efficiency and emission levels of atmospheric pollutants on the basis of criteria have been followed.

2. Materials and method

The system is schematically displayed in Figure 2.1. In this system that is manufactured as a prototype, it is envisaged that the coal whose approximate average thermal value is 5000 kcal/kg is going to be burned at a feeding speed of 7 kg/h, and a power of 40 kW will be obtained. The results of proximate and ultimate analysis of coal used are given in Table 1.

. **Table 1** Analysis of coal used in experiments (wt.%)

Proximate analyze	Asphaltite (Silopi)
Moisture	0.34
Ash	26.17
Volatility Matter	29.59
Fixed Carbon	43.90
LHV (kcal/kg, dry basis)	5000
Ultimate analyze	
C	64.08
H	4.54
S	7.5

For the design of head, the combustion chamber dimensions of previously made coal combustion systems were taken as reference (14). For 40 kW power of, the head was manufactured at a capacity of nearly 40 litres with a 36 cm diameter and 40 cm length. Depending on these head dimensions and bed slope, the bed volume and the coal waiting time on the head were calculated. It was found out that the bed volume was at least 5 dm^3, while it was 20 dm^3 at most; and waiting time was at least 35 minutes, while it was 130 minutes at most. Combustion head was manufactured out of C10 steel the outer diameter of which was 37 cm and the thickness of which was 5 mm. The length, width and height of the body of set-up were 160, 55 and 90 cm and it was manufactured by using the profile materials of 1x30x30 and 1x30x40 mm.

An electric motor with power of 800 W, rotation speed of 900 rpm, mono phase and working at 220V was used. A 20 rpm rotation was obtained from the motor output shaft by passing through couple worm screw system to the motor. 6 Gears the gear number of which are 12, 14, 16, 18, 21 and 24, respectively, were mounted on the motor output shaft, the gears are rotating together with motor shaft. The shaft that gives motion to the head receives its movement from these gears via a chain. The head speed is changed as in speed bikes gears that have 6 different gear numbers on the head moving motor. When the motion is transferred by means of the smallest gear, the head

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rotates at 1,6 rpm which is the lowest rotation. In this system, coal is carried from the bunker into the head via a spiral carrier. Considering the size of coal particles to be carried, C10 steel pipe with 10 cm diameter, 120 cm long, and 6 mm thick is used in making the spiral. In the spiral carrier, every foot of which is 11cm, a pipe with 1 inch is used as a shaft. The flow of coal is arranged by means of two pulleys in coal feeding system whose diameters are 30 cm.

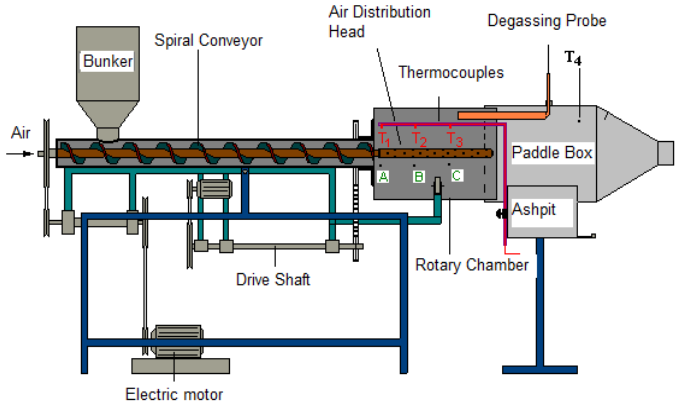

Figure 2.1 Schematic view of coal combustion system with rotating chamber

Air delivering head is screwed to the end of shaft and it takes place along the axis of rotating combustion chamber. This head is made of stainless steel with 20 mm diameter and it is screwed to the spiral carrier shaft. Air is dispersed from 24 holes each of which is 3 mm in diameter and which are opened around this air head the inside diameter of which is 14 mm. Hence, air is given into the combustion chamber in radial direction, and with high linear speeds from many points and since the backside of the head is in coal bed, both primary (air that directly sent to bed) and secondary (air that sent to the bed surface to complete burning gaseous released from the bed surface) air are provided by means of the same head. Long air delivery head is made by lengthening short air delivery head (primary) by 10 cm. Furthermore, experiments are repeated with using a flange and an additional air delivery head (secondary) plus flange. The additional air outlets increase air percentage sent to the rotating combustion chamber. The addition of the flange also increases the coal waiting time (residence time) in bed and the bed volume without increasing bed slope more than needed (because in high bed slopes, coal does not mix with air very well as a result of the coal not being mixed sufficiently), this reduces the amount of flammable substance in ash as much as possible.

The air necessary for combustion is provided by a compressor. In order to prevent the fluctuations in air flow and provide air at constant pressure, a pressure regulator is placed in the outlet of compressor. To measure the air flow, an orifice and sloped manometer is used and it was made in according to British BS1042.19 Firstly, air flow was increased at intervals of five minutes by increasing air flow of 10 m^3/h for each time. After approximately 15 minutes, it reached an EAR value of 1, in this case sloped manometer displayed the air flow of 25 m^3/h considering the flow rate of coal. Afterwards, air flow was increased continuously to obtain different EAR values. Air flow rate was increased by rising excessive air from stoichiometric rate until 50% with 10% step increase at each time. Excess Air Ratio (EAR) was calculated by using following equation:EAR=(A/F)actual/(A/F) stoichiometric, where (A/F) actual is a ratio of measured air and fuel consumption while (A/F) stoichiometric is obtained from stoichiometric combustion equation of air and fuel. A digital display Therpa-2000 model 6 channel thermometers equipped with K type (chromel- Alumel) thermocouples that can measure the temperatures between 0–2000 oC was used. It was calibrated according to these thermocouples. Three holes with 2 mm diameter were opened on the head (Figure 2.1, A, B, C holes)

in order to measure char temperatures. T1, T2 and T3 temperatures show the temperatures at the top regions at a distance of 5, 20 and 35 cm from the base in the rotating chamber, while T4 shows the gas temperature going out of the head. When these holes came to the top position due to rotation of the head, the points of thermocouples were extended inside the holes. With the rotation of the head, char temperatures were read in the areas where thermocouples were mounted. Combustion head was cleaned and filled with woods and coal particles until the maximum capacity in order to start combustion, and then ignited.

The amount of unburnt material like C in ash was determined by using fixed weight method. In this method, ash samples were grinned, and then their size was brought to nearly same size. Porcelain crucibles, which were washed and dried at 105 ºC, were brought to a fixed weight in terms of waiting in an oven heated to 700±20 ºC. A sample ash of 10 g was placed on crucibles, and it waited in oven at 700±20 ºC for four hours after brought to a fixed weight in oven at 105 ºC (in this progress, heating and weighing were made for one hour intervals) to remove

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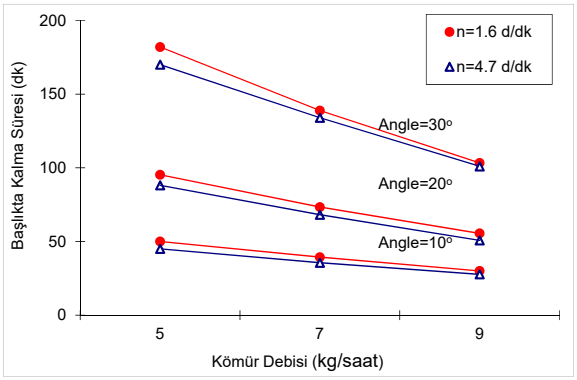
moisture within ash. Finally, the amount of combustible material like Carbon (C) in ash was calculated by following equation % $m_c = (m_2 - m_3)/(m_2 - c)$, where c; the weight of empty crucible, m_2; the total weights of crucible and slag after removal the moisture, and m_3; the total weights of crucible and ash after burnt at 700 ºC.

2.1.Cold Runs

Bifore firing the combustor, cold runs have been undertaken to determine the more importan operating characteristics of the combustor. This vork may be catagorised into, coal flow measurements and air flow measurements. In coal flow measurements residence time of the bed, have been determined as functions of coal flov rate, angle of title of combustor, and speed of rotation.

Althought the coal flow behaviour will be different from that when the coal would actually be burning these measurements could provide sufficient information to enable optimum working conditions to be achived more readily when running hot.

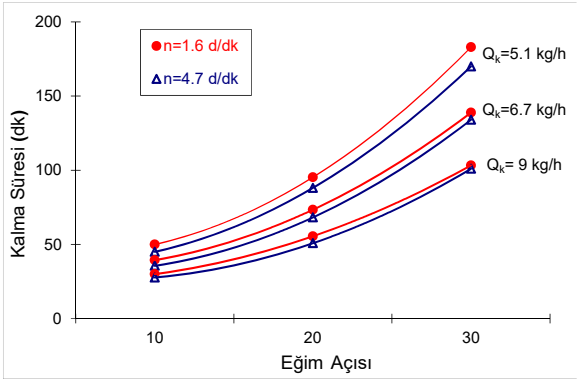
The cold data have been plotted as Figures 2.2 and 2.3, which illustrate the effect of different variables, such as.,coal flow rate, angle of tilt, and retort speed of rotation. A correlation between residance time, coal flow rate, angle of tilt and retort speed of rotation hes been found using a multivarible regressing.



Figures 2.2 The effect of angle of tilt on residence time of coal

As the angle of tilt is insreased, the residence time increases, and this rate of increase becomes more pronounced et the lower coal flow rates (Figures 2.2). Angle of tilt was found tbe most important variable with respect to change in residence time.

The residence time decreases with increasing coal flow rate fort he same angle of tilt (Figures 2.3). Coal flow was found to be the second most important variable. This is olso verified by the regresion analysis. The speed of rotation has only a limited effect on residence time



Figures 2.3 The effect of coal flow rate on mean residence time of coal particle in the rotating retort

2.2.Hot Runs

Hot runs were carried out to the performance of combustor for Slopi coal with regard to variation in the rate of air supply and distribution, the degre of agitation (related to the retort speed of rotation) the degre of agitation (related to retort speed of rotation), and the dept of the bed (by changing the angle of titleof combustor). The monitored

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gases were CO concentrations incrased very quickly to a maximum and then decreased sharply to 500 ppm whic councided with the disapperance of flame. Because of chare combustion, the CO_2, concentration does not go to 500 ppm,it is at the higgest level during volatiles combustion and then rapidly decreased to minimum before staying nearly costant minimum of rapid fal approximately coincided with the flame off time. CO exhibits a non-linear trend while, in general, it is high at low coal flow mainly due to low bed-temperature which affects greatly CO formation. For O_2 and CO_2, it is observed an opposite behavior as expected.

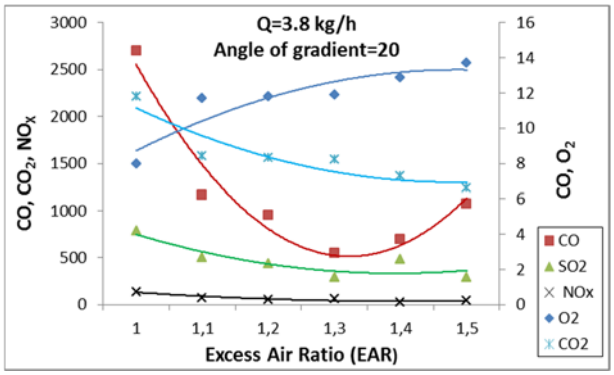

Figure 2.4 The effect of excess air ratio on the flue gas component

Generally, with the increase of EAR and coal flow, O_2 increased while CO_2 reduced, as shown in Figure 2.4. NO_X emissions at bed depths (angle of tilt gradient 20) Figure 2.4 shows the effect of excessair and bed depth on the emissions of NOx for Silopi coal. From the Figure 2.3 it can be deduced that for 20° tilt the NO_x levels are nearly constant at between 0-50% excess air. As the flue gas temparatures were found to be not high at all axcess air, this suggest a relationship betweeen temperature and NO_X (Figure 2.5). The change in temperature distribution on the head as function of excess air ratio (EAR) are shown in (Figure 2.5), where temperatures are measured under stable working conditions at 20° slope of the bed and coal flow of 3.8 kg/h. It is seen that temperatures initially increased at all measurement points with the increase of EAR and rose at its peak value when EAR was around 1.3 and then decreased again, and temperature distribution was homogenous throughout combustion head. This represents that the ignition level is higher in the centre of coal-bed than at the front and rear positions. The lower ignition level at the front arises from the freer air penetration and from relatively smaller quantity of coal-bed to this portion. It can be said that the temperatures on the head did not rise sufficiently, as a result, that surface reaction rates in combustion became important. In such a kind of combustion, oxygen can spread until the coal surfaces inside and when it reaches equilibrium, it is observed that the coal is burnt as a whole and then turns into ash without any shrinkage in the size of coal particle after the occurrence of combustion in the total volume of coal particle. It is seen that the ash formed over the coal particle during combustion became dust after being tapered a lot. This formation strengthens the consideration that combustion occurs at low temperature and depending on the surface reaction speeds. The ash in fine dust is thrown away from the chimney drifting by the air being sent at high speed from the air head on the coal bed. This, however, effects the chimney gas emissions negatively (15).

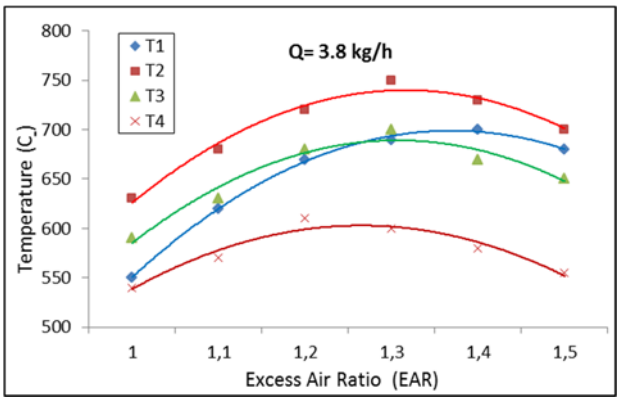

Figure 2.5 The effect of excess air ratio (EAR) on temperatures

Furthermore, NO_x values are low in all cases; this might be due to lower temperature obtained in the combustor with the supply of extra air with secondary air and increase in EAR that lead to dilution. This is in agreement with the other workers (16).

Emissions of NO_x and SO_2 from the combustion of Silopi coals at different EAR are shown in Fig. 2.4. İn general, SO_2 emission decreases as EAR increases. This is due to its sulfur content (Table 1) Excessive increase in air causes the

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combustor column to cool and lead to decrease in NO_x, and increase the CO emissions as well, as reported by Varol and Atimtay [Combustion of olive cake and coal in a bubbling fluidized bed with secondary air injection].

During all the runs no smoke was visible and no permanent percentage obscuration was recorded by smıoke meter. Typical smoke meter chart recording gave zero smoke levels except small peaks at startup were obtained

2.3. Combustion Efficienc (%)

Since the CO level in the flue gases was very low, the combustion efficiency was almost entirely based on the combustibles in the ash. Various tests were carried out to assess the combustion efficiency when burning of Slopi coal as a function of throughput and excess air. The typical results in the Figure 2.6 show the effect of the excess air for coal flow rate 3.8 kg/h. The blue lines show the combustion efficiency at various excess air rate suggesting increase in combustion efficiency with increase in excess air and accebtable levels of combustion efficiency can be observed at excess air 1.4 whic is in quite agreement to other work on modern stoker (17)

A relatively axtensive investigation into the amount of combustibles in the residue hes been carried out and the results here are shown as afunction of excess air at 3.8 kg/h coal throughput in Figure 2.5. It is not possible to deduce a definite trend however at high temperature providet a substantial decrease in the loss of combustiblesin the residue.

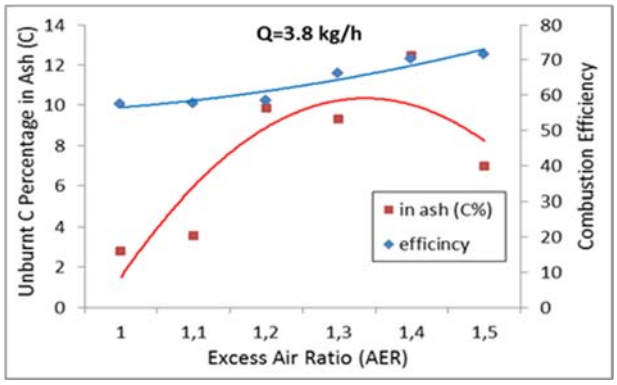

Figure 2.6 The effect of excess air ratio (EAR) on amount of combustibles C and combustion efficiency

In this system whose power is planned to be 40 kW, the optimum feed rate for coal is calculated as 7 kg/h. It is an anticipated result that the heat distribution on the head should be lower at low feeding rates than this feeding rate. In fact, although the first air sent into the bed directly is the most important factor in stable combustion, it is known that a secondary air should be sent onto the bed to complete the combustion of volatile products and gases emitted from the surface of the bed, but it is impossible to calculate the amount of this air theoretically. The premier and secondary air amounts change according to type of coal, combustion system and the way of air distribution.

3. Conclusion

In this study, the combustion of Silopi coals (asphaltites coking coals) was investigated in a rotating head combustor developed for burning the coking coals effectively with air supply arrangements. The main conclusions are as follows

(1) The air distribution characteristics were axperimentally determined without combustion and without coal present. When the air pressure were adjusted from regülatör, the percent reduction on air flow range from 100% to 50%.

(2) Combustion efficiency was found to be a strong function of air distribution throughout the coalbed, combustion chamber temperature, unburnt C percentage in ash and combustion of volatile substance. When the secondary air delivery head was employed, maximum efficiency increased from 60% to 72%. The lowest and highest C percentage in ash was found as 3 % and 9%, respectively.

(3) The C percentage in ash appeared to be high when coal was burnt in combustion chamber having low bed depth, and to enhance their combustion, the waiting time (residence time) of coal was increased by increasing slope but the lengthen of the head length was found to be better than former one when the high carbon coals were burnt.

(4) The shaking the bed prevented agglomeration and coke combining during combustion of coals with properties of high swelling.

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(5) The temperature distribution in the head was observed to be uniform in the case of the usage of secondary air delivery head.

(6) Bed height has an effect on the hydrocarbon and NO_X emission. Hydrocarbon falls with increase in depth. On the other hand NO_X rises very slightly with increase in depth.

(7) Higher temperatures in the flue gas lead to high levels of NO_X emission.

(8) Generally, with the increase of EAR and coal flow, O_2 increased while CO_2 reduced

(9) During all the runs no smoke was visible and no permanent percentage obscuration was recorded by smıoke meter.

(10) CO emissions is decreased until EAR reaches a value of 1.3. Further increase of EAR cooled the combustor and caused CO emission to increase.

In this study, it was shown that the swelling coals that were difficult to burn in conventional stokers could be burnt using a rotating head combustor in high efficiencies without any ash problem. In fact, recently, such types of systems have been adapted to boilers, which are widely used in the buildings, to ensure the burning of the coals with high swelling property.

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COMPARATIVE EVALUATION OF REPLACEMENT FOUNDRY SAND WITH MINERAL FINE AGGREGATES ON HMA PROPERTIES

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ABSTRACT

In this study the influence of using waste foundry sand (WFS) as replacement for mineral fine aggregates on the Hot Mix Asphalt (HMA) properties is evaluated. An experimental program was conducted on the asphalt concrete samples prepared with 5% replacement of mineral fine aggregates. HMA samples, made of WFS and conventional mineral aggregate, were compared in terms of their Marshall Stability, Flow, Bulk Specific Gravity, Void in Mineral Aggregates and Voids Filled with bitumen in the total mixture properties. The results obtained from the experiments indicate that the replacement of WFS with mineral fine aggregate has a significant potential to use in bituminous hot mixtures.

INTRODUCTION

One of the waste materials having that has a possibility to be used in road construction is waste foundry sand. For metal casting process to make molds and cores, uniform silica sand is used. Usability of foundry sands as an aggregate in road construction field gives the engineers the ability to construct better sustainable structures which is important to reduce their environmental pollution. Recently waste foundry sand has been used as a partial replacement for aggregate in bituminous asphalt mixture. Some states in USA have reported that the use of 8 to 25 % foundry sand is possible HMA to replace conventional aggregate (FHA 2004).

Use of waste foundry sand has a great potential in HMA for positive performance. Especially, the mixture stability, moisture resistance with waste foundry sand can be higher than HMA with conventional sand. In addition, some studies reported that foundry sand added samples demonstrated have increased rutting resistance (Delange et al 2001).

Foundry sands added HMA mixtures have good durability characteristics for weather affect. (Emery 1993). The same equipment and methods are used for foundry sand added HMA production. Regarding to HMA production at the plant, if the foundry sand has less than 5% moisture, it can be dispatch directly into a batch plants pug mill. Likewise, it can also dispatch through a recycled asphalt feed for drum plants where the foundry sand can be further dried, by the already heated conventional aggregates. Generally, foundry sand should be clean of thick coatings of burnt carbon, binders, and mold additives. It can be adhesion problem between the asphalt cement binder and the foundry sand. Clay clumps also can be removed by screening and/or washing. To remove iron and rubbish from the foundry sand, magnets and/or hand separation can be used (D'Allesandro et al 1990). At the drying process the presence of organic binder and bentonite materials can increase the time required. Also, this can increase the load on the hot mix plant dust collection system (Bradshaw et al. 2010).

The aim of this paper is to determine the general mechanistic characteristics of HMA that were made replacement foundry sand with mineral fine aggregates by measuring essential Marshall properties and by performing various laboratory tests. Marshall Stability, Flow, Bulk specific gravity (G_{mb}), Void in Mineral Aggregate (WMA) and Voids Filled with bitumen (VFA) were determined on the Marshall samples made with waste foundry sand and with conventional mineral aggregate added samples.

MATERIALS AND METHODS

Mineral Aggregates

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As a mineral aggregate a type of crushed dolomite was used for the coarse and fine aggregates for the asphalt concrete production. The crushed aggregates were produced in the Kayseri, Turkey. The quarry was made the aggregates in fractions 0/5, 5/9.5, 9.5/12.5 and 12.5/19.5 mm.

Waste Foundry Sand

The grain size of waste foundry sand has very uniform distribution. According to sieve analysis 88% percent of waste foundry sand that used in this study is in between #10 (2 mm) and # 200 (0.075 mm) sieve sizes. 11 percent of foundry sand is smaller than #200 sieve size. Particle shape of the foundry sand is typically sub angular to rounded. Foundry sand consists primarily of silica sand which has more than 80% silicon dioxide, coated with a thin film of burnt carbon and residual binder (Du et al 2002). Figure 1 shows a view of foundry sand used in this study.



Figure 1. A picture of waste foundry sand used in mixtures

EXPERIMENTAL WORK

Marshall Test

Foundry sand passing through a #4 sieve were added 5% to mixture instead of mineral aggregates of the same size to evaluate the usability of foundry sand in the binder course of HMA. For each mixture were designed according to Turkish General Directorate of Highways (KTŞ 2016) and the Marshall Mix design (ASTM D 6927) was carried out. Asphalt mixtures with mineral aggregate and foundry sand were prepared with a 3.5, 4.0, 4.5, 5.0, 5.5 and 6.0 percent rate of bitumen content for each dry mixture. Then, the Marshall Stability and flow tests were conducted.

Asphalt mixes with waste foundry sand are designed using standard HMA design method. In this study 50/70 penetration grade asphalt were used with dolomite and foundry sand aggregates for the fabrication of asphalt concrete specimens. The asphalt cement binder was provided from TUPRAS Company in Turkey. The physical properties of the bitumen were determined and controlled according to ASTM standards. Asphalt cement that is used in this research has a penetration grade of 55 (0.1 mm at 25 °C, 100 g & 5 s) and 1.025 g/cm^3 specific gravity. The aggregate gradation for two mixtures was selected in accordance with the guidelines specified by the Turkish General Directorate of Highways, as can be observed from Fig. 2. The total weight of aggregate for the standard Marshall specimens was prepared at 1150 g. and 75 blows were applied on each side to compact the specimens.

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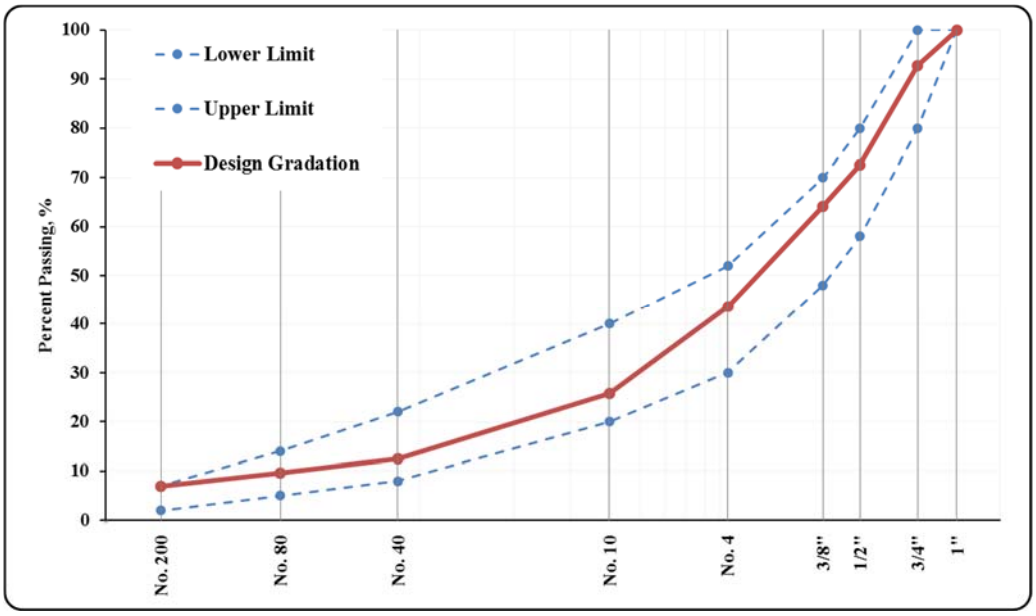

Figure 2. The aggregate gradation for the mixtures

RESULTS

Marshall samples were compacted and tested by employing the asphalt cement content corresponding to maximum stability, maximum Gmb, median of designed limits of percentage air voids in the total mix and median of designed limits of percentage voids filled with bitumen in the total mix. In order to determine the optimum bitumen content for the mix design, the bitumen content corresponding to median of designed limits of percentage air voids is taken.

Fig. 3 shows the Marshall Stability and flow results of HMA made with foundry sand added and mineral aggregates. Structural strength of the compacted HMA determined by Marshall stability. Aggregate properties and gradations affect this strength in the first order with binder. When Fig. 3 is observed, it can be clearly seen that the asphalt concrete stability with foundry sand is higher than the samples which were produced with mineral aggregates at the optimum binder content. Also, the Marshall Stability values of each asphalt concrete sample passed the 750 kgf that is the minimum limit for Turkey roads. The flow value of asphalt concrete is important due the fact that it reflects the plasticity properties and asphalt mixtures flexibility under traffic loads. The Marshall samples corresponding to the deformation of the load are broken; this represents a measure of the flow and flow with the value of the internal friction. Flow has a linear inverse trend relationship with internal friction (Brawn E.R. et al. 2009). Fig 3. Shows the relationship between flow and bitumen content for all mixtures. The results showed that the specimen flow results of the foundry sand added samples are lower than the control samples. Asphalt concrete samples containing waste foundry sand yielded better stability and flow resistance performances.

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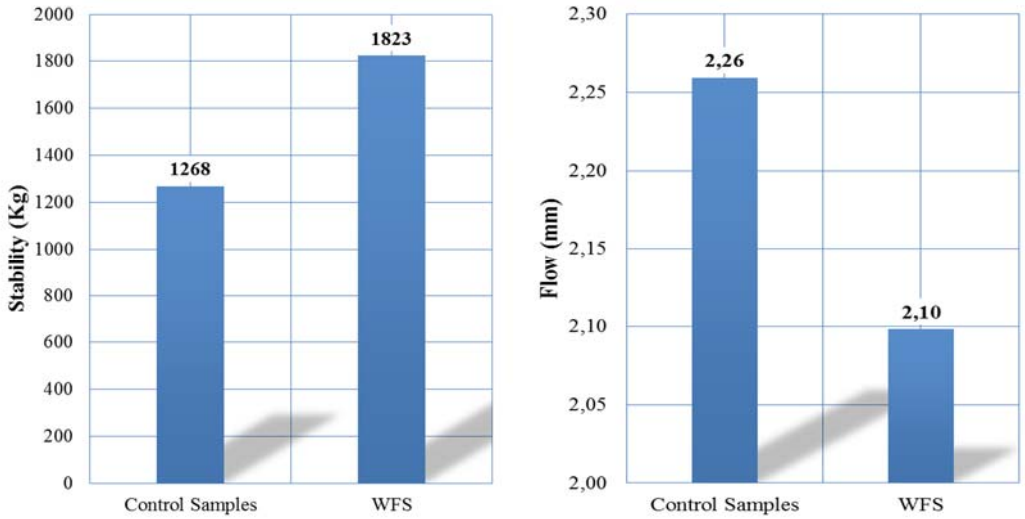

Figure 3. Marshall stability and flow values of asphalt samples at optimum binder content

Figure 4 shows the results of the optimum bitumen content, Gmb, VFA, and VMA of the specimens with foundry sand used and control mixtures. According to these results, it can be seen that the optimum bitumen content of WFS added samples is lower than the control samples. Also, bulk specific gravity increased with the WFS adding to mixture. Regarding to Vf and WMA, it also can be seen that they are slightly decreased with WFS added samples.

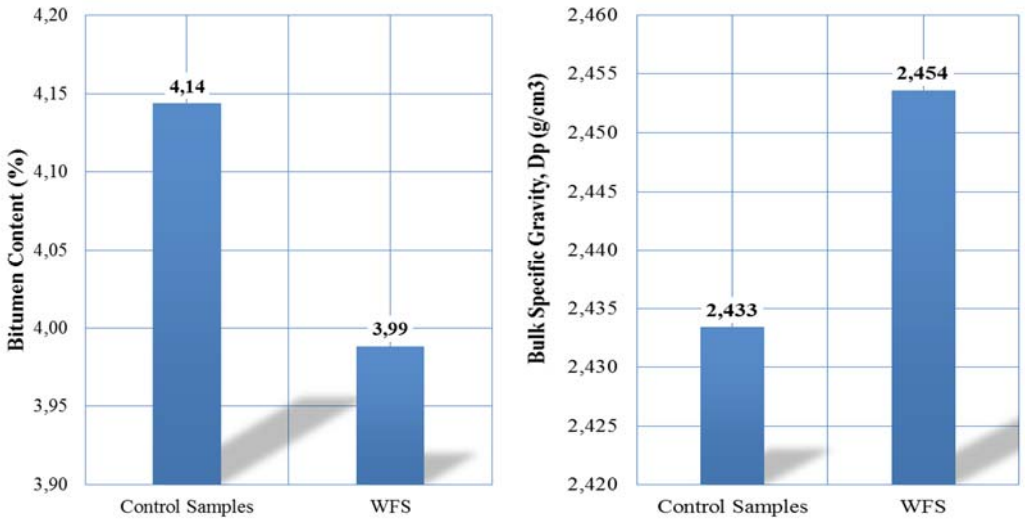

Figure 4a. Bitumen Content and Gmb results of the samples.

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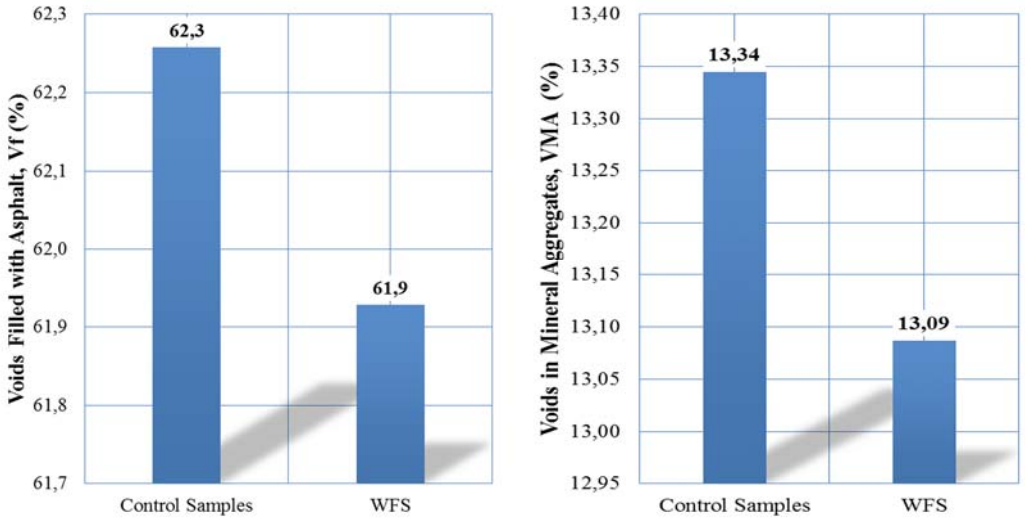

Figure 4b. Vf and VMA results of the samples.

CONCLUSIONS

This study aims to compare and evaluate the influence of using waste foundry sand as a replacement of mineral aggregate in HMA. At the laboratory Marshall tests performed to determine the characteristics of HMA with various bituminous rate. According to the results derived from the laboratory test data, these conclusions can be report: Marshall Stability values significantly increase with WFS addition in the mixture replace of mineral aggregate for optimum bitumen content. Both mixtures pass the Turkish Highway standard criterion (750 kgf) for binder course. Regarding to flow resistance of the samples, asphalt concrete samples containing WFS demonstrated better flow resistance than the control samples. Another important result of this study is optimum binder content decreased with the WFS adding. This study shows that there is high possibility to use waste foundry sand in HMA binder course. Performance tests such as rutting, creep test, dynamic modulus tests etc. would be very beneficial to understand successfully influence of this material in the mixture.

ACKNOWLEGEMENT

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COMPARATIVELY USE OF TIME SERIES AND ARTIFICIAL INTELLIGENCE METHODS IN THE PREDICTION OF AIR POLLUTANTS

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Abstract: Air pollution is a continuing environmental problem in many part of world which affects welfare adversely. Air pollution monitoring data can thus be used to forecast concentrations of air pollutants for short-term using time series and artificial intelligence approaches. In this paper, time series modelling techniques, auto regressive integrated moving average model and another type of it with exogenous variables (ARIMA and ARIMAX), and artificial neural networks (ANNs) have been comparatively used to model particulate air pollution (PM_{10}) for predicting one-hour ahead concentration of particles in the air. An hourly based data for the years 2015-2016 was composed with including meteorological factors and air particulate concentration. The models were structured with inputting external parameters to simulate air pollution better. ARIMAX(3,1,2) model with R^2 of 0.667 and ANN(5-13-1) model with R^2 of 0.857 produced reasonable predictions over hourly dataset. The best fitting model among these models have been chosen in further tests in the prediction of one-hour ahead PM_{10} concentrations.

Keywords: Air pollution, Time Series Methods, Artificial Neural Networks.

Introduction

Air pollution problem due to particulate matter (PM) is caused by a mixture of organic and inorganic particles which are solid and liquid phase spreading out from variable sources (WHO, 2006; Sfetsos and Vlachogiannis, 2010.) These particles with an aerodynamic diameter less than or equal to 10 µm, namely PM_{10}, arise in the atmosphere mainly from the fuel combustion (Aneja et al., 2001; Kampa, M. and Castanas, 2008; Vahlsing and Smith, 2012). The highest PM_{10} levels are associated to stable meteorological conditions with thermal inversion in urban and industrial areas. Epidemiological studies showed a close relationship between outdoor particulate matter concentration and increased mortality and morbidity (Shang et al., 2013; Pope and Dockery, 2006). High levels of these pollutants can be harmful for goods, and also decrease visibility. The air quality standards are thus set for PM_{10}, declaring hourly, daily and annual limits. According to EU standards for PM_{10}, the annual average limit value of 40 $\mu g.m^{-3}$ and 24-h limit value is declared as 50 $\mu g.m^{-3}$, and also the limit values should not be exceeded by the specified number of times in a year (EC, 2008).

Elevated levels of air pollutants in the air may cause acute or chronic health effects, and even cause premature deaths in the elderly people. The air quality forecasting studies is an important research topic in air pollution science for public health. Many functional alert systems were employed by utilizing statistical and hybrid models, to take precautions before and during air pollution episodes. In this scope, long-term or short-term air pollution forecasting models have been used as an aid for air quality management. Time series models, artificial neural networks (ANNs), multiple linear regression (MLR) and hybrid models are mostly preferred approaches in air quality forecasting researches (Schlink et al., 2003; Niska et al., 2004; Perez and Reyes, 2000). With nonlinear simulation and learning abilities, ANNs, are powerful tools for regression and pattern recognition problems. A real-life problem such as short-term air pollution prediction, covering complex nonlinear relations with meteorological factors, can be handled by ANN models very well. ANNs consist of neurons that are interrelated connections artificial processing units and they can process information by error minimization within a finite computation loop. ANNs can thus be trained to learn a complex relationship between two or more variables recorded in training datasets. Among the available ANNs, the feedforward error backpropagation neural networks are the most employed ANN types, of which inputs has a nonlinear transfer function. By this means, they have been used in many successful studies in local air pollution modelling for forecasting pollutants NO_2, O_3, SO_2, CO and PM_{10} (Kukkonen et al., 2003; Kurt et al. 2008).

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Time series modeling approaches for short-term air pollution prediction phenomena are also employed, of which results are comparable to other artificial intelligence methods. They mostly applied on continues time series datasets. These datasets include some degree of randomness, for example, random changes in meteorological parameters due to atmospheric events during diurnal changes and seasonal variations. Some studies have revealed that the air quality data are stochastic time series by making short-term estimations possible by exploring historical data patterns (Kao and Huang, 2000; Horowitz and Barakat, 1979). The most widely employed time series models (TSMs) are the non-seasonal and seasonal autoregressive integrated moving average and a type of them with external parameter models (e.g. ARMA, ARIMA, ARIMAX) in time series analysis (Goyal et al., 2006; Kumar and Goyal, 2011). In the case of conventional air pollutants non-seasonal and seasonal time series models have been successfully applied to monitored datasets that are based on mostly daily or monthly averaged values (Modarres and Dehkordi, 2005, Jian et al., 2012). Generally, the quality of models can vary on individual experience of issue, knowledge of time series analysis methods in the model identification stage. The visualization of time series forecasting plots leads to establish several models for the same dataset and most stable one can used in tests further.

In the present study, an air pollutant, PM_{10}, one-hour ahead concentration prediction of PM_{10} using ARIMA, ARIMAX and ANN based models were studied for the period of 2015-2016. Well-tuned models were then applied in short-term predictions of PM_{10} to determine a model best explains the variance in data with reduced inputs.

Materials and Methods

2.1 Data with explanatory statistics

An hourly dataset for Düzce province in Turkey was composed containing information about local meteorological parameters such as air temperature (AT, °C), wind direction (WD), wind speed (WS, m/s), relative humidity (RH, %) and mass concentration of particulate matter (PM_{10}, $\mu g/m^3$) for the period of 2015-2016. The meteorological data was taken from the General Directorate of Meteorological Affairs of Turkey and PM_{10} data was taken from the Ministry of Environment and Urban Planning, using the online web service of the National Air Quality Monitoring Network of Turkey. Table 1 shows the descriptive statistics of these variables and Fig. 1 visualizes an hourly time series plot for PM_{10} over air temperature.

Table 1: Descriptive statistics of hourly dataset (2015-2016) used for investigation.

	Valid (N)	Min.	Max.	Mean	Median	Mode	Freq. of Mode	25% Perc.	75% Perc.	Range	Std.Dev.
PM_{10}	8782	98.41	60.00	37	121	0.00	891	39	104	891	112.81
AT	8926	16.02	17.00	22	383	-13.00	42	8	23	55	9.82
WD	8926	192.29	201.00	182	71	0.00	359	123	268	359	92.79
WS	8926	0.62	1.00	1	5568	0.00	1	0	1	1	0.48
RH	8926	79.95	88.00	103	1563	12.00	103	63	100	91	22.78

In the hourly dataset, one step forward-lagged set of these variables were constructed for including the prior data from one-hour before. The peak levels of PM_{10} can be seen during winter due to residential heating by fossil fuels such as coal, lignite and wood, particularly at least five months from October to March in contrast to the levels observed during the summer periods. PM_{10} and temperature values were ranged in [0-891] $\mu g/m^3$ and [–13-42] ^0C, respectively. The mean and 75% percentile of PM_{10} level were 98.41±112.81 and 104 $\mu g/m^3$, respectively, however, which is higher than the acceptable limit of 90 $\mu g/m^3$ declared in National Air Quality Standard of Turkey. The statistics showed that the atmosphere over Düzce is highly polluted by particulate matter and the pollution episodes particularly during winter periods can affect human health adversely. Therefore, air pollution forecasting models can serve a tool in identifying emergency periods and short-term pollutant levels.

2.2. Modeling by Time Series Methods and ANNs

By analyzing patterns in historical data, such as trend, seasonality and noise, one can construct regressive models for predicting future data points. TSMs in forecasting are constructed based on historical data pattern in the series. Widely used kinds of TSMs are AR, ARMA, ARIMA, etc. and their multivariate forms such as ARMAX and ARIMAX (Taşpınar et al., 2013; Ibrahim et al., 2009; Suganthi and Samuel, 2012).

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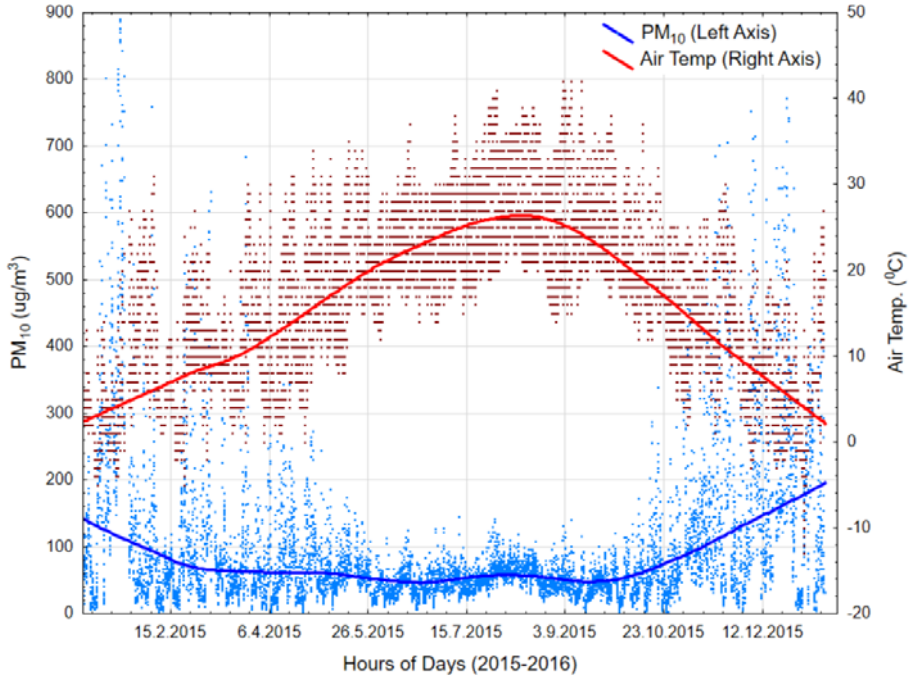

Figure 1. Hourly time series plots of PM_{10} and air temperature for 2015-2016 period.

In order to model one-hour ahead PM_{10} level, ARIMA and ARIMAX models with meteorological factors (AT, WS, WD, RH) were applied on hourly dataset. Based on these variables, the models ARIMA(p,d,q) and ARIMA[X](p,d,q) were examined. The non-negative integer elements p, d and q used in the non-seasonal models refer to the order of autoregressive part (AR(p)) and the order of differencing (I(d)) and moving average (MA(q)) parts of the models, and X refers to exogenous variables such as AT or WS used in this study, respectively. In the construction of models, the order of the model is selected by plotting the autocorrelation function (ACF) for determining the value of q used in MA(q) model and partial autocorrelation function (PACF) for determining the value of p used in AR(p) model. ARIMA model with a single variable and ARIMAX model with multi input-variable can be represented by the following equations, respectively:

$$\hat{y}_t = \mu + \phi_1 y_{t-1} + \ldots + \phi_p y_{t-p} - \theta_1 e_{t-1} - \ldots - \theta_q e_{t-q} \quad (1)$$

$$\hat{y}_t = \beta_0 + \beta_1 X_{1,t} + \beta_2 X_{2,t} + \ldots + \beta_k X_{k,t} + \frac{(1 - \theta_1 B - \theta_2 B^2 - \ldots - \theta_q B^q)}{(1 - \varphi_1 B - \varphi_2 B^2 - \ldots - \varphi_p B^p)} \varepsilon_t \quad (2)$$

where y_t is the t-th observation of the dependent variable, $X_{1,t}$, $X_{2,t}$, …, $X_{k,t}$ are the corresponding observations of the explanatory variables, β_0 is a constant, β_1, β_2, .. , β_k are the parameters of the regression part, and B is the backshift operator ($By_t = y_{t-1}$, $B^2y_t = y_{t-2}$), ε_t is error residuals (~$N(0,\sigma^2)$), $\varnothing_1$, $\varnothing_2$, …, $\varnothing_p$, and θ_1, θ_2,..., θ_q are the weights for the non-seasonal autoregressive and moving average terms, respectively. In order to test the lack of fit of time series models, the Ljung-Box test was applied in model diagnostic and the most suitable model was selected according to normalized Bayesian information criteria (NBIC) (Salcedo et al., 1999; Ljung and Box, 1978).

The artificial neural networks are adaptive nonlinear systems capable to approximate any function. ANNs are used in regression and classification studies in general, in which the inspired model that does not have a clear relationship between its inputs and outputs (Rumelhart et al., 1986). ANNs are built on a network of simple processing elements, namely neurons, that exhibit complex global behavior determined by the connections between the processing elements and element parameters. Generally, ANNs are made up of a number of layers with neurons. The ANN neurons are located in input, hidden and output layers, which is thus called as multi-layer perceptron (MLP) ANN in general (Fig. 2).

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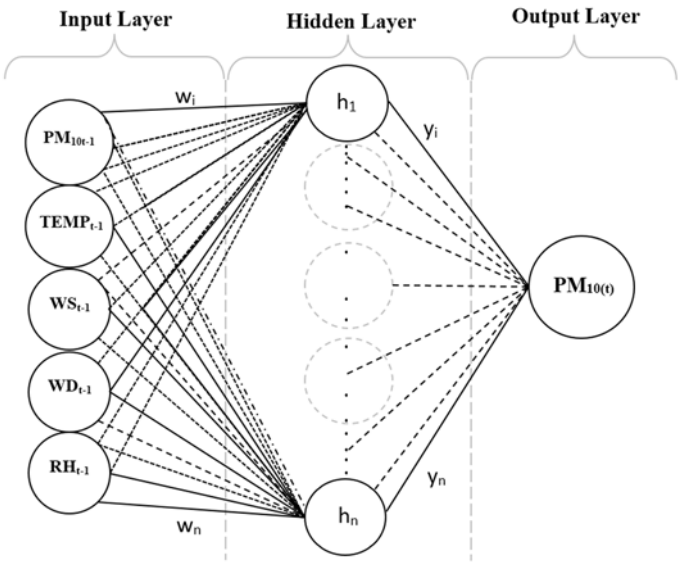

Figure 2. General structure and inputs of ANN model used in hourly PM_{10} modeling

The first layer corresponds to the input variables to the problem with one node for each input variable. The second layer used to capture nonlinear relationships among variables by interconnections. The third layer provides the predicted values. All weights are usually initialized with random values drawn from a standard normal distribution. During an iterative training process, ANN calculates an output o(x) for given inputs and current weights. If the training process is not yet completed, the predicted output (o) will differ from the input (y). An error function, like the root mean squared error (RMSE) which measures the difference between predicted and observed output. Finally, the process stops if a pre-specified criterion is fulfilled such as checking early stopping conditions by calculating global error. A single neuron processes multiple inputs applying an activation function on a linear combination of the inputs as follows:

$$y_i = f\left(\sum_{q=1}^{l} w_{iq}.f\left(\sum_{j=1}^{m}(v_{qj}x_i + b_j)\right) + b_q\right) \tag{3}$$

where x_j is the set of inputs, w_{iq} and v_{qj} ate the synaptic weights connecting the q_{th} input to the j_{th} neuron, b is bias term, f is the activation or transfer function, and y_i is the output of the i_{th} neuron. Weights are the knowledge base of the ANN system, which represents the non-linear properties of the neuron by its activation function. The activation function is usually non-linear, with a sigmoid shape such as logistic or hyperbolic tangent function, respectively, as follows:

$$sig(x) = \frac{1}{1+e^{-X}} \tag{4}$$

$$tanh(x) = \frac{1-e^{-2X}}{1+e^{-2X}} \tag{5}$$

Generally, feedforward MLP networks are trained using error back propagation (BP) algorithm (Lahmiri, 2011), which covers heuristic and numerical optimization algorithms. Heuristic techniques include gradient descent and the resilient algorithm (Dong and Zhou, 2008). So, some parameters such as learning rate, learning momentum, hidden layer neuron count etc. have been determined before training stage and then ANN model should be constructed. The inputs to the ANN models also have to be selected appropriately to better simulate the problem under consideration. Later, these parameters were determined by testing several ANN models on the same dataset.

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2.3. Data feature extraction and pre-processing

Time series dataset covering the variables PM_{10}, AT, WD, WS and RH were pre-processed prior to use in the models. Firstly, it's applied to a list-wise local linear regression to fill the missing values up to six cells by columns, but, the bigger missing areas were remained. Thus, the average valid data was about 91% of the entire dataset. When inputting to ANN models, the blank inputs can be skipped, however, TSMs need fully-filled input data. Hence, to execute TSMs on entire dataset, all the blank cells after missing value analysis were filled by the mean of the actual variable. The parameter WD is also converted to wind direction index (WDI) to avoid the discontinuity according to the following expression:

$$WDI = 1 + \sin\left(\mathrm{WD} + \frac{\pi}{4}\right) \tag{6}$$

In order to make input variables intercomparable before executing on the modelling framework, the variables were normalized in the range of 0.05-0.95 using min-max normalization given in Eq. (7) as follows:

$$y' = 0.05 + \frac{(y - y_{\min})}{(y_{\max} - y_{\min})} * 0.95 \tag{7}$$

where y' is the normalized value, y_{min} is minimum value, y_{max} is maximum value and y is the actual value.

Results and Discussion

Time Series Models and Performance Evaluation

Time series model for predicting one-hour ahead PM_{10} level is somewhat difficult comparing to ANN models. Because, tested TSMs are all hourly based which is difficult to handle in determining input lags of external variables. In fact, this problem is valid for ANN models, however, training an ANN model is much more fast and easy over a huge dataset like this.

In order to construct TSMs using ARIMA and ARIMAX methods, firstly ACF and PACF graphs were plotted for at least twenty lags of PM_{10} data. These plots were shown in Fig. 3. ARIMA model that is based on only PM_{10} data is firstly constructed. Since, the data used is based on hourly values, the periodicity is set to 24 in this case.

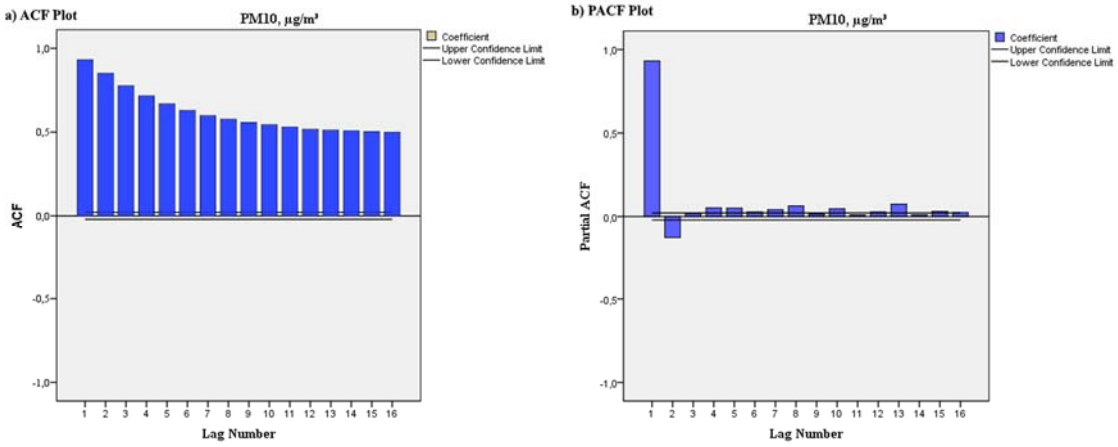

Figure 3. a) ACF and b) PACF plots for hourly PM_{10} data.

In ACF plot given in Fig. 3(a) an exponential decay with many lags over indicates moving average part in the data. PACF plot shows a significant lag at first which is an indication of AR process. Furthermore, the data is nonstationary considering high order lags in ACF plot. Thus, a non-seasonal differencing can be applied, setting parameter d to 1. So, ACF and PCAF plots for one lag non-seasonal differenced data was given in Fig. 4.

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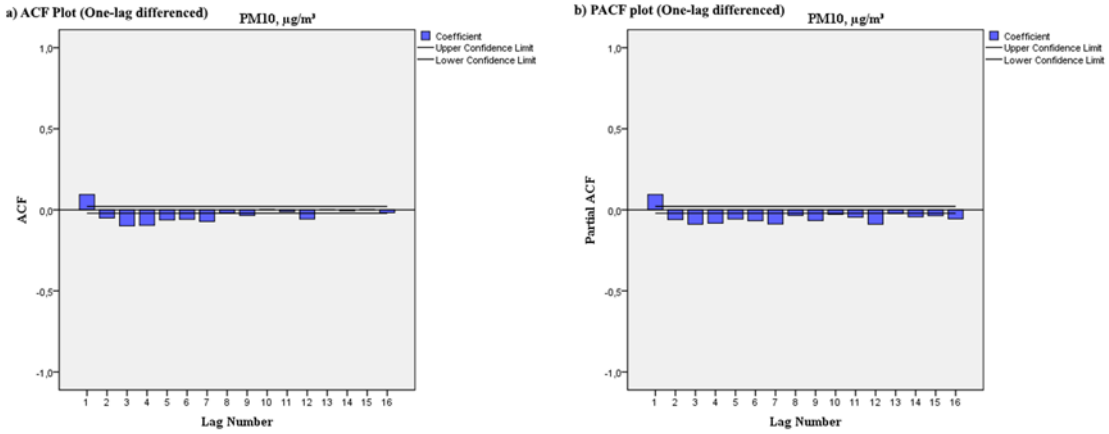

Figure 4. a) ACF and b) PACF plots for one-lag differenced hourly PM_{10} data.

One-lag differenced data shows a stationary character with time. Thus ARIMA model should include I(1) term. However, the degree of AR(p) and MA(q) processes are difficult to determine as periodicity is set to 24, which means many lags may be involved in the models. Here, although ACF plot promotes a clear MA(1) process and PACF plot promotes an AR(1) process at first sight, such ARIMA(1,1,1) model, other significant but negative lags were present in both levels at higher lags. ACF plot shows some significant lags up to 12 lag and then a sharp cut-off is observed. Therefore, we employed some models varying p and q between 1 to 3 to identify the best model without unit roots, comparing their NBIC values. Table 2 shows the models tried and related model performance statistics. Consequently, a trial-and-error work changing these model parameters was resulted in determining ARIMA(3, 1, 2) model including both AR(3) and MA(2) process with the lowest NBIC of 6.607 and R^2 of 0.663. AR lags from 1 to 3 was significant whereas MA lag at level 2 as significant. The parameter estimates of ARIMA(3,1,2) models was tabulated in Table 3 and arranged model equation was then given in Eq. (8).

Table 2: Identified ARIMA models in the prediction of hourly PM_{10} levels and model statistics

Model	NBIC	Stationary-R^2	Significant Lags (at p<0.05)
ARIMA(1,1,1)	0.791	0.549	AR(1), MA(1)
ARIMA(1,1,2)	0.698	0.561	AR(1), MA(1)
ARIMA(2,1,1)	0.692	0.602	AR(1,2), MA(1)
ARIMA(2,1,2)	0.702	0.597	AR(1,2), MA(1)
ARIMA(3,1,1)	0.675	0.653	AR(1,2,3), MA(1)
ARIMA(3,1,2)	*0.607*	*0.663*	AR(1,2,3), MA(2)
ARIMA(3,1,3)	0.670	0.658	AR(1,2,3), MA(2)

Table 3: Parameter estimates of ARIMA(3,1,2) model.

Model Partitions		Parameter Estimate	SE	t	Significance (at p<0.01)
AR	Lag 1	0.218	0.010	21.289	0.000
	Lag 2	0.845	0.005	158.374	0.000
	Lag 3	-0.364	0.010	-35.627	0.000
Differencing Order		1			
MA	Lag 2	0.996	0.002	635.015	0.000

$$PM10_t = 1.218 \cdot PM10_{t-1} - 1.063 \cdot PM10_{t-2} - 0.481 \cdot PM10_{t-3} + 0.364 \cdot PM10_{t-4} + (1 + 0.996.B)\varepsilon_t \quad (8)$$

Estimates of ARIMA(3,1,2) model with upper and lower confidence limits against to original data as time series plot were given in Fig. 5, which shows that estimated points fitted the historical PM_{10}pattern very well. Also, based on this univariate ARIMA(3,1,2) model, an ARIMAX model with the inputs from AT, WS, WD and RH were constructed. These meteorological factors affect PM_{10} level in air in real-life, so this situation can be simulated by an ARIMAX model. ARIMAX models are constructed by transfer functions by calculating weights of external variables. After parameter estimation a model equation can be arranged based on significant lags of variables.

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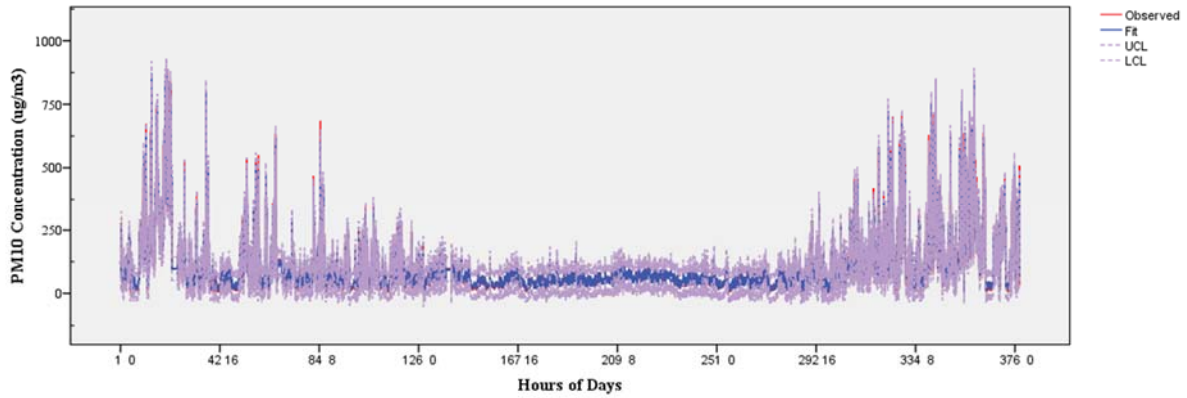

Figure 5. Line plot of the estimates of ARIMA(3,1,2) model with confidence limits against to observed data.

Based on the parameter estimates for ARIMAX(3,1,2) model including the terms from meteorological factors with R^2 of 0.667 and NBIC of 6.607, arranged ARIMAX model equation is given in Eq. (9) as follows:

$$PM10_t = 1.218 \cdot PM10_{t-1} - 1.063 \cdot PM10_{t-2} - 0.481 \cdot PM10_{t-3} + 0.364 \cdot PM10_{t-4} + (1 + 0.996.B) \cdot \varepsilon_t + (AT_t - 0.768 \cdot AT_{t-1}) + (WDI_t - 0.008 \cdot WDI_{t-1}) + ((1 + 9.021 \cdot WS_t) / (1 - 1.193 \cdot WS_{t-1} - 0.552 \cdot WS_{t-2})) + (RH_t - 0.463 \cdot RH_{t-1} - 0.484 \cdot RH_{t-4}) \quad (9)$$

Parameters estimates of ARIMAX model showed that $PM_{10(t)}$ was predicted by using AT at lags 0-1, WDI at lags 0-1, WS at lags 0-2 and RH at lags 0,1,4. Performance of ARIMA and ARIMAX models for one-hour ahead PM10 concentration prediction is very similar, comparing R^2 values. Thus, we selected PM_{10} ARIMAX model with external parameters from meteorological factors as benchmark for further tests.

ANN Models and Performance Evaluation

Designing of ANN models are related to selection of some parameters such as hidden layer neuron count and learning rate. Before construction of ANN model, the entire dataset is divided into training (75%), test (15%) and validation sets (10%). Later, ANN models were designated and model parameters were set. In the present study, an open source library, Fast Artificial Neural Network (*FANN*) implemented by Nissen (2003), was utilized as ANN modeling engine in the prediction of one-hour ahead PM_{10} concentration with lagged input vectors. The input vector includes the first lags of all model inputs as shown in Fig. 2, which can be written as $PM10_t = f_{net}\ (PM10_{t-1}, AT_{t-1}, WD_{t-1}, WS_{t-1}, RH_{t-1})$ model. The *FANN* library offers an automated training method, so-called cascading-training procedure, which provides a way to determine the final neural network structure consists of a number of hidden layers with one shortcut connected neuron in each. Therefore, the ANN model were set by utilizing cascading-training technique of this library.

Feed forward backpropagation type ANN with sigmoid function for transfer functions of input layer and tanh for hidden layer were then determined in training of networks. Maximum number of epochs was set to 1000, applying an early stopping criterion to avoid over fitting or underfitting, setting the validation process at every 10 training epochs. A starting learning rate of 0.45 was gradually decreased by 1.1% at every epoch during the cascading-training procedure, which was resulted in an ANN(5-13-1) model, including 13 hidden layer neuron. Several experiments with different structures were tried as mentioned here, however, ANN(5-13-1) model produced the best error measure and model accuracy with RMSE of 0.478, training R^2 of 0.857 and testing R^2 of 0.841. Also, Index-of-Agreement (IA) that measures prediction errors was calculated to test the quality of fit. IA value of 0.81 obtained with this model, which is close to 1.0, suggested a well agreement with the selected model. Thus, the validation of ANN model did not tend to underfitting or overfitting on average. A performance plot obtained from predicted values from ANN model was visualized in Fig. 6. The performance plot of the results of the best ANN model for the whole dataset is visualized on Fig. 3. The red line indicates an exact fit of R^2=1.0, hashed black line indicates a linear fitting line of R^2=0.857. 95% confidence band limits were also shown in blue-dotted lines, clearly indicating the most of the data points fall in the band limits.

Hourly time series dataset was plotted against to predictions of ANN(5-13-1) model in Fig. 7. All the data is well followed by ANN model, simulating historical pattern of hourly PM_{10} concentration. As it can be seen in Fig. 7 that at some extreme conditions with elevated PM_{10} levels, particularly the levels higher than 550 µg/m^3

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observed during strictly calm days. Due to air circulation issues occurred in Duzce province in calm nights during winter periods, extreme conditions can be observed. Therefore, elevated PM_{10} levels mostly occurred winter times with a rate of 2% for levels higher than 500 $\mu g/m^3$. However, most frequent PM_{10} values within a range of $\mu \pm 3\sigma$ were predicted reasonably successfully. Extreme value problem for ANN model is a well-known issue, because neural networks cannot successfully evaluate less trained input values or less frequent data observed at extreme conditions. However, all the ANN models experimented in the tests were very successful in the predictions comparing to TSMs.

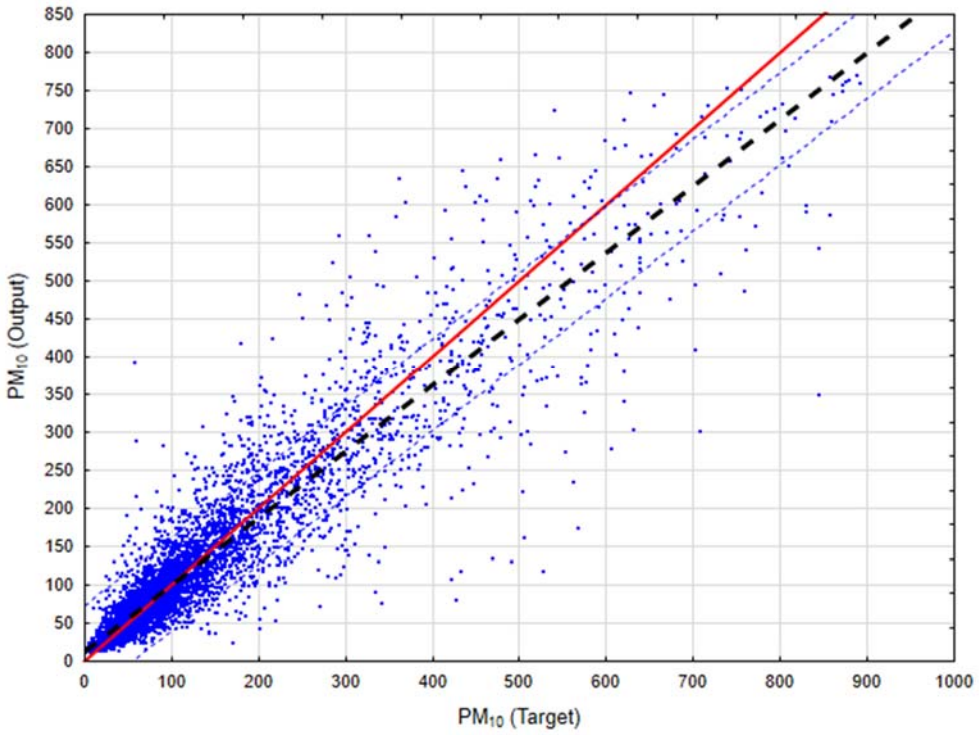

Figure 6. Performance plot for ANN(5-13-1) model and linear fitting line

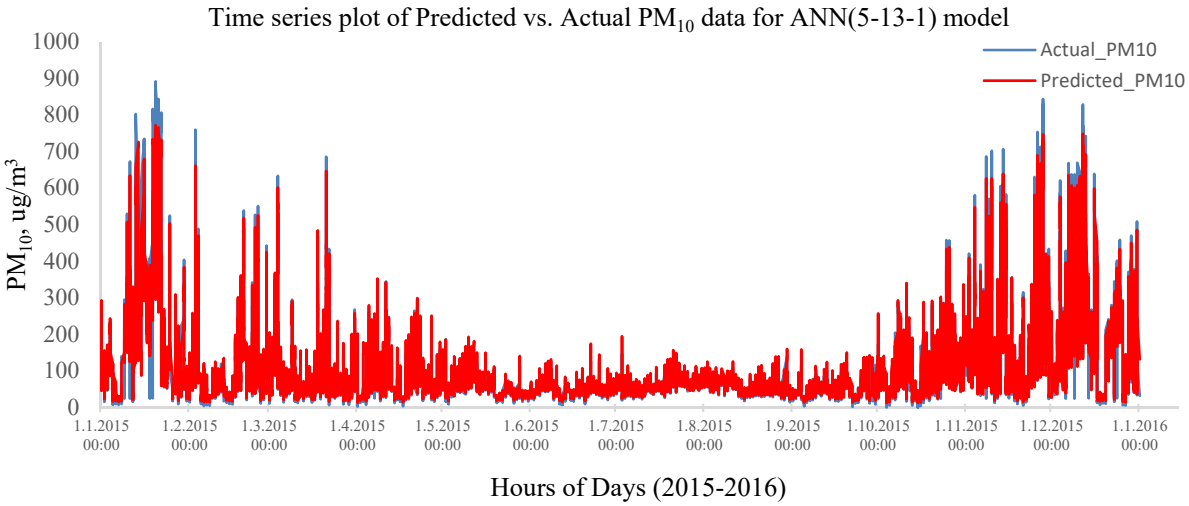

Figure 7. Hourly time series plots for the predictions of the ANN model against to actual data

Conclusion

The present study investigated short-term PM_{10} modelling based on hourly monitoring data of meteorological factors and particle concentrations. In order to obtained a reasonable model for time series data, we have used time series modeling techniques and ANN models. ARIMA and ARIMAX models were applied to data as TSMs. A univariate ARIMA(3,1,2) model were fitted to predicted hourly PM_{10} level one-hour ahead. This model

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included AR(3) and MA(2) processes with one lag differentiation, with R2 of 0.663. Based on this model, a multivariate ARIMAX(3,1,2) model fitted by covering the terms from $PM_{10(t-1...t-4)}$, $AT_{(t..t-1)}$, $WDI_{(t..t-1)}$, $WS_{(t..t-2)}$ and $RH_{(t,t-1,t-4)}$ with R^2 of 0.667. Therefore, ARIMAX model is selected as benchmark to compare predictions by ANN model.

ANN models for prediction next-hour PM_{10} level were designed. The best ANN model is in the form of 5-13-1 with 13 hidden neuron in middle layer, with testing R^2 of 0.857. The input vector of ANN was $PM10_{t-1}$, AT_{t-1}, WD_{t-1}, WS_{t-1}, RH_{t-1} and the output was $PM10_t$. Cascading-learning method of FANN library was utilized to determine ANN model parameters such as neuron count and learning rate. ANN model is slightly tended to underpredict mostly at extreme conditions but yielded better prediction results than TSMs in general. On the other hand, ANN model did not tend to overpredict as time series plots indicated. Comparing to TSMs, ANN models were very flexible in handling of model and execution, because TSMs need to be updated with new model residuals before operating on new input data in any new hour. Hence, TSMs are not tolerate any interruption on time scale as they were constructed on sequenced residual data, so their handling in real-life applications are difficult. On the other hand, ANN models obtained after training step can be used on any data with proper input vector. Therefore, we concluded that a real-life application of emergency perception strategy can be designed based on ANN models for hourly PM_{10} prediction. However, to properly tackle with extreme values of air PM_{10} levels observed during pollution episodes in winter periods in particular, some other methods such as time based hybrid models or discrete ANN models for higher levels should be considered.

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COMPARISON OF CONVENTIONAL AND MICROWAVE METHOD FOR THE DETERMINATION OF ACTIVATED CARBON PRODUCTION CHARACTERISTICS FROM WILD CHESTNUT SHELL

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Activated Carbon is an adsorbent material of which history is based on the ancient times and which cannot be defined with structural formula or chemical analysis and has high level of interior surface area and carbon content with higher application range. Activated carbons can be produced by several kind of agricultural waste materials with carbon content in laboratories. Even though there is not any restrictions about the raw material that will be used, cheap raw materials with high carbon content and lower inorganic structure are being preferred. Recently beside conventional pyrolysis at the activated carbon production, activated carbon was produced with microwave warming as the source of energy. [1, 2, 3].

In this study, comparison is performed with conventional method with the aim of determining the microwave activation method on activated carbon production. The most suitable conditions were determined by examining chemical activation, microwave interaction and parameters which are effective in carbonization phase. Elemental analysis, structural and morphological analysis (FTIR, SEM) surface area and pore distribution analysis were performed for the characterization of the obtained products. As the BET surface area of the activated carbon obtained by the conventional method 986.28 m^2/L, the BET surface area of the activated carbon obtained by microwave activation is calculated as 1034.42 m^2/L. Methylene blue adsorption is examined with the aim of determining the activated carbon produced at the most suitable optimum conditions by the horse chestnut shells. The results has shown that because of the high surface area and meso-porosity content microwave irradiation method is an alternative method which can be used against conventional method for the adsorbent production on the removal of the organic materials which causes contamination in the water.

Keywords: MICCROWAVE METHOD, ACTIVATED CARBON, CHARACTERIZATION,

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COMPARISON OF DIFFERENT TEMPORAL DATA WAREHOUSES APPROACHES

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Abstract: Data warehouses are mainly used for business data analysis by querying and reporting huge collections of data. For the management of historical data, temporal data warehouses have been developed. Two current approaches for dealing with temporal data in data warehouses are compared in this paper, Object-Relational Temporal Data Warehouse (O-RTDW) model and Starnest Temporal Data Warehouse (S-TDW) model. The O-RTDW model enables data values to be associated with facts, and specifies when facts are valid, thereby providing a complete history of the data values and their changes. To accurately and completely store all data changes, the valid time should be kept at the attribute level. On the other hand, the S-TDW model uses the starnest schema for the modeling of time-varying data in dimensions. The temporal starnest schema expresses naturally hierarchy levels by the clustering of data in nested tables, with result the description of aggregation levels for a dimension in a natural way. By comparing these two temporal data warehouses models, object-oriented and nesting approaches are also compared and evaluated.

Keywords: Data Warehouse, Temporal Data Warehouse, Object-Relational Model, Starnest Schema

Introduction

Data warehouses play a critical part in the success of businesses. Decision support systems, data mining, business analysis, forecasting and product line analysis are all good examples of where data warehouses can be used.
Two IBM researchers, Barry Devlin and Paul Murphy, introduced the term 'Business Data Warehouse' in 1988 (Devlin and Murphy, 1988). It was described as a 'single logical storehouse of all the information used to report on the business'. In 1990, Ralph Kimball introduced Red Brick Warehouse, a database management system specifically for data warehousing. In the following year, 1991, a software for developing a data warehouse was built by Bill Inmon, the Prism Warehouse Manager.
Since then, a data warehouse (DW) is considered to be the main component of every business intelligence environment. It is mainly used for business data analysis by querying and reporting huge collections of data. Data in a DW must be stored in a way that is secure, reliable, easy to retrieve and to manage.
According to Bill Inmon (Inmon, 2002) a DW is "a collection of subject-oriented, integrated, non-volatile and time-variant data to support management's decisions". The non-volatile and time-variant data features of data warehousing suggest that it should allow changes to the data values without overwriting the existing values.
The main characteristics of a DW are given briefly below: A DW stores current and historical data. Stored data cannot change. Insertions, deletions and updates do not take place in a DW. Data is used only for querying and consequently, it is essential that querying performance is as high as possible.
For the management of historical data, temporal DWs have been developed. Temporal DWs use the knowledge obtained from temporal databases for the treatment of time domain. Temporal databases have built-in support for representing and managing information varying over time. They are divided in three categories, valid time databases, transaction time databases and bitemporal databases according to the type of time they support, valid time, transaction time or both respectively. Valid-time expresses the time when a fact is true in the real world and transaction-time represents the time when a fact is current in the database.
Time can be added at the tuple level in a relation and this relation is called tuple timestamping relation or at the attribute level, called attribute timestamping relation, when individual time varying attributes are timestamped. SQL has also been extended to support features introduced in temporal databases.
In this paper, two temporal DWs models are evaluated and compared, the Object-Relational Temporal Data Warehouse (O-RTDW) model and the Starnest Temporal Data Warehouse (S-TDW) model.
The O-RTDW model uses the object-relational approach for the representation of time-varying data. This model inherently groups related facts into a single row, hence allowing changes to the data value and timestamps to be kept together. Dimensions may have levels. Multivalued attributes of data type T_ATOM are used for temporal

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support of a level attribute. The levels and dimensions can have many time-varying attributes stored as nested tables.
The S-TDW model uses the starnest schema for storing dimension's hierarchy. The starnest schema proposed in Garani and Helmer (2012) is based on the nested approach, where hierarchies are represented as nested tables. The starnest schema is extended in Garani, Adam and Ventzas (2016) to support time. In the temporal starnest schema every temporal dimension, i.e., dimension table dependent on time, contains time attributes for the support of time. Several queries expressed in SQL are implemented and executed using Oracle 11g in both approaches. Same data and queries are used. Execution time and result data are compared and useful results are obtained.
The remainder of the paper is structured as follows. Firstly, related research work is discussed. Afterwards, the two temporal DW models, O-RTDW model and S-TDW model are presented. The hospital's admission temporal DW case study is described in both models. Implementation issues are discussed and finally, last section concludes the paper.

Related Work

Temporal DWs have been the subject of research in recent years. In what follows, a brief description of research studies on this field is presented.
The term 'slowly changing dimensions' was introduced by Kimball (Kimball, 1996). It was used for storing slowly changing historical data. Three different techniques for dealing with attributes changing over time were proposed, either by overwriting the value, adding a dimension row, or adding a dimension column as well as a number of hybrid methods. In this research work, schema evolution and dimension updates have not been generally considered.
In Bliujute et. al. (1998) the temporal star schema proposed does not include a time dimension. Instead, every row appeared either in fact or dimension tables is timestamped which causes the increase of redundancy.
A bitemporal DW model proposed in Koncilia (2003) is an extended version of the COMET metamodel (Eder, Koncilia & Morzy, 2002). It supports valid time and transaction time both at instance and schema levels. The model allows all possible changes of schema and structure of a DW with the introduction of suitable transformation functions.
Malinowski and Zimanyi (2006) extended the conceptual multidimensional MultiDimER model for supporting valid time and transaction time. The model is suitable for representing time-varying levels, attributes and hierarchies. It distinguishes time variant elements from time invariant elements and treats them separately. The proposed model also supports DW loading time.
The bitemporal versioning of multidimensional schemas is used for defined the conceptual evolution DW model in Rechy-Ramírez and Edgard (2006). The model supports many versions with the same valid time and different transaction times. Sixteen schema evolution operators are defined for dimensions and cubes and a SQL-like language for the proposed model is also presented.
A review of issues associated to temporal data warehousing is presented in Golfarelli and Rizzi (2009). Three different topics are distinguished, handling changes in the DW, handling data changes in the data mart and handling schema changes in the data mart.
A graph based temporal semi-structured DW is presented in Combi, Oliboni & Pozzi (2009) and an appropriate query language for the modeling and querying of temporal data.
A multiversion DW management system called SysVersDW is defined in Turki, Jedidi & Bouaziz (2010). Versioning of schema and instance components is supported in the model. A number of integrity constraints are also included for data and structure consistency. The constraints presented are classified in three classes, structural constraints, temporal constraints and versioning constraints.
A new schema proposed in Garani and Helmer (2012), the starnest schema, is based on the nested approach. It is extended in (Garani, Adam, and Ventzas, 2014) for supporting time. The key component of the temporal starnest schema is the inclusion of time attributes in every dimension table depended on time.
A bitemporal DW model where both valid time and transaction time are attached to attributes is introduced by Atay and Alp in (Atay and Alp, 2016). DW objects and cubes are created with multidimensional bitemporal relational database.

Temporal Data Warehouse Models

For the management of historical data, temporal DWs have been developed for describing information changing over time. Two of the most recent proposed approaches are discussed and compared in this research work, O-RTDW and S-TDW models.

Object-Relational Temporal Data Warehouse (O-RTDW) model

The O-RTDW model uses the specifications provided by the Object-Relational model. It consists of a fact table

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and several dimension tables connected to it. A dimension is composed of one or more levels, whereas each level belongs to only one dimension. O-RTDW enables data values to be associated with facts and specifies when facts were valid, thereby providing a complete history of data values and their changes. To accurately and completely store all data changes, the valid time should be kept at the attribute level. Attributes can be temporal or non-temporal. Temporal attributes consist of temporal atoms (T-ATOM). A temporal atom is defined as <valid time, value> where valid time component can be applied as a time point, a time interval, or a temporal element. Therefore, a temporal atom in the form of $<[VT_{lb}, VT_{ub}), V>$ represents valid time lower bound as VT_{lb}, valid time upper bound as VT_{ub} and data value as V, respectively. In Figure 1 the conceptual model for the O-RTDW model is shown.

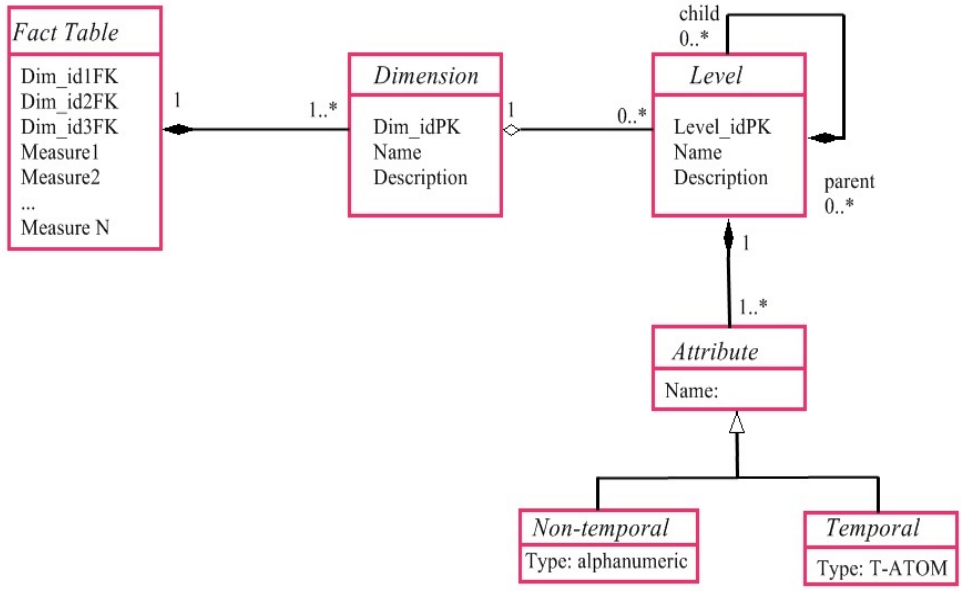

Figure 1. The conceptual model for the O-RTDW

Starnest Temporal Data Warehouse (S-TDW) model

S-TDW model uses the temporal starnest schema (Garani, Adam and Ventzas, 2014) for the modeling of time-varying data in dimensions. The starnest schema forms the integration of the star and snowflake schemas (Garani and Helmer, 2012). It expresses naturally hierarchy levels by the clustering of data in nested tables, with result the description of aggregation levels for a dimension in a natural way. It consists of a temporal fact table and a number of dimension tables. A temporal fact table can be timestamped by adding one or two time attributes representing a time point or a time interval respectively.

Dimension tables can also be timestamped similarly. Timestamped dimension tables are called temporal dimension tables. Temporal dimension tables are nested, since time attributes are inserted in a dimension in a nested way, where more detailed attributes are nested inside less detailed attributes. Therefore, dimension tables are not normalized. In each temporal dimension two valid time attributes are included, the start and stop time points of the corresponding time interval.

The fact table is linked to dimension tables with one to many relationships by foreign key attributes with a reference to the most detailed hierarchical attribute of each dimension. The conceptual model for the S-TDW model is shown in Figure 2.

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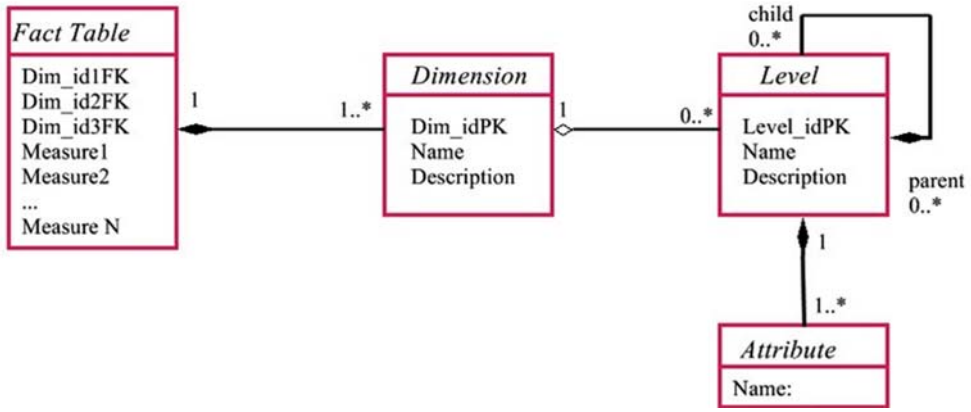

Figure 2. The conceptual model for the S-TDW

The main differences between O-RTDW and S-TDW models are presented in Table 1.

Table 1: The main differences between O-RTDW and S-TDW models

O-RTDW model	S-TDW model
Snowflake schema	Starnest schema
Object-Oriented approach	Nested approach
Temporal atom	Time attribute
Time interval	Time point (Start/Stop)

The Hospital's Admission Temporal Data Warehouse Case Study

A hospital's admission temporal DW has been used for the comparison of O-RTDW and S-TDW models. The hospital's admission temporal DW concerns the admission in the hospital of patients who suffer from different diseases and therefore, have different diagnoses and treatments.

In Figure 3 the schema of the O-RTDW model is shown. The schema is represented in snowflake format where dimension tables are split up into smaller normalized tables that express each dimension's hierarchy. Transitive functional dependencies do not exist.

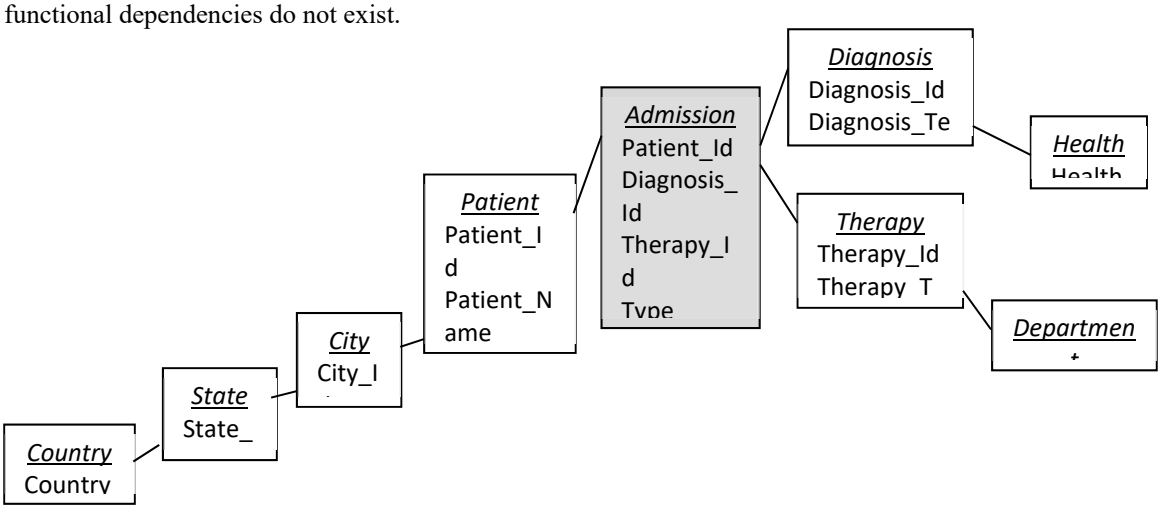

Figure 3. The schema for the O-RTDW model

Figure 4 presents the schema for the S-TDW model of the hospital's admission temporal DW. S-TDW model uses the starnest schema at the logical design. In the starnest schema a dimension's hierarchy is expressed as a nested table where hierarchy levels are expressed naturally and attributes can easily be associated within their corresponding levels. Each dimension table has a hierarchical attribute which is referred to a foreign key attribute of the fact table. The above mentioned hierarchical attribute is located in the most nested level of the dimension table.

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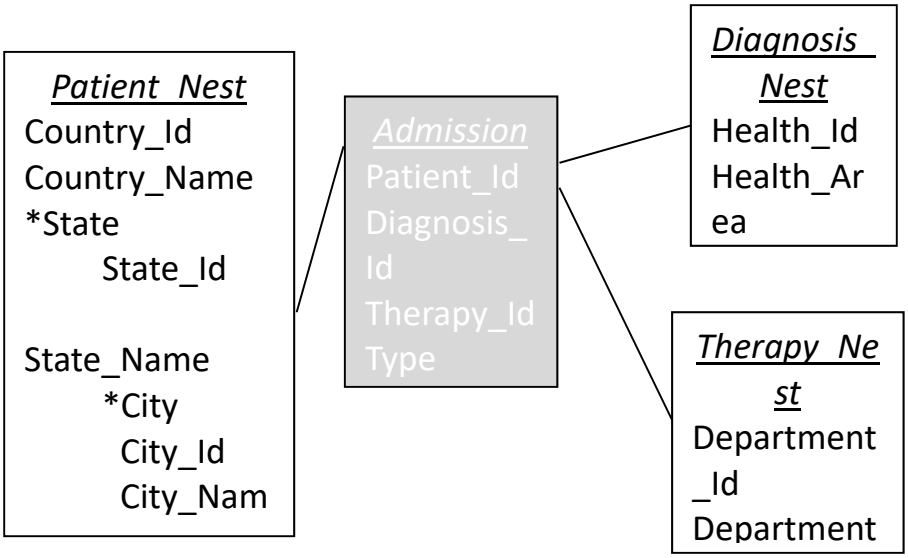

Figure 4. The schema for the S-TDW model

Figure 5 shows an instance of Patient dimension in the O-RTDW model. Address_Temporal attribute, as its name denotes, is temporal. It contains temporal atoms of the form <[VT_{lb}, VT_{ub}), V> where VT_{ub} can be either a time point representing the valid time upper bound of the corresponding time interval or 'now' denoting present time instant which increases as time advances.

PatientID	FirstName	LastName	BirthDate	Gender	Race	
101	JACKY	WANDA	03.03.1980	F	White	
102	TOM	BROWN	01.30.1989	M	White	
103	BILL	LAWRENCE	04.25.1977	F	Asian	
104	AMY	ANGEL	10.05.1985	F	Black	

Race	Address_Temporal	CityID
	< [01.30.1955, now], "625 13th Avenue">	45
	{< [03.03.1980, 06.06.2005), "55 Hamilton Avenue">, < [06.06.2005, 01.01.2008), "7 Leona Street">, < [01.01.2008, now], "96 Market Street">}	11
	< [01.30.1955, now], "111 Madison Avenue" >	18
	{<[04.25.1977, 11.12.2000), "5 Valley Road">, < [11.12.2000, now], "6255 Broadway">}	01

Figure 5. An instance of Patient dimension in the O-RTDW model

An instance of Patient dimension in the S-TDW model is presented in Figure 6. Patient dimension is a temporal dimension table since it is dependent on time. It is also nested since hierarchies in dimensions are presented as nested tables. Therefore, a temporal nested dimension table consists of hierarchical attributes, dimensional attributes and time attributes which can also be nested inside less detailed attributes. In Patient dimension *AddressDetails is a temporal nested attribute consisting of three attributes, one atomic, Address and two time attributes, AddressStart and AddressStop indicating the start and stop points of the time interval during which the corresponding address is valid.

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Dimension_key	Country_Id	CountryName	*State										
			State_Id	StateName	*City								
					City_Id	CityName	*Patient						
							Patient_Id	PatientName	BirthDate	Gender	Race	*AddressDetails	
												Address	AddressStart	AddressStop
D1	C1	USA	S1	Iowa	45	Iowa City	101	Jacky Wanda	03.03.1980	F	White	625, 13th Avenue	01.30.1955	now
					11	Waterloo	102	Tom Brown	01.30.1989	M	White	55, Hamilton Avenue	03.03.1980	06.06.2005
												7, Leona Street	06.06.2005	01.01.2008
												96, Market Street	01.01.2008	now
			S2	Alabama	18	Birmingham	103	Bill Lawrence	04.25.1977	F	Asian	111, Madison Avenue	01.30.1955	now

Figure 6. An instance of Patient dimension in the S-TDW model

Implementation

All queries have been executed on an Intel(R) Core(TM) i5 processor, running at 2.3 GHz, with 2.5 GB ram memory, under Windows 7 (32bit). The DW was built in Oracle Data Warehouse builder 11.2.0.1 and Oracle SQL Developer 4.0.3 was used.

The hospital's admission temporal DW consists of 9 tables in the O-RTDW model and 4 tables in the S-TDW model. Consequently, the number of joins in the O-RTDW model is much higher than in the S-TDW model. Relationship between a dimension and the number of tables it contains is one-to-one in the S-TDW model compared to one-to-many in the O-RTDW model. Tables in both models do not contain any data redundancy. Implementation of O-RTDW approach is platform independent in comparison to S-TDW approach which is platform dependent. The disk space required is more than three times higher in the O-RTDW approach than the S-TDW approach as it is shown in Table 2. In particular, the total space for the O-RTDW model is 14.3125 Mb in comparison to the S-TDW model where it is 4.1875 Mb.

Similarly, the number of rows is much higher in the O-RTDW approach than in the S-TDW model. Specifically, O-RTDW contains about 200,000 rows while S-TDW contains about 50,000 rows.

Table 2: O-RTDW model

Table name	Schema name	Size (Mb)	Number of rows
ADMISSION_O_CUBE_TAB	Admission	4.0	48,000
ADM_DEPARTMENTS	Department	0.0625	502
THERAPY_DIMENSION_O_TABLE	Therapy	3.0	50,200
ADM_HEALTH	Health	0.0625	501
DIAGNOSIS_DIMENSION_O_TABLE	Diagnosis	3.0	50,100
ADM_COUNTRIES	Country	0.0625	10
ADM_STATES	State	0.0625	100
ADM_CITIES	City	0.0625	1,000
PATIENT_DIMENSION_O_TABLE	Patient	4.0	50,000

Table 3: S-TDW model

Table name	Schema name	Size (Mb)	Number of rows
ADMISSION_N_CUBE_TAB	Admission_Nest	4.0	48,000
THERAPY_DIMENSION_TABLE	Therapy_Nest	0.0625	502
DIAGNOSIS_DIMENSION_TABLE	Diagnosis_Nest	0.0625	501
P_PATIENT_DIMENSION_TABLE	Patient_Nest	0.0625	10

Five different temporal and non-temporal queries are presented below in SQL. The same queries are expressed in both approaches and compared.

Query 1:
Which diagnoses have the same treatment? (non temporal)

O-RTDW model

```
SELECT Diagnosis1.Value AS Diagnosis1, Diagnosis2.Value AS Diagnosis2
FROM ADMISSION_O_CUBE_TAB A1, ADMISSION_O_CUBE_TAB A2,
DIAGNOSIS_DIMENSION_O_TABLE D1, DIAGNOSIS_DIMENSION_O_TABLE D2,
Table(D1.Diagnosis_Temporal) Diagnosis1,
Table(D2.Diagnosis_Temporal) Diagnosis2
WHERE D1.Diagnosis_Id < D2.Diagnosis_Id
```

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AND A1.Therapy_Id = A2.Therapy_Id
AND D1.Diagnosis_Id = A1.Diagnosis_Id
AND D2.Diagnosis_Id = A2.Diagnosis_Id

S-TDW model
SELECT V1.DIAGNOSIS_NAME, V2.DIAGNOSIS_NAME
FROM ADMISSION_N_CUBE_TAB A1, ADMISSION_N_CUBE_TAB A2,
DIAGNOSIS_DIMENSION_TABLE D1, DIAGNOSIS_DIMENSION_TABLE D2,
Table(D1.Diagnosis) V1, Table(D2.Diagnosis) V2
WHERE V1.Diagnosis_Id < V2.Diagnosis_Id
AND A1.Therapy_Id = A2.Therapy_Id
AND V1.Diagnosis_Id = A1.Diagnosis_Id
AND V2.Diagnosis_Id = A2.Diagnosis_Id

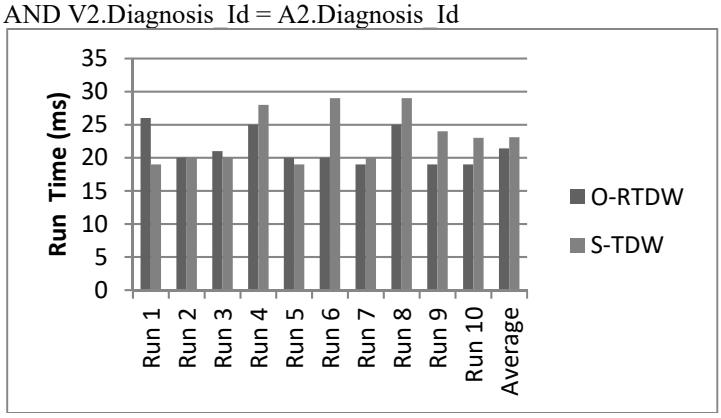

Figure 7. Query 1 run comparison chart

Query 2:
What is the average number of days for therapy in each department? (temporal)

O-RTDW model
SELECT Department_Id, AVG(Therapy.VALID_TIME_UB- Therapy.VALID_TIME_LB)
FROM THERAPY_DIMENSION_O_TABLE T, Table(T.Therapy_Temporal) THERAPY
GROUP BY Department_Id

S-TDW model
SELECT Department_Id, AVG(H.Therapy_Stop - H.Therapy_Start)
FROM Therapy_Dimension_Table T, Table(Therapy) H
GROUP BY Department_Id

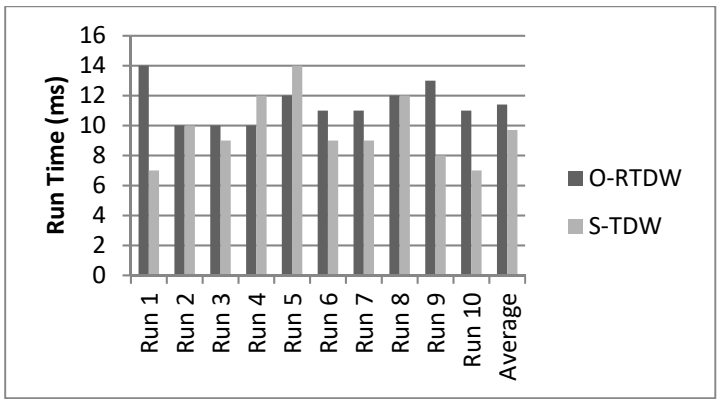

Figure 8. Query 2 run comparison chart

Query 3:
For each patient find the amount he/she paid for each admission and where he/she lived at that time. (temporal)

O-RTDW model
SELECT A.Patient_Id, A.Cost, ADDRESS1.Value

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```
FROM ADMISSION_O_CUBE_TAB A, PATIENT_DIMENSION_O_TABLE P,
TABLE(P.Address_Temporal) ADDRESS1
WHERE ADDRESS1.VALID_TIME_LB <= A.Admission_Time
AND ADDRESS1.VALID_TIME_UB >= A.Admission_Time
AND A.Patient_Id = P.Patient_Id
ORDER BY A.Patient_Id
```

S-TDW model

```
SELECT A.Patient_Id, A.Cost, F.Address
FROM P_PATIENT_DIMENSION_TABLE P, ADMISSION_N_CUBE_TAB A,
Table(P.State) S, Table(S.City) C, Table(C.Patient) F
WHERE F.Address_Start <= A.Admission_Time
AND F.Address_Stop >= A.Admission_Time
AND F.Patient_Id = A.Patient_Id
ORDER BY A.Patient_Id
```

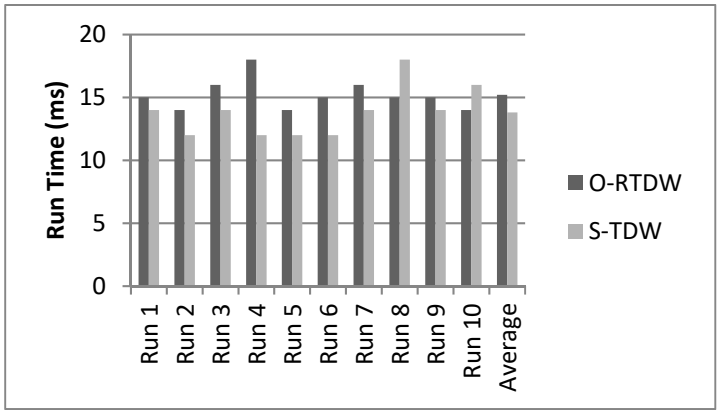

Figure 9. Query 3 run comparison chart

Query 4:
Which patients had cancer at New York in 2013? (temporal)

O-RTDW model

```
SELECT P.Patient_Name
FROM DIAGNOSIS_DIMENSION_O_TABLE D, ADMISSION_O_CUBE_TAB A,
Patient_Dimension_o_table P, ADM_CITIES C, TABLE(D.Diagnosis_Temporal) DIAGNOSIS1
WHERE D.description_d LIKE '%Cancer%'
AND A.Diagnosis_Id= D.Diagnosis_Id
AND A.Patient_Id=P.Patient_Id
AND C.City_Id=P.City_Id
AND   C.City_Name='New York'
AND ( EXTRACT(YEAR FROM DIAGNOSIS1.VALID_TIME_UB) = 2013
      OR EXTRACT(YEAR FROM DIAGNOSIS1.VALID_TIME_LB) = 2013 )
```

S-TDW model

```
SELECT F.Patient_Name
FROM   DIAGNOSIS_DIMENSION_TABLE D, ADMISSION_N_CUBE_TAB A,
P_PATIENT_DIMENSION_TABLE P, table(Diagnosis)   V, table(State) S, table(S.City) C,   table(C.Patient) F
WHERE V.description_d LIKE '%Cancer%'
AND V.Diagnosis_Id= A.Diagnosis_Id
AND A.Patient_Id=F.Patient_Id
AND C.City_Name='New York'
AND ( EXTRACT(YEAR FROM V.Diagnosis_Start) = 2013
     OR EXTRACT(YEAR FROM V.Diagnosis_Stop) = 2013 )
```

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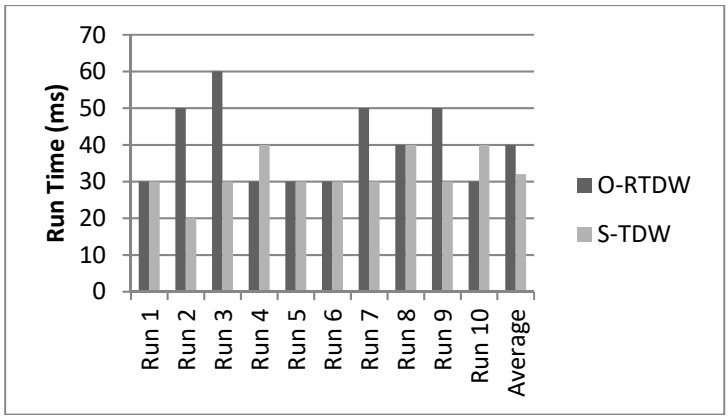

Figure 10. Query 4 run comparison chart

Query 5:
Which patients lived at the same city at the same time and had the same diagnosis? (temporal)

O-RTDW model

```
SELECT P1.Patient_Name, P2.Patient_Name, P1.City_Id, A1.Diagnosis_Id
FROM ADMISSION_O_CUBE_TAB A1, ADMISSION_O_CUBE_TAB A2, Patient_Dimension_o_table P1,
TABLE(P1.Address_Temporal) ADDRESS1, Patient_Dimension_o_table P2, TABLE(P2.Address_Temporal)
ADDRESS2
WHERE P1.Patient_ID < P2.Patient_ID
AND P1.City_Id = P2.City_Id
AND ((ADDRESS1.VALID_TIME_LB <= ADDRESS2.VALID_TIME_LB
            AND ADDRESS2.VALID_TIME_LB <= ADDRESS1.VALID_TIME_UB)
      OR (ADDRESS2.VALID_TIME_LB <= ADDRESS1.VALID_TIME_LB
            AND ADDRESS1.VALID_TIME_LB <= ADDRESS2.VALID_TIME_UB))
AND A1.Patient_Id = P1.Patient_Id
AND A2.Patient_Id = P2.Patient_Id
AND A1.Diagnosis_Id = A2.Diagnosis_Id
```

S-TDW model

```
SELECT F1.Patient_Name, F2.Patient_Name, C1.City_Id, A1.Diagnosis_Id
FROM P_PATIENT_DIMENSION_TABLE P1, Table(P1.State) S1, Table(S1.City) C1, Table(C1.Patient) F1,
P_PATIENT_DIMENSION_TABLE P2, Table(P2.State) S2, Table(S2.City) C2, Table(C2.Patient) F2,
ADMISSION_N_CUBE_TAB A1, ADMISSION_N_CUBE_TAB A2
WHERE   F1.Patient_Id < F2.Patient_Id
AND C1.City_Id = C2.City_Id
AND ((F1.Address_Start <= F2.Address_Start AND F2.Address_Start <= F1.Address_Stop)
    OR (F2.Address_Start <= F1.Address_Start AND F1.Address_Start <= F2.Address_Stop))
AND A1.Patient_Id=F1.Patient_Id
AND A2.Patient_Id = F2.Patient_Id
AND A1.Diagnosis_Id = A2.Diagnosis_Id
```

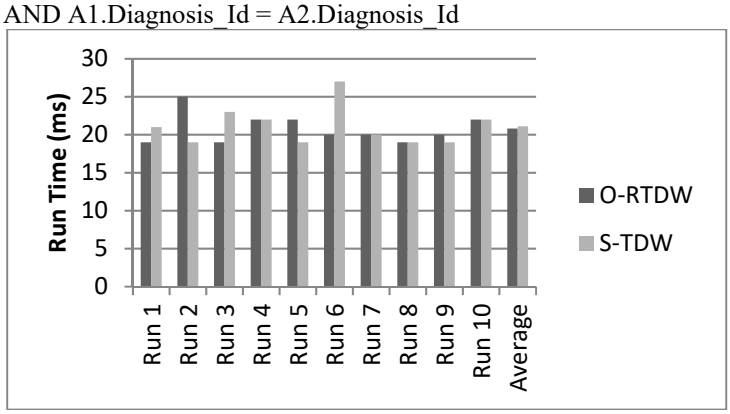

Figure 11. Query 5 run comparison chart

Overall, run times of the two approaches are similar, though S-TDW model is a little bit faster than O-RTDW as shown in Figure 12.

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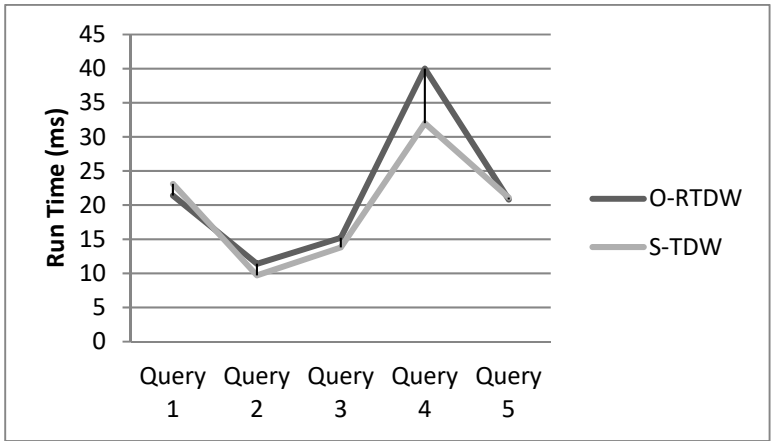

Figure 12. Queries' average run time comparison chart

Conclusion

Two current approaches for dealing with temporal data in DWs have been evaluated and compared in this research work, Object-Relational Temporal Data Warehouse (O-RTDW) model and Starnest Temporal Data Warehouse (S-TDW) model. Results showed that the S-TDW model requires significantly less space and it is a little faster on average than the O-RTDW model.

Future work includes implementation of optimization techniques for efficient evaluation of complex temporal nested queries, and the addition of transaction time to the implemented model.

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COMPARISON OF STATIC AND DYNAMIC STIFFNESS VALUE CHANGES FOR EMBEDDED AND SWALLOW FOUNDATIONS

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In this study,static stiffness parameters were calculated for constant rectangular footing width/length ratio by considering Turkish Earthquake Code 2007 Soil Type parameters. And the stiffness changes varying depth were obtained for all Soil Types. And also this values wee discussed with dynamic stiffness values by taking into account FEMA-356 part 4.4.2.2.1.2 for foundation type (Swallow and embedded foundation),external load frequency varying with depth.

Keywords: Soil-Structure İnteraction,Dynamic Stiffness,Swallow and embedded Foundation

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COMPARISON OF SUGAR AND ORGANIC ACID CONTENTS OF TURKISH ORANGES JUICES*

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ABSTRACT: Two different orange juices obtained from *cvs.* Kozan Misket and Kozan Yerli were compared in terms of sugar and organic acid composition. These two parameters are important in determining the ripeness of fruits. Samples were obtained from Cukurova region of Turkey and the analysis was carried out by high-performance liquid chromatographic methods. Four organic acids (citric, ascorbic, malic and succinic acids) and three sugars (sucrose, glucose and fructose) were determined. Sucrose had the majority in sugars in both samples with the concentration of 61.02 g/l in Kozan Misket and 63.23 g/l in Kozan Yerli, respectively. With regard to organic acids, citric acid was found to be present in the largest amounts having concentration of 16.25 g/l in Kozan Misket and 15.90 g/l in Kozan Yerli in both samples.

Keywords: Orange juice, organic acid, sugar, *cv.* Kozan

Introduction

Orange, the third largest produced fruit crop after grape and apple in Turkey, is an important fruit in terms of its high nutritional value and organoleptic properties (Selli, 2011). Turkey has reached an average of 1,277,613 tonnes in orange production according to the data in FAO (FAO, 2014). It is produced mainly in southern and eastern regions of Turkey and Cukurova region is known as the main production area (Kelebek, 2011). In this region, Kozan oranges stand as a native orange variety grown in a large scale. The fruit is generally medium size and has a bright orange flesh (Kelebek, 2009). Kozan oranges are claimed to be of the best quality for processing when harvested in February and March (Selli, 2008). Important parts of oranges are consumed as fresh and the remaining parts are processed into orange juice and concentrated. Organic acids and sugars are in the group of major compounds of oranges varying to the species and environmental conditions. Their concentrations are known to have an important effect on sensory characteristics of oranges and juices (Albertini, 2006). Organic acid is a substantial criterion to ascertain the adulteration in fruits. Citric and malic acids are responsible for the majority of citrus fruits. In addition, benzoic, oxalic and succinic acids were also reported to present in trace amounts (Karadeniz, 2004). Sugars form the greater part of soluble solids in orange juice and it is reported that the sweetness of juice is pertain to the sugar composition (Kelebek, 2009). Glucose, fructose and sucrose are known as main sugars found in orange juices (Albertini, 2006). The aim of this study was to determine and compare these two important parameters in orange juices obtained from *cvs*. Kozan Yerli and Kozan Misket.

Materials and Methods

Kozan Yerli (Figure 1) and Kozan Misket (Figure 2) oranges were obtained from Kozan district of Adana province of Turkey. Oranges were used for each variety with an average of 30 kg and age of the trees as well as the maturity of oranges was paid attention to be similar for picked fruits. Sugar and titration acidity were used in the determination of maturity. The samples were extracted by cutting the fruit in half and carefully hand-squeezing in a household type electric hand juicer (Siemens MC30000, Germany) on the same day of harvesting.

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Figure 1. Kozan Yerli oranges

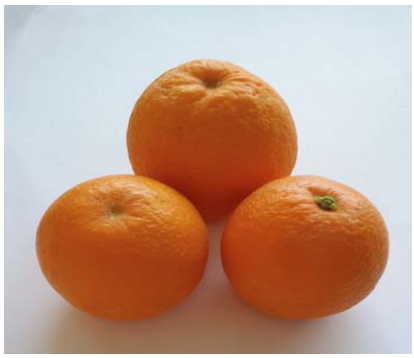

Figure 2. Kozan Misket oranges

Sugar and organic acid analyses of orange juices were carried out according to the methods of Lee and Coates (2000) with a slight modification. 100 ml sample from each variety vas centrifuged at 12000 rot/min and 4ºC, and then supernatants were passed through a 0.45 µm filter. Obtained extract was injected directly to a HPLC (LC-10A HPLC Series, Shimadzu, Kyoto, Japan) including SPD-20A UV/Vis (Shimadzu LC20AD) and RID 10A refractive index detectors. 5 mM sulfuric acid solution was used as mobile phase and flow rate is fixed as 1 ml/min.

External standard method was used in determination of sugar concentrations in samples. Calibration solutions were prepared using five different concentrations of sucrose, glucose and fructose standards and HPLC analyses were carried out. Calibration curves were obtained from the data and with the use of these curves, sugar concentrations of orange juices were determined.

Organic acid analysis was also performed with the same method using citric, ascorbic, malic and succinic acids as standards.

Results and Discussion

Sugar Composition

Sugars are one of the most significant compounds of citrus fruits. Three sugars (sucrose, glucose and fructose) were determined in the samples as displayed in Table 1. Total sugar concentration of Kozan Yerli and Kozan Misket orange juices were 126.52 g/l and 133.44 g/l respectively. Stella et al. (2011) indicated that the total sugar amounts of various ready-to-drink orange juices can change in between 95-165 g glucose/l. As Kelebek (2009) implied, three simple sugars which are sucrose, glucose and fructose are responsible for the main portion of carbohydrates in citrus fruits. It is also pointed out that these sugars form about 80% of the total soluble solids in orange juice. Kozan Yerli orange juices had the sugar composition as sucrose with an amount of 61.02 g/l, glucose with 35.16 g/l and fructose with 30.34 g/l. The sugar concentration of Kozan Misket juices was similar to Kozan Yerli including 63.23 g/l sucrose, 37.45 g/l glucose and 32.76 g/l fructose. Sucrose had the majority in sugars of both samples. As reported, the ratios of sucrose:glucose:fructose are generally about 2:1:1 (Kelebek,

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2009). Our results show correlation with this information. As stated in the same study, *cv.* Kozan orange juices were found to have 59.34 g/l sucrose, 32.30 g/l glucose and 28.55 g/l fructose. Another study investigated *cv.* Dortyol orange juices specific to Turkey and determined the sugar composition as 46.60 g/l sucrose, 30.99 g/l glucose and 33.05 g/l fructose (Kelebek, 2011).

Table 1: Sugar composition of Kozan Yerli and Misket orange juices

Sugars	**Kozan Yerli**	**Kozan Misket**	**F**
Sucrose	61.02±0.03	63.23±0.23	*
Glucose	35.16±0.15	37.45±0.02	*
Fructose	30.34±0.16	32.76±0.07	*

Concentrations are given as g/l. *Significance at which means differ as shown by analysis of variance (P<0.05).

Organic Acid Composition

Citrus fruits are known for rich organic acid content. It is also reported that, organic acids and sugar contents are used for the determination of maturity and sensorial quality (Kelebek, 2011). Four organic acids (citric, ascorbic, malic and succinic acids) were separated and identified in both Kozan Yerli and Misket orange juices. As displayed in Table 2, citric acid was found to be present in the largest amounts in both samples having concentration of 16.25 g/l in Kozan Yerli and 15.90 g/l in Kozan Misket. Kelebek (2011) determined the citric acid concentration as 14.22 g/L in Dortyol orange juices. Saavedra (2001) indicated that the citric acid amount change in the range of 8.4-12.6 g/l in freshly hand-squeezed Navelina orange juices. Malic acid followed the lead with an amount of 4.01 g/L and 3.78 g/L in Kozan Yerli and Misket respectively. In the same study of Kelebek (2011), the malic acid concentration is reported to be 3.91 g/L in Dortyol variety. Acidic citrus fruits, especially oranges have high antioxidant activity resulting from the ascorbic acid concentrations. Ascorbic acids are known to be strong antioxidants and used as implication for quality of orange juices (Kelebek, 2011). In the results, Kozan Yerli is shown to have higher ascorbic acid concentration than Kozan Misket with amounts of 0.55 and 0.44 g/l respectively. Reported results show that Navel orange juices also have ascorbic acid in addition to Valencia and Dortyol orange juices. Navel orange juices are stated to have 0.49 g/l ascorbic acid, Dortyol whereas juices have 0.47 g/l and Valencia juices have 0.41 g/l of ascorbic acid (Melendez-Martinez, 2007; Selli, 2011). Ascorbic acid concentrations of different orange juices from Mediterranean region are reported to change between 0.39-0.62 g/l (Melendez-Martinez, 2007).

Table 2: Organic acid composition of samples.

Organic Acids	**Kozan Yerli**	**Kozan Misket**	**F**
Citric Acid	16.25±0.05	15.90±0.13	*
Ascorbic Acid	0.55±0.17	0.44±0.06	NI
Malic Acid	4.01±0.05	3.78±0.13	*
Succinic Acid	1.93	0.88	*

Concentrations are given as g/l. *Significance at which means differ as shown by analysis of variance (P<0.05); NI: Not important in terms of statistical analysis.

Conclusion

In present study, sugar and organic acid compositions of orange juices obtained from *cvs.* Kozan Yerli and Kozan Misket grown in from Cukurova region of Turkey were examined. The results displayed similarity between two varieties. Kozan Yerli had slightly higher organic acid while Kozan Misket had higher sugar concentration. Four organic acids (citric, ascorbic, malic and succinic acids) and three sugars (sucrose, glucose

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and fructose) were determined in both varieties. Sucrose had the majority in sugars in both samples with the concentration of 61.02 g/l in Kozan Misket and 63.23 g/l in Kozan Yerli, respectively. In terms of organic acids, citric acid was found to be the abundant compound with a concentration of 16.25 g/l in Kozan Misket and 15.90 g/l in Kozan Yerli in both samples. Malic acid was found to have the second highest concentration in all samples. Organic acid and sugar composition and concentration are important in determination of quality in fruits and juices; hence this research is beneficial about orange juices. However, further investigation is advised.

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COMPARISONS OF POLYPROPYLENE COMPOSITES: THE EFFECT OF COUPLING AGENT ON MECHANICAL PROPERTIES

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Abstract: The aim of this work is to compare the glass fiber (GF)/polypropylene (PP) and black rice husk (BRH)/black rice husk ash (BRHA)/polypropylene (PP) composites on mechanical properties. Tensile, flexural and falling weight impact test was conducted to investigate the effect of filler content and coupling agent (MAPP) on the mechanical properties of the BRH/BRHA/PP composites. Using a coupling agent, the mechanical properties of glass fiber reinforced material is intended to reach. By incorporating up to 10% (by weight) fillers, the tensile strength of GF/PP increased by 21%, BRH/PP and BRHA/PP were decreased by 20% and 10%, respectively, compare to neat polypropylene. Using MAPP provided to enhance the tensile strength of BRH/PP and BRHA/PP composites. And also the effect of water absorption on GF/BRH/BRHA was investigated. Results showed that increasing BRH and BRHA concentration and increasing water contact time greatly increase water absorption.

Keyword: composites, mechanical properties, FTIR, rice husk, polypropylene

Introduction

In recent years, natural filler have a potential usage for composite production. Cellulosic fibers, like wheat straw, rice husk, flax, wood in their nature, as well as, several waste cellulosic products such as husk, shell flour and wood fiber have been used as reinforcement of different plastic resins. Cellulosic material reinforced plastics, are low cost, light-weighted, have enhanced mechanical properties, and are nonhazardous (Turmanova et al., 2008; Razavi-Nouri et al., 2006; Gupta et al., 2006). Despite the advantages of natural fiber reinforced plastic composites, they have lower impact resistance, lower strength and relatively poor moisture resistance compare to synthetic fiber reinforced composites such as glass fiber reinforced plastics (GFRP) (Lee & Jang, 1999; Rozman et al., 2010). Natural fillers have hydrophilic character in their nature and this cause incompatibility between filler and matrix. Water absorption can cause degeneration of dimensional stability and micro crack can be occurred in structure. This leads to decrease of strength of composite (Arbelaiz et al., 2005; Ershad-Langroudi et al., 2008; Premalal et al., 2002; de Carvalho et al., 2012). Therefore, interface of composite should be improved by chemically or coupling agent. Coupling agent provides to enhance the bonding between filler and matrix. This causes increase of strength and reducing of water absorption value.

Recently publications give information about using of natural fillers as reinforcements in composite applications. Turmanova et al. (2008) studied water absorption and mechanical properties of polypropylene filled raw rice husk and rice husk ash. The mechanical properties like tensile strength and Young's modulus that depend on filler content were determined. They investigated the water absorption and treatment of fillers how changes the mechanical properties. Razavi-Nouri et al. (2006) studied the reinforcing effect of chopped rice husk into polypropylene. And also the effect of coupling agent MAPP was investigated. Arbelaiz et al. (2005) have reported the effects of using different coupling agent for determining the coupling effectiveness for composites. Also they compared the influence of both fiber surface and matrix modification on mechanical properties. Ershad-Langroudi et al. (2008) studied modifying the chopped rice husk reinforced PP by recycled PET. They have investigated the potential usage of rPET on composite production and how can change the mechanical/thermal properties. Two kind of form of natural filler was chosen in this study because of its special properties. Black rice husk and black rice husk ash (obtained burned rice husk). Low cost, low density, high modulus etc. are some of properties that bring about to choose these fillers. In Turkey BRH production is not much but have potential. After harvesting rice husk has no special usage as filler or something like that. Black rice husk is the outer covering of paddy and accounts for 20% of its weight (Ershad-Langroudi et al., 2008). BRHA is form of BRH that is obtained by burning the BRH. It contains higher rate of silica which is usually used as filler. Also using BRHA as reinforcement in certain polymers gives composites with better dimensional stability, toughness, as well as processing properties, and cheap process cost. This characteristic structure may not be used as waste so it should be estimated valuable technical filler.

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This study aims to determine physical, mechanical and spectroscopic properties of BRH and BRHA reinforced PP composites. Therefore, tensile, bending tests, water absorption and FT-IR were carried out. The mechanical properties of the composite material obtained with natural fibers compared with neat polypropylene and glass fiber reinforced composite which is quite widely used in composite production. MAPP is used as a coupling agent on natural fiber reinforced PP to enhance the fiber-matrix interface bonding. This study was conducted to determine whether to use natural fibers instead of synthetic fibers. And also which form of rice husk more can be more effective for production compared to glass fiber reinforced composite.

Materials and method

Materials

In this study, the base resin used was S.R.L., a polypropylene homopolymer by ROM Petrol Petrochemicals with density of 0.90 g/cm³ and melt flow index of 9.36 g per 10 min (200 ^{0}C per 2.16 kg load cell). Poly-propylene-grafted maleic anhydride (PP-*g*-MA (Sigma Aldrich), MA content= 1% wt). Chopped glass fiber (E-glass) (PA2-4.5) was supplied by Cam Elyaf A.Ş. It has 10.5 µm diameter and 4.5 mm length (the nominal value from manufacturer's data sheet). And also it was treated by coupling agent silane 0.6%. The lignocellulosic material used as the reinforced filler in the composite was black rice husk (BRH) has been collected from Thrace region in Turkey at 2011 harvest time with moisture content (unseasoned) of 5.88 % according to AACC Method No: 44-15A. Rice husk was burnt in Protherm PLF 120/7 model ashing furnace at 600°C for 6 hours according to AACC Method No: 08-01. Ash content of 77.64% and average particle size of 500 µm were obtained (Anonymous, 2000). As it has been shown table 1, BRHs contain cellulose, hemicelluloses, lignin, waxes, and water-soluble substances (Turmanova et al., 2008).

Composites preparation

Rice husks were dried in a vacuum oven Ecocell 55 at 103 ±2 ^{0}C for 24 h to adjust the moisture content to 1–3% and then stored over desiccant before compounding. For this study moisture content decreased from 5.88% to 1.58%. Figure 1 shows drying and burning process.



Figure1. a) Drying process b) burning process

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TABLE 1: Typical composition of some of natural fillers (Turmanova et al., 2008; Arbelaiz et al., 2005; Julson et al., 2009).

Natural fibers	Density (g/cm^3)	Cellulose %	Hemicelluloses %	Lignin %	Mineral Ash %	Water Soluble M. %
Flax	1,51	65-85	18-20	1-4	5	1,5
Hemp	1,47	77,5	10	3,7-13	0,8	1,8
Kenaf	1,52	45-57	21,5-23	15-19	2-5	1,9
Sisal	1,45	50-64	10-24	7-11	0,6-1	1,7
Black Rice Husk	0,09-0,15	31-34	22-26	22-23	11-14	7-9
Chemical analysis of Black Rice Husk Ash						
Composition	SiO_2	K_2O	MgO	Al_2O_3	CaO	Fe_2O_3
%	93,19	3,84	0,87	0,78	0,74	0,58

Water causes lower adhesion between filler and matrix. Therefore, it should be removed from composite structure by drying process. Reinforced plastics granules were produced by single screw extruder (L/D= 28). The extruder has four zones with controlled temperature. The setting for these zones was: Z1 = 160^{0}C, Z2 = 175^{0}C, Z3 = 185^{0}C and Z4 = 185°C. The screw velocity used was 55 rpm. Sheets of dimensions 180x180x4 mm^3 were prepared using a hydraulic press under a pressure of 150 kg cm^2. Tensile strength, elongation at break were recorded and calculated by automatically. And elastic modulus was calculated from tensile test data by manually.

Mechanical properties

Tensile, flexural and impact are used for determining mechanical properties of reinforced plastics. In this study, both, tensile and flexural tests were performed using an Instron Universal Testing Machine Model 8501, equipped with a 500 kg load cell, strain-gauge extensometer (Instron, model 2620) after conditioning at 23 ±2 ^{0}C according to ISO 527 standard and ASTM D790, respectively. The cross-head speed used for the type IA tensile specimens was 5 mm/min. For the Flexural test (three point bending) a specimen with nominal dimensions of 80x10x4 mm^3, a span of 32 mm and a cross-head of 1 mm/min were used (Franco-Herrera & Gonzalez, 2005). Gardner impact test was carried out using a Devostrans Drop Impact Test Machine according to ASTM standard D5420. For the test a specimen with nominal dimensions of 60x60x3.2 mm^3, striker diameter 12.70±0.10 mm and support plate inside diameter 16.26 ±0.025 mm. Three specimens of each sample were tested for tensile and flexural tests, and the average results were reported. Gardner impact test was carried out according to Bruceton Staircase Method by 20 samples for each calculated value.

TABLE 2: Formulations of the Composites in Weight Percent

Sample ID	Ingredients (%)			
	PP	GF	BRH/MAPP	BRHA/MAPP
PP	100	0	0/0	0
PPGF10	90	10	0/0	0
PPGF20	80	20	0/0	0
PPGF30	70	30	0/0	0
PPBRH10	85	0	10/5	0
PPBRH20	75	0	20/5	0
PPBRH30	65	0	30/5	0
PPBRHA10	85	0	0	10/5
PPBRHA20	75	0	0	20/5
PPBRHA30	65	0	0	30/5

Water absorption properties

Water absorption tests were carried out according to the ASTM D 570-98 method. Composite samples were immersed in distilled water in Memmert WBN 22 model water bath at 90 ^{o} C. After that samples were dried an oven for 24 h at 103±2°C. The dried specimens were weighed with a precision of 0.0001 g by Sartorius ED224S

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precision balance. The samples were removed from the distilled water, dried with blotting paper, and weight values were determined. Water absorption percent was calculated using the following formula,

$$M\ (\%) = M_t - M_o / M_o \times 100$$

Where, M_o and M_t denote the oven-dry weight and weight after time t, respectively.

Spectroscopic characterization

Fourier transform infrared (FT-IR) spectroscopy was used to detect the presence of the functional group that exists in rice husk/rice husk ash/glass fibers. The IR spectrometer (Perkin-Elmer spectrum BX, Perkin-Elmer Canada) was used for detecting of spectra of samples. FT-IR spectra of the samples were collected in the range of 4000-400 cm^{-1} with a resolution of 4 cm^{-1}.

Morphological study

SEM was used for detecting morphology of interface of composite materials. SEM micrographs of the surfaces of impact fractured specimens were taken using a ZEISS Evo® LS 10 scanning electron microscope and FEI F50 SEM. The samples were first sputter-coated with a fine layer of gold under vacuum for 60 sec.

Results and discussion

Tensile properties

Tensile strength and modulus of PPGF composites increased by about 70% and 188%, respectively, according to neat PP at 30% filler content. Gupta et al. (2006) has reported that increase of tensile strength and modulus values reached 50% according to neat PP at same filler content. The increase of tensile strength, as a result of glass fiber incorporation, can be attributed to the good stress transfer to the glass fiber by the glass fiber-matrix interface. This good stress transfer from the polymer matrix to glass fibers leads to increase in tensile strength due to the strength of glass fiber. Figure 2 shows tensile strength and modulus of composites that depends on filler contents. Figure 3 depicts one set of BRH/BRHA reinforced composites' stress-strain graphs which have been obtained from test machine software.

The tensile strength of composites that containing PPBRH decrease by increasing filler content. At 20 % filler content, value of tensile strength reached 42% decrease according to neat PP (Tensile strength, 28 MPa). Tensile modulus of PPBRH composite had a small tendency to increase, at 20% filler content obtained value of 7% increase. Turmanova et al. (2008) has reported 14% tensile strength decrease and 5% tensile modulus increase at 20% raw rice husk content. After using MAPP, tensile strength of the PPBRH increased, and the value was obtained to be lower by 20% compared to the neat PP. The tensile modulus of PPBRH changed the upward and increased by 47% compared to reinforced PP. Tensile strength of PPBRHA decreased 21% and modulus increased 20% according to neat PP, at 20% filler content. Similar results have been reported by Turmanova et al. (2008). After incorporating MAPP, the tensile strength of PPBRHA reached similar value with neat PP. The modulus of PPBRHA decreased by 38% compared to PPBRHA without MAPP.

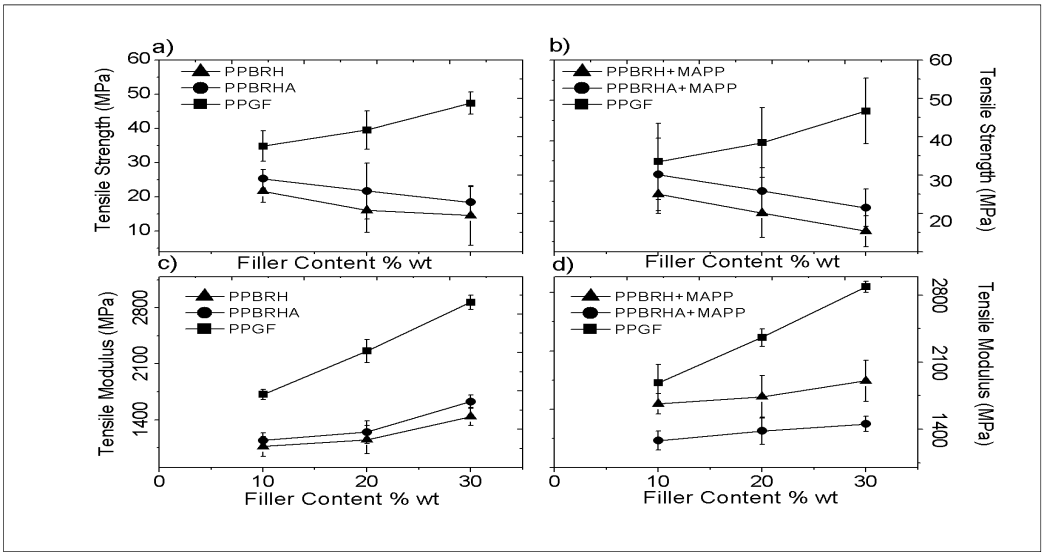

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Figure 2. Tensile modulus and strength of composites a) tensile strength of composites depend on filler content, b) tensile strength of composites with %5 MAPP c) tensile modulus of composites depends on filler content d) tensile modulus of composites with %5 MAPP

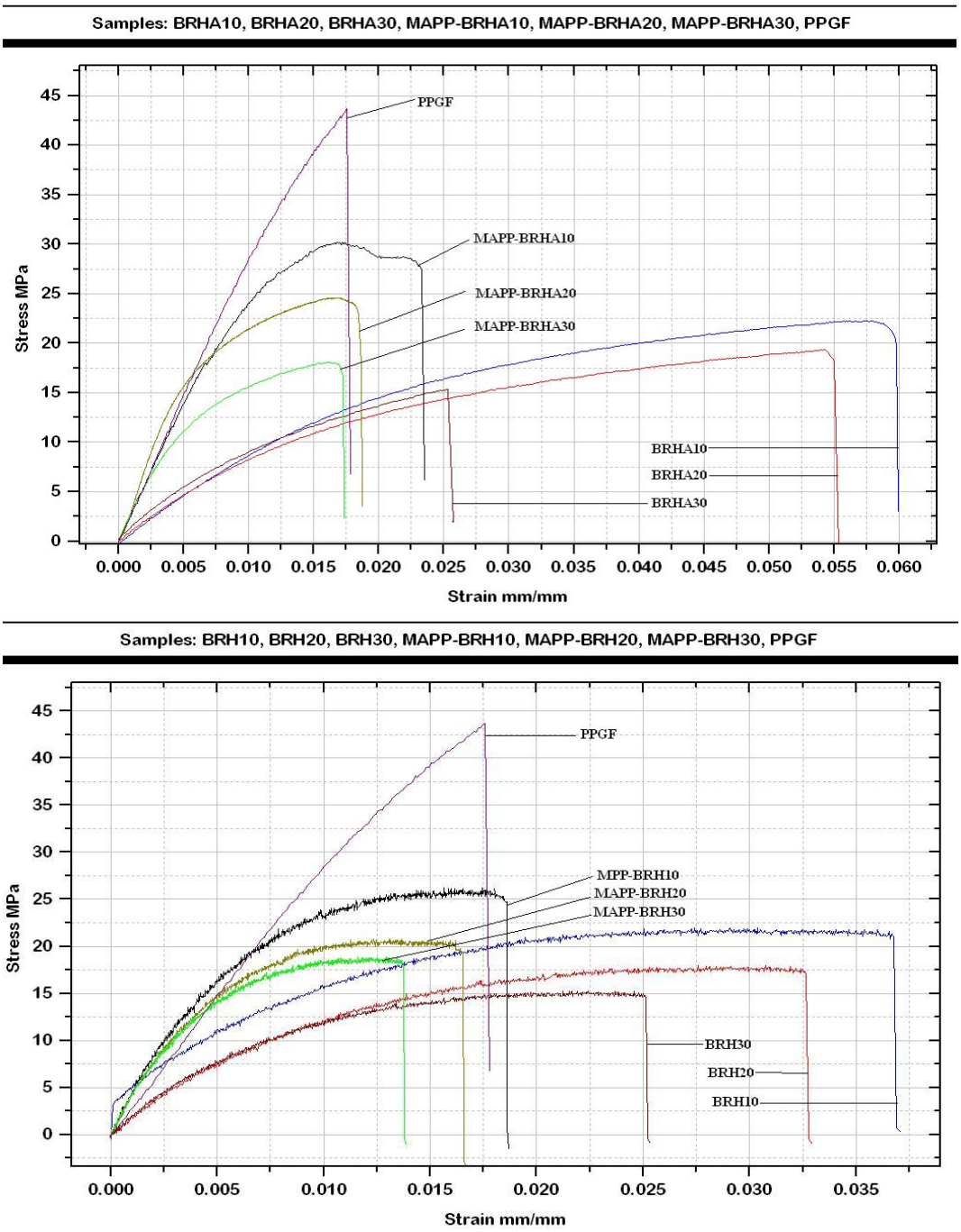

Figure 3. Stress-strain graph of BRH/BRHA composites

PPBRH and PPBRHA composites have lower tensile strength according to neat PP and PPGF composite. This mainly attributed to restricting of stress transfer by interface of composite. Weak adhesion force between filler and matrix cause not good interface bonding. It should be noted that BRHA composites have good dispersion because of its smaller size. And this provides higher strength due to better interaction between filler and matrix compared to BRH composites.

Composites had tensile moduli which tend to increase in all composition. This mainly attributed to presence of rigid filler in their structure. Fillers restrict the free motion of matrix and deformation has been avoided. This caused increase of elastic modulus with increase filler content (Crespo et al., 2008; George et al., 2001). It is

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more likely the rice husk/ash acts as stress concentrators in the PP matrix. Therefore, dispersion of fillers can provide reinforcing affect due to having higher modulus than PP matrix.

Flexural Properties

It was found that although the flexural strength of BRH reinforced PP relatively remained constant, in addition to this PPBRHA increased weakly. The flexural modulus of PPBRH and PPBRHA increased by about 44% and 71%, respectively, comparing to the neat PP. Razavi-Nouri et al. (2006) has reported for BRH composites 10% and 45% increase on flexural strength and flexural modulus, respectively. And also Fuad et al. (1995) reached 40% flexural strength value at BRHA composite.

Figure 4 shows comparison of flexural strength and modulus depend on filler content of composites. PPGF composite showed the highest flexural strength and modulus by about 90% and 153%, respectively, comparison to the others. Gupta et al. (2006) has reported 63% and 258% increase for the 30% filler content. Incorporating glass fibers to polymer matrix increases the stiffness of composite. This is mainly attributed to having higher stiffness according to polymer matrix.

The MAPP is a good coupling agent that is physically stronger and has thermally stable bonds, attributed to hydrogen bonding with BRH/BRHA and chain entanglements and co-crystallization with PP (Khalil, 2008). Using MAPP enhanced the compatibility of fiber-matrix and provided to increase flexural strength and modulus. Flexural strength of BRHPP and BRHAPP increased by 10% and 29% compared to neat PP. The flexural modulus of PPBRH and PPBRHA increased by about 94% and 97%, respectively, comparing to the neat PP.

Tension, compression and shear stress occurs during the flexural loading. Failure is mainly attributed to occurring bending and shearing in bending test. Incorporating of glass fiber provides to resist the shearing of composite and this cause an increase of flexural strength (Gupta et al., 2006; Lee & Jang, 1999).

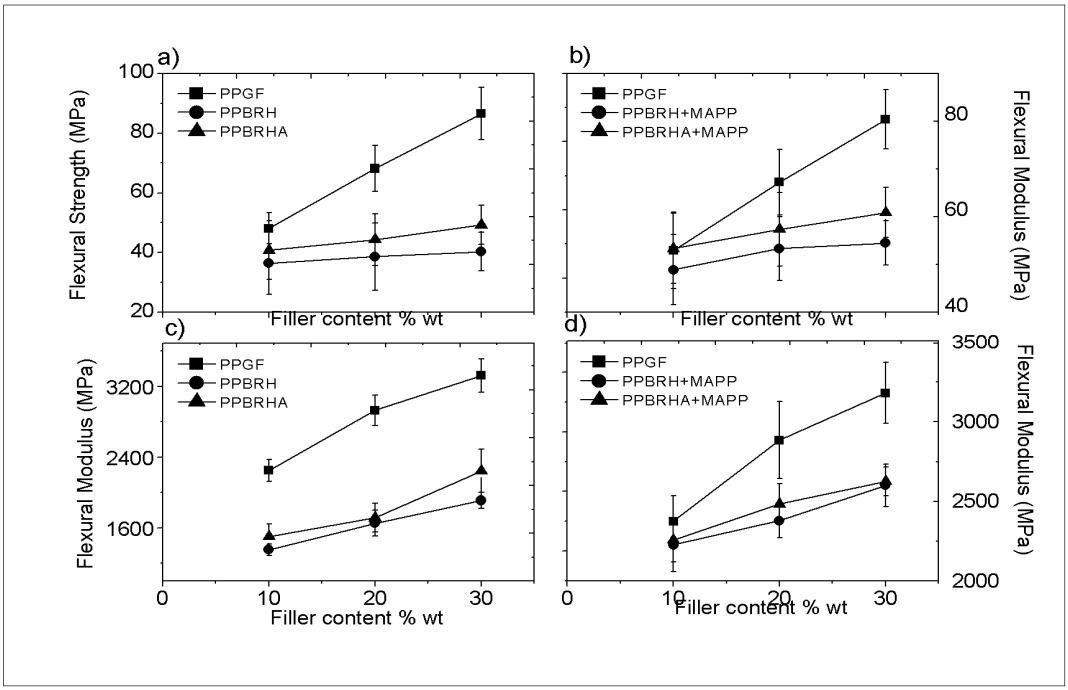

Figure 4. a) Flexural strength depends on filler content b) after using coupling agent, flexural strength-filler content c) flexural modulus without coupling agent d) flexural modulus of composites with coupling agent

Water absorption test results

PP is a non-polar polymer which has less tends to bound with water. In normal conditions, while the PP may contain 0.1% of water; at 90 degrees the water absorption value can reach 0.25 percent. The natural fillers are hydrophilic which restrict of their usage in production. The hydrophilic character of reinforcement in composites causes reduction of mechanical properties. Therefore polymers are required to undergo some operations before the additive into the matrix. Due to the high hydrophilic character of the components of natural fillers water absorption is a severe handicap for some applications of natural fiber polymer composites. Generally speaking, polypropylene hardly absorbs water due to its hydrophobic structure; however, rice husk can absorb water

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because of its hydrophilic character (Rozman et al., 2010; Nourbakhsh, et al., 2011; Yang, et al., 2006; Starks & Rowland, 2003; Julson et al., 2009; Jacoby et al., 2001; Thwe & Liao, 2002).

The study reports the effect of filler type and content on water absorption value of composite. Figures 5a reveals that the water absorption increases with increase of natural filler content. And also results showed that increasing BRH and BRHA concentration and increasing water contact time greatly increased water absorption, as it can be seen in Figure 5c. Figures 5b and 5d depicts that the water uptake and BRH filler content. Because of the free OH groups contained in cellulose, PP matrix composite acts as hydrophilic structure. Therefore, the water absorption increases with increasing rate of reinforcements. Similar curves were obtained by Turmanova et al. (2008). MAPP use, while ensuring the improvement of the interface between the reinforcement and the matrix, this improvement causes a lowering of water absorption. Reason behind this is considered to be a change in the diffusion mechanism of natural reinforcements. Water molecules are transferred to micro-gaps in the polymer by diffusion mechanism. In the fiber matrix interface, the water molecules are transferred by capillary action due to the lack of wetting. And also micro cracks can be occurred during production process, this cause water transportation to the gaps. Incorporating MAPP decreases the micro gaps due to enhance the bonding mechanism between filler and matrix. So water absorption value reduces by adding coupling agent.

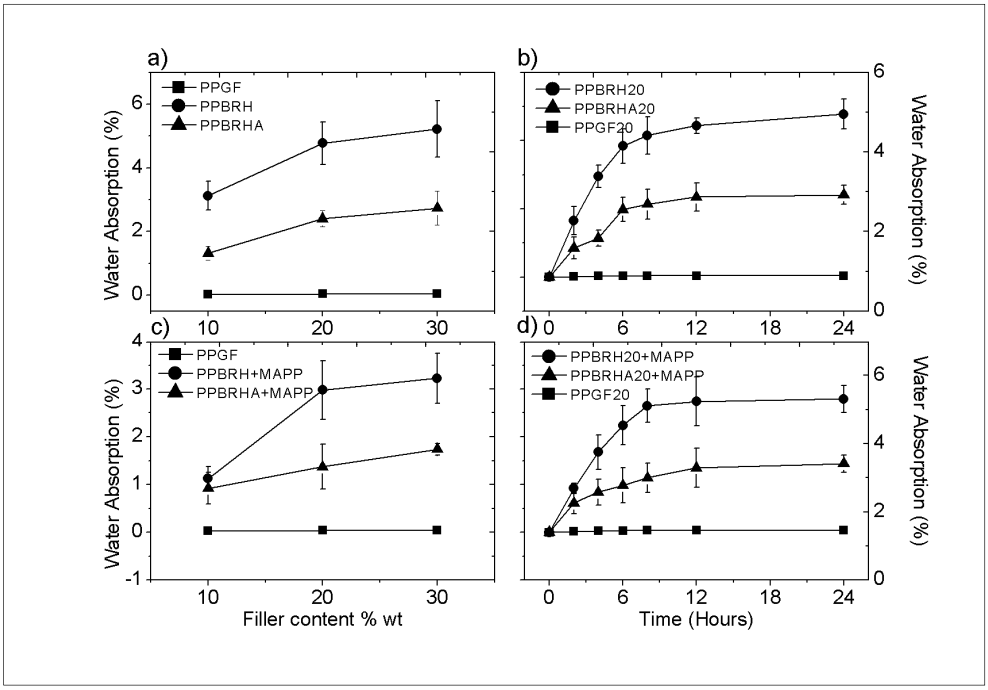

Figure 5. a) Water absorption according to filler content, b) Effect of coupling agent on water absorption, c) water absorption value at 90 ^{0}C, d) Dependences of water absorption after using coupling agent MAPP

It can be seen from Fig. 4c-d BRH20 had the highest water absorption value, PPGF20 had the lowest value. It means that the, PPGF is basically a hydrophobic polymer composite.

Gardner impact properties

Impact failures are the result of rapid crack propagation through the material. The crack's growth rate is inversely proportional to the impact resistance of the material. For a polymer to be considered as having good impact resistance, it should be able to absorb most of the impact energy and slows the rate of crack propagation (Bigg, 1987).

Gardner test is used for determining impact energy required for crack or failure on flat surface. A striker is used for impact by drop weight. Figure 6 shows the impact tester and one of the deformed 20% PPGF sample. The procedure determines the energy (mass x gravity x height) that will cause 50% of the specimens tested to fail. Incorporation of glass fibers provide to increase of impact strength. This is mainly attributed to having higher energy absorb capacity of fibers and it cause less fiber breakage and a higher residual strength to the composite (Gupta et al., 2006). PPGF composite reached maximum impact energy value at 10% filler content according to others. Lee et al. (1999) has reported the maximum impact energy at 20% glass fiber reinforced composite. Increasing glass fiber makes the composite structure more brittle and free motion of matrix chains is restricted by fibers. During the loading, matrix cannot damp the force due to less matrix transport are between fibers. This

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causes decrease of impact strength of composite. Some others explained that is mainly attributed to increase in the crystallinity orientation factor of PP by GF.

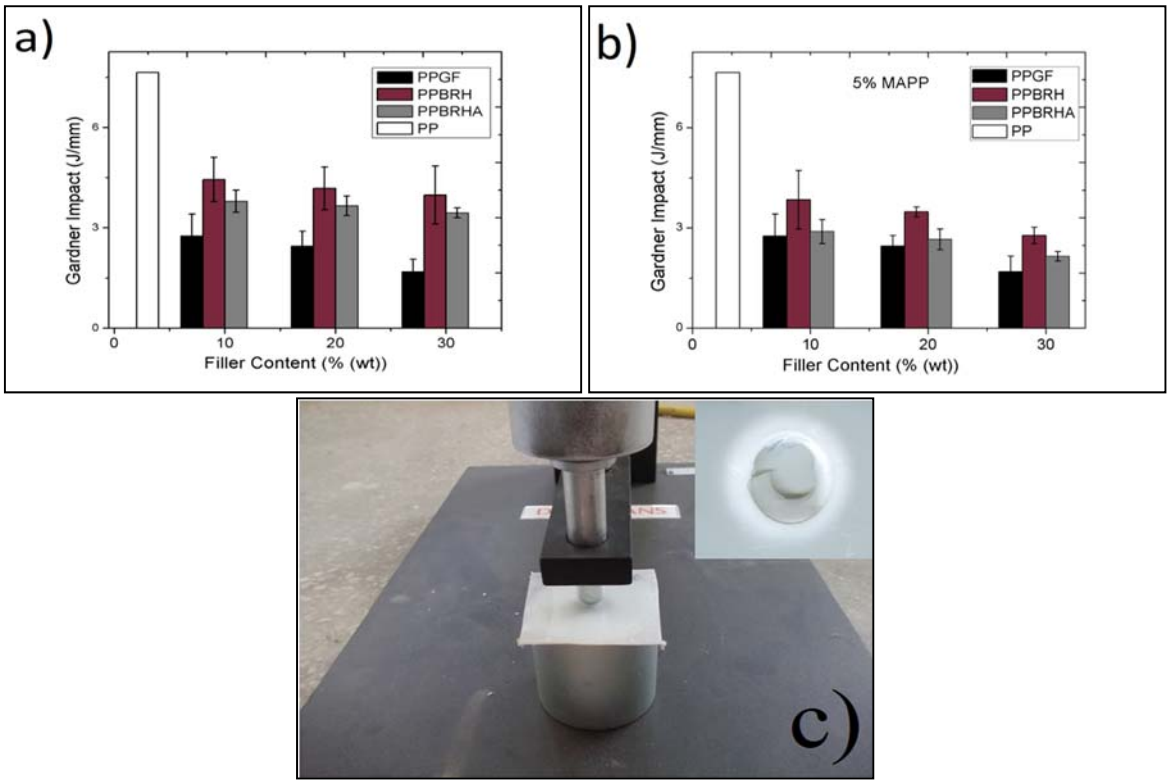

Figure 6. a) Gardner impact energy depend on filler content, b) Gardner impact energy of composites with MAPP c) test set-up

Adding BRH/BRHA filler into the polypropylene causes decrease of the impact strength. Interfacial adhesion effect the impact strength of composite. The weak bonding between filler and matrix cannot handle the energy of impact (Fuad et al., 1995). Crack moves along the weak interface. Polymer matrix cannot block the crack propagation and this cause lower impact strength. Increasing the rate of filler, increases the regions where the weak bonds and cannot prevent crack propagation.

Figure 6a) reveals that the BRH composite have higher impact strength than the BRHA composite. This may be explained higher agglomeration of BRHA that cause restriction of stress transfer to matrix. Agglomeration of the reinforcing particles has been suggested in previous studies by the effect of the adhesion forces within the composite structure (Fuad et al., 1995). BRHA particles make structure more brittle and tend to crack failure. Figure 6b) shows composites including MAPP. Adding MAPP to the structure of composite material makes the structure more brittle. Although, having stronger bond between fillers and matrix, the agglomeration of fillers is not inhibited in the composite structure. During the impact test, external mechanical energy is transferred to brittle structure of matrix and this cause a sudden damage.

Spectroscopic Results

FT-IR gives information about internal structure of composite. These curves present both PP and filler characteristic chemical bands. Figure 7 depicts that the IR spectra of filled PP. 2985-2640 cm^{-1} band give information about symmetric and asymmetric vibration of ethylene, methylene and CH groups (Turmanova et al., 2008). 1436-452 cm^{-1} have number of absorption bands (Hummel & Scholl 1968). The BRH are characterized by band between 3500 and 2700 cm^{-1}. Absorbed water and OH groups can be placed to this band. This band's position gives proof about presence of strong hydrogen bonds. 1600 cm^{-1} and 1500 cm^{-1} band give information about H_2O molecules physically adsorbed onto rice husks and C-H deformation vibrations, respectively. Siloxane bonds (Si-O-Si) bands were placed to peak at 450 cm^{-1}. Si-O network was placed to peaks between 1200 and 700 cm^{-1}. Differences between spectra of BRHA and BRH occurred at the band of 1305 and 450 cm^{-1}. This can be explained with the decrease of organic matter content and its transformation into active carbon (Turmanova et al., 2008). The bands at 1000 and 760 cm^{-1} correspond to the Si–O stretching vibration, and the bending vibration at 450 cm^{-1} appeared sharper as the organic matter was no longer present.

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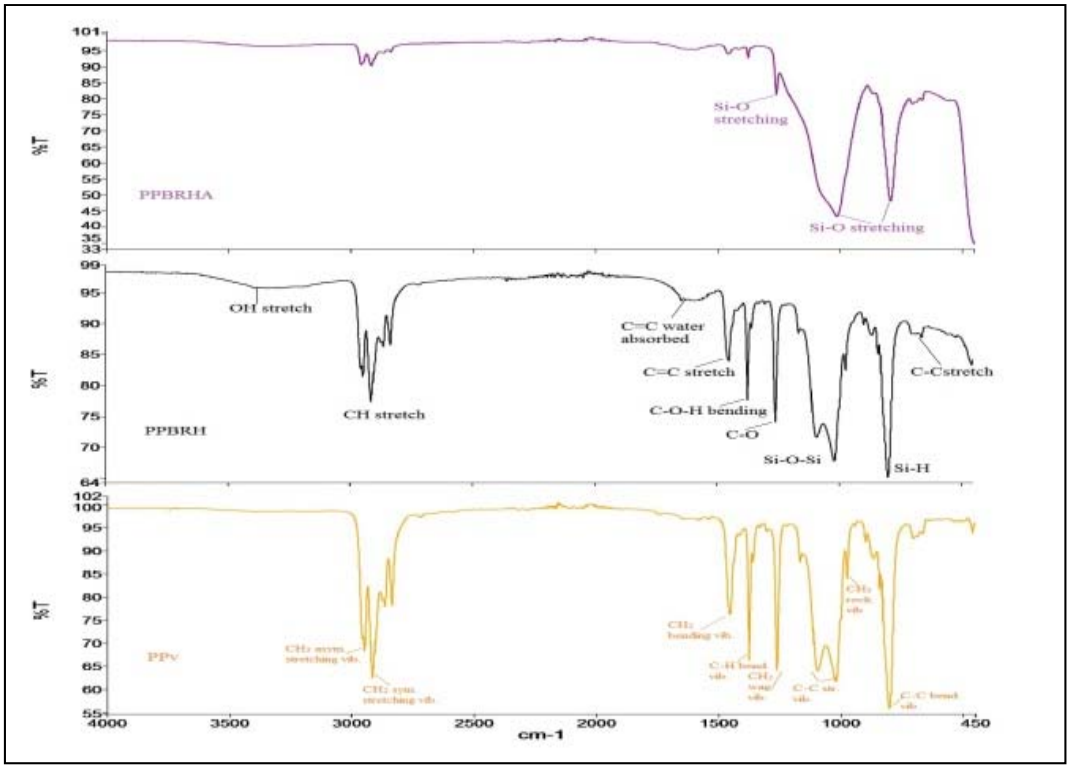

Figure 7. FTIR characterizations of composites

Morphological study of composites

Fig. 8 shows the fracture surfaces of PPGF composite after Gardner impact test. The fracture surface of matrix shows the brittle failure of PP, showing little plastic deformation resulting from fiber end (Fig. 8a). Figure 8b shows that there is a good adhesion between glass fiber and PP matrix. And also location of fibers refers a good dispersion.

Good interfacial adhesion between glass fiber and matrix enhance the stress transfer during the loading. Crack propagation is restricted by glass fiber and this cause increase of strength. Good interface between fiber and matrix also provide increase of energy absorption capacity. During impact loading, fracture propagation can be resisted by fiber-interface-matrix region (Rozman et al., 2010).

Figure 9a shows that BRHA reinforced composite have micro voids between filler and matrix. This causes poor interaction in interface. Fig. 9b reveals that presence of agglomeration on crack surface provides easy crack propagation. And also agglomeration causes lack of interfacial bonding between filler and matrix.

Figure 10a shows location of rice husk in the matrix. Figure 10b reveals that there are micro-cavities between filler and matrix due to the filler have been pulled out from polymer. These cavities result from polar-apolar incompatibility of filler-matrix. This incompatibility cause lower strength and increase of water absorption value.

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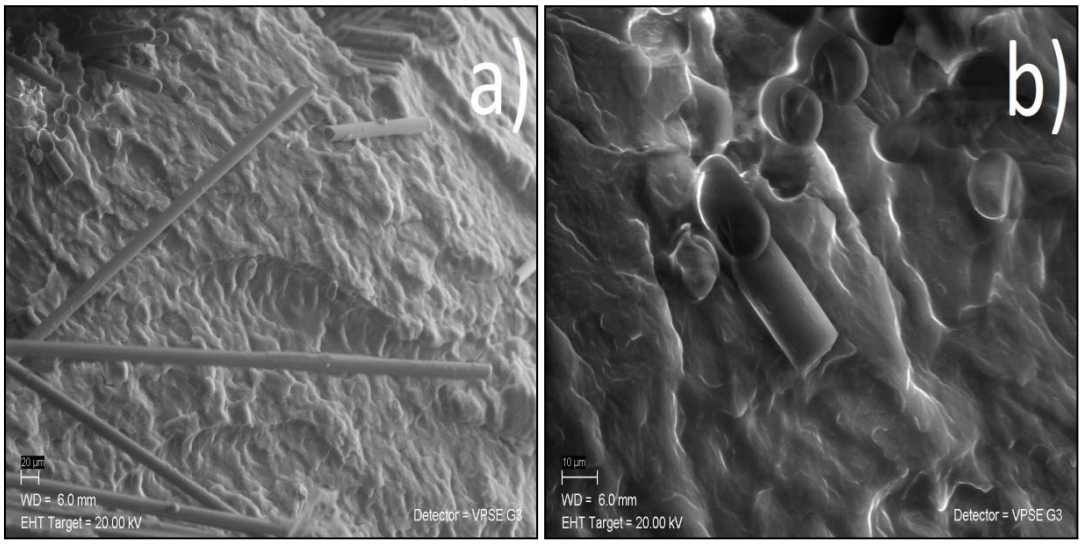

Figure 8. a) Brittle cracking of glass fiber b) Glass fiber and PP interface

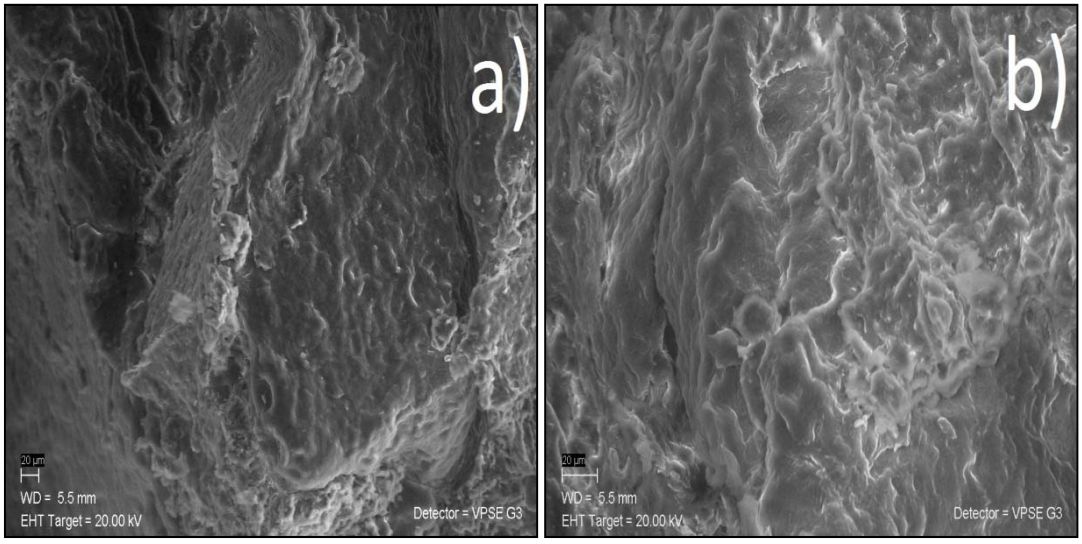

Figure 9. Failure on crack surface of composite b) BRHA agglomeration

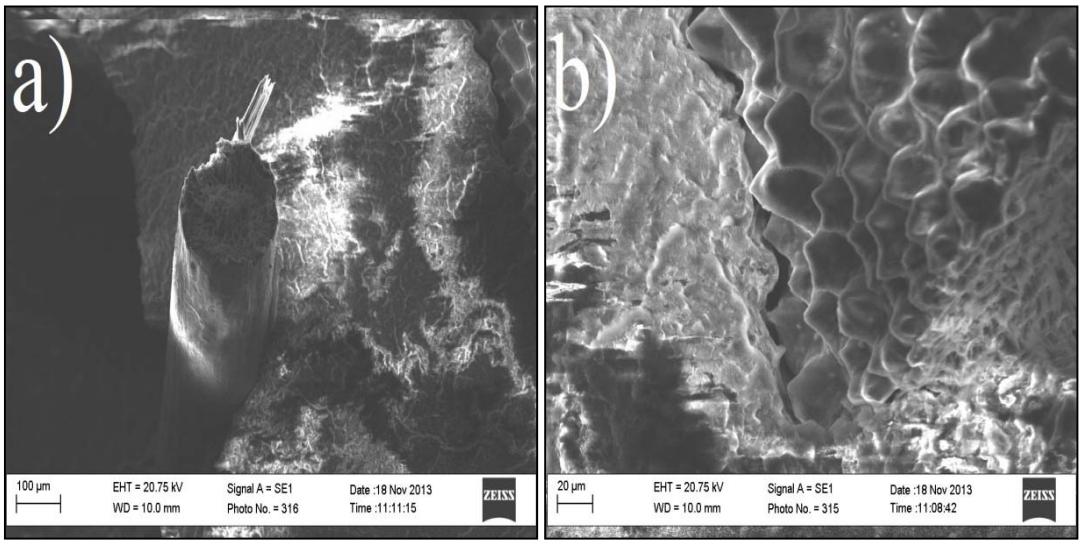

Figure 10. a) Dispersion of rice husk in the matrix b) Cavities between rice husk and matrix

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Conclusion

This study reports about usage of glass fiber and rice husk/ash as reinforcement. Composite materials were prepared by incorporating of glass fiber and rice husk/ash to the PP matrix at the weight rate 10 to 30%. MAPP coupling agents have been successfully used in application as a coupling agent for various fillers. It is observed that the mechanical properties, particularly the strength of the composites are increased when MAPP is added to the system. This is because of the improved surface interaction of filler and polymer in the presence of coupling agents and the transfer of stress from one phase to the other.

The tensile and flexural strength of the glass fiber reinforced composite increased up to 30% fiber content but BRH and BRHA composite's strength decreased by filler content. The tensile and flexural modulus of composites increased with filler content. Increase rate of modulus was occurred in composite of PPGF, PPBRHA and PPBRH, respectively. BRH (10% wt) reinforced PP composite had the maximum impact energy value. Energy value decreased with filler content. The highest water absorption values were obtained in PP composites reinforced by BRH, BRHA and the lowest in glass fiber reinforced composite. Water absorption increased with the increased filler content in BRH and BRHA reinforced composites.

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COMPUTERIZED ASSESSMENT OF THE ANNUAL GRADE POINTS OF SECONDARY SCHOOL SEVENTH GRADE STUDENTS IN THE COURSE OF ALGEBRA

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Development of a computerized assessment program of the annual grade points of secondary school 7th grade students at Azerbaijan in the course of algebra was considered within the scope of this study. This computer program was developed in order to prevent the occurrence of iniquities during the calculation of year-end grade point averages of all students of all grades. The program was written in the programming language of Microsoft Visual Basic 6.0. The questions presented to students by this computer program were selected from their Algebra 7 textbook which they had used along the year. By this computer program, questions from among the questions of algebra course -that would determine the knowledge level of 7th grade students- were selected and they were asked to students again within the program, and the annual grade point averages of students could be clearly calculated by high precision as per the provided answers.

Keywords: computer program, algebra, education, student.

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CONSTRUCTION AND ANALYTICAL APPLICATIONS OF THREE DIFFERENT PVC MEMBRANE PH ELECTRODES

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The pH measurements in industry, clinical processes, and environmental monitoring are generally carried out by the use of glass electrodes. Although pH-sensitive glass electrode has distinguished response characteristics and has been in use for such a long period it has certain setbacks such as its high resistance, fragility, its instability in hydrofluoric acid or fluoride solutions and its unsuitability to serve as microelectrode for biological applications. Therefore, it is a promising area of interest to construct new PVC membrane pH electrodes based on macrocyclic compounds. For this purpose, three different pH electrodes were developed with various membrane combinations. Electrode I, II, and III were found to work in wide pH ranges 1.9 – 12.7; 1.7 – 9.5; and 1.9 – 12.4. The response time, lifetime and the selectivity of the electrodes were investigated. They were successfully employed for the determination of pH and acidity in real samples and in HF medium.

Keywords: PVC membrane pH electrodes, titratable acidity, potentiometry

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CONTRIBUTION OF PRESCHOOL EDUCATION TO SOCIAL CAPITAL GAINS

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Ministry of Education

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ABSTRACT

Though it is obvious that the achieved high technology and globalizations facilitates human lives today, we live on a world where individuals composing society live away from each other and socialization. It is possible to say that the social order is prone to deteriorate because lives are detached from one another in every aspect; social relationships are experienced through technology without emotions and because individuals cannot reach social capital due to these factors. Lack of social capital ,which realizes interaction among human beings and includes terms like mutual trust, communication, economic and social expectations, poses an important role on the hierarchy of needs as well.

Education, the most crucial factor of social success and development , acts as the most effective key to solve this situation. People socializing in this individual active process and in class dynamics composed through rules that are created considering physical and economic conditions become active individuals who can communicate effectively and are compatible, creative, productive and self-confident. This situation can be solved fundamentally and effectively through preschool education designed to bring up individuals with adequate social capital, for the most critical period of an individual's behavioral development is preschool period.

Keywords: Socialization, Education, Preschool, Social Capital

1. INTRODUCTION

Many changes are being experienced in both economical and social and technological fields in our country as in the whole world. Depending upon development feature, the children coming of individualism and entering into the process of socialization, cannot share an active and social environment within home environment with their parents living as addicted especially to technology. This situation shows the reflections on lives of children who are mirrors of their families in a sad picture as a social problem of today. The parents who are aware of this situation support their children to socialize by sending them Pre-School Educational Institutions where the children from the same age group can communicate with each other as of an early age. When examining Pre-School Educational Institutions whose primary purpose is socialism of children, it is seen that the purposes of these institutions and the purposes of Social Capital are considerably similar and social capital acquisition of children who took education in these Pre-School Educational Institutions are in a size that cannot be ignored.

2. SOCIAL CAPITAL CONCEPT

Human being is born, lives, dies with its basic needs and these needs are always available until it dies. At the same time, its continues this life within a social network. When we think about individual and social life of human being, hierarchy of needs ranged in stages confronts us. Human being whose needs are covered within this hierarchy, grows as an active individual who can establish positive social relations and have positive effects for its circle.

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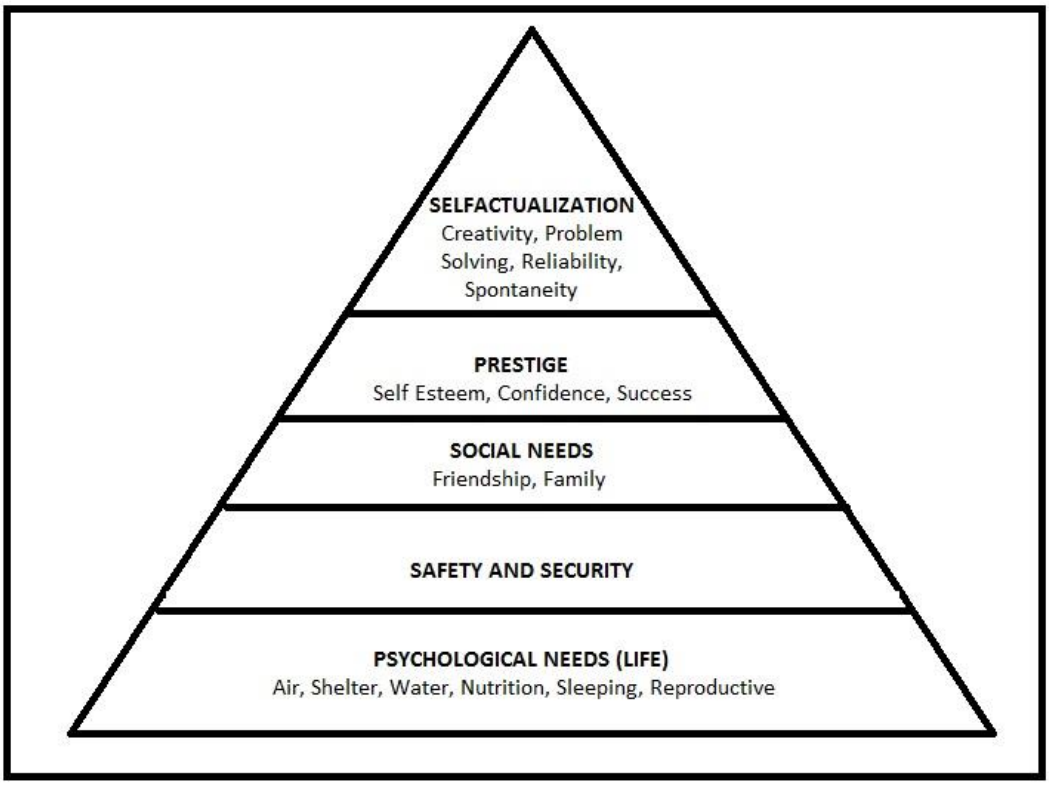
Table-1 Maslow's Hierarchy Pyramid of Needs



Source: (Ünver and Yamaçlı, 2014)

As it is seen in table; vital needs such as air, housing, water, feeding take part in the first step of hierarchy of needs. The person whose these needs are covered then tends to security and safety needs partaking in the second step and wants to cover these. In fact, we can observe that social capital begins to form as of the third step. The person whose vital and safety needs are covered, then covers its social needs. After this stage, respect and self-actualization, namely individual factors appear. Thus, the person who actualizes oneself will reach to a high level of social capital.

There are very different social capital concepts. The most important reason of it is that those who are coming from different disciplines use the social capital concept depending upon different purposes. However, there is an agreement about the emphasis laid on the function of civil norms such as social networks/participant to formal and informal voluntary organizations, understanding, trust, tolerance (Duman and Alacahan, 2011)

If we make a general definition; social capital is the rules, values, attitudes and relation networks which are regulating and managing the relations between people and contributing to economical and social development (Şahin and Ada, 2013)

3. THE DEVELOPMENT OF SOCIAL CAPITAL CONCEPT

The idea of social capital has been entreated for a long time in Europe with the purpose of providing social togetherness in basis and providing economical development in private. The idea of that social relations can be profitable and contributions can be made to these social relations for this purpose, takes part in the basis of this. In this respect, the concept of human capital has appeared in industry for the first time in 1930s, as the thought of preparing a more productive environment by protecting potential conflicts within business (Yarcı, 2011).

The first known usage of "Social capital" concept belongs to Lyda Judsen Hanifan. American reformist, educator Hanifan, developed the concept of social capital in his study named "The Rural School Community Center" performed in 1916, so as to call attention to occurence of a set of goodwill, friendship, sympathy and social relations established in relation to daily lives of people between individuals and families remaining out of economical dimension of capital but contributing to it and creating the social integrity. The concept had not come across for a long time after the first usage in Hanifan's study dated 1916. Second occurence of the concept has come across exactly forthy years later

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in 1956 in J. Seeley, A. Sim and E. Loosely's study named "Crestwood Heights: A Study of the Culture of Suburban Life" in which they mentioned the important of social capital in raising of their chief magistrate. (Şan and Şimsek, 2011)

Indeed, while the concepts discussed within the framework of social capital concept have newly come to light; the new one for today's social capital discussions is to comprehend how importance the social capital is for functionality of social life and to conceptualize within this frame (Yarcı, 2011).

4. SOCIAL CAPITAL FORMATION AND PRE-SCHOOL EDUCATION

Educational organizations are people-intensive organizations. In a word, they are organizations in which educational outputs occur as a result of interaction of people. In educational organizations, cognitive activities are mainly conducted differently from business organizations. This situation emphasizes the human factor and increases more the importance of social capital. Even if a lot of variables such as student features, environment conditions, socio-economical states of students, the number of people in family are considered, these cannot explain the differences of success between schools efficiently. (Şahin and Ada, 2013)

We can handle the social capital formation via two different frames. First one of them is social capital acquisition obtained by person from familial and environmental factors; second one is social capital acquisition obtained by person from school education. In relation to family, the factors affecting the social capital acquisition of person are; financial status namely income level of family that the person belongs to, educational status of parents. Apart from these two important factors, some factors such as intra-family communication, the structure of family, the position of family in society are important for social capital formation of person. School period is the period where social capital formation of person gains acceleration and may be person obtains the most important and most basic acquisition throughout its life.

Child interacts with the group via the pre-school education which is the first step that the child meets with the school and socializes in direction of this group's rules. This interaction that the child enters in the early period will create a permanent experience in child's life. In our country, the purposes of pre-school education in Regulation on Pre-School Education Institutions formed depending upon the application of national education, are ranged as follows;

- Providing children to gain body, mind and emotion development and good habits,
- Providing children to speak correctly and well, and therefore providing to express themselves in a more efficient way,
- Bringing children in some emotions such as love, respect, responsibility, tolerance, cooperation, solidarity and sharing,
- Bringing children in attitudes to be able to describe their imaginations, creative and critical thinking skills, communication and emotions

.

In direction of these principles, the children coming from different sociocultural and different socioeconomical structures meet with each other, they experience an effective process between each other with the rules created by considering physical structure and values of the class under the pre-school teacher's guidance.

This interaction bears a considerable resemblance to social capital. When social capital is examined, there are three compounds in direction of the general definition.

- Social networks; who knows who,
- Social norms; formal and informal rules determining how the network members act each other,
- Sanctions; the processes that will provide members to comply with the rules (Kenar, 2004).

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SOCIAL NETWORKS (NETWORK; WHO KNOWS WHO)	The children coming to pre-school educational institutions, know each other via entertaining activities. After then, it is measured whether they know their friends or not. Children are informed about different features of their friends in group and it is provided they interiorize these and are guided to act more sensitively about them. In this way, a strong base is prepared for a successful intragroup interaction.
SOCIAL NORMS (FORMAL AND INFORMAL RULES DETERMINING HOW THE NETWORK MEMBERS ACT EACH OTHER)	It is provided that children study within the studies performed under the teacher's guidance in class environment created by considering physical features of group and class without entering each other's application area and restricting each other's application and at the same time coordinately. So as to create and sustain such an efficient learning environment; intraclass rules are created together with the children and it is guided the children to comply with these rules and create a positive and permanent group dynamic.
SANCTIONS (THE PROCESSES THAT WILL PROVIDE MEMBERS TO COMPLY WITH THE RULES)	Physical environment of the class is designed by considering the rules created together with the children. These rules agreed upon orally are symbolized and exhibited visually in the class; it is guided group and individual attitudes to be actualized in frame of created norms. In activities performed during the day, it is provided an appropriate flow for the planning by effectively applying the rules created to protect the class order.

As it is understood from the table, social capital compounds bear a considerable resemblance to pre-school educational applications. The social capital that the person has throughout its life begins as of the moment of person's birth and these acquisition continues along its life. The part of pre-school education in this process is large that cannot be ignored. In this period, the person begins to meet with society and social rules, and increases the size and diversity of its acquisition by taking an active role within society. The experiences which is the most important factor of social capital, obtained by the person in pre-school educational institutions; are quite important because of creating a base for the experiences to be obtained throughout the life.

5. RESULT

Life is a whole of complex networks connected to each other. Socialization is a concept in the world which is continuously changing and developing in all fields, sometimes looses its importance and sometimes does not loose its importance in spite of many concepts whose importances increase. Its importance is high especially for people. The individual entering into a social environment as of its birth, will be in this environment until the end of its life. The individual is born with a lot of needs; physiological needs, safety and security needs, social needs, reputation need and self-actualization need. Social factors come into prominence in the needs after the physiological and basic trust needs are covered; and as long as these needs are covered, social acquisition of individual and accordingly social capital increase. Because the strongest bases are established of social capital whose importance level is so high and the biggest acquisition are gained in pre-school educational institutions; staff of these institutions have to have the awareness of creating a social capital and knowledge about the matter in depth. So as to provide this; it is necessary to do researches about social capital in higher educational institutions where the teachers are trained in the role of being educator taking charge in pre-school education, and provide them to have the necessary equipment by increasing teacher candidates' information levels about this matter in both theoretically and practically.

It should not be forgotten that the individuals comprising a socially strong society must have an efficient social capital. Awareness levels should be high of teachers working in pre-school education where the bases of social capital acquisition are established and they have to guide the individuals by

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considering this acquisition in their studies. In these institutions where the most efficient bases of social capital are established, teachers should extend their working area by being aware of this responsibility.

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MİLLÎ EĞİTİM BAKANLIĞI Okul Öncesi Eğitim Ve İlköğretim Kurumları Yönetmeliği

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CRITICAL SUCCESS FACTORS IN INFORMATION TECHNOLOGY PROJECTS

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Abstract: Budget and time limits are exceeded in Information Technologies Projects which results in being unable to complete them at the desired level or being completely unsuccessful. To prevent these failures and complete the project in the planned way, some definitions were made such as critical success factors. This is a review study which analyzes the research that identifies critical success factors in information technologies project management. These studies were evaluated under two categories consisting of theoretical and experimental. When Critical Success Factors obtained as a result of the study are conducted in information technologies projects, they increase the achievement possibility of these projects and prevent companies and countries from wasting millions of dollars.

Keywords: Information Technologies, Critical Success Factors, Project Management

BİLİŞİM TEKNOLOJİLERİ PROJELERİNDE KRİTİK BAŞARI FAKTÖRLERİ

Öz: Bilişim Teknolojileri Projelerinde bütçe ve süre sınırları aşılarak proje istenen seviyede gerçekleştirilememekte ya da tamamen başarısızlıkla sonuçlanabilmektedir. Bu başarısızlıkların önüne geçebilmek ve projeyi istenilen anlamda tamamlayabilmek için kritik başarı faktörleri gibi bazı tanımlamalar geliştirilmiştir. Bu çalışma bir derleme çalışması olup bilişim teknoloji projelerinde kritik başarı faktörlerini belirleyen çalışmaları ortaya koymaktadır. Yapılan çalışmalar teorik ve deneysel olmak üzere iki kategori altında değerlendirilmiştir. Çalışmalar sonucunda elde edilen Kritik Başarı Faktörleri bilişim teknoloji projelerinde uygulandığında projelerin başarıya ulaşma olasılığının artarak şirketlerin ve ülkelerin milyonlarca dolar kaybetmesinin önüne geçilebilecektir.

Anahtar Kelimeler: Bilişim Teknolojileri, Kritik Başarı Faktörleri, Proje Yönetimi

Giriş

Günlük hayatımızı etkileyen etkenlerden biri haline gelen bilişim teknolojileri, bilginin toplanması, saklanması, işlenmesi, iletilmesi gibi faaliyetleri yürütmemize olanak sağlamaktadır. İşletmeler bilişim teknolojilerini iş süreçlerini hızlandırmada, verilerini kayıt altına alarak ileriye yönelik karar almada, maliyetleri düşürmede ve performansı artırmada aktif olarak kullanmaktadır. Rekabetin üst düzeyde yaşandığı ticari hayatta, işletmeler yeni ürün geliştirme, ürünü piyasa da tutundurma ve sürekliliğini sağlama gibi işlemleri bilişim teknolojilerinin sağladığı esnek hareket edebilme özelliğini kullanarak gerçekleştirmektedirler. İfade edilen bu özelliklerden dolayı bilişim teknolojileri organizasyonların vazgeçilmez bir unsuru haline geldiği gibi üretilen projelerin nerede ise tamamı bilişim teknolojileri ile temas etmektedir.

Uluslararası Standish Grup tarafından yayınlanan CHAOS raporlarını analiz ettiğimizde bilişim teknolojilerinin projelerde uygulanması ile projelerde elde edilen başarı oranlarının 1994-2009 arasında her geçen yıl azda olsa arttığı görülmektedir. 1994 verilerine göre üretilen projelerin yalnızca %16,2'sinin istenilen seviyede tamamlandığı,

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%31,1'inin tamamlanmadan projeden vazgeçildiği bildirilmektedir. Ayrıca projelerin %52,7'sininde tahmin edilen maliyetin ve sürenin aşılarak tamamlandığı ifade edilirken, 2009 verilerinde ise başarılı proje oranı %32, Vazgeçilen proje oranı %44 ve başarısızlıkla sonuçlanan proje oranı ise %24'lerde olduğu belirtilmektedir. 2015 yılı verilerine bakıldığında ise 2010'dan itibaren başarılı olan proje oranlarında biraz düşüş yaşarken vazgeçilen proje oranlarında bir artış olmuştur. Buna göre 2015 yılında projelerin %29'unun başarılı olduğu, %52'sinden vazgeçildiği ve %19'unun ise başarısızlık ile sonuçlandığı rapor edilmektedir.

Aynı konu üzerine Gartner Institute'un yapmış olduğu araştırmada bilişim teknolojileri projelerinin %74'ünün başarısız olduğu ya da maliyet/zaman hedeflerini aştığı, %51'nin bütçelerini %200'lere varan oranda aştığı ve ürün olarak ortaya çıkan sonuçların beklentileri %75 oranın da karşılayabildiği rapor edilmiştir (TBD, 2008).

International Data Corporation (IDC) tarafından bilişim teknoloji projelerinin başarısızlık sebepleri üzerine yaptığı araştırmada ise %32 ile Proje Yönetimi Becerilerinin Yetersizliği, %20 ile İletişim Sorunları, %17 ile Doğru tanımlanmamış hedefler, %17 Kapsama Yabancılık ve %14 ile Yeni Teknolojiye Uyum Sorunu bilişim projelerinin başarısızlık sebepleri olarak sıralanmaktadır. Başarısızlık ile sonuçlanan projelerin 2004 yılı öncesinde global ekonomiye yıllık zararı yaklaşık 1 milyar dolar civarındadır (Xia & Lee, 2004). Standish Group 'un 2014 verilerine göre ise sadece Amerika Birleşik Devletlerinde bilişim teknolojileri temelli yıllık projelerde 250 milyar doların üzerinde bir harcama yapılmaktadır.

Projelerde yaşanan bu sıkıntıların temelinde planlama ve kontrol mekanizmalarının etkin bir şekilde yapılamaması gelmektedir. Bu süreçlerin proje paydaşları ile beraber etkin bir şekilde yönetilmesi işlemi proje yönetimi ile sağlanmaktadır (Alıç ve Durdu, 2015). Proje yönetiminde CMMI, PRINCE ve SPICE gibi yol gösterici nitelikte olan metodolojiler kullanılmaktadır. Burada ki amaç projenin planlanmasını, programlanmasını ve kontrolünü sağlamaktır.

Proje Yönetimi

Küresel ilerlemenin temeli haline gelen projeler, kurulmuş ve tanımlanmış bir hedefe ulaşmak için belirli bir zaman süresi içinde sürdürülen faaliyetler bütünüdür (Kerzner, 2006). Proje Yönetim Enstitüsünün tanımına göre proje, "özgün bir ürün, hizmet ya da sonuç yaratmak için yürütülen geçici bir girişimdir" (PMI, 2013). Proje tanımlarını genel bir çerçeveye oturtacak olursak proje, sıradan olmayan orijinal ve bir defaya mahsus belirli zaman, kaynak, bütçe ve performans ile sınırlı çabalar bütünüdür denilebilir.

Bir projeden söz edebilmemiz için proje fikrinin bir yaklaşımının, amacının, içeriğinin, yürütücüsünün, sorumlusunun, süresinin, faaliyetlerinin, planının, kaynağının, bütçesinin ve değerlendirmesinin olması ve çalışmalar haline getirilmesi gerekmektedir. Üretilen proje büyük, küçük veya karmaşık olursa olsun mutlaka bünyesinde amacı, zamanı, özgünlüğü ve kaynağı barındırmalıdır.

Üretilen projelerin başarıya ulaşabilmesi için projeyi oluşturan etkenlerin sistematik bir şekilde planlamasının yapılması gerekmektedir. Planlanma ise proje yönetimi anlayışı ile gerçekleştirilmektedir. Proje yönetimi, varılmak istenen hedefe doğru giderken kullanılan beşeri ve maddi kaynakların planlanması, örgütlenmesi, yürütülmesi ve denetlenmesi çalışmalarıdır (Kutlu, 2001). Proje yönetimi, tanımlanan işi en kısa zamanda, en düşük maliyette ve hedeflenen kalitede gerçekleştirmek demektir.

Proje Yönetiminin temel basamakları;

- Projenin tanımlanması
- Çözüm yöntem(ler)inin saptanması
- Çözümün uygulanması
- Projenin kontrolü

şeklinde ifade edilmektedir. Project Management Institute (PMI) kuruluşu ise proje yönetimini altı temel bölüme ayırmıştır ve bunları ağırlıklandırmıştır. Buna göre; (Project Management Institute, 2013)

- Projenin Başlatılması - %8,5
- Projenin Planlanması- %23,5
- Projenin Uygulanması - %23,5
- Projenin Kontrolü - %23
- Projenin Kapatılması- %7
- Profesyonel Sorumluluklar- %14,5

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Bilişim teknolojilerinin uygulandığı projelerde nokta hedefler ile gerçekleştirilenler arasında uyumun denetlenmesinde en önemli adımlar uygulama ve kontrol adımlarıdır.

Lewis (1995) ise proje yönetim sistemini yedi adımdan oluşturmaktadır. Bu adımlardan herhangi birisinde olumsuzluğun olması durumunda bütün projeyi olumsuz etkileneceğini ifade etmektedir.



Şekil 1. Proje Yönetim Sistemi

Şekil 1'de belirtilen şekilde en önemli basamak insan basamağı olmakla birlikte bütün sistem denetleme basamağı üzerine odaklanmaktadır.

Proje Yönetiminin Tarihçesi

Aşağıdaki açıklamaların ortaya koyacağı gibi, proje yönetiminin geçmişi çok da eskiye dayanmamaktadır. Bununla birlikte bazı çevreler Mısır'ın sulama kanalları ve piramitleri, Çin Seddi, Babil'in Asma Bahçeleri'nin önemli birer proje olduğu görüşündedir. Ancak bu yapıtlarla ilgili proje bilgilerinin korunmamış olmaları nedeniyle "Proje Yönetimi" nin bir disiplin olarak ne zaman ortaya çıktığı konusunda kesin ifadeler söylenememektedir.

Proje yönetimi ile ilgili ilk bilimsel çalışma Frederick Taylor (1856-1915) tarafından 1900'lerin başında başlatılmıştır. Bilimsel olarak yönetim tekniklerinin analiz edilebileceğini ve geliştirilebileceğini göstermiştir. Proje izleme ve değerlendirme yöntemlerinden olan PERT (Program Evaluation and Review Techniques) ve CPM (Critical Path Method) in esasını oluşturan "Gantt Şemaları (grafikleri, çizelgeleri)" nı geliştiren Henry L. Gant (1917) bilimsel yöntem akımının ilklerindendir. Bu yöntemler sayesinde projelerin gidişatlarının izlenmesi kolaylaşmış, "zaman (süre)" daha iyi yönetilmeye başlanmıştır. Kökeninin 1900'lü yıllarının başına kadar gittiği görülmekle birlikte proje yönetiminin 1941 yılında tasarlanan Atom bombasının geliştirildiği Manhattan Projesi ile başladığı kabul edilmektedir. ABD'nin dünyayı hâkimiyetinin altında yatan nedenlerden biri, kritik zamanlarda kritik projelerde başarılı olmasıdır. Proje yönetiminin bugünkü modern formunu almaya başlaması ise daha yenidir.

Türkiye'de proje yönetiminin tarihi 1960'larda inşaat sektörü ile başlamıştır. Savunma sanayinde yaşanan ilerlemeler proje yönetimini kaçınılmaz hale getirmiştir. Bilişim Sektöründe ise inşaat sektörü ile aynı yıllarda proje yönetimi uygulanmaya başlanmıştır.

Proje Yönetiminin Yaygınlaşmasının Nedenleri

Proje yönetiminin son yıllarda yaygınlaşmasının nedenlerinden bazıları aşağıda sıralanmıştır (Duman, 2009).

- İşletmelerde insan kaynağının azalmasına rağmen ortaya konulan işlerin niteliğinde ve kalitesinde artışın sağlanması,
- Projelerin daha kapsamlı olması,
- Küreselleşme kaynaklı gelişen rekabet ortamı,
- İletişimin kolaylaşması,
- Müşterilerin etkisinin artması,
- Çok uluslu işletmelerin ve işlemlerin gelişmesi ile merkezden yönetim isteğinin artması,

Proje Yönetiminde Başarı

- Kurumsal strateji ile uyumlu bir proje yönetim metodolojisinin uygulanmasına
- Bu metodolojiyi uygulayacak beceriye sahip proje yöneticisine
- Proje yönetim felsefesine yatkın organizasyonel yapıya doğrudan bağlıdır.

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Projelerin başarılı olmasını sağlayan etmenler incelendiğinde projelerde başarısızlık nedenleri kendiliğinden ortaya çıktığı görülmektedir.

- Kötü tanımlanan hedefler ve ihtiyaçlar
- Proje yönetim metodolojisinin uygulanmayışı veya kötü uygulanması
- Kültürel farklılıklar
- Yönetimin proje ekibini desteklememesi
- Planlama sürecinde yetersizlik, etkisizlik
- Risk yönetimi yapılmaması ya da eksikliği
- Değişiklik yönetimi yapılmaması ya da eksikliği
- Proje yöneticisinin yetersizliği

Projenin Başarısına Etki Eden Faktörler

Proje yönetiminde kaynak kullanımı, bütçeleme, çizelgeleme, iletişim ve problemlerin çözüm önerilerini ilgilendiren kararlar verilecektir. Stratejik amaçlar ve hedefler belirlenerek proje yöneticisi öncelikli olarak kritik işlerin üzerine odaklanır. Kritik olan işlemlerin hangisi veya hangileri olduğu projenin basamaklarına göre değişecektir.

Projenin başarısına etki eden faktörler üzerine birçok çalışma yapılmış olup bu çalışmalardan biride Pinto ve Slevin(1987)'in proje başarısına etki eden faktörleri belirlediği çalışmadır. Çalışmada proje başarı faktörleri 10 madde de sıralamıştır;

1. **Proje amaç ve hedefleri**: Projelerde belirlenen amaçlara ulaşabilmek için hedeflerin ve hedefleri değerlendirmede kullanılan performans kriterlerinin iyi tanımlanmış olması gerekmektedir. Ayrıca proje amaç ve hedefleri misyonu iyi yansıtmalıdır.
2. **Üst Yönetimin Desteği**: Proje süreci içerisin de iç ve dış paydaşların projeyi sahiplenebilmesi için üst yönetimin kuvvetli bir irade göstermesi gerekmektedir. Üst yönetimin desteği proje içinde oluşabilecek belirsizlikleri ve tıkanıkları aşmada önemli etkenlerden birisi olacaktır. Proje yönetimi ile üst yönetimin ahenk içerisinde çalışması projenin başarısını üst seviyelere doğru çıkaracaktır.
3. **Proje Planlaması**: Projenin belirlenen amaç veya amaçlara ulaşabilmesi hedeflere ve performans kriterlerine bağlıdır. Hedeflerin ve performans kriterlerinin işletilmesi planlamanın iyi yapılması ile doğrudan ilgilidir. Bundan dolayı proje başarısını etkileyen faktörlerden en önemlilerinden biriside planlamanın iyi yapılmasına bağlıdır.
4. **Müşteriye Danışma**: Projenin başarıya ulaşıp ulaşmadığının değerlendirecek asıl kişiler projenin faydalanıcısı olan müşterilerdir. Müşterilerin reaksiyonları projenin başarılı olup olmadığının en önemli göstergeleridir. Bundan dolayı müşterilerin istekleri projenin planlama aşamasında amaç ve hedeflerin belirlenmesinde mutlaka değerlendirmeye alınmalıdır. Proje sürecinde ve sonraki revizyonlarda mutlaka müşteriye danışılmalı böylelikle oluşabilecek hatalar minimize edilmeli proje başarısı artırılmalıdır.
5. **Personel ile ilgili konular**: Proje başarısının etkileyen bir diğer faktör ise proje personelinin diğer paydaşlar ile ilişkisidir. Proje personelinin müşteri, şirket içi ve dışı paydaşlar gibi personeller ile ilişkileri iyi organize edilmediğinde ise proje sürecinde motivasyonu aşağılara çekecek ve belirlenen amaç ve hedeflerden sapılarak projenin başarısına olumsuz katkı sağlayacaktır.
6. **Teknik Konular**: Proje içerisinde yer alan personelin yetenekleri doğrultusunda görevlendirilmeleri proje yöneticisinin sorumluluğundadır. Her türlü teknik konuda yaşanabilecek problem veya problemler projenin başarısını etkileyerek olumsuzluklara sebep olabilir.
7. **Müşteri Kabulü**: Projenin başarısının sağlanması asıl değerlendirici olan müşterinin projeyi kabul etme oranına bağlıdır. Müşterinin projeyi kabullenmesi proje süreci içeresinde devamlı olarak müşterinin görüşlerini almak ile doğrudan ilişkilidir.
8. **Proje Kontrolü**: Proje sürecinin değerlendirilmesinde sürekli bilgi akışının önemi yadsınamaz bir gerçekliktir. Geri bildirim olarak ifade edilen projenin sürekli değerlendirilmesi projeyi tehlikeye atacak ya da başarısızlıklara sebep olacak sorunların erken tespit edilmesini sağlamada önemli bir faktördür. Projede ve hedeflerde elde edilen geri bildirimler sonucunda değişiklikler yapılabilir ve böylelikle projenin başarıya ulaşmasında önemli adımlar atılmış olabilir.
9. **İletişim**: Projenin bütün aşamalarında ve katılanlar arasında uyum ve bilgi akışının olması gerekmektedir. Proje çalışmalarında hiyerarşik yapı iyi tanımlanmış ise çalışanlar ve müşteriler arasındaki iletişim daha problemsiz olabilir. Projede kullanılacak iletişim kanalları önceden belirlenmeli ve problem karşısında da alternatif iletişim kanallarını tercih edilmelidir.
10. **Problem giderme**: Projede oluşturulacak olan kontrol paneli ile problem alanlarının tespiti daha kolay olacaktır. Problem teşhisi ve hangi aşamada olduğu ile alakalı tespitler yapılmalıdır. Her türlü sorun ve problem karşısında alternatif planlar yapılmalı ve çözümü için hazırlanan planlar devreye sokulmalıdır, bu şekilde problemlerin çözümü için optimum tasarruf sağlanabilir.

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Proje başarı faktörlerinin belirlenmesinde yapılan çalışmalar teorik ve uygulama(deneysel) çalışmaları olmak üzere iki ana başlık da toplanabilir. Tablo 1'de her iki ana başlık da yer alan çalışmalar ve belirlenen kritik başarı faktörleri bulunmaktadır.

Tablo 1. Teorik ve Deneysel Çalışmalarda Proje Faktörleri

Çalışma Tipi	Çalışmacılar	Belirlenen Faktörler
Teorik Çalışmalar (Anket Çalışmaları)	Chow & Cao (2008)	Yetkili Proje Yöneticisi Net Proje Hedefleri Proje Takvimi ve Kontrol Proje Ekibi ve İnsan Kaynakları Yönetimi Üst Yönetimden Destek ve Yetki İletişim Proje Kontrolü Kullanıcı Katılımı
	Berntsson-Svensson & Aurum (2006)	
	White & Fortune (2002)	
	Loo (2002)	
	Martin (1996)	
	Sayles ve Chandler (1993)	
	Cleland ve King (1988)	
	Schutz, Slevin ve Pinto (1987)	
	Locke (1984)	
Deneysel Çalışmalar	Chua (2009)	Projenin Tanımlanması Projenin Amacı Proje Takım Üyeleri Proje Yürütücüsü Proje planı/takvimi Teknik Görevler Müşterilerin Katılımı Proje Kontrol Proje Organizasyonu
	Bradley (2008)	
	Nelson (2007)	
	Andersen ve Jessen (2003)	
	Pinto ve Slevin (1987)	
	Morris ve Hough (1987)	
	Belassi ve Tukel (1996)	
	Baker, Murphy ve Fisher (1983)	

Kaynak: Zhai Li, Hu Ri-xin, Xu Jian. (2005) Empirical Analysis of Critical Success Factors in Chinese IS/IT Projects[J], Science & Technology Review.

10 madde halinde sıralanan proje başarı faktörleri Sayles ve Chandler'in (1993) yapmış olduğu çalışmada 6 madde, Cleland ve King'in (1988) yapmış olduğu çalışmada 12 madde ve Baker, Murphy ve Fisher'de (1983) ise 9 madde şeklinde sıralanmıştır (Çimen, 1994).

Standish Group'un 2014 yılında yayınladığı rapora göre ise projelerin başarı faktörleri ve başarıya etki dereceleri Tablo 2'de gösterilmiştir.

Tablo 2. Proje Başarı Faktörleri

Proje Başarı Faktörleri	Etki yüzdesi (%)
Kullanıcı tutumu	% 15,9
Üst Yönetim desteği	%13,9
Gereksinimlerin net açıklanması	%13,0
Uygun Planlama	%9,6
Gerçekçi Beklentiler	%8,2
Kilometre (Milestone) taşları	%7,7
Yetkili Personel	%7,2
Mülkiyet	%5,3
Amaç ve Hedefler	%2,9
Personel odaklı sıkı çalışma	%2,4
Diğer	%13,9

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Bilişim Teknolojileri Projelerinde Kritik Başarı Faktörleri

Bilişim teknolojileri projelerinin başarısını artırmak için oluşturulan faktörlere başarı faktörleri denilmektedir (Olson, D.L., 2000). Başarı faktörleri uygulanan projenin türüne göre farklılık gösterebilmektedir. Farklılıklar olsa da projelerde üst yönetimin desteği ve tanımlanan hedef faktörler önemli olarak değerlendirilmektedir.

Kritik başarı faktörleri ve başarı kriterleri birbirinden farklı kavramlar olarak karşımıza çıkmaktadırlar. Başarı kriterleri projenin başarılı ya da başarısız olduğunun değerlendirmesinde kullanılırken başarı faktörleri, projeyi başarıya götüren girdiler olarak tanımlanmaktadır (Davies, 2002). Projelerde başarı kriterleri projenin büyüklüğüne, türüne ve özelliklerine göre farklılık gösterebilmektedir (Westerweld, E., 2003).

Başarılı bir bilişim projesi istenilen nitelikte, istenilen zamanda ve hedeflenen maliyette projenin tamamlanarak beklenilen etkinin oluşturulması ile ortaya çıkar. Bütçe, zaman ve nitelik bilişim projelerinde yer alan üç önemli kavramdır. Bu kavramlarda birbirleri ile sıkı ilişki içerisindedirler. Bunlardan her hangi birinde meydana gelebilecek problem diğerlerini de etkileyecek ve proje olumsuz olacaktır. İstenmeyen bu durumun önüne geçebilmek adına projenin yönetimi önem kazanmaktadır. Proje Yönetim Enstitüsü (PMI) projenin iyi bir şekilde yönetilebilmesi için bir projeyi Zaman, Kapsam, Entegrasyon, Maliyet, Tedarik, Risk, İletişim, İnsan Kaynakları ve Kalite olmak üzere dokuz bilgi alanına ayırmıştır (Milliyet, 2014).

Imtiaz vd. (2013) yapmış olduğu çalışmada 1999-2012 yılları arasında Bilişim Teknoloji Projelerinde kritik başarı faktörlerini konu alan çalışmaların analizini gerçekleştirmişlerdir. Analizler sonucunda kritik başarı faktörü olarak 15 faktör belirlenmiştir. Imtiaz'ın yapmış olduğu çalışma ile araştırmacıların yapmış olduğu çalışmalar birleştirilip Tablo 3'de gösterilmiştir.

Tablo 3. Kritik Başarı Faktörleri ve Yapılan Çalışmalar

Faktörler	Sudhakar (2012)	McLeod ve McDonell (2011)	Fan (2010)	Ding ve Wang (2008)	Biehl (2007)	Chow ve Cao (2008)	Lee ve Kim (2007)	Fortune ve White (2006)	Salmeron (2005)	Jones (2004)	Poon ve Wagner (2001)	Reel (1999)	**Etki Derecesi**
Üst Yönetim Desteği	+	+	+		+		+	+	+	+	+		Güçlü
Liderlik	+	+	+		+			+					Güçlü
Takım Çalışması	+	+	+		+	+							Orta
Hedefler	+	+	+	+	+	+		+		+	+		Güçlü
Takım Yeteneği	+	+	+		+	+		+	+		+		Güçlü
Bütçe/Finansal Destek	+				+			+		+			Orta
Etkili İletişim	+	+	+	+	+			+					Güçlü
Süreç Kalitesi	+									+		+	Zayıf
Eğitim		+			+			+					Orta
Proje Süreci Takvimi	+					+				+		+	Zayıf
Müşteri/Kullanıcı Katılımı	+	+	+			+	+	+	+		+		Güçlü
Risk Yönetimi			+	+				+					Orta
Etkili İzleme ve Kontrol	+		+	+		+		+		+			Orta
Yeterli Gereksinim		+	+	+					+		+		Güçlü
Doğru Takım Seçimi	+		+									+	Orta
Faktör Sayısı	**12**	**9**	**11**	**5**	**8**	**6**	**2**	**10**	**4**	**6**	**5**	**3**	

Bilişim Teknolojileri projelerinin kritik başarı faktörlerinin belirlenmesinde farklı çalışmalar yapılmıştır. Çalışmalarda 3 ile 12 faktörden oluşan faktörler belirlenmiştir. Faktörlerin proje başarısına etkilerine bakıldığında 7

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faktörün Güçlü oranda başarıya etki ettiği, 6 faktörün ise Orta düzeyde etki ettiği ve 2 faktörün ise Zayıf oranda etki ettiği tespit edilmiştir.

Sonuç

Projenin başarıya ulaşması projeyi hazırlayan ve uygulayan kişilerin en öncelikli hedefidir. Fakat gerçek hayatta yapılan her proje tam istenilen boyutta başarıya ulaşamamaktadır. Bu başarısızlık maliyet ve zaman kaybını doğurmaktadır. Araştırmacılar bu oluşan kayıpların önüne geçmek ve projelerin başarı oranlarını artırmak için çeşitli çalışmalar yürüterek standartlar geliştirmişlerdir. Yapılan araştırmalar ve ortaya konulan çalışmalar bilişim teknoloji projelerinin başarıya ulaşması için ilk olarak proje yönetiminde bir standartlaşmanın olması gerektiğini ortaya koymaktadır. Standartlaşma proje yönetimini daha kolay hale getirerek oluşabilecek riskleri düşürmektedir.

Bilişim projelerinin başarısızlık sebeplerine bakıldığında büyük bir çoğunluğunun Proje Yönetimi Becerilerinin Yetersizliğinden kaynaklandığı, sırası ile İletişim Sorunları, Doğru tanımlanmamış hedefler, Kapsama Yabancılık ve Yeni Teknolojiye Uyum Sorunu gibi problemlerin geldiği belirtilmektedir.

Başarılı bir bilişim teknoloji proje çıktısı için ilk önce yönetimin bu projeye inanması ve projenin arkasında durması gerekmektedir. Bu davranış projeyi yürüten uzmanların elini güçlendirirken bazı sorunların doğmadan engellenmesini sağlayacaktır. Proje yönetiminde herkesin alanları ve iş kalemleri net olarak tanımlanarak kimin hangi işlemi ne zaman ve nereye kadar yapacağı mutlaka belirlenmelidir. Projenin etkisini ve niteliğini artırmak için proje çıktısından yararlanacak kullanıcıların istekleri ve önerileri dikkate alınarak proje şekillendirilmelidir. Son olarak proje geri bildirimi proje yürütülürken ve bittikten sonra da devam etmelidir. Bu işlem projenin her zaman daha iyiye gitmesini sağlayacaktır. Tüm bu alınan tedbirlere ve yapılan işlemlere rağmen proje veya projeler başarısız olabilir, fakat projedeki başarısızlık bize hiç göremediğimiz yönleri ve bilgileri de öğreterek yeni projelerin daha sağlam ve başarılı olmasını sağlayabileceği unutulmamalıdır.

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CYTOTOXIC AND APOPTOTIC EFFECT OF CHALCONE DERIVATIVE WITH BROMO SUBSTITUENT ON T47D BREAST CANCER CELLS

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Chalcones, a group of aromatic enones, is known have a variety of biological properties, including anticancer. We have synthesized a chalcone derivate 1-(4'-bromophenyl) -3-(4-hydroxy-3-methoxyphenyl)-2-propene-1-on by aldol condensation reaction. The aim of the present study was to evaluate the effect of this compound on cytotoxicity and apoptosis induction of T47D breast cancer cell lines. The cytotoxic properties were determined using MTT [3-4, 5 dimetiltiazol-2-yl)-2,5difeniltetrazoilium bromide] assay. Apoptosis induction was carried out using Annexin-V flowcytometry method, and the observation of protein expression was determined by imunocytochemistry analyses. The result indicated that the compound has cytotoxic effect on T47D cells and was able to induce apoptosis throught decreasing Bcl-2 and increasing Bax.

Keywords: Chalcones, Bromo, cytotoxic, apoptosis, T47D

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ÇEVİK YAZILIM GELİŞTİRME YÖNTEMLERİNDE ETKİLİ TEST ARAÇLARI

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ÖZET : Çevik yazılım geliştirme yöntemleri, son zamanlarda kullanılan ana akım yazılım geliştirme yöntemleridir. Bu yöntemler, tek bir çevrim ile ürünü müşteriye sunmayı hedefleyen geleneksel yazılım geliştirme yöntemlerinin aksine, birçok iterasyon ve artırımlarla ürünü müşteriye, sürekli olarak sunar. Daha hızlı, daha fonksiyonel ve daha kaliteli ürün teslimi amacıyla tercih edilen bu yöntemlerde çeşitli test pratikleri oluşmuştur. Bu çalışmada, önce geleneksel yazılım geliştirme yöntemlerindeki test sorunları özetlenerek, çevik yazılım geliştirme yöntemlerinde kullanılan en iyi test pratikleri araştırması sunulmuş ve yazarların tecrübeleri ile birleştirilerek etkili test pratikleri önerilmiştir. Önerilen test pratiklerinin kullanımı ile daha kaliteli yazılım geliştirme süreçlerinin gerçekleştirileceği öngörülmektedir.

Anahtar Kelimeler: Çevik yazılım geliştirme yöntemleri, Çevik yazılım geliştirme yöntemlerinde test

EFFECTIVE TEST TOOLS IN THE AGILE SOFTWARE DEVELOPMENT METHODS

ABSTRACT: Agile software development methods are mainstream software development methods recently used. These methods, unlike traditional software development methods that offer products to customers with a single cycle, provide a lot of iteration and increment of the product to the customer continuously. In this methods that preferred in order to deliver faster, more functional and better higher quality products, various testing practices are. In this study, initially testing issues in traditional software development methods are summarized next, research of the best testing practices used in agile software development methods in the literature have been presented. Afterwards, effective test practices that have been combined with the best practices and experience of the authors have been proposed. It is predicted that high quality software development process can be carried out using these agile test practices.

Keywords: Agile software development methods, Test on agile software development methods

GİRİŞ

2001 yılında çevik yazılım geliştirme manifestosunun yayınlanmasından sonra; Microsoft, SAP ve Adobe gibi büyük yazılım şirketlerinin de çevik yazılıma adapte olmalarıyla birlikte, çevik yazılım geliştirme, ana akım yazılım geliştirme yöntemi haline gelmiştir (Schmidt, 2016; West ve Grant, 2010) ve 2015 yılı itibarı ile geliştiricilerin %95'i çevik yazılım geliştirme pratiklerini kullanmaktadır (Version One Inc, 2016).

Geliştiricilerin çevik yazılım yöntemlerini tercih etmelerinin birçok nedeni bulunmakla birlikte, yazılım kalitesini artırmak en önemli nedenler arasındadır (Version One Inc, 2016). Geleneksel yazılım geliştirme yöntemlerindeki yazılımın bir kez geliştirilip teslim edilmesine karşın, çevik yazılım geliştirme yöntemlerinde yazılım kısa aralıklarla sürekli geliştirilir ve müşteriye teslim edilir. Bu şekilde çevik yöntemlerde üretilen her artırımsal yazılım paketinin, müşterinin kalite beklentilerini karşılaması ve buna bağlı olarak da sürekli bir yazılım kalite güvencesi sağlanır (Schmidt, 2016).

Müşterilerin kalite beklentilerini sağlayacak "kaliteli bir yazılım ürünü" için, yazılımın olabildiğince "sorunsuz" olması gerekmektedir. Buradaki "sorun" çok geniş bir kavram olup; hatalı ihtiyaç tanımlanması sorunları, müşteri-geliştirici iletişiminden kaynaklı sorunlar, ihtiyaçlardan bilinçli bir biçimde sapma sorunları, mantıksal tasarım sorunları, kodlama sorunları, kodlama yönergelerine ve dökümantasyon ile uyuşmama sorunları, test

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sürecinin hızlı geçilmesinden kaynaklanan sorunlar, prosedür sorunları ve dökümantasyon sorunları başlıkları altında özetlenebilir (Galin, 2004).

Bu sorunların çoğunun hafifletilmesi için "yazılım testi" hususu öne çıkmaktadır. Yazılım testi, ürün kalitesini kontrol etmek için uygulanan temel kalite güvence aracıdır (Galin, 2004) ve önemi son zamanlarda giderek artmaktadır. Bilişim endüstrisinin 2012 yılında kalite güvence ve test çalışmalarına ortalama %18 bütçe ayırdığı, 2013'te %23, 2014'de %26 ve 2015'de %35 bütçe ayırdığı raporlanmıştır ve bu oranın 2018'de %40 olacağı tahmin edilmektedir (Capgemini vd., 2015). Test işlemlerini etkili bir şekilde yaparak yukarıdaki sorunların bir çoğu önemli derecede hafifletilebilir; ürün kalitesi, kullanım kalitesi ve veri kalitesi yükseltilebilir; yazılımın fonksiyonelliği, performans etkinliği, uyumluluğu, kullanılabilirliği, güvenilirliği, bakımının sürdürülebilirliği, taşınabilirliği iyileştirilebilir.

Bununla birlikte yazılım testleri için oldukça fazla yöntem ve araç bulunmaktadır (Hariprasath, 2015; Spillner vd., 2014). Her teknik, test nesnesinin özel bir yönünü test etmeye odaklanır. Yine her testin, çeşitli hataları bulmakta güçlü ve zayıf yönleri bulunmaktadır. Tüm hususlara çözüm olabilecek tek bir test tekniği bulunmamaktadır. Bu nedenle değişik nedenlerden kaynaklanabilecek hataları bulabilmek için farklı test tekniklerinin kombinasyonlarının kullanılması gereklidir. Birim testi, entegrasyon testi, sistem testi ve kabul testi standart testler olarak yapılırken, fonksiyonel test ve fonksiyonel olmayan test başlıkları altında onlarca farklı testler yapılabilmektedir. Yine statik test ve dinamik test farklı amaçlarla ve farklı hususlara odaklanan değişik teknikleri uygulayan test yöntemleridir (Spillner vd., 2014).

Her projede tüm bu testlerin uygulanması zorunlu değildir. Fakat her projenin ihtiyaçlarına göre, bahsedilen sorunları minimize edecek, etkili test tekniklerinin sistematik bir stratejiye göre uygulanması gereklidir. Bu çalışmada; çevik yazılım geliştirme yöntemlerinde kullanılan literatürdeki en iyi test pratikleri yazarların tecrübeleri ile birleştirilerek, çevik yazılım süreçlerinde uygulanabilecek etkili bir test stratejisi önerilmiştir.

Bu çalışma dört bölümden oluşmaktadır. İkinci bölümde, geleneksel yazılım geliştirme yöntemlerinin test hususlarındaki problemleri, üçüncü bölümde günümüzde en çok kullanılan çevik yazılım geliştirme yöntemleri tanıtılarak literatürdeki en iyi test pratikleri sunulmuştur. Çalışma, dördüncü bölümdeki sonuç ve öneriler ile sonlanmaktadır.

GELENEKSEL YAZILIM GELİŞTİRME VE TEST

Bu bölümde geleneksel yazılım geliştirme yöntemleri olan Şelale, V-Model, Helezonik Model ve W-Model kısaca tanıtılarak test hususları değerlendirilecektir.

Şelale modelinde (Royce, 1970) ihtiyaçların tanımlanması ve test aşamaları arasında uzun bir geri besleme olması nedeniyle model; değişen iş süreçlerini, değişen fikirleri, unutulan ihtiyaçları ve yanlış anlaşılan ihtiyaçları yönetemez. Bu sorunlar test aşamasında fark edildiğinde uzun zaman ve işgücü kaybına neden olur (Balaji ve Murugaiyan, 2012). Test için gerekli hazırlıklar yapılmadan geliştirme yapılması, sistematik bir testin yapılmasını zorlaştırır (Spillner, 2002). Bir aşamadaki problemler, o aşama boyunca tamamen çözümlenemez. Gerçekte, bir aşamaya ait problemler ancak o aşamadan sonraki aşama/aşamalarda görünür ve bu durum sistemin sorunlu geliştirilmesine neden olur (Balaji ve Murugaiyan, 2012; Christie, 2008). Test personeli tüm geliştirme aşamalarından sonra sürece dâhil olur. Kabul testine kadar olan testlerde müşteri bulunmamaktadır. Süreç içerisinde beklenmeyen bir durum ortaya çıktığında sürecin nasıl cevap vereceği tanımlı değildir (Spillner vd., 2014).

V-Modelinde (Boehm, 1979) testin plansız yapılması sorunu haricinde, şelale modelindeki tüm sorunlar geçerlidir (Spillner, 2002). Bununla birlikte; test planı ve stratejisi, ihtiyaçların tanımlanmasının hemen sonrasında tanımlandığı için, süreç boyunca olabilecek değişimlere adapte olamamaktadır. Testlerin, geliştirme aşamaları ile bire bir ilişkili olduğu varsayılmaktadır. Fakat gerçek hayat uygulamalarında çoğa çok ilişkilerin kurulması gerektiği ile oldukça sık karşılaşılmaktadır. "V" sembolünün sol bacağı ile sağ bacağı arasında kurulmuş olan test bağlantıları belirsizdir (Christie, 2008).

Helezonik (Spiral) modelinde (Boehm, 1988) test planının sistem tasarımından sonra yapılması V-modelindeki erken planlama problemini bir miktar hafifletmektedir (Spillner, 2002). Bununla birlikte, aşamalar ve aşama süreçleri hâlâ lineerdir (Christie, 2008). Son çevrimde Şelale basamaklarının kullanılması nedeniyle, test hâlâ kodlamadan sonra yapılmaktadır (Schwaber, 1997) ve bu durum plansızlık hariç, Şelale modelinin tüm sorunlarını beraber getirmektedir.

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W-Modelinde (Herzlich, 1993) analiz ve tasarım aşamaları ile test planlama aşamalarının birlikte yürütülmesine rağmen; hangi süreçlere ne kadar kaynak (zaman, personel)ayrılacağı belirlenmemiştir (Spillner, 2002). Sol bacaktaki test işlemlerinin farklı personel ile gerçekleştirilmek istenirse; ekstra personel çalıştırılmasına ihtiyaç doğurmaktadır. Aynı personel ile gerçekleştirilmek istenirse; kodlamada gecikmelere ya da test dokümanının kısa sürede gözden geçirilmesine neden olabilmektedir (Christie, 2008).

Bu kısıtlar, geleneksel yöntemlerle geliştirilen yazılımların sadece fonksiyonelliğinde sıkıntılara neden olmakla kalmayıp, yazılımların kalitesinde, performansında, uyumluluğunda, kullanılabilirliğinde, güvenilirliğinde, bakımının sürdürülmesinde ve taşınabilmesinde de çeşitli kısıtlara neden olabilmektedir (Balaji ve Murugaiyan, 2012; Jorgensen, 2013; Spillner vd., 2014).

ÇEVİK YAZILIM GELİŞTİRME VE TEST

Yazılım endüstrisinin, bugünün hızlı değişen bilişim dünyasına ayak uydurabilmesini sağlayan yazılım geliştirme yöntemi olan çevik yazılım geliştirme, 2001 yılında 17 yazılım geliştirici tarafından bir manifesto halinde ilkesel olarak yayınlanmıştır. Bu manifestoda

- Süreçler ve araçlardan ziyade bireyler ve etkileşimlere,
- Kapsamlı dökümantasyondan ziyade çalışan yazılıma,
- Sözleşme pazarlıklarından ziyade müşteri ile işbirliğine ,
- Bir plana bağlı kalmaktan ziyade değişime karşılık vermeye

değer vermeye kanaat getirildiği ifade edilmiştir (Beck vd., 2001). Daha önceden bilinen fakat bu manifestoda özetlenen bakış açısının yayınlanmasından itibaren; Uç Programlama (Extreme Programming [XP]), Scrum, Yalın Yazılım Geliştirme (Lean Software Development [LSD]), Kanban, Özellik Güdümlü Programlama (Feature Driven Development [FDD]), Dinamik Sistemler Geliştirme Yöntemi (Dynamic Systems Development Methodology [DSDM]) ve Adaptif Yazılım Geliştirme (Adaptive Software Development [ASD]) ana akım çevik yazılım yöntemleri olarak görülmeye başlanmıştır (Campanelli ve Parreiras, 2015). Bunlarla birlikte, Çevik Modelleme (Agile Modelling [AM]), Crystal ve Çevik Birleşik Süreç (Agile Unified Process [AUP]) yöntemleri tercih edilen diğer çevik yazılım geliştirme yöntemleri olup, bu son grup daha çok proje ve insan gücü yönetimine odaklanmıştır. Bu yüzden bu çalışmada ilk gruptaki 7 çevik yöntem kısaca tanıtılacak ve test pratikleri vurgulanacaktır.

Çevik yazılım geliştirme yöntemleri artırım ve iterasyon temelli yöntemlerdir. Artırım ve iterasyon temelli yöntemler, Şelale geliştirme yöntemini parçalara böler, her bir parça için aynı süreci gerçekleştirir ve geliştirme döngüsünde tekrarlar (Cohen vd., 2004). Artırımsal geliştirme, geliştirme süresini azaltmak amacıyla projeyi eşzamanlı artırımlara böler. Şelale'da olduğu gibi geliştirme başlamadan tüm ihtiyaçlar analiz edilir. Bununla birlikte, ihtiyaçlar fonksiyonel artımlar olacak şekilde parçalara bölünür. Artırımların geliştirilmesi eşzamanlı olduğunda, çok görevlilik mantığı ile proje geliştirme süresi azalır. İteratif geliştirme ise, projeyi çeşitli uzunluklarda iterasyonlara böler. Bu iterasyonların her biri, kullanılabilir ve dökümante edilmiş ürünler üretir. İlk iterasyon en temel ürünü üretmekle başlar ve ardışık her iterasyon ürüne yeni özellikler ekler. Her iterasyonda, o iterasyona ait analiz, tasarım, gerçekleştirme ve test etme işlemleri kendi Şelale süreci içerisinde sürdürülür. İteratif geliştirme, sadece bulunulan iterasyondaki ihtiyaçları karşılayacak değişimler ile ilgilenir. Sonraki iterasyon(lar)da gerekli olacak/olabilecek ihtiyaçlar, iterasyon sırası gelmeden değerlendirmeye alınmaz. Böylece, teknolojinin gelişimi ve/veya müşterinin fikir/istek değişimleri, projenin momentumuna minimum etki eder (Cohen vd., 2004).

Çevik yöntemler olarak adlandırılan bu yöntemler, manifestodan önce de kullanılan yöntemlerdir fakat manifesto ile daha çok kullanılmaya başlanmıştır. (Abrahamsson vd., 2003) bu yöntemlerin manifestoya kadar evrimleşmesini ve (Dingsøyr vd., 2012) ise 2001-2011 arası 10 yılda çevik yöntemlerin gelişimini şematik olarak göstermektedir.

Uç Programlama

XP ihtiyaçların belirsiz ve sıkça değiştiği şartlarda, küçük yazılım takımlarının başarılı bir yazılım geliştirmesine yardımcı olan yazılım mühendisliği pratiklerini ifade eder. Kısa iterasyonlarla (en fazla birkaç ay), küçük sürümler yayınlayarak hızlı geri besleme almak, müşterinin yakın katılımı, sürekli iletişim ve koordinasyon, çift

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halinde programlama, sürekli geliştirme, sürekli entegrasyon ve sürekli test bu yöntemin temel karakteristikleridir (Abrahamsson vd., 2003; Beck, 1999; Campanelli ve Parreiras, 2015)

XP'de bileşen (component) testleri programcılar tarafından anlık olarak yapılır. Bu testler bir araya getirilir ve bileşen testlerin tümünden geçmelidir. Test güdümlü geliştirme (Test Driven Development [TDD]) söz konusudur. Bu geliştirme tipinde hangi testlerin geçileceği bilinmeden kod yazılmaya geçilmez. Önce testler hazırlanır, kodlar yazılır ve düzenleme (refactoring) yapılır. Akademik ve endüstriyel çalışmalarda TDD'nin yazılım geliştirme sürecinde yazılım iç kalitesi (internal quality), dış kalitesi (external quality) ve üretkenliğe (productivity) etkileri incelendmiş ve iç kalitede %76 ve dış kalitede %88 avantaj sağladığı rapor edilmiştir (Bissi vd., 2016). Diğer taraftan müşteriler her bir iterasyon için iş odaklı, test edilebilir ve sonucu kestirilebilir fonksiyonel testler hazırlar ve bileşenler bu testlerin tümünden geçmelidir. Bazı durumlarda müşteri geçilemeyen testi çözümlemenin zaman gecikmesi ve maliyete etkisini birlikte değerlendirerek problemin çözümünden bilerek vazgeçebilir. Müşteri tam zamanlı olarak takımla birlikte çalışır. İterasyon sonuç ürünü yeni kod, aktif sisteme saatler geçmeden entegre edilir. Entegrasyon sırasında sistem sıfırdan inşaa edilir ve tüm testler geçilmelidir. Aksi durumda değişikliklerin entegrasyonu iptal edilir ve aktif iterasyona geri dönülerek sorun çözülmeye çalışılır (Beck, 1999). Her entegrasyon testinde tekrar test edilecek hususlar için test otomasyonu yazılması tavsiye edilir.

Scrum

Scrum (Schwaber, 1995), hızla değişen, gereksinimlerin açıkça tanımlanamadığı ve kaotik şartlarda yazılım geliştirme sürecini yönetmek için en çok kullanılan yöntemlerden biridir (Version One Inc, 2016). Esneklik, adaptiflik ve üretkenlik temelli deneysel bir yaklaşım olup, geliştiricileri kendi yöntemlerini kullanmaları konusunda serbest bırakır. Scrum'da karmaşık bir proje, küçük iş parçalarına bölünerek backlog denilen havuza atılır. "Bir iş parçası yeterince küçükse itemin açık, test edilebilir ve mümkün olup olmadığı anlaşılabilir" felsefesine göre değişik büyüklükte parçalar ayrılır. Backlog havuzundaki işler müşteri tarafından öncelik sırasına konulur ve gerektiğinde ekleme, çıkarma ve yeni sıralama yapılabilir. Her bir alt iş sprint adı verilen iterasyon içerisinde yapılır. Sprint süresi, katî olarak sınırlı bir çalışma süresidir. Bir iterasyon için, sprint öncesi planlama toplantısı, sprint ve sprint sonrası değerlendirme toplantısı (toplantılarda da saat sınırı vardır) yapılmakla birlikte, her gün 15 dakikayı geçmeyecek ayaküstü scrum-toplantıları yapılır. Takımlar küçük sayıdadır ve iterasyonlar kısa sürelidir (1-6 hafta). Sprint'ler lineer değildir. Varsa açık (explicit) bilgiler kullanılır, geri kalanı için örtük (tacit) bilgi ve deneme yanılma yöntemi kullanılır. Bu şekilde sprintlerin ilerlemesi ile nihai ürüne ulaşılır.

Scrum yönteminde kısa aralıklı sürüm yayınlanması, düzenli olarak küçük parçaların sisteme eklenmesi anlamına gelmektedir. Bu durum bakımı, testi ve hataların yakalanmasını kolaylaştırmaktadır (Cohen vd., 2004). Sürekli dökümantasyon yapılması, gerek bakımı gerekse testleri kolaylaştırmaktadır. Sürekli test pratiği; big-bang tekniğinin tam tersi şekilde, testi geliştirmenin ana unsurlarından biri haline getirir. Geliştiricilerin hatalarını kodlama aşamasında yakalamasını ve yöneticilerin herhangi bir zamanda demo yapımı veya ürün satmasını mümkün kılar. Müşteri sürekli olarak geliştirme odasında takım ile birlikte çalışır. Test sorumlusu bilgisayar başında demo'yu tanıtır. Müşteri "Tamam" dediğinde, yani yazılım kullanıcı hikayelerinden oluşmuş tüm kabul kriterlerini geçince, kabul söz konusudur. Bitmemiş veya hatalı bileşenler asla kabul edilmez. Bu hususlar, sıfır noktası olmak üzere backlog havuzuna geri konulur (Pichler, 2010).

Yalın Yazılım Geliştirme

Yalın yazılım geliştirmenin en öncelikli felsefesi üretim sürecindeki atıkları (waste) atmaktır. Atık; kısmi yapılmış işler, ekstra yapılan işlemler (bürokrasi gibi), program kusurları, ekstra özellikler, görev değişiklikleri (kişiye verilen iş süresince aradan çıkarılmak üzere başka bir iş verilmesi), beklemeler (özellikle biten bir bileşenin entegrasyon için diğer bir bileşeni beklemesi), hareketlilik (geliştiricinin konsantrasyonunu bozacak durumlar) ve program kusurları gibi müşteri açısından ürünün değerine katkısı olmayan herşeydir (Poppendieck ve Poppendieck, 2003). Bu şekilde sadece müşterinin istediğini karşılayacak ürünü elde etme süreci yürütülmüş olur. Süreç boyunca tüm varsayımlar tekrar tekrar doğrulanır. Bir metrik veya pratik artık geçerli değilse çöpe atılır. Kısa iterasyonlar sonunca geri beslemeler alarak ürün doğrulama (validation) gerçekleştirilir. Kararlar, mümkün olduğunca ertelenir ve alınması gereken son zamanda alınır. Bu şekilde kesinleşmemiş kararlara uygun atık işlemlerle gereksiz yere uğraşılmamış olunur.

Kanban

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Kanban, üretim operasyonlarından ödünç alınmış adaptif, görsel ve maliyet odaklı bir tekniktir. Toyota tarafından 1950'lerden beri kullanılmasına rağmen, yazılım geliştirme alanında uygulaması ilk kez, 2004 yılında David J. Anderson tarafından, Microsoft firmasında küçük bir takımla çalışırken yaşanan problemlerin giderilmesi için gerçekleştirilmiştir (Ahmad vd., 2013). Kanban'ın arkasındaki fikir yalın (lean) düşünceden gelmektedir. İş akışını görselleştirmek, üzerinde çalışılan işleri sınırlamak (limit Work In Progress [WIP]) ve döngü süresini ayarlamak Kanban yönteminin ana felsefesidir. Yöntemde yapılan ve yapılacak işler Kanban Board denilen bir tahtada görselleştirilir. Bu şekilde tüm takım ve müşteri; işlerin durumunu, önceliklerini ve darboğazları görerek hareket eder. Bu tahtada soldan sağa; yapılacak işler, yapılmakta olan işler ve testi geçen işler kağıtlara yazılmış şekilde bulunmaktadır. Süreç boyunca bu kağıtlar (yapılacak işlerin anlatıldığı hikayeler) soldan sağa doğru hareket ederler. Bununla birlikte amaçlardan biri WIP'i mümkün olduğunca küçük tutmaktır. Böylece geliştiriciler verilen bir zaman aralığında sadece bir işe odaklanır ve müşteri de o zaman aralığı sonunda ne elde edeceğini bilir. Zaman baskısı konusunda Scrum'dan farklıdır. Kısa geri besleme çevrimleri ile sürece hızlı adapte olmayı hedefler. Kanban kullanmanın anahtar güdüsü zorlayıcı iterasyonlara değil, akışa odaklanmaktır (Ahmad vd., 2013).

Kanban yönteminde program kusurları atık olarak görüldüğünden bunun yok edilmesi (en azından minimum hale getirilmesi) hedeflenmektedir. Program kusurundan kaynaklanan atığın miktarı, kusurun ürüne etkisi ve farkedilememe süresi olarak görülür. Üç dakika içerisinde farkedilmiş bir kritik kusur büyük bir atık kaynağı olarak sayılmaz. Haftalarca farkedilememiş küçük bir kusur ise daha büyük bir atık olarak sayılır. Kusurların etkilerini azaltmanın yolu, oluşur oluşmaz onları bulmaktır. Böylece kusurlar yüzünden harcanan zamanı azaltmak için kod yazarken anında test, sık sık entegrasyon ve mümkün olduğunca çabuk sürüm yayınlanması yapılır (Poppendieck ve Poppendieck, 2003).

Bununla birlikte son zamanlarda Scrum ve Kanban'ın bazı özelliklerinin bir araya getirildiği Scrumban isimli hibrit bir çevik yöntem çalışmalarına rastlanmaktadır. Bu yöntemde Kanban yönteminde olduğu gibi işler yapılacaklar tahtasına alınır ama farklı olarak bazı işler için zaman sınırı olduğunu gösterir farklı renkte kâğıtlar kullanılır (Reddy, 2014).

FDD

FDD, yazılım geliştirme yaşam döngüsünde sadece tasarım ve geliştirme aşamalarını etkileyen çevik ve adaptif bir yazılım geliştirme yöntemidir. Beş adet sıralı ana aktivitesi vardır: tüm sistemi modelleme, özellik listesi hazırlama, özellikleri planlama, özelliğe göre tasarım ve özelliğe göre geliştirme. Sistemin modelleme aşamasında, takım üyeleri ve uzmanlar sistem için bir "yol planı" hazırlar. İkinci aşamada gerekli özellikler tüm tarafların anlayabileceği basitlikte parçalara bölünür. Üçüncü aşamada "tasarım paketleri" adı verilen bu parçalar önceliklendirilir ve her bir parça, bir kaç programcıdan sorumlu bir şef programcıya atanır. Özelliğe göre tasarım aşamasında sürecin iteratif kısmı başlar. Şef programcı kendisine atanmış tasarım paketinden 1-2 hafta içerisinde yapılabilecek bir alt iş seçer. Geliştirme aşamasında bu alt iş yeniden ayrıntılı olarak analiz edilir tasarlanır, kodlanır, test edilir ve entegre edilir (Palmer ve Felsing, 2001). Diğer çevik yöntemlere kıyasla çok büyük ve kritik projelerde kullanılabilmektedir. Tüm süreç boyunca kalite hususuna ağırlık verir.

FDD yönteminde, kod yazıldıktan sonra birim testi ve kod inceleme alt süreçlerine geçilir. Hangisinin önce yapılacağına şef programcı karar verir. Birim testinin nasıl yapılacağına dair sınırlama yoktur. Manuel veya otomasyon aracılığı ile yapılabilir. Kod inceleme FDD için zorunlu bir uygulamadır ve bunun için kod yazma süresinin yaklaşık dörtte biri kadar süre ayrılır. Kod inceleme, iyi bir şekilde yapıldığında test etmekten daha fazla ve çeşitli yazılım kusurlarını bulabilmektedir (McConnell, 2004). Bu inceleme sadece geliştirici tarafından yapılmakla kalmayıp, takım içindeki tecrübeli programcılar tarafından da yapılır. Böylece yeni programcıların gelişmesine yardımcı olacak bir süreç olarak da görülebilir. Bununla birlikte, program kodlarının inceleceğini bilmek, programcıların daha dikkatli ve standartlara uygun kod yazmalarını sağlar. Kod incelemenin formalite seviyesi, iterasyonda geliştirilen özelliğin etki ve karmaşıklığına göre şef programcı tarafından tespit edilir. Önem ve karmaşıklık seviyesi düşük işler şef ve takım tarafından incelendiği halde, daha önemli ve karmaşık kod incelemelerinde diğer şef programcılar ve bazen diğer takımlardan programcılar da davet edilir. Bu şekilde XP programlamada yapılan çift (iki kişi) programlama pratiğinden daha iyi bir sonuç elde edilir. Burada programcıya koda bir süre sonra yeniden bakmasıyla kod optimizasyonu yapma şansı verilmekle birlikte, kodlara farklı gözlerin bakması ve fikir yürütmesi ile çok daha iyi, hızlı ve optimal kodların elde edilmesi mümkün olabilmektedir. Bu aşamalardan sonra eldeki kod, entegrasyona hazır hale gelir (Flora ve Chande, 2014; Palmer ve Felsing, 2001).

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DSDM

1994 yılında çok sayıda proje uzmanı tarafından Hızlı Uygulama Geliştirme (Rapid Application Development [RAD]) için kaliteyi hedeflemek amacıyla geliştirilen ve 1995'de (Millington ve Stapleton, 1995) tarafından tanımlanan bir iskelettir (framework) (Flora ve Chande, 2014). İlk çevik yöntem olan bu framework, proje ürün yönetimi yaşam döngüsünün en iyi süreçlerini birleştiren iteratif ve artırımlı bir metodolojidir. Sonuçlara hızlı ve efektif olarak ulaşmayı sağlayarak, zaman, maliyet, risk ve kaliteyi kontrol altında tutup iş faydalarını artırımsal olarak ulaştırmayı sağlamak, stratejik amaçtır. Kullanıcının aktif katılması, takımların güçlendirilmesi (empowering), kaliteyi en iyilemekten ziyade sürümlerin hızlı ulaştırışlması, geliştirme sırasında herhangi bir değişikliğin geri alınabilmesi, en üst seviye ihtiyaçların değişmemesi, tüm paydaşların birlikteliği ve iyi haberleşmesi ile tüm proje boyunca testin yapılması bu yöntemin prensipleridir. Zaman kutuları (Time boxing), MoSCoW, Prototipleme, Test, İmalat ve Modelleme, bu yöntemde kullanılan temel tekniklerdir. Framework dâhilinde ön-proje, fizibilite çalışması, iş çalışması, fonksiyonel model iterasyonu, tasarım ve geliştirme iterasyonu, uygulama ve proje sonu aşamaları gerçekleştirilir (Cohen vd., 2004; Millington ve Stapleton, 1995).

Fonksiyonel model iterasyonunda, dökümanlar gözden geçirilip, prototip sergilenerek ve yazılım parçasının başarılı bir şekilde test edildiği kanıtlanarak, işin doğru yapıldığı (verification) ispat edilir. Burada ürünün fonksiyonelliğe katkısı üzerinde odaklanılır. Fonksiyonel olmayan hususlar, tasarım ve gerçekleştirme aşamalarında test edilir. Kullanıcının aktif katılması, kabul testinin hızlıca geçilmesini sağlar. DSDM test araçlarının kullanımını savunmaktadır. Yakalama ve yeniden oynama (capture and replay) araçları ile testlerin yapılması, kanıtlama için iyi bir yol olmakla birlikte, kağıda geçirilmesinden daha az zahmetli bir işlem olarak görülür. Kod inceleme DSDM'de de önerilen bir pratiktir. Dinamik analiz araçları, demo sırasında dizi boyutları, hafıza kullanımı gibi hususları test etmek için kullanılabilmektedir (Millington ve Stapleton, 1995).

ASD

ASD, yüksek hızlı ve çok değişen internet ekonomisi için geliştirilmiş bir yazılım geliştirme yöntemidir. Yüksek hızlı ve çok değişimli projeler, tahmin edilemez ve geleneksel yöntemlerle işlenemeyecek kadar karmaşıktır. Bu nedenle geliştirme organizasyonunun adaptif olması, yeni değişimlere hızlı cevap vermesi gerekir. Sürekli prototip geliştirerek iteratif ve artırımsal geliştirmeyi teşvik eder. Yöntemde "kaosun sınırında dengeleme" mantığı ile, "yeterli klavuzluk ile projelerin kaosa düşmesi engellenebilir" düşüncesi temeldir. Bu yöntemde proje üç fazda değerlendirilir: tahmin etmek (speculate), işbirliği yapmak (collaborate) ve öğrenmek (learn). Belirsizliğin az olduğu durumlarda yapılan plan yerine, bu yöntemde tahmin yapılır. Birlikte çalışma hızla değişen sistem geliştirmede oldukça önemlidir. Hatalardan bilgi üretme ve geliştirme sırasındaki ihtiyaç değişimlerini sağlamak öğrenme fazıdır. Proje başlama, adaptif çevrim planlama, eşzamanlı özellik geliştirme, kalite gözden geçirme ve final kalite güvence-sürüm yayınlama olmak üzere beş genel adımdan oluşur. Kalite gözden geçirme ile çevrim planlama arasında öğrenme geri beslemesi bulunmaktadır (Highsmith, 2000).

Müşterinin geliştirme aşamasında bulunması ile Ortak Uygulama Geliştirme (Joint Application Development [JAD]) temeldir. Bu durum kabul testini kolayca geçmeyi sağlar. İlk kez tecrübe edilen işler ve araştırma geliştirme faaliyetleri için bu yöntemdeki öğrenme geri beslemesi oldukça önem arz etmektedir. Bu geri besleme ile birlikte ürün testi gerçekleştirilmiş olup, müşterinin bakış açısından ve teknik bakış açısından incelemeler yapılır. Bu incelemeler ile birlikte takım, performansını değerlendirme imkanı bulur. Ayrıca JAD oturumlarında tüm paydaşların projenin anlık durumunu gözden geçirme fırsatı olur (Abrahamsson vd., 2002; Highsmith, 2000).

SONUÇ VE ÖNERİLER

Bu bölümde, çevik yazılım geliştirme yöntemleri ile gerçekleştirilen yazılım geliştirme projelerinde başarı şansını artırabilmek için, literatürdeki ve yazarların tecrübeleri ile elde edilen test pratikleri verilmektedir. Bu kapsamda:

- Projenin tamamı için bir test master test planı ve her entegrasyon seviyesi için bir seviye test planı hazırlanıp, süreçler bu planlara uygun sürdürülmelidir,
- Test bir faz olarak değil, tüm süreç boyunca yürütülecek; planlama, uygulama ve kontrol aşamalarını içeren bir süreç olarak görülmelidir,
- Test özel olarak hazırlanmış test ortamlarında gerçekleştirilmelidir,
- İterasyonlarda test güdümlü hareket edilmelidir,
- Geliştirilen yazılım, hata oluşma durumlarını günlük dosyalarına kaydetmelidir,
- Hem el ile (manuel) hemde otomatik test araçları kullanılmalıdır. Hangi aşamalarda hangisinin kullanılacağını takım lideri ve programcılar birlikte kararlaştırmalıdır,

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- Entegrasyonda eksik parçaların fonksiyonunu sağlamak için koçan (stub) yazılım bileşenleri hazırlanmalıdır,
- Test gereksiz bir işlem, vakit kaybı veya sıkıcı bir bürokrasi olarak görülmemeli, projenin gelişimi için bir araç olarak görülmelidir,
- Mümkün olduğunca geliştirme sürecinde takımın aynı fiziksel ortamda bulunması sağlanmalıdır,
- Test sadece test edicilerin (tester) görevi değildir. Tüm ekibin bunun bilincinde olması sağlanmalıdır,
- Testin sadece hatalardan arınmayı ifade etmediği, bakım ve onarımı da kolaylaştırdığı bilinmelidir,
- Dökümantasyon gereğinden ne az, ne de çok olmalıdır. Kağıt kullanımı yanında kayıt ve oynatma araçları kullanımı ihmal edilmemelidir,
- Sık sürüm yayınlama ve müşteri testleri ile geri besleme sağlanması, gereksiz zaman kayıplarını azaltacaktır.
- Test işlemleri sadece hataları düzeltmeyi değil, öğrenmeyi de sağlar,
- Test personeli kritik süreçlere dahil edilmelidir,
- Test sonucu görülebilecek her hata iterasyonu başa döndürmez, durumun kullanıcıların önceliklerine sunulması gerekir,
- Test sonuçlarına göre hata seviyeleri yüksek ise, takımın motivasyonu ve çalışma saatları gibi yönetimsel hususların yeniden gözden geçirilmesi gerekir.

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ÇİMENTO ESASLI TAMİR HARÇLARININ FİZİKSEL VE MEKANİK ÖZELLİKLERİNİ MALİYET AÇISINDAN İNCELENMESİ

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Özet: Onarım, güçlendirme ve depreme karsı takviye amacıyla kullanılan birçok malzeme bulunmaktadır ve bu malzemelerde sürekli performans gelişimi gerçekleşmektedir. Onarım malzemeleri için hasarın yerine, tipine, yapının içinde bulunduğu durabilite ile ilgili koşullara bağlı olarak seçim yapmak gerekir. Seçilen onarım malzemelerinin maliyeti göz önüne alınması gereken önemli bir hususdur. Bu çalışma kapsamında farklı iki adet çimento esaslı tamir harcı üretilerek mekanik ve fiziksel özelliklerine ait deneyler yapılmıştır. Burada seçilen iki adet çimento esaslı tamir harçlarının basınç dayanımlarının benzer olması esas alınmıştır. Deneysel çalışmadan üretilen ürünlerin basınç dayanımı, eğilme dayanımı, yapışma suretiyle oluşmuş bağ dayanımı, aşınma dayanımı ve elastisite modülü deneyleri yapılmıştır. Deneylerden ele edilen sonuçlarının ayrı ayrı maliyetleri analiz edilmiştir.

Anahtar Kelimeler: Hasar, Güçlendirme, Onarım malzemeleri

COST ANALYSIS IN TERMS OF PHYSICAL AND MECHANICAL PROPERTIES OF CEMENT BASED REPAIR MORTAR

Abstract: There are many available materials used for repair, retrofit and reinforcement against earthquake purposes in which continous performance improvements are observed. Repairment materials should be chosen considering the location and type of the damage as well as the conditions regarding the durability of the structure. The cost of chosen repairment material is also an important issue that cannot be ignored. In the scope of the experimental study, two different cement based repair mortars were prepared and their mechanical and physical properties have been tested. The two mortars were selected with regard to their compressive strength being similar. The compressive strength, bending strength, adhesion bond strength, abrasion strength and elasticity modules were determined for the prepared materials. In the second part of the experimental study, the test results and costs of these materials were seperately.

Keywords: Damage, Reinforcement, Repairment Materials

Giriş

Günümüzde en yaygın kullanılan yapı malzemesi olan betonarme; atmosferik etkenler, yanlış tasarım, kötü malzeme kullanımı, yapılan hatalı uygulamalar, deprem vb. gibi çok çeşitli nedenlerle hasar görmektedir. Onarım, güçlendirme ve depreme karsı takviye amacıyla kullanılan birçok malzeme bulunmaktadır ve bu malzemelerde sürekli performans gelişimi gerçekleşmektedir. Onarım malzemeleri için hasarın yerine, tipine, yapının içinde bulunduğu durabilite ile ilgili koşullara bağlı olarak seçim yapmak gerekir.

Betondan beklenen 3 temel özellik vardır: İşlenebilirlik, mukavemet ve dayanıklılık. Genel anlamda dayanıklılık, bir yapı malzemesinin, bileşeninin ya da elemanının, kendisi için öngörülen süre içinde, hiçbir aksaklık göstermeden işlevini yerine getirmesi olarak tanımlanabilir. 21. Yüzyılda beton dayanıklılığının gelişimi; özelliklerini kontrol ve optimize ederek dikkatlice seçilmiş malzemelerle ve betonun; karıştırma, ulaşım, yerleştirme ve kürleme koşullarındaki değişkenliğinin azaltılmasıyla sağlanacaktır. Geri beslenme (feedback) yöntemi aracılığıyla ulaşılan bilgi ile uyumlu uygulamaların yapılması ve bunların değerlendirme teknikleri ile kontrol edilmesi, ürün ve yerleştirme hakkında daha fazla otomasyon ve beton ile bulunduğu çevre arasındaki etkileşimin anlaşılmasında kaydedilen ilerlemeler, bu gelişmelerin başardıkları arasında olacaktır. (Tıkalsky, P. J. - Mather, B)

Bir onarım çalışmasının temel amacı; düşük maliyetli ve durabilitesi (dayanıklılığı) yeterli, diğer bir ifadeyle kalıcı bir onarım yapmaktır. Kalıcı onarımları başarabilmek için, bir kompozit sistemin bileşeni olarak onarım sisteminin seçimi ve tasarımını etkileyen faktörlerin göz önüne alınması gereklidir. Burada onarım malzemesi ile mevcut eski beton arasındaki uyum onarım sisteminin en kritik bileşenidir. (Mcdonald, J.E., Vaysburd, A.M

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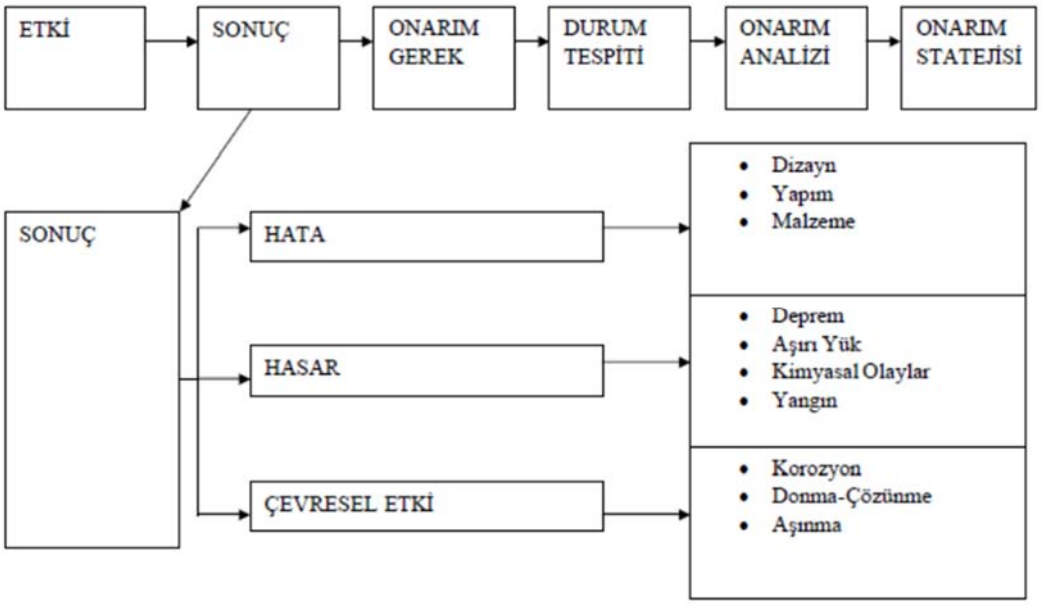
,2002) Onarım harçları değişik etkenler altında hasar görmüş yapı ve yapı elemanlarının özelliklerinin hasar öncesi durumuna getirilmesi ya da özelliklerinin daha da iyileştirilmesi amacı ile kullanılabilir. (Tasdemir, M.A., Ve Özkul, M.H.2003) Onarım malzemesinin eski beton üzerine uygulanması sonrası, yapı elamanının hasar almadan önceki durumuna benzer görünümünü, geometrik yapısını almalı ve bu tür niceliklerini zaman içinde muhafaza etmesi gereklidir. Çimento esaslı onarım malzemelerin büyük bir kısmı, döküm safhasında ve çevre koşullarına göre rötre yaparlar. Hasar görmüş mevcut betonun rötresinin büyük ölçüde tamamlanmış olması göz önüne alındığında, çimento esaslı onarım malzemesinin de rötresinin benzer şekilde mümkün olduğu kadar az olması gerekliliği ortaya çıkmaktadır.

Betonarme bir eleman zaman içerisinde çeşitli iç ve dış etkenlerden ötürü hasara uğrayabilir. Bu hasarlar az da olsa yapı için tehlikelidir ve zamanında onarım ve bakım gerektirmektedirler. Betonda oluşan hasara uygun onarım tipi dikkatlice yapılmalıdır. Şekil 1'de gösterildiği gibi onarımda dikkat edilmesi gereken en önemli hususlar uygun onarım tipinin seçilmesi ve özenle uygulanmasıdır. (B. Nejat,2008)



Şekil 1.Onarım prosedürü

Deneysel Çalışma Ve Deney Sonuçları ile Maliyet Karşılaştırması

Çalışmanın deneysel kısmında çimento esaslı tamir harçlarının standartlara göre istenen fiziksel ve mekanik özelliklerine ilişkin deneyler yapılmıştır. Deneyleri Yapılan iki farklı çimento esaslı tamir harcının deney sonuçları fiyatlara göre karşılaştırmalı olarak incelenmiştir.

Taze tamir harcında kıvam deneyi: Tamir harcı karıştırıldıktan sonra, karışımlar sertleşmeden önce yapılan deneylerdir. Bu deneylerle üretilen harcın beklenen özellikleri sağlayıp sağlamadığı kontrol edilmiştir.

Tablo 1: Taze betonda kıvam deneyi sonuçları

		R_1(cm)	R_2(cm)	R_3(cm)	Ortalama R(cm)	r(cm)	Kıvam
TAMİR HARCI	A Tipi	14,7	14,6	14,6	14,6	10	1,46
	B Tipi	14,4	14,3	14,4	14,4	10	1,44

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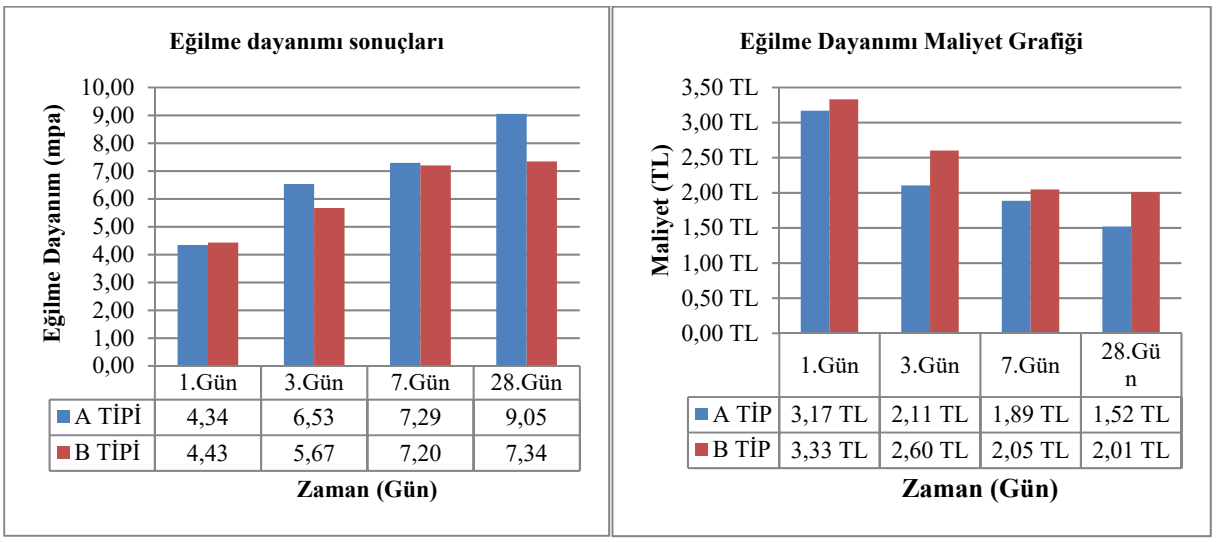
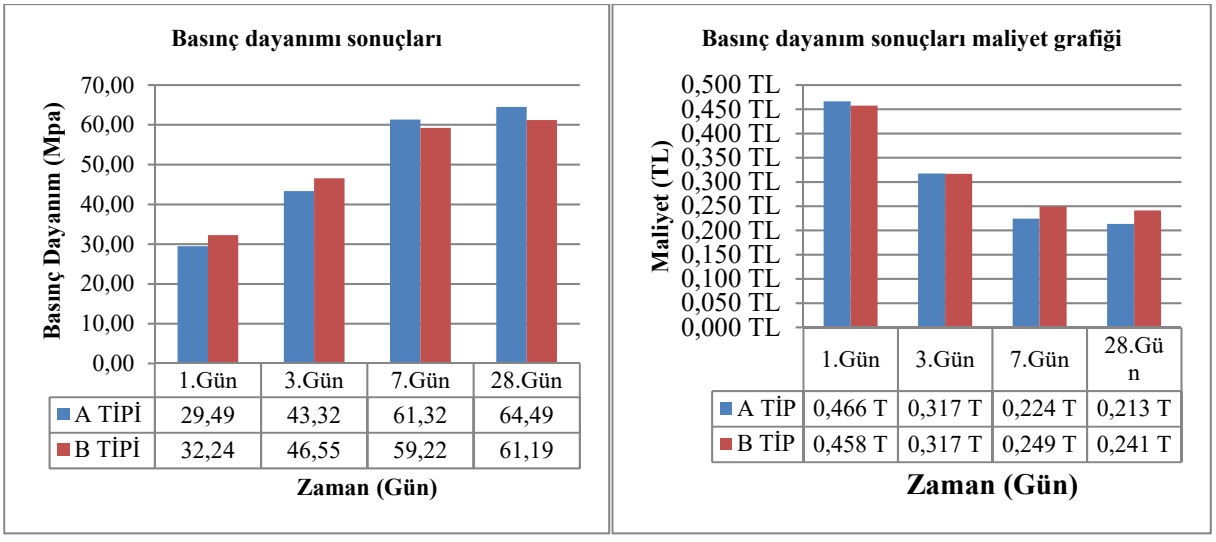
Eğilme dayanımı: Üretilen tamir harcı örneklerin eğilmede çekme dayanımını saptamak için orta noktasından yüklenmiş basit kiriş metodu ile eğilmede çekme tayini deneyi uygulanmıştır. Çıkan sonuçlar ve maliyet grafiği Şekil 2 de gösterilmiştir.



Şekil 2. A ve B Tipi tamir harçlarının eğilme dayanımı sonuçları ve maliyet grafiği

Tamir harcı basınç dayanımın tayini: PC (Polimer harçlar), PCC (Polimer hidrolik çimento harçları) ve HC (Hidrolik harçlar) için deney metodunun prensibi, 40 mm kenar uzunluğuna sahip küp numunelerde basınç dayanmanın tayin edilmesidir. Çıkan sonuçlar ve maliyet grafiği Şekil 3'te gösterilmiştir.



Şekil 3. A ve B Tipi tamir harçlarının basınç dayanımı sonuçları ve maliyet grafiği

Yapıştırma suretiyle oluşmuş bağ deneyi: Bu deney EN 1766'ya göre hazırlanan standart referans beton numuneye uygulanmış tamir harçlarının veya sistemlerinin yapışma dayanımını çekme uygulayarak ölçme işlemidir. Deney metodu, tamir harçlarının veya sistemleri yüzeyine, karot cihazı ile yuva açılarak belirlenmiş alana yapıştırılmış ayak kullanılarak doğrudan çekip çıkarma işlemi uygulanmasıyla gerçekleştirilir. Çıkan sonuçlar ve maliyet grafiği Şekil 4'de gösterilmiştir.

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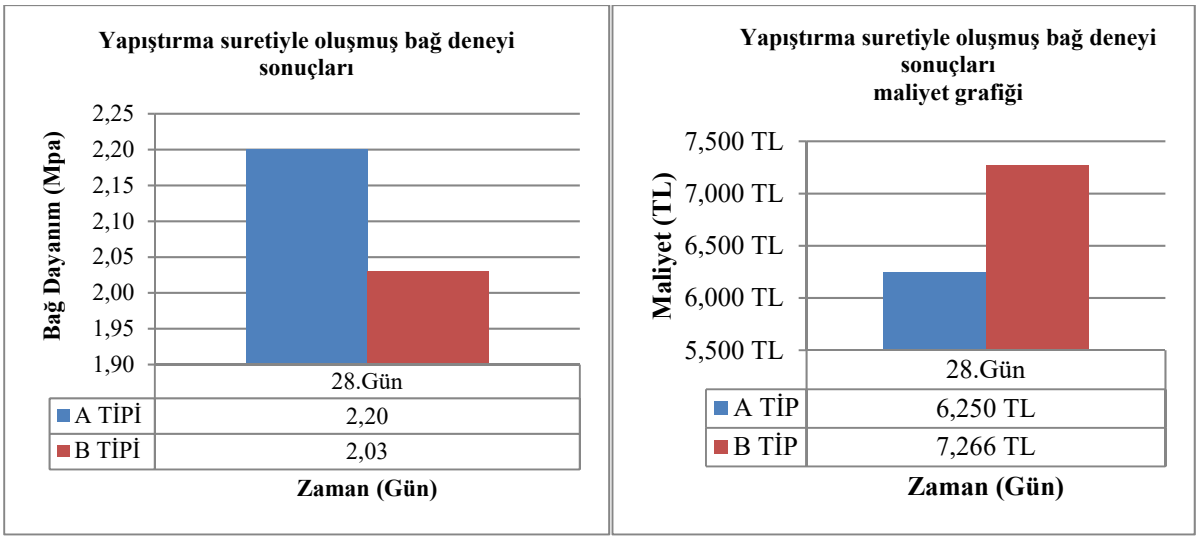
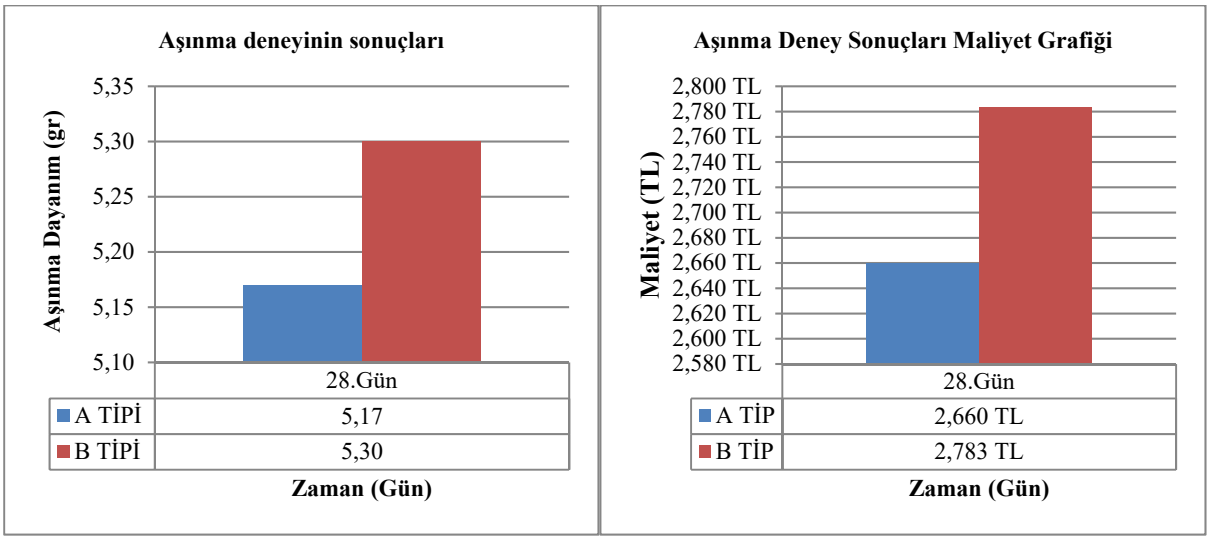


Şekil 4. A ve B Tipi tamir harçlarının yapıştırma suretiyle oluşmuş bağ deneyi sonuçları ve maliyet grafiği

Aşınma dayanımı: Deney 100*100 *10 mm kalıblara döküldükten sonra diğer numunelere aynı şartlar altında saklanmıştır.28.gün sonra kürlenmesi tamamlanan numunelerin aşındırma cihazında deneyleri yapılmıştır. İlk olarak hassas terazide tartılan numuneler cihazda 1000 devir döndükten sonra ikinci tartımları alınır ve ilk ölçüm son ölçüm arasındaki fark aşınan miktar olarak kaydedilmiştir. . Çıkan sonuçlar ve maliyet grafiği Şekil 5'te gösterilmiştir.



Şekil 5. A ve B Tipi tamir harçlarının aşınma dayanımı sonuçları ve maliyet grafiği

Elastisite modülü: Deneyin prensibi, en-boy oranı 1:4 olan bir prizma şekilli numuneye kontrollü bir eksenel basınç yükü uygulayarak numunenin sekant modülünün ölçülmesi ve boyuna değiştirmeye yol açan basınç gerilmesinin ilişkilendirilmesidir. . Çıkan sonuçlar ve maliyet grafiği Şekil 6'da gösterilmiştir.

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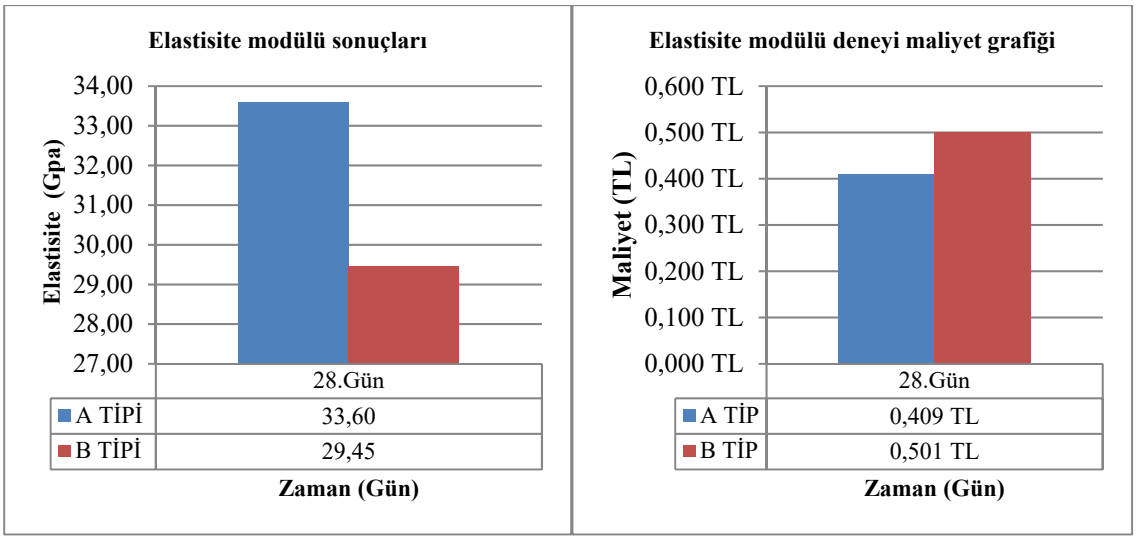

Şekil 6. A ve B Tipi tamir harçlarının elastisite modülü sonuçları ve maliyet grafiği

Sonuçlar

Yapılan deneysel çalışmadan elde edilen sonuçlar aşağıdaki gibi özetlenebilir;

- Eğilme dayanımı deneyinde 3, 7.ve 28 günlüklerde A tipi tamir harcı yüksek değer verirken 1.günde B tipi tamir harcı daha yüksek değere kadar çıkmıştır. Eğilme dayanımı deneyinde kürlenme süresi artıkça değerinin arttığı görülmüştür.Eğilme dayanımı deneyinde 28.günlüklerde A tipi tamir harcı yüksek değer vermiştir. Yüksek eğilme dayanım değeri tercih sebebidir.

- Basınç dayanım deneyinde 28.günlüklerde A tipi tamir harcı yüksek değer verdiğinden tercih sebebidir.Basınç dayanım deneyinde maliyet olarak baktığımızda A tipi tamir harcının 7.ve 28. günde daha uygun olduğu, 3.günlüklerde eşit olduğu ve 1.günlüklerde B tipi tamir harcının maliyetinin düşük olduğu görülmüştür.

- Yapışma suretiyle oluşmuş bağ deneyinde A tipi tamir harcının değeri yüksek çıkmıştır. Maliyet açısından A tipi tamir harcının B tipi tamir harcına göre avantajlı olduğu görülmüştür. A tipi tamir harcı bu deneyde mukavemet ve maliyet açısından tercih sebebidir.

- Aşınma dayanımı deneyinde A tipi tamir harcı daha az aşınmıştır. Aynı zamanda maliyet olarak da A tipi tamir harcının düşük olduğu görülmüştür.

- Elastisite modülü deneyinde A tipi tamir harcının sonucu yüksek çıkmıştır.A tipi tamir harcının maliyetinin de düşük olduğu görülmüştür

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Nejat Bayülke,Depremlerde Hasar Gören Yapıların Onarım Ve Güçlendirilmesi

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DEMİR ÇELİK ÜRETİCİSİ İLK ON ÜLKENİN DEMİR ÇELİK İHRACATININ GRİ TAHMİN YÖNTEMİYLE TAHMİNİ

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Özet: Demir çelik sektörü otomotivden, beyaz eşyaya, inşaattan gemiciliğe kadar pek çok sektör için girdi sağladığından, bu sektörde söz sahibi olmak her ülke için önem arz etmektedir. Son yıllarda yaşanan aşırı üretimden dolayı, üretici ülkelerin ihracat yapabilmeleri için daha planlı adım atmaları gerekmektedir. Demir çelik sektöründe lider konumdaki ülkelerden bazıları, diğerleri kadar yüksek üretim kapasitelerine sahip olmasa da; ihraç ettikleri ürün çeşitlerinden elde ettikleri gelirle diğerleriyle yarışabilmektedir. Bu çalışmada, en büyük on demir çelik üretici ülkenin ihracat miktarların gelecek 5 yıl için tahmini gri tahmin yöntemiyle yapılmıştır. Az veriyle doğru tahminler yapabilen gri tahmin yardımıyla ulaşılan sonuçlarla, sektörün geleceğine dair yön verici bilgiler elde etmek amaçlanmıştır.

Anahtar Kelimeler: Demir çelik, ihracat, gri tahmin

Giriş

Demir çelik sektörü hemen her alanda gerek hammadde gerek yarı mamul olarak kullanımından dolayı hemen her sektörde önemli bir yere sahiptir. Son yıllarda inşaat ve otomotiv sektörü başta olmak üzere yoğun olarak kullanılmaktadır. Bu özelliğinden dolayı ülkelerin ticaretlerinde de önemli bir rol üstlenmektedir. Ülkelerin bütçelerindeki asıl getiri kaynağı olan ihracat kaleminde mutlaka yer alması gereken demir çelik ürünlerinin istatistiksel olarak incelenmesi ise bir gerekliliktir. Ülkelerin ihracat stratejilerine, özellikle önemli bir alt başlık olan demir çelik ürünleri ihracatına yön verebilmek adına ileriye dönük tahminler de en başta gelen istatistiksel araştırmalardır. Tahminler yardımıyla demir çelik sektöründe daha doğru adımların atılması amaçlanmaktadır. İşte bu çalışmanın amacı da bu konuda destek sağlayıcı olmaktır.

Literatür tarandığında bu alanda Aydemir vd. (2013), inceleme makalelerinde gri modelin kullanıldığı çalışmaları incelemişlerdir. İncelediklerı 1998-2013 yılları arasındaki çalışmalardan bazıları şunlardır: Hsu ve Wen (1998), asya-pasifik bölgesinde bölge uçuş pazarında bulunan on ülke çifti arasındaki havayolu yolcu trafiği tahminlemesi için birinci dereceden tek değişkenli gri sistem modeli GM(1,1) kullandılar. GM(1,1), ARIMA ve çoklu regresyondan daha iyi sonuç vermiştir. Hsu (2003), gri tahminleme yöntemlerini geleneksel yöntemler ile karşılaştırdığı çalışmanın sonucunda, entegre devre sistemleri için talep tahminlemesinde, gri tahminlemenin kısa dönemlik tahminler için daha iyi sonuçlar verdiğini göstermiştir. Yao vd. (2003) elektrik enerjisi tahminlemesi konusunda yaptıkları çalışmada çok kısa dönemler için elektrik talebinin tahminlemesine yönelik gri tabanlı adaptif bir tahmin modeli geliştirmişlerdir. Hsu ve Chen (2003) ise; Tayvan'ın enerji talebi için geliştirdikleri gri tabanlı tahminleyici ile daha iyi tahminleme doğruluğu elde etmişlerdir. Chiou vd. (2004) ise, Tayvan donanması yedek parça stoklarının kontrolü için yaptıkları çalışmada, sadece talep miktarını belirlemek için gri tahminleme modeli ile malzeme gereksinimi üzerinde bir çalışma yapmışlardır. Askari ve Askari (2011) ise, gri zaman serisi modeli olarak altın fiyatlarının tahminlenmesi üzerine bir çalışma yapmışlardır. Sonuçta, geliştirilen gri yöntemin daha iyi olduğunu sayısal bir örnek ile göstermişlerdir.

Ayrıca Ma vd. (2013) yüksek doğruluk veren gri tahmin ve parçacık sürü algoritmasıyla optimize edilmiş kayan mekanizmalı bir hibrit oluşturarak Çin'in demir cevheri ithalatı ve toplam tüketimini gelecek 5 yıl için tahmin etmişlerdir. Akay ve Atak (2007) ile Boran (2014), farklı çalışmalarda Türkiye'nin elektrik ihtiyacı ve doğalgaz tüketimini kayan mekanizmalı gri tahmin modeliyle tahminlemişlerdir. Pi vd. (2010) yaptıkları çalışmada Çin'in 1984-2006 yılları arasındaki enerji ihtiyacı ve üretim verilerini kullanarak 2007-2015 yılları için tahminler yapmışlardır. Bunun için 3-nokta ortalaması teknolojisi ve artık modifikasyonu yöntemleriyle iyileştirdikleri gri tahmin

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modelini kullanmışlardır. Yin ve Tang (2013) ise yaptıkları çalışmayla gri tahmin modellerinin, Çin'in eksik ve tutarsız meslek verileriyle bile tahminde iyi sonuçlar verdiğini göstermişlerdir. Çin'deki 1998-2006 yıllarına ait toplam enerji, kömürden elde edilen ve temiz enerji kaynağı tüketim verilerini kullanarak yaptığı tahminleme çalışmasında Feng vd. (2012) gri tahmin modeli kullanmıştır. Hamzaçebi ve Es (2014), çalışmalarında gri tahmin modelinden daha iyi sonuçlar elde etmek amacıyla optimize gri tahmin yöntemini kullanmışlardır. Bu yöntemle 2013-2025 yılları için yıllık elektrik tüketimini tahmin etmişlerdir.

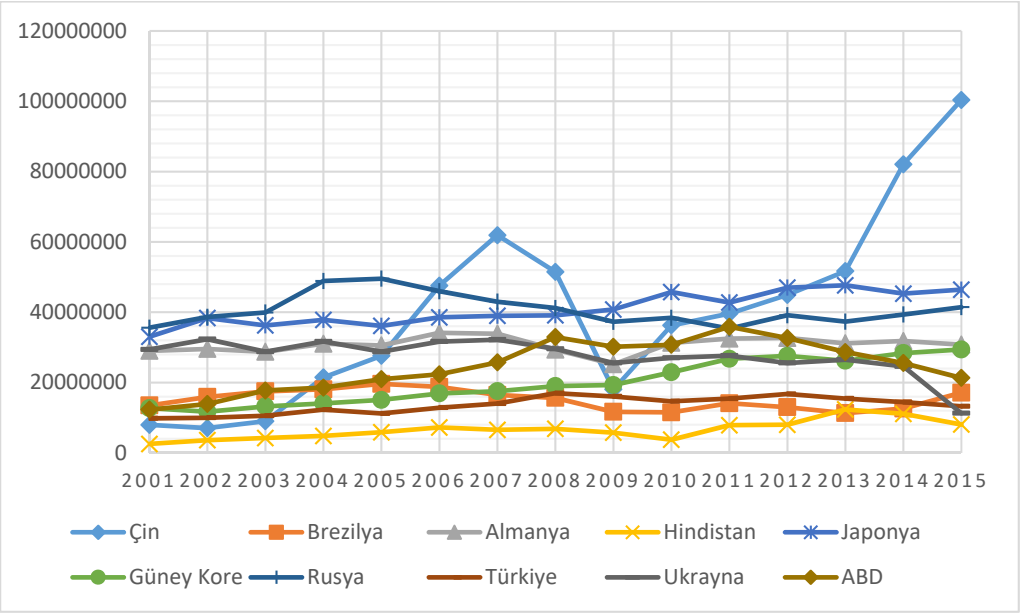
Materyal ve Metot

Çalışmada kullanılan veriler, Dünya Ticaret Örgütü - DTÖ (World Trade Organisation)'nün istatistik sitesinden elde edilmiştir. En çok üretim yapan ülkelerin sıralaması için, Dünya Çelik Birliği – worldsteel'in sıralaması referans alınmıştır.

Tablo 1: En çok demir çelik üretimi yapan ülkeler listesi

	2015 Yılı Üretim Miktarı (ton)	2015 Yılı İhracat Miktarı (ton)	2015 Yılı Birim Kazanç ($/ton)
1	Çin	Çin	Hindistan
2	Japonya	Japonya	Almanya
3	Hindistan	Rusya	Güney Kore
4	ABD	Almanya	ABD
5	Rusya	Güney Kore	Ukrayna
6	Güney Kore	ABD	Japonya
7	Almanya	Brezilya	Brezilya
8	Brezilya	Türkiye	Türkiye
9	Türkiye	Ukrayna	Çin
10	Ukrayna	Hindistan	Rusya

Tahmin için kullanılan ilk 10 ülkenin ihracat rakamları, 2001-2015 yıllarına ait demir çelik ürünleri ihracat verileridir. Veri olarak kullanılan ihracat rakamları ton cinsinden ihracat miktarıdır. Bu verilerin grafiği Şekil 1'de görülmektedir. Miktar olarak en çok üretim yapan ülke Çin'dir. Grafik incelenirse, miktar olarak en çok dalgalanma görülen veri de Çin'e aittir. Bunun dışında son yıllarda ABD, Ukrayna ve Hindistan'ın ihracatında düşüş görülmektedir.



Şekil 1. Demir çelik üreticisi ilk 10 ülkenin ihracat miktarları (ton)

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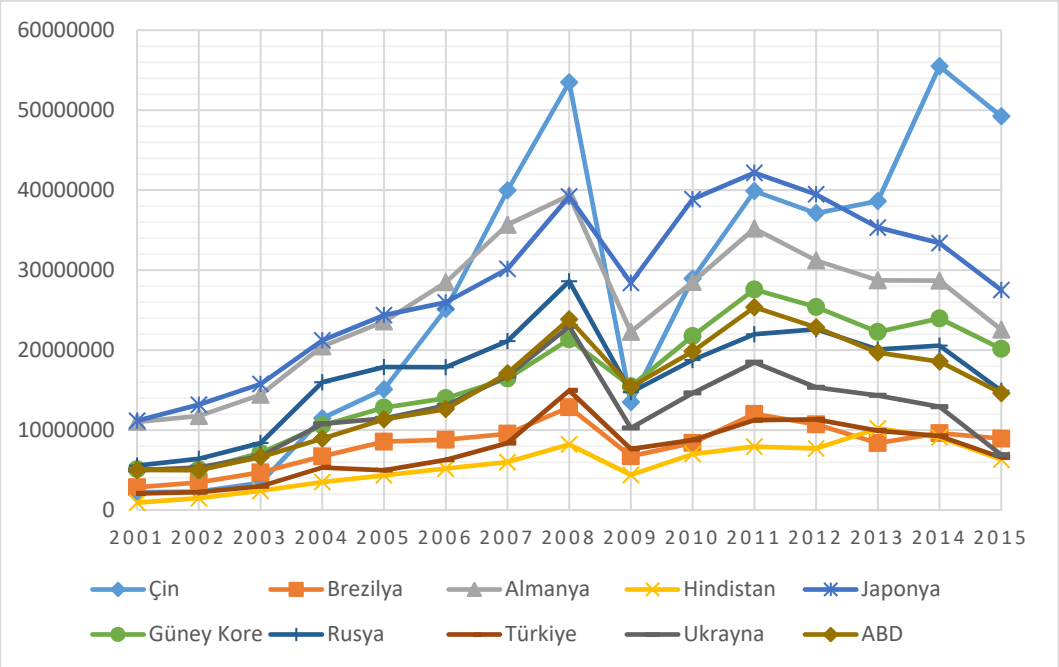
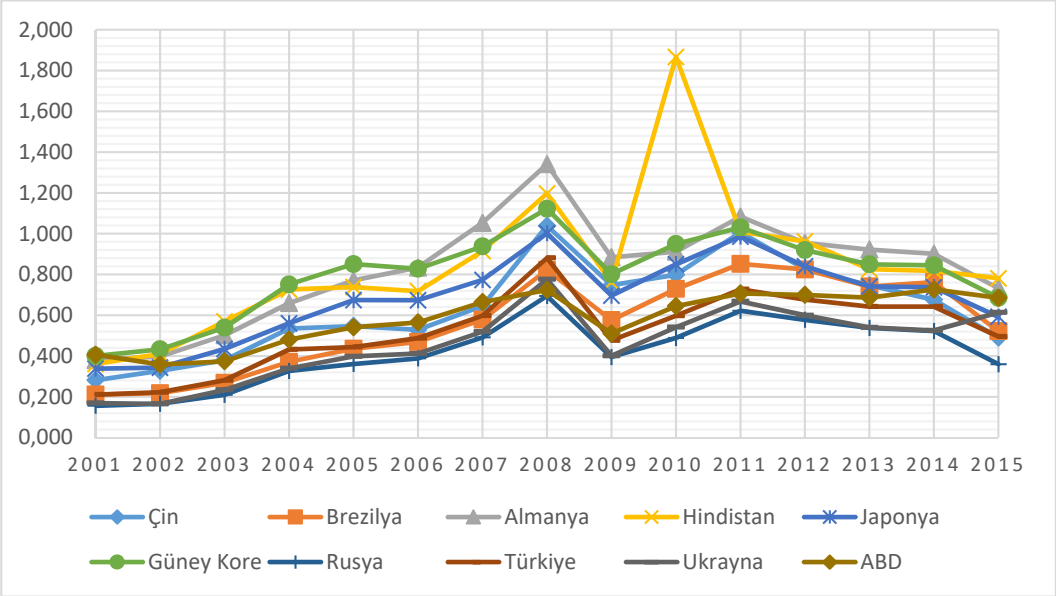


Şekil 2. Demir çelik üreticisi ilk 10 ülkenin ihracat miktarlarının değerleri ($-Amerikan doları)

Şekil 2'de yer alan ihracatın maddi değeri incelendiğinde Çin yine en yüksek ihracat değerine sahiptir. Daha düşük miktarlarda ihracat yapmasına rağmen, daha fazla maddi değerde ihracat yapan Güney Kore ve Almanya üst sıralarda yer almaktadır. Bu şekilde az ihracat yaparak, özellikle katma değeri yüksek ürün ihraç ederek, yüksek kazanç elde eden ülkelerin birim kazançlarının grafiği Şekil 3'de görülebilir. Birim kazancı en yüksek olan ülkeler ise Hindistan, Almanya ve Güney Kore'dir. Yüksek miktarlarda üretim ve ihracat yapan Çin ise bu ülkeler arasında birim kazanç olarak çok altlarda yer almaktadır.



Şekil 3. Demir çelik üreticisi ilk 10 ülkenin ihracattan elde ettiği birim kazançlar ($/ton)

Çalışmada 2016-2020 yıllarına ait 5 yıllık tahmin yapılmıştır. Tahmin için, Deng'in «Gri Tahmin» metodu tercih edilmiş, bu işlem için Matlab R2015a programında yazılan kodlar kullanılmıştır.

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Gri sistem teorisi (GST - Grey System Theory) bir sistem teorisi olarak 1980'li yıllarda geliştirilmiştir. 1982 yılında Julong Deng tarafından yayınlanan "Gri Sistemlerin Kontrol Problemleri (Control problems of grey systems)" başlıklı makale (Deng, 1982), GST'nin bahsedildiği ilk makaledir.

Belirsizliğin ve eksik bilginin olduğu durumlarda anlamlı sonuçlar elde etmenin zorluğuna karşın, bunu sağlayabilme yeteneği nedeniyle tercih edilen bir çözüm teorisi olarak karşımıza çıkmaktadır (Deng, 1989). GST'ye dayanan gri tahmin (GP - Grey Prediction) yöntemi genellikle tek faktörlü, kısa dönemli ve eksik veri içeren sistemlerin tahminlemesinde kullanılmaktadır. GM(1,1) modelinde bütün veriler tahmin için kullanılır.

GP yönteminde, n değişkenli birinci dereceden bir model GM(1,n) şeklinde ifade edilirken, tek değişkenli birinci dereceden bir model ise GM(1,1) şeklinde gösterilmektedir. GM(1,1) modeli için gerekli adımlar şunlardır (Akay & Atak, 2007):

a. Adım 1: n terimli orijinal zaman serisi,

$$x^{(0)} = (x^{(0)}(1), x^{(0)}(2), x^{(0)}(3), ..., x^{(0)}(n))$$

şeklinde tanımlanırsa, düzensiz $x^{(0)}$ serisinin monoton artan $x^{(1)}$=($x^{(1)}(1)$, $x^{(1)}(2)$,…, $x^{(1)}(n)$) serisine dönüştürülmesi, AGO (Accumulated Generating Operator) kullanılarak yapılır. $x^{(1)}$ serisi ise

$$x^{(1)}(k) = \sum_{i=1}^{k} x^{(0)}(i)$$

denklemi ile hesaplanır. Eşitlikteki k (k=2,3,…,n) zaman periyodunu göstermektedir.

b. Adım 2: GM(1,1) için, birinci-derece gri diferansiyel denklemi,

$$x^{(0)}(k) + az^{(1)}(k) = b$$

olarak yazılırken, denklemdeki $z^{(1)}$ ise

$$z^{(1)}(k) = 0.5x^{(1)}(k) + 0.5x^{(1)}(k-1)$$

şeklinde hesaplanarak diferansiyel denkleme dahil edilir. Diferansiyel denklemde yer alan *a* gelişme katsayısı, *b* ise yön verici katsayı olarak nitelendirilir.

GM(1,1) modeliyle tahmin yapılabilmesi için, gri diferansiyel denklemi sağlayan *a* ve *b* değerlerinin tahmin edilmesi gerekmektedir. Bu tahmin işlemi için en küçük ortalama kareler tahmin yöntemine başvurulmaktadır. Buna göre $[a\ b]^T$ matrisi

$$\begin{bmatrix} a \\ b \end{bmatrix} = \left[B^T B\right]^{-1} B^T Y$$

denklemine göre hesaplanır. Burada

$$B = \begin{bmatrix} -z^{(1)}(2) & 1 \\ -z^{(1)}(3) & 1 \\ \cdots & 1 \\ -z^{(1)}(n) & 1 \end{bmatrix}$$

ve

$$Y = \begin{bmatrix} x^{(0)}(2) \\ x^{(0)}(3) \\ \cdots \\ x^{(0)}(n) \end{bmatrix}$$

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olarak denkleme dahil edilir.

c. Adım 3: *a* ve *b* katsayılarının tahmini değerleri hesaplandıktan sonra, gri diferansiyel denklemde yerleştirilip çözülerek gelecek değer tahminlerinde kullanılacak olan GP denklemi elde edilir:

$$\hat{x}^{(1)}(k+1)=\left[x^{(1)}(0)-\frac{b}{a}\right]e^{-ak}+\frac{b}{a}$$

Buradaki $\hat{x}^{(1)}(k+1)$, periyot k+1'deki $x^{(1)}(k)$ için tahmin değeridir. Zaman serisi $x^{(0)}(k)$ için hesaplanacak tahmin değerleri serisi ise, $\hat{x}^{(1)}(k+1)$ için ˆIAGO (Inverse Accumulated Generating Operator) uygulanmasıyla elde edilir. k=2,3,…,n için tahmin değerleri

$$\hat{x}^{(0)}(k)=\hat{x}^{(1)}(k)-\hat{x}^{(1)}(k-1)$$

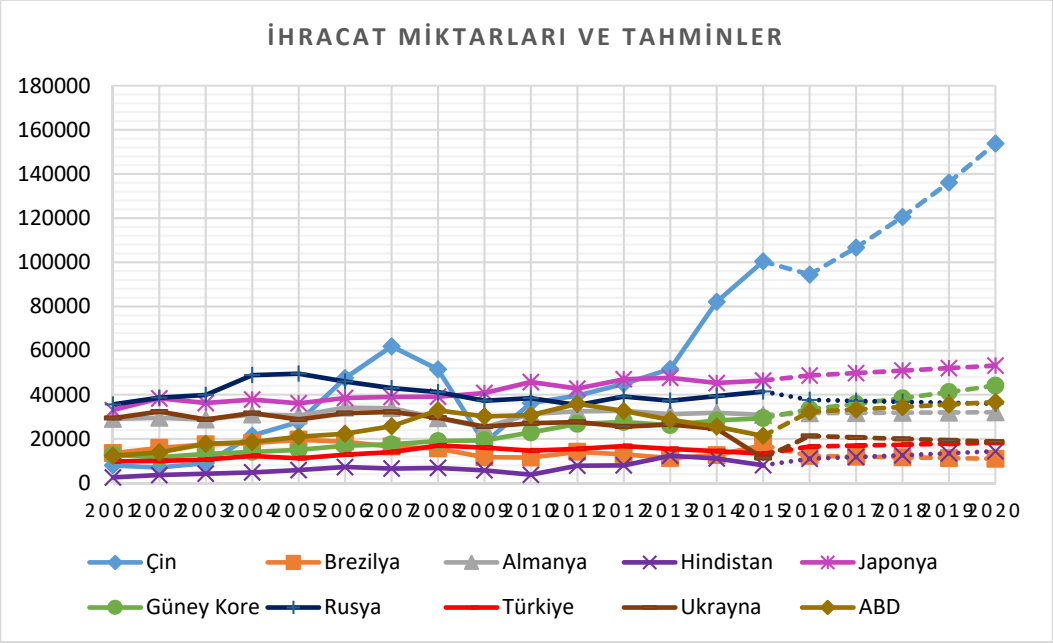
olarak belirlenir.

Bulgular

Çalışmada tercih edilen gri tahmin yönteminin veriler için uygun olup olmadığı test edildiğinde, sadece Çin'in verilerinin uygun olmadığı görülmüştür. Deng'in makalesinde (Deng, 1989) önerdiği testlere göre Çin'in verileri aşırı iniş çıkışlı yapısından dolayı gri tahmin yöntemine uygun değildir. Buna rağmen Çin'in ihracatı için gri tahmin kullanılarak tahmin yapılmıştır. Diğer ülkelerin verileri ise gri tahmine uygundur.

Çin'in ihracatındaki artışın devam edeceği öngörülmektedir. 2016 yılı için bir düşüş ve sonrasında yükseliş öngörülse de, modele uyumsuzluğu sebebiyle tahminin MAPE oranı %46 civarında düşük bir seviyede kalmıştır. Çin harici diğer ülkelerde tahminlerin MAPE oranları %20'nin altında kalmış, bazılarında ise %10'un altında iyi sonuçlar elde edilmiştir.

Rusya, Brezilya ve Ukrayna'nın ihracatında düşüş beklenmektedir. Almanya ve Türkiye'nin ihracat miktarının ise neredeyse değişmeden kalacağı öngörülmektedir. Diğer ülkeler olan Hindistan, Japonya, Güney Kore ve ABD'nin ihracatlarında ise Çin'deki kadar yüksek oranda olmasa da artış beklenmektedir.



Şekil 4. Demir çelik üreticisi ilk 10 ülkenin ihracat miktarları (2001-2015) ve gelecek dönem tahminleri (2016-2020)

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Sonuç

Son yıllarda Çin'in yüksek üretim ve ihraç miktarları demir çelik piyasasında fiyatların düşmesine neden olmuştur. Her ne kadar çalışmada kullanılan yönteme uymasa da Çin'in ihracatının artması beklenmektedir. Diğer ülkelerin ise üretimlerini ve buna bağlı ihracatlarını Çin kadar artıramayacakları görülebilmektedir. Bu sebeple üretim ve dolayısıyla ihracatını Çin kadar artıramayan ülkelerin, Çin'in sebep olduğu düşük fiyat ortamında ihracat yapabilmeleri için alternatif stratejilere yönelmeleri gerekmektedir. Türkiye'nin ve diğer ülkelerin; Hindistan, Almanya ve Güney Kore'nin yaptığı gibi katma değeri yüksek, az miktarda satışla yüksek gelir getiren ürünlere yönelmeleri doğru bir strateji olacaktır. Bu sebeple birim getirisi yüksek ürünlerle ilgili yapılacak çalışmaların sektöre faydalı olacağı görülmektedir.

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DESIGN AND SIMULATION OF AN ELECTRIC VEHICLE DRIVEN BY SERIES DC MOTOR USING THE EUDC CITY CYCLE

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Today,the efficient use of energyhas gained importance. Savings from efficient use of energy is provided. Designers and users are referred to use more efficient energy system and resources. In this present study, the design, modeling and simulation of an electric vehiclecommonly being started to be used in twenty-first century have been carried out. In modeling, the dimensions of a vehicle suitable for use and the technical features of an electric motor used in today's electric vehicle technology have been take into consideration. The vehicle ismodeledusingthe EUDC (Extra Urban Driving Cycle)citycyclesimulations were performed. The cyclefor movement of the vehicle duringup to maximum 18kW power and 531Nm of torquethat needs account. The maximum current value that will meet the torque and power values were determined as 156.A. Also In this performed Matlab environment study, the characteristics of electric motor and vehicle movement are described.

Keywords: Electric vehicle, vehicle design, DC motor, simulation, EUDC

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DESIGN OF FCL USING CORE WITH LOW INITIAL PERMEABILITY

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ABSTRACT

Increase in electrical energy consumption and continuously expansion of electrical power grid result in increasing the fault current level in the grid. In order to clear these increased faults, circuit breakers and similar protection devices are not providing the required limitation. For the grid to continue proper functioning, fault currents have to be limited to the level which the protection devices are able to clear.

Fault current limiters are expected to consume minimum energy during the normal operation so that they become invisible in the grid. To ensure that, for example saturated core fault current limiters needed to be in saturated condition continuously. In this way, they are invisible with little energy consumption in saturated region during the normal operation. However, continuously saturating the cores causes continuous energy consumption from a DC supply or need to have superconducting cables. These requirements cause operating and/or installation costs to increase. This study aims to eliminate the need of the saturated cores by using the type of cores which are able to operate in the low initial permeability region. From the literature search; it was determined that SAE 1020 low carbon steel indicates low initial permeability region having constant magnetic flux density for low magnetic field intensity values. This material has been inspected to have enough initial permeability window for normal operation. For this reason, the design simulation has been carried using required shape, dimensions and associated parameters. When simulation results are inspected, it was determined that the design simulation supports the argument.

Keywords: Fault current limiter

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DESIGNING AND IMPLEMENTATION OF OUTDOOR TRANSFORMER SECURITY SYSTEM

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Abstract: In agriculture, quality and high productivity depend on irrigation of crops in dry months. Pressurized irrigation methods are preferred due to both natural water resources more efficiently as well as better quality agricultural production. This situation brings with it the demand for electricity at irrigation. For this reason, the farmers are in need of transformers supplied with their own resources owned or state. During unirrigated winter months, states cut the energy of electrical transformers to eliminate or minimize energy losses occurred in transmission lines. However, this condition has created serious problems in the transformer security. In the previous studies, it is seen that many products have used GSM / GPRS communications technology taken their energy from network or solar panels connected to transformer. But, common feature of these products is a system that triggered by latching of lid in the protection provided region and then generating alarm. In this study, it is focused on the designing of security system triggered in the case of unauthorized persons to start approaching or leaving the transformer pole and this is the only possible by using system integrated outdoor PIR (Passive Infrared Sensor) sensors. In addition, developed Transformer Security System (TSS) uses both GPRS and MMS infrastructure. In sleep mode, TSS register the GPRS network in 4 seconds by receiving from the Passive Infrared Detector (PIR) and taking 5 seconds during video recording with audio and visual stimuli. After then, with alarm status information and image recording is transferred to the central monitoring software. As a result, security in the field of medium voltage electrical transformer is provided by using M2M technology and the continuity of the structure of interconnected power lines are protected.

Keywords: Agricultural Irrigation, Electric Transformer, M2M, GSM/TCIP

Introduction

Agriculture is among the most important source of income for many countries in the world are located in the first row. In agriculture, the quality and high yield depends on irrigated crop in arid last month (Schultz, 1964). In agricultural irrigation systems, pressure irrigation methods are preferred due to both more efficiently in natural water using and more quality in agricultural production (Nakayama, 1991). This situation brings with it the demand for electricity for irrigation. For this reason, the farmers are in need of transformers supplied with their own resources owned or state. During unirrigated winter months, states cut the energy of electrical transformers to eliminate or minimize energy losses occurred in transmission lines (Patterson, 1996). This situation is created serious security holes in the transformers. In addition, harm is not just to stay with stolen material, but also it leads to an explosion of the transformer when it is energized (Bisak, 1991). Considering the studies conducted on the subject, short message services provided by the GSM operators are used in the study for remote monitoring of transformer substations to security purposes (Bekiroglu, 2009).The general characteristics of security system using GSM/GPRS communication are products taking their energy from connected to the network or solar panels and it works with the snapping of a cover in the provided protection region (Korkmaz, 2007). Eventually, in the case of attempt to steal the system becomes active and provides notification center or person. But if the transformer is reached the system is disabled by cutting the cables connected to latch. The limited capabilities of existing solutions and not respond to the needs required different solution approaches. In this study, it is focused on the design and implementation of a system triggered in case of the approach to non-authorized persons transformer pole and start out directly. This is the only possible by using system integrated outdoor PIR (Passive Infrared Sensor) sensors. Developed transformer Security System (TSS) uses both GPRS and MMS infrastructure. The purpose of this study is to provide the ensuring security in the field of medium voltage electrical transformer using M2M technology (Wu, 2011) for agricultural purposes and protecting the sustainability of the interconnected structure in power lines.

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Materials and Methods

Passive Infrared Sensor (PIR) Sensor

Passive Infrared Sensor (PIR) is a kind of sensor can detect infrared radiation depending on the body temperature and translated into an electrical signal with the helping of lens. Physically, all objects having a temperature greater than absolute zero point (-273 centigrade degree) radiate energy according to their temperature. These rays moves strongly up to a certain distance and when entered the sensor's detection distance these emissions are converted into an electrical signal detecting by pyrocell (Hong, 2013). These sensors (general operating principle is shown in Figure 1) are categorized as two main groups; open and indoor area motion sensors. The indoor motion sensor has less sensitivity, detection angle and distance according the outdoor motion sensors. Outdoor motion sensors are commonly used in military border security system, fire alarm / warning systems and open area security systems. Considering the usage areas, it is appears to be important because of their properties such as the sensitivity of detection distance, animal distinguish and energy consumption. The sensing distance and operational stability of PIR sensors depend on the geometric shape of used Fresnel lens, focus distance between the lens and IR filter, the quality of IR filter, pyroelectric material and the stability of the amplifier and comparator circuit. The stability and distance of sensor is provided by the distance and placement angle between the Fresnel lens and pyroelectric sensor is adjusted in accordance with lens law.

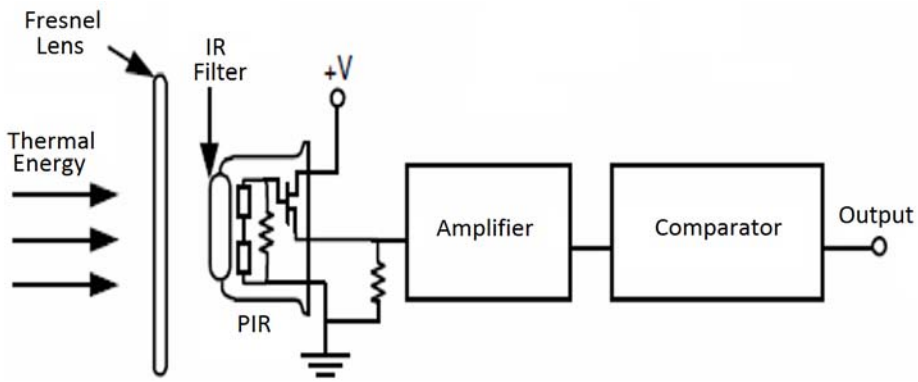

Figure 1. Operational principle of PIR Sensor

Transformer Security System

In the transformer security system (Figure 2), non-authorized persons input to the transformer pole when PIR sensor generates a warning sign. With taken this signal, video or photo of environment is taken and stored in external memory unit. Thanks to the communication unit on the system, the information is transmitted to main server locating in the monitoring center by establishing TCP/IP links over the GPRS/GSM line. The work integrity of the electrical transformer is checked using central monitoring unit or mobile devices by police and private security firms with individual users.

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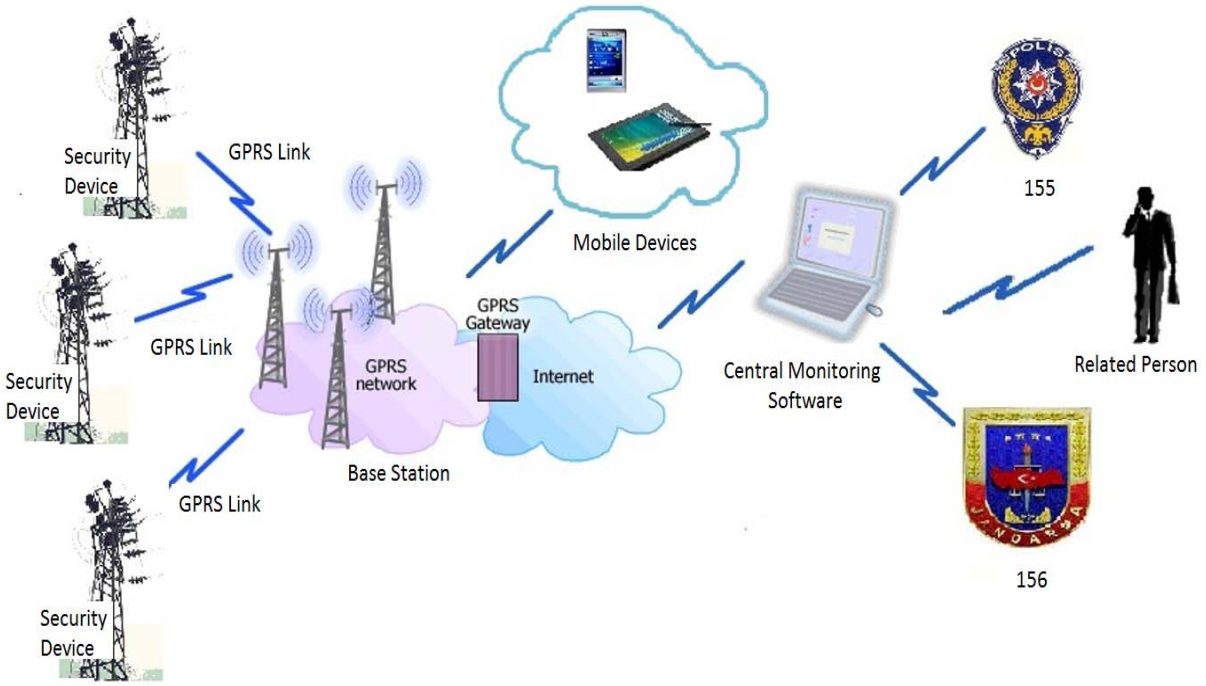

Figure 2. Transformer Security System

The working principle of Transformer Security System

The flow diagram of microcontroller software of TSS software is shown in Figure 3. After energizing the device, all elements included in the motion sensor and communication units are activated. Using GPS system device transmits information to monitoring center by taking information of coordinates and so ready for use. When alarm signal is came from the PIR sensor, videos / photos of environment are taken by activating IR illumination. The captured video or photo is stored in the external/internal memory unit. Then taken alarm information and video or photo is transmitted to server over the GSM/GPRS transmission line by connecting TCP/IP connection. When data transmission is performed successfully, the check information send by server is received and do not sent back. If data transmission is not performed successfully the error information is sent to the device by server. The device taken error information repeats transmission processing three times until it completes successfully. Alarm information received by successful software is displayed on the map in accordance with the coordinates of device. Alarm sending device can be controlled by an operator controlling system in the monitoring unit. In this control, it can be activated or passive by checking lighting on the device, audio devices or any mechanisms that can be added later. Alarm sending device without active or becomes inactive is also passed to state to produce a new alarm whether sleep mode taken out of event of alarm. As soon as the alarm generated by device is transmitted to center, if the connection has trouble for any reason, alarm information is stored in internal/external memory unit. When the device can also connect with the center, it transmits stored alarm information to center and a defined GSM number as MMS message.

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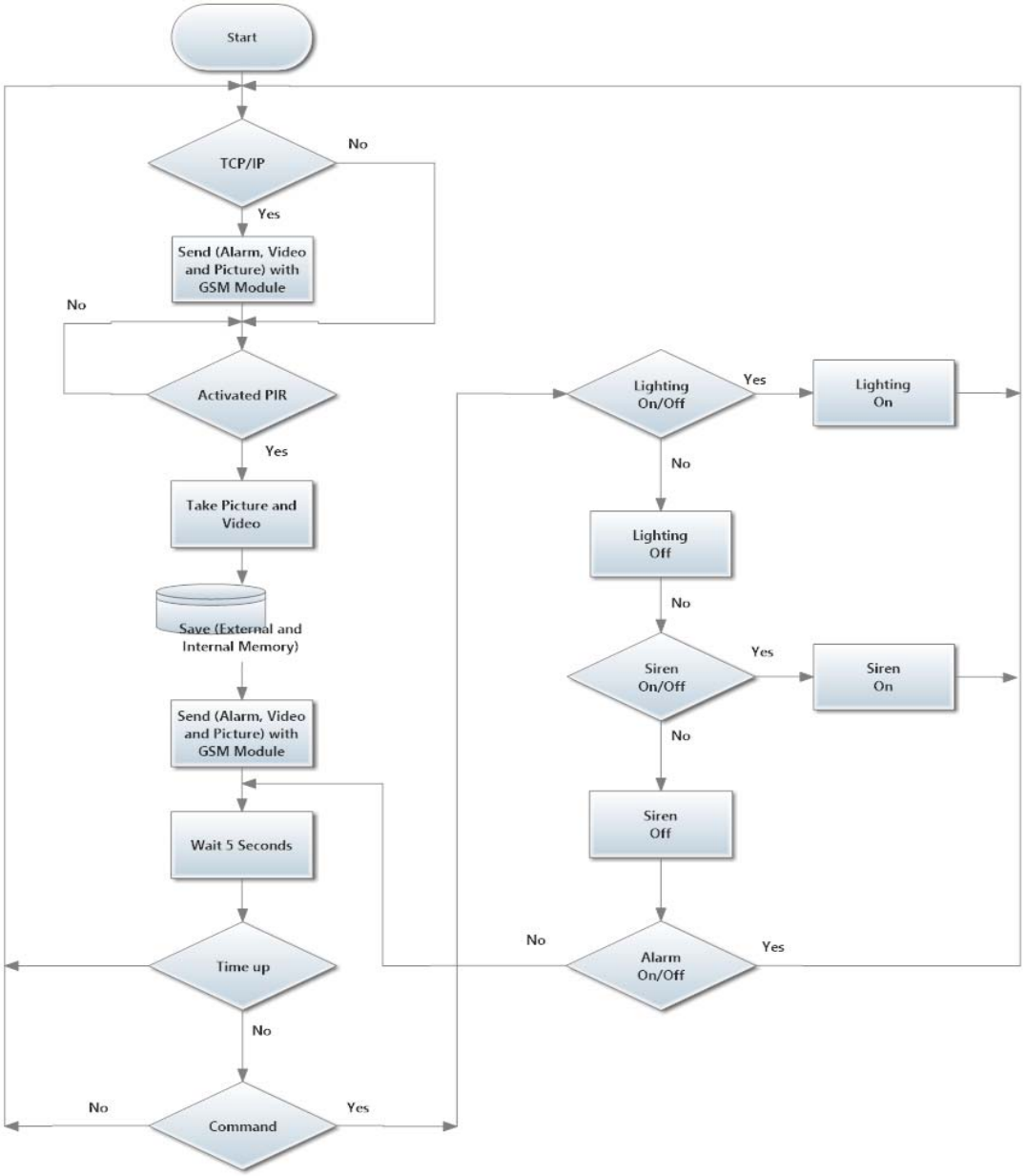

Figure 3. Flow diagram of system.

Results and Discussion

The features and hardware of designed outdoor security system are shown Figure 4. The device can be positioned in one or more points, produced alarm/warning and alerts with the helping of battery, taken photos or videos of environment and it is ready to communicate to introduced or will be introduced GSM number obtained all information via MMS. After energizing device, all elements on device are activated. After performing the task, device goes into sleep mode until the next warning sign. In this way, the device can be operated continuously for 3 years without being connected to any source of energy.

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Technical Specifications

- IP65 Protection
- 25 Meters Sensing Distance
- Sensitivity to 40kg and Over Bodies
- GSM / GPRS / GPS Communication Unit
- $3.3V_{DC}$ - $4.1V_{DC}$ Operating Range
- Sleep Mode
- Audible Warning
- Projector
- Night Vision Lighting
- External MMC Memory

Figure 4. Outdoor Security System

The interface of central monitoring software monitored devices from hardware is shown in Figure 5. At the point where the device is located when its position is changed or theft, notification is given to individual users and central monitoring instantaneously and this notification has taken coordinates at the certain time intervals and moving device information 7/24 monitoring of electrical transformer is provided with the monitoring software within the visual and audio stimuli .

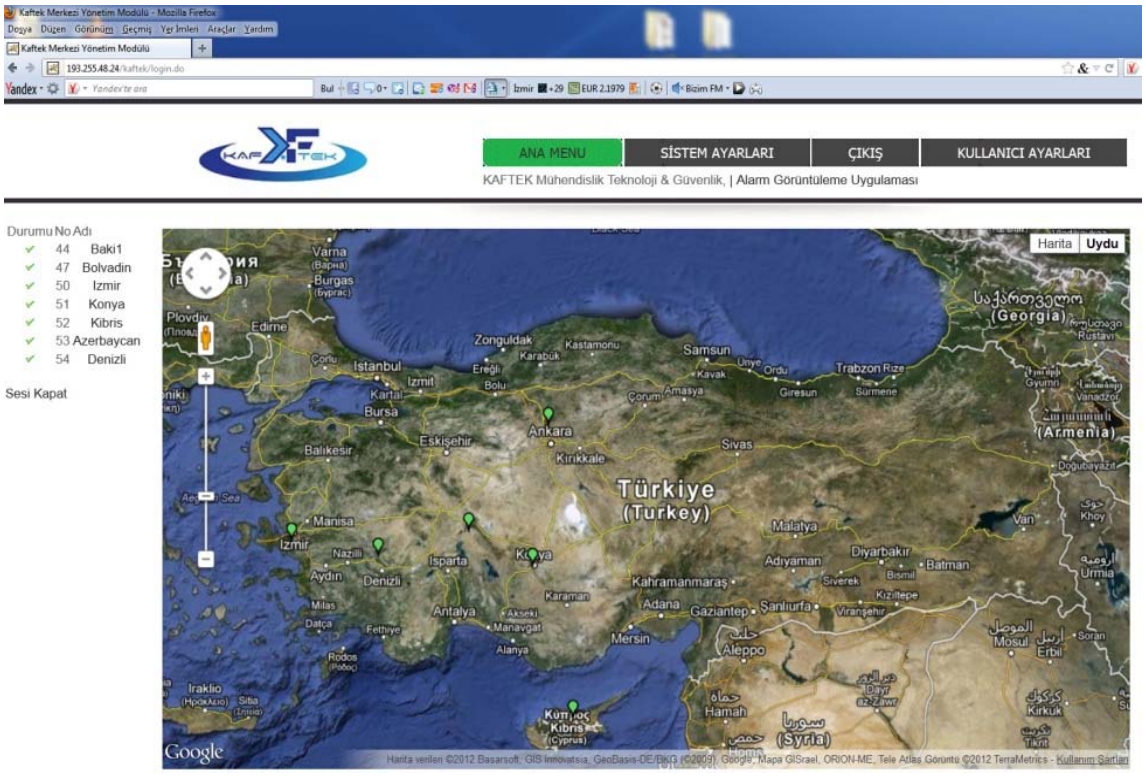

Figure 5. Central Monitoring Software

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Alarm and images of performed system with taken data are shown in Figure 6. In sleep mode, TSS register on GPRS networks in 4 seconds by receiving warn sign from Passive Infrared (PIR) detector and is taken video record of environment with visual and audio stimuli for 5 seconds. Status information with alarm and image recording are transferred to the software of central monitoring. In this process, if the fails to record the GPRS network it is provided uninterrupted transmission of the data to the monitoring center through SMS. When analyzed images, they have shown to be very successful to distinguish the environment and people. But at night times, it is not achieved the desired distinctiveness from the night images with IR illumination. Finally, it is determined that IR filter should be used in night to get quality image appropriate wavelength in camera.

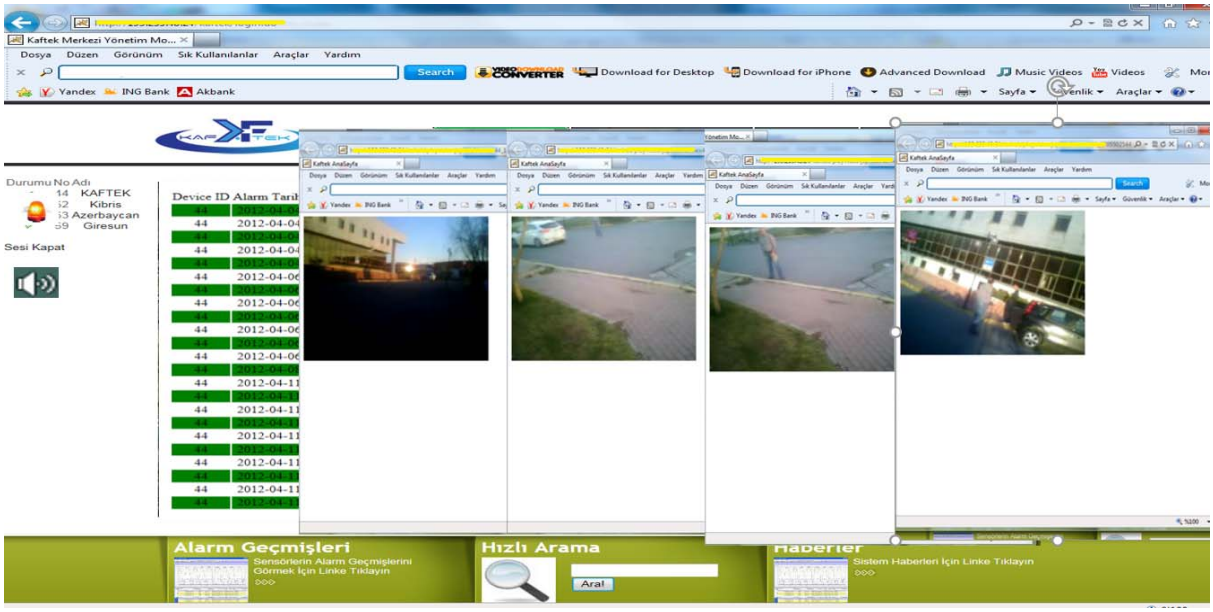

Figure 6. Integrated Test System

Conclusion

Agriculture plays a key role in many countries economy in the world. In agriculture effectively productivity depends on irrigation of crops in dry last month. For this reason, during unirrigated winter months, states cut the energy of electrical transformers to eliminate or minimize energy losses occurred in transmission lines. In this case, it has created serious vulnerability in transformers. The cooling oil and copper cables used in transformer attracts thieves due to higher selling prices. Performed transformer security systems use both GPS and MMS infrastructure. As a result, in this study a new monitoring system is realized for maintaining to continuity of the structure of interconnected power lines and security in the field of medium voltage electrical transformer used for agricultural purposes using M2M technology. The images are recorded in the server from the device that carries the distinction of being evidence in judicial review cases and with the lack of evidence, judicial process will provide the binding decisions faster. In the future studies, it will be continued in monitoring different species in their habitat and safety issues in the military field.

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DETECTING CELLS USING IMAGE SEGMENTATION OF THE CERVICAL CANCER IMAGES TAKEN FROM SCANNING ELECTRON MICROSCOPE

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Abstract: In this study, Matlab basic cell processes have implemented normal, benign and malign cervical cells taken from the Scanning Electron Microscope. These matlab basic cell process are binary gradient mask, dilated gradient mask, binary image with filled holes, cleared border, segmented, and outlined original. According to the results obtained after these operations, a difference has observed for malign image in images obtained from binary gradient mask, dilated gradient mask process. White space that is obtained after binary gradient mask and dilated gradient mask process applied to the malignant images were found to be much more than normal and benign images.

Keywords: Cervical Cancer, Matlab Basic Cell Process

Introduction

Cervical cancer is said that almost 288,000 deaths each year all over the world is the second most common cancer among women (Grubisic G, Klaric P, Jokanovic L, Soljacic Vranes H, Grbavac I, Bolanca I. 2009). cancer morbidity and mortality was determined 27 or earlier cancer can be reduced in the continuous case. In particular, such as the Pap smear for cervical cancer can be reduced. (Costa S, Negri G, Sideri M, Santini D, Martinelli G, Venturoli S, et al. 2007). Liquid-based cytology helps to reduce the percentage of 70-80 percent mortality of cervical cancer (Hanley KZ, Tadros TS, Briones AJ, Birdsong GG, Mosunjac MB.2009). The most important advantage of this test is simple and is the least invasive (Hoda RS, Colello C, Roddy M, Houser PM. 2005). These tests are effective and successful, although from what was expressed as the detection of preinvasive cervical lesions are located an average sensitivity of 55% (Saslow D, Runowicz CD, Solomon D, Moscicki AB, Smith RA, Eyre HJ, et al. 2002). invasive carcinoma detection accuracy is not perfect and show the different ranges of between 55% and 80% indifferent research (Benoit AG, Krepart GV, Lotocki RJ.1984). According to data provided by the American Cancer Society, about 3.6 million are classified as suspicious histological tests in the United States each year (Soost HJ, Lange HJ, Lehmacher W, Ruffing-Kullmann B.1991). .

There are only 8% of women are preinvasive lesions and invasive carcinoma during tissue biopsy 0.4%. 95% of the true negatives and provide relatively high (Nanda K,McCrory DC,Myers ER, Bastian LA, Hasselblad V, Hickey JD, et al.2000). Therefore, a more accurate by eliminating the additional steps of test criteria biopsy and colposcopy, HPV DNA screening can reduce the cost and patient discomfort. In this study is a developed different solution using Scanning Electron Microscopy (SEM) images. In this study, Matlab basic cell processes have implemented normal, benign and malign cervical cells taken from the Scanning Electron Microscope. These matlab basic cell process are binary gradient mask, dilated gradient mask, binary image with filled holes, cleared border, segmented, and outlined original.

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Materials and Methods

Image segmentation is the first step of the automatic picture pattern recognition and image analysis problems (Costa S, Negri G, Sideri M, Santini D, Martinelli G, Venturoli S, et al. 2007). Segmentation is the separation to constituent parts of image (Hoda RS, Colello C, Roddy M, Houser PM. 2005). The image segmentation process aiming grouped according to common characteristics of pixels, is intended to be a minimum of diversity in accordance with the criteria selected group obtained. In the literature, there are many segmentation algorithms. The most commonly used algorithms are algorithms such as Fuzzy c Means, K-means, such as Watershed. Proposed system used in this study is show in Figure 1. Segmentation used in this study was performed in stage 6.

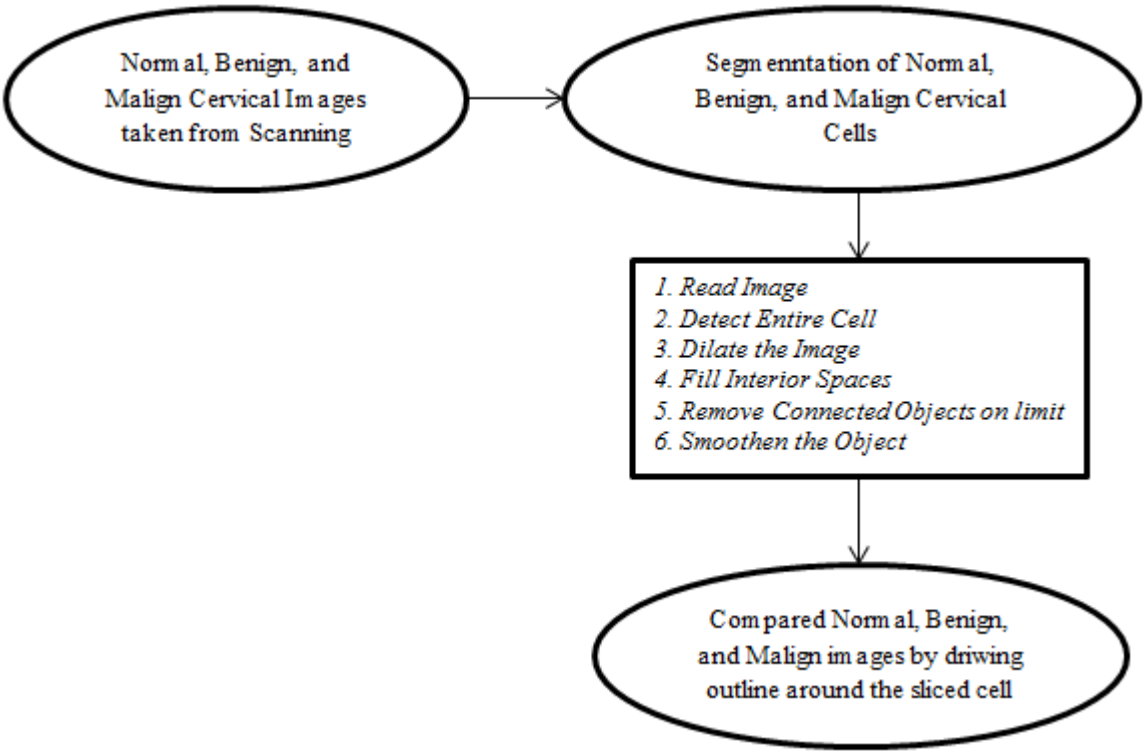

Figure 1. Proposed system in this study

Stage 1. Read Image

Read in the normal.tif, benign.tif, and malign.tif images, which are images of a cervical cancer cell (Mathworks. 1994-2016).

Stage 2. Detect Entire Cell

Cells are present in images. These images will detect cells. In other words, it is segmentation. Parts Separated image differs greatly in contrast to those in the background image. Changes in contrast can be determined by operators that calculate the gradient of an image. The gradient image can be calculated and a threshold can be implemented to create a binary mask containing the segmented cell. First, in this study is used edge and the Sobel operator to calculate the threshold value. Then, binary masks with threshold and edge cells are taken again (Mathworks. 1994-2016).

Stage 3. Dilate the Image

Binary gradient mask illustrates the route of high contrast in the image. These routes are not fairly that has strengthened the outline of the object of interest. Compared to the original image, the gradient of the line can be seen in the space surrounding the masked object. These linear gaps will lose if the Sobel image is expanded using linear structuring elements. The binary gradient mask is expanded using the vertical structuring element followed by the horizontal structuring element. The imdilate function is expanded the image (Mathworks. 1994-2016).

Stage 4. Fill Interior Spaces

It shows quite a nice gradient mask expanded cell lines, but they are still holes in the interior of the cell (Mathworks. 1994-2016).

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Stage 5. Remove Connected Objects on limit

The cell shas been successfully segmented. Any objects that are ligated to the border of the image can be eliminated using the imclearlimit function. The connectivity in the limit function was set to 4 to eliminate diagonal connections (Mathworks. 1994-2016).

Stage 6. Smoothen the Object

Finally, the image is shown for a smoother more natural look of the piece object. Cervical cancer images are created the diamond structuring element using the streel function. An alternate method for demonstrate the sliced object would be settle an outline around the sliced cell. The outline is composed by the bwperim function (Mathworks. 1994-2016).

Results and Discussion

In this study is a developed different solution using Scanning Electron Microscopy (SEM) images. In this study, Matlab basic cell processes have implemented normal, benign and malign cervical cells taken from the Scanning Electron Microscope. These matlab basic cell process are binary gradient mask, dilated gradient mask, binary image with filled holes, cleared border, segmented, and outlined original. According to the results obtained after these operations, a difference has observed for malign image in images obtained from binary gradient mask, dilated gradient mask process. White space that is obtained after binary gradient mask and dilated gradient mask process applied to the malignant images were found to be much more than normal and benign images.

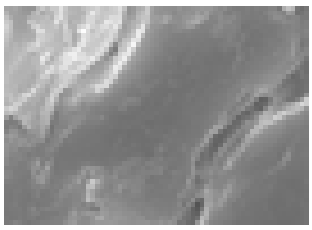

Figure 2. Normal cervical cell image

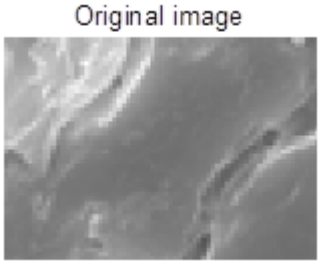

Figure 3. Grade converted image of the normal cervical cell

The larger the cell nucleus in Figure 3 was observed locally thickened.



Figure 4. Breaking of the edges with Sobel operator cell of normal cervical cell

In Figure 4 is remarkable the clutter of the edges. It shows the high-contrast areas of the image.



Figure 5. Obtaining of the enlarged edge

In addition to made processing in the above, by expanded of the edges in Figure 5 were found to be more dispersed.

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Figure 6. Image which uncovered gaps in the internal portion of the image

In Figure 6, the edges are unloaded and revealed large gaps.



Figure 7. Limits cleaned image

In Figure 7, it is seen that the boundary portions becomes clear.



Figure 8. Segmented image

In Figure 8, the image has a more natural impression.

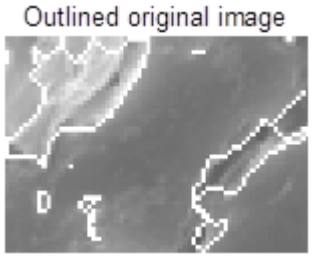

Figure 9. Outline determined image

In Figure 9 shows outline determined image

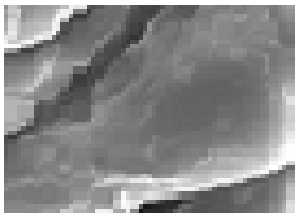

Figure 10. Benign cervical cell image

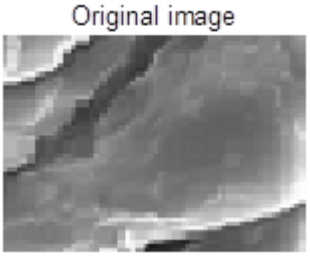

Figure 11. Grade converted image of the benign cervical cell

The larger the cell nucleus in Figure 11 was observed locally thickened.



Figure 12. Breaking of the edges with Sobel operator cell of malign cervical cell

In Figure 12 is remarkable the clutter of the edges. It shows the high-contrast areas of the image.



Figure 13. Obtaining of the enlarged edge

In addition to made processing in the above, by expanded of the edges in Figure 13 were found to be more dispersed.

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Figure 14. Image which uncovered gaps in the internal portion of the image

In Figure 14, the edges are unloaded and revealed large gaps.



Figure 15. Limits cleaned image

In Figure 15, it is seen that the boundary portions becomes clear.



Figure 16. Segmented image

In Figure 16, the image has a more natural impression.

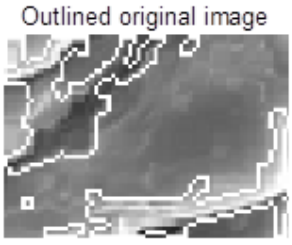

Figure 17. Outline determined image

In Figure 17 shows outline determined image.

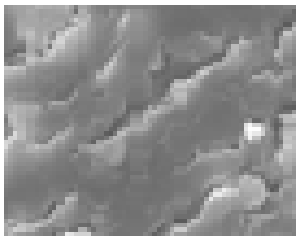

Figure 18. Malign cervical cell image

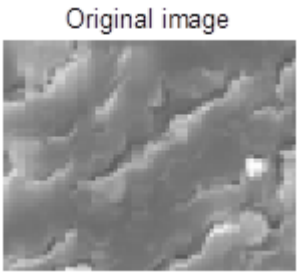

Figure 19. Grade converted image of the malign cervical cell

The larger the cell nucleus in Figure 19 was observed locally thickened.



Figure 20. Breaking of the edges with Sobel operator cell of malign cervical cell

In Figure 20 is remarkable the clutter of the edges. It shows the high-contrast areas of the image.



Figure 21. Obtaining of the enlarged edge

In addition to made processing in the above, by expanded of the edges in Figure 5 were found to be more dispersed.

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Figure 22. Image which uncovered gaps in the internal portion of the image

In Figure 22, the edges are unloaded and revealed large gaps.



Figure 23. Limits cleaned image

In Figure 23, it is seen that the boundary portions becomes clear.

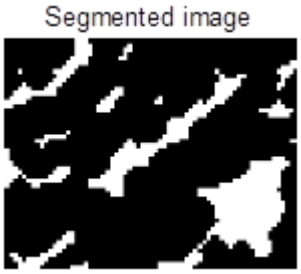

Figure 24. Segmented image

In Figure 24, the image has a more natural impression.

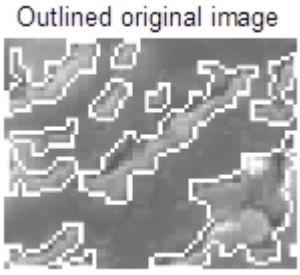

Figure 25. Outline determined image

In Figure 25 shows outline determined image.

Conclusion

Image segmentation is the first step of the automatic picture pattern recognition and image analysis problems [2]. Segmentation is the separation to constituent parts of image [4,5,6]. The image segmentation process aiming grouped according to common characteristics of pixels, is intended to be a minimum of diversity in accordance with the criteria selected group obtained. In this study, Matlab basic cell processes have implemented normal, benign and malign cervical cells taken from the Scanning Electron Microscope. These matlab basic cell process are binary gradient mask, dilated gradient mask, binary image with filled holes, cleared border, segmented, and outlined original. According to the results obtained after these operations, a difference has observed for malign image in images obtained from binary gradient mask, dilated gradient mask process. White space that is obtained after binary gradient mask and dilated gradient mask process applied to the malignant images were found to be much more than normal and benign images.

Acknowledgements

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Mathworks. (1994-2016). Detecting a Cell Using Image Segmentation

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DETECTING OF A PERSON'S FALLING MOMENT WITH MEAN SHIFT ALGORITHM

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Abstract: In the literature, studies in security field get important day by day. As a result of this situation the importance of image processing is also increasing. As an example, today, 100 hours of video streams are uploaded to Youtube per minute averagely. For this reason, processes like tracking, detecting and counting are getting important for both people and objects. There are different types of algorithms for all of these processes. Mean Shift Algorithm which is used in this paper is widely used in tracking. In this study, a video stream is captured from a definite camera. In this video stream, a person who is dressed in one color from top to toe and who is separated clearly from single color background is walking for a while and then he/she suddenly falls. After that, the person gets up and continues walking. Mean Shift Algorithm is used for tracking and detecting the falling moment of the person. Running Average Background Substraction Algorithm is used to find the location of the walking person. OpenCv 2.4.5 library is used for applying Mean Shift Algorithm. Finally success rate of Mean Shift Algorithm is measured.

Keywords: Mean Shift Algorithm, Running Average, falling person, detection, image processing.

1.Introduction

Image processing is the concept of processing of digital images and forming new images for special purpose. A lot of algorithms are developed in the field of image processing. One of these algorithms is Mean-Shift Algorithm (MSA). It is simple as well as stable. So it has important success in object tracking. MSA is a recursive procedure. It finds local extreme of a similarity measure between the color histograms or kernel density estimates of target image. Its application areas are computer vision, cluster analysis and image processing.

In recent years, a great deal of implementations using MSA have been proposed. In[1], detecting text in image was used with texture-based method. Textural properties of the text was indicated by Support Vector Machines (SVM). Then, MSA was continuously applied to text area. In this study, there was combination of MSA and SVM. But this method faced a problem classification of low contrast images or small size text.

In[2], It was provided appropriate generalization of MSA acts as if k-means clustering algorithm in special cases. Cluster analysis is treated as a deterministic problem of finding a fixed point of mean shift that characterizes the data. Applications of Clustering and Hough transform were shown. MSA was considered as an evolutionary strategy.

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In[3], problem of selecting appropriate scale using MSA was handled for blob tracking. Detection of blob scale using differantial scale-space filters was started with Lindeberg theory. To analysis mode at this scale-space, an efficient mean-shift prosedure was identified. Each mode represented position of location and scale of the blob. Finally two stage mean-shift algorithm was realised.

In[4], mean-shift based space analysis technique was developed. Combination of discrete data and recursive mean-shift procedure and advantage of identificatin modes of the density was proved. Relation with mean-shift procedure was realised from Nadaraya-Watson estimator to Kernal regresssion.

In[5], a video was captured from moving camera and a real-time tracking was realised. Tracking process was applied with MSA. The algorithm found which position is the most probable for tracking of target object in current frame. Difference between target object and target candidates was stated with metric derived. Theorical analysis of this approach was demonstrated.

In[6], a novel, simple computing and distinctive similarity scale was proposed. The novel similarity scale helped MSA for tracking of more general motion. Gauss transform was used to reduce the copmputation complexity. So, very effecient and stable algorithm was realised. This algorithm was tested on several image sequences and stable and reliable results were achieved.

Human tracking process in video streams is still a difficult problem. There were many unsuccessful stuation of MSA in human tracking. In[7], mean-shift tracking approach was presented against to the unsuccessful stuation. This study presented a solution to occlusion pedestrians problem.

The main objective of this paper is to implement detecting of a person's falling moment. In this paper, a video stream is captured from fixed camera to implement MSA. In the video stream, there is a person who is dressed in one color from top to toe and separated clearly from single color and fixed background. The person is walking for a whike in a certain direction and suddenly falls. Then the person gets up and continues walking. Background substruction operation is generally done for motion detection in video stream is captured from fixed camera. Running average algorithm is used for background substraction. Then MSA is used, for tracking and detecting. The application is realised Microsoft Visual Studio environment using OpenCV library and the success rate of the application is measured.

The rest of the paper is organized as follows : materials and methods, running average algorithm, mean-shift and cam-shift algorithms, results and discussion and conlusion.

2.Materials and Methods

Flowchart of this application is given in Figure 1. First of all, histogram is calculated. Hue value of HSV color space is used to calculate histogram. Then, running average algorithm is used for background substraction operation. MSA is used iteratively for tracking and detecting of falling moment. Number of frame controls the iteration. Finally, cam-shift algorithm is applied for detecting changeble size of the tracked person.

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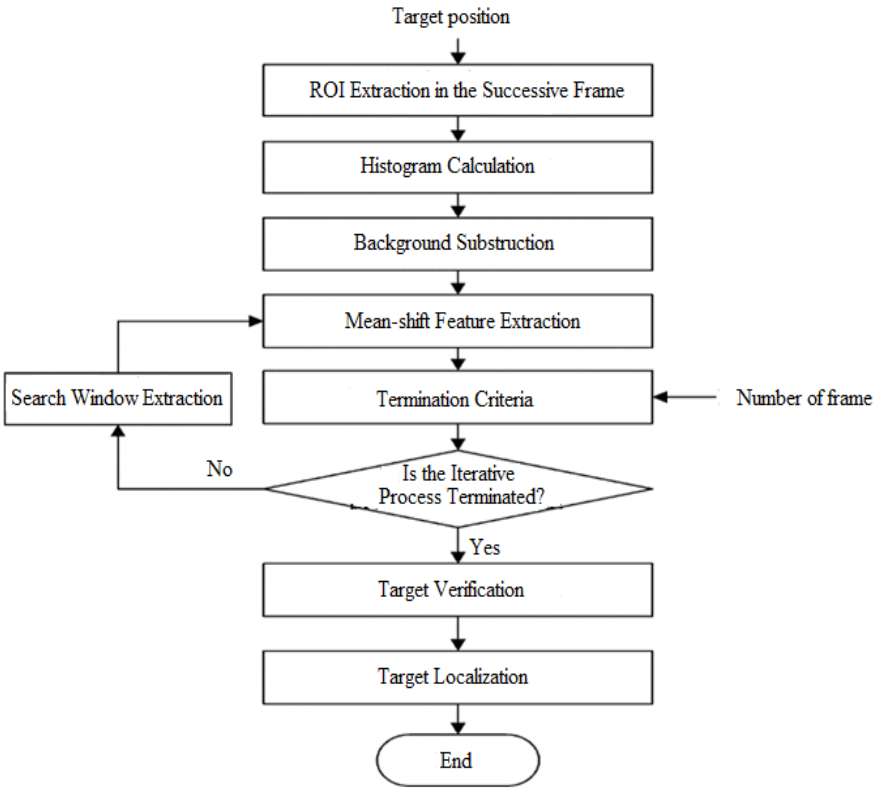

Figure 1: Flowchart of detecting of a person's falling moment with mean shift algorithm.

2.1 Running Average Algorithm

Background subtraction can be named Foreground Detection Technique. Background subtraction is a widely used approach for detecting moving objects in videos from static camera [8] and it provides important cues in computer vision such as

- surveillance tracking
- human poses estimation.

But, background subtraction is generally based on a static background, is not applicable in real environments. Wind, rain or illumination changes brought by weather, static backgrounds methods have difficulties with outdoor scenes.

Purpose of the running average algorithm is to keep the dynamic of the background image[9]. So, in this study, running average algorithm is selected for background substraction.

Background is calculated by equation 1.

$$B_{(t+1)} + 1(x,y) = (1-\alpha) * B_t(x,y) + \alpha * F_t(x,y) \quad (1)$$

α:learning rate

F_t(x,y): Funtion used to obtain a background image (must be the gray level) of any pixel values.

B_t (x,y): Any the pixel value of the background image of the previous image.

$B_{(t+1)}$(x,y) : Has been obtained any pixel values of the background image for the current image.

The problem arises when processing for the first two images. So, we start with the second image frame. The first image as the background for the second image frame.

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2.2 Mean-Shift Algorithm

Tracked object is considered as a set of points in MSA. The set of points is histogram of pixel or histogram backprojection on image frame. Maximum pixel intensity is claculated within determined a small window or a cycle. First case is shown by blue cycle and named C1, center of C1 is C1_o are shown in Figure 2. Intensity center of blue cycle(C1_r) is calculated. C1_o and C1_r are checked. If they are not overlap, C1_o is shifted toward C1_r. New center is computed again.

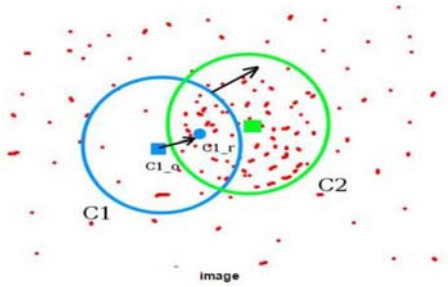

Figure 2: Example cycle to explain mean-shift algoritm[10].

As long as overlaping does not occur, cycle shifting process is continues. When overlap is realised, distribution maximum pixel is found. Green cycle is named C2 which is stable for video streams. When the object moves, histogram changes. Finally, MSA runs iteratively to determine maximum point. Target object must be determined for using this algorithm and histogram extraction must be performed. Backproject can be calculated for each image frame. RGB color space is converted to HSV color space. Hue value of HSV color space is only used. Noise pixels are ignored by InRange() function.

2.3 Cam-Shift Algorithm

When working with MSA, the object is tracked same size window all time. When the object is closed to camera or moved away from camera size of the object changes and problem occurs. Tracked object and track window must be changeable. MSA is working with camShift() function in Opencv library. Firstly MSA is applied. Track window is updated by equation (2) [10].

$$s = 2x\sqrt{\frac{M_{00}}{256}} \tag{2}$$

MSA is applied between new window and previous window. This operation continues as long as operlap is realised. Cam-Shift Algorithm is same with Mean-Shift Algorithm in Opencv library. The only difference between them is track window's being changeable or not.

3.Results and Discussion

A video stream which is has a resolution of 240x320 pixels and duration of 67 seconds is captured from a fixed camera to implement MSA. Unsuccessful results are obtained only during 17 seconds. The person is in the track window in 7 seconds of the 17 unsuccessful seconds. But track window size is larger than size of the person. Although the person is not seen in rest of the 10 seconds, the algorithm finds histogram value same as the person's histogram in the video stream, then tracking process continues. These results imply that 75 percent success rate is obtained. 5 best and worst image results are demonstrated in Table 1.

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Table 1: Good (left column) and bad (right column) results.

Good Results	Bad Results
	

MSA is successful on detecting of person's falling time. Reason of unsuccessful results is shadow of the moving person. When shadow occures, the algorithm calculates histogram of the person and the shadow together. Because shadow is dark and person dresses in dark color.

4.Conclusion

We have observed that as long as size of tracked object is stable and is moving through certain direction, success rate can be higher. When we are faced such a problem, cam-shift algorithm is engaged. We have observed that change of lightening affects success rate. We have considered that results can be much better on better lightening environment. Cam-shift algorithm works successfully on tracking and detecting operation regardless of the person position. Since size of tracked object is calculated dynamically. When color difference between background and tracked object is higher, success rate is getting higher.

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We have also observed that MSA is very successful using histogram value for tracking process. In the future work, success rate of the MSA can be increased by using together different color spaces such as gray, binary, RGB for calculating histogram.

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DETECTION THE CERVICAL CANCER

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Abstract: The aim of this article is to provide early detection of cervical cancer by using both Atomic Force Microscope (AFM) and Scanning Electron Microscope (SEM) images of the same patient. When the studies in the literature are examined, it is seen thatthe AFM and SEM images of the same patient are not used together for early diagnosis of cervical cancer. AFM and SEM images can be limited when using only one of them for the early detection of the cervical cancer. Therefore, multi-modality solutions which give more accuracy results than single solutions have been realized in this paper. 3x180 AFM and 3x180 SEM image sets have been taken from Firat University Science Faculty Nanotechnology and Scanning Electron Laboratories, respectively. Optimum attribute space has been obtained by Discrete Wavelet Transform (DWT) method applying to the 3x180 AFM and SEM images.

Keywords: Keywords Cervical SEM images; Atomic force; Jensen Shannon Divergence; Hellinger measure; Triangle distance; Discrete Wavelet Transfo

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DETERMINATION OF BORON IN HAZELNUT VARIETIES WITH THE ADDITION OF SORBITOL BY USING ICP-OES AND ULTRASONIC NEBULIZATION AFTER MICROWAVE DIGESTION SYSTEM

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Abstract: Turkey is generally origin of hazelnut for cultivated and wild varieties and has suitable ecological conditions for growing up high quality hazelnut varieties. Also hazelnut is very important commercial product for Turkey and is widely used in the food industry (1,2). Boron is an essential nutrient for plants and an essential element for many organisms, but can be toxic to aquatic and terrestrial organisms above certain concentrations (3). The aim of this research, Boron content of four varieties of Hazelnut (*Corylus avellana L.)* from Sakarya were determined by using inductively coupled plasma optical emission spectrometry (ICP-OES) with ultrasonic nebulization (USN). This method based on microwave digestion system and reduced memory effect of Boron by using sorbitol. Different conditions were optimized for this method. Four hazelnut varieties, eight soil samples and certificated referance material (NIM-GBW10012) were analyzed. Results revealed that the Turkish hazelnut is a good natural source of boron. The obtained results will be presented in International Science and Technology Conference (ISTEC 2016).

Keywords: Boron, Hazelnut, Sakarya, Ultrasonic nebulization, ICP-OES

Acknowledgement: This study was supported by Commission of SAU Scientific Research Projects (Project No: FBYLTEZ 2012-50-01-022)

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DETERMINATION OF CONTROL LIMITS FOR ASH CONTENT OF CLEAN COARSE COAL PROCESSED BY HEAVY MEDIUM DRUM

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Abstract: In this research, control limits of the ash content of clean coarse coal product (+18 mm) produced by a heavy medium drum at a coal preparation plant in Turkey was investigated. The importance of data normality and data independence to detect correct control limits of process control chart were shown for ash content of coal product. One year ash data obtained in 2010 which had non-normal distribution and autocorrelated were found to obey lognormal distribution well and ARIMA(1,0,1) model was the best model to remove autocorrelation. Assuming normal distribution and independence, the control limits of ash content were determined as UCL=16.97, CL=12.85, LCL=8.74 with original ash data. When considering only data non-normality and ignoring autocorrelation, the ash control limits were detected as UCL=17.49, CL=12.72, LCL=9.25. On the other hand, the control limits of ash content were implemented as UCL=19.56, CL=12.72, LCL=8.27 if we consider both lognormal distribution and autocorrelation by ARIMA(1,0,1) model. In addition, number of out-of-control points for ARIMA residual chart considering both data non-normality and auto-correlation were less than those obtained by control chart using original data.

Keywords: Non-normality, Autocorrelation, coal preparation, heavy medium drum, ARIMA chart

Introduction

Process control charts (SPCs) are widely used method to monitor and to control of a quality characteristic during an industrial production stage. Control charts provide to monitor the continuous variations in the process and can be applied and interpreted easily (Montgomery, 2011). Its application is based on two basic assumptions. These assumptions are that the data investigated obey normal distribution and independent, i.e not autocorrelated. However, these assumptions should be taken into account and verified prior to generate control charts. How data normality and autocorrelation affect the performance of control charts have been revealed in many scientific papers (Stoumbos and Reynolds, 2000; Castagliola, and Tsung, 2005; Alwan and Roberts, 1988; Bisgaard and Külahçı, 2005; Wheeler, 1991; Srinivasan, 2001; Vermat, 2006; Borror et. al., 1999; Montgomery, 2011; Montgomery, and Runger, 1997; Chou et. al., 1998; Reynolds and Lu, 1997; Lu and Reynolds, 1999; Zhang, 1997; Testik, 2005; Smeti, et. al., 2006, Psarakis and Papaleonida, 2007). It was reported in these works that, if the assumptions are not verified, the control limits determined would not be represent the process correctly and therefore, the resulted SPCs are interpreted wrong by the applicants and incorrect decisions are given about the process. If either of these assumptions is not confirmed, control limits estimated based on original data may not correctly capture the true unusual points. Hence, estimated control limits calculated by verifying assumptions would be incorrect and as a result control charts could be interpreted wrong in terms of their control limits and hence out of control points.
To avoid these mistakes, the data should be checked for data normality and autocorrelation.

This research aimed to determine the control limits in terms of ash content for +18 mm clean coarse coal produced by heavy dense drum device. The application of SPC charts on coal production have carried out by some researchers (Elevli, 2006; Elevli and Behdioğlu, 2006; Deniz and Umucu, 2013). Some studies have also shown that both data normality and autocorrelation affect SPC results seriously in mining and mineral processing applications (Bhattacherjee and Samanta, 2002; Samanta and Bhattacherjee, 2001 and 2004; Elevli et. al., 2009; Taşdemir, 2012 and 2013; Taşdemir and Kowalczuk, 2014)

The statistical properties of ash content data used in this research were investigated in detail by Taşdemir (2016a) and determined that the data obey to log normal distribution well instead of normal distribution and also not independent, i.e. autocorrelated. The autocorrelation between consequent ash content data was modelled best by ARIMA(1,0,1) model to achieve data independence (Taşdemir, 2016a). The control limits of SPC under data normality and independence assumptions and also under verification of these assumptions were presented and compared. As a result, correct control limits considering data normality and autocorrelation for the ash content of

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+18 mm clean coal produced by heavy medium drum were determined and the correct out of control points were found by ARIMA residual chart.

Materials and Methods

To determine the control limits of ash content for +18 mm coarse clean coals data produced by heavy medium drum, daily data which were obtained in the year of 2010 were supplied by Ege Linyitleri İşletmesi (ELİ) from the Dereköy coal preparation plant in Soma, Turkey. This coal preparation plant has about 4.8 million ton/year coal production capacity. Fig. 1 shows the simplified flowheet of it from Şengül (2008) (Taşdemir, 2016a and 2016b). Rather detailed information about the production stage were given at the first part of this study (Taşdemir, 2016a) and also in (Taşdemir, 2016b). The +18 mm clean coarse coals are floated in the first compartment of the drum and it is shown with a star symbol in Fig. 1. Totally 335 ash content data obtained from the production in 2010 were used in order to determine its control limits.

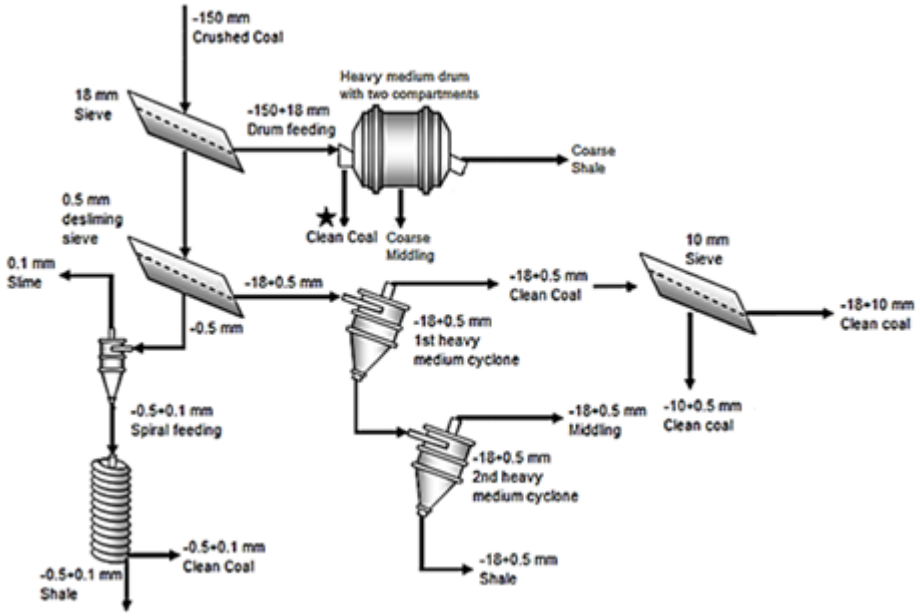

Figure 1. Modified flowsheet of Dereköy coal washing plant from Şengül (2008) and the +18 mm coarse clean coal product of heavy medium drum shown with a star symbol.

During the determination of the control limits of SPC charts, trial versions of Statgraphics XV and Minitab 16.0 softwares were used and SPC charts were generated. The data were found to obey lognormal distribution well to achieve data normality and the ARIMA(1,0,1)time series model was determined the best model based on its lowest AIC (Akaike Information Criterion) to remove autocorrelation (Taşdemir, 2016a). More detailed information for the determination of ARIMA time series models were already documented very well by Box and Jenkins (1976), Montgomery et al., (2008) and Montgomery & Runger (2011).

In this paper, the SPC charts generated under assumptions and verification conditions were presented in order to show the differences of results in terms of control limits and number of out of control points by using the data properties from Taşdemir (2016a).

Results and Discussion

Summary of statistical properties of ash content data

As stated above section, the ash content data have not obeyed normal distribution and lognormal distribution was suitable to make distribution normal (Taşdemir, 2016a). Fig. 2 compares the probability plots of normal and log transformed ash content data with resulted Anderson darling (AD) normality test statistics. The *p* value of normal distribution is very smaller than 0.05 (<0.005) indicating that the ash content data were not normally distributed. On the other hand, *p* value of log transformed ash content data distribution is 0.176 *(p>0.05)* showing that the data are represented by log normal distribution well after logarithmic transformation

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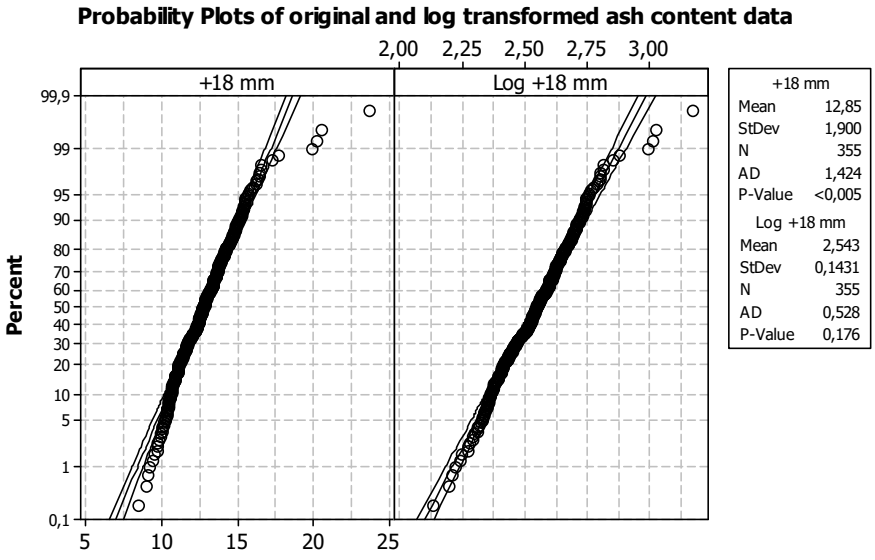

Figure 2. Probability plots of original and log transformed ash content data

Parameters of ARIMA time series model for log-transformed ash content data

After achieving data normality by log transformation, The log transformed ash content of +18 mm clean coal produced by heavy medium drum was found to be modelled by ARIMA(1,0,1) or ARMA(1,1) model well (Taşdemir, 2016a) and the details of model determination can be found there. Table 1 summarizes the ARIMA(1,0,1) model parameters.

Table 1: ARIMA(1,0,1) model summary for log-transformed ash content data (Taşdemir, 2016a)

Parameter	*Estimate*	*Stnd. Error*	*t*	*p value*
AR(1), ϕ	0.7688	0.074445	10.3271	0.000000
MA(1), θ	0.4609	0.102183	4.51042	0.000009
Mean, μ_0	2.5428	0.015762	161.324	0.000000
Constant, δ	0.5879			
WNV*, σ_a^2	0.0166			

*: white noise variance

The ARIMA (1,0,1) time series model is modelled by Eq. 1 as given the following (Castagliola and Tsung, 2005):

$$X_t = (1-\phi)\mu_0 + \phi X_{t-1} + \theta a_{t-1} + a_t \quad (1)$$

Where X_t is the observation at time t=1, 2, ,…, a_t is the random noise or white noise at time =1, 2, ,… which is assumed to have mean of zero (0) and standard deviation of σ_a, ϕ is the autoregressive parameter of the model which corresponds to p term in the model, θ is moving average parameter which corresponds to q term in the model and μ_0 is the nominal mean of the process (Castagliola and Tsung, 2005). The constant, δ, parameter in the model was calculated from $(1-\phi)\mu_0$.

By using these parameters, following ARIMA(1,0,1) time series model determined for the log transformed ash content of +18 mm clean coal produced by heavy medium drum is given in following Eq. 2 (Taşdemir, 2016a):

$$X_t = 0.5879 + 0.7688X_{t-1} + 0.4609a_{t-1} + a_t \quad (2)$$

Where, X_t is the log transformed ash content value at time, a_t is the random noise which have distribution of $N(0, 0.1289)$.

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Control limits under data assumptions

Table 2 summarizes the individual chart (I-chart) parameters obtained for the original ash content of +18 mm coarse coal under data assumptions, i.e. without data transformation and independence verification. Process sigma (σ) in Table 2 was estimated from average moving range ($\overline{MR}$) for the sample size of 2. The generated SPC and control limits under these assumptions is presented in Fig. 3. According to the Fig. 3, upper control limit (UCL) and lower control limit (LCL) were determined as 16.97 and 8.74 respectively while centre line was 12.85 which corresponded the mean of ash content data. Six points are out of control limits from UCL and one point is below the LCL.

If we assume that the ash content data had normal distribution and not autocorrelated, the observations of 31, 32, 53, 214, 347 and 348 were beyond the $+3\sigma$ while observation 208 was below the -3σ (Fig. 3).

Table 2: I-chart parameters of original ash content data of +18 mm clean coarse product by heavy medium drum

I-Chart Parameters	*Values*
$UCL=+3\sigma$	16.97
$CL=\ \bar{X}$	12.85
$LCL=-3\sigma$	8.74
$\sigma(\overline{MR}/1.128)$	1.37
$\overline{MR}$	1.55

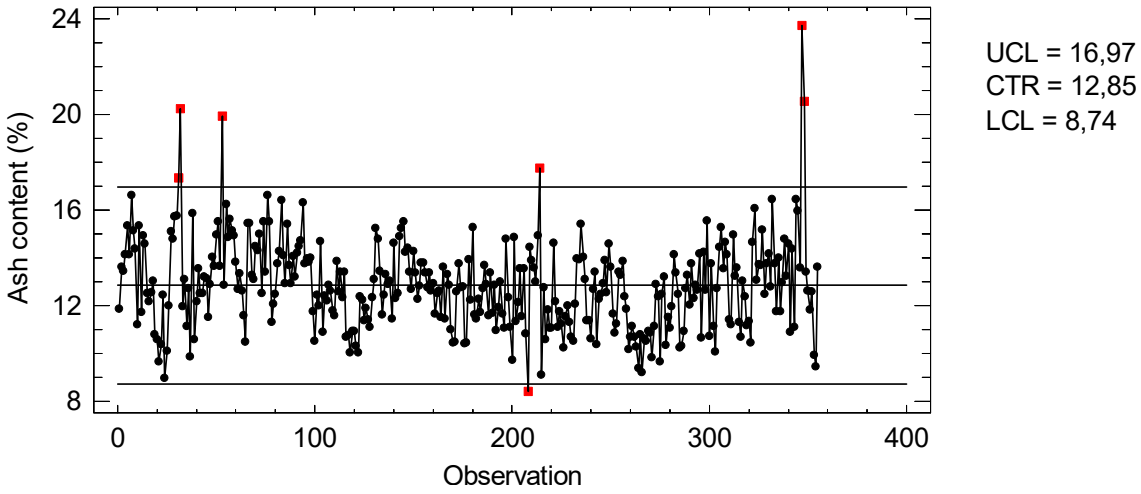

Figure 3. I-chart under normality and autocorrelation assumptions and its control limits

Control limits under verification of data normality and autocorrelation assumption

I-chart parameters after verifying the data normality by log transformation are presented in Table 2 with the corresponding original and transformed metric values. As presented in Fig. 2, the mean of log transformed ash content corresponded to 2.543 in transformed metric. Therefore, back transformed mean of ash content was equal to 12.72 in original metric.

Fig. 4 presents the control limits of ash content on SPC chart generated after data normality as in transformed metric in Fig. 4a and its back transformed metric, i.e. original unit in Fig. 4b. After log transformation, upper control limit (UCL), center line (CL) or (CTR) and lower control limit (LCL) are found as 2.86, 2.54 and 2.22 in logarithmic scale respectively. Since the log transformed values may not be meaningful or not be preferred, back transformed control limits are shown in Fig. 4b which shows the same out of control points with Fig. 4a. As seen in Fig. 4b, UCL and LCL are determined as 17.49 and 9.25 respectively. Compared to Fig. 3, the control limits are very different when the data normality is taken into account and data independence is just assumed. Larger control limits are obtained when data normality is achieved. Total number of out of control limits which beyond control limits are nine, five of them are beyond the UCL and four of them are below the LCL. These unusual points in Fig. 4a and 4b are different from the ones which are obtained in Fig. 3. The observations of 32, 53, 214, 347 and 348 are beyond $+3\sigma$ while observations of 24, 208, 215 and 266 are below -3σ.

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Table 2: I-chart parameters of original ash content data of +18 mm clean coarse product by heavy medium drum

Period	*Transformed metric*	*Original metric*
$UCL=+3\sigma$	2.86	17.49
$CL=\ \bar{X}$	2.54	12.72
$LCL=-3\sigma$	2.22	9.25

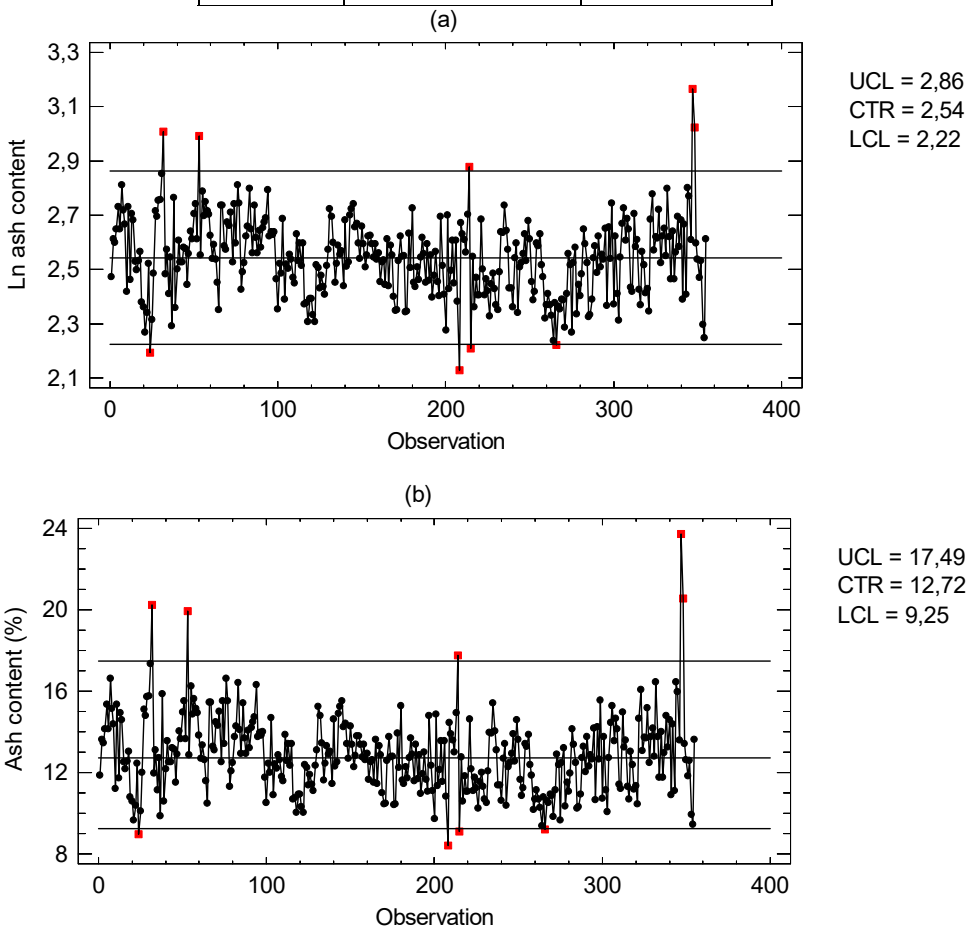

Figure 4. I-chart under normality verification and autocorrelation assumptions in transformed metric (a) and its back-transformed values of control limits in original metric (b)

Control limits under verification of both data normality and autocorrrelation

As stated above, data autocorrelation of log transformed ash content was removed successfully by ARIMA(1,0,1) time series model. While implementing control limits of SPC chart while considering autocorrelation, the process sigma, σ_x, was estimated from the both white noise or random shock and fitted ARIMA(1,0,1) model parameters (Table 1) for +18 mm clean coal product of heavy dense drum. In this chart, center line (CL) was estimated from the following formula;

$$CL = \mu_0 = \frac{\delta}{1-\phi} \tag{3}$$

The CL in Eq. 3 was determined from the parameters of ARIMA(1,0,1) model given in Table 1. Then, the control limits of data, UCL and LCL are drawn around centerline (CL) located at μ_0 by using the process sigma, σ_x;

$$\mu_0 \pm 3\sigma_x \tag{4}$$

The relation between the variance, σ_x^2, of the ARIMA(1,0,1) process, X_t, and the variation, σ_a^2, of the random noise, a_t, is calculated from the following Eq. 5 (Castagliola and Tsung, 2005):

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$$\sigma_x^2 = \frac{1+\theta^2-2\phi\theta}{1-\phi^2}\sigma_a^2 \quad (5)$$

The variance of random shocks, σ_a^2, i.e. white noise variance in Eq. 5 can be estimated by both the mean squared error (*MSE*) of fitted AR(2) model and the mean range ($\overline{MR}$) of residuals (Polhemus, 2005). By solving Eq. 5, the variances of log-transformed ash content is $\sigma_x^2 = 1.2318\sigma_a^2$ which means that it is about 1.23 times larger than the residual white noise variance.

The ARIMA(1,0,1) chart parameters where the random noise variance (σ_a^2) is estimated from the average moving range of ARIMA(1,0,1) residuals ($\overline{MR}$) and then process sigma (σ_x) was calculated by Eq. 5 was given in Table 3. The generated control charts are presented for log transformed metric in Fig. 5a and for back transformed metric in Fig. 5b.

Table 3: ARIMA chart parameters when the white noise variance, σ_a^2 was calculated by average moving range of ARIMA(1,0,1) residuals ($\overline{MR}$))

Period	*Transformed metric*	*Original metric*
$UCL=+3\sigma_x$	2.95	19.14
$CL=\ \mu_0$	2.54	12.72
$LCL=-3\sigma_x$	2.14	8.45

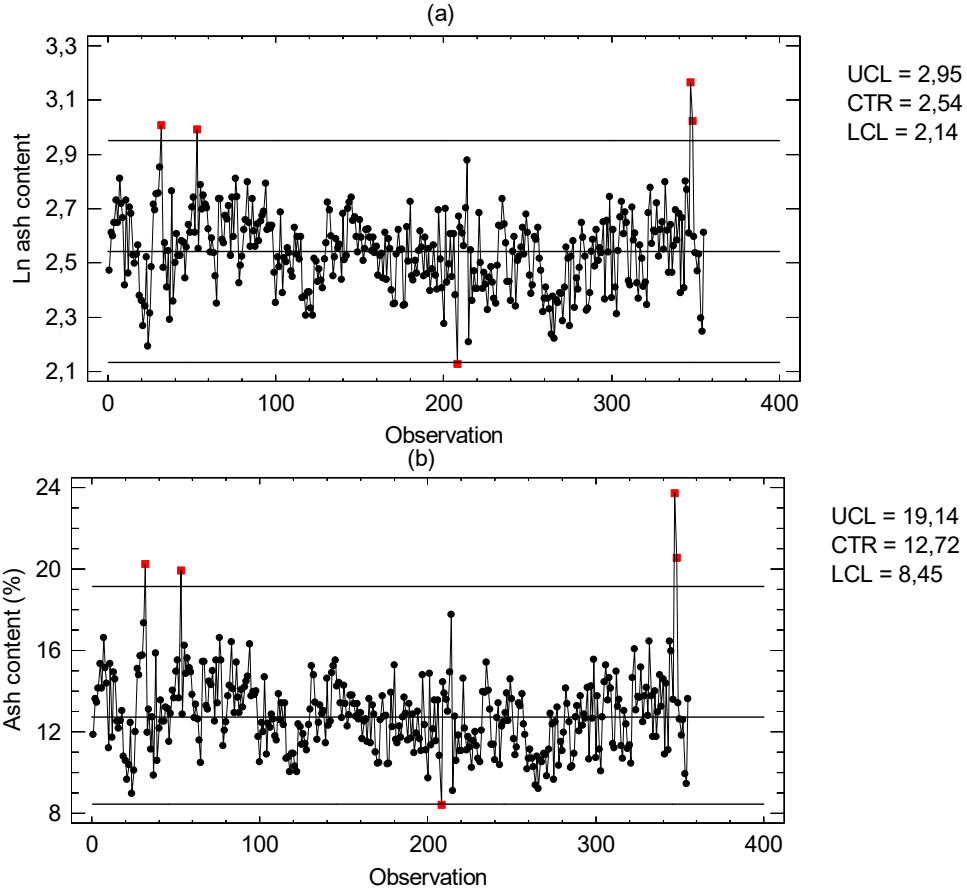

Figure 5. I-chart under normality and autocorrelation verification in transformed metric (a) and its back-transformed values of control limits in original metric (b) (white noise variance, σ_a^2 was calculated by average moving range of ARIMA(1,0,1) residuals ($\overline{MR}$))

Fig. 5a and 5b show the control limits of ash content where both normality and autocorrelation are verified. Compared to Fig 5 with Fig. 3 and Fig. 4, both control limits and out of control points are very different since the data normality and autocorrelation are taken into account when determining the control limits of ash content. The

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UCL and LCL were determined as 19.14 and 8.45 respectively when the data normality and autocorrelation are verified. The observations of 32, 53, 347 and 348 are beyond the $+3\sigma_x$ while the observation 208 was below the $-3\sigma_x$.
Table 4 shows the control limits of ash content determined for the ARIMA chart parameters when where white noise variance, σ_a^2 was calculated by the mean squared error, *MSE* to determine the process sigma, σ_x. The control limits of generated chart are considered as long term monitoring of the process (Polhemus, 2005). Polhemus (2005) indicates that this control limits are used to determine the process deviations from long-term mean more than expected given the dynamics of the process.

The control limits of ARIMA chart constructed in Fig. 6 shows the long term control limits for the +18 mm clean coarse coal by heavy dense drum. In this chart, process sigma, σ_x was estimated by Eq. 5 and white noise variance, σ_a^2 was calculated by *MSE* of ARIMA(1,0,1) model which was determined as σ_a = 0.1289 and given in Table 1 (Taşdemir, 2016a). As seen from the charts in Fig. 6a and 6b are considerably wider bounds than the charts in Fig. 5 and Fig. 4 since the estimated process σ_x is a function of both white noise or random shock and fitted ARIMA(1,0,1) model parameters (Table 1).
The UCL and LCL were determined as 19.56 and 8.27 for long term control limits. Total number of unusual points was four which are all beyond the UCL which corresponds to observations of 32, 53, 347 and 348.

Table 4: ARIMA chart parameters when white noise variance, σ_a^2 was calculated by *MSE* of ARIMA(1,0,1)

Period	*Transformed metric*	*Original metric*
UCL=$+3\sigma_x$	2.97	19.56
CL= μ_0	2.54	12.72
LCL=$-3\sigma_x$	2.11	8.27

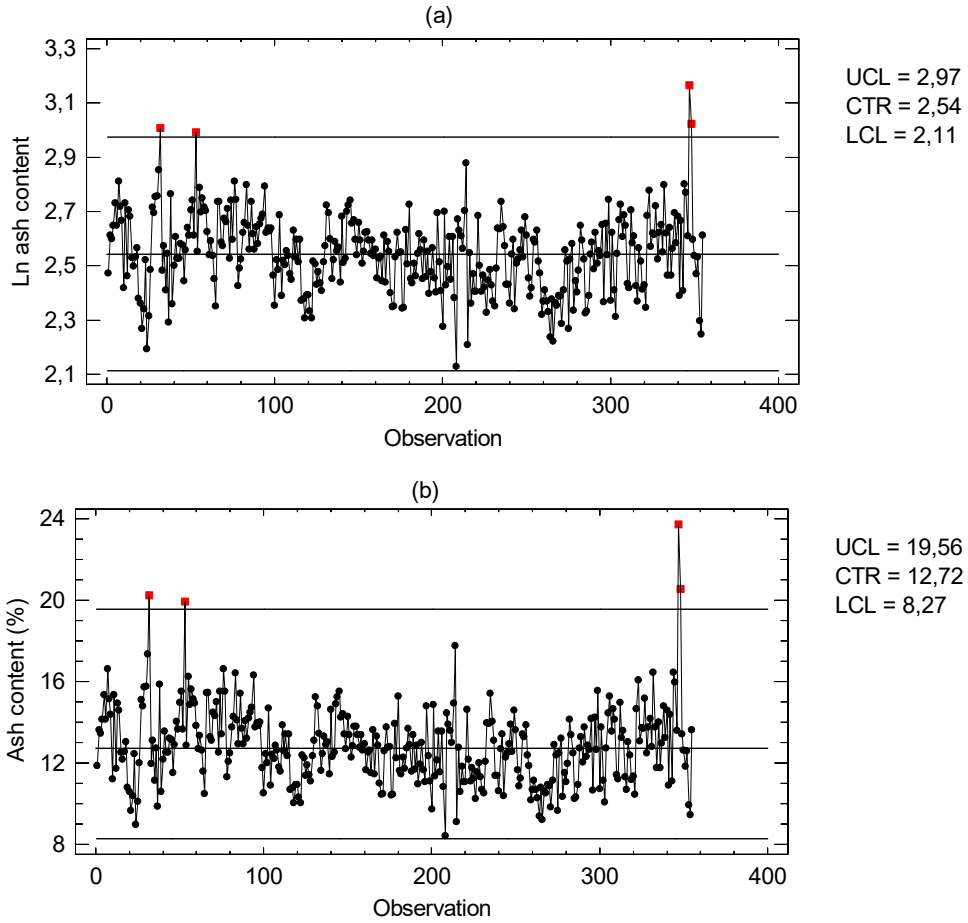

Figure 6. I-chart under normality and autocorrelation verification in transformed metric (a) and its back-transformed values of control limits in original metric (b) (white noise variance, σ_a^2 was calculated by *MSE* of ARIMA(1,0,1))

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ARIMA residual chart of log-transformed ash content data

The ARIMA residuals charts were generated for several conditions to detect real uncontrolled points of ash data. The ARIMA residuals were obtained from the difference between actual log transformed ash values and their forecasted values determined by ARIMA(1,0,1) model. The residuals, a_t, were calculated by rewriting the Eq. 2 as the following:

$$a_t = X_t - 0.5879 - 0.7688X_{t-1} - 0.4609a_{t-1} \quad (6)$$

Since a_t was determined to be independent and identically distributed (*i.i.d*) normal (0, σ_a), control limits of residuals, i.e., UCL and LCL which are drawn around centerline (CL) of zero (0) were calculated by the following Eq. 7 (Castagliola and Tsung, 2005):

$$0 + \pm 3\sigma_a \quad (7)$$

The resulted ARIMA residual chart obtained for ash content is shown in Fig. 7. As seen in Fig. 7, number of points beyond $\pm 3\sigma_a$ limits are 3 which corresponds to observations of 53, 215 and 347. Since the aim is to reduce the ash content as soon as possible during the coal washing process, the out of point beyond LCL (observation 215) cannot be considered uncontrolled process point actually. Therefore, the process can be considered out of control for the 53rd and 347th days in terms of ash content and was in control for the rest days in 2010 based on the ARIMA residuals chart given in Fig. 7.

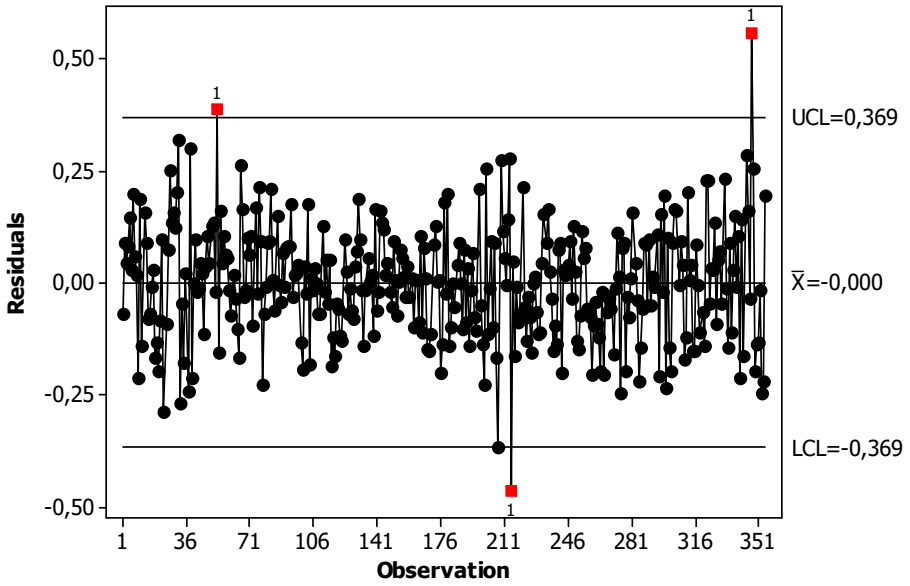

Figure 7. ARIMA residuals chart of ash content data

Conclusions

Control limits ıf ash content for the +18 mm clean coarse coal product produced by heavy medium drum was determined under data normality and data verification conditions. It was shown that the number of total out of control points were different if the assumptions were taken into account or not. In order to give right decision in monitoring and control of a process variable in terms of ash content, both data normality and autocorrelation should be verified prior to application of SPC charts. These can be done for the +18 mm clean coarse coal data by applying log transformation first to achieve data normality and then removing autocorrelation by ARIMA(1,0,1) time series model. Long term control limits were determined as 19.56 for the upper control limit and 8.27 for the lower control limit while center line was 12.72. Only two points were out of control which were determined by the ARIMA residuals chart in 2010 in terms of ash content. This result was different from the ones which were calculated by only assuming data normality and autocorrelation without verifying them.

Acknowledgement

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research

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DETERMINATION OF NATURAL REGENERATION SUCCESS OF BLACK PINE (PINUS NIGRA ARNOLD. SUBSP. PALLASIANA (LAMB.) HOLMBOE) AND ECONOMIC ANALYSES IN THE YENICE FOREST DISTRICT IN TURKEY

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In this research was determined success of natural regeneration of black pine forests and economical analyses of natural regeneration practices in Yenice Forest District in Turkey. In this context first of all, natural regeneration areas of black pine were determined by made on between 2005-2014 in Yenice district. Later, sampling plots were given as 20x20m in the natural regeneration areas and amount, height, root collar diameter, number of buds, length of branch, thichness of branch were determined in the sampling plots of black pine juvenilities in research area. On the other hand economic analyses were made of natural regeneration applications in Yenice district. In this reason, Net Present Value (NPV), Internal Rate of Return (IRR) and Cost-Benefit Analyses were made. According to results obtained from sampling plots and economical analyses, the success of natural regeneration practices are changed between 90.2% and 97.8% and natural regeneration applications were determined as a high econimal benefits and rate of return and many benefits of these regeneration applications respect to the sustainability of forest and environmental management

Keywords: Natural regeneration, Success of regeneration, Net Present Value, Internal Rate of Return, Cost-Benefit Analyses

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DETERMINATION OF PLATINUM LEVELS IN FOOD SAMPLES BY ICP-MS AFTER PRE-CONCENTRATION

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In recent years, there has been increased concern about the effects of noble metals such a platinum on human health. Platinum has been used as a catalytic converter material for the refinement of automobile exhaust gases. Although the benefits of car catalysts are indisputable, highly toxic elements including Pt, Rh and Pd are released into the atmosphere. Platinum content of road dusts can be soluble, and it enters the waters, sediments, soil and finally, the food chain. In this context , levels of platinum in food samples which had been collected in Siirt region where south-east of Turkey has been determinated. Total 40 samples, contain vegetables and animal origin food. After microwave acid digestion, samples had been subjected to pre-concentration process. Pre-concentrated samples were analysed by ICP-MS. The analytical method was verified by using certified standard material.

Keywords: ICP-MS, Platinum, Solid Phase extraction, Pre-concentration

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DETERMINATION OF SURFACE CHARACTERISTIC OF ATMOSPHERIC PRESSURE PLASMA MODIFIED POLYMERIC ULTRAFILTRATION MEMBRANE VIA CONTACT ANGLE MEASUREMENTS

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Abstract: The aim of this study was to improve the surface hydrophilicity of ultrafiltration membrane (UP150, PES, MWCO; 150 kDa) by using atmospheric pressure argon plasma jet (APAPlJ) modification system. Argon was selected as a precursor gas and three different distances between nozzle and substrate surface (25-30-35 mm) and three different exposure period (1-5-10 times) was applied during APAPlJ modifications. The effect of APAPlJ modifications on the membrane surface evaluated by contact angle measurements, surface free energy (SFE) method and xVDLO theory. APAPlJ modification was able to change membrane surface properties. More hydrophilic surface properties were obtained by APAPlJ modifications using 25 mm of distance of nozzle to substrate surface and 5 times of exposure period. Under these conditions, the water contact angle was decreased from 63.5 to 34.6°. The base component of SFE was increased 5 times and Giwi value was increased from -45.0 to 28.7 mJm^{-2}.

Keywords: Ultrafiltration membrane, atmospheric pressure argon plasma jet, modification, contact angle measurement, SFE, xVDLO theory

Introduction

The membrane separation processes is widely used today for separation of wide varying mixtures, purification and concentration of valuable components from industrial wastewater in petrochemical (Ravanchia et al., 2009), textile (Ciardelli et al., 2000), and food (Baldasso et al., 2011; Onsekizoglu 2013) industries. Especially, polimeric commercial membranes such as polyethersulfone (PES), polysulfone (PS), polyvinylidene fluoride (PVDF) are widely used in the pressure-driven membrane processes due to their high thermal, mechanical and chemical resistance (Mulder, 1996) However, they have hydrophobic surface properties, so that it severely limits its long-term membrane separation processes. Therefore, they need to surface modification to enhance hydrophilicity (Demirci et al., 2014).

Plasma modification is one of the modification method to change surface properties of membrane. It has many important advantages such as uniformity, reproducibility, short reaction time, and environmental safety. Plasmas, often considered as the fourth state of matter, are composed of an ionized gas containing a mixture of ions, electrons, neutral and excited molecules, and photons (Kull et al., 2005; Gulec et al., 2006). Plasma treatments can alter the surface energy of most polymers, changing their surface polarity, wettability, and adhesive characteristics without affecting the overall bulk properties. Helium, oxygen, nitrogen, argon plasma are used to modify polymeric membrane surfaces from hydrophobic to hydrophilic increasing the surface polar groups (Saxena et al., 2009). In addition, the changes in the polymeric surface depend directly on the plasma treatment conditions (Wavhal and Fisher, 2005).

The hydrophobicity or hydrophilicity of a solid surface can be determined by contact angle measurement which is a simple, useful and very sensitive method (Gulec et al., 2006). The surface free energy (SFE) and SFE components of membrane can be calculated with different approaches such as Zisman Plot, Equation of State, Fowkes/WORK, Wu and van Oss, Good and Chaudhury. van Oss, Good and Chaudhury's acid–base method is widely used by researchers, because it provide more detailed information about electron-acceptor and electron–donor interactions through membrane and test liquid interface (Cantin et al., 2006; Zenkiewicz, 2007; Damar Huner and Gulec, 2016). xVDLO theory is also used to evaluate interaction between foulant and membrane and it shows surface characteristic and fouling tendency of membrane surface (Subhi et al., 2012; Zuo and Wang, 2013).

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Steen et al. (2002) reported that low temperature H_2O plasma treatment improved the hidrophilicity of PES membrane. Their study revealed that the contatct angle of unmodified membrane decreased from 69.5 to nearly 0°. They obtained highly hydrophilic surface. Saxena et al. (2009) used argon–oxygen ($Ar–O_2$) plasma to modify the PES membrane. Unmodified PES membrane water contact angle value degreased from 56.9 to 8.6° by using $Ar–O_2$ plasma (%60 O_2 concentration) at 10 min exposure time. These results clearly demonstrated that the plasma treated PES membrane was more hydrophilic surface. Wavhal et al. (2002) modified PES membranes using low temperature Ar plasma, followed by grafting of hydrophilic monomers in the vapor phase. After 90 s plasma treatment, water contact angle of PES decreased from 90 to 40°. In literature, there is limited investigation report about the PES membrane modification using atmospheric pressure plasma jet (APAPlJ) system. And also, this study contributes by using contact angle measurement to determine surface hydrophilicity.

The objective of this study was to improve the surface hydrophilicity of UP150 PES ultrafiltration membrane, by using atmospheric pressure argon plasma jet (APAPlJ) modification system. Initially, different APAPlJ parameters (plasma treatment period: 1, 5 and 10 times, distance between nozzle and membrane surface: 25, 30, 35 mm) were used. The effects of APAPlJ modification on the membrane surface were determined using contact angle measurements. Surface free energy of unmodified and APAPlJ modified membrane were calculated using acid-base methods. The hydrophobicity/hydrophilicity characteristic of membrane was evaluated accordingly xVDLO theory.

Material and Methods

Material

Flat sheet commercial polyethersulfone ultrafiltration membrane (UP150) was used. Specific properties of the ultrafiltration (UF) membrane are summarized in Table 1. Before the plasma treatments and contact angle measurements, membrane was cut into rectangular shapes having size of 76 x 20 mm manually and they were fixed to glass support with double-sided tape.

Table 1: Specific properties of commercial microfiltration membrane

Supplier	Membranes	Material	MWCO (KDa)	Maximum Temperature	pH	Permeability (L m^{-2} $h^{-1}$$bar^{-1}$)
Microdyn-Nadir	UP150	PES	150	95 °C	0–14	286[a]

[a]: according to the indicative properties by the membrane manufacturer

Atmospheric pressure plasma jet system

The atmospheric pressure plasma jet system (OpenAir) manufactured by PlasmaTreat GmbH (Steinhagen, Germany). OpenAir plasma system (Fig. 1.) is equipped with plasma rotary jet (nozzle-RD2004), metallic carrier platform (10 x 20 cm) which allows x-direction of the moving at a parallel speed of 0 to 60 m min^{-1}, manual y-direction of moving column adjust the distance between substrate and nozzle, and plasma generator (FG5001). The membrane was placed in a distance of 25, 30 and 35 mm to the nozzle on metallic carrier platform that was moved with a speed of 1.5 m min^{-1}. Three different treatment times (1, 5, 10 times) were chosen for the plasma surface modification. The precursor gases to be used for plasma modification were selected argon at an input pressure of 3 bar. UP150 membrane was soaked ultra-pure water at 24 h to ensure wetting of membrane structure before and after modification.

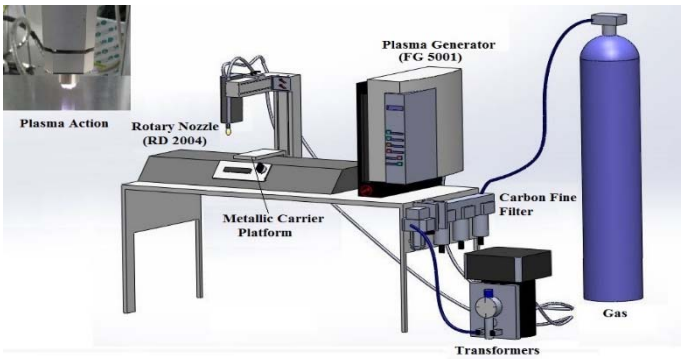

Figure 1. Schematic illustration of the PlasmaTreat OpenAir atmospheric pressure plasma jet system

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Contact angle measurements

Theta Optical Tensiometer (KSV Attension Instruments, Helsinki, Finland) was to measure the contact angle. It was equipped with an automated droplet dispenser, a high speed digital camera (60 fps), and image analysis software (OneAttension). OneAttension used Young-Laplace three-phase system consisting of standard test liquid, solid surface and air for contact angle determination (Fig. 2.). Contact angles measurement was performed by sessile drop technique using three standard liquid (ultra-pure water, formamide, diiodomethane). The droplet volume of standard liquids was 2.5 µl and the drop image was captured during 60 s. The contact angle measurements were performed at 5 random locations at room temperature (25 ± 3 ºC).

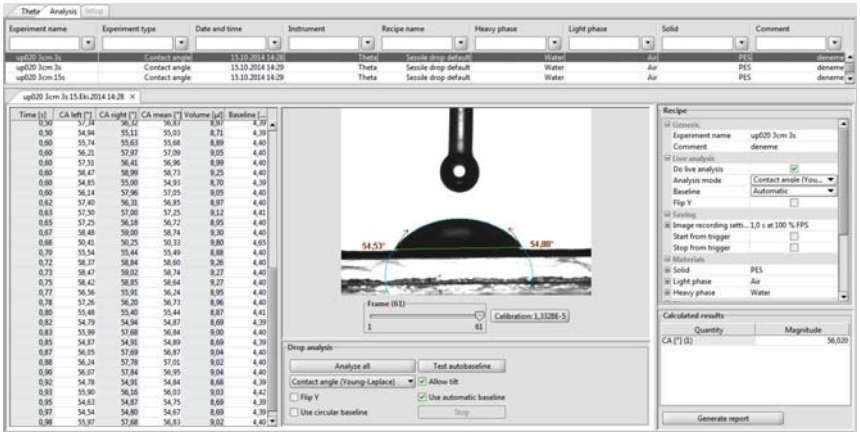

Figure 2. Contact angle in a three-phase system consisting of solid surface, liquid, and air (from OneAttention software)

Calculation of surface free energy

Surface free energy of membrane was calculated van Oss, Good and Chaudhury's acid–base method (van Oss et al., 1988). The surface free energy (SFE) was the sum of two components (Eq. 1), Lifshitsz van der Waals interactions (LW) and Lewis acid–base interactions (AB) according to this method. While, γ^{LW} represents apolar interactions such as London dispersion forces, dipole-dipole Debye and Keesom interactions, γ^{AB} also mentioned as the "polar component" contains, hydrogen bonding, π bonding and ligand formation (Cantin et al., 2006; Rieke 1997).

$$\gamma_{SV}^{TOT} = \gamma_{SV}^{LW} + \gamma_{SV}^{AB} \quad (1)$$

Lewis acid–base interactions are divided within itself, including the electron acceptor (Lewis acid, γ_i^+) and electron donor (Lewis base, γ_i^-) components and expressed as a geometric mean of acid and base force components.

$$\gamma_i^{AB} = 2\sqrt{\gamma_i^+ \gamma_i^-} \quad (2)$$

The solid-liquid interface tension can be expressed as

$$\gamma_{SL} = \gamma_{SV} + \gamma_{LV} - 2\left[\sqrt{\gamma_{SV}^{LW}\gamma_{LV}^{LW}} + \sqrt{\gamma_{SV}^+\gamma_{LV}^-} + \sqrt{\gamma_{SV}^-\gamma_{LV}^+}\right] \quad (3)$$

Combining this equation with Young-Dupre equation (Eq. 3) obtains van Oss, Good and Chaudhury's acid–base equation. The SFE of unmodified and modified membranes was calculated by this equation.

$$\gamma_{LV}(1 + \cos\theta) = 2\left[\sqrt{\gamma_{SV}^{LW}\gamma_{LV}^{LW}} + \sqrt{\gamma_{SV}^+\gamma_{LV}^-} + \sqrt{\gamma_{SV}^-\gamma_{LV}^+}\right] \quad (4)$$

At least 3 different standard liquids of known surface tension components are needed to determine the unknown surface free energy components ($\gamma_{SV}^+, \gamma_{SV}^-, \gamma_{SV}^{LW}$) of the membrane surface. Generally, to solve the equation should be used one dispersive and two polar liquid. In this study, polar liquids ultrapure water, formamide; and non-polar liquid diiodomethane were used as a standard liquid (Table 2).

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Table 2: Specific properties of the test liquids used in this study (OneAttention software)

	γ^{tot} [mN/m]	γ^{d} [mN/m]	γ^{+} [mN/m]	γ^{-} [mN/m]	g [g/cm^3]	Ŋ [mPa.s]	T [°C]	Mw [gmol]
Water	72.80	21.80	25.50	25.50	0.998	1.00	20.00	18.01
Formamide	58.00	39.00	2.28	39.60	1.133	3.30	20.00	45.04
Diiodomethane	50.80	50.80	0.00	0.00	3.325	2.80	25.00	267.84

xVDLO theory

In this study, Derjaguin, Landau, Verwey and Overbeek (xDLVO) theory was used to determination of hydrophilicity and hydrophobicity of membrane surface after plasma modification. According to, the total free energy of cohesion (ΔG_{iwi}^{Tot}) between foulant (i) and water (w) is the sum of apolar Lifshitz–van der Waals (LW) and polar acid–base (AB) forces (van Oss, 1993). ΔG_{iwi}^{Tot} can be written as

$$\Delta G_{iwi}^{Tot} = -2\left[\left((\gamma_i^{LW})^{\frac{1}{2}} - (\gamma_w^{LW})^{\frac{1}{2}}\right)^2 + 2\left((\gamma_i^{+}\gamma_i^{-})^{\frac{1}{2}} + (\gamma_w^{+}\gamma_w^{-})^{\frac{1}{2}} - (\gamma_i^{+}\gamma_w^{-})^{\frac{1}{2}} - (\gamma_w^{+}\gamma_i^{-})^{\frac{1}{2}}\right)\right] \quad (5)$$

If ΔG_{iwi}^{Tot} is lower than zero ($\Delta Giwi < 0$), the membrane is considered hydrophobic surface properties. In contrast, if ΔG_{iwi}^{Tot} is larger than zero ($\Delta Giwi > 0$), the membrane shows hydrophilic properties and has less fouling tendency (Subhi et al., 2012; Zuo and Wang, 2013).

Results and Discussion

Contact angle measurements

The aim of this study was to investigate the influence of the treatment parameters on the hydrophilicity and hydrophobicity properties of the membrane surface. The surface properties of the unmodified and APAPlJ modified membranes were characterized by contact angle measurements. Three different treatment times (1-5-10 times) and three different distances between nozzle and membrane surface (25-30-35 mm) were chosen as plasma treatment conditions.

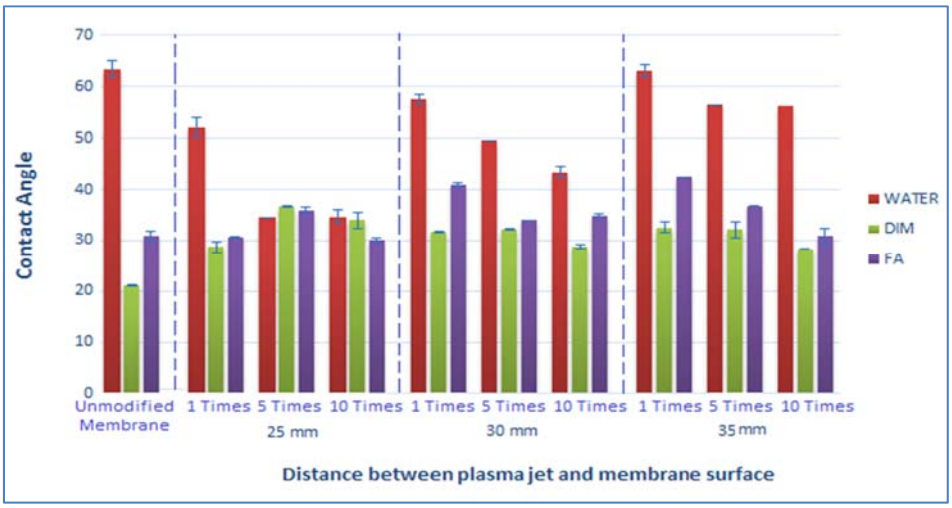

Figure 3. The contact angle measurements according to plasma jet modification conditions

If the water contact angle (θw) is higher than 65°, the surface is considered hydrophobic and if θw is lower than 65°, it is considered hydrophilic (Sadiki et al., 2014). According to the results presented in Fig. 3., θw showed that unmodified UP150 PES membrane has moderately hydrophobic surface (θw = 63.5 ± 1.6°). Similar results were reported by Steen et al., (2002); Kim et al., (2009). They were evaluated the hydrophobic character of the PES membrane (θw = 69.5°, θw = 69.0° respectively).

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The contact angle results of unmodified membrane were changed depending on plasma treatment conditions (Fig. 3.). The results revealed that, θw decreased with plasma treatment in all parameters. However, a slight decrease of θw was observed at the distance of 30 and 35 mm. In addition, θw decreased with increasing treatment times for the same distances. This can be attributed to high interaction between plasma ions and membrane surface with increasing treatment times. For plasma treatment, the lowest θw (θw =34.6±0.0°) was obtained at the distance of 25 mm and 5 times treatment (Fig. 4.).

Although, many other studies explained that the surface hydrophilicity related to the water contact angle value (Steen et al., 2002; Wavhal et al., 2002), diiodomethane and formamide contact angle values also can give an information about hydrophilicity. The surface hydrophilicity increases with decreased formamide contact angle (θf) and increased diiodomethane contact angle (θd). In this study, while θd increased in all plasma treatment conditions, the significant increase was observed at 25 mm 5 times (θd =36.6±0.1°). The lowest contact angle of formamide was obtained at 25 mm distance 10 times (θf =30.1±0.5°).

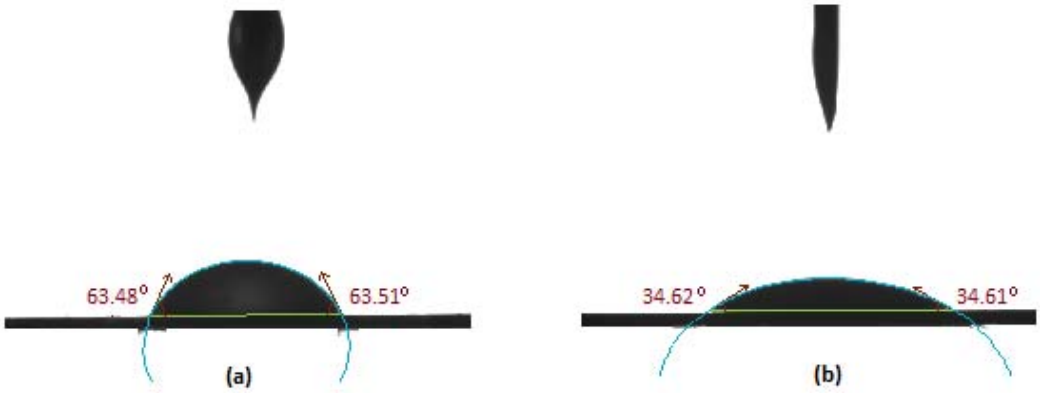

Figure 4: Water droplet image on UP150 PES unmodified (a) and APAPlJ modified membrane 5 times at 25 mm (b)

Saxena et al. (2009) used argon–oxygen (Ar–O2) plasma to modify PES membranes. They found that the contact angle decreases from 57.0° (untreated membrane) to 8.6° (Ar–O2 plasma treated membrane). Their study revealed that higher exposure time increases the hydrophilicity. Contrarily, in this study, the highest exposure period (10 times) did not decrease the water contact angle value as in 5 times treatment condition. This was mainly attributed to using only argon as a precursor gas in this study.

Calculation of surface free energy

The surface free energy was calculated from acid-base method. Total (γ_S^{tot}), disperse (γ_S^d), polar (γ_S^p), acid (γ_S^+) and base (γ_S^-) components of unmodified and modified membrane were given Table 3.

Table 3: The SFE components of unmodified and APAPlJM membrane

Distance (mm)	Times	γ_S^{tot} [mJm^{-2}]	γ_S^d (γ_S^{LW}) [mJm^{-2}]	γ_S^p (γ_S^{AB}) [mJm^{-2}]	γ_S^+ [mJm^{-2}]	γ_S^- [mJm^{-2}]
Unmodified Membrane		64.9±1.2	47.6±0.2	17.3±1.4	1.2±0.3	8.1±2.4
25	1	73.8±0.4	44.8±0.4	29.1±0.8	0.7±0.1	21.4±2.2
	5	50.7±1.8	41.3±0.0	9.4±1.8	0.1±0.0	47.5±0.5
	10	69.0±4.2	42.5±0.7	26.5±4.8	0.3±0.1	42.9±1.5
30	1	52.0±0.2	43.5±0.1	8.6±0.3	0.2±0.0	20.5±1.0
	5	66.7±0.1	43.3±0.0	23.4±0.2	0.4±0.0	26.3±0.0
	10	52.0±1.4	44.7±0.2	7.3±1.6	0.1±0.0	35.4±0.3
35	1	52.9±0.1	43.1±0.5	9.8±0.6	0.3±0.0	14.5±1.2
	5	63.2±1.8	43.3±0.7	19.9±2.5	0.5±0.0	19.3±1.4
	10	74.3±4.0	44.9±0.0	29.5±4.1	0.9±0.2	16.6±0.7

According to van Oss, Good and Chaudhury's method, especially higher base component value (γ_S^-) shows hydrophilicity character of surface (Sadiki et al., 2014). The results presented in Table 3, the γ_S^- component of

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SFE of UP150 showed a significant increase at 25 mm distance and 5 times treatment conditions. The γ_S^d component decreased from 47.6 to 41.3 mJ m^{-2} at the same treatment conditions. These results clearly indicated that APAPlJ modified membrane had more hydrophilic surface than unmodified membrane.

xDVLO theory

xVDLO theory was performed to state the change of surface hydrophilicity. While positive Giwi value indicates the hydrophilic surface, negative Giwi value refers hydrophobic surface properties. The effects of plasma modification on Giwi value were evaluated by MINITAB and presented in three dimensional graphs (Fig. 5.).

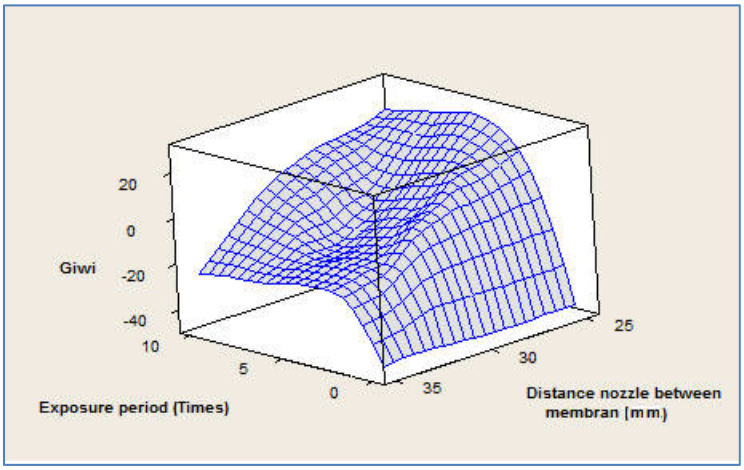

Figure 5: 3D graph depicts exposure period - distance nozzle to membrane surface - Giwi value

As shown in Fig. 2, Giwi value of unmodified membrane was lower than zero (Giwi=-45.8), it had a hydrophobic surface. While the treatment provided a positive effect on hydrophilicity of membrane in exposure period at 35 mm distance, Giwi did not take a positive value for this condition. This may be attributed to the weak interaction between the ions and electrons generated by plasma and the membrane surface. In contrast to this, the ions and electrons generated by plasma reacted easily with reactive groups on PES membrane surface at 25 mm distance. The highest positive value (Giwi=28.7) which indicates the hydrophilic property was observed at 5 times of exposure period and 25 mm of distance.

Conclusion

The main goal of this study was to determine change of hydrophilicity of UP150 PES membrane surface under various APAPlJ treatment conditions. The contact angle measurements, SFE method and xVLDO theory were used to evaluate the APAPlJ modification effect on the UP150 PES membrane surface. The results revealed that the use of APAPlJ to modify the PES membrane is an effective way to improve its surface hydrophilicity. The more hydrophilic surface properties (the lowest water contact angle, the highest base value of SFE and the highest Giwi value) were obtained by APAPlJ modifications using 25 mm of distance between nozzle and substrate surface and 5 times of exposure period.

Acknowledgment

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DEVELOPING AN RESILIENT MODULUS ESTIMATION MODEL FOR GRANULAR ROAD MATERIALS

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This paper demonstrates the applicability of the regression methodology to estimate resilient modulus of pavement layers using the results of triaxial resilient modulus tests. This methodology is proposed as an alternative to conventional nonlinear constitutive relationships.

Resilient modulus is an important design parameter for highway pavement structures because it represents the structural strength of pavement layers. In triaxial test, aggregate samples collected from seven different part of central Anatolia. All the aggregate sources are igneous rock (basalt, and trachy-basalt)

In the regression model three aggregate physical properties, three mixture properties and two loading factors (totally 8 variables) are used as input parameters and the resilient modulus of aggregate mixture (cylindrical sample) obtained as output. To compare the effectiveness of the new method coefficients for the Uzan constitutive model are also determined for laboratory test and compared with the approach described in this paper. Predicted resilient modulus values from each approach are separately compared with R^2 and Standard error to evaluate their efficiency and reliability in terms of resilient response prediction.

Performance parameters of R^2:0,98 and Standard eror:10,51 has been obtained from model prediction. These results are quite sufficient, regression model assume the resilient response like a function by using the stated material parameters. So this approach makes possible to estimate the resilient modulus of the different aggregates samples in real-time.

Keywords: Regression methodology, resilient modulus, basalt aggregate, pavement layers

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DEVELOPMENT AND EVALUATION OF WEB-BASED PRECONCEPTION HEALTH PROMOTION PROGRAM FOR COUPLE TO BE MARRIED

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This study was done to develop a web-based preconception health promotion program to improve perceived benefits of reproductive health behavior, to reduce perceived barriers and to improve preconception health promotion awareness in couple to be married. Participants were assigned to the experiment group (n=26 couple) or control group (n=25 couple).A web-based preconception health promotion program comprised of a six hour web-based lecture was given to an experimental group for four weeks. Results showed for the two groups, 1) a significant difference in preconception health promotion awareness in men (F=18.49, p<.001) in women (F=36.93, p<.001). 2) a significant difference perceived benefits in men (F=6.24, p=.003) , in women (F=6.38, p=.004). 3) a significant difference perceived barriers in men (F=3.64, p=.030), in women (F=11.36, p<.001). 4) a significant difference perceived self efficacy in men (F=12.16, p<.001), but no significant difference in women (F=1.93, p=.166). 5) a significant difference health promoting behavior in men (F=16.31, p<.001), in women (F=10.99, p=.001). This study through the above results shows that the web-based preconception health promotion programis an effective nursing intervention in couple to be married. Therefore, web-based preconception health promotion program can be useful for encouraging couple to be married' health-promoting behavior.

Keywords: Preconception care, Health promotion, Health behavior

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DEVELOPMENT OF THE MOBILE SERVICE ROBOT EQUIPPED WITH MULTIPLE SENSORS FOR HUMAN DETECTION AND TRACKING

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In this paper, we develop a mobile service robot with multiple sensors to navigate to and track human who commands the robot by applause sound in the environment with noise and obstacles. The robot uses a microphone and a camera to locate the human who applauds and proceeds to the target. An ultra-sonic sensor positioned at the front of the robot is used for collision detection. We use dsPIC microcontroller to generate PWM pulses controlling the speed of 2 DC motors to turn and move the robot to the human who applauded. The robot detects the applause sound by analyzing the spectrum of the incoming acoustic signal. Once the applause sound is detected, the robot exercises the camera to look for human who applauded by detecting human's face using Viola-Jones algorithms and the color of the target's dress. Then, the robot moves to the person who applauded where the Kanade–Lucas–Tomasi (KLT) algorithm is used to track the human face and re-align the robot if the tracked human face is shifted from the center of the camera or that human moves away from the current position. While moving, the robot senses the environment using the ultrasonic sensor to avoid collision with any obstacles. Without sunlight reflection, the robot successfully reaches the human who applauded without colliding with any obstacles. The average time to reach the target is 37.78 seconds when the target is 4 meters away from the robot. Future work will focus on reducing the impact of sunlight reflection impeding a camera to accurately detect the human's face.

Keywords: Acoustic Source Localization, Assistive robot, KLT, Viola-Jones, PWM

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DİN VE TOPLUMSAL CİNSİYET KISKACINDA DEĞİŞEN KADIN ALGILARI: BIR TİPOLOJİ DENEMESİ

Asım Yapıcı

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Abstract: Bu araştırmada üniversiteli gençlerin İslam dininde ve günümüz Türk toplumunda kadının yeri ve değeri konusunda ne düşündükleri tespite çalışılmıştır. Nitel bir yöntemin kullanıldığı bu araştırmada veriler, Çukurova üniversitesinin farklı bölümlerde öğrenim gören 374 öğrenci üzerinde yürütülen açık uçlu sorulardan oluşan anketle toplanmıştır. Elde edilen bulgular içerik analizi ile çözümlenmiş, kümeleme analizi ile gruplandırılarak bir tipoloji oluşturulmaya çalışılmıştır. Ulaşılan sonuçlara göre gençler İslam'da kadının yeri ve değeri konusunda *taklidî teslimiyetçiler*, *tahkiki tasdikçiler*, *dinin özü ile geleneği farklı algılayanlar, inançlı sorgulayıcılar, suskunlar, kararsızlık-çelişki yaşayanlar, taklidî eleştiriciler* ve *tahkiki eleştiriciler olmak üzere sekiz temel kategori içinde toplanmıştır.* Günümüzde kadının durumu hakkında ise *tamamen olumsuz görenler, genelleme yapmaktan kaçınanalar, kısmen olumlu görenler, tam eşitliğin gerçekleştiğini düşünenler* olmak üzere dört temel tip ortaya çıkmıştır.

Anahtar Kelimeler: Din, İslam, Kadın, Erkek, Toplumsal Cinsiyet

Giriş

Bilindiği üzere geleneksellikten modernliğe geçiş sürecinde *dinin kökeni ve fonksiyonları, dinsel bilginin değeri, dinin birey ve toplumla ilişkisi* gibi pek çok husus tartışmaya açılmıştır (Yapıcı, 2016). Bu süreçte toplumsal cinsiyet açısından *din ve kadın* meselesi de üzerinde en çok durulan ve en çok tartışılan konuların başında yer almıştır (Badinter, 1991).

Hristiyan Avrupa bir yandan kendi ürettiği değerler çerçevesinde modernizmin öncülüğünü yaparken, bir yandan da Batılı olmayan toplumların modernleşme sürecine uyum sağlayıp sağlayamayacaklarını tartışmaya açmıştır. Hristiyan Avrupa özellikle İslam dünyasına hem oryantalist bir bakışla eleştirilerde bulunmuş hem de modernleşme yolunda çeşitli reçeteler sunmuştur. İslam dininin gelişmeye ve modernleşmeye engel olduğu yönünde Batı'da ortaya çıkan düşünceler, Müslümanların "*gerici*", "*şiddet taraftarı*", "*fanatik*", "*kadını ezen*", "*kendinden olmayana yaşama şansı tanımayan*" ve "*asla tamamen modernleşemeyecek*" topluluklar olarak algılanmasına yol açmıştır (Köylü, 2001; Yapıcı, 2004; Yapıcı & Albayrak, 2002). Batılılaşmanın ve modernleşmenin değer yüklü tanımlanması meselesine bir de İslam dünyasının "*kültürel gecikmişliği*" (bkz. Ogburn, 1955) eklenince "*geri kalmış Müslüman*" imajı sürekli yeniden üretilmiştir. İslam dininin algılanmasından kaynaklanan çeşitli sıkıntılarla birlikte, *çok eşlilik*, *kadınları tek sözle boşama*, *kadınları eve hapsetme*, *evlenene kadar kızların bekâretini koruması yönündeki dinsel ve toplumsal talepler*, *erkeğe nispetle kadının mirastan yarım pay alması, şahitlikte kadının yarım kabul edilmesi, kadının dövülmesi* vb. dinsel ve kültürel kabuller, Batı'da, olumsuz Müslüman imajının katılaşarak devam etmesine zemin hazırlamıştır (Yapıcı, 2016).

Batı kendi geliştirdiği değer yargıları çerçevesinde bir kadın anlayışı ve modeli sunarken Türkiye dâhil, İslam dünyasında kadın meselesi genelde ön yargılı bir biçimde çözümlenmeye çalışılmıştır. Çünkü Türkiye başta olmak üzere Müslüman toplumlarda hem moderniteyi hem de gelenekselliği savunanlar çoğu kere kendilerini kadın üstünden tanımlamaktadır. Bu durum tarihin ve dinin ideolojik bir okumaya tabi tutulmasından beslenmektedir.

Türkiye'de bazı yazar ve araştırmacılar "*oryantalist bakış*" açısını benimseyerek Batılı bakış açısıyla hareket etmişler ve kadın meselesini bu bağlamda ele almışlardır. Bunlar, genellikle dinle ve gelenekle hesaplaşmak isteyen ve epistemik anlamda bilgiyi Batı'da üretildiği şekliyle benimseyenlerdir. Arsel (1997) ve Alkan'ın (1981) çalışması bu çerçevede değerlendirilebilir. Feminist bakış açısından hareket eden Berktay (2000) anaerkil toplumsal-dinsel sistem hariç politeist ve monoteist tüm inanç sistemlerini ataerkil olmakla ve kadını ezmekle itham etmektedir. Sabbah'ın (1995) feminist yaklaşımı daha ziyade psikanalitik bir modelden hareket etmektedir. Feminist yazarlardan Mernissi (1995; 1998) tarihi ve dini gelenekle ciddi bir şekilde hesaplaşma eğilimindedir. Kuşkusuz burada söz konusu edilen feminist anlayışlar da temelde oryantalisttir. Merkezî tutumlarını din oluşturan ve dünya görüşleri dinsel bir temele dayanan bir kısım yazarlar ise tamamen Kur'an ve

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güvenilir Hadisler üzerinden metinsel çözümlemeler yaparak ve birkaç tekil örneklemi ön plana çıkararak İslam öncesi ezilen kadının İslam ile özgürlüğüne kavuştuğunu ve neredeyse erkeklerle aynı haklara sahip olduğunu söylemektedirler (Aktaş, 1985; Ateş, 2001; Topaloğlu, 2001; Wedud-Muhsin, 2005). Temelde kutsal metinlerden hareket eden bu yazarlar, kısmen geleneği eleştirmekle birlikte, İslam'ı adeta tarih dışı bir şekilde ele almışlardır. *İslamcı bakış* olarak da adlandırılan bu yaklaşım, büyük ölçüde, kimliği koruma arzusundan beslenmektedir. Bir yönüyle bu kapsamda değerlendirilse de, gelenekle yoğun bir şekilde hesaplaşma gayretinde olan, fakat zaman zaman *tarihselcilikle tarihsiciliğin* iç içe girdiği Şefkatli-Tuksal (2001) ve Öztürk'ün (2004; 2012) çalışmalarında da oryantalist yaklaşımın etkilerini bulabilmek mümkündür. Müslüman duyarlılığı ile tarihçi bilimselliği arasında sıkışmış bir karakter arz eden Savaş'ın (1992; 1996; 2004) araştırmalarında Kur'an ve bilhassa Hz. Peygamber dönemi uygulamaları ön plana çıkarılarak sorunun asıl kaynağının Hz. Peygamber'den sonraki dönemde aranması gerektiği vurgulanmaktadır. Şişman'ın (2006) İslamî hassasiyet ile emperyalist modernite anlayışına eleştirici bir tavır takınması *post-modern* bir karakter arz etmektedir. Gerek oryantalist, gerek feminist gerekse İslamcı yaklaşımı yetersiz bulan Kandiyoti'nin (1997) problemi ele alış biçimi ise *sosyolojik*tir. Çünkü o, kadının durumunu tartışırken dinin önemini kabul etmekle birlikte, konuyu sadece dine indirgememekte; gelenek, kimlik ve toplumsal dönüşümleri hesaba katarak problemi analize çalışmaktadır. Yapıcı'nın (2016) yaklaşımı da bu kapsamda değerlendirilebilir. Bu noktada şu hususu özellikle vurgulamak gerekir: Kadın ve din konusu nasıl bir bakış açısıyla ele alınırsa alınsın ideolojik yaklaşımlar ve dinsel farklılıklar, yani araştırmacının dünya görüşü ve din anlayışı onun hem "*ne*" söyleyeceğine ve hem de "*ne*"yi "*nasıl*" söyleyeceğini etkilemektedir.

Dinlerin "*gerçekliği yorumlama*", "*kimliğin tanımını yaparak bireyi oraya yerleştirme*", "*günlük hayat için bir rehber sunma*" (Luckmann, 2003) ve "*toplumun ve kültürün yapısal açıdan devamlılığını sağlama*" (Mardin, 1995) olmak üzere dört temel işlevi vardır. Bu anlamda dinler mensuplarına bir algı kalıbı veren, bir referans çerçevesi sağlayan, bunu da kutsalla ilişkili olarak yapan sistemler olarak değerlendirebilir (Wach, 1995; Günay, 1998). Dinler, tanrı ve insan anlayışına bağlı olarak kendilerine has bir dünya görüşü oluştururken içinde geliştikleri sosyokültürel yapıyla karşılıklı ilişki (etkileşim) içerisine girerler. Bir yandan sosyokültürel yapıyı ve inanan bireyi biçimlendirmeye çalışan dinler bir yandan da mevcut sosyokültürel yapıdan etkilenmektedirler (Zuckerman, 2006). Özellikle İbrahimî gelenek içerisinde yer alan Yahudilik, Hıristiyanlık ve İslamiyet, ataerkil bir yapılanmayı ön plana çıkarttıkları ya da böyle bir toplumsal yapı da geliştikleri için, söz konusu her üç dinde de kadınlara yönelik tutumlarda erkek hâkim bir yaklaşım baskın hale gelmiştir (Yapıcı, 2016). Ancak her ne kadar bu üç dinsel sistem ataerkil yapıyı ön planda tutsa da bunların ataerkillik anlayışları ve kadına bakışları arasında önemli farklılıklar vardır.

Hz. Muhammed döneminde üç temel kadın modeli ile karşılaşmak mümkündür (Yapıcı, 2016: 76).

Hz. Hatice Modeli: Bu modeldeki kadın, ticaret hayatında aktif, sosyal statüsü yüksek bir kadındır. Eşinin kendi üstüne evlenmesine müsaade etmemiş (Hz. Peygamber Hz. Hatice ile evliyken ikinci bir evlilik daha yapmamıştır), hatta sevdiği erkekle (Hz. Muhammed'le) evlenebilmek için olağanüstü bir çaba sarf etmiştir. Evlendikten sonra da eşi tarafından korunmaktan öte eşini koruma altına alan güçlü kadın tipini temsil etmektedir. Kuşkusuz Hz. Hatice kocasına eş, çocuklarına da anne olarak ataerkil toplumsal yapı içerisinde yer almaktadır. Ancak burada katı değil, yumuşak ve ılımlı bir atacıllık söz konusudur.

Hz. Aişe Modeli: Özellikle dinî bilimlerde oldukça gelişmiş, Hz. Peygamber'in vefatından sonra erkek sahabelerle dinî konularda tartışmalara giren, sosyal ve siyasî oluşumlar yaratmaya çalışan ya da bazı oluşumlar içinde yer alan, hem Hz. Peygamber zamanında hem de onun vefatından sonra savaşlara katılan; sosyal, siyasal, askerî ve ilmî alanda son derece aktif bir kadındır. Hz. Ali'ye karşı olan mücadelesinde adeta "sivil itaatsizlik" örneği gösteren Hz. Aişe dışa dönük bir kişiliğe sahiptir. Eşini çok seven, eşi tarafından da çok sevilen bir kadındır. Yerine göre nazlı yerine göre kıskançtır.

Hz. Fatıma Modeli: Genellikle eşi ve çocuklarıyla ilgilenen, yani kocasına eş çocuklarına ana olmayı ön planda tutan bir kadını temsil etmektedir. Hz. Peygamber'in vefatından sonra halifelik ve Hz. Peygamber'in mirası konusunda Hz. Ebubekir'le küçük bir tartışma yaşasa da, neticede durumu kabullenen içe dönük, genellikle sessiz ve kendi halinde bir kadındır.

Aslında burada söz konusu edilen her üç kadın tipini Hz. Peygamber dönemindeki kadınlar arasında yaygın olarak görmek mümkündür. Bununla birlikte şu hususu vurgulamak gerekir: Katı ataerkil düzeni o günün şartlarında "ılımlı bir ataerkilliğe" dönüştürme hususunda İslamiyet'in yaptığı reform niteliğindeki girişimler dinin kurumsallaşmasıyla birlikte yavaş yavaş farklı bir görünüm kazanmıştır. Kadın haklarının zaman içerisinde daha da gelişmesi gerekirken kadının denetlenmesi ve ikincilleştirilmesi adeta kurumsallaşmıştır. Bu süreçte din

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ilimlerinde erkeklerin ön plana çıkması ve iktidarda olanların bilgiyi üretmesi nedeniyle kadının "ne"liği ve "nasıl"lığı tartışmaları sadece erkekler tarafından yapılmıştır.

Yöntem ve Araştırma

Bu araştırmada iki soruya cevap aranmıştır:
a) İslam'da kadının yeri ve değeri konusunda gençler ne/neler düşünmektedir?
b) Günümüzde kadının durumu nasıl anlaşılmakta ve nasıl değerlendirilmektedir?

Araştırmanın evreni Çukurova Üniversitesi öğrencileridir. Kesitsel olarak planlanan araştırmada örneklem rastlantısal yöntemle seçilmiş, Eğitim, Ziraat, Tıp, Mimarlık, Mühendislik, İlahiyat başta olmak üzere farklı fakültelerden toplam 374 öğrenci üzerinde uygulama yapılmıştır. Örneklemin % 51.9'u (n: 194) kadın; % 48.1'i (n: 180) erkektir. Araştırmaya katılanların yaş aralığı 17-29; yaş ortalaması 20.88'dir (ss. 2.08).

Nitel bir yöntemin kullanıldığı bu araştırmada üniversiteli gençlerin toplumsal cinsiyet stereotipleri tespite çalışılmıştır. Bu bağlamda: "İslam'da kadının yeri ve değeri konusunda gençler ne/neler düşünmektedir?", "Günümüzde kadının durumu nasıl anlaşılmakta ve nasıl değerlendirilmektedir?" sorularına cevap aranmıştır. Elde edilen bulgular içerik analizi ile çözümlenmiş, kümeleme analizi ile gruplandırılarak bir tipoloji oluşturulmaya çalışılmıştır.

Bulgular

Üniversite Öğrencilerine Göre İslam'da Kadının Statüsü

"İslam'da kadının yeri ve değeri" konusunda ileri sürülen görüşlerin farklı referanslara dayandığı görülmektedir. Öğrencilerin büyük bölümü İslam'ın kadına hem ontolojik anlamda, hem de sosyal hayatta çok önemli bir yer verdiği kanaatindedir. Ancak İslam'ın kadına bakışı ve kadının erkeğe göre nerede durduğu konusunda farklı ifadelerle karşılaşılmaktadır. Bazı öğrenciler: "*İslam kadını erkekle eşit hale getirmiştir.*" derken, bazıları: "*O günün şartlarında neredeyse erkeğe yaklaştırmış.*" demekte, bir kısmı da: "*İslam ilke olarak kadına değer verip onu yüceltmek istemiştir.*" şeklinde, pratiği değil ilkeyi ön plana çıkartmaktadır. Bu düşüncedeki öğrencilerin en çok vurguladığı husus Hz. Muhammed'in"*Cennet annelerin ayakları altındadır"* anlamındaki hadisidir. Bir nevi ataerkil kültürün kadın deyince akla getirdiği çocuk doğurma ve anne(lik) imgesi dinsel motiflerden de destek alarak devam etmektedir. Bu durum hem erkekler hem de kızlar tarafından benimsenmiş bir algılama biçimidir. İslam'ın mevcut şartlarda kadına en iyi imkanı sunduğunu düşünen gençler genellikle kendilerini "*inanan*" ve "*dindar*" olarak tanımlayan Sünnilerdir. Aynı şekilde, dindar Aleviler arasında az da olsa böyle düşünenler görülmektedir. Esasen bu tur düşüncelerin altında dinin mensuplarına sağladığı dünya görüsünün etkilerini güçlü bir şekilde bulmak mümkündür. Ayrıca bu tür açıklama yapanların dinsel kimlikleri çoğu kere cinsel kimliklerinin önüne geçmiştir. Gençlerin bir kısmı İslam'da kadın ve erkeğin eşit olmadığını, kadının alt statüde kaldığını, ikincilleştirildiğini "*çok eşlilik*", "*şahitlik*" ve "*miras*" gibi konuları gündeme getirerek ortaya koymaya çalışmaktadır. Kendilerini "*inançsız*", "*şüpheci*" ve "*sadece inanan*"olarak tanımlayanlar, mezhepleri hakkında ise genellikle "*kültürel Sünnîyim*", "*ailem Sünnî*", "*Alevîyim*" ve "*hiçbir mezhebe mensup değilim*"diyenler, İslam"ın kadınlara yönelik tutumu konusunda eleştirici bir yaklaşım içerisindedirler. Bununla birlikte "*inançları kuvvetli birisiyim" ve "dinimi yaşamaya gayret ediyorum*" diyen kız ve erkek öğrencilerden de bu tür tepkiler yükselmektedir. İnançlı olduğunu söyleyenler daha yumuşak bir üslupla, kendilerini inançsız ve şüpheci olarak tanıtanlar ise göreceli olarak daha sert bir üslupla düşüncelerini dile getirmektedirler. Burada ise geleneğin ve dinin algılanışına yönelik tepkileri bulmak mümkündür. Kendilerini inançlı ve dindar olarak tanımlamakla birlikte dinin kadını ikincilleştirdiğini söylemeye çalışan kız öğrenciler cinsel kimlikleriyle dinsel kimlikleri arasında sıkışma ve bocalama yaşamaktadır.

Gençlerin İslam'da kadının yeri ve değeri konusunda yaptıkları açıklamalardan hareketle onları sekiz farklı tip içinde değerlendirmek mümkündür:

a) Taklidî Teslimiyetçiler: İslam'da kadının konumunun iyi ve değerli olduğunu söyleyen ancak düşüncelerini gerekçelendirmeyenler bu kategoridedir (% 26.4). Bunlar "İslam'da ve Kur'an-ı Kerim'de kadınla ilgili söylenen her şey doğrudur." diyerek sorgulamadan, şüphe etmeden, doğrudan inanma eğilimi göstermektedir Taklidi teslimiyetçiler kendilerini inanan ve kesin inançlı olarak tanımlamaktadır. Bu anlamda onların dini hassasiyetleri yüksektir. Bu kategorideki öğrencilerin büyük çoğunluğu Sünnîdir. Az da olsa Alevi gençlerden de bu yaklaşımı benimseyenlere rastlanmaktadır. Taklidi teslimiyetçiler kapsamındaki kız öğrenciler dinsel kimlikleri ile cinsel kimlikleri, erkek öğrenciler ise geleneksel dini inançlarıyla modernite arasında çatışma yaşamamaktadırlar.

b) Tahkikî Tasdikçiler: Üniversiteli gençler arasında İslam'da kadın konusunu kendilerini ikna edecek düzeyde araştıran, buradan hareketle "işte tüm bu nedenlerden dolayı kadın yüksek bir statüye sahiptir" diyenler tahkiki

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tasdikçiler grubuna girmektedir (% 17.8). Bunları "*farkındalık kazanmış inançlılar*" diye adlandırmak da mümkündür. Tahkiki tasdikçiler "İslam, Cahiliyye döneminde ezilen kadını kurtarmıştır." "İslam geldiğinde Doğu Roma ve Sasani İmparatorluklarında kadın aşağılık bir varlık olarak kabul ediliyor ve eziliyordu, işte İslam ezilen kadını yüceltmiştir." "Judeo-Kristiyan gelenek kadını ikincilleştirmişti, İslam kadını yeniden layık olduğu statüye çıkartmıştır" vb. açıklamalarla görüşlerini delillendirmeye çalışmaktadır. Genellikle kendilerini "inançlı ve Sünni" olarak tanımlayan öğrenciler arasında gözlenen bu tür ifadelere nadiren "inançlı ve Alevi" gençler de katılmaktadır. Dini kimlikleriyle barışık ve dini hassasiyetleri yüksek gençler arasında yaygın olan bu tutum örtük ama özgüvenli bir şekilde meydan okuyucudur.

c) Dinin Özü ile Geleneği Farklı Algılayanlar: Bu gruptaki öğrenciler, İslam ile Müslümanı, gerçek din ile algılanan dini, asıl İslam ile kültürel İslam'ı birbirinden ayırarak bu sorunu çözme gayretindedirler (% 18.2). Bu gençler "Hangi İslam?" sorusunu ön plana çıkartmaktadır. İslam'ın ontolojik olarak kadını yücelttiği, ancak tarihsel süreçteki sosyolojik gelişmelerin kadınların aleyhine olduğunu söylemektedirler. Tarihsel süreçte Müslümanların yaptıkları hataları din olarak İslam'a yüklemenin yanlış olduğunu düşünmektedirler. Kadın konusunda sekülarist ve feminist yaklaşımların dine yönelik eleştirilerini bilen ve bundan rahatsızlık duyan gençler "asr-ı saadet" üzerinden oluşturdukları "Kur'an İslamı" kavramıyla bilişsel dengelerini sağlamaya çalışmaktadırlar. Bu görüşteki gençler dini kimlikleriyle barışık fakat yaşadıkları dini sosyokültürel yapıyı sorgulama eğilimindedirler. Hem "İnançlı Sünni" hem de "inançlı Alevi" gençler arasında bu görüş sıklıkla dile getirilmiştir.

d) İnançlı Sorgulayıcılar: Dini kimlik ve inançlarıyla modernite ve seküler yaşam bicimi arasında sıkışmışlık yaşadıkları halde, son tahlilde inançları lehine bir tutum ve kanaat oluşturmuşlardır (% 11.6). Bunlar kendi içinde "kısmi eşitlikçiler" ve "dargın inançlılar" şeklinde iki kısma ayrılmaktadır."Kısmi eşitlikçiler" İslam'da kadın ve erkeğin kısmen eşit olduğunu bunun da her iki cinsiyetin yaratılış özelliklerinden kaynaklandığını düşünmektedir."Dargın inanclılar" ise kısmi eşitlik söyleminden ciddi şekilde rahatsızlık duymaktadır. İnançları ile modern dünyanın kadın söylemi arasında sıkışmış bir ruh hali içinde yaşadıkları çatışmalarla baş etmeye çalışmaktadırlar. İnançlı sorgulayıcılık eğilimi kendilerini "dindar", "inançlı ama ibadetlerini yapmayan", "inançlarını yaşamak isteyen", "dinle pek ilgisi olmayan" şeklinde tanımlayan Sünni gençler arasında daha fazla gözlenmektedir.

e) Suskunlar: Bunlar, İslam'da kadının yeri ve statüsü hakkında açıklama yapmaktan kaçınanlardır (% 5.2). Bu kategori kendi içinde "*ilgisizler*" ve "*yanlış yorum yapmaktan sakınanlar"* olmak üzere iki kısımda değerlendirilebilir. İlgisizler hem genel anlamda dini konuları hem de özelde İslam'da kadının yeri ve değeri meselesini pek önemsemeyenlerdir. Yanlış yorum yapmaktan sakınanalar ise mevcut bilgilerine güvenmeyenlerdir. Bunlar, kadın konusunda din ile modernite arasındaki gerilimi görmezden gelerek, bir nevi bastırma mekanizması kullanarak kendilerini rahatlatmaya çalışmış olabilirler. Suskunlar kategorisinde yer alan gençler kendilerini tanımlarken "Sünni", "inançlı", "inançlarını yaşamayan", "dinle ilgilenmeyen", "sadece Tanrı'ya inanan" vb. ifadeler kullanmaktadır.

f) Kararsızlık ve Çelişki Yaşayanlar: Bunlar, İslam'da kadının yeri ve değeri konusunda "bu konuda kafam karışık", "kararsızım", "çözemediğim bir şeyler var" diyenlerdir (% 2.1). Anlaşıldığı kadarıyla bunlar, İslam'da kadının yeri ve değeri konusunda henüz tam bir kanaate ulaşamamıştır. Bilişsel çelişkileri çözümlenmemiş, düşünceleri billurlaşmamıştır. Kararsızlık ve çelişki içinde olanlar yaşadıkları krizin çözümünü ertelemiş bir görüntü arz etmektedirler. Bu kategoride öğrencilerin tamamı kendilerini inançlı ve Sünni olarak tanımlamıştır.

g) Taklidî Eleştiriciler*:* Bunlar, herhangi bir açıklama ve gerekçe göstermeden "İslam'da kadın ikinci sınıftır", "geri plandadır", "ezilmiştir" vb. görüşler ileri sürmektedirler (% 8.6). Kendilerini "inançlı ama dine ilgisiz", "inanç konusunda şüpheci", "dini konuları sorgulayıcı" ve "ateist" olarak tanımlayan taklidi eleştiriciler için İslam dini prestijli bir sosyal kimlik sunmamaktadır. Taklidi eleştiricilerden bir kısmı da kendilerini kültürel anlamda Sünni ve Alevi diye tanımlamaktadır. Dinle bağlantıları çok zayıf veya tamamen kopuk olan bu öğrenciler kadın konusunda modernist, sekülarist ve feminist söylemi paylaşmaktadır.

h) Tahkikî Eleştiriciler: Bunlar, İslam'da erkeğin kadından açıkça üstün olduğu, her iki cinsiyet arasında eşitliğin olmadığı, kadının ezildiği, sömürüldüğü vb. görüşleri birtakım delillerle gerekçelendirme gayreti içindedirler (% 10.1). İslam'da çok eşliliğin olduğu, sınırsız cariye ile cinsellik yaşandığı, iki kadının şahitliğinin bir erkeğin şahitliğine denk sayıldığı, mirastan kadının yarım pay aldığı, gerektiğinde erkeğin kadını dövebileceğini gibi uygulamaları görüşlerine delil getiren tahkiki eleştiriciler tüm bunların modern dünya ile bağdaşmadığı kanaatindedir. Bu görüştekiler kendilerini ateist, hümanist, deist, dine ilgisiz, inanan ancak mezhepleri kabul etmeyen şeklinde tanımlamaktadırlar. Tahkiki eleştiricilerin büyük çoğunluğu Alevidir. Az da

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olsa Sünni öğrencilerden arasında da bu tür görüşlere sahip olanlara rastlanmıştır. Bunlarda da modernist, sekülarist ve feministler ön plandadır.

Üniversiteli Gençlere Göre Günümüzde Kadının Konumu
"Günümüzde kadının durumu nasıldır?" sorusuna verilen cevaplar dört farklı kategoride toplanabilir:

a) Tamamen Olumsuz Görenler: Gençlerin büyük bir çoğunluğu günümüzde kadınların hâlâ ikinci sınıf insan muamelesi gördüğü, ezildiği, aşağılandığı, horlandığı, hatta dövüldüğünü söylemektedir (% 74.1). Dini inanç, dini pratik ve dini kimlik bakımından birbirinden çok farklı olan gençlerin yaklaşık ¾'ü bu kanaattedir. Bu noktada şu hususu belirtmek gerekir: Günümüzde kadının ikincilleştirildiğini söyleyenlerin gerekçeleri birbirinden farklıdır. Bir kısım gençler bu durumu ülkenin doğusunda yaşamaya bağlarken, bir kısmı eğitimsizliğe, bir kısmı geri kalmışlık olgusuna, bir kısmı da dinsel temelli kültürel geleneklere atıf yapmaktadır. Bu bağlamda bazı gençler günümüzde kadının ezilen taraf olmasından bizzat İslam'ı ve Kur'an-ı Kerim'i sorumlu tutarken, bazıları ise egemen güçlerin ve erkeklerin İslam'ı ve Kur'an-ı Kerim'i kendilerince algılayarak kadını ezmeye çalıştıklarını söylemektedir. "İslam'ın verdiği hakları erkekler kendi çıkarları doğrultusunda engellemiştir." diyenler de oldukça çok sayıdadır. Günümüzde kadının cinsel bir meta olarak kullanıldığı iddiası sıklıkla dile getirilmektedir. Bunun sorumlusu olarak geleneği ve dini gösterenler olduğu gibi tam tersine seküler-modern hayatı suçlayanlara da rastlanmaktadır.

b) Genelleme Yapmaktan Kaçınanalar: Bunlar "Türkiye'de kadının durumu ve konumu tek boyutlu değil", "genelleme yapmak hatalı olur" düşüncesindedirler (% 11.3). Bunlara göre kent ya da köyde yaşamakla birlikte toplumun dindarlık, eğitim, entelektüellik, modernleşme ve sosyoekonomik düzeyleri kadına bakış farklılaştırmaktadır.

c) Kısmen Olumlu Görenler: Bunlar, kadın ve erkek ilişkilerinde henüz tam bir eşitlik sağlanamadığını, bununla birlikte eskiye nazaran kısmi bir iyileşme olduğunu söylemektedirler (% 8.2).

d) Tam Eşitliğin Gerçekleştiğini Düşünenler: Bunlar her konuda eşitliğin sağlandığını, dahası kadının bunu yoğun mücadelelerle başardığını düşünenlerdir (% 6.4). Bu düşüncede olanlar eğitim, meslek, kariyer ve ekonomik özgürlük kavramları sıklıkla kullanmaktadır.

Tartışma ve Sonuç
İslam'da kadının yeri ve değeri konusunda yaptıkları açıklamalardan hareketle gençlerin sekiz farklı tipte toplandığı tespit edilmiştir. Bunlar, *taklidî teslimiyetçiler*, *tahkiki tasdikçiler*, *dinin özü ile geleneği farklı algılayanlar, inançlı sorgulayıcılar, suskunlar, kararsızlık- çelişki yaşayanlar, taklidî eleştiriciler ve tahkiki eleştiricileri*dir. Öğrencilerin inanma, inanmama, şüpheci olma durumu ve mezhebi eğilimleri bu sınıflamada etkindir. Dindar insanlar muhafazakâr bir eğilim göstererek kadını "korunmaya muhtaç", "kocasına eş", "çocuklarına ana" olarak tanımlama alışkanlıklarını sürdürmektedir. Dinsel inançların etkisini üzerlerinde daha az hissedenlerden de bu tür açıklamalar gelmektedir. Bu durum kültürün kadına biçtiği rollerin erkekler ve kadınlar tarafından içselleştirildiği, mevcut cinsiyet şemalarının içeriğinin dinsel algılar ve kültürel kalıplar tarafından doldurulduğu anlamı taşımaktadır. Kız öğrencilerin cevaplarında kadın kimliğine yönelik bu yöndeki tanımlamalar *kadının temelde bir kimlik krizi değil, değer ve statü krizi yaşadığı*, bunun da yerine göre kadının kendisini ezik hissetmesine sebep olduğu şeklinde değerlendirilebilir. İşte bu noktada şu hususu önemle vurgulamak gerekir. Dinler, dindar insanlara doğrudan dinsel bir dünya görüşü sunduğu gibi, dindar olmayanlara da kültür ve gelenekle eklemlenerek ve sürekli yeniden üretilerek yarı dinsel bir dünya görüşü sunmaktadır. Öğrencilerin bazıları dünya görüşlerinin dinî temelli olduğunun farkına varmakta, bazıları ise bunu kabul etmeyerek dinsel temelli kültürel yargıları bireysel tercihleri olarak ifade etmektedirler. Ataerkil kültürün etkisiyle dinsel bir renge bürünmüş olan cinsiyet ön yargılarının kadın ve erkek tanımlamalarında doğrudan akla gelmemesi, modernleşme süreci ile birlikte ataerkil yapının ciddi bir yumuşama gösterdiği şeklinde yorumlanabilir. Esasen yapılan pek çok alan araştırmasında bu durumu görmek mümkündür (Akyüz, 2003; Karaman, 2003; Özbekoğlu, 2010; Demez, 2005; Topcuoğlu ve ark. 2010; Kahraman, 2010). Bu çerçevede erkek öğrenciler örtük bir şekilde daha katı ataerkil bir yapının özlemini çekseler de, kız öğrenciler adeta "*kadını birey olarak algılamak şartıyla*"kültürün kendilerine biçtiği *annelik*, *ev işleri*, *çocuk büyütme* vb. rolleri yerine getirebileceklerini söylemektedirler. Hatta *kocaları tarafından korunma* ve *kendi şereflerini kocalarının şerefi olarak algılama*ları yönündeki ifadeler kızların, bireysel gelişimlerine izin verildiği oranda ataerkil kültürün taleplerini yerine getirmekte bir sakınca görmedikleri şeklinde değerlendirilebilir. Başka çalışmalarda tespit edildiği üzere kadınların erkekleri ataerkil kültürün tanımladığı erkeksi rollerle algılaması (Vatandaş, 2007; Pınar, Taşkın & Eroğlu, 2008; Ersoy, 2009; Özbekoğlu, 2010) bu bağlamda değerlendirilebilir. Gençler bir yandan dinin kendilerine sunduğu izafet çerçevesi ile kadını algılamaya çalışırken, hatta İslam'ın görüsünü kendilerince rasyonalize edip meşrulaştırmak isterken, bir yandan da özellikle inançlı ve dindar kız öğrencilerin

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iç dünyalarında burukluk hissettikleri görülmektedir. Onlar adeta: "*Biz inanan insanlar olarak dinin bizi erkek karşısında ikincilleştirmesini istemiyoruz, belki din böyle demiyor, ama toplum bizi dinsel bir baskıyla aşağı bir statüye yerleştiriyor, bu da bizi rahatsız ediyor."* demektedirler. Başka bir deyişle özellikle inanan ve dini değerleri kuvvetlice benimseyenler hem dinden uzaklaşmamak hem de kadınlık kimliklerini bireysel olarak yaşamak istemektedirler. Bu ise kadın konusunda İslam dinine dayalı ataerkil yorumların yeniden gözden geçirilmesi anlamına gelmektedir.

Günümüzde kadınların konumu ve değeri meselesinde yapılan açıklamalar dört farklı tipte göstermektedir: Bunlar, *tamamen olumsuz görenler*, *genelleme yapmaktan kaçınanalar, kısmen olumlu görenler* ve *tam eşitliğin gerçekleştiğini düşünenler*dir. Gençlerin günümüzde kadının konumuna yönelik açıklamaları literatürle uyumludur (Karaman, 2003; Vefikuluçay-Yılmaz ve ark., 2009; Topçuoğlu ve ark, 2010; Akşit, Şenturk, Küçükural & Cengiz, 2012). Yapılan açıklamalara bakılacak olursa kadının ikincilleştirilerek ezilmesi temelde ataerkil kodlarla ve stereotiplerle algılanmasından kaynaklanmaktadır. Burada da en çok dikkati çeken hususlar, kadının sadece evi idare eden doğurgan bir anne, erkeğin cinsel ihtiyaçlarını karşılayan bir eş ya da partner ve namusunu koruması gereken bir varlık olarak algılanmasıdır. Bu arada modern dünyanın kadını özgürleştirme adı altında kullandığı ve cinsel bir metaya dönüştürdüğü de vurgulanan hususlardandır.

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DÜZCE KENT ATMOSFERİNDE PM_{10} FRAKSİYONLARINDA ELEMENTAL KARBON SEVİYELERİNİN İNCELENMESİ

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[2]: Düzce Üniversitesi Çevre Mühendisliği Bölümü
[3]: Bolu Abant İzzet Baysal Üniversitesi Çevre Mühendisliği Bölümü

Bu çalışmada Türkiye'nin Düzce ili kentsel atmosferinde, PM_{10} fraksiyonunda EC seviyelerinin ve mevsimsel değişimlerinin ortaya konması amaçlanmıştır. Düzce Türkiyenin Kuzey Batısında yer almaktadır ve etrafının yaklaşık %85'ini çevreleyen dağ ve tepelerden oluşan bir jeolojik yapısı vardır. Bu nedenle Düzce kent merkezine doğru rüzgar akışı engellenmektedir buna bağlı olarak kent merkezinde hava kirleticileri çok fazla dağılamamakta ve yüksek seviyede hava kirleticileri gözlenmektedir. Bu çalışmada Türkiye'nin Düzce ili kentsel atmosferinde, PM_{10} partiküllerinde EC seviyelerinin ve mevsimsel değişimlerinin ortaya konması amaçlanmıştır. Bu amaçla 2015 yılı içerisinde yaz ve kış aylarında yüksek hacimli örnekleyiciler ile kuvars filtreler üzerine toplanan PM_{10} örneklerinde, termal-optik karbon aerosol analizörü kullanılarak EC seviyeleri ölçülmüş ve mevsimsel değişimleri incelenmiştir. Elde edilen verilere göre Düzce kent merkezinde EC seviyelerinin 0.85 $\mu g/m^3$ ile 5.75 $\mu g/m^3$ arasında değiştiği ve ortalama EC konsantrasyonunun 1.82 $\mu g/m^3$ olduğu görülmüştür. Aerosollerdeki EC seviyelerinin mevsimsel farklılıklar gösterdiği ve kış aylarındaki ortalama EC konsantrasyonlarının yaz aylarına oranla yaklaşık olarak 2 kat fazla olduğu ortaya konmuştur. En yüksek konsantrasyonlar Şubat ayında elde edilmiştir. Elde edilen ortalama konsantrasyonlar Dünya'nın diğer bölgelerinde elde edilen verilerle karşılaştırılabilir düzeyde bulunmuştur.
Anahtar kelimeler: Elemental Karbon, PM_{10}, Hava kirliliği

1. GİRİŞ

Şehirleşme ve endüstriyel faaliyetlerin artmasıyla birlikte artan antropojenik faaliyetler sonucunda şehir merkezlerinde yoğun hava kirliliği meydana gelmektedir (Grigoratos vd., 2014; Rodriguez Martin vd.,2015). Artan kirlilik ile beraber kent merkezlerinde özellikle partikül madde konsantrasyonları yükselmiştir. Özellikle PM 10 ve PM 2.5'un kent merkezlerinde insanlar üzerinde ciddi sağlık etkilerine neden olduğu yapılan çaçışmalarla ortaya konmuştur (Heninrich ve Salama, 2007; Ho vd., 2007). PM'in miktarı ile birlikte kompozisyonu da sağlık etkilerinin daha iyi anlaşılabilmesi açısından çok önemlidir (Samek, 2009). Partikül madde kompozisyonunu organikler ve inorganik olmak üzere birçok bileşen oluşturmaktadır. (Patearaki vd., 2012). Yanma kaynaklı oluşan partikül maddelerinin % 60'ını organik karbon (OC) ve %10'unu ise elemental karbon (EC) oluşturmaktadır (Masiello, 2004).

Atmosferde askıda halde bulunan partiküllerdeki elemental karbon (EC) sağlık, havadaki görüş mesafesi ve iklim etkileri açısından önemli rol oynamaktadır. Genellikle optik türevli ve ışığı absorplayan siyah karbon ile (black carbon-BC) eşdeğer kabul edilen EC'nun bölgesel düzeyde havanın ısınmasına neden olduğu bilinmektedir. Bu nedenle atmosferik kararlılığı ve dikey karışımı değiştirmekte ve büyük ölçekli sirkülasyonla birlikte hidrolojik çevrimi etkilemektedir Streets et al., 2003;
Bond et al., 2004; Haywood et al., 1997; Myhre et al., 1998;). Atmosferdeki elemental karbon daha çok fosil yakıtların ve biyokütlenin yakılması sonucu oluşan emisyonlardan kaynaklanmaktadır (Kondo vd., 2006). Bu nedenle özellikle kent atmosferindeki EC'nun en önemli kaynakları başta trafik olmak üzere fosil yakıtların kullanıldığı evsel ısınma olduğu söylenebilir (Ramanathan vd., 2001; Han vd., 2009). Atmosferdeki EC seviyeleri ile ilgili Dünya'da özellikle Çin'de ve Hindistan'da bir çok çalışma yapılmış olmasına rağmen Türkiye'de çok sınırlı sayıda çalışma yapılmıştır. Dolayısıyla Türkiye için önemli bir veri eksikliği söz konusudur. Bu nedenle bu çalışmada Türkiye'nin Düzce ili kentsel atmosferinde, PM_{10} fraksiyonunda EC seviyelerinin ve mevsimsel değişimlerinin ortaya konması amaçlanmıştır.

2. MATERYAL VE METOT

Örnekleme Bölgesi:

Çalışmada örneklemeler Düzce kent merkezinde bulunan Düzce Üniversitesi Meslek Yüksekokulunda gerçekleştirilmiştir (Şekil 1). Düzce, 40° 49. 8' kuzey enleminde 31° 10. 2' doğu boylamında bulunan,

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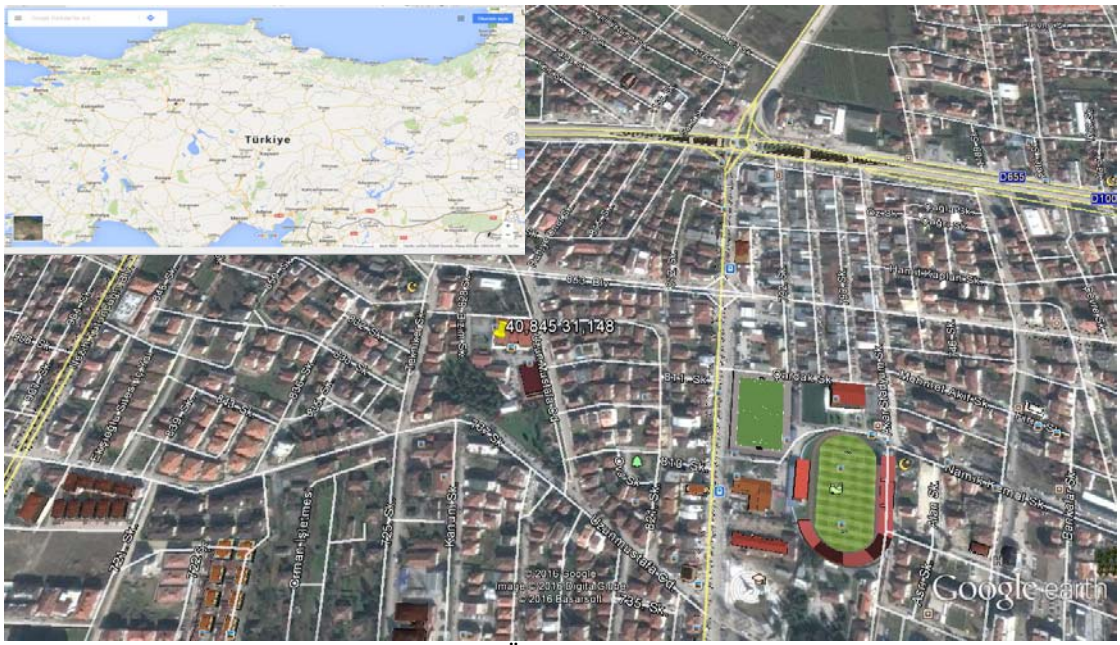
Türkiye'nin kuzey-batısında yer alan bir ildir. İlin topografyası genellikle dağlık ve tepelik (yaklaşık %85) olarak tanımlanır. İlin yüz ölçümü 2.574 km2, nüfusu 355.545 kişidir. İlin nüfusu yüz ölçümüne oranla düşüktür. Düzce merkezinde hakim rüzgar akışı etrafını çevreleyen dağ ve tepeler tarafından engellenmektedir. Bu nedenle özellikle ilin merkezinde kirleticiler dağılamamakta ve yüksek seviyelerde maruziyet gerçekleşmektedir. Düzce'de hava, sıcaklık inversiyonu nedeniyle Ekim ayından Mart ayına kadar, kış aylarında yaklaşık altı ay sislidir. Şehir merkezinin üzerinde düşük inversiyon tabakası hem kış ve hem de yaz mevsiminde görülebilmektedir.

Örnekleme Yöntemi

Bu çalışmada Thermo marka yüksek hacimli hava örnekleyicisi kullanılmıştır. Cihazda PM10 başlığı bulunmaktadır. PM10 örnekleri Palm marka tissuequartz filtre üzerine toplanmıştır. Örnekleme süresi 24 saat olarak belirlenmiştir. Örnekleme sırasında cihazın hava akış debisi 1,13 m3/dk olarak ayarlanmıştır. Örneklemeden önce quartz filtreler sabit tartıma gelinceye kadar, 24 saat sabit sıcaklık ve nem koşullarının sağlandığı desikatörlerde bekletilerek tartılmıştır. Örnekleme sonrasında quartz filtreler uygun koşullarda laboratuara taşınarak 24 saat süresince desikatörde bekletilmiş ve son tartımları alınmıştır. EC analizleri için 1cm^2'lik filtre parçaları kesilmiştir. Kış örneklemeleri Ocak-Mart 2015 tarihleri arasında, yaz örneklemeleri Haziran-Ağustos 2015 tarihleri arasında günlük olarak yapılmıştır.

Bu çalışmada PM10 örneklerinde EC/OC analizleri Sunset Lab. (Oregon, ABD) temin edilen "termal-optik karbon aerosol analizörü" kullanılarak yapılmıştır.

Standart büyüklükte kesilen PM yüklü kuvars filtreler analizörün kuvars fırınına yerleştirilmektedir. Daha sonra fırının sıcaklığı belli seviyelere çıkarılarak filtre üzerindeki karbon bileşiklerinin ayrılması sağlanır ve FID dedektörü ile EC ve OC belirlenir. Analizörde taşıyıcı gaz olarak helyum ve helyum/oksijen gazları karışımları kullanılmaktadır.



Şekil 1. Örnekleme bölgesi

3. BULGULAR VE TARTIŞMA

3.1 EC ve PM seviyeleri

Kent merkezinde toplanana PM10 aerosol örneklerinde ölçülen EC ve PM10 konsantrasyonları Tablo 1 ve Şekil 2'de verilmiştir. Buna göre yıllık ortalama PM10 miktarı ortalama 70 µg/m^3 olarak belirlenmiştir. Bu değer "Hava Kalitesi Değerlendirme ve Yönetimi Yönetmeliği" nde belirtilen sınır değeri aşmaktadır. EC

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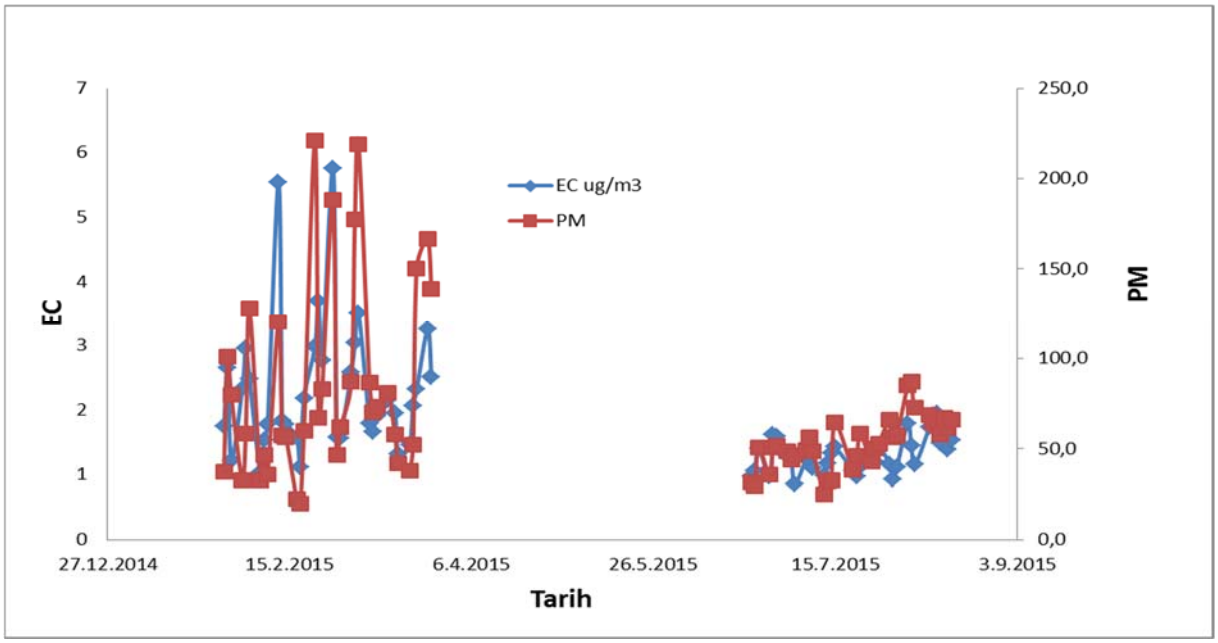
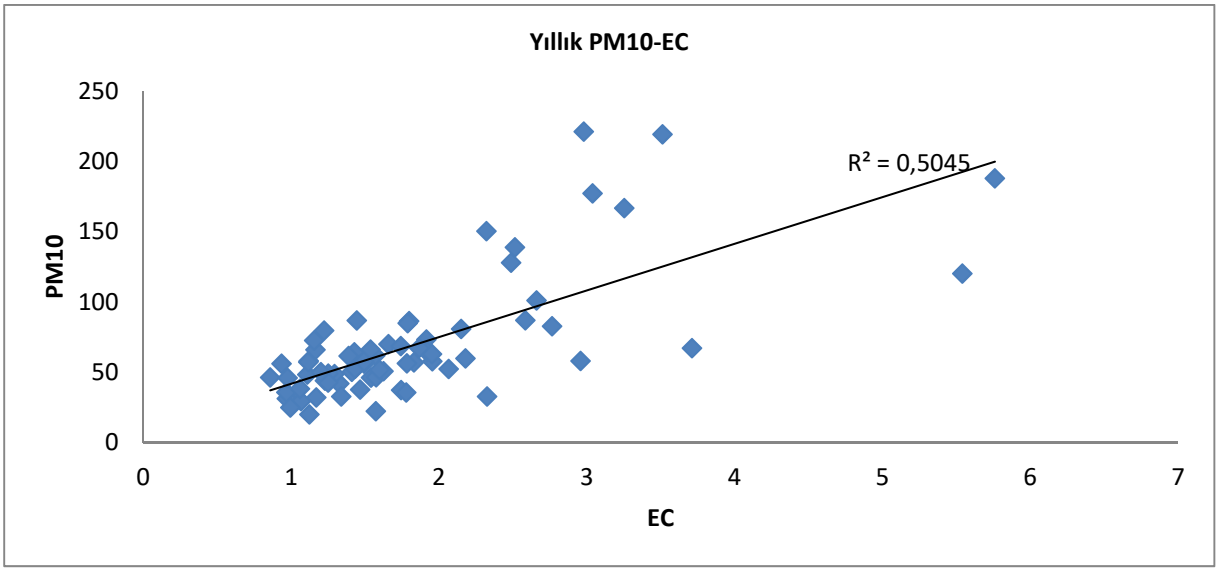
konsantrasyonu ise 0.86 ile 5.76 µg/m^3 aralığında belirlenmiştir. EC'ye ilişkin bir limit değer bulunmamaktaadır. Yıllık ortalama EC değeri PM10'un yaklaşık %10'nu oluşturmaktadır. Şekil 2 incelendiğinde PM10 ve EC konsantrasyonlarının benzr trend gösterdiği görülmektedir. Şekil 3'de ise EC ve PM10 knsantrasyonları arasında pozitif korelasyon bulunmuştur. R^2 değeri 0,5 olarak elde edilmiştir. EC ve PM10 konsantrasyonları arasındaki korelasyon daha önceden yapılan birçok çalışmada benzer şekilde bulunmuştur.

Tablo 1. Düzce kent merkezinde ölçülen PM10 ve EC konsantrasyonları (µg/m^3)

33	Yıllık Ort.	Medyan	SS	Yaz Ort.	Kış Ort.	Y/K	Min	Max
PM10	69,41	57,65	43,11	53,16	85,67	0,62	20,13	221,18
EC	1,83	1,57	0,92	1,32	2,33	0,57	0,86	5,76
%EC/PM10	2,96	2,74	1,17	2,60	3,32	0,78	1,35	7,07



Şekil 2. EC ve PM10 konsantrasyonlarının zamansal dağılımı



Şekil 3. EC ve PM10 konsantrasyonlarının korelasyon eğrisi

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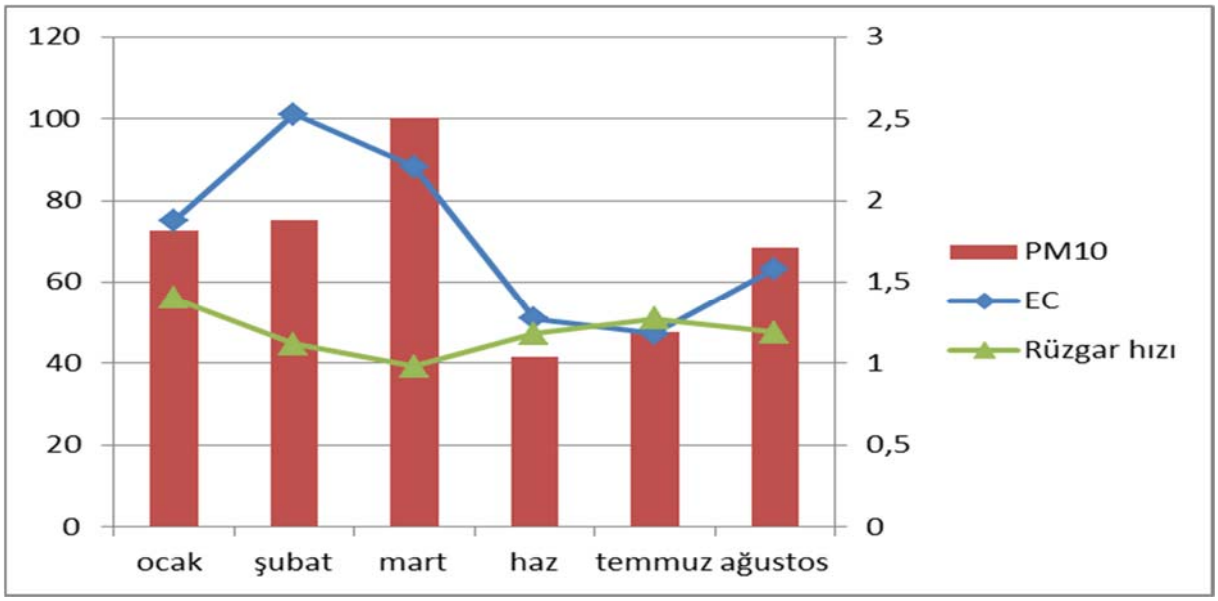
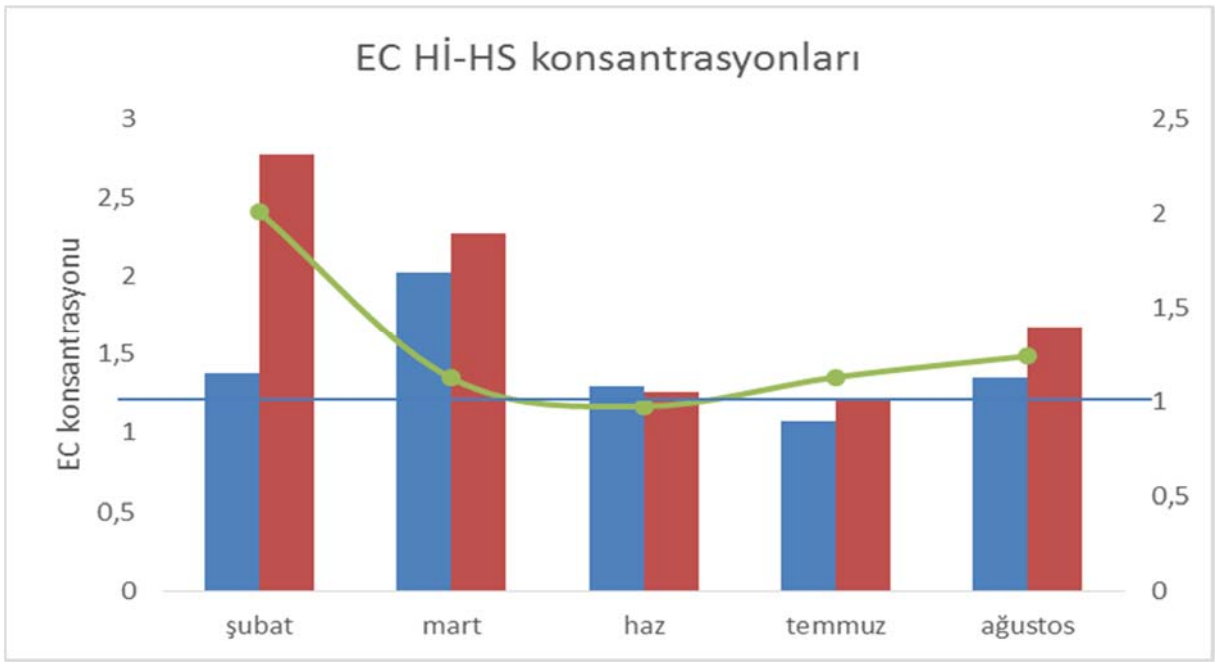
3.2. Mevsimsel Değişimler

Aylık ortalama EC ve PM konsantrasyonları Şekil 4'de verilmiştir. Şekil incelendiğinde en yüksek konsantrasyonların kış aylarında olduğu görülmektedir.. Kış aylarında gerek trafiğin daha yoğun olması gerekse ısınmadan dolayı fosil yakıt kullanımının artması sonucunda atmosferdeki EC konsantrasyonları da artmaktadır. Dolayısıyla Düzce'de elde edilen EC konsantrasyonlarının mevsimsel değişimi yakıt tüketimi ve trafiğe bağlı olarak arttığı söylenebilir. Öte yandan en yüksek ortalama konsantrasyonların mart ayında elde edildiği görülmektedir. Grafikte rüzgar eğrisine bakıldığında en düşük ortalama rüzgar hızının (m/sn) mart ayında olduğu görülmektedir. Atmosferdeki kirleticiler rüzgar hızı arttıkça daha fazla dağılmakta ve havadaki miktarları azalmaktadır. Dolayısıyla mart ayında elde edilen daha yüksek konsantrasyonlar trafikle ve ısınma ile birlikte rüzgar hızı ile de açıklanabilir.



Şekil 4. EC, PM ve rüzgar hızının aylık değişimi

Şekil 5'de EC konsantrasyonlarının hafta içi ve hafta sonu konsantrasyonları görülmektedir. Grafik incelendiğinde hafta içi konsantrasyonlarının hafta sonuna göre daha yüksek olduğu görülmektedir.



Şekil 5. Hafta içi vehafta sonu günlerinde EC konsantrasyonları

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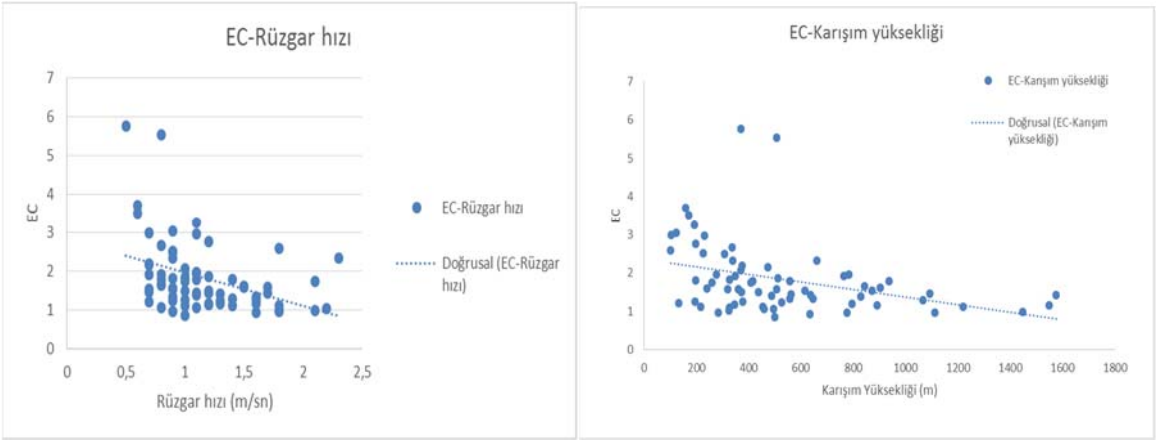
3.3. EC Konsantrasyonlarını Meteorolojik Parametrelerle İlişkisi

Tablo 2'de Düzce'de ortalama meteorolojik veriler görülmektedir. Veriler incelendiğinde Düzce'de kış aylarında ortalama sıaklığı 7ºC civarında, yaz aylarında ise 24 ºC olduğu görülmektedi.r karışım yüksekliği ve rüzgar hızının ise yaz ve kış aylarında birbiine oldukça yakın olduğu ve kısmen yüksek olduğu görülmektedir. Ortalama rüzgar hızının 2 m/sn.'nin altında olduğu görülmektedir. Düşük rüzgar hızından dolayı Düzce'de kirletici konsantrasyonları kent merkezinde yoğunlaşmakta ve dağılamamaktadır.

Örnekleme periyodu	Ortalama Bağıl Nem (%)	Ortalama Rüzgar Hızı (m/s)	Maksimum Rüzgar Hızı (m/s)	Sıcaklık (Cº)	Ortalama Yağış (mm)	Toplam Yağış(mm)	Karışım Yüksekliği(m)	Basınç (hPa)
28.01-26.03/2015	76,4	1,08	5,4	7,2	3,1	109	404	1000
22.07-16.08/2015	68,5	1,23	6,5	24	1,6	54,3	654	995,5

Şekil 6'da EC konsantrasyonları ile karışım yüksekliği ve rüzgar hızının ilişkisi görülmektedir. Bilindiği gibi karışım yüksekliği ve rüzgar hızı arttıkça kirletici konsantrasyonları azalmaktadır. Düzce'de elde edilen EC konsantrasyonlarının bu iki parametreyle ilişkisi incelendiğinde konsantrasyonların beklendiği üzere karışım yüksekliği ve rüzgar hızıyla azaldığı görülmektedir. Ancak her iki meteorolojik parametre değerlerinin yıl boyunca çok fazla değişiklik göstermemesi nedeniyle kısmi bir azalma görülmektedir.



Şekil 6. EC konsantrasyonlarının rüzgar hızı ve karışım yüksekliği ile değişimi

3.4. EC Konsantrasyonlarının Literatürle Karşılaştırılması

Tablo 3'de bu çalışmada elde edilen EC konsantrasyonları ile Dünya'nın çeşitli yerlerinde yapılan çalışmalarda elde edilen EC konsantrasyonları verilmiştir. Tablo incelendiğinde Düzce'de elde edilen konsantrasyonların genel olarak diğer çalışmalara göre daha düşük olduğu görülmektedir. Ancak Tokyo ve Baltimore gibi büyük kentlere çok yakın seviyelerde bulunmuştur. Yüksek EC konsantrasyonların daha çok yoğun nüfusa sahip Çin, Hindistan gibi ülkelerde elde edildiği görülmektedir. Öte yandan bu çalışmada elde edilen en yüksek konsantrasyonlar 5 µg m^{-3} civarında olup Çin ve Hindistan'da elde edilen verilere oldukça yakındır. Dolayısıyla Düzce'de EC seviyelerinin zaman zaman dikkat çeken boyutlara ulaştığı söylenebilir.

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Tablo 3. Bu çalışmada elde edilen EC verilerinin literatürle karşılaştırılması

Bölge	Örnekleme periyodu	EC µg m^{-3}	Analiz yöntemi	Referans
Tokyo, Japonya	2003-2005	1.8[a]	TOT[b]	Kondo vd., 2006
Seoul/Güney Kore	Ara.99	4.5[c]	TMO[d]	Park vd., 2007
Incheon/Güney Kore	Haziran-Ekim 2004	4,3[c]	TOT[b]	Kim vd., 2006
Baltimore/ABD	Şubat-Kasım 2002	1,1[c]	TOT[b]	Park vd., 2005
Atlanta, ABD	Ağustos-Eylül, 1999	2,3[c]	TOT[b]	Lim ve Turpin, 2002
Pekin/Çin	Kasım 2005-Ekim 2006	6,9[c]	TOT[b]	Han vd., 2009
Yeni Delhi	Ocak-Aralık 2012	7,79[c]	TOT[b]	Bisht vd., 2015
Düzce/Türkiye	**Ocak-Eylül 2015**	**1,83[c]**	**TOT[b]**	**Bu çalışma**

a:Medyan değeri
b: Termal optik geçirgenlik
c: Ortalama değer
d: TMO, termal manganez dioksit oksidasyonu

4. SONUÇ VE ÖNERİLER

Bu çalışmada elde edilen verilere göre özetle aşağıdaki sonuçlar ortaya konmuştur.

- Düzce atmosferinde PM10 fraksiyonlarında EC konsantrasyonları 0,86 ile 5,76 µg m^{-3} arasında bulunmuştur
- Kış aylarındaki EC konsantrasyonları yaz aylarına göre daha yüksek bulunmuştur
- EC ile PM10 konsantrasyonları arasında pozitif bir korelasyon bulunmuştur ve EC konsantrasyonu PM10'un yaklaşık %3'ünü oluşturmaktadır.
- EC'nin hafta içi konsantrasyonları hafta sonuna göre daha yüksek bulunmuştur
- EC konsantrasyonları rüzgar hızı ve karışım yüksekliğinin artışıyla azalmaktadır
- Düzce'deki EC konsantrasyonları Hindistan, Çin ve Kore'ye göre düşük olmakla birlikte Amerika'nın bazı bölgeleri ve Tokyo ile aynı seviyede belirlenmiştir

Öneriler:

- Bu çalışmada sınırlı sayıda örnek alınmıştır, ilerleyen çalışmalarda daha fazla sayıda örneklemeler yapılarak tüm yıla ait EC değerleri ortaya konmalıdır
- Her ne kadar Çin, Hindistan gibi ülkelere göre EC konsantrasyonları daha düşük olsa da Tokyo gibi yoğun nüfuslu kentlerle aynı seviyelerde bulunmuştur. Düzce Tokyo ile karşılaştırıldığında nüfusu az ve küçük bir şehirdir. Bu nedenle hava kalitesi açısından kirli olduğu söylenebilir. PM10 değerlerinin de çoğu kez sınır değeri aşması bunun bir göstergesidir. Bu nedenle yerel yönetimlerin yapılan bu çalışmaları dikkate alarak hava kalitesinin iyileştirilmesi için önlemler alması gerekmektedir
- Bu çalışma PM10 fraksiyonundaki aerosol örnekleriyle yapılmıştır. EC antropojenik bir kirletici olması ve daha çok ince partiküllerde bulunması nedeniyle, ilerleyen çalışmalarda PM2.5 aerosollerinde de EC konsantrasyonları belirlenmelidir.

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DÜZCE YÖRESİ DOĞU KAYINI MEŞCERELERİNDE ARALAMA ŞİDDETİNİN ÖLÜ ÖRTÜ DİNAMİĞİNE KISA SÜRELİ ETKİLERİ

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Özet: Orman ölü örtüsü orman ekosistemin en önemli dinamik bileşenlerinden biridir. Yetişme ortamı özellikleri, ağaç türü-karışımı ve silvikültürel aktiviteler ölü örtü üretimini önemli şekilde etkileyebilmektedir. En önemli silvikütürel aktivitelerden biri olan aralamalar orman altında mikro-klimayı ve ölü örtü miktarını değiştirebilmektedir. Bu çalışmada, Düzce (Türkiye) yöresindeki doğu kayını meşcerelerinde ölü örtü miktarının belirlenmesi ve farklı şiddette aralamanın ölü örtü miktarı üzerine kısa süreli etkileri araştırılmıştır. Düzce yöresindeki Asar ve Darıyeri sahalarında 2009 yılında aralama denemeleri kurulmuş, üç tekrarlı rastlantısal blok desenine göre üç farklı şiddette aralamalar uygulanmıştır. Aralama öncesi ve aralamadan bir yıl sonra her iki sahadaki parsellerde 10 tekrarlı olarak yaprak, dal ve çürüntü miktarları ayrılarak ölü örtü ölçümleri yapılmıştır. Araştırma sonuçlarına göre, aralamadan önce ölü örtü miktarı Asarda 7.5 ton ha^{-1}, Darıyeri'nde ise 12.3 ton ha^{-1} bulunmuştur. Aralamadan bir yıl sonra aralanan parsellerde toplam ölü örtü miktarı artmıştır. Her iki deneme de yaprak ölü örtü miktarı aralanan parsellerde azalırken, dal ölü örtüsü artış göstermiştir. Çürüntü ölü örtü ise aralamadan etkilenmemiştir. Aralama öncesi olduğu gibi aralamadan bir yıl sonrada çürüntü ölü örtü>yaprak ölü örtü ilişkisi devam etmiştir. Sonuç olarak, doğu kayını meşcerelerinde uygulanan aralamalar kısa vadeli olarak ölü örtü dinamiğini etkilemiştir. Aralamanın ölü örtü dinamiğine etkilerini tam olarak anlamak için uzun süreli çalışmalara ihtiyaç vardır.

Anahtar Kelimeler: aralama, doğu kayını, Düzce, ölü örtü

Giriş

Doğu kayını (*Fagus orientalis* Lipsky), ülkemizdeki yapraklı türler arasında yayılış alanı (1.9 mil. ha) ve ağaç serveti (264 mil. m^3) bakımından ilk sırada gelmektedir (OGM, 2006). Düzce doğu kayının optimal yayılış yaptığı yörelerden birisidir. Orman ölü örtüsü (ÖÖ) orman ekosisteminin en belirgin özelliklerinden biridir. Ormanda toprak üstünde yatan ve çoğunluğunu yıllık yaprak dökümünün oluşturduğu organik maddelerin bütününe ÖÖ denilir. ÖÖ, yapraklar, ibneler, tomurcuk pulları, dal parçaları v.s. bitki örtüsü (flora) ve küçük ve büyük hayvanların artıklarını içermektedir. ÖÖ tam olarak oluştuğunda yaprak tabakası, çürüntü tabakası ve humus tabakası olmak üzere üç kısımdan oluşmaktadır (Irmak, 1966). ÖÖ ve onun ayrışma ürünleri toprak minerallerinin ayrışmasında, kırıntılı bir toprak strüktürünün oluşumunda rol oynar ve toprak genetiğini etkiler. Diğer yandan ağaçlar tarafından alınan besin maddeleri yıllık yaprak dökümü ve dal düşürmesi ile tekrar toprağa geri döner. Bundan dolayı ÖÖ mineral madde döngüsünü sağlayan önemli bir kaynaktır (Karaöz, 1991). Ayrıca ÖÖ topraktaki omurgalı veya omurgasız küçük canlılara besin kaynağı, bitkilere su ve besin maddesi sağlamaktadır. Türkiye'de değişik türlerde ÖÖ miktarının belirlenmesi ve ayrışması üzerine çalışmalar bulunmaktadır (Arol, 1959; Irmak, 1966; Kantarcı, 1979; Çepel ve Tekerek, 1980; Karaöz, 1988; Karaöz, 1991; Karatepe, 2004; Yener, 2006; Sariyildiz ve Küçük, 2008; Sargıncı, 2014). Faklı yörelerdeki doğu kayını meşcerelerinde yapılan üç farklı çalışmada ÖÖ miktarı 6.7 ton ha^{-1} ile 36.5 ton ha^{-1} arasında değiştiği belirtilmektedir (Arol, 1959; Karaöz, 1988; Yener, 2006; Sargıncı, 2014). ÖÖ miktarı ve ayrışması üzerine çevresel koşullar (Trofymow ve diğ., 2002; Kurz-Besson ve diğ., 2005), mikro organizmalar ve toprak faunası aktivitesi (Neely ve diğ., 1991; Cox ve diğ., 2001) ve ölü örtü kalitesi (Swift ve diğ., 1979; Heal ve diğ., 1997) etkilidir. Birçok çalışma göstermektedir ki, topoğrafya özellikleri (bakı ve yükseklik) (Barnes ve diğ., 1997) ve silvikültürel müdahaleler (Smethurst ve Nambiar, 1990; Martin ve diğ., 2001) çevresel koşulları değiştirebilmektedir. Topografik özelliklerinin ölü örtü ve ayrışma üzerine yaptığı olumlu veya olumsuz etkiyi konu alan sınırlı sayıda çalışma mevcuttur (Mudrick ve diğ., 1994; Vitousek ve diğ., 1994; Scowcroft ve diğ., 2000; Karatepe, 2004; Yener, 2006; Sariyildiz ve Küçük, 2008; Sargıncı, 2014). En önemli silvikültürel müdahalelerden biri olan aralama (Saatçioğlu, 1971), mikro-klimayı değiştirdiği için ölü örtü ayrışmasını

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hızlandırmakta (Smith ve diğ., 1997) ve orman verimliliğini (Çiçek ve diğ., 2013; Özbayram, 2015) artırabilmektedir. Bazı ekosistemlerde bakım kesimleri ölü örtü ayrışmasını geriletebilmekte (Cortina ve Vallejo, 1994), bazı durumlarda ise iklim etkisi silvikültürel etkinin önüne geçebilmektedir (Tolunay, 2003). Maalesef, Türkiye'de tür bazında aralamanın ÖÖ miktarına ve değişimine etkisi hakkında çok az bilgiye sahibiz. Bu çalışmanın amacı Düzce yöresinde iki farklı sahada, saf ve doğal DK meşcerelerindeki ölü örtü miktarlarını belirlemek ve aralamanın ölü örtüye etkisinin bir yıllık sonuçlarını değerlendirmektir.

Materyal ve Yöntem

Deneme sahası Düzce ili Kaynaşlı ilçesi sınırları içerisinde Darıyeri ve Asar yöresinde doğal ve saf doğu kayını (*Fagus orientalis* Lipsky.) meşcerelerinde 2009 yılında üç tekrarlı rastlantısal blok deneme desenine göre kurulmuştur. Her denemede 625 m^2 alana sahip 9 parsel bulunmaktadır. Aynı yıl üç farklı şiddette (göğüs yüzeyinin kontrolde %0; mutedilde % 30'u, kuvvetlide % 48'i çıkarıldı) aralama uygulandı. Aralama öncesi Asar denemesi 28 yaşında, 1350 m rakımda, % 26 eğime sahip ve kuzey bakıda yer alırken, Darıyeri denemesi ise 43 yaşında, 630 m rakımda, % 19 eğim ve kuzey bakıda bulunmaktadır. Uzun yıllar ortalamasına göre (1975-2009), Asar ve Darıyeri'nde yıllık toplam yağış sırasıyla 1465 mm ve 1050 mm ve iki denemede de yıllık yağışın % 39'u vejetasyon döneminde (Nisan-Eylül) düşmektedir. Uzun yıllar ortalama sıcaklık Asar ve Darıyeri'nde sırasıyla 7.0 °C ve 10.6 °C'dir. Walter yöntemine göre her iki yörede de kurak dönem bulunmamaktadır. İlk ÖÖ ölçümü aralamadan önce (2009 yılında) tüm parsellerde, Şubat ayında, ikinci ölçüm ise aralamadan 1 yıl sonra 2010 Şubat ayında ölçülmüştür. Her denemede 9 parsel olmak üzere toplamda 18 deneme parselinde 180 alt örnekleme ile ÖÖ ölçümü yapılmıştır. Alt örnekleme parselin merkezinde, diğerleri merkezin 5 m kuzeyinde, doğusunda, güneyinde ve batısında, kalan 5 örnekleme noktası ise rastgele seçilmek suretiyle parsel içerisinde ÖÖ ölçümleri gerçekleştirilmiştir. Örneklerin alınmasında 25x25 cm boyutunda (625 cm^2) ve 15 cm derinliğinde keskin ağızlı demir çerçeve kullanılmıştır. Uygulamada keskin ağızlı metal çerçeve üstten bastırılmak suretiyle organik tabakayı kesmesi ve mineral toprağa saplanması sağlanmıştır. Daha sonra çerçeve içerisine giren ölü örtü, yaprak, dal ve çürüntü şeklinde ayrılmış ve farklı şekilde torbalanarak laboratuvara getirilmiştir. Laboratuvara getirilen ölü örtü örnekleri serilerek hava kurusu hale gelmesi beklendikten sonra, tüm örnekler fırında 70 ºC' de 48 saat kurumaya terk edilmiştir. Fırın kurusu hale getirilen örnekler zaman kaybetmeden 0,01 gr hassasiyetindeki dijital terazide tartılarak fırın kurusu ağırlıkları belirlenmiştir. Yaprak, dal ve çürüntü ağırlıkları belirlenen örnekler hektara çevirme katsayısı ile çarpılarak hektardaki (ton ha^{-1}) miktarları bulunmuştur. Verilerin istatistiki analizi için SPSS v.22 paket programından yararlanılmıştır. Denemelerin aralama öncesi yaprak ölü örtüsü (YAÖ), dal ölü örtüsü (DÖÖ), çürüntü ölü örtüsü (ÇÖÖ) ve toplam ölü örtü (TÖÖ) miktarlarının karşılaştırılması bağımsız örneklem t-testi ile yapılmıştır. Her iki denemede de aralamanın YÖÖ, DÖÖ, ÇÖÖ ve TÖÖ miktarlarına etkileri deneme desenine uygun şekilde varyans analizi (ANOVA) ile bakılmıştır. Ortalamaların karşılaştırılmasında D*uncan* testinden yararlanılmıştır ($P<0.05$).

Bulgular ve Tartışma

Aralama öncesi TÖÖ miktarı bakımından iki denemede kendi içerisinde homojendir ($P<0.05$). Aralama öncesi Darıyeri TÖÖ (12.3 ton ha^{-1}) Asar TÖÖ'den (7.5 ton ha^{-1}) % 64 daha yüksek bulunmuştur (Şekil1). Bu fark çürüntü ölü örtü (ÇÖÖ) den kaynaklandığı söylenebilir (Şekil 1). Çünkü YÖÖ ve DÖÖ miktarları her iki denemede de aynıdır ($P<0.05$; Şekil 1). Darıyeri, Asar denemesinden 700 m daha alt rakımda yer aldığından ortalama sıcaklık daha yüksektir. Böylece ayrışan ölü örtü miktarı daha fazla olabilir. Nitekim yapılmış çalışmalarda yükseklik arttıkça ayrışmanın azaldığı ve bunun nedeni düşen ortam sıcaklığı olduğu yönündedir (Piene ve Cleve, 1978; Çepel ve Tekerek, 1980; Mudrick ve diğ., 1994; Yener, 2006; Sariyildiz ve Küçük, 2008).

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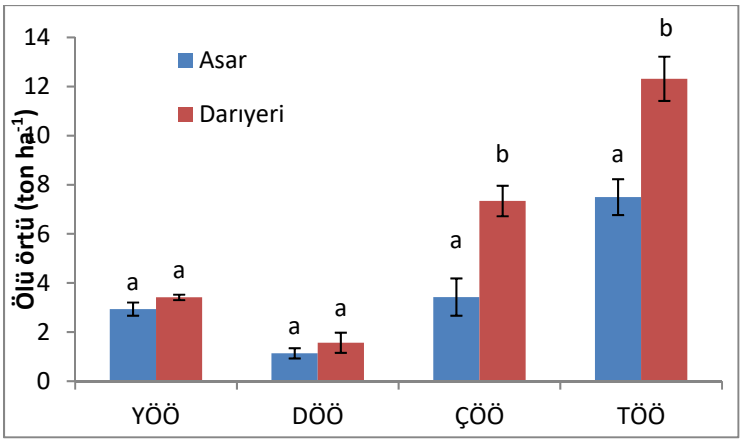

Şekil 1. Asar ve Darıyeri denemelerinde aralama öncesi yaprak ölü örtüsü (YAÖ), dal ölü örtüsü (DÖÖ), çürüntü ölü örtüsü (ÇÖÖ) ve toplam ölü örtü (TÖÖ) miktarları. Barlar standart hatayı göstermektedir. Aynı harfle gösterilen ölü örtü miktarları 0.05 düzeyinde farksızdır.

Asar denemesinde YÖÖ, DÖÖ ve ÇÖÖ miktarlarının TÖÖ'ye oranı sırasıyla % 40, % 16 ve % 44 iken, Darıyeri'nde ise sırasıyla % 28, % 12 ve % 60'dır. Yani, iki denemede de TÖÖ içerisinde ÇÖÖ miktarının oranı daha yüksektir (Şekil 1). Benzer sonuç Yener (2006) tarafından Sinop yöresindeki doğu kayınında bulunmuştur. Yener (2006), ölü örtü içerisinde ÇÖÖ miktarının YÖÖ miktarından yüksek olduğunu bildirmektedir.

Aralamadan bir yıl sonra, Asar denemesinde kuvvetli işlemde YÖÖ miktarı % 46 oranında azalmıştır ($P<0.001$; Tablo 1). Kontrol ve mutedil parsellerdeki YÖÖ miktarları aynı (2.87 ton ha^{-1}) ve aralama öncesi değere (2.93 ton ha^{-1}) oldukça yakındır. Darıyeri denemesinde ise aralama şiddetine bağlı olarak YÖÖ miktarı azalmaktadır (Tablo 1). Aralama sonrası kontrol YÖÖ değeri aralama öncesi değere oldukça yakın iken, aralama sonrası YÖÖ değeri mutedilde %26, kuvvetlide ise % 45 daha düşüktür. Diğer bir ifadeyle, kuvvetli aralanan parsellerde YÖÖ miktarı daha keskin şekilde azalmıştır. Bu, kuvvetli işlemde daha fazla galip ve müşterek galip ağaçlar kesildiği için yüksek döküntü oluşturan kaynakların azalmasına bağlanabilir. Mutedilde ise ılımlı aralama yapıldığı ve üst tabakadaki ağaçlardan ziyade ara tabakaya müdahale edildiğinden YÖÖ miktarı kuvvetli işlemdeki kadar düşmemiştir. Benzer sonuçlar farklı türde yapılan birçok çalışmada belirtilmektedir (Çepel ve diğ., 1988; Trofymow ve diğ., 1991; Prescott, 1997; Roig ve diğ., 2005; Blanco ve diğ., 2006, 2008; Kunhamu ve diğ., 2009). Roig ve diğ. (2005), Blanco ve diğ. (2006) ve Kunhamu ve diğ. (2009) aralamaların şiddetine bağlı olarak yıllık döküntü miktarının (özellikle yaprak/ibre döküntüsünün) azaldığını belirtmektedirler. Diğer taraftan her iki denemede de aralama sonrası YÖÖ'nün TÖÖ'ye oranı giderek azalması, literatürü desteklemektedir. (Şekil2).

Tablo 1. Aralama şiddetinin yaprak ölü örtüsü (YAÖ), dal ölü örtüsü (DÖÖ), çürüntü ölü örtüsü (ÇÖÖ) ve toplam ölü örtü (TÖÖ) miktarına etkisi. Her deneme içerisinde aynı sütunda aynı harfle gösterilen veriler benzerdir ($P>0.05$).

Deneme Sahası	İşlem	YÖÖ	DÖÖ	ÇÖÖ	TÖÖ
Asar	Kontrol	2,86 b ±0,23	1,77 a ±0,28	3,42 a ±0,37	8,05 a ±0,48
	Mutedil	2,87 b ±0,16	2,67 ab ±0,48	4,21 a ±0,41	9,74 b ±0,75
	Kuvvetli	1,55 a ±0,11	3,68 b ±0,55	4,61 a ±0,41	9,84 b ±0,78
Darıyeri	Kontrol	3,37 c ±0,19	1,50 a ±0,24	7,25 a ±0,49	12,12 a ±0,34
	Mutedil	2,49 b ±0,14	2,43 ab ±0,40	9,27 a a±0,70	14,18 ab ±0,88
	Kuvvetli	1,85 a ±0,19	3,59 b ±0,63	8,96 a ±0,80	14,40 b ±0,88

Aralama sonrası dal ölü örtüsü (DÖÖ) her iki denemede en yüksek kuvvetli işlemde bulunmuştur ($P<0.01$). Kontrol ile mutedil işlemler benzer DÖÖ miktarına sahiptir ($P>0.05$). İki denemede de DÖÖ nün TÖÖ'ye oranı aralanan parsellerde artmaktadır (Şekil 2). Normalde kontrol parsellerinde rekabet daha yüksek olduğundan dal düşürme miktarının yüksek olması, buna bağlı olarak DÖÖ miktarının daha yüksek olması beklenirdi. Ancak, aralama sonrası DÖÖ'nün artması, aralama ile kesilen ağaçların ince dallarının sahada bırakılmasından kaynaklandığı düşünülebilir. Çünkü her iki deneme de aynı şekilde aralamadan sonra DÖÖ artmaktadır (Şekil 2). Ayrıca her iki denemede benzer aralama şiddeti uygulandığından, denemelerdeki aralanan parseller birbirine yakın DÖÖ miktarına sahiptir (Tablo 1).

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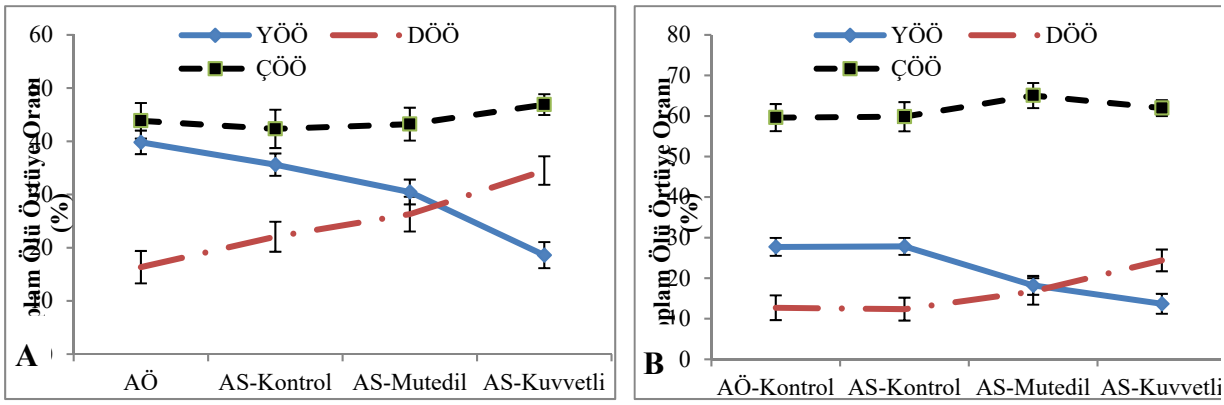

Şekil 2. Asar (B) ve Darıyeri (B) denemelerinde yaprak ölü örtüsü (YAÖ), dal ölü örtüsü (DÖÖ) ve çürüntü ölü örtüsü (ÇÖÖ)'nün toplam ölü örtüye oranının aralama öncesi (AÖ) ve aralama sonrası (AS) işlemlere göre değişimi.

İki denemede de aralamanın ÇÖÖ miktarına etkisi önemsizdir (P>0.05). Aralama öncesi gibi, aralama sonrası ÇÖÖ miktarı Darıyeri denemesinde Asardan yaklaşık iki kat daha yüksektir (Tablo 1). Deneme sahaları arasındaki ÇÖÖ farkı yetişme ortamı özelliklerinden kaynaklanıyor olabilir. Nitekim yükseklik arttıkça sıcaklık düşmekte ve yağış artmasına bağlı olarak ayrışma yavaşlayabilmektedir (Yener, 2006; Sariyildiz ve Küçük, 2008). Her iki denemede de ÇÖÖ miktarının TÖÖ'deki oranı önemli düzeyde değişmemiştir (Şekil 2). İki denemede de mutedil ve kuvvetli işlemlerde aralamayla ağaç sayısı azalmasına bağlı YÖÖ'de azalma olmasına rağmen, ÇÖÖ miktarında aralama öncesine göre önemli değişiklik olmamıştır. Bunun nedeni araştırma süresinin kısa olmasından kaynaklanabilir. Nitekim aralama çürümeyi (ayrışmayı) hızlandırdığı yönünde birçok çalışma vardır (Piene ve Cleve, 1978; Prescott ve diğ., 2000; Thibodeau ve diğ., 2000; Kunhamu ve diğ., 2009). Örneğin Prescott ve diğ. (2000) aralamanın ÖÖ miktarını iki yıl içinde %10 azalttığını belirtmektedir.

Kontrole göre aralanan parsellerde TÖÖ miktarı artmıştır (Tablo 1). Asar denemesinde TÖÖ aralanan parsellerde benzer ve kontrolden % 22 daha yüksektir. Darıyeri denemesinde ise kuvvetli işlemde TÖÖ kontrolden % 19 daha yüksektir. Kuvvetli işlemlerdeki TÖÖ artması aralama sonrası DÖÖ miktarının artmasıyla sıkı ilişki içerisindedir. Diğer yandan, TÖÖ miktarı aralama öncesi gibi aralamadan sonra da Darıyeri'nde daha yüksektir. Bu, Darıyeri denemesinde meşcere yaşının daha yüksek olmasına bağlı olabilir. Nitekim Yener (2006) doğu kayınında meşcere yaşı artıkça ölü örtü miktarının arttığını belirtmişlerdir. Aralama öncesi TÖÖ miktarı 7.5 ile 12.3 ton ha^{-1} arasında, aralama sonrasında ise ortalama olarak 8.0 ile 14.4 ton ha^{-1} arasında değişmektedir. Bu değerler daha önce Türkiye'de doğu kayınında ölçülen TÖÖ miktarlarına oldukça yakındır (Arol, 1959; Karaöz, 1988; Yener, 2006; Sargıncı, 2014).

Sonuç

Aralama öncesi TÖÖ miktarı Asarda 7.5 ton ha^{-1} iken Darıyeri'nde 12.3 ton ha^{-1}olarak bulunmuştur. Aralama öncesi denemeler arası YÖÖ ve DÖÖ miktarları benzer iken, ÇÖÖ ve TÖÖ miktarları Darıyeri'nde daha yüksektir. Aralamadan 1 yıl sonra TÖÖ miktarları artmış, Asarda 8.0 ile 9.8 ton ha^{-1} arasında, Darıyeri'nde ise 12.1-14.4 ton ha^{-1} arasında değişmektedir. Ayrıca aralamadan bir yıl sonra kuvvetli işlemde YÖÖ miktarı her iki denemede de yaklaşık % 45 azalmıştır. Ancak DÖÖ ve TÖÖ miktarları aralamadan 1 yıl sonra kuvvetli işlemde artmıştır. Ancak her iki denemede de ÇÖÖ miktarı aralamadan 1 yıl sonra işlemler arasında değişmemiştir. Aralama öncesi ÇÖÖ-YÖÖ farkı aralamadan sonra daha da artmıştır.

ÖÖ dinamik bir yapıdır. Yıldan yıla, iklimden iklime değişebilmektedir. Aralamanın ÖÖ miktarına ve ayrışmaya etkisini tam olarak anlayabilmek için uzun süreli çalışmaların sonuçlarına ihtiyaç vardır. Bu nedenle aralamanın ÖÖ miktarına ve ayrışma üzerine uzun yıllar etkileri araştırılmalıdır. Ayrıca farklı yetişme ortamlarındaki doğu kayınında yapılacak aralamaların ÖÖ miktarına etkileri ile bu sonuçlar kıyaslanabilir.

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EFFECT OF Al CONTENT ON STRUCTURE AND WEAR BEHAVIOR OF AlCoCrFeMoNi HIGH ENTROPY ALLOYS

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Abstract: High-entropy $Al_xCoCrFeMo_{0.5}Ni$ (x=0-2) alloys are prepared by the vacuum arc melting and casting method. The effects of Al content on the microstructure, hardness and wear resistance of the high-entropy alloys (HEAs) are investigated. The HEAs were characterized for phase content by X-ray diffractometer (XRD) and morphology by scanning electron microscope (SEM). Wear tests were performed under dry friction conditions with WC balls at a 5 N normal load and sliding speed of 5 $cm \cdot s^{-1}$ in a ball-on-disc geometry. The worn surfaces of the samples were also examined by SEM to identify the wear mechanism. The hardness starts from 328 HV, at x=0, reach to the maximum, 710 HV, at x=1.0 and then declines to 684 HV, at x=2.0. On the other hand, the wear resistance of HEAs gradually increases with the increasing aluminum content. The correlation between composition, microstructure, hardness and wear properties of these alloys is detailed discussed with in this study.

Keywords: High Entropy Alloys, Wear, Hardness

Introduction

HEAs are the new field of materials science, which are defined as more than five major elements in equi-atomic or near equi-atomic compositions with each elemental concentration between 5 at% and 35 at% (Yeh et al., 2004). In this way, these alloys are perfectly form disordered solid solutions due to the higher mixing entropy (Yeh, 2006). However, many experimental studies show that the intermetallics and ordered solid solutions besides the simple solid solutions can be found in HEAs. Although, the formation of these phases is a contrast to the origin of HEAs, controlling the formation and the amount of phases is crucially important to the design of HEAs according to the desired application. Since its discovery, HEAs have been extensively investigated for the many applications due to their exceptionally high strength and hardness, good wear and corrosion resistance and high-temperature strength properties (Wu, 2006; Mary, 2015).

The AlCoCrFeMoNi system is one of them that has potential for structural and tool industries. The effects of the elements Co, Fe, Cr, Al, Ni and Mo contents on the microstructure of the AlCoCrFeMoNi HEAs that have been widely studied by Hsu et al. (2010a, 2010b, 2011, 2013a, 2013b) and Zhu et al. (2010). The alloy system exhibits the face-centered cubic (FCC), body-centered cubic (BCC), ordered body-centered cubic (B2) and body-centered tetragonal (σ) phases for the various contents. The BCC and B2 phases are promoted by Al, where Co and Ni promoted FCC, Cr and Mo promoted σ, and Fe inhibited the σ phase in alloy system (Hsu et al., 2013c).

To investigate the mechanical properties of alloys, commonly hot-hardness measurements were performed by the same groups while wear behavior only examined for the $AlCoCrFe_xMo_{0.5}Ni$ HEAs, where x changes between the 0.6-2.0 in molar ratio. Both hardness and wear resistance declines as the Fe content increases that is related to the decreased volume fraction of the σ phase in structure. From the examination of worn surface and worn debris, they found that the wear mechanism of alloys is abrasion (Hsu et al., 2010b).

In HEAs, wear is an important phenomena and gives a good indication for the aforementioned potential applications. Thus, the purpose of this paper is to elucidate the effect of aluminium on wear behavior related with microstructural and compositional phase changes in alloys.

Materials and Methods

$Al_xCoCrFeMo_{0.5}Ni$ high-entropy alloys with different aluminium contents (x = 0-2.0 molar ratio) (these alloys are designated: Al0.0, Al0.5, Al1.0, Al1.5, Al2.0) were prepared by the vacuum arc melting and casting method in high purity argon atmosphere. The purity of each constituent elements were above 99.95%. For the chemical homogeneity of alloys, the melting procedure was repeated at least four times. As-cast microstructures and phases of the alloys were characterized with SEM (ZEISS SUPRA 50 VP) and XRD (Panalytical EMPYREAN). Microhardness measurements (Future Tech FM-700) were performed with a load of 100 g and duration time of 10

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s. Sample surfaces were polished with the standard metallographic procedure. The wear behavior of the alloys under the dry sliding condition was examined using ball-on-disk testing machine (CSM Instrument) according to ASTM G99 standard. The 3mm WC ball was used as the counter body with a normal load of 5N. The rotation diameter, sliding speed and sliding distance were 5 mm, 5 $cm \cdot s^{-1}$, 100 m, respectively. After the wear tests, specific wear rates of the alloys were calculated from track profiles, which measured with a surface profilometer (Mitutoyo SJ-400) and rear tracks were also examined by SEM.

Results and Discussion

XRD patterns of the alloys are presented in Fig. 1. Alloys with different aluminum content show different phases, including FCC, BCC, B2 and σ. XRD examination of alloys indicated that Al0.0 and Al0.5 alloys consist of the FCC and σ phases. The addition of aluminium to the alloys causes formation of the B2 phase, while the FCC phase totally disappeared when aluminium content higher than x=0.5. Also, the BCC phase appeared in Al1.5 alloy. The σ phase, which exists in all alloys except the Al2.0 alloy that contains only the B2 and BCC phases. This trend can be explained by Al acts as a stabilizer of the BCC and B2 phase [Hsu et al., 2013a], and also increasing the aluminum content hinders the formation of σ phase in alloy.

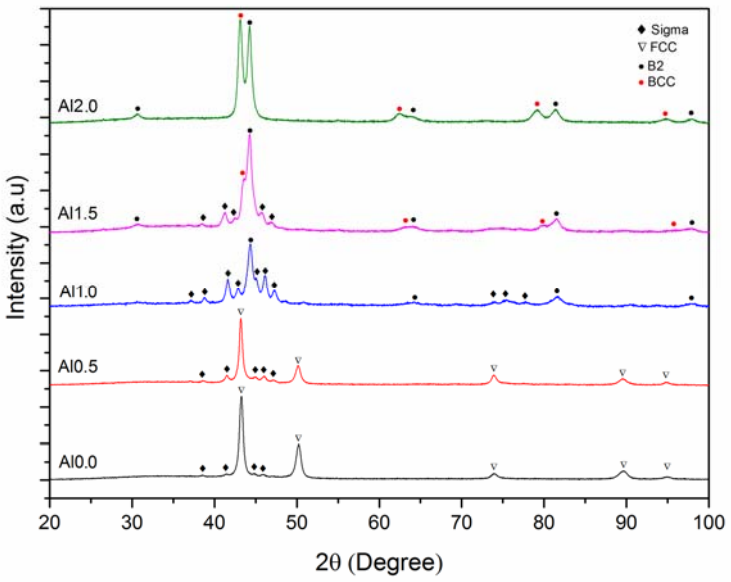

Figure 1. XRD patterns of as-cast $Al_xCoCrFeMo_{0.5}Ni$ alloys.

Fig. 2. presents the microstructures of as-cast $Al_xCoCrFeMo_{0.5}Ni$ alloys. The observed phases in microstructures are labelled on SEM images based on XRD analysis. Also, this is supported from hardness measurements. The Al0.0, Al0.5, Al1.5 and Al2.0 alloys exhibit a dendritic structure, while the Al1.0 alloy has a equiaxial grain structure with visible grain boundaries, where richer σ phase.

Fig. 3. shows the hardness and specific wear rate of alloys as a function of Al content. The hardness of alloys starts from 328 HV, at x=0, reach to the maximum, 710 HV, at x=1.0 and then declines to 684 HV, at x=2.0. Hardness value of alloys is fairly consistent with a presented phases in the structure. Although the Al0 and Al0.5 alloys, which consist of the same phase crystal structures, the hardness of Al0.5 higher than the Al0 alloy due to difference in amount and distribution of the σ phase. The hardness is the maximum in Al1.0 alloy resulting from the formation of a harder the B2 phase. In Al1.5 and Al2.0 alloys hardness slightly decrease compared to the Al1.0 alloy. This is linked with decreasing amount of the σ phase. Also, hardness of phases can be ranked as follows σ>B2>BCC>FCC in alloy system.

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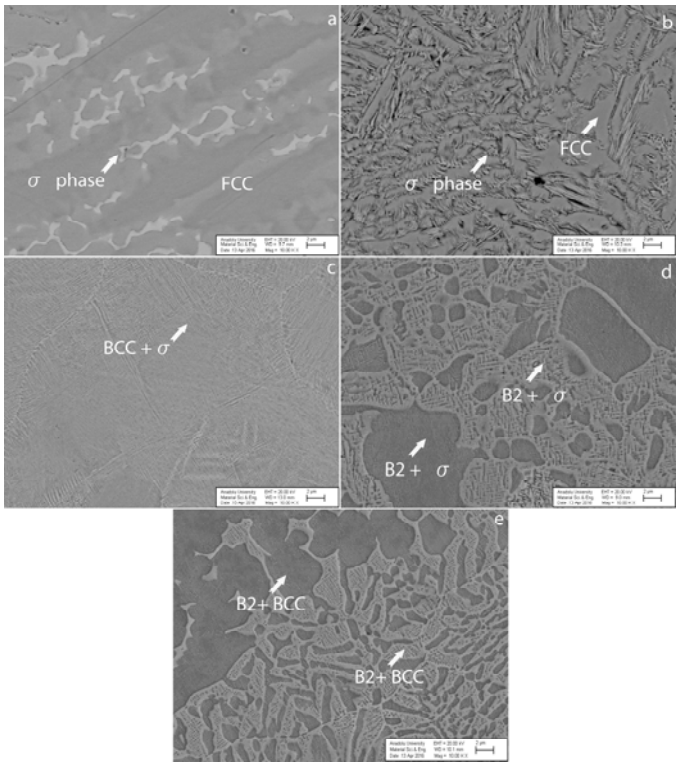

Figure 2. SEM images of as-cast $Al_xCoCrFeMo_{0.5}Ni$ alloys (a) x=0.0, (b) x=0.5, (c) x=1.0, (d) x=1.5, (e) x=2.0.

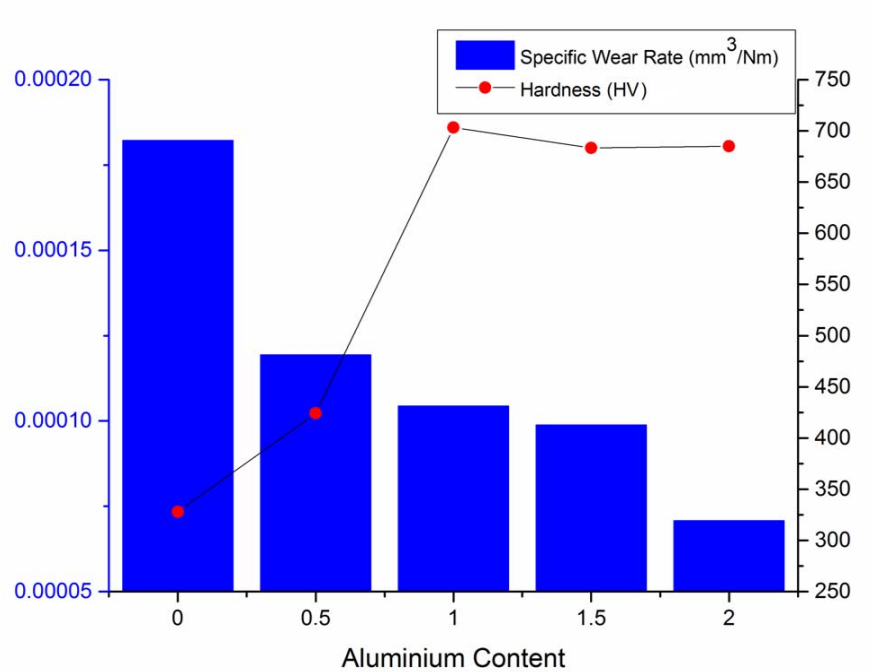

Figure 3. Hardness values of $Al_xCoCrFeMo_{0.5}Ni$ alloys plotted with obtained specific wear rate by wear track profile analysis.

To better understand the wear mechanism for the $Al_xCoCrFeMo_{0.5}Ni$ alloys in dry-sliding conditions, SEM analysis was carried out after wear tests. Fig. 4 presents the worn surfaces and debris of the alloys. Fig. 4 a and b shows the wear surface of the Al0.0 and Al0.5 alloys. The worn surface of these alloys is similar, appearing delamination without oxides. This finding is reasonable since delamination wear is a typical mechanism for ductile metals and Al0.0 and Al0.5 alloys are contained ductile FCC phase [Wu et al., 2006]. In sharp contrast to the wear surfaces of these two alloys, abrasive scratches and significant oxidation features are observed on the worn surfaces of Al1.0, Al1.5 and Al2.0 (Fig. 4 c, d and e) alloys. The dominant wear mechanism was abrasion and oxidation for these alloys.

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Fig. 5 displays the wear tracks of alloys. It can be seen from Fig. 5 that the wear tracks of Al0.0 were significantly wide, showing a severe wear occurred in the sliding process. Clearly, the alloys which contain Al exhibited much lower wear rates compared to the Al0.0 alloy.
The highest wear resistance was obtained with the Al2.0 alloy, followed by the Al1.5, Al1.0 and Al0.5, respectively.

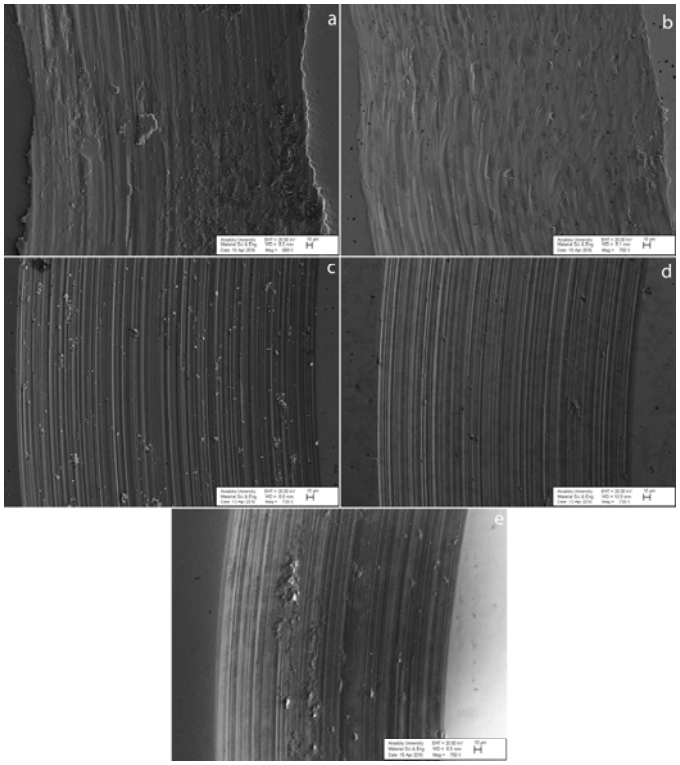

Figure 4. SEM images of worn surface of as-cast $Al_xCoCrFeMo_{0.5}Ni$ alloys (a) x=0.0, (b) x=0.5, (c) x=1.0, (d) x=1.5, (e) x=2.0.

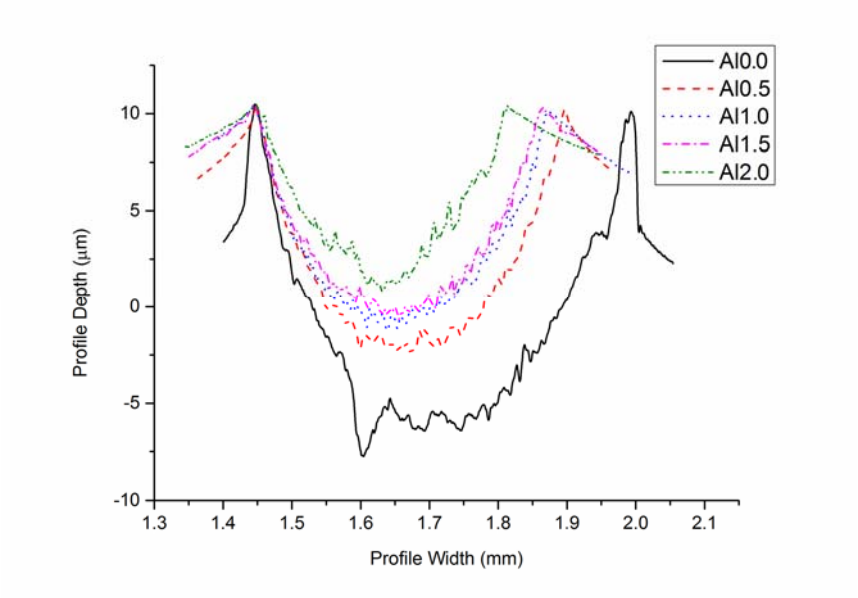

Figure 5. Cross-section profiles of the wear track.

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Conclusion

High entropy $Al_xCoCrFeMo_{0.5}Ni$ alloys in different aluminum contents (x=0-2) were successfully produced by vacuum arc melting and casting method. The aluminum content greatly affected the wear performance due to bringing in microstructural and compositional phase changes in alloys. The Al1.0 alloy composed of the B2 and the σ phases has the highest hardness of 710 HV, while the lowest specific wear rate was found 0.00007 mm^3/Nm in the Al2.0 alloy composed of the BCC and B2 phases. Thus, controlling the number and amount of phases was highly important to achieve desired wear performance from HEAs.

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EFFECT OF GROWTH RATE ON MICROSTRUCTURE AND MECHANICAL PROPERTIES OF AL-MN-SI TERNARY ALLOY

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Abstract: Cylindirical Al-2Mn-5Si (wt.%) samples were prepared by melting weighed quantities of Al, Mn and Si (high purity >99.99 %) in a graphite crucible placed into a vacuum melting atmosphere. After allowing time for melt to become homogeneous, the molten alloy was poured into 10 graphite crucibles (250 mm in length 4 mm ID and 6.35 mm OD) in a hot filling furnace and then directionally solidified upward with different growth rate ranges (8.30–978 μm/s) at a constant temperature gradient G (4.90 K/mm) in the Bridgman-type growth apparatus. The values of dendritic spacing were measured from longitudinal and transverse sections of the samples. The dependence of dendritic spacing on the growth rate was determined by using linear regression analysis. The microhardness and tensile strength of the studied alloy also were measured from directionally solidified samples. The dependency of the microhardness and tensile strength for directionally solidified Al-2Mn-5Si alloy on the growth rate were investigated and the relationships between them were experimentally obtained by using regression analysis. The results obtained in present work were compared with the previous experimental researches and it was found that the experimental results in this work are in good agreement with the similar works in the literature for binary and ternary alloys.

Keywords : Al-Mn-Si alloy, Microhardness, Microstructure, Tensile strength

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EFFECT OF LIMITING CURRENT DENSITY (LCD) IN HEAVY METAL REMOVAL BY ELECTRODIALYSIS SYSTEMS

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Abstract: Heavy metals are one of the major contaminants in receiving waters from manufacturing processes such as metal and plastic coating, petroleum refineries, battery industries, electronic industry, mining, smelting, electroplating industries. They can cause serious damages to human health and the environment. Heavy metals are non-biodegradable and highly toxic in nature. Thus they can be accumulative in the ecosystems and human bodies even at low concentrations. Therefore, the treatment of wastewaters for removal of such metals is very important before discharging.

Several methods commonly used for the removal of heavy metals from wastewater such as solvent extraction, chemical precipitation, filtration, coagulation/flocculation, ion exchange, membrane filtration, and adsorption. However the conventional processes have many disadvantageous such as high energy requirements, sludge problems, secondary pollutions, high capital and regeneration costs, long operation time, use of chemicals. Thus more effective treatment technologies are required for heavy metal removal or reuse such as electromembrane processes.

Electrodialysis (ED) is an electromembrane separation process which has ion exchange membranes to separate ions from the solution under the electric field. ED system has some advantages in comparison with other conventional treatment system such as chemical and temperature stability of membranes, no adding chemical, low pretreatment requirements, high water recovery.

ED system consist one or more anion (AEM) exchange membranes and cation exchange membranes (CEM) which are fixed between two electrodes the anode and the cathode. Under the influence of a electrical potential difference between the anode and the cathode, the cations migrate to the cathode and the anions migrate to the anode. However, cation exchange membranes are negatively charged and anion exchange membranes are positively charged so the flow of ions is selectively blocked. The result is the ions are depleted in some compartments (dilute) and concentrated in the contiguous compartment (concentrate). After a while a concentration gradient occurs on the boundary layers of ED membrane and the current density close to the maximum value that call as the limiting current density (LCD)

ED system performance depends on several phenomena such as limiting current density (LCD), ionic mobility, applied potential, flow rate, feed concentration, ED cell construction, membrane structure etc. LCD is one of the most important parameter for determining the current utilization in the ED process and measured using the current–voltage relationship. When the current density reaches to the LCD or exceeds, the electrical resistance in the dilute solution drastically increases, the water decomposition occurs and pH of the system changes. Thus detection of LCD is required for designing an efficient electrodialysis system.

The purpose of this research was to investigate the limiting current density of the electrodialysis system by current-voltage curves and explore the effect of feed heavy metal concentration and flow rate on LCD variance.

Keywords: Concentration Polarization, Current–Voltage Curve, Electrodialysis, Heavy Metal Removal, Limiting Current Density.

Giriş

İyon değiştirici membranların kullanıldığı elektrodiyaliz sistemleri, önemi gittikçe artan membran proseslerinden birisidir. Tuzsuzlaştırma, atıksu arıtımı, ultra saf su eldesi, seyreltik çözeltilerin konsantre hale getirilmesi, tuzlarından asit ve alkali çözeltilerin eldesi gibi bir çok alanda yaygın olarak kullanılmaktadır. Aynı zamanda peynir altı suyu, organik asit ve şeker deminerilasyonunda, amino asit ve kan arıtımında, mineral asit konsantre hale getirilmesinde de yaygın olarak kullanılmaktadır. İyon değiştirici membranların kullanım alanları ve gelişimi tablo 1'de verilmiştir. Bu metodun çevre dostu olması nedeni ile gelecekteki uygulamalarda da umut vaadedici olduğu bilinmektedir (Sadrzadeh and et al., 2007).

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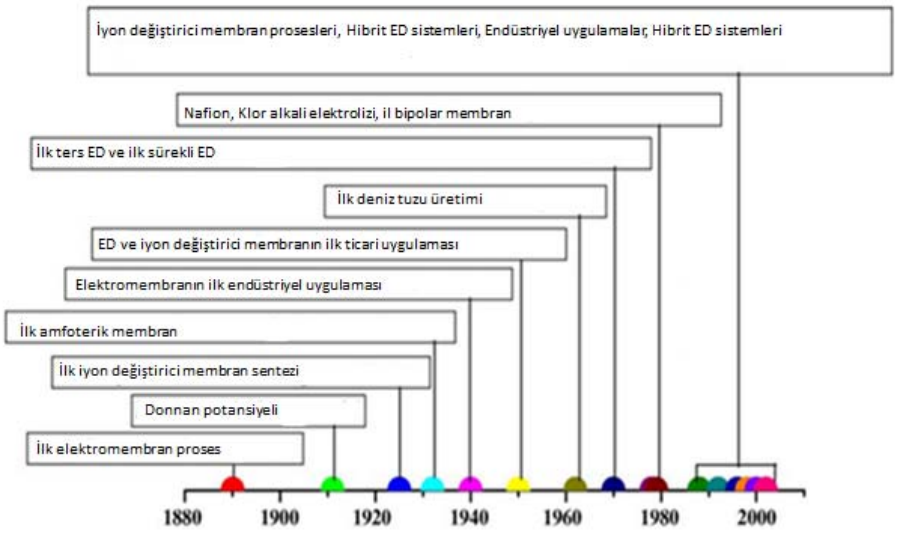

Şekil 1. ED sistemlerinin yıllara göre gelişimi (Xu and et al., 2005)

Elektrodiyaliz teknolojisinin ilk ticari kullanımı 1950 yıllarında tuzlu suların ekonomik olarak tuzsuzlaştırılması amacı ile olmuştur. ED sistemleri Amerika ve Avrupa'da yaygın olarak tuz gideriminde kullanılmaktadır (Bernardes and et al., 2014).

Elekrtodiyaliz Sistemleri

Elektrodiyaliz, endüstriyel olarak kullanılan ilk iyon değiştirici membrandır. ED sisteminde anyonik ve katyonik membranlar hücre içinde anot ve katot arasında sıralanmıştır. Sisteme elektrik akımı verildiğinde çözelti sisteme pompalanır. Çözeltideki pozitif yüklü katyonlar katota doğru ve anyonlar anota doğru hareket ederler. Katyonlar, negatif yüklü katyon değiştirici membranlardan kolaylıkla geçerler ancak pozitif yüklü anyon değiştirici membranlardan geçemezler. Benzer durum anyon değiştirici membranlar için de geçerlidir. Böylece hücrede seyreltik ve derişik bölmeler oluşur (Abou-Shady and et al., 2012, Baker, 2012, Káňavová and et al., 2014, Václavík and et al., 2015).

Bir katyon değiştirici membran, bir konsantre hücre, bir anyon değiştirici membran ve bir seyreltik bölme, bir hücre çiftini oluşturmaktadır. Endüstriyel büyüklükteki bir ED hücresi elektrotlar arasında sıralanmış 100-200 hücre çiftinden oluşmaktadır. Çeşitli boşluklar ve plaka olarak bilinen hücre yapısı pratik uygulamalarda kullanılmaktadır. Boşluklar membranları ayırmanın yanında hücre içindeki çözeltinin iki farklı akımın karışmasını da sağlar (Strathmann, 2010).

Elektriksel iletkenlik, pH, elektrolit konsantrasyonu, elektrik akımı veya uygulanan potansiyel, ED sisteminin en temel kontrol parametreleri olarak sayılabilmektedir. Ancak sistemin teknik olarak yüksek verimde kullanabilmek için öncelikle iyon değiştirici membranların davranışlarının, yapısının, kararlılığının, iletkenlik ve seçiciliğinin iyi anlaşılması gerekmektedir. Sınırlayıcı akım değeri ve konsantrasyon polarizasyonu gibi daha özel durumlar da oldukça önemlidir. Tüm bu parametreler sistemi etkilemekte ve elde edilen verime yansımaktadır. Literatürde yapılan çalışmalara gör iyon değiştirici membranların kullanıldığı sistemlere ait uygulama alanları, gelişme durumu ve başlıca avantaj- dezavantajları aşağıdaki tabloda verilmiştir.

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Tablo 1: İyon değiştirici membran uygulamaları, gelişimi, avantaj ve dezavantajları (Xu, 2005)

Uygulamalar	Proses Gelişim Durumu	Avantajlar	Uygulama problemleri
Bipolar membranlar ile ED Uygun tuzlardan mineral asit ve baz eldesi	Pilot ölçekli tesisler	Düşük enerji gereksinimi	Ürün kontaminasyonu ve düşük akım kullanımından dolayı oluşan düşük membran seçiciliği
Fermentasyon proseslerinden organik asit üretimi veya geri kazanımı	Ticari ve pilot tesisler	Basit proses, düşük enerji	Yetersiz membran kararlılığı ve tıkanma sorunu
SO_2 gazı giderimi	Yaygın pilot tesis çalışmaları	Az tuz üretiminden dolayı tuzun giderim maliyetinin düşmesi	Yüksek yatırım maliyeti,
H_2SO_4 ve NaOH geri kazanımı	Laboratuar, pilot ölçekli ve bazı ticari tesisler	Geri kazanılan ürün tehlikeli değildir, kimyasal olarak kullanılabilir ve maliyeti düşürür	Uzun dönem içinde deneyimlenmemiştir ve membran kararlılığı çok iyi değildir, membran tıkanmaları yüksek maliyete neden olur
Çelik işleme çözeltilerinden HF ve HNO_3 geri kazanımı	Ticari tesisler	Asit geri kazanımı ile maliyette artış ve tuz gideriminde azalma	Karmaşık proses, yüksek yatırım maliyeti
Gıda endüstrisi	Laboratuar ve pilot ölçekli tesisler	Daha az yan ürün, daha az kimyasal ve tuz üretimi ve bertarafında azalma	Uygulama azlığı, proses ve yatırım maliyeti
Enerji depolama ve çevrimi	Sadece teorik	Ekonomik avantajlar	Deneysel veri yok
Metanolden NaOH üretimi	Laboratuar testleri	Diğer yöntemlerden daha ekonomik	Uzun dönemli çalışmalar yok
EDI- Ultra saf su üretimi	Ticari tesisler	Yan ürünleri olmayan sürekli proses, yüksek verim	Yüksek yatırım maliyeti, atık bertarafı, Ön arıtma
EED-Membran Elektrolizi	Ticari tesisler	Sürekli proses, yüksek verim	Yüksek yatırım maliyeti, membran kararlılığı ve seçiciliği
ED- İçme sularında denitrifikasyon	Pilot ölçekli tesisler ve bazı ticari tesisler	Sürekli proses, yüksek verim	Membran kararlılığı ve seçiciliği, proses karmaşıklığı
ED ve filtrasyon- atık geri dönüşümü	Ticari tesisler	Sürekli proses, daha birleşik bir sistem	Karmaşık bir proses

Farklı sektörlerde yaygın olarak kullanılan ED sisteminde elde edilen giderim verimi birçok parametreye bağlıdır. Bu parametreler aşağıdaki şekilde sıralanabilir;

- Sınırlayıcı akım yoğunluğu
- pH
- Bakır konsantrasyonu
- Akış hızı
- Elektrolit çözeltisi ve türü

Bu çalışmada ED sistemlerini etkileyen parametrelerden sınırlayıcı akım yoğunluğunun (LCD) tanımı yapılacak, yapılan çalışmalardan bahsedilecek ve gerçekleştirilmiş olan deneysel çalışmamızdaki değerler tartışılacaktır.

Sınırlayıcı Akım Yoğunluğu

Akım yoğunluğu, her santimetrekareye düşen amper cinsinden elektriksel akı miktarı olarak nitelendirilmektedir. Akım her bir iyonun hareketliliği için gereklidir ve aynı zamanda iyonların çözeltideki serbest hareket etme oranları sınırlayıcı faktördür. Çözeltideki iyon hareketi ile membrandaki iyon hareketi denge halindedir. Akım yoğunluğu; akış hızı, sıcaklık ve iyon türüne bağlıdır. Akım yoğunluğunun artması ile çözeltideki iyonların

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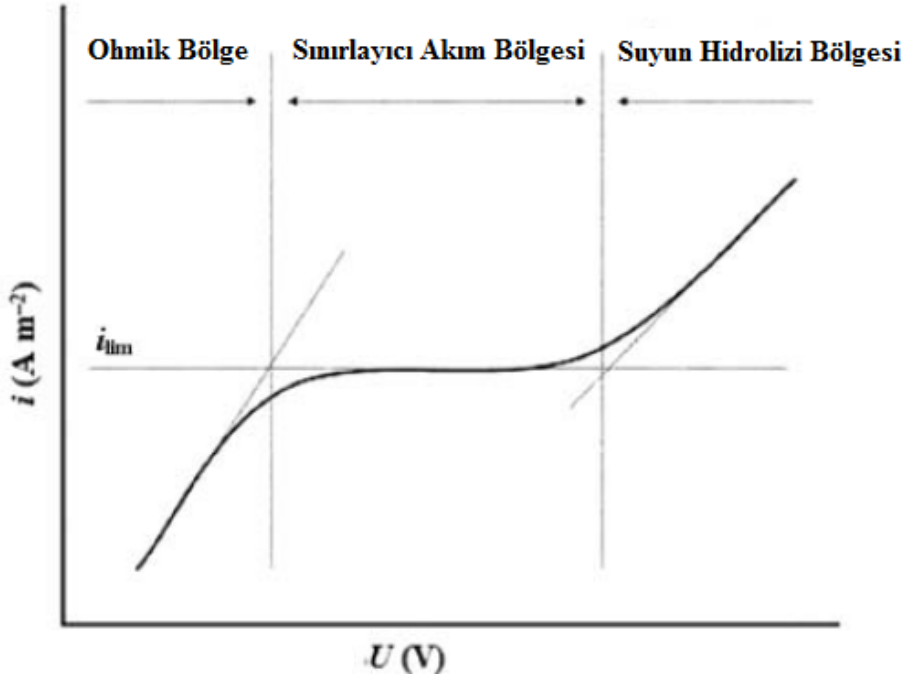
membran boyunca olan hareketi, çözelti boyunca olan hareketlerinden daha hızlı olur. Çözelti iyon bakımından tükenmiş hale gelir ve bu durum su moleküllerini etkiler. Voltajın daha da arttırılması ile su H^+ ve OH^- iyonlarına ayrılır. Bu durum polarizasyon noktası olarak adlandırılır ve seyreltik bölmede meydana gelir. Polarizasyon meydana geldiğinde seyreltik bölmede pH değeri değişir. H^+ ve OH^- iyonları katyon ve anyon değiştirici membranlara doğru hareket eder. OH^- iyonları konsantre bölmedeki pozitif yüklü iyonlarla birleşme eğilimindedir. Bu birleşme sonucunda sistemde çökelmeler meydana gelebilmektedir. Ayrıca istenen ürün H^+ ve OH^- iyonları olmadığı halde transfer edileceklerinden dolayı sistem verimi de düşer. Akımdaki ek artışlar, polarizasyon alanındaki verimi daha da düşürür (AWWA, 1995).

Sistemdeki iyon transfer hızı elektrotlar arasındaki elektriksel akıma bağlıdır. Bu nedenle genellikle yüksek akım yoğunluğunda çalışılmak istenmektedir. Sistemde uygulanan voltaj (V) ve akım (I) arasındaki ilişki Ohm kanunu ile açıklanabilir;

$$V=I \times R \qquad \text{(Eşitlik 1)}$$

Eşitlikte R ile gösterilen elektriksel dirençtir, hücredeki iyon değiştirici membran ve konsantre veya seyreltik bölmedeki toplam direnci gösterir. İyonların transferi, membran boyunca gerçekleşen transfer hızı ile sınırlıdır. Belirli akım değerlerinde membran boyunca olan transfer hızı, membran yüzeyindeki difüzyon tabakasındakinden daha hızlı olur. Bu elektriksel akım değeri sınırlayıcı akım yoğunluğu olarak adlandırılır. Sınırlayıcı akım yoğunluğuna ulaşılması ile katyon değiştirici membranların yüzeyindeki katyonlar veya anyon değiştirici membranlar yüzeyindeki anyonlar sıfıra ulaşır. Seyreltik bölmedeki elektriksel direnç iyon tükenmesi sonucu hızla artar. Bu bölgede Ohm kanunu geçerliliğini yitirir (Natália and et al., 2013).



Şekil 2. Tipik akım-voltaj eğrisi

İyon değiştirici membranlara ait tipik bir akım-voltaj eğrisi yukarıdaki şekilde görüldüğü üzere üç bölgeye ayrılabilmektedir. Ohmik bölge denilen ilk bölgede akım yoğunluğu, Ohm kanununa uygun olarak elektriksel potansiyel fark ile orantılıdır. Akım yoğunluğunun artması ile membran yüzeylerindeki iyon konsantrasyonları sıfıra ulaşır. Bu bölge sınırlayıcı akım yoğunluğu bölgesidir. Sınırlayıcı akım yoğunluğu tüm iyonların transferi için önemlidir. Bu durumu takip eden üçüncü bölme ise akım-voltaj eğrisi tekrar artar ancak eğim ilk bölmeye göre daha düşüktür (Choi and et al., 2001). Sınırlayıcı akım yoğunluğu deneysel verilerden elde edilen akım-voltaj grafiği ile bulunabilmektedir (Natália and et al., 2013).

ED sistemi sınırlayıcı akım yoğunluğuna ulaştığında, sisteme uygulanan voltaj ve dolayısıyla akım yoğunluğu ne kadar artırılırsa artırılsın, sistemde iyon taşınım hızı ve membranların etrafındaki akım sabit kalır. Bu noktadan sonra sistemde yapılan tüm iş, sıcaklık artışı ve enerji kaybı olarak sisteme yansır. Sınırlayıcı akım yoğunluğu sabit bir sayı değildir. ED prosesinin yapısına ve işletim koşullarına göre değişmektedir. Eğer ED prosesinde

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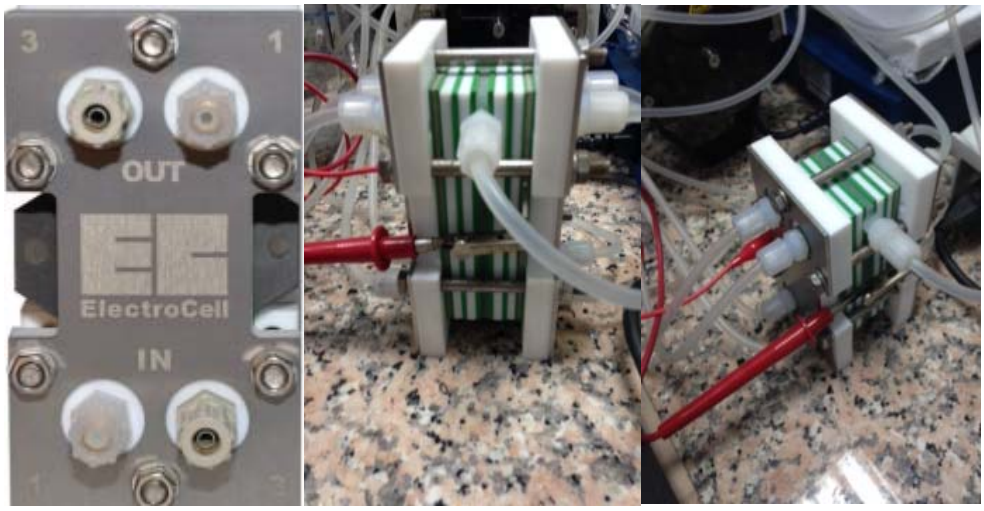
akım yoğunluğu aşılırsa, sistemin elektriksel direnci artarken proses verimi hızlı bir şekilde düşer. Buna ek olarak suyun hidrojen ve hidroksitlere parçalanması meydana gelir ve bu durum membran yüzeyindeki çözeltinin pH değerini değiştirir. Bu durum metal hidroksitlerin membran yüzeyinde birikmesi gibi ek işletme sorunlarına yol açar. Eğer membranlar yeteri kadar asidik veya alkali ortama dirençli değil ise, bozulmaya başlayabilir (Bernardes and et al., 2014, Marder and Pérez Herranz, 2014).

Gherasim and et al. (2014) elektrodiyaliz ile kurşun giderim yaptıkları çalışmada akım yoğunluğunun bulunması için öncelikle sınırlayıcı akım yoğunluğu deneylerini tamamlamıştır. Yaptıkları çalışmada kullanılan konsantrasyon 25-2000ml/L Pb aralığında olup akım ve voltaj arasında lineer bir ilişki ortaya çıkmıştır. Bu nedenle akım – voltaj eğrisi ohmik bölgede kalmış ve uygulanan 0-30 V aralığında sınırlayıcı akım yoğunluğuna ulaşılamamıştır. Böylece 25-2000mg/L aralığındaki konsantrasyonlarda ED prosesi sınırlayıcı akım yoğunluğunun altında çalıştırılmıştır. Aynı zamanda çözelti konsantrasyonu azaldıkça sınırlayıcı akım yoğunluğunun azaldığı bilinmektedir ve ayrıca pratikte de ED sistemlerinde kullanılan akım sınırlayıcı akım yoğunluğunun altındadır. Bu çalışmada oldukça seyreltik besleme sularından(5mg/L Pb) yüksek giderim verimi (0,5mg/L Pb) elde edilmesi amaçlanmıştır. Bu gibi aşırı seyreltik çözeltilerde sınırlayıcı akım yoğunluğuna ulaşılma durumu ile karşılanır ve bu da istenmeyen suyun parçalanması olayına neden olur. Bu durum ise akım veriminde azalma ve enerji gereksiniminde artışa neden olur. Sonuç olarak ED prosesler için seyreltik çözeltilerde giderim verimi önemli olduğu kadar enerji kullanımı da oldukça önemlidir (Gherasim and et al., 2014).

ED sistemindek sınırlayıcı akım yoğunluğu membran ve boşluk yapısına bağlı olduğu gibi bunun yanında çözeltinin iletkenliği, sıcaklığı gibi farklı fizikokimyasal yapısına da bağlıdır (Novalic and et al., 1995).

Deneysel Düzenek

Yapılan çalışmada beş bölmeli, laboratuar ölçekli bir elektrodiyaliz hücresi kullanılmaktadır. Ticari olarak temin edilen bu elektrodiyaliz hücresi anot, katod, iki anyon ve iki katyon değiştrici membranlardan meydana gelmiştir. Platinyum kaplı titanyum elektrotlar hücrenin en dış bölmesinde yer almıştır. Elektrik akımını sağlayabilmek için bir doğru akım güç kaynağı, sistemin akım ve voltajını ölçebilmek için bir multimetre kullanılmıştır. Sistemin pH değişimi, bir pH metre ile, iletkenlik değeri ise iletkenlik ölçer ile ölçülmüş ve alınan örneklerde ağır metal analizi atomik absorpsiyon spektrofotometresinde yapılmıştır.



Şekil 3. ED hücresi giriş ve çıkış yapıları

ED hücresinde kullanılan anyon ve katyon değiştirici membranlar da ticari olarak temin edilmiş olan Nafion 117 Katyon Değişim Membran ve Neosapta AEM Anyon Değişim Membranı olarak belirlenmiştir. Tüm bu membranlar farklı bölmelerle birbirinden ayrılmakta ve bir anyon değiştirici, bir katyon değiştirici membran şeklinde sıralanmıştır. Ticari olarak temin edilen ED hücresi aşağıdaki şekilde gösterilmiştir.

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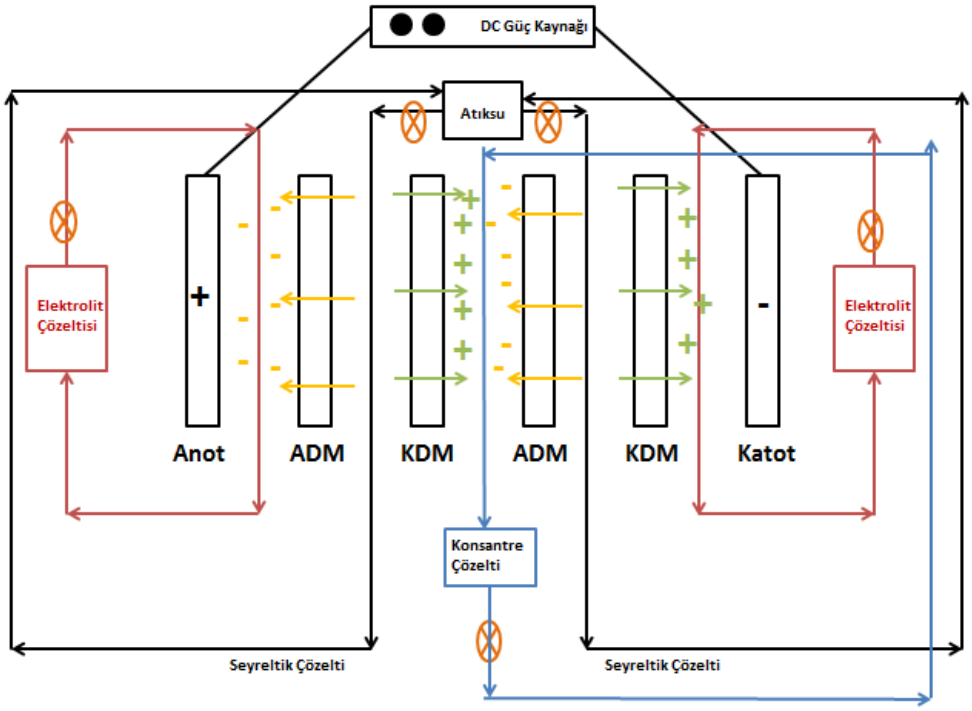

Şekil 4. ED Hücresi
(ADM: Anyon değiştirici membran, KDM: Katyon değiştirici membran)

ED Sistemi için LCD Çalışması

Akım-voltaj karakterinin belirlenmesi tüm sistemin LCD hesabı için çok önemlidir. Akım -voltaj eğrilerinde kararlı durum 3 bölme gösterir. Düşük akımlarda akım yoğunluğu ve voltaj arasında lineer bir değişim vardır. İkinci bölgede akım, voltajla birlikte yavaş artış halindedir ve sonunda sınırlayıcı akıma ulaşır. Bu sınır geçtiği bölgede ise akım yoğunluğu uygulanan voltaj ile tekrar artmaya başlar. Sisteme elektriksel potansiyel farkı uygulandığında elektriksel akımla birlikte aynı veya karşı yükteki iyonların hareketliliği başlar. Membrandan iyonların geçmesi ve engellenmesi ile bazı bölmelerde iyon birikirken, bazı bölmelerde iyon azalması meydana gelir. Bu durum akım-voltaj eğrilerindeki eğimlerle de gözlemlenir (Valerdi-Pérez and Ibáñez-Mengual, 2001).Yapılan birçok çalışmada sınırlayıcı akımın bulunmasında akım-voltaj eğrisinden yararlanılmıştır.

ED sistemi için farklı konsantrasyonlarda LCD çalışması yapılmıştır. Bu nedenle çeşitli konsantrasyonlarda (100ppm, 125ppm, 150 ppm, 175 ppm, 200 ppm ve 250 ppm) Cu^{+2} içeren çözeltiler hazırlanmış ve 165 dk boyunca her 5 dk'da voltaj arttırılarak akım değerleri kaydedilmiştir ve 15dk'da bir numune alınmıştır. 0-60V aralığında çalışma tamamlanmış ve aşağıdaki voltaj-akım eğrileri oluşturulmuştur.

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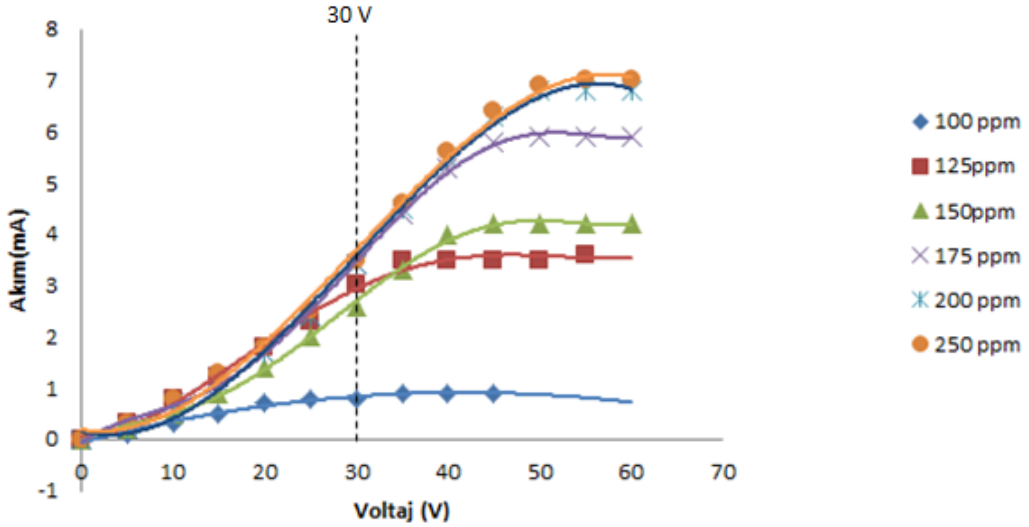

Şekil 5. Farklı konsantrasyonlarda elde edilen voltaj-akım eğrileri-LCD çalışması

Grafiklerden görüldüğü üzere tüm konsantrasyonlarda artan voltajla birlikte akım lineer olarak artmış ve bir süre sonra bu artışın eğimi azalmıştır. Azalmanın başladığı nokta sınırlayıcı akım yoğunluğu olarak adlandırılmaktadır. Tüm bunlar dikkate alındığında ED sistemi için sınırlayıcı akım yoğunluğu; 100 ppm için 25 V, 125 ppm için 30V, 150 V için 35V, 175 ppm için 40V, 200 ppm için 45V, 250 ppm için 45 V olarak belirlenmiştir. Konsantrasyon azaldıkça sınırlayıcı akım değeri de azalmıştır ve bu durum literatürle de desteklenmiştir.

Tablo 2: ED Sisteminde Konsantrasyona Göre LCD Değeri

Konsantrasyon	LCD Değeri (Voltaj)
100 ppm	25 V
125 ppm	30 V
150 ppm	35 V
175 ppm	40 V
200 ppm	45 V
250 ppm	45 V

LCD değerleri genellikle daha düşük konsantrasyonlarda 30V'u gösterdiği için LCD değeri 30V olarak belirlenmiştir. Sonraki çalışmalarda kullanılan optimum voltaj değeri etkisinin belirlenmesinde 3 ayrı voltaj bu LCD değerine göre belirlenmiştir. Literatürdeki bilgilere göre LCD değerinin genellikle %100, %85 ve %75 değerleri alınarak sisteme voltajın etkisinin belirlenmesi çalışmaları yapılmaktadır.

Lee and et al. (2006) yaptıkları çalışmada sınırlayıcı akım yoğunluğunun seyreltik bölmedeki iyon konsantrasyonunun artması ile arttığını belirtmişlerdir. Ayrıca çalışmaya göre sınırlayıcı akım yoğunluğu kullanılan elektrolit çözeltisinin konsantrasyonu ile de lineer olarak artış göstermiştir.

LCD değeri sabit bir değer değildir. LCD değeri çalışma parametreleri ve işletme süresine göre değişebilir. Nataraj and et al. (2007) yaptıkları çalışma için en düşük sınırlayıcı değer 50 V için 10mA/cm^2 bulunmuştur. Seyreltik bölmedeki elektriksel iletkenlik zamanla azalmıştır. 40 ve 50 V değerlerinde seyreltik bölmedeki seyrelme ile elektriksel iletkenlik sürekli bir azalma göstermiştir. Ancak sadece 60 V için iletkenlik farklı bir davranış göstermiş, başlangıç değerinin üzerine çıkmıştır. Bu durum çalışmadaki meydana gelen ozmotik basınç ile açıklanmıştır. Aynı zamanda çözünmüş olabilmesi de iletkenliği yükseltmiş olabilmektedir. Ancak işlem sonucunda 60 V değerindeki yüksek transfer sayesinde düşük iletkenlik (0.084 µS) elde edilmiştir.

Sonuç ve Tartışma

ED sisteminin ekonomik olarak kullanılması için sınırlayıcı akım bulunması gereken oldukça önemli bir parametredir. LCD genellikle Voltaj-akım eğrileri oluşturularak bulunur. İyon değiştirici membranlarda konsantrasyon polarizasyonuna ait klasik teoride, voltaj-akım eğrileri 3 bölümde incelenir. Düşük akımlarda akım ve voltaj artışı arasında lineer bir ilişki vardır. İkinci aşamada ise akımın voltajla değişimi çok yavaştır

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hatta akımın değişmediği gözlemlenebilir. Bu bölge sınırlayıcı akım yoğunluğu olarak adlandırılır. Son bölgede ise sınırlayıcı akımın aşıldığı bölmedir. Akım, artan voltajla tekrar artışa geçer (Meng and et al., 2005).

ED sistemi sınırlayıcı akım yoğunluğuna ulaştığında, sisteme uygulanan voltaj ve dolayısıyla akım yoğunluğu ne kadar artırılırsa artırılsın, sistemde iyon taşınım hızı ve membranların etrafındaki akım sabit kalır. Bu noktadan sonra sistemde yapılan tüm iş, sıcaklık artışı ve enerji kaybı olarak sisteme yansır. Sınırlayıcı akım yoğunluğu sabit bir sayı değildir. ED prosesinin yapısına ve işletim koşullarına göre değişmektedir. Eğer ED prosesinde akım yoğunluğu aşılırsa, sistemin elektriksel direnci artarken proses verimi hızlı bir şekilde düşer. Buna ek olarak suyun hidrojen ve hidroksitlere parçalanması meydana gelir ve bu durum membran yüzeyindeki çözeltinin pH değerini değiştirir. Bu durum metal hidroksitlerin membran yüzeyinde birikmesi gibi ek işletme sorunlarına yol açar. Eğer membranlar yeteri kadar asidik veya alkali ortama dirençli değil ise, bozulmaya başlayabilir (Bernardes and et al., 2014, Marder and Pérez Herranz, 2014).

Sınırlayıcı akım yoğunluğunun belirlenmesinin, ED sistem verimine olumlu etkisi oldukça fazladır. Bu nedenle elektrodiyaliz sistemlerde LCD değerinin öncelikli olarak belirlenmesi gerekmektedir. Sistemin daha verimli, daha ekonomik ve daha uzun ömürlü çalışması bu duruma bağlıdır. Sisteme uygulanacak voltaj, LCD değerine göre belirlenerek diğer parametrelerin optimizasyonuna geçilebilir. Bu sistem için uygulanan şartlarda LCD değeri 30 V olarak belirlenmiştir. Sistemin verimliliğinin düşmemesi için uygulanacak voltaj değeri LCD değerine göre belirlenecek, LCD değerinin %100, 85 ve 75'i alınarak sisteme uygulanacak optimum voltaj bulunacaktır. Bu çalışmada da yapıldığı gibi voltaj-akım eğrileri sınırlayıcı akım yoğunluğunun bulunmasında hızlı ve pratik bir yöntemdir.

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EFFECT OF LITHIUM DOPING ON THE STRUCTURAL AND OPTICAL PROPERTIES OF CDS FILMS USED AS WINDOW LAYER IN SOLAR CELLS

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CdS and CdS:Li films have been deposited by ultrasonic spray pyrolysis method. Three different atomic ratios of LiCl were used as a dopant element. The effect of lithium incorporation on structural and optical properties of CdS films has been investigated. XRD spectra show that the crystalline quality decreased with incorporation of small amount of lithium in the spraying solution. The crystallite sizes were calculated to be in the range of 60-85 nm. The SEM measurements showed that the surface morphology of the films was affected from the Li incorporation. All the films exhibit the Raman peaks centered around 120, 298 and 590 $cm^{-1}$and the peak profiles are almost symmetric. The optical band gap and Urbach energy values of these films were determined. The maximum transmittance is found to be almost 80% for the visible region. The optical properties of Li doped CdS films changed compared to undoped CdS film.

Keywords: Li doped CdS film; XRD; Raman; Optical properties

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EFFECT OF THINNING INTENSITY ON THE STEM FORM OF NARROW-LEAVED ASH

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Narrow-leaved ash (*Fraxinus angustifolia* Vahl.) is getting more and more important in European forestry for its valuable wood and fast growing ability. Mean annual increment can reach at about 15 and 25 m^3 ha^{-1} in natural stands and plantations, respectively. Most of the stands dominated by narrow-leaved ash have been converted to pure ash plantations for the past forty years in Turkey. However there is limited information about silvicultural treatments, especially on thinning regime, used in these plantations. This study started in 2005 and three thinning intensities (control: 0%; moderate: 19%; heavy: 28% of basal area removed) were applied in narrow-leaved ash plantations in Adapazarı, Turkey. Six years growth results of the study were published. However, the effects of thinning on stem form have not been investigated. In spite of many thinning studies about the effects of thinning intensities on growth variables, the effects of thinning intensity on stem form is very limited. Possible changes in stem form by thinning are very important in silvicultural practice. This study was carried out the mentioned thinning experiment and seven-year's results of thinning intensity on stem form were investigated. For this purpose, a total of 27 sample trees were harvested and stem cross-sectional samples (disk) were taken for stem analysis. In each plot, two of the three trees (dominant or co-dominant) represented the mean basal area tree and another tree (dominant) were represented the largest 100 trees/ha in plots. All disks samples were brought to the laboratory, and annual ring counting and measurements were carried out on them. Numerical definition of stem form as diameter decrease, stem form factor, taper coefficient and height-diameter ratio were calculated for each tree using stem analyses data, and stem forms were compared to thinning intensity. Thus, change of stem form according to treatments before thinning and seven years after thinning was evaluated.

Keywords: Narrow-leaved ash, Fraxinus angustifolia, thinning, stem form

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EFFECT ON THE CORNEAL STRUCTURE OF THE METAL PARTICLES SCATTERED FROM CUTTING AND GRINDING

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Abstract: Cutting and grinding wheels which are used with manual or stationary engine are designed to rotate at very high speeds. Therefore, once cutting and grinding wheels are broken in use, they cause loss of life and property such as serious injuries and damage of products. In addition, corneal injuries may occur due to foreign object or metal particles scattered by cutting or grinding machine and equipment. In this study, 520 workers have been exposed to foreign object scattered by grinding machine. Changes in the structure of the cornea have been analyzed. It was obtained that corneal foreign bodies have been diagnosed in 325 (%62.5) workers, since; they didn't use safety goggles. However 195 (37.5%) workers stated that they used safety goggles. Consequently, as usage rate of safety goggle increased, diagnosis of corneal foreign body showed a decreasing tendency.

Keywords: Cutting and grinding wheels, Corneal injuries, Safety goggles.

Introduction

Grinding is material removal processes from surfaces with the help of grinding wheel. Measurement precisions on the hardened or only surface-hardened parts are provided by grinding. Grinding can be used in order to polish surfaces of work pieces (Hacıfazlıoğlu, 2009).

When grinding wheel come into contact with the workpiece, each grain of grinding wheel in the cutting position begins to remove material (Demir, 2000). Throughout cutting, the dulled or loosen grains of grinding wheel are scattered with chips due to pressure of grinding wheel. Providing it is fulfilled all the conditions necessary for a good grinding, the quality of the surface will be clean and smooth (Atasoy, 2012).

As all cutters used in machining, grinding wheels are also dulled with time. The dulling of abrasive wheels builds up over time. Therefore, pores in the abrasive wheels are filled with time. Consequently, cutting of abrasive wheels will be difficult, since; surfaces of grinding wheel have porous structure. When pore of grinding wheels is filled, surface of abrasive wheels is gotten slippery. Under these conditions, surface quality will not be good to cut the materials and combustion zones occur on surfaces (Atav, 1970).

While grinding wheel turns around own axis with a certain cutting speed, the workpiece passes with a certain speed under the grinding wheel. This situation is known as feed rate of grinding wheel. The cutting speed of grinding wheel is chosen between 25 and 30 m/s in order to make a good grinding under the normal conditions. Cutting speed of grinding wheel depends on the type of the selected materials (Şahin, 2002). Values of Cutting speed affect rotation speed of grinding wheels. Grinding can lead to the emergence of various powder components. It is obvious that the arising metal powder can damage the vital organs. Metal particles scattered from cutting and grinding can cause severe corneal structure disorders.

During grinding and cutting, since; metal particles which are separated off from samples are in direct contact with the eyes, it can damage the eyes directly in case of any accident. This situation may reach dangerous levels.

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Figure 1. Worker grinding without protective goggles.

Occupational accidents are an unexpected condition. This causes loss of property, damage or halt of production by effecting and leading to injury, disability or death of worker (Macedo, 2005). Corneal foreign bodies are a common cause of minor work accidents depending on grinding and cutting (Kanoff, 2010). Corneal injuries are not fatal, but it can cause loss of labor (Şahin, 1978).

In this study, effect on the corneal structure of the metal particles scattered from cutting and grinding and the usage of personal safety goggles were investigated experimentally.

Materials and Methods

520 workers who applied to Adıyaman University education and research hospital emergency department with complaint of sight disorder between January 1st 2013 and January 1st 2016. All workers were underwent a detailed ophthalmological examination with a silt lamp bio microscope in polyclinic. It was used for corneal anesthesia topical anesthetic drops. Metal particles were removed by using a 20 gauge needle. A topical antibiotic treatment was prescribed after the metal particles were removed. Statistical analyses were performed with Statistical Program for Social Science 15.0 (SPSS Inc., Chicago, and ABD).

These workers were scanned retrospectively in database of hospital to find their application numbers in the recent 4 year. In this study, workers were scanned backward-information. Workers were classified as first application, 2-5 applications, 5-10 applications and more than 10 applications according to their applications number in order to determine the importance of protective goggles.

Results and Discussion

The mean age of the worker included in this study was 38.2±13.6 years (range: 18-72 years). 98.46% (n=512) of the patients were male and 1.53% (n=8) female. There were 102 worker (19.62%) in first application group, 172 worker (33.07%) in 2-5 applications group, 72 worker (13.85%) in 5-10 applications group and 174 worker (33.46%) in more than 10 applications (max 15) group.

Table 1. Number of applications, patients and usage of goggles.

Interval	Protective Goggles (+)	Protective Goggles (-)	Total
1 Application	30	72	102
2-5 Application	56	116	172
5-10 Application	37	35	72
10 More applications	72	102	174
Total	195	325	520

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Safety goggle usage ratio was 29,41% in first application group, 32,55% in 2-5 applications group, 51,38% in 5-10 applications group and 41,37% in more than 10 applications group. Metal particles were removed from cornea in 520 patients safely.

It was found that large numbers of workers who applied with the metal particles scattered from cutting and grinding to clinic didn't use safety goggles, whereas the other workers in safety goggles-using group used insufficient protection.

Considering the large number of the worker in a short period as one month and repetitive applications, workplaces and education about health, risk and safety in these places seem insufficient and require immediate action. Work safety inspections, occupational and safety educations are unsatisfactory. Some precaution must be taken against chemical mechanical and thermal irritants before process. In the course of grinding and cutting, workers should wear protective goggles. Thereby, the contact of the metal parts with eyes will be blocked.

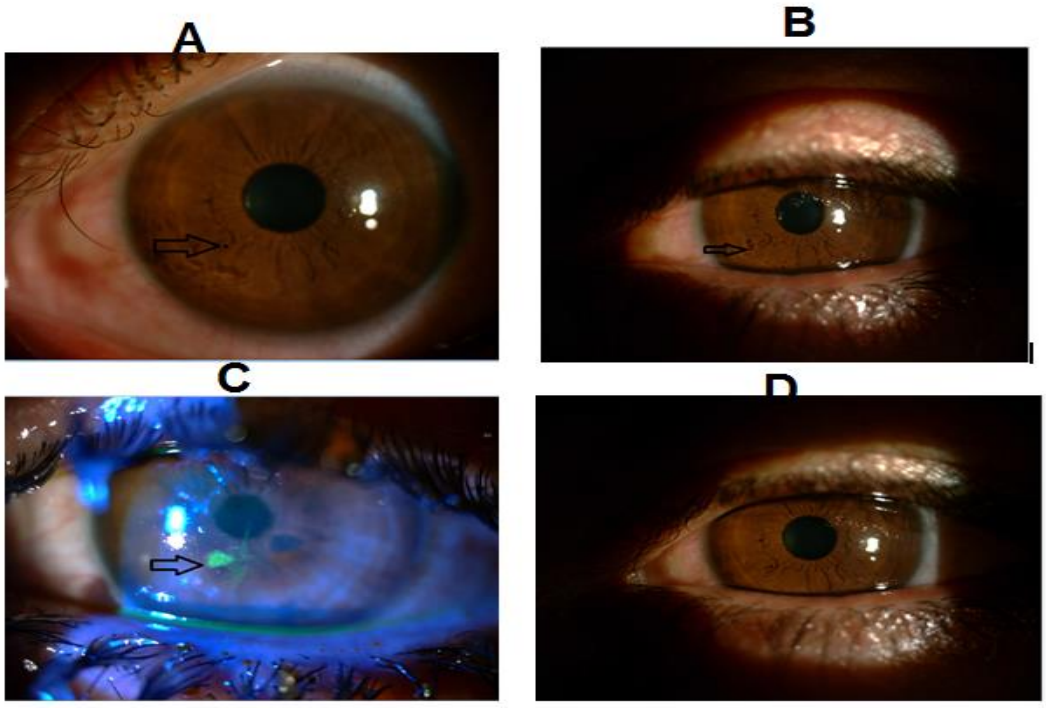

Figure 2. Effect on the corneal structure of the metal particles scattered from cutting and grinding
A: before treatment,
B: After removal of the metal particle,
C: The performed by fluorescent staining after the removal of metal particle,
D: 1 week after treatment.

Conclusion

The environment of the grinding zone should be covered with protective panels or curtains to protect worker from hazardous particles. Panels should be made from portable materials. However, in case plastic curtains or panels are used, curtains and panels should be kept away from grinding zone. Workers should be educated in this direction and take precautions. Effect on the corneal structure of the metal particles scattered from cutting and grinding can be prevented. Finally, the metal particles scattered from cutting and grinding cause to work force loss and treatment costs.

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EFFECTS OF CHEMICAL MODIFICATION ON WOOD PROPERTIES

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Abstract: Chemical modification can be used to improve the properties of wood. Effect of melamine formaldehyde modification on the physical and mechanical properties of Scots pine and Chestnut was investigated in this study. Wood samples were impregnated with melamine formaldehyde (MF) resin under 3 bar pressure for 10 or 30 min and were cured at a temperature of 150 °C for 20 min in an oven. Weight percent gain, water uptake, volumetric swelling, Brinell hardness, modulus of rupture and modulus of elasticity values of the samples were determined according to relevant standards. Modification with MF reduced the water uptake and the volumetric swelling of the woods. Anti-swelling efficiency of the modification were approximately 66 % and 57 % in chestnut and scots pine, respectively. MOE increased in scots pine (3% - 17 %) while unchanged in chestnut but MOR decreased significantly by modification in both chestnut (2.5% - 17.9%) and scots pine (26.2% - 32.7%). Also, MF modification increased the Brinell hardness of the wood, slightly.

Keywords: Wood modification, Melamine formaldehyde, Physical and mechanical properties

Introduction

Wood has many desirable characteristics required for a variety of end uses such as construction, furniture, and tools. However, wood also has properties that, in relation to specific applications, can be regarded as disadvantages. One main disadvantage of wood is its inherent moisture sensitivity, a major cause for fungal decay, mold growth and dimensional instability, resulting in decreased service life as well as costly maintenance (Gindl et al. 2003; Epmeier et al. 2004). Therefore, suitable technologies are needed to improve woods' properties, i.e., the dimensional stability, durability, mechanical strength, and hardness, to meet specific end-use requirements (Cai 2007; Hochmanska et al. 2014). Different methods, involved chemical and thermal modification, have been developed over many years to overcome these disadvantages. Major research approach has been carried out to improve physical properties. Physical properties could be improved, but the mechanical properties of wood decrease during the modification process (Poncsak et al. 2006; Gündüz and Aydemir 2009). Chemical modification of wood can be defined as a process of bonding a reactive chemical to a reactive part of a cell wall polymer to form a covalent bond between them (Rowell 2006).

The treatment of wood, with different types of chemicals or resins, has been widely studied with the end goal of enhancement. Melamine formaldehyde (MF) and phenol formaldehyde (PF) are two common resins for wood-related applications. Melamine formaldehyde (MF) resin, commonly used in thermosetting, has applications in coatings, adhesives, and both paper and textile treatments (Pittman et al. 1994). Various types and grades of MF resin are available for the impregnation of wood. Gindl et al. (2003) examined the factors were selected that influenced the uptake of MF resin into the cell wall of softwood. Impregnation of solid wood with water-soluble MF resin has led to a significant improvement in the surface hardness (Miroy et al. 1995; Gindl et al. 2004) and the modulus of elasticity (MOE) (Deka and Saikia 2000; Deka et al. 2007). Epmeier et al. (2003) and Deka et al. (2007) reported that modification of wood with MF has led to a decrease in swelling (30% - 75%) and equilibrium moisture of content (EMC) (20%) of the wood. Although many studies have been focused on MF modification, it has not been widely applied in an industrial setting because of its higher cost than other polymerizable monomers and pre-polymers (Deka et al. 2007). Epmeier et al. (2004) compared the physical and mechanical properties of 9 different modified woods and reported that the acetylation and furfurylation were the most effective modification methods for achieving a high dimensional and stiffness stability and a low EMC.

The main purpose of this study is improving the properties of wood by using chemical modification to produce value-added material. To achieve this purpose, the effects of melamine-formaldehyde (MF) modification on the physical and mechanical properties of Scots pine and Chestnut wood was investigated.

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Materials and Methods

Materials

Scots pine (*Pinus silvestris* L.) (SP) and chestnut (*Castenea sativa* Mill.)(CH) were used as wood material in this experiment. Commercially available melamine formaldehyde resin (Almin-65), provided by the Gentaş Kimya Inc., Tuzla, Turkey, was used for the modification. The properties of the resin are given in Table 1, based on the manufacturer's information.

Table 1: Properties of Melamine Formaldehyde Resin

Appearence	Clear, colorless liquid
Solid content % weight	51±1
Viscosity (sn F.C.4 20 °C)	15 - 20
pH(20 °C)	9.6 - 10.5
Dansity (g/cm3 20 °C)	1.220 - 1.240
Water tolerance (20 °C)	1/1,0 - 1/2,0
Gel time (min. 130 °C)	35.00 - 40.00

Methods

Wood samples cut into dimensions according to relevant standard and were acclimatized before testing at a temperature of 20 ± 3 °C and a relative humidity (RH) of 65%. The weight and the volume of the samples were determined. Then the samples were oven-dried at a temperature of 103 ± 2 °C and the oven-dried densities were calculated before chemical modification.

Melamine formaldehyde resin was used in two grades. One group was modified with melamine formaldehyde resin which was diluted by 50% with distilled water (MFW) while the other group was modified with MF without further modification. Impregnation was performed in a stainless steel vacuum chamber at 3 bar pressure for 10 or 30 minutes and impregnated samples cured in an oven at a temperature of 150 °C for 20 minutes. The impregnation was performed separately for each treatment level and a new resin solution was used for each of the different variations. Before physical and mechanical analysis testing, the samples were cut into various dimensions, according to the specifications of the testing standard. Ten replicates were prepared for each experiment, and the samples were acclimatized at a temperature of 20 ± 3 °C and a RH of 65%. The experimental design was given in Table 2, and the modification process was summarized in Figure 1.

Table 2: Experimental design

Modification groups (Codes)	Wood species	Chemical	Distilled water	Impregnation duration (min)	Pressure	Number of samples
SP-C	Scots pine	Control	-	-	-	10
SP-MF-10		MF	-	10	3 bar	10
SP-MF-30			-	30	3 bar	10
SP-MFW-10		MFW	% 50	10	3 bar	10
SP-MFW-30			% 50	30	3 bar	10
CH-C	Chestnut	Control	-	-	-	10
CH-MF-10		MF	-	10	3 bar	10
CH-MF-30			-	30	3 bar	10
CH-MFW-10		MFW	% 50	10	3 bar	10
CH-MFW-30			% 50	30	3 bar	10

The oven-dry densities of the samples, before and after the modification treatment, were determined according to the testing standard, TS 2472 (1976). The weight percent gain (WPG) of the samples was calculated according to the following equation:

$$WPG = \frac{m_i - m_0}{m_0} \times 100 \quad (1)$$

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where m_o is the oven-dry weight of the samples before the modification in grams and m_j is the oven-dry weight of the samples after the modification in grams.

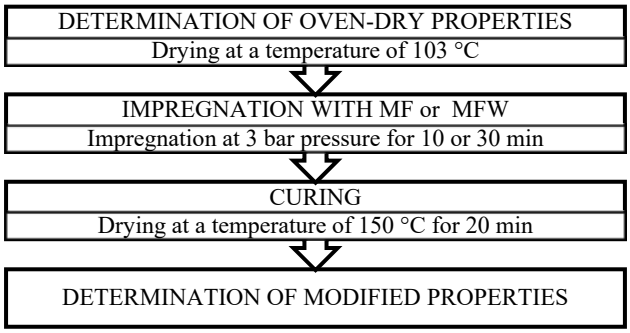

Figure 1: Chemical modification process

To determine the effect of the modification on the dimensional stability, the water uptake (WU), swelling (S), and anti-swelling efficiency (ASE) values of the samples were determined. According to the testing standard, TS 4086 (1983), 20 × 20 × 30 mm (T×R×L) samples were immersed in distilled water for 4 wk. After immersion, the dimension and the weight of the samples were recorded, and the dimensional stability values were calculated according to equations 2 through 4:

$$WU = \frac{m_w - m_i}{m_i} X100 \quad (2)$$

where m_w is the weight of the samples after water immersion in grams and m_i is the oven-dry weight of the samples after the modification in grams;

$$S = \frac{V_W - V_i}{V_i} X100 \quad (3)$$

where V_w is the volume of the samples after water immersion in cm^3 and V_i is the oven-dry volume of the samples in cm^3; and

$$ASE = \frac{S_m - S_u}{S_u} X100 \quad (4)$$

where S_m is the swelling ratio of the modified samples as a percentage and S_u is the swelling ratio of the unmodified samples as a percentage.

The mechanical properties of the MF modified samples, including the modulus of rupture (MOR), modulus of elasticity (MOE), and Brinell hardness (BH) were determined according to the TS 2474 (1976), TS 2478 (1976), and TS 2479 (1976) testing standards, respectively.

The data were analyzed statistically using an SPSS software system (SPSS17, IBM Corp., Armonk, NY). An analysis of variance (ANOVA) model was used to determine the effect of the MF resins on the mechanical and physical properties of wood. Duncan's multiple range tests were used for pairwise comparisons when the overall ANOVA model was significant. Data for Scots pine and chestnut woods were analyzed using separate models.

Results and Discussion

The oven-dry densities of the MF modified wood, and the change as a percentage compared to the unmodified control samples were given in Table 3. Modification with MF or MFW increased the oven-dry density of the both wood species. The highest density increase was determined as 27.2% in Scots pine modified with MFW for 30 min. The density increase in Scots pine were higher than that of chestnut and the change increased with the increasing impregnation duration. Modification with MFW resulted in a higher density increase than modification with MF.

The weight of the samples before and after modification, and WPG values of the modification were shown in Table 4. The WPG values varied from 17.83% to 46.53%. Although the greatest WPG was observed in modification with MFW for 10 min (46.53%), there was no statistically significant difference between the 10-

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min and 30-min impregnation durations in Scots pine. It has been found that WPG alters more chestnut than Scots pine. This could be attributed to the relatively low permeability of chestnut. Dieste et al. (2013) noted that the average water vapor permeability of chestnut was lower than that of pine, and this low permeability is attributed to the wood extractives, which reduce the void space and hindered condensation. Chestnut wood has different vapor sorption and vapor permeability than conifers normally used in construction.

Table3: The oven-dry densities of the modified woods

Wood species	Chemical	Distilled water	Impregnation duration (min)	Oven-dry density (g/cm^3)	Change (%)
Scots pine	Control	-	-	0.451	-
	MF	-	10	0.514	14.0
		-	30	0.541	20.1
	MFW	50%	10	0.529	17.4
		50%	30	0.573	27.2
Chestnut	Control	-	-	0.539	-
	MF	-	10	0.592	9.8
		-	30	0.621	15.3
	MFW	50%	10	0.603	12.0
		50%	30	0.614	13.9

Table 4: Weight percent gain values of the modified wood

Modification groups	m_o (g)	m_i (g)	WPG (%)	HG
SP-MF-10	12.49	15.89	26.91	a
SP-MF-30	12.39	16.47	32.75	ab
SP-MFW-10	11.36	16.63	46.53	c
SP-MFW-30	11.72	16.92	44.38	c
CH-MF-10	13.19	15.54	17.83	x
CH-MF-30	12.94	16.42	26.96	y
CH-MFW-10	13.05	16.81	28.91	y
CH-MFW-30	12.97	17.29	33.34	z

HG: Homogenity groups. Means within a column with different subscripts differ ($P < 0.05$)

WPG were higher in MFW than MF in both wood species. These results showed that MF or MFW impregnated both the cell lumens and the cell walls. It was reported that an aqueous melamine formaldehyde solution can penetrate the secondary cell wall of Scots pine or larch wood (Gindl et al. 2002) and the amorphous region of cellulose fibrils (Hua et al. 1987).

Table 5: Water uptake values of modified and unmodified wood

Modification groups	Water Uptake (%)	Change (%)	HG
SP-C	82.1	-	a
SP-MF-10	72.3	11.9	ab
SP-MF-30	65.0	20.8	bc
SP-MFW-10	69.8	15.0	abc
SP-MFW-30	54.3	33.9	c
CH-C	98.0	-	x
CH-MF-10	68.3	30.3	y
CH-MF-30	63.9	34.7	z
CH-MFW-10	62.8	35.8	z
CH-MFW-30	62.1	36.5	z

HG: Homogenity groups. Means within a column with different subscripts differ ($P < 0.05$)

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The WU values of the modified with MF and MFW, and unmodified wood were given in Table 5. Reductions in the WU varied from 11.9% to 36.5%. The average decrease in the WU in modified chestnut was about 35%, and there was no statistically difference between them except in modified with MF for 10 min (30.3%). But the difference among the modified pine groups was more evident. It was determined that the impregnation duration was quite effective on the WU in Scots pine; longer impregnation duration caused about twice a decrease.

The volumetric swelling and the ASE values of the modified wood were shown in Table 6. Modification with MF or MFW decreased the volumetric swelling of Scots pine and chestnut. The ASE values of the MFW-modified samples were higher than that of MF-modified samples. Deka et al. (2007) reported a 17.5% increase in ASE for MF-modified Norway spruce. In this study, higher ASE values of 57% and 67.5% for MFW-modified Scots pine and chestnut, respectively, were achieved. Deka et.al. (2007) indicated that this dimensional stability might be due to blocking of water accessible OH groups of wood component with MF resin, which was perceived even after repeated wetting and drying of wood. Since, the MF resin caused volumetric swelling of wood (Militz et al, 1997), it could be inferred that the resin could easily penetrate the wood substrate to reach OH groups of the cell wall components for dimensional stability.

Table 6: Volumetric swelling and ASE values of the modified wood

Modification groups	Volumetric Swelling (%)	HG	Anti-swelling Efficiency (ASE) (%)
SP-C	7,45	a	
SP-MF-10	4,46	c	-40,1
SP-MF-30	5,67	b	-23,9
SP-MFW-10	3,43	c	-54,0
SP-MFW-30	3,2	c	-57,0
CH-C	11,54	x	
CH-MF-10	7,92	b	-31,4
CH-MF-30	6,71	c	-41,9
CH-MFW-10	3,75	d	67,5
CH-MFW-30	3,99	d	65,4

HG: Homogenity groups. Means within a column with different subscripts differ ($P < 0.05$)

Table 7: MOR and MOE of the modified wood

Modification groups	MOE (N/mm^2)	HG	Change in MOE (%)		MOR (N/mm^2)	HG	Change in MOR (%)
SP-C	7566.8	a	-		93.3	a	-
SP-MF-10	8389.5	b	10.9		68.9	b	-26.2
SP-MF-30	8874.8	c	17.3		68.2	b	-26.9
SP-MFW-10	8038.1	ab	6.2		62.8	b	-32.7
SP-MFW-30	7928.1	ab	4.8		64.6	b	-30.8
CH-C	9616.2	p=0.264	-		105.5	x	-
CH-MF-10	9983.4		3.8		102.9	x	-2.5
CH-MF-30	9587.9		-0.3		90.4	y	-14.3
CH-MFW-10	9315.7		-3.1		86.6	y	-17.9
CH-MFW-30	10070.8		4.7		87.7	y	-16.9

MOR: Modulus of rupture; MOE: Modulus of elasticity
HG: Homogenity groups. Means within a column with different subscripts differ ($P < 0.05$)

The mechanical properties of the modified wood were determined and the results were summarized in Table 7. Modification with MF or MFW reduced the modulus of rupture (MOR) more in Scots pine than chestnut. The decrease in MOR was approximately 30% compared to unmodified Scots pine and there was no statistically

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significant difference among the modified groups. Decrease in MOR were varied by 2.5% to 17.9% in modified chestnut and there was no statistical difference among the modified groups except samples modified with MF for 10 min. Epmeier et al. (2003) reported an approximately 10% increase in MOR with the methylated melamine formaldehyde resin modification; however, acetylation and furfurylation were not significant. The reduction in the MOR of the MFW-modified samples was higher than that of the MF-modified samples. This reduction in the MOR might be caused by high temperature of the curing step of the modification process. A high treatment temperature causes strength loss in wood (Thermowood 2003;Lekounougou and Kocaefe 2014). Therefore, the process values must be selected carefully when exploiting heat in wood modification. Winandy and Rowell (2013) stated that the bending strength depends on many properties, like specific gravity and Weigl et al. (2012) found that the bending strength reduction is aligned with hemicelluloses degradation.

Modification with MF or MFW increased the MOE of the Scots pine. The highest increase was observed in samples modified with MF for 30 min as 17.3%. The increase was relatively low in the other groups and there was no statistically difference among them. Modification with MF or MFW slightly changed the MOE of the chestnut and there was no statistically difference compared to unmodified samples (p=0.264). Epmeier et al. (2004) indicated that although the MOE was affected by a change of density, an increase in density caused by chemical modification does not affect the MOE in the same manner.

Although chemical modification with MF and MFW slightly increased the HBR (Table 8), it was found that this increase was statistically insignificant. Gindl et al.(2002), Epmeier et al. (2003), Lande et al. (2004), and Deka et al. (2007) reported that the hardness of the wood notably increased by chemical modification at high weight percent gain levels. Deka et al. (2007) inferred that resin's adherence and/or reaction on the surface of treated wood caused increase in surface hardness considerably.

Table 8: Brinell hardness of the modified wood

Modification groups	HB N/mm^2	HG
SP-C	1,49	P=0.368
SP-MF-10	1,76	
SP-MF-30	1,63	
SP-MFW-10	1,49	
SP-MFW-30	1,57	
CH-C	2,93	P=0.107
CH-MF-10	3,23	
CH-MF-30	3,13	
CH-MFW-10	3,05	
CH-MFW-30	2,64	

Conclusion

Certain physical and mechanical properties of the wood modified with melamine formaldehyde (MF), and melamine formaldehyde diluted with water (MFW) were investigated. The results show that chemical modification affects the properties of wood in different ways. Based on the findings of this study, conclusions given below can be inferred:

- Chemical modification with MF increased the density of both Scots pine and chestnut,
- WPG values and density increase were higher in samples modified with MF diluted with water,
- Longer impregnation time resulted higher WPG and density increase,
- Modification with MF or MFW decreased the water uptake and swelling of wood significantly,
- ASE of the modification were higher in chestnut than that of Scots pine. ASE of the modification with MFW were higher than that of modification with pure MF. Approximately 55% and 65% ASE were determined in Scots pine and chestnut modified with MFW, respectively.
- Modification with MF or MFW decreased the MOR of Scots pine, significantly. (30%) Decrease in MOR were relatively lower in chestnut (17%).
- Modification did not affect the MOE in chestnut, significantly (p=0.264). But, modification with MF increased the MOE in Scots pine (10%-17%).
- Modification with MF or MFW did not affect the HB of the wood, significantly.

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EFFECTS OF COPPER CONTENT ON MICROSTRUCTURE AND MECHANICAL PROPERTIES OF AL–MN EUTECTIC ALLOYS

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Abstract: Alloying elements in aluminium have further been improving the strength and stiffness properties that provide superior compared to other metals. Especially the alloying of copper, silicon and manganese in aluminium alloys improves the casting ability, as well asincrease strength and stiffness properties. In the literature, it is the attention that the especially studies on eutectic composition are abundant. Because the eutectic composition has a lower melting point than the melting point of the other elements, both obtains two separate solid phases from a single liquid phase and aluminium alloys increasing of fluidity. In this work, in order to investigate the effect of copper content on the microstructure and mechanical properties of the Al-Mn eutectic alloy, 5 percentby weight of copper was added to the base alloy. Al–2Mn–5Cu (wt.%) alloys were prepared in a graphite crucible under vacuum atmosphere. The samples were directionally solidified upward at a constant temperature gradient (7.1 K/mm) and different growth rates (from 8.3 µm/s to 978 µm/s) by using a Bridgman type directional solidification furnace. The primary dendrite arm spacing, microhardness and tensile strength of alloys were measured from directionally solidified samples. The effects of copper content on the microstructure and mechanical properties of Al–Mn eutectic alloys were investigated and the relationships between them were experimentally obtained. The results obtained in the present work were compared with the previous experimental results.

Keywords: Aluminium Alloys, Microstructure, Microhardness, Tensile Strength

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EFFECTS OF THE COUNT OF HIDDEN NEURONS ON ARTIFICIAL NEURAL NETWORKS

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Artificial Neural Networks (ANNs) consist of inputs, outputs and neurons which are classified as input layer, hidden layer and output layer. Neurons keep the weights to get desirable output. Neurons are trained using some techniques and methods to set optimal weights. This paper shows the effects of the count of hidden neurons on ANNs performance and training time.

Keywords: Neural Network, Artificial Intelligence, Hidden Neurons

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EĞİTİLEBİLİR ZİHİN ENGELLİ ÇOCUKLARDA DRAMA YOLUYLA YAPILAN EĞİTİM PROGRAMIN ZİHİN KURAMI BECERİLERİ ÜZERİNE ETKİLERİ

THE EFFECTS OF EDUCATİONAL DRAMA ON THEORY OF MİND SKİLLS İN EDUCABLE İNTELLECTUAL DİSABİLİTY STUDENTS

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Abstract The aim of this research was to investigate the effect of educational drama on theory of mind skills in 29 *educable intellectual disability* students aged 16-19 years from government high schools located in Istanbul, Turkey. The research was designed in experimental model which was based on pre-test and post-test. To evaluate the theory of mind skills in *educable intellectual disability* students by applying the Sally Ann (Wimmer ve Perner, 1983; Leslie ve Frith, 1988); "Smarties" test (Perner, Leekam, ve Wimmer, 1987), Chocolate bar test (Flobbe, Verbrugge, Hendriks, ve Krämer, 2008) and "Strange Stories Test" (Happé, 1994) that were translated and adapted to the Turkish language by Girli (2010). During the application of programme, all students had been applied drama activities related to selected words for 3 months. Prior results obtained from some other researches supported the results of the present study. Later research should be done with large group and different educational drama programmes. The present research offers hope for fallowing research in the future. The topic should also be examined with different age groups and variables. *The results of this study indicated* that *educable intellectual disability* students were promoted their theory of mind skills by using drama programme

Keywords: Theory of mind / educable intellectual disability / Drama

Özet: Bu araştırmanın amacı 16-19 yaş arası eğitilebilir zihin engelli bireylere drama yoluyla yapılan eğitimin zihin kuramı üzerindeki etkilerini araştırmaktır. Araştırma yarı deneysel olarak desenlenmiştir. Araştırmada Sally Ann (Wimmer & Perner, 1983; Leslie & Frith, 1988); "Smarties" test (Perner, Leekam, & Wimmer, 1987), Chocolate bar test (Flobbe, Verbrugge, Hendriks, & Krämer, 2008) and "Strange Stories Test" (Happé, 1994) Girli(2010) tarafından Türkçeye adapte edilmiş testler uygulanmıştır. Uygulama süresince katılımcılar üç ay boyunca araştırmaya katılmışlardır. Araştırma sonunda elde edilen bulgularda eğitilebilir zihin engelli bireylerde drama programıyla zihin kuramı yetilerinin desteklendiği sonucuna ulaşılmıştır.

Anahtar Sözcükler: Zihin Kuramı-Eğitilebilir Zihin Engelli-Drama

Giriş

Zihin kuramı, çocuğun kendi düşüncesi ile başkasının düşüncesini ayrı olduğunu anlama yeteneği ve kapsamlı bileşenleri olan sosyal anlamayı içermektedir (Premack ve Woodruff,1978). Başkalarının düşüncelerini, inançlarını, istek ve duygularını, mecazları, imaları anlama ve hatırlama çocukların sosyal gelişiminde çok önemlidir (Frith, Happe ve Siddons, 1994). Yüz ifadelerini gözlemleme, vücut dili ve bilinçli hareketler (kendi hareketlerinin başkalarının davranışları üzerindeki etkisi), bireylerin başka insanların aldatmaca davranışlarını tahmin etmelerini sağlayan stratejileri içermektedir (Smith, 2009; Sayın ve Candansayar 2008; Wellman, Cross ve Watson, 2001).

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Normal gelişim gösteren çocuklarda en geç 3-4 yaşından itibaren en basit zihin kuramı yetenekleri kendiliğinden kazanılmaya başlanır ve gelişimin en hızlı olduğu zaman 4-6 yaş olarak belirtilir (Perner, Leekam ve Wimmer, 1987; Wimmer ve Perner, 1983; Hoogewes, 2004; Frith ve Frith, 2005). Zihin kuramının temel gelişiminin tamamlanması ise 11-12 yaşlarına kadar sürebilir (Frith ve Frith, 2005; Korkmaz, 2005; Perner, Leekam ve Wimmer, 1987; Wimmer ve Perner, 1983).

Zihinsel Engellilik, gelişim süreci içerisinde genel zihinsel işlevlerde normallerden önemli derecede gerilik, bunun yanında uyumsal davranışlardan (iletişim, öz bakım, ev yaşamı, sosyal beceriler, toplumsal yararlılık, kendini yönetme, sağlık ve güvenlik, işlevsel akademik beceriler, boş zaman ve iş) iki ya da daha fazlasında sınırlılık gösterme durumudur (Eripek, 1996).

Zihinsel engelli çocukların, dikkat süreleri çok kısa olduğu görülmektedir. Algılamaları basit düzeyde olduğu, kavramları anlamakta güçlük çektikleri, duygu ve düşüncelerini açıkça ifade edemedikleri, etkinliklerde çabuk yoruldukları bilinmektedir. Taklit yetenekleri iyi olmakla birlikte soyut kavramları geç ve zor anlayıp kavramaktadırlar. Yeni durumlara uymada zorluk çektikleri, algılarının, kavramlarının ve tepkilerinin basit olduğu gözlenmektedir (Akkök, 1991). Eğitilebilir zihin engelli çocukların toplumun içinde bulunma diğer bireylerle ilişki içinde olma durumları orta ve ağır derecedeki çocuklara oranla çok daha yüksektir. Bu nedenle de toplumda varlıklarını devam ettirmede diğer bireylerin davranışlarını yorumlamaları, niyetlerini algılamaları önemlidir.

Zihinsel Engelli çocuklarda zihin kuramı ile ilgili yapılan çalışmalar çoğunlukla otizmli çocuklarla karşılaştırma şeklinde deşelenmiştir. Bu alanda zihinsel engellilerde zihin kuramı gelişimi ile ilgili çalışmalar ilk kez Baron-Cohen (1985) tarafından desenlemiştir. Araştırmasında, aynı zekâ yaşındaki Down sendromlu, otizmli ve normal çocuklara test düzeneklerini uyguladıklarında normal ve Down Sendromlu çocukların doğru düşünce stratejisine sahip olabildikleri halde otizmli çocukların başkasının düşüncesin fark edemedikleri dolayısıyla doğru sonuca varamadıkları sonucuna ulaşmışlardır.

Happe (1994) çalışmasında doğal ve karmaşık olarak hazırlanmış hikâyelerle yanlış inanış ve ikinci yanlış inanış testi uygulamıştır. Otizmli katılımcılar, zihinsel engelli ve normal gelişim gösteren katılımcılarla karşılaştırıldıklarında hikaye kahramanlarının mecazi anlamdaki konuşmalarından anlam çıkarmada yetersiz bir performans gösterdikleri belirlenmiştir.

Cobos ve Castro, (2010)'ın yaptıkları araştırmada yetişkin down sendromlu bireylere daha önceden yaşamadıkları değişik durumlarla ilgili hikâyelerden test edilmişlerdir. Katılımcılarda bu hikâyelerde kahramanın seçenekleri ve seçeneklerin ardından yaptıkları ile ilgili değerlendirme yapmaları istenmiştir. Çalışmanın ikinci kısmında ise karakterleri tercihleri konusunda uygun olan bölgeye yerleştirmeleri istenmiştir. Katılımcıların kahramanlarının durumlarıyla ilgili tercihleri kendi tercihleri ve kahramanın tercihleri ayırmada güçlük çektikleri ve yavaş hareket ettikleri gözlemlenmiştir.

Atasoy (2008) çalışmasında Sally-Ann ve Bonibon testi (MveM Testi) kullanmıştır. Çalışmasında normal gelişim gösteren çocukların Sally-Ann testinden %78.3 'ü geçerken (54 çocuk) ,%21.7 (15 çocuk) kalmıştır. Bonibon Testinde de %88.4 'u (61 çocuk) testi geçerken, %11.58 (8 çocuk) kalmıştır. Zihinsel engelli çocuklar ise Sally-Ann testinde %34.3 'ü (15 çocuk) geçerken %65.7'si (44 çocuk) başarısız olmuştur. Bonibon testinde ise % 58.2 (39 çocuk) geçerken %24.18 (28 çocuk) başarısız olmuştur.

Zihin engelli bireylerin olayları yorumlayabilmeleri için gerçek yaşamdaki benzerlikleri fark etmeleri önemlidir. Bu anlamda günlük yaşamda karşılaştıkları durumları canlandırması gereklidir.

Drama tekniği, tüm yaşlarda ve sınıf seviyelerinde kullanılabilmektedir. Küçük çocuklar da drama çalışmalarında başarılı olabilmektedirler. Gerek çocuk gerekse yetişkin eğitimi alanlarında yapılan çalışmalarda drama uygulamalarının yapıldığı görülmektedir.

Drama, çocuğun kendini başkalarının yerine koyarak çok yönlü gelişmesi, kendini tanıması, kendini ifade edebilmesi, kendinde bulunan özelliklerle başkalarını karşılaştırabilmeyi sağlaması ve yaparak-yaşayarak öğrenme bakımından en etkili eğitim yöntemlerinden biridir. Drama, çocuğun sosyal çevresindeki yaşantılar

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yoluyla edinilen bilgileri kazandırılması ve olumlu değişmeler sağlanması amacıyla da kullanılmaktadır (Gönen ve Dalkılıç, 2002).

Zihinsel engelli çocukların da diğer normal çocuklarda olduğu gibi gerçek hayatı model alarak oyunlarına yansıtmakta olduklarını ifade etmektedir. Drama da çocuğu yönlendirmek için zihinsel engelli çocuğu tanımak ve özelliklerini bilmek çok önemlidir. Drama da zihinsel engelli çocuktan geri iletim beklenenden daha sonra alınabilir. Drama uygulamalarında zihinsel engelli çocuğun diğer çocuklardan daha çok yardıma ve güdülenmeye ve daha fazla ve sık tekrara ihtiyacı olabilir (Bayhan, 1995).

Drama etkinlikleri konusunda belirleyici olan, çocuğun engel türüne göre, dikkat süresi, sözel anlatım becerileri, algılama kapasitesi ve bedensel hareket yeteneğidir. Drama etkinlikleri hazırlanırken çocukların özel yetenekleri ve sorunları dikkate alınmalıdır (Önder, 2001).

Zihin engelli lise seviyesinde olan gençler günlük yaşamda sosyal ortamlarda yoğun bir şekilde bulunmaktadırlar. Zihin engelli gençlerin toplum ortamlarında karşılarındaki kişilerin niyetlerin anlamaları ve kendilerini ona göre düzenlemeleri sağlıklı ilişki kurma ve kendilerini koruma adına çok önemlidir. Bu araştırmada zihin engelli gençlere drama yoluyla zihin kuramı becerilerin geliştirme için desenlenen eğitim programının etkililiği araştırılmaktadır.

Yöntem

Araştırma Modeli

Bu çalışmada, yarı-deneysel araştırma yönteminin tek grup öntest-sontest modeli kullanılmıştır. Yarı-deneysel araştırmalar, rastlantısal olmadan desenlenen çalışmalardır. Rastlantısal desenlenen araştırmalarla ortak yanı, uygulama ve sonuç arasındaki bağlantı ve uygulamanın etkililiğini araştırmasıdır. Bu araştırma deseni ile yapılan çalışmalar, bazı kaynaklarda "önce-sonra müdahaleli çalışmalar" olarak da geçmektedir (Yeniova ve Aşçıoğlu, 2006).

Araştırmanın Bağımlı ve Bağımsız Değişkenleri

Bu çalışmadaki bağımsız değişken, zihinsel engelli öğrencilerle gerçekleştirilen etkinlikler (drama ve okuma) olarak planlanmıştır. Bağımlı değişkenler ise bu etkinliklerin zihin kuramı üzerindeki etkisidir

Katılımcılar

Çalışmaya, İstanbul sınırları içerisindeki resmi bir Özel Eğitim Mesleki Eğitim Merkezinde eğitimlerine devam eden 29 zihinsel engellilik tanısı almış özel gereksinimle öğrencilerdir.

Araştırma Süreci

Araştırmada araştırma yapılan okula staj için giden altı öğretmen adayına zihin kuramına yönelik içeriği olan hikaye kitapları ile zihin kuramı hakkında dört oturumluk bir eğitim verilmiştir. Eğitimin ardından araştırmacı gözetiminde iki grubu 9 bir grubu 11 kişiye uygulama yapılmıştır. Çalışma üç ay (12 oturum) uygulama evresinden oluşmuştur.

Drama yapmadan önce okul öncesinde kişisel gelişim ile ilgili Muge Yukay Yuksel tarafından yayınlanan kitaplardan zihin kuramına uygun olan 12 hikâye seçilmiştir. Hikâyelerin kahramanlarının kullanacağı malzemeler ve isimlikler önceden hazırlanmıştır. Hikâyelerin öncelikle çocuklar tarafından okunup anlaşılması sağlanmıştır. Ardından katılımcılarla drama çalışması yapılmıştır.

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Sally-Ann (Birinci Düzey Zihin Kuramı Testi)

Yanlış inanç testi olarak, 1983 yılında Wimmer ve Perner tarafından okul öncesi ve okul çağı çocuklarında kullanmak amacıyla geliştirilmiş (Wimmer, Perner, 1983), Baron- Cohen ve diğ. (1985) tarafından değiştirilmiştir (Baron- Cohen, Leslie, Frtih, 1985). Türkçe'ye uyarlamasını Alev Girli ve Deniz Tekin yapmıştır. Bireysel olarak uygulanan bu testin, zaman sınırlaması yoktur. 5 karelik resimli öykülerden oluşmaktadır (Bayraklı, Çelik, Diken, Kaner, 2012).

Birinci düzey ZK testi olarak bilinen Sally ve Anne Testi'nde; katılımcının bir nesnenin durumundaki bir değişikliği, hikayedeki bir karakterin bildiğini, ama diğer kişinin bunu bilmediğini anlaması ve diğer kişinin eylemini bu ayrıma dayanarak öngörebilme becerisi değerlendirilmektedir (Bora, 2009).

Girli ve Tekin'in (2010) yaptığı çalışmada güvenirlik Kuder-Richardson testi ile (KR-21) hesaplanmıştır. Sally-Anne testi için KR-21 değeri. 78 olarak bulunmuştur.

Çikolata Testi (Zihin Kuramı Testi) Flobbe, Verbrugge, Hendriks, ve Krämer (2008) tarafından geliştirilmiş (Girli, Tekin, 2010, s.1947), Türkçe'ye uyarlaması Alev Girli ve Deniz Tekin tarafından yapılmıştır. Test 5 karttan oluşmaktadır. Testin uygulanması sırasında herhangi bir süre sınırlaması yoktur (Bayraklı, Çelik, Diken, Kaner).

Türkiye uyarlamasında, karakterlerin ismi Türkçe'de yaygın kullanılan Arda ve Ceren şeklinde değiştirilerek, Türkçe' ye çevrilip geçerlilik ve güvenirlik çalışması yapılan formu kullanılmıştır. İçerisinde kutu ve çekmecenin olduğu pencereli bir odada Ceren ve Arda isimli iki çocuk bulunmaktadır. Arda'nın annesi odaya girerek Ardaya çikolata vermekte, Arda çikolatayı çekmeceye koyarak odadan çıkmaktadır. Arda odadan ayrıldıktan sonra, Ceren çikolatayı çekmeceden alıp kutunun içine koymakta ve bu sırada Arda pencereden gizlice odayı izlemektedir. Sonrasında, Arda tekrar odaya girmekte ve çikolatasını almak istemektedir. Araştırmacı tarafından katılımcıya, "Ceren, Arda'nın ilk nereye bakacağını düşünüyor?" şeklinde ikinci derece inanç sorusu ve "Arda ilk nereye bakacak?" şeklinde kontrol sorusu sorulur ve kaydedilir (Girli, Tekin, 2010).

Girli ve Tekin'in (2010) yaptığı çalışmada güvenirlik Kuder-Richardson testi ile (KR-21) hesaplanmıştır. Çikolata testi için KR-21 değeri. 84 olarak bulunmuştur.

Bonibon Testi (İkinci Düzey Zihin Kuramı Testi- M ve M) (Smarties Testi)

Bonibon Testi, Hogrefe, Wimmer ve Perner tarafından (1986) geliştirilmiş, Girli ve Tekin (2010) tarafından Türkçe'ye çevrilip geçerlilik ve güvenirlik çalışması yapılmıştır. Türkçe formunda, MveM ya da Smarties markalı şeker paketi yerine, Türkiye'de yaygın kullanımı olan Bonibon markalı şeker kutusu kullanılmıştır (Girli, Tekin, 2010).

Girli ve Tekin'in (2010) yaptığı çalışmada güvenirlik Kuder-Richardson testi ile (KR-21) hesaplanmıştır. Bonibon testi için KR-21 değeri. 82 olarak bulunmuştur.

Dondurma Kamyonu Testi (İce-Cream Truck Task)

Dondurma Kamyonu Testi" (Perner ve Wimmer 1985) İkinci aşama yanlış kanı atfı (Second order false belief) görevinde ise bireyin anlatılan hikâyede yer alan iki kahramanın zihinsel durumlarının ne olabileceğini tahmin etmesi istenmektedir (Baron-Cohen, 2000). İnsanların sadece gerçek olan durumla ilgili inançlarının olabileceğine değil aynı zamanda başkalarının inançlarıyla ilgili de inanç geliştirebilmeleri anlamına gelmektedir. İkinci derece inanç testleri Perner ve Wimmer tarafından (1985) tarafından araştırılmıştır. Ölçeğin Türkçeye uyarlanması Girli ve Tekin tarafından 2010 yılında yapılmıştır (Girli ve Tekin'in çalışmasında "kilise" yerine "okul" ifadesi kullanılmıştır).

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Verilerin Analizi

Bulgular

Tablo 1 Öğrencilerin cinsiyet ve yaşına ilişkin betimsel istatistikler

Cinsiyet	n	%	Ortalama Yaş (range)
Kız	11	37,9	17,7±1,1 (16-19)
Erkek	18	62,1	17,3±1,2 (15-20)
Toplam	29	100,0	17,5±1,2 (15-20)

Çalışmaya katılan öğrencilerin %37,9'u kız ve %62,1'i erkektir. Kızların yaşları 16 ile 19 arasında değişmekte olup ortalama yaşları 17,1±1,1'dir, erkeklerin ise yaşları 15 ile 20 arasında değişmekte olup ortalama yaşları 17,3±1,2'dir. Genel yaş ortalaması ise 17,5±1,2'dir

Tablo 2 Öğrencilerin ilk ve son uygulama Zihin Kuramı puanlarına ilişkin betimsel istatistikler (N=29)

Test	İlk Uygulama				Son Uygulama			
	Min.	Maks.	$\overline{X}$	ss	Min.	Maks.	$\overline{X}$	ss
Sally Testi	0	3	1,97	1,12	0	3	2,34	0,86
Bonibon Testi	0	3	1,83	1,14	0	3	2,31	0,85
Yer Değiştirme Testi	0	2	1,24	0,79	0	2	1,55	0,74
Dondurma Testi	0	2	1,07	0,84	0	2	1,66	0,61
Toplam Puan	0	10	6,10	2,96	2	10	7,86	2,34

Öğrencilerin zihin kuramı ilk ve son performanslarına ilişkin puanlarının ortalamasına bakıldığında tüm testlerden ve toplam puanlarında son uygulama lehine bir artış olduğu görülmektedir. Öğrencilerin hikayelere ilişkin testlerde son uygulama sonrası daha başarılı sonuçlar elde ettikleri görülmektedir. Bu farkların anlamlı olup olmadığı ilişkili gruplar t-testi ile incelenmiş ve sonuçları aşağıda, Tablo 3'de özetlemiştir.

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Tablo 3 Öğrencilerin ilk ve son uygulama zihin kuramı performans puanları arasında anlamlı fark olup olmadığına ilişkin t-testi

Test	Betimsel İstatistikler			t-testi		
	N	$\overline{X}$	ss	t	sd	p
Sally-Anne Testi (ilk)	29	1,97	1,12	3,02	28	0,005*
Sally-Anne Testi (son)	29	2,34	0,86			
Bonibon Testi (ilk)	29	1,83	1,14	3,31	28	0,003*
Bonibon Testi (son)	29	2,31	0,85			
Yer Değiştirme Testi (ilk)	29	1,24	0,79	2,07	28	0,048*
Yer Değiştirme Testi (son)	29	1,55	0,74			
Dondurma Testi (ilk)	29	1,07	0,84	4,31	28	0,000**
Dondurma Testi (son)	29	1,66	0,61			
Toplam Puan (son)	**29**	**6,10**	**2,96**	**5,93**	**28**	**0,000****
Toplam Puan (son)	**29**	**7,86**	**2,34**			

**Fark p<.05 ve **fark p<.001 düzeyinde anlamlıdır.*

Tablo 3'den de görüleceği üzere, öğrencilerin ilk ve son uygulama zihin kuramı hikayeleri ve toplam puanları arasında anlamlı fark olduğu bulunmuştur. Buna göre ;Öğrencilerin ilk Sally-Anne Testi puanları ile son uygulama puanları arasında anlamlı bir fark olup bu fark son uygulama puanları lehinedir [$t_{(28)}$=3,02 ve p<,05]. Gruplara ait ortalama puanlara bakıldığında, öğrencilerin Sally-Anne hikaye testi son uygulama puanları daha yüksektir ($\overline{X}_{\text{İlk uygulama}}$=1,97 ve $\overline{X}_{\text{Son uygulama}}$=2,34).

Öğrencilerin ilk Bonibon Testi puanları ile son uygulama puanları arasında anlamlı bir fark olup bu fark yine son uygulama puanları lehinedir [$t_{(28)}$=3,31 ve p<,05]. Gruplara ait ortalama puanlara bakıldığında, öğrencilerin Bonibon Testi son uygulama puanları daha yüksektir ($\overline{X}_{\text{İlk uygulama}}$=1,83 ve $\overline{X}_{\text{Son uygulama}}$=2,31).

Öğrencilerin ilk Yer Değiştirme Testi puanları ile son uygulama puanları arasında anlamlı bir fark olup bu fark yine son uygulama puanları lehinedir [$t_{(28)}$=2,07 ve p<,05]. Gruplara ait ortalama puanlara bakıldığında, öğrencilerin Yer Değiştirme Testi son uygulama puanları daha yüksektir ($\overline{X}_{\text{İlk uygulama}}$=1,24 ve $\overline{X}_{\text{Son uygulama}}$=1,55).

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Öğrencilerin ilk Dondurma Testi puanları ile son uygulama puanları arasında anlamlı bir fark olup bu fark yine son uygulama puanları lehinedir [$t_{(28)}$=4,31 ve p<,001]. Gruplara ait ortalama puanlara bakıldığında, öğrencilerin Dondurma Testi son uygulama puanları daha yüksektir ($\overline{X}_{\text{İlk uygulama}}$=1,07 ve $\overline{X}_{\text{Son uygulama}}$=1,66).

Son olarak, öğrencilerin ilk zihin kuramı toplam puanları ile son uygulama puanları arasında anlamlı bir fark olup bu fark yine son uygulama puanları lehinedir [$t_{(28)}$=5,93 ve p<,05]. Gruplara ait ortalama puanlara bakıldığında, öğrencilerin zihin kuramı son uygulama toplam puanları daha yüksektir ($\overline{X}_{\text{İlk uygulama}}$=6,10 ve $\overline{X}_{\text{Son uygulama}}$=7,86).

Tartışma ve Yorum

Bu çalışmada 16-19 yaş gençlerine drama yoluyla verilen zihin kuramı becerilerini geliştirmeye dönük 12 oturumluk eğitimlerin sonucunda da şu sonuçlara ulaşılmıştır. Deney grubundaki gençlerin ön -test ve son -test puanlarının ilişkili grup t testi sonuçları incelendiğinde deney grubundaki çocukların zihin kuramı becerileri destekleme drama Programı öncesinde ve sonrasında artış olduğu görülmektedir ($\overline{X}_{\text{İlk uygulama}}$=6,10 ve $\overline{X}_{\text{Son uygulama}}$=7,86). Yapılan t testi neticesinde bu artışın istatistiksel açıdan anlamlı olduğu saptanmıştır (p<,05). Bu alanda yapılan araştırma sonuçlarıyla örtüşmektedir (Ozonoff, ve Miller, 1995; Newton, ve Jenvey, 2011; Goldstein, ve Winner, 2011; Goldstein, ve Winner, 2012; Mathersul, McDonald ve Rushby, 2013).

Eğitebilir zihin engelli gençler topluma adapte olmaya en yakın gruplardan biridir. Daha çok sosyal yaşamın içinde bulunmalarından dolayı zihin kuramı becerilerin geliştirilmesi yaşamlarını kolaylaştıracaktır. Bu becerilerin geliştirilmesi için drama yoluyla yapılan çalışmaların etkililiğini sunduğumuz çalışmanın, yarı deneysel bir çalışma olması, kontrol grubunun bulunmaması araştırmanın eksikliklerinden biri olarak belirtilebilir.

Araştırma sonuçlarında tüm uygulanan testlerde eğitim –öncesi ve sonrası becerilerde artış görülmüştür. Ancak uygulamanın içeriğinde yer alan hikâyelerin okul öncesi döneme ait olması aslında bu çalışmaların çok daha yoğun yapılması gerekliliğinin de bir göstergesidir. Drama da uygulanan senaryoların sistemli olarak zorlaştırılması gençlerin zihin kuramı yetilerinin de gelişimine olumlu yönde katkıda bulunacaktır.

Sonuç olarak, zihin engelli gençlere sağlanan yaşantılar zihin kuramı gelişiminde etkili olmaktadır. Bu noktada zihin engelli gençlere zengin uyarıcı çevre olanakları ve bu olanakları içeren eğitim programları sağlanması bu gelişim sürecini önemli ölçüde etkilemektedir. Bu çalışmada da zihin engelli gençlere drama yoluyla verilen eğitim programının gençlerin zihin kuramı becerileri üzerinde olumlu etkiye sahip olduğu belirlenmiştir. Özellikle toplumla iç içe olan gençlerin varlıklarını sağlıklı şekilde devam ettirmeleri açısından çok önemlidir. Bu çalışmanın zihin kuramı becerilerini içeren bir eğitim programını içinde bulundurması nedeni ile alan yazınına katkı sağlaması beklenmedir. Bütün bu nedenlerle ilerleyen yıllarda bu ve benzeri çalışmaların yapılarak zihin engelli gençlerin desteklenmesi önerilmektedir.

Teşekkür

Bu araştırmanın yapılması sürecinde çalışmaya katılan tüm öğrencilerime ve Marmara Üniversitesi Bilimsel Araştırma Birimine teşekkürlerimi sunarım.

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EĞİTİM ÖRGÜTLERİNDEKİ DEĞİŞİM SÜRECİNCE YAŞANAN SORUNLARIN İNCELENMESİ

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Değişim evrensel bir kuraldır. İnsanlar değişir, iklimler değişir, toplumların yaşam biçimi değişir. Değişime duyulan ihtiyaç gelişimden kaynaklanmaktadır. Hiyeroglif yazıdan e-mail ile iletişim sistemine, fermandan internet ilanlarına geçiş bu gelişmelere örnektir. Sürekli değişim içinde olan çağımızda varlığını sürdürmek ve gelişebilmek için her örgüt planlı ve başarılı bir değişim süreci geçirmek durumundadır, hatta bu değişim süreçlerini sürekli bir hale getirmesi gerekmektedir. Bu bağlamda hızlı değişimle birlikte ortaya çıkan bunalım yaşadığımız çağın en önemli özelliğidir.

Eğitim reformunun uygulayıcısı olacak öğretmenler ve onların reforma yaklaşımı, stratejik rolleri nedeniyle değişimin sonuçlarını doğrudan etkilemektedir. Öğretmenlerin eğitim reformunu nasıl algıladığı ve uyguladığı aslında reformun hedeflerine ulaşıp ulaşmadığı sorusuna yanıt verebilir. Yapılan çalışmalar eğitimde değişimin uzun bir süreç gerektirdiği ve özellikle uygulama noktasında problemlerle karşılaştığını göstermektedir. Özellikle değişimin karar alıcılar tarafından uygulayıcılara dayatıldığı geleneksel reform yaklaşımlarında reform hareketlerinin başarısız olmasının öncelikli nedeninin öğretmenler olduğu düşünülmektedir. Bu bağlamda öğretmenlerin değişim karşısındaki tutum ve yaklaşımlarının neler olduğu ve bunların nedenlerinin ortaya çıkarılması reform sürecini anlamamıza yardımcıolmaktadır.

Eğitim örgütleri yapısı itibari ile sürekliliğini sürdürmek ve toplumun kendisinden beklediği durumlara, kendi koyduğu örgütsel hedefler doğrultusunda ulaşmaya çalışmaktır. Eğitim örgütleri kendi içinde ve dışında meydana gelen değişimi doğru okuyabildiği sürece bu hedeflere ulaşabilir. Değişimin eğitimde yarattığı sancılı durumlarla baş edebilmesi de değişimin zamanını ve yönünü etkileyen en önemli değişkendir. Değişimin örgütlerde sebep olduğu, direnç mekanizmaları ve oluşturduğu problemlerle başa çıkabilmesi ve bu çatışma ve kriz durumundan daha güçlü çıkabilmesi için de uygulanacak stratejiler bir ülkenin geleceğine etki eden eğitim örgütleri için hayati öneme sahiptir.

Bu araştırmanın temel amacı eğitim örgütlerinde değişim sürecinde yaşanan sorunların incelmesidir.

Araştırma betimsel tarama yöntemi kullanılmıştır. Veri toplama aracı olarak anket kullanılmıştır. Anket iki bölümden oluşmaktadır. Birinci bölüm kişisel bilgiler, ikinci bölüm değişimle ilgili maddelerden oluşmaktadır. Değişimle ilgili maddeler örgütsel değişimin nedenleri, örgütsel değişim engelleri, örgütsel değişime hazırl olma faktörlerinden oluşmaktadır. Araştırmanın bulgularının analizi devam etmektedir.

Keywords: Değişim, süreç, eğitim örgütü

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ELECTRICAL AND THERMAL PROPERTIES AL-2MN-5FE TERNARY ALLOY

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Abstract: Al-2Mn-5Fe alloy (wt.%) was prepared in a graphite crucible under vacuum atmosphere. Al-2Mn-5Fe alloy melt was first obtained in a hot filling furnace and then directionally solidified upward with different growth rate ranges (8.3–978 μm/s) at a constant temperature gradient (6.7 K/mm) in the Bridgman-type directional solidification furnace. Variations of electrical resistivity () for casting samples with the temperature in the range of 287-574 K were also measured by using a standard dc four-point probe technique. The enthalpy of fusion and specific heat for same alloys were determined by means of differential scanning calorimeter (DSC) from heating trace during the transformation from solid to liquid.

Keywords : Al-Mn-Fe Alloy, Electrical Properties, Thermal Properties, Enthalpy

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ELECTRONIC FLIGHT BAG IN THE OPERATION OF AIRLINE COMPANIES: APPLICATION IN TURKEY

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Electronic Flight Bag (EFB) is a kind of technology which is using paperless flight operation in the airplane. Using of EFB aims to increase efficiency of the aviation companies. In the scope of this research, the advantages to airline companies and the procedures of EFB using in the flight operations are investigated.
In the first part of the paper, the concept of efficiency and requirements of flight operations planning procedure are investigated with literature review. In the second part, electronic flight bag is defined with the properties, types, services, and using conditions. In the last part, the efficiency of EFB using is estimated with the data which collected from semi structured interview method. Research is completed with 6 different participation of airlines companies from Turkey. In the result of the paper, the time saving of the data updating process is found as one of the advantages of the EFB. Moreover, the companies gets time saving with faster aircraft turnaround.
Keywords: Electronic Flight Bag, Flight Operations, Information Technology

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ELEMENTS TO BE CONSIDERED IN MUSIC AND COLOUR RELATION FOR EFFECTIVE EDUCATIONAL SOFTWARE

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Relation of colour and music was researched by many scientists and artist since Pythagoras and has still been researching. Because, there are seven colours in chromatic spectrum corresponding to seven musical note and frequencies of colors and musical notes coincide with each other. If we consider that education system has been developing by transferring to digital environments in our era, coherence of music and colour relation has become important for preparing educational software. In this paper, by submitting the relation of music and colour, we aim to inform the designers about these two elements which are required for effective educational software.

Keywords: Educational Software, Educational Technology, Relation of Colour and Music, Frequencies of Colours, Frequencies of Musical Notes

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EMPIRICAL MODELING OF EXCHANGE RATE RETURNS

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Abstract: This study investigate exchange rate volatility of EURO/ALL daily exchange rate using autoregressive conditional heteroscedasticity (ARCH) model and generalized autoregressive conditional heteroscedasticity (GARCH) model. Daily percentage return of the EURO/ALL exchange rate is used, which cover a period from 5 January 2010 to 30 December 2015. In order to capture the financial stylized fact of return both symmetric and asymmetric models are employed. According to AIC and SIC the EGARCH(2, 3) is identified as the best fitted model. The results also indicate volatility clustering, persistence of volatility and laverage effect of exchange rate returns.

Keywords: Generalized Autoregressive Conditional Heteroscedasticity, Exchange Rate Returns, Volatility Persistence, Laverage Effect

Introduction

Since the adoption of the floating exchange rate regime the behavior of exchange rate has been investigated by many researches. Modeling and forecasting the exchange rate volatility is a crucial area because the foreign exchange volatility is an important determinant for pricing of currency derivative. Exchange rate volatility is a measure of the fluctuation in an exchange rate, and it is also known as a measure of risk (Abdalla 2012).

Volatility has some commonly characteristics observed, referred as stylized facts. First, high volatility is follows by high volatility and low volatility follows by low volatility, i.e. volatility acts in clusters. Second volatility is often stationary, i.e. volatility does not diverge to infinity. In financial market volatility tend to be higher after depreciation, referred as leverage effect. This means that volatility is higher after negative shocks that after positive shocks of the same magnitude (Tsay, 2010). Various models are introduced to model the volatility of exchange rate. One such a model is introduced by Engle (1982) named autoregressive conditional heteroscedasticity model (ARCH). This model is generalized by Bollerslev (1986) into GARCH models. Nelson (1991) proposes the exponential GARCH (EGARCH) model which allow for asymmetric effect between positive and negative asset returns. Another model which allow for asymmetric is the threshold GARCH model (TGARCH), proposed by Zakoian(1994). This model allows having differential impacts on conditional variance of the past shocks.

This study examines the exchange rate volatility model of daily percentage return of EURO exchange rate against Albanian Lekë (EURO/ALL) using both symmetric and asymmetric GARCH model.

Materials and Methods

Data

The data consist of daily nominal exchange of Euro against Albanian Lekë. The time series cover the period from 5 January 2010 to 30 December 2015, i.e. 1511 observations. The data set is obtain from Bank of Albania (http://www.bankofalbania.org/), the monetary authority of Albania, which applies a free fluctuation regime, i.e. the currency is determined according to the foreign exchange markets. The percentage return of the exchange rate is calculated as, $r_t = 100 * (\ln(y_t) - \ln(y_{t-1}))$ where y_t is the exchange rate at time moment t and y_{t-1} is the exchange rate at time moment $t-1$.

Unit root test

The foundation of a time series is stationarity or weakly stationarity. Weakly stationarity implied that the two first moments of the series do not depend on time. In order to check for stationarity we use Augmented Dicker Fuller (ADF) test and Philip Perrons (PP) test. The null hypothesis of ADF test is the existence of unit root against the alternative hypothesis of no unit root. The null hypothesis is rejected if the test statistic is greater than the critical

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value. The PP test is similar to the ADF test, but correct for any serial correlation and heteroscedasticity in the errors terms. The null hypothesis of PP test is rejected if the test statistic is greater than the critical value.

Test of Heteroscedasticity

In order to apply the GARCH model first we examine the residual of the mean equation for heteroscedasticity, known as ARCH effects, by using ARCH-LM test and Ljung-Box statistic.

The ARCH-LM test is used to test the presence of conditional heteroscedasticity by regressed the squared residual on q lag. The null hypothesis of the test is no heteroscedasticity in the model residual versus the alternative hypothesis of heteroscedasticity in the model residual. The test statistic is

$$LM = NR^2,$$

where N is the number of observation and R^2 the coefficient of determination of the residual regression. The null hypothesis is rejected if the p-value is less that the significance level.

Ljung–Box Q statistic test the joint hypothesis that the autocorrelation coefficients up to lag q are equal to zero on the squared residual series. This test is defined as

$$\mathrm{Q} = \mathrm{N}(\mathrm{N}+2)\sum_{\mathrm{i}=1}^{\mathrm{q}} \frac{\rho_{\mathrm{i}}^2}{\mathrm{N}-\mathrm{i}} \sim \chi^2(\mathrm{k}),$$

where ρ_{i}^2 are the autocorrelation on lag q. The null hypothesis, that the autocorrelation function of the series is zero, is rejected if the p-value of the test is less than the significance level.

Volatility models

The autoregressive conditional heteroscedasticity (ARCH) model violated this conditions assumed that variance of the residual of the mean equation fluctuate on time. ARCH(p) model is defined as follows

$$\sigma_t^2 = \alpha_0 + \alpha_1\varepsilon_{t-1}^2 + \alpha_2\varepsilon_{t-2}^2 + \cdots + \alpha_p\varepsilon_{t-p}^2$$

Bollerslev(1986) developed the ARCH model into GARCH model, which allow the conditional variance to depend not only by the squared residuals of mean equation but even by the previous own lags. The GARCH(p, q) model is

$$\varepsilon_t = \sigma_t a_t, \quad \sigma_t^2 = \alpha_0 + \sum_{i=1}^{p}\alpha_i\varepsilon_{t-i}^2 + \sum_{j=1}^{q}\beta_j\sigma_{t-j}^2, \ \alpha_0 > 0, \alpha_i \geq 0, \beta_i \geq 0 \text{ and } \sum(\alpha_i + \beta_i) < 1.$$

Nelson (1991) proposes the exponential GARCH model. The EGARCH (p, q) models is define as follows

$$\ln(\sigma_t^2) = \alpha_0 + \sum_{i=1}^{p}\alpha_i\left|\frac{\varepsilon_{t-i}}{\sigma_{t-i}} - \sqrt{\frac{2}{\pi}}\right| + \sum_{i=1}^{q}\beta_i\ln(\sigma_{t-i}^2) + \sum_{j=1}^{r}\gamma_j\frac{\varepsilon_{t-j}}{\sigma_{t-i}}$$

This model allowed capturing asymmetric effects of positive and negative shocks of the same magnitude.

A model commonly used to handle leverage effects is the Threshold GARCH (TGARCH) model proposed by Zakoian(1994). A TGARCH(p,q) model is as follows

$$\sigma_t^2 = \alpha_0 + \sum_{i=1}^{q}(\alpha_i + \gamma_i d_{t-i})\varepsilon_{t-i}^2 + \sum_{j=1}^{p}\beta_j\sigma_{t-j}^2,$$

where d_{t-i} is an indicator for negative ε_{t-i}, i.e. $d_{t-i} = \begin{cases} 1, & \varepsilon_{t-i} > 0 \\ 0, & \varepsilon_{t-i} \leq 0 \end{cases}$.

Test of Asymmetry

Before applied any asymmetric model we investigate for laverage effect by using sign and size bias test for asymmetry in volatility proposed by Engle and Ng (1993). Define S_{t-1}^- as an indicator dummy that takes the value 1 if $\hat{\varepsilon}_{t-1} < 0$ and zero otherwise and $S_{t-1}^+ = 1 - S_{t-1}^-$. A joint test for sign and size bias based on the regression

$$\hat{\varepsilon}_t^2 = \phi_0 + \phi_1 S_{t-1}^- + \phi_2 S_{t-1}^-\varepsilon_{t-1} + \phi_3 S_{t-1}^+\varepsilon_{t-1} + \upsilon_t$$

Significance of ϕ_1 indicates the presence of sign bias, where positive and negative shocks have differing impacts upon future volatility, meaning that the variance of returns is high after a negative returns that a positive return. On the other hand, the significance of ϕ_2 or ϕ_3 would suggest the presence of size bias, where not only the sign but the magnitude of the shock is important, meaning that the variance is higher after a large return that a small return. A joint test statistic is formulated in the standard fashion by calculating TR^2 from the regression which will asymptotically follow a χ^2 distribution with 3 degrees of freedom under the null hypothesis of no asymmetric effects, i.e. $\phi_1 = \phi_2 = \phi_3 = 0$.

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Results and Discussion

As showed by Table 1, the kurtosis 3.742 shows that the Euro/All exchange rate series is leptokurtic and the distribution is negatively skewed. Jarque –Bera statistic of 200.772 support the non-normality of the distributions at 1% significance value, since p-val. 0.000. To better perform a statistical interpretation of daily exchange rate we calculate the daily percentage return of the EURO/ALL exchange rate and check the stationarity of this series by applying ADF- test and PP-test. Both tests indicate that the data are stationarity, as showed in Table 3.

According to the AIC and SIC values we fit an AR(2) model as mean equation, see table 4. By Figure 3 one can observe the volatility clustering of the residual of AR(2) model, meaning that high volatility tends to be followed by high volatility and low volatility tend to be followed by low volatility. We tests for heteroscedasticity on the residual of the AR(2) model by performing ARCH LM and Ljung-Box statistic. Both tests strongly suggests for heteroscedasticity on the residual of the mean equation, see table 6 and table 7.

We perform several ARCH model and according to AIC and SIC ARCH(5) model was selected the best, see table 8. The variance equation, table 9, indicates that the squared residues are significant at 5% level. We estimate GARCH(1,3) model as the best GARCH model, see table 10. One can observe that the sum of α_i and β_i is less than one, see table 11, which implied persistence of volatility in daily exchange rate. This means that the new shocks will last for a long period in daily exchange rate.

In order to investigate for asymmetric effects in volatility sing and size bias test was performed, results of which are presented in table 12. The significance of ϕ_1 indicates that the variance of returns is high after a negative returns that a positive return. The significance of negative size bias, ϕ_2, suggests that a negative return has a larger effects that positive return. Also, since ϕ_2 is negative this implied that volatility increase more after a negative shock that after a positive shock. These results indicate that asymmetric volatility models are more suitable for capturing the volatility process of the return. So we estimates EGARCH and TGARCH model, selectin the EGARCH(2,3) model and TGARCH(3,3) as the bests model according by AIC and SIC values, see table 13 and 15. From table 14 and 16 we can see that the coefficients of the variance equations of EGARCH(2,3) model and TGARCH(3,3) model are all significant at 1% level. Since the laverage parameter, γ, is negative in EGARCH(2,3) model and positive in TGARCH(3,3) model, then there is evidence of laverage effects in the asymmetric models. Meaning that the impacts of negative shocks overcome that of positive shocks. The impact of negative shock is 0.768218 in EGARCH(2,3) model and 0.790884 in TGARCH(3,3) model, while the impact of positive shock is 0.466974 in EGARCH(2,3) model and 0.51418 in TGARCH(3,3) model.

The best of overall models according to AIC AND SIC value results to be that EGARCH(2,3) model, see table 17, and checking the model by ARCH-LM test, Ljung-Box test of standardized residual and squared standardized residual the model turns to be adequate.

Table 1: Description Statistics of Euro/All exchange rate series

Mean	139.517
Median	139.820
Maximum	142.840
Minimum	134.860
Std. Dev.	1.2969
Skewness	-0.8120
Kurtosis	3.7424
Jarque-Bera	200.772
Probability	0.000
Observations	1511

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Figure 1. Histogram of Euro/All exchange rate series

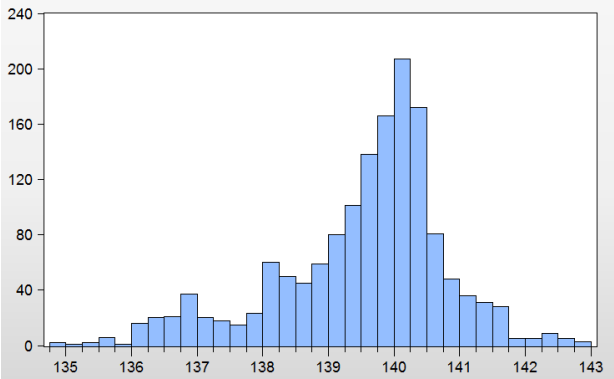

Table 2: Description Statistics of Euro/All exchange rate returns series

Mean	-0.000
Median	0.000
Maximum	1.592
Minimum	-1.413
Std. Dev.	0.130
Skewness	-0.298
Kurtosis	31.049
Jarque-Bera	49522.95
Probability	0.000
Observations	1510

Figure 2. Histogram of Euro/All exchange rate returns series

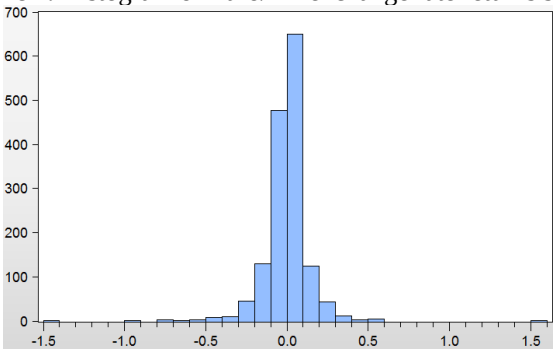

Table 3: Unit root test of exchange rate return

	ADF test	**PP test**
t-statistic	-26.861	-28.397
p-value	0.000	0.000
Critical values 1%	-3.434	-3.434
5%	-2.863	-2.863
10%	-2.567	-2.567

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Table 4: Selecting the mean equation

MA / AR	**0**	**1**	**2**
0	-1.23027 -1.22675	-1.31844 -1.30787	-1.31814 -1.30404
1	-1.30308 -1.29251	-1.31794 -1.30384	-1.32019 -1.30348
2	**-1.32043** **-1.30633**	-1.31916 -1.30155	-1.31998 -1.29884

Note: AIC value above and SIC value below

Table 5: Estimate AR(2) model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.000186	0.004171	-0.044708	0.9643
AR(1)	0.306255	0.006983	43.85614	0.0000
AR(2)	-0.136067	0.008352	-16.29153	0.0000

Figure 3. Residual graph of AR(2) model

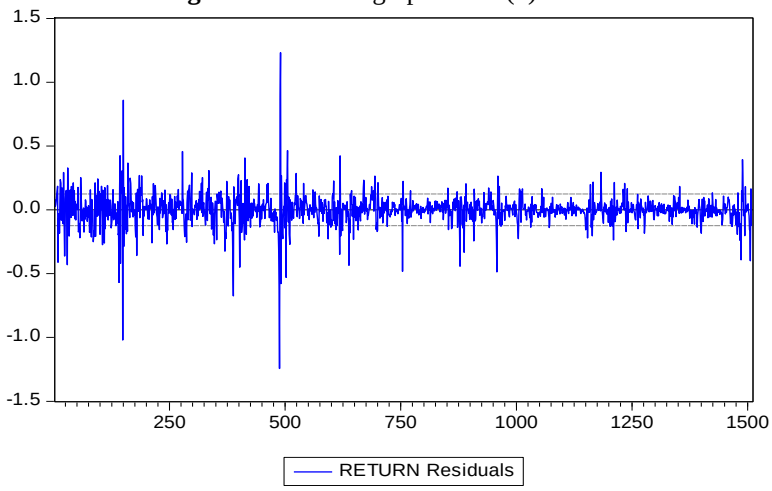

Table 6: ARCH LM test of heteroscedasticity of residual

F-statistic	673.222	Probability F	0.000
Obs. R-squared	465.958	Probability Chi-Square	0.000

Table 7: Test of heteroscedasticity by using Ljung-Box test

Lag	Test Statistic	P-value
6	795.44	0.000
12	807.64	0.000
18	830.15	0.000
24	830.99	0.000

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Table 8: Selecting ARCH model

Model	AIC	SIC
1	-1.7385	-1.7209
2	-1.8141	-1.7929
3	-1.8449	-1.8202
4	-1.8489	-1.8207
5	**-1.8607**	**-1.8290**

Table 9: Estimated ARCH(5) model

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Mean Equation				
C	0.004465	0.003059	1.459642	0.1444
AR(1)	0.363416	0.028899	12.57554	0.0000
AR(2)	-0.018107	0.031174	-0.580823	0.5614
	Variance Equation			
α_0	0.002676	0.000158	16.94483	0.0000
α_1	0.341650	0.037216	9.180260	0.0000
α_2	0.241605	0.029523	8.183558	0.0000
α_3	0.228324	0.033768	6.761655	0.0000
α_4	0.041901	0.020185	2.075783	0.0379
α_5	0.129661	0.025359	5.112930	0.0000

Table 10: Selecting the best GARCH model

p \ q	1	2	3
1	-1.8674 -1.8462	-1.8662 -1.8415	**-1.8756** **-1.8475**
2	-1.8663 -1.8416	-1.8689 -1.8407	-1.8746 -1.8429
3	-1.8754 -1.8473	-1.8678 -1.8361	-1.8674 -1.8412

Note: AIC value above and SIC value below

Table 11: Estimated GARCH(1,3) model

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Mean Equation				
C	0.003940	0.003148	1.251576	0.2107
AR(1)	0.385941	0.027651	13.95763	0.0000
AR(2)	-0.073492	0.029149	-2.521233	0.0117
	Variance Equation			
α_0	0.000673	8.04E-05	8.369239	0.0000
α_1	0.305607	0.021768	14.03922	0.0000
β_1	0.901475	0.042783	21.07102	0.0000
β_2	-0.641796	0.044666	-14.36863	0.0000
β_3	0.424594	0.024753	17.15347	0.0000

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Table 12: Result of asymmetric test for GARCH(1,3) model

Variable	Coefficient	St. error	t-stat.	Prob.
ϕ_0	0.0136	0.0026	5.1671	0.000
ϕ_1	-0.0274	0.0041	-6.5952	0.000
ϕ_2	-0.4118	0.0250	-16.449	0.000
ϕ_3	0.0417	0.0225	1.8524	0.064
LM –stat.			233.211	
p-value			0.000	

Table 13: Selecting the best EGARCH model

p \ Q	1	2	3
1	-1.8952 -1.8706	-1.8939 -1.8657	-1.9046 -1.8729
2	-1.8947 -1.8666	-1.9043 -1.8726	**-1.9093** **-1.8741**

Note: AIC value above and SIC value below

Table 14: Estimated EGARCH(2,3) model

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Mean Equation				
C	-0.001464	0.002715	-0.539304	0.5897
AR(1)	0.379888	0.025733	14.76242	0.0000
AR(2)	-0.060591	0.029628	-2.045026	0.0409
	Variance Equation			
α_0	-0.895960	0.073967	-12.11303	0.0000
α_1	0.347398	0.035462	9.796224	0.0000
α_2	0.270198	0.042902	6.297976	0.0000
γ	-0.150622	0.019025	-7.916903	0.0000
β_1	0.863216	0.072668	11.87891	0.0000
β_2	-0.453755	0.099719	-4.550353	0.0000
β_3	0.494579	0.045566	10.85409	0.0000

Table 15: Selecting the best TGARCH model

ARCH \ GARCH	1	2	3
1	-1.8781 -1.8535	-1.8772 -1.8490	-1.8904 -1.8590
2	-1.8769 -1.8487	-1.8775 -1.8458	-1.8910 -1.8557
3	-1.8796 -1.8479	-1.8764 -1.8412	**-1.8977** **-1.8590**

Note: AIC value above and SIC value below

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Table 16: Estimated TGARCH(3,3) model

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Mean Equation				
C	5.65E-05	0.003234	0.017465	0.9861
AR(1)	0.401139	0.017916	22.38992	0.0000
AR(2)	-0.055471	0.021280	-2.606692	0.0091
	Variance Equation			
α_0	0.001395	0.000144	9.715693	0.0000
α_1	0.076303	0.022208	3.435868	0.0006
α_2	0.208044	0.015637	13.30454	0.0000
α_3	0.229833	0.018603	12.35435	0.0000
γ	0.276704	0.026327	10.51042	0.0000
β_1	0.179173	0.020768	8.627421	0.0000
β_2	-0.354139	0.017355	-20.40602	0.0000
β_3	0.513693	0.018015	28.51398	0.0000

Table 17: Selecting the most appropriate model

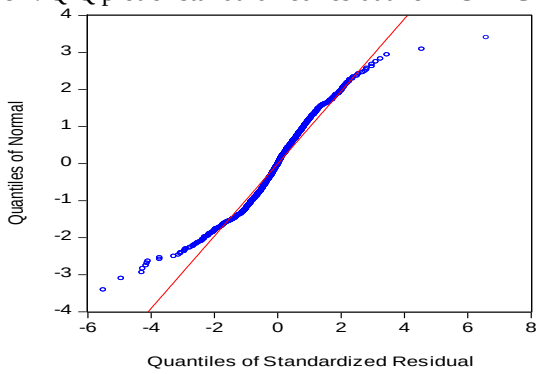
Model	AIC	SIC
ARCH(5)	-1.8607	-1.8290
GARCH(1,3)	-1.8756	-1.8475
EGARCH(2,3)	**-1.9093**	**-1.8741**
TGARCH(3,3)	-1.8977	-1.8590

Table 18: Diagnosing EGARCH(2,3) model

Ljung-Box Q statistic	Q(9)= 13.42 (0.098)
Ljung-Box Q2 statistic	Q2(9) = 5.987 (0.741)
ARCH-LM statistic	ARCH(2) = 0.976635 (0.376)

Note: p-value are reported in breaks

Figure 4. Q-Q plot of standardized residual of EGARCH(2,3)



Conclusion

In this paper we investigate the model of volatility of Euro/ALL exchange rate return. The data set consists from 5 January 2010 to 30 December 2015. Some autoregressive conditional heteroscedasticity model are employs, such as the ARCH, GARCH, TGARCH and EGARCH. The coefficients of the estimated model are all significant at 5% level, except for the constant in the mean equations. The GARCH model shows persistence volatility, which mean that the new shocks will last for a long period in daily exchange rate. Sing and size bias test indicate for asymmetric effects in volatility. The asymmetric models conduct shows evidence of leverage effects, meaning that the impacts of negative shocks overcome that of positive shocks. The EGARCH(2,3) model was selected as the best model for the data set.

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ENVIRONMENTAL EDUCATION AND EDUCATIONAL BEHAVIOR

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Abstract: Educational behavior is one of the most common problems of modern educational system. Nowadays, schools try to combine education with behavioral management. Therefore all topics are taught at school should be focused on improving kids behavior and preparing them for future life .One of the main purpose of this article is to develop student`s ability to make a choice. For the future they can be career and college ready students. A lesson based on Science topic which is given as an example to explain application of educational behavior in depth. Students were given chance to choose one type of profession and put into life.
Science-is systematic knowledge of the physical or material world gained through observation and experimentation. When we say Science we can not to mention GEOSCIENTISTS.
There are types of scientists such as Hydrologist, Seismologist, Soil Scientist, Petroleum Geologist, Atmospheric Scientist, Structural Geologist and Volcanologist. Each of these jobs have their own interesting sides.

Generally while I was teaching these information for students, before if they wanted just to be only the professions which they knew like lawyer, teacher, doctor, judge, fire fighter now they have a range of jobs which they know and want to choose as their future profession. I can ensure that students have learned a lot of new things about these professions and even they have found out that each of this profession has its own benefit.
I have taught this lesson to the children and they collected data from the information which I have given to them. They came to the conclusion that professions, I mean each person`s career must be chosen from the childhood. Also each person must choose the profession which he or she likes. Profession which is called "Soil Scientist" really took my interest. I have a country house , but I have never planted in our garden anything.
Soil Science gave me information about how to make a homemade garden. I pretended myself as a home gardener and used compost in garden beds to enrich the soil with humus are large and healthy. Since then I have planted our vegetables and all staff like that in our garden. So, this way I have motivated myself.

Keywords: Key words: behavior, respect the planet Earth, motivational learning, responsibility, project work.

Introduction

There are types of scientists such as Hydrologist, Seismologist, Soil Scientist, Petroleum Geologist, Atmospheric Scientist, Structural Geologist and Volcanologist. Each of these jobs have their own interesting sides.

Hydrologists- Gather and evaluate meteorological data to predict a drought. Help create environmentally responsible water usage regulations for communities along a major river. Help create environmentally responsible water usage regulations for communities along a major river Collect and analyze water and mud samples to determine levels of pollutants in a water system Predict whether snow pack levels on a mountain range will cause flooding in the spring.

Seismologists -study the genesis and propagation of seismic (earthquake) waves in geologic materials, both in the Earth or through laboratory experiments. They study the composition of soils on Mars to determine what elements they contain. Chemically evaluate soil nutrient levels in a farming community to determine what crops would grow best there. Analyze soil from an archeological site to determine how the landscape previously looked. Help determine the likelihood of future soil erosion in an area, given soil composition and placement.

Petroleum geologist- Petroleum Geology plays an important role in today's society. Petroleum Geologists are the men and women who know how to read the story told by the very earth beneath our feet in order to find oil and

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natural gas, which are vital resources in our lives. Politics and prices often overshadow the story of what happens before the oil and gas ever reaches the headlines.

Marine biologist- research how ocean acidification is affecting marine organisms. They discover new compounds to make medications by studying novel marine bacteria. Help the seafood industry provide consumers with sustainable food choices. Also, they Tag and track whales to learn more about their behavior.

Atmospheric scientist- studies the scientific and mathematical aspects of the Earth`s atmosphere, climate and weather. They develop reports, forecasts, and climate change research from their analysis of weather and climate data. Most atmospheric scientists work indoors in weather stations, offices, or laboratories. Occasionally, they do fieldwork, which means working outdoors to examine the weather.

Volcanologist- frequently visit volcanoes, especially active ones, to observe volcanic eruptions, collect rock and lava samples. Volcanologists study volcanoes in order to better predict eruptions. There is currently no way to predict volcanic eruptions. Predicting eruptions, like predicting earthquakes, can save a lot of lives. Being a volcanologist is one of the most dangerous scientific professions there is. Many volcanologists have died because of sudden eruptions while they were studying volcanoes.

Structural geologist- structural geologists now study the distortions of rocks in general. Commonly investigated structural forms or shapes lead to a comparison of observed features and, eventually, to the classification of related types. Comparative structural geology, concerned with large external features, contrasts with theoretical and experimental approaches, which employ the microscopic study of mineral grains in deformed rocks. Oil and coal geologists employ structural geology in their daily work, especially in petroleum exploration to detect structural traps that can hold petroleum.

Generally while I was teaching these information for students , before if they wanted just to be only the professions which they knew like lawyer, teacher, doctor, judge, fire fighter now they have a range of jobs which they know and want to choose as their future profession. I can ensure that students have learned a lot of new things about these professions and even they have found out that each of this profession has its own benefit.

If you are a marine geologist you sure work with acoustic engineers to develop sonar instruments that allow you to see underwater structures by bouncing sound waves off rock formations. Sonar can show the size and location of volcanoes and canyons in deep water. Marine geologists use these data to map the bottom of the ocean, one of the most geologically active regions on Earth.

If you are an Atmospheric Scientist then, you depend on a whole family of engineers to develop the instrumentation to help you gather the data you need to learn about atmospheric phenomena.

If you are a Seismologist then you use seismographs and computer programs to find and monitor fault lines. This is such an exciting process.

If you are a Hydrologist , then you measure the quantity and quality of drinking water lakes, rivers, and wells. Isn`t it wonderful to save water? Isn`t it wonderful to know that each person looks after water?

If you are a Soil Scientist then you are a kind of a person who really loves nature. For instance, many gardeners improve their garden soil with compost. Composting is a way to produce humus. With a little simple home engineering, you can make a compost bin. Toss in vegetable waste from the kitchen, lawn and plant clippings, dead leaves, and other plant material. As bacteria and fungi decompose the organic material, it slowly changes into pure dark brown humus. The humus can be worked into soil to enrich its fertility.

If you are a Volcanologist then you study volcanoes and possible volcanic regions. You determine if geothermal engineers might tap this heat source to generate electricity. Being volcanologist is so exciting!

If you are a Structural Geologist then you can record the shape of Earth`s Surface also study the massive forces that produce earthquakes and create mountains.

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I have taught this lesson to the children and they collected data from the information which I have given to them. They came to the conclusion that professions , I mean each person`s career must be chosen from the childhood. Also each person must choose the profession which he or she likes. Profession which is called "Soil Scientist" really took my interest. I have a country house , but I have never planted in our garden anything.

Soil Science gave me information about how to make a homemade garden. I pretended myself as a home gardener and used compost in garden beds to enrich the soil with humus are large and healthy. Since then I have planted our vegetables and all staff like that in our garden. Second profession which I was interested was Hydrologist. They monitor Earth1s fresh Water. This is a very responsible job. As I understand it is so nice to know that there is enough fresh water in the world. I mean we know that in some countries there is a lack of fresh water. Countries in Africa ,struggle by not having fresh water. That is why group of people should think about how to enrich the amount of water or to think how they can enlarge this process.

Third profession which made me to think is petroleum geologist. They explore Earth for deposits of oil and natural gas. They attempt to find the particular rock formations deep underground that contain these resources to produce petroleum. To tell the truth this is also very responsible job.Scientists must be so careful that they should not let the petrol to spread into the water. We should not throw anything to anywhere in the street or into water.

Being scientist is great!

Materials and Methods

Environmental behavior is very important for children`s future development because the behavior should be taught from early years. As a teacher I know that, general introduction should start from early years and soon further it must be developed. Materials which the children have used for doing the investigations were absolutely productive. They have used from Rocks , Soils and Landforms Foss Resource books ,interactive smart board lessons in order to realize their investigations.

Results and Discussion

I hope I'm doing this right. I understand that there are many simple things you can do to save planet Earth! Ask your parents to help you plant a tree. Trees and plants help to absorb the carbon dioxide in the Earth`s atmosphere.
Save water .Something as simple as turning off the water while brushing your teeth makes a huge difference for Plant Earth. Doing this one thing helps you save up to 25 gallons of water a month!
This all helps students to understand the professions such as Soil Scientist or Hydrologist better, because at the end they understand the result of these professions.
The discussion was with the fourth grade teacher Marly Reyes who has been teaching for six years. She has been teaching the Earth Science integrated with English .She exclaims that she has taught to her students about ecology and with her students they have asked themselves:"What can we do to save the environment? Students came up with different ideas. They wrote argumentative speeches and they tried to educate and convince others to do something about these issues. They have become more conscious about what they can do about reusing and not to litter in the streets, to plant a tree at home even it is just a small plant and one or single tree that they know that they have made the difference and they tired to educate and convince others to do something about these issues. They have become more conscious about what they can do about reusing and not litter

Conclusion

The students came to the conclusion that whatever they do in order to save the earth starts from the educational behavior.

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WHSmith Science Key Stage 2

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ENVIRONMENTAL MANAGEMENT SYSTEMS FOR PORT AREAS

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Abstract: This paper is a report the two main environmental management system (EMS) standards EMAS and ISO 14001 environmental performance indicator for port industry. The European Union (EU) is considered by some to have the most extensive environmental laws of any international organization. Protection of the environment is a well-established policy in the European Union. The environment has become a critical issue in business today. Since the applications of logistics are generally positive for the efficiency of transport systems, it has been suggested that logistics are environmentally friendly. Therefore organizations systematic environmental programs are planned and documented way to manage the case.

Keywords: Environmental management systems, EMAS, ISO 14001

Introduction

Europe constitutes the densest port regions worldwide. It has more than 1200 commercial seaports along the 70,000 km of coastal zone, and over 200 ports in its inland waterways. According to the latest 2011 figures, more than 60,000 merchant ships called at European ports, which represented approximately 3.7 billion tonnes of cargo. Bulk carriers accounted for 70% of it, container ships 18% and Ro–Ro vessels 7%, the rest being other general cargo. A total number of 385 million passengers pass by ports every year and about 1.5 million of workers are employed directly in European ports (EC, 2013).

Environmental Management Systems (EMS) consists of a collection of internal policies, assessments, plans and implementation actions (Coglianese, & Nash, 2001). The ISO 14000 series of standards or the International Standard for Environment was released in September 1996 and comprises of two main parts: (i) specification with guidance for use and (ii) general guidelines or principles, systems and supporting techniques (Zutshi & Sohal, 2004). The reactive (or traditional) safety management approach is useful when dealing with technological failures, or unusual events (ICAO, 2013). An environmental management system helps organizations identify, manage, monitor and control their environmental issues in a “holistic” manner (ISO, 2015). The international standard ISO 14001 designed by the private body called International Organization for Standardization (ISO), and the Eco Management and Audit Scheme (EMAS) regulated by the European Regulation EC 1221/2009 (Testa et al., 2014). Port areas are hazardous areas of intense intermodal consideration as all the transport modes coalesce there. In most cases port areas are situated next to urban areas and/or other areas of special environmental attention due to the presence of protected species or even due to recreational purposes. Environmental Management System specifically for ports that can also be used by companies. Port development indicators are also included in operational indicators and they relate to operations carried out at sea, on land or both, be planned and executed with careful consideration of their environmental impacts (Puig, Wooldridge, & Darbra, 2014).

Environmental Management

Environmental management system has become one of the main tools used by companies to handle the environmental aspects and the impacts that their activities have on the environment. The first version of ISO 14001 (Environmental Management System: Requirements with guidance for use), the EMS standard from the International Organization for Standardization (ISO) was launched in 1996 (Lucila M. S. Campos, 2012). The ISO 14000 family of standards provides practical tools for companies and organizations of all kinds looking to manage their environmental responsibilities. Voluntary standards such as ISO 14001 were developed to overcome weaknesses in traditional regulatory instruments (McGuire, 2014). EMAS and ISO 14001. These schemes provide a third-party guarantee of environmental “excellence”, which is able to give an advantaged position (with respect to their competitors) to those organizations that, by adopting EMAS or ISO 14001, commit themselves to improve the environmental performance (Iraldo, Testa, & Frey, 2009). In 1987, the World Commission on the Environment and Development of the United Nations published the report “Our Common Future” in which sustainable development is defined as the principle of “meeting the needs of the present without compromising the ability of

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future generations to meet their own needs" (To & Lee, 2014). ISO 14001 or EMAS, provide benefits on environmental and economic performances (Fresner & Engelhardt, 2004). Effective port environmental management needs to take into account the potential impacts on the environment, mitigating options, methods of prediction, information on environmental indicators and legislation (PPRISM, 2012). The ECOPORTS project also develops tools that will help port administrations to put the recommendations of the 2001 Environmental Review into action (for instance, the Port Environmental Review System (PERS) can be used as a standard for the implementation of these recommendations) (ESPO 2003). In 1974, the European Commission set up a Port Working Group, consisting of port authority representatives from Europe's major ports. Early 1993, the European Sea Ports Organisation was born out of this working group, as an independent lobby for seaport interests (ESPO, 2012). As part of the Environmental Performance Review, the environmental priorities of the sector have been redefined. Priority issues change their ranking with time but certain components retain their significance for the sector (ESPO, 2013).

In 1994, the Europen Sea Ports Organisation (ESPO) published its first Europen Enviromental Code Of Practise. This code was intended to be an expression of the collective commitment of the European port administrations to environmental improvement (Hooydonk, 2006). ISO 14001:2015 specifies the requirements for an environmental management system that an organization can use to enhance its environmental performance (ISO, 2015).

ISO 14001-EMAS

The ISO 14001 is an international environmental standard that specifies requirements related to an EMS to allow the organization to devise its policy and objectives while considering the legal requirements and information concerning significant environmental impacts (L. M. S. Campos, Heizen, Verdinelli, & Miguel, 2015). One of the most widely used voluntary approaches involves the adoption of the certified environmental management system (EMS) called ISO 14001 (Arimura, Darnall, Ganguli, & Katayama, 2016). There are two main reference standards that set requirements for an EMS: the international standard ISO 14001 designed by the private body called International Organization for Standardization (ISO), and the Eco Management and Audit Scheme (EMAS) regulated by the European Regulation EC 1221/2009 (Testa et al., 2014). The first step aims at testing if EMAS and, more in general, an Environmental Management System, are really able to produce an improvement in environmental performance as perceived by the organization. The second step aims at investigating if and how this performance, especially when strengthened by a third-party registration such as EMAS, can really give an organization better position on the four most important competitive leverages: innovation, marketing, productivity and intangible assets (Fig. 1) (Iraldo et al., 2009).

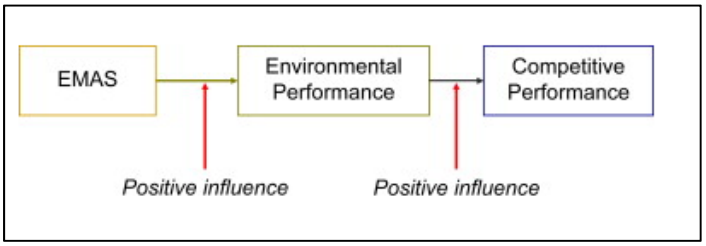

Figure1. The conceptual framework.

The Self Diagnosis Method

The Self Diagnosis Method (SDM) is designed to support port managers in their efforts to regularly review the environmental management performance in their port. The diagnosis generated through this analysis can determine both the enabling factors and the barriers to the implementation of effective environmental management systems (Romero, Asmus, Milanelli, Buruaem, & Abessa, 2014). The SDM should be a practical first step towards meeting ISO 14001 and/or EMAS. The presence of important ISO 14001 and EMAS requirements has been reviewed. The structure of the new version of the SDM is practically parallel to the order of the standard ISO 14001 (Table 1) (Darbra, Ronza, Casal, Stojanovic, & Wooldridge, 2004).

Table 1. Relationship between the structure of the SDM and ISO 14001.

SDM section	ISO 14001 section

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1. A. Environmental policy document	4.2
1. B. Environmental policy scope	4.2
1. C. Environmental regulations and port activities	4.3.1, 4.3.2
1. D. Objectives and targets	4.3.3
1. E. Resources and budget	4.4.1
2. A. Responsibilities of the environmental management representative	4.4.1
2. B. Responsibilities of key personnel	4.4.1
2. C. Individual environmental responsibilities	4.4.1
3. Environmental training	4.4.2
4. A. Internal communication	4.4.3a
4. B. External communication	4.4.3b
5. A. Management programs and action plans	4.3.4
5. B. Standard operating procedures and working instructions	4.4.6
5. C. Environmental management manual	4.4.4
5. D. Environmental documentation management	4.4.4, 4.4.5
6. Emergency planning	4.4.7
7. A. Environmental monitoring	4.5.1–4.5.3
7. B. Monitoring of management program	4.5.1–4.5.3
8. A. Environmental audit	4.5.4
8. B. Review	4.6

Results and Discussion

The first remark to be made is that all the priorities of the 2013 top-10 remain in the top-10 of 2016. There are just some variations in the ordering of the priority items. The relationship with the local community, port development and water quality primarily appear to be gaining importance. On the other hand, the handling of port waste, and dredging appear to move down the top-10 scale. Air quality remains the number one priority of the European ports, as in 2013. This is fully in line with the maintenance of air quality as a top priority also of the EU policy agenda and the various ongoing policy initiatives that include the implementation of the Sulphur Directive and the ongoing political process on the air quality package. Energy consumption becomes the second priority issue of the European ports. Since 2009, the importance of energy consumption has raised year over year as. One of the reasons for this increase is, of course, the direct link between energy consumption, and the carbon footprint of the ports and Climate Change. Noise is the third concern by priority and its importance has also grown smoothly since 2004. The relationship with local community climbs at the number four of priorities as the ports grant their license to operate and to grow from their local communities. Another interesting fact is that there are three issues that have appeared consistently in the priority list of the port sector over the last 20 years, although they are not in the top positions of the table 2. These issues are port development (land), dredging operations and dust (ESPO, 2016).

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Table 2. Top 10 environmental priorities of the European port sector over time.

	1996	2004	2009	2013	2016
1	Port Development (water)	Garbage / Port waste	Noise	Air quality	Air quality
2	Water quality	Dredging: operations	Air quality	Garbage/ Port waste	Energy Consumption
3	Dredging disposal	Dredging disposal	Garbage / Port waste	Energy Consumption	Noise
4	Dredging: operations	Dust	Dredging: operations	Noise	Relationship with local community
5	Dust	Noise	Dredging: disposal	Ship waste	Garbage/ Port waste
6	Port Development (land)	Air quality	Relationship with local community	Relationship with local community	Ship waste
7	Contaminated land	Hazardous cargo	Energy consumption	Dredging: operations	Port development (land related)
8	Habitat loss / degradation	Bunkering	Dust	Dust	Water quality
9	Traffic volume	Port Development (land)	Port Development (water)	Port development (land)	Dust
10	Industrial effluent	Ship discharge (bilge)	Port Development (land)	Water quality	Dredging: operations

A set of 10 key management indicators has been developed for this purpose in cooperation between ESPO, EcoPorts and PORTOPIA. These have also been monitored back in 2013 and the 2016 review comes to update the figures and to show their evolution. Table 3 below shows the percentage of positive responses to each of these 10 indicators in the review of 2013 and 2016, so that the variations over time are demonstrated Clear positive trends can be demonstrated over time for the majority (7/10) of the selected indicators while one stays stable and 2 decline. The rise in the percentage of ports that are certified by a recognised Environmental Management System (EMS), such as ISO 14001, PERS and/or EMAS, from 54 to 70 % between 2013 and 2016 is particularly impressive. On the other hand the results show an 11 % decrease in the percentage of ports that have an environmental training programme for their employees and this clearly requires further investigation by ESPO. The results demonstrate that the big majority of European ports have implemented an Environmental Policy (92 %), maintain actual inventories of applicable environmental legislation (90%) and of their significant environmental aspects (89%), define objectives and targets for environmental improvement (89%), have documented environmental responsibilities of key personnel (85%) and monitor their environmental impact (82%). The trends are also positive on communicating efforts with 2 out of 3 of the respondent ports producing a publically available environmental report on a regular basis. The table 4 below shows the Environmental Management Index of European ports in 2013 and in 2016 respectively. The evolution confirms the positive trends identified. (ESPO/EcoPorts, 2016).

As stated above, the overall improvement over time of European ports in environmental management is well demonstrated by the increase in the percentage of ports that achieve certification under one or more of the established environmental management systems (EMS). A total of 64 ports out of the 91 that contributed to the review are EMS certified, being 46 of 5 them under ISO 14001, 5 under EMAS and 26 under the EcoPorts Port Environmental Review System (PERS) as shown in the following figure 2. Some ports are certified under more than one system (ESPO/EcoPorts, 2016).

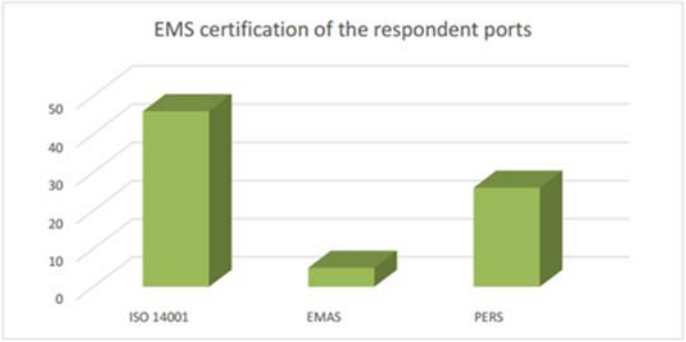

Figure 2. EMS certification of the respondent ports

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Table 3. Percentages of positive answers and 2013-2016 variations on key environmental management indicators

	Key Environmental Management Indicators	2013 (%)	2016 (%)	Changes 2013-2016
A	Certified Environmental Management System (EMS)	54	70	+16
B	Existence of an Environmental Policy	90	92	+2
C	Environmental Policy making reference to ESPO's policy documents	38	34	-4
D	Existence of an inventory of relevant environmental legislation	90	90	-
E	Existence of an inventory of Significant Environmental Aspects	84	89	+5
F	Definition of objectives and targets for environmental improvement	84	89	+5
G	Existence of an environmental training program for port employees	66	55	-11
H	Existence of an environmental monitoring program	79	82	+3
I	Documented environmental responsibilities of key personnel	71	85	+14
J	Publicly available environmental report	62	66	+4

Tablo 4. Environmental Management Index 2013 - 2016

	2013	2016
Environmental Management Index	7.25	7.72

The products currently provided by ECOPORTS gradually lead to the level required to attain ISO 14001 or EMAS certification (Fig. 3), although all of them may also be considered as tools that stand on their own.(Darbra et al., 2004).

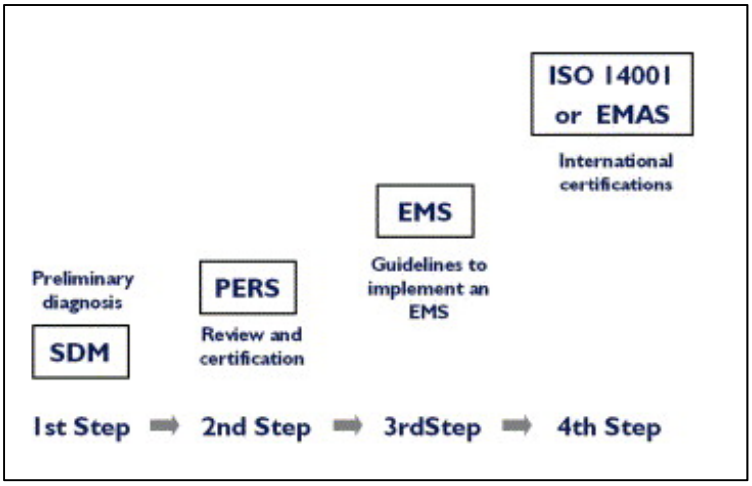

Figure 3. Diagram showing the relationship between the ECOPORTS tools and the international standards.

Conclusion

The vital importance of the ports industry for EU trade is demonstrated by the statistics: the maritime sector is responsible for over two thirds (70%) of all trade between the Community and the rest of the world, as well as 41% of goods traffic within the Community (Short Sea Shipping). Ports are the gateway for the movement of millions of passengers each year and a wide range of goods (including vehicles, fresh food, steel, timber, building materials, machinery and manufactured goods) and raw materials (oil, petroleum, chemicals, ores, grain and animal feedstuffs) which are needed to fuel the European Union's economy (ESPO, 2004). The EC PORTOPIA project has gained data and insight on Environmental Performance Indicators for inland ports (Seguí, Puig, Quintieri, Wooldridge, & Darbra, 2016).

A sustainable port is one in which the port authority together with port users, proactively and responsibly develops

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and operates, based on an economic green growth strategy, on the working with nature philosophy and on stakeholder anticipation, starting from a long term vision on the area in which it is located and from its privileged position within the logistic chain, thus assuring development that anticipates on the needs of future generations, for their own benefit and the prosperity of the region that it serves (Vellinga, 2013). Among various motivations for green activities, the rise of environmental awareness can be critical to the development of a firm's green strategies (Luan, Tien, & Chen, 2016).

Maritime ports, especially those connected with or situated far inland in estuaries connected with navigable inland waterways and railways, can also play a significant role in reducing CO_2 emissions, but will also have to face the effects of climate change (EC, 2011). International Maritime Organization (IMO) has recognized that provision of reception facilities is crucial for effective MARPOL implementation, and the Marine Environment Protection Committee (MEPC) has strongly encouraged Member States, particularly those Parties to MARPOL as port States, to fulfil their treaty obligations on providing adequate reception facilities. MARPOL Annex VI, first adopted in 1997, limits the main air pollutants contained in ships exhaust gas, including sulphur oxides (SO_X) and nitrous oxides (NO_X), and prohibits deliberate emissions of ozone depleting substances (IMO, 2011).

Implementing ISO 14001can be time-consuming and incur some initial costs but the benefits outweigh the expense (Davies, 2005). Future research should deeply measure how certified organizations implement the requirements included in the environmental management system standards such as EMAS and ISO 14001.

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EVALUATION OF ARASTAS AND BAZAARS OF OTTOMAN CITIES WITHIN THE CONTEXT OF CONSTRUCTION MATERIALS AND ARCHITECTURAL TYPOLOGIES

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Abstract

In Anatolian cities of the Ottoman period, such as the inns, bedestens (covered bazaars), arastas, bazaars, grand bazaars and stores formed the commercial centers. These commercial structures with different functions were the main components forming the fabric of the commercial districts. These commercial centers also contained major public buildings, such as mosques and baths. Depending on the size of a city or town, the number of these structures could vary greatly. All of the buildings located in the center were important facilities, contributing economic, social and distinctive features to an Anatolian city or town. In this study, the "Arasta" and "Bazaar" in historical cities located on the axes of important trade routes in Anatolia were investigated. In addition, the conceptual and architectural differences of arastas and bazaars from inns and bedestens, which are major commercial structures, were investigated. The structures were selected from the cities of İstanbul, Bursa, Edirne, Hatay, and Konya, which were located on the important trade routes of the time. Especially, construction and material techniques, plan and façade typologies of these structures, built in the 15th and 16th centuries, were evaluated, as were the common and distinctive features of the various cities.

Keywords: Historic Commercial Buildings, Arasta, Ottoman Bazaar, Bazaar, Grand Bazaar, Long Bazaar

Introduction

In the Ottoman cities, commercial buildings were not separated from religious buildings. During the process of establishing commercial districts, religious and cultural buildings, such as mosques and madrasas, were constructed within the same urban texture as commercial buildings, such as inns, bedestens, and baths. The commercial organization became prevalent as trade developed over time, and streets consisting of buildings involved in similar businesses were formed in the commercial districts. In these streets, bazaars and small shops that were run by a variety of professional groups were aligned in rows. From the center of the commercial area to the outer castle walls, the buildings for various occupations were arranged in an orderly manner. Workshops such as tanneries, felting shops, dyehouses, smithies, boiler smiths, and tinner shops were located in the outer ring of the commercial district. In the commercial districts, it is seen that the production areas of commercial goods were planned close to the commercial buildings where these goods were sold. This orderly arrangement led to workplaces being located in the streets extending from the center to the castle, and even to the emergence of "long bazaars," which were often seen in the Ottoman cities (Kuban, 1968; Can, 1995; Şahinalp&Günal, 2012;Akar, 2009; Saoud, 2002; Erzen, 1991; Kuban, 1968; Günal&Şahinalp, 2012). The Ottoman-era arastas and bazaars show interesting features in terms of their inner-city locations and architectural properties. These structures, referred to by different names, will be evaluated in the same category because all of them have a similar architectural scheme. In this study, the "arasta" and "bazaar" structures in the cities located on three major trade axes during the Ottoman period will be studied and compared. The following were selected: the ***Selimiye Arasta (Edirne***), the ***Ali Pasha Bazaar (Edirne)***, the ***Spice Bazaar (İstanbul)***, the ***Suleymaniye Tiryaki Bazaar (İstanbul)***, the ***Havsa Sokullu Mehmed Pasha Arasta (Edirne)***, the ***Ilgın Mustafa Pasha Bazaar (Konya)***, the ***Payas Sokullu Mehmed Pasha Arasta (Hatay)***, the ***Hisar Mosque Bazaar (İzmir)***,and the ***Shadirvan Mosque Bazaar (İzmir)*** **(**Figure 1**).**These will be examined and evaluated, especially in terms of their designs and plan schemes. Typological evaluations will be made on the basis of the common and distinctive features of these structures in general (Ataman, 2000; Erdoğan&Kuter, 2010).

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Figure 1.The Arasta and Bazaar Structures located on major trade axes during the Ottoman Period (Yıldırım, 2014).

The 16th Century Commercial Buildings: Arastas and Bazaars

The word "arasta" means a bazaar, military bazaar, or mobile bazaar established in the military area where similar types of goods are sold. The structure of an arasta consists of shops arranged on opposite sides; sometimes it has an open top, or is covered with a vault in the center. The structure can be also built as a part of a külliye (a complex of buildings) (Hasol, 1995;Özdeş, 1998:7). In the definition of Sözen and Tanyeli (1986), an "arasta" is "a type of structure with an open or covered top in the Ottoman architecture, where a series of shops is located on an axis, sometimes side by side or sometimes on opposite sides"(Kuban, 2009). The word "bazaar" is derived from the root of the Persian term "Cıhar-Suk," which means "four streets." The bazaar structures are described as areas with open or covered tops, surrounded by shops on both sides, suitable for shopping (Özdeş, 1998:7). However, a bazaar can also be defined as a region which has a bedesten (covered bazaar) in the center and is surrounded by shops of different groups of tradesmen, workshops, an inn, a bath-house, a soup kitchen, a mosque, and a hospital (İnalcık, 1997:120). According to this definition, a bazaar can be described as a region with a commercial focus, in which people living in and around the city meet their social and economic needs and public and business areas are included (Kejanlı, 2010; Dumont &Georgeon, 1999; Faroqhi, 2000).



Figure 2. Shops in the Spice Bazaar, İstanbul (www.misircarsisi.org)



Figure 3. The Suleymaniye Tiryaki Bazaar (http://www.discoverislamicart.org/)

Evaluation of Arastas and Bazaars within the Context of Construction Materials and Architectural Typologies

In many cities of Anatolia, arasta and bazaar buildings attract attention with their substantial masonry masses extending in a longitudinal direction, containing wooden shops in the center of the commercial area. These buildings were built with a stone masonry wall construction system. The tops of these buildings, which were generally built in a single-storey and lengthwise rectangular plan, are closed and the roofs are covered with lead. Some bazaars were located beneath mosques and sometimes designed with an open top, in such a way as to face a street or a passage. By building shops around the shops located on the outer ring, the commercial streets were emphasized. Some bazaars and arastas, on the other hand, were built in the form of a complex and the two main walls of the building were built adjacent to the structures.

According to the location of the building, entrance gates are usually seen on two sides. These gates can be flashy, high, and with gem embellishments. In general, it is seen that the arasta and bazaar gates are sometimes made of iron, and sometimes of wood with ornaments (Cezar, 1985; Yenen, 1987; İntepe, 2005).

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Figure 4. The Sokullu Mehmed Pasha Caravanserai, Inn and Arasta; Hatay Payas (http://www.hatay.bel.tr/)

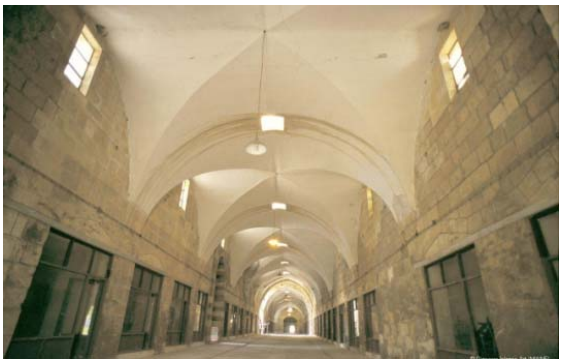

Figure 5. The cross-vaulted interior corridor of the arasta (http://www.discoverislamicart.org/)

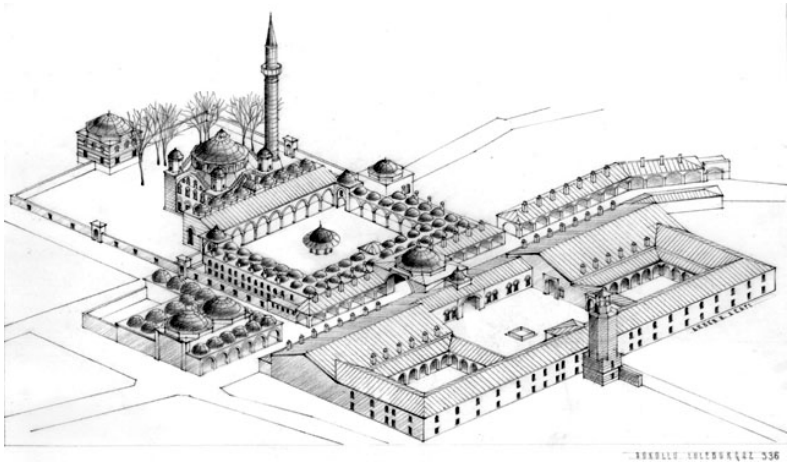

Figure 6.The Lüle Burgaz Sokullu Mehmed Pasha Caravanserai, Inn and Arasta (http://luleburgaz.blogcu.com)



Figure 7.The Ilgın Lala Mustafa Pasha Complex; Ilgın Konya (Genç, 2015)

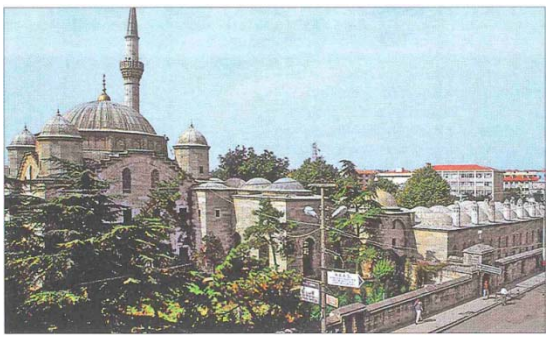

Figure 8. The Sokullu Mehmed Pasha Complex (Islam Encyclopedia, 2009)

Most of the arastas and bazaars that are regarded as dating from the 16th century were built by Sinan, the Architect, and the Sultan's society of architects. Moreover, the distinctive features of these buildings are largely similar due to the facilities of the era and the available construction materials. In the plan schemes of the arastas and bazaars, no development over time is seen. However, it can be said that the cities' needs, depending on their size, had an impact on the size of the plan schemes of these buildings.

As it can be seen in Table 1, in general, the arastas and bazaars of the middle or the end of the 16th century can be separated into two types according to their designs and plans, in order to avoid any conceptual confusion.

- **Type 1. Open-top bazaars and arastas with shops facing the street or passage**

These can be described as bazaars which were built on the ground floor, consisting of a single row of shops facing the street or passage. Sometimes the ground floor of a mosque was planned to be completely filled with bazaar stores. The Tiryaki bazaar in Suleymaniye İstanbul (Figure 2) and the Shadirvan Bazaar (Figure 9.) Hisar Bazaar in İzmir (Figure 10), , can be given as examples of this type of bazaar (Ersoy, 1991; Atay, 1999; Beyru, 1973).

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Figure 9. Hisar Mosque and Bazaar in Kemeraltı İzmir



Figure 10. The Shadirvan Mosque, Kemeraltı İzmir (Canbalaban, 2006)

In some parts of The Sokullu Mehmed Pasha Complex (Lüleburgaz, Figure 11), the Sokullu Mehmed Pasha Bazaar (Havsa, Edirne, Figure 8) and the Lala Mustafa Pasha Bazaar (Ilgın, Konya, Figure 7), a plan type is seen where the middle passage was planned with an open top and the shops were designed in opposing longitudinal rows. There is a prayer dome in the center of the sections of these types of structures that are called "arastas" or "bazaars." The prayer dome is a space that is erected with walls, under which one can pass through arches and with a dome in the center. It connects two spaces together (Ramazanoğlu, 2008). The shops in these structures each have an area of approximately 20 m^2 or more. The middle passage corridor is about 8–9 meters wide in these structures.



Fig. 11.The Lüleburgaz Sokullu Mehmed Pasha Complex, the Prayer Dome and the Shops (http://mimariforum.com)



Fig. 12. Ali Paşa Bazaar, Edirne (http://wikimapia.org/)



Fig. 13.Selimiye Arastas, Edirne (http://www.kadimdostlar.com/)

Type 2. Covered bazaars and arastas with shops facing the corridor (longitudinal rectangular, L- or T-planned)

This type consists of rows of shops aligned on both sides of a corridor with a covered top. The Ali Pasha Bazaar (Edirne) (Figure 12), the Selimiye Arasta (Edirne) (Figure 13), the Spice Bazaar (İstanbul), (Figure 2) the Sokullu Mehmed Pasha Arasta (Payas, Hatay) (Figure 4 and Figure 5), and the Lala Mustafa Pasha Bazaar (Ilgın, Konya) (Figure 7) are examples of this type.

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There is a prayer dome in the center of the Sokullu Mehmed Pasha Arasta (Payas, Hatay), but there is also a central passage/corridor covered with cross-vaults in this structure. This type of central corridor with a covered top can be compared to the Sokullu Mehmed Pasha Complex (Lüleburgaz) or the demolished Sokullu Mehmed Pasha Complex (Havsa, Edirne) (Ramazanoğlu, 2008). The size of the shops in these structures is approximately between 10–20 m^2. There are no external shops. While the roofs of the shops are low, the roof of the central corridor is cross-vaulted and high. On the walls that result from the difference in height between the shops and the central corridor, windows were cut and illumination of the central corridor was achieved. The central passage corridor in these structures is approximately 6 meters wide. In some structures, those buildings that were built as simple bedestens (covered bazaars) containing shops may also be called “arastas” or “bazaars.” In this study, these types of structures were considered bedestens, and were not included in the typology of arastas or bazaars (Pakalın,1983).

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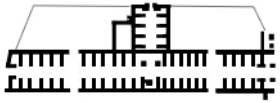
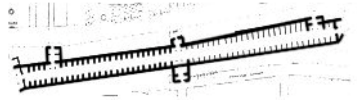
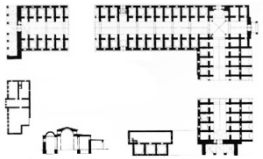
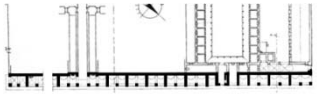
	Building Name and Location	**Year of Construction / Commissioned by and Built by**	**Plan type and Architectural Distinctive Features**	**Material and Buildings**	**Internal/ External Shops and Corridor width (approx.)**	**Plan scheme** (Özdeş, 1998).
Building 1	The Selimiye Arasta Edirne (Located on the İstanbul-Aleppo-Damascus-Hejaz way)	Commissioned by Murad III and built by Davud Agha the Architect (Özdeş, 1998).	T-plan type, single-row shops.	Stone /Brick Masonry System	Internal shops are 16–20 m^2 No external shops, Corridor is 6m.	
Building 2	The Ali Pasha Bazaar Edirne	1569/ Commissioned by Murad III and built by Sinan the Architect (Özdeş, 1998).	There are longitudinal, single-row shops on either side.	Stone / Brick Masonry System	Internal shops are 10–20 m^2 No external shops, Corridor is 6m.	
Building 3	The Spice Bazaar İstanbul	1660/ Commissioned by Sultan Turhan and built by Kasım Agha (Özdeş, 1998).	There are single-row shops on either side in an L-plan type. There is a dome at the intersection point of the vaults in the center.	Stone / Brick Masonry System	Internal shops are 20 m^2, No external shops, Corridor is6m.	
Building 4	The Suleymaniyah Tiryaki Bazaar İstanbul	Built by Sinan the Architect in the years 1550–1557(Özdeş, 1998).	Single-row shops face the street.(Shops downstairs, madrasa upstairs above the shops)	Stone / Masonry System	No internal shops, External shops are 20 m^2, No Corridor	

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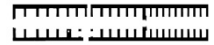
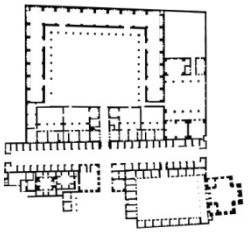
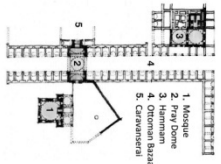
Building 5	The Ilgın Mustafa Pasha Bazaar Konya	In 1576, it was commissioned by Lala Mustafa Pasha. It is mentioned among the works built by Sinan the Architect. The Arasta is thought to have been built along with the inn in 1584. The Arasta, which consists of two sections, open and closed, was partially restored to its original state by building on the foundations in 1960 (Genç, 2015).	Entirely covering the north of the Complex, the north side of the Arasta faces the main street, its east and west are adjacent to the road, and its south is adjacent to the inn and the soup kitchen. There is a barrel vault roof above the center of the rectangular shops that face each other.	Stone / Brick Masonry System	Internal shops are 16 m^2 No external shops, Corridor is 6 m. .	
Building 6	The Sokullu Mehmed Pasha Arasta Payas/ Hatay (A Menzil Complex located on the İstanbul-Aleppo-Damascus-Hejaz way. There is an arasta in the center of the Complex in the north-south direction)	In 1574, it was commissioned by Selim II and built by Sinan the Architect. In the Complex, buildings for accommodation, such as the caravanserai, soup kitchen, and guest rooms were located to the east of the Arasta, whereas facilities for worship, education, and cleaning purposes, such as the mosque, primary school, madrasa, and bath were located on the west side.	The "Arasta" was built adjacent to the inn structure. The arasta, with anarea of 115 × 15 meters, consists of 48 shops located on opposite sides of a corridor covered with a cross-vault, also including a prayer dome in the center. The roof cover is a hipped roof.	Stone / Brick Masonry System	Internal shops are 10–12 m^2 Corridor is approx.8 meters.	
Structure 7	The Sokullu Mehmed Pasha Complex Havsa/ Edirne	In the years 1576–77, a Complex consisting of mosque, madrasa, arasta, inn, soup kitchen, double bath, lodge, bridge, fountain, and primary school was commissioned by Sokullu Mehmed Pasha. It was built with the cooperation of the Sultan's Society of Architects and Sinan the Architect (Islam Encyclopedia,2009) The parts of the Complex, the mosque, the prayer dome of the arasta, the bath, its alcove wall, prayer-room/lodge, and corner fountain have survived to the present day.	There is a prayer dome in the space into which the doors of the arasta, the mosque, and the inn open. The other parts of the Complex, such as the arasta, inn, soup kitchen, guest rooms, madrasa, bridge, founding and primary school have not reached the present day. As understood from the traces, the arasta included rows of shops on either side. The rectangular-planned arasta provided a structural and functional connection between the building masses. The top of the central corridor was open (IslamEncyclopedia,2009)	Stone / Brick Masonry System	Destroyed, Corridor approx. 9 meters.	

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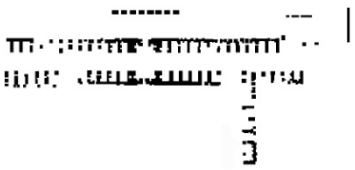
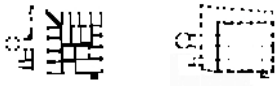
Building 8	The Sokullu Mehmed Pasha Complex and bazaar Lüleburgaz	It is believed that it was commissioned by Sokullu Mehmed Pasha in the years 1559–1570. The design and construction of the complex were carried out by Sinan and the Sultan's Society of Architects, under the sultan's directorship. The historical İstanbul-Edirne-Central Europe road passes through it(Islam Encyclopedia, 2009).	What has survived from the arasta located in the complex are dilapidated shops, whose number has been reduced by half, and the prayer dome. The arasta is adjacent to the north wing of the madrasa, and consists of shops built on both sides of a road extending in an east-west direction. The arasta, consisting of 59 shops built on both sides and a prayer dome, forms the spine of the complex. There are shops lined up in single rows longitudinally. The top of the central corridor is open.	Stone / Brick Masonry System	Shops are mostly destroyed. Internal shops are approx. 10–12 m^2 Corridor is about 8 meters. The corridor is rather wide, as a road passes between the shops.	
Building 9	The Hisar Mosque Bazaar İzmir	It is written in some sources that it was transformed from a Latin Church, and that this was done by Aydınoğlu Özdemiroğlu (Molla) Yakup Beyin 1597–1598. The same sources also state that this transformed mosque was demolished by Timur in 1402. (http://www.izmirkulturturizm.gov.tr/). According to an inscription on the gate of the mosque, it was repaired in H.1298 (1881) (Özdeş, 1998).	There are shops in rows added next to the mosque. The shops of the bazaar are open to the streets and the courtyard surrounding the mosque.	Cut-rubble stone Masonry System	There are shops of various sizes.	
Building 10	The Shadirvan Mosque Bazaar İzmir	This mosque, which is located on the Old Inner Harbor shore inside the Historical İzmir Kemeraltı Bazaar, took its name from the eight-columned shadirvan beside and under it. Therefore, it is referred to as the Shadirvan Mosque and Bazaar. It was built in 1636 and restored in 1815 (Özdeş, 1998).	There are shops under the mosque. The shops located on the ground floor face the streets and the passage around the mosque.	Cut-rubble stone Masonry System	There are shops of various sizes.	

Table 1. Systematic evaluation of building materials and typologies of Arastas and Bazaars

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Discussions and Results

Arastas and the bazaars, located in the Ottoman trade routes, have been built in the 17th and 16th centuries. 10 important structure of them, located in this trade route and examine the scope of the this research, contribution of the architecture of Arastas and bazaars.

When examining the plan schemes of arastas and covered bazaars in, it is seen that single-row shops face each other on either side. There is a high vault above the central corridor, which usually extends longitudinally. There may be a dome in the midpoint of the longitudinally extending corridor, or at the intersection of the corridors. These domes functioned as prayer dome in some arastas.

For example, it is seen that some buildings, such as the Spice Bazaar (İstanbul), the Selimiye Bazaar (Edirne),and the Tokat Bazaar, were planned with a central dome over the central aisle. There is, again, a prayer dome at the center of the Sokullu Mehmed Pasha arastas (Lüleburgaz, Edirne, Hatay).

The sizes of the shops that are located on opposite sides, as required by plan schemes in arastas, bazaars, and covered bazaars, vary between 10 and 20 m^2.For example, while the widths of the shops in the Niğde Covered Bazaar range between 2 and 2.5 m, the widths of the shops are 3.75 m in the Ali Pasha Bazaar (Edirne) by Sinan, and 3 m in the Payas Covered Bazaar. When we look at the Edirne arasta, it is seen that the façades of the shops vary between 3 and 4m in width. The internal shops face the corridor. External shops are not included in most arastas. The width of the corridors is usually 6 meters wide. The shops are closed, with arched doorways. In some arastas and bazaars, there may be divisions for sales stands without any doors. The cross-vault or the dome can be seen from each shop individually.

The construction technique in the arastas, bazaars, and covered bazaars, and the commercial structures investigated, is, in general, masonry; the construction material is usually stone and brick, and sometimes only stone. Security concerns dictated the use of this construction technique. Sometimes, since these structures operated as banks and stock bazaars, as in bedestens, and valuable goods were sold, stored and exhibited in these places, the walls of these structures were made relatively thick, and the windows were located quite high and secured with iron grates. When we look at the architectural characteristics and construction techniques of arastas, bazaars, and covered bazaars, it is seen that these structures were built with a one- or two-storey, stone/brick masonry system.

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EVALUATION OF THE EFFECTS OF SOME COMPOUNDS ON DILL CATALASE ACTIVITY

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Catalases (hydrogen peroxide oxidoreductase, EC 1.11.1.6) involve elimination of hydrogen peroxide to water and oxygen widely distributed in nature and found in different organisms such as bacteria, plants, and animals. Plant catalases are involved in anti-oxidative defense system where found in different cellular compartment such as peroxisome, chloroplast and mitochondria. Hydrogen peroxide can easily penetrate though the membrane of organelles in plant cells and cause to the oxidative stress. Catalase can act as an anti-oxidative enzyme to detoxify H2O2. In the present study, catalase enzyme was isolated and characterized from dill (*Anethum graveolens* L.) plant grown in Sakarya, Turkey and the effects of some compounds such as amino acids and metals were investigated on dill catalase activity. The results showed that L-Cysteine, L-Histidine, L-Tyrosine, KCN and some heavy metals such as Pb+2, Hg+2, and Sn+2 had inhibitory effect on dill catalase activity. Zn+2, Mn+2 and Fe+2 metals increased the enzyme activity. The results obtained suggest that these unique properties of the enzyme are important for understanding of the natural function of catalase enzyme in dill plant.
This research was financed by Scientific Research Foundation of Sakarya University, Turkey (Project No.BAP 2016-02-04-026).

Keywords: Anethum graveolens L., Catalase, Dill,

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EVALUATION OF THE ENVIRONMENTAL IMPACTS OF RENEWABLE ENERGY SOURCED ELECTRIC PRODUCTION FOR THE PROVINCE OF SINOP/ TURKEY

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Abstract: This paper is a report on the findings of a study conducted on a graduate level virtual conference summer school course. Discourse analysis techniques were used to examine the resulting transcript of texts for evidence of a democratic discourse within a community of learners. Findings indicate that gender is not masked in the text driven discussions on the Internet. Distinctive discursive styles are often sex class linked. Like face to face or classroom contexts, status is accorded unequally within discourse communities. Participants are not equal and are not equally attended or responded to. Educators need to take a serious and wary approach to accepting claims of ensured democratic participation in computer mediated communication formatted classes.

Keywords: Gendered Voices, Teacher, Virtual Conference

1. Introduction

Demand for energy is increasing day by day in our country and worldwide due to many factors, such as population growth, industrialization, technological progress, more people live in the city (Mann and Teilmann, 2013). From the perspective of our country, our energy production from domestic sources cannot meet the energy that we consume (Yüksel, 2010). In order to get to the level of the industrialized countries in the development process of our country, the need to increase energy production and energy consumption compared to the current situation (Acaroğlu, 2013). In developed countries, there have been made investments at a great rate in renewable energy sources, to meet the energy demand of electricity production and to minimize the damage to the environment (Kenisarina et al. 2006). Adding essence and affordable, environment- friendly alternative energy sources to our energy production policy, it is an inevitable necessity to reduce our dependence foreign countries (Yüksel and Kaygusuz, 2011). In addition, national and international legal and statutory contracts are also supportive of this orientation (Anonim1, 2016). It makes attractive alternative energy sources that they are unlimited, renewable and not cause environmental pollution. As a result of these developments in the energy sector in our country, a large number of theoretical and practical studies have been made on environmentally friendly energy sources (Akdağ and Güler 2010). Wind energy is the energy source that in the focus of this studies (İlkiliç, 2012). Wind energy stands out in terms of more economical, easy installation and operation of power plants when compared with other forms of energy (Güler, 2009). Researchers have done a lot of work for the regions where they thought it was the wind potential in sub-issues such as, cost, environmental impacts and site selection (Özgener, 2010). In our country, with increase of the support in the wind energy field of, increasing numbers of new wind power plants have been established every day without huge installed power capacities. In Turkey, annual production capacity of wind energy is 11 552 GWh at the end of 2015. The installed capacity of wind power plants in operation by the end of the year 2015 4.503 MW (Anonim2, 2016).

In this study it was analyzed and evaluated of the possible environmental impact of a wind energy power generation system with taking into account recent data that may be established in Sinop.

2. Evaluating The Environmental Impact Of The Wind Energy Plant For Sinop City

2.1 Electric Energy Production and Consumption in Sinop

Altınkaya, First Energy, Boyabat, Erfelek and Ayancık HPP plants provide the electricity for Sinop. Installed capacity of these HPPs except for Altınkaya HPP is 543 MW. Annual electricity production of these plants is 872 GW (Anonim3, 2016). Electricity distribution in the region is executed by a privileged company called Yesilirmak Electricity Distribution Co. (YEDAS). As seen in Table 1, electricity energy consumption in Turkey is increasing every year.

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Table 1. Electric Energy Consumption in Turkey (2010-2014) (Anonim4, 2016).

Year	Government	Industrial	Commercial	Household	Illumination	Other	Total (GWh)
2010	4,1	46,1	16,1	24,1	2,2	7,4	172.051
2011	3,9	47,3	16,4	23,8	2,1	6,5	186.100
2012	4,5	47,4	16,3	23,3	2,0	6,5	194.923
2013	4,1	47,1	18,9	22,7	1,9	5,3	198.045
2014	3,9	47,2	19,2	22,3	1,9	5,5	207.375

When Table 2 is examined, the consumption of electric energy in Sinop has been increasing every year as much as in Turkey general.

Table 2. Electric Energy Consumption in Sinop (2010-2014) (Anonim4, 2016).

Year	2010	2011	2012	2013	2014
Net Consumption (MWh)					
Household	106.853	119.894	127.491	128.209	136.943
Commercial and Public Services	65.414	71.266	73.438	78.980	94.977
Industrial	84.461	105.494	83.722	77.167	71.727
Agricultural Irrigation	605	1.293	1.269	1.732	1.894
Other	11.058	21.404	21.164	19.925	22.482
Total (MWh)	268.391	319.351	307.083	306.013	328.022
Number of Subscribers					
	133.231	135.808	140.564	144.845	149.699
Loss-Theft Rate (%)					
	14,9	11,1	9,7	8,4	7,5

The total number of subscribers was 154 225 in Sinop in 2015. The total power consumption was 339.499.562 kWh. Sold energy was 312.784.282 kWh (Anonim5, 2016). According to these data, theft-loss rate was 7.87% in Sinop.

2.2. Wind Energy in Sinop

Sinop is a city established in Mid- Black Sea region in north Anatolia at the narrowest part of Boztepe peninsula. Its location serves as a transition zone of between the West and the East of Black Sea region. The city is situated between 41.2 to 43.5 34.5 to 35.5 meridians and parallels. The city has a total border of 475 kilometers with 300 kilometers inland border and 175 kilometers marine border (Anonim6, 2016). Sinop is a city in the Central Black Sea Region with an average height of approximately 200 m. The height of the Küre Mountains, located behind the coast, is above 1500 meters. Seasonal temperature difference is not high in Sinop. The long term average temperature in the coastal towns of Sinop is 13-15◦C and 12◦-14◦C in the inland towns. Main wind direction is northwest (mistral) and the long term average wind speed is 3,5 m / sec. In inner parts, the dominant wind direction is west and the wind blows softer than the coastal winds with an average of 1.0m / s to 2.0 m / s . The population of Sinop is 204 133 (Anonim6, 2016). In Table 3, Sinop wind intensity and speed at a height of 50 meters have been shown. In addition, the total power capacity of the wind power plant that may be installed has been given. For an economic wind power plant (WPP) investment, a wind speed of 7 m / s or more is required. As seen in Table 3, dominant wind speed is between 6.8 and 7.5 m / s in Sinop; thus, it can be argued that it would be an economic investment

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Table 3. Wind Power Plant Power Capacity that may be installed in Sinop (Anonim8, 2013).

50 m Wind Power (W/m^2)	50 m Wind Speed (m/s)	Total Area (km^2)	Total Power Capasity (MW)
300-400	6,8- 7,5	289,63	1.448.16
400-500	7,5- 8,1	8,59	42,96
500-600	8,1- 8,6	0,00	0,00
600-800	8,6-9,5	0,00	0,00
> 800	> 9,5	0,00	0,00
		298,22	1.491.12

2.3. Environmental Impact Assessment (EIA)

It is important to have an understanding of environmental issues in order to suggest solutions for these problems. Environmental impact assessment reports may suggest ideas on how to suggest solutions for environmental issues. These reports determine the possible positive and negative effects of environment-related plans and projects. EIA reports benefit from the studies on evaluation and supervision methods and measures to be taken so that environmental damage will be minimized (Anonim9, 2016). The power plants are used to produce electricity energy through energy conversion. In this conversion process, these power plants can have both positive and negative effects on environment. Wind power plants have positive aspects such as not polluting the air. Attention should be paid to location selection, field conditions, noise sequence, visual pollution and impacts on bird mortality in the wind power plants planning process.

2.3.1. Air Pollution Concerns

Industrialization, increasing number of motor vehicles, urban life and many other factors lead to increased air pollution. Moreover, in Turkey, coal-based thermal power plants operate on high sulphur brown coal. They are constructed via old-fashioned techniques. The absence of filter system or efficiency causes problematic sulphur dioxide (SO_2) emissions. These facilities are considered high level pollutants in power generation facilities category. Therefore, there are specific emission limit values decreed by environmental legislations (Yüksel and Sandalcı, 2011). In Table 4, the limit values by the International Air Quality Index have been given. This table is categorized according to airborne pollution levels in different colours. For example purple colour illustrates that there is a health emergency status and that this status is more likely to affect the entire population.

Air Quality Index (AQI) Values	Levels of Health Concern	Colors
When the AQI is in this range:	*..air quality conditions are:*	*...as symbolized by this color:*
0 to 50	Good	Green
51 to 100	Moderate	Yellow
101 to 150	Unhealthy for Sensitive Groups	Orange
151 to 200	Unhealthy	Red
201 to 300	Very Unhealthy	Purple
301 to 500	Hazardous	Maroon

Table 4. EPA (Environmental Protection Agency), International Air Quality Index (Anonim10, 2016).

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Air Quality Index Levels of Health Concern	Numerical Value	Meaning
Good	0 to 50	Air quality is considered satisfactory, and air pollution poses little or no risk.
Moderate	51 to 100	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.
Unhealthy for Sensitive Groups	101 to 150	Members of sensitive groups may experience health effects. The general public is not likely to be affected.
Unhealthy	151 to 200	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.
Very Unhealthy	201 to 300	Health warnings of emergency conditions. The entire population is more likely to be affected.
Hazardous	301 to 500	Health alert: everyone may experience more serious health effects.

Table 4. EPA (Environmental Protection Agency), International Air Quality Index (Anonim10, 2016).

Air pollution reduces the quality of life by affecting human health directly or indirectly. There is an air quality monitoring station in the central town of Sinop. At the station, PM_{10}, $S0_2$, relative humidity, relative temperature, wind direction and speed, air pressure values are measured regularly. In Figure 1, airborne pollutants PM_{10} and SO_2 values from the previous year in Sinop are provided. Natural gas is not available in Sinop yet. Coal is used for heating. Therefore, air pollution in winter has usually been observed to increase due to coal use for heating.

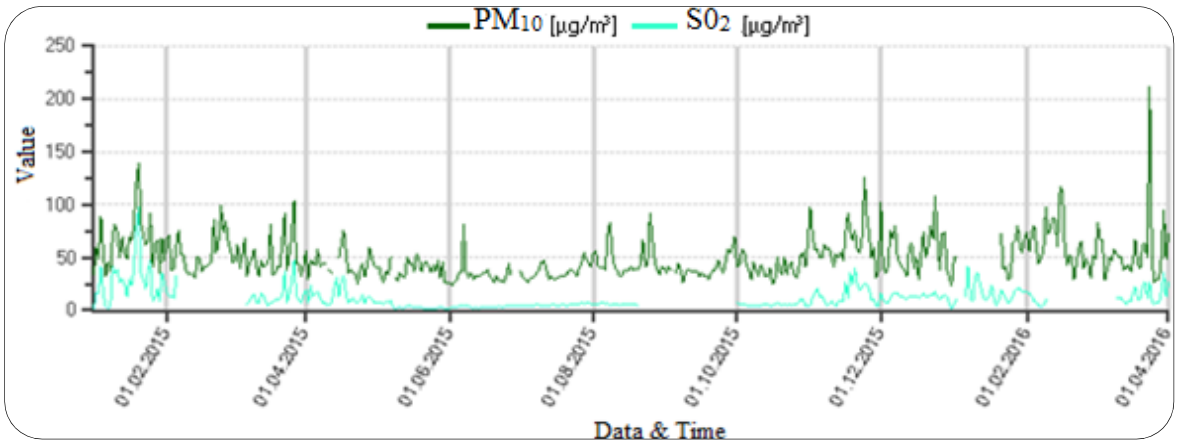

Figure 1. 2015 Air Quality Measurement Station Locations and Measured Parameters in Sinop (Anonim11, 2016).

Wind energy is one of the renewable energy sources and has a positive impact on the environment. Wind turbines are extremely important for reducing CO2 emissions. In table 5, it is shown that the harmful gas emissions into the atmosphere from wind energy production can be prevented by using 1 kW of energy.

Table 5. Prevention of emissions by 1kW wind power generation (Anonim11, 2016).

Emission Type	Quantity(gr)
Carbon dioxide (CO2)	0,7
Sulfur dioxide (SO2)	7,1
Nitrogen dioxide (NOx)	2,8
Carbon monoxide (CO2)	0,9

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For example, wind power plant's contribution to the reduction of 1 MW carbon dioxide emissions has been calculated considering the wind data from Sinop province. As a result, it is seen that 1 MW Suzlon S64 / 1000 brand wind turbine produces 2,844,492.38614521 kWh of energy per year. Fossil fuels lead to an emission of 0.7 kg CO2 to produce 1 kWh energy. Therefore, using the above mentioned turbine, approximately 2.8 GWh energy may annually be produced and emission of 2000 tons of CO2 may be prevented. On the other hand, one acre (0.404 acres) forest (plant) clears 5 tons of CO2 from the atmosphere per year. Thus, generating energy with a 1 MW turbine, 400 acre forest (wooded with 152 000 trees) is equivalent with CO2 (2000 tons / 5 (tons / acre) = 400 acre = 162 acres) cleaning job (Özkaya et al.,2008, Özgener, 2002).

2.3.2 Noise Concerns

Noise is a major problem that results from unwanted sounds in their environment. Noise pollution is one of the environmental problems that are caused by factors such as development of technology, rapid population growth, unplanned urbanization and industrialization. There are different opinions about the noise from the wind power plants. Some argue that the quality of life in the city is affected adversely by wind turbines and it is disruptive for human health. Some others state that two types of wind turbine noise occur- mechanical noise and aerodynamic noise- and noise pollution is at a high level (Anicica et al., 2006). Many experimental and theoretical studies have been made in order to minimize the noise (Leea and Leeb 2016). According to the data, the noise level is 45 dB, 250 metres away from of a wind turbine. Insomnia is caused when the noise is beyond this level. Therefore, the distance between wind turbines and residential units should be arranged to be less than 500 m. In addition noise problems can be reduced significantly using insulation materials. Two locations in Sinop are suitable to install a wind power plant. These locations are outside the residential area. Thus, it can be argued that the wind turbine in the province of Sinop do not create a negative environmental impact in terms of noise level (Özkaya et al.,2008).

2.3.3. Bird mortality and Habitat Effects of Wind Turbines

In many countries around the world, projects and policies have been developed to rapidly increase the share of renewable energy sources in energy production in recent years. Wind power plants stand out among the renewable energy sources in the world with its increased production volumes with low costs, easy installation and operation (Dai et al., 2015, Dennis and Leung, 2012). However, the adverse environmental impact has been also increased together with the increase of electricity generation from wind energy. The disadvantages of wind turbines include impact on bird mortality and habitat (McDonald et al. 2009). In many countries around the world and in Turkey, various studies have been carried out in order to eliminate these problems (Larsen et al. 2007). In addition, some studies have been carried out to compare the impact on nature and bird mortality caused by wind energy production and fossil fuel energy production technologies (Sovacool, 2009).

In these studies have shown that the adverse impact on nature caused by wind energy production is significantly less than the adverse impact on nature caused by fossil fuel power plants. Sinop covers an area of 586 200 hectares. 37% of the 217 276 hectares of land is arable except meadows and pastures. Agriculture can be done on a total of 91 865 hectares of this area. The remaining 56% of non-agricultural areas are forested. 6% is settlement area and 1% is pastures and meadows. Available land for agriculture is rugged, very fragmented and 86 % of land is susceptible to water erosion (Anonim7, 2016). Sarıkum zone is located within the area of nature protection in Sinop. It is an area of 785 hectares, 20 kilometres from the city centre. Sarıkum Lake hosts various ecosystems and habitats. It is a convenient place for feeding and wintering for birds. RES map in Figure 2, there is also Sarıkum in areas cannot be established seen by grey colour. Short-term migration of various species of birds are seen every month.

7 m / s wind speed or over is required for an economic WPP investment. As can be seen in Table 3, dominant wind speed is between 6.8 to 7.5 in Sinop, WPP can be said to be an economic investment (Anonim8, 2013). When the wind speed at 50 m height and at the distribution of power are considered, the effect can be seen in the total number km^2 In the framework of this effect is shown in the total number of MW wind power plant can be built. As a result, the idea of wind power plant construction in Sinop is not been considered as a drawback in terms of bird mortality and agricultural areas.

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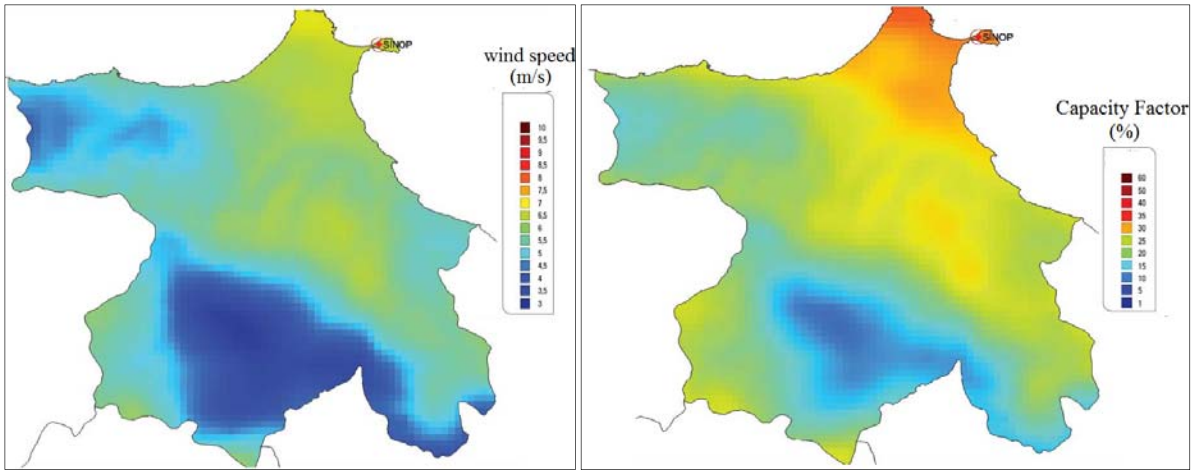

Figure 2. Sinop wind resource information.

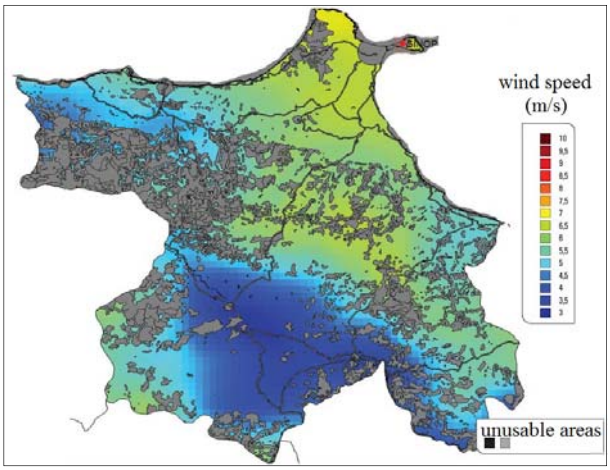

Figure 2. Sinop wind resource information.

Conclusions

Wind energy is a renewable alternative energy source that can meet growing energy needs in the world and in Turkey. Wind energy is indispensable, because it is an environmentally friendly and infinite source of energy that does not release emissions into the atmosphere.

Among the factors that are taken into account for a possible project of a wind power plant in Sinop environmental impact assessment; location selection, space requirements, air pollution, noise effect, impact of turbine presence or absence on habitat, bird migration routes and impact on the natural conservation areas can be listed. This study also provides an environmental impact evaluation for Sinop Province.

A wind speed of 7 m / s or over is required for an economic WPP investment. When the wind atlas prepared for the province of Sinop is examined, it can be assumed that the wind speed in Sinop is at a suitable level that can support an economic WPP investment. Today, any such investment has not been made yet. The region should benefit from this environmentally friendly and renewable energy sources as soon as possible.

Based on wind data from the province of Sinop, the construction of a possible 1 MW wind power plant will contribute 2.8 GWh per year to electricity production. Moreover, the wind power plant will help prevent approximately 2,000 tons of carbon dioxide emission per year.

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In Sinop, air pollution is seen especially in winter due to absence of natural gas heating infrastructure and coal use for heating. In this regard, WPPs are promising because they don't cause air pollution.

The effect of the construction of a possible WPP on migratory birds should not be ignored. Therefore, taking into account WPP numbers of operations and migration time of birds at Sarıkum Lake, which is an important bird migration area in Sinop peninsula, will be helpful in preventing potential losses. It is expected that, if these studies done, harmful effects of WPPs on the environment will be eliminated.

Priority should be given to methods of electricity generation with renewable energy technologies as an alternative to nuclear and thermal power plants being considered to be established in Sinop.

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EVALUATION OF VIRTUAL REALITY APPLICATIONS IN THE FIELD OF SPECIAL EDUCATION

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The term virtual reality represents environments generated in computers with graphical and sound applications. These environments can be a simulation of outside world as well as unreal environments or objects. Virtual reality, which has been discussed in the computer sciences since 1970's, has become more accessible with the advances in technology. Applications are used extensively with desktop computer monitors or accessories strapped to head. Virtual reality has a history of 20 years in the field of special education. These applications can be used in teaching various academic, social and daily skills. In the current study, the aim is a systematic study of special education practices based on virtual reality. In this regard studies with intellectual disability, autism, learning disability, physical disability and hearing disability participant groups are evaluated. Based on the defined keywords, studies which met the criterions were included in the study. Findings were evaluated on the basis of participant characteristics, used virtual reality applications and outputs. A discussion is also presented for specialists, teachers who intend to use these applications.

Keywords: special education, virtual reality, educational technologies

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EXPERIMENTAL AND COMPUTATIONAL STUDIES (DENSITY FUNCTIONAL THEORY) ON 2,5-BIS(1-NAPHTHYL)-1,3,4-OXADIAZOLE MOLECULE

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The theoretical and experimental vibrational spectra of 2,5-bis(1-naphthyl)-1,3,4-oxadiazole molecule were studied. In this study, geometrical optimization and vibrational frequencies of 2,5-bis(1-naphthyl)-1,3,4-oxadiazole was studied by utilizing DFT/B3LYP with 6-311 G(d,p) basis set. The Fourier Transform Infrared (FT-IR / 4000-400 cm^{-1}) spectra of the studied molecule was recorded in solid phase. The electronic properties like the Highest Occupied Molecular Orbital (HOMO) energies, the Lowest Unoccupied Molecular Orbital (LUMO) energies and Molecular Electrostatic Potential (MEP) analysis were reported.

Keywords: FT-IR, DFT, HOMO-LUMO, MEP

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EXPLORING DYNAMICS OF MULTIGRADE TEACHING IN PRIMARY SCHOOLS IN RURAL PAKISTAN

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The study aims to explore the English language teaching strategies practiced by primary school teachers in multi-grade classrooms in rural Pakistan. One teacher schools are common and instruction by necessity often take place in settings with students across two or more different grades being taught by a single teacher. Multi-grade schooling is not accepted as a distinct unit and schools are presumed to be teaching under a mono-grade system, but in reality a number of primary classes are conducted as multigrade. The emphasis of teacher training on mono-grade pedagogies in addition to many of the teachers opting to work in urban areas has created a situation where the alternative to multigrade schooling is no schooling at all. For the purpose of the study the data was collected from two rural multi-grade schools using teacher observations and document analysis. The findings of the study show that the multi-grade teaching does not merely recompense for the inadequate number of teachers in a school, but also makes the teachers' tasks more creative and radical. The thoughtful modification of classroom materials, lesson plans and teaching techniques used by these teachers provides scaffolds to increasing students' language learning achievements. The study also highlights the role of the Education department; in providing appropriate training to the teachers for effective implementation of multigrade teaching approaches in order to raise the quality of teaching and learning at the primary school level.

Keywords: multi-grade schools, teacher training, classroom materials, teaching techniques

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F TİPİ UÇUCU KÜL KULLANILARAK ÜRETİLEN ALKALİ AKTİVE EDİLMİŞ HARÇLARIN YÜKSEK SICAKLIK DİRENÇLERİ

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Özet: Evsel ve endüstriyel atıkların çevreye vermiş olduğu zararları azaltmak ve sürdürülebilir bir çevre koruma sistemi oluşturmak amacıyla tüm dünyada bütün sektörlerde önleyici çalışmalar hız kazanmıştır. Günümüzde çimentoya dayalı sektörlerin çevreye vermiş olduğu zararları azaltmak amacıyla, alternatif bağlayıcı elde etme çalışmaları da devam etmektedir. Uçucu kül ve yüksek fırın cürufu gibi yapısında Al_2SiO_3, SiO_2 ve CaO içeren endüstriyel atıklardan alkali aktivatörler kullanılarak kuvvetli bağlayıcı elde etmek mümkündür. Bu çalışmada, Kütahya Tunçbilek Termik Santrali'nden sağlanan, sepere edilmiş F tipi uçucu kül; ağırlıkça %14 Na içeren, silikat modülü Ms=0,2 olan, $nSiO_2Na_2O$ ve NaOH karışımı aktivatör ile aktive edilmiştir. Su/bağlayıcı oranı % 35 ve bağlayıcı/kum oranı 1/2,5 olacak şekilde optimizasyon yapılmıştır. Tüm karışımlarda standart CEN kumu kullanılarak alkali aktive edilmiş 40mm×40mm×160mm prizma harç numuneler üretilmiştir. Numunelere, 50°C, 60°C, 70°C, 80°C, 90°C ve 100 °C de 48 saat süreyle ısıl işlem uygulanmıştır. Isıl işlemden çıkarılan numuneler, 28 günü tamamlayacak şekilde ±22 °C oda sıcaklığında, havada kür edilmiştir. 28 gün sonunda 2,9 Mpa ile 8,51 MPa arasında değişen eğilme dayanımları, 7,63Mpa ile 50,64 MPa arasında değişen basınç dayanımları tespit edilmiştir. Karşılaştırma numunesi olarak; CEMI 42,5 portland çimentosu ile 1/3 bağlayıcı/kum ve 0,50 su/bağlayıcı içeren harç numuneler hazırlanıp 28 gün standart su küründe bekletilmiştir. Daha sonra tüm numuneler, 200°C, 400°C, 600°C ve 800°C yüksek sıcaklığa maruz bırakılmıştır. Numunelerin sıcaklık öncesi ve sonrası ağırlıkları, ultrases geçiş hızları, eğilme ve basınç dayanımları incelenmiştir. Sonuç olarak, farklı sıcaklıklarda alkali aktive edilmiş harçların yüksek sıcaklık sonundaki eğilme ve basınç dayanımı değerlerinin, çimento bağlayıcılı kontrol numunelerine kıyasla daha yüksek olduğu gözlenmiştir.

GİRİŞ

Çimento, yapı sektörüne girdiği 19. yüzyıldan günümüze kadar, en yaygın, en çok kullanılan bağlayıcı yapı malzemesidir. Hammaddesinin kolay temin edilebilmesi, dayanım ve dayanıklılığı yüksek beton üretimindeki özelliği, üretim sektörünün dünya genelinde yaygınlığı ve ekonomisi, dikkate alındığında çimentonun ilerleyen yıllarda kolay vazgeçilebilecek bir yapı malzemesi olmadığı düşünülmektedir.

2014 yılı itibariyle dünya genelinde çimento üretiminin 4,3 milyar tona ulaştığı belirtilmektedir. 2014 yılı itibariyle Türkiye, 2014 yılı itibariyle yıllık 71,2 milyon ton çimento üretimiyle dünya genelinde 7. sırada yer almaktadır (Cembureau, 2014). Çimento üretiminde 2014 yılı itibariyle, yıllık yaklaşık 320 milyon ton üretimiyle Asya ülkeleri önde gelirken, yıllık yaklaşık 90 milyon ton üretimle Avrupa ülkeleri son sırayı almaktadır. Çimento üretimi sırasında klinker, döner fırınlarda yaklaşık 1450 ºC'de pişirilmektedir. Bu kadar yüksek bir sıcaklığa erişmek için de yüksek miktarda enerjiye ihtiyaç

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duyulmaktadır. Yani çimento üretimi enerjiye bağımlı sektördür. Elektrik ve yakıt olmak üzere, çimento maliyetinin %59,1'ini enerji kalemi oluşturmaktadır (SGM, 2015).

Çimento üretimi sırasında havaya karbondioksit (CO_2) gazı çıkmaktadır. 1 ton çimento üretimi sırasında atmosfere yaklaşık 900 kg CO_2 salınımı gerçekleşmektedir. Dünyada 30 gigametrik ton CO_2 salınımın %5'i, çimento sektöründen kaynaklanmaktadır (Benhelal, 2013). Türkiye'de 2014 yılı çimento üretiminin yaklaşık 69,7 milyon ton olduğu ve önümüzdeki yıllarda bu miktarın artacağı düşünüldüğünde, atmosfere salınan CO_2 ve diğer gazların her geçen gün çevreye vereceği zararın artacağı kaçınılmazdır (SGM, 2015).

Kömürle çalışan termik santrallerde bacadan uzaklaşan ve uçucu kül olarak tanımlananan önemli atık malzeme, yanma nedeniyle baca tarafından çekilen gazlarla birlikte yukarıya sürüklenen çok ince kül parçacıklarıdır. Bu ince kül parçacıkları elektro filtrelerde yakalanmakta, baca gazları ile atmosfere çıkışları önlenmektedir (Ünal, 2004)

Uçucu kül ve yüksek fırın cürufu gibi yapısında Al_2O_3, SiO_2 ve CaO içeren amorf malzemelerden alkali aktivatörler kullanılarak kuvvetli bir bağlayıcı madde üretimi mümkündür. Alüminosilikat uçucu küllerin aktivatörlerle reaksiyonu sonucunda "geopolimer" adı verilen amorf yapıdaki inorganik polimerler oluşurken, yüksek fırın cürufunun reaksiyonu sonucunda kalsiyum silikat hidrat (C-S-H) jeline benzer hidrate kalsiyum silikat oluşmaktadır. Alkali aktivasyonu ile üretilen bağlayıcıların kullanımı, yüksek mekanik performans, düşük enerji giderleri, düşük kirletici gaz salınımları (CO_2, SO_2, NOx vb.) ve çevrenin daha az tahribi gibi avantajlar sunmaktadır. Ayrıca, büyük ölçüde atık malzemelerin kullanımıyla, atıkların çevreye verdiği zararlar ve depolama sorunları önemli ölçüde azalacaktır (Aydın 2010).

Bu çalışmada, Kütahya Tunçbilek Termik Santrali'nden sağlanan, sepere edilmiş F tipi uçucu kül; ağırlıkça %14 Na içeren, silikat modülü Ms=0,2 olan, nSiO2Na2O ve NaOH karışımı aktivatör ile aktive edilerek geopolimer harç numuneler üretilmiştir. Numunelere, 50°C, 60°C, 70°C, 80°C, 90°C ve 100 °C de 48 saat süreyle ısıl işlem uygulanmıştır. Isıl işlemden çıkarılan numuneler, 28 günü tamamlayacak şekilde ±22 °C oda sıcaklığında, havada kür edilmiştir. Karşılaştırma numunesi olarak; CEMI 42,5 portland çimentosu ile 1/3 bağlayıcı/kum ve 0,50 su/bağlayıcı içeren harç numuneler hazırlanıp 28 gün standart su küründe bekletilmiştir. Daha sonra tüm numuneler, 200°C, 400°C, 600°C ve 800°C yüksek sıcaklığa maruz bırakılmıştır. Numunelerin sıcaklık öncesi ve sonrası ağırlıkları, ultrases geçiş hızları, eğilme ve basınç dayanımları incelenmiştir.

Materyal ve Yöntemler

Deneysel çalışmada kullanılan sodyum hidroksitin (NaOH) kimyasal kompozisyonu Çizelge 1'de verilmiştir.

Çizelge 1. NaOH'un kimyasal kompozisyonu

Kimyasal Adı	Sodyum Hidroksit (Kostik)
Kimyasal Formülü	NaOH
Molekül ağırlığı	40 gr/mol
Asidimetrik	≥97
Na_2CO_3	≤1
Cl	<0,01
SO_4	≤0,01
Ağır Metal	≤0,002
Al	≤0,002
Fe	≤0,002

Cam suyu olarak da bilinen Sodyum silikat ticari olarak kapalı plastik ve cam kaplarda sıvı olarak satılmaktadır. Çalışmada kullanılan sodyum silikatın kimyasal kompozisyonu Çizelge 2'de verilmiştir.

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Çizelge 2. Na_2SiO_3'ün kimyasal kompozisyonu

Kimyasal Adı	Sodyum Silikat (Cam suyu)
Kimyasal Formülü	$Na_2SiO_3nH_2O$
Molekül ağırlığı	122,06 g/mol
Yoğunluk	1,39 g/cm3 (20 C'de)
Ağırlıkça Modül SiO_2/Na_2O	2,00
Na_2O	%11,71
SiO_2	%23,46
Demir(Fe)	39 ppm
Klor (Cl)	%0,01
Sülfat (SO_4)	%0,01

Çalışmada kullanılan F Sınıfı uçucu kül, Kütahya Tavşanlı'da Bulunan Tunçbilek Termik Santrali'nden tedarik edilmiştir. Tunçbilek F sınıfı uçucu külün fiziksel ve kimyasal özellikleri Çizelge 3'te verilmiştir.

Çizelge 3. Tunçbilek F sınıfı uçucu külünün fiziksel ve kimyasal özellikleri

Kimyasal kompozisyon	(%)
MgO	3,68
Al_2SO_3	21,41
SiO_2	58,73
SO_3	0,25
Na_2O	0,28
Ka_2O	1,65
CaO	1,88
Fe_2SO_3	10,46
Çözünmez kalıntı	24,33
Kızdırma kaybı	0,64
TOPLAM	98,98
Fiziksel özellikler	
Özgül ağırlık (ton/m^3)	2,24
45 mikron elek bakiyesi (%)	4,9
Blain özgül yüzey (cm^2/gr)	3703

Çalışmada harç karışımlarının tamamında içme suyu şebekesinden alınan su kullanılmış olup kimyasal özellikleri Çizelge 4'te verilmiştir.

Çizelge 4. İçme suyu şebekesinden alınan suyun kimyasal özellikleri

Al (µg/l)	Fe(µg/l)	Amonyum(mg/l)	İletkenlik(µg/cm)	Nitrit(mg/l)	pH
0	10	0,13	730	0	7,96

Deneylerde, TS EN 196-1 e uygun maksimum agrega boyutu 2 mm olan Rilem Cembureau Standart kumu kullanılmıştır. Tablo 4.7'de standart kumun granülometrisi ve sınır değerleri verilmiştir.

Çizelge 5. Standart kumun granülometrisi ve sınır değerleri

Özellik	Tane Büyüklüğü (mm)					
	0,08	0,16	0,5	1	1,6	2

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Kalan (%)	99	85	64	36	9	0
Sınır Değer (%)	99±1	87±5	67±5	33±	7±5	0

Kontrol numuneleri üretiminde, CEM I 42,5 R çimento kullanılmıştır. Çimentonun kimyasal ve fiziksel özellikleri Çizelge 6'da verilmiştir.

Çizelge 6. CEM I 42,5R portland çimentosunun kimyasal ve fiziksel özellikleri

Kimyasal komposizyon	%	Fiziksel özellikleri	
SiO_2	18,60	Özgül Ağırlık	3,10
Al_2SO_3	5,70	Priz Başlangıç (dk)	160
Fe_2O_3	3,1	Priz Bitiş (dk)	210
CaO	62,60	Hacim Genleşmesi (mm)	0,70
MgO	2,3	Blane özgül yüzey (cm^2/gr)	3331
Na_2O	0,2	2 günlük basınç dayanımı (MPa)	32,3
K_2O	1,2	7 günlük basınç dayanımı (MPa)	45,5
SO_3	2,73	28 günlük basınç dayanımı (MPa)	54,7
Cl^-	0,01		
Kızıdırma kaybı	2,9		
Çözünmeyen kalıntı	0,70		
Serbest CaO	0,70		

TS EN 1363-2 yangına dayanıklılık deneyleri standardına uygun olarak yapılan deney kapsamında, 40x40x160 mm boyutlarında alkali aktive edilmiş prizma numuneler üretilmiştir. Numunelerin yüksek sıcaklık öncesi eğilme ve basınç dayanımları ölçülmüştür. Üretilen numuneler 1 saat boyunca ayrı ayrı 200 ºC, 400 ºC, 600 ºC ve 800 ºC'deki sıcaklığa maruz bırakılmıştır. Yüksek sıcaklık fırınında ısı artış hızı 7 °C/dk. olarak tespit edilmiştir.Yüksek sıcaklığa maruz bırakılan numuneler daha sonra, 24 saat oda sıcaklığında soğuması için laboratuvar ortamında bekletilmiştir.Yüksek sıcaklığa maruz kalmış numunelerin eğilme ve basınç dayanımımı değerleri test edilerek, sıcaklık öncesi dayanımları ile karşılaştırma yapılmıştır.

Numunelerin yüksek sıcaklık öncesi ve sonrasında, eğilme dayanımları aşağıdaki Çizelge 7'de verilmiştir.

Çizelge 7. F sınıfı uçucu kül kullanılarak üretilen numunelerin yüksek sıcaklık etkisinde eğilme dayanımları

Eğilme Dayanımları (MPa)							
Sıcaklık	F50	F60	F70	F80	F90	F100	Kontrol
Sıcaklık Öncesi	2,96	6,12	7,02	7,16	8,51	8,03	7,98
200 °C	6,63	5,94	5,34	5,80	6,59	6,47	5,70
400 °C	3,50	3,02	3,16	2,67	2,41	3,59	2,75
600 °C	2,90	1,99	2,28	1,76	2,02	2,21	1,24
800 °C	3,48	2,95	2,45	2,98	2,51	2,34	0,52

Numunelerin yüksek sıcaklık öncesi ve sonrası eğilme dayanımları incelendiğinde, sıcaklık öncesi eğilme dayanımı en düşük olan F50 numunesinin, 200 °C, 400 °C, 600 °C ve 800 °C' yüksek sıcaklık sonrası eğilme dayanımları diğer çimentosuz numunelerden ve kontrol numunesinden daha yüksek bir değere ulaşmıştır. Bütün numunelerin eğilme dayanımları düşerken F50 numunesinin eğilme dayanımı artmıştır. Ayrıca F sınıfı uçucu külle üretilmiş çimentosuz numunelerin tamamının 800 ºC yüksek sıcaklığa maruz kaldıktan sonraki eğilme dayanımları kontrol numunesine kıyasla daha fazladır. Numunelerin yüksek sıcaklık öncesi ve sonrasında, eğilme dayanımları Şekil 1'de grafiksel olarak gösterilmiştir.

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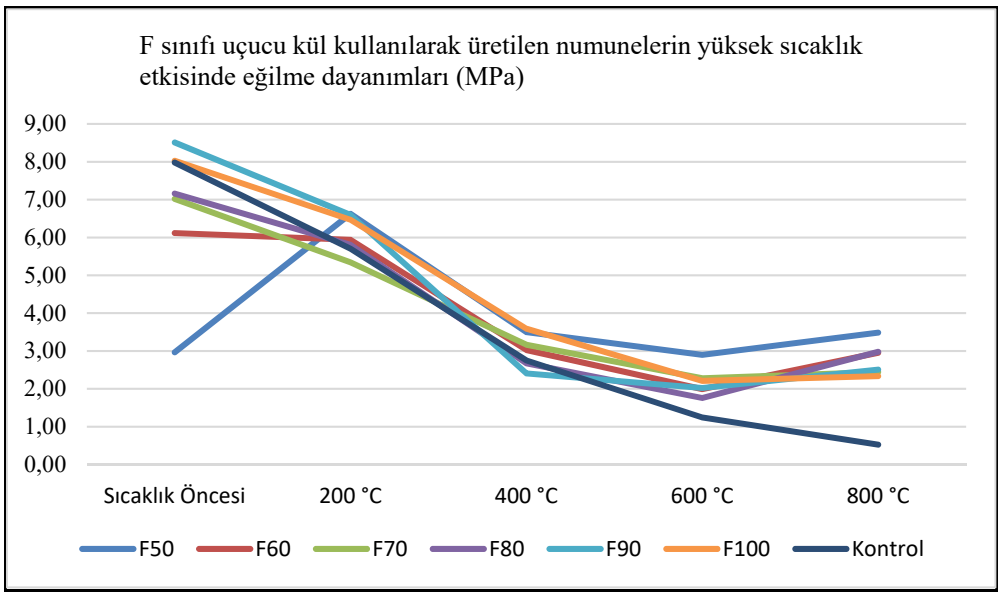
F50 numunesi, sıcaklık öncesi 2,96 MPa eğilme dayanımına sahipken, 200 °C sıcaklık sonrası eğilme dayanımı 6,63 MPa ulaşmış, 800 °C sıcaklık sonrası ise 3,48 MPa eğilme dayanımı değerine ulaşmıştır. F100 numunesi sıcaklık öncesi 8,03 MPa eğilme dayanımına sahipken 800 °C sıcaklık sonrası %70,8 dayanım kaybederek, 2,34 MPa eğilme dayanımı göstermiştir. Kontrol numunesi ise sıcaklık öncesi 7,98 MPa eğilme dayanımına sahipken, 800 °C sıcalık sonrası %93,48 dayanım kaybederek 0,52 MPa eğilme dayanımı göstermiştir. Genel olarak F sınıfı uçucu kül kullanılarak üretilen çimentosuz numunelerin yüksek sıcaklık karşısındaki dayanıklılıkları, kontrol numunelerine göre daha fazladır.



Şekil 1. F sınıfı uçucu kül kullanılarak üretilen numunelerin yüksek sıcaklık etkisinde eğilme dayanımları

Numunelerin yüksek sıcaklık öncesi ve sonrasında, basınç dayanımları Çizelge 8'de listelenmiştir.

Çizelge 8. F sınıfı uçucu kül kullanılarak üretilen numunelerin yüksek sıcaklık etkisinde basınç dayanımları

Basınç dayanımları (MPa)							
Sıcaklık	F50	F60	F70	F80	F90	F100	Kontrol
Sıcaklık Öncesi	7,63	18,63	28,38	37,81	50,64	42,11	37,70
200 °C	36,05	37,57	34,55	45,83	47,00	43,21	40,97
400 °C	27,61	23,24	23,54	21,77	22,01	20,77	40,33
600 °C	26,77	17,67	24,81	19,61	19,29	18,30	27,86
800 °C	40,70	33,94	32,35	32,35	34,11	31,06	11,75

F sınıfı uçucu külle üretilen çimentosuz numunelerin yüksek sıcaklık etkisi sonundaki basınç dayanımları, çimentolu kontrol numunesinin basınç dayanımından yüksektir. 50 °C, 60 °C ve 70 °C'de kür edilerek üretilmiş çimentosuz numunelerin yüksek 800 °C yüksek sıcaklık etkisinden sonra basınç dayanımları artmıştır. 800 °C yüksek sıcaklık etkisinden sonra F50 numunesinin basınç dayanımı 7,63 MPa'dan 40,70 MPa'a, F60 numunesinin basınç dayanımı 18,63 MPa'dan 33,94 MPa'a, F70 numunesinin basınç dayanımı 28,38 MPa'dan 32,35 MPa 'a artış göstermiştir. 800 °C yüksek sıcaklık etkisinden sonra F90 numunesi %16,64, F100 numunesi % 26,31 basınç dayanımı kaybı gösterirken, kontrol numunesi % 68,83 dayanım kaybetmiştir. Genel olarak, F sınıfı uçucu kül kullanılarak üretilen çimentosuz numunelerin yüksek sıcaklık etkisindeki dayanıklılıkları, kontrol numunelerine kıyasla daha iyidir.

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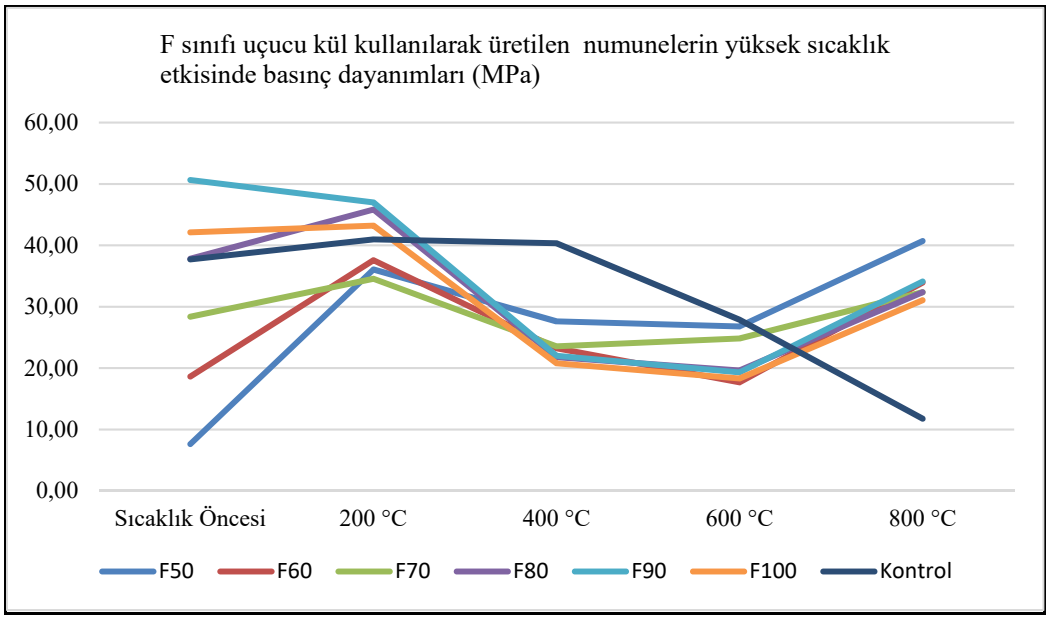

Şekil 2. F sınıfı uçucu kül kullanılarak üretilen numunelerin yüksek sıcaklık etkisinde basınç dayanımları

SONUÇ

F Sınıfı uçucu kül kullanılarak üretilen alkali active edilmiş harç numunelerden 50 ºC, 60 ºC ve 70 ºC' de sıcaklık kürü uygulanarak üretilen numunelerde 800 ºC yüksek sıcaklık etkisi sonucunda eğilme ve basınç dayanımlarında artış gözlenmiştir. Diğer sıcaklık gruplarında kür edilenlerin ise yüksek sıcaklık etkisi sonundaki performansları çimento bağlayıcılı numunelerden daha iyi olduğu gözlenmiştir. Sonuç olarak alkali aktive edilmiş harçlar yüksek sıcaklık etkisine maruz yerlerde yapı malzemesi olarak kullanılabilir.

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FACTORS PROMOTING *STAPHYLOCOCCUS AUERUS* DISINFECTION BY TiO_2, SiO_2 AND AG NANOPARTICLES

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Abstract: The use of conventional disinfection products and methods in drinking water treatment continue to fail in many undeveloped countries. Those applications need to be re-evaluated and innovative approaches to be considered to enhance the reliability and robustness of disinfection while avoiding disinfection byproducts (DBPs) formation. The rapid growth in nanotechnology has prompted significant interest in the environmental applications of nanoparticles (NPs). In order to understand the antibacterial effect of NPs, *Staphylococcus aureus* treated with TiO_2, SiO_2 and Ag NPs were studied under ambient conditions. The results indicated that the most bactericidal effect with specific die-off rates of 0,003 L/mg (TiO_2 NPs) and 0,002 L/mg (Ag NPs) were defined in the absence and the presence of photoactivation, respectively. Moreover, as ionic strength of the test media increases from 10 to 100 mM, NP-NP and NP-bacteria interactions were negatively affected.

Keywords: Disinfection, TiO_2, SiO_2, Ag, Nanoparticles, *Staphylococcus aureus*

Introduction

Among many pathogenic bacteria, *Staphylococcus aureus* are highly infectious and are commonly cause infectious diseases and gastrointestinal illness in humans (Lowy 1998, Kadariya 2014). To overcome the potential serious consequences of those infectious pathogens, new technologies and materials for disinfection purposes have been prompted (Hu 2006, Parnia 2009, Oliveira 2014). The conventional disinfectants (i.e. chlorine, ozone, chlorine dioxide and chloramines) known to produce carcinogenic disinfection byproducts (DBPs) (Nieuwenhuijsen 2000, Krasner 2009). Advanced oxidation processes (AOPs) can be applied to reduce the formation of DBPs, to inactivate water pathogens and to mineralize the refractory organic compounds (Chong 2010). Among these AOPs, heterogeneous photocatalysis employing semiconductor nanoparticles (TiO_2, ZnO, Fe_2O_3, etc. NPs) has been highly effective on disinfecting the pathogenic bacteria. Matsunaga et al. (1985) reported for the first time that TiO_2 photocatalyst could kill bacterial cells in water by illumination, which could generate reactive oxygen species (ROS) in water medium. Since then, numerous photocatalytic disinfection studies under UV light (Wei 1994, Christensen 2003, Gogniat 2006, Bonetta 2013) and fewer studies under solar light (Hu 2007, Helali 2014) using TiO_2 photocatalyst studies have been reported. In addition to those studies, TiO_2 NPs (Shah 2008, Xing 2012, Barnes 2013), TiO_2 thin films (Kambala 2009), Ni doped TiO_2 NPs (Yadav 2014), Fe doped Ti-CNTs (Latif 2014), Ce_2O_3/ TiO_2 composites (Hassan 2012), Ag doped TiO_2 NPs (Kowal 2011), and Al_2O_3-TiO_2-Ag composites (Tartanson 2014) Ag-SiO_2 composite films (Lei 2014), Ag-SiO_2 particles (Sotiriou 2010), and polymer coated Ag NPs (Vukoje 2014), and nano-Ag ions (Feng 2000, Kim 2007, Jung 2008, Sotiriou 2010) were employed to inactivate *S. aureus* and other bacteria.

This study reveals the disinfection efficiency of TiO_2, SiO_2 and Ag NPs on Gram-positive *S. aureus*. The objectives of this study were to determine (a) the antibacterial NP concentrations, (b) whether ionic strength of the suspensions affects antibacterial activity, and (c) whether inactivation of bacteria occurs in the absence of light.

Materials and Methods

Culture of microorganisms: The Gram (+) *Staphylococcus aureus* (ATCC 43300) were cultivated in 100 mL of Luria-Bertani (LB) broth at 37°C on a rotary shaker (150 rpm) for 18 h. The cultures with an initial population of $10^6 \pm 10^2$ CFU mL^{-1} were used in the experiments.

Nanoparticles: Commercially obtained TiO_2, SiO_2 and Ag NPs were used in the experiments (Table 1). A 1000 mg/L stock suspension for each NP was prepared in 0, 10, 50 and 100 mM of deionized water using Na_2HPO_4, KH_2PO_4, NH_4Cl, and NaCl immediately before the experiments. The final concentrations of 10, 100 and 500 mg L^{-1} NPs were prepared by serially diluting of the stock suspensions having different ionic strength. All

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experiments were conducted in continuously shaken aqueous slurry solutions to ensure mixing and to prevent settling of the NPs. The bacteria were added to the suspensions immediately prior to the disinfection runs.

Table 1. Nanoparticles used in the experiments.

Nanoparticle	Particle Size (nm)	Surface Area (BET, m^2g^{-1})	Physical appearance
TiO_2 (Anatase)	32	45	White powder
SiO_2	10 - 20	NA	White powder
n-Ag	20 - 40	NA	Black powder

Exposure experiments: To determine the effect of particle concentration and ionic strength of the test media on the survival of bacteria, dose-response experiments were conducted. Forty five mLs of NP solutions and 5 mL of bacteria prepared in 0, 10, 50 and 100 mM sterile test media were added to each beaker to make initial NP concentrations of 0, 10, 100, and 500 mg L^{-1}. Four artificial light sources (color temperature of 4300 K, and total light intensity of 7000 lux), mimicking the spectrum of natural solar light, were placed 30 cm above the orbital shaker to produce light intensity of *2.1 W* cm^{-2}. The temperature inside the cabinet was maintained at 25.0 ± 1.5◦C. The shaker was set to mix at 150 rpm throughout all experiments. All antibacterial tests were triplicated in presence and absence of light lasted 1 h.

End point test: The numbers of viable cells were determined by LB agar plating. The plates were incubated at 37°C for 24 h, and then the colony counting was done using Lassany model digital colony counter. The survival fractions (N/N_0) and the specific die-off rates (k', Eq 1) (Erdem 2015) were calculated by the following equation:

$$k'\,(L\,mg^{-1}) = \frac{-\ln(N/N_0)}{C} \qquad \text{(Eq 1)}$$

where N_0 (CFU, colony forming unit) is the population of the control cultures, N (CFU) is the population of the NP exposed cultures after 1 h in presence and absence of light, and C (mg L^{-1}) is the NP concentration.

Results and Discussion

Four different NP concentrations (10, 100, 500 and 1000 mgL^{-1}), and light (light intensity: *2.1 W* cm^{-2}) condition were used to evaluate the effect of NP concentration and light on the survival of *S. aureus*, and the results are shown in Table 2. Regardless of NP type, both NP concentration increment and changing the light condition from dark to light increased the mortality rate of the bacteria when 10 mM ionic strength of test media was used. However, the most effective antibacterial impact was observed when 1000 mg L^{-1} of TiO_2 NPs were used in presence of light. In absence of light, when NP concentration increased, the most increase in mortality rates were observed as 57 % (500 mg L^{-1}), 47 % (500 mg L^{-1}) and 40% (1000 mg L^{-1}) in TiO_2, n-Ag and SiO_2 NP setups, respectively. The effects of SiO_2 on bacterial viability were as low as 40 and 56% in absence and presence of light, respectively. TiO_2 NPs were more effective on the *S. aureus* bacteria than n-Ag and SiO_2 NPs in both absence and presence of light.

Table 2. The effect of nanoparticle concentration on the survival of *S. aureus* in absence and presence of light. (Ionic strength: 10 mM, light intensity: *2.1 W* cm^{-2})

NP Concentration (mgL^{-1})	Death (%)					
	TiO_2		SiO_2		Nano-Ag	
	Dark	Light	Dark	Light	Dark	Light
10	13	75	32	33	32	41
100	45	57	27	30	34	49
500	57	76	23	52	47	75
1000	47	93	40	56	32	47

Figure 1 shows the survival ratios of the *S. aureus* treated with TiO_2, SiO_2 and Ag NPs under dark (a) and light (b) conditions. At each concentration of NPs, k' was determined by Eq 1 for both dark/light conditions and ionic strength condition, and k' values were averaged (k'_{ave}), where lower k'_{ave} value means higher antibacterial effect. In absence of light, the lowest k'_{ave} values of TiO_2, SiO_2 and n-Ag NPs were calculated as 0.003 L mg^{-1} (0 mM), 0.010 L mg^{-1} (10 mM) and 0.004 L mg^{-1} (50 mM), respectively. The lowest k'_{ave} values of 0.004 L mg^{-1} (50 mM), 0.010 L mg^{-1} (100 mM) and 0.002 L mg^{-1} (10 mM) were calculated when bacteria were exposed to TiO_2, SiO_2 and n-Ag NPs, respectively. The results in Figure 1 show that *S. aureus* was sensitive when lower ionic strength media was used in absence of light. One possible explanation for higher bacterial sensitivity in absence

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of light may be linked to the release of metal ions or NP-specific mechanisms (Cumberland 2009; Gottschalk 2011; Dobias 2013).

Figure 1. The effect of ionic strength and TiO_2, SiO_2 and Ag nanoparticle concentrations on *S. aureus* under dark (a) and light (b) conditions.

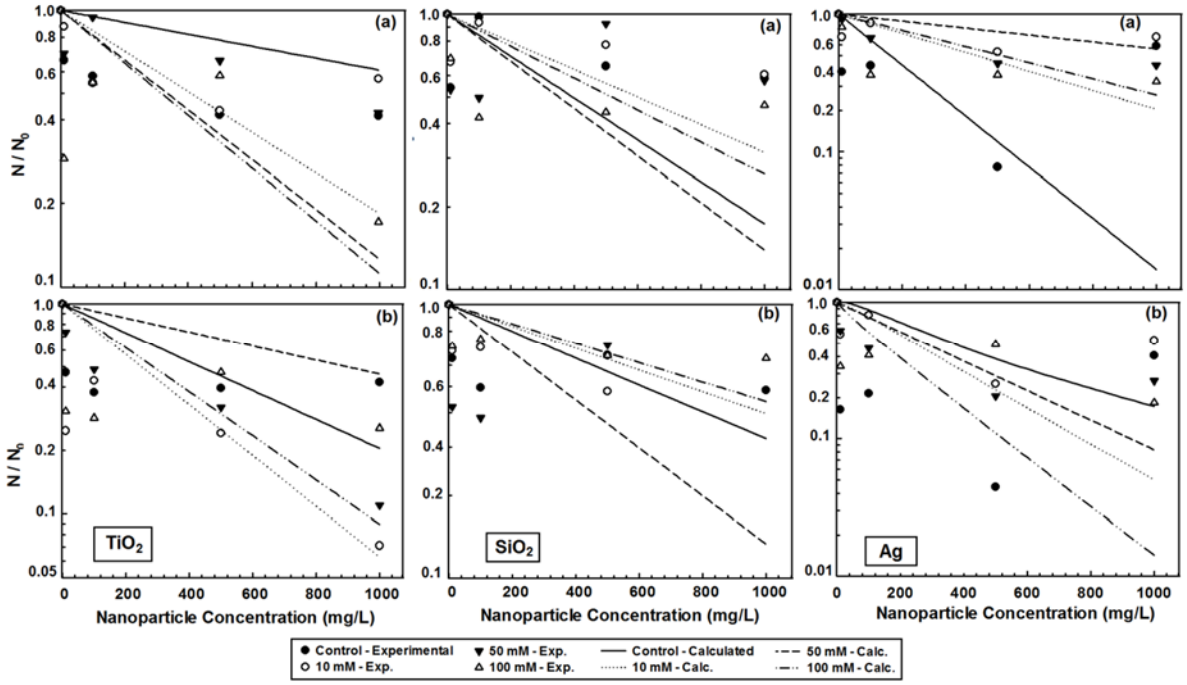

Figure 1 also shows the curve fits obtained from the calculated survival fractions. In order to implement those values, experimentally verified k'_{ave} values were used in Eq 1 and then the calculated survival fractions were estimated. R^2 values were presented in order to correspond the curve fits with experimental results. Highest correspondence ($R^2 = 0.9194$) was observed when *S. aureus* was exposed to TiO_2 NPs under dark, while lowest correspondence ($R^2 = 0.5625$) was observed when SiO_2 NPs were employed. In presence of light, lowest R^2 value of 0.4626 was calculated from bacteria- SiO_2 NPs reactions and highest R^2 value of 0.9563 was observed when *S. aureus* was exposed to nano-Ag particles.

Conclusion

In order to define the factors promoting the disinfection of the *S. aureus* specific die-off rates of the NPs were calculated and were used in this study. It was clearly revealed that TiO_2, SiO_2 and Ag NPs promoted the inactivation of *S. aureus* and the bacteria showed higher sensitivity to TiO_2 and Ag NPs than SiO_2 NPs in both absence and presence of light conditions. However, aggregation/agglomeration of the NPs in water negates inhibition process. Therefore, dispersion of NPs need to be considered. Moreover due to the conduction of the experiments in a relatively clean laboratory conditions, the sustainability of antimicrobial activities of NPs in natural or waste water need to be clarified. Therefore, more research to further assess the applicability and sustainability of NPs in disinfection processes.

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FAILURE CHARACTERISTICS OF GLASS-FIBER / EPOXY COMPOSITE JOINT STRUCTURES EXPOSED TO ACCELERATED AGING PROCESS

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Estimating the long term life performance of joints is one of the major issues in structural composite design. Accelerated aging in hot and wet environment can be used to evaluate the failure behaviour of adhesively bonded joints which can be considered as the most vulnerable part of composite structures especially exposed to continuous harsh conditions during operating life. The current experimental work is about the post-exposure changes in tensile properties of bonded single lap joints between glass fiber / epoxy composites with [0/90/45/-45]s fibre orientations. The joints formed with Loctite Hysol-9466 epoxy adhesive were kept in purified hot water for one and two weeks time periods at 50, 70, and 90 °C immersing temperatures, each of which was practiced separately. Both water temperature and exposure time are found to be explicitly effective on specific properties such as load-displacement characteristics, failure loads and failure modes. Moisture absorption phenomenon which is most responsible for the observed degradation of maximum failure load and distance to failure values, was found to be more destructive at higher temperatures and prolonged immersion times.

Keywords: Joints, Composite Structures, Glass-fiber, Mechanical Testing

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FARKLI GEOMETRİLERE SAHİP AÇIK KANAL KESİTLERİNİN OPTİMİZASYONU

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Özet: Bu çalışmada, üçgen, dikdörtgen ve trapez kesitli kaplamalı açık kanal kesitlerinin inşaat maliyetini minimum yapacak kesit değişkenlerinin (şev eğimi, taban genişliği, akım derinliği gibi) en uygun değerleri araştırılmıştır. Amaç fonksiyonu maliyet fonksiyonu olan ve kısıtı uniform akım olarak oluşturulan bir optimizasyon modeli ele alınmıştır. Problemin çözümünde daha önce bu amaçla kullanılmayan ateş böceği algoritması ve av arama algoritması kullanılmış ve elde edilen sonuçlar literatür ile karşılaştırılarak önerilen optimizasyon algoritmalarının performansları değerlendirilmiştir.

Anahtar Kelimeler: Açık Kanal, Optimizasyon, Ateş Böceği Algoritması, Av Arama Algoritması

Abstract: In this study, triangular, rectangular and trapezoidal lined open channel cross sections' variables, such as side slope, bottom width, flow depth, are investigated for minimizing channel cost. An optimization model that has cost function as an objective function and subject to a uniform flow is considered. Firefly algorithm and hunting search algorithm which are not used before for solving this optimization model are used and obtained results are compared with results in literature.

Keywords: Open Channel, Optimization, Firefly Algorithm, Hunting Search Algorithm

Giriş

Açık kanallar su kaynakları sistemlerinde kullanılan suyu serbest yüzeyli olarak ileten önemli iletim yapılarındandır. Sulama, drenaj ve hidroelektrik gibi sistemlerin unsurlarından biri olarak kullanılmaktadırlar.

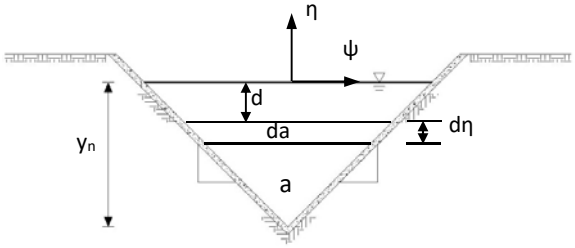
Her mühendislik projesinde maliyetin azaltılması için gerekli çalışmalar yapılmaktadır. Bir açık kanal projesi ele alındığında maliyetinin azaltılması amacıyla en uygun güzergâh seçiminden sonra açık kanalın geometrisi de göz önüne alınarak maliyeti en küçükleyecek kesit değişkelerinin değerleri aranmaktadır.

Bu amaçla problem bir optimizasyon problemine dönüştürülerek çözüm aranmaktadır. Literatürde farklı kesit geometrileri ve farklı amaç fonksiyonları için çalışmalar bulunaktadır (Swamee ve ark. 2000; Aksoy ve Altan-Sakarya 2006; Turan ve Yurdusev, 2011).

Bu çalışmada, inşaat maliyetini minimum yapacak farklı geometrilere sahip açık kanal kesit değişkenlerinin (şev eğimi, taban genişliği, akım derinliği gibi) en uygun değerleri araştırılmıştır. Problem, uniform akım şartları için kanal kaplama ve kazı maliyeti içeren amaç fonksiyonuna sahip bir optimizasyon problemi olarak ele alınmıştır. Problemin çözümünde daha önce bu problemin çözümünde kullanılmayan ateş böceği algoritması ve av arama algoritması kullanılmış ve elde edilen sonuçlar literatür ile karşılaştırılarak önerilen optimizasyon algoritmalarının performansları değerlendirilmiştir.

Yöntem

Bu çalışmada ele alınan açık kanal kesit optimizasyon problemi maliyet amaç fonksiyonu minimizasyonu ve akım şartı kısıt fonksiyonundan oluşmaktadır. Karar değişkenleri, kenar eğimi, kanal genişliği ve akım derinliği gibi kanal kesitine ait büyüklüklerdir. Herhangi bir tipik kanal kesiti için geometrik değişkenler Şekil 1'de verilmiştir.



Şekil 1: Tipik Kanal Kesiti

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Aynı zemin koşullarında, farklı sebeplerden dolayı derinlik ile kazı maliyetinin arttığı kabul edilebilir. Bu etkiyi de dikkate alarak kaplama yapılan bir kanal kesiti için maliyet fonksiyonu aşağıdaki gibi yazılabilir.

$$C = \beta_L P + +\beta_E A + \beta_A \int_0^A a \ d\eta \quad (1)$$

Burada β_L birim kaplama maliyeti TL/L^2, β_E birim kazı maliyeti TL/L^3, β_A her birim derinlik için ek kazı maliyeti TL/L^4, a η derinliğinde akım alanı, P ıslak çevre, A ıslak alan ve L uzunluk olarak ifade edilmektedir.

Açık kanal akımının genellikle uniform olduğu kabul edilebilir. Bu akım şartının sağlanması için bir uniform akım denkleminin problemin kısıt fonksiyonu olarak eklenmesi gerekmektedir. Bu çalışmada Manning uniform akım denklemi kullanılmış ve denklemi aşağıda verilmiştir.

$$Q = \frac{1}{n} A R^{2/3} S^{1/2} \quad (2)$$

Burada n, Manning pürüzlülük katsayısı, A, ıslak alan, R, hidrolik yarıçap ve S, kanal eğimini ifade etmektedir.

Yukarıda verilen ifadeler kullanılarak herhangi bir açık kanal kesiti için optimizasyon problemi aşağıdaki gibi tanımlanabilir.

$$\min \ C = \beta_L P + +\beta_E A + \beta_A \int_0^A a \ d\eta \quad (3)$$

$$Q - \frac{1}{n} A R^{2/3} S^{1/2} = 0 \quad (4)$$

Literatürde daha önceden verilen sonuçların karşılaştırılabilmesi açısından optimizasyon problemi boyutsuz terimler tanımlanarak aşağıdaki gibi tekrar düzenlenmiştir. Bu amaçla önce uzunluk ölçeği (λ) Denklem 5' te tanımlanmıştır.

$$\lambda = \left(\frac{Qn}{S^{1/2}}\right)^{3/8} \quad (5)$$

Daha sonra tanımlanan uzunluk ölçeği (λ) kullanılarak optimizasyon problemindeki boyutlu terimler Denklem 6 ile Denklem 13' e kadar verilen işlemler ile boyutsuz hale getirilmişlerdir.

$$C_* = C/\beta_E \lambda^2 \quad (6)$$

$$\beta_{L_*} = \beta_L/\beta_E \lambda \quad (7)$$

$$\beta_{A_*} = \beta_A \lambda/\beta_E \quad (8)$$

$$A_* = A/\lambda^2 \quad (9)$$

$$P_* = P/\lambda \quad (10)$$

$$b_* = b/\lambda \quad (11)$$

$$y_{n_*} = y_n/\lambda \quad (12)$$

$$r_* = r/\lambda \quad (13)$$

Burada "*" boyutsuz terimleri ifade etmektedir. Tanımlanan boyutsuz terimlerin kullanılması ile optimizasyon probleminin boyutsuz hali aşağıdaki gibi elde edilir.

$$\min \ C_* = \beta_{L_*} P_* + A_* + \frac{\beta_{A_*} \int_0^{y_n} a \ d\eta}{\lambda^3} \quad (14)$$

$$1 - A_*^{5/3} P_*^{-2/3} = 0 \quad (15)$$

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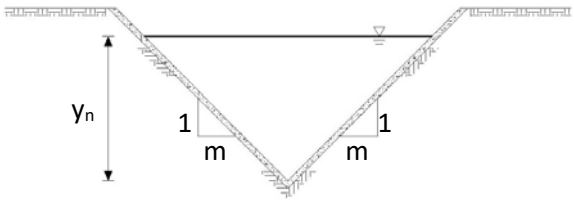
Denklem 14 ve Denklem 15' te genel halde verilen optimizasyon modeli üçgen, dikdörtgen ve trapez açık kanal kesitleri için ayrı ayrı düzenlemiştir. Şekil 2' de verilen üçgen açık kanal kesiti için optimizasyon modeli Denklem 16 ve Denklem 17' de verilmektedir.

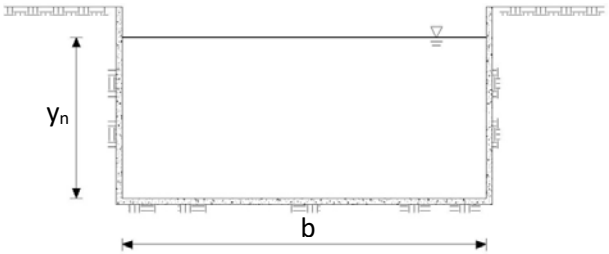


Şekil 2: Üçgen Açık Kanal Kesiti

$$\min\ C_* = 2\beta_{L_*} y_{n_*}\sqrt{1+m^2} + m y_{n_*}^2 + \frac{\beta_{A_*} m y_{n_*}^3}{3} \tag{16}$$

$$1 - \frac{\left(m y_{n_*}^2\right)^{5/3}}{\left(2y_{n_*}\sqrt{1+m^2}\right)^{2/3}} = 0 \tag{17}$$

Şekil 3' te verilen dikdörtgen açık kanal kesiti için optimizasyon modeli Denklem 18 ve Denklem 19' da verilmektedir.

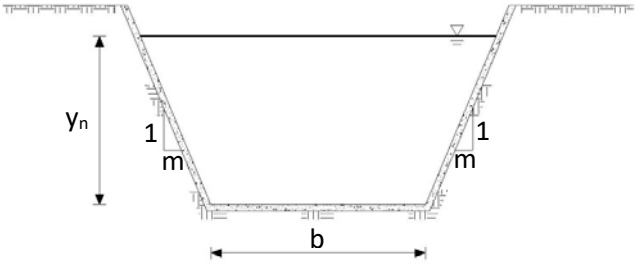


Şekil 3: Dikdörtgen Açık Kanal Kesiti

$$\min\ C_* = \beta_{L_*}\left(2y_{n_*} + b_*\right) + b_* y_{n_*} + \frac{\beta_{A_*} b_* y_{n_*}^2}{2} \tag{18}$$

$$1 - \frac{\left(b_* y_{n_*}\right)^{5/3}}{\left(2y_{n_*} + b_*\right)^{2/3}} = 0 \tag{19}$$

Şekil 4' te verilen trapez açık kanal kesiti için optimizasyon modeli Denklem 20 ve Denklem 21' de verilmektedir.



Şekil 4: Dikdörtgen Açık Kanal Kesiti

$$\min\ C_* = \beta_{L_*}\left(2y_{n_*}\sqrt{1+m^2} + b_*\right) + \left(b_* y_{n_*} + m y_{n_*}^2\right) + \beta_{A_*}\left(\frac{b_* y_{n_*}^2}{2} + \frac{m y_{n_*}^3}{3}\right) \tag{20}$$

$$1 - \frac{\left(b_* y_{n_*} + m y_{n_*}^2\right)^{5/3}}{\left(2y_{n_*}\sqrt{1+m^2} + b_*\right)^{2/3}} = 0 \tag{21}$$

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Açık kanal kesitleri için verilen optimizasyon modellerinde y_{n_*} su derinliğini, m şev eğimini, b_* kanal taban genişliğini ifade etmektedir

Ateş Böceği Algoritması

Ateş Böceği Algoritması 2007 yılında Xin-She Yang tarafından geliştirilmiştir. Ateş böceklerinin sosyal davranışlarından esinlenilerek geliştirilmiş sürü tabanlı bir optimizasyon algoritmasıdır.

Ateş böceklerinin büyük bir kısmı çiftleşmek, avlanmak, korunmak amacıyla kısa süreli ritmik ani ışıklar yaymaktadırlar. Biyolojik olarak üretilen bu ışık ile bütün ateş böcekleri belli bir uzaklık limitinde görünür olmaktadırlar ve bu onların haberleşmesini sağmaktadır. Ayrıca ışık yoğunluğu da önemli bir rol oynamakta ve ışık yoğunluğu mesafenin (r) karesi ile ters orantılı olarak azalmaktadır.

Algoritmanın temelini ateş böceklerinin en parlak ateş böceğine doğru hareket edeceği kabulü oluşturmaktadır. Her bir ateş böceği problemin öneri bir çözümünü oluşturmaktadır. Amaç fonksiyonu değerine göre ateş böceklerinin parlaklıkları hesaplanmaktır. Çözüme yakın ateş böceği daha parlak kabul edilmekte ve diğer ateş böcekleri parlak olan ateş böceğine doğru hareket etmektedirler. Böylece optimum çözüm aranmaktadır.

Algoritmada bazı kabuller yapılmıştır. Bütün ateşböcekleri uniseks olarak kabul edilerek birbirlerini çekmeleri sağlanmıştır. Parlak olan ateş böceği diğer ateş böceklerine için daha çekici hale gelmektedir. Son olarak bir ateş böceği kendisinden daha parlak bir ateşböceğine doğru gidecektir.

Bir ateş böceğinin kendisinden daha parlak bir ateşböceğine doğru hareketi Denklem 22 ile ifade edilmektedir.

$$x_i' = x_i + \beta_0 e^{-\gamma r^2}\left(x_j - x_i\right) + \alpha\varepsilon_i \tag{22}$$

Denklem 22' de r ateş böcekleri arasındaki mesafeyi ifade etmektedir ve Denklem 23 ile hesaplanmaktadır.

$$r_{ij} = \sqrt{\sum_{k=1}^{d}\left(x_{i,k} - x_{j,k}\right)^2} \tag{23}$$

β_0, γ ve α ise algoritmanın kontrol parametrelerini ifade etmektedir (Yang, 2013).

Av Arama Algoritması

Av Arama Algoritması 2009 yılında Oftadeh ve arkadaşları tarafından geliştirilmiştir. Algoritma, hayvanların grup olarak avlanmasından esinlenilerek geliştirilmiş bir sürü tabanlı optimizasyon algoritmasıdır.

Aslanlar, kurtlar ve yunuslar gibi hayvanlar av bulup yakalamak amacıyla sürü halinde avlanmaktadırlar. Sürünün avı yakalamak için belli stratejileri vardır. Öncelikle sürü ava göre konumlanmaktadır. Avlanma sırasında da grubun her bir üyesi kendi konumunu diğer üyelerin konumuna göre değiştirmektedir. Eğer av sürüden kaçarsa, sürüdekiler avı tekrar kuşatmak için konumlarını değiştirirler.

Algoritmanın işleyişi sürüdeki avcıların daha iyi konumdakine, yani lider avcıya doğru hareket edeceği kabulüne dayanmaktadır. Sürüdeki her bir avcı problemin öneri bir çözümünü oluşturmaktadır. Amaç fonksiyonunun değerine göre sürünün lideri avcı bulunmaktadır. Sürüdeki diğer avcılar da lider avcıya doğru hareket etmektedirler. Böylece optimum çözüm aranmaktadır.

Sürüdeki bir avcının lidere doğru hareketi Denklem 24 ile hesaplanmaktadır.

$$x_i' = x_i + rand \times MML \times (x_i^L - x_i) \tag{24}$$

Burada, rand 0 ile 1 arasında rastgele sayıyı, MML ise lidere doğru maksimum hareket değerini ifade etmektedir. Bir sonraki adımda avcılar sürüye göre Denklem 25 ile tanımlanan işlemler ile konumlarını güncellemektedirler.

$$x_i' \leftarrow \begin{cases} x_i' \in \{x_i^1, x_i^2, \ldots, x_i^{HGS}\} & HGCR \;\; olasılığı \;\; ile \\ x_i' = x_i \pm Ra & (1 - HGCR) \;\; olasılığı \;\; ile \end{cases} \tag{25}$$

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$$Ra(it) = Ra_{min}(x_{max} - x_{min}) exp\left(\frac{Ln\left(\frac{Ra_{max}}{Ra_{min}}\right) it}{itm}\right) \quad (26)$$

Burada HCGR avcı gurubu değerlendirme oranını, x_{max} ve x_{min} x değişkeninin alabileceği maksimum ve minimum değerlerini, Ra rastgele yarıçap mesafesini, Ra_{max} ve Ra_{min} Ra'nın alabileceği maksimum ve minimum değerleri ve itm maksimum iterasyon sayısını ifade etmektedir.

Son olarak ise çözümde yerel optimum noktalardan kaçınmak için Denklem 27 ile sürü kendini yeniden organize eder.

$$x_i' = x_i^L \pm rand \times (x_{max} - x_{min}) \times \alpha \times exp(-\beta \times EN) \quad (27)$$

Burada, EN yeniden organizasyon sayısını, α ve β pozitif reel sayıları ifade etmektedir (Oftadeh ve Mahjoob 2010).

Uygulama

Ateş böceği ve av arama algoritması için optimizasyon probleminin çözümüne başlamadan önce sahip oldukları kontrol parametrelerinin belirlenmesi gereklidir. Bu parametreler algoritmanın optimum çözümü bulmasını ve çözüme yakınsama hızını etkilemektedirler. Ateş böceği algoritması için seçilen kontrol parametre değerleri Tablo 1' de, av arama algoritması için seçilen kontrol parametre değerleri Tablo 2' de verilmiştir.

Tablo 1: Ateş Böceği Algoritması için seçilen kontrol parametreleri

Kontrol Parametresi	Değer
Ateş Böceği Sayısı	40
Minimum Beta	0,2
Maksimum Beta	1
Alfa	0,5
Gama	1
Maksimum İterasyon Sayısı	1000

Tablo 2: Av Arama Algoritması için seçilen kontrol parametreleri

Kontrol Parametresi	Değer
Avcı Sayısı	40
Lidere doğru maksimum ilerleyiş	0,05
Avcı grubu dikkate alma oranı	5000
Maksimum Ra	0,01
Minimum Ra	0,0000001
Alfa	1,2
Beta	0,02
Maksimum İterasyon Sayısı	1000

Uygulamada iki farklı durum incelenmiş ve literatürde daha önce elde edilen sonuçlar ile karşılaştırılmıştır. Ayrıca ilk durumda elde edilen sonuçlar için ateş böceği algoritması ile av arama algoritması yakınsama hızı açısından birbirleri ile karşılaştırılmıştır.

Birinci durumda ek kazı maliyeti dikkate alınmayarak maliyet fonksiyonun sadece birim kaplama maliyeti ve kazı maliyetinden meydana geldiği kabul edilmektedir. Başka bir deyişle Denklem 14' te verilen ifadede yer alan β_A katsayının değeri sıfır olmuştur. Bu durum için literatürde bulunan sonuçlar ile bu çalışmada tüm kesitler için elde edilen sonuçlar Tablo 3' te verilmektedir. Tablo 3' te verilen LM (Lagrange Multipliers) Lagrange çarpanları yöntemini, DEA (Differential Evolution Algorithm) diferansiyel gelişim algoritmasını, BA (Bees Algorithm) arı algoritmasını, ABC (Artificial Bee Colony) yapay arı kolonisi algoritması, MHBMO (Modified Honey Bee Mating Optimization) modifiyeli bal arısı çiftleşme algoritmasını, FF (Firefly Algortihm) ateş böceği algoritmasını, HuS (Hunting Search) av arama alritmasını ifade etmektedir.

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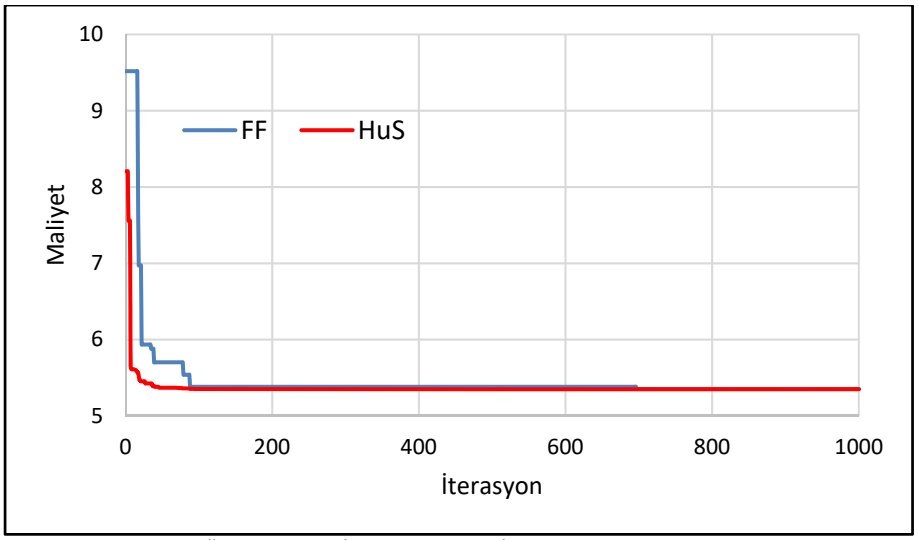
Tablo 3: Av Arama Algoritması için seçilen kontrol parametreleri

Yöntem	Kesit	Kanal Dizayn Değişkenleri			Maliyet
		y_n*	m	b*	
LM (Aksoy, Altan Sakarya, 2006)	Üçgen Kesit	1,297	1	-	5,3507
DEA (Turan, Yurdusev, 2011)		1,297	1	-	5,3507
BA (Aydoğdu, Akın, 2011)		1,299	0,996	-	5,3474
ABC (Aydoğdu, 2012)		1,2972	0,9993	-	5,3495
MHBMO (Niazkar, Afzali, 2015)		1,2968	1	-	5.3496
FF		1,30538	0,987757	-	5,3528
HuS		1,300566	0,994277	-	5,349838
LM (Aksoy, Altan Sakarya, 2006)	Dikdörtgen Kesit	0,917	-	1,834	5,3498
DEA (Turan, Yurdusev, 2011)		0,91721	-	1,83358	5,3498
BA (Aydoğdu, Akın, 2011)		0,939	-	0,179	5,3488
ABC (Aydoğdu, 2012)		0,9196	-	1,8288	5,3496
MHBMO (Niazkar, Afzali, 2015)		0,9170	-	1,8340	5,3498
FF		0,913409	-	1,841269	5,34992
HuS		0,915791	-	1,836424	5,349787
LM (Aksoy, Altan Sakarya, 2006)	Trapez Kesit	0,968	0,577	1,117	4,976
DEA (Turan, Yurdusev, 2011)		0,968	0,577	1,118	4,9741
BA (Aydoğdu, Akın, 2011)		0,969	0,579	1,112	4,9726
ABC (Aydoğdu, 2012)		0,9645	0,5768	1,1256	4,9748
MHBMO (Niazkar, Afzali, 2015)		0,9678	0,5774	1,1175	4,9749
FF		0,901821	0,659964	1,208616	4,99633
HuS		0,962824	0,577662	1,128858	4,975106

Tablo 3 incelendiğinde listelenen algoritmaların her kesit için benzer performansa sahip oldukları görülmektedir. En düşük maliyet fonksiyonu değerine üç kesitte arı algoritmasının sahip olduğu görülmektedir. Bu çalışma kapsamında ele alınan iki algoritmadan ateş böceği algoritmasının sahip olduğu kontrol parametresi değerlerine göre en büyük maliyet fonksiyon değerlerine sahip olduğu görülmektedir. Av arama algoritması ise arı algoritmasına daha yakın sonuçlar elde etmiştir.

Ek kazı maliyetinin dikkate alınmadığı birinci durum için ayrıca her kesit için ateş böceği algoritması ve av arama algoritması yakınsama hızlarını gösteren grafikler Şekil 5'ten Şekil 7' ye kadar verilmiştir.



Şekil 5: Üçgen Kesit İçin Maliyetin İterasyon Sayısı ile Değişimi

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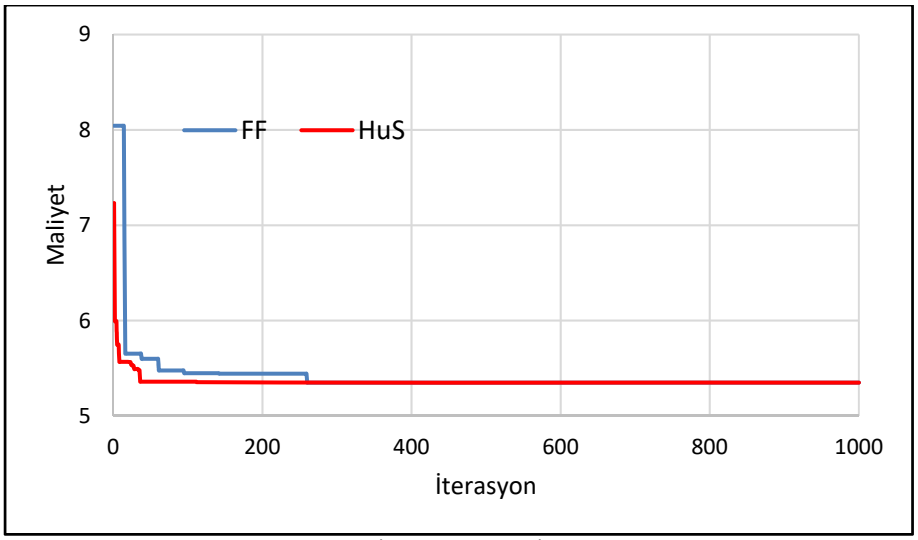
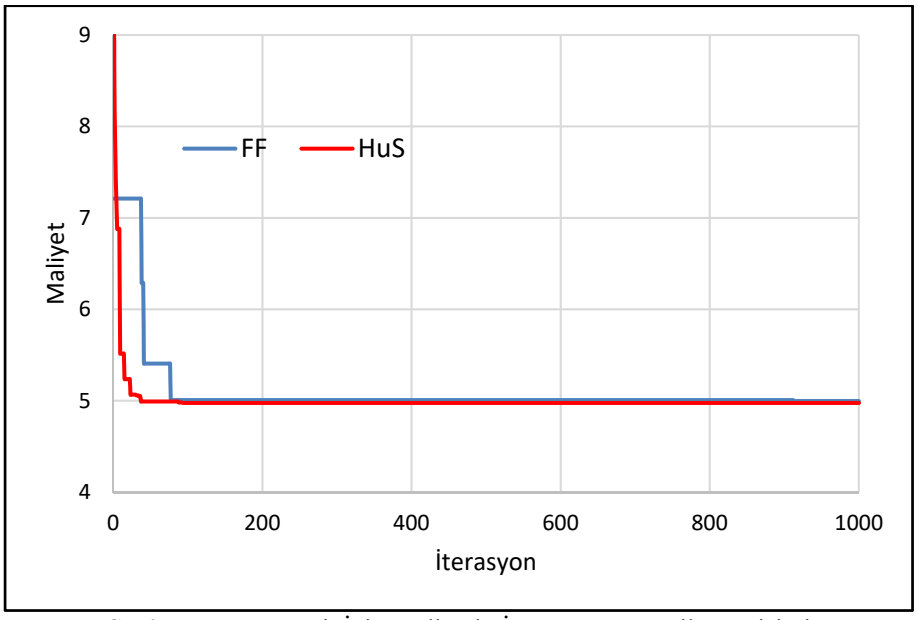


Şekil 6: – Dikdörtgen Kesit İçin Maliyetin İterasyon Sayısı ile Değişimi



Şekil 7: Trapez Kesit İçin Maliyetin İterasyon Sayısı ile Değişimi

Yukarıda verilen grafikler incelendiğinde av arama algoritmasının üç açık kanal kesiti için de sonuca daha hızlı yakınsadığı görülmektedir. Ateş böceği algoritmasında sekiz yüz iterasyondan sonra bile değişim gözlenirken av arama algoritmasında değişimin ilk yüz iterasyonda tamamlanmış olduğu görülmektedir.

Ek kazı maliyetinin dikkate alındığı ikinci durumda literatürde sonuçların sadece üçgen kesit için olmasından dolayı bu kesit için çözüm yapılmıştır. Üçgen kesite ait değişkenler olan m şev eğimi ve y_n^* boyutsuz su derinliğinin optimum değerleri faklı β_A^* ve β_L^* değeri için hesaplanmıştır. Elde edilen sonuçlar grafik olarak Şekil 78 ve Şekil 9'de verilmiştir.

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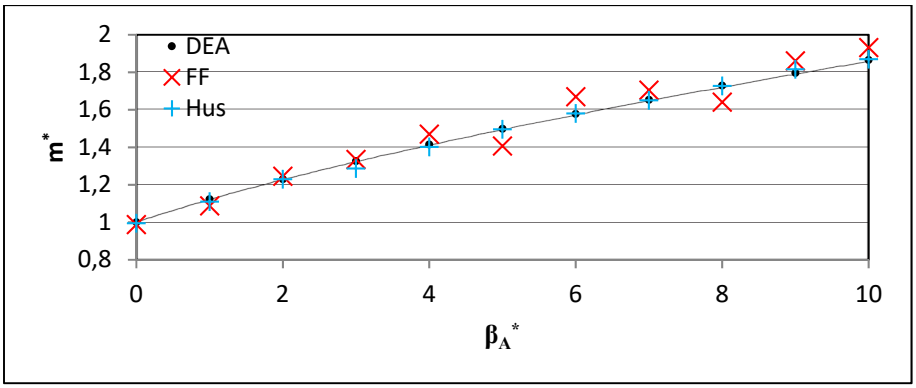
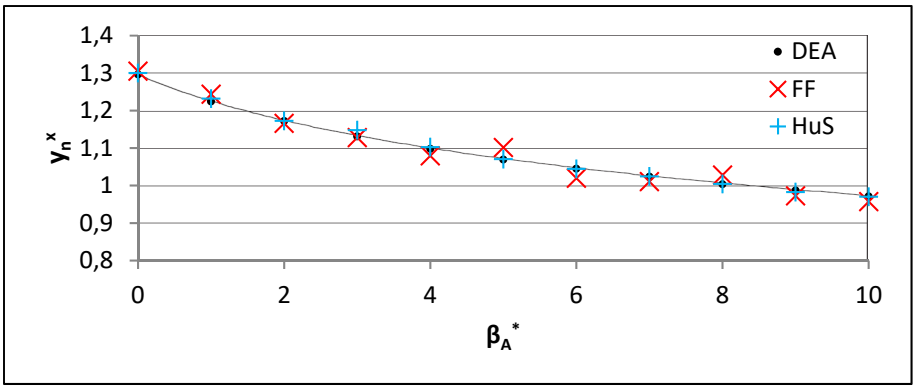
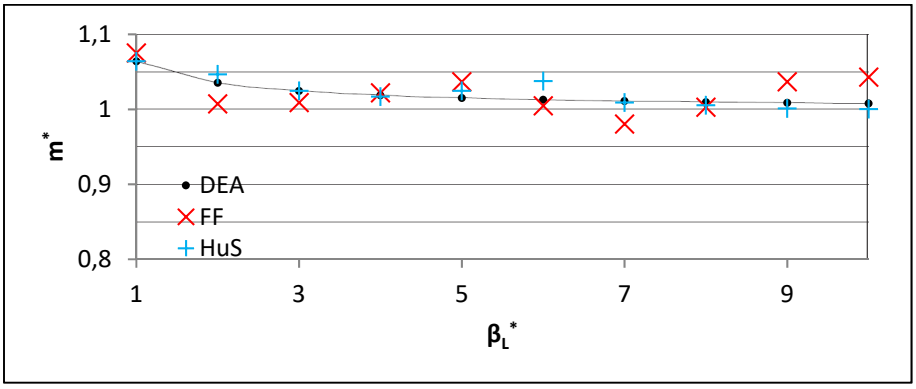


(a)

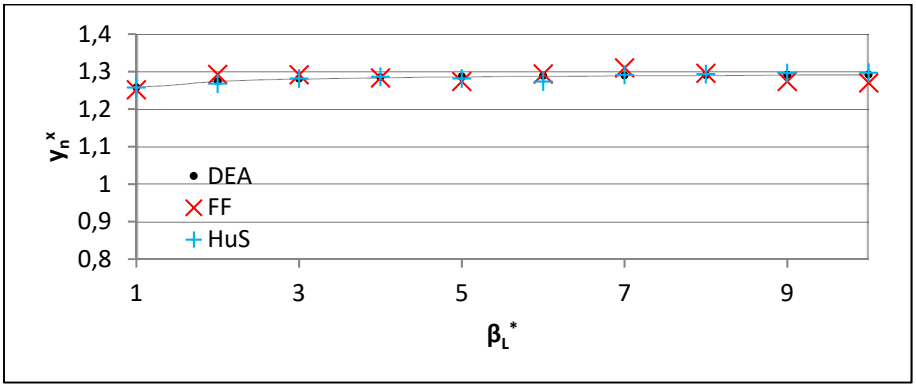


(b)

Şekil 8: Üçgen Kesit İçin (a) Optimum Boyutsuz Kenar Eğiminin ve (b) Optimum Boyutsuz Kenar Eğiminin β_L^*=1 Durumunda Değişimi



(a)



(b)

Şekil 9: Üçgen Kesit İçin (a) Optimum Boyutsuz Kenar Eğiminin ve (b) Optimum Boyutsuz Kenar Eğiminin $\beta_A^* = 0{,}5$ Durumunda Değişimi

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Şekil 7 ve Şekil 8' de ikinci durum için ateş böceği ve av arama algoritmasından elde edilen sonuç ile diferansiyel gelişim algoritması sonuçları verilmektedir. Grafikler incelendiğinde ateş böceği algoritması sonuçlarının diğer algoritmalardan elde edilen sonuçlara göre uyumsuz olduğu bunun yanında av arama algoritması ile diferansiyel gelişim algoritması sonuçlarının birbirleriyle daha uyumlu olduğu görülmektedir.

Sonuç

Bu çalışmada üçgen dikdörtgen ve trapez kaplamalı açık kanal kesitlerinin optimizasyonu yapılmıştır. Optimizasyon modelinin çözümünde ateş böceği ve av arama algoritması kullanılmış ve sonuçlar literatür ile karşılaştırılmıştır.

Sonuç olarak iki algoritmanın da açık kanal kesit optimizasyonu probleminde kullanılabileceği görülmüştür. Av arama algoritması ile hem optimizasyon probleminin çözümünde ateş böceği algoritmasına göre daha iyi sonuçlar elde edilmiş hem de yakınsama hızı konusunda daha iyi sonuçlar elde edilmiştir.

Sonuçların literatürle karşılatılması ile daha önceki çalışmalarda daha düşük maliyet değerlerine ulaşılabildiği görülmüştür.

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FARKLI ORANLARDA UÇUCU KÜL KULLANIMININ BETONARME DAVRANIŞA ETKİLERİ

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Özet: Betonun ana bileşenlerinden olan çimentonun karışımdaki oranı hacimce %13, ağırlıkça %15'tir. Bu değerlerle çimento beton maliyetinde büyük bir yer tutmaktadır. Çimento üretimi sırasında ortama CO_2 gaz çıkışı olmaktadır. Dolayısıyla çimentonun çevreye verdiği zarar da küçümsenemeyecek kadar fazladır. Ayrıca çimento betonun özağırlığını ve maliyetini de arttırmaktadır. Söz konusu çalışmada çimentonun tüm bu dezavantajlarını azaltabilmek adına kullanılan çimento hacmini küçültmek hedeflenmiştir. Bu amaçla çimento hacmi ile çevresel bir atık olan uçucu kül hacmi yer değiştirilmiştir. % 25, % 33 ve % 50 uçucu kül kullanım oranları baz alınarak betonarme bir kiriş tasarlanmıştır. Bu kiriş ANSYS Sonlu Elemanlar Programında eğilmeye maruz bırakılmıştır. Sonucunda yüklemeler altında oluşan çatlaklar ve gerilme değerleri karşılaştırılmıştır. Sonuç olarak uçucu kül kullanımının betonarme davranış üzerinde olumsuzluk yaratacak bir etkisinin olmadığı ve kullanımının çevreye ve ekonomiye fayda sağladığı ortaya konulmuştur.

Anahtar Kelimeler: Betonarme kiriş, Çatlak, Sonlu Elemanlar, Uçucu kül.

Giriş

Günümüzde beton, çimento, uygun granülometride agrega, su ve ihtiyaca göre ilave edilen uygun katkı maddelerinden oluşmaktadır. Teknolojinin gelişmesiyle beraber beton karışımına giren malzemeler araştırılmaya ve yeni özel karışımlı betonlar üretilmeye başlanmıştır. Burada amaç; ilave katkılar üreterek veya hâlihazırda bulunan malzemeleri kullanarak, ihtiyaca göre beton dayanımını ve/veya durabilitesini arttırmak, yapının ağırlığını veya maliyetini düşürmektir. Betonun ana bileşenlerinden olan çimentonun karışımdaki oranı hacimce %13, ağırlıkça %15'tir (Doğangün, 2007). Bu değerlerle çimento beton maliyetinde büyük bir yer tutmaktadır. 1 ton çimento üretimi sırasında yaklaşık olarak 1 ton CO_2 gazının açığa çıktığı düşünülecek olursa, çimentonun çevreye verdiği zarar azımsanmayacak kadar fazladır (Roumain ve Sarkar, 2000). Bu sebeple günümüzde çimentonun puzolanik malzemelerle yer değiştirmesi ile hem daha ekonomik hem de çevreye daha duyarlı beton üretimi yapılabilmektedir. Uçucu kül de son yıllarda kullanım alanının genişlediği çevresel bir atıktır. Uçucu külün betonun durabilitesini arttırmasının yanı sıra çimento hacmi ile değiştirildiğinde beton ağırlığını düşürdüğü yönünde çalışmalar da mevcuttur (Zandi, 2012). Söz konusu çalışmada, uçucu külün yapısal elemanlarda kullanılmasının yaygınlaştırılması hedeflenmektedir. Kullanılan farklı uçucu kül miktarlarındaki C30 beton sınıfı hedefli uçucu küllü numuneler hazırlanarak basınç deneyine tabi tutulmuştur. Elde edilen karakteristik beton basınç dayanımları, gerilme-şekil değiştirme ilişkileri göz önünde tutularak ANSYS sonlu elmanlar programında betonarme kirişler tasarlanmış ve kirişlerde farklı etriye aralıkları da değişken olarak seçilerek uçucu kül oranı ve etriye aralıklarının betonarme davranışa etkileri ortaya konulmuştur.

Deneylerde Kullanılan Malzemeler

Türkiye'de 12 adet faaliyet gösteren termik santral bulunmaktadır. Türkiye'deki elektrik üretiminin büyük bir bölümü bu termik santrallerden elde edilmektedir. Santrallerde yakıt olarak kullanılan kömür neticesinde de değişik özelliklerde kül ve cüruf açığa çıkmaktadır. Endüstrinin diğer kollarında yararlanılamayan linyit

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kömürlerinin gelecekte termik santrallerde kullanılacak olduğu da düşünülünce, bu yıllık üretim miktarının gelecekte artacağı ortadadır. Bu sebeple santrallerden elde edilen endüstriyel atıklardan faydalanma yolları araştırılmıştır. Atık maddeleri tekrar kazanmak amacıyla, bu tip endüstriyel atıklar betonda katkı maddesi olarak kullanılmaya başlanmıştır. Söz konusu çalışmada kullanılan uçucu kül Zonguldak Çatalağzı Termik Santrali (ÇATES)'den temin edilmiştir.

Uçucu kül sınıflandırılmasında kimyasal bileşen yüzdesi esas alınarak ASTM C 618 ve TS EN 197-1 standartları baz alınmaktadır. Buna göre uçucu küller ASTM C 618'e göre C ve F sınıfı olmak üzere iki sınıfa; TS EN 197-1 göre ise kalkersi (W) ve silissi (V) olmak üzere ikişer gruba ayrılmaktadır. Türkiye Çimento Müstahsilleri Birliği tarafından 2009 yılında yayınlanmış kitapta, Türkiye'deki 11 adet termik santralde 5 gün süre ile elde edilen uçucu kül numunelerinin ham olarak laboratuvarda kimyasal, mineralojik, morfolojik, fiziksel ve mekanik özelliklerini inceleyerek gerekli yorumlama ve sınıflandırmalar yapılmıştır. Bu kaynağa göre, ÇATES'ten elde edilen uçucu külün kimyasal bileşim açısından bileşen yüzdelerinin birbirine çok yakın olması sebebiyle, bu santralden uniform özellikte kül elde edilebileceği belirtilmiştir. Ayrıca reaktif kireç miktarının %10'un altında olması nedeniyle TS EN 197-1 standardına göre V sınıfına girdiği belirtilmiştir. ASTM C 618 standardına göre ise SiO_2+Al_2O_3+Fe_2O_3 değerinin %70'in üzerinde olması ve CaO miktarının da %10'dan az olması sebebiyle F sınıfına girdiği belirtilmiştir. SiO_2+Al_2O_3+Fe_2O_3 değerinin %70'in üzerinde olması nedeniyle de TS 639'da istenen şartlara uyduğu ve SO_3 ile serbest kireç yüzdelerinin sırasıyla % 0.08 ve % 0.13 olduğu için TS EN 450 standardında istenilen koşulları sağladığı belirtilmiştir. Bu sonuçlar dâhilinde de ÇATES uçucu külünün dört standartta da kimyasal bileşen bazında istenilen koşullara tamamen uygun bir kül olduğu vurgulanmıştır. Tablo 1 ve 2'de ÇATES uçucu külünün kimyasal analiz sonuçları verilmiştir.

Tablo 1.ÇATES uçucu külünün kimyasal analiz sonuçları(Türker vd., 2009).

	Numune							
Oksit (%)	1	2	3	4	5	Ortalama	St.sapma	Varyasyon kats.,%
SiO_2	58.69	58.48	58.55	58.95	59.07	58.75	0.25	0.43
Al_2O_3	25.10	25.34	25.48	24.94	25.36	25.24	0.22	0.87
Fe_2O_3	5.80	5.77	5.66	5.81	5.74	5.76	0.06	1.05
S+A+F	89.59	89.59	89.69	89.70	90.17	89.75	-	-
CaO	1.49	1.48	1.34	1.55	1.45	1.46	0.08	5.48
MgO	2.22	2.22	2.22	2.22	2.20	2.22	0.01	0.45
SO_3	0.12	0.12	0.10	0.03	0.05	0.08	0.04	50.00
K_2O	4.04	4.09	4.04	4.02	4.05	4.05	0.03	0.74
Na_2O	0.59	0.59	0.59	0.61	0.61	0.60	0.01	1.83
KK	1.28	1.01	1.33	1.02	0.98	1.12	0.17	15.18
Cl^-	0.013	0.027	0.011	0.016	0.010	0.015	0.007	50.00

Tablo 2.ÇATES uçucu külünün kimyasal analiz sonuçları değerlendirmesi (Türker vd., 2009).

	Standartlara Uygunluk Sınırları						
Oksit (%)	Uçucu Kül	TS EN 450	TS EN 197-1		TS 639	ASTM C 618	
			V	W		F	C
SiO_2	58.75						
Al_2O_3	25.24						
Fe_2O_3	5.76						
S+A+F	89.75				> 70.00	> 70.00	> 50.00
CaO	1.46						
MgO	2.22				<5.00		
SO_3	0.08	<3.00			<5.00	<5.00	<5.00
K_2O	4.05						
Na_2O	0.60						
KK	1.12	<5.00	<5.00	<5.00	<10.00	<5.00	<6.00
Cl^-	0.015	<30.10					
Serb.CaO	0.13	<1.00					
Reak.SiO_2	34.18	>25.00	> 25.00	> 25.00			
Reak.CaO	0.65		<10.00	> 10.00			

ÇATES uçucu külün morfolojik incelemesi sonucunda ise çoğunluğun 1-20 µm arasında tam küresel tanecikler

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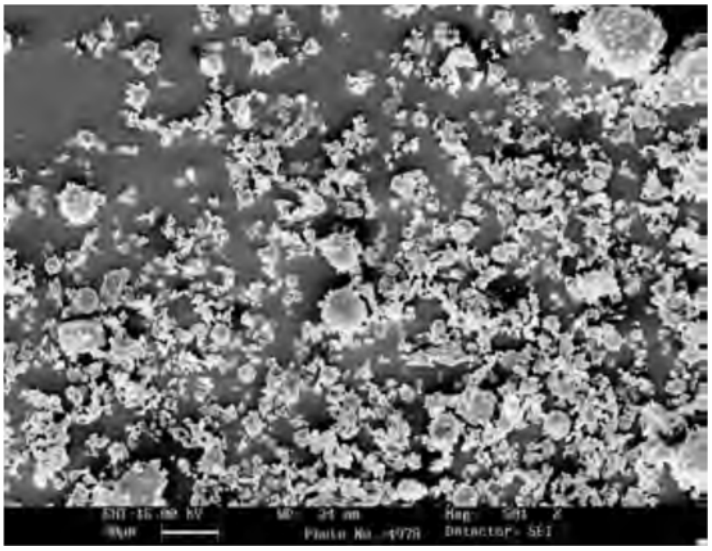
olmakla birlikte yarı köşeli taneciklerden oluştuğu belirtilmiştir (Şekil 1).



Şekil 1. ÇATES uçucu külünün yüzey yapısına ait fotoğraf (Türker vd., 2009).

Karışımda kullanılan uçucu kül F Sınıfı olmakla birlikte %25,33 ve 50 oranında çimento hacmi ile yerdeğiştirilmiştir. Çimento sınıfı CEM-1 42.5 R tipi Portland çimentosudur. Kimyasal katkı olarak, çimento ağırlığının %1.2 si oranında süper akışkanlaştırıcı kullanılmıştır.

Beton Üretimi

Beton üretiminde karışıma girecek agrega, su ve çimento önceden tartılıp hazırlanmıştır. Betonu karıştırmak için kullanılacak olan düşey eksenli betoniyer nemlendirilmiştir. Agregalar, çimento ve uçucu kül önceden tartılarak betoniyere konulmuştur. Hazırlanan kuru karışım kısa bir süre döndürülerek homojen bir karışım olması sağlanmıştır. (Şekil 2). Daha sonra betoniyerdeki karışıma gerekli su, süper akışkanlaştırıcı ile birlikte katılarak karıştırılmaya devam edilmiştir.



Şekil 2. Karışımda kullanılan uçucu kül ve beton harcı.

Hazırlanan betona öncelikle kıvamını belirleyebilmek için slump deneyi yapılarak kıvam sınıfı doğrulanmıştır. Hazırlanan her farklı karışımdan üçer adet silindir numune alınmıştır (Şekil 3).

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Şekil 3. Kalıplara yerleştirilen numuneler.

Üretimden bir gün sonra ise beton numuneler kalıplarından çıkartılarak, deneylerin yapılacağı 28.güne kadar sıcaklığı 20±2 °C olan kür havuzunda standart suda saklanmıştır. Kür havuzunda saklanan silindir numuneler 28. günde kalıplardan çıkartılmıştır. Numunelere basınç deneyi uygulanırken yük altındaki gerilme-şekil değiştirme ilişkisini elde edebilmek amacıyla numunelerin orta noktalarına birim deformasyon ölçerler yapıştırılmış ve birim deformasyon ölçer Data-Logger'a bağlanarak diğer ucu da presin ilgili kanalına bağlanmıştır. Numuneler basınç yükü altında kırılarak gerekli okumalar kayıt altına alınmıştır (Şekil 4, 5).



Şekil 4. Numunelere birim deformasyon ölçer yapıştırılması.

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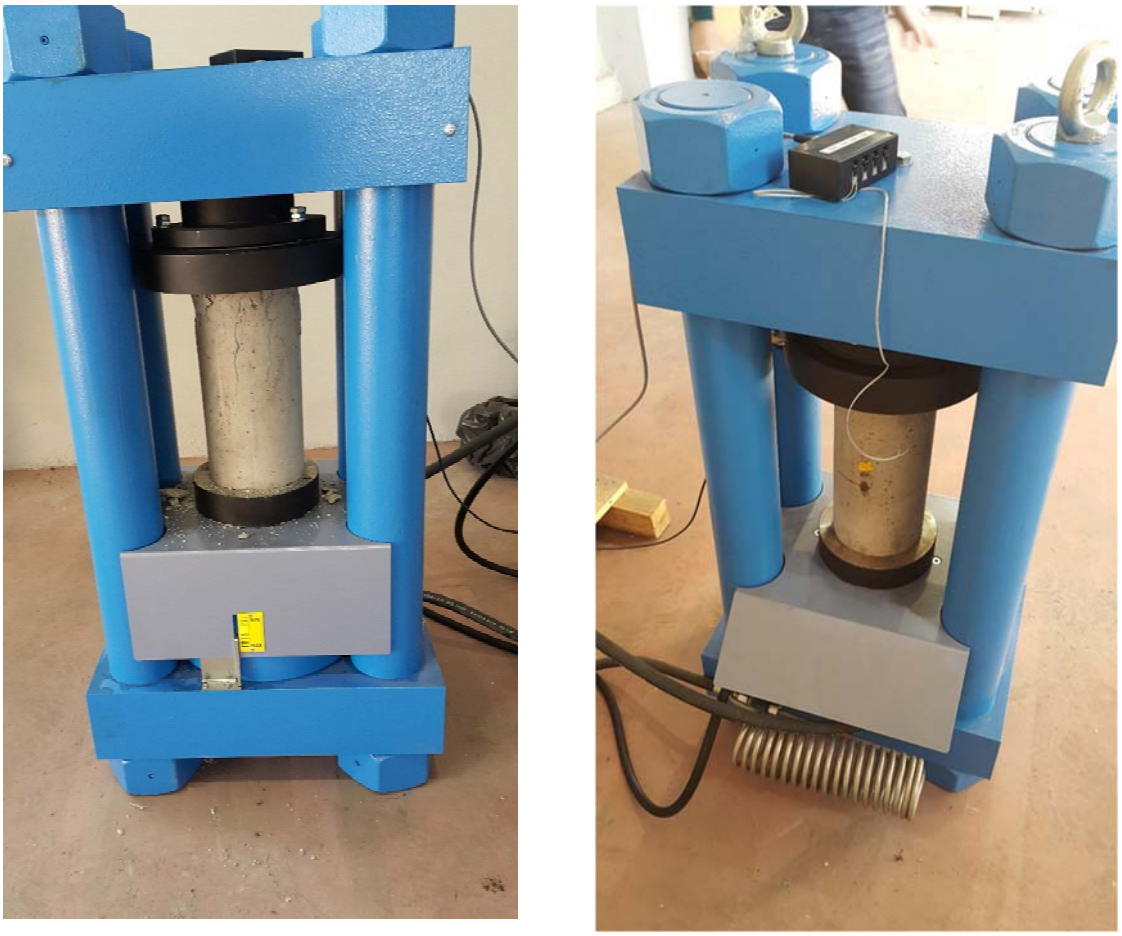

Şekil 5. Basınç deneyi yapılması.

Burada betonun yük altındaki gerilme- şekil değiştirme ilişkisini elde etmek istenmesindeki amaç ANSYS programında uçucu küllü beton davranışını modelleyebilmektir. Beton davranış modeli olarak William Wranke modeli kullanılmıştır. Elde edilen sonuçlara göre saptanan farklı kül oranlarındaki beton basınç dayanımları Tablo 3'de verilmiş olup, çalışmanın beton basınç dayanımı değerlerini oluşturmuştur.

Tablo 3. Numunelerin William Wranke Modeli'ne göre basınç dayanımları.

	UK-25	UK-33	UK-50
1.NOKTA	9.06	8.86	8.65
2.NOKTA	8.90	8.79	8.69
3.NOKTA	21.16	20.84	20.55
4.NOKTA	29.22	28.61	28.09
5.NOKTA	30.17	29.44	28.84
ÇEKME	3.42	3.38	3.34

Analitik Çalışma

Söz konusu çalışmada eğilme etkisi altında kirişin yapısal davranışını incelemek için kurulan senaryolar kapsamında ANSYS sonlu elmanlar programında modellenecek olan betonarme kirişin eni 125 mm, boyu 1100 mm ve yüksekliği de 250 mm olarak seçilmiştir. Kabuk beton kalınlığı da 25 mm olarak alınmıştır.
Modellenen kirişin şematik planı Şekil 6'da verilmiştir. Kirişlerde 2Ø10 üst, 2Ø10 alt boyuna donatıları kullanılmıştır. Seyrek etriye adımlı modelde 20 cm (200 mm) aralıklı, sık etriye adımlı modelde ise 10 cm (100 mm) aralıklı olarak Ø8'lik etriyeler ile kiriş sarılmıştır.

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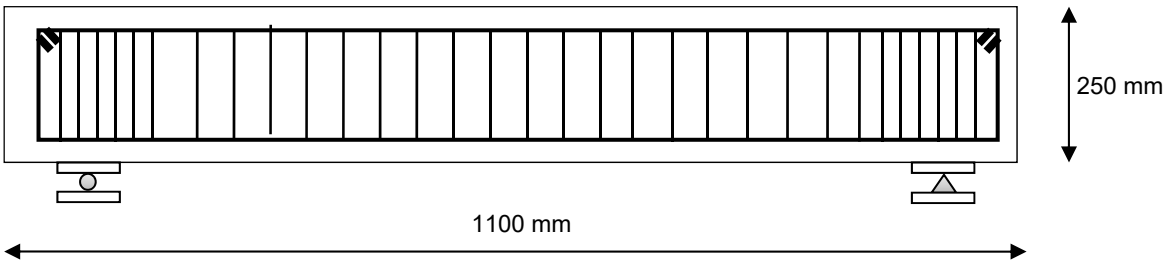


Şekil 6. Kiriş Ebatları

Bu kapsamda araştırılmak istenen betondaki uçucu kül miktarının ve kesitteki etriye sıklığının betonarme kirişlerde davranışı nasıl etkilediğidir. Araştırma kapsamındaki değişken parametreler uçucu kül oranı ve yapısal davranış açısından etriye sıklığı ile sağlanacak olan kesitteki donatı oranıdır. Modellemeleri yapılacak olan kiriş tiplerine ait özellikler Tablo 4'de verilmiştir.

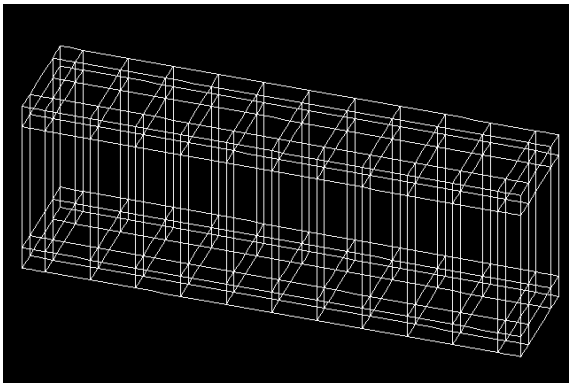
Tablo 4. Kiriş Donatı ve Uçucu Kül Detayları

Etriye Düzeni	**%25 Uçucu Küllü Beton**	**%33 Uçucu Küllü Beton**	**%50 Uçucu Küllü Beton**
Seyrek Etriye Adımlı	M-1	M-2	M-3
Sık Etriye Adımlı	M-4	M-5	M-6

Tablo 4 incelenecek olursa, söz konusu çalışma, etriye düzenine göre seyrek etriye adımlı ve sık etriye adımlı olmak üzere iki; malzeme özelliklerine göre %25, 33 ve 50 oranlı uçucu küle sahip beton olmak üzere üç farklı malzeme parametresine sahiptir. Toplamda ise 6 adet kiriş modeli mevcuttur.

Modelleme ve Analiz

Modelleme için ANSYS programı kullanılmıştır. ANSYS ilk olarak Turner ve arkadaşları tarafından ortaya sunulan Sonlu Eleman Analizleri (Finite Element Analyse) (FEA) yöntemi programı olarak ortaya çıkmıştır (1956). Yaklaşık çözümler için güçlü bir hesaplama tekniği olan ANSYS dünya çapında simülasyonlar için araştırmacılar tarafından kullanılan mühendislik yazılımıdır.
ANSYS sonlu eleman modelinde, modeller komut istemi hat girişi veya grafik kullanıcı ara yüzü (GUI) kullanılarak oluşturulabilir. Bu uygulamada, modeli oluşturmak için grafik ekran (GUI) kullanılmıştır.
Beton kiriş modelinde katı hacim için SOLID65, donatılarda ise LINK8 çubuk modeli kullanılmıştır. Bütün senaryolar malzeme modelleri ve etriye adımlarına göre tek tek kurulmuştur (Şekil 7).



Şekil 7. Sık etriye adımlı modele ait üç boyutlu boyuna donatı ve etriye yerleşimi.

Tasarlanan modeller ANSYS programında 100 kN'luk tekil yükleme yapıldıktan sonra grafik ekrandan çağırılarak analiz sonuçları (çatlaklar, deformasyon, sehim) incelenmiştir. Analiz sonrası oluşan çatlakların sırasını programdan birincil, ikincil, üçüncül ve toplam çatlak olarak izlemek mümkün olmakla birlikte Şekil 8,

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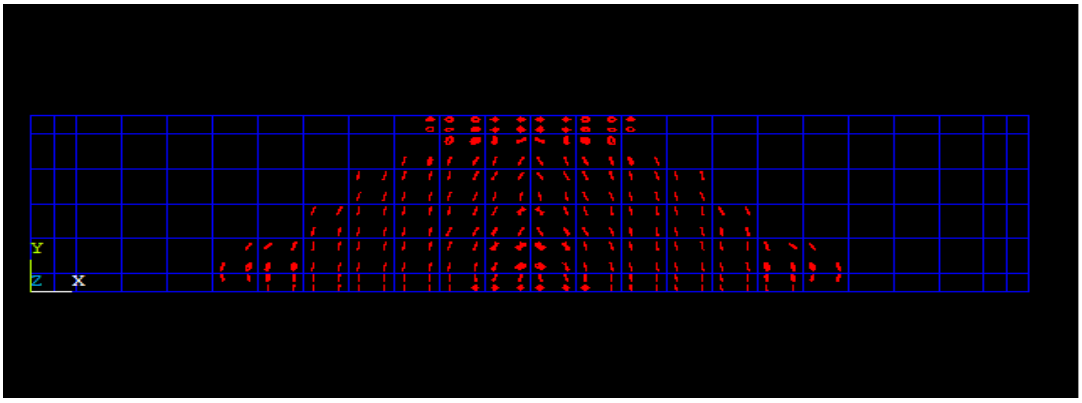
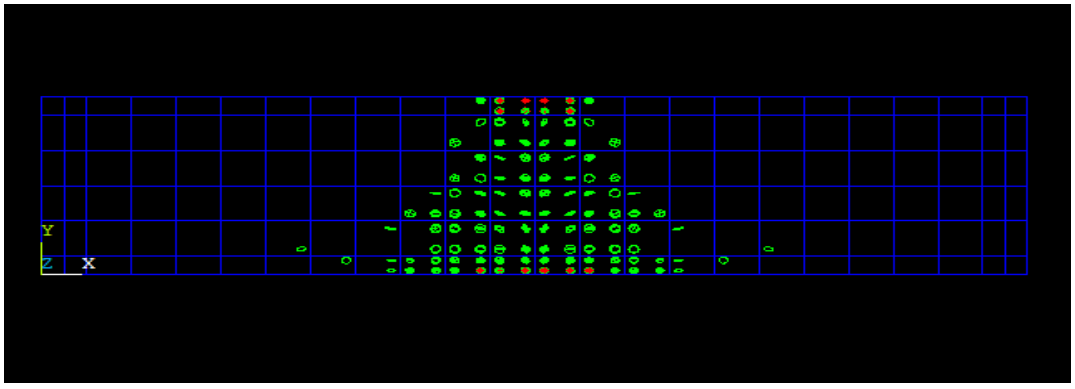
9, 10'da %25 uçucu küllü sık etriye adımlı kirişlerde gerçekleşen çatlak sıraları gösterilmiştir. Diğer uçucu kül oranlarında ise çatlakların toplamını ifade eden çatlak değişimleri verilmiştir. Çalışmada malzeme ve etriye aralığı olmak üzere 2 ana parametre bulunduğundan çatlak sonuçları seyrek ve sık etriye adımlı olmak üzere iki başlık altında özetlenmiştir.

Sık Etriye Adımlı Modellere Ait Analizler Sonucu Oluşan Çatlaklar

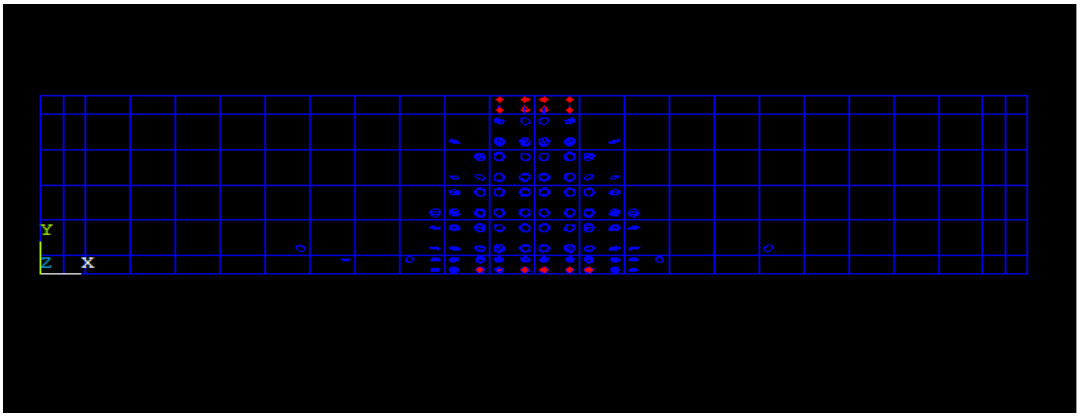
Sık etriye adımlı modellere ait çatlak oluşumları Şekil 8-13'de görülmektedir. %25 uçucu küllü sık etriye adımlı kirişlerde oluşan çatlaklar ise sırasıyla Şekil 8-11'de verilmiştir. Burada birincil çatlaklar kesitin ilk zorlanmaya başladığı liflerde mesnetlere yakın ve ağırlıklı olarak yükün uygulandığı orta bölgede çıkmıştır. Yükün etkisi arttıkça da kesit zorlandığı için çatlak şekilleri artmış ve derinleşmiştir.
Uçucu kül oranının arttığı Şekil 11, 12, 13 incelendiğinde ise ikincil ve üçüncül çatlakların değiştiği görülmektedir. Bu da kül artışının dayanımı az da olsa zayıflattığını ortaya koymaktadır.



Şekil 8. %25 uçucu küle sahip sık etriye adımlı modelin birincil çatlakları



Şekil 9. %25 uçucu küle sahip sık etriye adımlı modelin ikincil çatlakları



Şekil 10. %25 uçucu küle sahip sık etriye adımlı modelin üçüncül çatlakları

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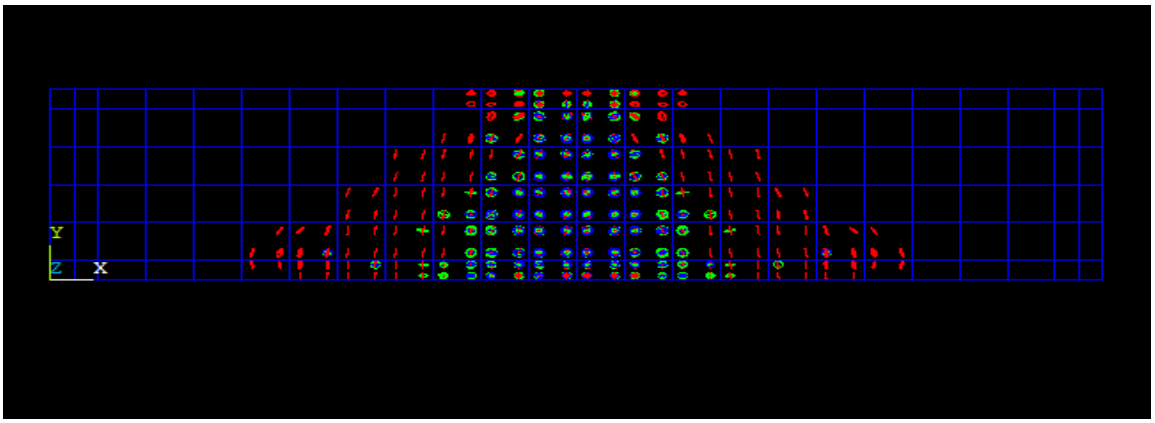
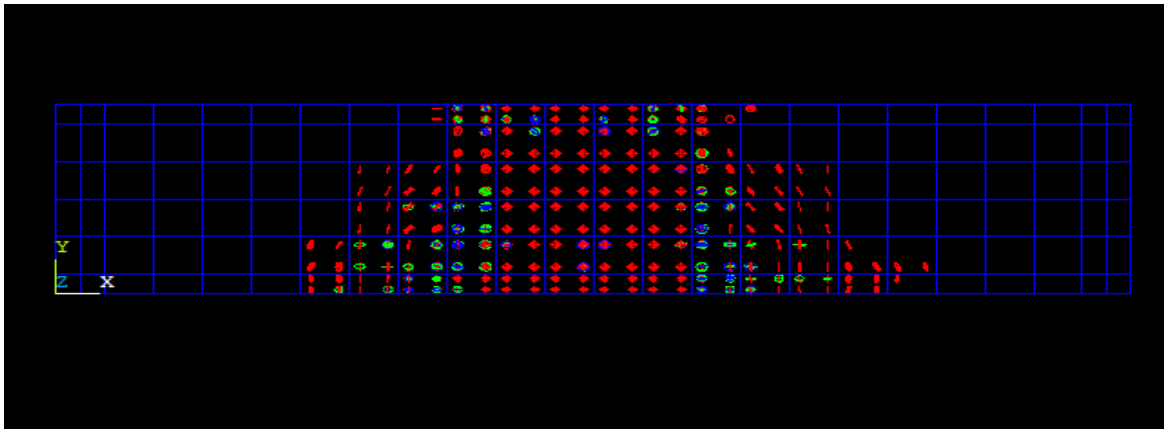
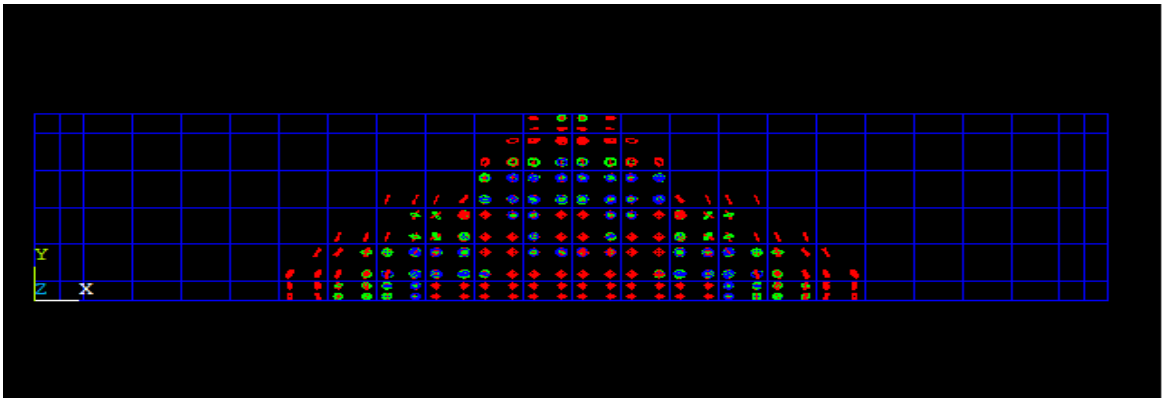


Şekil 11. %25 uçucu küle sahip sık etriye adımlı modelde oluşan tüm çatlaklar



Şekil 12. %33 uçucu küle sahip sık etriye adımlı modelde oluşan tüm çatlaklar



Şekil 13. %50 uçucu küle sahip sık etriye adımlı modelde oluşan tüm çatlaklar

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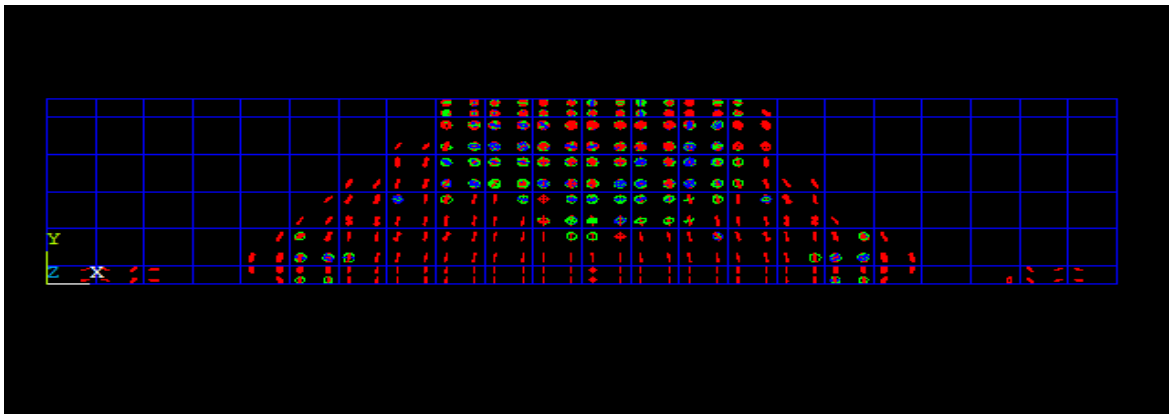
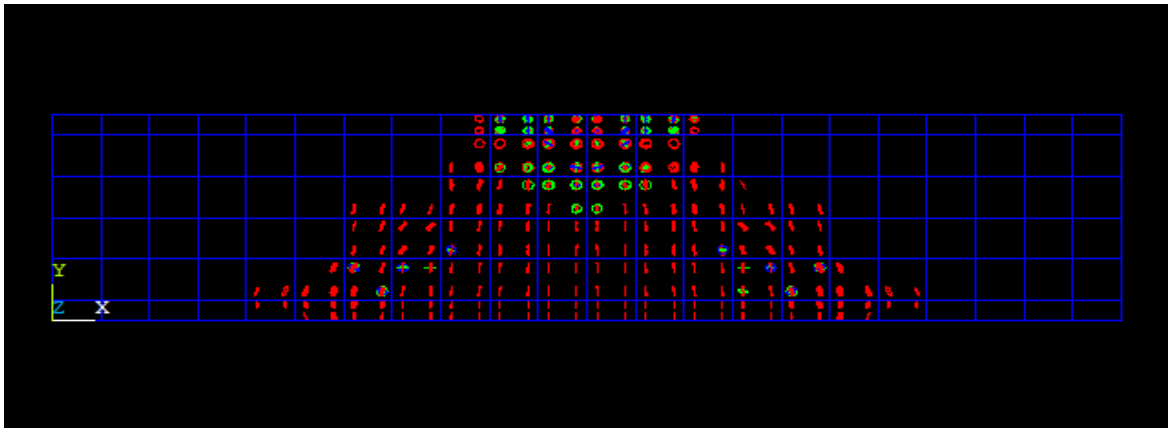
Seyrek Etriye Adımlı Modellere Ait Analizler Sonucu Oluşan Çatlaklar

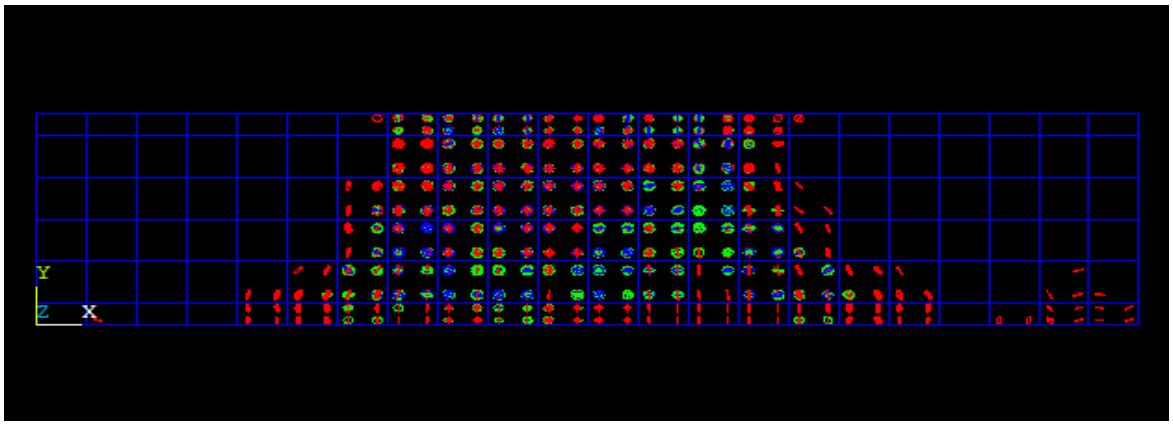
Seyrek etriye adımlı modellere ait çatlak oluşumları Şekil 14-16'da görülmektedir.
Şekiller incelendiğinde yine uçucu kül oran artışının çatlak oluşumunu olumsuz yönde etkilediği görülmektedir. Ayrıca uçucu kül oranı sabit tutulduğunda, etriye adımının azaltılmasının davranışı olumsuz yönde etkilediği de açıkça görülmektedir(Şekil 13,16).



Şekil 14. %25 uçucu küle sahip seyrek etriye adımlı modelde oluşan tüm çatlaklar



Şekil 1. %33 uçucu küle sahip seyrek etriye adımlı modelde oluşan tüm çatlaklar



Şekil 16. %50 uçucu küle sahip seyrek etriye adımlı modelde oluşan tüm çatlaklar

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Sonuçlar

Sonuç olarak meydana gelen bu çatlaklar genel olarak kirişin orta bölgesinde, momentin ve sehimin maksimum olduğu bölgelerde yoğunlaşmıştır.
Uçucu kül oranı sabit tutulduğunda(%50) etriye adımının artması ile çatlak dağılımı ve sayısının arttığı gözlemlenmiştir (Şekil 13, Şekil 16).
Etriye adımı sabit tutulup uçucu kül oranı arttırıldığında ise çatlakların daha az sayıda fakat daha derin şekilde oluştuğu gözlemlenmiştir. Bu davranışa sebep olarak uçucu kül artışı ile betonun çekme ve basınç dayanımının azalması gösterilebilir (Şekil 14, Şekil 15).
Çimento içerisindeki uçucu kül betonun dayanımını ve maliyetini belirli oranda düşürmektedir. Bu durum ekonomiklik ve çevre kirliliği açısından sağlıklı olmasına rağmen belirli oranların üzerinde kullanılan uçucu küller dayanımın ve mukavemetinin azalması sebebi ile yapısal açıdan sakıncalı olabilir. Fakat literatürde uçucu kül ile geleneksel beton davranışının benzer olduğu vurgulanmaktadır (Arezoumandi vd. 2013). Dolayısıyla bilinçli bir tüketimle çevresel bir atık olan uçucu kül kullanımı teşvik edilmelidir.

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FEN BİLGİSİ ÖĞRETMEN ADAYLARININ BİLİMSEL HİPOTEZ, TEORİ VE YASAYA YÖNELİK GÖRÜŞLERİ

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Özet: Bu çalışmanın amacı, fen bilgisi öğretmen adaylarının bilimsel hipotez, teori ve yasa kavramlarına yönelik görüşlerini belirlemek ve öğretmen adaylarında oluşabilecek kavram yanılgılarını ortaya çıkarmaktır. Çalışmanın örneklemini Afyon Kocatepe Üniversitesi, Eğitim Fakültesi Fen Bilgisi Öğretmenliği programında okuyan 180 öğretmen adayı oluşturmaktadır. Veri toplamak aracı olarak; araştırmacılar tarafından geliştirilen bilimsel hipotez, teori ve yasa kavramları ile ilgili açık uçlu sorular kullanılmıştır. Çalışmadan elde edilen veriler betimsel analize tabi tutulmuştur. Çalışmanın sonucu fen bilgisi öğretmen adaylarının bazılarının bilimsel hipotez, teori ve yasa kavramlarına yönelik yanlış anlamalara sahip oldukları görülmüştür. Ayrıca bilimsel hipotez, teori ve yasa arasında hiyerarşik bir ilişkinin olduğunu düşündükleri tespit edilmiştir. Bunlara ilave olarak bazı fen bilgisi öğretmen adaylarının bilimsel bir yasanın kesin ve değişmez olduğunu düşündükleri belirlenmiştir.

Anahtar kelimeler: Bilimin Doğası, Fen Bilgisi Öğretmen Adayları, Bilimsel Hipotez, Bilimsel Teori, Bilimsel Yasa

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FEN BİLİMLERİ ÖĞRETMENLERİNİN BAKIŞ AÇISIYLA SOSYO-BİLİMSEL KONULAR

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Özet

Günümüzde sosyo-bilimsel konular üzerine daha fazla yer verildiği görülmüştür. Bu çalışmada, fen bilimleri öğretmenlerinin almış sosyo-bilimsel konulara bakış açıları detaylı olarak incelenmiştir.. Araştırmada, nitel araştırma desenlerinden olgu bilim deseni kullanılmıştır. Araştırmanın amacı, fen bilimleri öğretmenlerinin sosyo-bilimsel konular hakkındaki görüşlerini belirlemektir. Araştırmanın katılımcılarını, 2015-2016 eğitim öğretim yılı bahar döneminde 4 farklı ilkokulda görev yapan 12 fen bilgisi öğretmeni oluşturmaktadır. Araştırmanın katılımcılarının belirlenmesinde amaçlı örnekleme yöntemlerinden maksimum çeşitlilik örneklemesi kullanılmıştır. Araştırmada veriler, araştırmacılar tarafından geliştirilen ve açık uçlu sorulardan oluşan "Yarı Yapılandırılmış Görüşme Formu" ile nitel araştırma yöntemi kapsamındaki görüşme tekniklerinden biri olan odak grup görüşmesi tekniği kullanılarak toplanmıştır. Araştırmada, Fen Bilimleri öğretmenlerinin yaparak yaşayarak öğrenilen bir ders olmasından ve günlük yaşamdan ilişki kurularak işlemesinden dolayı Fen Bilimleri dersinin beceri kazandırmada çok önemli bir ders olduğunu belirttikleri sonucuna ulaşılmıştır. Ayrıca öğretmenlerin sosyo-bilimsel konuları kazandırmada öğretmen, aile, okul, öğrenci, program, eğitim sistemi, okul yönetimi ve çevrenin etkili olduğu belirtilmiştir.

Anahtar kelimeler: Sosyo-bilimsel konular, Fen bilimleri öğretmenleri, odak grup görüşmesi, nitel araştırma

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FRICTION AND WEAR BEHAVIOR OF PLASMA TRANSFERRED ARC COATING ON AISI 4140 STEEL OF BORON CARBIDE AND NICKEL POWDER MIXTURE

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ABSTRACT: Reducing effect of wear and friction is an important research area in machine design. In order to reduce these effects; lubrication, heat treatments and coatings are used on machine parts. Hard coatings are used in wear intensive environments and Plasma Transferred Arc (PTA) Coating is an innovative hard coating method. PTA coatings are used in applications such as automotive valves, glass and ceramic molds and plastic extrusion dies. PTA coating properties are gained from coating powder, thus coating powder research is an important aspect. In this study microstructure and wear behavior of AISI 4140 steel surface coated by Boron Carbide was inspected. Two different mixtures was prepared, Ekabor II ™ powder that contains Boron Carbide and pure Boron Carbide was mixed with a Nickel base to produce two different coating powder recipes. Wear tests were conducted on a Ball-on-Disk device with circular geometry. Optical and Electron Microscopy was used to characterize microstructure of coating layer formed on the surface of AISI 4140.

Key Words: Boron Carbide, PTA, Tribology, Ball-on-Disk

1. Introduction

Industrial applications cause friction and wear on parts. An important research field is the reduction of wear and friction. Lubrication is the first method used to reduce friction and wear. When lubrication cannot achieve required properties surface modification techniques are used. An important surface modification technique is Plasma Transferred Arc (PTA) coating that can reach high temperatures up to 30000K and has a relatively ease of use (Liu, Liu, Xu, & Yang, 2010). Low thermal stress on material, high coating thickness and high energy density makes PTA coatings a suitable method for glass and ceramic molds, automative valves, petro-chemical vanes, lamination cylinders, plastic extrusion molds and plastic extrusion screws (Gatto, Bassoli, & Fornari, 2004). PTA coating powders are composed of a base and additional materials. Base powders are usually composed of Cobalt and Nickel powders, where as WC, NiCrWC, Cr3C2, TiC and VC additives are used on steel to achieve required properties (Deuis, Yellup, & Subramanian, 1998).

In this study effect of B4C addition on PTA coatings was examined. Two different B4C sources were used and their effect on coating properties were inspected. Coating samples than tested on Ball-on-Disk machine. Both wear test samples and metallography samples were inspected by SEM and EDS.

2. Materials and Methods

In this study Ekabor II (that contains 5% B_4C, 5% KBF_4 and 90% SiC (Suwattananont, n.d.)) or Boron Carbide (B_4C) was mixed with Nickel in weight ratios given at Table 1 to produce PTA powder. The coating powder produced was put on a channel prepared on 100x40x20mm AISI 4140 steel with 1 mm depth and 3 mm width. A binding agent was used for binding powder to sample surface and samples were left to dry for 24 hours in a shaded moisture controlled environment. PTA coating is conducted at 100A current with a 3mm electrode and working distance of 4mm after 24 hour period and samples were preheated at 300°C. Argon was used as shielding and plasma gas at 25 l/min and 1.0 l/min flow rates respectively.

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Sample	Powder	Ratio	Mixing Method
N1	Ekabor II	4%	Manual
N2	Ekabor II	8%	Manual
C1	Ekabor II	6%	Manual
C2	Ekabor II	10%	Manual
C3	Ekabor II	12%	Manual
C4	Ekabor II	4%	Mill
C5	Ekabor II	6%	Mill
D1	Ekabor II	8%	Mill
D2	Ekabor II	10%	Mill
D3	Ekabor II	12%	Mill
E1	B4C	4%	Mill
E2	B4C	6%	Mill

Table 1 PTA Powder Mixtures

Cross sections of PTA coated samples were taken for metallography analysis. Metallography specimens were prepared by standard sample preparation techniques and etched with 2% Nital etchant for 40s.

Ball-on-Disc wear tests were conducted on CSM tribometer at 3N load, 2.5 cm/s speed for 80m. Samples surfaces were prepared to 0.6µm average surface roughness prior to test. Counterpart for Ball-on-Disc tests were 3mm diameter WC balls and all tests were conducted at 25ºC ambient temperature and 35% relative humidity. In order to calculate specific wear rate wear track profiles were measured using Mutitoyo SJ-400 surface profilometer. Ball-on-Disc test results were analyzed using trib R package developed by authors (AY, 2015).

3. Results and Discussion

3.1 Microstructure

In order to understand coating a panoramic image of etched samples were obtained. As can be seen from **Figure *1***, coating produced different phase structures. These phases have varying hardness.



Figure 1. Panoramic view of D1

Figure *2* a, shows hardness values of different phases differ between 750HV and 240 HV. As seen in **Figure *2*** b, c and d; high hardness phases have more dendritic formations.

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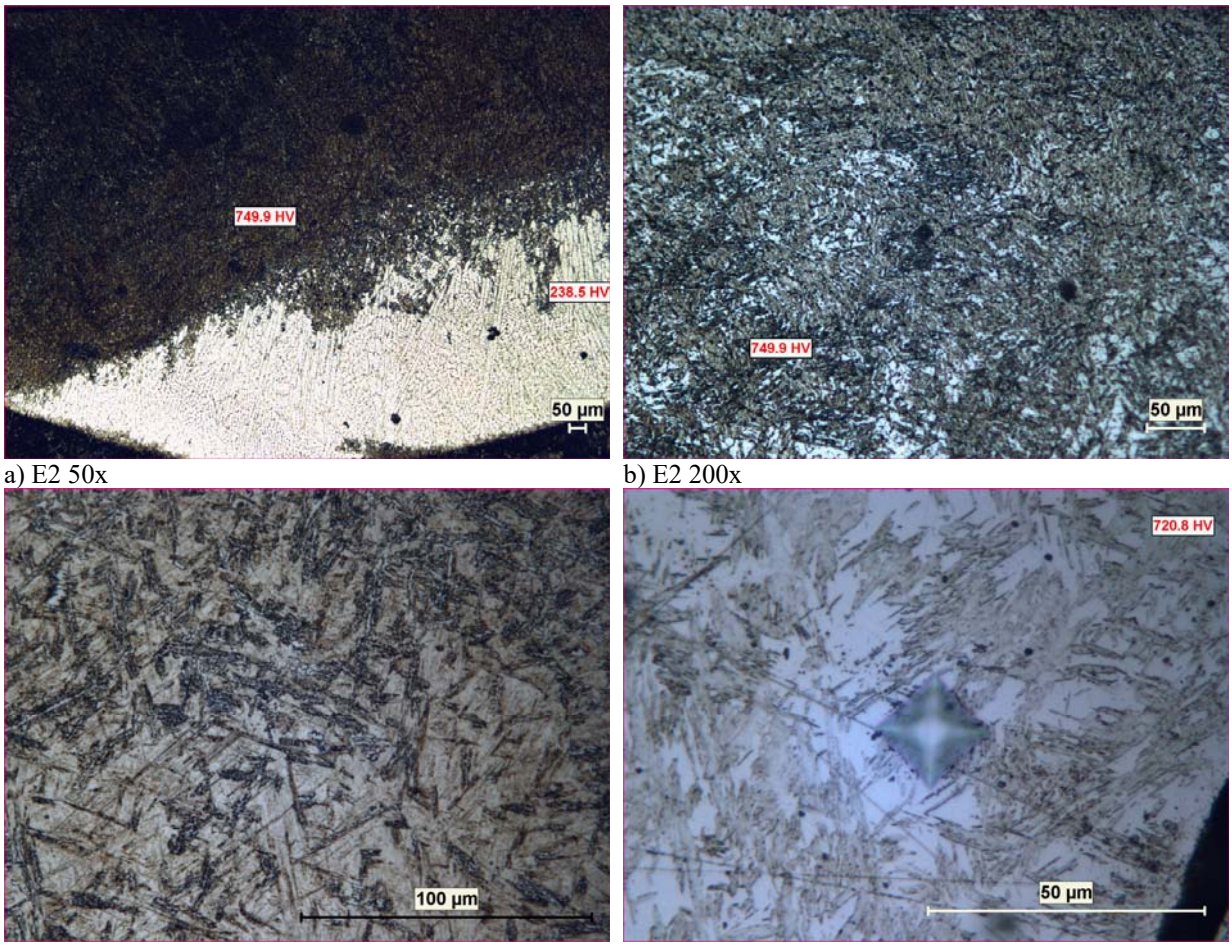
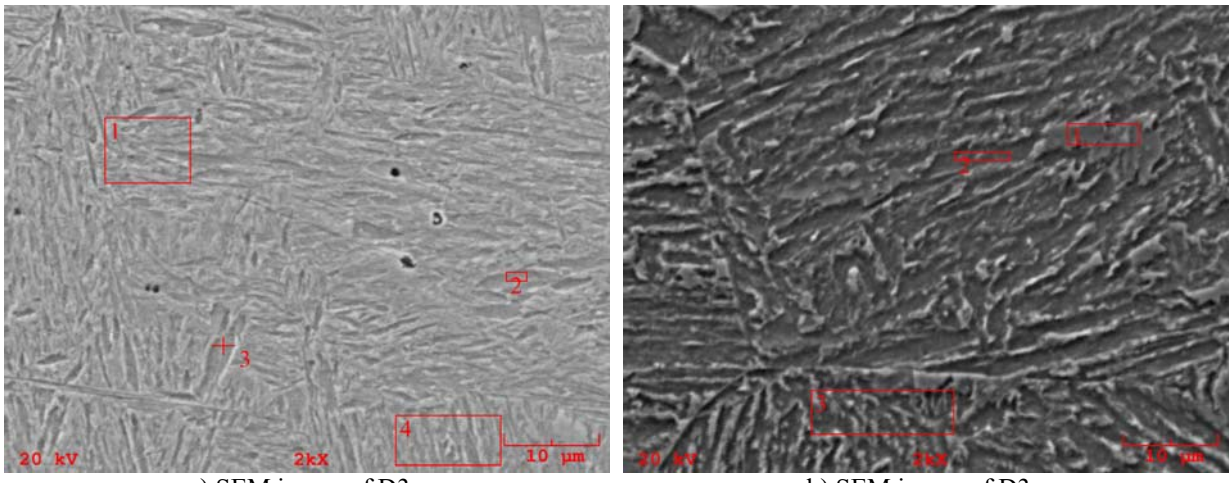


a) E2 50x b) E2 200x

c) C1 500x d) D3 1000x

Figure 2. Samples etched with Nital 2% 40s

SEM and EDS analysis of samples were conducted. As a representation SEM images and EDS results of sample D3 is given at **Figure *3*** and **Figure *4*** respectively. SEM results show there are dendritic formations and carbide phases. EDS analysis determines Cr and Mn from substrate mixed into the coating.



a) SEM image of D3 b) SEM image of D3

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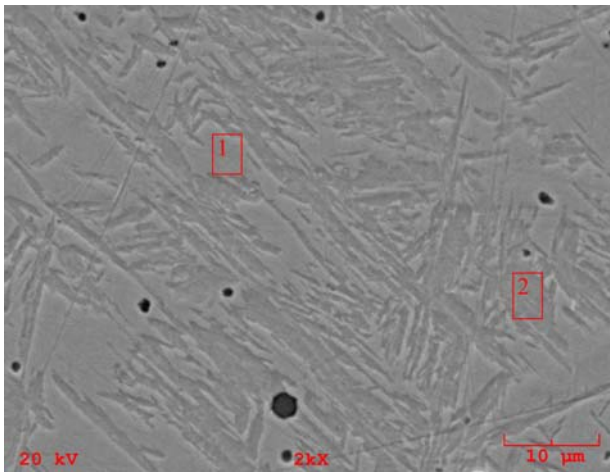
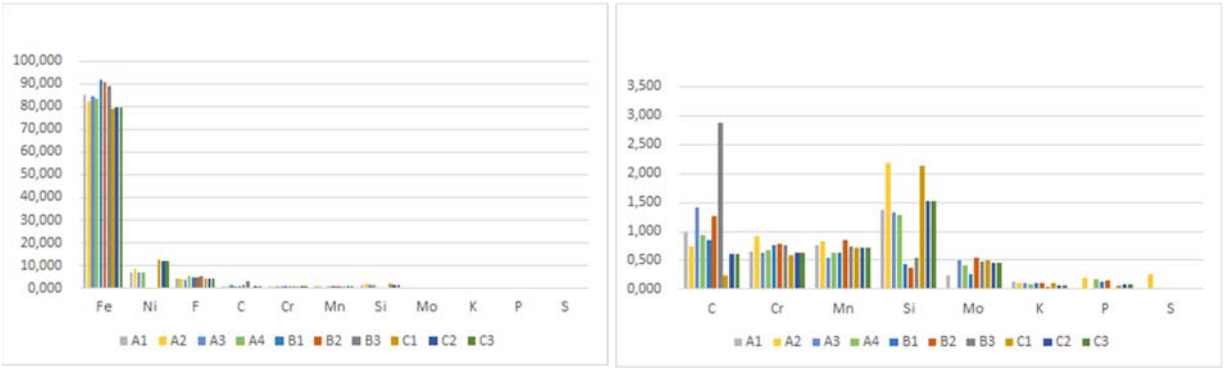


c) SEM image of D3

Figure 3. SEM images of sample D3

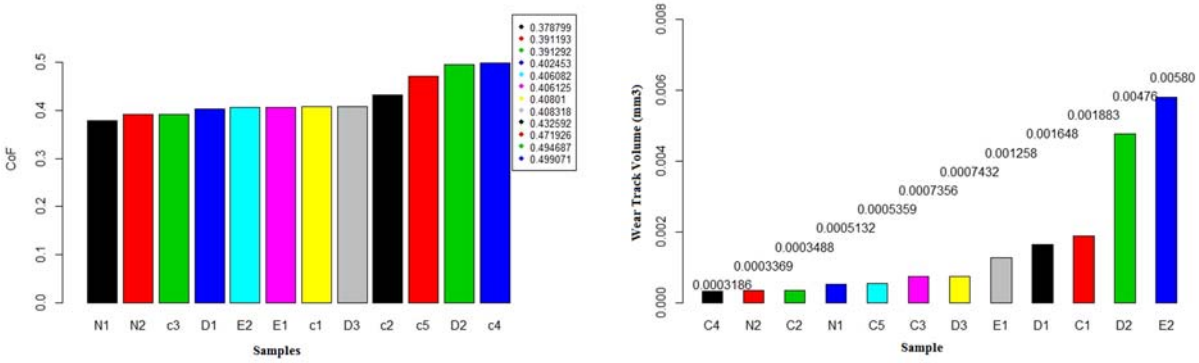


a) Element Weight Ratios of sample D3 b) Element Weight Ratios of sample D3 lower values

Figure 4. EDS Analysis of sample D3

3.2 Ball-on-Disk Test

The results of ball-on-disk tests were analyzed using trib on R. Coefficient of friction and wear track volumes of samples are given at **Figure *5***. The sample with the least amount of wear track volume, C4 has the highest CoF.



a) Coefficient of Friction of Samples b) Wear Track Volume of Samples

Figure 5. Coefficient of Friction and Wear Track Volume

In order to understand wear characteristics, change in friction force with respect to distance graph given at **Figure *6*** should be inspected. As seen from figure C4 sample that contains 4% Ekabor II and was prepared at mill reached steady state around 30m like the other samples but then friction force started to increase. As seen from **Figure *7*** C4 has the smallest wear track of all samples.

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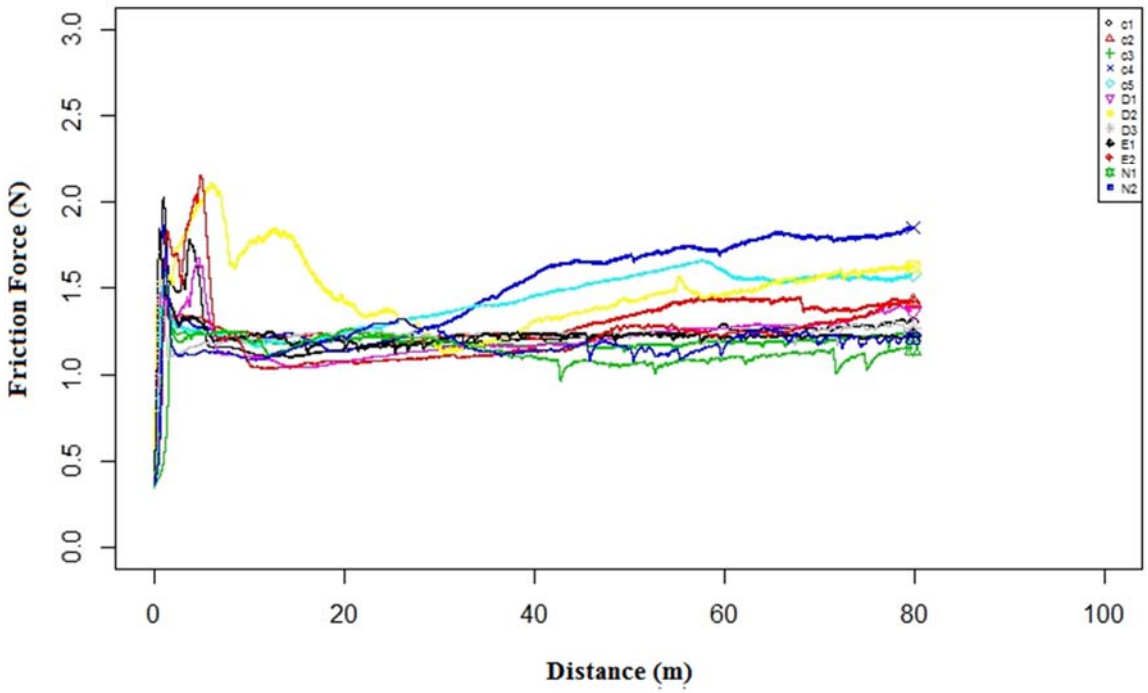

Figure 6. Friction Force vs Distance graph

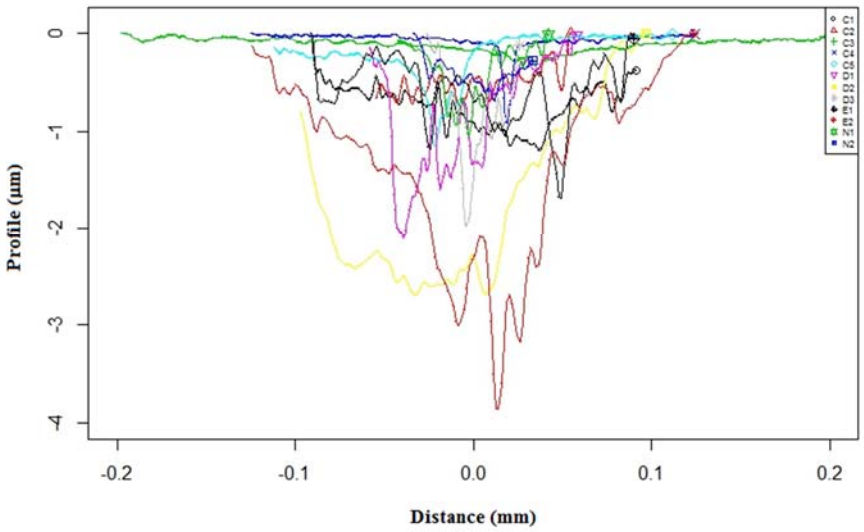

Figure 7. Wear Track Profile

So as to understand wear mechanism SEM and EDS analysis of wear tracks of samples were conducted. C4 shown adhesive and abrasive wear behavior and as seen from **Figure *8***. D3 however show mostly abrasive wear as seen at **Figure *9***.

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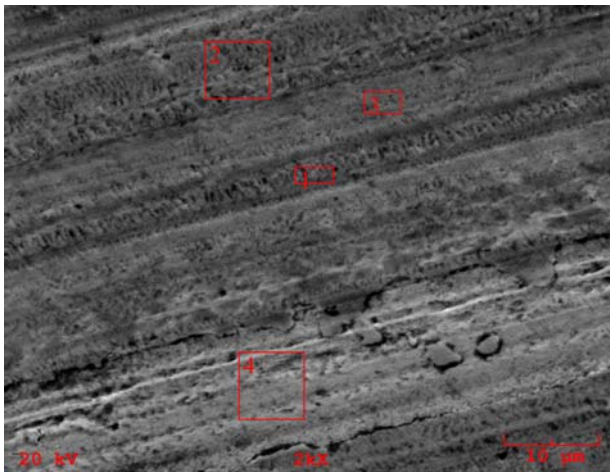
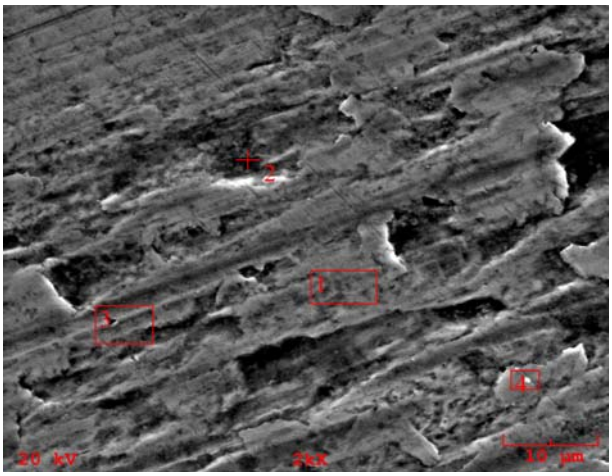
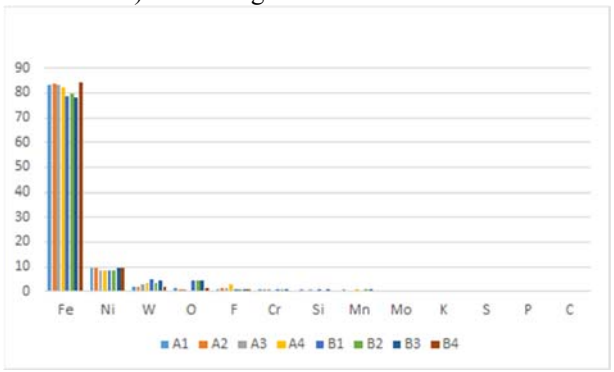


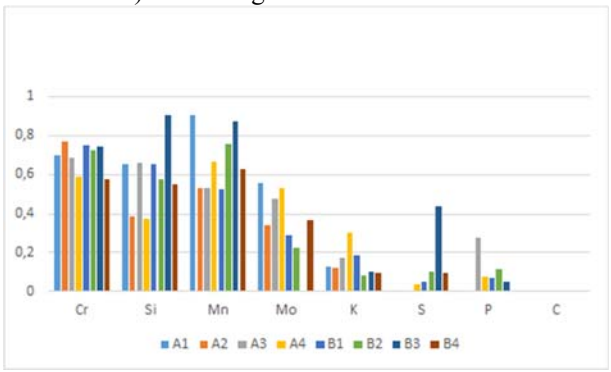
a) SEM image of C4 Wear Track



b) SEM image of C4 Wear Track

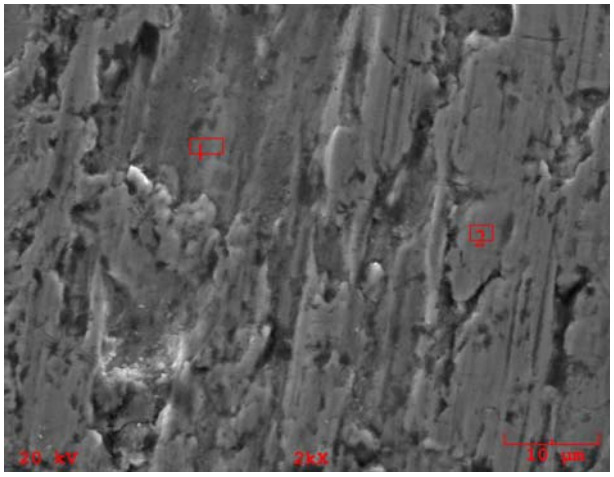


c) EDS analysis of C4 Wear Track

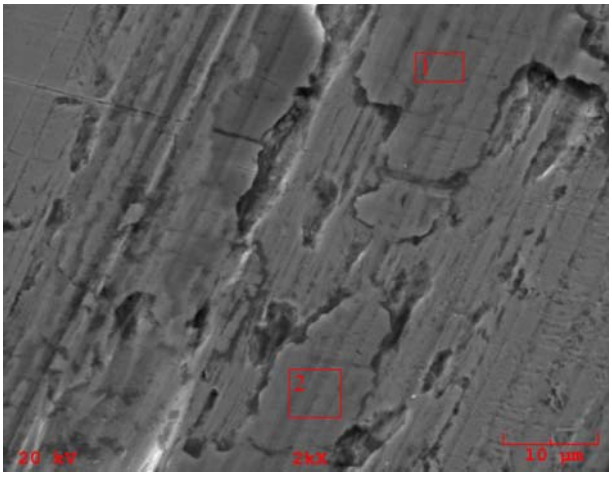


d) EDS analysis of C4 Wear Track Lower Values

Figure 8. SEM and EDS of C4 wear track



a) SEM image of D3 Wear Track



b) SEM image of D3 Wear Track

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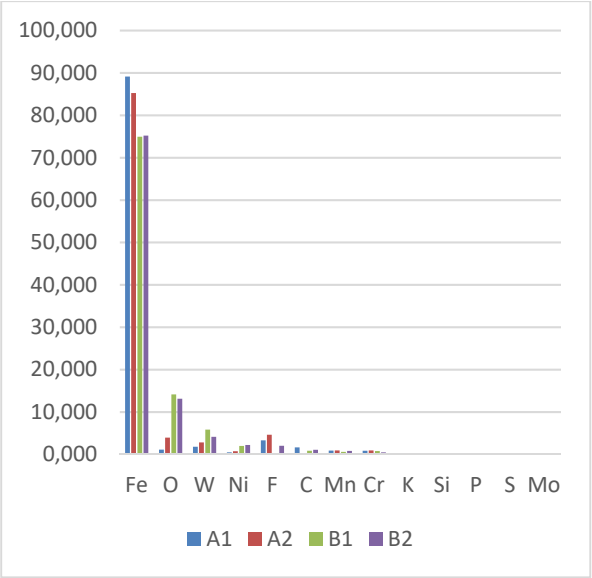
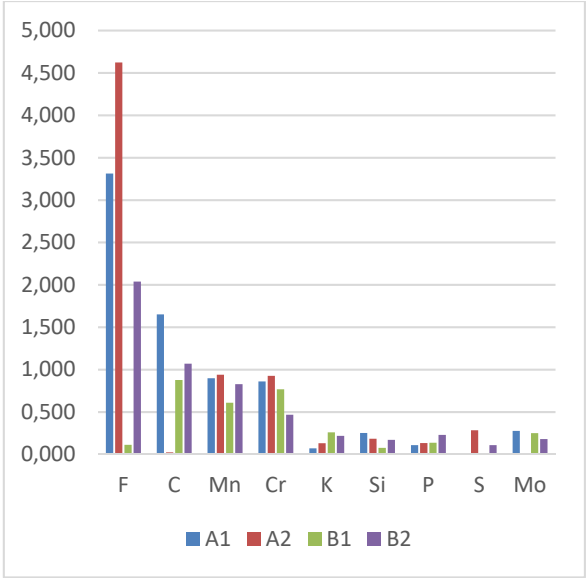


c) EDS analysis of D3 Wear Track



d) EDS analysis of D3 Wear Track Lower Values

Figure 9. SEM and EDS analysis of D3 Wear Track

High percentage of Tungsten (W) content in EDS results show that there exists higher adhesive wear on samples. This is the result of two mechanisms working on samples. First the wetting angle of Nickel to Tungsten is 0 (de Macedo, da Silva, & de Melo, 2003). Zero wetting angle means Nickel will coat WC if melts while wear tests. In studies conducted on WC cutting tools on Nickel alloys it was found that WC diffuses to Nickel and tool wear is observed (Xue & Chen, 2011), (Liao & Shiue, 1996). A study on NiCrSiB coating found that Nickel adheres to WC and hard carbides or borides remove that layer of Nickel and cause adhesion (da Silva & D'Oliveira, 2016). These studies confirm that adhesive wear is main wear mechanism on these samples.

In order to understand the relations between wear track volume, coefficient of friction and mixture ratio a 3d graphic was plotted. As seen from **Figure *10***, 2 samples are out of pattern. Those were E2 (6% B4C) and D2 (10% Ekabor II ™). These are result of increased abrasive wear on samples. Adhesive wear generated particles and those particles act as third body and caused an increase in abrasive wear.

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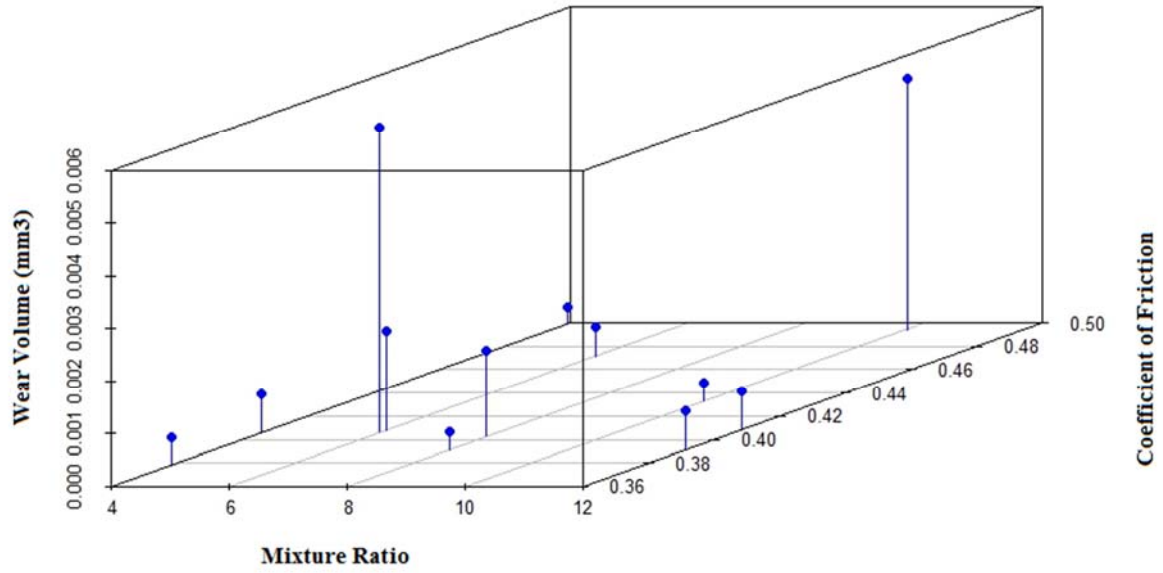

Figure 10. 3D plot of variables.

Inspecting Coefficient of Friction versus Wear Volume Plot at **Figure *11*** shows that N1, N2, C3, E1 and D3 result in best Coefficient of Friction and Wear Volume.

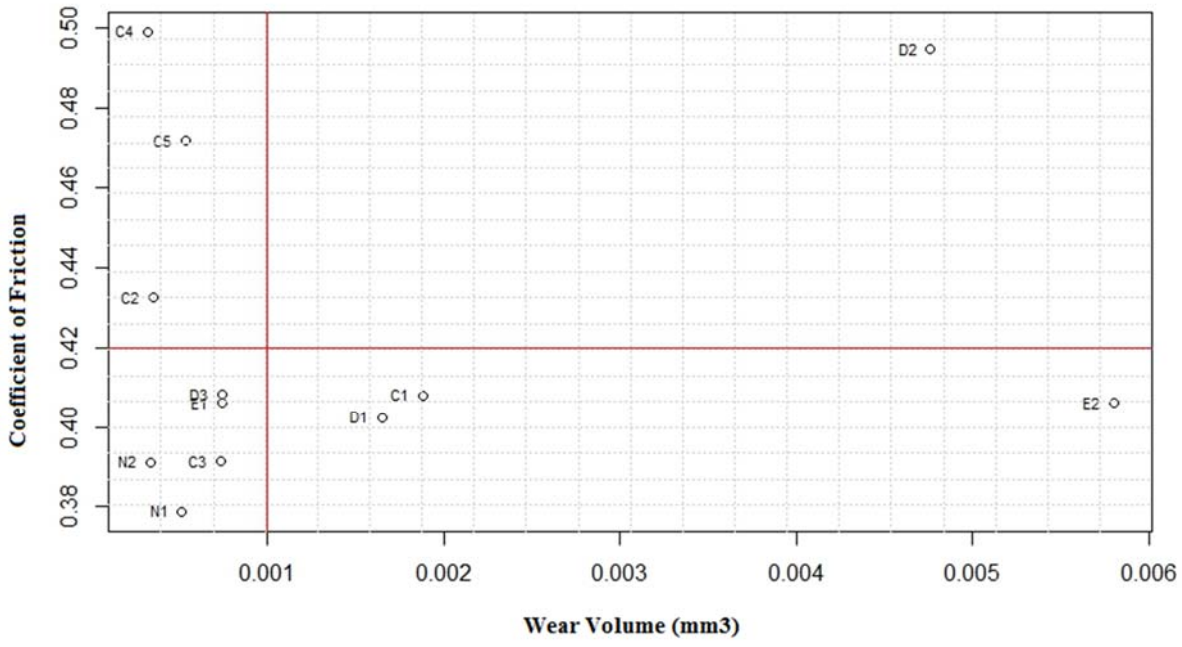

Figure 11. Coefficient of Friction versus Wear Volume Plot

Conclusion

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The results show that

- Although B4C in coating increased surface properties, more than 4% B4C causes a decrease in surface properties, thus should be avoided.
- Nickel base shouldn't be used for low temperature environments because of adhesive wear properties. Thus Nickel base should be used in high temperature environments where Nickel Oxides can form.

Acknowledgements

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FRICTION WELDING OF AL 7075 ALLOY AND 316 L STAINLESS STEEL

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Abstract: Friction welding of Al 7075-T6 alloy and 316 L stainless steel carried out for different times under a constant friction and forging pressure, a forging time, rotational speeds. Microstructures of the welds were examined by scanning electron microscopy and optical microscopy. The results showed that all of the welded samples were free of any or crack along the weld interface. The chemical compositions of the interface of the welded joints were determined by using energy dispersive spectroscopy. The micro hardness of the welded samples was measured. The strength of the welds was determined by the shear tests. It was observed that the shear strength of the welds depended on the welding time. The maximum shear strength was 210, 7 MPa.

Keywords: Al7075, 316 L Stainless steel, Friction welding

Introduction

Cr–Ni austenitic stainless steels, especially, AISI 316 exhibit considerably better corrosion resistance than martensitic or ferritic steels and also have excellent strength and oxidation resistance at elevated temperatures (Kumar 2014, Kumar 2015, Marshal 1984, Oshima 2007). The fusion weld of these steels is usually the part of a system with reduced corrosion resistance and low-temperature toughness, and therefore in many cases it is the limiting factor for material application. The heat of fusion welding also leads to grain coarsening in the heat-affected zone and solidification cracking in the weld metal of stainless steels (ASM Handbook 1999). Aluminum is currently the most widely used metallic material besides steel. The mechanical characteristics of aluminum offer an increasing application field, especially where lightweight constructions are required (Kurt 2007, Lugscheider 1995) Al 7075-T6 alloy which is used in this study has low specific weight, high strength-to-weight ratio, as well as high electrical and thermal conductivity.

Friction welding is well known among solid-state welding methods and used for welding similar and dissimilar materials (Satyanarayana 2005, Torun 2011, Çelikyürek 201, Ates 2007). This method is very useful for the welding of dissimilar combination, and the welding process is easily automated. Also, this welding method has several advantages over fusion welding methods such as high energy efficiency, narrower heat affected zone (HAZ), and low welding cost. In particular, the friction welding is able to easily produce joints with high reliability; it is widely used in the automobile industry and applied to fabricate important parts such as drive shafts and engine valves. Moreover, this welding method can also provide the joint of dissimilar combination as well as the circular pipe. Some researchers have reported that the mechanical and metallurgical properties of the friction-welded joints of circular pipes of dissimilar combination show desirable characteristic (Wang 1975, Maalekian 2007, Kimura 2016)

Materials and Methods

Al 7075-T6 alloy and AISI 316 L stainless steel were received from a private company. The cylindrical samples 50 mm in length and 8 mm in diameter were machined from 316 L stainless steel and Al 7075-T6 alloy. The friction welding experiments were carried out by a continuous-drive friction welding machine for different times under a constant friction and forging pressure, a forging time and a rotational speed (Table 1). After welding, the welded samples were cut perpendicular to the welding interface. The surfaces of the welded samples were ground with 1200 grinding paper and polished with 1 µm diamond paste, then 316 L sides of welded samples were etched with a mixture of H2O (30 ml), HNO3 (30 ml), HCl (20 ml) and HF (20 ml) and The Al 7075-T6 sides were etched with Keller. The microstructures were observed with light microscopy and scanning electron microscopy (SEM). The chemical compositions of the weld zone and the base alloys were determined using energy dispersive spectroscopy (EDS). Microhardness values were measured to both sides from center of the

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Table 1. Parameters of the friction welding.

Friction Speed, rmp	Friction Pressure, (MPa)	Forging Pressure (MPa)	Friction Time (s)	Forging Time (s)	Burn-off (mm)
1000	50	100	6	10	0,4
1000	50	100	8	10	0,9
1000	50	100	10	10	1,5
1000	50	100	12	10	2,2

welded samples by means of Vickers indenter with a load of 100 g. Shear tests were performed to determine the strength of the weld interface using an electromechanical universal test machine (Shimadzu AG-IS-250) at room temperature. A specially designed specimen holder was used to measure the shear strength. Three samples were tested for each welding condition.

Results and Discussion

Optical micrograph of the sample welded for 10 s is presented in Fig. 1. All of the welded samples were of sound quality, and they did not exhibit any pores or crack formation along the weld interface. Three main regions are observable on the Al 7075 side of the interface of all of the welded samples: a dynamically recrystallized zone with very fine grains (DRX), thermo-mechanically affected zone (TMAZ) and heat affected zone (HAZ) (Fig. 1a) (Khalid 2010). The width of the DRX for all of the welded samples was approximately 250-330µm. The micrographs demonstrated a slight variation in the width of DRX independent on the friction time. There was not any change on the 316 L stainless steel side (Fig. 1b).

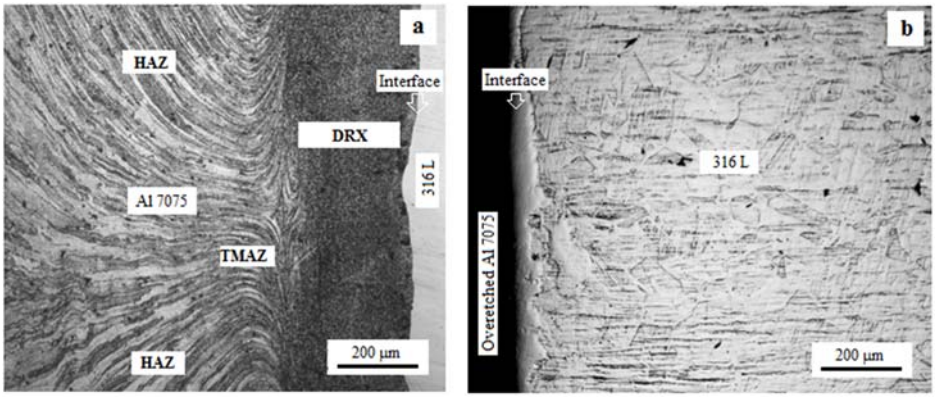

Figure 1.Optical micrograph of the sample welded for 10 s.

SEM micrograph and EDS analysis for welded samples for 10 s are shown in Fig. 2. It cannot be clearly observed that a diffusion zone at the weld interface for all of the welded samples (Fig 2a). However, EDS analysis results showed that there was a diffusion zone at the weld interface all the welded samples (Fig. 2b).

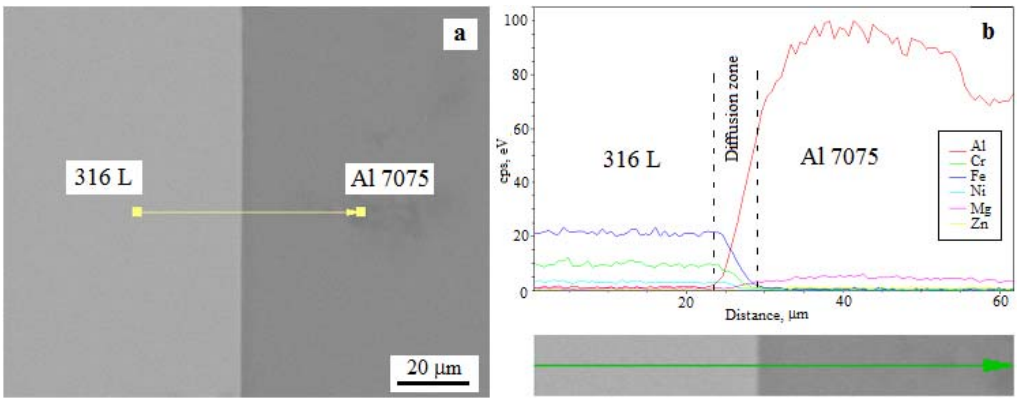

Figure 2.SEM micrograph and EDS analysis of welded samples for 10 s.

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The diffusion zone present at the weld interface consists of Fe, Al, Cr, Ni, Mg atoms. The diffusion zone is rich in Fe and Al atoms and has lower amounts of Cr, Ni and Mg atoms.

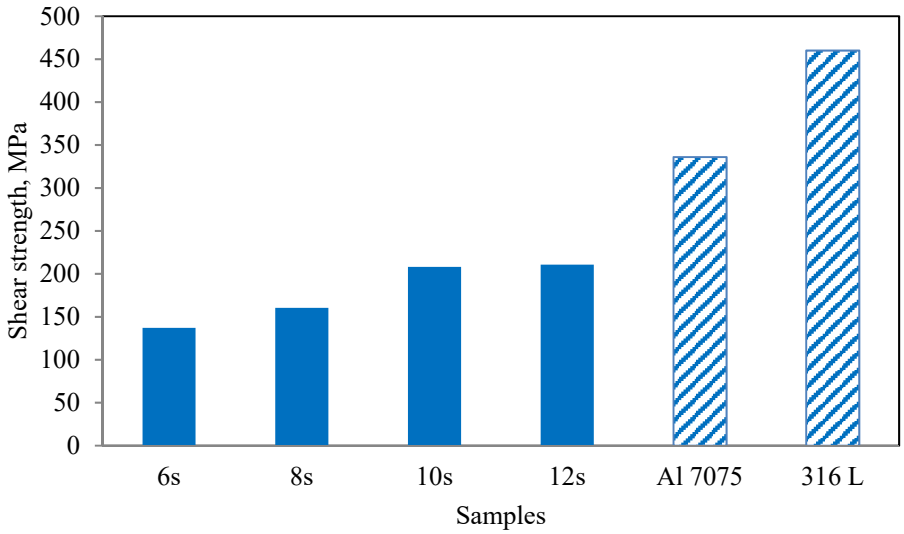

Figure 3.The shear strengths of the welds and the base alloys.

The shear strengths of the welds and the base alloys are shown in Fig. 3. The results showed that the values of the shear strength of the welded samples increase with increase in friction time. Under these experimental conditions, it can be said that the shear strength of welds was dependent on the friction time. This observation indicates that the increase in the shear strength is related to the magnitude of the accumulated heat input, which depends on the friction time. Especially, 6 s and 8 s friction times were not high enough to produce the required heat for the friction welding, compared with the 10 and 12 s treatments. Microhardness values were measured in the direction from the center of the weld to both sides of the welded samples. The micro hardness profiles for all of the friction welding times were found to be similar. Fig. 4 shows the hardness values obtained from all welded samples.

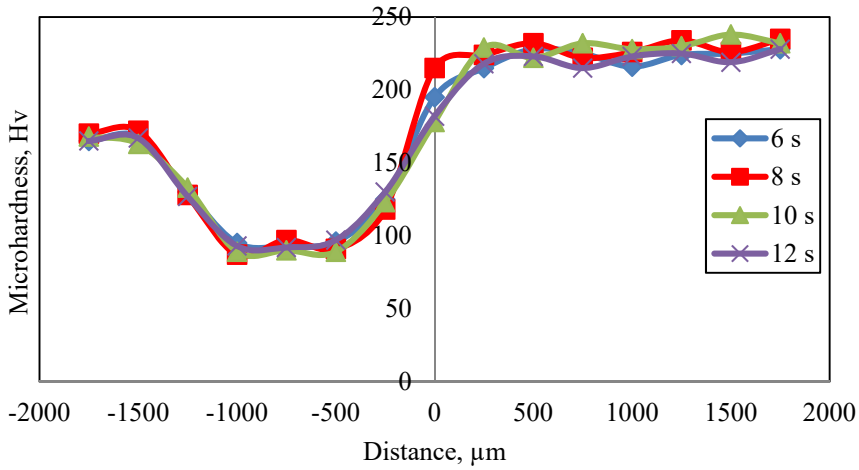

Figure 4. The hardness values obtained from all welded samples.

The hardness of the DRX, HAZ and TMAZ is lower than that of the base alloy on the Al7075-T6 side. The DRX hardness is not as low as the HAZ/TMAZ because of its extremely fine grained microstructure. The drop in HAZ and TMAZ can be explained based on strengthening precipitation. Al 7075 base metal in T6 condition contains a large number of submicroscopic Mg_2Zn and AlCuMg precipitate particles, which confer high strength and

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hardness to the alloy. During friction welding, The HAZ/ TMAZ experiences high enough temperatures for causing dissolution or coarsening of these strengthening precipitates. During cooling, the cooling rates are high enough to allow any reprecipitation of these strengthening phases. Therefore, the HAZ/ TMAZ hardness is lower than the base alloy harness (Khalid 2010). There was not any change on hardness of 316 L stainless steel side.

Conclusion

Al 7075-T6 alloy and 316 L stainless steel were welded by friction welding methods. All of the welded samples were of sound quality, and they did not exhibit any pores or crack formation along the weld interface. The friction time play an important role in flash formation and welds shear strength. The welds shear strength samples and burn-off increase with increase in the friction time. After welding, while three different zone observed in the Al 7075-T6 side, there was not any difference on the 316 L stainless steel side. The hardness profiles for all friction time are similar. It was observed that Al 7075-T6 side has different hardness values.

Acknowledgements

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FRICTION WELDING OF THE AISI316 STAINLESS STEEL TO COMMERCIALLY PURE COPPER

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The AISI316 stainless steel was bonded with commercially pure Copper by friction welding process. The welding process was carried out by continuous drive friction welding machine. The friction time was used as friction welding parameter, and the effects of the friction time on the microstructure and mechanical properties of the welding interface were investigated. Characterization of welding interface microstructure and fractured surfaces of joints was carried out by optical microscopy and scanning electron microscopy. Microstructural investigations revealed that the welding interfaces have a smooth and continues morphology. The micro hardness' and shear strengths of the base materials and the welding interfaces were measured in order to determine the mechanical properties of joints. The results showed that the welding interface microstructure and strength was affected by the friction time.

Keywords: AISI316 stainless steel, pure copper, friction welding, microstructure, strength, hardness.

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FUTURE APPLICATION OF THE MOTION THREADED MECHANISM

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This paper introduces the linear motion drives, mainly lead screw, ball screw and a new innovative idea – motion threaded mechanism. The motion threaded mechanism is linear motion screw with rolling elements, sheaves. Presumptive advantages in comparison with the ball screw are smooth and silent movement, possibility of high threaded pitch, possibility of variable threaded pitch (variable linear motion), simple and flexible construction and cheap production. A disadvantage is low load capacity. These and other qualities have to be confirmed by testing and simulations. Future application is very wide. It is possible to use it in all production industries, health care, military, research equipment, automatic home equipment and so on.

Keywords: Linear Motion Drive, Ball Screw, Lead Screw, Motion Threaded Mechanism, Nut, Sheaves

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GEOGRİD DONATILI ŞEV DOLGUSUNUN STABİLİTE ANALİZİ

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Özet: Geogrid malzemeler zemin içerisindeki çekme yüklerini alarak zeminin taşıma kapasitesini arttırmakta ve oluşması muhtemel farklı oturmaları azaltabilmektedir. Geogrid donatılı dolgular özellikle yol dolguları ile otoyol kenarlarında yapılan şevlerde yaygın olarak kullanılmaktadır. Gerekli olması durumunda, yapı temelleri kontrollü sıkıştırılmış dolgu tabakları üzerine de oturabilmektedir. Bu çalışmada; Kayseri (Türkiye) ilinde yer alan ve temel alanının yaklaşık üçte birlik kısmının 70º'lik şev açısına sahip kontrollü sıkıştırılmış gegrid donatılı dolgu üzerine oturduğu10 katlı bir yapının dolgu şevinin stabilitesi MiraSlope ve PLAXIS 3D programları kullanılarak analiz edilmiştir. Limit denge yöntemine dayalı analiz yapan MiraSlope programı yardımı ile kullanılacak gogrid donatının boyu, tabaka sayısı ve tabakalar arası mesafesi belirlenmiştir. Daha sonra elde edilen stabil sistemin yapı ile etkileşimi ve deformasyon analizleri de sonlu elemanlar yöntemine dayalı analizler yapan Plaxis 3D programı kullanılarak araştırılmıştır.

Anahtar Kelime: Geogrid, Dolgu Şevi, MiraSlope, Plaxis 3D

Abstract: Geogrid materials receiving tensile strengths in soil increase the bearing capacity of soils and decrease probable different settlement. Geogrid reinforced fillings especially are widely applied at the road embankment and slopes made in highway edges. If it is necessary, foundations of building can be sit on layer of controlled compacted earthfill. In this study, the stability of geogrid reinforced embankment slope which has a slope angle of 70 degree has been analyzed using the MiraSlope and Plaxis 3D softwares. In the analyses, the load of a ten-storey building was considered as a surcharge pressure acting on the surface of geogrid reinforced embankment. The approximately one-third of the foundation base placed on the controlled compacted filling. The properties related with the geogrids such as the lengths of the geogrids, the vertical distances between the geogrid layers and the number of geogrid layers have been determined using the MiraSlope software based on the limit equilibrium method. The deformation analyses of the system have been performed using the Plaxis 3D software based on finite element method.

Keywords: Geogrid, Embankment Slope, MiraSlope, Plaxis 3D

Giriş

Son yıllarda geosentetik malzemelerin zemin iyileştirme uygulamalarında kullanımı artmaktadır. Geosentetikler, örgülü ve örgüsüz geotekstiller, geogrid,geomembran, geonet, geohücre ve geokomposit olarak sınıflandırılabilir (Karagül, 2015).

Geogridler, yüksek çekme mukavemetleri ve uzun ömürleri sayesinde donatılı duvar olarak ve zemin iyileştirilmelerinde yaygın olarak kullanılmaktadır. Zayıf zemin tabakaları üzerine dolgu yapılması durumunda dolgu ile zayıf zemin tabakaları arasında ve yüksekliği fazla olan dolgu imalatlarında kullanılabilmektedir. Geogrid malzemeler zemin içerisindeki çekme yüklerini alarak zeminin taşıma kapasitesini arttırmakta ve oluşması muhtemel farklı oturmaları azaltabilmektedir (Karagül, 2015).

Bu çalışmada; Kayseri (Türkiye) ilinde yer alan ve temel alanının yaklaşık üçte birlik kısmının 70o'lik şev açısına sahip kontrollü sıkıştırılmış gegrid donatılı dolgu üzerineoturduğu10 katlı bir yapınındolgu şevinin stabilitesiMiraSlope ve PLAXIS 3D programları kullanılarak analiz edilmiştir.MiraSlope programı yardımı ile kullanılacak gogrid donatının boyu, tabaka sayısı ve tabakalar arası mesafe belirlendikten sonra elde edilen stabil sistemin yapı ile etkileşimi ve deformasyon analizleri Plaxis 3D programı kullanılarak araştırılmıştır.

Miraslope Programi İle Analiz

Yapılan analizlerde MiraSlopeVersion1.0 yazılımı (limit denge yaklaşımı) kullanılmış olup analizlerde kullanılan geometri ve yükleme bilgileri (yapı-zemin kesiti) Şekil 1'de verilmiştir. Arazi araştırmalarında yol kotundan itibaren (1151.60) 15.0 m derinlik boyunca yer altı su seviyesine rastlanılmamıştır. Yapıdan zemine aktarılan

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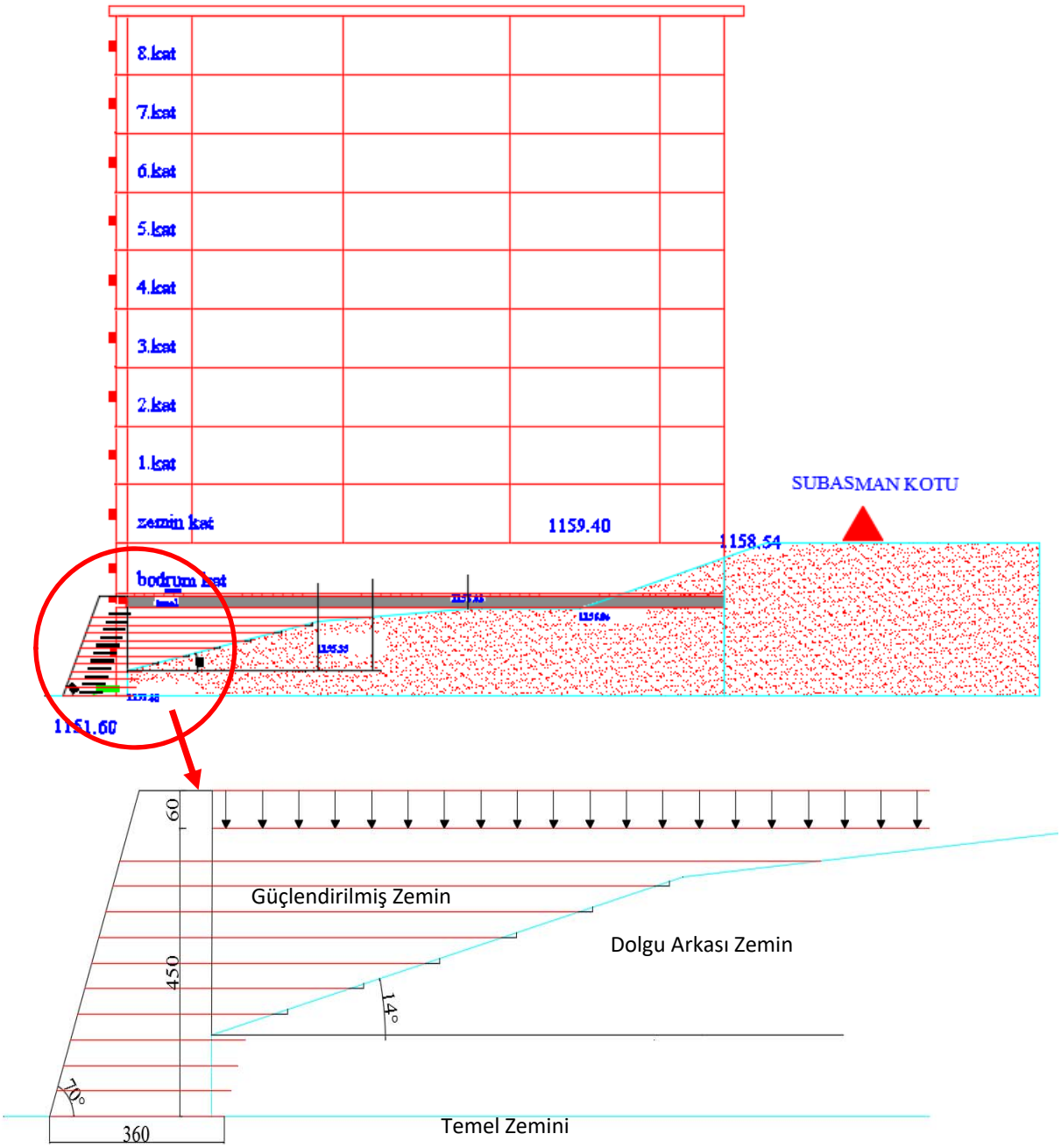
taban basıncı 180.0kPa olarak dikkate alınmıştır. MiraSlope analizinde kullanılan güçlendirilmiş zemin (reinforcedsoil), dolgu arkası zemin (retainedsoil) ve temel zemini (foundationsoil) özellikleri Tablo 1'de verilmiştir.

Yapılan analizlerde Miragrid 3XT geogridinin3.40 m boyunda ve 11 sıra yerleştirilmesi durumunda, problem oluşturmayacak güvenlik katsayıları elde edilmiştir (>1.13). Miragrid 3XT geogridi ile ilgili geosentetik tasarım parametreleri ve güvenlik sayıları Tablo 2'de verilmiştir. Ancak yerinde yapılan imalatlarda geogrid boylarının temel altına kadar uzatılarak kullanılmış olup tüf birim üzerinde oluşturulan basamaklardan başlangıç noktasına çevrilerek dolgu tabakası bohçalanmıştır. Plaxis 3D analizleri yerinde imal edilen durum göz önüne alınarak oluşturulan model geometriye göre yapılmıştır.



Şekil 1. Analizlerde Kullanılan Yapı-Zemin Kesiti

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Tablo 1: MiraSlope analizinde kullanılan zemin özellikleri

Güçlendirilmiş Zemin (ReinforcedSoil)	İçsel sürtünme açısı, ϕ°	38.00
	Kohezyon, c [kPa]	10.00
	Tabii birim hacim ağırlık, γ [kN/m³]	20.00
	Dolgu tipi: Kaba çakıl ve pH4.0-9.0	
Tutulan Zemin (RetainedSoil)	İçsel sürtünme açısı, ϕ°	38.00
	Kohezyon, c [kPa]	0.00
	Tabii birim hacim ağırlık, γ [kN/m³]	19.00
Temel Zemini (Foundation Soil)	İçsel sürtünme açısı, ϕ°	33.00
	Kohezyon, c [kPa]	30.00
	Tabii birim hacim ağırlık, γ [kN/m³]	20.00

Tablo 2. Miragrid 3XT Geogridine Ait Tasarım Parametreleri ve Güvenlik Sayıları (http://www.tencate.com)

Mekanik Özellikleri		Güvenlik Sayıları	
Nihai durumdaki çekme mukavemeti, T_{ult} (kN/m)	51.1	Zeminin kayma mukavemetine göre F_s	1.13
%5 şekil değiştirme durumundaki çekme mukavemeti, kN/m	15.4	Geosentetik mukavemetine göre F_s	1.13
Uzun süreli izin verilebilir tasarım yükü, kN/m	28.0	Çekme direncine göre F_s	1.50
RF_{id} (installationdamage)	1.25	Direk kayma direncine göre F_s	1.10
RF_d (Durablity)	1.10		
RF_c (Creep)	1.45		

Geogrid Donatılı Dolgu

Bodrum, zemin ve sekiz normal kattan oluşan bir yapı inşa edilecek olup, yapı temel taban alanı 25.0 x 32.0 m = 800.0 m²'dir. Yapı temeli, 60 cm kalınlığında radye temel olarak tasarlanmıştır. Yapı temelinin oturacağı alanda yer alan doğal eğim nedeni ile temelin uzun kenar doğrultusundaki yaklaşık olarak üçte birlik kısmı doğal zemin kotuna göre yaklaşık olarak 4.50 m yukarıda yer aldığından mevcut durumda boşta kalmaktadır. Bu amaçla; radye temelin boşta olan kısmının oturacağı bir temel zemini oluşturmakamacıyla yol kotundan itibaren yaklaşık olarak 4.50 m yükseklikte 70° eğime sahip geogrid donatılı kontrollü sıkıştırılmış bir dolgu inşa edilmesi planlanmış ve temel tabanının tamamının aynı kot seviyesinde zemine bastırılması amaçlanmıştır.

Plaxis 3D 2012 kullanılarak gerçekleştirilen üç boyutlu non-lineer sonlu eleman analizleri ile söz konusu yapının inşası ile birlikte geogrid donatılı dolguda meydana gelebilecek deformasyon davranışlarının nasıl oluşacağı ve büyüklükleri ile bu deformasyon davranışları sonucunda yapı temelinde oluşacak kesit tesirleri incelenmiştir.

Yapı temel zemini sarı, beyaz ve gri pomza içeren tüf birim olduğu ve kalınlığının değişken olmakla birlikte 20.0 m'ye kadar devam ettiği belirlenmiştir. Başakpınar tüf birimi; orta derecede bozulmuş, sert, kırıklı ve çatlaklı yapıya sahip, orta derecede ayrışmış düşük dayanımlı volkanik kayaç olarak tanımlanmıştır. Laboratuvar deney sonuçları söz konusu tüf birimin ortalama doğal birim hacim ağırlığının γ_n = 23.0kN/m³ ve en düşük serbest basınç mukavemeti (q_u) değerinin de 321.50 kg_f/cm^2 olduğu belirlenmiştir (Kaygısız, 2010). Söz konusu alanda yapılan sondaj çalışmalarında yer altı suyuna rastlanmamıştır.

Sayısal analiz çalışmalarında kullanılan Başakpınar Tüf biriminin davranışının modellenmesi için gerekli parametreler (elastisite modülü, E, ve poisson oranı, ν) söz konusu alan ile ilgili yapılmış tezçalışmasından alınmıştır (Kaygısız, 2010). Çalışmada kullanılan geogrid "Miragrid 3XT" olup geogrid malzeme eksenelrijitlik değeri "Miragrid 3XT" geogridine ait mukavemet ve deformasyon değerleri kullanılarak hesaplanmıştır.

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Zemin Davranışının Modellenmesinde Kullanılan Parametrik Değerler

Hesaba esas zemin modeli ve parametreleri Tablo 3'te verilmiştir.

Tablo 3: Zemin modeli ve parametreleri

	ReinforcedSoil	***RetainedSoil***	***Foundation Soil***
Malzeme Modeli	MohrCoulomb (MC)	Lineer Elastik (LE)	Lineer Elastik (LE)
Drenaj Tipi	Drained	Non-Porous	Non-Porous
$\gamma_{unsat.}$	20.0 kN/m^3	23.0 kN/m^3	23.0 kN/m^3
γ_{sat}	20.0 kN/m^3	-	-
E	42 000 kN/m^2	1.32 x 10^{6}kN/m^2	1.32 x 10^{6}kN/m^2
ν	0.30	0.20	0.20
c	10 kN/m^2	-	-
ϕ	38°	-	-
ψ	8°	-	-
R_{inter}	0.7	0.7	0.7

γ: Birim Hacim Ağırlık; E: Elastisite Modülü; ν: Poisson Oranı; c: Kohezyon; ϕ: İçsel Sürtünme Açısı; ψ: Dilatasyon Açısı; R_{inter}: Ara Yüzey Davranış Katsayısı.

Radye Temel Yapısının Modellenmesinde Kullanılan Parametrik Değerler

B+Z+8N kattan oluşacak yapının, boyutları yaklaşık olarak 24.0 x 30.0 m² olan 60 cm kalınlığındaki birradye temele oturacağı kabulü ile analizler gerçekleştirilmiştir. Yapı yükü, temel alanı boyunca üniform yayılı olarak etkiyen 180 kN/m² değerinde basınç yükü olarak hesaba katılmıştır. Radye temel, Plaxis programında Plate eleman kullanılarak modellenmiş olup plate eleman için gerekli parametrik değerler Tablo 4'te verilmiştir.

Tablo 4: Radye temele ait özellikler

Temel Kalınlığı	0.60 m.
Malzeme Tipi	Lineer Elastik
γ	24 kN/m³
E	30 000 000 kN/m²
ν	0.15

Geogrid Donatının Modellenmesinde Kullanılan Parametrik Değerler

Donatılı kontrollü dolgunun içerisinde kullanılan Miragrid 3XT geogrid donatı malzemesi, plaxis analizlerinde geogrid eleman kullanılarak modellenmiştir. Zemini çekmeye karşı güçlendiren donatı elemanları için analizlerde eksenel rijitlik (EA) değerlerinin mutlaka göz önüne alınması gerekmektedir. Miragrid 3XT geogrid donatının eksenel rijitlik değeri Tencate Firması tarafından bu malzeme için tanımlanmış mukavemet ve deformasyon davranışlarına ait değerler dikkate alınarak hesaplanmıştır. Analizlerde kullanılan geogridin malzemetipi elastik, EA değeri ise 310 kN/m olarak alınmıştır.

Plaxis 3D 2012 Programı ile Gerçekleştirilen Sonlu Eleman Analizleri ve Elde edilen Sonuçlar

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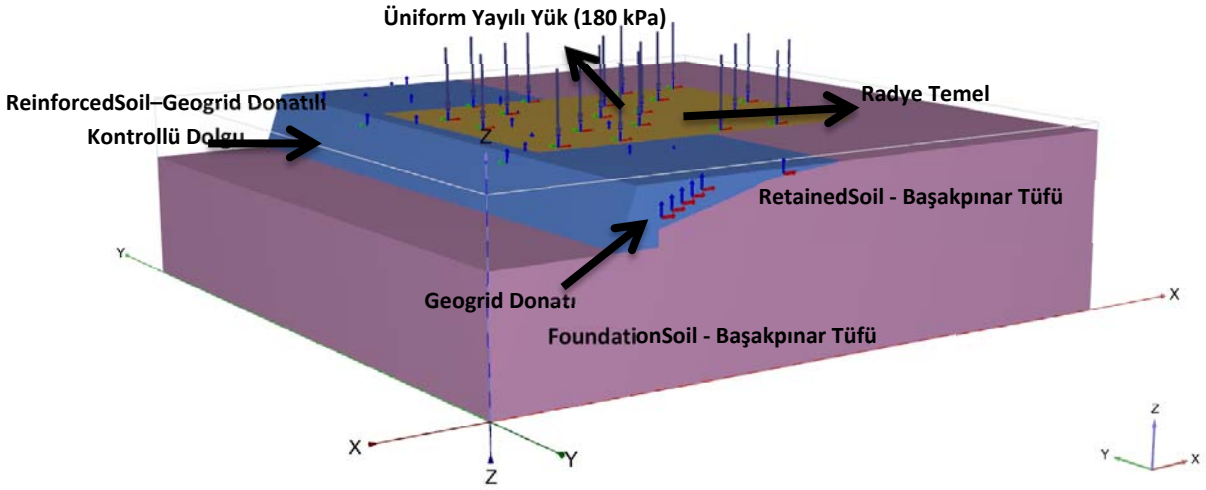
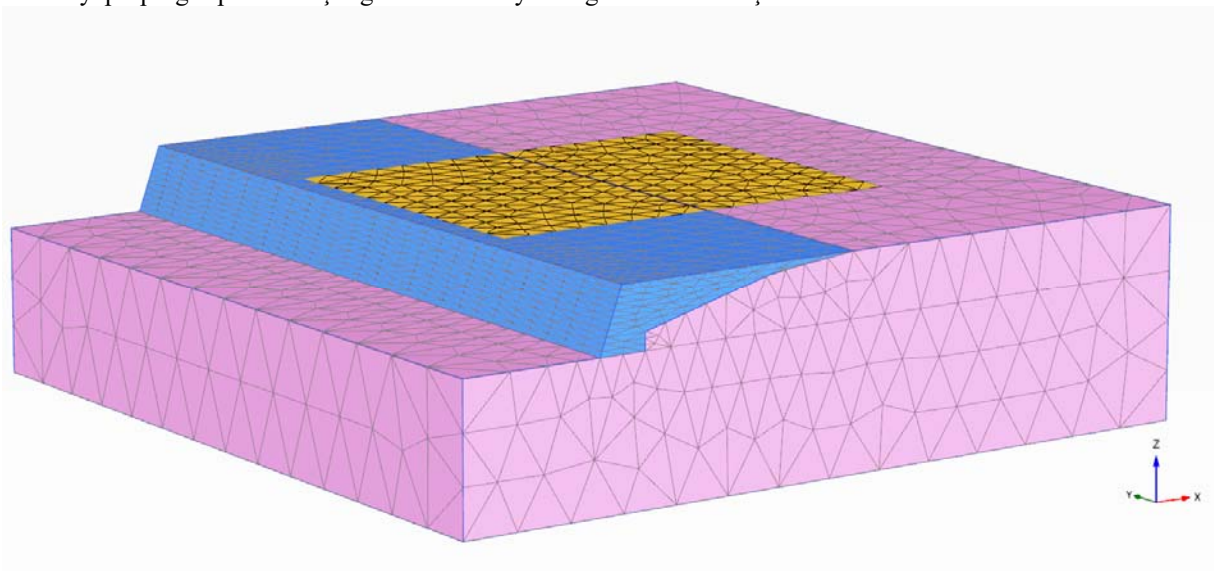
Analizlerde orta kabalıktaki (medium) sonlu eleman ağı kullanılmıştır. Analizlerde göz önüne alınan problem geometrisi ve onun sonlu elemanlara ayrılmış hali sırası ile Şekil 2 ve Şekil 3'te gösterilmiştir.



Şekil 2. Analizlerde kullanılan problem geometrisi

Söz konusu inşaat alanının eğimli olmasından dolayı başlangıç gerilme koşulları "gravityloading" seçeneği ile oluşturulmuştur. Başlangıç gerilme koşullarının oluşturulmasının ardından her biri 40 cm kalınlığındaki 11 adet dolgu tabakası ve her bir dolgu tabakası üzerine serilen geogrid donatı tabakasının imalatı "stagedconstruction" olarak adlandırılan aşamalı inşa seçeneği ile gerçekleştirilmiştir. ReinforcedSoil olarak adlandırılan donatılı kontrollü dolgunun oluşturulması sonrasında bir bölümü dolgu üzerine basacak şekilde radye temel oluşturulmuştur. Radye temelin inşasından sonra da üniform yayılı yük temel yüzeyine uygulanarak yapı yükü temsil edilmiştir. Son hesaplama adımında ise "safety" seçeneği kullanılarak tasarlanan geometriye ait güvenlik analizi yapılıp ilgili problem için güvenlik katsayısı değeri elde edilmiştir.



Şekil 3. Problem geometrisinin sonlu eleman ağı

Analizler sonucunda elde edilen toplam deplasman değeri Şekil 4'da radye temelde oluşan kesit tesirleri Şekil 5'te verilmiştir. Toplam deplasman 1.40 cm olarak belirlenmiş olup yatay deplasman miktarı 0.013 cm ve düşey deplasman miktarı ise 0.19 cm olarak hesaplanmıştır. Analizler sonucunda; temelin dolgu üzerine basan köşesinde, dolgu ve doğal zemin birleşim noktasında ve doğal zemin üzerinde yer alan köşesinde seçilen düğüm noktalarında yük-deplasman ilişkileri elde edilmiş olup Şekil 6'da verilmiş olup temel köşesinde düşey yönde meydana gelen deplasman miktarı yaklaşık olarak 1.10 cm olarak belirlenmiştir.

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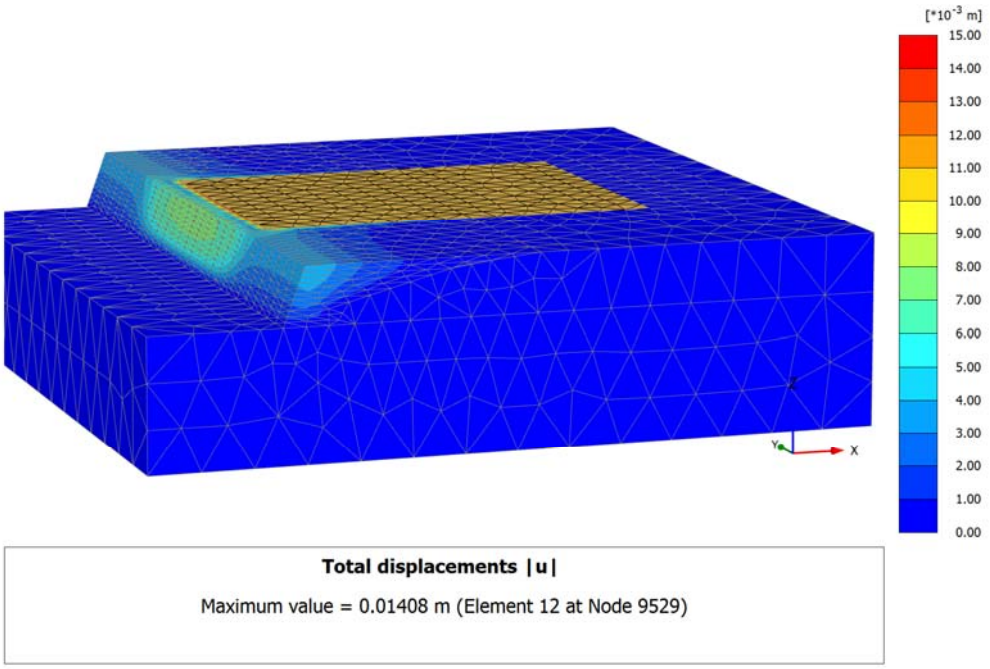
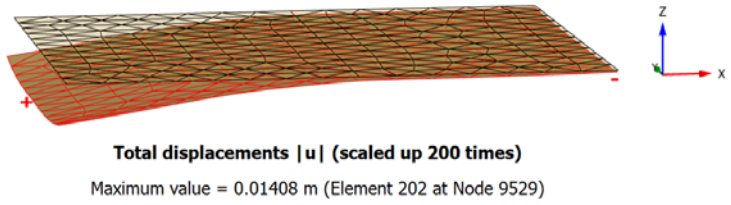
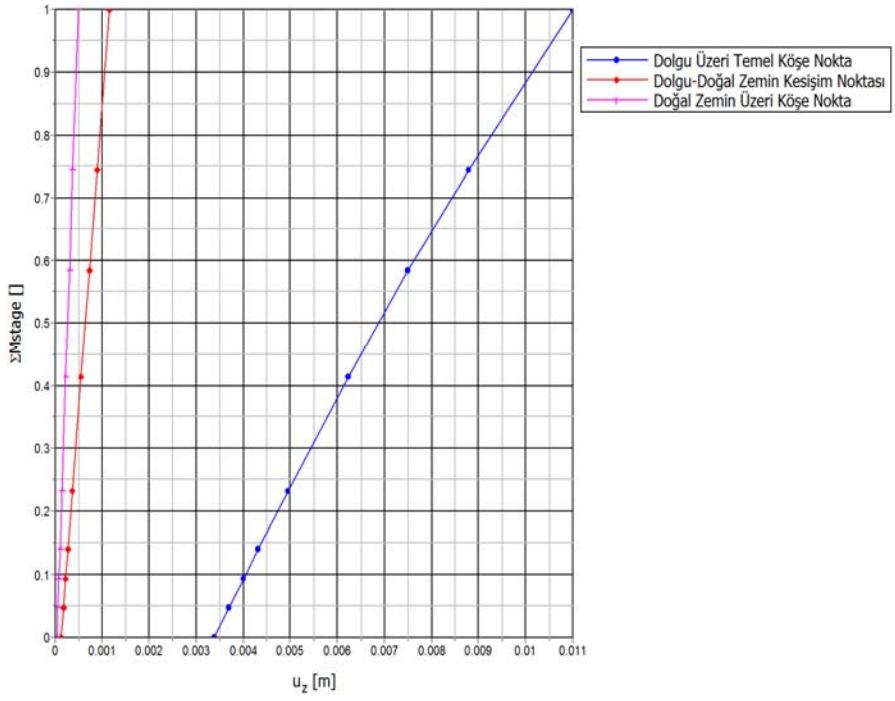


Şekil 4. Toplam deplasman hareketleri



Şekil 5. Davranış sonrası radye temel



Şekil 6. Temel tabanı altında farklı noktalardaki yük-deplasman ilişkileri

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Mobilize olan maksimum kayma mukavemeti değeri ise 140.6 kN/m² olarak belirlenmiştir.Radye temelde oluşan kesit tesirlerinin maksimum değerlerinden kesme kuvveti, Q_{max}=154.4kN/m, eğilme momenti, M_{max}=106.7 kNm/m olarak belirlenmiştir. Analiz sonucu çözümlenen sisteme ait güvenlik katsayısı değeri SF = 3.985 olarak elde edilmiştir.

Sonuçlar

- 10 katlı bir yapı altında yapılması planlanan geogrid donatılı dolgudan oluşan kesit üzerinde MiraSlope version 1.0 yazılımı kullanılarak yapılan analizlerde T_{ult}=51.1kN/m olan L= 3.40 m uzunluğunda 11 adet gogrid kullanılması durumunda yeterli güvenlik sayıları elde edilmiştir.
- Plaxis programı (sonlu elemanlara dayalı analiz) yardımı ile söz konusu sistemin deformasyon davranışı analiz edilmiş ve elde edilen deplasman değerlerinin izin verilebilir sınırlar içerisinde kaldığı görülmüştür.
- Gogrid kullanılarak oluşturulan şev dolgusunun Plaxis programı yardımı yapılan stabilite analizi sonucunda güvenlik katsayısı SF = 3.985 olarak elde edilmiştir.

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MiraSlope Software, TenCate geosynthetics introduces TenCate MiraSlope design solutions software for Mechanically Stabilized Earth applications.

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GÖRME ENGELLİLER İÇİN BİLİŞİM DÜNYASININ YETERLİLİĞİ VE KULLANILABİLİRLİĞİ; DÜNYADA VE TÜRKİYE'DE YAPILAN ÇALIŞMALAR

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Özet: Bilgisayar teknolojileri ve Internet, günümüz insanının, bilgi ve iletişim ihtiyaçlarına daha kolay, daha hızlı ve daha ekonomik ulaşabilmesini sağlamaktadır. Bununla bağlantılı olarak bilişim dünyasının kullanımı, her alanda yaygınlaşmış ve kendine önemli bir yer edinmiştir. Fakat bilişim dünyasında web sitelerinin kullanılabilirliği görme engelli bireyler için tasarlanmamış olması, önemli bir ihtiyacı da ortaya çıkarmıştır. Web sitelerinin, normal kullanıcılara sunduğu imkanların, görme engelli bireyler için de sağlanması önemli bir sorumluluktur. Böylece elektronik ortamdaki bilgi, erişim özgürlüğü, özgüven ve iş yapabilirlik kapıları görme engelli kişiler için de açılacaktır. Bu çalışmada, görme engelli bireyler için bilişim dünyasında web sitelerinin kullanımında karşılaştıkları sorunlar, anket çalışması ile saptanmış ve paylaşılmıştır. Ayrıca görme engelli bireyler için Dünyada ve Türkiye'de yapılan çalışmalar araştırılmış, yaşanılan sorunlar ve öneriler ileri sürülmüştür.

Anahtar Kelimeler: Görme Engelli Bireyler, Bilişim Teknolojileri, Anket Çalışması.

Abstract: Computer technology and the Internet, the modern human, easier access to information and communication needs, provide faster and more economical access. In this connection the use of information technology in the world, has gained widespread in all areas and self-important. However, the availability of information on the website to see a world not designed for people with disabilities has also revealed an important requirement. Web sites, the opportunities offered by normal users, is also an important responsibility to provide vision for people with disabilities. Thus, the electronic information from the media, freedom of access, visual capabilities and business confidence will open doors for people with disabilities. In this study, the problems encountered by the use of websites for the visually impaired individuals in the IT world, determined by surveys and shared. For visually impaired individuals also researched the work done in the world and Turkey, experienced problems and suggestions were put forward.

Keywords: Visually Impaired Individuals, Information Technology, Survey.

Giriş

Günümüzde bir kurumun veya bir kişinin web sayfası edinmesi neredeyse zorunluluk haline gelmiştir. Hazırlanan web sayfalarının ziyaret eden herkes tarafından sorunsuzca erişilebilir olması gittikçe daha fazla önem kazanmaktadır. Örneğin, kamu kurumları kamu hizmeti sağladıkları web sayfalarının tüm vatandaşlar tarafından sorunsuzca erişilebilir olduğundan emin olmalıdır. Ticari firmalar ise daha kaliteli hizmet sunmak, mevcut müşterilerini korumak ve müşteri potansiyelini artırmak adına, web sayfalarının erişilebilirliğini sağlamalıdır. Erişilebilirlik, diğer taraftan, bir grup kullanıcı için de büyük önem taşımaktadır: engelli kişiler. (Yücel, Acartürk 2006)

Çeşitli engelleri sebebiyle günlük yaşamlarında pek çok olanaktan ve hizmetten engelli olmayanlar kadar yararlanamayan bu kişiler için, oturdukları yerden bir bilgisayar aracılığıyla çeşitli hizmetlerden faydalanmak, bilgi kaynaklarına erişmek ve iletişim kurmak gibi işlevler daha kolay ve daha az maliyetle mümkün olabilmektedir. Özellikle görme engelliler için, bilgisayar kullanımı ve pek çok hizmet ve olanağa ulaşmalarını mümkün kılan web sayfaları, bu kişilerin yaşam kalitesinin yükseltilmesinde büyük rol oynamaktadır. (Yücel, Acartürk 2006).

Görme engelliler için günümüze kadar bilişim dünyasında birçok çalışma yapılmıştır. Emiroğlu B. Çalışmalarında görme engelli kişilerin de yararlanabilmesi için, verilen web hizmetlerinde bazı düzenlemeler yapılması gerektiğini vurgulamıştır. Böylece elektronik ortamdaki bilgi, erişim özgürlüğü, özgüven ve iş

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yapabilirlik kapıları görme engelli kişiler için de açılacağını belirtmiştir. çalışmasında, görme engelli bireyler için bilgisayar erişimi ve bilişim çalışmaları konusunda var olan imkanlar ve yürütülen çalışmalardan kesitler sunulmakta, Türkiye ve Dünyadan örnekler verilerek durum hakkında yorum ve öneriler getirilmektedir.

Yücel C., Acartürk C., çalışmalarında, görme engelli kişilerin bilgisayar kullanırken ve web sayfalarını ziyaret ederken karşılaştığı sorunlar özetlemekte; web sayfalarının hangi özelliklere sahip olursa görme engelli kişilerce için erişilebilir olduğu üzerine öneriler sunmuşlardır.

Türkiye Engelsiz Bilişim Platformu "Engelsiz bir dünya için bilişimle engelleri kaldırıyoruz" , isimli projelerinde engellilerin bilişimden beklentileri konulu anket çalışması yapmıştır. Anket sonuçlarını yayınlayarak gerekli düzenlemelere yardımcı olmuştur.
(http://www.engelsizbilisim.org/engellilerin-bilisimden-beklentileri-konulu-anket-calismasi-sonuclari/)

Günümüzde artık görme engelli bireyler içinde birçok çalışmalar yapılmaktadır. Bunlardan kullanılanları kısaca açıklayabiliriz.

Yapılan Çalışmalar :

-Görme Engelliler için Market Alışveriş Arabası: Görme engelli bireyler için market dizaynının bir standardizasyonu sağlandıktan sonra ilk olarak ürünlerin bulunduğu stantların adını sesli olarak bildirimi yapılır. İkinci adımda ürünlerin bulundukları raflardaki bar kodların bar kod okuyucuyla okunup kulaklığa ürünün ad, marka, miktar ve fiyat bilgilerinin sesli olarak bireye bildirilmektedir.

Görme engelliler için Sesli Adımlar: Avea'nın teknolojik desteğiyle kullanıma hazır hale gelen "Sesli Adımlar" uygulaması, Boni Beacon'larının kurulu olduğu MetroCity AVM'de, bulunulan noktayı belirtme, mekân sorgulama gibi özellikleriyle görme engellilerin alışveriş merkezlerinde daha rahat ve özgür dolaşabilmelerine imkân veriyor. Uygulama, MetroCity Alışveriş Merkezi'nin yanı sıra ECE Türkiye bünyesinde İstanbul'daki Neomarin AVM, Maltepe Park ve Marmara Park AVM, Eskişehir'de Espark AVM ve Ankara'da ACity AVM'nin dahil olduğu 6 alışveriş merkezinde kullanılıyor. Sesli Adımlar uygulaması aşağıdaki linklerden indirilebilir:
https://itunes.apple.com/tr/app/sesli-ad-mlar/id915304189?mt=8

Görme Engelliler için Akıllı Ev: Ortam aydınlıksa eğer perdeler açık durumda kalır ve oda lambaları sönük durumdadır. Karanlıkta ise perdeler otomatik olarak kapanmakta ve oda lambaları yanmaktadır. Giriş kapısı üzerinde bulunan Ultrasonik sensor ile cisim algılama işlemi yapılmaktadır. Akıllı evde bulunan 2 oda kapısı da el çırpma sesi ile açıp kapanmaktadır. Oda sıcaklığı arttığında fan devreye girer ve oda soğutması tamamlandığında fan tekrar pasif olur.

Yöntem ve Bulgular

Bu çalışmada Beyazay Engelliler Derneği aracılığıyla, görme engelliler için bilişim dünyasının kullanılabilirliği 120 görme engelli bireye bir anket yapılarak araştırılmıştır. Anket çalışmasında görme engelli bireylerin bilişim dünyasını kullanırken yaşadığı zorluklar ve Web sitelerine bakış açısı incelenmiştir.

- Ankete katılanların %80'i hiç görmeyen, %20'si az gören bireydir.

Tablo 1: Yaş Dağılım Tablosu

Görme engelliler için bilişim dünyasının yeterliliği ve kullanılabilirliği hakkında yapılan ankete katılan görme engelli bireylerin yaş dağılımı	
20-30 Yaş Arası	%43,8
30-40 Yaş Arası	%50
40 Yaş üstü	%6,3

Yaş dağılım tablosu daha çok yetişkin (orta yaşlı) kesim bilişim ile daha ilgili ve duyarlı olduğunu gösteriyor.

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Tablo 2: Görme Engelli Bireylerin bilişim dünyası yeterliliği ile ilgili düşünceleri

Görme engellilerin bilişim dünyasında eşit haklara sahip olduğunu düşünüyor musunuz?	Evet	Hayır
	%6,7	%93,3

Tablo2'de de açık olarak görme engelliler için web siteleri uygun bir şekilde tasarlanırsa, rahatlıkla erişim imkanı olabilecektir. Buradan da anlaşıldığı gibi görme engelli bireyler bilişim dünyasında eşit haklara sahip olmadıklarını belirtmişlerdir.

Tablo 3: Görme engelli bireylerin web sayfalarının kullanım zorluğuna bakış açısı

	Evet	Hayır
İnternet yazılım ve tasarımı görme engelliler için uygun mu?	%14,3	%85,7
Kurum ve kuruluşların erişim olanağını yeterli buluyor musunuz?	%0	%100

Tablo 4: Görme engelli bireylere yönelik bilişim olanakları

Görme engellileri yönelik bilişim olanakları hazırlanabilir mi?	Evet	Hayır
	%100	%0

Tablo 5: Görme engelli bireylerin için web sayfalarının uygunluğu

	Evet	Hayır
Web siteleri görme engelliler için uygun mudur?	%0	%100
Web sitelerinin görme engelliler için tasarlanmasını tercih eder misiniz?	%93,3	%6,7
Görme engellilerin rahat kullanabileceği bir site v ar mı?	%6,7	%93,3

Sonuçlar ve Öneriler

Bilgisayar teknolojileri ve Internet, günümüz insanının, bilgi ve iletişim ihtiyaçlarına daha kolay, daha hızlı ve daha ekonomik ulaşabilmesini sağlamaktadır. Bununla bağlantılı olarak bilişim dünyasının kullanımı, her alanda yaygınlaşmış ve kendine önemli bir yer edinmiştir. Fakat bilişim dünyasında web sitelerinin kullanılabilirliği görme engelli bireyler için tasarlanmamış olması, önemli bir ihtiyacı da ortaya çıkarmıştır. Web sitelerinin, normal kullanıcılara sunduğu imkânların, görme engelli bireyler için de sağlanması önemli bir sorumluluktur. Böylece elektronik ortamdaki bilgi, erişim özgürlüğü, özgüven ve iş yapabilirlik kapıları görme engelli kişiler için de açılacaktır. Bu çalışmada, görme engelli bireyler için bilişim dünyasında web sitelerinin kullanımında karşılaştıkları sorunlar, anket çalışması ile saptanmış ve paylaşılmıştır.

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Kaynaklar

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GÖRÜNTÜ İŞLEME TEKNİKLERİ KULLANILARAK ÇOKTAN SEÇMELİ SINAVLARI DEĞERLENDİRME SİSTEMİ

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Abstract: Eğitimde kullanılan ölçme değerlendirmede en yaygın kullanılan yöntemlerin başında çoktan seçmeli sorular gelmektedir. Özellikle öğrencilerin tasarım yapması, ürün oluşturması gerektirmeyen sınavların çoğunda uygulanabilir ve alt bilişsel düzey ölçmeleri için objektif bir ölçüm yöntemidir. Bu çalışmada, herhangi bir ofis tarayıcısı kullanılarak bilgisayar ortamına aktarılan sınav kâğıtları üzerinde, görüntü işleme teknikleri kullanılarak çoktan seçmeli soruları değerlendiren bir sistem gerçekleştirilmiştir. Geliştirilen bu sistem özel bir optik form kâğıdı gerektirmediği için sınav maliyetleri büyük ölçüde düşmektedir.
Keywords: Görüntü işleme, OMR, optik işaret okuma, çoktan seçmeli sınav

1. GİRİŞ

Bilişim teknolojilerinin gelişimiyle beraber insan gücüyle gerçekleştirilen birçok işlem bilgisayar tarafından otonom şekilde yapılır hale gelmiştir. Yapay zekâ, bilgisayar görmesi, sayısal görüntü işleme gibi yöntemler tıp, tarım, imalat, güvenlik ve eğitim olmak üzere birçok alanda yaygın olarak kullanılmaktadır.

Demirbaş ve Dursun 2007 yılında yaptıkları çalışmada tarım alanında ülkemizde yaygın olarak yetiştirilen bazı buğday çeşitleri tanelerinin uzunluk, genişlik, kalınlık, izdüşüm alanı, çevre, küresellik derecesi ve farklı şekil katsayıları gibi bazı fiziksel özelliklerinin görüntü işleme tekniğinden yararlanılarak belirlenmesi üzerine çalışmıştır. Elle ve görüntü işleme teknikleriyle yapılan çalışmalar karşılaştırıldığında bilgisayar temelli otonom bir sistemin daha verimli olacağı kararlaştırılmıştır (Demirbaş & Dursun, 2007).

Kısaoğlu'nun çalışmasında üretilen dokuma kumaşların kalitesi kamera vasıtasıyla alınan görüntüler işlenerek analiz edilmiştir. Geliştirilen sistemin maliyet, güvenilirlik, hız ve uluslararası kabul edilebilirlik açısından avantaj sağladığı ortaya koyulmuştur (Kısaoğlu, 2011). Üretim sürecinde ürün tespiti, nesne tanıma, ürün ayrıştırma, ürün hasar tespiti de imalatta kullanılan temel alanlar arasında yer almaktadır (Samtaş & Gülesin, 2012).

Bulut ve arkadaşlarının çalışmasında kırık kemiklerin tespitinde görüntü işleme teknikleri kullanılmıştır. Geliştirilen yöntem, geleneksel yöntemlere göre çok daha başarılı olduğu gözlenmiştir (Bulut, Ozcinar, Ciftcioglu, & Akpek, 2015). Ortopedi, mikroskobik, kardiografi, sintigrafi, ultrason ve röntgen görüntülerini iyileştirme ve değerlendirme görüntü işlemenin tıpta kullanıldığı başlıca alanlar arasında yer almaktadır(Samtaş & Gülesin, 2012).

Şenol ve Fidan hazırladıkları bir düzenek sayesinde bilgisayara takılan web kameradan alınan görüntüleri görüntü işleme yöntemleriyle değerlendirmişlerdir (Şenol & Fidan, 2014). Kağıtların tek tek elle okutulması gerektiğinden daha hızlı ve pratik çalışan bir sisteme ihtiyaç duyulmaktadır.

Bu çalışmada ise görüntü işleme teknikleri kullanılarak çoktan seçmeli sınavların değerlendirilmesi ve istatistiksel veriler çıkartılması hedeflenmiştir. Microsoft C# programlama dili ve AForge.NET kütüphanesi kullanılarak geliştirilen program vasıtasıyla, taratılan sınav kâğıtları değerlendirilmiş ve

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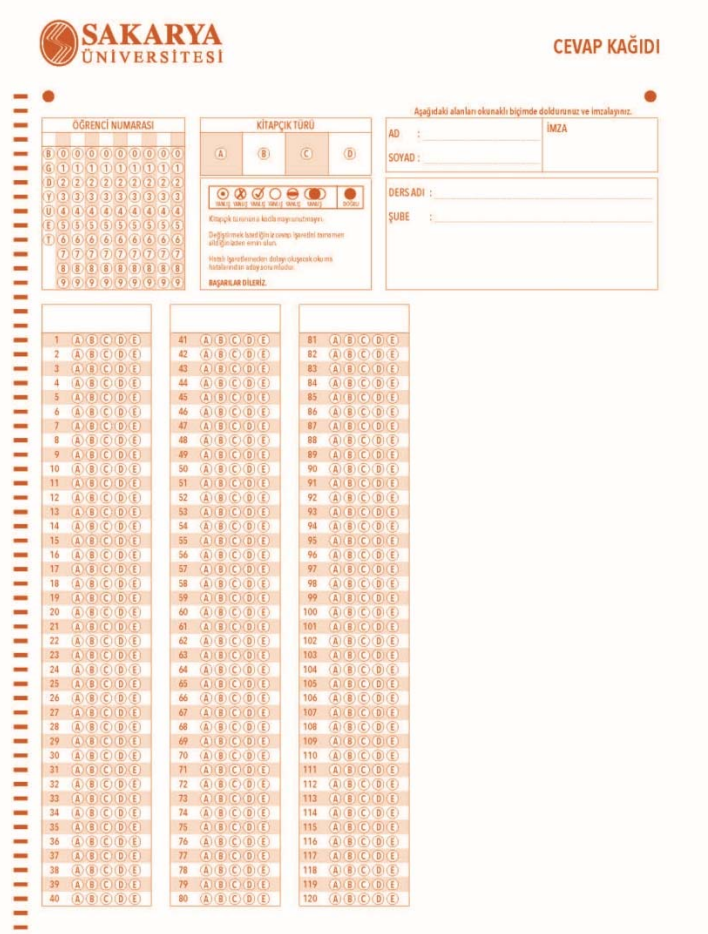
soru bazlı başarı oranları hesaplanmıştır. Makalenin diğer bölümleri şu şekilde organize edilmiştir. Bölüm 2'de geliştirilen sistemin adımlarının detaylı olarak yer aldığı materyal ve metot kısmı yer almaktadır. Bölüm 3'de ise çalışmanın sonucunda elde edilen veriler, geliştirilen sistemin avantajları ve gelecek çalışmaları içermektedir.

2. MATERYAL VE METOT

Çoktan seçmeli sınav kâğıtlarında kodlamaları gereken öğrenci numarası, kitapçık türü, cevap alanları ile öğrencinin adı soyadını, ders bilgilerini yazacakları bölgeler de yer almaktadır. Tasarlanmış olan sınav kâğıdında Şekil 1'de göründüğü gibi ilk hanesi öğrenim türünü ifade eden karakter diğerleri rakam olmak üzere 10 haneli öğrenci numarası, 4 farklı gurubu destekleyen kitapçık türü ve toplamda 120 tane olan 5 seçenekli soru cevap anahtarı yer almaktadır.



Şekil 1: Sakarya Üniversitesi Test Sınav Kağıdı

Geliştirilen sistem çoktan seçmeli kâğıtların bilgisayar ortamına aktarılması, resim üzerinde ön işlem, işaretçilerin bulunması, hizalama, bölgelerin ayrıştırılması, bölgelerin okutulması, değerlendirme ve aktarma aşamalarından oluşmaktadır (Şekil 2).

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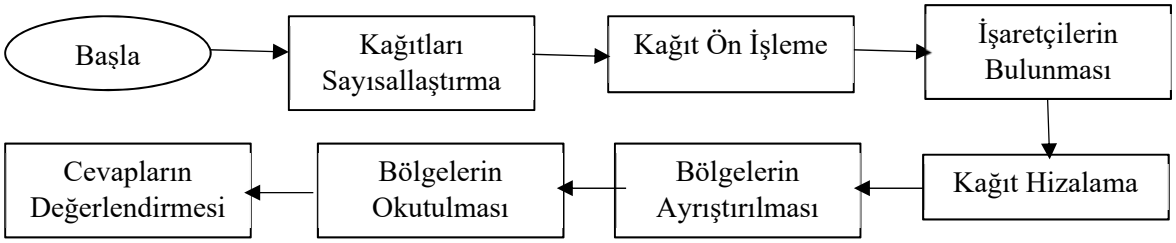

Şekil 2: Sistemin Akış Diyagramı

Kağıtları Sayısallaştırma

Kağıtların bilgisayar tarafından görüntü işleme teknikleri kullanılarak değerlendirilmesi için sınav kağıtlarının kamera, resim çekme veya tarayıcı vasıtasıyla sayısallaştırılma işlemidir. Kamera veya resim çekme yönteminde kağıtlar tek tek elle işleme tabi tutulacağı için hem zaman hem de iş gücü gerektirmektedir. Sayısallaştırma işlemi için çoklu doküman tarayıcı(ADF) türünde bir tarayıcı tercih edilmiştir. ADF tarayıcılar, özelliğine göre değişmekle beraber 50-100 adet kağıdı tek seferde tarayıcıya yükleyerek dakikada 40-100 adet kağıdı tarayarak bilgisayar ortamına aktarma imkanı sunmaktadır.

Kağıt Ön İşleme

Sayısallaştırılan görüntülerdeki istenmedik bozulmaların (gürültülerin) giderilmesi, farklı çözünürlük ve boyutlardaki görüntülerin boyutlarının ayarlanması bu aşamada gerçekleştirilmektedir. Resim üzerinde hızlı işlem yapmak ve piksellerin boyutunu düşürmek için renkli görüntünün siyah beyaz görüntü haline getirilme işlemi yine bu aşamada yapılmaktadır.

İşaretçilerin Bulunması

Şablon eşleştirme(template matching) algoritması kullanarak kâğıdın solunda bulunması gereken şerit işaretçi (Şekil 3) tespit edilmektedir. Verilen şablona uymayan görüntüler hatalı kâğıt olarak değerlendirilmektedir. Tarayıcıya yerleştirilen kâğıtlarda arkası dönük haldeki yerleştirilen kâğıtlar veya sınav kâğıdı formatında olmayan kâğıtlar bu aşamada tespit edilmektedirler. Şerit işaretçinin konumu tespit edildikten sonra en üst noktası hizasında nokta şeklindeki iki nokta işaretçi (Şekil 4) bulunmaktadır. Nokta işaretçilerin konumlarına bakılarak kâğıdın hizalaması ve her bir işaretleme hücrelerinin kaç pikselden oluştuğunun hesaplanmasına yardımcı olmaktadır.



Şekil 3: Kağıdın Solundaki Şerit İşaretçi



Şekil 4: Nokta İşaretçi

Kağıt Hizalama

Sınav kâğıtlarının sayısallaştırılması aşamasında bazı kâğıtlar belirli oranda dönebilmektedirler. Nokta şeklindeki iki işaretçinin konumlarına bakarak kâğıdın kaç derece döndüğü hesaplanmakta ve kâğıt hizalanmaktadır.

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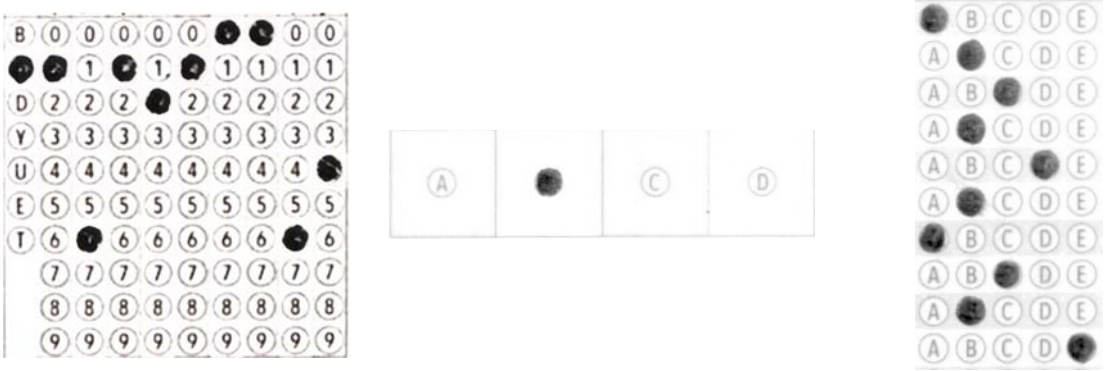
Bölgelerin Ayrıştırılması

Sol üstte yer alan nokta işaretçisinin konumuna göre öğrenci numarası (Şekil 5a), kitapçık türü (Şekil 5b), cevapların kodlandığı bölgelerin (Şekil 5c) koordinat, genişlik ve yükseklik bilgileri hücre miktarı cinsinden sistemde tanımlanmıştır. Nokta işaretçiler arası 42 hücreden oluştuğundan bu mesafe 42'ye bölünerek her bir hücrenin kaç pikselden oluştuğu hesaplanır. Bölgelerin bilgileri hücre bazında olduğundan, ayrıştırma işleminde hücre değerinden piksel değerlerine geçişte bu oran kullanılır.



a) Öğrenci Numarası Bölgesi b) Kitapçık Türü Bölgesi c) Cevaplar Bölgesi

Şekil 5: Nokta İşaretçi

Bölgelerin Okutulması

Bir önceki aşamada ayrıştırılan resimler bu aşamada hücre hücre yorumlanarak okutulma işlemi gerçekleştirilmektedir. Örnek olarak öğrenci bölgesi 10 sütundan oluşan ilk hanesi karakter sonraki 9 hanesi rakamlardan oluşmaktadır. Öğrenci bölgesi sütun olarak 10 eşit alana bölünür ve her alan öğrenci numarasının bir hanesine karşılık gelmektedir. Bu alanlar da kendi içlerinde 10 eşit parçaya bölünerek de hanelerin hücrelerini oluşturmaktadır. Her bir hücrenin piksel değerlerine bakarak siyah olan piksel sayısının hücredeki toplam piksel sayısına oranı hesaplanmaktadır ve hücre doluluk oranı olarak isimlendirilmektedir. Hücre doluluk oranı 0.25'in üzerinde olan hücreler işaretlenmiş olarak değerlendirilmektedir. Bir hanede birden fazla işaretlenmiş hücre bulunması durumunda ise hane değeri hatalı işaretleme anlamına gelen 'X' olarak değerlendirilmektedir. Hatalı okumaları tespit edebilmek için resim üzerinde okutulması gereken bölgeler dikdörtgen içerisine alınmaktadır. Aynı zamanda sistemin okuduğu değerler de yazılmakta ve cevaplar ise resmin üzerine işaretlenmektedir (Şekil 6). Bu işaretli resimler de bilgisayar ortamına kaydedilerek ileri geri alınarak hızlı bir şekilde kontrol sağlanabilmektedir.

3. TARTIŞMA VE SONUÇ

Geliştirilen sistem Sakarya Üniversitesi Bilgisayar, Bilgisayar ve Bilişim Sistemleri Fakültesi, Mühendisliği Bölümünde 11 farklı derste uygulanmış ve 5384 tane çoktan seçmeli sınav kâğıdı değerlendirilmiştir. Bu kâğıtlarda yapılan incelemelerde 43 tane kâğıtta kitapçık türü kodlanmadığı, 27 öğrenci numarasının yanlış kodlandığı veya kodlanmadığı, 45 tane kâğıtta öğrencinin önceki tercihini düzgün silemediğinden dolayı çift cevap olarak okunduğu ve 9 tane kâğıt ters taratıldığı için değerlendirmeye girmediği tespit edilmiştir. Karşılaşılan problemler incelendiğinde sistemin sorunsuz çalıştığı, her sistemde olduğu gibi kullanıcı tabanlı sorunların ortaya çıktığı ve zamanla eğitimlerle sorunun optimum seviyeye indirilebileceği kararına varılmıştır.

Optik okuyuculu sistemlerde kullanılan 110gr kâğıt yerine gündelik hayatta kullandığımız 80gr kağıt kullanılması sadece kağıt maliyetini üçte iki oranında düşürmektedir. En uygun optik form okuyucu cihaz düşünüldüğünde tarayıcı kullanılması da cihaz maliyetlerini en az dörtte üç oranında düşürmektedir.

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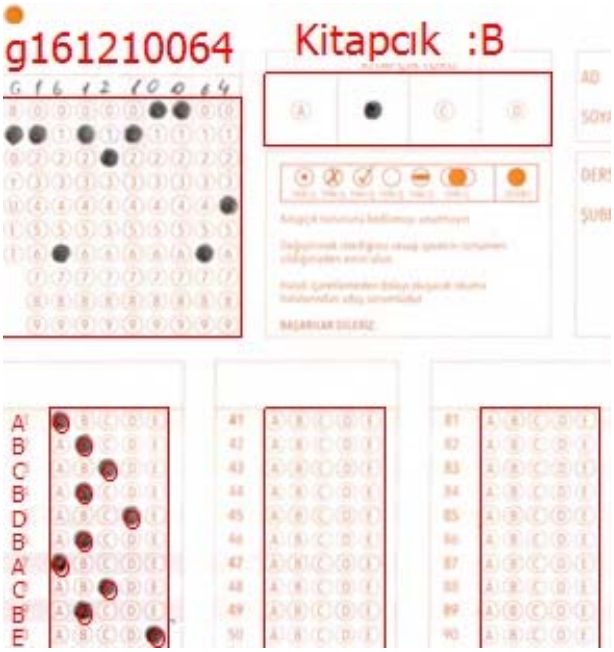

Şekil 6: Değerlendirilmiş Kağıt Görüntüsü

Çalışmanın bundan sonraki bölümünde çevrimiçi bir sistem tasarlanarak, taratılmış kâğıtların yüklenmesi öğrencilerin notlarını görüntülemesi hedeflenmektedir. Düşünülen bu sistemle öğrenciler isteğe bağlı olarak cevap kâğıtlarını da görüntüleyebileceklerdir. Kullandığımız sistem sadece özel hazırlanmış çoktan seçmeli sınav kâğıt formatını desteklemektedir. Form üzerine farklı noktalara konumlandırılmış öğrenci numarası, kitapçık türü ve cevap bölgeleri kullanıcılar tarafından tanımlanarak genel bir optik form okuma sistemi geliştirilmesi hedeflenmektedir.

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GRAPH-BASED SERVICE COMPOSITION: SOLUTION TO WEB SERVICES STANDARDS LIMITATIONS

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Abstract: With the growing need for service oriented architecture and the rise of cloud computing, web services have become the focus of many researchers and software developers. Subsequently, the standardization of web services has become crucial. In this paper we are evaluating existing standard related to web services mainly to accomplish the most popular and common tasks performed in web services. WSDL for web service description, PBEL for business process description and creation,WSO2 web service application, SOAP messaging protocol, and WS-Policy to describe and create rules to be applicable on web services. We list the main limitations of BPEL and SOAP and we propose a graph based service composition algorithm as an alternative to overcome existing issues with BPEL and combine it with the use or REST instead of SOAP.

Keywords: Web Services, WSDL, PBEL,SOAP, WSPolicy,WSO2, graph-based service composition.

Introduction

Web services can be any application or service available over the web. The execution of most services over the net require only for the user to install and use the appropriate browser. Most web based services are compatible with all popular browsers. Therefore, the issues of software and hardware compatibility is rare if not absent. All of this has pushed software developer and user to opt for web based services. From that came the need for standardization. Since web based applications can be developed using different languages and have different functionalities; One of the key attributes of Internet standards is that they focus on protocols and not on implementations. thus standards allow for services to be described in a common language (WSDL), to use a common messaging protocol to communicate (SOAP) and finally the integration of these web services and the creation of newer ones based on some features of existing ones (PBEL). Figure1 illustrates the main web service standards, allowing a wide range of functionalities based on web services. All of which will be described in detail in the remaining sections of the paper.

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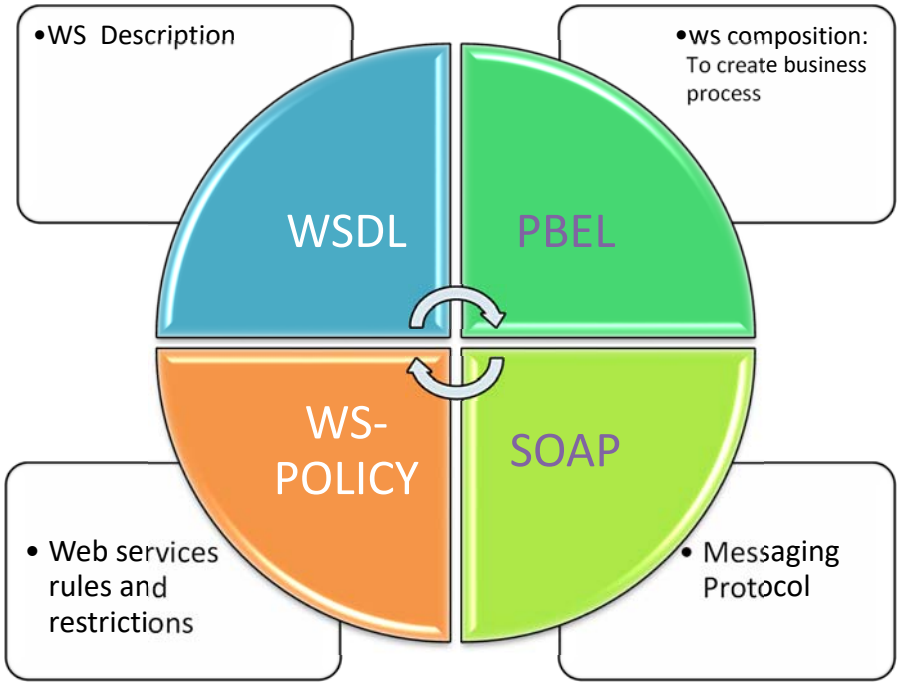

Figure1: Web Service Standards

WSDL

WSDL stand for web service description language. It allows a service provider to write a description of its service. The WSDL file contains information about the service, how to access it and its input and output. WSDL is a specification defining how to describe web services in a common XML grammar. WSDL describes four main important pieces of data:

- Address location of the specified service
- Information about the interface to describe all service functions
- Information about the Data type for all message requests and message responses
- Information about binding specifications for the transport protocol used

The main advantage of WSDL is that it is both language and platform independent. Services by different providers running in different platforms and written in different languages can interact and communicate easily using this specification. WSDL allows for a given service to be invoked by clients and to use all or some of its functionalities.

Web Service Composition

1. BPEL'n'Aspects is a non-intrusive mechanism for adaptation of control flow of BPEL processes based on the AOP paradigm. It relies on Web service standards to weave process activities in terms of aspects into BPEL processes. This paper is a logical continuation of the BPEL'n'Aspects approach. Its main objective is to enable compensation of weaved-in Web service invocations (activities) in a

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straightforward manner [1]. PBEL is mainly used in static web service composition which has many limitations such as: a. cannot handle dynamic user preferences because it requires complex programming, b. difficult to maintain the solution and modify it according to changes in the business environment. The new services cannot be dynamic added. Finally it's hard to ensure that the system will perform during unexpected fault scenarios.

2. Petri nets and Pi calculus: formal languages have proven to be the ones to provide a dynamic service composition that can evolve with the environment changes and continue to adapt to meet the user's needs. However we find that they haven't being used much in business and were used mainly in academia, because of the complexity to build solutions using formal languages. Also because there aren't many frameworks allowing the creation of service composition processes using formal languages. Some vendors claim that their systems are based on Petri nets or Pi calculus and other vendors suggest that they do not need a formal language to base their system on. In essence there are three "camps" in these discussions: the "Petri net camp", the "Pi calculus" (or process algebra) camp, and the "Practitioners camp"[2]
3. WS Service Composition: Figure 2 shows how a set of participating services are combined to create a new composed web service to accommodate the user's need. The proposed composed service is palace an order. The customer make a purchase and is in need to get an invoice from the invoice WS, to use shipping WS and to pay the total amount using the credit card WS. The new composed WS combines functionalities from different WSs and prevent the user from having to interact with each WS separately.

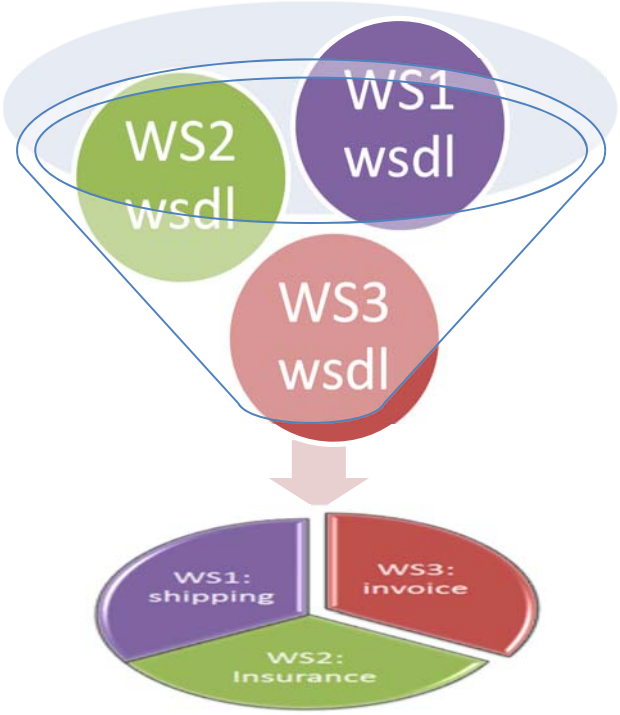

Figure2: Composed Service

4. Graph-based composition: our solution combines the use of web service standards and using formal languages to build a graph in order to generate the needed business process. Figure 3 show the graph-based service composition. The participating services are selected based on the input/output values listed in the wsdl for each WS, the ones that match the user's request either partially or fully are then selected to be part of the composition process, meaning that each WS will be then part of the composition graph. Each participating WS is represented using a node in the graph. The links between the services are the transitions between services. The execution of the service composition orchestration is done using the policies. These policies can include any restrictions or constraints by the service provider or the service user. For example a credit card transaction WS may have a constraint to not process any transaction where the amount is less than 10$. Therefore if the purchase amount is < 10 then the execution of the participating WS will not be done.

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5. The graph traversal generates a process; therefore different processes can be generated by different graph traversal, depending on the order of nodes chosen. This order can be based on quality of the result (how close that it match the user's request), or based on other criteria such as response time, shortest traversal…ect. In case of fault from a given node: non responsive web service can be replaced by using a different process, meaning a different traversal of the graph. This makes the composition process more fault tolerant. And offers different alternative solutions based on the user's criteria of selection.



Figure 3: graph-based service composition

WSO2 Web Services Application

WSO2 WSAS is the Enterprise ready Web services engine powered by Apache Axis2. It is a lightweight application server for Web services that incorporates leading open source components into a simple, easy-to-use and highly performant package.

It supports Java components as services using both SOAP and REST models. Web services support include WS-Security, WS-Trust, WS-SecureConversation, WS-Reliable Messaging, WS-Addressing, WS-Policy, WS-SecurityPolicy and more, giving a fully secure and reliable infrastructure that interoperates with both J2EE and .NET frameworks using open standard protocols.

WSO2 WSAS is built on Apache Axis2, the popular Web services framework mainly developed by WSO2 engineers. WSO2 WSAS provides many value additions on top of Axis2, making it a more enterprise ready product. It also integrates other core Apache Web services projects such as Apache Axiom, Apache Rampart, Apache Sandesha2 , and Apache Neethi to form a production quality, comprehensive Web services server platform.[3]

SOAP/REST

SOAP stands for simple object access control. It is a standard to allow different services by different providers to communicate and exchange data. SOAP protocol is intended for exchanging structured information in a decentralized, distributed environment. It uses XML technologies to define an extensible messaging framework providing a message construct that can be exchanged over a variety of underlying protocols [4]. The framework is intended to be independent of any specific programming model and other implementation particular semantics. Below in figure 4 we compare SOAP the web services standard communication protocol and REST Representational State Transfer an architectural style for building networked applications. We see that SOAP Provides significant pre-build extensibility in the form of the web services standards, it includes built-in error handling and has the advantage of automation when used with certain language products. On the other hand REST is easier to use for the most part and is more flexible. It has the following advantages when compared to SOAP:

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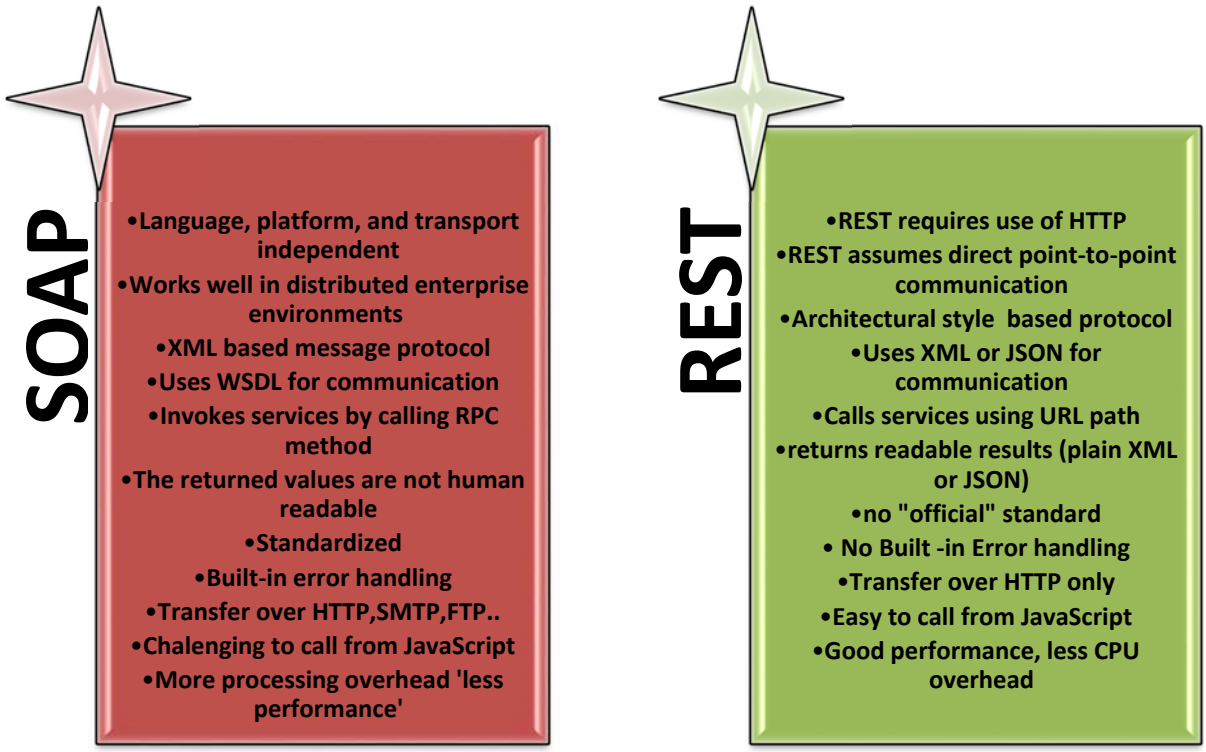

Figure 4: SOAP protocol Verses REST

WS-POLICY

A Policy is a rule for a given action to take place if a given set of conditions are true. Polices allowed adding more functionalities and restrictions to services. There is a wide range of policy writing languages including Ponder and others. Each language has its own pros and cons. The challenge was that policies written in different language cause a problem of interoperability and compatibility. For different policies to apply on a given set of services they have to be expressed using the same language. Thus, there was a need for standardization. Policies declaratively specify the behavior of these services in certain circumstances and can be used in areas like security or quality of service [5]

WS-Policy is a specification for creating and describing policies to be applicable on web services. At the abstract level a policy is a potentially empty collection of policy alternatives. A policy with zero alternatives contains no choices; a policy with one or more alternatives indicates choice in requirements (or capabilities) within the policy. Alternatives are not ordered, and thus aspects such as preferences between alternatives in a given context are beyond the scope of this specification.

Alternatives within a policy may differ significantly in terms of the behaviors they indicate. Conversely, alternatives within a policy may be very similar. In either case, the value or suitability of an alternative is generally a function of the semantics of assertions within the alternative and is therefore beyond the scope of this specification [6].

Conclusion

In this paper we have presented an overview of the main existing standards for web services. We illustrated the main issues and limitations for BPEL and proposed our solution: a graph based service composition based on formal language. The goal is to benefit from the advantages of web services standards such as interoperability and platform independence, and benefit from the advantages of dynamic service composition such as an easy to update solution without any major changes to the structure and the flow of the composition process. It's important to benefit from all the functionalities that web services standards offer. Standardization is not only for application it's also for databases where we could have a database of web services that are dynamically searched and a new composed service is generated upon the user's request. There is the need for standardized semantic metadata

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about data-sources and protocols to publish data [7]. In order to reach a potential semantic and automatic navigation at a Web scale Nowadays software development is going more towards service based architecture. The standards covered in this paper cover the main functions done on web services. These are web services description, web service messaging, web service composition and finally web service policies.

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HARD SURFACE COATİNG TiC (0.9C%) METAL POWDERS TO SURFACE OF THE AISI 1020 LOW CARBON STEEL WİTH PLASMA TRANSFERRED ARC METHOD

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Abstract: In this study, TiC (0.9C%) mixed powder has been alloyed on the low carbon steel surface by using plasma transferred arc process. Weight rates of 0,9%C added to TiC powders.Titanium contents of 5%Ti, 10%Ti, 15%Ti, 20%Ti by weigh were mixed the effect on microstructure of titanium different contents were investigated. With this aim, alloyed layer and interface were examined with optical microscopy, SEM, EDX and interface micro hardness distribution were obtained. Also in this study, differences of PTA process in comparison to other surface alloying process.

Keywords: PTA, Microstructure, TiC

Introduction

The plasma transferred-arc (PTA) powder surfacing process has been widely used in surfacing and coating engineering. During PTA processing the powder is fed into the melting pool on the substrate through the plasma arc space by a specially designed powder feeder. The powder's thermal behavior, melting, vaporization and decomposition, will affect the surface layer's structure and properties greatly, especially under metal–ceramic composites surfacing condi-ting conditions [4,1]. Hence, an understanding of the powder particles' thermal behavior in the plasma arc column will be of general interest, both to the metallurgist wishing to know more about the metallurgy of the powder surfacing process and to those concerned with the powder surfacing industry, such as powder manufacturers and users. Though some work has been done in this field under plasma non-transferred-arc spraying conditions [4,2,3], little work in this field regarding PTA powder surfacing conditions has been reported. Different surface techniques were carried out in order to improve surface properties of materials. plasma transferred arc (PTA) process was widely used for the surface treatment of materials and developed as a modification of the plasma arc welding method [5,6–8]. This technology emerged from the basic principles used in traditional welding surfacing techniques such as oxy fuel gas welding (OFW), gas tungsten arc process (GTAW), manual metal arc welding (MMAW), gas metal arc welding (GMAW) and submerged arc welding (SAW). Compared to these processes, PTA surfacing provides a higher deposition rate (except in the case of SAW) and a relatively low dilution [5,10,7]. The PTA surfacing process is characterized by extremely high temperature, excellent arc stability, low thermal distortion of the part, and high coating speeds [5,9]. PTA process has an advantage of using two independent arcs (i.e. non-transferred arc as pilot and transferred arc as main arc). This advantage may play a role in allowing proper microstructural development and was used in the present study to investigate its effect on the resulting coating properties [5,10]. Argon gas passes through an inner annulus between the cathode and anode and is ionised, forming a constricted plasma arc column. This ionised gas provides a current path for a transferred arc [5,6].TiC carbide as one of common ceramics has many excellent advantages, such as very high melting point and thermal stability, high hardness and excellent wear resistance, low coefficient of friction, high electrical and thermal conductivities. TiC carbide is widely used as the reinforcing phase of the wear-resistant coating for cutting tools and as diffusion barriers in semiconductor technology . Because of its high melting point, good resistance to thermal shock, and good chemical and physical sputtering properties, TiC is also a promising material to be used in fusion reactors [11]. In this study TiC powders was coated on surface of an the low carbon steel (AISI 1020) plate by using plasma transferred arc (PTA) as the heat source. Surface coating was performed in different TiC alloying percentage values under Ar gas protection. As a result of TiC of different percentage values the microstructural changes occurred were examined.

Materials and Methods

TiC coatings were carried out on low carbon steel (AISI 1020) plate by using plasma transferred arc. The operating principle of PTA melting used was schematically shown in Fig. 1. Surface coating procedure was realized in one welding current. Parameters of the PTA deposition were given in Table 1. Low carbon steel plates of 70×25×10 mm in dimension were cut and then polished down to 1200 grit abrasive paper and finally rinsed with ethyl alcohol before coating. TiC powder was mixed with sodium silicate. [5,12] .

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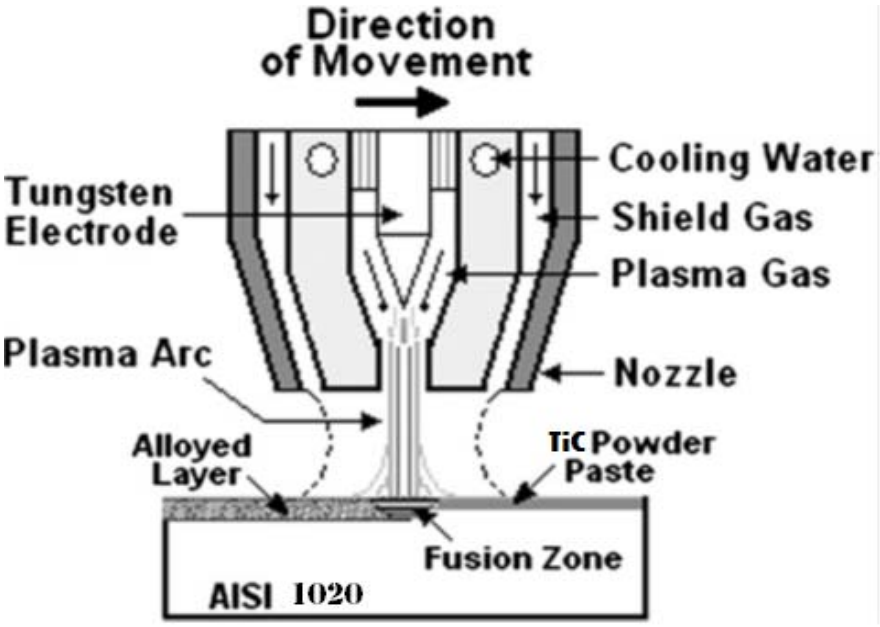

Figure 1. Schematic of the PTA system[5].

A groove, 2 mm in depth and 4 mm in width, machined on the surface of the substrate by a milling machine and mixed powders were applied into this groove and dried in hot air. Chemical compositions of substrate and coating material were presented in Table 2. Plasma arc was used as the heat source to melt the coating layer and substrate [5,13,14]. Plasma transfer arc experimental parameters presented in Table 1. Photos of the produced speciments given in Fig. 2. Metallographic examination of coated surfaces involved preparing transverse sections by grinding and polishing to 3 μm diamond paste. For microstructural examination, substrate was etched electrolytically in a solution of % 50 HNO_3+% 50 H_2O, and coating layer was etched by 10 ml HF+25 ml HNO_3+ 150 ml H_2O solution. The microstructures of the specimens were investigated by optical microscope and scanning electron microscopy (SEM). Micro hardness measurements were carried out by a Future Tech micro hardness tester FM-700 under a load of 20 g [5].

Table 1: PTA experimental parameters

Parameters	Values
Arc current (A)	130
Energy input (kj/mm)	0.82
Arc voltage (V)	18
Shield gas flow (Ar, l/min)	25
Plasma gas flow (Ar, l/min)	0.8
Diameter of electrode (mm)	4.7
Travel speed (mm/s)	2.2
Powder feed rate (gr/s)	0.134
Torch gap (mm)	3

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Table 2: The chemical compositions of substrate and coating materials

Alloy	Weight (%) Composition									
	C	**Si**	**Mn**	**P**	**S**	**Cr**	**Ni**	**Mo**	**Ti**	**Fe**
AISI 1020 -Plate	0,19	0,24	0,65	0,01	0,04	0,02	0,01	0,04	0,01	97,20
TiC (S1)	0,9	-	-	-	-	-	-	-	5	Balance
TiC (S2)	0,9	-	-	-	-	-	-	-	10	Balance
TiC (S3)	0,9	-	-	-	-	-	-	-	15	Balance
TiC (S4)	0,9	-	-	-	-	-	-	-	20	Balance

According to R. L. Deuis article more suitable arc current as 130A determined for PTA process of the TiC(table 2.).

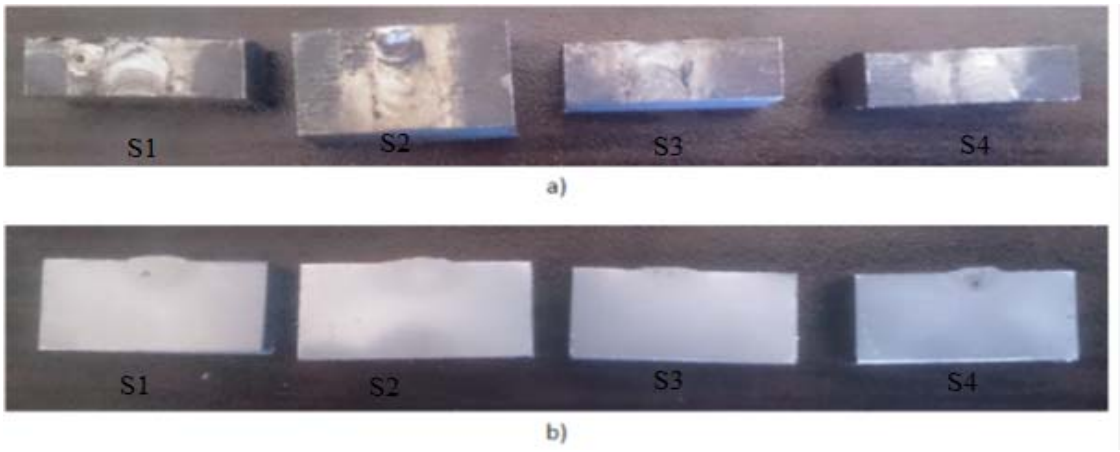

Figure 2. Speciments (from left to right S1, S2, S3, S4), a) top wiew, b) front wiew.

We can see in Fig. 2-a section of raw speciments images and in Fig. 2-b photos of the speciments of the prepared to metallographic analysis. It was observed good penetration of the coating layers examination of with eye done. Also result of the coating process wasn't occurred structural fault.

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Results and Discussion

Investigation of the image of optical micrograph

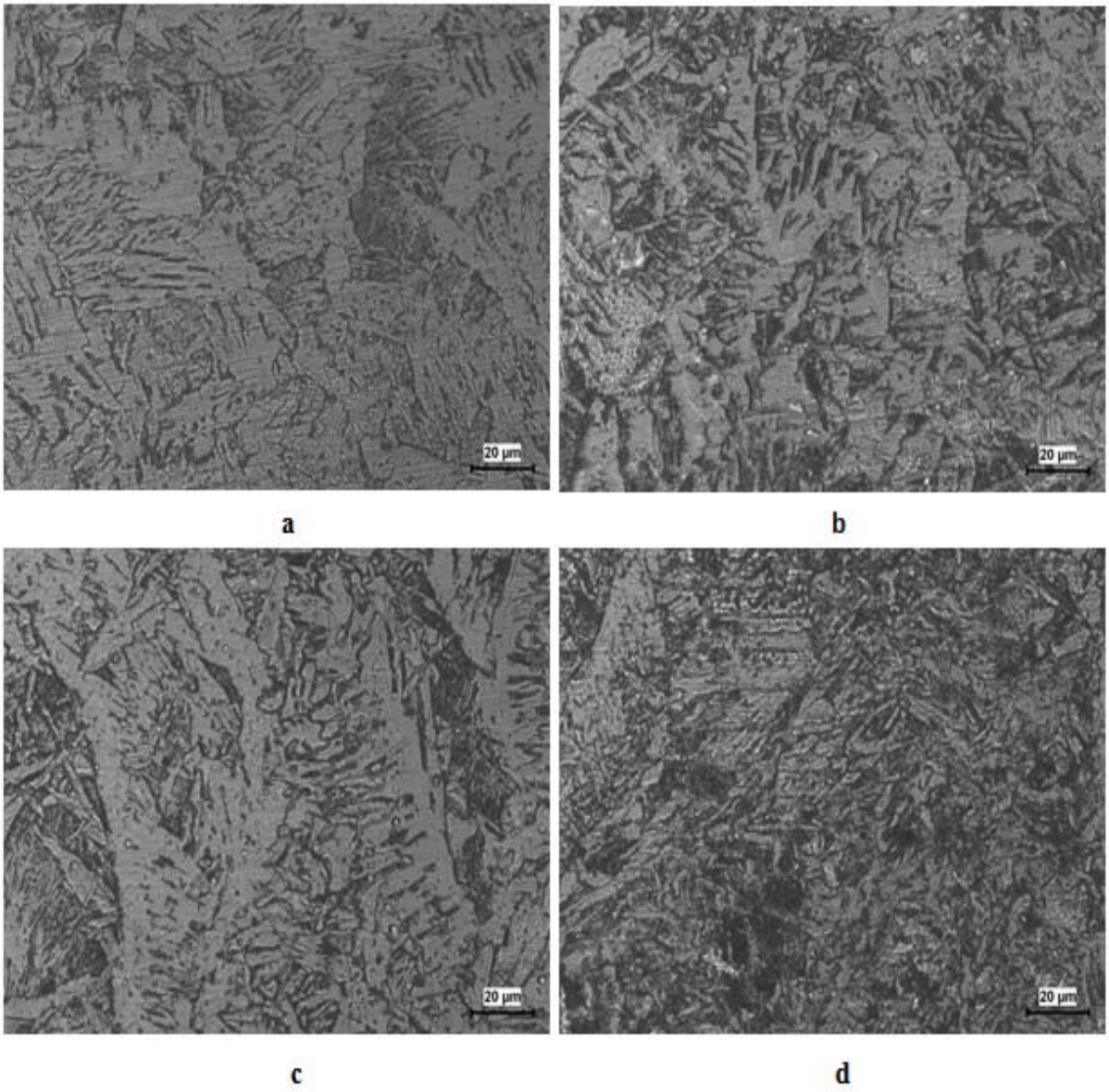

Figure 3. Optical images of coating plates of the a) S1, b) S2, c) S3, d) S4 samples at 20µm.

Optical images of samples coating plates are shown in Fig.3. When investigated images rate of dendrite where in the coating layers increasing observed with increased Ti rate. The maximum rate of dendrites observed in 20%Ti alloying sample. During other method coating process substrate with coating materials each other can't to diffuse and occurred pores observed in the interface zone. But in the PTA coating process, observed fine bonding interface of two materials. Also occurred pores and macro cracks not seen in the microstructure. [16]. During the alloying process reached high temperature (10000 ile 30000°K). [16]. Because of heat both substrate and coating materials affected from heat. Then atoms occurred diffuse both sides and transformations occurred in the microstructure. [17].

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Investigation of the images of SEM micrograph

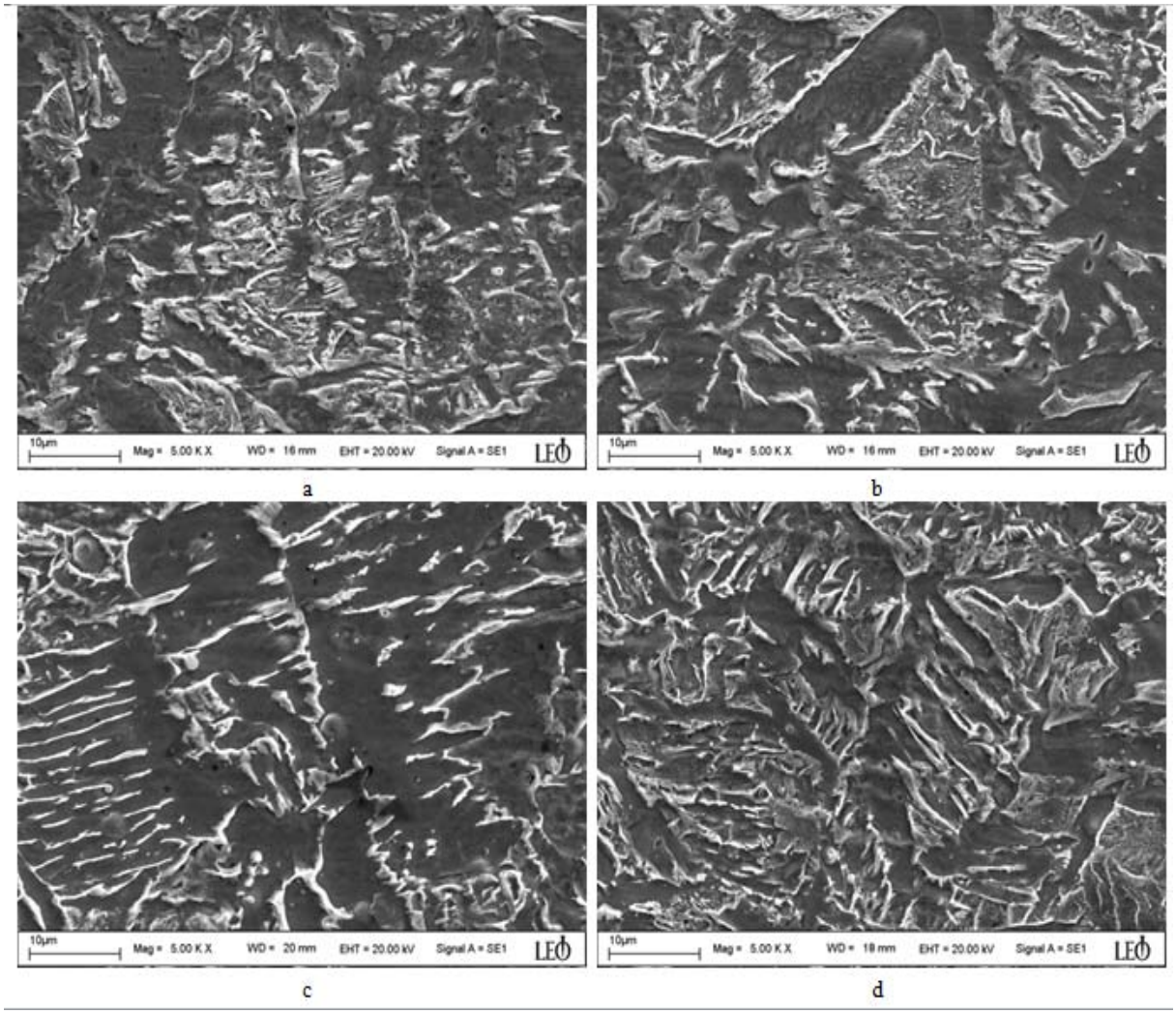

Figure 4. SEM micrograph of coating layer and substrate material interface for a)S1, b) S2, c)S3, d)S4.

No cracks or pores were seen both in the coating layer and interface. In a previous study it was reported that small pores were detected in the NiTi coating layer produced by TIG process and poor shielding caused pore formation in the coating layer [10]. This problem was exceeded by using plasma transferred arc. Figure 4. showed the entirely dendritic solidification of coating microstructures for all coatings. Some grain boundary solid solutions such as βTi occurred due to diffusion from the coating layer to substrate material, as could be seen in Fig. 5.

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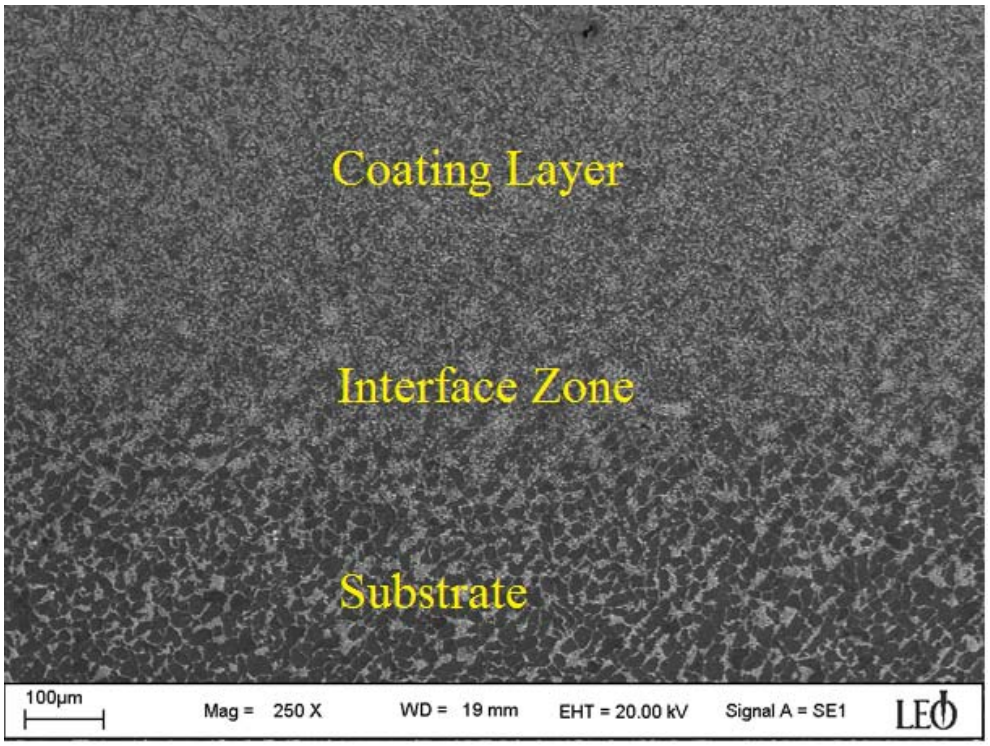
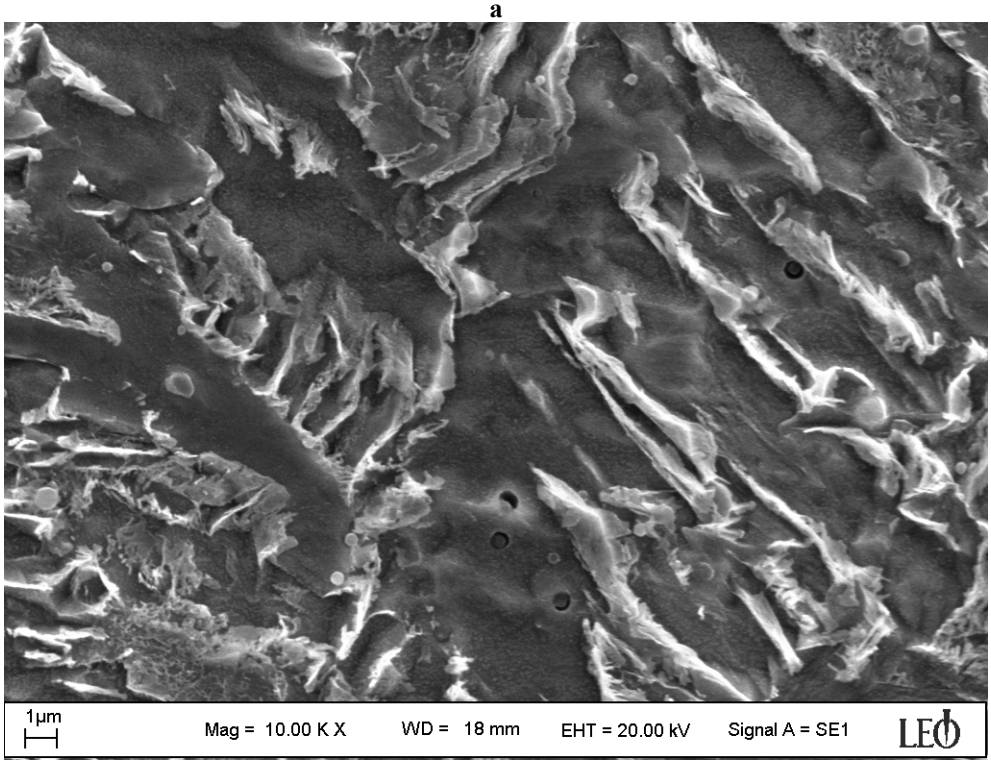


a



b

Figure 5. SEM micrograph of a) all layers b)coating layer at the S4.

Four different regions occurred during coating, namely: coating layer, interface region, heat affected zone (HAZ) and substrate [5]. Fig. 5 shows typical morphology of the alloyed layer. It shows clearly that interface zone between coating and substrate. Ferritic and pearlitic structure was observed in the substrate. Also Fig. 5 shows the microstructures of the coating layers for %20 Ti. When Fig 5. a. investigated it was observed very fine grains. We are thinking that proportionally with the thinner grain hardness of the coating layers will increase. It was seen clearly diffusion of the coating atoms from interface zone to substrate. It was observed very fine binding because of the fine diffusion in the interface zone. Also it was observed existence of TiC compound and solid solutions as a result of the diffusion of the Ti in the heat effected zone (HAZ) When Fig. 5. b. İnvestigated dark zones consist

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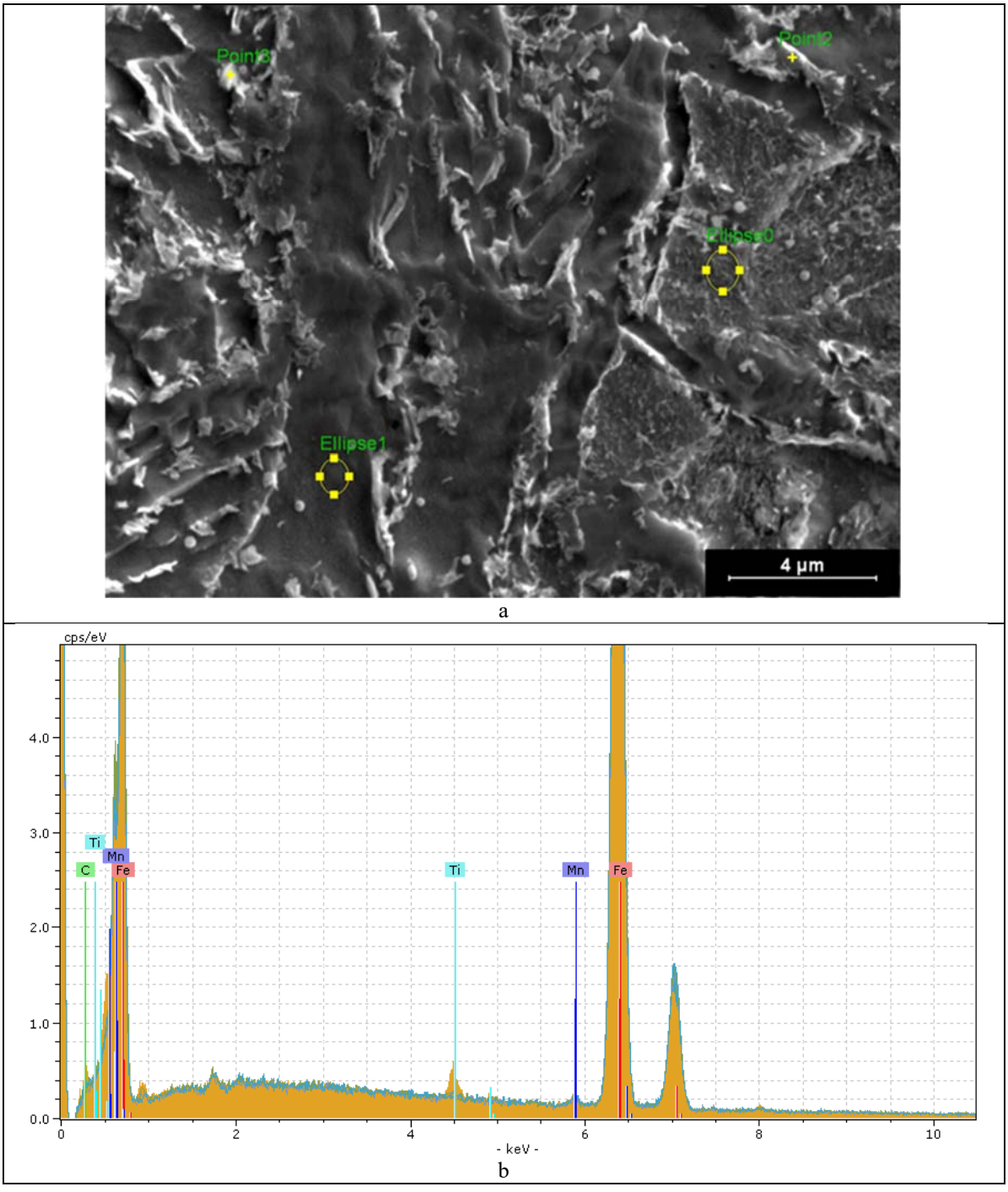
of the Fe base and Ti solid solutions. Also we are thinking white zones consist of the TiC compound. The width of the interface zone, which formed with rapid solidification, was 80 µm for S4. The width of heat affected zones (HAZ) was approximately 120 µm for S4.

Investigation of the SEM-EDX analysis

It was observed where taken image and EDX analysis in the Fig.6 S4 of the interface zone, best diffusion and bonding occurred in the 20%Ti sample. coating plate of the 20%Ti alloyed observed most βTi solid solution contained, when investigated Ti- C binary phase diagram in Fig. 8. Due to the excess βTi solid solution according to the other samples Ti diffusion more occurred to interface zone



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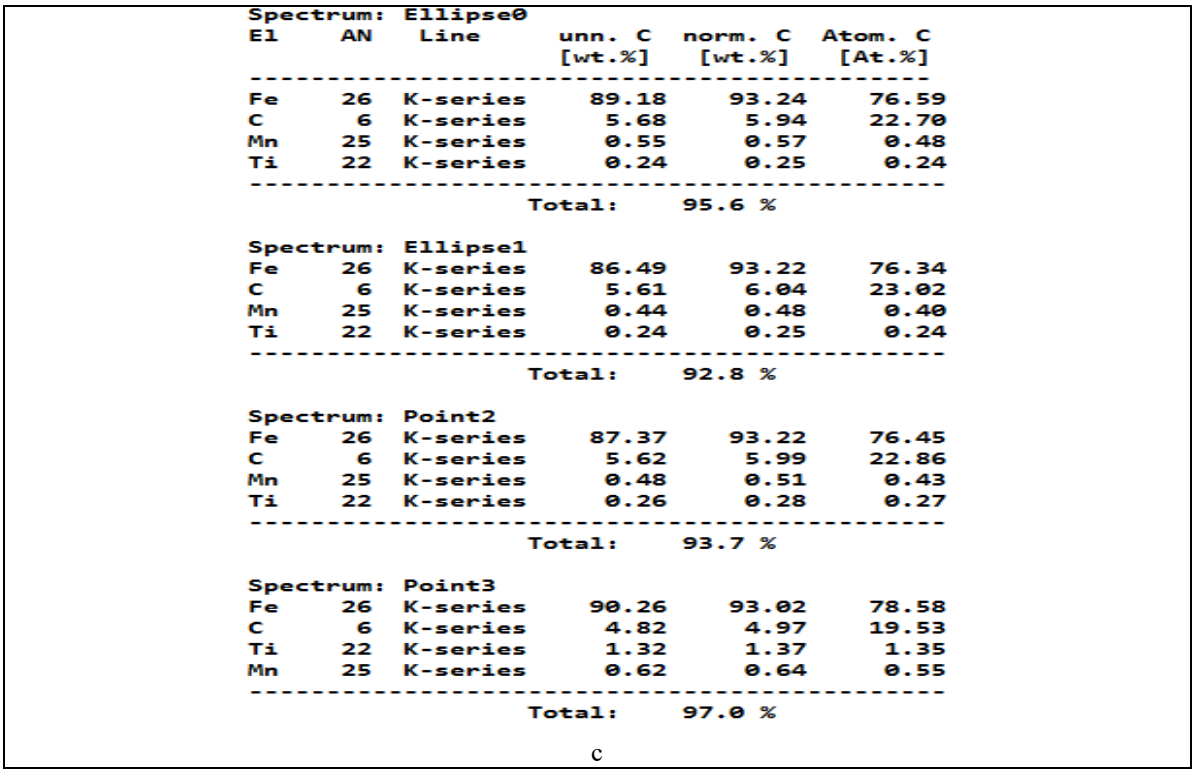

Spectrum: Ellipse0

El	AN	Line	unn. C [wt.%]	norm. C [wt.%]	Atom. C [At.%]
Fe	26	K-series	89.18	93.24	76.59
C	6	K-series	5.68	5.94	22.70
Mn	25	K-series	0.55	0.57	0.48
Ti	22	K-series	0.24	0.25	0.24
		Total:	95.6 %		

Spectrum: Ellipse1

Fe	26	K-series	86.49	93.22	76.34
C	6	K-series	5.61	6.04	23.02
Mn	25	K-series	0.44	0.48	0.40
Ti	22	K-series	0.24	0.25	0.24
		Total:	92.8 %		

Spectrum: Point2

Fe	26	K-series	87.37	93.22	76.45
C	6	K-series	5.62	5.99	22.86
Mn	25	K-series	0.48	0.51	0.43
Ti	22	K-series	0.26	0.28	0.27
		Total:	93.7 %		

Spectrum: Point3

Fe	26	K-series	90.26	93.02	78.58
C	6	K-series	4.82	4.97	19.53
Ti	22	K-series	1.32	1.37	1.35
Mn	25	K-series	0.62	0.64	0.55
		Total:	97.0 %		

c

Figure 6. SEM-EDS ve XRD graphics analysis results of the S4 sample in the interface zone.

The EDX results taken from interface zone of S4 were shown in Fig. 6-b,c. The composition of the plotted region as ellipse0 in Fig. 6-a consisted of 0,24% Ti and 22,70% C. In Ti-C binary phase diagram, this composition corresponds to TiC phase. The plotted Elipse 1 consisted of 0,24% Ti, 23,02% C, 76,34%Fe and 0.40 Mn . Point2 consisted of 0,27% Ti, 22,86% C, 76,45% Fe and 0,43 Mn which corresponded to TiC intermetallic in Ti-C binary phase diagram. Point3 consisted of 1,35%Ti, 19,53%C, 0,55Mn% and 78,58%Fe. We can observe via diffusion of Ti and C atoms from coating layers to interface zone because of this conclusions. We are thinking when we investigate EDX analysis in the Point3 white zones was formed from TiC base. Moreover we think dark zones occur Fe based ferritic solid solutions.

Investigation of the Micro hardness

The micro hardness test results taken from the coating layer, interface and substrate were shown in Fig. 7. Maximum hardness was measured in the coating layer whereas the lowest values were recorded in the substrate. Regarding alloying TiC ratio input, it can be seen that hardness increased with the increasing TiC ratio. Increasing in the micro hardness occurred usually as directly proportional from substrate materials to coating layers. Increasing micro hardness of the S1,S2,S3 samples occurred low level and each other near value. But micro hardness of the S4 more high observed than other samples. When Ti-C binary phase alloy diagram investigated in the S4 sample estimated formed phases = 25% TiC + 75% βTi solid solution. Due to high proportion βTi solid solution in this sample high micro hardness was observed. We believe that increasing micro hardness because of the proportion βTi solid solution in the S4 structure

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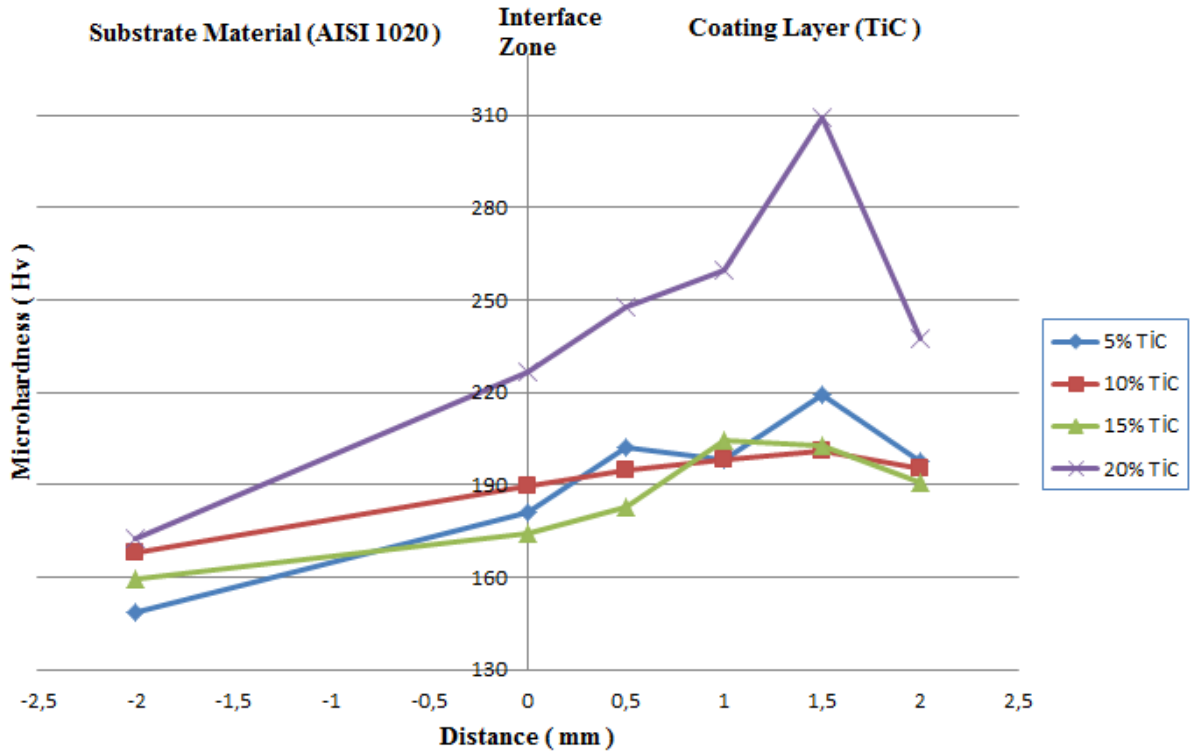

Figure 7. Micro hardness values of coating layer, interface and substrate.

When referencing binary phase diagram in Fig. 8, analysis of the phase structure which formed TiC alloy samples is as follows. βTi solid solution ratio increased in the structure with increased titanium ratio. Therefore as parallel increasing of the βTi solid solution in the structure, we can observe linear increasing in micro hardness values.

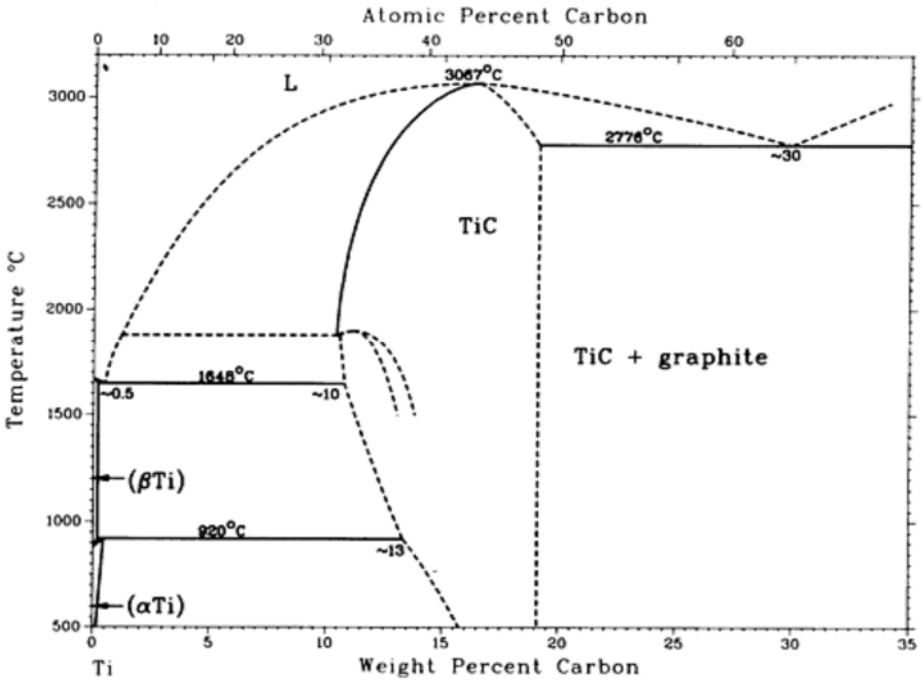

Figure 8. Binary Phase diagram of the Ti – C [15] .

When applied lever arm rule to Ti-C binary phase diagram according to alloying proportion, estimated phase structure is like formula (1)

S1= (0,9C / 5TiC) x 100=18% C = 82% Ti, Estimated formed phases = 100% TiC

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S2= (0,9C / 10TiC) x 100=9% C = 91% Ti, Estimated formed phases = 85% TiC + 15% βTi solid solition.
S3= (0,9C / 15 TiC) x 100=6% C = 94% Ti, Estimated formed phases = 50% TiC + 50% βTi solid solition.
S4= (0,9C / 20 TiC) x 100=4.5% C = 95,5% Ti, Estimated formed phases = 25% TiC + 75% βTi solid solition.

(1)

Conclusion

When investigated optical images, rate of dendrite where in the coating layers increasing observed with increased Ti rate. The maximum rate of dendrites observed in 20%Ti alloying sample.

When investigated SEM images , Four different regions occurred during coating, namely: coating layer, interface region, heat affected zone (HAZ) and substrate. No cracks or pores were seen both in the coating layer and interface. Also showed the entirely dendritic solidification of coating microstructures for all coatings. Some grain boundary solid solutions such as βTi occurred due to diffusion from the coating layer to substrate material.

When investigated all coating layers, We are thinking that proportionally with the thinner grain hardness of the coating layers will increase. It was seen clearly diffusion of the coating atoms from interface zone to substrate. It was observed very fine binding because of the fine diffusion in the interface zone. Also it was observed existence of TiC compound and solid solutions as a result of the diffusion of the Ti in the heat effected zone (HAZ).

When investigated SEM-EDS ve XRD graphics analysis results, We can observe diffusion of Ti and C atoms from coating layers to interface zone. And best diffusion observed 20% Ti alloyed sample.

Also we were investigate micro hardness results, we could observe βTi solid solution ratio increased in the structure with increased titanium ratio. Therefore as parallel increasing of the βTi solid solution in the structure, we can observe linear increasing in micro hardness values.

When investigated Ti-C binary phase diagram, it was observed that βTi solid solution ratio increased with increasing the ratio Ti in estimated phase structure

According to estimated phase structure with micro hardness analysis, SEM images, EDX analysis the best micro hardness value and the best bonding of interface observed in the 20%Ti alloying coating plate.

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ÖZET

Türkiye'de iklim değişikliğinin gözlenen ve beklenen etkilerini açıklayan birçok bilimsel çalışma, Şanlıurfa çevresi ve Harran Ovası'nın, iklim değişikliğinden olumsuz etkilenen/etkilenebilecek alanlar içinde kaldığını göstermektedir. Türkiye'deki önemli tarımsal üretim bölgelerinden olan Harran Ovası, kuraklık ve çölleşme ilişkileri açısından oldukça kırılgan bir bölgede yer almaktadır. Atatürk Baraj Gölü'nden sulama kanallarıyla taşınan su, kurak ve çok sıcak olan yaz aylarında bu ovada gerçekleşen olumsuz etkileri bertaraf etmeye yardımcı olmaktadır. Fakat, bu iklim koşullarında açık sulama kanallarının yüzeyinde gerçekleşen şiddetli buharlaşma önemli su kaybına neden olmaktadır. Buharlaşmanın fazla olmasıyla birlikte yanlış sulama teknikleri de toprak sorunlarını ortaya çıkarmaktadır. Ova çevresinde yer alan, doğal süreçlerin kontrolündeki ekosistemler ise çölleşmeye karşı daha savunmasızdır. Bu nedenle, iklim değişikliğinin neden olacağı olumsuz etkileri azaltmak ve yeni koşullara uyum yöntemlerinin geliştirilmesi çok önemlidir.

Bu çalışmada, Akçakale ile Şanlıurfa meteoroloji istasyonlarının 1975-2012 yılları arasındaki verileri kullanılarak Harran Ovası'ndaki kuraklık özellikleri Standart Yağış İndeksi (SPI) ve Thornthwaite yöntemi ile incelenmiştir. Yağışlı geçmesi beklenen mevsimlerde gerçekleşen kuraklık, zaten kurak bir mevsim olan yaz mevsiminde gerçekleşen kuraklıktan daha tehlikelidir ve bunun belirlenmesi oldukça önemlidir. Kuraklık olayını başlatan meteorolojik kuraklığın yağışla ilgisinden dolayı, ovadaki meteorolojik kuraklığın uzakbağlantı (teleconnection) ilişkileri de incelenmiştir. Bu amaçla Türkiye'nin önemli bir bölümünde özellikle kış yağışlarını etkileyen Kuzey Atlantik Salınımı'nın (NAO), Harran Ovası ve çevresindeki yağış ve kuraklık olaylarıyla ilişkisinin doğası tanımlanmıştır. Yıl içinde tarımsal sulama döneminin ve sulama miktarının belirlenmesi için yararlı olacağı düşüncesiyle kurak dönemin başlangıcı, bitişi ve süresi belirlenmiştir. Ayrıca kuraklık olasılığı, kuraklık şiddeti, kuraklık genliği ve kurak dönemlerin sayısı da belirlenmiştir.

Anahtar Kelimeler: Harran Ovası, Kuraklık, Standart Yağış İndeksi (SPI), Thornthwaite metodu, Kuzey Atlantik Salınımı (NAO).

CHARACTERISTICS OF DROUGHT EVENTS IN THE HARRAN PLAIN

ABSTRACT

Many scientific studies describing the observed and expected effects of climate change in Turkey, indicate that Şanlıurfa and Harran Plain are in the area which affected/could be affected negatively by climate change. The Harran Plain which an important agricultural production region in Turkey, is located in a highly vulnerable region in terms of drought and desertification relationships. The water carried by irrigation canals from Atatürk Dam helps to avoid negative impacts on a very hot and dry summer in the plain. However, high rate of evaporation in this conditions cause a significant amount of water loss by evaporation from the surface of open irrigation channels. Also improper irrigation techniques with high rate of evaporation emergences the land use problem. The ecosystems which under the control of natural processes at around the plain are more vulnerable to desertification. Therefore, to reduce the negative effects of climate change and the development of methods of compliance with the new conditions is very important.

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In this study, we investigated the drought properties in Harran Plain by the Standardized Precipitation Index (SPI) and Thornthwaite method using Akçakale and Şanlıurfa meteorological stations data within the period of 1975 to 2012. The drought that occurred in the season expected rainy is more dangerous than the drought occurred in dry summer season and so to determine this is very important. Due to rainfall events related to meteorological drought that starts drought, the meteorological drought in the plains was investigated by teleconnection relations. For this purpose, the nature of the relationship with North Atlantic Oscillation (NAO), which affects especially winter rainfall in the important part of Turkey, and Harran Plain and its surrounding rainfall and droughts was identified. At the thought would be useful for the determination of the irrigation period of the year and amount of irrigation, the beginning, ending and duration of the dry season were determined. In addition, the possibility of drought, drought intensity, the number of dry periods and drought magnitude was determined.

Key Words: Harran Plain, Drought, Standardized Precipitation Index (SPI), Thornthwaite method, North Atlantic Oscillation (NAO).

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HASTA ODALARININ MİMARİ MEKÂN VE YAPI ELEMANLARININ İŞLEVSEL PERFORMANSLARINDAN KULLANICI MEMNUNİYET DURUMUNUN İNCELENMESİNE YÖNELİK ÖRNEK ÇALIŞMA: ERÜ GEVHER NESİBE HASTANESİ

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ÖZET: Sürekli kullanımı olan ve sağlık hizmeti veren mekânların, kullanıcıları tarafından nasıl algılandığının ve ne derece memnun kalındığının araştırılması ve değerlendirmesi önemlidir. Toplam kalite yönetimine de geçen hastanelerde, hasta ve çalışan memnuniyetinin sağlanması için hastaların ve çalışanların mekândan beklentilerinin ölçülmesi önemli görülmektedir.

Bu çalışmada Erciyes Üniversitesi Tıp Fakültesi Gevher Nesibe Hastanesi hasta odaları, mimari mekân tasarımı ve yapı elemanları, işlevsel performans açısından incelenmiştir. Bu amaçla; çalışma yapılırken kullanıcıların memnuniyet durumlarını belirlemek önemli görülmüştür. Belirlenen kullanıcılara, bölüm klinikleri personeline (doktor, hemşire, teknisyen vb.) ve hasta odalarında kullanıcı olarak yatan hastalara veya çocuk hastaların yakınlarına, anket uygulanmıştır. Mekânların planlamasıyla ve yapı elemanları ile ilgili memnuniyet ve istek durumları ile ilgili anket uygulanmıştır. Bu, mekânların algısal kalitesini belirlemek için de önemli olmuştur. Hastanelere yönelik yapılan çalışmanın sonucunda, mimari mekânın işlev yönü ile kalitesi ve yapı elemanlarının performansı belirlenmiştir. Çalışmanın hastanelerin mekânsal ve yapı elemanlarına yönelik kullanıcı memnuniyeti ve toplam kalite yönetimi alanlarında yapılacak çalışmalara katkı sağlaması umulmaktadır.

Anahtar Kelimeler: hastane, yapı elemanları, performans ölçümü, kullanıcı memnuniyeti

1. GİRİŞ

Sağlık ve sağlıklı olma insanoğlunun varoluşundan itibaren vazgeçilmez olmuştur. Teknolojinin ve bilimin gelişmesiyle beraber sağlık anlayışında da farklılıklar olmuştur. Günümüzde halk sağlığında, hastalık olgusu oluşmadan sağlığın korunması veya iyileştirilmesi ön plana çıkmaya başlamıştır (Biçer T., vd. 2001; Tezcan S., vd., 2000). İnsanoğlu, hastalıklarını iyileştirebilmek için tedavi olabilecekleri mekâna ihtiyaç duymaktadır. Hastaneler, bu ihtiyacı karşılayan günümüzdeki sağlık koşullarını sunan mekânları oluşturmaktadır. Geçmişten beri mekânsal, teknolojik, kurumsal vb. konularda çok hızlı bir şekilde gelişen sağlık kurumları, insanların sağlık yönünden ihtiyaçlarını karşılamaktadır (Yıldırım K., Muslu M. S., 2006).Hastaneler insanların günlük yaşam alanlarından ve yaşam biçimlerinden farklı ortam ve mekânları içermektedir. Hastanelerde tedavi için konaklama tedavi süreci, tanı, teşhis gibi kavramlar, insanlar üzerinde biyolojik, fizyolojik ve ruhsal yönden negatif bir izlenim ve etki oluşturmaktadır. Hastane kurumlarındaki olumlu fiziksel çevre, insanları fiziksel, ruhsal ve sosyal yönden pozitif etkilendiğinden dolayı diğer kurumlara kıyasla çok daha önemlidir. Hastanelerdeki çevrenin olumlu etkisinin hastaların iyileşme sürecini olumlu yönde etkilediği düşünülmektedir (Yıldırım K., Muslu M. S., 2006).

Sağlık hizmeti ise, birçok faktörü içinde barındıran organizasyonların bileşiminden oluşmaktadır (Çıraklı Z. L., Sayım, F., 2009 ve Aslan Ş.,Özata M., 2005). Kalite hasta memnuniyetini anlama ve karşılama konusunda önemli bir etmendir. Hasta memnuniyetini ölçmede verilen hizmetin kalitesi ve süresi, teşhis, tedavi, bakım gibi çeşitli unsurlar etkin rol oynamaktadır. Verilen hizmet ile beklentilerin arasındaki farktan oluşan hasta memnuniyetinin derecesini; verilen hizmetin algılanması, hizmet süresi ve sürekliliği, çalışanların nezaketi, hizmet sunan kişilerin uzman olması, gibi olgular değişmektedir (Tarım, M., 2000).

Bireylerin, sağlık hizmetine ihtiyaç duymaları ve gelişen teknoloji sonucunda, sağlık hizmetinden beklentileri değişmiştir. Kaliteli hizmet uygulaması ile bireyler daha seçici davranmış ve kaliteli hizmet sunulması gündeme

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gelmiştir. Sağlık hizmetlerindeki kalitenin belirlenmesinde hasta memnuniyeti önemli bir yere sahiptir. Memnuniyet kavramı kişiye göre değişmekte ve ortak bir karara varılması zor olmaktadır. Hasta memnuniyetini sağlamak, bir sağlık kurumunda kolay bir durum değildir. Sürekli hizmet veren bir sağlık kurumu kullanıcılarının kurum hakkındaki isteklerini, beklentilerini ve sağlık kurumundan memnunluk derecelerini araştırmak, değerlendirmek ve sonuçlara göre nasıl bir hizmet sunulması gerektiğini tasarlamak önemlidir. Strasen (1988) '*hasta memnuniyeti, klinik sonuçlar kadar önemlidir ve bunu ölçmek her sağlık kuruluşunun hedeflerinden biri olmalıdır.'* görüşündedir (Strasen L., 1988). Bu bakımdan kalite ve memnuniyet kavramı insanlar bilinçleştikçe hayatımızda daha önemli bir konuma sahip olmaya başlamıştır.

Sağlık sektöründen yararlananlar, kısa sürede tedavi olmayı, tedavi ve tanı gibi olayların doğru ve başarılı bir şekilde gerçekleşmesini arzulamaktadır. Teknolojinin ve bilimin gelişmesi, kalite beklentisini de arttırmıştır. Sağlık alanında hizmet sunumunda doğabilecek hatalar veya yetersizliklerden dolayı kalite kavramı çok önemli bir konuma gelmektedir (Aydın, B., 2008). Sağlık sektöründeki kullanıcılar, hastane mekânlarını kullanan hizmet alan veya veren tüm kişilerdir. Hastanelerde kullanıcı profili, iki grupta incelenmektedir. Bunlardan ilki iç müşteri olarak tanımlanan sağlık kurumunda çalışan veya sağlık kurumuyla iletişim halinde bulunan, sağlık çalışanları olarak bilinen doktor, hemşire, farklı konularda hizmet veren sağlık teknisyeni, sağlık hizmetlileri vb. kişi ya da gruplardır. İkinci kullanıcılar ise dış müşteri olarak tanımlanabilecek bir sağlık kurumunun sunduğu hizmetlerden doğrudan ya da dolaylı olarak yararlanan kurumları, hastalar, hasta yakınları ve ziyaretçileri oluşmaktadır.(Kavuncubaşı S., 2000).

Sağlık yapılarını sadece hastalar ve hasta yakınları kullanmamaktadır. Memnuniyet kapsamına hastane çalışanları da girmektedir. Bu doğrultuda hastane çalışanlarının da sağlık kurumundan beklentileri önemlidir. Özellikle yeni uygulamaya geçirilmeye çalışılan iş sağlığı ve güvenliği konusuna yönelik yasal mevzuatlarda da yer alan çalışma ortamının durumuna yönelik uygulamalar, konunun önemini vurgulamaktadır. Hastalar, hasta yakınları ve hastane çalışanları için mekânsal memnuniyet ve kalite önemli bir konudur. Fakat ülkede sağlık yapılarına yönelik, kullanıcı memnuniyeti odaklı çalışmalar sınırlı kalmıştır. Her iki kullanıcı grubu için de mekansal memnuniyet önemli olmaktadır. Bu durum toplam kaliteyi de beraberinde getirmektedir. Ancak ülkede hastane yapılarına yönelik olarak son 25 yılda fazla çalışma yapılmadığı bilinmektedir (Ergenoğlu S. A.,Tanrıtanır A, 2013). Hastanelerde mekânsal olarak yapılacak ve kullanıcı memnuniyetinin içeren alan çalışmaları önemli görülmektedir. Hastane yapıları birbirinden farklı kullanıcıların ihtiyaçlarını ve isteklerini karşılayacak nitelikte olmalıdır. Kullanıcı memnuniyeti arttıracak mekânsal düzenlemelerin tasarım ve yapımında alan çalışmalarını içeren geri besleme sayesinde, hastaneler artık sadece klinik hizmet veren mekânların dışında fiziksel ve ruhsal iyilik halinin yükseltilmeye çalışıldığı alanlar olabilecektir. Böylece iki kullanıcı gurubunun mekânsal memnuniyetleri artırılacaktır.

Hastane yapıları tasarlanırken hastaların ve kullanıcıların kolay erişebilir, güvenilir, nitelikli ve keyifli, stresi azaltan, ruhen ve fiziksel olarak iyileşmeye pozitif etkisi olabilecek mekânların olması önemlidir. Hastane yapılarının plan ve mekân kurgusunun hastalara, engelli insanlara, çocuklara yani her gruptaki insana hitap etmesi önemlidir. Dolayısı ile hastane yapıları, diğer kamu yapılarına göre daha kompleks ve yoğunluklu bir planlama ve kurgu gerektirmektedir (Gezer H., 2014).

Önal ve Önal'a (2000) göre hastane yapıları yatan hasta, ayakta tedavi gören hasta, tanı ve tedavi, idari ve fiziki hizmet, eğitim ve araştırma fonksiyonlarını kapsamaktadır. Bu fonksiyonların ihtiyaçlarını karşılamak için bir hastanede; hasta bakım alanı, klinik alan ve hastanenin işlevini sürdürmesini sağlayan servis birimleri olmak üzere üç ana kullanım gerektiğini vurgulanmıştır (Önal F.,Önal B., 2000). Değişim ve dönüşüm olgusu mimarlıkta ve mimari ürünlerde sıklıkla görülmektedir. Mimarideki bu değişimin hastane yapılarında ve mekanlarında daha fazla olduğu düşünülmektedir (Ergenoğlu S., Aytuğ A., 2007).

Yapılan hastane tasarımlarında; kaliteyi arttırarak kullanıcıların psikolojik, ergonomik, fizyolojik olarak mutlu ve rahat bir ortam tasarlamak, önemli bir amaç haline gelmektedir. Bu bağlamda; 'iyileştiren hastane' ve 'hastanelerde kalite' ön plana çıkmaktadır. İyileştiren hastane; Hastane ortamının; sosyal, manevi, psikolojik, estetik, hayat standartlarını konforunu artıran, iyileştirici, rahatlatıcı, güven verici, ergonomik, ışık, ses, renk ve malzemeye yönelik istekleri karşılayan alanlardan oluşması gerekmektedir. Hastanelerde tasarım kalitesi konusu mekan standartları ve maliyet ile birlikte kullanıcının ergonomik, psiko-sosyal kalitesini de düşünmeyi gerektirmektedir (Ergenoğlu S., Aytuğ A., 2007).

Çoruh'a (1998) göre *"Kalite Kavramının sürekli kendini yenilemesi ve toplumun gereksinimlerine yanıt vererek gelişmesinin yolu, bu kavram aracılığıyla ortaya çıkacak zorunlulukların ve bunların ne derece uygulanabildiğinin sıkı şekilde takip edilebilmesinden yani ölçülebilmesinden geçer"* (Çoruh, M., 1998). Bu

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ifadeden anlaşıldığı gibi kalite ve memnuniyetin sürekliliği ve verimi için rutin olarak kaliteyi ve memnuniyeti artıracak etmenleri denetlemek ve güncellemek gerekmektedir.

Hastane yapılarında aydınlatma, ses-gürültü, hastane planlaması, erişilebilirlik gibi konular, kullanıcı memnuniyetini önemli derece etkilemektedir. Bu açıdan, tasarımcılara bu konuda büyük bir yük düşmektedir. Aydınlatma için Bayar (1994), uygun ve gerekli aydınlatmayla görsel konforun sağlanması gerektiğini yoksa yanlış teşhis -tanı, çabuk yorulma, göz hastalıkları gibi belirtilerin ortaya çıkacağı, bundan dolayı aydınlatma şeklinin ve konforunun iyi bir şekilde oluşturulması gerektiğini vurgulamıştır (Bayar M., 1994). Ses ve gürültü için Şentürk (1994), bu kavramların sağlık alanında ne kadar önemli olduğunu ve çalışan personellerin bu konuda eğitim almaları gerektiği, kullanılan araç, gereç ve malzemelerin sürekli kontrol edilip, bakımının yapılması ve ses ve gürültü oluşturmayacak kalitede olması, hasta odalarının kapılarının kapalı tutulması çalışanların kullandığı ayakkabıların ses çıkartmayan türde olması gerektiğini belirtmiştir (Şentürk F., 1994). Hastane planlamasında, sağlık yapıları kullanıcıları için kaliteli tasarım ölçütleri, net bir planlama, denetim altına alınmış fiziksel değişkenler, hasta ve ziyaretçilerin ilişkilerinde denetim ve iç mekân tasarımının kullanıcıları moral ve sosyal düzeylerini iyileştiren ve geliştiren bir planda olması gerektiğini ifade etmiştir (Tüker Ç., 1996). Sağlık yapılarında erişilebilirlik kapsamında, yapıların planlamasında oda, koridor boyutların genişliklerini, yüksekliklerini, yüzeylerin, bildirişim elemanlarının gerekli yönlendirme ve uyarı işaretlerinin standartlar doğrultusunda erişilebilir olması gerekmektedir (Gezer H., 2014). Bu başlıklar kullanım alanları olarak; otopark, bina girişi, asansör, rampa, merdiven, kapı ve pencereler, tuvaletler, manevra alanları, yönlendirme ve iletişim uygulamalarının, döşeme ve duvar yüzeyleri tasarımlarının erişilebilir olması önem kazanmaktadır. Kısacası sağlık yapılarında tasarımcının yaptıkları kullanıcının memnuniyetini ve sağlığını önemli derecede etkilemekte olduğu için tasarımcılara büyük bir sorumluluk düşmektedir.

Bu çalışma Kayseri Erciyes Üniversitesi Gevher Nesibe Hastanesi'nin incelenmesi ile hastanede kullanıcılarının memnuniyeti ve kalite ölçümü yaparak mimari tasarımların kullanıcılar üzerindeki etkisini somut bir şekilde ortaya koymak amaçlanmıştır. Kayseri Erciyes Üniversitesi Gevher Nesibe Hastanesi'nin seçilme sebebi ise Kayseri'deki son derece yoğun, çok çeşitli kompleks ve heterojen hastaların bulunmasıdır. Hastanede birçok farklı hizmet alan ve veren hasta odaları, bekleme salonları, ameliyathane, tedavi, teşhis odaları, vb. gibi farklı kullanıcı profiline sahip odalar bulunmaktadır. Hastanede mekânların ve kullanıcıların çeşitliliği sayesinde yapılan çalışma, sağlık alanında her kesime hitap edebilecektir. Bu nedenle hastanede doğrudan veya dolaylı olarak hizmet veren ve alan kişilere bir anket çalışması düzenlenmiştir. Bu anket çalışması ortamın mimari, estetik, ergonomik, açıdan kalitesini ve memnuniyet oranını ölçmesinde yardımcı olmuştur. Anketteki sorular bu amaca özel olarak hazırlanmış ve elde edilen bulgular çerçevesinde yapının kullanıcılar açısından ne tür bir sıkıntı yaşadıkları, nerelerden, nasıl, memnun olup olmadıkları yapılan anket sonucunda ortaya çıkması amaçlanmıştır. Çıkan sonuç çerçevesinde hastane bina yönetiminin ve/veya Sağlık Bakanlığı'nın alması gereken önlemleri ve geliştirmesi gereken konular, hangi malzemelerin nerede, nasıl, ne çeşit olması gerektiği gibi konular irdelenerek öneri haline getirilmiştir. Bu çalışmada sadece hasta odalarına yer verilmiştir. Hastanedeki poliklinik ve ameliyathane gibi diğer bölümlerin ise başka çalışmalara temel olması düşünülmektedir.

2. YÖNTEM

Hasta sayısı hastalık türü ve tipindeki değişimler doğrudan yapay çevreyi etkilemekte ve bu etkileşim mekan tasarımında önemli bir belirleyici olarak ortaya çıkmaktadır. Bu bağlamda, çalışmada; Erciyes Üniversitesi Tıp Fakültesi Gevher Nesibe Hastanesi örnek uygulama yapılacak hastane olarak belirlenmiştir. Bu belirlemede hastanenin, Kayseri'deki yoğun, çeşitli, kompleks ve heterojen hastaların tercih ettiği, her konuda tam teşekküllü hizmet sunmakta olan ve çevre illerden de hastaların hizmet aldığı en büyük kuruluş olma özelliği göstermesi etkili olmuştur. İç Anadolu Bölgesi içerisinde farklı yerleşimlerden gelen kullanıcılara, hastanede dâhili ve cerrahi her alanda hizmet sunulmaktadır. Hastanede farklı hizmet alan ve hizmet veren, hasta odaları, bekleme salonları, ameliyathane, tedavi, teşhis odaları, vb. gibi farklı kullanımlara hizmet eden mekanlar bulunmaktadır. Mekânların ve kullanıcıların çeşitliliği sayesinde yapılan çalışmanın, sağlık alanında katkı sağlayacağı açıktır.

Çevre illerden hasta alımı ile hastaneden hizmet alan farklı kültürlerden ve yaşam ortamlarından geldiği görülen kullanıcının bulunması, çalışmanın güvenilirliğinin artmasına katkıda bulunmuştur. Ayrıca, bu durum, kullanıcının mekan üzerindeki beklentilerini ve algılamalarındaki farklılıkları da getirmiştir.

Araştırma için çalışmanın yapılacağı sağlık kurumunun başhekimliği ile görüşülerek resmi izin alınmıştır. Bu çalışma, Erciyes Üniversitesi Rektörlüğü Sağlık Uygulama Ve Araştırma Merkezi Müdürlüğü'nün 44008645-010.99/65318 sayı ve 28.08.2015 tarihli izni alınarak yasal uygulamalar çerçevesinde gerçekleştirilmiştir. Anketler; hasta ve/veya hasta yakınları ve sağlık personelinin araştırmaya katılmalarında isteklilik/gönüllülük ilkesine özen gösterilerek gerçekleştirilmiştir.

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Araştırmada hastanenin fiziki koşullarını ölçmeye yönelik hastane kullanıcıları olarak hizmet alan ve çalışanlara mekânsal algı ve memnuniyeti içeren veri toplama gereci olarak anket yöntemi kullanılmıştır. Anket formu, 5'li Likert Ölçeği kullanılarak hazırlanmış 31 adet sorudan oluşmaktadır. Anketteki meslek, cinsiyet, yaş soruları ile hastaların sosyo-demografik özellikleri; kalış süresi ile mekanı deneyimleme süreleri; hasta odasına yönelik, odanın bulunduğu kat ,bölüm, cephesi sorularıyla da hastanın anketini cevapladığı oda tanımlanmıştır. Ankette hastaların cevaplarını 'çok kötü-kötü-kararsız-iyi-çok iyi' şeklinde 5 farklı derecelendirme ile cevaplaması istenmiştir.

Çalışma; amacı kişilere yüz yüze anlatıldıktan sonra, hastanede yataklı tedavi hizmeti alan hasta ve hasta yakınından ve sağlık personelinden, çalışmaya katılmayı kabul eden 127 hasta, hasta yakını ve 10 hastane çalışanı toplamda 137 kişi ile gerçekleştirilmiştir. Hizmet alanlar sadece hastalar olarak görülmemiş bunun yanında özellikle çocuk ve bakım hastalarının refakatçileri de anketi cevaplamışlardır. Çalışanlar ise sadece doktor ve hemşireler değil aynı zamanda teknik ve diğer hizmetleri gerçekleştirenler de olmuştur. Çalışmaya gebeler, doğum servisi hastaları, psikoloji servisi hastaları, 18 yaşından küçükler ve cerrahi operasyon geçirmiş hastalar da dahil edilmiştir.

Hastane ana işlev olan hastane odaları üzerinde durularak incelenmiştir. İlki farklı branşlardaki servis katları olarak değerlendirilmiştir. Çalışma, hastane servis katları; gastroloji, ortopedi, jinekoloji, genel cerrahi, beyin cerrahi, çocuk cerrahi, endokrin, psikoloji, kulak-burun-boğaz, göz, göğüs hastalıkları, fizik tedavi bölümü ve üroloji olmak üzere, toplamda 13 farklı branş ve bu branşların kendi içlerinde ayrıldıkları farklı uzmanlık alanlarına göre değerlendirilerek yürütülmüştür.

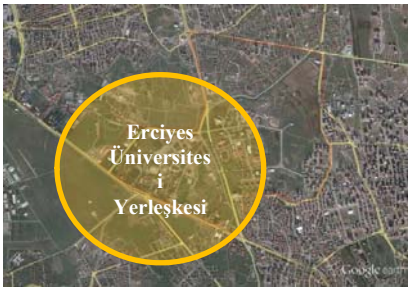
Çalışmada, hastane binasının ve mikro ölçekte hasta odalarının hasta bakım kalitesini etkileyişi üzerinde durulmuş ve bu etkiler; işlev, psiko-sosyal ve teknik konular üzerinden irdelenmiştir. Anket çalışmasında hasta odaları mekan kalitesini ölçmeye yönelik; işlev, estetik-konfor ve güvenlik ana başlığı altında hazırlanmış ve tek kişilik banyolu, 2-3 kişilik banyosuz, 4 ve üstü sayıda kişinin kaldığı banyosuz olmak üzere farklı oda tipolojilerinde yatarak hizmet alan hasta ve hasta yakınlarına uygulanmıştır. Bu çalışmada hastanenin psikiyatri servisi de dâhil olmak üzere özel izin ile her katındaki ve her tip odasında kalan hasta veya hasta yakınlarına anket yapılmıştır. Bu durum çalışmanın önemini artırmaktadır.

Bu çalışma 3 aşamalı oarak gerçekleştirilen bir üst çalışmanın işlev kısmının ele alındığı bölümünden oluşturulmuştur. Ana çalışmada mekanlar işlev, estetik ve konfor ve güvenlik başlıkları altında incelenmiştir. bu çalışmada yer alan işlev kavramı mimarinin ilk basamağını oluşturduğu için önemli görülmüştür. İşlevsel olarak, oda dolaşımı, boyutu, malzeme seçimi, malzeme kullanımı, banyolu odalarda ise; banyo tasarımı ve hasta odasının engelliler tarafından kullanımı gibi sorular ile mekansal organizasyon, kullanım ve ulaşılabilirlik analiz edilmiştir.

3. BULGULAR

3.1. Erciyes Üniversitesi Gevher Nesibe Hastanesi Konumu ve Fiziksel Durumu

Kayseri coğrafi konum itibari ile İç Anadolu ve diğer çevre illerden kolay ulaşılabilir durumdadır. Kayseri'de yer alan sağlık kurumları da bu coğrafi durum sebebi ile ulaşımı kolay olan bir yere sahiptir. Erciyes Üniversitesi ise Kayseri kent merkezine, havaalanına, çevre yoluna ve raylı sisteme mesafe olarak kısa ve kolay ulaşılabilir bir mevkie sahiptir (Harita 1-2). Erciyes Üniversitesi'nin pek çok alanda eğitim-öğretim vermesi ile birlikte kuruluşundan itibaren bulunan Tıp Fakültesi'nin bulunması üniversitenin önem algısını artırmaktadır. Bunun yanı sıra Erciyes Üniversitesi Tıp Fakültesi'nin vermiş olduğu eğitim ve hasta tedavi hizmetleri de ülkede ve dünyada iyi bilinen bir seviyede bulunmaktadır. Ayrıca Tıp Fakültesi hastanesinin her alanda tam donanıma sahip olması, hastaların burayı tedavi için seçme tercihlerini artırmaktadır.



Harita 1: Erciyes Üniversitesi Yerleşkesi, www.google earth, 2016)



Harita 2: E.Ü. Gevher Nesibe Hastanesi Çevre Yerleşkesi, (www.google earth, 2016)

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Tıp Fakültesi bünyesinde 6 hastane bulunmaktadır. Bu hastaneler kendi alanlarında, uzmanlaşılan hizmetleri sunmaktadır. Hastane yapıları içerisinde ilk ve en büyük kullanıma sahip olan Gevher Nesibe Hastanesi, iki kat poliklinik, ameliyathane ve yönetim kısmı ile 12 kattan oluşan servislerin bulunduğu ana bloğa sahiptir (Fotoğraf 1). Bu çalışmada Servislerin bulunduğu 10 kat ele alınarak inceleme yapılmıştır.

Hastane zemin ve ikinci katı ana polikilinikler, acil servis, ameliyathaneler ve öğretim elemanlarının yer aldığı birimlerden oluşmaktadır. Bu kısımlar kampus içerisinde geniş bir yer tutmaktadır. Servislerin bulunduğu blok ise 12 katlı olup her katta ayrı bir branşın servisi olduğu gibi bazı katlarda iki yada üç branş bir katı kullandığı duruma sahiptir. Hastanenin hizmet ettiği hasta sayısı arttıkça ve hastane içerisinde hizmet veren branşlarda uzmanlaşma arttıkça bu durumla daha çok karşılaşılmıştır.

Hastane planında iki hasta asansörü, bir öğretim elemanı asansörü bir servis asansörü ve üç genel kullanıma yönelik asansör ile merdivenin bulunduğu bir çekirdek bulunmaktadır. Çekirdeğin doğu batı yönüne doğru yer alan iki yanında ise hasta odaları bulunmaktadır. Bu hasta odalarının arasında koridorlar, toplu duşlar, wc, depolar ve genel sekretarya hizmetlerinin bulunduğu servis alanları mevcuttur(Şekil 1).

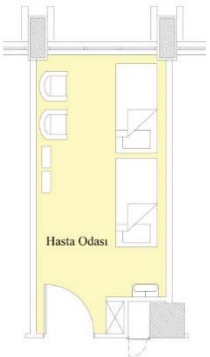


Şekil 1: Gevher Nesibe Hastanesi Kat Planı, Argeus Mimarlık (Argeus Mimarlık Ltd. Şti., 2016)

Hasta odaları, tek, iki, üç ve dört kişilik olarak düzenlenmiştir (Şekil 2-3). Tek kişilik odalarda hasta yatağının yanı sıra refakatçinin kullanabileceği katlanır yatak (Fotoğraf 2), soğutucu, tv bulunan bir yatma birimi ve içerisinde duş-klozetin bulunduğu bir banyo da (Fotoğraf 3-4) yer almaktadır. İki ve üstü kişi içini düzenlenen odalarda ise sadece hastaların kalabileceği şekilde düzenlenmiş, birkaç adet de refakatçi için koltuk tefrişte yer almaktadır (Fotoğraf 5-6-7).



Fotoğraf 1: E.Ü. Gevher Nesibe Hastanesi Genel Görünüşü, (http://hastaneler.erciyes.edu.tr/Gevhernesibehast, 2016)



Şekil 2: E.Ü. Gevher Nesibe Hastanesi Hasta Odası, (Argeus Mimarlık Ltd. Şti., 2016)



Şekil 3: E.Ü. Gevher Nesibe Hastanesi Özel Oda, (Argeus Mimarlık Ltd. Şti., 2016)

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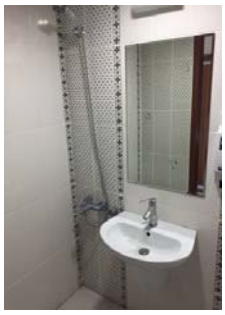
Fotoğraf 2: E.Ü. Gevher Nesibe Hastanesi Tek Kişilik Hasta Odası, (Parlak Biçer, Z.Ö., 2016)



Fotoğraf 3: E.Ü. Gevher Nesibe Hastanesi Tek Kişilik Hasta Odası Banyo/Wc, (Parlak Biçer, Z.Ö., 2016)



Fotoğraf 4: E.Ü. Gevher Nesibe Hastanesi Tek Kişilik Hasta Odası Banyo/Wc, (Parlak Biçer, Z.Ö., 2016)



Fotoğraf 5: E.Ü. Gevher Nesibe Hastanesi Çift Kişilik Hasta Odası, (Parlak Biçer, Z.Ö., 2016)



Fotoğraf 6: E.Ü. Gevher Nesibe Hastanesi Dört Kişilik Hasta Odası, (Parlak Biçer, Z.Ö., 2016)



Fotoğraf 7: E.Ü. Gevher Nesibe Hastanesi Dört Kişilik Hasta Odası, (Parlak Biçer, Z.Ö., 2016)

3.2. Hastane Odalarının İşlevsel İnceleme Sonuçları

Çalışmada yer alan anketi cevaplayanların 88'i bayan (%64,7) 42'si bay (30,9) olmuştur. cinsiyeti girilmeyen anket katılımcıları da düşünüldüğünde anket katılımcılarının cinsiyet geçerlilik oranları %67,7 bayan ve %32,3 bay olarak alınmıştır (Tablo 1).

Tablo 1: Anketi Yanıtlayanların Cinsiyet Oranları

	Frekans	Yüzde %	Geçerli Yüzde %
Bayan	88	64,7	**67,7**
Bay	42	30,9	**32,3**
Toplam	130	95,6	100,0
Girilmeyen	6	4,4	
Toplam	**136**	100,0	

Anketi cevaplayanların yaşları değişkenlik göstermektedir. Anketi cevaplayanlar yoğunluk olarak en çok 21, 60 yaşındaki hastalar birinci sırda, 40, 57 yaşındaki hastalar ikinci sırada yer almaktadır (Tablo 2). Dolayısı ile anketi cevaplayanların hastane konusunda sorulan anket sorularına verecekleri cevapların gerçeği yansıtacak yaş düzeyine sahip oldukları görülmektedir. Ayrıca hastane odaları ile ilgili algılarındaki farklılıklarında çok olmayacağı ve algılamada bir ortalama çıkarılabileceği düşünülmektedir.

Anket hastanede tüm servislere uygulanmıştır. Bu hastaların %7,5'i (7 kişi) gastroloji, %8,6'sı (8 kişi) göz, %11,8'i (11 kişi) göğüs hastalıkları, %7,5'i (7 kişi) fizik tedavi, % 5,4'ü (5 kişi) kbb, %4,3'ü (4 kişi) psikoloji, %7,5'i (7 kişi) endokrin, %16,2'si (16 kişi) genel cerrahi, %8,6'sı (8 kişi) beyin cerrahisi, %6,4'ü (6 kişi) çocuk cerrahisi, %4,3'ü (4 kişi) perinatoloji, %11,8'i (11 kişi) kadın hastalıkları, %20,15'i (20 kişi) ortopedi, %10,7'si (10 kişi) üroloji, %13,9'u (13 kişi) diğer servisinde kalmaktadır (Tablo 3.).

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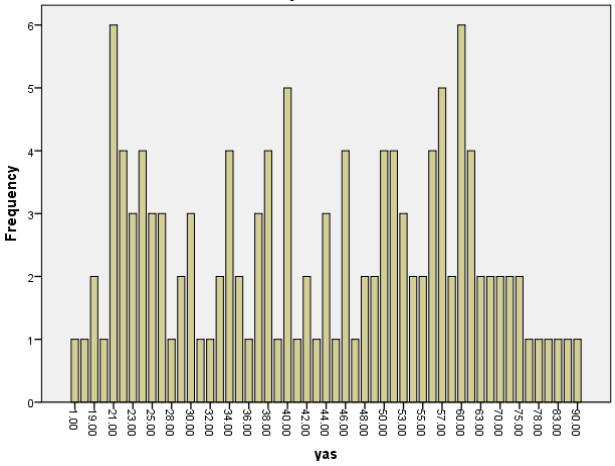
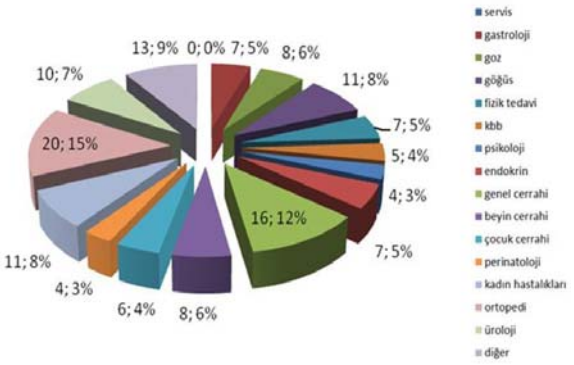
Tablo 2: Anketi Yanıtlayanların Yaşları



Tablo 3:Anketi cevaplayanların Kaldıkları Servisler



Hasta ve hasta yakınlarının hangi tip odalarda kaldıkları sorgulanmıştır. Anket yapılan kişiler, % 26,4'ü tek kişilik ve banyoulu (34 kişi), %42,6'sı (55 kişi) 2-3 kişilik banyosuz, %25,6'sı (33 kişi) 4 ve daha fazla kişilik odalarda kalmaktadırlar (Tablo 4). Bu durum hastaların oda ile ilgili görüşlerinde etkili olacak bir konu olduğu için sorgulanmıştır.

Tablo 4: Kalınan oda tipi

	Frekans	Yüzde %	Geçerli Yüzde %
Tek Kişilik Banyolu	34	25,0	**26,4**
2-3 Kişilik Banyosuz	55	40,4	**42,6**
4 Ve Üstü Banyosuz	33	24,3	**25,6**
Diğer	7	5,1	**5,4**
Toplam	129	94,9	100,0
Girilmeyen	7	5,1	
Toplam	**136**	100,0	

Anketi cevaplayanların hangi yöne bakan bir odada kaldıkları, oda ile ilgili görüşlerde etkili olacağı düşünüldüğü için ankette oda yönü ile ilgili soru yer almıştır. Anketi cevaplayanların %42,1'i (48 kişi) kuzey, %46,5'i (53 kişi) güney (53kişi), %3,5'i (4 kişi) doğu, %7,9'u (9 kişi) batı cephesinde yer alan odalarda kaldıklarını belirtmişlerdir (Tablo 5). Güney ve kuzey yönlerine bakan odalarda kalan sayısının çok görünme sebebi ise Şekil 1.'de görüldüğü üzere hastane planının dikdörtgen bir şemaya sahip olması ve uzun cephelerinin bu yönlere gelecek şekilde vaziyet uygulamasının yapılmış olmasından kaynaklanmaktadır.

Tablo 5:Kalınan Odanın Yönü

	Frekans	Yüzde %	Geçerli Yüzde %
Kuzey	48	35,3	**42,1**
Güney	53	39,0	**46,5**
Doğu	4	2,9	**3,5**
Batı	9	6,6	**7,9**
Toplam	114	83,8	100,0
Girilmeyen	22	16,2	
Toplam	**136**	100,0	

Hasta ve hasta yakınlarına kullandıkları odanın boyutunun kullanıma uygunluğu ile ilgili soru sorulmuştur. Anketi cevaplayanlar %3,0'ı (4 kişi) çok kötü, %20,3'ü (27 kişi) kötü, %6,0'ı (8 kişi) kararsız, %59,4'ü (79 kişi) iyi, %11,3'ü (15 kişi) çok iyi olduğunu belirtmişlerdir (Tablo 6). Bu konu, kullanıcıların oda içerisinde hareketlerindeki rahatlık durumu için sorgulanmıştır.

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Tablo 6: Kalınan Oda Boyutundan Memnuniyet Durumu

	Frekans	Yüzde %	Geçerli Yüzde %
Çok Kötü	4	2,9	**3,0**
Kötü	27	19,9	**20,3**
Kararsız	8	5,9	**6,0**
Iyi	79	58,1	**59,4**
Çok Iyi	15	11,0	**11,3**
Toplam	133	97,8	100,0
Girilmeyen	3	2,2	
Toplam	**136**	100,0	

Hasta odası kullanıcılarının tedavi, yatış ya da ameliyat sonrası fiziksel durumları düşünülerek kullanıcılara odanın mahremiyeti ile ilgili soru sorulmuştur. Anketi cevaplayanların %3,1'ı (4 kişi) çok kötü, %24,6'sı (32 kişi) kötü, %6,9'u (9 kişi) kararsız, %49,2'si (64 kişi) iyi, %16,2'si (21 kişi) çok iyi olduğunu belirtmişlerdir (Tablo 7). Hasta odalarında bölücü elemanların var oluşu ve personelin davranışı ile bu durum kullanıcılar bakımından iyi bulunmuştur.

Tablo 7: Kalınan Odanın Mahremiyetinden Memnuniyet Durumu

	Frekans	Yüzde %	Geçerli Yüzde %
Çok Kötü	4	2,9	**3,1**
Kötü	32	23,5	**24,6**
Kararsız	9	6,6	**6,9**
Iyi	64	47,1	**49,2**
Çok Iyi	21	15,4	**16,2**
Toplam	130	95,6	100,0
Girilmeyen	6	4,4	
Toplam	**136**	100,0	

Hasta odası kullanıcılarına hem yatma bölümünde hem de ıslak hacimlerde mahremiyetin görsel ve işitsel tasarımı hakkında soru sorulmuştur. Anketi cevaplayanların %6,3'ü (8 kişi) çok kötü, %22,7'si (29 kişi) kötü, %8,9'u (11 kişi) kararsız, %48,4'ü (62 kişi) iyi, %14,1'i (18 kişi) çok iyi olduğunu belirtmişlerdir (Tablo 8). Kullanıcıların çoğunun görsel ve işitsel mahremiyet tasarımını iyi bulduğu görülmektedir.

Tablo 8: Görsel Ve İşitsel Mahremiyetten Memnuniyet Durumu

	Frekans	Yüzde %	Geçerli Yüzde %
Çok Kötü	8	5,9	**6,3**
Kötü	29	21,3	**22,7**
Kararsız	11	8,1	**8,6**
Iyi	62	45,6	**48,4**
Çok Iyi	18	13,2	**14,1**
Toplam	128	94,1	100,0
Girilmeyen	8	5,9	
Toplam	136	100,0	

Hasta odalarında birçok mobilya bulunmaktadır ve oda boyutu da düşünülerek hasta ve hasta yakınlarına odadaki eşyalar için ayrılan boyut hakkında soru sorulmuştur. Anketi cevaplayanların %6,3'ü (8 kişi) çok kötü, %26,0'ı (33 kişi) kötü, %7,9'u (10 kişi) kararsız, %48,0'ı (61 kişi) iyi, %11,8'i (15 kişi) çok iyi olduğunu belirtmişlerdir (Tablo 9).

Tablo 9: Kalınan Odanın Hareketli ve Hareketsiz Tefrişlerden Memnuniyeti

	Frekans	Yüzde %	Geçerli Yüzde %
Çok Kötü	8	5,9	**6,3**
Kötü	33	24,3	**26,0**
Kararsız	10	7,4	**7,9**
Iyi	61	44,9	**48,0**
Çok Iyi	15	11,0	**11,8**
Toplam	127	93,4	100,0
Girilmeyen	9	6,6	
Toplam	**136**	100,0	

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Hastalar rahatsızlıları dolayısıyla tekerlekli sandalye ve serum askısıyla odada bulunabilirler. Bu gibi durumlarda odada dolaşım konusu sorugulanmıştır.Anketi cevaplayanların %5,3'ü (7 kişi) çok kötü), %27,8'i (37 kişi) kötü, %15,8'i (21 kişi) kararsız, %42,9'u (57 kişi) iyi, %8,3'ü (11 kişi) çok iyi olduğunu belirtmişlerdir (Tablo 10).

Tablo 10: Kalınan Odada Tekerlekli Sandalye ve Serum Askısı İle Dolaşım

	Frekans	Yüzde %	Geçerli Yüzde %
Çok Kötü	7	5,1	**5,3**
Kötü	37	27,2	**27,8**
Kararsız	21	15,4	**15,8**
Iyi	57	41,9	**42,9**
Çok Iyi	11	8,1	**8,3**
Toplam	133	97,8	100,0
Girilmeyen	3	2,2	
Toplam	**136**	100,0	

Hasta ve hasta yakınlarına odada kullanılan malzemelerin işlevine uygun olması konusunun anlaşılması için, malzemelerin kullanıma uygunluğu ile ilgili soru sorulmuştur. Anketi cevaplayanların %5,4'ü (7 kişi) çok kötü, %13,1'i (17 kişi) kötü, %10,8'i (14 kişi) kararsız, %60,0'ı (78 kişi) iyi, %10,8'i (14 kişi) çok iyi olduğunu belirtmişlerdir (Tablo 11). Verilen cevaplar doğrultusunda kullanıcıların genellikle sorun yaşamadıkları görülmektedir.

Tablo 11: Kalınan Odada Kullanılan Malzemenin İşleve Uygunluğu

	Frekans	Yüzde %	Geçerli Yüzde %
Çok Kötü	7	5,1	**5,4**
Kötü	17	12,5	**13,1**
Kararsız	14	10,3	**10,8**
Iyi	78	57,4	**60,0**
Çok Iyi	14	10,3	**10,8**
Toplam	130	95,6	100,0
Girilmeyen	6	4,4	
Toplam	**136**	100,0	

Hasta odası kullanıcılarına, odadaki banyo tasarımının kullanışlı olma durumunun anlaşılması için soru sorulmuştur. Anketi cevaplayanların %12,3'ü (14 kişi) çok kötü, %25,4'i (29 kişi) kötü, %27,2'si (31 kişi) karasız, %27,2'si (31 kişi) iyi, %7,9'u (9 kişi) çok iyi olduğunu belirtmişlerdir (Tablo 12). Kararsız yanıtının fazla çıkmasının nedeni birçok hastanın banyoyu, özellikle kişisel hijyen alışkanlıklarından dolayı, kullanmamış olmasından kaynaklanmaktadır.

Tablo 12: Kalınan Odanın Banyo Tasarımı

	Frekans	Yüzde %	Geçerli Yüzde %
Çok Kötü	14	10,3	**12,3**
Kötü	29	21,3	**25,4**
Kararsız	31	22,8	**27,2**
Iyi	31	22,8	**27,2**
Çok Iyi	9	6,6	**7,9**
Toplam	114	83,8	100,0
Girilmeyen	22	16,2	
Toplam	**136**	100,0	

Banyo kullanmış hasta ve hasta yakınlarına, banyo kullanan yaşlı, çocuk, engelli gibi birçok hasta türü açısından duş tasarımının uygunluğu konusunda soru sorulmuştur. Anketi cevaplayanların %11,8'i (14 kişi) çok kötü, %17,6'sı (21 kişi) kötü, %32,8'i (39 kişi) kararsız, %29,4'ü (35 kişi) iyi, %8,9'u (10 kişi) çok iyi olduğunu belirtmişlerdir (Tablo 13). Kararsız yanıtının fazla çıkmasının nedeni birçok hastanın banyoyu kullanmamış olmasından kaynaklanmaktadır ve kullanıcılar genellikle banyo tasarımını kullanım açısından iyi bulduğu görülmektedir.

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Tablo 13: Kalınan Odanın Duşlarının Kullanım Kolaylığına Yönelik Tasarımı

	Frekans	Yüzde %	Geçerli Yüzde %
Çok Kötü	14	10,3	**11,8**
Kötü	21	15,4	**17,6**
Kararsız	39	28,7	**32,8**
Iyi	35	25,7	**29,4**
Çok Iyi	10	7,4	**8,4**
Toplam	119	87,5	100,0
Girilmeyen	17	12,5	
Toplam	**136**	100,0	

Standart boyuttaki hasta odalarını engelliler de kullanmaktadır. Oda boyutlarının engelliler için uygun olamsı konusu sorgulanmıştır. Ankete katılanların %9,9'u (12 kişi) çok iyi, %26,4'ü (32 kişi) kötü, %29,8'i (36 kişi) kararsız, %27,3'ü (33 kişi) iyi, %6,6'sı (8 kişi) çok iyi olduğunu belirtmişlerdir (Tablo 14). Kararsız yanıtının fazla çıkmasının nedeni engelli hastanın az olması ve diğer hastaların bu konu hakkında yorum yapamamasından kaynaklanmaktadır.

Tablo 14: Kalınan Odanın Engelliler İçin Uygunluğu

	Frekans	Yüzde %	Geçerli Yüzde %
Çok Kötü	12	8,8	**9,9**
Kötü	32	23,5	**26,4**
Kararsız	36	26,5	**29,8**
Iyi	33	24,3	**27,3**
Çok Iyi	8	5,9	**6,6**
Toplam	121	89,0	100,0
Girilmeyen	15	11,0	
Toplam	**136**	100,0	

4. TARTIŞMA VE SONUÇ

İnsan yaşamının standart düzeylerin dışına çıktığı süreçlerde kullanılan sağlık kurumları, mekânsal, teknolojik, kurumsal gibi konularda sürekli bir devinim içerisinde olmuşlardır. Bu süreç kendi içerisinde gerekli teknik gelişmeleri getirmiş ve hastanelerde mekânsal farklılıklar olmuştur. Dolayısı ile sağlık hizmetlerinden ve buna bağlı olarak mekânlarından beklentiler artmıştır. Buna rağmen hastaneleri özellikle normal yaşam aktivitelerinin bozulduğu dönemlerde kullanan ve günlük yaşam alanlarından ve yaşam biçimlerinden farklı bir mekânda geçirmek zorunda kalan insanların hastane algılarının, olumsuz olduğu görülmüştür. Burada o mekâna girilme sebebi ve orada bulunulduğunda günlük yaşam standartlarının dışında bir ortamda olmalarının etkisi ve hasta olma psikolojisi etken olmaktadır. Bunun sonucu olarak memnuniyet durumu da düşme göstermektedir. Kalite ve memnuniyet kavramları da baskın olarak bu mekânlarda olrtaya çıkmakta ve algısı farklılaşmaktadır. Çünkü insanlar hizmeti mi yoksa mekânı mı değerlendireceklerini karıştırmakta ve hizmeti iyi değil ise mekân da iyi değil yaklaşımı içerisine girmektedirler. Ayrıca genel yanılgılardan bir diğeri ise kullanıcı olarak sadece hasta ve hasta yakınları ele alınarak çalışmaların yapılmasıdır. Mekân kullanıcıları arasında o mekânda çalışanların da mekân hakkındaki görüşleri önemlidir ve mekânı belirleyici olarak düşünlümelidir. Özellikle hastane çalışanlarının çeşitliliği mekân kalitesi üzerindeki görüşleri ve algıyı da etkilemektedir.

Bu çalışmada; hem hastlar ve haysa yakınları hem de hastane çalışanları yer almıştır. Çalışma psikiatri, çocuk dâhil tüm servislere, yapılmıştır. Bu açıdan çalışma; alanında tek olma özelliğine de sahiptir. İstatiksel verilerde çalışmanın eksikliği ise; SPSS programı ile analiiz yapılırken bir örneklem grubu oluşturulmamasıdır. Ancak tüm servislere yapılması ile bu eksikliği, farklı bir yönden giderilmiştir. Çalışmada, gerekli tüm etik ve yasal izinler, çalışmanın yapıldığı üniversite hastanesi yönetiminden alınmıştır. Çalışma 3 aşamalı bir üst çalışmanın ilk aşaması olan işlev bölümün ele alınarak yapılmıştır. Çalışmanın gerçekleştirildiği hastane tüm İç Anadolu Bölgesi'ne hitap eden bir bölge hastanesidir. Bu durum çalışmayı değerli kılmaktadır.

Yapılan çalışmaya katılanların anket cevaplamada başta teredütleri olmuştur. Hasta ve hasta yakınları, hatane ile ilglili her hangi bir konuyu eleştirdiklerinde, bunun kendilerine olumsuz yansıyacağını ve tedavilerine devam edilmeyeceği veya edilse de iyi olmayacağı düşüncesine olmuşlardır. Hastane kullanıcılarına yapılan bu uygulamanın aşılması gereken zorluğu olarak karşılaşılan bu durum, çalışmaya katılanlara tek tek durumun anlatılması ile mümkün olduğunca aşılmaya çalışılmıştır. Once hasta ve hasta yakınları ikna edilmiş ve daha sonar uygulama yapılmıştır. Ancak yine de bazı konularda bilgi eksikliği ve çekinceler olduğu gözlemlenmiştir.

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Anket bayan ve bay olmak üzere her iki gruba da yapımıştır. Cinsiyetin istatistiksel olarak mekânda memnuniyeti üzerinde etkisi olmamıştır. Aynı zamanda farklı yaş guruplarının da ankete katılımı sağlanmıştır. Yaşın algıda fark yaratmadığı düşünülmektedir. Anket tüm servislerden en fazla 20, en az 4 kişiye yapılmıştır. 4 kişi yapılan birim, hastaların özel durumundan dolayı, psikiatri olmuştur. Çalışmaya katılanların tek, iki, 4 ve üzeri ve banyolu-banyosuz gibi farklı odalardan olmalarına özen gösterilmiştir. Odaların her cepheye bakan odalar olması istenmiştir. Ancak diktörtgen plana sahip olan hastanede odaların büyük çoğunluğu kuzey ve güney yönünde yer almaktadır.

Çalışmaya katılanlar kullandıkları odaların boyutunu, oda içerisinde rahat hareket etme durumlarını göz önüne alarak, yeterli görümüşlerdir (% 70,7). Odalarının mahremiyet durumu da kullanıcılar tarafından olumlu algılanmaktadır (%65,4). Hasta odalarında bölücü elemanların var oluşu ve personelin davranışı ile bu durum kullanıcılar bakımından iyi bulunmuştur. Odalardaki görsel ve işitsel mahremiyet durumunda kullanıcıların fikirler farklılaşmıştır. Bu durumun tek, iki, üç ve daha fazla sayıda kişnin kaldığı odalarda farklılaştığı düşünülmektedir (% 29'u olumsuz, % 8,9'u kararsız, % 62,5 olumlu). Hasta odalarının boyutunun tefrişe uygunluğu konusunda kullanıcıların yine farklı görüşleri olmuştur (%32,3 olumsuz, %7,9'u kararsız, % 59,8'i olumlu). Çalışmaya katılanların farklı oda grubunda bulunmaları, hastanenin mobilyalarındaki kullanıma bağlı olarak oluşan yıpranma, kişisel ihtiyaçların farklılığı ve beklentiler sonucu bu konuda sonuç değişken olmuştur.

Hastane kullanıcılarının engelli olma olasılığı diğer bir kamu kurumuna göre daha fazladır. Ayrıca hasta odalarının rahatsız kişilerin tekerlekli sandalye kullanma durumunda uygun olması önemlidir. Tekerlekli sandalye ile odada dolaşım durumu incelendiğinde kullanıcıların %15,8 i kararsız kalmıştır. Bunun sebenin de tekerlekli sandalye kullanmalarına gerek kalmadığından fikir beyan etkmedikleri olduğu düşünülmektedir. Ancak hastaların çoğunluğunun odanın tekerlekli sandalye için yeterli boyutta olduğunu belirtmişleridir (%61,2). Engellilerin de kullandığı standart boyuttaki odaların engellilere uygunluğuna bakıldığında ise kullanıcıların karasızlığı söz konusu olmuştur (% 36,3 olumsuz, %29,8 kararsız, % 33,9'u olumlu). Çünkü kullanıcıların bu konuda bilinçsizliği söz konusudur. Hasta odalarındaki malzemelerin işlevine uygunluğuna yönelik kullanıcı algısı incelenmiştir. Buna gore; kullanıcıların % 70,8'i malzeme seçiminin işleve uygun olduğunu söylemiştir.

Banyo tasarımlarının kullanışlılığı sorgulanmıştır. Burada karasızlıkların fazlalığı dikkat çekici olmuştur. Çünkü çoğu hastanın banyoyu, özellikle kişisel hijyen alışkanlıklarından dolayı kullanmamış olması ve ev ortamındaki banyo beklentileri ile kıyaslamaları söz konusudur (% 37,7'si olumsuz, %27,2'si karasız, % 35,1'i olumlu). Banyoların engelli, yaşlı, çocuk vb hasta gruplarına uygunluğu da incelenmiştir. Yine karasız yaklaşımlar vardır (%29,4'ü olumsuz, %32,8'i kararsız, %38,3 olumlu). Çünkü engellilere, çocuk ve yaşlılara yönelik olan tasarımların neler olabileceği konusunda da bilgi eksikliği bulunmaktadır.

Çalışmada incelene Erciyes üniversitesi Tıp FAkültesi Gevher Nesibe Hastanesi, hasta odalarının bir üniversite hastenesi, bölge hastanesi ve bir kamu kurumu olarak, işlev bakımından genelde, olumlu özelliklere sahip olduğu belirlenmiştir. Buna rağmen; çalışmada yapılan gözlemlerde özellikle hasta refakatçilerinin kalmaları gerekli ise odalarda buna yönelik düzenlemelerin artırlıması ve tefrişin düzenlenmesi gereklidir. 2 ve daha fazla sayıda hastanın kaldığı odalarda bu durum daha önemli olmaktadır. Tek kişilik odalarda refakatçi daha uzun sure kalabilmektedir. Bu odaların da mümkün olduğunca tefrişlerinin yenilenmesi ve gerekli ise iki refakatçi için tasarlanması gereklidir. Tek kişilik odalarda sağlık personelinin çalışması zor olmaktadır. Seçilecek tefriş elemanlarının buna gore tasarlanması gereklidir. Personelin evrak işlerini yaptığı masa ve hastalarını yemek yediği masa aynı olmaktadır. Bunun hem çalışan hem hasta açısından hijyenik bir durum olmadığı açıktır. Everk işleri ve yemek olayının ayrı düşünülmesi gereklidir. Ayrıca refakatçiler için yemek yeme işlevi zordur. Katlarda belli saatlerde refakatçiler için ayrı bir alan veya odaların içerisinde ayrı bir düzenleme yapılması gereklidir. Özellikle tek kişilik odalarda televizyon, buzdolabı gibi donanım bulunmaktadır. Bunlar yeterli görülmüştür. Ancak iki ve daha fazla kişnin kaldığı odalarda dab u donanımlara ihtiyaç daha fazla bulunmaktadır. Banyolarda açık duşun bulunması yerine ayırıcı seperatörlerin yapılması ile bir mikta hijyen de sağlanmış olacaktır.Bu öneriler yapılırken hastanenin hizmet verdiği hasta ve yakınlarının sayısının fazlalığı ve hastane fiziksel imkanlarının mevcut durumu da göz önüne alınmaktadır.

Hasta odalarında engelli yaşlı ve çocuklara yönelik olan yasal mevzuata uygunluk önemlidir. Tüm hasta odalarında bu konuya dikkat edilmesi gereklidir. Kullanıcıların da konu üzerinde bilinç düzeylerinin artırılması, mekan algısı için önemli görülmektedir. Hastane odalarında yapılan çözümlemeler günün koşulları ve teknolojisi için tasarlanmaktadır. Ancak ileride gelişebilecek farklı durumlar da göz önüne alınarak tasarımlar gerçekleştirilirse mekanların sürdürülebilirliği sağlanmış olacaktır. Elbetteki boyutlandırmada birincil very olarak insane faktörü önemlidir. Ancak kapasitenin artırılmasına yönelik de tedbir alınmalıdır. Teknolojik verilerin gelişmesi her zaman söz konusudur. Bunun için hasta odalarında ön görülü davranıp fazladan tesisat alanı için uygun boyut ve yer bırakılmalıdır.

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İncelenen bir bölge, üniversite ve kamu hastanesi olan binadan çıkarılan sonuçların genel olarak diğer aynı özelliklere sahip hastane yapıları için de geçerliliği bulunmaktadır. Çalışmanın, kullanıcı memnuniyeti, mekanların işlev açısından sürdürülebilirliği, kalite kavramı ve bundan sonar yapılacak çalışmaları katkıda bulunması umulmaktadır.

TEŞEKKÜR

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HASTA VE ÇALIŞAN GÜVENLİĞİ BAĞLAMINDA C13 VE C14 ÜRE NEFES TESTLERİNİN KARŞILAŞTIRILMASI

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Giriş: Sağlık hizmetleri sunumunda hastalıkların teşhis ve tedavilerini gerçekleştirmek amacıyla birçok invazif ya da noninvaziv testler yapılmaktadır. Bu çalışma ile hasta ve çalışan güvenliğine etkisi açısından aynı amaçla kullanılan iki farklı testin karşılaştırılması amaçlanmıştır.

Materyal-Metot: H. plori insanlarda mide ve duodenum mukozasına yerleşerek enfeksiyon ve ülsere sebep olan bir bakteri olup tespiti için invaziv,noninvaziv testler bulunmaktadır. Noninvaziv testlerden birisi de Üre nefes testidir. Üre nefes testi için iki farklı yöntem bulunmaktadır. Birbirlerine üstünlükleri çok fazla olmayan bu iki testen birincisi C14 üre diğeri de C13 üre testidir. C14 üre solunum testi maliyeti ucuz olup daha hızlı sonuç vermektedir ancak radyoaktiftir. C13 üre solunum testi ise maliyetinin daha fazla olmasına karşın radyoaktif olmadığından emniyetli ve kolay uygulanabilir bir testtir. Bir kısım maliyeti pahalı fakat hem sağlık çalışanı hem de hastalar açısından daha güvenli olan C13 üre nefes testini tercih etmesine karşın diğer bir kısım ise maliyeti daha az ve hızlı sonuç vere fakat gebelerde ve çocuklarda önerilmeyen C14 üre nefes testini tercih etmektedir.

Sonuç: Hasta ve çalışan güvenliğinin ön planda tutulması gerekliliği düşünüldüğünde maliyeti pahalı da olsa, risk açısından sıfır riskli olduğu düşünülen yöntemlerin tercih edilmesinin uygun olacağı değerlendirilmiştir.

Keywords: Üre testi, C13 ve 14 testi

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HAVA TÜREVLERİ VE GELİŞMEKTE OLAN ÜLKELERDE KULLANIMINA YÖNELİK BİR UYGULAMA

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Özet: Günümüzde tarım, turizm, enerji ve giyim gibi birçok sektör hava durumuna bağlı olarak yaşanan değişimlerden etkilenmektedir. Hava durumunda beklenmeyen değişimlere karşı işletmeler satış, kar ve müşteri kaybı gibi sorunlar yaşamaktadır. Bu olumsuzluklara karşı bazı gelişmiş ve gelişmekte olan ülkelerde havayla ilişkili riskleri yönetmek için sigortanın yanı sıra finansal türev araçlardan yararlanılmaktadır. Hava veya iklim türevi olarak ifade edilen bu araçların en çok kullanılan türleri opsiyon, swap ve future sözleşmelerdir. Bu çalışmanın ilk bölümünde hava türevleri, hava türevlerinin türleri ve farklı sektörlerdeki hava türevi uygulamaları ele alınmaktadır. Daha sonra, bir hava türev uygulama örneği sunulmaktadır. Çalışmanın sonuç bölümünde, hava türev piyasalarının gelişmekte olan ülkelerde gelişmesi için öneriler sunulmuştur.

Anahtar Kelimeler: İklim Değişimi, Türev Ürünler, Hava Türevleri, Gelişmekte Olan Ülkeler

WEATHER DERIVATIVES AND AN APPLICATION FOR USE IN DEVELOPING COUNTRIES

Abstract: Today, many sectors such as agriculture, tourism, energy and clothing are affected by changes in weather. Due to unexpected changes in the weather, business suffer from problems such as loss of customers, sales and profit. Businesses in some developed and developing countries against these problems, to manage the risks associated with weather are also benefit from financial derivative instruments, as well as the insurance. The most widely used types of these instruments expressed as weather derivatives are options, swaps and futures contracts. The first part of this study, weather derivatives, types of weather derivatives and weather derivatives applications in different sectors are examined. Later, the application example for weather derivatives are presented. In the conclusion of the study, recommendations for growth in developing countries of the weather derivatives market are presented.

Keywords: Change of Climate, Derivative Instruments, Weather Derivatives, Developing Countries

Giriş

Hava riski ifadesi bir işletmenin sıcak, soğuk, kar, yağmur ve rüzgâr gibi hava olayları sonucu ortaya çıkan finansal etkilere maruz kalmasını tanımlamak için kullanılır. Bu durum, doğada meydana gelen fakat felaket olarak tanımlanmayan hava olaylarının bir sonucudur ve işletmenin karlılığını etkilemektedir. Arzulanmayan hava durumlarının ortaya çıkardığı finansal dalgalanmaları elimine etmek veya azaltmak için hava riski mutlaka yönetilmelidir (Clemmons, 2002: 3). Hava koşullarında oluşan normalden sapmalar, ısı etkisi dışında, yağış miktarı, kar miktarı ve rüzgâr düzeyleri gibi hava parametrelerini de kapsamaktadır (Sytsma ve Thompson, 2002: 3). Hava risk piyasası enerji, sigorta, banka, tarım, turizm ve eğlence gibi birçok sektörden katılımcıları içermektedir. Hava risk piyasası ABD'de doğup gelişmeye başlamış olup Avrupa, Asya ve Latin Amerika'dan yeni katılımcılarla hava türev piyasası genişlemektedir (Geyser, 2004: 1).

Hava türevleri, geleneksel riskten korunma enstrümanlarından farklılık göstermektedirler. Hava türevleri, mal futures sözleşmeleri ve diğer finansal türev türlerinden farklı olarak bir malın tedarik ve talep miktarında havayla ilişkili azalmalara karşı korunma sağlamak için oluşturulur. Bu, fiyat riski değil, miktar riskidir (Ali, 2004: 75).

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Bu çalışmanın amacı, günümüzde küresel iklim değişimiyle birlikte yaşanan hava durumuyla ilgili risklere karşı bir finansal risk yönetim aracı olan hava türevlerini tanıtmak ve uygulama örnekleri sunmaktır. Bu amaçla, ilk olarak hava türevleri piyasasının doğuşu ve gelişimi, hava türev ürünlerinin temel unsurları, hava türev ürünleri ve özellikleri ele alınmakta, sonrasında ise uygulama örnekleri sunularak sonuç bölümünde Türkiye gibi gelişmekte olan ülkelerde bu piyasanın sağlıklı gelişmesi için çeşitli öneriler sunulmaktadır.

Hava Türevleri Piyasası Ve Gelişimi

Hava türevleri; sıcaklık, yağış miktarı gibi hava değişkenleri üzerine düzenlenen türev ürünler olup, çeşitli hava indeksleri üzerine düzenlenen opsiyon, futures ve swap sözleşmeleridir. Bir diğer ifadeyle hava türevi, hava türevi sözleşmesine konu olan taraflar arasındaki ödemelerin nasıl değiştirileceğinin, sözleşme dönemi boyunca gerçekleşen hava koşullarına bağlı olmasının şart koşulduğu, iki taraf arasındaki sözleşmedir (Geyser, 2004: 1).

Hava türevleri, borsalarda işlem gören standartlaştırılmış future ve opsiyonlar ya da bankalar tarafından üretilen müşteriye özel yapılanmalar kullanmak suretiyle hava durumu risklerine karşı korumayı sağlayan finansal araçlardır (Sarıoğuz, 2007: 176). Hava türevleri, hava şartlarındaki değişiklikler nedeniyle kazançları olumsuz etkilenen taraflarca kullanılır. Bunlar arasında enerji, inşaat, altyapı ve sigorta şirketleri, tarım ve turizm sektörü sayılabilir. Enerji sektörü, hava koşullarından en çok etkilenen sektördür. Hava risklerine karşı korunmanın belirlenebilmesi için öncelikle hava türevlerinin nasıl bir hava düzensizliğine karşı kullanılacağının bilinmesi gerekmektedir (Chambers, 2005: 55-56).

Hava türevleri ve sigorta sözleşmeleri benzer bir amaçla kullanılabilmesine rağmen, bu sözleşmeler arasındaki temel farklılık, sigorta sözleşme sahibinin tazminat alabilmek için havaya bağlı bir finansal kayba uğradığını kanıtlamak zorunda olmasıdır. Hava türevlerinin ödemeleri ise, sadece hava koşullarının sonucuna bağlıdır. Türev ürün sahibinin bundan nasıl etkilendiğine bağlı değildir. Ayrıca hava türev sözleşmesinden faydalanmak için hava şartlarına duyarlı bir ürüne sahip olmaya da ihtiyaç yoktur. Bu sözleşmeler sadece spekülasyon için satın alınabilir (Alaton vd., 2002: 5). Ayrıca sigorta yüksek risk ve düşük olasılıklı olayları kapsarken, hava türevleri düşük risk ve yüksek olasılıklı olaylara (örneğin ılık kış) karşı gelirleri korumaktadır (Garcia ve Sturzenegger, 2001: 9).

Hava türevleri tezgâh üstü piyasası ilk olarak enerji sektöründeki şirketler tarafından başlatılmıştır. hava koşullarına dayalı ilk hava türevi sözleşmesi, Eylül 1997'de Enron ve Koch arasında yapılmıştır. Enerji üreticilerinin ihtiyacı, ısı dalgalanmalarının neden olduğu miktar riskine karşı korunmaktır (Geyser, 2004: 2). Bu tarihten sonra, hava türevleri piyasası, tezgâh üstü piyasa içinde hızla gelişme göstermiştir. Hava türevleri piyasasında, 2001 yılının Nisan ayına kadar yapılan sözleşme sayısı 4784'tür. Toplam nominal değer 4.5 milyar $'dır (Hess, 2001: 16).

Chicago Ticaret Borsası Eylül 1999'da hava türevleri için GLOBEX adında standart hava türevi ticaretinin ilk olarak yapıldığı yeni bir elektronik piyasa başlatmıştır. 1999'da, sıcaklıkla ilgili hava türevlerinin dünyadaki ilk borsa işlemi, 4 ABD şehri, Atlanta, Chicago, Cincinnati ve New York için HDD indeks futures sözleşmeleriyle başlamıştır. CME'de küçük işlem miktarı ve düşük maliyetler bulunması, yeni katılımcıların artmasını sağlamıştır (Property & Casualty/Risk & Benefits Management, 1999: 12). Londra Uluslararası Finansal Futures ve Opsiyon Borsası'nda (LIFFE) 2001 yılında hava futures sözleşmeleri işlem görmeye başlamıştır (Burçkin ve Boyacıoğlu, 2004: 104).

CME'de hava türevleriyle ilgili işlemlerin başladığı ilk 5 saat içinde 53 sözleşme satılmıştır (Carpenter, 1999: 12). 1997 yılından 2002'ye kadar geçen beş yılda, hava riski ile ilgili hava türevi sözleşmelerinin işlem tutarı, 7 milyar $'ın üzerine çıkmıştır. ABD'nde CME Borsası'nın kotasyonu sıcaklık bazlıdır ve CME'de, günün ısı dereceleri indeksi bazında futures sözleşmelerinin alım satımı yapılmaktadır. CME, Atlanta GA, Chicago IL, Cincinnati OH, Dallas TX, DesMoines IA, Las Vegas NV, New York NY, Philadelphia PA, Portlans OR ve Tuesan AS gibi 10 ABD şehri için günün dereceleri indeksi temelinde futures ve futures bazlı opsiyonları alım satıma sunmaktadır (Connors, 2003: 21-22). CME şu an CME Group adıyla 45 şehrin (ABD 24, Avrupa 10, Kanada 6, Japonya 2, Avustralya 3) hava sıcaklığına dayalı hava durumu türevi sunmaktadır (Görgün, 2009: 76). CME'de işlem gören futures üzerine opsiyon sözleşmeleri, Avrupa tipi opsiyonlardır. CME son kullanıcılardan ziyade, pozisyonlarını riskten korumak için piyasa yapıcılarının yer aldığı bir borsadır (Alaton vd., 2002: 2-4). Piyasa yapıcıları, borsa tarafından istendiğinde, belli bir opsiyon için alış ve satış fiyatı kote eden kişi veya kuruluşlardır (Ceylan, 2003: 328). Hava türevleri piyasası, birincil ve ikincil piyasa olarak ikiye ayrılabilir. Son kullanıcılar, birincil piyasada alım satım işlemleri yapmaktadır. Bu kapsamda "son kullanıcı" terimi elektrik veya gaz dağıtım işletmeleri gibi kamu hizmeti işletmeleri, inşaat işletmeleri, eğlence parkları ve tarım işletmeleri gibi kendi faaliyet alanlarında hava riskleriyle karşılaşan kuruluşlar demektir. İkincil piyasa, genelde

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hava türevlerinde uzmanlaşmış yatırım bankaları ve aracı kurumlar alanlarından oluşmaktadır. Bunların amacı, hava türevlerinde alım satım işlemleri yaparak alım satım ve arbitraj karı elde etmektir (Müller ve Grandi, 2005: 21-22).

Hava Türevlerinin Unsurları

Hava türev sözleşmesi, genellikle ortalama veya maksimum günlük sıcaklık gibi bir hava olgusunu temel alan bir indeks seviyesine karşılık ödeme yapmayı sağlayan bir sözleşmedir (West, 2002: 9). Hava türev sözleşmesinde; türev ürün alıcısı, olumsuz hava koşullarından kaynaklanan risklere karşı korunmayı isteyen taraftır. Hava türev türlerini sunabilen kuruluşlar ise; diğer enerji firmaları için bu ürünleri tedarik eden enerji firmaları, bu tür anlaşmalar için gerekli işlem yapma ve fiyatlandırma becerisine sahip yatırım bankaları, reasürörler ve hava durumu hasarlarına karşı poliçeler düzenleyen sigorta şirketleridir. (Sarıoğuz, 2007: 179).

Finansal türevler hisse senetlerine, tahvillere, kur oranlarına veya paralara dayanır ve bunların tümü havanın aksine teslim edilebilir nesnelerdir. Hava türevlerinin temeli ise, örneğin bazı malların alım satım miktarını etkileyen ısı derecesi gibi, hava parametrelerine dayanır (Müller ve Grandi, 2005: 1). Bu nedenle hava türevleri değişkenlerinin alınıp satılabilme özelliği ve fiyatı yoktur. Hava türevi değişkenleri, ürünlerin alım satım miktarını etkileyen sıcaklık, yağış gibi verilere dayalıdır. Ayrıca finansal türev ürünlere göre hava türevleri; miktar riskinden korunmak için kullanılmakta, manipüle edilememekte ve hava değişkenlerinin alım satımı yapılamamaktadır (Cao ve Wei, 2001: 21).

Bir hava durumu türevinin işleyişinde, ilgili mevsim için, anlaşmaya konu olan sıcaklık endeksinin belirlenen seviyenin altına düşmesi veya üzerine çıkması durumunda tazminat alınacaktır. Sıcaklık endeksi, toplanmış sıcaklık derecelerinden meydana gelir. Örneğin kış soğudukça endeks en üst seviyesine çıkmaktadır. Kış sıcak geçtikçe endeks en alt seviyesine inmektedir. Derece günü (Degree Day) terimi; hem yazın, hem kışın yakıt tüketimini ölçen bir endeksin birim değeri olarak tarif edilmektedir (Sarıoğuz, 2007: 168-169).

Hava türevleri, temel alınan hava indeksinin farklılıkları bazında, genellikle swap, futures ve alım/satım opsiyonları şeklinde yapılandırılmaktadır. Kullanılan indeksler, sıcak ve soğuk derece günler, nemlilik, yağmur ve kar yağışıdır. Bununla beraber sektör, sözleşmeler için temel olarak ısı üzerine kurulmuştur. Hava türev sözleşmeleri ile ilgili kullanılan temel kavramlar aşağıda ele alınmaktadır (Alaton vd., 2002: 3):

Günün sıcaklık derecesi (DD) ($T_{(i)}$) i günü için sıcaklığı gösterir. Hava türevleri için temel alınan en önemli değişken günün sıcaklık derecesidir. T_i^{max} ve T_i^{min} olarak verilen spesifik bir hava durumu, belirli bir i gününde ölçülen maksimum ve minimum sıcaklık derecesini (santigrat derece) gösterir. Bir i günü için sıcaklık ise şöyle tanımlanır:

$$T_i \equiv \frac{T_i^{max} + T_i^{min}}{2}$$

En temel hava indeksleri, ısınma derecesi gün-HDD_i, (Heating Degree Day- HDD) ve soğuma derecesi gün CDD_i (Cooling Degree Day- CDD) olarak tanımlanır. Bunlar, aşağıdaki gibi oluşturulur.

$HDD_i \equiv \max \{18 - T_i, 0\}$
$CDD_i \equiv \max \{T_i - 18, 0\}$

Belirli bir gün için, HDD_i veya CDD_i rakamları referans ısı düzeyinden ayrılan ısı derecesi rakamlarıdır. Bu rakam, referans düzeyi 65 fahrenhayt (18 C derece) olarak konulan ABD'ndeki endüstri standardıdır. Isınma ve soğuma derece gün ifadesi, ABD enerji sektöründe ortaya çıkmıştır. Bunun nedeni ise şöyle açıklanabilir. Eğer sıcaklık 18 derecesinin altına düşerse, insanlar evlerini ısıtmak için daha fazla enerji kullanmaya yönelecekler, buna karşın eğer sıcaklık 18 derecenin üzerine çıkarsa insanlar serinlemek için klimalarını açacaklardır (Alaton vd., 2002: 3).

Sıcaklık sözleşmeleri daha çok günlük ortalama sıcaklık bazında tanımlanan HDD ve CDD'ler olarak işlem görür. HDD sayısı, 65 F^0 (18 C) ile günlük ortalama sıcaklık arasındaki farkı gösterir, CDD sayısı ise günlük ortalama sıcaklık ile 65 F^0 arasındaki farktır. HDD ve CDD negatif olamaz. Günlük ortalama sıcaklıklar gece yarısı temeline göre, bir gece yarısındaki minimum ile maksimum aritmetik ortalama kayıtlarıdır. HDD ve CDD'nin tanımları daha açık bir ifadeyle aşağıdaki gibi oluşturulur (Garcia ve Sturzenegger, 2001: 9):

HDD = maksimum { 65 F^0 – günlük ortalama sıcaklık, 0}
CDD = maksimum { günlük ortalama sıcaklık – 65 F^0, 0}

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Hava türevleriyle ilgili temel unsurlar aşağıdaki gibi açıklanabilir (Connors, 2003: 22):

- **Günün Sıcaklık Derecesi (Degree Day (DD)):** Gece yarısı esasına göre, bir gece yarısında bir günün ortalama sıcaklığının ölçümüdür.
- **Isınma derecesi gün (Heating Degree - Day (HDD)):** 65 F^0 ile karşılaştırılan günlük derecenin soğukluğunun ölçümüdür. Günlük HDD= Maksimum (65 F^0 – DD).
- **Soğuma derecesi gün (Cooling Degree - Day (CDD)):** 65 F^0 ile karşılaştırılan günlük derecenin sıcaklığının ölçümüdür. Günlük CDD= Maksimum (DD – 65 F^0)
- **Isınma Derecesi Günler İndeksi- (Heating Degree - Day Index):** Bir ay üzerinden günlük olarak tutulan, günlerin sıcaklık derecelerinin toplamıdır. Referans sıcaklık ile günlük ortalama sıcaklık arasındaki farka görü günlük HDD bulunur. Sonra günlük HDD'ler kümülatif olarak toplanır ve HDD indeksi oluşturulur. HDD İndeksi = HDD
- **Örnek**: Nisan HDD ∑ 0, 31, 20 ,10, 0, 25, 15, 10, 8, 7, 9, 11, 12, 40, 17, 10, 2, 0, 0, 17, 10, 13, 9, 27, 40, 26, 20 , 21, 0, 5, 3.
- Nisan HDD İndeksi = 0+31+20+10+0+25+15+10+8+7+9+11+12+40+17+10+2+0+0+ 17+10+13+9+27+40+26+20+21+0+5+3 = 418.
- **Soğuma Derecesi Gün İndeksi (Cooling Degree - Day Index):** Bir ay üzerinden günlük olarak tutulan, günlerin soğukluk derecelerinin toplamıdır. CDD İndeksi = CDD
- **Sözleşme Değeri:** HDD/CDD futures sözleşmelerinin değeri HDD veya CDD indeksinin 100 $'la çarpılmasıyla bulunur.
- **Örnek:** Nisan HDD İndeksi = 418 ise, Sözleşme Değeri = 418 x 100$ = 41.800 $ olur.
- **Tik Büyüklüğü:** Sözleşmede, temel değişken olarak kullanılan indeks değerindeki minimum değişmeyi gösterir. Tik, bir derece güne karşılık gelmektedir.

En çok ısı bazında yapılan hava türevleri, belirli bir dönem esnasındaki HDD_s veya CDD_s'lerin hesaplanması temeline dayanır. Bu dönem genellikle bir takvim ayı veya bir kış/yaz dönemidir. Genellikle, HDD sezonu Kasım ayından Mart ayına kadar olan kış aylarını kapsarken, CDD sezonu ise Mayıs ayından Eylül ayına kadar olan zamanı içerir. Nisan ve Ekim aylarına çoğu zaman "destek ayları" olarak başvurulur (Alaton vd., 2002: 4). Hava türevleri temel olarak satın alma opsiyonu, satma opsiyonu, swap ve bunların kombinasyonlarından oluşmaktadır. Opsiyon, futures veya swap'ların dört unsuru bulunmaktadır. Bunlar; temel alınan HDD/CDD indeksleri, toplam dönem (bir sezon veya bir ay), günlük sıcaklık kayıtları için belirli bir hava istasyonu, her bir HDD/CDD için belirlenen tik büyüklüğüdür (Garcia ve Sturzenegger, 2001: 9-11).

Hava Türevlerinin Türleri

Hava Opsiyonları

Hava türevleri piyasasındaki işlemlerin yaklaşık %70-80'ini sıcaklık dalgalanmalarından korunmayı amaçlayan opsiyonlar oluşturmaktadır. Opsiyonlarda satın alma opsiyonu alınması/satılması ve satma opsiyonu alınması/satılması olmak üzere dört çeşit temel işlem bulunmaktadır. Opsiyon işlemleri için HDD ve CDD indeksleri baz alınır. HDD indeksi kış mevsimi, CDD indeksi ise yaz mevsimi için ortalama sıcaklığı ölçer (Burçkin ve Boyacıoğlu, 2004: 96). HDD satın alma opsiyonunda, vade sonunda, HDD belirlenen kullanım düzeyini aşarsa alıcı ödeme alır. Ödemenin miktarı, kullanım düzeyi ve tik değeri tarafından belirlenir. Hava opsiyonunda sözleşmenin türü (alım veya satım), sözleşmenin vadesi (örneğin Ocak 2001), temel alınan indeks (HDD veya CDD), sıcaklık verilerinin elde edileceği resmi bir hava istasyonu, kullanım düzeyi, tik büyüklüğü, maksimum ödeme (eğer varsa) parametreleri mevcuttur (Alaton vd., 2002: 4). Sözleşmelerde bir derece güne karşılık gelen *tik büyüklüğü*, ödeme düzeyini belirlemek için tanımlanır (Müller ve Grandi, 2005: 2).

Satın alma opsiyonunun alıcısı, vade sonunda, hava indeksinin kullanım düzeyini aşması durumunda ödeme alır. Ödeme tutarı, indeksin kullanım düzeyini ne kadar aştığıyla ilişkilidir (Feachems, 2000: 39). Satın alma opsiyonunun satın alınmasıyla işletme kendini soğuk kışa veya sıcak yaza karşı koruyabilir. Kış ne kadar soğuk veya yaz ne kadar sıcak olursa, opsiyonu satın alana ödenecek miktar o kadar artar. Fakat bu ödemenin maksimum bir üst sınırı olur (Burçkin ve Boyacıoğlu, 2004: 96).
. Sözleşme dönemi için alım ve satım opsiyonunun formülleri aşağıdaki gibidir (Alaton vd., 2002: 4):

$$P = k \text{ maks } \{W - S, 0\}$$

W = Hava indeksi, S = Kullanım Düzeyi, k = Tik değeri

Satma opsiyonun satın alınmasıyla işletme kendini sıcak kışa veya soğuk yaza karşı koruyabilir. Satma opsiyonun ödeme formülü de aşağıdaki gibidir.

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P = k maks {S -W,0}
W: Hava indeksi S: Kullanım düzeyi k: Tik değer

Belirli bir alanda ölçülen hava faktörünün kümülatif değeri, belirlenmiş kullanım düzeyinin altına düştüğü zaman, satma opsiyonu gerçek değere sahip olur. Eğer opsiyon gerçek değerinde değilse, kullanılmayacağından alıcısı sadece primi kaybeder. Hava indeksinin alışılmadık şekilde düşmesi halinde, satıcının aşırı kaybını önlemek için sözleşmeye "floor" bir diğer ifadeyle taban şeklinde bir sınırlama getirilir (Gardner, 2003: 10).

Bir HDD satma opsiyon sözleşmesinde, opsiyonunun alıcısı, uygun hava koşullarında kazançlarını arttırır, ılık yani sıcak bir kışta ise kazançlarındaki düşüşe karşı korunmak istemektedir. Ödeme, indeks kullanım düzeyinden aşağıya düştükçe artar. Eğer HDD, kullanım düzeyinden aşağıya düşerse satma opsiyonunun alıcısı satma opsiyonunun satıcısından ödemeyi alır (Feachems, 2000: 39-40).

Bir CDD satma opsiyonu satın alan işletmeye yapılacak ödeme şu şekilde bulunur (McKay, 2004: 12):

P= k x (S-W)
W: Günün gerçek dereceleri, yani CDD indeksi, S: Satma opsiyonu kullanım düzeyi, k: Tik.

Yukarıdaki veriler ışığında oluşturulan örnek bir CDD satma opsiyon sözleşmesinde aşağıdaki maddeler üzerinde anlaşılmıştır (McKay, 2004: 12):
Kullanım: 3150 CDD, Tik: CDD başına 20.000 $, Prim: 400. 000 $
Dönem için gerçekleşen CDD: 3100'dür.

Satma opsiyonunun ödemesi: 20.000 $ x (3100 – 3150) = 1.000.000 $. 400.000 $ prim düşüldüğünde, işletmenin net karı 600.000 $ olur. Dolayısıyla opsiyonun işletmeye maliyeti sadece primdir (McKay, 2004: 12-13).

HDD/CDD satın alma ve satma opsiyonlarının ısı temelli sağladıkları korunmalar, bunların uygulanma zamanları ve ödemenin yapılışı aşağıdaki tablo 1'de gösterilmektedir (Müller ve Grandi, 2005: 10):

Tablo 1. HDD/CDD Satın alma ve satma opsiyonunun ısı temelli sağladığı korunma, uygulanma zamanı ve ödeme yapısı

Opsiyon Türü	Sağladığı Korunma	Uygulanma Zamanı	Ödeme Yapısı
HDD satın alma	Aşırı soğuk kışlara karşı	HDD > Kullanım Düzeyi	Tik x (HDD -Kullanım Düzeyi)
HDD satma	Aşırı ılık kışlara karşı	HDD < Kullanım Düzeyi	Tik x (Kullanım Düzeyi - HDD)
CDD satın alma	Aşırı sıcak yazlara karşı	CDD > Kullanım Düzeyi	Tik x (CDD -Kullanım Düzeyi)
CDD satma	Aşırı serin yazlara karşı	CDD < Kullanım Düzeyi	Tik x (Kullanım Düzeyi - CDD)

Hava Swapları

Hava swapı, üzerinde anlaşılan swap düzeyine ve sözleşme vadesinin sonunda oluşan hava indeksine bağlı olarak taraflar arasındaki nakit akışının değiştirilebildiği finansal sözleşmedir. Swap'ın alıcısı eğer indeks, swap düzeyinin üzerinde oluşursa satıcıdan ödeme alır. Tersine, indeks swap düzeyinden aşağıda oluşursa alıcı satıcıya ödeme yapar. Swap sözleşmelerinde prim yoktur (Feachems, 2000: 40). Sözleşmenin sonunda satıcı alıcıya P = k (W - S) miktarında bir ödeme yapar. P 'nin negatif olması durumunda ödeme alıcı tarafından satıcıya yapılır. Buradaki S, swap için "kullanım indeksi" veya "referans indeksi" olarak bilinir (Zeng, 2000: 73). Hava swapları, teknik olarak forward ya da futures sözleşmeler olarak ele alınabilir. Fiyatlar, indeksin kullanım düzeyince konulur. Futures olarak swapların 15'i ABD'de, 5'i Avrupa'da ve 1'i de Japonya'da olmak üzere toplam 21 bölgede, aylık ve mevsimlik sözleşmeler olarak CME'de alım satımı yapılmaktadır (Jewson, 2004: 57-58).

Eğer, belirli bir dönem sonunda günün derecesi sözleşmede belirlenen dereceden daha yüksek olursa, bir taraf diğerine ödeme yaparken, eğer günün derecesi belirli bir dönem sonunda kullanım düzeyinden daha düşük olursa diğer taraf ödeme yapacaktır (Garcia ve Sturzenegger, 2001: 11).

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Hava Futures Sözleşmeleri

HDD/CDD indeksi futures sözleşmeleri belirli bir gelecek tarihteki HDD/CDD indeks değerinin alınması ve satılması sözleşmeleridir. Sözleşmeler HDD/CDD indeks puanlarına göre kote edilmiştir. Futures sözleşmeler nakit olarak sonlandırılmaktadır. Müşterinin hesabına kazanç ve kayıplar uygulanarak günlük fiyat ayarlaması yapılmaktadır (Alaton vd., 2002: 4). Eğer, günün dereceleri aylık olarak üzerinde anlaşılan düzeyden daha yüksek ise, bir taraf ödeme yapar. Eğer günün dereceleri aylık olarak üzerinde anlaşılan düzeyden düşükse, bu defa diğer taraf ödeme yapar.

Pek çok inşaat firması, aşırı sıcaklık değişimine karşı teminata ihtiyaç duyar. Öneğin yol inşaatı yapan bir firma, sıcaklık donma derecesinin altına düşerse, betonun karıştırılması güçleştiği için asfalt boşuna harcanmış olur. İnşaat sektöründe, belediyeler ve hükümetle yapılan sözleşmelerde, sözleşme bitiş tarihinde, sözleşme gerekleri yerine getirilmezse, bu durum, taahhüt veren tarafa gün başına yüksek maliyetlere neden olabilmektedir (Sarıoğuz, 2007: 163).

Bir işletmenin futures sözleşmeyle korunması, inşaat sektöründe yer alan bir işletme örneğiyle aşağıda açıklanmaktadır (Connors, 2003: 22-23):

İnşaat şirketi, havayla ilgili tarihsel verileri incelemiş ve inşaat maliyetleri ile soğuk hava arasında yüksek korelasyon olduğunu fark etmiştir. Ortalamaya yakın kışlar normal karlara, ılık geçen kışlar ortalamadan daha yüksek karlara, soğuk kışlar ise, yüksek maliyetlere neden olmaktadır. İşletme, CME'nin HDD indeks futures sözleşmelerini kullanarak ortalamadan daha soğuk bir kışın riskinden korunmayı seçmiştir. Basit olması açısından, örnekte sadece Şubat ayı ele alınmaktadır.

Korunmanın nasıl oluşturulacağını belirlemek için inşaat şirketinin yönetimi, soğuk hava maliyetleri ile HDD hava veriler ilişkisini incelemek zorundadır. İstatistiksel araştırma sonuçları, indeksteki %1'lik artışın yapı maliyetlerini % 0,5 arttırdığını göstermektedir. Şubat ayı için tahmini yapı maliyeti 72.000.000 $'dır. Şubat ayı futures sözleşmesi için HDD indeksi 1200 değerindedir. Şubat HDD indeksindeki %1 artış mevcut fiyat düzeyinde sözleşme başına 1.200 dolar değerindedir (%1 X 1200 (HDD indeks fiyatı) X (tick başına 100 $)). HDD indeksindeki % 0,5'lik artış, yapı maliyetlerinde 360.000 $'lık artışa (% 0,5 * 72.000.000) neden olacaktır. Korunma oranı veya satın alınan sözleşme sayısı 300 sözleşmedir (360.000 $ / sözleşme başına 1200 $).

Eğer kış ortalamadan daha soğuk olursa, varsayalım ki, 2 Martta, Şubat ayı HDD sözleşmesi 1400 olsun. İndeksten % 16,66 daha soğuk hava, ilave 6.000.000 $ ilave yapı maliyetleri getirir. Bu ilave yapı maliyetinin bulunuşu ise şöyledir: %16,66 X 0,5 X 72.000.000 $ = 6.000.000 $. HDD indeks sözleşmesinden 6.000.000 $ [300 sözleşme X tik başına 100 $ X (1400 HDD – 1200 HDD)] kazanılır. Bu kazanç, kayıpları karşılar.

Eğer kış ortalamadan daha ılık olursa, varsayalım ki, 2 Martta, Şubat ayı HDD sözleşmesi 1100 olsun. Ilık kış, indeksten % 8,33 daha ılıktır. İşletme ılık geçen havadan dolayı 3.000.000 $ kazanacaktır (%8,33 X 0,5 X 72.000.000 $). HDD indeks sözleşmesinden İnşaat firmasının kaybı 3.000.000 $ olacaktır. (3.000.000 $= 300 sözleşme X tik başına 100 $ X (1100 HDD – 1200 HDD)). İnşaat firması, HDD indeks futures sözleşmesindeki zararını, ılık havadan elde ettiği kazançla karşılar.

Hava Türevlerinin Fiyatlaması

Hava türevleri konusundaki önemli konulardan biri de fiyatlama konusudur. Bu konuda birçok akademik çalışma yapılmış ve yapılmaktadır. Örneğin bu çalışmalardan birinde Sun ve Van Kooten (2015) buğday üretiminde hava riskinden korunmak için finansal türev araçların fiyatlandırılmasını ele almışlar ve büyüme dereceli günlere (GDDs) dayalı olarak hava türev seçeneklerinin fiyatlandırmasındaki farklı metotları karşılaştırmışlardır.

Hava türevlerinde temel alınan değerler hava değişkenleri olduğundan ve bunların da ticareti yapılmadığından, hesaplamalarda gerekli olan para çarpanı, hava değişkenlerinin günün ısı derecesi para değerine dönüştürülerek bulunur (West, 2002: 9). Hava türevleri için genel kabul görmüş bir fiyatlama modeli bulunmamaktadır. Geleneksel opsiyon fiyatlama modeli Black/Scholes ve Arbitrajsız opsiyon fiyatlama modeli, hava türevlerinin değerlemesinde kullanılamamaktadır. Çünkü bu modeller, alınıp satılabilen bir değişkenin varlığını şart koşmaktadır. Hava türevlerinin temel değişkenleri finansal piyasalarda alınıp satılabilen değerler olmayıp, vade sonunda normal dağılım da göstermeyebilirler. Temel hava indeksleri, sabit olmadığından fiyatlama için aktüeryal tekniklerin uygulanmasında da zorluklar bulunmaktadır (Zeng, 2000: 72-73). Günümüzde hava türevleri fiyatlaması, aktüeryal hava tahmin bilgisi ile birleştirilen standart opsiyon fiyatlama modelleri ve burn

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analizinin karmasından oluşmaktadır (Müller ve Grandi, 2005: 19). Türkiye için sıcaklığa dayalı hava durumu opsiyonlarının fiyatlandırılmasını ele aldığı çalışmasının sonucunda Göncü vd. (2011) gelişmekte olan ülkelerin politika yapıcıları için çeşitli öneriler sunmuşlardır. Bu anlamda hükümetler özel sektördeki bilgi ve uzmanlık eksikliğini giderecek çeşitli mekanizmalar geliştirebilir. Bu konuda görev alabilecek finansal kurumlar da belirli sektörlerin taleplerini karşılamak için bu sektörlere özel ürünler geliştirebilirler.

Gelişmekte Olan Ülkelerde Hava Türevleri Piyasası Ve Uygulamaları

Hava türevleri piyasaları, gelişmekte olan ülkelere afet risklerinin yönetimi ve tarım gibi havaya son derece bağlı sektörler için yeni sigorta ürünlerinin geliştirilmesi yönünde katkı sağlamaktadır. Hava türevleri gelişmekte olan ülkelerde, hava riskini yönetmede, doğal afetlere karşı önemli bir araç haline gelmektedir. 1999 yılında doğal afetler tüm dünyada yüz beş binden fazla insanı etkilemiş ve ABD'nde 100 milyar $'lık bir zarara neden olmuştur. Doğal afetler gelişmekte olan ülkeleri çok daha fazla etkilemekte ve bu ülkelerde daha büyük zararlar oluşturabilmektedir (Varangis, 2001: 1-3).

Gelişmekte olan ülkelerde, hava türevleri daha çok tarım sektöründe uygulama olanağı bulmaktadır. Ancak, tarımda hava türevlerinin kullanımı diğer sektörlerden farklıdır. Ürün ve hava faktörü arasındaki ilişkinin dikkatlice ortaya konması gerekir. Örneğin enerji sektöründe hava türevleri için HDD'ye bağlı bir türevde ısı ve ısıtıcı talebi arasındaki ilişki basit ve doğrusaldır. Tarımsal üretim ilişkisi ise her zaman için böyle doğrusal değildir. Çünkü yetiştirilen ürünler, ürünlerin gelişim aşamaları ve toprak yapısı farklıdır. Örneğin, aynı hava faktörlerine karşı verilecek yanıt, farklı coğrafik bölgeler ve farklı ürünler için farklı olacaktır. Bu nedenlerle tarımda hava türevlerinin uygulaması da önemli derecede farklılıklar göstermektedir (Stoppa ve Hess, 2003: 4). Ayrıca hava şartları çok geniş bir faaliyet alanını etkilediğinden çiftçi ve üreticilerin hava şartlarından kaynaklanan istikrarsızlığı, tarım alanında makroekonomik dalgalanmalara dönüşür (Hess vd., 2002: 2).

Hava türevleriyle ilgili olarak birçok ülkede çeşitli uygulamalar gerçekleştirilmiştir. Örneğin Meksika'da havaya dayalı risk yönetim ürünleriyle birleştirilebilen iki tane kurumsal yenilik gerçekleştirilmiştir. İlki, 1996'da kurulan Doğal Afetler Fonudur (FONDEN) (Skees vd., 2002: 16). İkincisi ise tarım sigortası kapsamında, çiftçi organizasyonları için ortak sigorta fonlarının oluşturulmasıdır. Ayrıca Dünya Bankası tarafından Meksika'da prototip yağış miktar sözleşmesi oluşturularak, bu sözleşmenin ürünlerden elde edilen gelirleri nasıl etkilediği incelenmiştir. Yağış miktarı sözleşmeleri nispeten riskin % 30 kadarını azaltabilmektedir. Elde edilen bulgular yağış miktarı sözleşmelerinin Meksika'da potansiyelinin olduğunu göstermektedir (Varangis, 2001: 8-9).

Romanya'da ise tarım alanıyla ilgili olarak yağmur yağışını temel alan hava türev sözleşmesi yapılmıştır. Yağmur yağışının temel alınmasının nedeni, tarımsal gelirlerin yağmur yağışıyla olan korelasyonunun yüksek olmasıdır (Spaulding vd., 2004: 7).

Güney Afrika'da ise önceleri havayla ilgili risklere sadece geleneksel sigorta perspektiften bakılmıştır. Özellikle enerji piyasasının liberalleşmesinden önce başlıca hedef sektör olarak tarım sektörü ön plana çıkmış ve hava türevlerine önemli bir ilgi artışı olmuştur. Gensec Bankası, ilk kez aktif olarak Güney Afrika piyasasına hava türevlerini pazarlamıştır (Sacharowitz, 2004: 7).

Fas'ta ise Faslı tahıl üreticilerini kuraklığın ekonomik etkilerinden korumak için yağış miktarı indeks türevi yapılmıştır. Yağmur yağışı türev planının pilot uygulaması, Fas'ın kuzeyinde, buğday yetiştirme alanı olarak görülen Meknes bölgesinde yapılmıştır (Stoppa ve Hess, 2003: 8-9). Bu tür sözleşmelerin altında yatan temel fikir yağış miktarı ile gelir arasında kurulan korelasyonun yüksek olmasıdır. Bu nedenle tarım üreticileri, seçilen kullanım düzeyinin altına düşen yağmur yağışı durumunda ödemelerin yapılacağı bir sözleşmeye girerek kendilerini koruyabilmektedir. Ancak sözleşmeyi oluşturmak için kullanım düzeyinin ve bunun hangi düzeyde nasıl oluşturulacağının değerlendirilmesi önemlidir (Hess vd., 2002: 9).

Hava indeks sigortasının tarım sektöründe kullanıldığı gelişmekte olan ülkelerde, bu sigorta türü tarım sigortasına bir alternatif olarak kullanılırken, Türkiye'de henüz tarım sigortası uygulamasının tam olarak gelişmemesi, tarım sektöründe hava indeks sigortasının gelişimi açısından bir dezavantaj oluşturmaktadır. Bu nedenle, öncelikle tarım sigortasının gelişmesi gereklidir. Ayrıca Türkiye'de tarım alanlarının mülkiyet yapısı, işletme ölçeği, üreticinin niteliği, tarım işletmelerin işletilme, üretim ve verimlilik farklılıkları hava indeksinin uygulanabilmesi açısından görülen diğer dezavantajlardır (http://www.zmo.org.tr/etkinlikler/6tk05/061tanferdinlerson.pdf, 02.03.2005).

Hava türev sözleşmelerinin dünyada çıkış noktası olan enerji sektörü, Türkiye gibi gelişmekte olan ülkeler için de hava türevlerinin kullanılabileceği sektörlerin başında gelmektedir. Nitekim Türkiye'de, hava durumu

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türevlerinin ilk örneği 2005 yılında Bursa Gaz firması tarafından gerçekleştirilmiştir. Firma bu alanda Türkiye'de bilinen ilk Türk şirketidir. Bursa'da Kasım 2004 - Nisan 2005 kış dönemi ortalamanın üzerinde ılık geçince, şirketin satışları azalmıştır. Bu nedenle Bursa Gaz, hava türevleri üzerine araştırma yapmaya başlamıştır. Türkiye'de bu konuyla ilgili uzmanlığa sahip bir kuruluş bulunmadığından, Bursa Gaz Avrupa'da bir reasürans şirketi olan Swiss Re firmasıyla görüşmüştür. Bursa Gaz, bu firmayla sözleşme yaparak, hava durumu HDD satma opsiyon sözleşmesi satın almıştır. Sözleşme, Aralık 2005 - Nisan 2006 kış döneminde günlük ortalama sıcaklığın 9°C'nin üzerine çıkması durumunda opsiyonun kullanılabilmesi üzerine kurulmuştur. Sözleşme döneminde sıcaklık, opsiyonun uygulanabilmesi için gereken değere ulaşmadığından opsiyon uygulamaya konmamıştır. Bursa Gaz'ın opsiyon anlaşması yapması diğer şirketlerin de bu piyasaya ilgisini çekmek konusunda fayda sağlamıştır. Nitekim bazı firmaların bilgi almak için Swiss Re firmasıyla görüştüğü bilinmektedir (Sarıoğuz, 2007: 232).

Hava Türevlerine Yönelik Bir Uygulama

Hava türevleri çok çeşitli sektörlerde uygulanmaktadır. Farklı sektörlerin hava durumundan etkilenme durumu ve karşılaşacağı riskler de farklı olmaktadır. Aşağıdaki tablo 2'de çeşitli sektörlerin maruz kalabilecekleri hava olayları ve üstlenecekleri riskler yer almaktadır (Cui ve Swishchuk, 2015: 60).

Tablo 2. Sektörler, maruz kalınabilecek hava durumu ve risk türleri

Sektör	Hava türü	Risk
Enerji tüketicileri	Sıcaklık	Aşırı veya azalan talep
Enerji sektörü	Sıcaklık, rüzgâr, güneş ışınımı, yağış	Aşırı veya azalan tedarik
Tarım	Sıcaklık ve yağış	Mahsul verimi, taşıma, depolama, zararlılar
Perakendecilik	Sıcaklık ve yağış	Azalan talep
Seyahat	Sıcaklık, yapış, kar yağışı	İptaller ve daha düşük gelir
Taşımacılık	Sıcaklık, yağış, rüzgâr, don ve kar yağışı	Gecikmeler, iptaller, daha yüksek operasyon maliyetleri, daha düşük gelirler
Hükümet	Sıcaklık, yağış, kar yağışı	Daha yüksek bütçe maliyetleri
İnşaat	Sıcaklık, yağış, kar yağışı	Gecikmeler, daha yüksek bütçe maliyetleri

Birçok sektör üzerinde etkili olan hava değişimi bisiklet kullanımı üzerinde dahi etkili olabilmektedir. Bu konuda Norveç'in Bodø kentinde yapılan bir çalışmada, iklim değişikliğine ilişkin öngörüler gerçekleşirse, kısa vade de olmasa da 2050 yılında kış ayının yaklaşık iki ay kısalacağı, bununla birlikte bisiklet kullanma süresinin daha uzun olacağı öngörülmektedir (Mathisen vd., 2015: 270).

Cayra ve Kusyb (2007) ise hava türevlerinin kullanılabilirliğini Kanadalı Buz Şarabı Üretimi üzerinde araştırmışlardır. Buz şarabı, iklim ve belirli ısı şartlarının uygun olduğu dünyanın çok az bölgesinde üretilmektedir. Bu bölgelerden biri de Kanada'nın Niagara bölgesidir. Uygun şartların dışına çıkılması bu bölgedeki üretimi doğrudan etkilemektedir. Çalışmada bu bölgedeki tarihsel mevsimlik ısı değişimleri incelenmiş ve üreticiler için bu tür opsiyon sözleşmelerinin önemli korunma fırsatları sağladığı bulunmuştur.

Günümüzde işletmelerin finansal performansı üzerinde hava ve iklim şartlarının etkili olduğu konusunda artan bir farkındalık bulunmaktadır. Örneğin, FirstEnergy tarafından hazırlanan raporda, Amerika Birleşik Devletleri'nin kuzeydoğusundaki elektrik satışlarından elde edilen 2001 son çeyrek gelirlerinin ılık geçen kış nedeniyle bir önceki yıla göre 122.000.000 $ az olduğu belirtilmiştir (Dutton, 2002: 1304).

Olağandışı hava koşulları doğal gaz şirketlerine son kullanıcıdan gelen talep miktarının düşmesine sebep olmaktadır. Ilık geçen bir kış veya serin geçen bir yaz, doğal gaz şirketlerinin faaliyet karlarının düşmesine neden olmaktadır (Sarıoğuz, 2007: 251).

Hava şartlarından etkilenen başlıca sektörlerden biri de doğal gaz sektörüdür. Bir gaz şirketinin yıllık raporuna göre, satış hacmi, normale göre daha ılık sıcaklıkların bir sonucu olarak azalmıştır. Aşağıda gaz sektörüyle ilgili bir uygulama örneği ele alınmaktadır(http://64.125.144.31/librarydocs/bc51_wrma/public/file542.pdf, 01.10.2004, s. 1-2).

Tarihsel durumu verilerine göre, dağıtılan gaz miktarıyla temel alınan kış arasında yüksek bir korelasyon bulunmaktadır. Kasım-Mart dönemi için, gaz şirketi son 30 yıllık ortalamaya bakarak HDD'nin 5.330 olacağını tahmin etmektedir. MMBtu's satışı konusunda, bu HDD miktarı (5330) için bütçelenen gelirler bölgede 50

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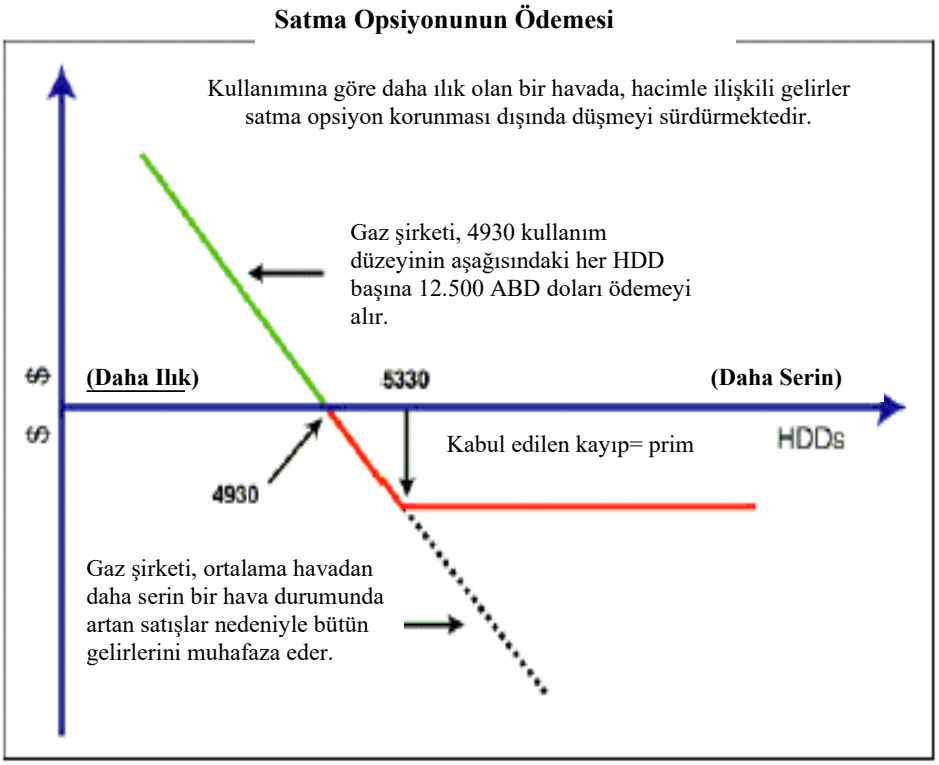
milyon $'dır ve tahmin edilen marjin her bir HDD sapması için 12,500 $ kadar geliri azaltmaktadır. Eğer hava ortalamaya göre (bu tam olarak 4,930 HDD'dir) %7,5'dan daha fazla sıcak olursa, bu gelirlerde %10'dan daha fazla bir düşüşe neden olmaktır.

Kasım ayından Mart ayına kadar 4930 HDD veya daha azının gerçekleştiği bir kışa karşı korunmak isteyen bir gaz şirketi için oluşturulan bir "satma opsiyon" yapısı aşağıdaki şekil 1'de gösterilmektedir. Bu kullanım düzeyinin altındaki her bir HDD için şirket 12,500 $'lık bir ödeme alacaktır.

Belirlenen dönemde, eğer 4,920 HDD meydana gelirse (daha önceden belirlenen kullanım düzeyine göre daha ılık bir hava), gaz şirketi (ödemiş olduğu prim dışında) 125.000 $ [(4930-4920)*12500] bir ödeme alır. Bu ödeme, azalan gaz dağıtımının neden olduğu şirketin gelir kaybını dengeler.



Şekil 1. Satma Opsiyonunun Ödemesi

Soğuk kışlar, gaz dağıtım şirketleri için uygun şartlar yaratmaktadır. Ancak ılık kışlar hacmi zayıflatmakta ve bu durum, bir sonraki yıl için nakit akış problemleri meydana getirmektedir. Bu yöneticiler için büyük sorunlara neden olurken, potansiyel kredi verenler de özellikle Ekim-Nisan dönemi kazançlarındaki dalgalanmalarla ilgilenirler.

Sonuç

Türev piyasaların ortaya çıkışının arkasındaki temel fikir riskten korunma olup, hava türevleri piyasasında da temel amaç hava durumunun neden olduğu risklerden korunmaktır. Hava riski, ekonomik riskin diğer kaynaklarıyla karşılaştırıldığında bazı farklı özelliklere sahiptir. Özellikle, hava riskinin kontrol edilemeyen, yerel bir coğrafik riski vardır. Ayrıca, hava riski genellikle hacimsel risk olarak adlandırılır. Potansiyel etkileri doğrudan fiyat üzerinde değil, esas olarak hacim üzerinde olmaktadır (Scaillet ve Barrieu, 2010).

Son on yılda, hava risk yönetimi cazip ve ilginç yeni türev sınıfı olarak ortaya çıkmıştır. Hava türevleri, beklenmeyen veya ters hava şartlarının doğuracağı riski azaltmak için risk yönetim stratejisinin bir parçası olarak organizasyonlar veya bireyler tarafından kullanılan finansal araçlardır (Botoş ve Ciumaş, 2012). Hava türevleri işletmelerin ve diğer kuruluşların hava durumundaki dalgalanmalara karşı kendilerini korumasına imkan sağladığından sigorta, reasürans şirketleri, bankalar, hedge fonları ve enerji şirketleri gibi bir çok işletme tarafından kullanılmaya başlanmış ve bu konuda departmanlar oluşturmuşlardır (Swishchuk ve Cui, 2013: 81).

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Hava türevleri piyasası finansal türev piyasasıyla karşılaştırıldığında, likidite ve hacim olarak hava türevleri piyasasının zayıf kaldığı ve henüz gelişimini tamamlamadığı ve hatta pek çok ülke piyasasında ya hiç ya da yeterince bilinmediği gözlenmektedir. Bütün piyasalarda olduğu gibi hava türevleri piyasasında da hacmi ve likiditeyi arttırmak için bazı koşulların yerine getirilmesine ihtiyaç vardır. Bu koşullar; piyasa katılımının arttırılması, indeks için güvenilir verilerin sağlanması, riski yüklenmeye istekli tarafların varlığı ve artmasıdır (Feachems, 2000: 33-35). Gelişmekte olan ülkelerden biri olan Türkiye'de havaya ilişkin sıcaklık, yağış ve rüzgâr gibi veriler, Türkiye Meteoroloji Genel Müdürlüğü tarafından 1971 yılından beri tutulmakta ve bu veriler talep edildiğinde belirli bir ücret karşılığında verilmektedir. Hava türevlerinin uygulanabilmesi için en az 30-40 yılık verilere ihtiyaç olduğu düşünülürse, Türkiye'de kayıtları tutulan verilerin tarihselliği konusunda bir sorun bulunmamaktadır. Ancak Changnon ve Changnon'un (2010: 325) önerdiği gibi hava türevleri gibi yeni risk yönetim araçlarının geliştirilmesine ve kullanımına katkı sağlayabilecek olan ve/veya katkı sağlamak isteyen meteoroloji alanında çalışan bilim insanları finans, coğrafya, ekonomi, istatistik ve bilgi teknolojileri gibi alanlarda eğitim deneyimlerini genişletmeli ve bu konulardaki bilgi ve yeteneklerini geliştirmelidirler.

Hava türevleri piyasasının gelişimin önünde bazı engel ve endişeler de bulunmaktadır. Örneğin Banka ve Wiesner (2011) tarafından Avusturya'daki 61 telesiyej operatörüyle görüşülerek yapılan araştırmada, kış turizmi sektöründe hava türevlerinin kullanımına yönelik olarak operatörlerin motivasyonları, endişeleri ve engeller araştırılmıştır. Araştırma sonucunda operatörlerin çoğunluğunun havadan kaynaklanan risklerin farkında oldukları, ancak hava türevleri kullanılarak potansiyel kayıpların önlenebileceğini bilmedikleri bulunmuştur. Bunun temel nedeni operatörlerin farkındalıklarının olmaması ve bilgi eksikliğidir. Bu anlamda hava türevlerinin kullanımına yönelik referanslarla farkındalık, bilgi ve desteği artırmak mümkün olabilecektir.

Gelişmekte olan ülkelerden biri olan Türkiye'de hava türevleri piyasası oluşmamıştır. Hava türevleri piyasasının oluşmasının ön şartı, iyi işleyen bir türev ürünler piyasasının olmasıdır. Türkiye'de, ilk türev ürün borsası olan Vadeli İşlemler ve Opsiyon Borsası, 4 Şubat 2005'te açılmıştır. Türkiye'de, hava türevlerinin etkin bir şekilde kullanımı söz konusu değildir. İşletmeler, hava türevleriyle ilgili eğitim alıp, bilgi eksikliklerini gidererek, faaliyet alanlarıyla hava durumu riskleri arasındaki ilişkiyi de iyi kurarak, uluslararası hava türev piyasalarına da başvurabilirler. Bu şekilde kullanımın yaygınlaşması, Türkiye'de de hava türev piyasasının gelişmesine ön ayak olacaktır.

Ayrıca, Akkaya'nın (2010: 15) da belirttiği gibi hava türev piyasası şimdiye kadar yüksek oranda tezgâh üstü piyasada geliştiğinden Türkiye gibi gelişmekte olan ülkelerde hava türevlerinin uygulamaya geçilebilmesi için öncelikle tezgâh üstü piyasada bu tür sözleşmelerin alınıp satılması gerekmektedir.

Bu çalışmada hava türevleri konusu teorik olarak ele alınmıştır. Gelecekte yapılacak çalışmalarda gerçek uygulama örneklerinin ele alınması hem pratik hem de akademik olarak hava türevleri konusundaki bilgi birikiminin artmasına katkı sağlayacaktır.

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HAVACILIK SEKTÖRÜNDE TOPLAM VERİMLİ BAKIM UYGULAMASI: CESSNA UÇAĞI PERVANE ÇATLAK ÇENTİK KONTROLÜ

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Havacılık sektöründe artan ekipman teknolojisi ve otomasyonla beraber uçuş faaliyetlerinin aksamaması, maliyetlerin artmaması için; bakım için gereken insan gücünün, eğitim becerisinin, motivasyonun ve organizasyonun önemi de artmaktadır. Bu amaçla Toplam Verimli Bakım - TVB (Total Productive Maintenance - TPM) uygulamaları ön planda yer almaktadır. Havacılık sektöründe özellikle de sivil havacılık alanında toplam verimli bakım uygulamalarının artmasıyla beraber, uçak kazalarında rapor edilmemiş hataların önüne de geçilebilecektir. Yapılan çalışmada "Cessna Model T41-D" uçakları pervane çatlak çentik kontrol ve bakımı üzerinde incelemeler yapılmış olup, toplam verimli bakım uygulamalarına katkı sağlayan yöntem ve faaliyetlerin uygulama öncesi ve sonrası etkileri kıyaslanmıştır.

Anahtar Kelimeler: Havacılık, Toplam Verimli Bakım, Bakım Kontrol

Giriş

Özellikle 2. Dünya Savaşından sonra Japon endüstri yönetimi imalat beceri tekniklerini ABD 'den ithal edip bir takım değişikliklerden sonra kendi tekniklerini uygulamaya başlamışlardır. Japon ürünlerinin, bu süreçten ve uygulamalardan sonra kazandıkları üstün kalite özelliklerinin tüm dünyaya yayılmasıyla bütün dünya gözlerini Japon yönetim sistemlerine çevirmiştir.

Japonlar elli yıl öncesinin amerikan tarzı bir bakım sistemi olan VERİMLİ Bakımı kendi ülkelerine ithal etmiştir. 1969 yılında bir Toyota gurubu üyesi olan, otomobil parçaları üreticisi Nippodenso Co. Ltd. tarafından tanıtılmış ve şirket tüm üyelerin katılımıyla VERİMLİ bakım sistemini; Toplam VERİMLİ Bakımı benimsemiştir. 1971 mali yılında PM (Japonya)ödülü kazanmıştır. Böylelikle TVB ilk olarak Toyota şirketler gurubunda yayılmıştır.

TVB ın temeli, operatörün makinesini sahiplenmesi, makinesinin farkına varması, makine, enerji hammadde ve kendisi ile ürün, yani girdiler ile çıktılar arasında ilişkiyi kurması, makine ve enerji bilgilerini ön plana çıkararak bunları iş hayatına yansıtması şeklindedir.

TVB' ın temel amacı üretimde çalışana verilen değeri ön plana çıkararak kalite ve verimliliği maksimum değere ulaştırmaktır. TVB, üretim araçlarının sıfır hata ve sıfır kayıp ile üretir hale getire bilinmesiyle, kalite ve verimliliğin üst sınırlarının sürekli zorlandığı bir sistem olarak ürünlerin, firmalar arası artan rekabetin içinde, rekabet güçlerini devamlı geliştirebilmek amacıyla uygulanacak bir sistemdir.

TVB ilk Toyota gurubu içinde yayılmakla beraber sonraları otomobil, makine, yarı iletken endüstrileri gibi imalat ve montaj endüstrilerinde uygulanmaya geçilmiş, 1980 lerde kimyasal gıda maddeleri, çimento, ve seramik gibi proses endüstrilerinde ve havacılık endüstrisinde proje tipi üretimlerde uygulanmaları görülmüştür.

TVB ın ilk uygulamaları üretim faaliyetlerinde görülmekle beraber, son zamanlarda üretim kapsamı genişletilerek şirketin bütün departmanlarına (örnek olarak sekreterlik ve mühendislik gibi) yayılmasıyla, TVB ın üretimle sınırlandırılmasına oranla çok daha etkili olması sağlanmıştır. Bu sayede şirketin daha etkileyici

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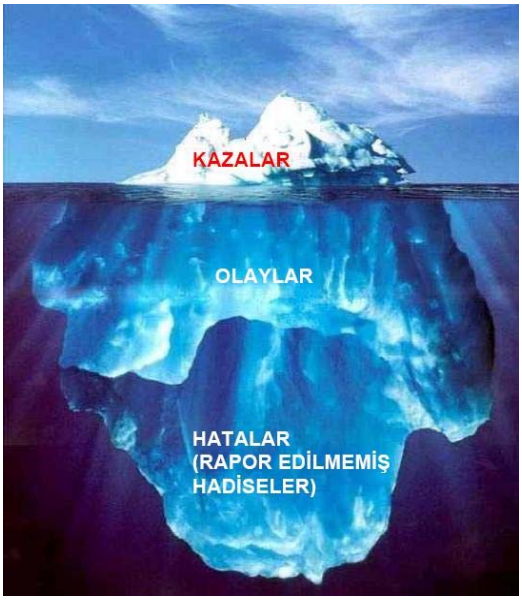
sonuçlar alması sağlanır, ve en üst yönetimden, işçilere, ofis sekreterlerinden tüm mühendislere kadar tüm birimlerin iştiraki gerçekleştirilir.

Havacılık ve uzay endüstrisinde ve özellikle de sivil havacılık alanında toplam verimli bakım uygulamalarının artmasıyla beraber, uçak kazalarında rapor edilmemiş hataların önüne de geçilebilecek olup, Yapılan bu çalışmada "Cessna Model T41-D" uçakları pervane çatlak çentik kontrol ve bakımı üzerinde incelemeler yapılmış olup, toplam verimli bakım uygulamalarına katkı sağlayan yöntem ve faaliyetlerin sonucunda elde edilen kazanımlar paylaşılmıştır.

Bulgular ve Yöntem

Havacılık sektöründe meydana gelmesi arzu edilmeyen uçak kazalarında, rapor edilmemiş hatalar bir buzdağına benzetilmektedir.(Bkz. Resim 1.) TVB uygulamaları bu buzdağının azaltılması ve kazaların minimize edilmesinde yardımcı olacaktır.



Resim 1. Uçak kazalarında rapor edilmemiş hataların bir buzdağına benzetilmesi

Bu istenmeyen kazaların meydana gelmesinde tüm organizasyon depertmanlarına görev yükleyen toplam verimli bakım uygulamasında, bakım-onarım, kazalara karşı önlem maksadıyla ve alınması gerekli tedbirleri erkenden görmek amacıyla tüm yetkili birimlere sorumluluk yüklemektedir. (Bkz. Şekil 1.)

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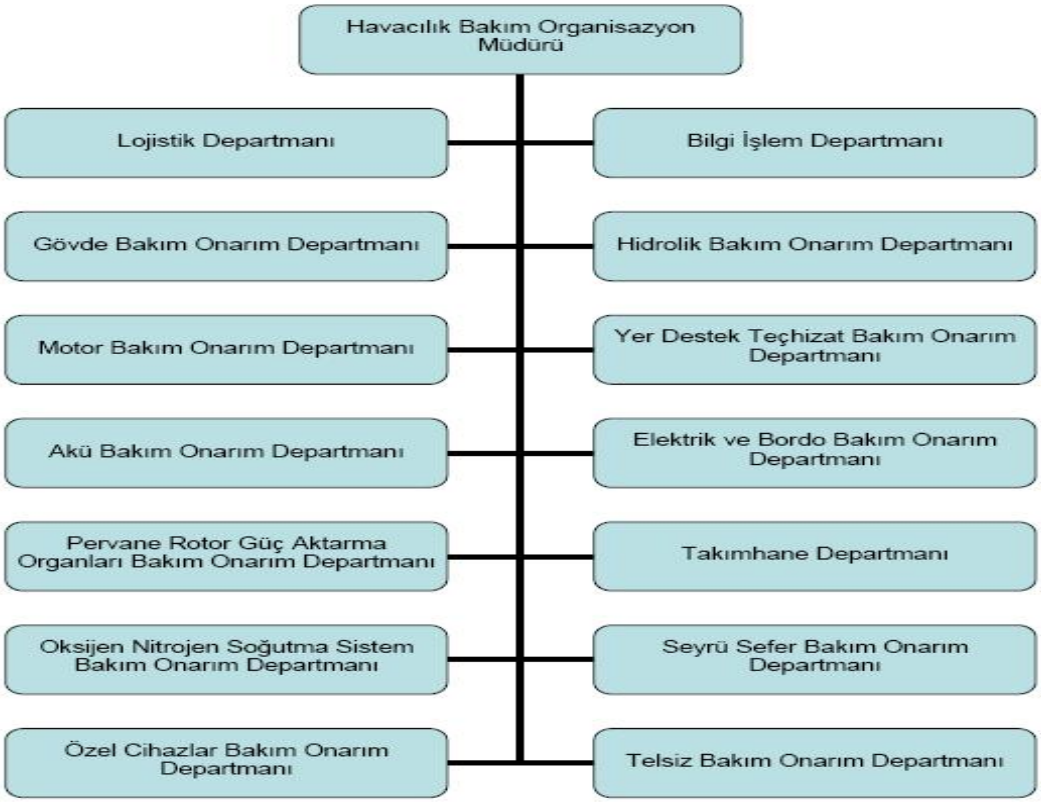

Şekil 1. Havacılık Bakım – Onarım Organizasyon Şeması

Yapılan ön araştırmalarla Günlük faaliyet raporları incelendiğinde 13 Kasım 2013 – 13 Temmuz 2014 tarihlerinde 2211 bakım onarım isteğinin 519(%23.47)' unun T-41D uçağına ait olduğu ve bunun 77(%14.83)' sinin aynı uçağın çatlak çentik kontrollerini içerip, 67(%87) adedinin T-41D **pervane** çatlak çentik kontrolüne yönelik olduğu görülmektedir. (Bkz. Resim 2.,3.,4.)



Resim 2. Pervane çatlak çentik kontrolü geriden görünüm

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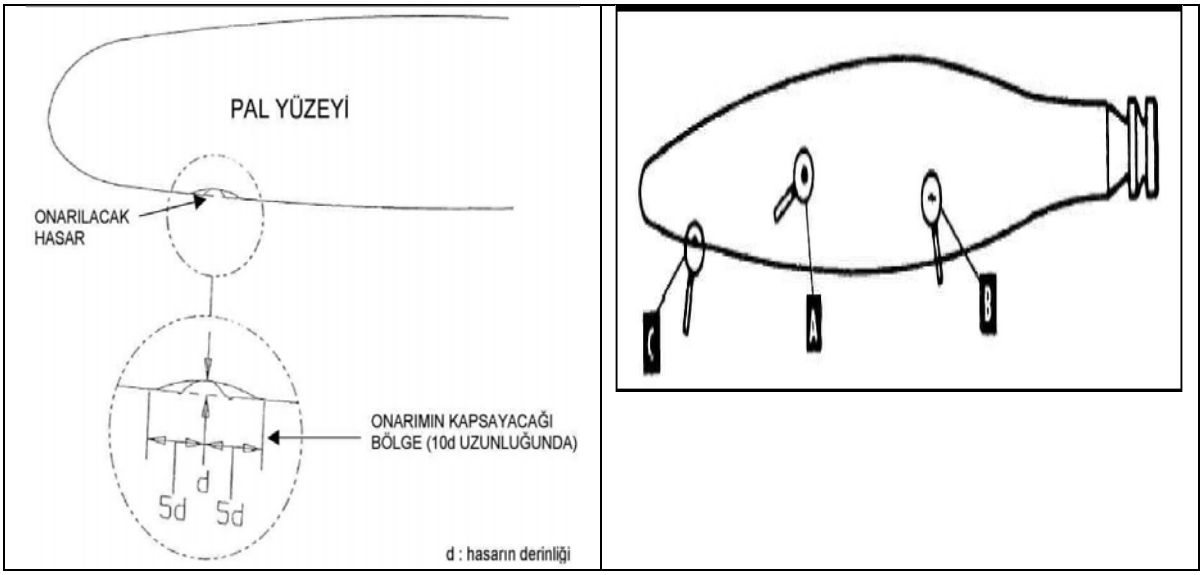
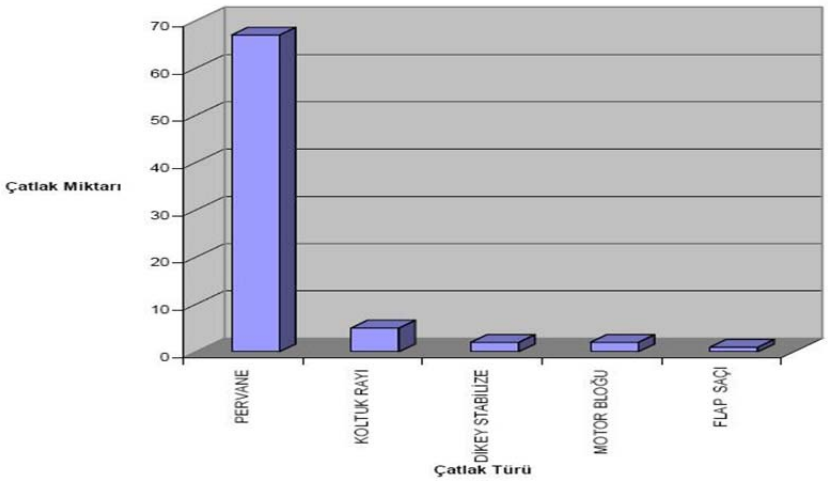
Resim 3. Pervane çatlak çentik hücum kenarı görüntüsü



Resim 4. Pervane hücum ve firar kenarı onarımını ve sonrası görüntüler.

T-41D Uçağı günlük faaliyet raporları 8 aylık süre dikkate alındığında pervane çatlak kontrollerinin aylar bazında dağılımı aşağıda verilmiştir. (Bkz. Şekil 2.)



Şekil 2. T-41D Uçağı Genel Çatlak Kontrol Dağılımı

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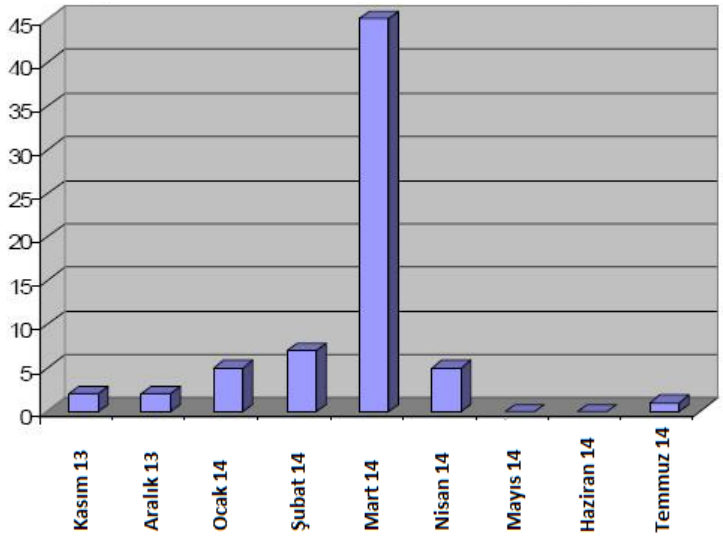
Aylara göre pervane çentik çatlak kontrolleri yapıldığında Mart ayında görülen artışla birlikte öncelikle pervanelerde hasarın azalmasına yönelik yöneticilere aktarılarak kullanıcılara eğitim verilmesi sağlanmış; TVB'nin otonom bakım uygulamasının küçük bir örneği yapılmıştır. (Bkz. Şekil 3.)



Şekil 3. Aylara Göre Pervane Çatlak Kontrol Dağılımı

Bu eğitimde;

- Çatlak çentiğin nasıl oluştuğu,
- Uçuş emniyetinin taşıdığı önem,
- Pilotların dikkat etmesi gereken hayati hususlar ,
- Uçuş meydan sorumlularına çatlaklara sebep veren pistteki çakılların temizlenmesi 5S(temizlik-tertip-düzen-disiplin-standartlaşma) uygulaması kapsamında anlatılmıştır.
- Yatay bilgi akışı ile günlük bakımı yapan teknisyen ile çatlak kontrolü yapan teknisyenin bilgi paylaşması sağlanmıştır.

Yapılan uygulama çalışması sonrasında, toplam verimli bakım uygulamalarına katkı sağlayan yöntem ve faaliyetlerin uygulama öncesi ve sonrası etkileri kıyaslanmıştır. (Bkz. Tablo 1.)

Tablo 1. Toplam Verimli Bakım Uygulamalarının Etkilerinin Karşılaştırılması

	TVB UYGULAMA ÖNCESİ	TVB UYGULAMA SONRASI	İYİLEŞME %
Her günlük bakımında 1 pal için kontrol	1 adam x 0,5 saat	1 adam x 0,5 saat	-
Uçağın taşınması	1 adam x 0,25 saat	1 adam x 0,15 saat	% 40
Yatay iletişim eksikliğinden gecikme	1 adam x 1,1 saat	1 adam x 0 saat	% 100
Standartlaşma eksikliği	1 adam x 0,5 saat	1 adam x 0 saat	% 100
Kayıtların tutulması	1 adam x 0,5 saat	1 adam x 0,25 saat	% 50
Onarım	1 adam x 0,5 saat	1 adam x 0,33 saat	% 34
Çatlak kontrolü	1 adam x 2 saat	1 adam x 2 saat	-
Boyama	1 adam x 0,5 saat	1 adam x 0,5 saat	-
Boya kuruması için gereken zaman (bekleme süresi)	10 saat	4 saat	% 60
Genel Toplam	1 adam x 5,85 saat	1 adam x 3,73 saat	% 36

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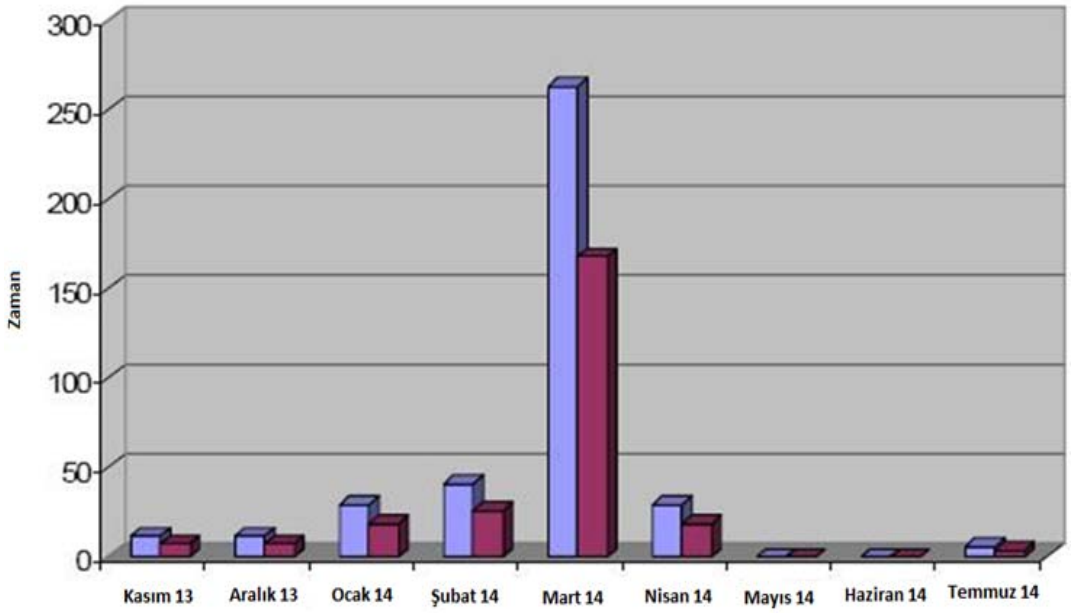
67 adet kontrol için ihtiyaç duyulan 315.95 adam x saatlik süreyi 249.91 adam x saate indirerek %36 oranında tasarruf sağlayıp günlük faaliyet durum çizelgesinin 8 aylık sürede görülen 400 farklı türde 2211 adet bakım onarım faaliyetine daha çok zaman ayrılabilecektir.

Buna göre, Toplam Verimli Bakım uygulamalarıyla aylara göre oluşan verimlilik kıyaslamaları aşağıda verilmiştir. (Bkz. Şekil 4.)



Şekil 4. Aylara Göre Toplam Verimli Bakım Verimlilik Oranı

Sonuç

Çalışmada da belirtildiği gibi otomasyonun gelişmesi ve bakım onarım faaliyetlerindeki yenilikler ile insandan çok ekipmana bağlı üretim sistemleri gelişmiş ve işletme için kalite, verimlilik, maliyet, güvenlik, sağlık gibi öğeler gittikçe ekipmana bağlanmaktadır. Bu açıdan TVB, işletmeler için kazançlı bir yöntem olarak ortaya çıkmaktadır.

Her ne kadar otomasyonun gelişmesi, şirketlere insansız üretim olanakları sunsa da ekipman bakımı için insana ve yoğun bir insan becerisine ihtiyaç duyulmaktadır. Fakat unutulmaması gereken, insan becerileri, tek başına yeterli olmayışı, bakım faaliyetleri için bir etkin bir organizasyonu sağlanması gerekmektedir. TVB işletmelerde bu organizasyonu sağlamaktadır.

İncelemede, genel olarak TVB ile ilgili iyi tablolar çizilmiş, genel uyarılar çeşitli noktalarda verilmiştir Gerçekte bütün TVB uygulamaları başarı kazanmakta mıdır? Cevap ne yazık ki "Hayır" olacaktır. Peki, başarısızlıkların genel sebepleri nelerdir?

Unutulmaması gereken temel nokta TVB her ne kadar otomasyon sistemlerinin gelişmesiyle ekipman kullanım etkinliğini arttırmaya çalışan bir yöntem olarak dikkat çekse de, TVB "İnsan" üzerine organize olmaktadır.

İnsan belirsizliklerin temel kaynağı olarak gösterilmektedir. TVB organizasyonun bütün olarak çalışanların katılımını gerektirmesi açısından temel olarak bu belirsizliklerin ortadan kaldırılması gerekmektedir. bunun için temel şart eğitimdir. Peki, eğitim yeterlimidir? TVB uygulamasının başarısı için iyi bir liderlik çevresi, ihtiyacı da bulunmaktadır. Bu çevreyi sağlayamayan, baskıcı, otoriter bir anlayışla ilerleyen organizasyonlar çalışanlarında gerekli motivasyon ve morali sağlayamayacaktır. Dolayısıyla çalışanlar değişimi benimsemeyecekler veya hedeflere olan inançlarını kaybedeceklerdir.

Unutulmamalıdır ki; Ancak, değişime inanmış, motive edilmiş, moralli, hedefler konusunda inançlı çalışanlardan oluşan aktif varlıklarla, çalışanlarının gelişimi için gerekli olanakları sunan, sabırlı, hedeflerine

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tutkuyla bağlı ve başarı için şartlanmış bir üst yönetimden oluşan bir organizasyonun TVB uygulamasında büyük başarılar kazanması muhtemeldir.

Yapılan bu çalışma da toplam Verimli Bakım Faaliyetlerinin öncesi ve sonrasındaki kıyaslamalar göstermiştir ki, bu faaliyetlerin ana görevi yüksek işletme güvenilirliği, yüksek bakım güvenilirliği ve yüksek devamlılık sağlamaktır. Bunu başarabilmek için üretim ve bakım departmanları müştereken bakım planlamasını yaparlar.

Burada toplam verimli bakım 'ın (7) temel hedefi vardır. Bunları sıralarsak; İş veriminin ve ürün kalitesinin yükseltilmesi, Esnek üretim imkanlarının artırılması, Çok yönlü donanmış çalışanlar yetiştirmek, Bakım faaliyetlerinde ortaya çıkan sorunların çözümlenmesinde iyileştirme çemberleri kullanmak ve onları desteklemek, "YAŞAM BOYU MALİYET" kavramını yatırımların geliştirilmesi çalışmalarında hayata geçirmek ve kullanmak, yeni ürünler tasarlamak ve rasyonalizasyon, temizlik ve düzeni, yaşam biçimine dönüştürmektir.

Sonuçta bu çalışmada, verimlilik artışı, hataların giderilmesi, iş kazalarının azalması, çalışanların motivasyonu ve ürün kalitesinin artması olarak işletmeye geri dönmüştür. Toplam Verimli Bakım için yapılan harcamaların elde edilen kazanımlardan oldukça az olduğu görülmüştür.

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HERMITE-HADAMARD-FEJER TYPE INEQUALITIES FOR CONFORMABLE FRACTIONAL INTEGRALS

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In this work, Firstly we have established Hermite-Hadamard-Fejer inequality for conformable fractional integrals. Secondly, we give a new lemma and obtain Hermite-Hadamard-Fejer type integral inequalities for conformable fractional integrals by using this lemma.

Keywords: Hermite-Hadamard-Fejer inequality, Riemann-liouville integral, conformable fractional integrals.

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HIBRIT ARAÇLARDA DC/DC KIYICI ILE AKÜ ŞARJ DEVRESININ TASARIMI VE UYGULANMASI

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Ulaşım sektöründe yüksek paya sahip olan karayolu araçlarında temiz enerji kullanımına verilen önem son yıllarda hızla artmaktadır. Günümüzde otomotiv sektörü zararlı emisyonları azaltarak, ekonomik, yüksek verimli hibrit ve elektrikli araçlar üretme eğilimindedir. Bu elektrikli araçların kullanımı yaygınlaşmaya başladıkça, bu araçların elektriksel güç ihtiyaçlarının karşılanması için gereken şarj istasyonları kurulumu da hızla artmaktadır. Bu ihtiyaçların karşılanması amacıyla, DC/DC kıyıcı kullanarak hem istasyonların boyutunun küçültülmesi hedeflenmekte hem de Hibrit araçların ihtiyaç duyduğu enerjinin kesintisiz, kaliteli ve ucuz olarak karşılanması sağlanarak bir performans artışı beklenmektedir.

Bu çalışmada DC/DC kıyıcı ile akü şarj devreleri tasarımı yapılıp daha küçük boyutlarda ve kayıpları daha az olan akü şarj istasyonları tasarlanarak, enerjinin kaliteli, ucuz ve sürekli olması sağlanmıştır. Bu tasarım esnasında sarmaşık tip DC/DC kıyıcı ve yumuşak anahtarlama teknikleri kullanılarak mosfetin anahtarlama esnasında oluşan anahtarlama kayıpları en aza indirilmiştir.

Keywords: DC/DC Kıyıcı, Yumuşak Anahtarlama, Hibrit Araç

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HİDROMEKANİK DERİN ÇEKME İŞLEMİNDE BASKI YASTIĞI/KALIP AÇISI DEĞİŞİMİNİN DERİN ÇEKME ORANINA ETKİLERİNİN SONLU ELEMANLAR YÖNTEMİ İLE ANALİZİ

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Özet: Saç malzemelerin derin çekme yöntemi ile şekillendirilmesinde baskı yastığı ve kalıp açısının değişimlerinin şekillendirilebilirlik parametreleri üzerine etkilerinin incelenmesi konusunda çalışmalar yapılmaktadır. Çalışmalarda, baskı yastığı ve kalıp açısının belirli değerlerinin şekillendirilebilirliğe olumlu katkı sağladığı görülmektedir.

Saç malzemelerin şekillendirilmesi alanında hidromekanik derin çekme yöntemi son yıllarda ilgi çekmeye başlamış ve saç malzemelerin şekillendirilmesi proseslerinde olumlu gelişimlere imkan sağlamıştır.

Bu çalışmada; hidromekanik derin çekme işleminde baskı yastığı/kalıp açısı değişiminin derin çekme oranına etkilerinin sonlu elemanlar yöntemi ile analizi yapılmıştır. Silindirik hidromekanik zımba ve kalıp kullanılarak, α=0°, α=5°, α=10°,α=15° olmak üzere 4 farklı baskı yastığı/kalıp açısının derin çekme oranına etkileri incelenmiştir. Analizler sonlu elemanlar yöntemi ile simülasyon ortamında yapılmıştır.Soğuk haddelenmiş DC03 otomotiv sacı kullanılmıştır.

Anahtar Kelimeler: Kalıp Açısı Değişimi, Derin Çekme Oranı, Hidromekanik Derin Çekme, DC03

Giriş

Madeni düz pulların veya plakaların çekme kalıbı dediğimiz düzenlerle pres altında çökertilerek belirli derinlik ve profillerde kap şekline sokulması işlemine presçilikte "çekme" ismi verilmektedir. Derinliği fazla olan kaplar birkaç çekme işlemi ile elde edilebilirler. Birkaç işlemle yapılan çekme "derin çekme" olarak isimlendirilir. Çekilecek parçalar silindirik, konik, küresel ve benzeri biçimlerde olabileceği gibi herhangi bir biçimde de olabilir (Tonka, 2009).

Literatürde, farklı malzemelerin derin çekme yöntemi ile kare yada silindirik profilde şekillendirilmesi durumunda, ilkel parça geometrisi, baskı plakası kuvvetleri ve zımba radyüsü gibi birçok derin çekme parametrelerinin β üzerindeki etkilerinin deneysel olarak araştırıldığı görülmektedir. Özek çalışmasında, mevcut literatürden farklı olarak, DIN EN 10130–1999 derin çekme sacının kare derin çekilmesi işleminde diğer derin çekme parametrelerinin yanı sıra matris/baskı plakası açılarının β, zımba kuvveti ve duvar kalınlığı üzerindeki etkilerini deneysel ve Sonlu Elemanlar Metodu (SEM) ile araştırmıştır (Özek, 2011).

Özek, açılı kalıplarda baskı yastığı / kalıp açısı ve zımba radiüslerinin sınır çekme oranına etkilerini incelemiştir. 0-15 derece baskı yastığı/ kalıp açısı ve 0-10 derece kalıp zımba radüslerini değişken olarak kullanmıştır. Deneylerinde zımba radius artışı ve kalıp/baskı yastığı açısının artışıyla sınır çekme oranının arttığını gözlemlemiştir (Özek, 2009).

Savaş, yeni bir kalıp tasarımı çalışmalarında bulunmuş, 8 mm kalıp radiüsünde 0-15° arasında 4 farklı kalıp açısı değişkeni denemiş ve kare kalıpta 15° kalıp açısında 2,175 derin çekme oranı elde etmiştir (Savaş 2007).

Hidromekanik derin çekme yönteminde ise; ilk aşamada, akışkan sıvı dişi kalıp içerisine doldurulmaktadır. Devamında; sıvı ile doldurulmuş hazne üzerine şekillendirilmemiş sac metal malzemenin yerleştirilmesi ile birlikte baskı plakası başlangıç sac numunesi üzerine kapanmaktadır. Sonraki adımda, şekillendirme işlemi olmakta zımba sac malzemeye doğru hareket etmektedir. Bu esnada, başlangıç sac numunesi sıvı ile ön basınç verilerek şişirilmektedir. Zımbanın sac malzemeye teması ile birlikte, kalıp içerisindeki hidrolik sıvı basıncı artmaya başlamaktadır. Kalıp içerisinde oluşan hidrolik sıvı basıncı, hassas kontrol valfleri ile sabit değerlerde tutulmaktadır. Kalıp içindeki hidrolik sıvı basıncı, başlangıç sac numuneyi zımbaya doğru preslemekte ve sac malzemenin şekil almasını kolaylaştırmaktadır. Kalıp içindeki hidrolik sıvı

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basıncının bir diğer fonksiyonu da; zımba ve sac malzeme arasında sürtünmeyi arttırması, kalıp ve sac malzeme arasında ise sürtünmeyi azaltması ve ürün üzerindeki gerilim dağılımını iyileştirmesidir. Bu durum, sac malzemenin yırtılmadan daha çok şekil almasını sağlamaktadır.(Karaağaç, 2013).

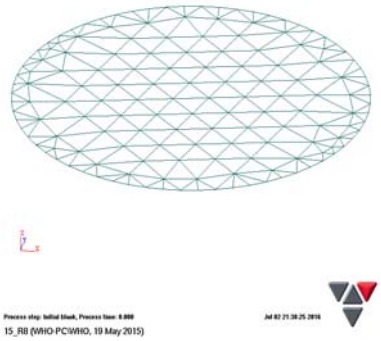
Sonlu Elemanlar Yöntemi ile analizde, kalıp içerisinde sacın hareketi küçük zaman adımları ile çözülürken her zaman adımında pekleşme (stress hardening), sac geometrisinin o andaki durumu ve etkileri (örn. baskı yastığı üzerindeki alan), incelmeler, kırışmalar (malzeme yığılması) gibi birbirini etkileyen değişkenler dikkate alınmakta ve bir sonraki adımda kullanılmaktadır. Zamanda entegrasyon alınırken olayın nonlineerliği küçük zaman adımları sayesinde simülasyon edilebilmektedir. Çıkan sonuçlar, gerçek hayattaki sonuçlarla % 95 civarında bir doğrulukla uyum sağlamaktadır. Bu tip bir çözüm kullanıldığında; pratik hayatta yapılan kalıp için istenilen kaliteyi sağlayacak olup gereksiz maliyetlerden ve zaman kayıplarından kurtulmayı mümkün kılacaktır (Grupotomasyon, 2010).

Bu çalışmada; hidromekanik derin çekme işleminde baskı yastığı / kalıp açısı değişiminin derin çekme oranına etkilerinin sonlu elemanlar yöntemi ile analizi yapılmıştır. Silindirik hidromekanik zımba ve kalıp kullanılarak, α=0°, α=5°, α=10°, α=15° olmak üzere 4 farklı baskı yastığı/kalıp açısının derin çekme oranına etkileri incelenmiştir. Analizler sonlu elemanlar yöntemi ile simülasyon ortamında yapılmıştır. Soğuk haddelenmiş DC03 otomotiv sacı kullanılmıştır.

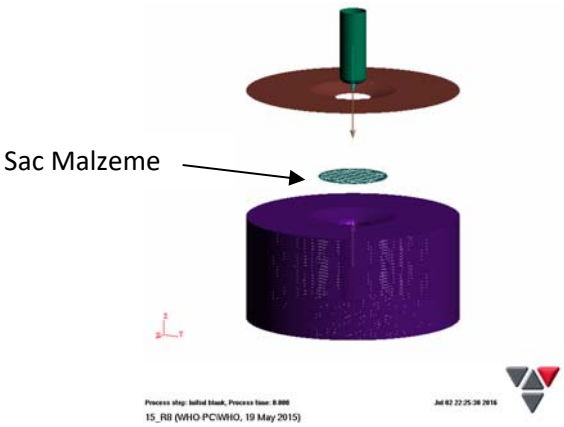
Materyal ve Metod

Baskı yastığı / kalıp açısı değişiminin derin çekme oranına etkilerinin sonlu elemanlar yöntemi ile analizi için AUTOFORM paket programı kullanılmıştır. Deney değişkenlerinin analizine geçmeden önce en uygun sonuçları verecek deney düzeneğinin hazırlanması ve diğer değişkenlerin tespit edilmesi işlemi yapılmıştır. Deney düzeneği için kalıp, zımba ve sac malzeme paket programlar ile çizilmiş ve "igs" formatında kaydedilmiştir. "İgs" formatındaki kalıp, zımba ve sac malzeme AUTOFORM paket programına ithal edilmiştir.

İlk aşamada, paket programda "mesh"leme işlemi, yani sonlu elemanlar yöntemi ile analizde kullanılacak parça büyüklükleri tespit edilmiştir. Çok küçük parça seçiminde analizlerin çok uzun zaman aldığı, çok büyük parça seçiminde ise sonlu elemanlar yöntemi ile analizde hasas kalıp radiüslerinde doğru hesaplama yapamadan parçaların kesildiği (kırıldığı) görülmüştür. Meshlemede 0,01x5 mm paket program değerleri kullanılmıştır. Şekil 1'de meshleme yapılmış sac malzeme görülmektedir. Sac malzeme kalınlığı 0,8 mm'dir.



Şekil 1.Meshleme Yapılmış Sac Malzeme.



Şekil 2.Kalıp, Baskı Plakası, Sac Malzeme ve Zımbanın Koordinat Sistemindeki Konumu.

Meshleme ayarlarından sonra kalıp, baskı plakası, zımba ve sac malzeme paket programda koordinat systemine yerleştirilmiştir. Söz kosunu parçalar Şekil 2'de görülmektedir. Baskı plakasının kapama işlemi sağlanarak zımba ile sac malzeme şekilllendirilmiştir. Kalıp boşluğu (offset) 0,1 mm olacak şekilde zımba tarafına verilmiştir. Daha büyük yada daha küçük kalıp boşluğu değerlerinde çekme işlemi kötüleşmiştir. Analizlerde 30 mm çapında zımba kullanılmıştır.

Sistemin yağlanmasında zımba tarafında sürtünme katsayısı 0,15, kalıp tarafında ise 0,05 olarak belirlenmiştir. Zımba tarafında sürtünme daha yüksek, kalıp tarafında ise daha düşük belirlenmiştir.

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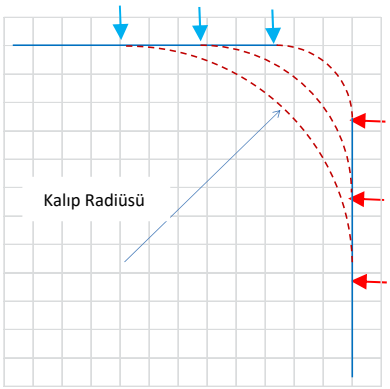
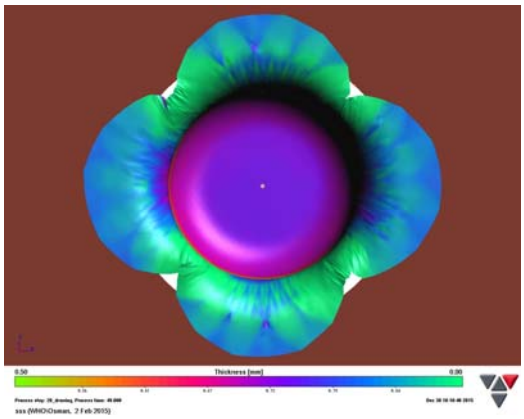


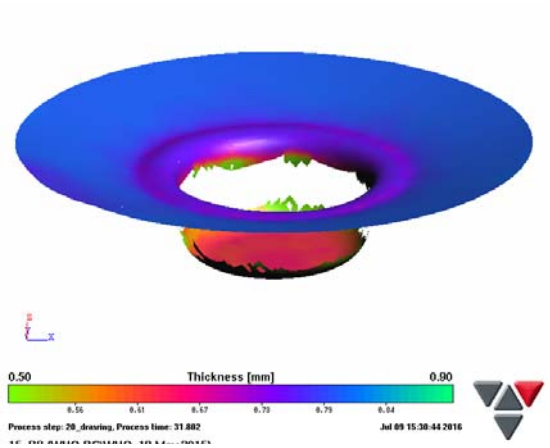
Şekil 3. Sac Malzemenin Çekillendirme Etkisinden Çıktığı Noktalar (Mavi ve Kırmızı Oklar).



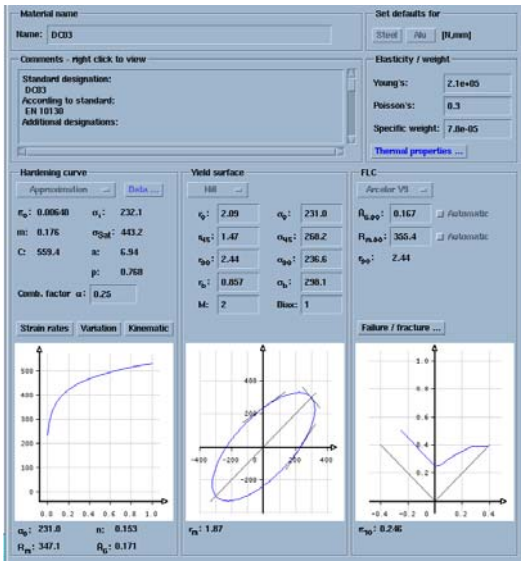
Şekil 4. Sac Malzemede Kulak Oluşumu ve Baskı Plakasının Kapama Etkisini Kaybetmesi.

Kapama esnasında zımba ve baskı plakası 1 mm/sn hızla 10 adımda hareket etmiştir. Çekme esnasında kalıp sabit tutulup baskı plakası 2 MPa baskı kuvveti ile sac malzemeyi baskılamış ve zımba 1 mm/sn çekme hızında sac malzeme çapına bağlı olmak üzere zaman basamaklaması yapılarak şekillendirme sağlanmıştır. Bu esnada sac malzemeye sabit sıvı basıncı uygulanmıştır.

Şekillendirme işlemi sac malzeme kalıp içerisine çekildiğinde, kulaklar oluşup kulak haricindeki kısımlar baskı plakası etkisinden çıktığında durdurulmuştur. Sac malzemenin bir kısmı baskı plakası etkisinden kurtulduğunda sıvı basıncı sac malzeme üzerindeki etkisini kaybetmektedir. Şekil 3'de sac malzemenin şekillendirme etkisinden çıktığı noktalar (mavi ve kırmızı oklar), Şekil 4'de sac malzemede kulak oluşumu ve baski plakasının kapama etkisini kaybetmesi durumu görülmektedir.



Şekil 5. Şekillendirme Olmadan Kesilme Meydana Gelmiş Bir Analiz Örneği.



Şekil 6. DC03 Sac Malzemenin Analiz Programındaki Teknik Özellikleri.

Şekillendirme esnasında paket programın "elastik-plastik shell" modu seçilmiştir. Diğer modlarında sac malzeme tam temsil edilememiş ve malzemede deformasyon meydana gelmiştir. Şekil 5'de şekillendirme olmadan kesilme meydana gelmiş bir analiz örneği görülmektedir. Şekil 6'da DC03 sac malzemenin analiz programındaki teknik özellikleri görülmektedir. Sac malzeminin çekme eğrisinden ve şekillendirme eğrisinden kopmadan çekilebileceğini, Anizotropi değerlerinden ise hadde yönüne bağlı olarak kulak oluşumuna neden olabileceğini görebilmekteyiz.

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Hidromekanik Derin Çekme yönetmi ile farklı kalıp açılarının sonlu elemanlar yöntemi ile analizinde kullanılan deney değişkenleri Tablo 1'de görülmektedir.

Tablo 1. Deney Değişkenleri.

Kalıp Açısı (°)	0°			5°			10°			15°		
Kalıp ve Zımba Radiüsü (mm)	4	6	8	4	6	8	4	6	8	4	6	8
Sac Malzeme İlk Çapı (mm)	72-73	77-78	79-80	72-73	77-78	79-80	73-74	78-79	80-81	73-74	78-79	80-81
Sıvı Basıncı (MPa)	10-20-30-40-50-60											
Baskı Plakası Kuvveti (MPa)	2											
Çekme Derinliği (mm)	Deneyde kullanılan sac malzemenin ilk çapına ve kalıp radiüs değerine göre değişkenlik göstermiş, sac malzeme baskı plakası etkisinden çıkıncaya kadar devam etmiştir.											

Bulgular ve Tartışma

Analizlerde 0°-15° arası kalıp açıları için 4-6-8 mm kalıp-zımba radius değerleri kullanılmıştır. Hazne basıncı olarak 10-60 MPa arası 6 farklı basınç değeri kullanılmış, deneyler esnasında baskı plakası kuvveti 2 MPa olarak sabit tutulmuştur. Çekme derinliği deneyde kullanılan sac malzemenin ilk çapına ve kalıp radiüs değerine göre değişkenlik göstermiş, sac malzeme baskı plakası etkisinden çıkıncaya kadar devam etmiştir. Sac malzeme kalınlığının 0,5 mm'ye düştüğü durumlarda analizler sonlandırılmış, 0,5 mm kalınlık miktarı analiz sonrası Kabul edilebilir sonuç olarak belirlenmiştir. Bu durumda incelme %38 olmaktadır. Sac malzemenin kesilmeden çekilebildiği değerlerin %44'leri bulduğu gözlenmiştir.

Analizlerde 6 mm kalıp-zımba radius değeri için 0-5° kalıp açılarında 2,60, 10-15° kalıp açıları için 2,63 derin çekme oranı elde edilmiştir. Hidromekanik derin çekme analiz sonuçları Şekil 7'de sunulmuştur. Kalıp Açısı arttıkça daha fazla çekme oranına ulaşılabilmiştir. Analizde çekme oranının tek başına yeterli olmadığı çekme derinliğinin değerlendirilmesinin daha faydalı olacağı görülmüştür. Kalıp açısına bağlı olarak çekme derinliğinin artmasından çekme oranının artacağı görülmektedir. 6 mm kalıp-zımba radius değeri için 0° kalıp açısında 33 mm çekme derinliğine ulaşılabilirken 15° kalıp açısında 36,977 mm çekme derinliğine ulaşılmıştır.

0° Kalıp Açısı için; 4 mm Kalıp-Zımba radiüs değerinde 32 mm çekme derinliğine, 6 mm Kalıp-Zımba radiüs değerinde 33 mm çekme derinliğine ve 8 mm Kalıp-Zımba radiüs değerinde 30 mm çekme derinliğine ulaşılmıştır. 6 mm kalıp radius değerinde daha fazla çekme derinliğin ulaşılmış, Radiüs değerinin 8 mm'ye çıkması ile sac malzemenin baskı yastığı etkisinden kurtulmasından dolayı daha büyük çap çekilmesine ragmen etkili çekme derinliği azalmış, 4 mm radius değerine göre daha düşük çekme derinliği elde edilebilmiştir. 4 mm radius değerinde ise sac malzeme çekilmeden kesilme meydana geldiğinden çekilebilir sac malzeme ilk çapı düşmüştür. İdeal şekillendirme 6 mm kalıp radius değerinde meydana gelmiştir.

5° Kalıp Açısı için; 4 mm Kalp-Zımba radiüs değerinde 32,3 mm çekme derinliğine, 6 mm Kalıp-Zımba radiüs değerinde 34,47 mm çekme derinliğine ve 8 mm Kalıp-Zımba radiüs değerinde 32,65 mm çekme derinliğine ulaşılmıştır. 6 mm kalıp radius değerinde daha fazla çekme derinliğin ulaşılmış, Radiüs değerinin 8 mm'ye çıkması ile sac malzemenin baskı yastığı etkisinden kurtulmasından dolayı daha büyük çap çekilmesine ragmen etkili çekme derinliği azalmıştır. 4 mm radius değerinde ise sac malzeme çekilmeden kesilme meydana geldiğinden çekilebilir sac malzeme ilk çapı düşmüştür. İdeal şekillendirme 6 mm kalıp radius değerinde meydana gelmiştir. Kalıp açısının artmasından dolayı 8 mm radius değerindeki şekillendirmede 0°'dekine göre çekme derinliğinde artış meydana gelmiştir.

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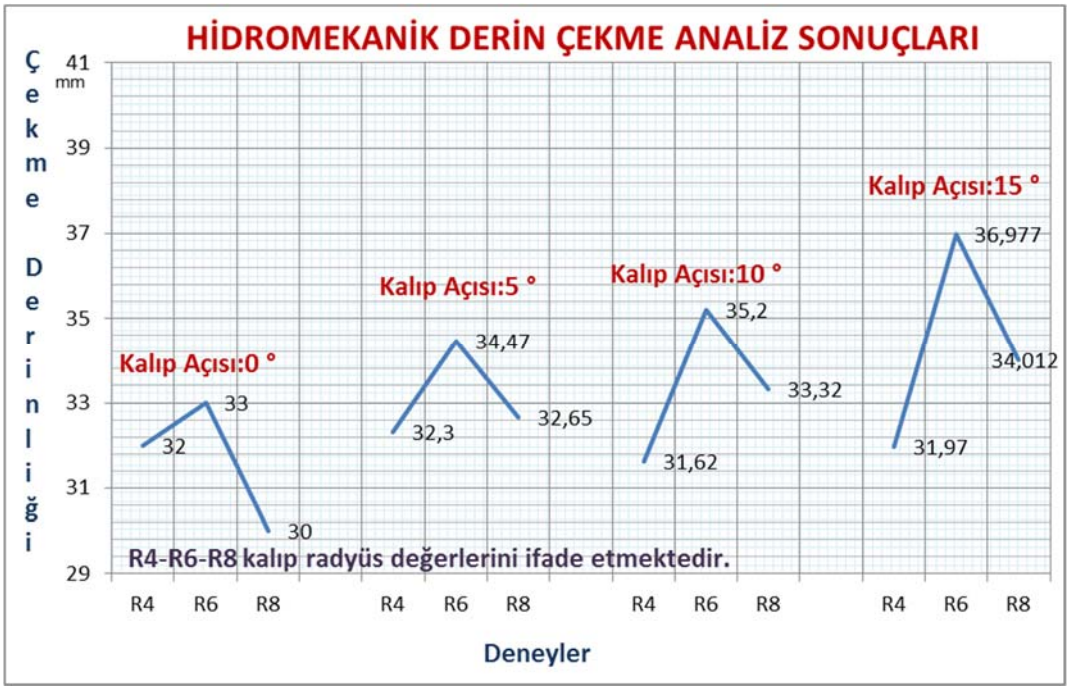

Şekil 7.Hidromekanik Derin Çekme Analiz Sonuçları.

10° Kalıp Açısı için; 4 mm Kalp-Zımba radiüs değerinde 31,62 mm çekme derinliğine, 6 mm Kalıp-Zımba radiüs değerinde 35,2 mm çekme derinliğine ve 8 mm Kalıp-Zımba radiüs değerinde 33,32 mm çekme derinliğine ulaşılmıştır. 6 mm kalıp radius değerinde daha fazla çekme derinliğin ulaşılmıştır.

15° Kalıp Açısı için; 4 mm Kalp-Zımba radiüs değerinde 31,97 mm çekme derinliğine, 6 mm Kalıp-Zımba radiüs değerinde 36,977 mm çekme derinliğine ve 8 mm Kalıp-Zımba radiüs değerinde 34,12 mm çekme derinliğine ulaşılmıştır.

15° Kalıp Açısında ve 6 mm kalıp radius değerinde diğer kalıp açılarına ve kalıp-zımba radiüs değerlerine göre en fazla çekme derinliğine ulaşılmıştır.

15° Kalıp Açısında ve 8 mm kalıp radius değerinde 2,7 ile en fazla çekme oranına ulaşılabilirken en fazla faydalı çekme derinliğine 15° Kalıp Açısında ve 6 mm kalıp radius değerinde ulaşılmıştır.

Hidromekanik Derin Çekme yöntemi ile farklı kalıp açılarının sonlu elemanlar yöntemi ile analizi sonucunda elde edilen Çekme Kuvveti değerleri, Şekillendirme Sınır Diyagramı ve çekilen parça örnekleri Şekil 8'de sunulmuştur. Şekil 8'de 15° kalıp açısında 6 mm kalıp radiüsünde ve 2,63 çekme oranında 36,977 mm faydalı çekme derinliğinde elde edilen sonuçlar bulunmaktadır. Proses data'sında zamana bağlı olarak kalıp, zımba ve baskı yastığı kuvveti değerleri görülmektedir. Analiz programı analiz esnasında baskı yastığının açılmasına müsade etmeyecek kuvvet artışını gerçekleştirmiştir.

Şekillendirme sınır diyagramında şekillendirme eğrisinin sol tarafına ve eğrinin hemen üzerinde şekillendirme olduğu daha çok çekme- çekme yerine çekme-basma şeklinde şekillendirme meydana geldiği görülmektedir.

DC03 sacı için 4 adet kulaklanma meydana geldiği, kulaklanma bölgesinde kalınlık artışı olduğu diğer bölgelerde ise incelme meydana geldiği görülmektedir. Sac malzemenin baskı plakası etkisinden kurtulmasıyla analizin sonuçlandığı görülmektedir.

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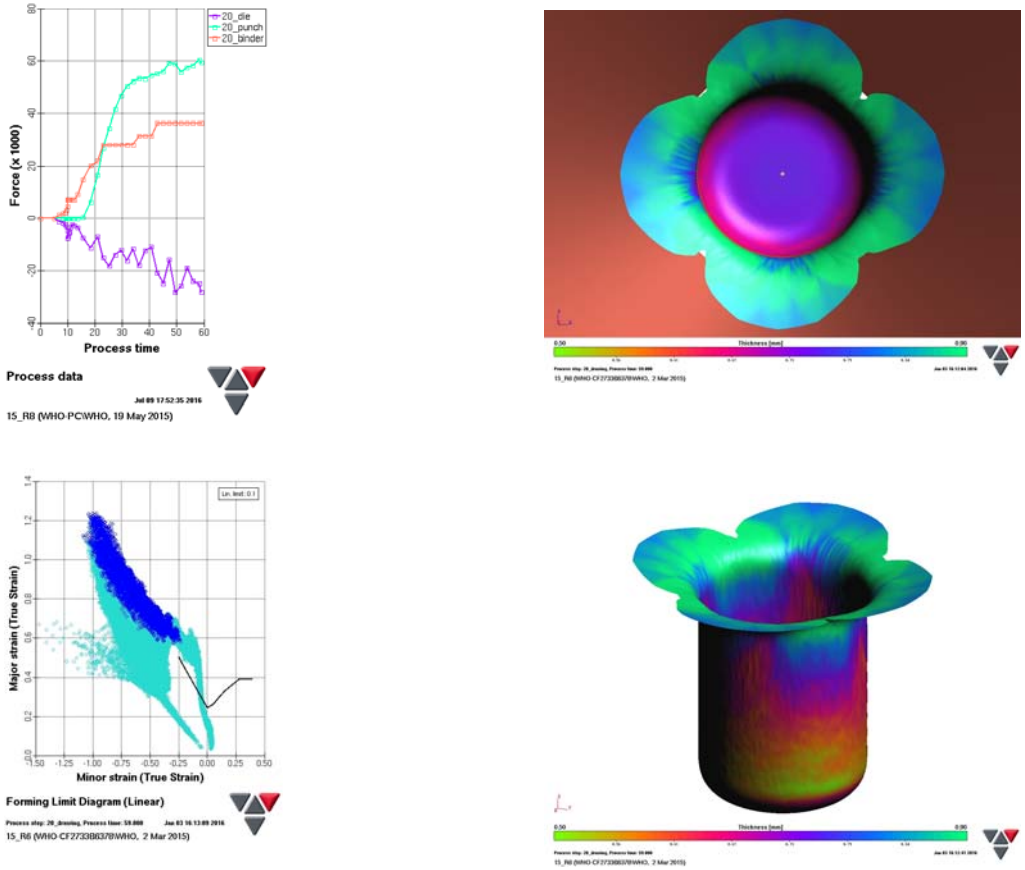

Şekil 8. Hidromekanik Derin Çekme Yöntemi ie Farklı Kalıp Açılarinin Sonlu Elemanlar Yöntemi ile Analizi Sonucunda Elde Edilen Çekme Kuvveti Değerleri, Şekillendirme Sınır Diyagramı ve Çekilen Parça Örnekleri.

Sonuçlar

Kalıp açısının artmasıyla; yüksek radius değerlerinde daha fazla çekme derinliğine, doğal olarak çekme oranına ulaşılabildiği, düşük radius değerlerinde ise çekme derinliğinde herhangi bir artış olmadığı gözlenmektedir. 4 mm radius değerinde 32 mm civarı toplam çekme derinliği elde edilebilirken, 6 mm radius değerinde kalıp açısının artmasına bağlı olarak 33 mm'den 36,977'ye ve 8 mm radiüs değerinde aynı şekilde kalıp açısının artmasına bağlı olarak 30 mm'den 34,012 mm'ye artma meydana geldiği görülmektedir.

Elde edilen derin çekme oranı değerlerinin Özek'in çalışmaları ile uyumlu olduğu görülmektedir. Özek çalışmalarında 15° kalıp açısı için 2,32 kare kalıp derin çekme oranı elde etmiştir. Buradaki çalışmada 15° kalıp açısı için silindirik derin çekmede 2,63 derin çekme oranına ulaşılmıştır.

En fazla çekme derinliğine 15° kalıp açısında ve 6 mm Kalıp-Zımba radiüs değerinde ulaşılmıştır. Analizlerden, kalıp açısının artması ile derin çekme oranının ve derinliğinin arttığı, Kalıp-Zımba radiüs değerinin ise 6 mm'de en iyi sonuç verdiği görülmüştür.

Hidromekanik derin çekmede 2,63 derin çekme oranı elde edilerek literatürde elde edilen 2,32 derin çekme oranlarının çok üzerinde çekme oranı elde edilebilmiştir.

Analiz sonuçlarının literatürde yapılmı olan Savaş ve Özek'in çalışmaları ile mukayesesi yapıldığında Sonlu elemanlar yöntemi ile analizde gerçek deney şartlarına yakın sonuçlar elde edildiği bu kapsamda gerçek üretim aşamasına geçmeden sonlu elemanlar yöntemi ile analiz yapan paket programlardan elde edilecek sonuçların optimum üretim şartlarını elde etmede büyük fayda sağlayacağı, zaman, malzeme ve maliyet kaybını en aza indireceği görülmektedir.

Teşekkürler

Bu çalışmanın sonlu elemanlar yöntemi ile analizi süreçlerinde emeği geçen Gurupotomasyon'a şükranlarımızı sunarız.

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Kaynaklar

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HM-CFRP İLE GÜÇLENDİRİLMİŞ KOMPOZİT KİRİŞLERİN YÜKLEMEDEN BAĞIMSIZ KAPASİTE ANALİZİNDE YENİ BİR YAKLAŞIM

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Özet: Günümüzdeki bazı yapılar çeşitli sebeplerden dolayı güçlendirme ihtiyacı doğabilmektedir. Güçlendirilmedeki başlıca sebepler arasında, hesaplarda küçük alınmış yükler, gerçek yük değerlerine karşı dayanıklılığı arttırmak, işlev değişimi veya iyileştirme nedeniyle yük taşıma kapasitesini arttırmak, yetersiz detaylandırmaya bağlı ortaya çıkan erken kırılmaları önlemek, korozyon veya yaşlanmayla oluşan bozulmalara bağlı yük taşıma kapasitesinde meydana gelen kayıpları ortadan kaldırmak gibi etkenler sayılabilir. Çelik köprülerde ise, güçlendirme durumu daha çok elemanlardaki paslanmadan ve trafik yüklerindeki artıştan dolayı olmaktadır. Bilimin yeni malzeme arayışı ile fiber teknolojisinin güçlendirme alanına girmesi ile FRP malzemelerinin korozyona dayanıklı olması ve özellikle çelik köprü kirişlerinin devamlı korozyona maruz kalmalarından dolayı FRP malzemesi tercih sebebi olmaktadır. Ancak yeni malzemelerin sağladığı yararların anlaşılabilmesi için deney yapılması gerekmektedir. Çelik, epoksi ve fiber takviyeli malzemeden oluşan güçlendirilmiş kirişlere ait deneysel çalışmalar zaman ve parasal yönden ekonomik olmamaktadır. Bu gibi durumlarda numerik modeller hazırlanıp doğrulanarak parametrik çalışmalar yürütülebilmektedir. Bu çalışmadaki numerik model, deneysel çalışma ile doğrulanmış daha sonra parametrik çalışmalar yapılmış ve YSA ile test edilmiştir. Çalışmanın numerik modellemesinde ABAQUS sonlu eleman modeli kullanılmıştır.

Anahtar Kelimeler: HM-CFRP, ABAQUS, Yapay Sinir Ağları, Çelik

Giriş

Bilimin yeni malzeme arayışı ile fiber teknolojisinin güçlendirme alanına girmesi, güçlendirmede yeni bir sayfa açmıştır. FRP malzemelerinin korozyona dayanıklı olması ve özellikle çelik köprü kirişlerinin devamlı korozyona maruz kalmalarından dolayı ayrı bir tercih sebebi olmaktadır. FRP malzemesi, ince ve hafif olması nedeniyle sistemin ağırlığını fazla artırmamaktadır. Ayrıca yorulmamın sebep olduğu çatlakları da önlemektedir. Bu nedenle güçlendirme tekniği olarak FRP malzemesinin kullanılması bir avantaj daha sağlamaktadır.

Çeliğin betonarmeden daha dayanıklı bir malzeme olmasından dolayı, güçlendirilmesinde kullanılacak FRP malzemesinin de betonarmenin güçlendirilmesinde kullanılan FRP malzemelerinden daha yüksek dayanıma sahip olması gerekmektedir. Karbon Takviyeli Polimer (CFRP), çeliği güçlendirmede yeterli olamamaktadır. İstenilen performansa erişebilmek için fazla miktarda CFRP kullanılması gibi bir sorun karşımıza çıkmaktadır. Bu soruna, son zamanlarda üretilen HM-CFRP'nin çözüm olacağı düşünülmektedir. Yapılan literatür araştırmalarında, ülkemizde bugüne kadar çelik kirişlerin güçlendirilmesinde HM-CFRP'nin kullanıldığı çalışmaya rastlanmamıştır. Ülkemizin deprem kuşağında yer alması ve 2003 yılı itibarı ile sadece demiryollarımızda 1432 adet çelik köprü olması, bu konuda araştırma yapılması için bir teşvik kaynağı olmuştur.

Yapı elemanlarının FRP tekstiller ve kompozit laminatlar ile güçlendirilmesi ile ilgili Türkiye Deprem Yönetmeliğinde (DBYBHY-2007) betonarme kolonların ve kirişlerin güçlendirilmesi konusunda kurallar yer alırken, çelik yapıların güçlendirilmesine değinilmemiştir. Yurt dışında bu malzemelerin kullanımına yönelik ACI 440'ta taslak bir yönetmeliğin varlığının yanı sıra, İngiltere Karayolları İdaresi tarafından kullanılan bir takım kurallar yer almaktadır. Ayrıca, kompozit malzemelerin betonarme elemanlara yapıştırılarak güçlendirilmesi ile ilgili Avrupa Birliği bünyesinde EUROCOMP tasarım ve el kitabı da mevcuttur.

FRP ile güçlendirilmiş çelik kirişlerin dayanımlarında, kullanılan FRP'nin boyu, kullanılan yapıştırıcı türü, FRP kalınlığı önemlidir(Ağcakoca 2012, Hollaway 2002, Colombi 2006, Tavakkolizadeh 2001). Ayrıca FRP malzemesi sadece köprü elemanlarında değil aynı zamanda iletişim kuleleri gibi farklı tür yapıların dayanımlarında istenilen artışı sağlayabilmektedir(Tavakkolizadeh, 2001).

Literatürde yapay sinir ağları ile birçok alanda çalışma yapılmıştır. YSA İnşaat Mühendisliği alanında mevcut yapıların deprem performansının belirlenmesinde(Garip,2012), yapıların deprem güvenliklerinin belirlenmesinde(Koyuncu, 2009), doğrusal ve doğrusal olmayan yapıların kontrol edilmesinde(Kim,2000), yapı hasarlarının belirlenmesinde(Marwala,2000) yapıların dinamik analizlerinin daha hızlı ve güvenilir

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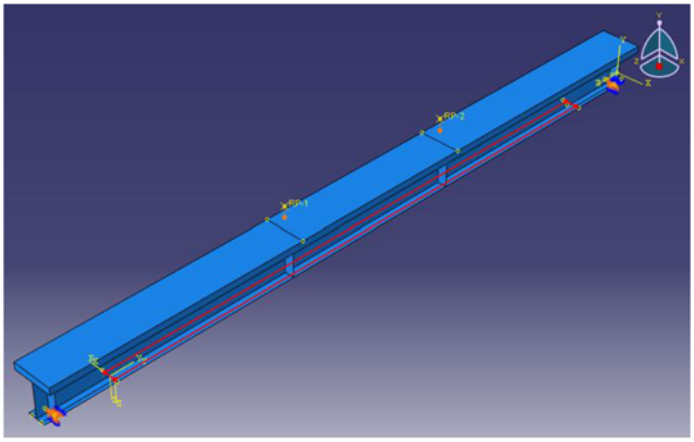
yapılabilmesinde(Çağlar,2002) deprem etkisindeki binaların yapı zemin etkileşimi ile ilgili sorunların çözümünde(Pala,2004)kullanılmıştır.
Bu çalışmada farklı boy ve kalınlıkta kullanılan HM-CFRP ile güçlendirilen çelik kirişlerin sonlu eleman modeli ABAQUS yardımı ile oluşturulmuş, kirişlerin güçlendirme sayesinde artan moment taşıma kapasiteleri bulunarak bu artış YSA ile test edilmiştir.

Solu Eleman Metodu

Sonlu elemanlar metodları (SEM), analitik olarak çözümü mümkün olmayan veya çeşitli mühendislik problemlerine kabul edilebilir bir yaklaşımla çözüm arayan sayısal çözüm yöntemidir. Sonlu elemanlar yönteminin daha etkin ve yaygın kullanımı bilgisayar teknolojisindeki gelişmelere paralel olarak sağlanmıştır. İlk kullanımı 1950' li yıllara dayanan sayısal çözüm yöntemi daha çok yapı sistemleri için geliştirilmiş olsa da dayandığı esasların genellikle zemin mekaniği, uçak mühendisliği gibi birçok mühendislik alanında problemlerin çözümünde kullanılmaktadır. Sonlu elemanlar analizi yapının belli parçalarını bölen, malzeme özelliklerine sahip ve sınır şartları olan bir sistemdir. Bu tür bilgisayar programlarından biri olan ABAQUS doğrusal ve doğrusal olmayan problemlerin çözümünde kullanılmaktadır. Programında implicit ve explicit olarak 2 farklı çözüm yöntemi vardır. Implicit çözümler, explicit çözümlere göre genellikle daha az işlem adımıyla çözüm yapmaktadır. Dolayısıyla implicit metod, explicit çözüme göre daha kısa zamanda çözüm olanağı sunmakta ancak daha genel sonuçlar vermektedir. Bu çalışmada ise hassas çözüm gerektiren kompozit eleman davranışı incelerken ABAQUS/Explicit kullanılanılmıştır.
Doğrulanması yapılan kiriş numerik modelinde çelik malzeme, ideal elasto-plastik malzeme davranışına göre tanımlanmıştır. HM-CFRP malzemesi ise çekme kırılmasının etkin olduğu bir malzeme olduğu için, ABAQUS sonlu elemanlar programında modellenirken gevrek kırılma malzeme davranışını temsil eden "brittle cracking" malzeme modeli kullanılmıştır. Yani HM-CFRP malzemesi doğrusal olmayan gevrek malzeme olarak modellenmiştir. HM-CFRP malzemesi maksimum çekme gerilmesine kadar lineer elastik kabul edilmiştir. Yapıştırıcı elemanlar için yine sonlu eleman modellemesinde kullanılan ara yüzlerden faydalanılmıştır. Yapıştırıcı elemanlar, ABAQUS eleman kütüphanesinden COH3D8 ile tanımlanmıştır. Yapıştırıcı eleman her iki yüzeyde bulunan çelik ve HM-CFRP elemanlarına bağ olarak isimlendirilen elmanlarla sayesinde birlikte çalışması sağlanmıştır. ABAQUS programında oluşturulan HM-CFRP'li kiriş elemanı için, malzemelerin mekanik özellikleri yapılan deneylerle belirlenerek ABAQUS programında Tablo 1'de gösterildiği şekilde tanımlanmıştır.

Tablo 1: Malzemenin mekanik özellikleri

HM-CFRP		Çelik (I-Kiriş)			Epoksi	
Kopma Gerilmesi (MPa)	1200	Başlık	Akma Gerilmesi (MPa)	275	G, Modül (GPa)	10720
E. Modül (GPa)	440		E. Modül (GPa)	179	E. Modül (GPa)	29770
Genişlik (mm)	50	Gövde	Akma Gerilmesi (MPa)	265	σ.Normal (MPa)	25
Kalınlık(mm)	1.4		E. Modül (GPa)	161		
			Poison Oranı	0.3		



Şekil 1. Çelik kirişin sonlu eleman modeli

Tablo 1'de malzeme özellikleri verilen çelik kiriş, çelik plaka ve HM-CFRP'nin numerik modeli Şekil 1'de görülmektedir

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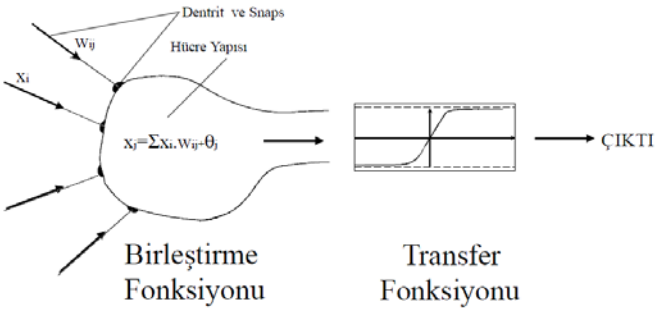
YSA

YSA, çalışma prensibi olarak insan beynini ve sinir sisteminin mimarisini kendine model edinmiş yapay bir sistemdir. Öğrenme ve genelleştirme özelliği, yapay sinir ağlarının en önemli özelliğidir. YSA, mevcut örnekleri kullanarak, herhangi bir problemin nedenleri ve sonuçları arasındaki ilişkiyi öğrenebilmektedir. Mevcut örneklerle eğitilmiş YSA modeli daha önce hiç karşılaşmadığı problemleri çözebilmektedir.

YSA modeli, birbirine bağ ağırlıkları ile bağlı, bir girdi katmanı, bir veya daha fazla gizli katman ve bir çıktı katmanından oluşmaktadır. Gizli katman sayısı ve bu katmanlarda bulunacak işlem elemanı sayısı, deneme yanılma yöntemi ile belirlenmektedir. Bu aşamada dikkat edilmesi gereken husus ağ hatasının minimum olması ve öğrenme hızının maksimum olmasıdır.

Yapay sinir ağlarının en temel birimi işlem elemanıdır. Bir işlem elemanı girdiler, ağırlıklar, birleşme fonksiyonu, transfer fonksiyonu ve bir çıktı olmak üzere beş elemandan oluşmaktadır. YSA modeli oluşturulurken girdiler seçilen bir birleştirme fonksiyonunda işlenir ve transfer fonksiyonuna iletilir. Bu elde edilen bilgi transfer fonksiyonu ile işlenerek işlem elamanının çıktısı oluşturulur. İşlem elemanın çıktısı diğer işlem elemanlarına gönderilir (Şekil 2).



Şekil 2. Bir işlem elemanın yapısı

Sayısal Çalışma

Bu çalışmada,I kesitli Çelik-Betonarme kompozit kirişlerin HM-CFRP ile onarım ve güçlendirilmesine yönelik geliştirilen nümerik metot ile elde edilen veriler yüklemeden bağımsız kapasite belirlemesinde yeni bir yaklaşım olarak yapay sinir ağları kullanılmıştır. Nümerik yöntemle elde edilen verilerin daha hızlı, güvenilir ve ekonomik alternatif bir yöntemle doğrulanması amaçlanmıştır. Bunun için YSA tabanlı bir değerlendirme modeli oluşturulmuştur.

Tablo 2'de verilen girdi bilgileri kullanılarak YSA tabanlı değerlendirme modelinde nümerik yöntemle elde edilen veriler tahmin edilmeye çalışılmıştır. Bu amaçla deneysel veriler kullanılarak 127 farklı nümerik model eğitim seti ve 20 farklı nümerik model test seti olacak şekilde belirlenmiştir. Test setinde kullanılan veriler eğitim setinde kullanılmamıştır. YSA tabanlı değerlendirme modeli 30000 iterasyon yapılarak eğitim seti ile eğitilmiş ve test seti ile test edilmiştir.

YSA tabanlı değerlendirme modelinin mimarisi 1 adet girdi katmanı, 2 adet gizli katman ve 1 adet çıktı katmanı ile oluşturulmuştur. Katmanlardaki işlem elemanlarının dağılımı, girdi katmanında 11 adet, 1. gizli katmanda 20 adet, 2. gizli katmanda 10 adet, çıktı katmanında 1 adet olarak belirlenmiştir (Şekil 3). YSA tabanlı değerlendirme modelinin mimarisinde gizli katman sayısı ve katmanlardaki işlem elemanı sayıları deneme yanılma yöntemi ile belirlenmiştir.

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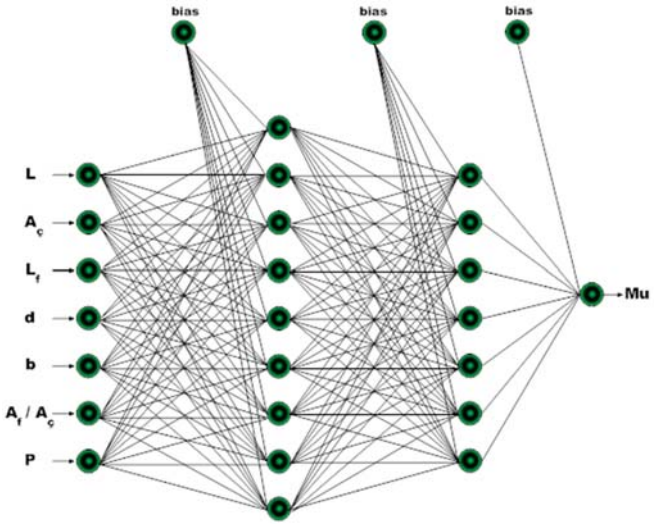
Tablo 2. YSA tabanlı değerlendirme modelinin girdi ve çıktı katmanındaki veriler (Eğitim ve Test Seti)

	Girdi ve Çıktı Parametreleri	simge	birim	minimum	maksimum	normalizasyon işlemi bölenleri
Girdiler	IPE	S		120	500	500
	Çelik Levha Kalınlığı	d_s	mm	110	380	400
	Çelik Levha Yüksekliği	h_s	mm	30	80	100
	IPE Taban Genişliği	w_s	mm	64	200	200
	Kiriş Uzunluğu	L	mm	3000	12000	12000
	Profil Alanı	A_s	mm^2	1320	11600	12000
	Faydalı Mesafe	d	mm	900	3600	3700
	FRP Uzunluğu	L_f	mm	2600	10400	10500
	FRP Kalınlığı	d_f	mm	0.93	11.92	12
	FRP Genişliği	b	mm	50	150	200
	FRP A./ Profil A.	A_f / A_s		1.70	22.40	25
Çıktı	Moment Artışı	Mu	%	0.00	109	110



Şekil 3. YSA tabanlı değerlendirme modelinin mimarisi

YSA tabanlı değerlendirme modelinde sigmoid fonksiyonu transfer fonksiyonu olarak kullanıldığı için tüm veriler 0 ile 1 arasında normalize edilmiştir. YSA tabanlı değerlendirme modelinin yapısı geri beslemeli olarak tasarlanmıştır.

YSA modelinin performansı belirlenirken; gerçeğe en uygun değerler için eğitim ve test seti verilerinin R^2 (determinasyon katsayısı) değerlerinin birbirine yakınlığı ve 1'e yakın olması (regresyon doğrusunun etrafında dağılması) dikkate alınmıştır. YSA tabanlı değerlendirme modeli ile elde edilen tahminlerin 45^0 açı yapan doğrunun üzerinde olması modelin istenen sonuçları tahmin ettiğini göstermektedir. Bu doğru üzerinden sapmalar olması durumunda istenen değerlerden uzaklaşmaları göstermektedir (Şekil 4,5).

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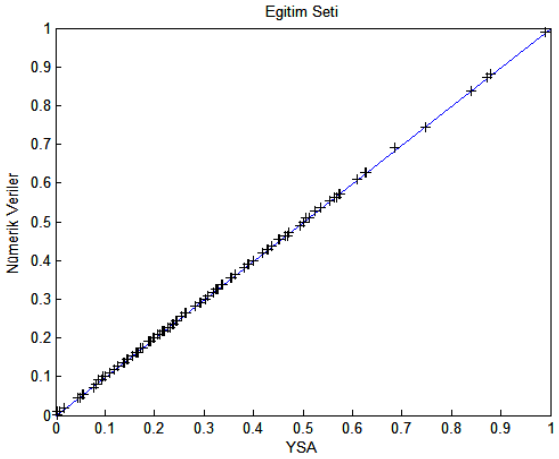
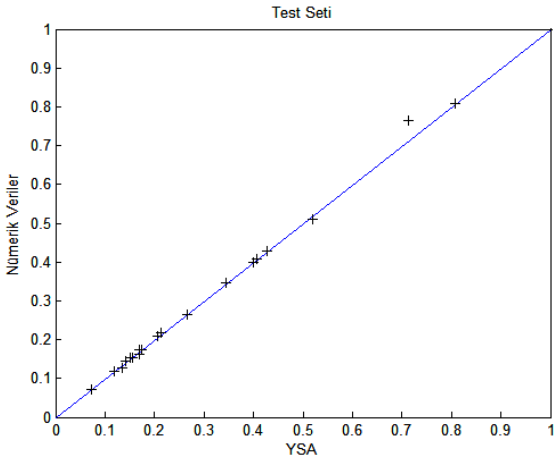


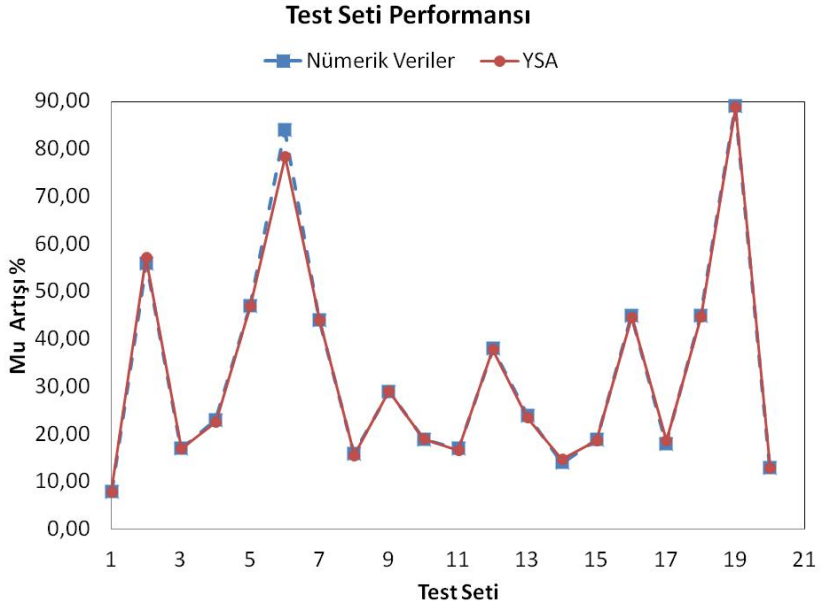
Şekil 4. YSA tabanlı değerlendirme modelinin eğitim setinin performansı



Şekil 5. YSA tabanlı değerlendirme modelinin test setinin performansı

Sonuçlar

I kesitli Çelik- Betonarme kompozit kirişlerin HM-CFRP ile onarım ve güçlendirilmesine yönelik geliştirilen nümerik metot kullanılarak elde edilen veriler ile eğitilen ve test edilen YSA tabanlı değerlendirme modeli yaklaşık olarak %80 doğrulukla nümerik verileri yakalamıştır. Test setindeki 20 nümerik veriden 16 tane veriyi yakalamış olduğu sadece 4 nümerik veri değerinde sapma yaptığı gözlemlenmiştir (Şekil 6 ve Tablo 3).



Şekil 6. YSA tabanlı değerlendirme modelinin test setinin performan

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Tablo 3. YSA tabanlı değerlendirme modelinin nümerik veriler ile karşılaştırılması

No	*Nümerik Veri*	*YSA*	$\frac{Nümerik Veri}{YSA}$	No	*Nümerik Veri*	*YSA*	$\frac{Nümerik Veri}{YSA}$
1	10.0000	12,7827	0,782307	11	29.0000	26,6849	1,086757
2	82.0000	82,3795	0,995393	12	10.0000	70,2353	0,142379
3	17.0000	19,9173	0,853529	13	22.0000	4,2077	5,22851
4	4.0000	41,9496	0,953525	14	27.0000	21,2446	1,270911
5	16.0000	15,595	1,02597	15	33.0000	37,4825	0,880411
6	47.0000	47,1121	0,997621	16	17.0000	0,4705	36,13177
7	21.0000	20,3637	1,031247	17	24.0000	23,8987	1,004239
8	21.0000	20,7692	1,011113	18	55.0000	49,6551	1,107641
9	48.0000	47,5641	1,009164	19	50.0000	50,7806	0,984628
10	50.0000	56,7491	0,881071	20	59.0000	56,7583	1,039496

YSA tekniğinin, varsayımlar ve kabuller yapmadan problemi direk örneklerden öğrenmesinden dolayı diğer yöntemlerle kıyaslandığında birçok üstünlüğü bulunmaktadır. YSA tekniği kullanılarak I kesitli Çelik- Betonarme kompozit kirişlerin HM- CFRP ile onarım ve güçlendirilmesinde daha hızlı, güvenilir ve ekonomik sonuçlar elde edilebilir.

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HYBRID IMPRINTED MEMBRANES AS TOOLS FOR SELECTIVE RECOGNITION OF QUERCETIN

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The imprinting technique [1] was exploited for developing Hybrid imprinted membranes for the specific recognition of the flavonoid quercetin (QCT).

Flavonoids represent a class of natural antioxidants that increase the lifetime period and the nutrition value of food. They exhibit also a protection against cardiovascular diseases and cancer [2] as well as anti-allergic, anti-inflammatory, and anti-viral functions. These compounds are present in natural complexes matrices and during the production process are transferred to beverages. Since their low concentration in these matrices, new efforts are required for developing innovative techniques aimed at sample enrichment and purification. In this perspective, molecularly imprinted membranes (MIMs) are potential tools to facilitate selective analyte isolation from these matrices. MIMs are advanced functional membranes with high specificity and selectivity toward a molecule of particular interest called template. This peculiarity is due to the presence of specific recognition sites in the membrane, which are complementary to the template in chemical function, shape and size. These sites contain the molecular memory of the template and are introduced into a membrane by means of the molecular imprinting technique [3].

Aim of this work was to extend some advances of this technique to develop novel imprinted membranes towards quercetin by hybridizing cross-linked imprinted polymer powders into a poly(ether ether ketone) PEEK-WC support matrix [4]. Different membranes were prepared varying the amount of the imprinted polymer in the hybrid system (10-30 wt.%). For each membrane, binding capacity towards QCT and the selectivity against the structurally related compounds chrysin (CRY) and naringin (NR), was investigated by performing binding experiment in a filtration cell.

The highest binding capacity (12.0 μmol/$g_{memb.}$) was exhibited by the membrane containing the 25 wt. % of MIP particles. Referring to this membrane, the selectivity These results are encouraging for a potential employment of the novel QCT-imprinted membranes in pre-concentration and/or clean-up of this potent antioxidant and valuable flavonoid.

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Keywords: Membrane technology, molecular imprinting, bioactive compounds, solid-phase-exrtraction.

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HYBRID MATERIALS OF TRANSITION METAL DICHALCOGENIDES AND REDUCED GRAPHENE OXIDE

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The rapid progress in graphene research has led to intensive exploration of novel 2D materials. In particular, transition metal chalcogenides with layered structures have received significant attention because they offer many opportunities for fundamental and technological research in a variety of fields, including catalysis, energy storage, sensing, and electronic devices. In this talk, I demonstrate how to prepare various transition metal chalcogenides/reduced graphene oxide (rGO) composites such as VS_4/rGO, CoS_2/rGO, and WS_2/rGOby a simple hydrothermal method. In the experimental condition that In particular, an interesting thing is that $VS_4$was selectively synthesized on graphitic layer such as rGO. In the same experimental condition without rGO, only VS_2 was synthesized. Furthermore, I introduce that VS_4/rGO and WS_2/rGO can be promising functional materials for Li storage and hydrogen evolution, respectively.

Keywords: reduced graphene oxide, transition metal dichalcogenides, hybrid, hydrogen evolution reaction

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HYDROGEN ADSORPTION PROPERTIES ON NATURAL ZEOLITES FROM BIGADIC AND GORDES REGIONS

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Abstract: In this study, hydrogen adsorption properties of the clinoptilolite rich zeolite tuff, from Bigadic and Gördes (Turkey) were investigated. Zeolites are microporous crystalline aluminosilicates with a framework formed by a three-dimensional network of SiO_4 and AlO_4 tetrahedra linked together by common oxygen atoms. In zeolite structure, some of the Si^{4+} is replaced by Al^{3+}, giving rise to a negative charge balanced by exchangeable cations such as Na^+, K^+, Ca^{2+} etc., in the framework. The adsorption of gases by microporous solids has shown to great potential in the fields of gas separation, gas storage and environmental problems. The demand for an alternative to fossil fuels is escalating due to the increasing problem of global warming and climate change. Bigadic and Gördes clinoptilolite-rich minerals were crushed into small pieces from rock forms and then powdered in a mortar. After sieved through 63 micrometer < samples collected from under the sieve were used in the hydrogen adsorption study.Samples of 5.0 g of clinoptilolite-rich minerals were activated by washing with 100 ml of 0,1M HCl solution followed by a washing in de-ionized water. These washed zeolites were dried in an oven at 110 °C for 16 h. Hydrogen adsorption isotherms of clinoptilolite samples were obtained by a static volumetric method. XRF, XRD, SEM and nitrogen adsorption methods were used for the characterization of the zeolites. BET, DFT and *t*-plot methods were applied in the analysis of nitrogen adsorption data. Hydrogen adsorption isotherms for both adsorbents at 77 K were obtainedat pressures up to 100 kPa. It was found that natural clinoptilolite (G-CLN.) obtained from Manisa–Gördes is more suitable adsorbent forhydrogen storage than natural clinoptilolite (B-CLN.) from Bigadic.

Keywords: zeolites, clinoptilolite, adsorpsiyon, hydrojen, XRD, SEM, N_2 adsorption.

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Abstract: IEEE 802.11 kablosuz ağlarında gecikmeye duyarlı multimedya çerçeveleri hattı ele geçirmek için diğer çerçevelerle eşit koşullarda yarıştığından, çerçevelerin beklenenden geç iletimi ve dolayısıyla düşük servis kalitesi (QoS) problemiyle yüzleşmektedirler. Bu problemin çözümü için IEEE tarafından 802.11e standardı getirilmiş ve ses, video ve data çerçevelerine farklı backoff aralığı imkanı sunulmuştur. Yalnız, IEEE 802.11e standardı, yoğun trafiğe sahip kablosuz ağlarda, çerçevelerin yüksek çarpışma ihtimalinden dolayı, iletilen çerçevelerin çarpışmalar sonucu tekrar tekrar iletilmesi ve çerçevelerin karşı tarafa çok geç ulaştırılması sorununu çözememektedir. Bu problemin çözümü için bu çalışma kapsamında kullanıcı-taraflı geri-bildirime dayanan yeni bir hızlı çerçeve iletimi yaklaşımı önerilmektedir. Önerilen yöntemde, hattaki bir ses veya video çerçevesi başka bir çerçeve ile çarpışmış ise, çarpışan ses/video çerçevesi için ACK_timeout süresi dolmadan hatta bir geri-bildirim yapılmaktadır. Bu geri-bildirim ile; hatta bir çarpışma olduğu ve bu çarpışma sonucu bir multimedya çerçevesinin gecikeceği ağdaki diğer tüm kullanıcılara bildirilir. Bu sayede hattaki istasyonların backoff aralığını en az bir slot kaydırmaları ve çarpışan multimedya istasyonunun da çerçevesini hattı ele geçirmek için diğer istasyonlarla yarışmadan (zaman kaybetmeden) tekrar iletmesi sağlanır. Önerilen yöntemde kullanıcıların kanala yolladıkları geri-bildirim çerçeveleri, kablosuz ağ standardında belirlenen CTS (clear-to-send) çerçeveleri olduğu için, IEEE 802.11 kablosuz ağ standardında herhangi bir değişikliğe veya eklentiye ihtiyaç duyulmamaktadır. Bu sayede önerilen çalışma kolayca cihazlar üzerine yazılımsal olarak yüklenebilir.

Keywords: IEEE 802.11 Kablosuz Ağları, Hızlı tekrar çerçeve iletimi, QoS

Introduction

Gecikmeye duyarlı gerçek zamanlı multimedya uygulamaları için servis kalitesi (QoS) desteği hem eknik hem de ticari açıdan önemli bir konudur. Örneğin, yüksek çerçeve kayıpları ve çerçeveler arası gecikme süreleri VoIP uygulamalarının ses kalitesini önemli ölçüde düşürür. Kablosuz ağlarda [1] link katmanında kullanılan tekrar iletim mekanizması sayesinde gönderilemeyen çerçevelerin tekrar gönderim teşebbüsüyle, çerçeve kayıpları minimuma indirilmektedir. Yalnız, bu işlemde çerçeve kayıp oranıyla çerçeveler arası gecikme süreleri arasında bir mübadele söz konusudur. Çerçeve kayıpları azaltıldıkça, gecikme süreleri artacağından istenilen servis kalitesi sağlanamamaktadır. Bu amaçla çerçeve kayıplarını azaltırken, çerçeveler arası gecikme sürelerini de belirli bir servis kalitesi değeri içerisinde tutabilen yeni bir çerçeve ietimi algoritmasına ihtiyaç duyulmaktadır.

Literatürde gecikme süresini minimize etmeyi amaçlayan hızlı çereve iletmi ile ilgili yapılan farklı çalışmalar mevcuttur. Örneğin [3]'de yazarlar VoIP uygulamaları için backoff prosedürünün getirdiği ek yükleri minimize ederek hızlı tekrar çerçeve iletimi yöntemi sunmuştur. [4]'te yazarlar gecikme varyasyonlarını önleyebilmek için dağıtık bir kontrol mekanizması önermişlerdir. [5]'te yazarlar yeni bir algısal ses kalite düzeyi ölçebilen tekrar iletim mekanizması önermiştir. Ayrıca [6]'te yazarlar Network Coding yöntemi ile alınan çerçevelerin gecikme ve varyasyon sürelerini azaltmayı amaçlayan farklı bir çalışma sunmuşlardır. Yalnız, yukarıdaki çalışmaların hiçbiri backoff prosedürünün getirdiği eksponensiyel artış oranını incelememiş ve bu konuda herhangibir çözüm sunmamıştır.

Bu çalışmanın temel amacı kullanıcı-taraflı geri-bildirime dayanan yeni bir hızlı çerçeve iletimi yaklaşımı tasarımıdır. Önerilen yöntemde, hattaki bir ses veya video çerçevesi başka bir çerçeve ile çarpışmış ise, çarpışan ses/video çerçevesi için ACK_timeout süresi dolmadan hatta bir geri-bildirim yapılmaktadır. Bu geri-bildirim ile; hatta bir çarpışma olduğu ve bu çarpışma sonucu bir multimedya çerçevesinin gecikeceği ağdaki diğer tüm kullanıcılara bildirilir. Bu sayede hattaki istasyonların backoff aralığını en az bir slot kaydırmaları ve çarpışan multimedya istasyonunun da çerçevesini hattı ele geçirmek için diğer istasyonlarla yarışmadan (zaman

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kaybetmeden) tekrar iletmesi sağlanır. Önerilen yöntemde kullanıcıların kanala yolladıkları geri-bildirim çerçeveleri, kablosuz ağ standardında belirlenen CTS (clear-to-send) çerçeveleri olduğu için, IEEE 802.11 kablosuz ağ standardında herhangi bir değişikliğe veya eklentiye ihtiyaç duyulmamaktadır. Bu sayede önerilen çalışma kolayca cihazlar üzerine yazılımsal olarak yüklenebilir.

IEEE 802.11 Kablosuz Ağları

Kablosuz yerel ağ standardında cihazların ağa erişimini sağlayan yöntem Dağıtık Koordinasyon Fonksiyonu (DCF) yöntemidir. DCF CSMA/CA yaklaşımını geri çekilme (backoff) algoritması ile gerçekleştirir. DCF yaklaşımında, ağa erişmek isteyen bir cihaz iletim öncesi ağı bir DIFS (Distributed Interframe Space) süresi kadar bekler. Bu süre zarfında kanalın meşgul olduğu algılanırsa, cihaz iletimini kanalın boşalacağı süreye kadar beklemeye alır. Birden fazla cihazın bulunduğu bir ağda, ağın meşgul olduğunu anlayan cihazların tamamı ağ boşalana kadar iletimlerini ötelerler. Ağın boşaldığı algılanınca cihazlar aynı anda iletim yapmaya kalkışırlarsa, iletilen çerçeveler çarpışır. Aynı ağdaki farklı cihazların aynı anda çerçeve iletme ihtimalinin azaltılması için DCF cihazlar üzerinde rassal bir geri çekilme algoritması çalıştırır. Bu algoritma cihazların çerçeve iletimlerini DIFS sonrası belirli bir süre daha beklendikten sonra iletme prensibine dayanır. Kablosuz ağlarda zaman dilimi slotlara ayırılmıştır ve cihazların beklemesi gereken toplam slot sayısı her cihaz tarafından rassal olarak belirlenir.

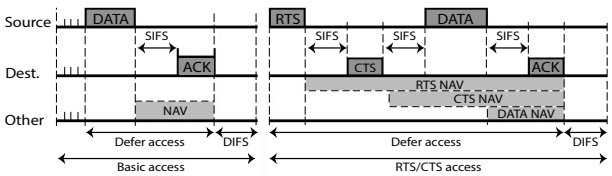
$$Backoff = rassal(1, CW) \times slot \;\; süresi$$

Bu yöntem ile ağın boşaldığını aynı anda algılayan cihazlar geri çekilme değerlerini rassal olarak seçerek iletim zamanlarını farklılaştırırlar ve çerçevelerin çarpışma ihtimalini azaltırlar. Bir cihaz çerçevesini ilk defa iletmek için hatta yarışıyorsa, cihaz o çerçeve için 1 ile CW_{min} (31) arası bir geri çekilme değeri seçer ve toplam geri çekilme süresini belirler. İletilen çerçevenin başka bir çerçeve ile çarpışması durumunda ise, cihaz o çerçeve için daha büyük bir geri çekilme aralığı seçerek, çerçevenin tekrar çarpışma ihtimalini azaltır. İletilmeye çalışılan çerçeve başka çerçevelerle çarpıştıkça, geri çekilme slot aralığı büyütülür. Yalnız, çerçeve aralığı CW_{max} 1024 değerinden büyük olamaz. DCF protokolü tarafından kullanılan ikili üssel geri çekilme prosedürü Algoritma_1'de gösterilmektedir. İletilen çerçevelerin başarılı olması durumunda ise alıcı tarafından ileticiye çerçevenin başarıyla alındığını bildiren ACK çerçevesi yollanır.

Algorithma 1: İkili Üssel Geri Çekilme Prosedürü (Backoff)

```
if ( Rc == 0 ) then                    // ilk iletim
    CW = CWmin                             // CWmin = 32
else                                   // tekrar iletim
    CW = 2(CW + 1) – 1
    CW = min(CW, CWmax)                    // CWmax = 1024
Backoff = rand(1, CW) x (slot)
```

Ayrıca Şekil 1'de gösterildiği gibi, ağdaki çarpışmaların önlenmesi için Request to send ve Clear to send (RTS/*CTS*) ağ erişim metodu da kullanılabilir (Langendoen and Halkes 2005). Yalnız bu yöntemde, özellikle de ağda çok sayıda cihaz bulunmuyor iken, ek RTS/CTS çerçeve gönderimlerinden dolayı, data çerçevelerinin iletimleri daha uzun süreler alır ve bu da ağın iş-yükü performansının düşmesine ve enerji tüketiminin artmasına sebep olur.



Şekil 1. IEEE 802.11 Ağa Erişim Metodları

Hızlı Tekrar Çerçeve İletim Yöntemi

Kablosuz ağlarda iletim yapan bir istasyon gönderdiği çerçeve için belirlenen süre içerisinde ACK çerçevesi almazsa Çekişme Penceresinin (CW) değeri iki kat artırılır. Bunun sonucunda çerçeve iletimi gerçekleştiren

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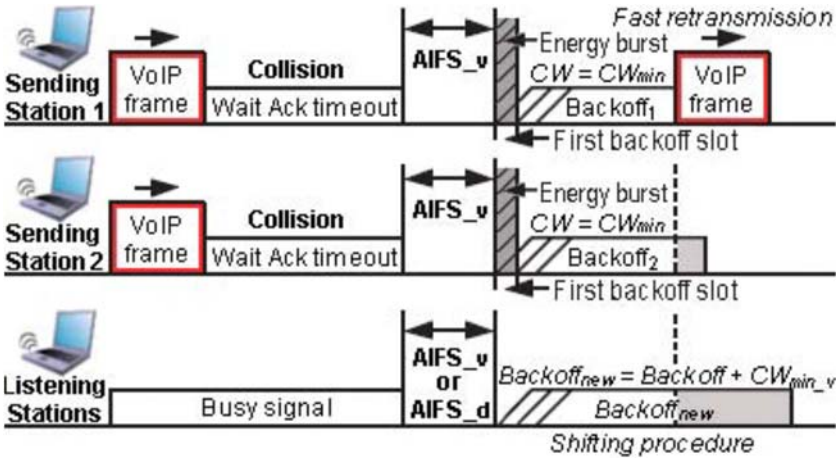
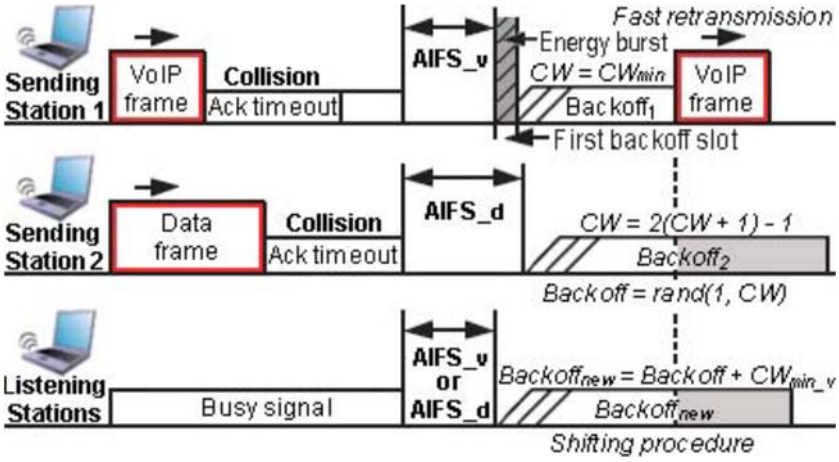
istasyonun yeni backoff değeri muhtemelen çok daha büyük bir süreye tekabul edecektir. Bu da iletilen çerçevenin daha da gecikmesine sebep olur. Halbuki VoIP çerçeveleri gecikmeye duyarlı gerçek zamanlı erçevelerdir ve düşük gecikme sürelerine ihtiyaç duymaktadırlar. Data çerçeveleri VoIP çerçeveleri gibi gecikmeye duyarlı olmadıklarından dolayı, VoIP çerçevelerine data çerçevelerinden farklı bir yaklaşım uygulanması, bahsedilen gecikme ve gecikme varyasyonu problemini çözebilir.

Bildiri kapsamında önerdiğimiz çalışmada CTS çerçevelerinden yararlanılmaktadır. Bu çerçeveler hattaki tüm istasyonlara çarpışan veya kırıma uğrayan bir VoIP istasyonunun olduğunu bildirmektedirler. Eğer bir istasyon gönderdiği VoIP çerçevesi için belirlenen süre içerisinde bir ACK çerçevesi almazsa, istasyon hatta bir CTS çerçevesi yollar. Çarpışan VoIP istasyonu veya istasyonları yeni çerçeve iletimleri için CW(0,7) aralığını seçerken, hattaki diğer istasyonlar ise yeni backoff değerini en az 7 slot olacak şekilde kaydırırlar. Bu sayede çarpışan veya kırıma uğrayan VoIP çerçevesi, hattı ele geçirmek için tekrar diğer istasyonlarla yarışmazlar. Bu da çarpışmaya veya kırıma uğrayan VoIP çerçevelerinin mümkün olan en kısa sürede hattı tekrar ele geçirerek, çerçeve iletimlerini gerçekleştirmelerini sağlamaktadır.



Şekil 2. İki VoIP çerçevesinin çarpışması ve hızı tekrar iletii



Şekil 3. Bir VoIP ve bir data çerçevesinin çarpışması ve hızı tekrar iletimi

Önerilen hızlı tekrar çerçeve iletimi yöntemi ile ilgili iki farklı senaryo Şekil 2 ve Şekil 3'te gösterilmektedir. İlk senaryoda iki VoIP çerçevesinin çarpışması incelenmektedir. Önerilen algoritmamız kullanıldığında çarpışma sonrası ortama gönderilen CTS çerçeveleri (iki istasyon için iki farklı zamanlı gönderilen CTS çerçevesi) ile hattaki tüm istasyonlar çarpışma veya çerçeve kırımı hakkında bilgilendirilmiş olur. CTS çerçevesini alan hattaki istasyonlar backoff değerlerini 7 slot kaydırarak çarpışan istasyonların diğer istasyonlarla tekrar çarpışarak gecikme ve gecikme varyasyonu sürelerini daha da artırmalarını önlerler. Bu sayede çarpışan VoIP istasyonları

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CW değerlerini (0,7) arasında seçerek, hattı çok daha kısa sürede ele geçirerek, hızlı bir şekilde çerçevelerini iletmiş ve gecikme sürelerini minimize etmiş olmaktadır.

İkinci senaryoda ise çarpışma bir VoIP ve bir data istasyonu arasında gerçekleşmektedir. Bu senaryoda ise CTS çerçevesi sadece VoIP istasyonu için gönderilir ve diğer istasyonlar ve çarpışan data istasyonu backoff değerini 7 slot kaydırır. Bu sayede çarpışan VoIP istasyonu CW değerini (0,7) arasında seçerek hattı ilk ele geçiren istasyon olur ve herhangi bir gecikmeye uğramadan çerçevesini tekrar ileterek gecikme süresini ve varyasyonunu minimize eder.

Sonuç

Bu çalışma kapsamında kullanıcı-taraflı geri-bildirime dayanan yeni bir hızlı çerçeve iletimi yaklaşımı tasarlanmıştır. Önerilen yöntemde, hattaki bir ses veya video çerçevesi başka bir çerçeve ile çarpışmış ise, çarpışan ses/video çerçevesi için hatta bir geri-bildirim yapılmaktadır. Bu geri-bildirim ile; hatta bir çarpışma olduğu ve bu çarpışma sonucu bir multimedya çerçevesinin gecikeceği ağdaki diğer tüm kullanıcılara bildirilir. Bu sayede hattaki istasyonların backoff aralığını en az bir slot kaydırmaları ve çarpışan multimedya istasyonunun da çerçevesini hattı ele geçirmek için diğer istasyonlarla yarışmadan (zaman kaybetmeden) tekrar iletmesi sağlanır.

Önerilen yöntemde kullanıcıların kanala yolladıkları geri-bildirim çerçeveleri, kablosuz ağ standardında belirlenen CTS (clear-to-send) çerçeveleri olduğu için, IEEE 802.11 kablosuz ağ standardında herhangi bir değişikliğe veya eklentiye ihtiyaç duyulmamaktadır. Bu sayede önerilen çalışma kolayca cihazlar üzerine yazılımsal olarak yüklenebilir.

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İMALAT SANAYİNDE FABRİKASYON METAL ÜRÜNLERİ İMALATININ (MAKİNE VE TECHİZAT HARİÇ) VE METALİK OLMAYAN DİĞER MİNERAL ÜRÜNLERİN İMALATININ İNCELENMESİ

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Özet: Türkiye ekonomisinde sanayi sektörü madencilik, imalat sanayi, elektrik, gaz ve su olarak üçe ayrılmaktadır. Bu sektörlerden imalat sanayi katma değer, istihdam ve ihracat ile oldukça önemli bir yere sahip olmakla birlikte birçok alanda faaliyet göstermektedir. Yapılan çalışmada imalat sanayinin faaliyet gösterdiği alanlardan fabrikasyon metal ürünleri imalatının (makine ve teçhizat hariç) ve metalik olmayan diğer mineral ürünleri imalatı ele alınarak genel olarak imalatlar arasındaki ilişki incelenmiştir. Bu amaçla TÜİK (Türkiye İstatistik Kurumu) tarafından belirlenen veriler kullanılarak istatistiksel olarak test edilmiştir.

Anahtar kelimeler: imalat sanayi, metal ürünler, üretim endeksi

IN THE MANUFACTURING INDUSTRY THE MANUFACTURE OF FABRICATED METAL PRODUCTS (EXCEPT MACHINERY AND EQUIPMENT) AND THE EXAMINATION OF THE MANUFACTURE OF OTHER NON-METALLIC MINERAL PRODUCTS

Abstarct: Industry in Turkey's economy, mining, manufacturing, electricity, gas and water is divided into three. This sector of the manufacturing has been active in many areas but have a very important place, value added, employment and exports. Studies in the field of activity in the manufacturing of fabricated metal products (except machinery and equipment) and the relationship between overall manufacturing by considering the production of other non-metallic mineral products were examined. To this end, TÜİK (Turkey Statistical Institute) were tested statistically using the data specified by.

Keywords: manufacturing, metal products, production index

Giriş

Bir ülkenin kalkınmasında, uluslararası rekabet gücü kazanmasında sanayi politikalarının önemi büyüktür. Birçok gelişmekte olan ülke için sanayileşme ve kalkınma neredeyse eş anlamlıdır. Sanayi üretimini, verimliğini, katma değerini, teknoloji içeriğini artırabilen ülkeler dünya çapında rekabet gücü kazanmakta, hızla milli gelirlerini de artırmaktadır (Bayar, 2014). Türkiye ekonomisi son yıllarda önemli bir dönüşüm içine girmiştir. Bu dönüşümün tetikleyicisi küresel ekonomideki gelişmeler olmuştur. Şirketlerin rekabet gücü ve ekonomi politikaları açısından bakıldığında, bu değişimler yeni yaklaşımların geliştirmesini zorunlu kılmıştır. Türk sanayisi hem ürün grubu açısından, hem de coğrafi yoğunluk açısından önemli ölçüde çeşitlenmiştir. Kamunun yanı sıra özel sektöre dayalı üretim yapısının büyüklüğü ve çeşitliliği, coğrafi açıdan büyüklüğü bu çeşitlenmeye neden olmuştur (Çağlar, 2006).

Türkiye'de sanayi sektörü sınai faaliyetleri kapsar. Bu faaliyetler; üretim faktörlerini kullanarak hammadde ve yarı mamul maddelerin nihai ürün haline getirilmesi, bir başka ifadeyle 'üretim' faaliyetleridir. Türkiye ekonomisinde sanayi sektörü madencilik, imalat sanayi, elektrik, gaz ve su olarak üçe ayrılmaktadır (Tonus, 2016).

Bu çalışmada İmalat sanayinin alt sektörlerinden olan makine ve teçhizat hariç fabrikasyon metal ürünler imalatı ve metalik olmayan diğer mineral ürünlerin imalatının TÜİK verileri ile istatistiksel olarak incelenmiştir. Fabrikasyon metal ürünleri imalatı (makine ve teçhizat hariç) genellikle statik, sabit bir işleve sahip "saf" metal

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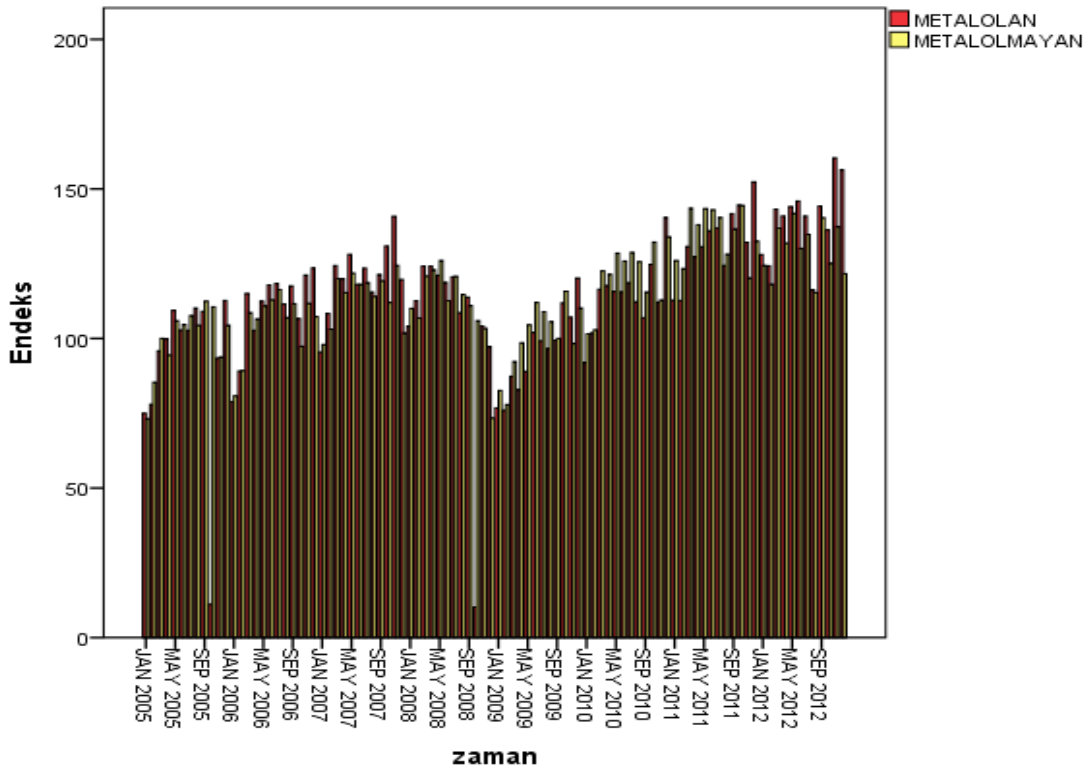
ürünlerin (parçalar, muhafaza kapları (fıçı, varil vb.), yapılar gibi) imalatını ve takip eden 26 ile 30 arasındaki bölümlerin tersine, hareketli parçalarla çalışan, tamamıyla elektrikli, elektronik veya optik olmayan bu gibi ürünlerin (bazen diğer materyallerle) daha karmaşık birimlere dönüştürülmesine yönelik bağlantı veya montaj ürünlerinin imalatını kapsamaktadır. Silah ve cephane imalatı da dâhildir (Atıl, 2013).

Metalik olmayan diğer mineral ürünlerin imalatı genellikle cam ve cam ürünleri imalatı, ateşe dayanıklı (refrakter) ürünlerin imalatı, kilden inşaat malzemeleri imalatı, diğer porselen ve seramik ürünlerin imalatı, çimento, kireç ve alçı imalatı, beton, çimento ve alçıdan yapılmış eşyaların imalatı, taş ve mermerin kesilmesi, şekil verilmesi ve bitirilmesi, aşındırıcı ürünlerin ve başka yerde sınıflandırılmamış metalik olmayan mineral ürünlerin imalatını kapsamaktadır (TÜİK, 2014).

Analiz ve Yöntem

Yapılan çalışmada, 2005 ve 2012 yılları arasında Türkiye üretilen metal ürünleri imalat sanayi endeksleri ile metalik olmayan diğer mineral ürünleri imalat sanayi endeksleri arasında bir farklılığın olup olmadığı incelenmek istenmiştir. Bu amaçla 2005-2012 yılları arasındaki 12 şer aylık veriler TUİK veri tabanından alınarak bağımsız örneklem t testi kullanılarak değerlendirilmiştir. Öncelikle metalik olan ve metalik olmayan diğer mineral ürünlerin imalat sanayi endeksleri arasında ilgi yıllara göre bir farklılığın olup olmadığına bakılmış şekil 1 de bar grafiği ve tablo 1 de ise test sonuçları verilmiştir.



Şekil 1. 2005-20012 Yılları Arası 12 şer Aylık Metal Ürünleri ve Metalik Olmayan Diğer Mineral Ürünleri İmalat Sanayi Endeksleri

Tablo1. Metal Ürünleri İmalatının ve Metalik Olmayan Diğer Mineral Ürünleri İmalatı Endeksleri Test Sonuçları

Malzeme	Ortalama Endeks	t	p
Metalik Olan	113,61	-0,294	0,080
Metalik Olmayan	114,47		

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H_0: Metal ürünleri ve metalik olmayan diğer mineral ürünleri imalatı endeksleri arasında 12 şer aylık dönemlerde 2005 ile 2012 yılları arasında fark yoktur.

H_1: metal ürünleri ve metalik olmayan diğer mineral ürünleri imalatı endeksleri arasında 12 şer aylık dönemlerde 2005 ile 2012 yılları arasında fark vardır.

Yapılan test sonucunda imalat sanayinde metal ürünleri ve metalik olmayan diğer mineral ürünleri imalat sanayi endeksleri arasında % 95 güvenle istatistiksel olarak farkın olmadığı söylenebilir.

Yapılan bu testten sonra metal ürünlerin imalat sanayi endekslerinin 2005 ve 2012 yılları arasında 12 şer aylık dönemler için bir farklılık gösterip göstermediğine ait test sonuçları tablo 2' de verilmiştir.

Tablo2. 12 şer Aylık Dönemde Yıllara Göre Metal Ürünleri İmalatı Endeksi Test Sonuçları

Malzeme	Ortalama Endeks	s.d	t	p
Metalik Olan	113,61	95	46,98	0,00

H_0: Metal ürünleri imalatı endeksleri arasında 12 şer aylık dönemlerde 2005 ile 2012 yılları arasında fark yoktur.

H_2: Metal ürünleri imalatı endeksleri arasında 12 şer aylık dönemlerde 2005 ile 2012 yılları arasında fark vardır.

Yapılan test sonucunda imalat sanayinde metal ürünleri imalat endeksleri arasında % 95 güvenle istatistiksel olarak farkın olduğu söylenebilir.

Aynı test metalik olmayan diğer mineral ürünleri imalat sanayi endeksleri için yapıldığında ise tablo 3 de ki sonuçlara ulaşılmıştır.

Tablo3. 12 şer Aylık Dönemde Yıllara Göre Metalik Olmayan Diğer Mineral Ürünleri İmalatı Endeksi Test Sonuçları

Malzeme	Ortalama Endeks	s.d	t	p
Metalik Olmayan	114,47	95	69,80	0,00

H_0: Metalik olmayan diğer mineral ürünleri imalatı endeksleri arasında 12 şer aylık dönemlerde 2005 ile 2012 yılları arasında fark yoktur.

H_2: Metalik olmayan diğer mineral ürünleri imalatı endeksleri arasında 12 şer aylık dönemlerde 2005 ile 2012 yılları arasında fark vardır.

Yapılan test sonucunda imalat sanayinde metalik olmayan diğer mineral ürünleri imalatı endeksleri arasında % 95 güvenle istatistiksel olarak farkın olduğu söylenebilir.

Sonuç

2005-2012 yılları arasında TÜİK veri tabanında 12 şer aylık dönemler itibari ile verilmiş olan İmalat Sanayi Eğilim Endekslerine göre metalik metal ürünleri ve metalik olmayan diğer mineral ürünleri imalatı endeksleri arasında istatistiksel olarak bir farkın olup olmadığı belirlenmek istenmiştir. Bu amaçla yapılan t test sonuçlarına göre, ilgili dönemler arasında metal ürünleri ve metalik olmayan diğer mineral ürünleri imalatı arasında istatistiksel olarak anlamlı bir fark çıkmazken, metal ürünleri imalat endeksi ve metalik olmayan diğer mineral ürünleri imalat endekslerine ilgili dönemler açısından ayrı ayrı bakıldığında istatistiksel olarak anlamlı farkın olduğu görülmüştür.

Teşekkürler

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IMPLEMENTATION OF BERNSEN'S LOCALLY ADAPTIVE BINARIZATION METHOD FOR GRAY SCALE IMAGES

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Abstract: In digital image processing, binarization (two-level thresholding) is a commonly used technique for image segmentation. It is the process of converting a gray scale image to a binary image. Furthermore, binarization methods are divided into two groups as global binarization and locally adaptive binarization. A number of binarization techniques have been proposed over the years. Bernsen's method is one of locally adaptive binarization methods developed for image segmentation. In this study, Bernsen's locally adaptive binarization method is implemented and then tested for different gray scale images.

Keywords: Digital Image Processing, Image Segmentation, Binarization, Thresholding, Locally Adaptive Binarization, Bernsen's Method

Introduction

Binarization is a well-known method for image segmentation due to applicability to many fields in digital image processing (Sahoo et al., 1988). In order to separate objects from background, it is an effective technique. A number of binarization applications have been proposed over the years such as document image analysis for extracting printed characters, logos, graphical content or musical scores, map processing for finding place of lines, legends or characters, scene processing for detecting a target, quality inspection of materials, extraction of edge field and spatio-temporal segmentation of video images (Sezgin and Sankur, 2004).

In recent years, the field of document image analysis has received significant attention and has become one of the important parts of digital image processing. There are various researchers which are seeking to design systems for extracting information from extensive documents as maps, magazines, newspapers, engineering drawings, forms and mails. In most of these systems, binarization is applied as the first step (Trier and Taxt, 1995a). The aim of the binarization of document images is extracting text from images, removing noise and reducing image size. This process is performed with removing useless information in order to increase visibility of useful information in an image (Bataineh et al., 2011). In the work of Kefali et al. (2010), it is asserted that the purpose of binarization is to decrease the existence of undesirable data and conserve the desired data in document images. This operation is done by converting all gray levels of images into two levels as black and white.

Binarization techniques are divided into two groups. These are global binarization and locally adaptive binarization (Singh et al., 2011). Global binarization methods compute a single threshold value for the entire image. Pixels having a gray level darker than the threshold value are marked as black (foreground). In the contrary case, the other pixels are labeled as white (background) (Trier and Jain, 1995). Some of the global binarization methods existing in the literature are Abutaleb's method (Abutaleb, 1989), Kapur et al.'s method (Kapur et al., 1985), Kittler and Illingworth's method (Kittler and Illingworth, 1986) and Otsu's method (Otsu, 1979). Besides, locally adaptive binarization methods calculate a threshold value for each pixel on the basis of information contained in a neighborhood of the pixel. Some of these methods compute a threshold surface over the entire image. In the input image, if a pixel (x, y) has a higher gray level than threshold surface evaluated at (x, y), then the pixel (x, y) is marked as background, otherwise it is marked as foreground (Trier and Jain, 1995). In the literature, some of the locally adaptive binarization methods are Bernsen's method (Bernsen, 1986), Chow and Kaneko's method (Chow and Kaneko, 1972; Nakagawa and Rosenfeld, 1979), Eikvil et al.'s method (Eikvil et al., 1991), Mardia and Hainsworth's method (Mardia and Hainsworth, 1988), Niblack's method (Niblack, 1986), Taxt et al.'s method (Taxt et al., 1989), Yanowitz and Bruckstein's method (Yanowitz and Bruckstein, 1989), White and Rohrer's dynamic threshold algorithm (White and Rohrer, 1983), White and Rohrer's integrated function algorithm (White and Rohrer, 1983), Parker's method (Parker, 1991) and Trier and Taxt's method (Trier and Taxt, 1995b).
The rest of the paper is organized as follows. In materials and methods section, Bernsen's locally adaptive binarization method is explained. In results and discussion section, the results of applying Bernsen's method on

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gray scale images are showed for different neighborhood values and contrast limits. Finally, conclusions being under study are summarized in conclusion section.

Materials and Methods

In this paper, Bernsen's locally adaptive binarization method is used in order to extract texts from gray scale images. Furthermore, it is implemented and tested for different neighborhood values and contrast limits. In Bernsen's method (Bernsen, 1986), the threshold value is calculated for each pixel (x, y) according to the following equation (1).

$$T(x, y) = (Z_{low} + Z_{high}) / 2 \quad (1)$$

where Z_{low} and Z_{high} are the lowest and highest gray level pixel values in a square r x r neighborhood centered at (x, y). The contrast measure is calculated for each pixel (x, y) according to the following equation (2).

$$C(x, y) = Z_{high} - Z_{low} \quad (2)$$

If the contrast measure $C(x, y) < l$, then the neighborhood consists only of one class, foreground or background. In addition, r and l values vary depending on the used images and areas. Applying Bernsen's method for gray scale images is shown in Figure 1.

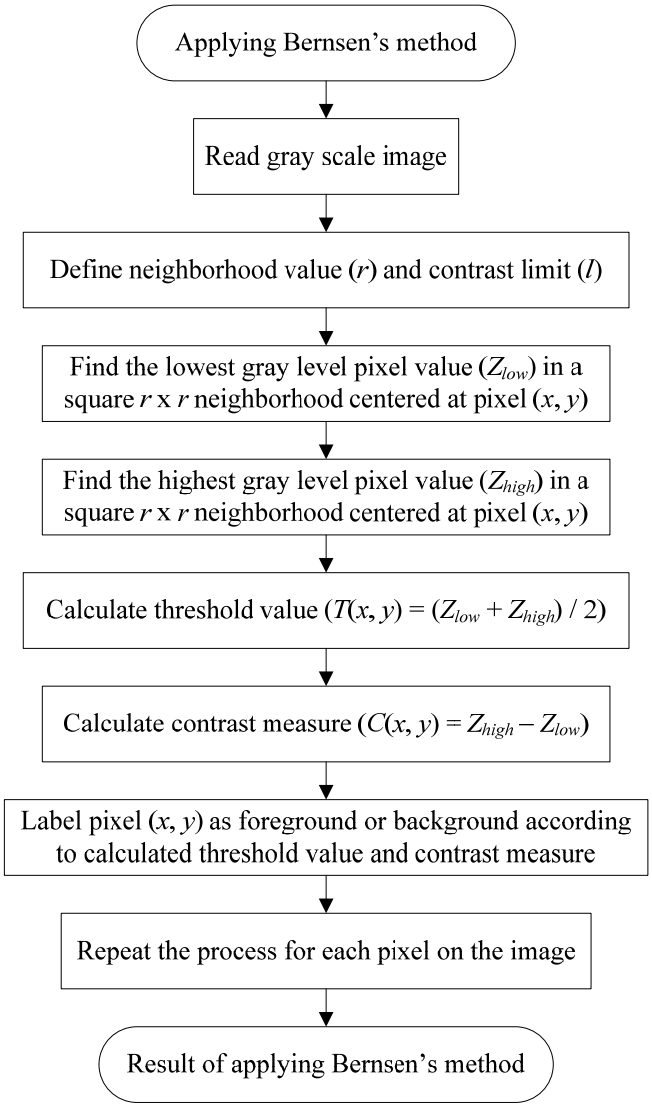

Figure 1. Flowchart of applying Bernsen's locally adaptive binarization method for gray scale images.

As seen in the flowchart, firstly, the gray scale image used for testing is read. Secondly, the neighborhood value and contrast limit are defined. After that the lowest and highest gray level pixel values in a square r x r

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neighborhood centered at (x, y) are found and then the threshold value and contrast measure are computed. In the sequel, the pixel (x, y) is labeled as foreground or background according to calculated threshold value and contrast measure. Finally, this process is repeated for each pixel on the image.

Results and Discussion

In this study, in order to extract texts from gray scale images, Bernsen's locally adaptive binarization method is used. The application used for binarization is implemented using MATLAB R2014a. The application is tested for different neighborhood values and contrast limits on various gray scale images. The neighborhood values are chosen as 3, 5 and 15. Moreover, the contrast limits are selected as 15 and 50 for testing the performance of Bernsen's method. As an example, one of the original gray scale images used in this work is shown in Figure 2. The size of this gray scale image is 202 x 202 pixels.

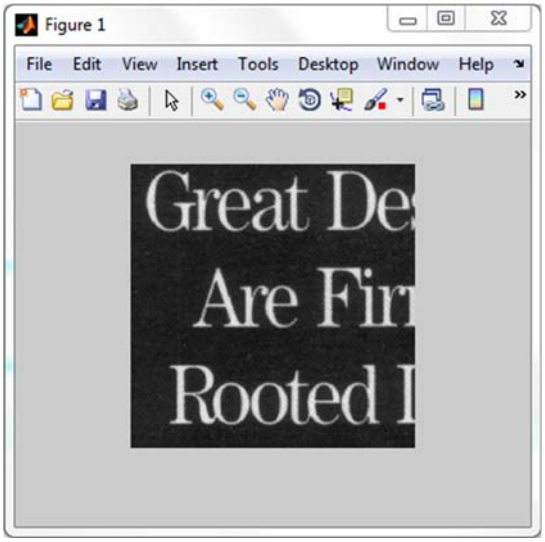

Figure 2. Orijinal gray scale image used for testing Bernsen's method.

The results of applying Bernsen's method on the original gray scale image for r=3 are shown in Figure 3.

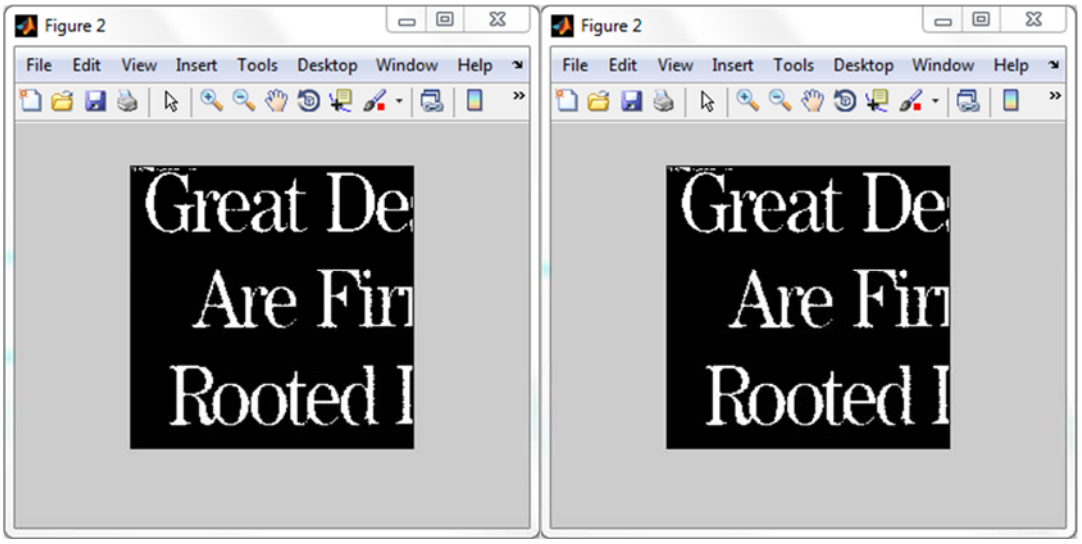

Figure 3. Applying Bernsen's method on the original image for r=3 (l=15 and l=50 respectively).

The results of applying Bernsen's method on the original gray scale image for r=5 are shown in Figure 4.

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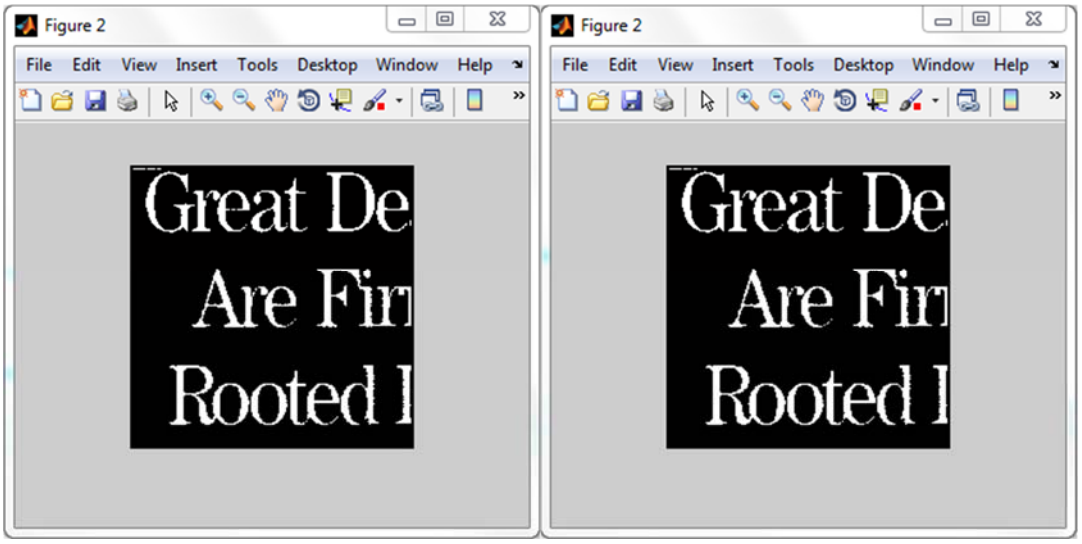

Figure 4. Applying Bernsen's method on the original image for r=5 (l=15 and l=50 respectively).

The results of applying Bernsen's method on the original gray scale image for r=15 are shown in Figure 5.

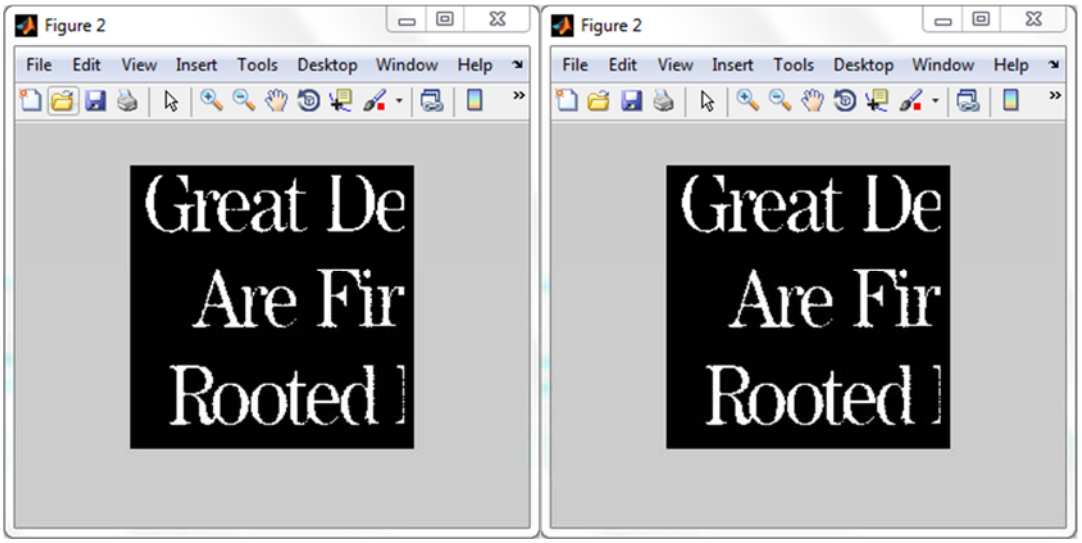

Figure 5. The results of applying Bernsen's method on the original image for r=15 (l=15 and l=50 respectively).

As seen in Figure 3, 4 and 5, the useless information is removed from the original gray scale image and the visibility of the useful information is increased. Consequently, the texts are successfully extracted using Bernsen's binarization method. It is observed that this method is efficient for different r and l values. However, the increase of neighborhood value and contrast limit raises the process time of the method. Besides, the process time is inversely proportional to the processing speed of Bernsen's method.

Conclusion

In recent years, document image analysis has become a significant research topic in the area of digital image processing. Binarization is applied as the first step in most of the document image analysis applications. The purpose of the binarization of document images is to remove useless information and noise in order for extracting text and useful information from images. In this paper, Bernsen's locally adaptive binarization method is implemented and then it is evaluated for different neighborhood values and contrast limits. According to the study results, it is seen that the texts are successfully extracted and Bernsen's method is effective for various neighborhood values and contrast limits. In addition, the more neighborhood value and contrast limit raise, the more the process time of the method increases.

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IMPORTANCE OF SKETCHING IN THE DESIGN PROCESS AND EDUCATION

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ABSTRACT: Design education adopts different education models that changes constantly due to differences among disciplines. Education models can be varied with different training techniques. The design approaches introduced during the design process, which forms the basis of design education, gain meaning through sketching "with free-hand drawing" which is an effective communication tool for the profession. Sketching ensures fast development and introduction of opinions, serving as an active transmitter of visual expression. The computer technologies that are advancing rapidly today turns the traditional design, the "free-hand technique", into an element with a conceptual impact on the design process. The study aims to discuss the "process of sketching" behind the design factor in the architecture and interior architecture education in Turkey and to analyse the method of sketching as well as its application styles, design, presentation, education, process and results, discussing the importance of sketching process in the education. Finally, the sketching process is associated with the concept of design, emphasizing that it is essential for the architecture and interior architecture design education and it is a skill that must be enhanced through education.

Key Words: Architecture and Interior Architecture Education, Design, Sketching process.

Introduction

Design is to look at the design problem in a different way considering operational, functional, aesthetic concerns by developing new methods. Design, acting towards its personality in this process, is to tangibly provide transfer of ideas in conceptual meaning. Therefore, the effect of visual transfer on persons gains importance. The most efficient method to embody an intangible expression in the design process is to transfer the ideas on a paper fast, in a way to benefit from freehand technique which is a traditional expression method. The most used visualization techniques are freehand drawing, technical drawing and drawing digitally (Gümüş, 2007). Research, thinking, application methods and developing unique design ideas is aimed in design education. In a sense, transfer of unique design ideas tangibly stresses on the importance of sketching namely design data. Sketching is the most influential means of communication in design jobs such as architect and interior architect. Sketching helps to become skillful at fulfilling and developing the idea in design process in a short time and brings continuity with it. It can produce different processes by being supported with visual presentation. In this regard, examining sketching process which is an important element in design education is aimed in this study. Design process and consequences of design education in the Interior Architect and Architect disciplines is studied; Design, design knowledge, design education, the importance of freehand and sketching process in education is examined. In this regard, it is stressed out in this study that sketching process behind the design has a required place in design education.

Design and Design Education

Design is envisaging, shaping or an envisaged fact produced to make a plan or sketch. It is a mental project or scheme in which steps to make a consequence is set forth (Bayazıt, 1994). At present, Interior Architect and Architect are among the modern and renewed jobs with the effect of socio-cultural and economic changes. Therefore, it is inevitable that Interior Architect and Architect education to be shaped under different approaches (Özker, Makaklı, 2015). In the Interior Architect and Architect education especially project/design studio courses are steering and shaping education. According to James Reswick, design which is a creative action is a fact involves creating a new and useful thing which has not existed (Ketizmen, 2002). Design is a creative process; solving problems, sketching, thinking and producing process in a sense. On the other hand, design education is to develop individual behaviors with education and guidance. The aim of design jobs such as Architect and Interior Architect is to transfer the method and fiction of design education to the student. In this sense Interior Architecture education program is consists of design courses such as basic design, project/design studio, furniture design which are design-oriented courses out of technical courses. On the other hand, design

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courses such as basic design, project/design studio which are design-oriented courses out of technical courses are in the education program of Architect. Sketching is highly important in design courses in which the student can express herself/himself or becomes skillful at that. Developing design skills, having an idea about what is design is provided with design courses.

Education quality of these jobs which are shown among the popular jobs and increased rapidly is a crucial matter to be examined. In design education especially which is gained at Design studios, questioning the relation between education and design by transferring the definition and process of design correctively is necessary. Design is a new experience for students. Design education is an education type which is continuously open to development and change. It is necessary to properly form the foundation of design education which will adapt developing and changing life conditions (Çetinkaya, 2011). Sketching and visually thinking skills should be gained to the student. So designers' visual communication means in which they express abstract and concrete concepts in way to reflect their own identities, likes and purposes is mostly possible with sketching.(İslamoğlu, 2012). Some works include superficial, fast produced, unclear creative ideas while others include detailed and clear design ideas. Both are necessary for design methods and they are elements that support each other (Silav, 2013). Therefore the purpose of Design education is to raise individuals who think individually and critically, have an aesthetic perception, can interpret its neighborhood by perceiving it, developed his/her expression power. Students, thanks to design courses in design education, learns about unclarity of sketching; that each line crossed has a potential meaning and opens to different interprets; concepts such as visualization, analyzing, determination and nourished from them (Adıgüzel and others, 2012a). Design action is an action that creativity matters. Developing, interpreting and transferring ideas in a paper improve the individual creativity in a sense. What is expected from design education is transferring design conceptualization which students will use in their educational and professional life through a variety of courses, teaching sketching language to them in order to express themselves.

Sketch in the Design Process

Sketch, is a draft data occurs through thinking, it is the first stage, it does not represent "the perfect", it is the language among individuals. As for sketch process is the process of making lots of sketches, "freehand drawing". According to İnceoğlu and others, if writing is the means of expression in literature, drawing is the means of expression in architect. In this sense, sketching in the architect, interior architect and similar design education is important as writing. This process is the preliminary draft of project; a part of design; effective element which produce the outcome. In this regard, sketch is the thinking method which gives meaning to the project in the design courses. Goldschmidt name this process as sketch dialect. Sketching provide with interprets and new deductions of this process to occur (Goldschmidt, 1991). Sketches are dynamic production which can appear in every stage of whole design process. It does not stop, develops continuously, and this dynamic act continues in every stage of whole process (Yakın, 2012a). Sketch is the best sentence describes the idea, finding the idea through sketch is the most important factor of the design process. Spontaneous drawings arise from sketch, it brings the continuity but it is not permanent, the solution shows up while the image is becoming clear (Dodsworth, 2011). The principle aim of design disciplines which look differently at various subjects and try to find a solution is to achieve the same goal. In this context, the objective of Design jobs is to create the design fast and think fast. In order to determine the problem and reach out the solution, the ability to make sketches is crucial. Making the problem and its definition properly, offering the right solutions make the sketch necessary. Even though some designers limit their design process with various criteria, design, indeed, is a process shaping unique for each designer. Sketching is an important part of the design process, it shapes with creative actions. Drawing which is a process of thinking and interpretations starts with expression of visual image with hands and it improves while disciplined eyes and mind evaluate and change the image. Drawing is accepted as whole process or rather as cycle (Hanks, Belliston, 1977). In this regard, sketching "freehand drawing" appears as the most effective means of expression, language of thinking.

Sketching has an interactive role of unifying the ideas in mind, defined functions and the meaning of drawings; finding new forms and adapting them to the design (Edwards, 1979). It is possible to divine sketching studies in two groups as "Searching" and "Interpreting". While the Searching sketches is to find solution to a problem which has not discovered yet, Interpreting sketches is to expressing an existing concrete or tangible actions as newly and uniquely by filtering it with interpreting (Yakın, 2012b). The result expected from drawing in the design process is not the product but its semantic value that is going to show up is important. Therefore, researching, interpreting, develop unique design ideas shows that sketching is important indesign process.

Importance of Sketching In the Design Process and Education

Design education express an entirety with sketching "freehand style", presentation and application methods and there is no matter for distinctive for design jobs. Design is complicated process; designer or project coordinator

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manages this process by using their knowledge, experience and creativity. While making analysis by examining certain parameters such as environmental design, historical process relating to architecture and its neighborhood, user needs, functional analysis; concept developing suggestions related to design are offered (Adıgüzel and others, 2012b). In this context, analysis, synthesis along with sketch drawings contributes to design. In this regard, it is possible to examine design education and process like this:

Design Education,
Design education is type of education in which student gains lots of ideas such as thinking, researching, acquiring of knowledge, questioning, and solving problems. Design education namely project courses in disciplines of Architect and Interior Architect is a creative process for creating the new. Establishing common working areas coordinated together with student in the supervisory of a coordinator, design method and fiction are transferred to the student.

Process in Design Education,
Design education process starts with determining a project subject every midterm, the project is completed with end of term jury and in the supervision of coordinator. The student, whose project subject has been decided, researches the design he/she wants to introduce with the data she acquired in the process of acquisition information through freehand sketching methods. In the Architect and Interior Architect education, the aim of the design courses, along with their weight is different from each other, is to raise individuals who defend original ideas, able to speak up and interpret their creativities. Type of education differentiates from departments to departments such as course content, hour, theory, types of teaching lessons. For Example, while design education is performed with computer aided in one department, it can be concluded with computer or hand drawings methods aided by sketching.

Presentation in Design Education,
Design education and reflecting of designer identity to opposite party appear in presentation stage. Observer has an idea about person's creativity while looking his/her presentation. Presentation stage in design education can either be with freehand sketch drawings or it can be prepared while having been benefited from computer environment.

Another supporter of traditional design methods is today's computer technology. Computers which are becoming a must technology and need of modern age are now turning into commonly used devices at the first and last stage of design. However, design first on paper, the first stage of design education, is supported with different drafts. Draft drawings which gains clarity are concluded with computer aid in the last stage of design. Today's developments in digital technology has improved, changed and brought the production process of design focused jobs to different dimensions. Digital based solutions such as parametric modeling, computational design digital design and fabrication, and Building Information Management (BIM) relation with design creation process is being started to questioned. For example, a symposium was held at Yale School of Architecture about questioning the place of a traditional drawing titled "Is Drawing Dead" in digital age.The status of traditional drawing is examined in the digital age.) Keynote speaker Peter Cook mentioned that he is interested less polished version where building remains fictional in an honest way rather than computer renderings with perfect images(URL1).

Digital technologies have developed every day and provide designer with ease of use. In design education, it is aimed that student learns utilization of computer technology and the whole process from two dimensional drawings to rendering. Transferring the ideas mind to a paper or preparing them digitally is interpreted as a mater of choice. Whatever the type of means the aim is to provide an embodiment of an idea in the end. The first sketching design created with computer in education process is only possible after learning various programs. For the students who newly started to design education the place of freehand drawing, in this context, is inevitable for the first experiences in design process. Freehand drawing is not a drawing which only capable ones can make and perfection is pursued in the end rather an expression means in which tangible ideas embody in order to solve problems in design process, and it is a method that can be improved while sparing time on it. By which method that the designer will prepare his/her sketching can be improved accordingly his/her choice at next

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process. In this regard, increasing of intellectual quality; being able to make computer aided visual analysis; modeling of created or existed designs or environments with computer; being able to review design rules; improving the tendency to gain disappeared cultural values at virtual platform, what is expected from computer aided design, are benefited by utilization of them in architect education and application (Tokman, 1998). In this sense, the student who design with freehand sketching understands that intellectual quality and design is a thinking power, it is important matter to create fast designs with sketching.

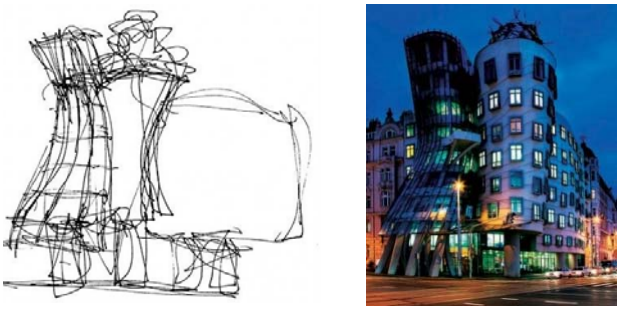

Figure 1-2. Frank O Gehry



Figure 3-4. Mario Botta

Conclusion

Design is an action that affects development of new information and production besides is a process in which design action is realized. Therefore, in design education which is a creative process, it is necessary to bring students sketching habit of which contribution to creativity can not be ignored from the beginning of design education to occupation practices. Sketching is the production first thinking, contributes significantly to making of creative designs. It should be taught that sketching is a necessity and basis of the design education especially, in project courses. In this sense, it should be shown that design education is a problem solving focused education process in which skills such as design, gaining experience, researching, analyzing, synthesizing which are being improved with different education methods and suggestions, are being gained.

In this context, suggestions of this study are ;

- Importance should be given to freehand sketch drawings in the disciplines such as Architect, and Interior Architect,
- Places that encourage creativity should be created in design process,
- Methods that can reveal student's own skill, gain him/her individual self confidence should be found out ,
- It should be transferred to the student that sketch drawing is a design thing rather than a necessity,
- It is necessary to transfer to the student with education that, for creative designs, fast thinking through freehand sketching is contributing significantly to transfer the idea to paper.

Consequently, it has been felt that freehand sketch drawing is losing its importance with today's increasing computer aided design technology environment. However, although it seems as if sketching losing its importance in Design education, freehand sketch drawing is a process attributes meaning to design. Sketch drawing which is shown as a traditional method should not lose its value, it should be aimed to gain sketch habit to the student in all of the design courses.

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IMPROVED PI CONTROLLER FOR DC-DC BUCK CONVERTER

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Abstract: This paper presents an improved PI controller for robust DC-DC buck converter operation. Accurate pulse width modulation (PWM) switching based operation duty ratio of the buck converter is achieved by the closed-loop PI controller. A control law based on instantaneous values of the input voltage and the desired output voltage is used to support the PI controller to obtain fast operation duty ratio. Thus, the stability and the efficiency of the converter is improved for high quality desired output voltage when the input voltage, the reference output voltage and the load values are changed. Simulation study has been done in MATLAB-Simulink to demonstrate the efficiency of the improved PI controller based on the proposed control law. The results have proved that the proposed improved PI controller achieves stable, accurate and efficient operation for the buck converter under different system conditions.

Keywords: Buck Converter, PI Controller, PWM

Introduction

The need for various forms of the electrical energy increases depending on the developing technology. For this aim, many converters are developed by the help of improvements in power electronics. DC-DC converters are the power electronics converters that changes the input direct voltage with a different value from the output and they are widely used in many industrial applications where direct voltage regulation is required (Zhang *et al.*, 2015; Babaei *et al.,* 2016; Wu *et al.,* 2015).

DC-DC buck converter produces an output direct voltage value lower than the input voltage value (Kok *et al.,* 2015). Direct voltage transformation depends on the PWM switching duty ration in the buck converter as well as in the other DC-DC converters that are boost and buck-boost converters (Siwakoti *et al.,* 2015; Bhajana *et al.,* 2015). Ideally, the relation between the converter input and output voltages can be derived depending on the PWM duty ratio as algebraically without depending on the system parameters. But in practice, non-ideal converter components and the case of discontinuous current mode converter operation prevent to obtain a certain duty ratio for converter operation for the related operating point. Thus, a feed-back control structure depending on the real and reference output voltage values is strictly required for the accurate converter operation (Ahmed *et al.,* 2003).

There are many studies that use different controllers for the control of the DC-DC buck converter in the literature. The designed controller checks the error between the converter reference and real voltages of the output and eliminates the error according to providing the parameters of the system response. The closed-loop control structures that use traditional PI and PID controllers are frequently applied to control of the DC-DC buck converters (Sira-Ramirez, 1991; Lee *et al.,* 2011). The Sliding Mode Controller control technique that is one of the modern control techniques is applied to many studies successfully where the PI and PID controllers are not sufficient for the converter response (Ling *et al.,* 2016). The design of the mentioned controllers are obtained according to the mathematical models for the defined converter operating points. So, it is clear that the change of one of the system parameters forces to change the mathematical model of the converter. Therefore, it is impossible to provide the performance of the system response for the designed controller parameters. For the DC-DC buck converter performance, it is so important to provide desired system response performance while eliminating the error between the converter reference and real output voltages. So, it is clear that it is impossible to provide the desired converter performance with only the mentioned controllers for the operating points different than the controller parameters which are derived for the determined operating points.

In this study, a new control structure based on the PI controller for the DC-DC buck converter is proposed. In this control structure, the operating duty ratio for the converter is obtained by the PI controller and the proposed open-loop control law. The open-loop control law helps the PI controller through supporting it to eliminate the converter operating error in a fast manner and thus takes the mission to accelerate the system response. Thus, the

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control law prevents the need of changing the determined controller parameters for different converter operating points. The control law is the algebraic duty ratio of switching depending on the converter input voltage and the reference output voltage. It can be obtained easily and fast, thus, it does not cause additional complexity and design challenges. The proposed approach for the DC-DC buck converter has been tested in MATLAB-Simulink environment as simulation. The obtained simulation results for different operating points have shown that the proposed control structure based on the open-loop control law have provided robust and efficient converter operation.

Design of the Proposed Converter Control Structure

Open-loop control law

The topology of the DC-DC buck converter is given in Fig. 1 (Salimi *et al.,* 2015). In Fig. 1, $V_i(t)$, $V_o(t)$, L, C, D and S represent the input direct voltage, output direct voltage, inductor, capacitor, diode and the switch that is one way conductive and capable of being turned on and turned off, respectively.

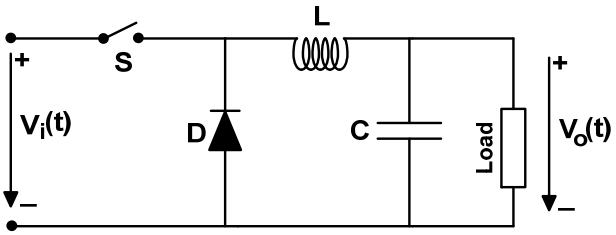

Figure 1. The topology of the DC-DC buck converter.

MOSFET device is used as switch S in this study. The DC-DC buck converter circuit using controllable MOSFET as switching device is given in Fig. 2. In Fig. 2, $I_L(t)$, $I_C(t)$ and $I_o(t)$ represent the inductor current, capacitor current and load current, respectively.

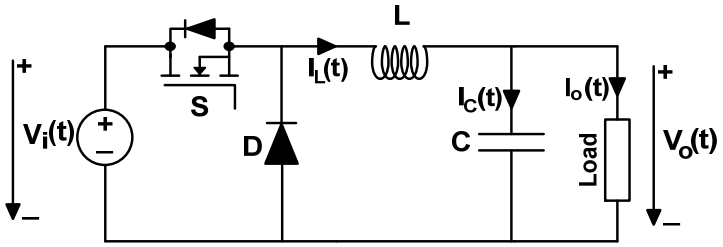

Figure 2. The DC-DC buck converter circuit using MOSFET as switching device.

The operation of the DC-DC buck converter can be explained through the circuit given in Fig. 2. When S is turned on, diode D is off as it is reverse biased. In this case, converter input direct voltage supplies the inductor, the capacitor and the load, thus the inductor is energized. When S is turned off, the diode is forward biased and it is on. In this case, the energized inductor supplies the capacitor and the load. Thus, a voltage value lower than the input voltage value is obtained at the output of the converter depending on the duty ratio of S (Sahin *et al.,* 2014). By assuming that the inductor current is continuous and the converter components are ideal, the relation between the converter input and output voltages can be given as follow (Li *et al.,* 2014);

$$V_o(t) = d(t)V_i(t) \tag{1}$$

Here, $d(t)$ represents the PWM switching duty ratio of S and it is defined as the ratio of the turn-on time of S to the switching period of S ;

$$d(t) = \frac{t_{on}}{T} \tag{2}$$

The open-loop duty ratio that provides the converter operation can be obtained through Eq. (1) under the mentioned ideal conditions above. This open-loop duty ratio is defined as control law and can be given as;

$$d_{CL}(t) = \frac{V_r}{V_i(t)} \tag{3}$$

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Here, V_r is the reference value of the desired converter output direct voltage.

The proposed closed-loop converter control structure

As mentioned before, the derived open-loop control law cannot meet to obtain the required converter output voltage value in practice. Because of the discontinuous current situation caused by different load values and non-ideal converter components, the duty ratio of the converter providing the required output voltage is different from than the duty ratio obtained by the open-loop control law. So, the real converter duty ratio that eliminates the error between the reference and real output voltage must be obtained from the closed-loop controller. In this study the PI controller is used as closed-loop controller. The proposed closed-loop control structure for the control of the DC-DC buck converter is given in Fig. 3.

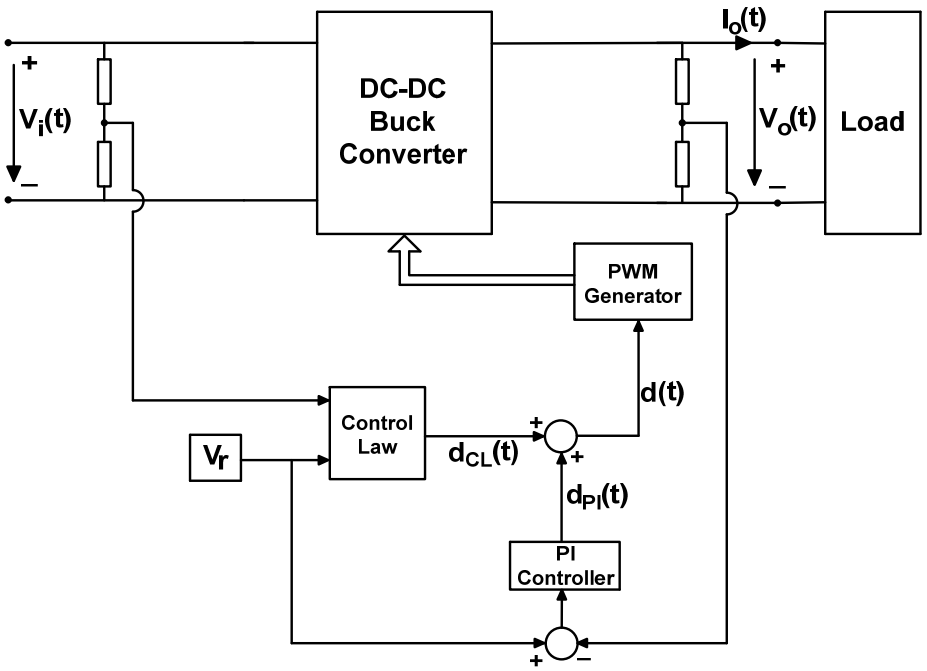

Figure 3. The proposed closed-loop control structure for the DC-DC buck converter.

As seen from Fig. 3, the PI controller produces a feedback duty ratio $d_{PI}(t)$ through the error between the reference and real converter output voltages. The open-loop duty ratio $d_{CL}(t)$ given in Eq. (3) supports the feedback duty ratio $d_{PI}(t)$ obtained by the PI controller and thus, the real duty ratio $d(t)$ for accurate converter operation is produced.

$$d(t) = d_{CL}(t) + d_{PI}(t) \tag{4}$$

As seen from Fig. 3, the PWM generator produces the control signal of the switch S depending on the duty ratio derived by Eq. (4).

Deriving the converter mathematical model for the PI controller

The PI controller is designed by the mathematical model of the converter circuit given in Fig. 2. The mathematical model of the converter can be derived from the equivalent converter circuit given in Fig. 4.

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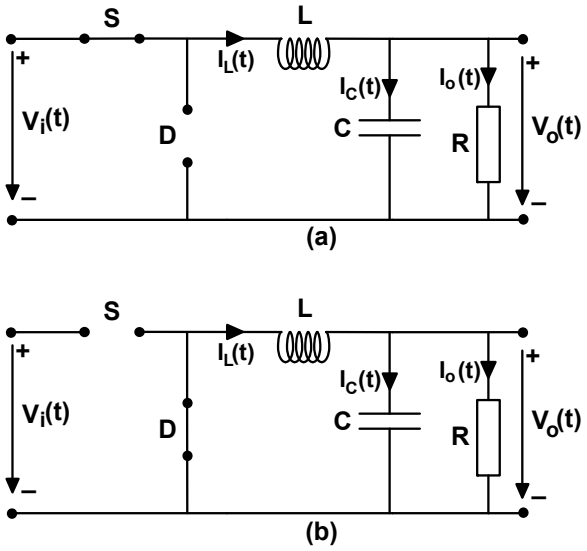

Figure 4. Equivalent circuit of the converter: a) Switch S is on – mode I, b) Switch S is off – mode II.

The dynamic equations for mode I where S is on in Fig. 4(a) can be obtained as;

$$L\frac{dI_L(t)}{dt} = V_i(t) - V_o(t) \tag{5}$$

$$C\frac{dV_o(t)}{dt} = I_L(t) - \frac{V_o(t)}{R} \tag{6}$$

The dynamic equations for mode II where S is off in Fig. 4(b) can be obtained as;

$$L\frac{dI_L(t)}{dt} = -V_o(t) \tag{7}$$

$$C\frac{dV_o(t)}{dt} = I_L(t) - \frac{V_o(t)}{R} \tag{8}$$

The state-space equations for mode I and mode II can be defined from Eq. (5)-(8) respectively as;

$$\frac{d}{dt}\begin{bmatrix} I_L(t) \\ V_o(t) \end{bmatrix} = \begin{bmatrix} 0 & -1/L \\ 1/C & -1/RC \end{bmatrix}\begin{bmatrix} I_L(t) \\ V_o(t) \end{bmatrix} + \begin{bmatrix} 1/L \\ 0 \end{bmatrix} V_i(t) \tag{9}$$

$$\frac{d}{dt}\begin{bmatrix} I_L(t) \\ V_o(t) \end{bmatrix} = \begin{bmatrix} 0 & -1/L \\ 1/C & -1/RC \end{bmatrix}\begin{bmatrix} I_L(t) \\ V_o(t) \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \end{bmatrix} V_i(t) \tag{10}$$

And the average state-space model of the DC-DC buck converter can be given from Eq. (9) and (10) as follow;

$$\frac{d}{dt}\begin{bmatrix} I_L(t) \\ V_o(t) \end{bmatrix} = \begin{bmatrix} 0 & -1/L \\ 1/C & -1/RC \end{bmatrix}\begin{bmatrix} I_L(t) \\ V_o(t) \end{bmatrix} + \begin{bmatrix} d/L \\ 0 \end{bmatrix} V_i(t) \tag{11}$$

The closed-loop control block diagram of the system can be given in Fig. 5 through the closed-loop control structure given in Fig. 3.

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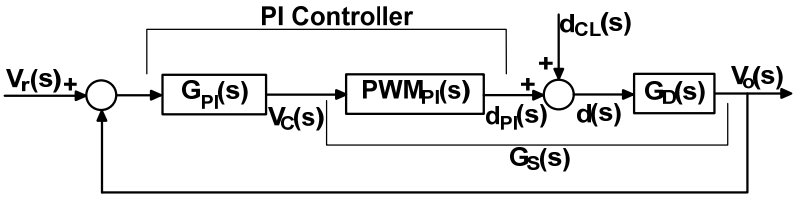

Figure 5. The closed-loop control block diagram of the system.

The transfer function between $V_o(s)$ and $d(s)$ can be obtained through Fig. 5 and Eq. (11) as;

$$G_D(s)=\frac{V_o(s)}{d(s)}=\frac{V_i(s)}{s^2LC+s\frac{L}{R}+1} \tag{12}$$

As seen in Fig. 5, the duty ratio of control law $d_{CL}(s)$ affects to the operation duty ratio $d(s)$. By assuming $d_{CL}(s)$ is zero (considering there is no supporting from the control law), it is considered that;

$$d_{PI}(s)=d(s) \tag{13}$$

$PWM_{PI}(s)$ is the transfer function of the PWM stage between $d_{PI}(s)$ and the PI control signal $V_C(s)$ and can be given as,

$$PWM_{PI}(s)=\frac{d(s)}{V_C(s)}=\frac{1}{V_{PWM}} \tag{14}$$

where V_{PWM} is the amplitude of the ramp in the PWM conversion of the PI controller. Thus, the transfer function of the system which the transfer function of the PI controller $G_{PI}(s)$ is designed according to is derived as;

$$G_S(s)=\frac{V_o(s)}{V_C(s)}=\frac{V_i(s)}{V_{PWM}}\frac{1}{s^2LC+s\frac{L}{R}+1} \tag{15}$$

PI controller has a dynamic behavior and it requires a response time. But the control law has a static behavior as seen from its algebraic structure. As mentioned before, the control law produces a duty ratio value close to the desired operation duty ratio simultaneously with the error change. So, the control law leads the PI controller to compensate the system from the duty ratio point obtained by the control law. Thus, the control law speeds up the system response, after than the PI controller takes over the mission from the control law to eliminate the system error.

Results and Discussion

The proposed control structure of the DC-DC buck converter has been tested in MATLAB-Simulink environment as simulation for different system operating conditions. The simulation results of the proposed approach are given with the results of the traditional PI controller based converter comparatively to show the accuracy and the efficiency of the proposed control structure for the DC-DC buck converter operation. The comparison studies have been done for 3 different operation conditions: changing the reference output direct voltage, changing the input direct voltage and changing the load.

The switching frequency is selected as 10 kHz for the simulation studies. The inductance value of the inductor and the capacitance value of the capacitor in the converter circuit are determined as $L=1\mu H$ and $C=3000\mu F$, respectively. The parameters of the PI controller are kept constant for all operation conditions. The analog PI constants determined for an operating point are used as $K_P=3$ and $K_I=0.08$.

In the first case, the reference output voltage is forced to change during the DC-DC buck converter operation. The converter input voltage and the load are kept constant. The input voltage and load are $V_i=40\,V$ and $R=15\Omega$, respectively. The reference output voltage is increased from $V_r=15\,V$ to $V_r=20\,V$. The comparative results of the

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proposed approach and the traditional PI controller based converter operation for case 1 are given together in Fig. 6.

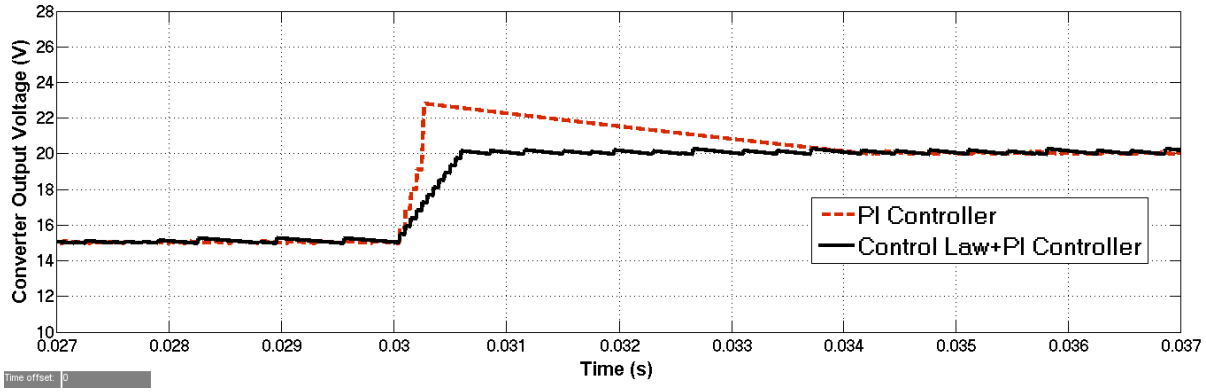

Figure 6. The comparative converter operation results for the change of the reference output direct voltage.

As seen in Fig. 6, the converter controlled by the proposed approach where the proposed control law supports the PI control reaches to the new reference output voltage faster than the converter controlled by the traditional PI controller. On the other hand, the proposed approach prevents the overshoot according to the traditional method.

For case 2, the converter input voltage is changed when the reference output voltage and the load are kept constant. The reference output voltage and the load are $V_r=15\,V$ and $R=15\Omega$, respectively. The input voltage is changed from $V_i=50\,V$ to $V_i=70\,V$. The comparative results of the proposed approach and the traditional PI controller based converter operation for case 2 are given together in Fig. 7.

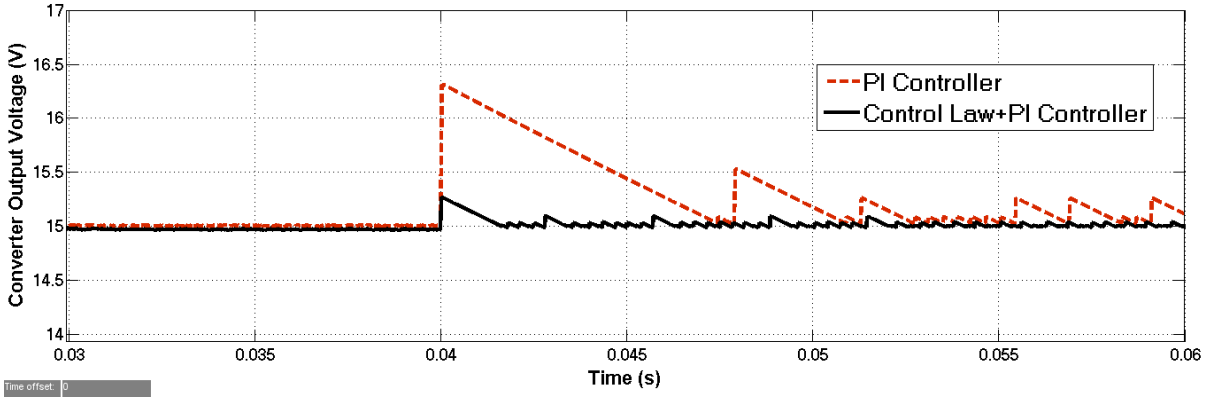

Figure 7. The comparative converter operation results for the change of the input direct voltage.

Fig. 7 shows that the sudden rise of the input voltage causes to increase the output voltages of both of the two converters. But it is clear that the proposed approach provides the converter output voltage to reach to the reference value with less overshoot in a less response time.

The load is forced to change during the converter operation while the reference output voltage and the input voltage of the converter are kept constant for case 3. The reference output voltage and the input voltage are $V_r=20\,V$ and $V_i=45\,V$, respectively. The load is changed from $R=15\Omega$ to $R=30\Omega$. The comparative results of the proposed approach and the traditional PI controller based converter operation for case 3 are given together in Fig. 8.

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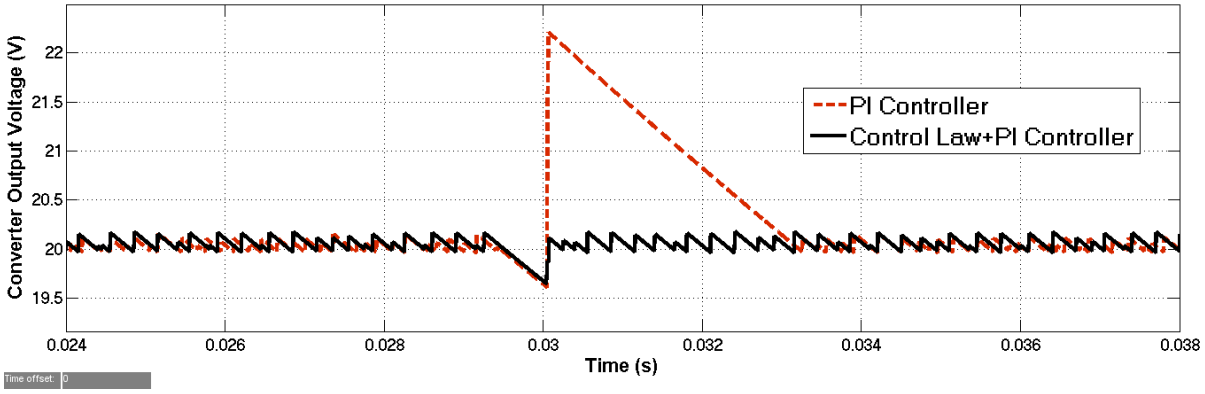

Figure 8. The comparative converter operation results for the change of the load.

As seen from Fig. 8, the sudden decrease in the load value affects increase of the output voltage in both of the two converter operations. At the beginning of the load change the converters output voltages decrease firstly, after than the output voltages increase immediately. The proposed control law based control structure provides the converter output voltage to return to the reference value with less overshoot in a less response time.

It is clear from the results of three different operation cases that the proposed control law approach improves the DC-DC buck converter operation efficiently through supporting the closed-loop PI controller structure. Thus, the better quality converter output voltage is achieved according to the traditional PI controller based system.

Conclusion

Apart from the control structure based on the traditional PI controller, a new control structure based on open-loop control law that supports the PI controller is proposed for the control of the DC-DC buck converter in this study. The control law is derived as algebraic depending on the reference output voltage and input voltage of the converter and it supports the PI controller. Thus, the PI controller is intended to achieve efficient and better quality converter operation for different operation parameters through the control law. The comparative simulation results have proved that the proposed approach has further improved the converter operation than the traditional PI controller based control structure.

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INFLUENCE OF MICA CONTENT ON DYNAMIC SHEAR MODULUS OF SANDY SOILS

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Abstract: The Gediz River Delta soils contain abundant flatty (platy) mica grains. Mica grains can alter static and dynamic engineering characteristics of sandy soils due to their flatty shapes. In this study, influence of mica grains on dynamic shear modulus of sandy soils in Gediz River Delta was investigated. Maximum shear modulus (G_{max}), which is a major parameter in dynamic soil response analyses, can be obtained at small deformation amplitudes. Therefore, it is determined through measurement of shear wave velocity. Shear wave velocity provide valuable information about dynamic characteristics of soils. So it is very important to determine the shear wave velocity with high accuracy for dynamic soil response analysis. In this respect, firstly engineering boreholes were drilled and sandy soil samples were recovered along the borehole depth. The mica content of the samples was determined by means of X-RD analysis method. Then test sample contain 1.5%, 10% 20% mica grains were prepared to represent the Gediz River soils. Shear wave velocity of the sand samples were determined with bender element tests under 100 kPa cell pressures in triaxial test device. Followed by the bender element tests maximum shear modules were determined. End of the test program, shear wave velocity of the dense (Dr:55%) samples were determined as 249 m/sn, 214 m/sn and 187 m/sn for 1.5%, 10% and 20% mica content respectively. Mica was reduced the shear wave velocity in considerable percentage about 25% rate. Smiler effect was observed on the maximum shear modules and it is determined as 111.6 MPa, 82.4 MPa, and 62.9 MPa for 1.5%, 10%, 20% mica contents respectively for dense samples (Dr:55%). 20% mica content was reduced the shear wave velocity about 44% rate.

Keywords: Sand, mica content, shear wave velocity, maximum shear modulus

Introduction

Soil properties especially dynamic properties are determined by the empirical relations, although there are special tests for this purpose in the geotechnical engineering. The tests have high cost and perform of the tests requires long time. For this reasons, dynamic properties of the soil are determined by means of Standard Penetration Tests (SPT), Coni Penetration Tests (CPT), and Dynamic Penetration Tests (DPT) etc. Use of the empirical relations based on SPT, CPT, and DPT may lead to error in dynamic soil response analyses for the soils which contain abundant platy grains. In this respect, an experimental study was conducted on sandy soils which are deposited by Gediz River and contain abundant platy mica grains.

The shape of the soil grains are mainly depended on their geological origin and environmental conditions. Alluvial deposits formed by the Gediz River in the west Anatolia are good examples for the soils which contains abundant platy grains. The foundation of Gediz Basin contains rocks which consist of mica minerals (Tabban, 1980) so alluvial deposits in the Gediz Basin may contain about %20 platy mica grains (Başarı, 2012).

In the literature, there are many studies about influence of grain shape on soil behaviors (Santamarina & Cho, 2004). The studies mainly focused on angularity or roundness of grains (Thevanayagam, 2007). Grain shape effects on shear wave velocity were explored by some researchers. Cho et al. (2006) conducted a series bender element tests on rounded and crushed sands. The test results of the Cho et al. (2006) are given in Figure 1. According to Cho et al (2006), shear wave velocity increase with roundness as seen in Figure 1. Shear wave velocity of rounded sand samples is higher than shear wave velocity of angular sand samples. Angularity of the sand grains cause an increase voids between the grains this effect leads to decrease in density of media which shear waves propagate in its. Also, angularity of the grains causes a decrease contact surface area between sand grains. Decreases both of contact surface area and density of media leads to decrease shear wave velocity in soil. Stresses on contact surfaces between grains have a significant role on energy transmission between grains. High stress on the contact surface creates more stable structure in soil, so energy can transferred more easily between grains. In Figure 1 mean effective stress indicates stress on contact surfaces. High mean effective stress means high stress on

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contact surfaces. Therefore, increasing the mean effective stress cause an increase shear wave velocity as seen in Figure 1.

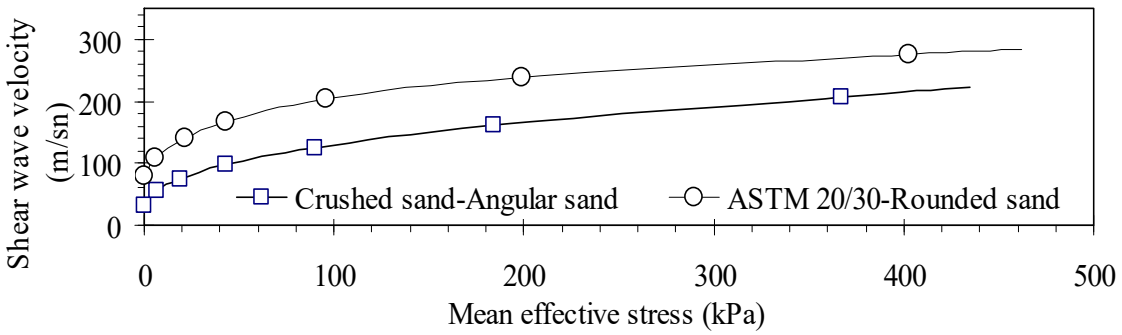

Figure 1. Roundness effect on the shear wave velocity (Cho et al. 2006).

Lee et al. (2007) explored effects of mica grain size ratio on shear wave velocity of sand. In the study, mica grains in different sizes were used. Bender element tests were conducted on samples, which were prepared in conventional oedometer cell as they were vertically loaded. Unfortunately, void ratios or densities of the samples cannot be inferred from the study. Nevertheless, mica effect on the sand samples is obvious in the study (Figure 2). As seen in Figure 2, shear wave velocity decreases with mica content for all mica grain sizes ratio.

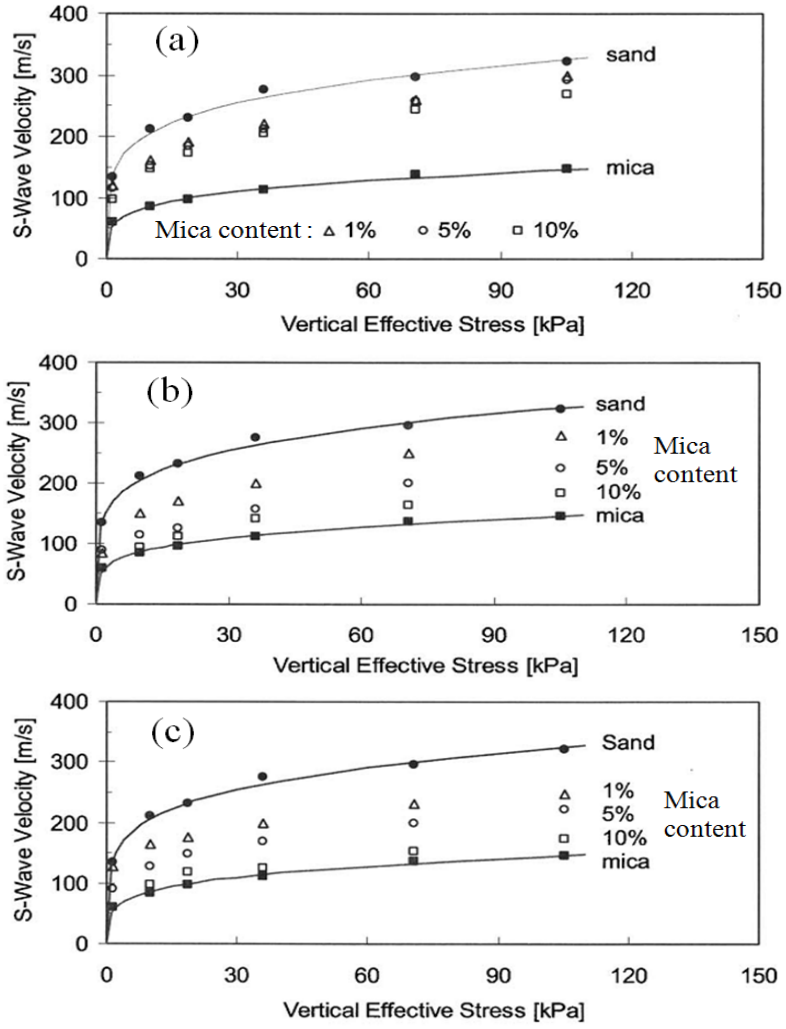

Figure 2. Mica grain size effect on shear wave velocity. (a), (b) and (c) are D_{mica}/D_{sand}=0.33, D_{mica}/D_{sand}=1.0 and D_{mica}/D_{sand}=3.0, respectively (Lee et al., 2007).

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Lee et al. (2007) and Santamarina & Cho (2004) explain mica effect on the sand behavior with ordering and bridging concept (Figure 3 and Figure 4). In this concept, when size of the mica grains are equal to or larger than size of the sand grains (D_{50}-mica/D_{50}-sand 1.0), mica grains create bridges among sand grains, and increase the global void ratio. When the global void ratio increases, the strength of sand decreases while compressibility of the sand increases.



Figure 3. Possible mica-sand ordering patterns depending on orientation angle (Lee, et al. 2007).

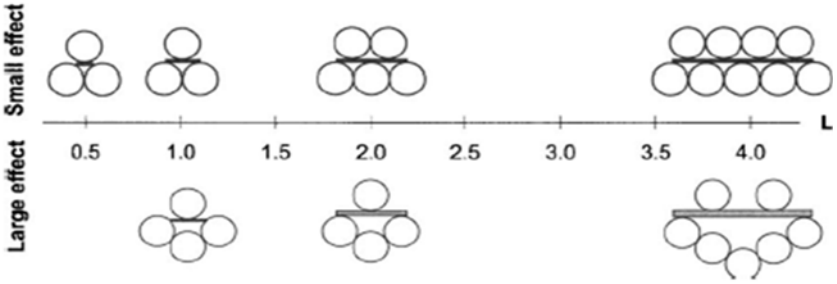

Figure 4. Bridging and ordering effects of mica plates (Lee, et al. 2007)

Materials and Methods

The test samples were taken from field (Figure 5). For this purpose boreholes were drilled in alluvial sandy soils of Gediz River Delta. Alluvial sandy materials which contain platy mica grains in test program were generally obtained from the Standard Penetration Test (SPT) spoon as seen in Figure 5. Amount of sample obtained from the SPT spoon is not enough to prepare the test sample for triaxial device. Because of this reason, the sandy samples of SPT spoons were combined then test program were conducted. The grain size distributions of the field (test samples) can be seen in Figure 5. The upper and lower bounds for the grain size of the alluvial sandy materials in Gediz River Delta are also shown in Figure 5. Diameter ratio of separated sand and platy mica grains (D_{mica}/D_{sand}) is 1.07. Coefficients of uniformity (c_u) for sand and mica grains are 1.67 and 1.64 respectively.

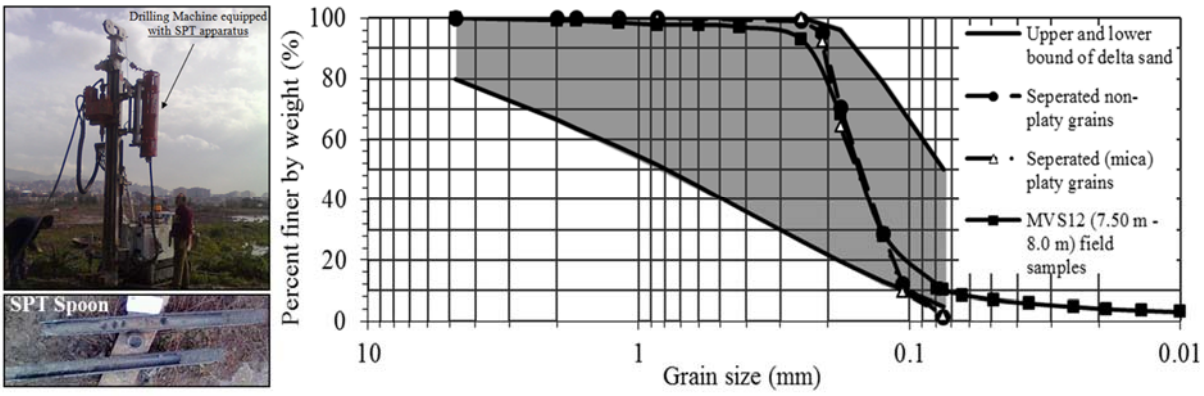

Figure 5. Field study and grain size distribution of field and test samples.

The percentage by weigh of mica minerals (platy grains) for field samples was determined by analyzing the X-Ray Diffraction (X-RD) test results (Başarı, 2012). Mica contents of field samples were determined as %5 - %20. Then mica flakes and rounded sand grains were separated from each other by flotation technique (Geredeli & Özbayoğlu 1995). Separated rounded sand grains and mica flakes were mixed in certain percentage for prepare test samples.

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Test samples were prepared at three different mica contents (1.5%, 10%, 20%) by weigh and three different relative densities (30%, 55%, 80%).

Maximum shear modules (G_{max}) of the test samples were determined helping with Equation 1. Shear wave velocity (V_s) of the samples were determined with bender element test. Bender element tests were conducted on triaxial test samples under 100 kPa confining pressure (cell pressure).Triaxial test samples were prepared with moist tamping method (Ishihara, 2003). Diameter and length of prepared samples are 70 mm and 140 mm respectively. Before the bender element test, test samples were saturated and isotopically consolidated under 100 kPa confining pressure. Saturation degree of the tests samples was determined with B value. B values of the all samples are equal or higher than 0.95.

$$G_{max}=\rho V_s^2 \quad (1)$$

Bender element test device consists two piezoelectric tips, signal generator and oscilloscope. One of piezoelectric tips is called transmitter and other tips is called receiver. Transmitter converts electric signals to waves, receiver converts waves motion to electric signals. Travelling time of shear waves in soil sample is determined as illustrated in Figure 6. Wave velocity within the soil is found by dividing the distance between bender element tips to the travelling time. In the bender element test program, amplitude of the used signal was 20 mV.

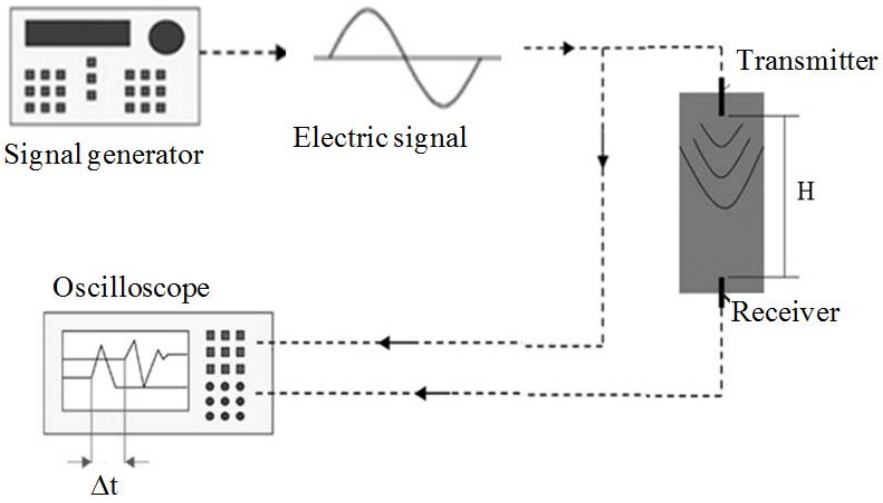

Figure 6. Illustration of bender element test.

Tests Results

Shear wave velocities of soil samples at different mica contents, prepared at relative density values between loose, dense and very dense states, were measured via bender element tests as described above. Samples were set up at 1.5, 10 and 20% mica content. Size ratio of mica and sand (D_{mica}/D_{sand}) grain is 1.07. One of the recorded signals from bender element tests and measured shear wave velocity (V_s) are presented in Figure 7.

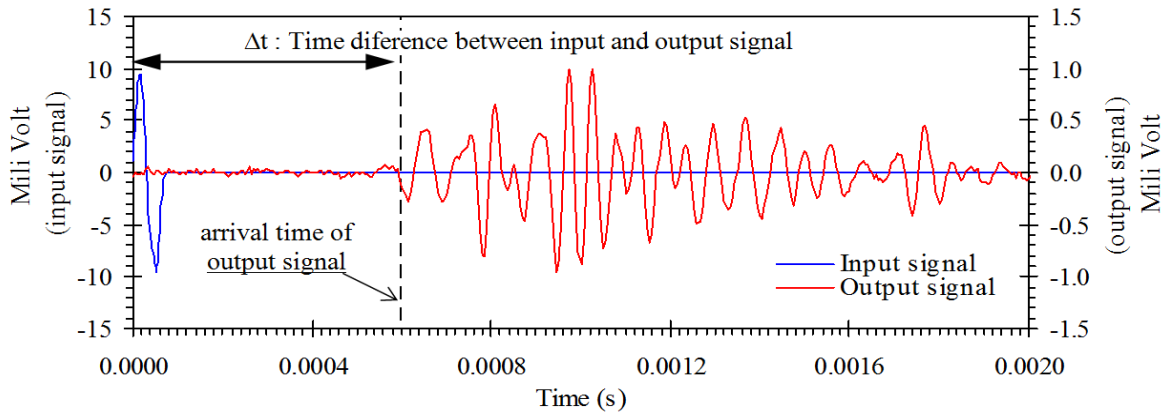

Figure 7. Recorded signals during bender element test.

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Test results for shear waves (V_s) presented in Figure 8. Changes of shear wave velocity corresponds to the mica content given in Figure 8.a. Effects of the relative density on shear wave velocity is shown in Figure 8.b. Maximum shear modules (G_{max}) can be seen in Figure 9. Maximum shear modules calculated helping with Equation 1 as seen in Figure 9.a and Figure 9.b. As expected mica and relative density have similar effect on shear waves velocity and maximum shear modules. Both of shear wave velocity (V_s) and maximum shear modules (G_{max}) decrease with increasing of mica content. When the Figures 8 and Figure 9 are carefully examined, it can be seen that relative density can change influence of mica content on shear wave velocity and maximum shear modules.

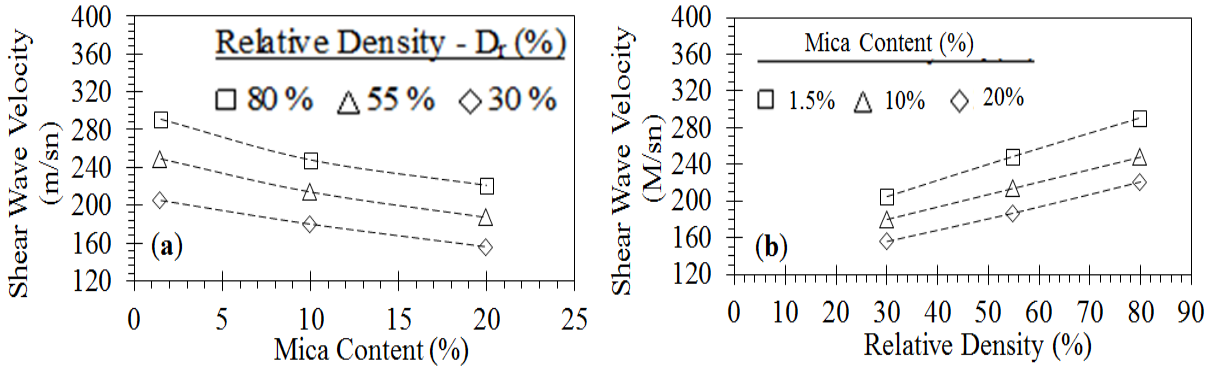

Figure 8. Effects of Platy mica grain and relative density on shear wave velocity.

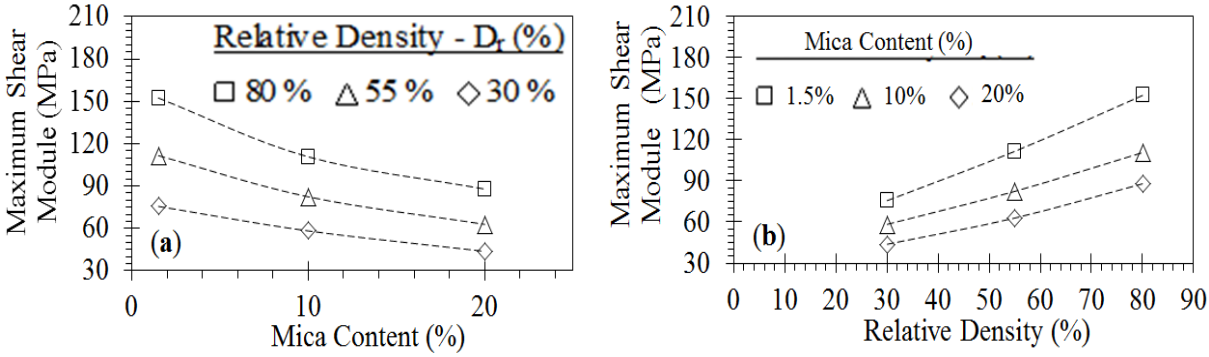

Figure 9. Changing of the maximum shear modules with mica content and relative density.

Conclusion

In this experimental study, the effects of the platy mica grains, on shear waves and maximum shear modules of the sandy soils within the liquefaction depth (20 m) of the study area have been researched.

Soil samples that were recovered from the study area were used in the testing program. Apart from the present study, dynamic experimental studies regarding the Old Gediz River Delta are scarce. Therefore, the findings of this study have significant importance since they will be informative and advisory for future researches to be conducted on the sandy soils of the area.

Platy mica content of the soils within the study area was determined down to 20 m from the surface. Soils of the survey area contain platy mica mineral ranging between 5% and 20%. Such mica content for sandy soils may be sufficient to change major engineering properties especially dynamic properties of the sandy soils. In order to estimate soil behavior correctly, mica content of the sandy soils were studied in detail.

Influence of platy mica grains on shear wave velocity and maximum shear modules were observed during bender element tests. For all mica contents, shear wave velocity and maximum shear modules decrease as relative density and effective confining pressure decreases. It was noticed that shear wave velocity and maximum shear modules were inversely proportional with mica content

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Test results shows that, small amount of mica can change shear wave velocity and maximum shear modules of sandy soils. As seen in Figure 8 and Figure 9, when the mica content increases 1.5% to 20%, maximum shear modules decreases 111.6 MPa to 62.9Mpa for dense sand (Dr:55%). Maximum shear modules were decreased about 43.6% rate. Similar effects were observed loose (Dr:55%) and very dense (Dr:80%) sands. When the mica content increases 1.5% to 10%, maximum shear module decreases about 42.1% and 42.3% for loose and very dense sand respectively. An increasing about 10% in mica content caused to decrease in maximum shear modules about 22.9%, 26.1% and 27.4% rates for loose, dense and very dense sand respectively. Shear wave velocity is effected similarly by the platy mica grains. Increasing of platy mica grain contents caused a diminish in shear wave velocity as seen in Figure 8. 10% and 20% mica content caused diminishes about 12~15% and 23~25% in shear wave velocity respectively.

Platy grains have considerable effects on dynamic properties of the sandy soils. Ignoring the effects of platy grain on the sandy soils leads to significant errors in dynamic soil response analyses and other dynamic analyses. Empirical relations should not be used for estimation of soil parameters which contain platy grains.

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INFLUENCE OF TEACHER'S PERSONAL FACTORS AND ORGANIZATIONAL CHANGE STRATEGY ON TEACHER EVALUATION FOR PROFESSIONAL DEVELOPMENT IN ELEMENTARY SCHOOLS

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Abstract: The main purpose of this study was to research the influence of teacher's personal factors and organizational change strategy on Teacher Evaluation for Professional Development (TEPD) in elementary schools. According to the literature reviews in influence of teacher's personal factors and organizational change strategy on TEPD, using TEPD Influence Factor Scale as the research tool, targeting elementary school teachers. There are 299 effective samples. With AMOS processing CFA to choose the best model, and further its reliability and validity were tested. Results showed that the model fits, and its goodness-of-fitness conformed to standard. It can prove that teacher's personal factors have influences on the TEPD with causal relationship and organizational change strategies intervening variables effect are significant. We suggest that education institution can notice this issue in order to enhance the efficiency of the TEPD paper is a report on the findings of a study conducted on a graduate level virtual conference summer school course. Discourse analysis techniques were used to examine the resulting transcript of texts for evidence of a democratic discourse within a community of learners. Findings indicate that gender is not masked in the text driven discussions on the Internet. Distinctive discursive styles are often sex class linked. Like face to face or classroom contexts, status is accorded unequally within discourse communities. Participants are not equal and are not equally attended or responded to. Educators need to take a serious and wary approach to accepting claims of ensured democratic participation in computer mediated communication formatted classes.

Keywords: teacher's personal factor, organizational change strategy, Teacher Evaluation for Professional Development, confirmatory factor analysis

Introduction

1. Research Background and Motives

A teacher plays an important role in ensuring the teaching quality and students' learning effectiveness in school (Tucker & Stronge, 2005). Nowadays, each country is committed to improving teachers' quality and promoting teachers' professional knowledge and teaching skills, and their main practice is to apply teacher evaluation which can enhance teachers' professional literacy and promote teachers' professional career development to improve education achievements (Avalos & Assael, 2006; Danielson, 2001). Therefore, the establishment of appropriate teacher evaluation system can improve teachers' quality and working performance and highlight teachers' professionalization, and it is also the only effective method to ensure teachers' dignity and social status (Yen, 2003).

Many researches suggest that teacher evaluation is an important method to increase teachers' professional development, and it is also an important mechanism to guarantee students' achievement (Sun, 2008). In order to respond to the highly expectation from all works of life to education quality, Ministry of Education ever listed "establishment of teacher evaluation mechanism and improvement of teachers' teaching performance" and "improvement of the current performance appraisal system of elementary and secondary school teachers and the enhancement of teachers' professional performance" into the discussion outline "in the meeting on education reform

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review and advancement in 2001" (Ministry of Education, 2001). In September 2003, in the meeting on national education development, Ministry of Education draws a conclusion to especially formulate "the implementation essentials on the handling of teacher evaluation for professional development with the subsidy of Ministry of Education", so as to assist in teachers' professional growth, increase teachers' professional literacy, improve teaching quality and increase students' learning achievements. With the premise of teachers' voluntary participation, a three-year "pilot subsidy scheme on teacher evaluation for professional development" has been promoted since 2006 to courage school to participate in pilot scheme (Ministry of Education, 2006). Pilot scheme has been changed into normal scheme since 2007, and "the implementation essentials on the handling of teacher evaluation for professional development with the subsidy" are published, with the purpose of promoting the professional development of elementary and secondary school teachers and enhancing students' learning achievements through normal handling of teacher evaluation for professional development (Ministry of Education, 2014).

The scheme on teacher evaluation for professional development has been promoted for nearly 10 years in Taiwan. In 2016, there are 1,441 elementary schools participating in pilot scheme, accounting for 54.5% of all elementary schools in Taiwan, with 29,493 participating teachers, accounting for 29.91% (website for teacher evaluation for professional development, 2015); the continuous growth in the number of participating schools and teachers shows that teachers can gradually accept and participate in teacher evaluation for professional development, but there is still room for improvement. Executive Yuan has passed "Amendments on some Articles in Teacher's Law" to bring the teacher evaluation in senior high school and below into law, which has entered into the second reading program of Legislative Yuan (Chiu and Lin, 2012). In order to avoid falling into the same old trap of poor effectiveness in education reform in Taiwan, it is necessary to discuss the factors influencing teacher evaluation for professional development, which can be used as reference for future implementation schools and help to promote teacher evaluation policy and achieve the goal of evaluation.

Teacher evaluation for professional development is one of the important education policies at present and is critical to the significant organizational change of schools. During the implementation of this significant policy, the proper organizational strategies are required to be put forward, and meanwhile teacher's personal factors should also be considered, so that organizational stability and development can be achieved. Wu (1999) indicates that teacher evaluation process is a part of teacher's personal development and administrative reform of school. With teacher's personal factors and organizational change strategy as pointcut, this research first collects data and then applies confirmatory factor analysis to analyze the influence of above-mentioned two factors on implementation effectiveness of teacher evaluation for professional development in elementary schools. Thus, it will help to implement teacher evaluation for professional development in elementary schools and put forward feasible improvement strategies.

2. Research Purposes

According to the above research background and motives, the main purpose for this research is to know about the influence of teacher's personal factors and organizational change strategy on implementation effectiveness of teacher evaluation for professional development; with the technology of Structural Equation Modeling as theoretical verification tool, the goodness of fit for the model "influence of teacher's personal factors and organizational change strategy on implementation effectiveness of teacher evaluation for professional development" is tested to further understand its direct and mediating effect.

Literature Review

Teacher evaluation for professional development is the policy scheme promoted strongly by Ministry of Education in recent ten years, and will also bring significant organizational change in schools. This research will verify the influence of teacher's personal factors and organizational change strategy on implementation effectiveness of teacher evaluation for professional development, and the relevant literature review is as follows:

1. Teacher's personal factors

(1) Teacher's demand and attitude. The demand for teacher's professional development comes from the perceived role gap between "reality" and "ideality" (Sun, 1997); Chang and Lin (2006) points out that in order to respond to the implementation of new curriculum and policies of teaching and evaluation, teachers need professional development to increase confidence and self-efficacy and to understand the weakness in their profession and demand and connotation for professional growth through teacher evaluation for professional development, so as to improve

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teacher's professional status. Castle and Aichele (1994) think that intrinsic motivation is the important kinetic energy to promote teacher's continuous professional growth, and the teacher's consciously professional development demands his personal education idea and professional awareness to generate internal driving force for the pursuit of professional growth; Beerens (2001) also indicates that the best method for teacher's professional development is the initiative pursuit based on intrinsic motivation and demand. In addition, for instance, a teacher can sort out teaching files and data systematically due to being the national education guidance group members, so as to understand his own profession degree or strengths and weaknesses in teaching through sharing and counseling the teacher's teaching process (Chang and Lin, 2006).

This research discusses the teacher's demand for professional development as well as his attitude towards teaching and evaluation to understand the influence of this factor on the implementation effectiveness of teacher evaluation for professional development.

(2) Teacher's concerns. Discussion on teacher's concerns originates from the "concerns theory" of Fuller (1969). "Concerns" mean that one person tries to do something under the expected situation or has the tendency of trying to do something under other special situations. Concerns can be said to be the motive power of action, while action is the result of concerns (Sun and Chen, 2007). Fuller divides teacher's concerns into three phases: 1) Self-concerns phase: teacher concerns whether his own performance in teaching ability and role play is competent and affirmed. 2) Task-concerns phase: teacher concerns the environmental factors of teaching and how to achieve teaching task, such as routine of school-room, teaching material resources, working atmosphere, etc. 3) Impact-concerns phase: teacher concerns students' learning process, emotional demand, social development, etc. In her opinion, teacher's concern for teaching is a kind of demand and also the learning motive. Following the research into teacher's concerns for teaching, Hall and Hord (1987, 2001) propose "Concerns-Based Adoption Model" (CBAM) to divide teacher's concerns into 7 development phases: awareness, information, personal, management, consequence, collaboration and refocusing, and their integrated viewpoints are shown in Table 1.

Table 1: Characteristics of teacher's concerns in each phase

Phase	Name	Characteristics
Self-concerns	Awareness	Rare concerns for or participation in innovation.
	Information	Having a preliminary understanding of innovation and wishing to understand more contents about innovation.
	Personal	Aimed at the conflict between innovation and existing school structure, innovate in contradictions between the responsibilities needing to be shouldered now as well as in the connotation of their own and colleagues' treatment and status, and consider it deeply.
Task-concerns	Management	Concerns focus on implementation process and work of innovation as well as the best method for information and resource usage, especially the concerns for the requirements for working efficiency, organization, management, plan and time limit.
Impact-concerns	Consequence	Concerns for the influence of innovation on students, focusing on the applicableness of innovation on students, evaluation for students' learning achievements and change demands for students' performance gains.
	Collaboration	Concerns for how to coordinate and cooperate with others during the implementation of innovation.
	Refocusing	Concerns for searching more wide benefits from innovation, including discussion on significant change or feasibility of being replaced by another innovation; individuals have other schemes or more specific ideas for selection or innovation.

Source: revision by Hall & Hord, 1987, NY: State University of New York Press, p.60.

Hall and Hord (2001) think that in spite of respective characteristics in each development phase, they are not mutually exclusive with each other and have the relationship of dynamic change. That is to say, a teacher may have concerns for different development phases simultaneously in the certain time, where the greatest concerns will change due to the implementation of change. With the time going, the change participants' concerns for change will change for being affected by personal experience, knowledge, impressions and the attitudes towards participation

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degree in change. The opinions of teacher's concerns imply the problems facing them, the assistance required and psychological resistance to innovation (Hall & Hord, 1987; Hall & Shieh, 1998); it also shows that the input and commitment of organizational members and requires the change agent to provide effective support and intervention. Thus, this research discusses the above-mentioned 7 kinds of teacher's concerns.

2. Organizational change strategy

From the perspective of organizational change theory of Kurt Lewin, teacher evaluation for professional development implemented in elementary schools can be divided into 3 phases of strategy dimensions of unfreezing, action and freezing, and the discussions are as follows:

(1) Strategy in unfreezing phase

1. Inspiration of change demand: Jackson (2000) and Kotter (2007) think that if organizational members have high degree of self-satisfaction, they will have lower interest in participating in change; in the case of lacking incentive factors, the change work will become more difficult. Successful changes mainly originate from that individual or team begins to seriously think about organizational competition situation and pays attention to potential crisis. Therefore, Kotter (2007) puts forward that the top priority is to establish crisis awareness among the 8 steps of change leadership. The promotion of organizational change requires the highly cooperation of organizational members, and the inspiration of change demand through crisis awareness is related to the cooperation degree of change action, so how to develop members' demands for organizational change and cultivate crisis awareness are the indispensable methods. By means of crisis awareness, the potential crisis and opportunity appearing in organizations are found out, or with the understanding of market competition situation and organizational status, organizational members are promoted to reflect on their own situation to increase their commitment to organizational change.

2. Analysis of change environment: Chen (2003) and Hsieh (2004) indicate that the resistance of school organizational members to the promotion of teacher evaluation change for professional development should be eliminated in unfreezing phase, so as to shape the organizational culture in favor of change. During the promotion of change scheme, the positive driving force in favor of change and negative driving force going against change are bound to appear. Fidler (1996) thinks that school organization has 3 important jobs in this phase: they are respectively presenting the evidence of organizational problems, linking organizational problems and school goals to trigger teachers and administrative staff's anxiety and motivation and presenting the possible solving strategies. In other words, in order to eliminate the adverse factors for the promotion of teacher evaluation for professional development in unfreezing phase, schools should analyze the adverse environment factors and make students know about them, so as to formulate solving strategies in combination with school goal.

(2) Strategy in action phase

1. Organizational change team: Keyton (2005) indicates that the premise for school's promotion of change is that school must formulate change scheme according to organizational characteristics, and the expectation of students, teachers and administrative staffs, community and parents, and really carry out the action strategy of change. Yukl (2002) further indicates that organizational working scheme and promotion process need powerful force, and it is certain that the work will not be completed with only one-man force. The establishment of a powerful change team is the indispensable factor of organizational change and transformation for change team, and its team members must have mutual trust and common goal; only if the team members have the aspiration to pursue common excellent goal, the true collaboration will occur.

2. Construction of shared vision: organizational shared vision is one of the key factors for the success of organizational change (Hall & Hord, 2001), as organizational vision has three roles: clarifying the direction of organizational change, inspiring organizational members to adopt proper action towards the correct direction and rapidly and effectively organizing members to coordinate each other's action. Vision is just like an image presenting the future and provides an open or implicit explanation for the future that partners are try best to create. Keyton (2005) further points out that the formation of vision relies on the effective communication and coordination between change leaders to reach a consensus; the team's change cognition is increased and teacher's personal goal and organizational goal are integrated through the process of whole staff's participation, so as to improve school organizational change efficiency.

3. Inspiration of change and innovation: for individuals, team or organizations, change often goes along with pains and difficulties (Torres & Preskill, 2001), which may cause individual's sense of anxiety for the uncertainty of future

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or the resistance to organizational structure inertia or team inertia to threaten the existing power relation (Robbins & Judge, 2007). Therefore, the method of inspiring change and innovation or reducing the resistance to change can be adopted, such as, increasing staff's participation and communication to enhance identity and support, intensifying staff's educational training, adopting material and spiritual reward and counseling and step by step method (Wu, 1999). In addition, relevant researchers indicate that the external incentives and motivations are also extremely important factors; in particular, the factors of peer influence and invitation of directors hold a majority (Li, 2007; Hung, 2007; Chen and Lo, 2011).

4. Enhancement of teacher's empowerment: with teacher's professional development as the main guidance, teacher evaluation for professional development aims to assist teacher in professional growth and increase teacher's professional literacy and improve teaching quality. If school operator can construct a platform where teachers can give full play to their expertise and potential and are willing to share, so as to apply the concepts of teaching leadership, teacher leadership and other distributed leadership for fully empowerment and hierarchical responsibility, the members can be inspired to implement change and innovation to effectively achieve organizational goal (Li, 2003; Lin, 2011; Chang, Chou, and Li, 2011) and realize the functions of teacher empowerment.

(3) Strategy in freezing phase

According to Kurt Lewin, organizational change theory means that establishment of a certain program can make the new action and operation continue and original state will no longer recover, so that the effectiveness obtained in promotion phase is steadied and retained (Hall & Hord, 2001). Only when change is transformed into organizational culture and integrated into the blood of organizations, change can last for long. (Kotter, 2007).

1. Timely review and improvement: after the evaluation for the effectiveness of change, the evaluation results must be fed back to organizational members for the revision of change strategies; with the methods of reward system, resource support, positive reinforcement, etc, the change scheme will become the formal organizational planning to retain the change effectiveness for a long term. After the change (no matter whether it is change in organization, individual or team and technology) lasts for some time and can achieve the change goal of school organizations, it must be institutionalized and formalized to retain the change effectiveness for long, so that organizations will return to the stable and balanced state, i.e. the organizational institutionalization and the permanence of new action of organizational members (Hall & Hord, 2001).

2. Shape of organizational culture: organizational culture is the code of conduct and shared value of organizational members; during the shape of change culture, it is necessary to let members know about the new practice and action to improve performance and guarantee the consistence of supervisor's words with his action (Yen, 2003; Kotter, 2007); if members can clearly see and affirm the effectiveness of change, they will further vigorously advocate the effectiveness of change. In case of the combination between organizational change and organizational culture, organizational members can not only observe the system of organizational change, but also can accept the idea of organizational change heartily (Kotter, 2007).

Therefore, the effectiveness of teacher evaluation for professional development lies in whether organizational members can timely make the review and improvement, so that change scheme will become the common rules of organizational members and be shaped into organizational change culture to retain the effectiveness of organizational change for long.

3. Relationship between teacher's personal factor, organizational change strategy and teacher evaluation for professional development

Tseng (2006) thinks that teacher evaluation for professional development refers to the "formative evaluation" for teacher's profession; during the process of change, teachers are helped to understand their own strengths and weaknesses in teaching or where it can be better and proper help are provided for teacher's growth, so as to promote teacher's professional development and improve teaching quality. Hung and Hsieh (2007) hold that teacher evaluation for professional development refers to the teaching evaluation with the aim of enhancing teacher's professional development. With the teacher's profession as principal axis, this evaluation emphasizes the teacher's initiative participation; a set of systematic evaluation indictors is used to carry out teacher's self-evaluation and intramural evaluation, and evaluation results can assist teachers to understand the strengths and weaknesses in

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teaching and its reasons and can be used as the basis for the arrangement of teacher's training or enhancement of professional knowledge and skills. Based on the Taiwanese research, it is found that teacher's initiative, personal motives and attitude are all the influence factors promoting teacher's professional development (Chen and Jiao, 2009; Li, 2002). Goodson (2001) emphasizes that the educational change should not only consider the organizational internal affairs and external relationship, it should also consider the balance between personal factors. In the analysis of change, personal transformation should be put to the top; only when teacher's personal input is considered as the motives for change and its necessary goal, educational change can achieve the greatest effectiveness. Lin (2007) thinks that the implementation process of teacher evaluation for professional development is affected by social opinions, teacher culture, economic factors, structure, politics and other environment factors. According to Chang, Chou, and Li (2011), the influence factors for teacher evaluation scheme for professional development focus on 3 items of teaching leadership, teacher culture and external environment.

School organizations are characterized by bureaucracy system and loosely coupled dual system and belong to domesticated organization (Qin, 2000), so it is more difficult to promote organizational change in schools compared with general business establishments. Since 2006, Ministry of Education has promoted and encouraged teachers below high schools and higher vocational schools to voluntarily participate in evaluation scheme for professional development; it is hoped to assist in teacher's professional growth, increase teacher's professional literacy, enhance teaching quality and increase students' learning achievements through the promotion of this scheme. According to Owens (1995), in face of the change of internal and external environmental factors, in order to achieve the sustainable development in school affair and improve education quality, the school authority will certainly master school organizational characteristics and change focus and adopt good coping strategies for organizational change.

RESEARCH DESIGN AND IMPLEMENTATION

1. Research Subjects

According to the data provided by website for teacher evaluation for professional development (2015), aimed at the schools selected by each county and city to implement teacher evaluation for professional development in elementary schools, stratified random sampling was used for test according to the proportion of teachers in elementary schools participating in teacher evaluation for professional development in northern, middle and southern district; after deducting the samples with incomplete answers and the samples answered by teachers without the experience of participating in evaluation, 299 valid samples were obtained.

2. Research Tools

This research adopted "scale on influence factors of teacher evaluation for professional development implemented in elementary schools" (Su, 2014) as the tool, and the measurement items in this scale has been treated as follows in trial test: 1. With the adoption of extreme value test method, trial test samples are divided into two groups by 27% before and after trial test samples; with the significant difference of the two as discrimination degree, items without discrimination degree are deleted; 2. With the use of correlation analysis method of items and total scores, items where the correlation coefficient between item and total scores is smaller than 0.3 and the Cronbach's α coefficient will increase after the deletion are deleted; 3. According to the suggestions of Hair, Anderson, Tatham and Black (2009), items where commonality is smaller than 0.5 are deleted. The scale on "teacher's personal factors" covers teacher's personal demand and attitude (attitude towards teaching and demand for professional development) and teacher's concerns (awareness concerns, information concerns, personal concerns, consequence concerns, collaboration concerns, refocusing concerns), with a total of 8 factor dimensions and 25 items. Bartlett's sphericity test of dimensions is significant, KMO value is 0.939, dimension explanation quantity is 82.30% and Cronbach's α coefficient is 0.931. The scale on "organizational change strategy" is divided into 6 potential factors: inspiration of change demand, analysis of change environment, organizational change team, construction of shared vision, inspiration of change and innovation, enhancement of teacher's empowerment, with a total of 27 items. Bartlett's sphericity test of dimensions is significant, KMO value is 0.942, dimension explanation quantity is 84.230% and Cronbach's α coefficient is 0.944, indicating the good reliability and validity in this questionnaire, so it can be used to discuss the influence of organizational change strategy on implementation effectiveness of teacher evaluation for professional development.

3. Research Method

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Through literature review and integration, this research constructs the research structure of teacher's personal factors and organizational change strategy (Figure 1), and applies the structural equation modeling software Amos for confirmatory factor analysis (CFA) to confirm the goodness of fit of this structural modeling.

By referring to Bagozzi and Yi (1988), Jöreskog and Sörbom (1996) and Hairet al. (2009), this research uses the indicator of overall goodness of fit, including (a) the chi-square value of absolute index ($\chi 2$), ratio of chi-square and degree of freedom ($\chi 2/df$), fit index (GFI), root mean square residual (RMR) and root mean square error approximation (RMSEA); b. incremental fit index of incremental index (IFI) and comparative fit index (CFI); c. Parsimony Goodness Of Fit Index (PGFI) after the parsimony and adjust for parsimony index and Parsimony Normed Fit Index (PNFI) to gain compact model.

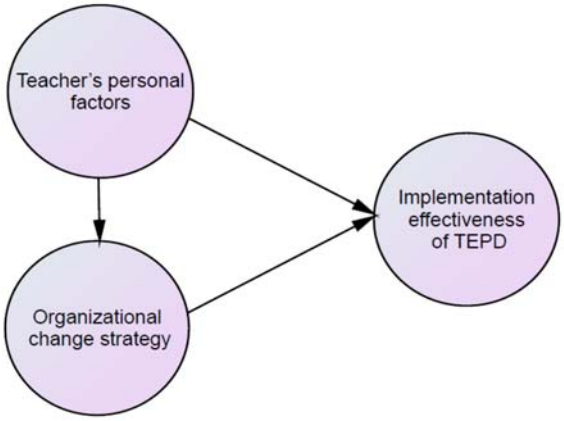

Figure 1. Structural Equation Modeling

RESEARCH RESULTS AND ANALYSIS

1. Goodness of fit test for the modeling of teacher's personal factors

This research uses 299 valid samples to carry out the SEM analysis, and there are totally 8 observation variables in teacher's personal factors (see Figure 2), degree of freedom 8* 9/2=36, with a total of 8 residual errors; with the addition of 1 variance and 7 factor loadings, the degree of freedom is greater than estimated parameter, so the modeling belongs to over identification, conforming to the requirements of positive definite model in theory. The factor loading of the 8 observation variables after CFA is greater than 0.5, but the residual errors of 3 observation variables of collaboration concerns, personal concerns and information concerns are not independent. Due to the compact modeling and the violation of the principle of residual error independence, 5 observation variables are retained after these 3 observation variables are deleted. Each factor loading is as follows: attitude towards teaching is 0.65, demand for professional development is 0.87, awareness concern is 0.6, consequence concern is 0.69, and refocusing concern is 0.76 (see Figure 3).

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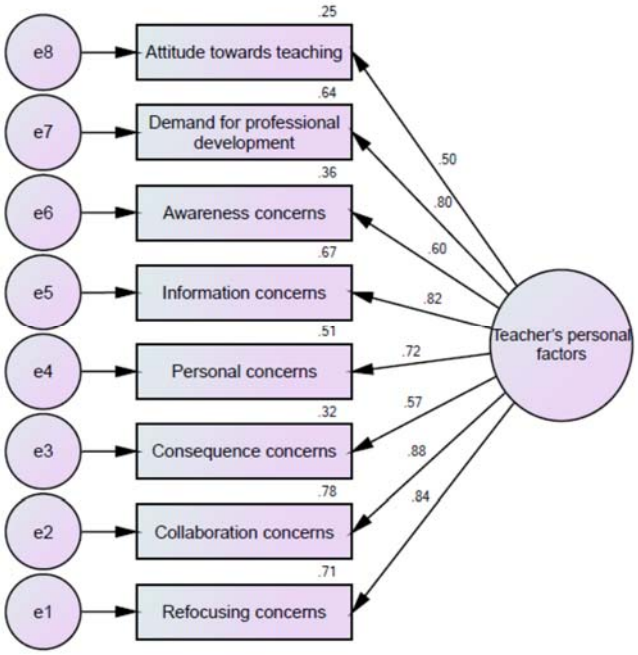

Figure 2. Dimension of teacher's personal factors

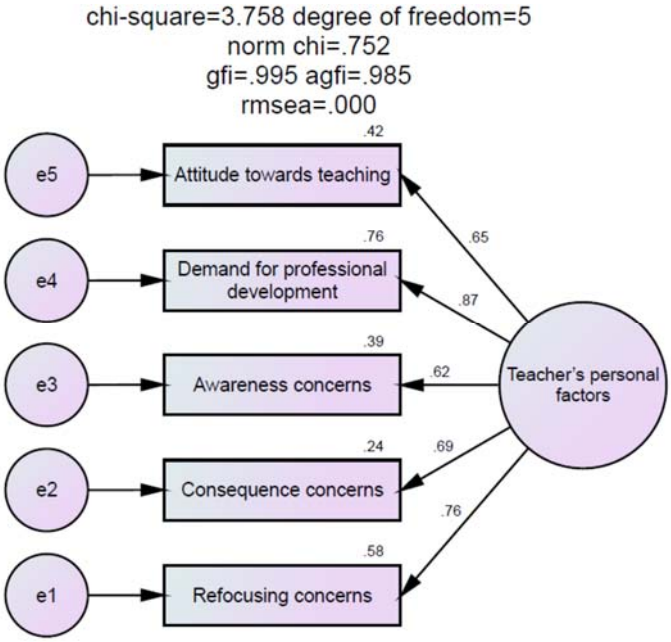

Figure 3. Dimension of teacher's personal factors after cfa

After deleting observation variables, PGFI=0.332 is smaller than suggestive value 0.5, and the reason may be that the item similarity is too high, causing the lower statistics of this index; other absolute fit index, incremental fit index and PGFI all get the ideal value, and the index within the evaluation index is greater than suggestive value, indicating that this modeling has good goodness of fit (See Table 1); the composite reliability of this dimension is (CR value) is 0.884, average variance extracted (AVE) is 0.524, and both of them are greater than suggestive value.

Table 2: Each goodness of fit index and statistics for the dimension of teacher's personal factors

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Goodness of fit		Statistics	Suggestive value
Absolute fit index	χ^2	3.758	The smaller, the better
	df	5	
	χ^2/df	.752	<3
	GFI	.995	>0.9
	AGFI	.985	
	RMR	.009	<0.08
	SRMR	.0181	
	RMSEA	.000	
Incremental fit index	NFI	.991	>0.9
	NNFI	1.006	
	CFI	1.0	
	RFI	.983	
	IFI	1.00	
PGFI	PGFI	.332	>0.5
	PNFI	0.50	
	CN	878	>200

2. Goodness of fit test for the modeling of organizational change strategy

There are totally 6 observation variables in organizational change strategy (see Figure 4), degree of freedom 6* 7/2=21, with a total of 6 residual errors; with the addition of 1 variance and 5 factor loadings, the degree of freedom is greater than estimated parameter, so the modeling belongs to over identification, conforming to the requirements of positive definite modeling in theory. The factor loading of the 6 observation variables after CFA is greater than 0.5, but the residual errors of observation variable of "inspiration of change demand" are not independent. Due to the compact modeling and the violation of the principle of residual error independence, 5 observations are retained after this observation variable is deleted. Each factor loading is as follows: inspiration of change and innovation is 0.70, analysis of change environment is 0.83, organizational change team is 0.72, construction of shared vision is 0.83 and enhancement of teacher empowerment is 0.77(see Figure 5).

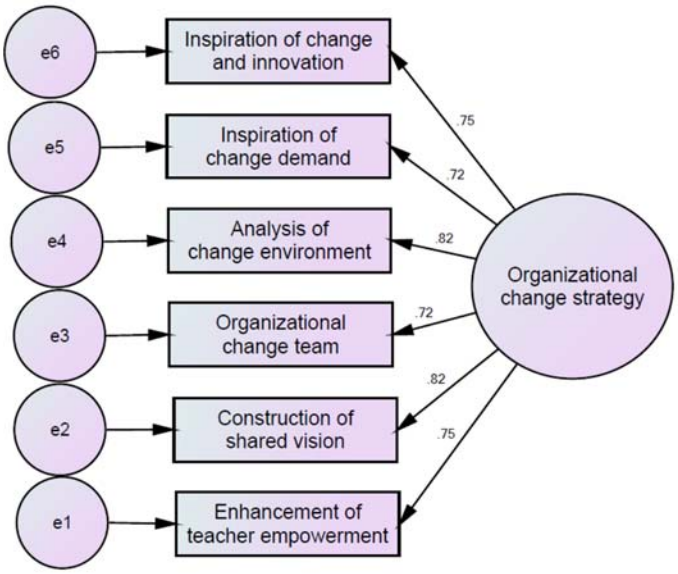

Figure **4.** Modeling of dimension of organizational change strategy

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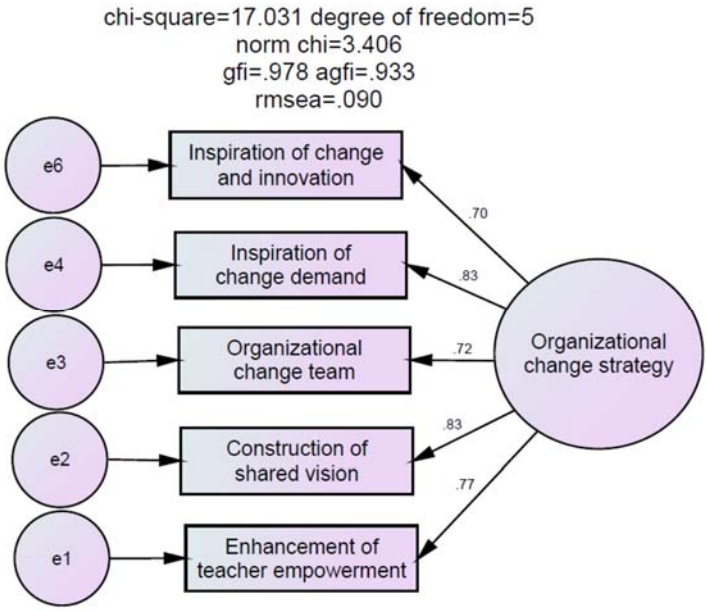

Figure 5. Modeling of dimension of organizational change strategy after cfa

Table 3: Each goodness of fit index and statistics for the dimension of organizational change strategy

Goodness of fit		Statistics	Suggestive value
Absolute fit index	χ^2	17.03	The smaller, the better
	df	5	
	χ^2/df	3.406	<3
	GFI	0.978	>0.9
	AGFI	0.933	
	RMR	0.008	<0.08
	SRMR	.0266	
	RMSEA	0.009	
Incremental fit index	NFI	0.977	>0.9
	NNFI	0.967	
	CFI	0.984	
	RFI	0.955	
	IFI	0.984	
PGFI	PGFI	.326	>0.5
	PNFI	0.499	
	CN	264	>200

3. Effect analysis between potential variables for structural modeling

According to the results of path model (see Figure 6), it can be known that the influence coefficient of teacher's personal factors on teacher evaluation for professional development has achieve significant level (0.79). Thus, teacher's personal factor has the significant direct effect on implementation effectiveness of teacher evaluation for professional development.

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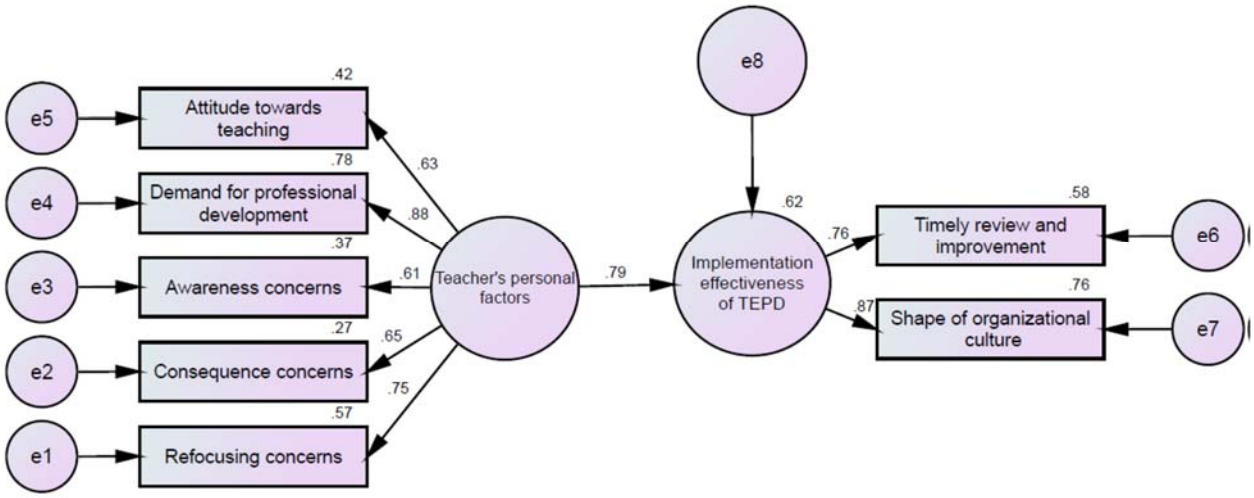

Figure **6.** Coefficient of path structural modeling

As for the effect between all the variables of structural equation modeling in this research, (see Figure 7), Amos is used to test mediating effect and it is found that teacher's personal factors and organizational change strategy have the significant total effect on implementation effectiveness of teacher evaluation for professional development. Moreover, teacher's personal factors also have significant indirect effect on implementation effectiveness of teacher evaluation for professional development through organizational change strategy, indicating that organizational change strategy has the significant mediating effect. The effect of each variable is summarized in Table 4.

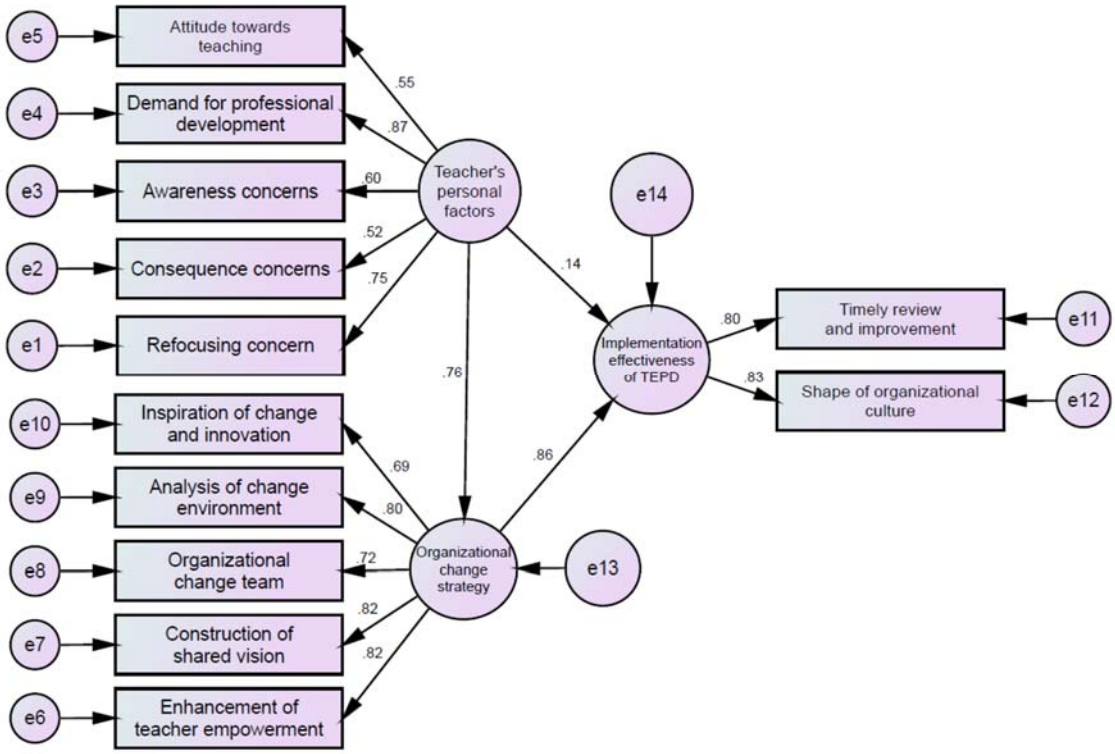

Figure 7. Structural equation modeling for teacher's personal factors and organizational change strategy

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Table 4: Effect between variables of structural equation modeling

Potential independent variable	Potential dependent variable	
	Organizational change strategy	Implementation effectiveness of teacher evaluation for professional development
Teacher's personal factors		
Direct effect	.76	.14
Indirect effect		.65
Total effect		.79
Organizational change strategy		
Direct effect		.86
Total effect		.86

Conclusion and Suggestions

With the teacher evaluation for professional development strongly promoted by Ministry of Education since 2007, the trial scheme has been further changed into normal scheme, hoping that the teacher's professional development can be promoted through teachers' participating in the process of evaluation activity. This research discusses the influence of teacher's personal factors and organizational change strategy on implementation effectiveness of teacher evaluation for professional development in elementary schools, so as to test, clarify and master the relationship between variables, which can help to research and formulate the thoughtful and feasible improvement method. The conclusions and suggestions in this research are illustrated as follows:

Conclusion

The conclusions for this research are as follows:

1. The research results show that teacher's personal factors and organizational change strategy have the significant direct effect on teacher evaluation for professional development, and teacher's personal factors also have significant indirect effect on implementation effectiveness of teacher evaluation for professional development through organizational change strategy, indicating that organizational change strategy has the significant mediating effect.

2. Attitudes towards teaching, demand for professional development, awareness concerns, consequence concerns, refocusing concerns, etc in teacher's personal factors are all the important factors influencing the implementation of teacher evaluation for professional development. It can be known from research results that "demand for professional development" and "refocusing concerns" are the two items with the highest factor loading in the teacher's personal factors, while teacher's "awareness concerns" has the lowest factor loading.

3. Analysis of change environment, organizational change team, construction of shared vision, inspiration of change and innovation and enhancement of teacher's empowerment in organizational change strategy are the important factors influencing the implementation of teacher evaluation for professional development. "Construction of shared vision" and "enhancement of teacher's empowerment" are the two items with the highest factor loading in the organizational change strategy, while "inspiration of change and innovation" has the lowest factor loading.

Suggestions

1. Teacher's "awareness concerns" has the lowest factor loading, indicating that teachers rarely concern for or participate in teacher evaluation for professional development. Therefore, only the elimination of misgiving and discomfort in teachers' heart, selection of proper contents, criteria and methods of teacher evaluation for professional development can reduce teacher's psychological obstacle of participating in evaluation so as to improve the

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effectiveness of teacher evaluation for professional development, which is also the urgent task of the government. Therefore, schools should assist in the teacher's professional development and provide various rewards to improve the effectiveness of teacher evaluation for professional development.

The understanding of relevant teacher's personal factors can help to increase the willingness to participate in evaluation or reduce the obstacle of participating in evaluation.

2. The subjects for this research are only restricted to teachers in public elementary schools, and the subjects will be expanded to teachers in public middle schools and even in private elementary and secondary schools in the follow-up research; after the cross validation is carried out for the research scale, the modeling stability for this research is further verified, and then whether the difference in teacher's factors in elementary and secondary schools with different levels will generate significant change in implementation effectiveness of evaluation is discussed.

3. This research is conducted in terms of teacher's personal factors and organizational change strategy; it is suggested to discuss the influence of organizational change background and other factors on implementation effectiveness of teacher evaluation for professional development in the follow-up research, so as to make the structural modeling more complete to give play to the best effectiveness of teacher evaluation for professional development.

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INFLUENCES OF PROCESS PARAMETERS ON THE QUALITY OF HYDROXYAPATITE COATING ON AZ91 MAGNESIUM ALLOY

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Abstract: Biodegradable materials such as AZ91 magnesium alloy arouse most of the researchers' interest in recent years. AZ91 Magnesium alloy is a potential alloy in order to use in biomaterial applications as it is both light and similar to the mechanical features of bone. However, this alloy shows corrosive behavior (in biological environment) in human body. Extensive studies have been conducted to use of AZ91 Mg alloy as a biodegradable material. This study focuses on the use of AZ91 Mg alloy as a permanent implant. As it is necessary to prevent the corrosion of such alloy in the body, its surface was coated by sol-gel method with hydroxyapatite material which has sufficient strength and tissue compatibility. The effects of process parameters, i.e. different dipping numbers of sol-gel coating at the coating stage and different sintering temperatures of these coatings, on coating quality was analyzed with Scanning Electron Microscopy (SEM) and x-ray diffractometer (XRD).

Keywords: AZ91 magnesium alloy, hydroxyapatite, Sol-gel coating method

Introduction

AZ91 Magnesium alloy is a potential alloy in order to use in biomedical applications as it is both lightweight and similar to the mechanical features of human bone particularly it shows similar Young's modulus to bone. Lightness is extremely important in biomedical applications because stainless steel and many of the similar metallic alloys can lead to infection by causing harm to tissues around the implant when it is used in the body (Wang, M.J., et al., 2016; Surmeneva, M.A. & Surmenev, R.A. , 2015; Liu, G.Y. , et al., 2011; Liu, G.Y. , et al., 2011; Niu, B., et al., 2016). However, its biodegradable behavior in biological environment restricts its use (Surmeneva, M.A., et al., 2015; Niu, B., et al., 2016). Various studies have been conducted to reduce its degradation rate; process modification, alloying of the magnesium and surface coating techniques (Chen, X.-B. , et al., 2012; Hiromoto, S. & Tomozawa, M., 2011; Xu, L., et al., 2009) for instance electrophoretic deposition, electrochemical deposition, sol-gel and dip coating have been widely studied. Corrosion preventive coatings for AZ91 magnesium alloy is very important to develop its usage area (Hiromoto, S. & Yamamotoa, A., 2009).

Hydroxyapatite is a bioceramic material widely used in medicine and dentistry and a calcium phosphate-based material forming the inorganic structure of bone tissue (Kannan, M. B., 2015). HAp has almost the same chemical composition and structure as human bone (Rojaee, R., et al., 2014). Because of its biocompatibility, it is used in the construction of various prosthesis, repairing of cracks and broken bones and coating of metallic biomaterials as an artificial bone (Hiromoto, S. & Tomozawa, M., 2011).

In this study, AZ91 Mg alloy was produced with hot press sintering method and coated with hydroxyapatite using combination of sol-gel and dip coating method. The effects of sintering temperature and dipping number on the quality of surface coating was investigated. Surface morphology and phase structure evaluation of the coatings were analyzed with SEM and XRD, respectively.

Materials and Methods

Sample Preparation

AZ91 magnesium alloy powders were sintered at a pressure of 275 MPa at 325 ºC for a period of 1 h with unidirectional hot pressing. Produced AZ91 Mg alloy was cut in to 60×10×8 mm pieces. The specimens were mechanically ground with SiC papers and finished with 1200 grit, then polished with 6 and 3 µ diamond suspension. Cleaning process was followed by dipping the specimens in acetone and ethanol in ultrasonic bath for 10 and 20 minutes, respectively.

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Calcium nitrate tetra hydrate ($Ca(NO_3)_2.4H_2O$) and phosphorous pentoxide (P_2O_5) were selected as Ca and P precursors and dissolved separately in ethanol. Ca precursor was added drop wise to P precursor and then stirred at ambient temperature for 5 hours.

The specimens were dipped the number of 1, 3, and 5 vertically into the prepared solution and pulled off at the speed of 6 mm/min by an electrical dip coater. The dip coated specimens were maintained at room temperature for 24 hours to complete the aging process. Then, they were dried at 60 ºC for 24 hours and sintered to 300 ºC, 400 ºC, and 500 ºC for 6 hours (heating rate: 5 º/min.). The codes of the specimens are given in **Table 1**.

Table 1: Code-designated specimens.

Number of dipping → / **Sintering temperature ↓**	**1 dip**	**3 dip**	**5 dip**
300 ºC	1-300	3-300	5-300
400 ºC	1-400	3-400	5-400
500 ºC	1-500	3-500	5-500

Characterization

The surface and the cross-section morphologies of the specimens were obtained by a scanning electron microscope (SEM). The phases of the coatings sintered at different temperatures and different number of dipping were determined by X-ray diffraction (XRD) technique with a CuKα wavelength of 1.5418 (Å). The settings of diffractometer were adjusted to 40 kV and 30 mA at a 2Θ range of 20-70 º employing a step size of 0.02 º/s.

Results and Discussion

The surface of morphologies of the specimens prepared under different sintering temperatures and dipping numbers are shown in **Fig. 1**. It is obviously seen that coatings fully cover the substrate but there are a lot of cracks on the surface. Crack formation could be resulted from the stresses when volatile constituents escape from the material surface at the sintering stage. And the amount of the cracks and crack area portion decrease with increasing dip number.

The cross-section micrographs of the specimens are shown in **Fig. 2**, which reveals coating thickness of about 3 µm. The coating thickness of the specimens increase with increasing dip number and decrease with increasing sintering temperature.

The distribution of elements in the coatings is given by the EDS analysis in **Table 2**, which indicates the presence of O, Mg, Al, P and Ca. According to the EDS results coating layer consists substrate major element and at the same time the substrate consists the coating elements, too. So, although there are a lot of cracks on the surfaces, the coating layer and substrate are integrated each other.

Fig. 3, Fig. 4, and Fig. 5 shows the XRD patterns of the coatings sintered at stable temperature with 1, 3 and 5 dip numbers and pure AZ91 Mg alloy; **Fig. 6, Fig. 7, and Fig. 8** shows the XRD patterns of the coatings sintered at 300, 400, and 500 ºC with stable dip number and pure AZ91 Mg alloy. α, β, and γ represent Mg, $Mg_{17}Al_{12}$, and hydroxyapatite phases, respectively. Phases were determined according to the literature (Hou, et al., 2015; Razavi, et al., 2014; Kabirian & Mahmudi, 2009; Lee, et al., 2013). AZ91 Mg alloy used in present study was composed of Mg phase together with some $Mg_{17}Al_{12}$ phase as stated in the literature. Coating and substrate peaks cannot be distinguished from each other. This may be due to the average up to 3 micrometers thin film coating layer. As the number of dip and sintering temperature increased, the new γ peaks are formed and the intensity of AZ91 peaks are decreased.

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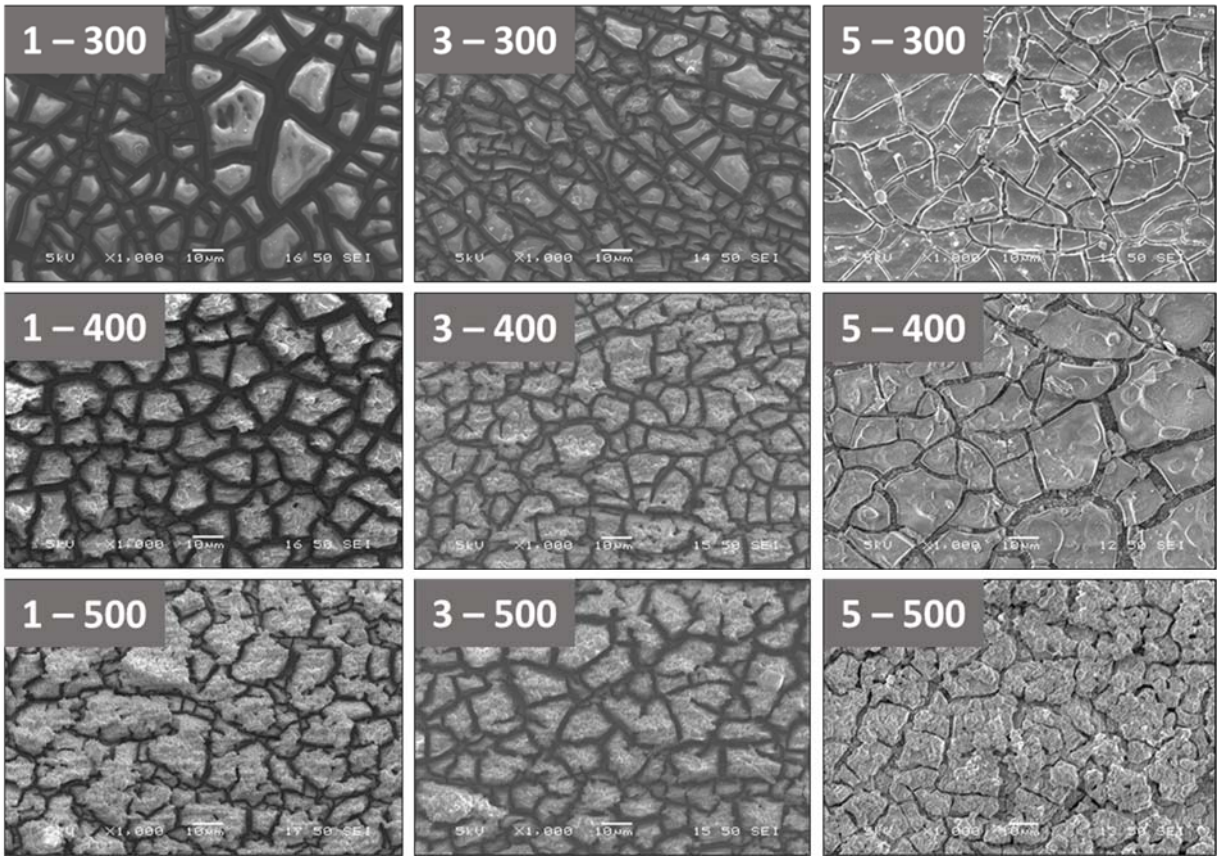

Figure 1. SEM images of the specimens at a magnification of 100x.

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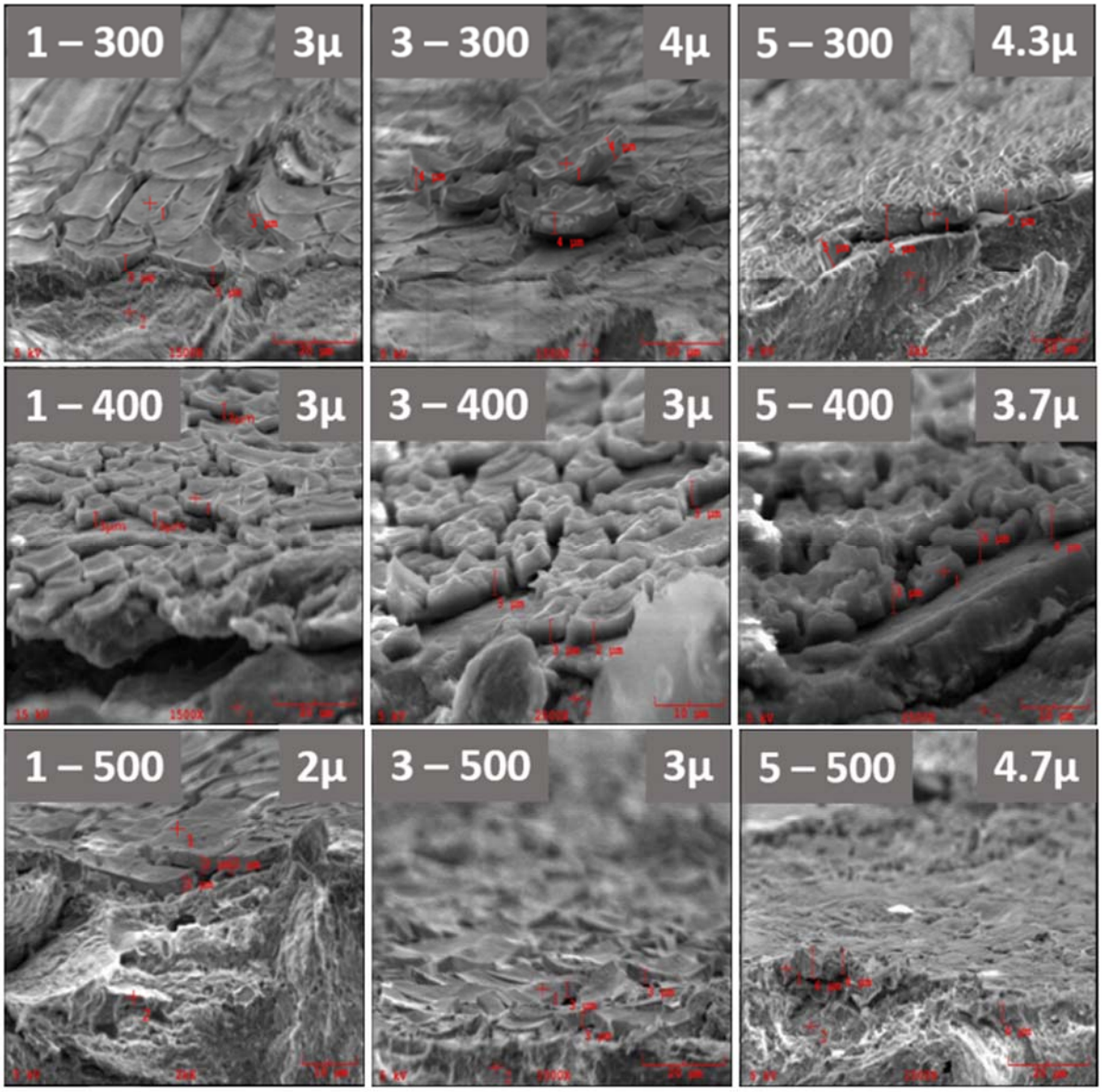

Figure 2. Cross section and EDS analysis of the specimens.

Table 2: The average value of point EDS analysis of specimens given in **Fig. 2.**

Element	O		Mg		Al		P		Ca	
Point	1	2	1	2	1	2	1	2	1	2
Average	8.434	3.227	12.071	76.473	1.747	2.528	11.375	2.160	66.373	15.612

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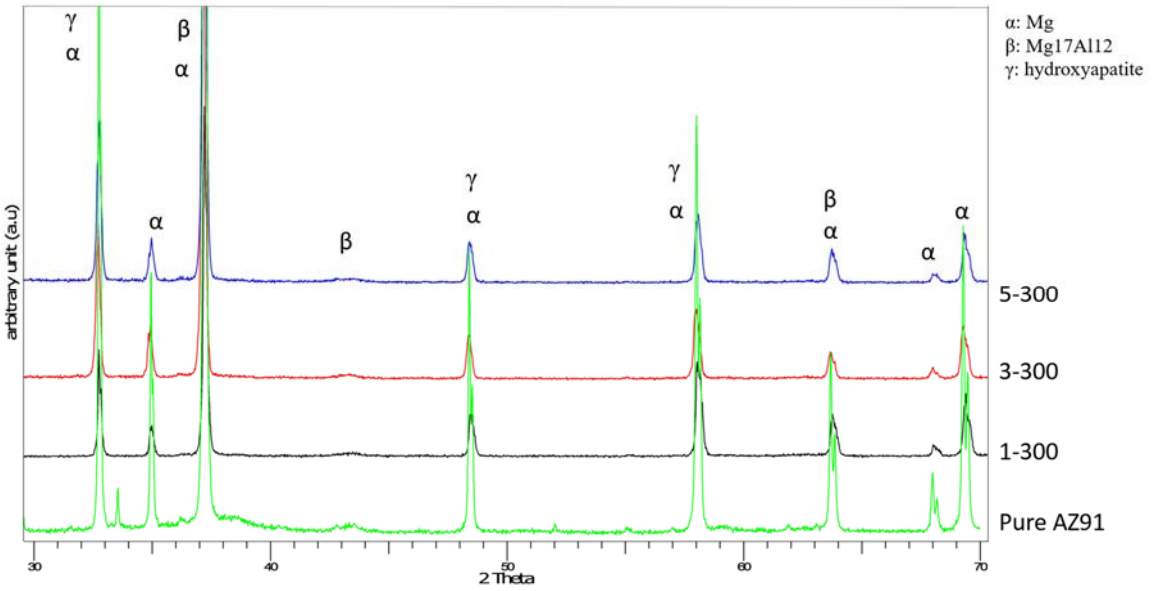

Figure 3. XRD patterns of the coatings sintered at 300 ºC with 1, 3 and 5 dip numbers and pure AZ91 Mg alloy.

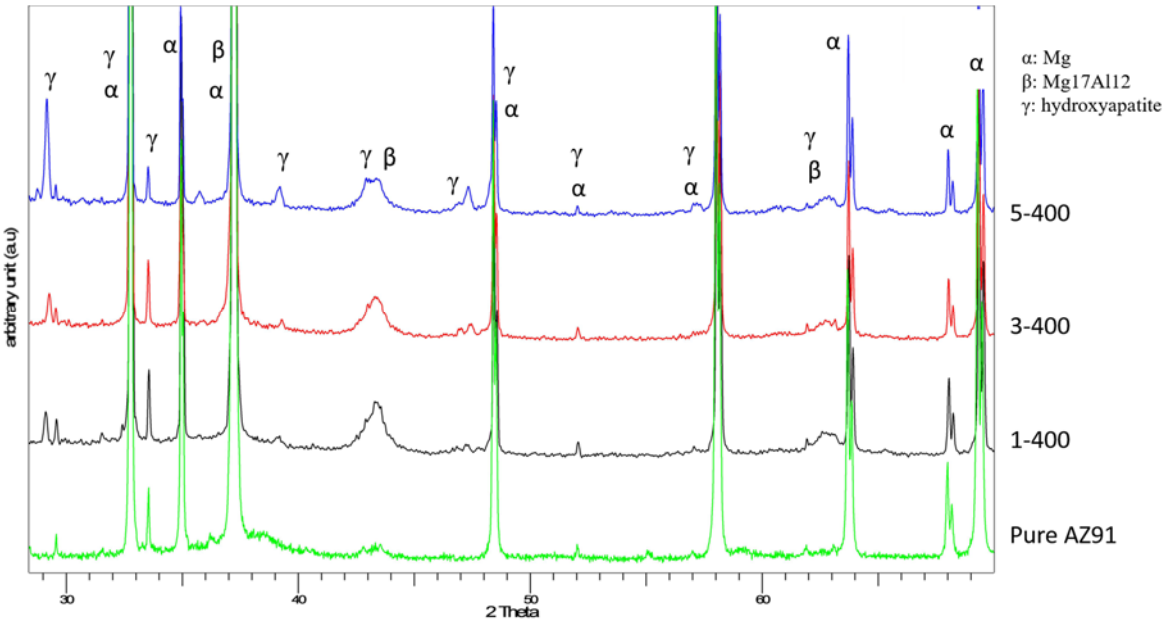

Figure 4. XRD patterns of the coatings sintered at 400 ºC with 1, 3 and 5 dip numbers and pure AZ91 Mg alloy.

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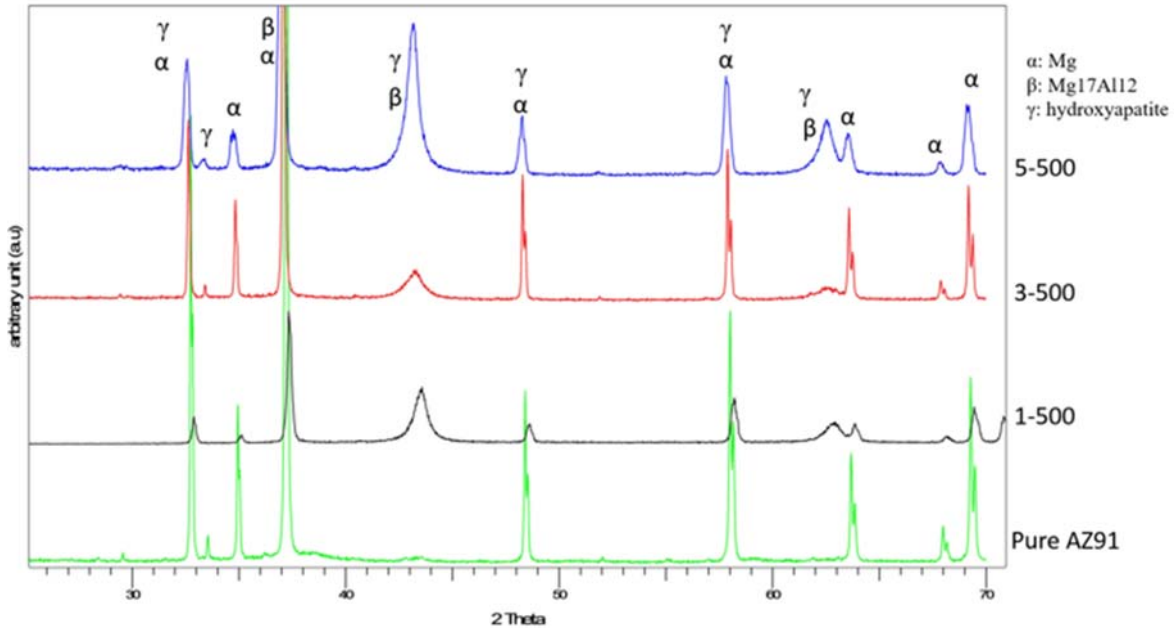

Figure 5. XRD patterns of the coatings sintered at 500 ºC with 1, 3 and 5 dip numbers and pure AZ91 Mg alloy.

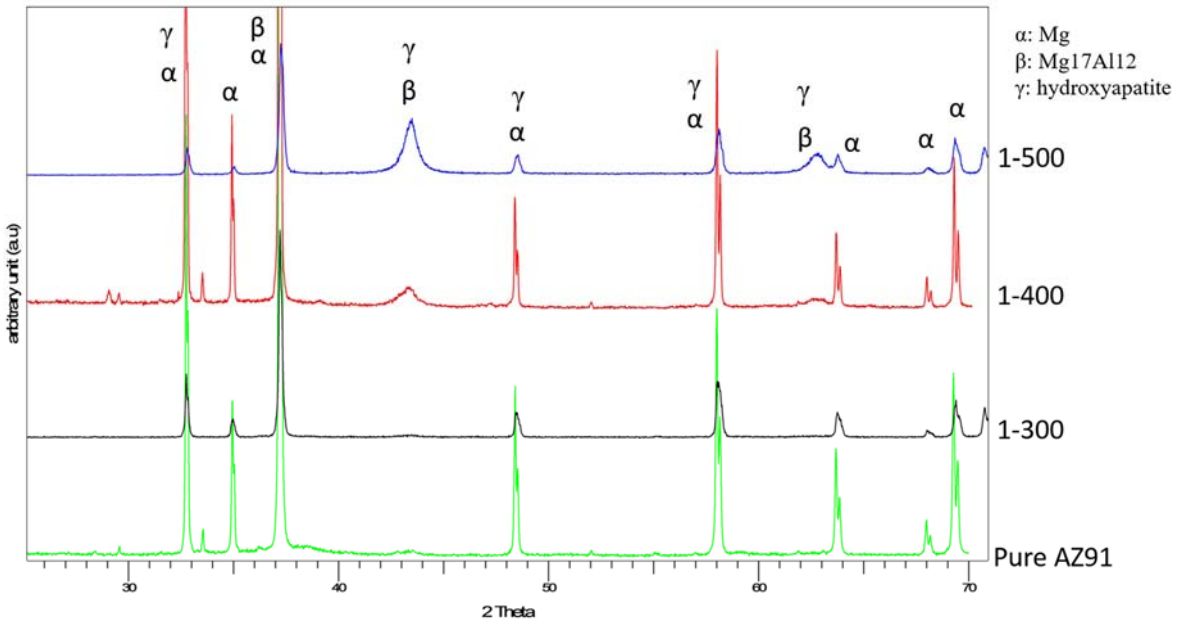

Figure 6. XRD patterns of the coatings sintered at 300, 400, and 500 ºC with 1 dip number and pure AZ91 Mg alloy.

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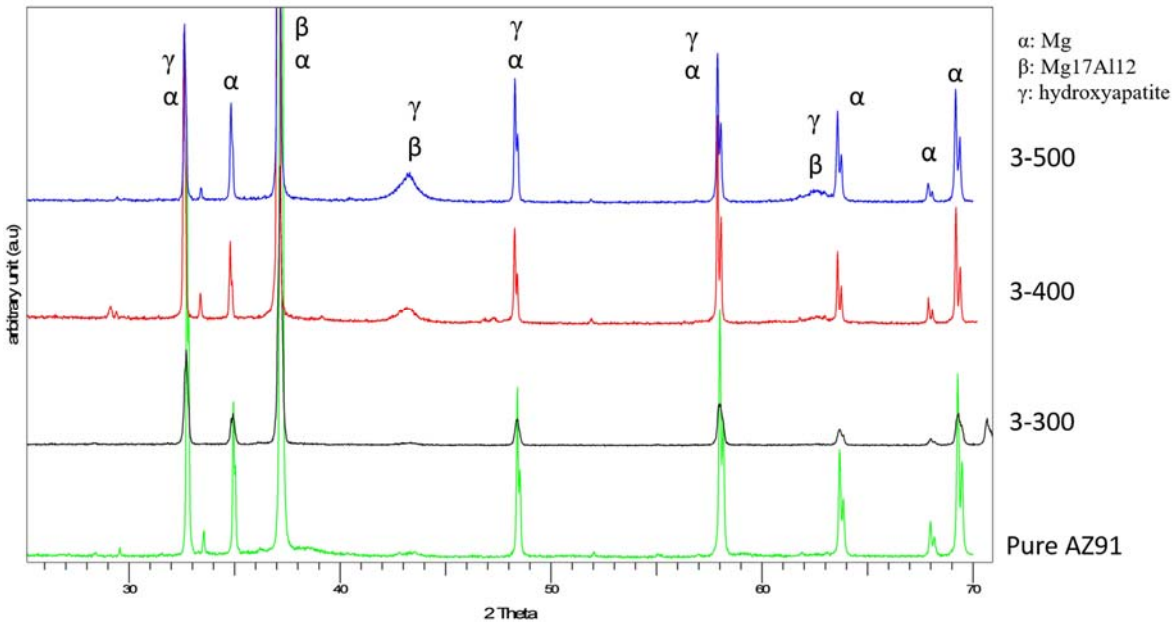

Figure 7. XRD patterns of the coatings sintered at 300, 400, and 500 ºC with 3 dip number and pure AZ91 Mg alloy.

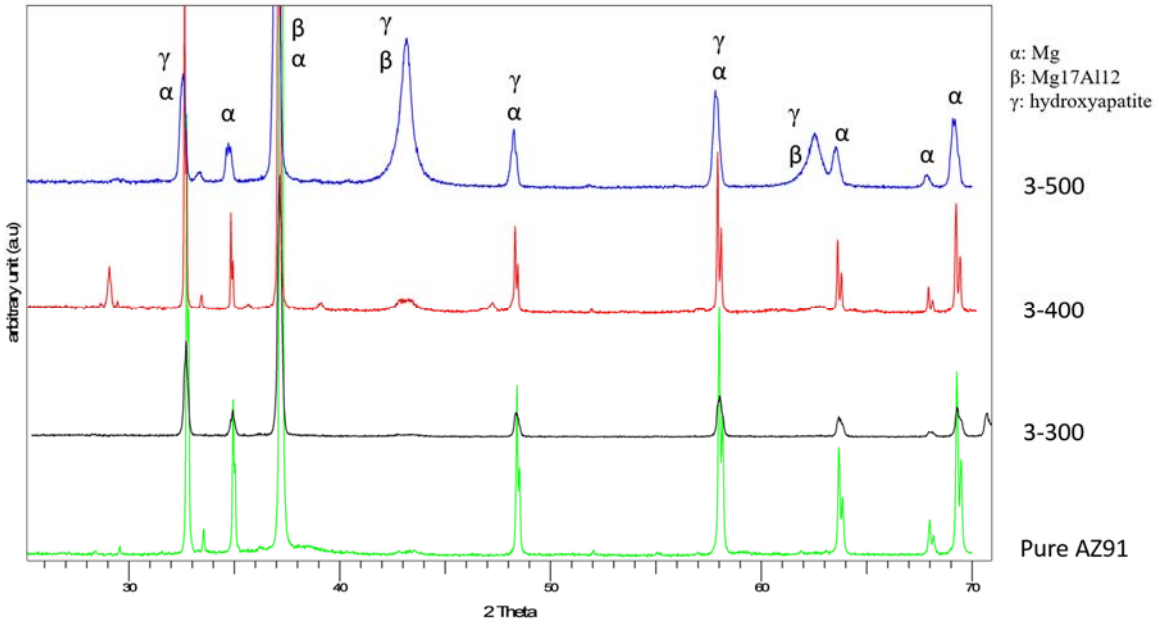

Figure 8. XRD patterns of the coatings sintered at 300, 400, and 500 ºC with 5 dip number and pure AZ91 Mg alloy.

Conclusion

AZ91 alloy was produced with hot press sintering method in this study. Produced specimens were coated with hydroxyapatite using combination of sol-gel and dip coating method. The effects of process parameters on coating quality was evaluated with SEM and x-ray diffractometer (XRD). Coating layer thickness is increased with the increasing number of dip. Furthermore, with increasing sintering temperatures, the cracks on the surface of coatings are increased.

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INFLUENCING FACTORS ON THE COGNITION OF FEMALE SENIORS LIVING IN FISHING VILLAGES

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This study was performed in order to provide the basic materials for developing a cognition improvement program for female seniors living in fishing villages. This study examined 45 seniors living in Nun in Gyeongsangnam-do, Republic of Korea. Data on the 45 seniors were collected from March 2 to 6, 2015 and the SPSS was employed herein for data analysis. The cognitive(K-MMSE) of the study participants was 19.02±3.10 points and Depression was 7.71±2.23 points. Concerning blood vessel conditions, Blood Vessel Tension (BVT) was -25.00±13.29; Blood Vessel Output Power (BVOP), 64.36±15.54; Remaining Blood Volume (RBV), –47.04±13.68; and Blood Vessel Aging Level (BVAL), 3.25±1.20. Their body mass index (BMI) was 23.09±3.08㎏/m2. Cognition, age (r=-.624), Systolic blood pressure (r=-.402), blood vessel aging level (r =-.401), and body mass index (r =.478) were found to have statistically significant correlation. Based on the study findings, a multi-dimensional program is proposed which helps improve the blood vessel health, reduce obesity and ease depression in order to improve the cognition of female seniors living in fishing village.

Keywords: Nursery, Basic materials, Spss

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INTERNET OF THINGS AND THE END OF OFFSHORING

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As production becomes more capital-intensive with the investment in new technologies a threat for industrialization in emerging countries may surge. Low labour cost advantages will shrink. The robots and other technologies, whose prices are declining, can carry out many production tasks cheaper than human labour with economies of scope and scale, greater productivity.

However, new technologies are more present in capital-intensive industries (automobiles, electronics) than in labour- intensive ones (garment, footwear, leather, and assembly activities). In the latter, robots are not yet able to solve technical problems concerning the accurate transformation of intermediate materials. New technologies are not sufficiently flexible or cost-effective to allow very short cycles of production (quick changes in fashion). In labour-intensive industries the flexibility of labour is higher than one of robots.

Conclusion: unless a breakthrough in technologies generates very readjustable capital goods for assembly processes, the conditions for offshoring will subsist.

Keywords: Offshoring, new technologies, robots, labour-intensive industries

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INTERNET RESEARCH METHODOLOGIES

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Traditional researches mainly involve seminal methodologies of research design and data gathering methods. It requires some physical efforts to design research and gather data. The analyses on data can then be conducted using statistical software systems. After determining research goals and hypotheses, it takes time to define resrach type, choose sample data, and collect data from that sample. After collecting, it is important to clean the data, code them and apply analysis techniques on them to reach out findings. There are time gaps among each step of research. This takes very long a reseach to complete. In Communication, whes a crisis occur, such a long time creates a heavy burden on decision makers on doing the right thing.

Especially in the Internet era, you need to be proactive to problems that may appear. Internet is new media for communicating among individuals. This media has two distinct features: First, it allows fast communication. And the second, it allows wide communication. We can call it time amd space squeeze.

As speed and wideness allows so many individuals to communicate and share their views and things, they like or dislike and express their opinions about so many different things. The results of these efforts is that there are enormous amount of data piling up very second on the Internet, especially on the social media. Many people call those data as "big data".

Internet data or big data have different features than traditionally collected data and need to be handled with different methodologies than the traditional research methodologies. The notion of "meta data" is important in this respect. On the Internet, this type of data can be found in forms of text, sound and image, which we call multimedia.

In this paper, Internet research methodologies are examined and classified according to needs of fast, wide and big data of today's communication environment.

Keywords: Internet research, big data, meta data

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INVESTIGATION OF 2-ACETYLPYRIDINE IN A LOW TEMPERATURE NITROGEN MATRIX

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Studies on matrix isolated chemical entities in solidified inert gases (e.g., noble gases, N_2) at temperature close to the absolute zero were pioneered by George Pimentel and his co-workers, as early as in 1954. It is nowadays a well-established technique that still continues to expand its domains of application. One of the most relevant characteristics of the matrix isolation method is that it allows to study with stationary spectroscopic techniques molecules which under other experimental conditions have very short lifetimes. In fact, the chemical inertia of the matrix, together with the used low temperatures, rigid environment and low concentration, allows to preserve almost indefinitely unstable molecules allowing theiur examitation by techniques that do not require time-resolution.
In this study, 2-acetylpyridine (2AP) was isolated in a cryogenic N_2 matrix from the room temperature 2AP gas phase. Only the most stable *cis* conformer was experimentally observed in the matrix by infrared (IR) spectroscopy. Besides the IR spectrum of 2AP isolated in N_2, the IR spectra of the low temperature amorphous and crystalline neat solid states of the compound were also recorded, and correlations between the spectroscopic data and the strength and nature of the dominant intermolecular interactions in 2AP neat condensed phases were evaluated. The analysis of the experimental vibrational data was supported by theoretical calculation of harmonic and anharmonic frequencies and IR intensities obtained at the DFT/B3LYP/6-311++G(d,p) level of theory.
Acknowledgments: The author thanks FCT, Lisbon, for the award of a post-doctoral grant (SFRH/BPD/88372/2012), and for funding the Coimbra Chemistry Centre (Project QUI/UI0313/2013, also supported by COMPETE-UE).
Keywords: Matrix Isolation Spectroscopy, 2-Acetylpyridine, Density Functional Theory

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INVESTIGATION OF CARBON PREPREG DISC SPRINGS AT DIFFERENT ANGLES OF ORIENTATION

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Global warming and the reduction in oil resources is one of the most serious problems of today's world. Therefore, some measures are taken to solve these problems in the machinery sector. Therefore vehicle bodies and some internal structural components made from composite materials, anymore use of composites is became widespread in machine elements. However, it is undesirable to have any disruption in the function of machine elements.

In this study, the aim is to manufacture a composite disc spring to approximate or better the characteristic curve of the steel disc spring constituenting a group of these machine elements. In this way, the weight of the design will be reduced without compromising the force/deformation ratio of disc spring. Firstly, the finite element analysis of the layers of the composite disc spring will be carried out at different cone heights, orientation angles and number of layers for carbon prepregs, and the disc spring will be manufactured and subjected to experiments using the determined methods.

The spring characteristics obtained by compression tests of steel and composite disc springs will be compared and evaluated accordingly.

Keywords: Disc spring, spring characteristic, carbon prepreg, tapering angle

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INVESTIGATION OF CONCRETE GRAVITY DAM BEHAVIOUR CONSIDERING DAM–FOUNDATION–RESERVOIR INTERACTION

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Abstract: Ground motion effects on a concrete gravity (CG) dam in the earthquake zone should be taken into account for design conditions. Boyabat CG dam constructed in Sinop, Turkey, is selected as an application. This study presents two-dimensional earthquake response of Boyabat CG dam including friction between dam and foundation. The two-dimensional finite element model of Boyabat CG dam is obtained using ANSYS finite element software. The unfavorable section of the dam is selected for two-dimensional numerical analyses. The contact-target element pairs are used in the dam–foundation–reservoir interaction. In this case, friction contact is considered in the numerical solutions. Empty and full reservoir cases are also considered in these solutions. The hydrodynamic pressure of the reservoir water is modeled with two dimensional fluid finite elements based on the Lagrangian approach. In the earthquake analyses, the finite element model has fixed boundary conditions. According to linear dynamic analyses, maximum horizontal displacements and maximum principle stress components are presented by dam height in the largest section. These results are evaluated considering empty and full reservoir conditions.

Keywords: Concrete gravity dam, Contact-target elements, Dam-foundation-reservoir interaction, Lagrangian approach.

Introduction

Water has been one of the most important things in human life from first era to now. People always try to live in around water resources. Because water is necessary for the continuing of life, so people had to learn how water was stored and how water usage was done. In many area, water has vital importance for instance, consumption, irrigation, climate and power.

Dam is one of the most difficult structural construction in civil engineering field because dam has huge potential risk in active seismic zones especially. A gravity dam is a massive sized dam fabricated from concrete and designed to hold back large volumes of water (Cracking Dams, 2008). By using concrete, the weight of the dam is actually able to resist the horizontal thrust of water pushing against it. This is why it is called a gravity dam. Gravity essentially holds the dam down to the ground, stopping water from toppling it over. Gravity dams are well suited for blocking rivers in wide valleys or narrow gorge ways. Since gravity dams must rely on their own weight to hold back water, it is key that they are built on a solid foundation of bedrock. The one advantage of a gravity dam is its rather simple design, with most dams being a straight vertical wall across a valley or gorge way. However, gravity dams can also be designed curved, as in the Hoover dam. Gravity dams are very durable and still highly preferred over buttress dams and arch dams (About Dams, 2008). The one drawback is that gravity dams require a large amount of material and construction to build are therefore relatively expensive (Gravity Dams, 2008). Therefore, each project should be evaluated on its own. When the conditions allow consideration of a concrete gravity dam alternative, the following points can be a plus. The method or scheme of diverting flows around or through the dam site during construction is an important consideration to the economy of the dam. A concrete gravity dam offers major advantages and potential cost savings by providing the option of diversion through alternate construction blocks, and lowers risk and delay if overtopping should occur (USACE, 1995).

This study showed that linear behavior of the concrete gravity Boyabat dam under Kocaeli earthquake. The change of maximum principal stresses and horizontal displacements by dam height were investigated. Numerical analyses were performed for empty and full reservoir cases considering fixed boundary conditions. ANSYS software was used for dam modeling and all dynamic analysis. The contact-target element pairs are used in the dam–foundation–reservoir interaction. Besides, friction is considered in the numerical solutions. It is provided by no

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separation friction case.

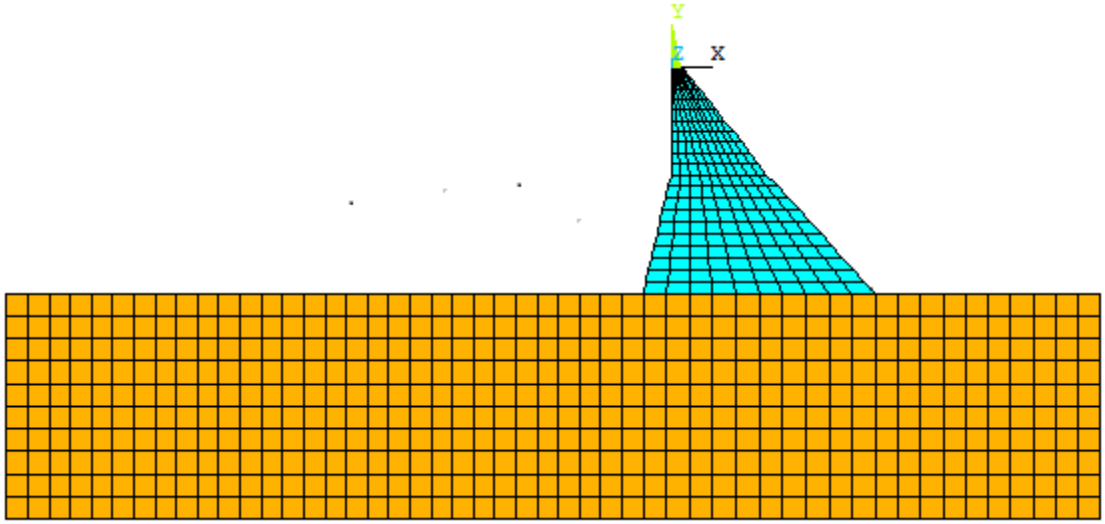
Mathematical Model of Boyabat CG Dam

Boyabat dam, located approximately 10km south-east of Duragan county center, Sinop, was constructed in 2012 by General Directorate of State Hydraulic Works. It was established on Kızılırmak River. The reservoir is used for irrigation and energy purposes. The dam crest is 262 m in length and 8 m wide. The maximum height of the dam from base to top crest point is 195 m, respectively. The annual total power generation capacity is 1.500×10^6 kWh/year.



Figure 1. Boyabat Dam.

Boyabat concrete gravity dam was modeled in ANSYS software. Finite element model of concrete gravity dam was divided to convenient finite element sizes. Finite element mesh was carried out approximately resemble measurements for dam model. Finite element model of the dam was given in given Fig. 2.



a) Empty reservoir condition

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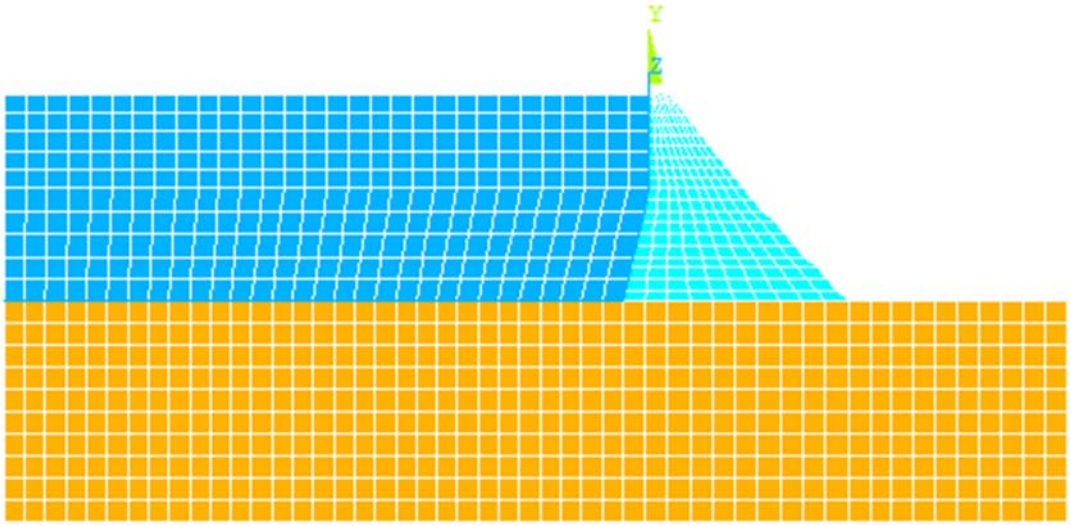

b) Full reservoir condition

Figure 2. Finite element model of Boyabat Dam

Firstly, contact-target elements were identified between dam body and foundation. Dam model includes two cases. One of these situations is empty reservoir conditions and second one is full reservoir conditions. Linear dynamic analysis was done for the both situations.

Material Properties

The material properties of dam-foundation-reservoir interaction model used in linear analyses given in Table 1.

Table 1: Material properties of Boyabat dam

	Elastic modulus (kN/m^2)	Poisson ratio (υ)	Density (γ) (kN/m^3)
concrete	2.8×10^7	0.2	2.3955
foundation	$10.5E^6$	0.17	2.73293
water	$2.07E^6$	0	0.99918

Lagrangian Approach for Dam -Reservoir -Foundation Interaction

The formulation of the fluid system based on the Lagrangian approach is presented as following (Wilson and Khalvati, 1983). In this approach, fluid is assumed to be linearly compressible, inviscid and irrotational. For a general two-dimensional fluid, pressure-volumetric strain relationships can be written in matrix form as follows,

$$\begin{Bmatrix} P \\ P_z \end{Bmatrix} = \begin{bmatrix} C_{11} & 0 \\ 0 & C_{22} \end{bmatrix} \begin{Bmatrix} \varepsilon_v \\ w_z \end{Bmatrix}$$

where P, C_{11}, and ε_v are the pressures which are equal to mean stresses, the bulk modulus and the volumetric strains of the fluid, respectively. Since irrotationality of the fluid is considered like penalty methods (Zienkiewicz and Taylor, 1989) rotations and constraint parameters are included in the pressure-volumetric strain equation (Eq. (1)) of the fluid. In this equation P_z, is the rotational stress; C_{22} is the constraint parameter and w_z is the rotation about the Cartesian axis y and z.

In this study, the equations of motion of the fluid system are obtained using energy principles. Using the finite element approximation, the total strain energy of the fluid system may be written as,

$$\pi_e = \frac{1}{2}\mathbf{U}_f{}^T\mathbf{K}_f\mathbf{U}_f \qquad (2)$$

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where U_f and K_f are the nodal displacement vector and the stiffness matrix of the fluid system, respectively. K_f is obtained by the sum of the stiffness matrices of the fluid elements as follows,

$$\left.\begin{aligned}\mathbf{K}_f &= \Sigma \mathbf{K}_f^e \\ \mathbf{K}_f^e &= \int_V \mathbf{B}_f^{eT} \mathbf{C}_f \mathbf{B}_f^e dV^e\end{aligned}\right\} \quad (3)$$

where C_f is the elasticity matrix consisting of diagonal terms in Eq. (1) is the strain-displacement matrix of the fluid element.

An important behaviour of fluid systems is the ability to displace without a change in volume. For reservoir and storage tanks, this movement is known as sloshing waves in which the displacement is in the vertical direction. The increase in the potential energy of the system because of the free surface motion can be written as,

$$\pi_s = \frac{1}{2} \mathbf{U}_{sf}^T \mathbf{S}_f \mathbf{U}_{sf} \quad (4)$$

where U_{sf} and S_f are the vertical nodal displacement vector and the stiffness matrix of the free surface of the fluid system, respectively. S_f is obtained by the sum of the stiffness matrices of the free surface fluid elements as follows,

$$\left.\begin{aligned}\mathbf{S}_f &= \Sigma \mathbf{S}_f^e \\ \mathbf{S}_f^e &= \rho_f g \int_A \mathbf{h}_s^T \mathbf{h}_s dA^e\end{aligned}\right\} \quad (5)$$

where h_s is the vector consisting of interpolation functions of the free surface fluid element. ρ_f and g are the mass density of the fluid and the acceleration due to gravity, respectively. Besides, kinetic energy of the system can be written as,

$$T = \frac{1}{2} \dot{\mathbf{U}}_f^T \mathbf{M}_f \dot{\mathbf{U}}_f \quad (6)$$

where $\dot{\mathbf{U}}$ and M_f are the nodal velocity vector and the mass matrix of the fluid system, respectively. M_f is also obtained by the sum of the mass matrices of the fluid elements as follows,

$$\left.\begin{aligned}\mathbf{M}_f &= \Sigma \mathbf{M}_f^e \\ \mathbf{M}_f^e &= \rho_f \int_V \mathbf{H}^T \mathbf{H} dV^e\end{aligned}\right\} \quad (7)$$

where H is the matrix consisting of interpolation functions of the fluid element. If (Eq. (2), (4) and (6)) are combined using the Lagrange's equation (Clough and Penzien, 1993) ; the following set of equations is obtained,

$$\mathbf{M}_f \ddot{\mathbf{U}}_f + \mathbf{K}_f^* \mathbf{U}_f = \mathbf{R}_f \quad (8)$$

where $\dot{\mathbf{U}}_f$, $\dot{\mathbf{U}}_f$, $\mathbf{U}_f$ and $\mathbf{R}_f$ are the system stiffness matrix including the free surface stiffness, the nodal acceleration and displacement vectors and time-varying nodal force vector for the fluid system, respectively. In the formation of the fluid element matrices, reduced integration orders are used.

The equations of motion of the fluid system, (Eq. (8)), have a similar form with those of the structure system. To obtain the coupled equations of the fluid-structure system, the determination of the interface condition is required. Since the fluid is assumed to be inviscid, only the displacement in the normal direction to the interface is continuous at the interface of the system. Assuming that the structure has the positive face and the fluid has the negative face, the boundary condition at the fluid-structure interface is,

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$$U_n^- = U_n^+ \tag{9}$$

where U_n is the normal component of the interface displacement. Using the interface condition, the equation of motion of the coupled system to ground motion including damping effects are given by,

$$\mathbf{M}_c\ddot{\mathbf{U}}_c + \mathbf{C}_c\dot{\mathbf{U}}_c + \mathbf{K}_c\mathbf{U}_c = \mathbf{R}_c \tag{10}$$

in which $\mathbf{M}_c$, $\mathbf{C}_c$, and $\mathbf{K}_c$ are the mass, damping and stiffness matrices for the coupled system, respectively. $\ddot{\mathbf{U}}_c$, $\dot{\mathbf{U}}_c$, $\mathbf{U}_c$ and $\mathbf{R}_c$ are the vectors of the displacements, velocities, accelerations and external loads of the coupled system, respectively (Kartal, 2012).

Kocaeli Earthquake

In this study, 1999 Kocaeli earthquake records were used in all linear dynamic analysis. The earthquake duration is 27.185 seconds. The earthquake accelerogram was given in Fig .4.

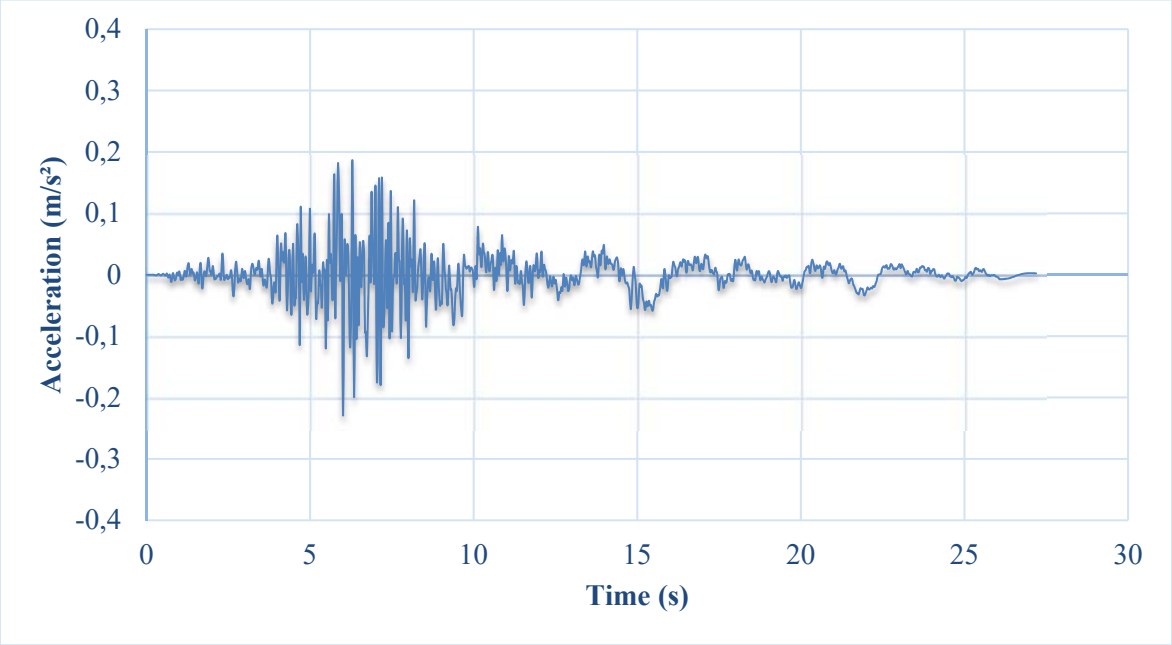

Figure 3. 1999 Kocaeli Earthquake records

Results

The displacements of upstream site of dam were calculated for empty and full reservoir cases. It is clearly seen that full reservoir case has higher displacements than empty reservoir case in linear dynamic analysis due to hydrodynamic pressure. The maximum displacement in full reservoir case is 3.2 cm and the maximum displacement in empty reservoir case is 2.7 cm for the dam. The change of displacements by dam height is given in Fig. 4 and 5.

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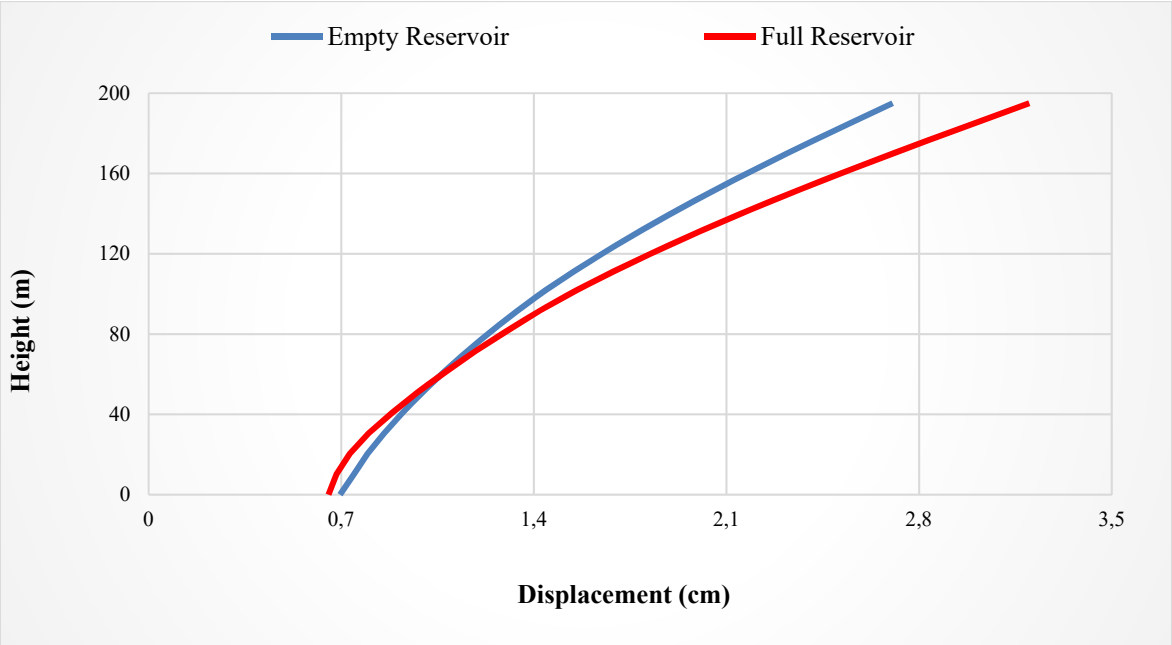

Figure 4. Maximum displacements changing

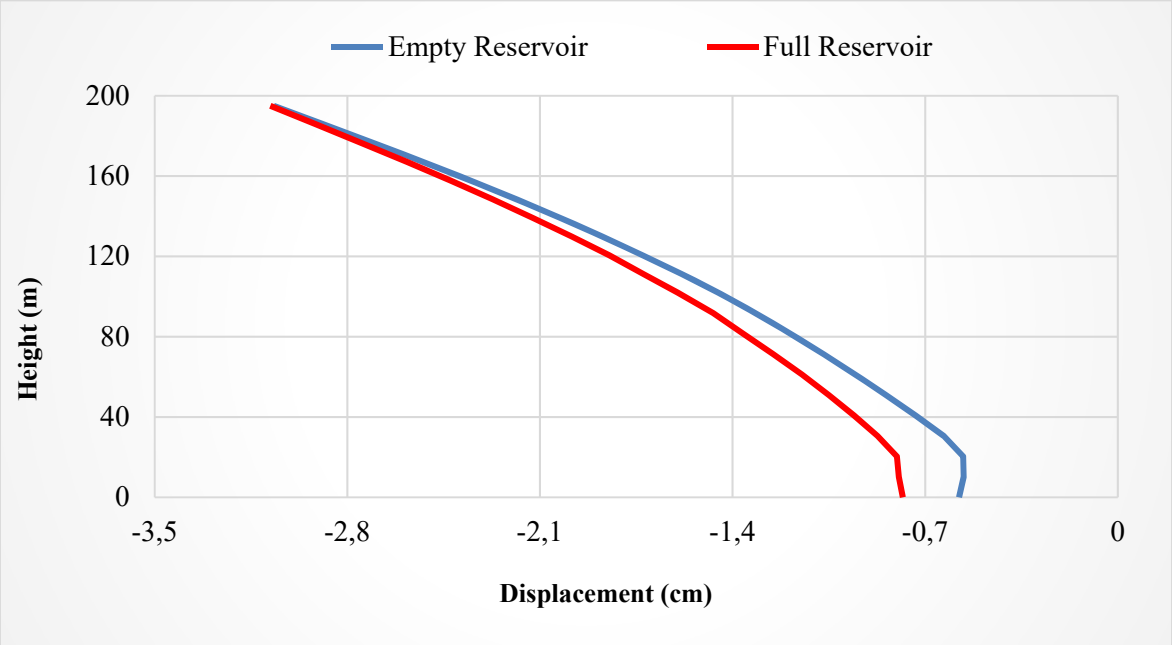

Figure 5. Minimum displacements changing

We investigated the principal stress changing by dam height under Kocaeli earthquake for linear dynamic analysis. It was expected that full reservoir case had higher principal stresses than empty reservoir case because of hydrodynamic pressure effect. According to linear dynamic analysis, it was observed that full reservoir case has higher principle stresses. The maximum principal stress is 2206.96 kN/m² in empty reservoir condition and 2904.08 kN/m² in full reservoir condition for the dam. Besides, the maximum compressive stress is 2622.44 kN/m² in empty reservoir condition and 2324.98 kN/m² in full reservoir condition for the dam. The change of maximum principal stresses and compressive stresses by dam height are given in Fig. 6 and 7.

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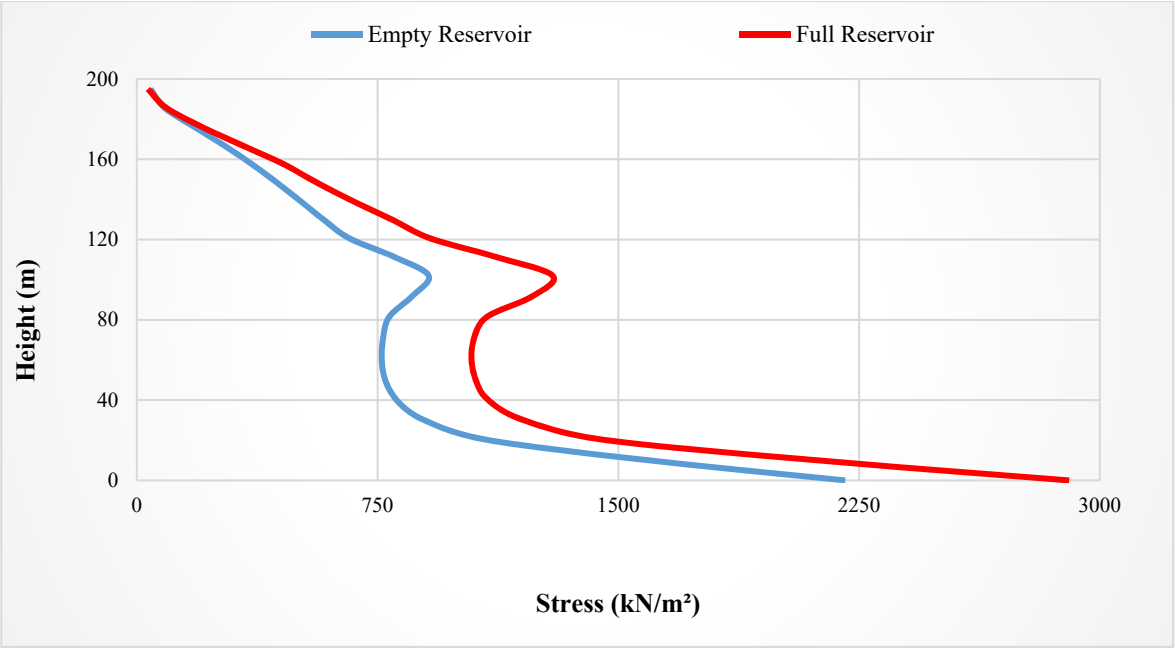

Figure 6. Maximum tensile stresses changing

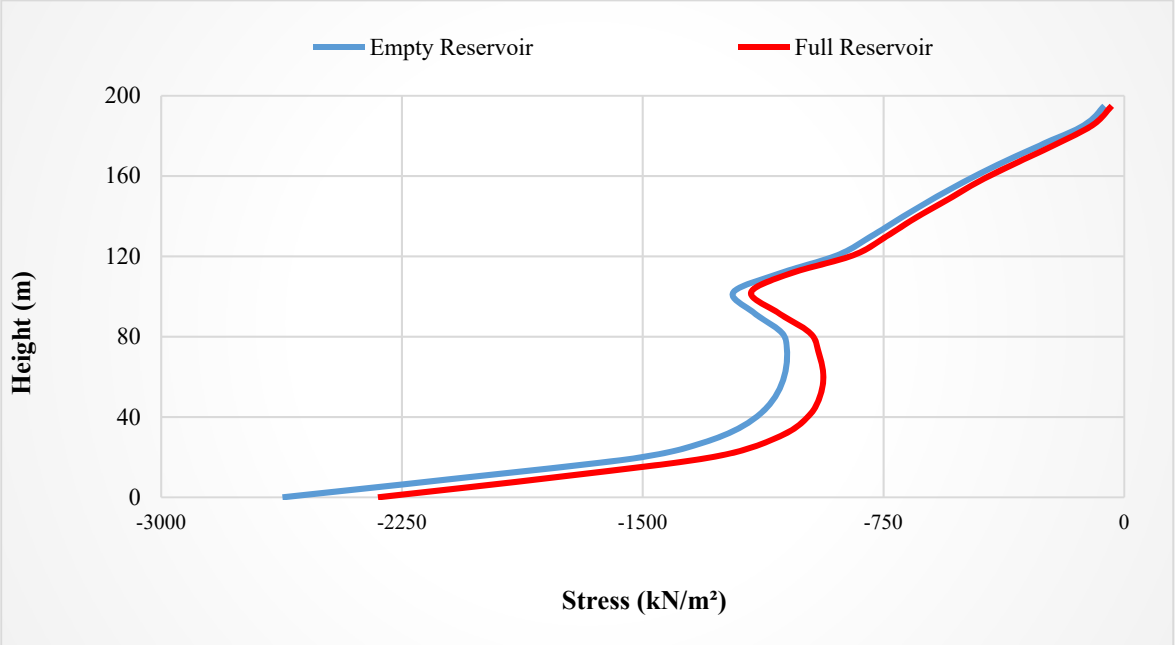

Figure 7. Maximum compressive stresses changing

Conclusion

Boyabat CG Dam geometry and the unfavorable section of the dam was examined using finite element model. Boyabat dam was modeled as two-dimensional and the material and foundation soil mechanical properties were obtained from the experimental data of the dam. After that these materials were identified to dam model by ANSYS software. Fixed boundary conditions were defined around dam and foundation. Finally, 1999 Kocaeli earthquake was selected for this application due to similar earthquake seismic zones.

In this study, we investigated the effect of strong ground motion on stresses and displacements. In addition to this, it was examined that friction, which was identified between dam body-foundation soil, effect on stress for empty and full reservoir conditions. It is clearly seen that full reservoir model has larger tensile-compressive stresses and displacements than empty reservoir model.

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INVESTIGATION OF CORROSION BEHAVIOR OF HOISTING ROPES

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ABSTRACT

Hoisting ropes often used in port cranes that exposed to high humidity and sea salt. If the effect of corrosion on the rope in this environment neglects, it arises a serious risk factor for these elements in high load carrying capacity. To prevent this, primarily it is necessary to observe the effects on the rope caused by the corrosion.

In this study, the aim is to investigate the behavior after exposure to corrosion of different types of hoisting ropes. For this, hempen and steel core 6x19 Standard, 8x19 Seale and 6x36 Warrington Seale group ropes are examined. The ropes are applied rapid aging test in aging test chamber for one month according to ASTM B117 standard. The aging test is made with 24 hours cycle and 30 days period process. Afterwards, tensile tests are applied to the ropes and observed changes in mechanical properties.

As a result, it is examined that the corrosion effect on hoisting ropes and given solution proposals and information about studies that can be done in the future with this study.

Keywords: Hoisting ropes, aging test, corrosion, tensile test

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INVESTIGATION OF INHIBITORY EFFECTS OF TRIAZOLE DERIVATIVES ON THE PROTEASE ENZYMES

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Triazoles constitute an important class of heterocyclic organic compounds because of their wide range of applications as pharmaceutical agents. Theyhave common mode of action like inhibiting ergosterol synthesis, decreasing adhesion potential of pathogen cells to host tissues and morphogenetic transformation of yeasts to mycelial form. Fungicidal properties of azole agents have been known for many years, however, the investigation of inhibitiory effects of these molecules on various enzymes have increased in recent years. As being the most important group of industrial enzymes, proteases has received significant interest in the food, pharmaceutical and detergent industries.

In this study, the inhibition effect of three triazole derivatives on serine (chymotrypsin and trypsin) and cysteine (papain) proteases were examined and IC50 values were determined. Also, the inhibition type for trypsin was established for each molecule separately

Keywords: triazole, serine protease, cysteine protease, inhibition

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INVESTIGATION OF SINGLE AND MULTI-LAYER NONWOVENS THERMAL INSULATION AND AIR PERMEABILITY BEHAVIORS

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Abstract: Textile materials have potential importance for an alternative use on thermal insulation as their porous and fibrous structure. In this study, thermal insulation and air permeability of multi-layer nonwovens with 120, 180 and 500 g/m^2 forming single and double layer were investigated. Moreover, thermal insulation and air permeability of triple-layer and four-layer nonwovens with the weight of 180 g/m^2 were analyzed. It was found that the single layer nonwovens give better thermal insulation properties than the multi-layer nonwovens. Furthermore, the increase of weight of nonwovens causes to increase in thermal conductivity coefficients. According to the air permeability measurements, the results show that the air permeability of samples decreases with the increase of weight of samples and number of layer.

Keywords: Nonwoven, Multi-layer, Thermal Conductivity, Air Permeability.

Introduction

It is very important to have thermal insulation on daily and special habitats. The thermal insulation defined as absorbing (not reflecting) the thermal energy within the material. The textile materials being fibrous and porous have potential applications where thermal insulation is necessary.

The properties of insulation and absorption of the nonwovens differ by fiber geometry and fiber regularity within the texture. It is rather difficult to identify the microstructure of the nonwovens for their complex texture. Nonwoven structure contains not only fiber as well as air gaps. Different fiber composition within the nonwovens leads to change the total surface area (Seddeg, 2009). The sound absorption properties of the textiles having porous structure (Tascan and Vaughn, 2008; Tascan and Vaughn, 2008; Shoshani and Yakubov, 2000), different fiber blends (Nick et al. 2002; Seddeq et al., 2013), stratified composition (Lin et al., 2011; Kucuk and Korkmaz, 2015), standard and hollow polyester with different weight (Abdelfattah et al., 2011). Furthermore, the effect of the acoustic characteristic of nonwovens containing polyester, viscose, glass fiber and basalt fibers on the material thickness, weight, air permeability and porosity have been studied (Yang et al., 2001). There are also more studies on the effect acoustic properties of jute, polypropylene and polyester containing nonwovens on the bases of weight, fabric type, fiber density, number of ply, the distance between the origin of sound and material, and also fiber types (Sengupta 2010).

The energy sources are running out rapidly. This situation, leads activities on especially in developed and other countries to take control of their energy needs, and lead them to search for new energy sources. The major part of the energy saving is natural thermal energy.

Nowadays it became common to use thermal insulation materials on habitants in order to reduce the energy consumption. There are a number of researches on thermal insulation behavior of waste woven fabrics (Briga-Sa et al., 2013), waste wool and regenerated polyester fibers (Patnaik et al., 2015), nonwovens (Woo et al., 1994), stratified nonwovens (Mohammadi et al., 2003), the effect of fiber diameter and porosity dimensions (Zhu and Li, 2003), nonwovens produced by pinning methods (Saleh, 2011), glass, wool, rook wool and mineral wool (Abdou and Budaiwi, 2013).

In order to use polyester nonwovens is a various applications the behavior of air permeability behavior of the weightand pinning density of the polyester viscose blend nonwovens (Zu et al., 2015; Cincik and Koc, 2012), theoretical and experimental as well as artificial neural networks of multi-ply nonwovens (Mohammadi et al., 2002; Debnath et al., 2000), the relations, the pore size effect (Epps and Leonas, 2000), the effect of thermal insulation (Debnath and Madhusoothanan, 2010), and also the relations between air permeability and sound absorption was studied (Thilagavathi et al., 2010).

In this study, the thermal insulation and air permeability properties of nonwoven fabrics with different weight were investigated. The purpose for chosen nonwovens is for being lightweight materials, making them preferable on thermal insulation. In this context, thermal insulation and air permeability of multi-layer nonwovens with 120, 180 and 500 g/m^2 forming single and double layer were investigated. Moreover, thermal insulation and air permeability of triple-layer and four-layer nonwovens with the weight of 180 g/m^2 were analyzed. The thermal

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insulation and air permeability properties of samples increase with the decrease of weight and layer numbers of samples.

Materials and Methods

Fabric

Polyester nonwovens with 45 µm fiber diameter of 120, 180 and 500 g/m^2 were used.

Preparation of Multi-Ply Nonwovens

From the polyester nonwovens having 120 and 500 g/m^2 weight of the prepared samples of single and double layer, and 180 g/m^2 polyester nonwovens single, double, triple and fourfold samples were prepared.

Measurements of the Thermal Conductivity Coefficient

Thermal conductivity coefficients of the samples were evaluated in accordance with TS 4512 Standard (TS EN ISO 10534-2) via using P.A.HILTON LTD.H940 instrument. In order to measure thermal conductivity coefficients of the samples prepared, the samples with the diameter of 25 mm was primarily experimented. The heat value (Q) in watt was determined from the digital screen of the instrument. The measurements of the thickness and area of the tested fabrics as well as heat difference between them were replaced in the following equation (Kılıc and Yigit, 2008).

$$Q = -k.A.\frac{dT}{dx}$$

In this equation, Q is the heat flow (W), A is the surface field (m^2), x is the thickness of sample (m), ΔT is the temperature difference (K) and k is thermal conductivity coefficient (W/m K). The measurements of thermal conductivity coefficient were iterated three times.

Measurements of the Air Permeability

The measurements was carried out by using 20 cm^2 circular fabric with 100 Pa pressure difference for 1 second and the results was expressed in mm/s by taken the average of five different measurement. The test was performed according to TS 391 EN ISO 923 (TS 391 EN ISO 9237) test method.

Results and Discussion

Results of Thermal Conductivity Coefficient Measurements

The thermal conductivity coefficient results of the samples with different weights and number of layers are given on Figure 1.

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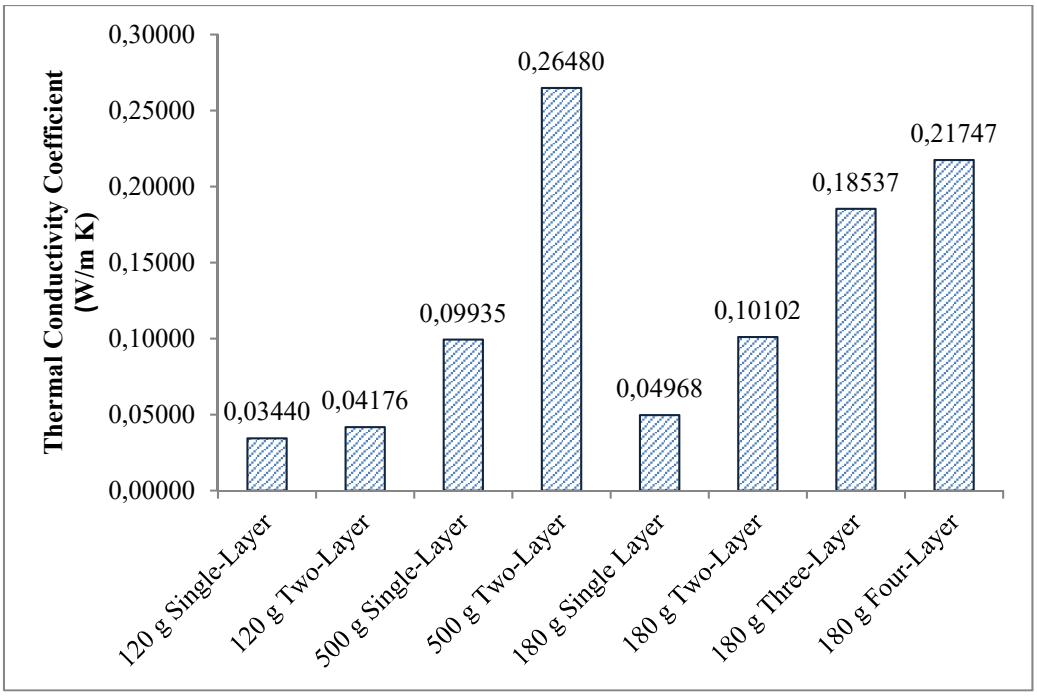

Figure 1. Thermal conductivity coefficient of samples.

Figure 1 shows that, the increased nonwoven weight increases the thermal conductivity coefficient, as a result of increased weight leads to increasing the thickness of the materials. According to the Fourier Law, the increased sample thickness and number of layers causes increasing the thermal conductivity coefficient.
The increased number of layers causes increased thickness, and as a result of this leads to increases the thermal conductivity coefficient. These results were also correlated with the air permeability of the samples decreases by increasing the number of layers and weights.

Results of Air Permeability Measurements

The air permeability results of the samples with different weights and number of layers are given on Figure 2.

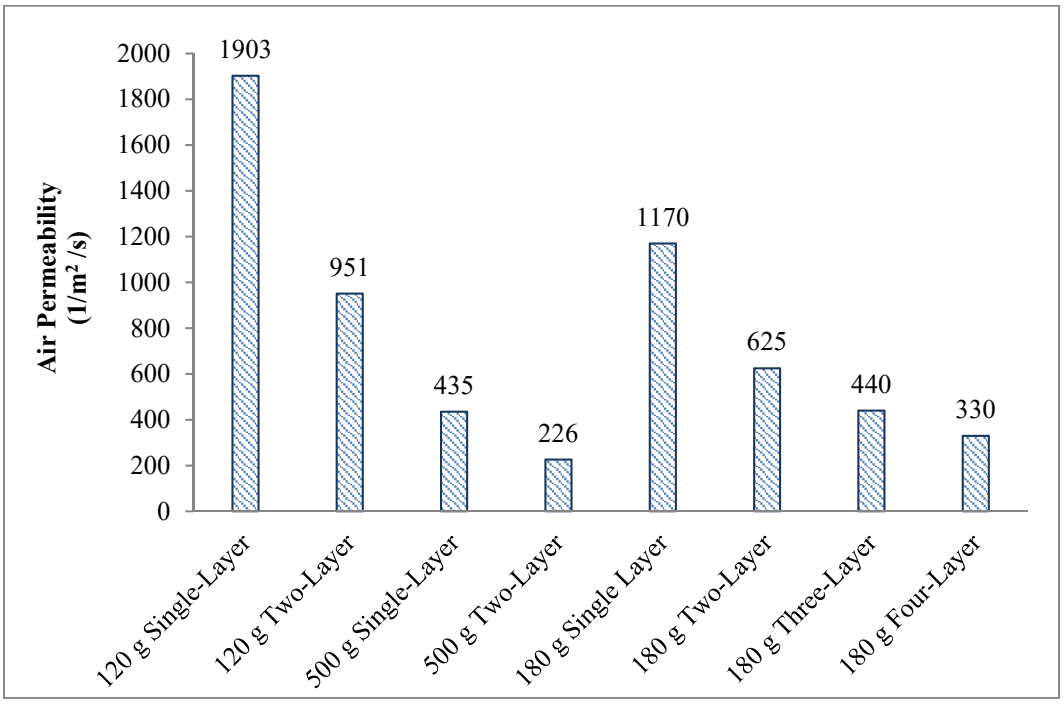

Figure 2. Air permeability measurements of samples.

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The air permeability results show that, the increased sample weight decreases the air permeability. This can be explained by the weight increasing causing to density decrease. The density increase leads to decrease the air permeability. The increased number of layers of the samples causes decrease on air permeability. This can be explained by increased number of layers causing increase on the sample thickness. The increased sample thickness causes increased air flow distance during the test and this results decrease on air permeability. Besides, the increased number of layers leads density increase.

Conclusion

In this study, the thermal conductivity coefficient and air permeability of the nonwovens with different weight and number of layers was investigated. In this context, the thermal conductivity and air permeability coefficient of polyester nonwoven fabrics with 120, 180 and 500 g/m^2 weights and also their 2,3 and 4 layers samples was investigated. As a result, the increased weight and number of layers of the nonwovens leads to increase on thermal conductivity and decrease on air permeability. The prepared nonwovens found very suitable materials as having light, cheap, high air permeability and thermal insulation properties.

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INVESTIGATION OF SLOSHING IN A PRISMATIC TANK FILLED WITH DIFFERENT LIQUID LEVEL

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Abstract: In this study, sloshing behavior in a prismatic tank that is approximately the same volume with a vehicle' s fuel tank is investigated by Computational Fluid Dynamics (CFD) method. Tank is modeled with vertical baffle and without baffle. The tank is filled with water where the rate of 50%-70% and the dynamic behavior of the system examined for both cases. The tank is subjected harmonic motion at the lateral direction, the velocity change of fluid and the pressure at the tank wall are examined.

Keywords: Sloshing, tank baffle, fuel tank

Introduction

The fuel tank is called tank which stores the fuel used to provide the energy required for operation of the vehicle. These tanks can be produced in different sizes and different materials. At last years, it can be said that the investigation of the sloshing event in the fuel tank has gained importance in the automotive industry because of more detailed analysis of vibration and noise in the vehicle (Jadon et al. 2014, Kingsley 2005, Wiesche 2003, Chitkara et al. 2013, Kılıç 2015).

Free liquid surface is formed on the liquid surface of the tank partially filled with liquid fluid. The movement of the surface is defined as sloshing. Free liquid surface shows various types of motion according to the shape of the tank movement and geometry of the tank. These can be classified such as simple planar, non-planar, random shock, symmetric, asymmetric, quasi periodic and chaotic. The amplitude of the sloshing movement depends on the shape of the actuation, the depth of the liquid in the tank, the geometry of the tank and the fluid properties (İbrahim et al. 2001, İbrahim 2005, Akyıldız et al. 2006).

The movement of the fluid in the tank is interested in many engineering systems such as fuel tank, space vehicles and high water towers. Pressure forces at the tank generated as a result of sloshing motion can lead to strain and security problems in mechanical systems. Therefore, determination of distribution of the hydrodynamic pressure and forces and natural frequency of the free liquid surface during sloshing is important (İbrahim 2005, Akyıldız and Ünal 2006). When evaluated according to the tank acceleration, external signals, tank settlement and liquid level of the tank, these loads should not exceed a certain maximum value and should remain within safety limits.

The studies done in the automotive field are investigated widely and summarized below. Wiesche (2003) made investigations from theoretical studies and industrial applications to calculate numerically the sloshing behavior of the viscous liquid in the fuel tanks with different geometries. The Volume of Fluid method (VOF) was used to calculate the free surface flow and prismatic, spherical and non-symmetric fuel tanks were analyzed. Jadon et al. (2014) used a multi physics based numerical method to estimate the sound change from sloshing behavior. During the study, the sloshing model was created by using Computational Fluid Dynamics (CFD), Finite Element Method (FEM) and the Boundary Element Method (BEM). The vibration calculations were carried out under LS-DYNA program. Many parameters such as tank surface pressure, surface integral force, momentum, the average kinetic energy were investigated together with these systems. Chitkara et al. (2013) investigated the sloshing for partially filled tanks using VOF method and analyzed two different geometries using computational simulations considering 40% of fuel and 60% of air inside a 40 liters fuel tank under longitudinal acceleration. Iu et al. (2004) studied on the noise caused by sloshing. Several baffle designs were investigated to suppress the fuel slosh by using FLOW-3D CFD software theoretically and experimentally. Estimated mean kinetic energy and average turbulent kinetic energy of the fluid obtained from the computer simulations were used to compare with sound measurements obtained from experiments. İbrahim et al. (2001) made a very large review study on dynamics of liquid sloshing. Information is given about 1319 publications on sloshing event made up to publication date.

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Akyıldız and Ünal (2006) were investigated the sloshing pressure variations and the three dimensional behavior of the liquid in the partially filled prismatic tank by experimental and theoretical studies. Çelebi and Akyıldız (2001) investigated the sloshing event in the partially filled tank with and without baffle structure. Jung et al. (2012) analyzed the lateral oscillating movement of the partially filled fluid tank and investigated the effect of the length of baffle vertically placed into the tank. VOF method was used for monitoring the fluid motion and pressure changes were investigated according to the different baffle height. Kingsley (2005) made various sloshing optimization studies to develop the liquid tank design and analysis. In the study computational fluid dynamics and finite element methods were used.

In this study, sloshing behavior in a prismatic tank with 50 lt volume and 0.3-0.7-0.24 m the width, the length and height is investigated by CFD method. The tank is filled with water where the rate of 50%-70% and the dynamic behavior of the system examined for both cases. Tank is modeled with vertical baffle and without baffle, and subjected to the lateral harmonic movement. The velocity changes of fluid and the pressure values at the tank wall are examined.

Materials and Methods

1. Mathematical model of sloshing

In this section, basic equations of fluid motion and mathematical models of sloshing event are presented briefly. Basic equations for mathematical modeling of sloshing are continuity, momentum and fluid volume VOF equations.

The continuity equation for a control volume with dimensions dx, dy and dz in cartesian coordinate system can be defined generally as below (Çengel and Cımbala 2005, Umur 2009);

$$\frac{1}{\rho}\frac{D\rho}{Dt} + \nabla\vec{V} = 0 \tag{1}$$

Momentum equation with the assumption that the fluid is Newtonian, the flow is incompressible and working condition is isothermal can be written as;

$$\rho\frac{D\vec{V}}{Dt} = -\nabla\vec{P} + \rho\vec{g} + \mu\nabla^2\vec{V} + f \tag{2}$$

The terms defining irregular changes are added to the laminar momentum and continuity equations for turbulent flow and conservation equations for turbulent flow are obtained (Çengel and Cımbala 2005, Umur 2009).

The VOF method is an efficient multi-phase method used to simulate the flow of immiscible liquids (Vaishnav et al., 2014). This method is used for examining the movement of the free surface during sloshing of the liquid in the tank (Jadon et al., 2014). This method developed by Hirt and Nichols (1981) follow the upper surface of the liquid in the container or follow the interphase surface of the system in other words. The liquid defined by the mesh is divided to the fixed or moving small particles to make this follow.

According to linear wave theory, natural frequency of fluid for a rectangular prismatic shaped tank can be defined;

$$\omega_n^2 = g\frac{n\pi}{L}tanh\left(\frac{n\pi}{L}d\right) \tag{3}$$

Here, g: acceleration of gravity (m/s^2), L: tank length in the direction of the movement (m), d: fluid level in the tank (m) and n: mod number. Accordingly, it can be seen that the natural frequency of the fluid in the tank prismatic tank changes depending on the fluid level in the tank, the length of the tank in the direction of the warning (Abraham 2001, Kingsley 2005).

2. System Structure and Simulation

The tank that capacity is 50 lt and 0.3- 0.7- 0.24 m width, length and height, the placement of the baffle into the tank and the pressure measurement points are shown in Figure 1.

In this study, the baffle was placed in the middle of the tank and the height of the baffle is taken 42% of the tank height. Because the tank is symmetrical and homogenous, pressure measurement points are positioned only one side wall of the tank. Tank movement is provided so that it can oscillate in the lateral direction indicated by x. The equation of the acceleration representing the described input can be seen below;

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$$\ddot{x} = -A\omega^2 sin(\omega t) \quad (4)$$

Here, A: amplitude of the movement (m), ω: angular frequency (rad/s). The input function is given as acceleration input and an appropriate program is written in C language for the analysis. The tank movement and angular frequency are taken as 2 cm, $\omega=\omega_n$ respectively for baffled and unbaffled cases. There are two different phase as air and water in the tank so multiphase flow model is used in the study. The node and element numbers used in modeling are given in Table 1. Analyses are performed using ANSYS Fluent program.

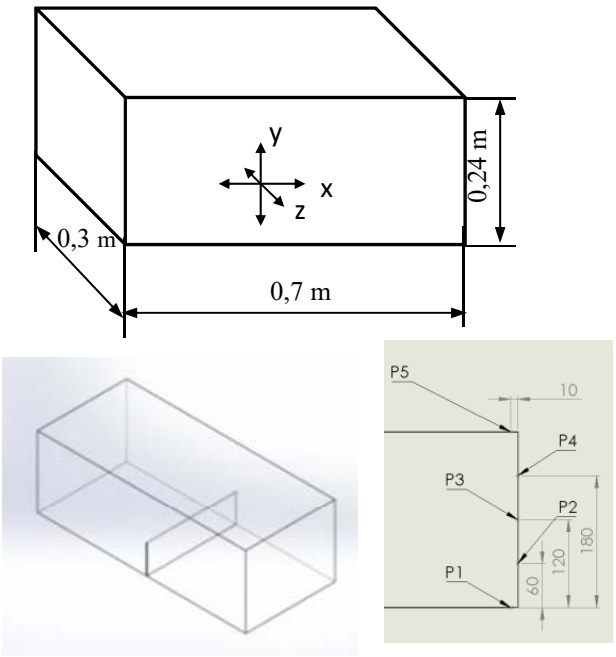

Figure 1. The size of the tank, placement of the baffle and pressure measurement points

Table 1: The number of the node and element

Tank model	Node number	Element number
Tank with baffle	55025	50400
Tank unbaffled	55800	50730

3. Results and Discussion

In this study, the pressure changes at the wall of the tank and the instant pressure and velocity distribution of the liquid in the baffled and unbaffled tank for 50% and 70% filling rates are obtained as simulation results.

In Figure 2 and Figure 3, pressure changes at the P_1, P_2, P_3 and P_4 points and the pressure and velocity distribution at t=2.35 second for unbaffled tank filled 50% and 70% water are shown respectively.

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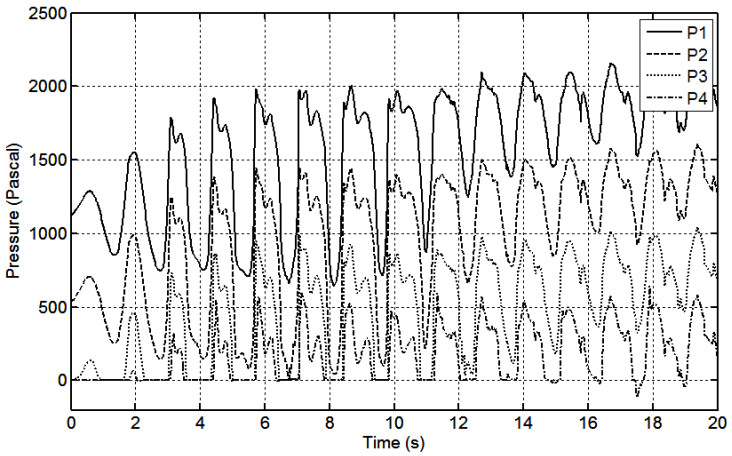

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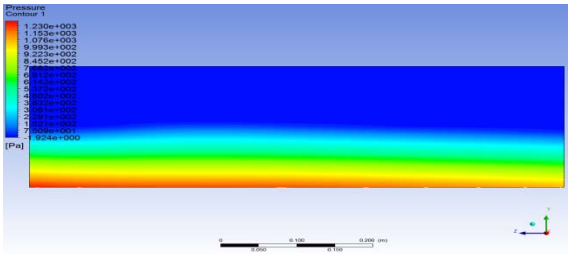

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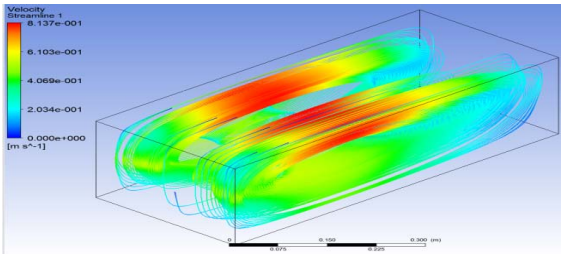

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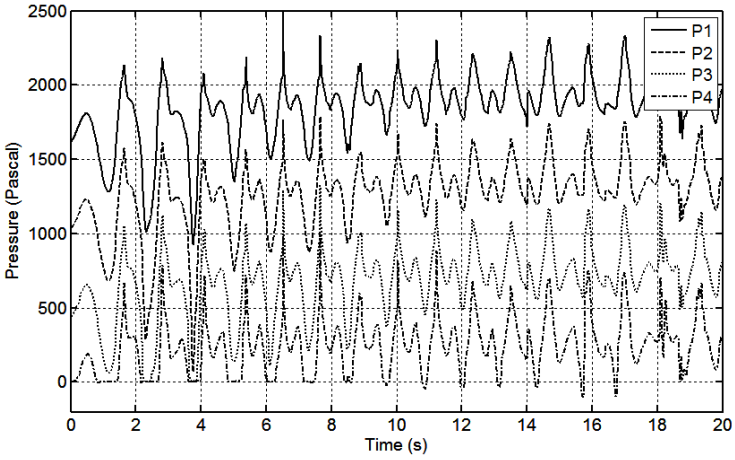
Figure 2. Unbaffled tank (50% filled)
a) Pressure-Time changes, b) Instant pressure distribution, c) Instant velocity distribution



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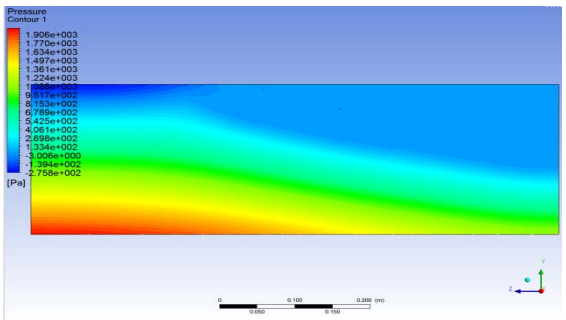

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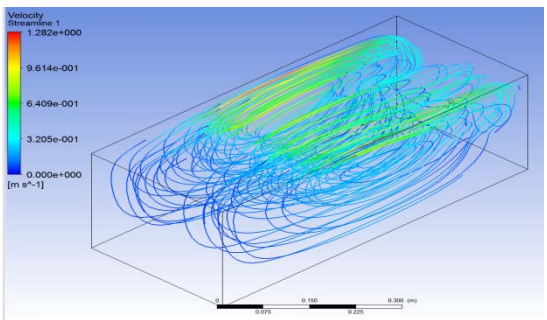

(c)

Figure 3. Unbaffled tank (70% filled)
a) Pressure-Time changes, b) Instant pressure distribution, c) Instant velocity distribution

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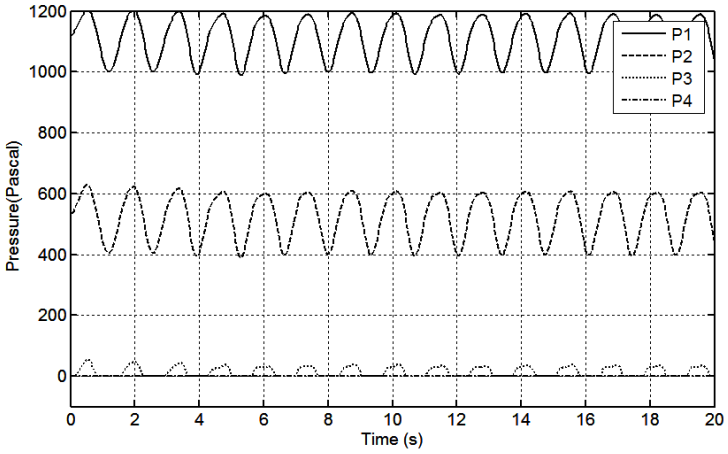
In Figure 4 and Figure 5, pressure changes at the P_1, P_2, P_3 ve P_4 points and the pressure and velocity distribution at t=2.35 second for baffled tank filled 50% and 70% water are shown respectively.



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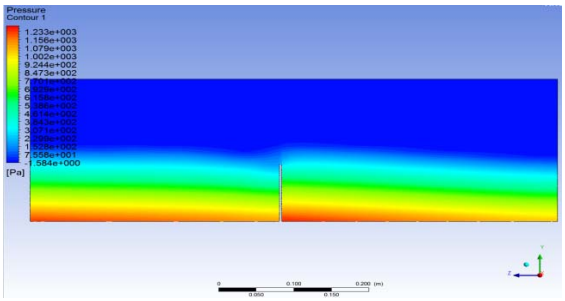

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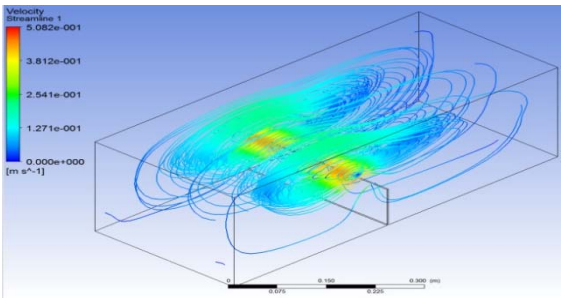

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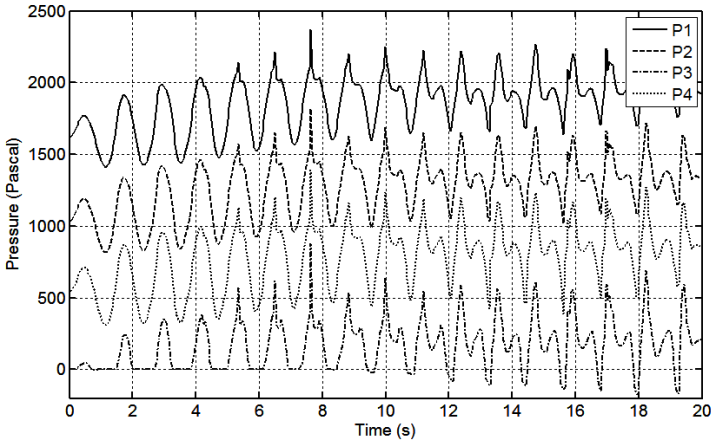
Figure 4. Baffled tank (50% filled)
a) Pressure-Time changes, b) Instant pressure distribution, c) Instant velocity distribution



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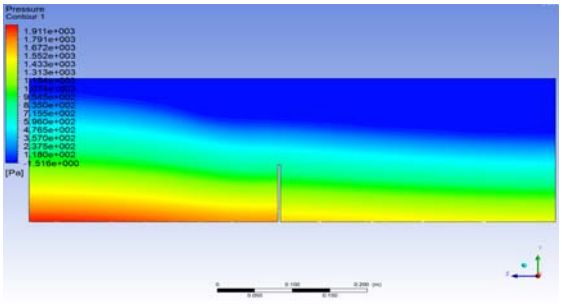

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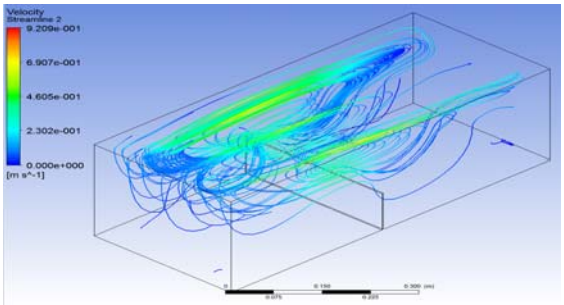

(c)

Figure 5. Baffled tank (70% filled)
a) Pressure-Time changes, b) Instant pressure distribution, c) Instant velocity distribution

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When Figure 2 and Figure 4 are examined, it can be shown that the sloshing behavior vary considerably between 50% filled baffled and unbaffled tanks. When the baffled tank case is investigated, it can be observed that the fluid cannot be reached to the pressure point 4 (P4) and the pressure distribution become more regular form. When the instant pressure and speed distribution are investigated for two cases, it can be shown that the maximum speed value of the baffled case is reduced at the rate of 62.5% approximately.

As it can be seen from Figure 3 and Figure 5, there are no big difference on the pressure values between baffled and unbaffled tanks. However, it can be said that the form of the sloshing behavior was changed and the maximum speed value is reduced at the baffled tank when the instant pressure and speed distribution are observed.

Conclusion

In this study, fluid sloshing behavior in a prismatic tank that has approximately the same volume with a vehicle fuel tank is investigated by CFD method, pressure and instant speed variations are obtained.

Two different tank configurations are modeled as tank with vertical baffle and unbaffled tank. The tank is filled with water where the rate of %50-70 and subjected harmonic motion at the lateral direction, the dynamic behavior of the system examined for both cases. It was seen from the results that the liquid level and the baffle in the tank affects the sloshing behavior of the fluid significantly. When making design studies, it is important to take into account these parameters such as fluid level and baffle structure placed in the tank.

Acknowledgments

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INVESTIGATION OF TENSILE STRENGTH AND ELONGATION PROPERTIES OF BASALT FIBER-PUMICE REINFORCED POLYPROPYLENE COMPOSITES

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Abstract: Basalt fibre is obtained from volcanic basalt rocks. The manufacture of basalt fiber requires the melting of the basalt rock to about 1400°C. Its chemical structure is nearly related to glass fiber. It has slightly better mechanical properties than glass fiber. Basalt fiber has great potential application to composite manufacturing. In this study, multiaxial fabrics were produced from basalt filaments. Multiaxial basalt fabric and pumice stones were used as reinforcement material for the production of the composite structures. Polypropylene was used as resin. Finally multiaxial basalt fabric-pumice stone reinforced polypropylene composites were produced by using hot press compression machine. Then modulus of elasticity, tensile strength and elongation properties of the thermoplastic composites were investigated.

Keywords: Basalt fibre, composite, polypropylene, pumice

Introduction

Production and using of fiber reinforced composite structures is very attractive and developing subject for few years. Fiber reinforced composite structures have very important advantages such as low weight, low cost, high strength, resistance to flame and corrosion, etc. Due to their advantages, fiber reinforced composites are used instead of conventional structural parts especially in construction, automotive and industrial applications.
Basalt fiber is a newly developed inorganic fiber which produced from molten volcanic basalt rocks [1]. It is similar to carbon fiber and glass fiber, having better mechanical properties than glass fiber, but it is significantly cheaper than carbon fiber and little more expensive than glass fiber. Its chemical structure is nearly related to glass fiber. The most important components of basalt fiber are SiO_2, Al_2O_3, CaO, MgO, Fe_2O_3 and FeO. The manufacture of basalt fiber requires the melting of the basalt rock to about 1400°C. They are not required any additional additives during the production process, so their production cost is low. The molten rock is then extruded through small nozzles to produce continuous filaments of basalt fiber. The fibers typically have a filament diameter between 9 and 13 micrometres. Compared with glass fiber, basalt fibers are more resistant to strong alkali and less resistant to strong acids. Basalt fibers can be used over a wide range of temperature, from 200°C to 600°C. They are resistant to high temperatures. Basalt fiber has great potential to be used in composite structures. The basalt filaments are more ductile than glass and carbon fibers [2-6].

Materials and Methods

Materials

In this study basalt filaments (400 Tex) were used for the reinforcement of the composites. In order to use basalt filaments in composite structures, multiaxial fabrics were produced. Multiaxial fabrics were manufactured by using basalt filaments in 0°, 90°, and ±45°. Photo of the multiaxial fabric is given in Figure1. Also pumice stones were used as filling material. Used pumice stones were in 3 different sizes. Particle sizes of the pumice stones were 0-1 mm, 1-2.5 mm and 2.5-4 mm.

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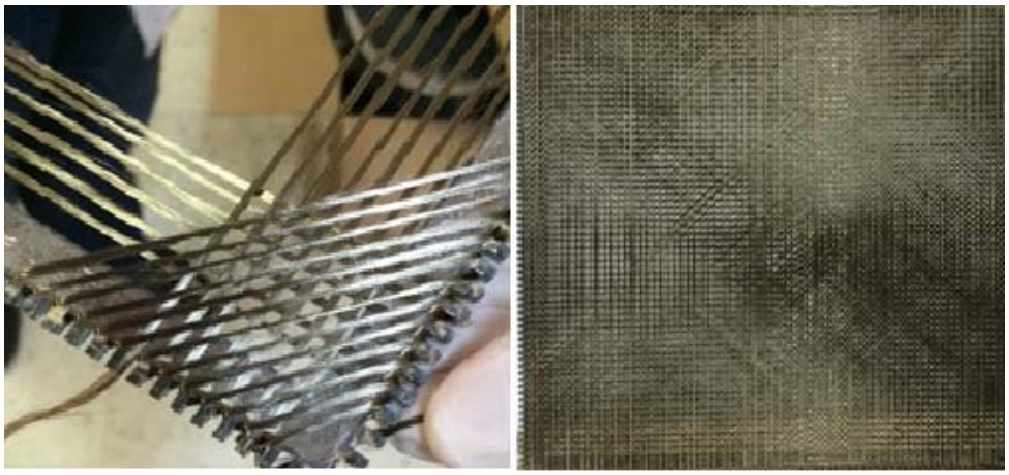

Figure 1. Produced Multiaxial Basalt Fabrics

Production of Composite Structures

Multiaxial basalt filament- pumice stone reinforced polypropylene composites were produced by using hot press compression machine. Production of the composites were performed under 200 °C and 100 bar pressure. Polypropylene resin was used in granule form. Properties of the produced thermoplastic composites are given in Table 1. Photo of the hot press compression machine and produced composite structure are given in Figure 2.

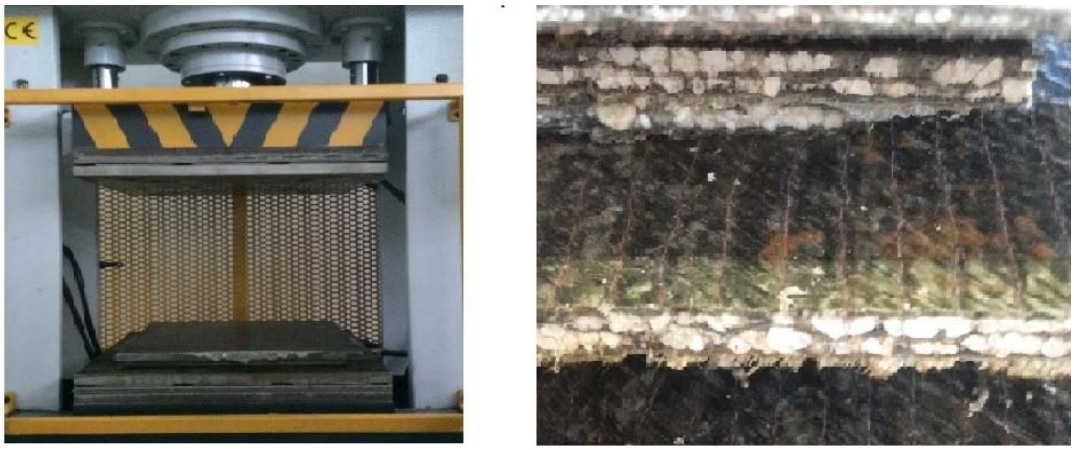

Figure 2. Hot press compression machine and cross sectional view of the composites

Table 1: Properties of the Produced Basalt Filament-Pumice Reinforced Polypropylene Composites

Composites	Ratio of Polypropylene (%)	Ratio of Pumice Stone (%)	Ratio of Basalt Fibre (%)	Pumice Particle Size (mm)
C 1	72	-	28	-
C 2	56	18	26	2.5-4
C 3	56	18	26	1-1.5
C 4	56	18	26	0-1

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Results and Discussion

Tensile Strength and Elongation Analysis

Elasticity modulus, tensile strength and elongation at break properties of the multiaxial basalt filament-pumice stone reinforced polypropylene composites were investigated by using Zwick Z010 testing instrument. Tensile strength and elongation analyses of the composites were performed according to ASTM D 3039/D3039M–07 standard.

Elasticity modulus, tensile strength and elongation at break properties of the thermoplastic composites are given in Figures 3, 4 and 5 respectively.

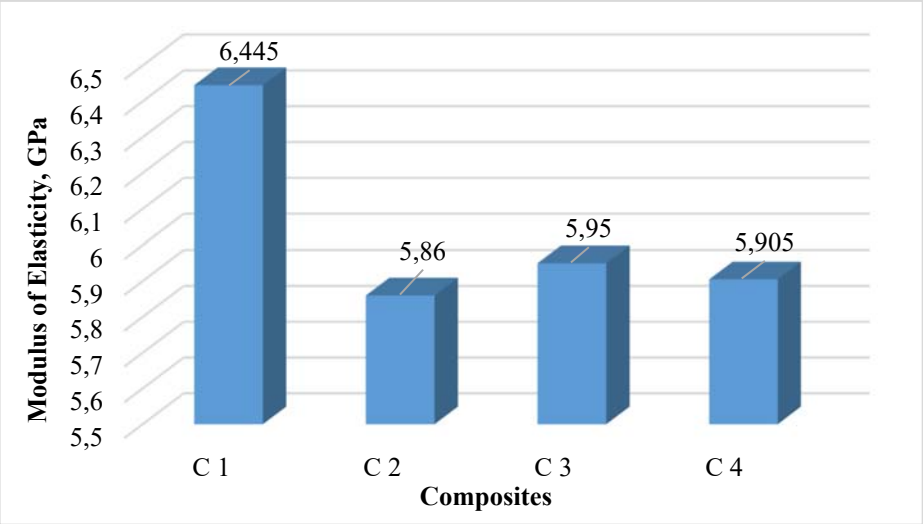

Figure 3. Elasticity modulus properties of the produced composites

Addition of pumice stones decreased the modulus of elasticity properties of the composites. The highest elasticity of modulus properties were obtained by using 1-2.5 mm pumice stones. 2.5-4 mm pumice stone added composites have the lowest elasticity of modulus properties.

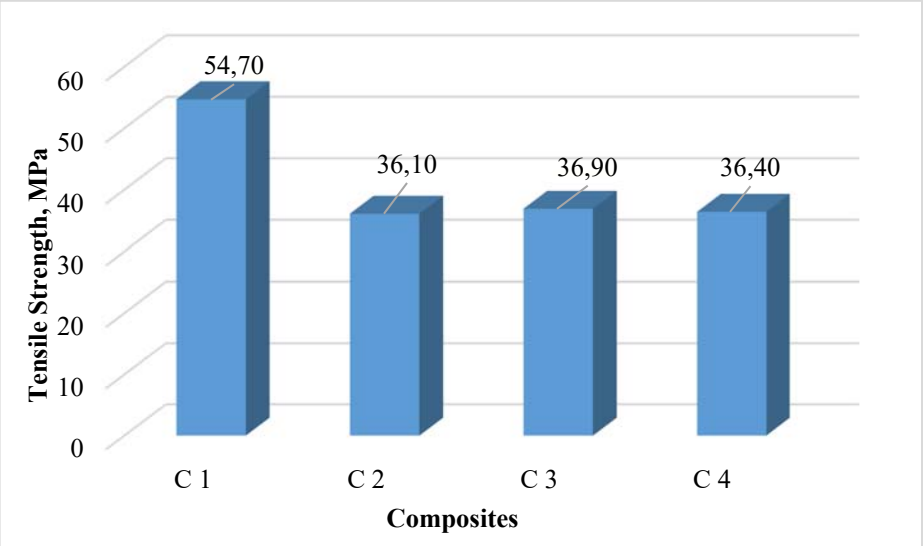

Figure 4. Tensile strength properties of the produced composites

Addition of pumice stones decreased the tensile strength properties of the composites. The highest tensile strength properties were obtained by using 1-2.5 mm pumice stones. 2.5-4 mm pumice stone added composites have the lowest tensile strength properties.

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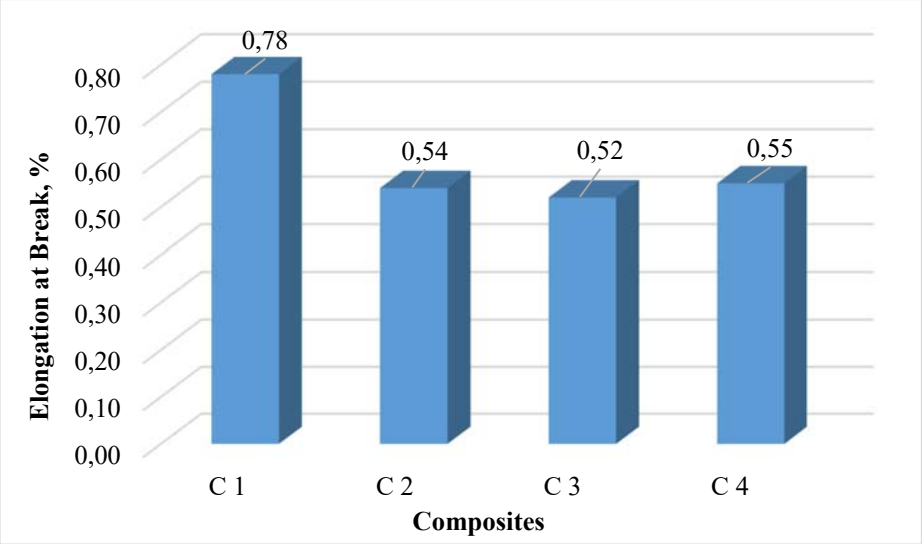

Figure 5. Elongation at break properties of the produced composites

Addition of pumice stones decreased the elongation at break properties of the composites. The effect of the pumice stone sizes on the elongation at break properties of the composites is negligible.

Morphology of the composite structures

Morphology of the produced multiaxial basalt filament-pumice reinforced polypropylene composite structures were analysed by using JEOL JSM-5410 LV Scanning Electron Microscope. SEM micrographs of the composites are given in Figure 6.

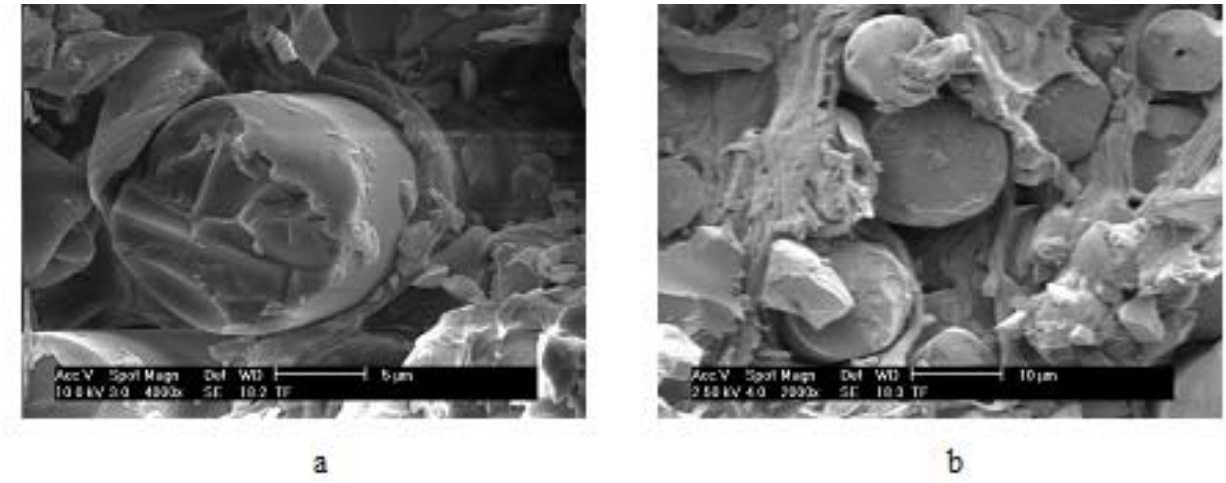

Figure 6. SEM Micrographs of the a)Multiaxial basalt filament reinforced composite b)Multiaxial basalt filament-pumice stone reinforced composite

It is seen from the Figure 6, good adhesion occurred between the basalt fibre and polypropylene resin, it is also observed that pumice stones were slightly bonded to the polypropylene resin.

Conclusion

In general, addition of pumice stones decreased the modulus of elasticity, tensile strength and elongation at break properties of the composites. Better modulus of elasticity and tensile strength properties were obtained by using 1-1.5 mm pumice stones. It is seen that pumice stone size is effective on modulus of elasticity and tensile strength properties of the composites. And good adhesion was occurred between the basalt fiber-polypropylene resin and pumice stones – polypropylene resin. As a result, pumice stones can be added to the fiber reinforced composite structures as filler to obtain moderate tensile and improved insulation properties.

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Acknowledgements

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INVESTIGATION OF WIND POWER IN THE REGION OF SAKARYA PROVINCE (TURKEY)

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The capacity of the Turkish electricity sector will reach the demand of the 56 GW forecast by 2018. This value assumes steady yearly average increase of some 2,5%. Currently the rate of thermal power plants fed by natural gas, oil and coal is too high within the total capacity of power plants, especially those fed by natural gas reach 50% . Industrial development continues and the demand for electric energy is growing but national energy dependency has not been yet solved, because Turkey is not self-sufficient in production of both natural gas and oil. As an alternative wind energy resource may be more suitable option compared with others. This option is supported that wind technology costs decreases in recent years and will continue to decrease in near future as showing market trends. Evaluation of the wind potential in different areas of the country must be done in order to ensure the best use possible of this option. This paper gives a statistical analysis of the wind characteristics in the region of Sakarya Province. The daily, monthly and annual wind speed values have been discussed together with their prevailing direction. The data will be analyzed correspond to three meteorological stations located in the area.

Keywords: Wind speed, Electricity, Average speed

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INVESTIGATION ON ENDURANCE, SPEED AND VERTICAL JUMP PARAMETERS OF SOCCERS

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Abstract: Football is a collective game, even though their positions according to the task of football are different features. Conditions in different areas in the tempo and distance, need to jump several times in the performance of the three pillars of the soccer game, physical conditioning, technique and tactics are. Physical Conditioning as important features for speed and endurance are a footballer. In addition to playing football in the air not only from place to leap to the fore the importance of the length and size are removed. Football is a collective game, even though their positions according to the task of football are different features. The aim of our study, vertical jump, speed and durability characteristics of football players have played their positions (defense, center court, assault) What percentage of differences between levels and to find out which position player is more dominant. Research in our province of Bursa in the first amateur football each class of the cluster a total of 30 volunteers 10 footballer footballer joined. Vertical jump from the direction; defense, the middle field and attack players, a significant statistical difference between ($p > 0.05$), a significant difference in speed and endurance properties were found ($p < 0.05$). As a result, the mid-field endurance of players, the offensive player of the features of the speedboat, which he played better than in other positions that were observed ($p < 0.05$).

Keywords: Football, Vertical Jump, Speed, Endurance.

Introduction

Football, the width of the playing field, game time and the excessive number of players who play with the richness of the rules with the feature that requires versatile behavior and struggle in terms of other sport has found its own place. So we have to be seen in public in any sport, it has led millions of people to fill a football field (Başer 1994). Football game contains violent and effort of frequently changing time. Effort style of play to the team's technical, tactical and physical fitness varies depending on the situation. Mobility sprint from standing during the game or show up to walk several variables (Sağlam 1993). In general, football, throw the ultimate goal of the pre-planned goals and application made or action occurred as a spontaneous and passing performed works is defined as moving toward game (Türel 1990). In terms of scientific football, which used successive aerobic and anaerobic effort, speed, strength, agility, flexibility, balance, muscular and cardiorespiratory coordinate high to act together to performance factors such as durability it is a sports discipline (Akgün 1992 Eniseler 1994). Football lately based on scientific basis, conscious and showed great progress with systematic studies and technical development of these players, tactics and showed itself clearly in the conditional properties. Football lately based on scientific basis, conscious and showed great progress with systematic studies and technical development of these players, tactics and showed itself clearly in the conditional properties. Measurements carried out on players by various researchers, the total ran the distance in 90 minutes of a football player to be around 12 000 meters and 8680 meters is stated (Bizanz 1988, Eniseler 1994,Reilly1976). Footballers in varying degrees to form a variety of movements while running this distance, accelerating or standing, or running to make the cut to stop or change speeds without stopping at various speeds. The football game is analyzed, the movement to stop the way, walking, jogging, submaximal running, seems to be in the form of maximal running. According to this motion movement numbers as used during football games, 298 of jogging, 226 of walking, 98 of submaximal running, 35 of maximal running (Akgün 1992, Eniseler 1994).

Endurance and sprint performance in football motoric traits that most affect. Durability, the whole organism to resist fatigue in long-standing sporting exercise, the installation of high intensity is defined as the ability to maintain long-term (Renklikurt 1991,Türel 1990).

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Football players are not only endurance but also must be fast and quick. Because of the high level of speed and quickness to the team but it can be countered with the speed and quickness of the players in the advanced level (Yavuz 1995). Face; as soon as the unit is in most ways get Capability (Sevim1991), to be able to react as soon as possible against any stimulus (Renklikurt 1991), react in a short period of time and series of low resistance to movement to reach high speeds (Bizanz 1988) is defined as.

Today's football players and durable, both fast should have a good bounce property. According to the position played by football players to rise to the forefront of some of these features can also be an advantage for that position.

Today's football players and durable, both fast should have a good bounce property. According to the position played by football players to rise to the forefront of some of these features can also be an advantage for that position.

Materials and Methods

Our research Bursa First Amateur 10 players from each position playing football in Serie A total of 30 players, including volunteers. Players with their respective vertical jump, assays were performed to measure the speed and durability.

It was found to be in the age of the players. The height and feet bare condition Holtain Limited brand meter height, the body weight of shorts and bare feet were with Arzum brand scales situation.

Applied in vertical jump measurement of subjects' Sargent Jump Test "to measure the difference between the height of which can be reached by leaping with standing height is based on (Bağırgan 1990 Tamer 1991, Withers, 1982). Testing was performed twice with one-minute break was considered the best value.
Measuring 30 meters sprint at the indoor sports hall with electronic photocell unit was on the parquet floor. Each subject ran twice quickly with the highest five-minute break from the 30-foot outpatient output. It was considered the best value.

Resistance value of the 20-meter shuttle run test (Shuttle Run test) were detected with (Şipal 1989). The subjects were 20-meter course in a regular cassette tape and ran as the tempo gradually and in accordance with sound direction by changing round-trip signal from the increased range. Leaving test subject was recorded as the number of stages and the running resistance value.

In statistical analysis, mean, standard deviation and standard applications were made in other calculations. The comparison of the players according to their played position Student "t" test was used.

Results and Discussion

Table 1. According to the statistical analysis of the position of vertical jump feature.

Position,	Average	SD	T	P
Defense	61,3	4,322		
			1,145	>0,05
Midfielder	58,5	6,416		
Defense	61,3	4,322		
			0,84	>0,05
Offensive	63,3	6,165		
Midfielder	58,5	6,416		
			1,705	>0,05
Offensive	63,3	6,165		

There was no statistically significant difference between the sites in terms of vertical jump (p> 0.05).

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Table 2. Statistical analysis of speed according to the position of 30 meters.

Position,	Average	SD	t	P
Defense	4,684	0,129		
			0,622	>0,05
midfielder	4,751	0,203		
Defense	4,684	0,129		
			2,363	<0,05
Offensive	4,554	0,117		
Midfielder	4,751	0,203		
			2,654	<0,05
Offensive	4,554	0117		

The difference between the positions of direction in terms of statistical significance was found 30 meters sprint. speed characteristics of the defense and midfield attacking players are better players based ($p < 0.05$).

Table 3. Statistical analysis of the positions of the resistance trait.

Position	Average	SD	t	P
Defense	57,96	3,212		
			1,736	>0,05
midfielder	59,83	1,130		
Defense	57,96	3,212		
			1,881	>0,05
Offensive	55,32	3,293		
Midfielder	59,83	1,130		
			4,186	<0,05
Offensive	55,32	3,293		

Positions in terms of endurance was a significant difference in terms of statistical significance ($p < 0.05$). According to the defense and attacking midfielder player has been observed to be more durable.

Table 4. A comparison of the subjects to their played position.

	Defense	Midfielder	Offensive	P
vertical jump (cm)	61.3+2,68	58,5+3,98	63,3+3,82	p>0,05
30 m. sprint (sn)	4,684+0,08	4,751+0,13	4,554+0,07	p<0,05
Endurance (ml/kg.dk)	57,96+1,99	59,83+0,70	55,32+2,041	p<0,05

Vertical jump players of the participants, 30 m. When compared to the position they play the speed and durability, vertical jump feature not carry a significant difference ($p < 0.05$), there were significant differences in other properties.

Table 5. Statistical values based on the position of physical properties

Physical properties	Defense	Midfielder	Offensive
Age	20,9+1,353	19,9+1,072	21,1+0,989
Height (cm)	180,9+1,926	176,7+3,708	176,3+3,065
Body Weight (kg)	71,3+1,923	67,2+2,44	71+2,615

In our study, we could not obtain a significant difference when you compare it according to the position we have achieved vertical jump values ($p > 0.05$). But when we look at the average values (Table 4) in order to attack players that have the highest value, then it is seen that the defense and midfield reamers. These results also bear the statistical significance Akgun et al (Akgun 1992) supports the results of research made by. In a study of German footballers (T.F.F. Publications, 1978), the offense and defense from the midfield reamers reamers were found to be the more balls in the air. In our research of the players play offense and defense of the values of the vertical jump with the results being the best German players Akgun and his friends is in line with the results of research

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carried out. More often go to the balls in the air may have been influential in the development of the vertical jump feature.

Özder and his friends l (Özder, Gunay 1994) in their study on amateur footballers, there was no significant difference when compared to subjects footballer of properties located in the vertical jump. This supports the results we found.

Speed and speed of the offensive players when compared to the strength properties of position, seems to be better durability of the midfielder PREVIEW ($p < 0.05$). The midfielder durability of our study was found to be better than any other position player ($p < 0.05$). after the midfielder was determined to have the highest values of defense and offensive players. Similar sequences have been expressed by many researchers (Cochrane, 1976 Yücetürk 1993). Yücetürk, in a more dominant over the midfielder of the durability defensive and offensive players, the training requirements of midfielders, so the both competitions in defense and attack players than longer run is said to be effective for them to add more distance.

Conclusion

In conclusion, the midfielder of durability, speed feature of the offensive players found to be better than the other position players ($p < 0.05$). There was no significant difference between the sites in terms of vertical jump ($p > 0.05$).

According to the positions of the players to play with different motor skills, pre-season preparation training and the season within the organization, we think it would be more useful in this regard. If required to be included in the club-house expert coaches for each individual property can be an important factor in their success. Also known these characteristics differ from site staff will help to create a match the coach.

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İPEK YOLUNUN ŞANLIURFA İNANÇ TURİZMİNE ETKİSİ: ŞEYH MESUD ÖRNEĞİ

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Özet: Türkiye'nin Güneydoğu Anadolu Bölgesinde bulunan Şanlıurfa ili doğudan Mardin, batıdan Gaziantep, kuzey ve kuzeybatıdan Adıyaman, kuzey ve kuzeydoğudan Diyarbakır illeri ile sınırlandırılmıştır. Güneyden ise Suriye sınırı ile çevrilidir.

Şanlıurfa, coğrafi konumu nedeniyle üzerinde tarih boyunca birçok devlet ve beyliğin hüküm sürdüğü, değişik kültürlerin geçiş ve kaynaşma alanı olmuştur. İlk ve ortaçağ da eski uygarlık merkezleri olan Çin, Orta Asya, Mezopotamya ve Arap ülkeleri ile Avrupa arasındaki ipek yolunun bir kolu Şanlıurfa üzerinden geçmektedir.

Çin'den başlayan ipek yolu orta Asya'dan geçerek Anadolu üzerinden Avrupa'ya kadar uzanan önemli bir ticaret ve kültür yoludur.

İpek Yolu sadece ticaret için kullanılmamıştır. İpek yolu, aynı zamanda doğudan batıya ve batıdan doğuya âlimlerin, orduların, fikirlerin, dinlerin, medeniyetlerin ve kültürlerin de yolu olmuştur.

İnsanların İslâm'ı daha iyi anlayabilmesinde ve İslâmiyet'in yayılmasında ipek yolu ile birlikte Anadolu Selçuklular dönemindeki tekke ve zaviyeler önemli rol oynamışlardır. Anadolu'yu Türkleştirmek ve İslamlaştırmak için önemli İslam bilginlerinden olan Hoca Ahmet Yesevî'nin halifeleri dervişleri ile birlikte küçük gruplar halinde Anadolu'ya göç etmişlerdir. Anadolu'nun değişik yerlerinde tekke ve zaviyeler kurmuşlardır.

Şeyh Mesud da 1183 tarihinden önce dervişleriyle birlikte Nişabur'dan Şanlıurfa'ya gelerek Şanlıurfa'nın Türkleşmesine ve Müslümanlaşmasma hizmet etmiş, Ahmed Yesevi halifelerinden biridir. Şeyh Mesud'un babasının adı Said Hengel'dir." Şeyh Mesud'un türbesi ve zaviyesi Şanlıurfa'da bulunan iç kalesinin de güneyinde tepenin üzerindedir. Mezarı bu türbenin içindedir. Bu türbe ve zaviye hem bir ziyaret hem de bir mesire yeridir. Şanlıurfa inanç turizmi için önemli bir ziyaret yeri olan Şeyh Mesud türbesi ve zaviyesi her yıl binlerce yerli ve yabancı turist ziyaret etmektedir.

Bu çalışmamızda İpek yolunu kullanarak Nişabur'dan gelen Şeyh Mesud'un Şanlıurfa İnanç turizmindeki yerini ve önemini tespit etmektir. Şeyh Mesud türbe ve zaviyesinin inanç turizm destinasyonları içerisine dâhil edilerek tanıtılmasını sağlamaktır.

Anahtar Kelimeler: Şanlıurfa, Turizm, İnanç, İpekyolu. Şeyh Mesud.

THE EFFECT OF SILKROAD TO ŞANLIURFA'S BELIEF TOURISM: AS A SAMPLE OF SHEIK MESUD

Abstract: Şanlıurfa City is in the south-east of Turkey and it has borders with Mardin at east , with Gaziantep at west , with Adıyaman at north and north-west , with Diyarbakır at north and north-east. Also it has border with Syria at south. Because of the geoghrapgic location of Şanlıurfa, many states and seigniories have ruled throughout history on it, and it has been also different cultures' transition and coalescence area. One of the silkroad's part between China, Middle Asia, Arabian countries and Europe, was in Şanlıurfa at first age and middle. Begining from the China, the silkroad which is an important trade and culture road cross over Middle Asia and by way of Anatolia it reachs to Europe.

The silkroad has not been used just for trade, it also has been a road, from east to west and from west to east, for scholarly people, armies, ideas, religions, civilizations and cultures. Islamic monasteries and zawias had an important role under favour of silkroad at the period of Anatolian Seljuk Empire and they served to be understood and spread of Islam. Hodja Ahmet Yesevi's khalifas and dervishes who wanted to turkify and islamicize the Anatolia, migrated

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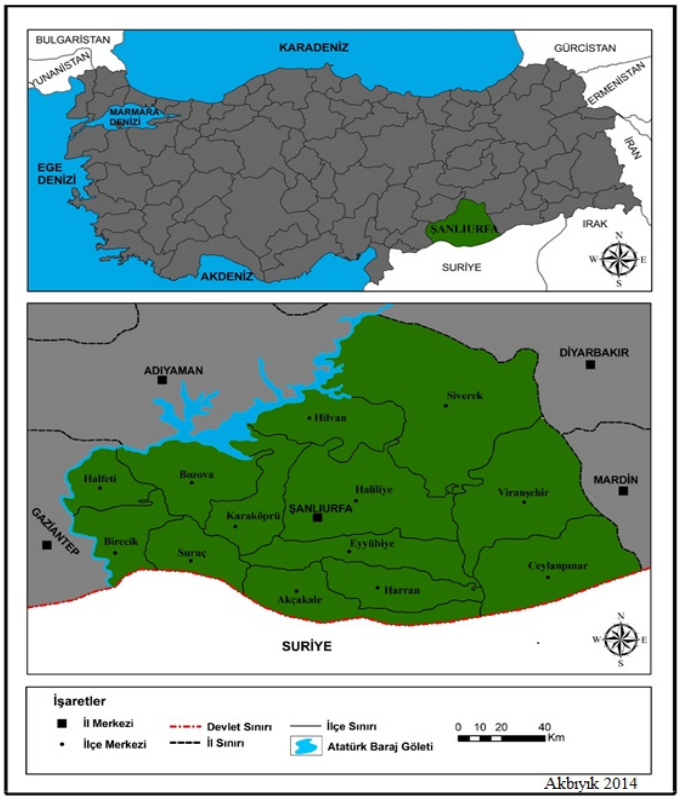
to Anatolia in small groups and established Islamic monasteries and zawias in different areas of Anatolia.
Sheik Mesud who is a khalifa of Hodja Ahmet Yesevi came to Şanlıurfa with his dervishes from Nisabur and he served to turkify and islamicize Şanlıurfa. His father's name is Said Hengel. His zawiya and tomb is at the south hill of Şanlıurfa's castle. This zawiya and tomb is both a showplace and picnic area. Every year thousands of foreign and domestic tourists visit Sheik Mesud tomb which is an important place for Şanlıurfa's belief tourism.
This study aims to determine importance of Sheik Mesud who came to Şanlıurfa from Nisabur by way of silkroad for Şanlıurfa's belief tourism.
Keywords: Tourism, Şanlıurfa, Belief, The Silk Road. The Sheik Massoud.

1.Giriş

1.1. Şanlıurfa İlinin Konumu ve Başlıca Özellikleri

Şanlıurfa Güneydoğu Anadolu Bölgesinde yer alır. Komşuları doğuda Mardin, batıda Gaziantep, kuzey ve kuzeybatıda Adıyaman, kuzey ve kuzeydoğuda Diyarbakır illeri bulunmaktadır. Güneyde ise Türkiye -Suriye sınırı ile sınırlanmıştır. (Harita1).



Harita 1.Şanlıurfa İlinin Lokasyon Haritası

Güneyden Batıya doğru kenarları fazla uzanmış bir altıgene benzeyen ilin yüz ölçümü 18.584 km2'dir (D.İ.E 1997). Bu Türkiye yüz ölçümünün yaklaşık % 3 üne eş değerdir. Şanlıurfa bu yüzölçümü ile Türkiye'nin 7. büyük ilidir. İlin nüfusu 2015 yılında 1.892.320 yükselmiştir.

Şanlıurfa ili morfolojik bakımdan çok sade bir görünüm arz etmekte olup, ana yer şekillerinden dağ, plato ve ovaları içine almaktadır. Coğrafi anlamda dağ diyebileceğimiz tek kütle Karacadağ (1938 m) volkanik kütlesidir.

Günümüzde de Şanlıurfa, Dünya'nın ve Türkiye'nin en önemli bölgesel kalkınma projelerinden biri olan GAP'ın (Güneydoğu Anadolu Projesi) merkezidir.

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Şanlıurfa, 12.000 yıllık tarihi ile Sümer, Pers, Roma, Selçuklu ve Osmanlı gibi uygarlıklara beşiklik etmiştir. Şanlıurfa, çok eski tarihi geçmişi ile doğu ve batının buluşma noktalarından en önemlisi ve de en hareketlisi olmuştur. Aynı zamanda kültür medeniyetlerin Dünya'ya yayıldığı bölge olarak kabul edilen ve "Bereketli Hilal" olarak adlandırılan Mezopotamya topraklarında bulunması nedeniyle, medeniyetlerin de beşiğidir. Yerleşme ve Arkeoloji tarihini değiştiren ''Göbeklitepe'' Dünya'nın ilk tapınağı olarak kayıtlara geçmiştir. Bu medeniyetlere ait çeşitli tarihi mirasları ile tarihi turizmi, geçmişten günümüze ulaşan ve yaşayan kültürel özellikleri ile kültür turizmi, Termal su kaynakları ile sağlık ve termal turizmi, kendine özgü bazı hayvan varlığı ve flora özellikleri ile eko turizmi, Birecik, Halfeti ve Atatürk Baraj gölünde yapılan su sporları ile Karacadağ'da yapılan kayak sporları ile spor turizmi, Sıra geceleri ve zengin mutfağıyla gurme turizmi vb. özellikleri ile turizm potansiyeli yüksek bir şehirdir. Şanlıurfa, üç semavi dinin atası olarak bilinen Hz İbrahim'in doğduğu, Hz Eyüp'ün çile çektiği, Hristiyanlığın ilk kabul edildiği ve Hz İsa'nın mendilini göndererek kutsadığı, Hz Şauyb, Hz Elyasa, Hz Lut, Hz Âdem'in yaşadığı bilinen Peygamberler Şehri'dir. Birçok dinlere ev sahipliği yapmış, birçok peygamberin yaşadığı ve peygamberler şehri olarak bilinen özelliği ve çok sayıda evliyanın türbeleri, tekkeleri ve zaviyelerinin yanı sıra onlarca cami, mescit, kilise, manastır ve tapınak gibi çeşitli dinlere ait inanç mabetlerinin varlığı, Şanlıurfa'yı bu anlamda inanç turizm açısından önemli kılmaktadır.

1.2. Araştırmanın Amacı, Materyal ve Metot

Şanlıurfa ilinin inanç turizmi potansiyelini ve Şeyh Mesud'un inanç turizmine etkisini araştırmayı amaçlamaktayız. Bu amaca ulaşmak için inanç turizmi açısından değeri olan yerlerde ve Şeyh Mesud türbesi ve zaviyesinde öncelikle kaynak taraması yapılmıştır. Ayrıca alan çalışması ve gözlemler yapılmıştır. Alan araştırmasında inanç turizmle ilgili yerlerde ve Şeyh Mesud türbe ve zaviyesinde gerekli görüşme ve mülakatlar yapılmıştır. Şeyh Mesud türbesi ve zaviyesi fotoğraflarmıştır.

2.Şeyh Musud'un inanç Turizmine Etkisi

Günümüzde turizm, birçok ülkede ve bölgede ekonomik ve kültürel kalkınmanın, gelişmenin ve bölgelerarası gelişmişlik farklarının azaltılması için en önemli kaynaklardan biridir. Büyük ölçüde hizmet sektörüne dayalı olan turizm, işsizliğin yoğun olarak bulunduğu ülke ve bölgeler için büyük önem taşır. Dünya'daki birçok ülkede olduğu gibi, ülkemizde de bölgelerarası gelişmişlik farkları bulunmaktadır. Bu bağlamda, Şanlıurfa'nın gelişmişlik farkının azaltılması ve ekonomik kalkınmasının sağlanmasına etki edecek sektörlerden biri de turizmdir.

İnanç turizmi ise İnsanların yaşadıkları, çalıştıkları ve çeşitli gereksinmelerini karşıladıkları yerlerin dışında, inanç merkezlerini ziyaret etmek, inançlarının gereğini yerine getirmek amacıyla gerçekleştirdikleri dini amaçlı turistik gezilerin, turizm olgusu içerisindeki değerlendirilmesi olarak tanımlanabilir.

İnanç turizmi bakımından ülkemiz büyük bir potansiyele sahiptir. Nitekim gerek ilkçağ medeniyetlerinin Anadolu'da gelişmesi gerekse de Hristiyanlığın ilk dönemlerinde Havarilerin, Ortaçağ'da ise Musevilerin yaşadıkları yerlerde karşılaştıkları ağır baskı ve yok etme politikaları sonucu, bu topraklara sığınmış olmaları, Türklerin kendi dini olan İslamiyet'e ait eserlerin yanı sıra, çok sayıda sinagog ve kilisenin Anadolu'da yer almasına neden olmuştur (Zaman, 2012: 395).

Bunun sonucunda da Anadolu'da inşa edilmiş dini mabetler ve tapınaklar, milletimizin İslami anlayış paralelinde derin saygı ve hoşgörü içerisinde günümüze kadar ulaşmıştır.

Şanlıurfa ilinde pek çok dinin geliştiği, birçok peygamberin yaşadığı veya bulunduğu, bu anlamda da peygamberler şehri adının verildiği Şanlıurfa, inanç turizm bakımından önemli bir potansiyele sahiptir. Şanlıurfa; insanların yerleşik düzene geçtiği çok eski dönemlerden itibaren muhtelif kültür ve medeniyetlerin bulunduğu, farklı toplulukların mensup oldukları çeşitli inançların yaşandığı bir alandır.

Dicle ve Fırat nehirleri arasında yer alan Yukarı Mezopotamya bölgesinde Bereketli Hilal olarak tanımlanan geniş ve verimli toprakların bulunması nedeniyle tarihte birçok medeniyetler oluşmuştur. Şanlıurfa doğu ve batının buluştuğu bir şehirdir. Doğu ve batı dünyasını kültür, medeniyet ve ticaret bakımından birbirine bağlayan

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eski ve önemli ulaşım yollarının kesiştiği bir coğrafi konumda olması nedeniyle tarihin her döneminde önemli bir yerleşme alanı olmuştur.

Türkiye Turizm Stratejisi belgesinde Şanlıurfa Tarsus'tan başlayarak Hatay, Gaziantep ve Mardin yörelerini de kapsayan İnanç Turizmi Koridorunda yer almaktadır.

12.000 yıllık tarihi ile birçok dinin geliştiği, birçok peygamberin yaşadığı veya bulunduğu, bu anlamda da peygamberler şehri adının verildiği Şanlıurfa, inanç turizm bakımından önemli bir potansiyele sahiptir.

Anadolu'nun Türkleşmesi ve İslamlaşması sürecinde gerçekleşen fetih hareketlerinin en önemli neticelerinden birisi bu coğrafyaya yapılan büyük göç hareketleridir. Mâverâünnehir, Harezm, Azerbaycan ve Erran Türkmenleri'nin Anadolu topraklarında yer bulma amacıyla gerçekleştirdikleri bu göç hareketleri, X.-XIII. yüzyıllarda yoğunluk kazanmıştır (Şeker,1997:65).

Söz konusu süreçte göçebe Türkmenler arasında Anadolu'ya gelen ulema ve derviş zümrelerinin de bulunduğu bilinmektedir. Nitekim bu dervişler XI. ve XIII. yüzyıl Anadolu'sunda vergiden muaf bir şekilde medrese, tekke ve zaviyelerde dönemin halkına İslâmiyet'i anlatmışlardır (Barkan, 1942:159) Anadolu'nun fethini müteakip burada kurulan Türkiye Selçukluları, Beylikler ve Osmanlı devirlerinde, bu faaliyetleri destekleme adına dinî-hayrî anlamda birçok müesseseler vücuda getirilerek bunların masraflarını karşılamak üzere bir takım emlak ve arazi vakfedildiği de bilinmektedir (Köprülü, 2005:323).

Türk halk İslâmî'nin şekillenmesinde etkili olan sûfîlik geleneğinin, üç evliya veya sûfî zümresini ön plana çıkardığı görülmektedir. Bunlardan birincisi, Orta Asya'da İslâm'ın yayılmasına önayak olan ve Ahmed-i Yesevî ile başlayan Türk sûfîlik geleneği; İkincisi Horasan Melâmetiyyesi, yani İran sûfîliği; üçüncüsü ise, ilk ikisinin oluşturduğu temelde teşekkül etmiş, Mevlânâ, Hacı Bektâş-ı Velî ve Yunus Emre tarafından temsil edilen Rum/Anadolu sûfîliği sentezidir (Ocak, 2002:33).

Daha çok Anadolu'nun fethi ve Moğol istilası sürecinde Orta Asya, İran ve Anadolu coğrafyasından gelen bu dervişlerin çoğu, devlet adamları tarafından saygıyla karşılanarak, adlarına tekke ve zaviyeler yaptırılmış, vergiden muaf tutulmuş, bölgedeki tarım arazisini kullanmalarına imkân tanınmıştır (Barkan, 1991:292).

Halkın İslâm'ı daha iyi anlayabilmesinde ve İslâmiyet'in yaygınlaşmasında Anadolu Selçuklular dönemindeki tekke ve zaviyeler önemli rol oynamışlardır. Anadolu'yu Türkleştirmek ve İslamlaştırmak için Hoca Ahmet Yesevî'nin halifeleri bazen dervişleri ile birlikte küçük gruplar halinde Anadolu'ya göç etmişler, tekke ve zaviyeler kurmuşlardır.

Anadolu'nun çeşitli yerlerinde kurulan tekke ve zaviyelerde bölgeye gelip giden ticaret yapan insanlara, yolculara veya askerlere barınma ve yiyecek ihtiyaçlarını karşılayan dervişler İslamiyet'i yaygınlaştırmaya çalışmışlardır.

Şeyh Mesud'un kimliği hakkında tek bilgi, zaviyesinin birkaç metre batısında Yağmur sularını toplamak için kazılan sarnıcın hemen doğu duvarı üzerinde yükselen kayanın üzerine kazdırdığı Şanlıurfa'da en eski Eyyûbî-İslâm kitabesidir. İşte bu kitabe şöyledir.

"Kad farağa min ameli sahrinci el-fakiru ila rahmetillahi Mesud ibni Said Hengel el-Nişaburi fı'l-aşereti min recebi'l-ağer. Senete tis'a ve sab'ine ve hamse mietin. ferahimallahu men dea (...) ve i'anehu ve sa'adehu ve li'cemi'i'l- müminin."(Karakaş, 2010:80). (Fotoğraf 1.).

Günümüz Türkçesine çevirisi şu şekildedir: "Bismillâhirrahmanirrahîm.

Allah'ın rahmetine muhtaç, fakir, Nişaburlu Said Hengel'in oğlu Mesud bu sarnıcın yapımından fariğ olup inşasını Recep ayının onlu günlerinden Pazar günü. Sene beş yüz yetmiş dokuzda tamama erdirdi. Allah'ın rahmeti, inâyeti onun üzerine olsun. Onun ve tüm mü'minlerin yardımcısı olsun!" (mufidyuksel.com). Buradaki tarihe bakacak olursak 579 yılı Recep ayının onlu günlerinde, Pazar günü 11 Recep veya 18 Receb'e tekabül

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etmektedir. Bu durumda Miladi takvimle 30 Ekim 1183 veya 6 Kasım 1183'e karşılık gelmektedir (mufidyuksel.com).



Fotoğraf 1. Sarnıçın yanındaki kayaya yazılmış kitabe.

Kitabeden Şeyh Mesud'un yaşadığı dönem Şanlıurfa'da Zengi-Eyyübi döneminin hüküm sürdüğü zamana denk gelmektedir. Şeyh Mesud devrinin âlim ve mutasavvıflarından biridir. Doğum ve vefat tarihleri bilinmemektedir. Kitabeden anladığımıza göre Nişaburludur ve babasının da adı Said Hengel'dir. Nişaburlu Said oğlu Mesud hakkında bu iki satırlık kitâbeden başka yazılı bir belge bulunmamaktadır. 1183 tarihinden önce Nişabur'dan Şanlıurfa'ya gelerek, iç kalenin güneyindeki tepelerin üzerinde çaykuyu platosunun kuzeye bakan yamaçlarında bir zaviye yaparak yerleşmiştir. Nişabur'un İslam tarihindeki yerine baktığımız zaman 651 tarihinde Basra Valisi Abdullah b. Amir tarafından İslam topraklarına katıldığını görmekteyiz. Horasan'ın en büyük şehirlerinden biri olan Nişabur, IX. Yüzyılda Horasanın en ileri gelen medeniyet merkezlerinden biri olmuştur. Ekonomide ileri bir durumda olduğu gibi kültür bakımından da Horasanın merkezi durumuna gelmiştir. Burada çeşitli dini akımlar bulunuyordu. Çok sayıda büyük âlimler ve mutasavvıflar yetiştirmiştir. Bunlardan biri olan XI. Yüzyılda yaşayan mutasavvıflardan Şeyh Ebu Said Ebul-Hayr, miladi 1024 ile 1035 yılları arasında Nışabur'da bulunmuştur.

Büyük mutasavvıflardan Kuşeyri (986-1072) ve Sülemi (936-1021) Nişabur'da doğmuşlardır. XI. yüzyılda Nişabur, ilimlerin, fakihlerin, edebiyatçıdan ve mutasavvıfların bir arada yaşadığı bir kültür şehri haline gelmiştir. Bu bakımdan Nişabur'a "Darü'l-İlm" adı vermişlerdir.

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Türklerin Müslüman olduktan sonra kalabalık bir şekilde yaşadıkları bölgeler Türkistan şehirleridir. İlim ve irfan öğrenmek isteyenler, Horasan ve Buhara gibi âlim ve mutasavvıfların kalabalık olduğu bu şehirlere giderler. Bu tarihlerde Türkistan'da şöhret kazanmış ve "Pir-i Türkistan" diye de isim yapmış Hoca Ahmed Yesevî'nin (ö. 1166) yaşadığı devreye rastlamaktadır.

Hoca Ahmed Yesevî'nin: yetiştirdiği öğrenciler doğu Türkistan, Anadolu ve hatta Bulgar içlerine kadar giderek İslam dinini yaymaya çalışmışlardır. O tarihlerde Anadolu, Selçuklular tarafından yeni fethedilmiş ve Müslüman Türkler büyük gruplar halinde Anadolu'ya gelerek yerleşmeye başlamışlardır. İşte Anadolu'yu Türkleştirmek ve İslamlaştırmak için Hoca Ahmet Yesevî'nin halifeleri bazen dervişleri ile birlikte küçük gruplar halinde Anadolu'ya göç etmişlerdir. Hatta Hacı Bektaşi Veli'nin bile bunlardan olduğu söylenilmektedir.

Böylece Şeyh Mesud' da 1183 tarihinden önce 'Horasan Ereni' olarak Şanlıurfa bölgesine geldiği kabul edilmektedir. Nişabur'dan Şanlıurfa'ya gelerek buranın Türkleşmesine ve Müslümanlaşmasına hizmet etmiş, Ahmed Yesevi halifelerinden biri olması kuvvetle muhtemeldir. Ahmed Yesevi'nin ölümü ile Şeyh Mesud'un Şanlıurfa'da bulunuşu arasında sadece 17 yıl bulunmaktadır. Bu da görüşümüzü kuvvetlendirmektedir (Fotoğraf 2). Zaviyesinin yanında bir sarnıç kazarak, su ihtiyacını buradan temin etmiştir Böylece Şeyh Mesud uzun yıllar Şanlıurfa'da halkı Müslümanlaştırmaya çalışmış evliyalarından biridir diyebiliriz.



Fotoğraf 2. Türbe ve Zaviye İç kalenin Güneyinde Tepelik Alanda Bulunur.

Şanlıurfa'daki türbe ve zaviye tarzındaki yapıların en eski tarihlisi olan yapı, dört eyvanlı, Selçuklu medrese mimarisine uygun tarzda köşegen olarak inşa edilmiştir (Fotoğraf 4).

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Fotoğraf 3. Şeyh Mesud Türbesi ve Zaviyesi Şanlıurfa Taşı ile İnşa Edilmiştir.

Türbe ve Zaviye inşa edilirken ortada yer alan kubbenin üstü yarı açık bırakılmıştır. Karasal iklime sahip olan Şanlıurfa'da hem gün ışığından azami derecede istifade etmek hem de hava dolaşımını sağlayarak yazın sıcaklığının etkisini azaltmayı amaçlayan bir mimari ile tasarlanmıştır (Fotoğraf 4).

Bu türbe ve zaviyenin geçmiş tarihte iki defa tamir gördüğü iç bölümde yer alan batı ve kuzey duvarları üzerinde bulunan kitabelerinden anlaşılmaktadır. Şeyh Mesud Türbesi ve zaviyesi en son 2010 yılında Vakıflar Bölge Müdürlüğü tarafından restore edilmiştir.



Fotoğraf 4. Gökyüzünü Gören Bir Mimari ile İnşa Edilmiştir.

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Doğu tarafındaki eyvanın alt kısmındaki bodrumdaki odada, Şeyh Mesut'un mezarı, üstündeki eyvan içerisinde de sandukası vardır. Türbe ve zaviyenin içinde mescidi, çilehaneleri ve misafirler için ayrılan odaları bulunmaktadır (Fotoğraf 5).



Fotoğraf 5. Şeyh Mesud'un Mezarı Bodrum Katında Yer Almaktadır.

Sonuç ve Öneriler

Şeyh Mesud türbe ve zaviyesi hem inanç turizmi açısından ziyaret yeri hem de ziyaretçiler için bir mesire alanıdır. Şeyh Mesud günümüzde halk tarafından Şıh Maksud olarak bilinmektedir. Şeyh Mesud türbesi ve zaviyesi Şanlıurfa şehir yerleşmesi yakınında bulunan iç kalenin güneyinde bulunan tepelik mekânda yer almaktadır. Bu türbe ve zaviye yerleşme alanı ve ulaşım imkânları yeterli olmayan mevkide iken Şanlıurfa'nın nüfus artışına bağlı olarak yerleşme alanları genişlemiş ve zamanla yerleşmeler yakınına kadar gelmiştir. Yerleşmelerin türbe, zaviye ve zaviyenin etrafını çevrelemiştir. Türbe ve zaviyenin etrafındaki yerleşmelerin ulaşımı sağlamak için Şanlıurfa Büyükşehir Belediyesi tarafından düzenli otobüs seferleri düzenlenmesi Şeyh Mesud türbesi ve zaviyesinin daha çok tanınmasına ve erişebilirliğini artırmıştır. Şanlıurfa Büyükşehir Belediyesi tarafından türbe ve zaviyenin çevre düzenlemesi yapılmıştır. Şeyh Mesud türbesi hem bir mesire alanı hem de Şanlıurfa inanç turizmi için önemli bir ziyaret yeri olarak her yıl binlerce yerli ve yabancı turist ziyaret etmektedir.

Sonuç olarak; Şanlıurfa ilindeki turizm faaliyetlerini çeşitlendirmek için, çok zengin bir inanç turizm potansiyeli bulunmaktadır. Tarihi süreç içerisinde çeşitli dinlere mensup insanların yaşadığı, ibadetlerini gerçekleştirdikleri mekânları, günümüzde de aynı dinlere mensup insanlara ve diğer ziyaretçilere tanıtımları yapılarak inanç turizminin hizmetine sunmak gerekmektedir. Şeyh Mesud türbe ve zaviyesinin de Şanlıurfa inanç turizminin gelişmesi ve çeşitlenmesi için yerli ve yabancı turistlere gerekli tanıtımların yapılması inanç turizminin gelişmesi açısından son derece büyük bir öneme sahiptir.

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İŞKOLİZM VE MÜKEMMELLİYETÇİLİK

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Özet: İşkoliklik ve mükemmeliyetçilik, aşırı iş yükü, iş-aile çatışması, A Tipi kişilik ve tükenmişlik kavramlarıyla pozitif ilişkilidir. İşkolik kavramı, "iş" ve "alkolizm" kelimelerinin bir bileşimidir. Çoğu kişi, işkolikle çalışkan olmayı karıştırır. Aşırı iş yükü, ya mevcut zamanda gerçekleştirilecek çok iş olmasından ya da işin gerçekleştirilmesinin çok zor olmasından kaynaklanır. Son çalışmalar göstermiştir ki, mükemmeliyetçilik odaklı davranışlar, başarıyı engeller. İş-aile çatışmasının ilişkili olduğu konulardan bazıları; daha az iş tatmini, daha az yaşam tatmini, daha yüksek stres, artan depresyon ve sıkıntı, fiziksel sağlık şikâyetleri, yüksek tansiyon ve artan hazır gıda tüketimidir. A tipi bireyler arasında işkoliklere daha fazla rastlanmaktadır. İşkolik A tipi bireyler, aynı anda birçok görev yerine getiren, son teslim tarihleriyle yaşayan ve en küçük ertelemeden mutsuz olan bireylerdir. Tükenmişlik ise, aşırı iş yükünden kaynaklanan bir iş stresi durumudur.

Anahtar Kelimeler: İşkolizm, mükemmeliyetçilik, stres.

WORKAHOLISM AND PERFECTIONISM

Abstract: Workaholism and perfectionism are positively correlated with work overload, work-family conflict, type A personality and burnout syndrome. The term "workaholic" is a combination of the words "work" and "alcoholism". Many people confuse hard-working people with workaholics. Work Overload results if there is too much work to perform in the time available, or work that is too difficult for the employee to perform. Recent studies show that perfectionist attitudes actually interfere with success. Work-Family Conflict has been linked to: lower job and life satisfaction, higher stress, increased depression and anxiety, physical health complaints and hypertension, increased fatty food consumption. Type A individuals are often highly achieving workaholics who multitask, drive themselves with deadlines, and are unhappy about the smallest of delays. Burnout is a condition of job stress that results from overwork.

Key words: Workaholism, perfectionism, stress.

Giriş

Bireyler arasında kötü alışkanlıkların sayısı günden güne artmaktadır. Bireyleri böyle kötü alışkanlıklara iten birçok sebep olmasına karşın, içinde bulunduğu aile ortamı, benlik gelişimi ve yetiştiği çevre gibi önde gelen özellikleri saymak mümkündür. Hızla değişen aile yapısının etkisiyle uyuşturucu ya da uyarıcı madde kullanımı ciddi bir problem olarak toplumu ve insan hayatını tehdit etmektedir.

İnsan olma özelliğimizi oluşturan sosyal, biyolojik ve psikolojik boyutlardan birinde, ikisinde veya hepsinde sorun varsa; problem var demektir ve yardım gerektirir. Bağımlılık, 21. yüzyılın önde gelen insanlık sorunudur. **Zevkle çalışsalar da işkolikler**, kendilerine ve yakınlarına (ruhsal, bedensel ve toplumsal olarak) zarar vermeyeceklerini zannederler.

Son yıllar içerisinde meydana gelen teknolojideki hızlı değişim ve ekonomideki küreselleşme, işgörenlerin daha uzun sürelerle çalışmalarına yol açmış ve işkolik davranışlar göstermelerine neden olmuştur. Birçok örgütte kurumsal kültür, kişilerin işte uzun saatler geçirmelerini sağlamaya yönelik ödüllendirici bir nitelik taşımaktadır.

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Worth (1987) bu konuyla ilgili yaptığı araştırmada, her on işyerinden dokuzunun kişileri daima işleriyle meşgul olmaya yönlendirdiğini ortaya koymaktadır. Bu tarz işyerleri, e-posta, çağrı cihazları, cep telefonları, taşınabilir bilgisayarlar ve çeşitli teknolojik araç ve gereçlerle çalışanlarına 24 saat işle ilgili olabilme olanağı tanımaktadır. Aynı zamanda kurumların küçülmesi, çalışanları daha fazla çalışmak zorunda bırakmakta, bu durum da çalışanların zihinlerinin sürekli işle meşgul olmasını ve işe motive olmasını gerektirmektedir. Böylece çalışanlarda, işkoliklik bir alışkanlık haline gelmektedir. Ayrıca aşırı çalışmanın ödüllendirildiği bir sistemin olduğu örgütlerde kişilerin işe bağımlı olmaları kaçınılmaz olmaktadır (Garson, 2005'den akt.: Temel, 2006: 112). Kimi zaman ekonomik krizlerin etkisiyle örgütlerdeki çalışan sayısının azaltılması da bireylerin daha uzun sürelerde çalışmak zorunda kalmalarına yol açmaktadır (De La Poza vd., 2014).

İşkoliklik Kavramı

İşkolik kavramı, «İş» ve «Alkolizm» kelimelerinin bileşiminden oluşur. İşkoliklik, 1960'lı yılların sonunda türetilmiş bir kavramdır. Bu dönemde performansı arttıran olumlu bir ruh hali olarak da ele alındığı görülmektedir. Fakat ilerleyen zamanlarda, bireyin sağlığına ve toplumsal ilişkilerine zarar verdiği için, olumsuz bir durum olarak değerlendirilmeye başlanmıştır.

İşkoliklik, ilk olarak Birleşik Amerikalı ilahiyat profesörü Wayne Oates (1971) tarafından alkol ve uyuşturucu bağımlılığı gibi diğer bağımlılık türlerinden hareketle türetilmiştir. İlk olarak 1971 yılında Oates'in "Bir İşkoliğin İtirafları" adlı kitabında kullanılmıştır. Oates, işkolikliği bir çeşit alkol veya uyuşturucu bağımlılığından yola çıkarak "kompulsif ve kontrol edilemeyen bir şekilde sürekli olarak çalışma ihtiyacı" olarak tanımlanmaktadır. Bağımlılık kişileri kontrol altına aldığı için obsesif olmaya sürüklemektedir. Ayrıca işkoliklik, "iş bağımlılığı" anlamında kullanılmakla birlikte "aşırı derecede çalışma" olarak da ifade edilmektedir (Salihoğlu, 2014). Günümüz modern örgütleri için verimliliği düşüren en önemli problemlerden belki de birincisi işkolikliktir. İşkolikler çok çalışmalarına rağmen, iş yoğunluğundan kaynaklanan psikolojik ve fizyolojik problemler nedeniyle yüksek performans gösterememektedirler.

Genellikle araştırmacılar işkolikliği olumsuz bir tutum ve durum olarak ifade etmiştir (Akdağ ve Yüksel, 2010):

- *Maschlowitz (1980) ile Mosier (1983)'e göre, işkoliklik; çalışanların işe koşulların gerektirdiğinden fazla zaman ayırmaları ve haftada 50 saatin üzerinde çalışmanın yanısıra, sürekli işlerini düşünmeleridir.*
- *İşe olan bu ekstra bağlılık ve çalışma saatlerinin fazlalığı, rasyonel bulunmamaktadır.*
- *İşkoliklik aynı zamanda depresyon, kaygı (Haymon, 1993), stres ve mükemmeliyetçilik ile de ilişkilendirilmektedir.*

İşe karşı aşırı ve kontrol edilemez bir bağımlılık olarak tanımlanan işkoliklik, kısa vadede bireyin işine olan ilgisini ve motivasyonunu artırsa da uzun vadede bedensel, ruhsal ve sosyal sorunlara yol açmaktadır (Gülova vd, 2014.). İşkolikliğin «fizyolojik» etkileri sonucunda, bireylerde; sağlık problemleri görülmektedir. Nedeni ise işkoliklerin sağlıklarıyla ilgilenecek vakit bulamamaları veya hissettikleri baskıdan rahatsızlanmalarıdır (Salihoğlu, 2014). Hızlı yemek yeme nedeniyle kilo almak, hızlı yaşamak sonucu iletişim kurduğumuz kişilere yeterli ilgiyi göstermemek, çevremizdeki kişilere daha az sevgi ve ilgi göstermek, hızlı çalışmanın getirdiği artan hata oranı, hızlı karar almanın getirdiği yanlış kararlar, hızlı iş yapmak için daha kalitesiz işler çıkarmak; işkoliklerin yaşadığı üzücü olumsuzluklardandır.

İşkoliklik sadece sağlık sorunlarının değil, iş dışı sosyal ilişkilerin de zayıflamasına neden olmaktadır. İşkolikliğin «sosyal» etkileri açısından; işkolik bireyler enerjilerinin çoğunu işlerinde harcadıkları için sosyal ilişkilerinde azalmalar görülmektedir. Diğer insanların yaşamlarına karşı umursamaz davranmakta, sosyal ilişkilerde daha alıngan davranışlar sergilemektedir.

Literatürde işkolikle ilgili teorik çalışmalar iki kısımda incelenebilir: (Akdağ ve Yüksel, 2010.)

- (1) içsel faktörlerden kaynaklanan işkoliklik (korkular, özgüven eksikliği, kendini değersiz hissetme, mükemmelliyetçilik) (Porter,1996; Killinger, 1991; Scott v.d. , 1997),
- (2) dışsal faktörlerden kaynaklanan işkoliklik (ebeveyn ve/veya toplumun yüksek beklentileri (Dougherty, 1989).

İşkolikler farklı farklı tanımlamalarla sınıflandırılabilmektedir. Robinson yaptığı araştırma sonucunda işkolikleri aşağıda belirtilen kategoriler altında sınıflandırmıştır (Robinson, 2006'dan aktaran Goodman, 2006: 41):

• Hep ya da hiç işkolikler: Bu tip işkolikler yaptıkları işi ya mükemmel yaparlar ya da hiç yapmazlar. Yaptıkları her işin mükemmel olmasını isterler, çevrelerinden de bunu beklerler. Onlar için sadece bekleneni veya isteneni karşılayan performans yeterli değildir. İşe ilgili başarması imkânsız beklentilere sahiptirler.

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• Devam eden işkolikler: Bu tip işkolikler işe başlamakta değil bitirmekte zorlanırlar. İş delege etmekten hoşlanmazlar, her şeyi kendileri yapmak isterler. Kendilerine verilen her işi "Hayır" demeden kabul ederler. Ellerinde gereğinden ve olması gerektiğinden fazla iş olduğu içinde işleri zamanında ve istenen kalitede tamamlamakta zorlanırlar.

• Detaycı işkolikler: Bu tip işkolikler işin detaylarına çok fazla odaklanırlar ve işi tamamlasalar bile eksik bir şeyler olduğunu düşünüp tekrar işle ilgili tüm detayları tek tek gözden geçirirler. İşi başkaları yaptığında hep bir şeylerin eksik yapıldığını ve kendisi yapsaydı daha mükemmel olacağını düşünürler. • Kahraman işkolikler: Bu tip işkolikler kendilerinin sorun çözen kahraman olmaları için bilerek sorun ve krizler yaratırlar. Kriz veya sorunu çözen olmanın onları diğer kişilerden ayıran üstün bir özellik olduğuna inanırlar.

1.Alkolizm ile İşkolizmin Karşılaştırılması

a) Hem alkoliklerin hem de işkoliklerin ortak özelliği; aileyi, arkadaşlıkları, kişisel ilişkileri ve diğer sorumlulukları ihmal etmeleridir.

b) Alkolikler; alkol alındığında kendini aktif ve başarılı hissetmektedir. Duygulardan kaçmak için alkole yönelmektedir. **İşkolikler ise;** kendisini daha iyi hissetmek ve kendilerini rahatsız eden duygularından kaçmak için çabalamaktadır.

c) Hem alkoliklerin hem de işkoliklerin diğer bir ortak özelliği, bağımlılığı bıraktıklarında geri çekilme davranışıdır. (Alkolsüz olduğunda endişeli olma ve fiziksel olarak geri çekilme davranışı yaşanmaktadır. Benzer şekilde, işle ilgili olunmadığında da endişeli olma ve fiziksel olarak geri çekilme davranışı söz konusudur.) (Salihoğlu, 2014)

2.İşkoliklik / Çalışkanlık:

İşkolikliğin toplumda kabul edilmiş bir durum olması ve bir problem olarak görülmemesi aslında büyük bir sorundur. Gereğinden fazla çalışmak, sürekli mesai yapmak, sürekli iş düşünmek çalışma hayatında çalışkanlığın göstergesi olarak görülmektedir. İşkolikler, dağınık ve düzensizdir. Çalışkanlar ise organizedir ve odaklanırlar. İşkolikler; daha fazla çalışmak için nedenler arar, iş yapmadıklarında ise kaybolmuş hissederler. Çalışma sayesinde sorunlarını gizler, nasıl ve ne zaman dinleneceğini bilmezler. Çalışkanlar ise ne zaman duracağını bilir. İşkolikler; eve iş getirir, ailesi ile iyi iletişim kuramazlar. Dengesiz ve tek boyutlu hayata sahiptirler. Çalışkanların ise iş dışında bir hayatı vardır.

İşkolizm Ve Mükemmeliyetçilik

İşkoliklik ile ilgili olan bazı kavramlar; bağımlılık, aşırı iş yükü, iş-aile çatışması, alkoliklik, A tipi davranış, çalışmaya tutkunluk, iş stresi, dinlenme zamanlarında çalışmamaktan dolayı can sıkıntısı, yalnızlık, tükenmişlik, yaşam memnuniyetinde azalış ve mükemmeliyetçiliktir. İşkoliklik arttıkça, üzüntü ve stres de artmaktadır. Çalışmaya bağımlılık oluştuğu için çalışmama nedeniyle; işkoliklerde üzüntü, sinirlilik, can sıkıntısı, utanç ve suçluluk gibi olumsuz duygular oluşur. Görünüşe göre işkolik çalışanlar, olumsuz duyguları yaşamamak için kendilerini çalışmaya verirler. Düşük öz değer ve güvensizlik duygularına bir cevap olarak, işkoliklik gelişir. Kaygı, uykusuzluk ve sosyal işlev bozukluğu; işkolikliğin en yaygın olumsuz belirtileridir. Yapılan bir araştırmada zayıf ruh sağlığının, işkoliklikle ilişkili olduğu bulunmuştur (Bartczak & Bulik, 2012).

İşkolikler normal bireylere göre daha fazla mükemmeliyetçi olmaktadırlar. Bu nedenle yetkilerini devretmekte isteksiz davranırlar. Mükemmeliyetçi kişilik tipinde "gerçekçi olmayan yüksek hedeflere ulaşma ile kendini yenilgiye uğratıcı düşüncelere sevk eden" bir yapı söz konusu olmaktadır. Mükemmeliyetçi bireylerin; diğer bireylerin istek ve gereksinimlerine karşı duyarlılık gösterememeleri, ilişkilerinde başarısız olmalarına neden olmaktadır.

a) Mükemmeliyetçilik: Mükemmeliyetçilik, basitçe "Hiç hata ve eksik yapmadan kusursuza ulaşma çabası" olarak tanımlanabilir. Mükemmeliyetçilerin önemsiz ayrıntılarla aşırı meşguliyeti, zaman alıcıdır ve etkinliği azaltıcıdır. Hatalara yönelik tekrar tekrar incelemeler yapılır. Stresli ve gergin hissetmeleri nedeniyle görevlerini ertelerler. İş nedeniyle genellikle gece geç uyurlar. Kişi, kendisinin aptal olduğunu düşünebilir. "Tam bir başarısız olacağım ya da en yüksek standartları başarmalıyım." düşüncesiyle görevlerini yönetme stratejisi söz konusu olabilir. Mükemmeliyetçiliğin temel unsurları; kişinin kendisinden beklentileri, diğerlerinin kişiden beklentileri ve kişinin diğerlerinden beklentileri olarak belirtilebilir. Mükemmeliyetçilik azaldıkça, başarı artar.

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Mükemmeliyetçilerin bazı özellikleri şunlardır:

-Eleştirilmeye tahammülleri yoktur: Bu yüzden kusursuz davranma çabasına girerler.
-Kendini yenilgiye uğratıcı: Mükemmeliyetçilikte, aşırı derecede yüksek ve gerçekçi olmayan hedeflere yoğunlaşan, kendini yenilgiye uğratıcı bir dizi düşünce ve davranışa yönelten bir yapı söz konusudur. İşlerin yolunda gitmediğini fark ettikleri anda kaygı yaşamaya başlarlar. Kendilerine zarar verdiklerinin genellikle farkına varmazlar.

-Süreç yerine "hedef" üzerinde odaklanmaları: Bir şeyi elde etmeye çalışırken yaşananlardan zevk almak, süreç sonunda elde edileceklerden daha önemlidir. Yalnızca sonuçtaki başarıyı ya da başarısızlık korkusunu kafalarına taktıkları için, süreç içinde yaşadıkları yoğun kaygılar, kendilerinin tüm çabalarını sabote eder.

Anthony ve Swinson (2000), mükemmeliyetçilerin özelliklerini şu şekilde belirtmiştir:
1.Ya hep ya hiç düşüncesi: Doğru ile yanlış arasında pek çok derece olabileceğini düşünmeden, olayları sadece doğru veya yanlış görme eğilimindedir.

2.Süzgeçten geçirme: Mükemmeliyetçiler, seçici bir şekilde davranarak olumsuz detayları abartma eğilimindedir.
Bu olumlu bilgilerin gözden kaçmasına neden olmaktadır.

3.Zihin Okuma: Genellikle insanların kendisi hakkında olumsuz düşündüklerini sanmaktadırlar.
4.Tünel bakışı: Mükemmeliyetçiler, detaylara fazlaca dikkat ederler ve bu yüzden genel durumu görememektedirler.

5.Kişisel hassasiyet: Genellikle başkalarının fikirlerine aşırı önem verirler, beğenilmek isterler.

6.Felaket olacağını düşünme: Olumsuz olayları, baş edemeyecekleri felaketler olarak nitelendirirler ve kaçınma davranışında bulunurlar.

7.Aşırı katı standartlar ve esnek olamama: Daha azına razı olmayı yenilmek olarak değerlendirirler. Beklentilerini esnetmekte zorlanırlar.

8.Aşırı sorumlu hissetme ve kontrol ihtiyacı: Çevrelerinde olan insanların hata yapmalarından kendini sorumlu görerek, onların davranışlarını kontrol etmenin gerekli olduğuna inanmaktadırlar.

9.Zorunluluklar: İşlerin nasıl olması gerektiği konusunda kurallar belirlerler. Bu kuralları bozduklarında ise, suçluluk ve yetersizlik hissederler.

10.Başkalarına güvenme güçlüğü: Bir işi yaparken başkalarına görev verme veya iş paylaşımı konusunda güçlük
çekerler.

11.Uygunsuz sosyal karşılaştırma: Kendilerini sürekli diğer insanlarla karşılaştırmakta ve bu karşılaştırmalar sonucu daha fazla olumsuz duygu hissetmektedirler.

b) Mükemmeliyetçilik Türleri: Gordon L. Flett, Andrea Green ve Paul L. Hewitt (2004) üç çeşit mükemmeliyetçilik tanımlamıştır:

***1.Kendine yönelik*:** Ulaşılması olanaksız ve gerçek dışı standartlar belirleme eğilimidir. Kişi, kendisine son derece yüksek beklentiler dayatır, hata kabul etmez ve sürekli olarak kendisini eleştirir.

***2.Başkasına yönelik mükemmelliyetçilik*:** Belirlenen gerçek dışı ve yüksek standartlara başkalarının uymasını bekleme eğilimi. Bu kişiler başkalarına iş veremezler, yaptıklarını beğenmez, sürekli hata bulurlar. Genellikle öfke ve doyumlu ilişki kuramama sorunları vardır.

3.Sosyal beklentili mükemmeliyetçilik: Başkalarının kendilerinden ulaşılması olanaksız beklentileri olduğu inancı. Bu kişiler çevrelerinden onay ve takdir görmek için çok yüksek standartlara ulaşmaları gerektiğine inanırlar. Genellikle öfke, standartlara ulaşamadıklarında depresyon ve başkaları tarafından yargılanma korkusu duyduklarında da sosyal kaygı sorunları vardır.

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c) Mükemmeliyetçiliğin Nedenleri: Mükemmeliyetçilik, kişinin mevcut durumundan daha üstün bir noktaya ulaşmak amacı ile hedefler koyarak bu hedeflere ulaşmaya çalışmanın ötesinde, takıntılı bir şekilde ulaşılması imkânsız hedefler koyması ve kendi değerini yalnızca koymuş olduğu hedeflere ulaşıp ulaşamaması üzerinden kazandığı başarı ile sağlaması olarak tanımlanabilir (Burns, 1980). Bu kişiler, başarısız olma durumu ile baş edemezler ve kendi değerlerini başarı dışındaki herhangi bir şey üzerinden sağlayamazlar. Sosyal ilişkiler konusunda zorluk çekerler ve çoğunlukla yalnızdırlar. Bunun bir nedeni, kusursuz olmazlarsa diğer insanlar tarafından kabul edilmeyecekleri düşüncesidir. Düşüncelerinin aptalca bulunacağı korkusu ile insanlara yakınlaşamaz ve iç dünyalarını açamazlar. Eleştirileri dinleyip işlevsel olarak algılayamamaları ve kendi benliklerine yapılmış birer tehdit olarak algılamaları, yaşadıkları sosyal sorunların diğer bir nedenidir.

Yetersiz görünmekten korktukları için gerçek duygu ve düşüncelerini açıklamaktan çekinirler. İlişkilerinde sıcaklık ve samimiyet ortamı oluşmaz. Kendilerini yetersiz görürler. Çünkü başarılı insanların kişisel amaçlarına yüksek özgüven ile çok çaba harcamadan ulaştıklarını düşünürler. Kendilerinin geliştirmiş olduğu başarı yöntemlerini yetersiz görürler. Kendilerine sürekli olarak ulaşılması güç hedefler koymaları ve yetersizlik duyguları, öğrenilmiş çaresizlik yaşamalarına sebep olur (Burns, 1980).

Sosyal ortamda sorun yaşadıkça, kabul görebilmek için kusursuz olmaları gerektiğine dair inançları pekişir ve bu sosyal mutsuzluk, bir kısırdöngü halinde devam eder. Onaylanmama ve kabul görmemeye karşı taşıdıkları hassasiyet nedeniyle, sosyal ortamlarda ödülden çok ceza ile karşı karşıya kalırlar (Burns, 1980).

1.Sosyal beklenti: Küçüklükte başkaları tarafından sevilme/takdir görme/onaylanma ve kabul edilme gereksinimlerinin başarı karşılığında doyum görür. Böylece çocuk kendi kendisine başkalarının kendisine verdiği değer kadar değer vermeyi öğrenir ve özgüveni dış etmenlere bağlı olarak biçimlenir. Kendisini eleştirilerden korumak için de, tek silahının "mükemmel olmak" olduğuna karar verir. Bu kimseler başkalarının düşüncelerine ve eleştirilerine karşı duyarlı ve kırılgan birer yetişkine dönüşürler.

2.Sosyal öğrenme: Anne-babaları mükemmeliyetçi olan çocuklar onları taklit etme eğilimine girerler. Çocuklar mükemmel görünen anne-babalarını yüceltir ve onlar gibi olmak ister.

3.Sosyal tepki: Karmaşa içindeki (örneğin, sürekli kavga eden ana-baba, belirsiz ya da tutarsız kuralların olduğu bir ev ortamı) bir ortamda büyümüş ve çeşitli tacizlere (örneğin, fiziksel şiddet görmek, utanca boğulmak) uğramış çocuklarda oluşma olasılığı fazladır. Bu çocuklar, kendi denetleyemedikleri ve öngöremedikleri şeylerin olduğu bir ortamda, denetim duygusu geliştirebilmek amacıyla savunma mekanizması olarak mükemmeliyetçilik geliştirebilir.

d) A Tipi Davranış: A tipi kişiler, genellikle aynı anda birkaç görevi yürütmekte, işin bitiş tarihleri konusunda kendilerini zorlamakta ve en küçük ertelemede mutsuz olmaktadır. İlk olarak kardiyoloji uzmanları Meyer Friedman ve R. H. Rosenman tarafından, A tipi davranışın damar hastalıklarına yol açan bir risk etkeni olduğu belirtilmiştir. Rekabetçi, saldırgan, hızlı konuşan, sabırsız ve gevşeyemeyen kişilerdir.

A tipi davranıştan kaygısızlığa ulaşmak isteyen her kişi için yararlı olabilecek stratejiler:

- **1.Beyninizi yeniden eğitin:** Zorunluluk kelimeleri içeren mükemmeliyetçi düşüncelerinize dikkat edin. Yapmalıyım, zorundayım şeklindeki düşüncelerinizi kontrol edin, doğru mu düşünüyorsunuz? Yoksa duruma bakmanın başka yolları olabilir mi?

- **2.Kökteki mükemmeliyetçi düşünceyi bulun:** Bir sorun nedeniyle strese girdiğinizde nedenini bulmak için birkaç dakika ayırın. Arkadaşınızın şehrinize gelmesi nedeniyle gergin olduğunuzu varsayalım. Arkadaşınızı etkilemek için niçin bu kadar endişelisiniz? Arkadaşınızın, sizden daha iyi olduğunu düşündüğüne inanmanız, mükemmeliyetçi olmanıza yol açar. Şimdi bu kök düşüncenizi değiştirin.

- **3.Alışkanlığınızı değiştirin ve olumsuza «teşekkür ederim, hayır» deyin:** Her akşam, gün süresince olan yeni veya iyi olayları birkaç dakika düşünün.
-
- **4.Yüzde 80/20 planını deneyin:** Zamanınızın % 80'ini hedefinize ayırdıysanız, % 20'si daha dikkatsiz olabilir.

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e) .İş-Yaşam Kalitesi: İşkoliklik davranışı, iş-yaşam kalitesinin bir alt boyutu olan iş-yaşam dengesini etkilemektedir. İş yaşam kalitesi yalnızca iş tatminini etkilememekte, aynı zamanda sağlık, aile yaşamı, iş dışındaki boş zamanlar, kültürel ve sosyal yaşam, ekonomik durum, eğitim, arkadaşlık ilişkileri, komşuluk ilişkileri, maneviyat gibi diğer yaşam boyutları üzerinde de etkiye sahiptir. Çünkü yayılma etkisi sayesinde, bir yaşam boyutunda tatmin sağlanması, diğer yaşam boyutlarındaki tatmine etki etmektedir. Uzun çalışma süreleri olan işlerde çalışan bir birey, daha düşük iş yaşam kalitesi algısına sahip olabilmektedir.

Daha düşük iş ve yaşam doyumu (Kossek & Ozecki, 1998) ve daha yüksek stres (Parasuraman & Simmers, 2001); iş yaşam kalitesini etkiler.

f) Tükenmişlik Sendromu ve İşkolizm: Tükeniş, fazla çalışmadan kaynaklanan iş stresi durumudur. İlk kez 1974 yılında Herbert Freudenberg tarafından "başarısız olma, yıpranma, enerji ve gücün azalması veya tatmin edilemeyen istekler sonucunda bireyin iç kaynaklarında meydana gelen tükenme durumu" şeklinde tanımlanan tükenmişlik üzerinde birçok araştırma yapılmış ve yeni tanımlar geliştirilmiştir. En yaygın kullanılan ve kabul gören tanım, kendi adıyla da anılan Maslach Tükenmişlik Ölçeğini (MBI) geliştirmiş olan Christina Maslach'ın tanımıdır (Gülova vd, 2014). Maslach'a göre tükenmişlik, "işi gereği yoğun duygusal taleplere maruz kalan ve sürekli diğer insanlarla yüz yüze çalışmak durumunda olan kişilerde görülen fiziksel bitkinlik, uzun süreli yorgunluk, çaresizlik ve umutsuzluk duygularının, yapılan işe, hayata ve diğer insanlara karşı olumsuz tutumlarla yansıması ile oluşur. İşkoliklik sürecinin yol açtığı bir sonuç olarak tükenmişlik, örgütsel önlemler gerektiren bir hastalıktır.

Sonuç Ve Öneriler

Teknolojik gelişmeler ve çalışma hayatında her geçen gün hızla artan rekabet ortamı kişileri daha iş odaklı yaşamaya itmektedir. Sürekli iş düşünen ve çalışmadığı zaman kendini mutsuz hisseden birer işkolik haline dönüşen çalışanlar, zaman ve işleri yetiştirme baskısı nedeniyle de hayatta yaptıkları her şeyi normalinden 2-3 kat daha hızlı yapmaktadır. İşyerinde mükemmeliyetçilik ile ilgili çalışmalar, mükemmeliyetçilik ve işkoliklikte benzer özellikler bulunduğunu göstermiştir. İşkoliklerin, mükemmeliyetçilerle benzer özellikleri savunulmaktadır. Belki de en doğru varsayım, işkolikliğin özelliklerinden birinin mükemmeliyetçilik olmasıdır.

İşkoliklik problemi yaşayan bir kişinin bu sorunu çözümlemesi için yapması gerekenler aşağıda sıralanmıştır:

- Davranış ve düşünce değişimi: Rasyonel olmayan fikirlerin yerine rasyonel olanları koymak. İşi yaşam amacı ve hayatın merkezi olarak görmemek, iş dışındaki yaşamında farkına varmak. İşkolikliğin çözülmesi gereken bir problem olduğuna inanmak.

- Delegasyon: Çalışma arkadaşlarına da iş ve görev aktarmak, paylaşımda bulunmak.

- Sınırları belirleme: Mesai saati bitiminde çalışmayı bırakmak, iş-özel hayat arasındaki sınırları belirleyip dengeyi sağlayarak stres ve kaygıdan uzak durmak.

- Kaygıyla başa çıkabilme: Az çalışma nedeniyle işini kaybetme kaygısını yenmek için aşama aşama çalışma süresini azaltma. Çalışma süresini bir anda günde 12 saatten 8 saate düşürme zor olacağı için her gün 5 dakika azaltarak çalışma süresini kısaltma ve eve iş götürmemek.
- Hayata eğlence katma: İş dışında hobi ve spor vb. hayata eğlence katıp rahatlamayı sağlayan aktiviteleri zaman kaybı olarak görmemek, bu tip faaliyetlere zaman ayırmak.

İşkolik eşe sahip olan bireylere sunulan öneriler de yararlı olabilir: Bireye öncelikle içinde bulunduğu durum, kendisine ve etrafına verdiği zararlar fark ettirilmeli ve evde geçireceği zamanı en iyi şekilde geçirmesi sağlanmalıdır. Sosyal aktiviteler planlayarak eşi işten biraz da olsa uzak tutmaya çalışmalı, ev veya aile ile ilgili konularda işkolik eşten yardım istenmeli. Örneğin, işkolik eşin haftada iki gün çocukları okuldan alması veya her ay bir cumartesi-pazar ailece, arkadaşlarla bir yere gidilmesi sağlanmalıdır. İşkolik eşin bir hobi edinmesine yardımcı olunmalı ve teşvik edilmeli. Bu yöntemler yeterli gelmiyorsa, sorun büyüyorsa bir profesyonelden destek alınmalıdır.

Mükemmeliyetçilikle mücadele için; istek ve gereksinimlere uyan gerçekçi hedefler belirlenmelidir. Böylece bireyin kendine duyduğu güven artacaktır. İşler önem sırasına göre planlanmalıdır. Bir işte yüzde yüz başarı sağlanamayan durumlarla yüzleşmeli, bu durumun getirileri veya kaybettirdikleri değerlendirilmelidir. Sonuca değil, sürece odaklanılmalı, yapılan işten zevk almayı öğrenmelidir. Her insanın ilgi, yetenek ve gereksiniminin

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farklı olduğu kabul edilmelidir. Mükemmeliyetçiliğin arkasındaki korkularla nedenini sorgulayarak yüzleşmelidir. Hatalardan neler öğrenilebileceği değerlendirilmelidir. Eleştirilerle nasıl baş edileceği öğrenilmelidir. Dış çevrenin değerlendirmelerine karşı aşırı hassas yaklaşım yerine kişinin kendi kapasitesi ölçüsünde performans hedefini belirlemesi de oldukça önemlidir. Hayatın "Hep ile Hiç" arasındaki bir anlayıştan ibaret olmadığını fark etmek gerekir. Kaybetmeyi göze almak gerekir. Katı zaman sınırlamaları konulmamalıdır. Mükemmel, iyinin düşmanıdır.

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İZMİR ALİAĞA BÖLGESİNDE RÜZGAR TÜRBİNLERİNİN YÜKSEKLİĞE BAĞLI ENERJİ DEĞİŞİMLERİNİN İNCELENMESİ

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Bu çalışmada, Türkiye'de İzmir-Aliağa bölgesinde bulunan Ege Üniversitesi Aliağa Yerleşkesi Kampüs Alanınında 5kW lık rüzgar türbininün farklı yüksekliklerde bir yılda üreteceği elektrik enerji değerleri hesaplanarak yorumlanmıştır.

Çalışmada; 5kW'lık bir rüzgar türbininin İzmir-Aliağa bölgesinde üreteceği elektrik enerji miktarlarının belirlenmesi amaçlanmıştır. Bu türbinin üretebileceği enerji miktarlarını belirleyebilmek için, İZMİR-Aliağa bölgesindeki kampüs alanı içerisine kurulan ölçüm istasyonunundan yararlanılmıştır. Bu istasyonundan 27 m yükseklikte 1 yıllık saatlik rüzgar hız ve yön ölçüm verilerileri alınarak değerlendirme yapılmıştır. 1 yıl 8760 saatlik bu ölçüm verileri excell programından yararlanarak bilgisayara girilmiştir. 5kW'lık rüzgar türbininin 20, 30 ve 40 m yükseklikte üreteceği, teorik güç, maksimum güç ve saatlik elektrik enerji değerleri hesaplanmıştır.

Çalışma sonucunda, küçük güçlü rüzgar türbinleri ile bu kampüs alanının aydınlatma ve bilgisayarların kullanımı gibi temel bazı ihtiyaçlarının karşılanabileceği kanaatine varılmıştır.

Keywords: Enerji, Rüzgar Enerjisi, Rüzgar Türbini.

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KALMAN FILTER OFFLINE PARAMETER TUNING VIA GENETIC ALGORITHM AND A PASSENGER JET AIRCRAFT STATE ESTIMATION EXAMPLE

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Kalman filter has been widely usedfor parameter estimation at aviation industry for over 50 years. Some applications of Kalman filter are, noise elimination, state and parameter estimation, sensor fusion, integrated measurement unit and global positioning system coupling for navigation solutions.

If noise to be eliminated has uncorrelated Gaussian distribution, then Kalman filter fulfills very satisfying results. But an important issue arises at the applications where we are assumed to know exact values of the system modeling and sensor measurement error correlation matrices. When we have no idea about these matrices or have little knowledge which yields unrealistic values will cause divergence problems due to miscalculation of the error covariance matrix and also Kalman gain. Since these matrices are hard to know and need serious tests to tune them statistically from observation data, one may try to find these values via optimization algorithms.

Popular optimization algorithms for these usage are artificial neutral networks and evolutionary algorithms thanks to their derivative free approach. Since neutral networks and fuzzy logic algorithms are applied to online parameter tuning or namely adaptive tuning, this paper is intended to use genetic algorithm because of offline tuning.

Optimization procedure heavily relies on choosing the right minimizing function which is called fitness function at genetic algorithms. In our case, also Kalman filter depends, fitness function is chosen as error covariance matrix

$E\{(x-e\_x)(x-e\_x)'\}$

where x is the state vector for aircraft, e_x is estimated value of the state vector and E{} is the expectation operator. So optimum correlation matrices values which minimizes above equation will force the Kalman filter to find the optimal values for aircraft states and prevents the divergence problems.

At this paper, several different correlation matrices are optimized via proposed genetic algorithm based on monte carlo simulations and improvements are compared as final conclusion.

Keywords: kalman filter, parameter tuning, estimation, genetic algorithm, aircraft

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KARESEL KESİTLİ BORU HATTI ETRAFINDAKİ AKIMIN SAYISAL İNCELENMESİ

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Özet: Boru hatları, aşırı hidrodinamik kuvvetlerden korumak veya balıkçılıktan kaynaklanabilecek zararlara engel olmak amacıyla genellikle deniz tabanına gömülmektedir. Gömme işlemi mekanik şekilde yapılan hendek açılması ile yapılabildiği gibi fırtına durumlarında boru hattı ve deniz tabanı arasındaki etkileşim sayesinde kendi kendine de meydana gelebilmektedir. Deniz tabanında yapılan pahalı hendek açma operasyonlarından kaçınmak ve öz-gömülme hız ve derinliğini artırmak amacıyla boru hattı üzerine başlık yerleştirilmesi tekniği geliştirilmiştir. Daha önce yapılan deneysel ve sayısal çalışmalar, başlığın boru hattı memba ve mansabında oluşan ayrılma bölgelerinin boyutlarını artırdığı ve bu ayrılma bölgeleri içerinde oluşan girdaba benzeyen enerjik yapıların sızmayı ve borulanmayı artırarak deniz tabanındaki oyulmayı tetiklediğini göstermektedir. Borulanma ve sızmanın artmasıyla boru hattı altındaki deniz tabanının taşıma gücü azalmakta ve nihayet başlığın sebep olduğu ters yönlü kaldırma kuvveti boru hattını deniz tabanına doğru itmektedir. Onlarca yıldan beri birçok projede uygulanmış olmasına karşın, başlığın boru hattı etrafındaki akıma, boruya etkiyen kuvvetlere ve oyulma mekanizmasına etkisi konusunda yayınlanan yeterli veri bulunmadığı görülmektedir. Bu çalışmada kare ve dairesel kesitli boru hatları üzerine yerleştirilen 0.5D yüksekliğindeki başlığın akım alanına etkisi sayısal olarak analiz edilmiştir. Oluşturulan sayısal model, üç farklı türbülans kapatma yöntemi kullanılarak çözülmüştür. Simülasyon sonuçları, boru hattı etrafındaki ayrılma bölgesi genişliğinin karesel kesitlerde daha geniş olduğunu ve başlığın varlığının ayrılma bölgelerinin genişliklerini daha da artırdığını göstermektedir.

Anahtar Kelimeler: Boru hattı, Başlık, Öz-gömülme, Ayrılma Bölgesi

Abstract: Pipelines are often buried underneath the seabed to be protected from excessive hydrodynamic forces or to avoid the damage of fishing gear. The pipeline is buried completely in the seabed either by mechanical trenching or by itself during storm conditions due to interaction between pipeline and the erodible seabed. To avoid expensive trenching operations and to increase the speed and final depth of the self-burial process, the technique of applying a spoiler on the top of a submarine pipeline has been developed. Past experimental and numerical researches showed that spoiler increases the length of the upstream and downstream separation regions and energetic vortical structures in this separation zones stimulate the scouring process by increasing the degree of seepage and piping that takes place on the seabed. The processes of piping and seepage both initially decrease the value of the bearing capacity of the seabed beneath the pipeline and eventually spoiler cause a downward lift force to push the pipeline into the seabed. In spite of the usage of the spoiler in numerous pipeline projects for decades, it seems that there is, still, a paucity of data regarding the effect of the spoiler on the flow area around the pipeline, the forces acting on the pipe and the scouring mechanism. In the present study, the flow field around a pipeline analyzed numerically for circular and square shape pipelines with a spoiler of 0.5D heights. The simulations analyzed by three turbulence closure methods. The simulations show that the size of the separation areas around the pipeline found to be larger for the square shaped one and the existence of the spoiler is enlarging the separation areas.

Keywords: Pipeline, Spoiler, Self-burial, Separation Area

Giriş

Katı madde bakımından hareketli bir taban üzerine, kıyı ötesine veya nehir tabanına yerleştirilen boru, iletim hatları veya deşarj boruları gibi küt cisimler sebebiyle tabanda oyulmalar meydana gelebilmektedir. Oluşan oyulmalar neticesinde, zamanla, boru yada iletim hattı ile taban arasında boru çapına eşdeğer büyüklüklere varabilen boşluklar oluşabilmekte ve bunun sonucunda, boru hattı tabana yakın bir mesafede askıda kalabilmektedir. Bir boru hattının veya yatay bir silindirik yapı elemanın tabana yakın şekilde monte edilmesi yada zamanla erozyon sebebiyle askıda kalması durumunda silindir ile taban arasında oluşan boşluk mesafesi, silindir etrafındaki akım alanı özelliklerinin belirlenmesinde tasarım açısından önem kazanmaktadır. Ayrıca tabandaki aşınma boru hattı boyunca ilerlediğinde boru hattı kendi ağırlığı altında tabana gömülmektedir (Sumer ve Diğ., 2001). Boru hattı memba ve mansabında oluşan oyulmalarda, tabanda oluşan vortisitelerin de etkili olduğu bilinmektedir (Mao, 1988). Hidrodinamik kuvvetlerden ya da insanların sebep olabileceği zararlardan korumak için iletim hattının taban içerisine gömülmesi gerekebilmektedir. İletim ya da boru hattı, zaman içerisinde

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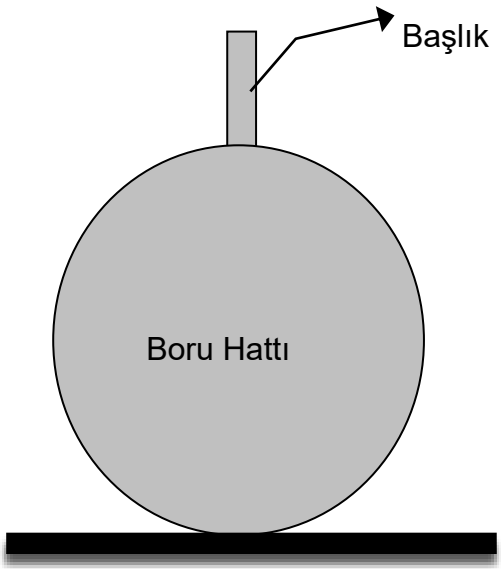
meydana gelen akıntılar, fırtına gibi doğal etkenlerle, yukarıda anlatıldığı gibi, kendi kendine taban içerisine gömülebilmektedir. Ancak doğal etkenler her zaman beklendiği gibi sonuçlanmayabilmektedir. Ayrıca balıkçılık gibi faaliyetlerin yapıldığı yada hidrodinamik kuvvetlerin fazlasıyla etkin olduğu bölgelerde boru hattını, oluşabilecek zararlardan korumak için tabanda belli derinliklere gömmek gerekebilmektedir. Bunun için, hattın geçtiği güzergâhta tabanda bir hendek açıp boruyu yerleştirmek ve hendeği doldurarak borunun gömülmesi gerekmektedir ki, bu işlemler boru hattı maliyetini fazlasıyla artırmaktadır. Bu sebeple boru hattının gömülmesinde alternatif, ucuz yöntemler araştırılmaktadır. Daha önce yapılan çalışmalar (Hulsbergen,1984, Hulsbergen ve Bijker, 1989) bir boru hattının kendi kendine gömülmesini artırmanın ve hızlandırmanın boru hattı üzerine bir başlık (spoiler) yerleştirilerek yapılabileceğini göstermiştir (Şekil 1). Boru üzerine başlık yerleştirilmesi yeni bir fikir gibi görülse de arabaların, bacaların üzerine başlık yerleştirilmesi işlemi eskiden beri yapılmaktadır. Bütün bu başlık yerleştirme işlemlerinin ortak amacı cisim etrafındaki akım alanının istenilen şekilde değiştirilmesidir.



Şekil 1. Geçirimsiz Taban üzerine Oturan Başlıklı Boru Hattı

İlk olarak Kuzey (Dutch) denizinde uygulanan başlıklı boru hattı, günümüzde birçok projede uygulanmaktadır. Boru hattı üzerine başlık yerleştirilmesinin, oluşan oyulma miktarını artırdığı gibi başlıksız bir boru hattına göre 10 kata kadar daha hızlı gömülmeye sebep olduğu bildirilmektedir (Hulsbergen ve Bijker, 1989). Bu konuda yapılan deneysel ve teorik çalışmalar, oyulma miktar ve hızında meydana gelen artışa sebep olarak, yerleştirilen başlığın neden olduğu blokaj etkisini ve taban ile boru hattı arasındaki akım yoğunluğunun artmasını ana etkenler olarak göstermektedir (Mao,1988, Chiew 1992).

Birçok projede uygulama alanı bulmuş olmasına karşın, konunun ticari boyutu sebebiyle boru hattı üzerine yerleştirilen başlığın boru hattı etrafındaki akıma etkisi konusunda literatüre yansıyan yeterli verinin bulunmadığı görülmektedir. Bu çalışmada dalga etkisinin hissedilmediği düzenli akıntı durumunda, aynı çapa (D=50mm) sahip dairesel ve kare kesitli bir boru üzerine yerleştirilen, boru çapının yarısı yüksekliğe sahip (0.5D), başlığın akımda neden olduğu değişimleri incelemek amacıyla, ANSYS® 14-Flotran CFD(HAD) paket programı kullanılarak sayısal bir model oluşturulmuş ve dairesel ve kare kesit için elde edilen simülasyon sonuçları karşılaştırılmıştır.

Temel Denklemler

Silindir etrafındaki iki-boyutlu, düzenli, sıkışmayan, türbülanslı akımda hareketi idare eden, temel denklemler aşağıdaki gibi yazılabilir;

$$\frac{\partial u_i}{\partial x_i} = 0 \tag{1}$$

$$\rho u_j \frac{\partial u_i}{\partial x_j} = \rho K_i - \frac{\partial p}{\partial x_i} + \mu \frac{\partial^2 u_i}{\partial x_j \partial x_j} + \frac{\partial}{\partial x_j}(-\rho \overline{u_i' u_j'}) \tag{2}$$

denklemdeki türbülans kayma gerilmesi bünye denkleminden elde edilmiştir ve aşağıdaki gibi verilebilir:

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$$\tau_{ij} = -\rho\overline{u_i' u_j'} = \eta\left(\frac{\partial u_i}{\partial x_j} + \frac{\partial u_j}{\partial x_i}\right) \quad (3)$$

denklemde yer alan η, türbülans viskozitesi olarak adlandırılır. Hesaplamalı Akışkanlar Dinamiği (CFD) yöntemleri ile yapılan modellemelerde, denklemindeki η türbülans viskozitesinin belirlenmesi için farklı türbülans modelleri geliştirilmiştir.

Bu çalışmada, akışkan hareketini idare eden denklemlerin sayısal çözümü, standart k-ε, standart k-ω ve SST türbülans modelleri kullanılarak, sonlu elemanlar yöntemine dayalı olarak çalışan ANSYS®14 paket programı ile yapılmıştır.

Standart k-ε türbülans kapatma modeli (Launder ve Spalding, 1974)

İki denklemli türbülans kapatma modellerinin en çok bilinenlerinden olan k-ε türbülans kapatma modelinde türbülans viskozitesi η, türbülans kinetik enerjisi, k, ve onun kayıp oranı, ε'a bağlı olarak aşağıdaki gibi verilmiştir:

$$\eta = \rho C_\eta \frac{k^2}{\varepsilon} \quad (4)$$

Denklem 4'teki C_η sabittir ve genellikle 0.09 değerini almaktadır.

Standart k-ω türbülans kapatma modeli (Wilcox, 1988)

k-ε türbülans kapatma modelinden sonra geliştirilmiş olan iki denklemli türbülans kapatma modellerinden biri olan ve katı sınır yakınlarında daha iyi sonuç vermesi için tasarlanan k-ω türbülans kapatma modelinde türbülans viskozitesi η'nın hesaplanmasında türbülans kinetik enerjisi, k'nın yanında özgül kayıp oranı olarak isimlendirilen ω için ikinci bir transport denkleminin çözümü gerekmektedir;

$$\eta = \rho \frac{k}{\omega} \quad (5)$$

Denklemdeki ω, birim türbülans kinetik enerji için türbülans kayıp oranıdır ve aşağıdaki gibi ifade edilmektedir:

$$\omega = \frac{\varepsilon}{C_\eta k} \quad (6)$$

SST türbülans kapatma modeli (Menter, 1994)

k-ε ve k-ω türbülans kapatma modellerinin birleşiminden oluşmaktadır. sst türbülans kapatma modelinde, katı sınıra yakın bölgelerde daha iyi sonuç verdiği biline k-ω modeli katsayıları kullanılırken, katı sınırdan uzak bölgelerde ise k-ε model katsayılarına geçiş yapılmak suretiyle her iki modelin üstün yönleri tek bir modelde birleştirilmeye çalışılmıştır.

Çözüm Bölgesi ve Sınır Şartları

Başlıklı ve başlıksız boru hatları etrafındaki akım alanının sayısal olarak hesaplanabilmesi için oluşturulan sayısal hesap bölgesi geometrisi, sınır ve başlangıç şartları Şekil 2'de verilmiştir. Çözüm bölgesinin orijini silindir merkezi olarak seçilmiştir. Katı yüzeyleri oluşturan kanal tabanı ve silindir yüzeyinde hız sıfır (no-slip) sınır şartı kullanılırken üst yüzey ve çıkış atmosfer (p=0) sınır şartı ile tanımlanmıştır. Girişte ise akımın yatayda u0=190mm/s 'lik serbest akım hızıyla aktığı kabulü yapılmıştır ki bu hıza karşılık gelen boru çapına bağlı Reynolds sayısı $\mathrm{Re} = \frac{U_0 D}{\nu}$ =9500 (ν; akışkan viskozitesi) olmaktadır.

Şekil 2. Sayısal Hesaplama Bölgesi ve Sınır Şartları

Şekil 2'de verilen sınır şartlarına göre oluşturulan sayısal model ile (1) ve (2) denklemlerinin hız ve basınç için sayısal benzemiş sonuçları, sonlu elemanlar yöntemine dayalı olarak çalışan ANSYS 14.0 CFD paket programı kullanılarak yapılmıştır.

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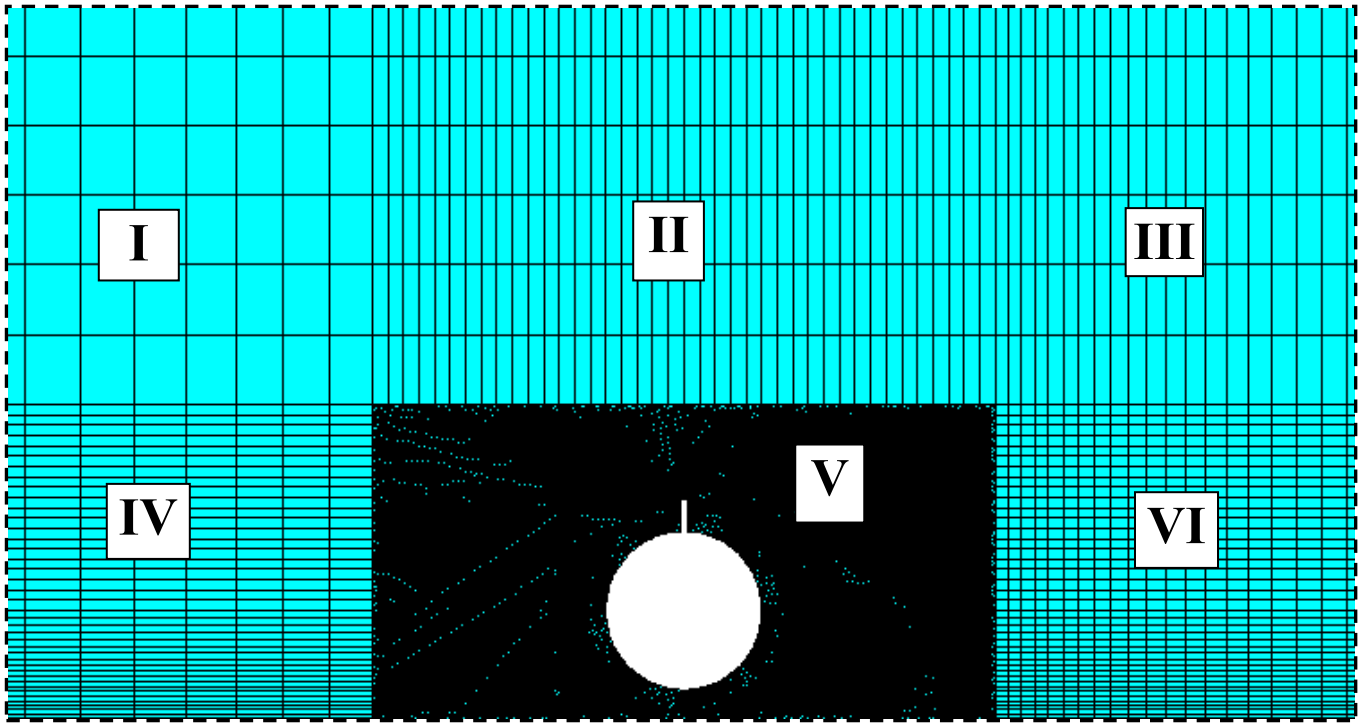
Sonlu Elemanlar Hesap Ağı

Bu çalışmada oluşturulan sayısal modelde ağ çalışması yapılmamıştır. Farklı sıkılığa sahip, optimum ağ yapısının aranmasından çok türbülans kapatma yöntemlerinin sonuca etkisi ve kare kesit ile başlığın akım alanında oluşturduğu değişimler irdelenmiştir. Buna karşın sayısal modellemelerde çok sık ağ kullanmanın çözüm süresini uzatmasına karşın sonuca fazla etkimediği, pozitif basınç gradyanı oluşan bölgelerde ve katı sınıra yakın bölgelerde daha sık ağ yapısı kullanmanın gerektiği önceki çalışmalardan bilinmektedir (Öner, 2016). Bu sebeple sayısal hesaplama bölgesi, akım alanı içine yerleştirilen boru hattından etkilenme derecesine göre 6 farklı bölgeye ayrılmış ve farklı yoğunluğa sahip olacak şekilde ağ geometrisi oluşturulmuştur. Şekil 3'de görüldüğü gibi, hesaplamalarda dörtgen eleman kullanılan IV ve VI bölgeleri tabana doğu sıklaştırılırken I, III, IV ve VI bölgeleri aynı zamanda boru hattına doğru da sıklaştırılmıştır. Boru hattının varlığından en çok etkilenen V bölgesinde ise çok daha yoğun bir eleman yapısı kullanılmış ve silindir şeklinden dolayı ağ şekillerinde oluşan bozuklukları engellemek amacıyla üçgen eleman seçilmiştir. Şekil 3'de görülen I ve II bölgelerinde 1250, III, IV ve VI bölgelerinde ise 2500 quadratik eleman kullanılmıştır. Silindir etrafındaki V bölgesinde ise yaklaşık 20000 üçgen eleman kullanılmıştır.



Şekil 3 Sayısal Hesaplama Ağı

Bulgular

Akım çizgileri

Şekil 4, Şekil 5, Şekil 6 ve Şekil 7'de oluşturulan sayısal model ile elde edilen hız alanlarının değerlendirilmesi sonucu bulunmuş olan başlıksız silindirik, başlıksız kare, başlıklı silindirik ve başlıklı kare kesitli boru hatları etrafındaki akım çizgileri verilmiştir.

Hesaplamalarda kullanılan sst, k-ω ve k-ε türbülans kapatma modellerinden elde edilen sonuçlar incelendiğinde k-ω ile elde edilen sonuçların sst ve k-ε ile elde edilen sayısal benzemiş sonuçlarının arasında bir görüntü verdiği belirlenmiştir. sst modelinde tabanda k-ω, tabandan uzakta k-ε model katsayılarının kullanıldığı düşünülürse bunun beklenen bir sonuç olduğu söylenebilir. Akım çizgileri incelendiğinde; sst ile elde edilen boru hattı etrafındaki ayrılma bölgeleri ölçülerinin k-ω ve k-ε modelleri ile elde edilenlere nispeten daha geniş olduğu belirlenmiştir.

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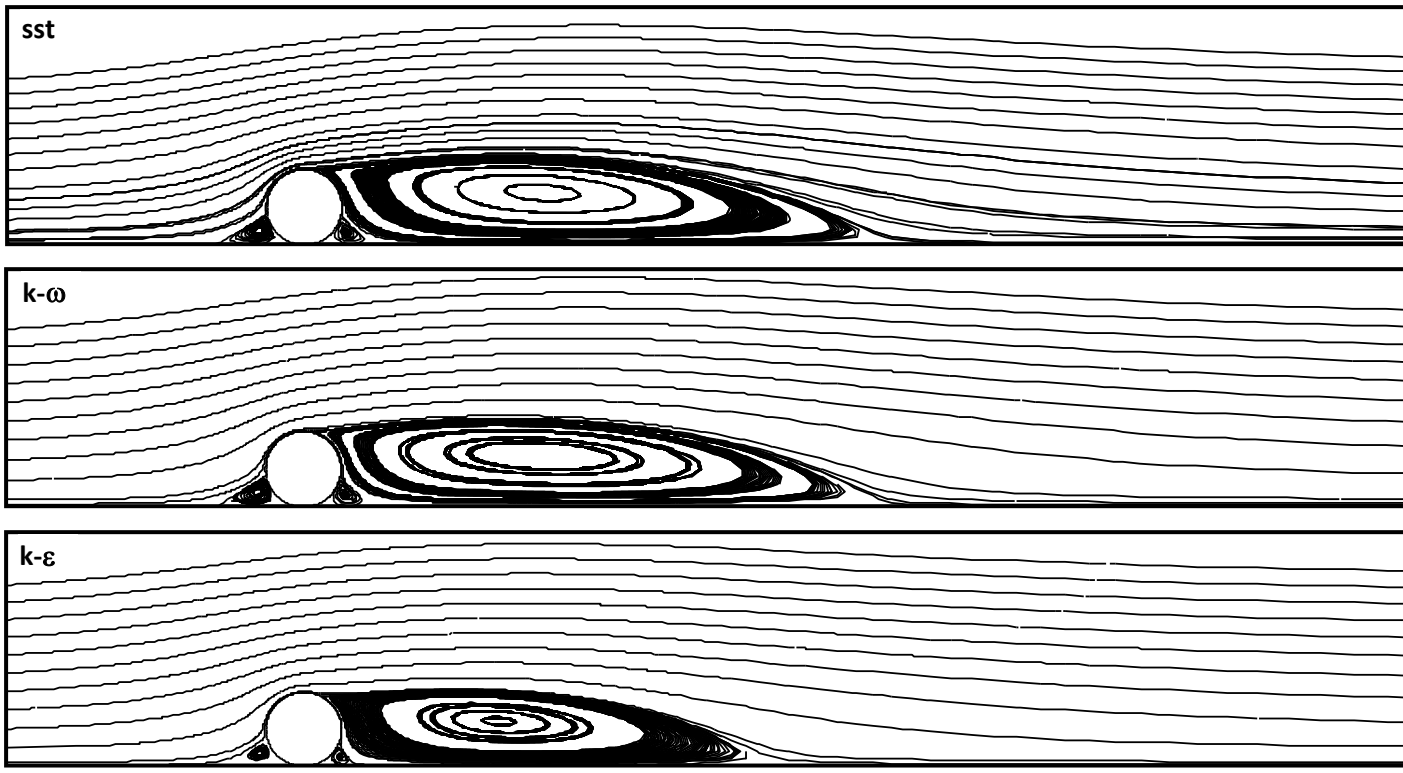
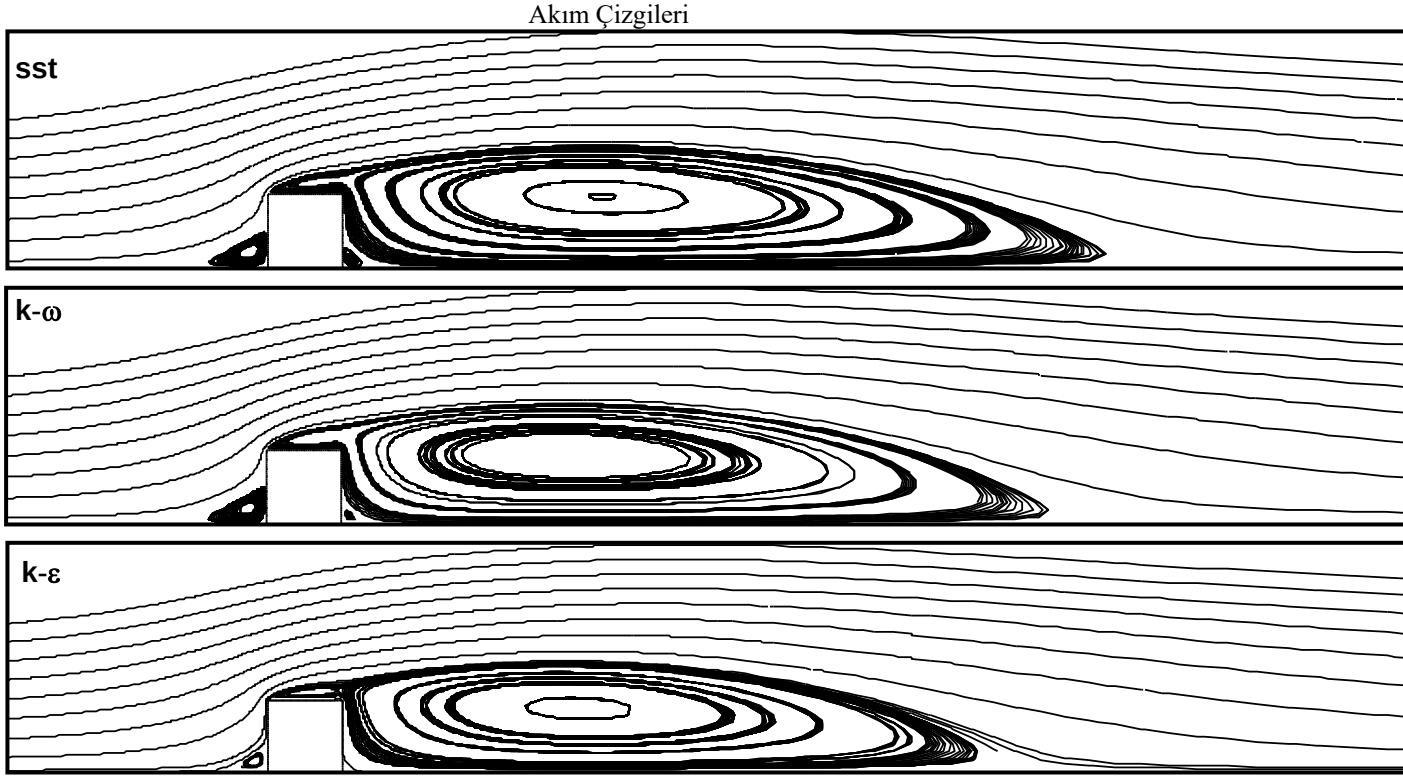


Şekil 4 Başlıksız Dairesel Bir Boru Hattı için sst, k-ω ve k-ε Türbülans Kapatma Modelleri ile elde Edilen Sayısal Akım Çizgileri



Şekil 5 Başlıksız Kare Kesitli Bir Boru Hattı için sst, k-ω ve k-ε Türbülans Kapatma Modelleri ile elde Edilen Sayısal Akım Çizgileri

Şekil 4 ve Şekil 5 incelendiğinde, dairesel yerine kare kesitli boru hattı kullanılması durumunda, özellikle boru hattı mansabındaki ayrılma bölgesi boyutlarının önemli ölçüde arttığı görülmektedir. Ancak, Şekil 6 ve Şekil 7'de görüldüğü gibi aynı şeyi boru hattı üzerine 0.5D yüksekliğe sahip bir başlık yerleştirilmesi halinde söylemek mümkün değildir. Zira her iki kesit şeklinde de ayrılma bölgelerinin genişlikleri yaklaşık aynı kalmaktadır.

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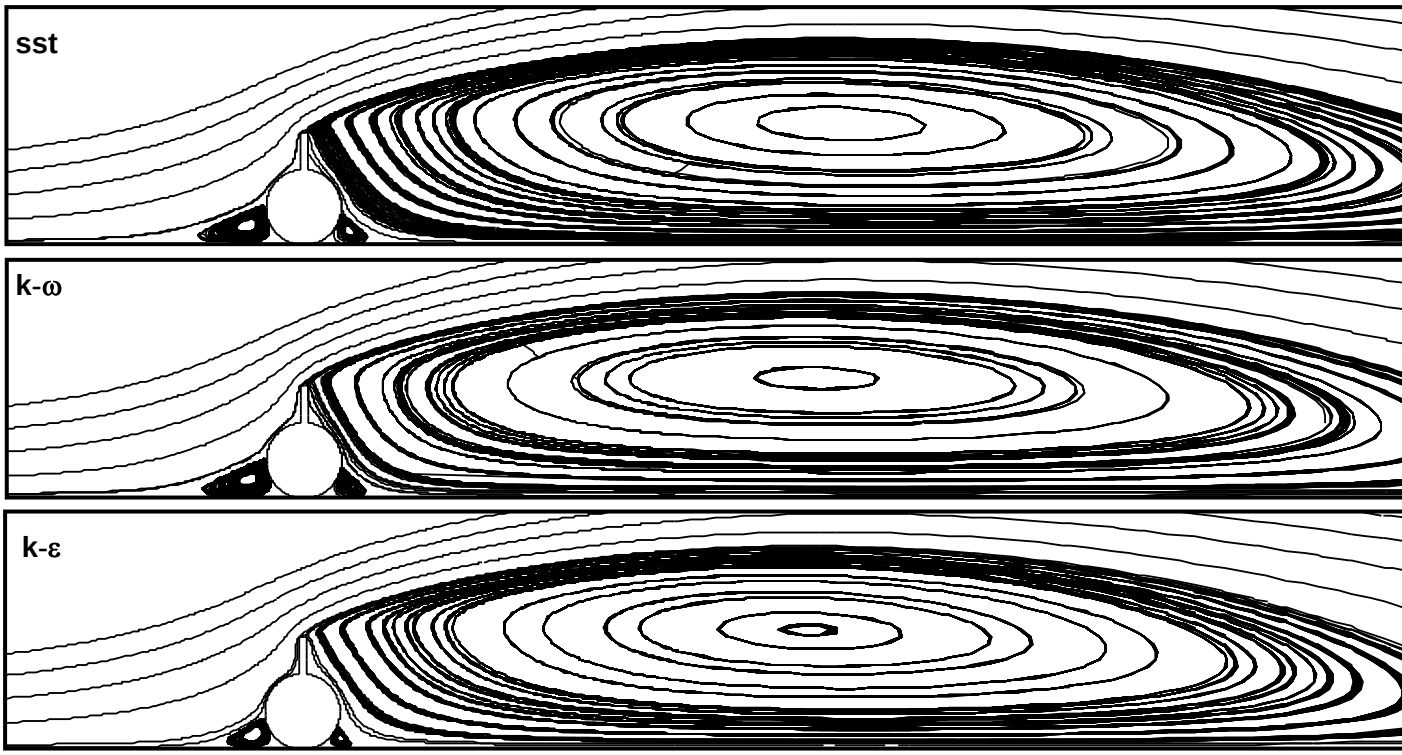
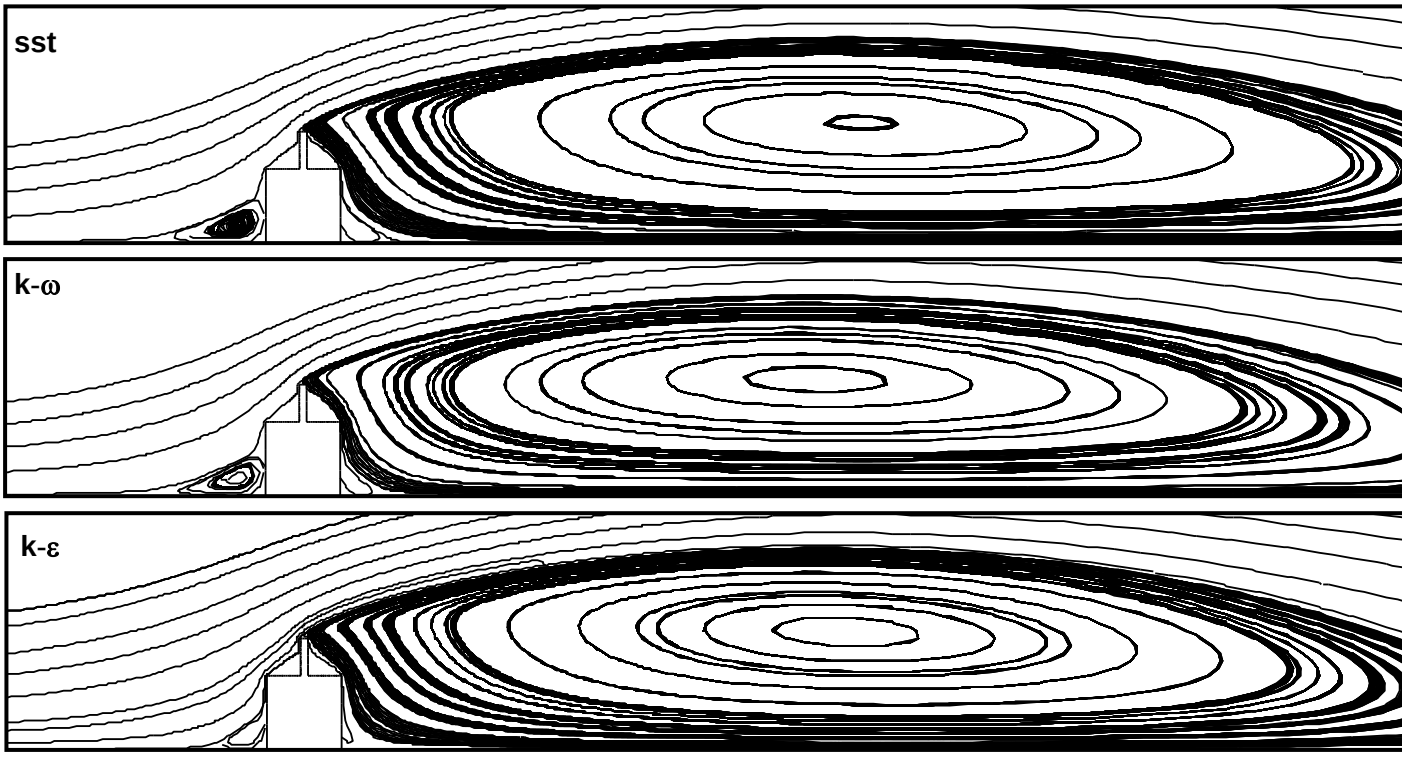


Şekil 6 Başlıklı Dairesel Bir Boru Hattı için sst, k-ω ve k-ε Türbülans Kapatma Modelleri ile elde Edilen Sayısal Akım Çizgileri



Şekil 7 Başlıklı Kare kesitli Bir Boru Hattı için sst, k-ω ve k-ε Türbülans Kapatma Modelleri ile elde Edilen Sayısal Akım Çizgileri

Basınç Dağılımı

Bu bölümde, oluşturulan sayısal model bulgularına dayanarak boru hattı etrafındaki akım alanında meydana gelen basınç dağılımının değişimi irdelenmiştir. Üstteki bölümde de bahsedildiği gibi k-ω türbülans kapatma modeli sst ve k-ε arasında kalan bir sonuç vermektedir. Dolayısıyla bu bölümde sadece sst ve k–ε türbülans kapatma modeli ile elde edilen sayısal basınç alanlarının verilmesi yeterli görülmüştür.

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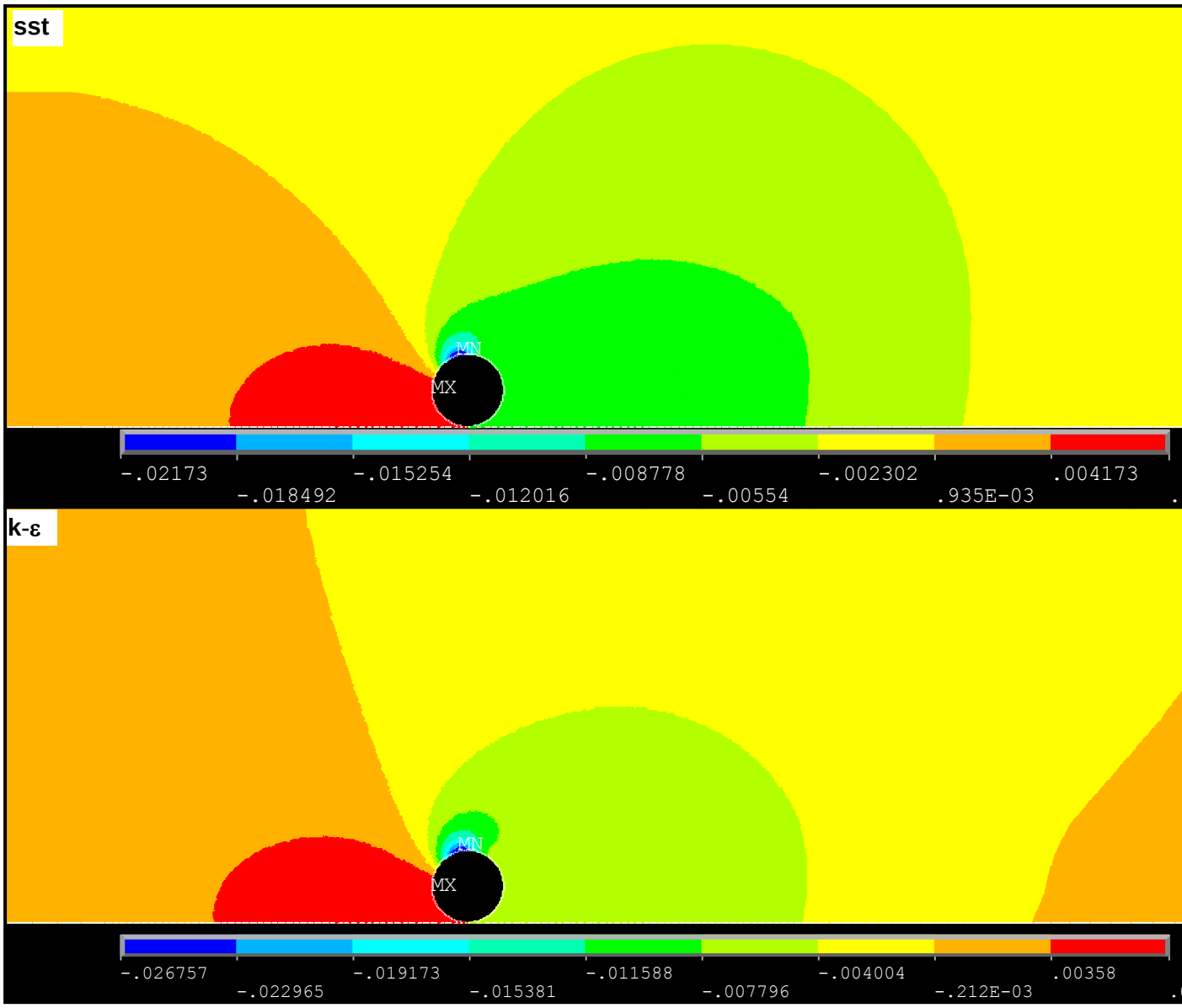

Şekil 8 Başlıksız Dairesel Bir Boru Hattı için sst ve k-ε Türbülans Kapatma Modelleri ile elde Edilen Basınç Dağılımı (Pascal)

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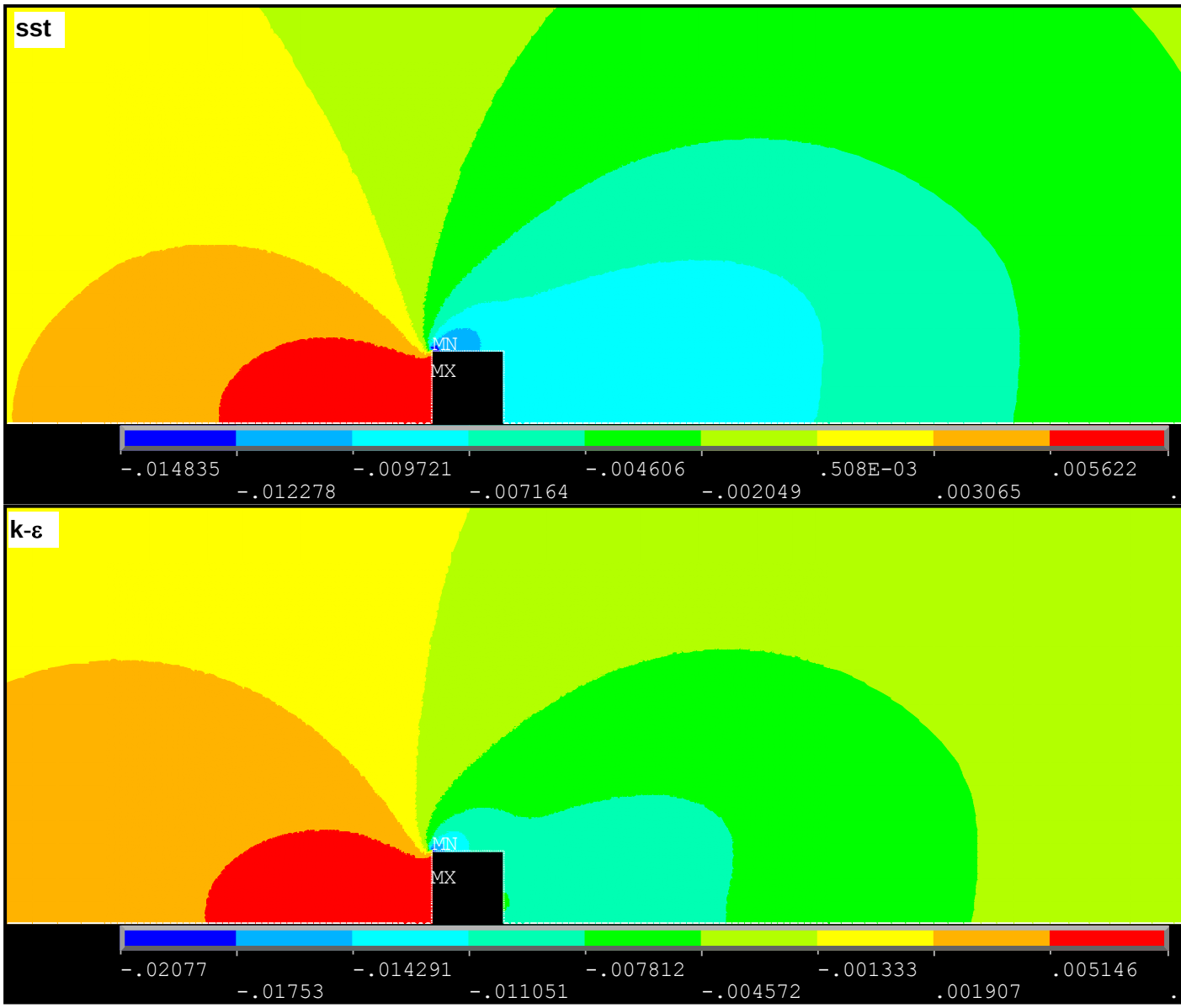

Şekil 9 Başlıksız Kare Kesitli Bir Boru Hattı için sst ve k-ε Türbülans Kapatma Modelleri ile elde Edilen Basınç Dağılımı (Pa)

Şekil 8 ve Şekil 9'da görüldüğü gibi boru hattı mansabında oluşan ayrılma bölgesi içerisinde negatif basınç meydana gelmektedir. Maksimum basınç değeri her iki kesit şeklinde de boru hattının memba yüzeyinde oluşmaktadır. Dairesel kesit için sst modeli ile elde edilen basıncın maksimum ve minimum değerleri daha büyük iken kare kesitte ise k-ε modeli ile daha büyük değerler hesaplanmıştır. sst ile elde edilen maksimum basınç değeri dairesel kesitte 0.007411Pa iken, kare kesitte bu değer 0.008179Pa değerine çıkmaktadır. Minimum değerler ise dairesel kesitte -0.02173Pa iken kare kesitte bu değer -0.014835 olmaktadır.

Şekil 10 ve Şekil 11'de verilen, boru hattına başlık yerleştirilmesi durumunda ise maksimum basınç değerleri k–ε türbülans kapatma modeli ile elde edilen hesaplamalar ile elde edilmiştir. Maksimum basınç değerleri başlıksız boru hatlarında olduğu gibi boru hattı membasında oluşmaktadır. Basıncın maksimum değerleri dairesel kesitli başlıklı boru hattında sst modeli için 0.008969Pa, k-e için ise 0.009268Pa olarak hesaplanmışken, bu değerler kare kesitli boru hattı için sst modeli ile 0.09113Pa, k-e modeli ile 0.09353Pa olarak bulunmuştur. Minimum basınç değerleri ise başlığın üzerinde oluşmaktadır ve dairesel kesitli başlıklı boru hattı için sst ile -0.01062Pa, k-e için -0.011628Pa, kare kesit için ise sst ile -0.011495Pa, k-e için ise -0.012614Pa olduğu Şekil 10 ve Şekil 11'de görülmektedir.

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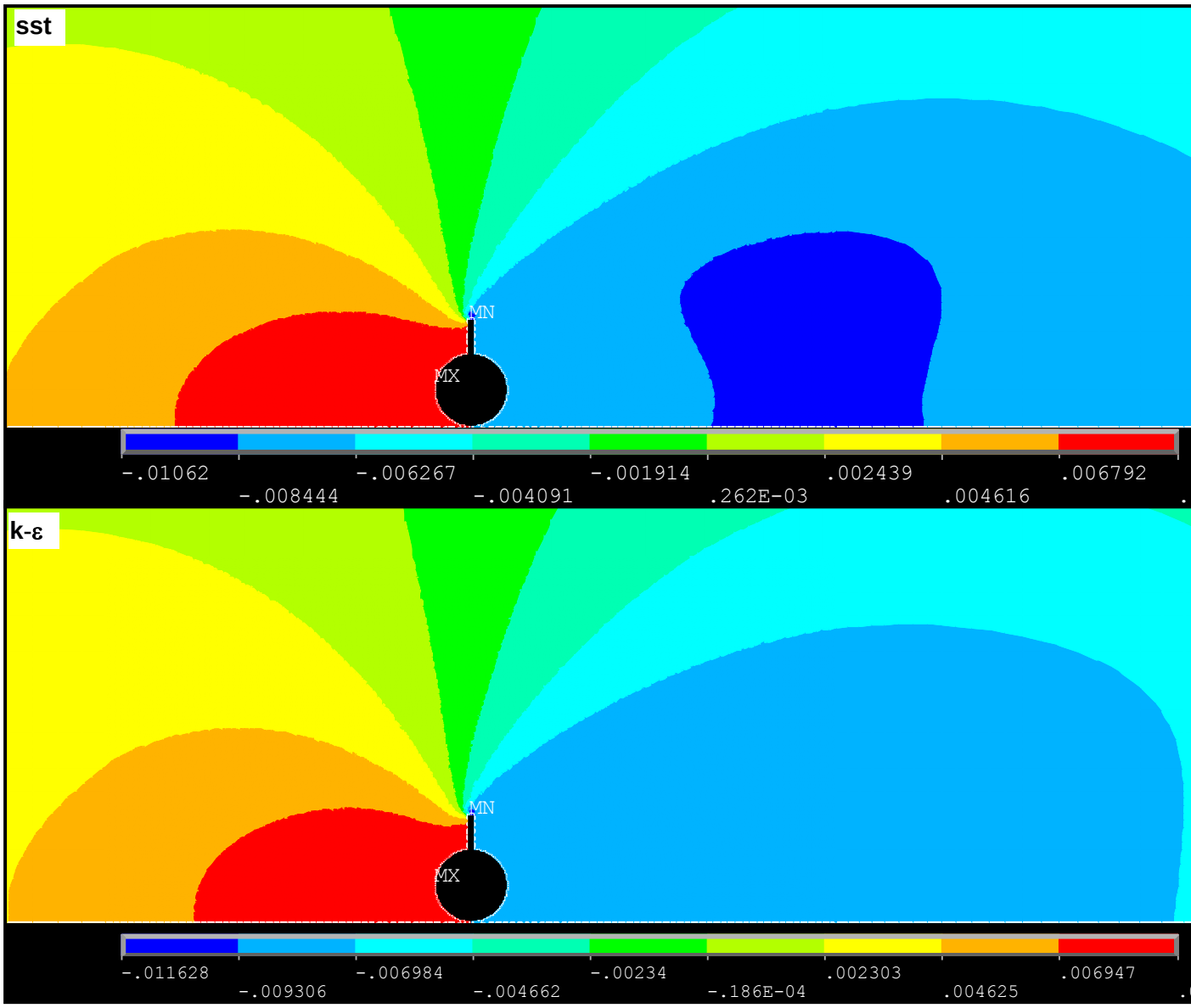

Şekil 10 Başlıklı Dairesel Bir Boru Hattı için sst ve k-ε Türbülans Kapatma Modelleri ile elde Edilen Basınç Dağılımı (Pa)

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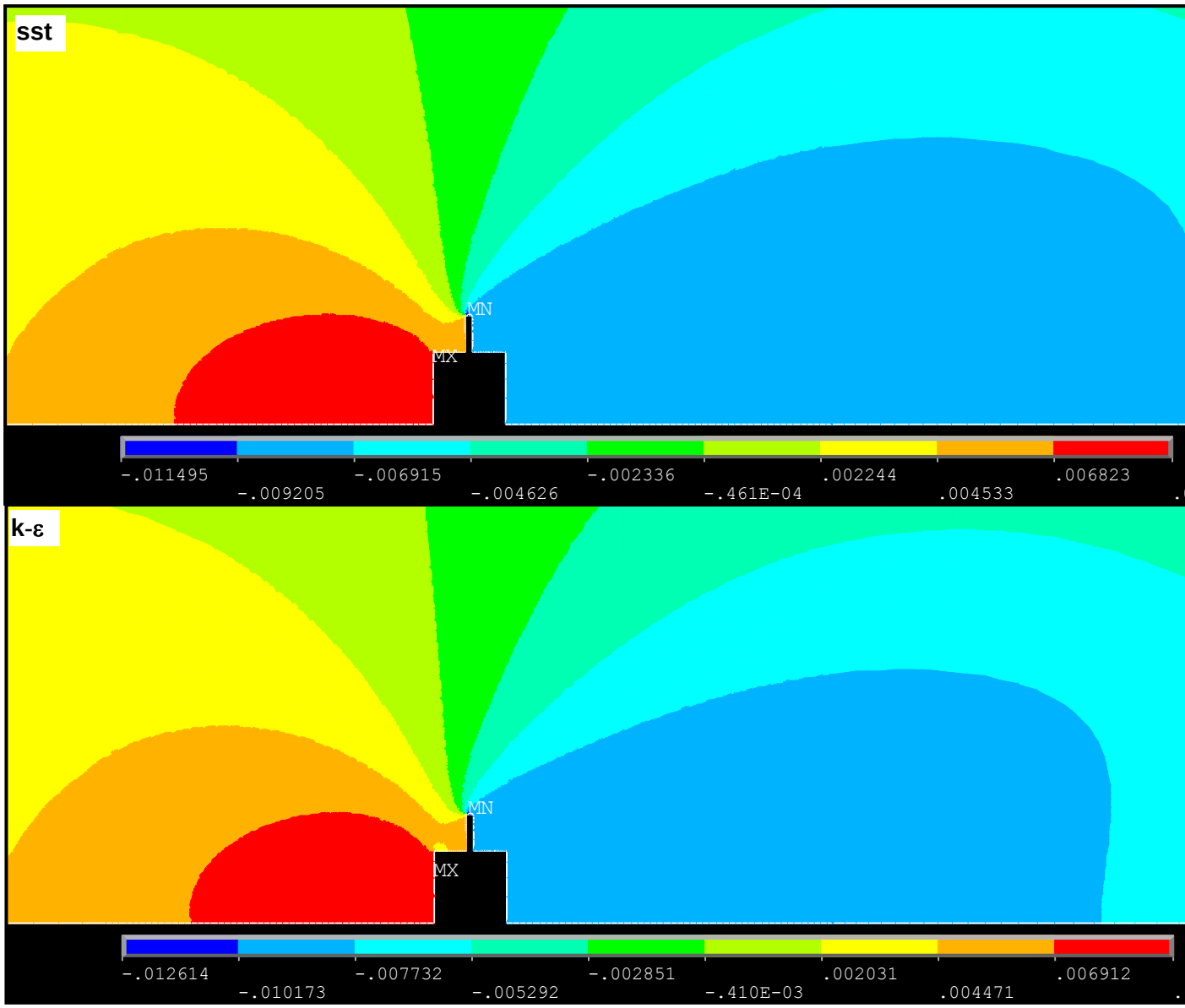

Şekil 11 Başlıklı Kare Kesitli Bir Boru Hattı için sst ve k-ε Türbülans Kapatma Modelleri ile elde Edilen Basınç Dağılımı (Pa)

Sonuçlar ve Tartışma

Bu çalışmada, kare ve dairsel kesitlerdeki boru hatları etrafında akım alanı bir Hesaplamalı Akışkanlar Dinamiği paket programı olan ANSYS 14.0-Flotran ile sayısal olarak simule edilmiştir. Simülasyonların oluşturulmasında boru hatlarının öz gömülmesini sağlayan, boru hattı üzerine başlık yerleştirilmesinin akım alanında meydana getirdiği değişimler üç farklı türbülans kapatma modeli kullanılarak incelenmiştir.

Sayısal hesaplamalarda kullanılan sst, k-ω ve k-ε türbülans kapatma modellerinden elde edilen sonuçlar, incelendiğinde sst modeli ile elde edilen ayrılma bölgesi genişliklerinin diğer iki modele nispeten daha geniş olduğu ve k-ω ile elde edilen akım çizgisi boyutlarının sst ve k-ε türbülans modelleri ile elde edilenlerin arasında bir görüntü verdiği belirlenmiştir ki sst modelinde tabanda k-ω katsayılarının kullanıldığı, tabandan uzaklaştıkça k-ε türbülans kapatma modeli katsayılarına geçildiği düşünülürse bunun beklenen bir sonuç olduğu söylenebilir.

Kare şekline sahip boru hattı kullanılması durumunda, özellikle mansap, ayrılma bölgesi boyutlarının büyüdüğü tespit edilmiştir. Borular üzerine başlık yerleştirilmesi durumunda ise mansaptaki ayrılma bölgesinin boyutları çok daha fazla artmaktadır. Ancak başlıklı kare ve dairesel kesitli boru hatları etrafındaki ayrılma bölgeleri boyutları arasında önemli bir farklılık belirlenememiştir.

Kare ve dairesel kesitli boru hatları kullanılması durumunda ve boru hattı üzerine başlık yerleştirilmesi halinde boru hattı etrafındaki basınç dağılımı belli oranlarda değişmektedir. Zemin taşıma gücünü azaltarak öz gömülmeye önemli katkı sağladığı düşünülen borulanmanın temel sebebi olarak su yapısının memba ve mansabı arasındaki basınç farklığı gösterilmektedir (Sümer ve Frodsoe, 2001, Öner, 2009). Hesaplamalarda boru hattı membasında

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oluşan maksimum basıncın dairesel kesit yerine kare kesit kullanılması durumunda yaklaşık 0.0008Pa, başlık kullanılması durumunda başlıksız dairesel kesitle başlıklı dairesel kesit arasında 0.0015Pa, başlıksız kare kesit ile başlıklı kare kesit arasında ise 0.001Pa artış olduğu belirlenmiştir. Başlıklı dairesel kesit ve kare kesit arasında ise yaklaşık 0.001Pa artış meydana gelmektedir.

Bu çalışmadan elde edilen veriler ışığında, boru hattı üzerine başlık yerleştirilmesi durumunda silindir memba ve mansabında oluşan daha geniş ayrılma bölgeleri içerisindeki vorteks hareketlerinin varlığı sebebiyle bu bölgelerdeki oyulmaların tetikleneceği, boru hattı memba ve mansabı arasındaki basınç farkının artması sebebiyle boru hattı altında oluşacak borulanma miktarının artarak kendi kendine gömülme mekanizmasını hızlandıracağı sonucuna varılmıştır.

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KEY POINT EXTRACTION AND TRACKING OF TWO TARGETS WITH SIFT AND SURF METHODS

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Abstract: Tracking of the target, environment and position of the target may vary depending on the position of the camera. Target and camera movements cause continuously to change of position and size of the target in the video stream. In this study, tracking of the target is performed by considering all these changes. SIFT(Scale-invariant feature transform) and SURF (Speeded Up Robust Features) algorithms are used for this purpose. In this study, two different books are identified by system as images then, these books are placed in various locations in the room and a video stream is captured. These books are tracked with SIFT and SURF algorithms. First, scalar space is created. Then, key points of these books are detected. The original book images filtered with Gaussian smoothing. Thus, the processing load is reduced by decreasing the numbers of keypoints. FLANN (Fast Approximate Nearest Neighbor) method is used for the matching in the video stream. At the end, success rate of SIFT and SURF algorithms are measured. This application is realized using OpenCv 2.4.5 library.

Keywords: SIFT, SURF, FLANN, Keypoint Extraction, Tracking, Image Processing.

1.Introduction

Purpose of the tracking algorithm is detection of next state of a moving object. Properties of the object such as color, size, speed etc should be known for this purpose. Tracking problem can be studied by using three main approaches. The first approach is used for tracking fixed object from moving background. The second approach is used for tracking moving object from fixed background The third approach is used for tracking moving object from moving background. A great deal of tracking algorithms are developed for each approach. In this paper, we use the first approach. SIFT(Scale-invariant feature transform) and SURF(Speeded Up Robust Features) methods are selected from developed algorithms for the first approach. SIFT and SURF algorithms are local feature detector and descriptor which are used for object recognition, image registation, classification, 3D reconstruction, robotic mapping and navigation, image stitching, 3D modeling, video tracking and match moving[1,2].

In recent years, a great deal of results concerning with the SIFT and SURF methods for tracking have been proposed. In[3], outdoor changes are observed by SIFT and SURF methods when season changes. Namely, they focused to appearance-based topological localization problem. SIFT and SURF methods which is based on local image feature is used for comparison. Methods are applied on multiple data sets. The data sets consist of

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panoramic images that are acquired nine months period. Then they introduce epipolar constrait to improve the results.

In[4], they match two image frames that are taken by looking at object from a different angle. First of all, distinctive and fixed features of object are extracted. SIFT and SURF methods were used to detect and descript scale and rotation invariant interest point.

SIFT and SURF algorithms were performed on different datasets in [5]. 64D, 96D and 128D shorter SIFT descriptors were proposed. These descriptors reduced the computational cost and also good classification results were observed by using SURF methods on different datasets.

In[6] success rates of SIFT and SURF methods are compared in terms of runtime. They observe that SIFT finds more keypoint than SURF, but SURF is faster than SIFT in terms of runtime.

In[7], a new method is called BRISK that is presented for keypoint detection, description and matching. A comprehensive evaluation was made on datasets to reveal BRISK's adaptive, and low computational cost was observed.

ORB method is presented alternative to SIFT and SURF methods, in[8]. ORB is a very fast binary descriptor based on BRIEF. This method is rotation invariant and resistant to noise. Experiments show that ORB is faster than SIFT at two order magnitude. ORB is experienced on several application such as object detection and patch-tracking.

The main objective of this paper is to implement key point extraction and tracking of two books with SIFT and SURF methods. In this paper, a video stream is captured from a moving camera. In the video stream, two books are placed to different place in a room. Because the camera is moving, size of the books and viewpoint to the books are contiously changing. All of this changes are considered for tracking process. So, key points of the books are separately extracted. The application is realised Microsoft Visual Studio environment using OpenCV library. Success rates of the methods are measured and compared.

The rest of the paper is organized as follows: materials and methods, SIFT and SURF methods, results and discussion and conlusion parts.

2.Materials and Methods

2.1 SIFT Method

In this paper, SIFT algorithm is divided into 4 stages.

- Scale-space extrema detection
- Definition of Keypoints' Location
- Acquiring Resistance Against Keypoint Orientations
- Determine the identifiers of the key points

2.1.1Scale-Space Extrema Detection

Here are lots of techniques to find constant extreme points at scale-space. DoG(Difference of Gaussians) method is used in this application. Scalar space is created. Determination of keypoints is made. The original image is filtered using following Gaussian filter equation which is given with equation(1).

$$G(x, y, \sigma) = \frac{1}{2\pi\sigma^2} e^{-(x^2+y^2)/2\sigma^2} \quad (1)$$

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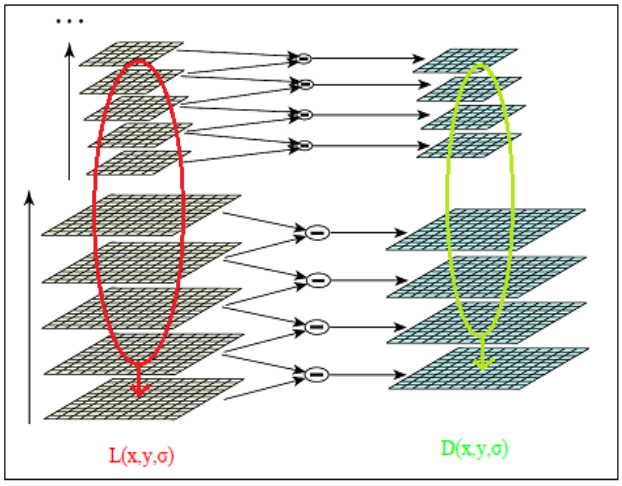

Figure 1: Formation of Scale-Space[9].

I: Original image
G: Gauss function
Scale space function equation L:

$$L(x, y, k\sigma) = G(x, y, k\sigma) * I(x, y) \quad (2)$$

D(x, y, σ) is a DoG function which calculates difference of two images, one of the images is k times bigger than the other image,

$$D(x, y, \sigma) = L(x, y, k\sigma) - L(x, y, \sigma) = (G(x, y, k\sigma) - G(x, y, \sigma)) * I(x, y) \quad (3)$$

$$\sigma\nabla 2G = \partial G/\partial \sigma \approx [G(x, y, k\sigma) - G(x, y,\sigma)] / (k\sigma-\sigma) \quad (4)$$

and thereby

$$G(x, y, k\sigma) - G(x, y,\sigma) = (k-1).\sigma 2\nabla 2G \quad (5)$$

is optained.
This equation shows similarity between Laplace transform and Gauss filtering. The point is extremum point or not in its neighbours is controlled.

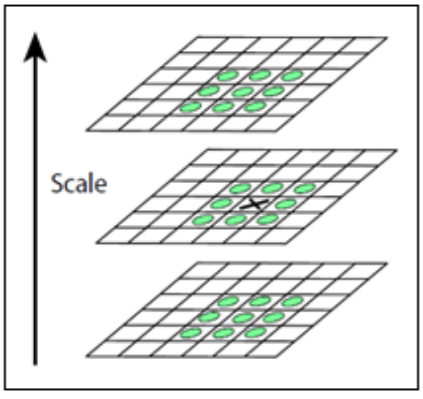

Figure 2: Extraction of Keypoints[9].

Original images of the two books are on the left sight, extrema points of the books are shown on the right sight in Figure 3.

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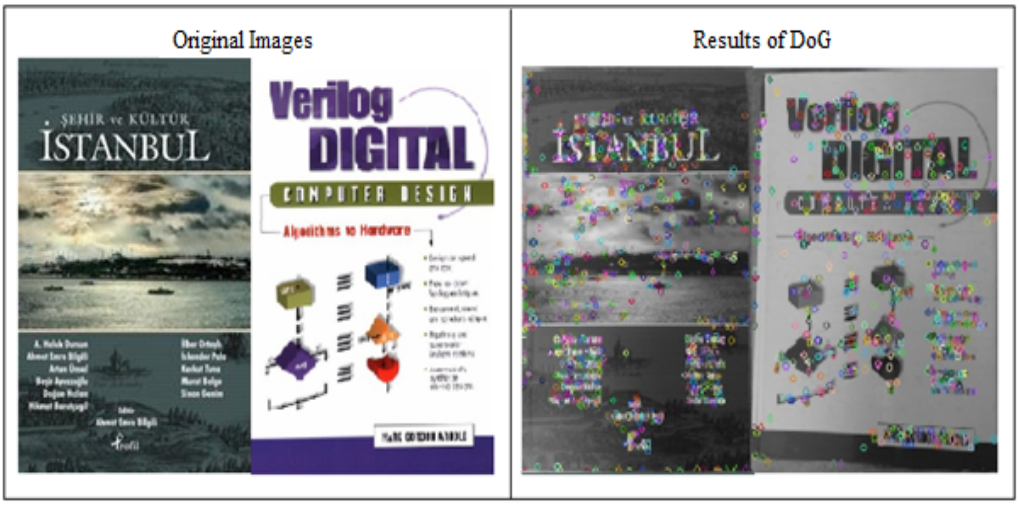

Figure 3: Result of DoG Scale-space extrema detection.

2.1.2 Definition of Keypoints' Location

In the previous step, there are great number of key point canditates that can be non-stable. In this step, non-stable key point candidates, low contrast pixels(affected by noise) or weak edges are extracted.

2.1.3 Acquiring Resistance Against Keypoint Orientations

This step of the SIFT method is important because resistance is acquired against to two dimentional orientation. Gradient magnitude m(x,y) and angle θ(x,y) of gaussian smooted image I(x,y) at scale σ are calculated using L(x, y, σ) = G(x, y, σ) * I(x, y) by following equations (6) and (7).

$$m(x,y) = \sqrt{(L(x+1,y) - L(x-1,y))^2 + (L(x,y+1) - L(x,y-1))^2} \quad (6)$$

$$\theta(x,y) = \tan^{-1} \frac{L(x+1,y) - L(x-1,y)}{L(x+1,y) - L(x-1,y)} \quad (7)$$

2.1.4 Determine the Identifiers of the Key Points

In this step, resistence is gained against the other changes (brightness, 3D appearance, etc). Firstly, gradient magnitude and angles around the key point are sampled using scaler magnitude key areas (n×n). To provide rotational invariance ,location and gradient angles are rotated based on key point angle.

This step is comparable to previous step. Eight-dimentional vectors are identified around the key point for each point in n×n region. Thus the length of the vector that is defined for each key point becomes n×n×r.

2.2 SURF Method

SURF method is based on the same principles as SIFT; but details in each step are different. The method is devided into three parts:

- Interest point detection,
- Local neighborhood description
- Matching.

2.2.1 Interest Point Detection

SURF uses square-shaped filters as an approximation of Gaussian smoothing. SURF uses a blob detector based on the Hessian matrix to find points of interest. The determinant of the Hessian matrix is used as a measure of local change around the point and points are chosen where this determinant is maximal. In contrast to the Hessian-Laplacian detector by Mikolajczyk and Schmid, SURF also uses the determinant of the Hessian for selecting the scale, as is also done by Lindeberg. Given a point p=(x, y) in an image I, the Hessian matrix H(p, σ) at point p and scale σ, is:

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$$H(p,\sigma) = \begin{pmatrix} L_{xx}(p,\sigma) & L_{xy}(p,\sigma) \\ L_{xy}(p,\sigma) & L_{yy}(p,\sigma) \end{pmatrix} \quad (8)$$

where $L_{xx}(p,\sigma)$ etc. are the second-order derivatives of the grayscale image.

2.2.2 Local Neighboorhood Description

The goal of a descriptor is to provide a unique and robust description of an image feature. The first step consists of fixing a reproducible orientation based on information from a circular region around the interest point. Then we construct a square region aligned to the selected orientation, and extract the SURF descriptor from it.

2.2.3 Matching

The descriptors which are obtained from different images by comparing, matching pairs can be found.

3.Results and Discussion

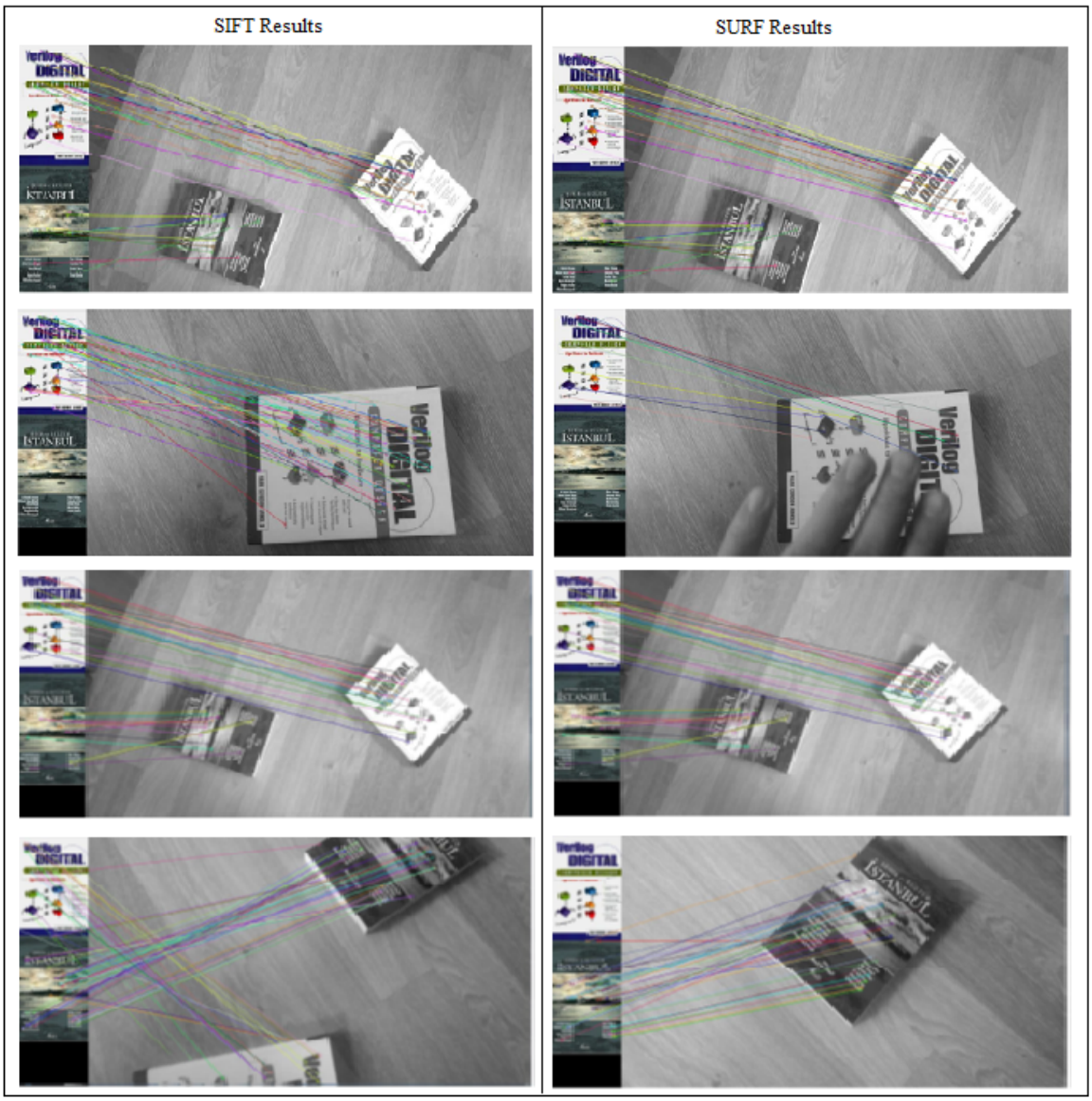

Figure 4: SIFT and SURF results

In Figure 4, examples of SIFT and SURF methods results are depicted, number of keypoints, maximum and minimum distance are shown for each ten image frames which are selected randomly using respectively SIFT and SURF methods in Tables 1 and 2.

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Table 1: SIFT Results.

	Keypoints1	Keypoints2	Maximum Distance	Minimum Distance
1	1388	1359	449.692108	37.067505
2	1388	1363	454.993408	48.435524
3	1388	1321	461.323090	42.684891
4	1388	1356	470.399841	51.146847
5	1388	1358	447.535461	53.319790
6	1388	1411	465.710205	43.197224
7	1388	1407	459.327759	44.788391
8	1388	1389	458.978210	34.205261
9	1388	1295	451.336914	38.131351
10	1388	1049	473.667603	39.217342

Tablo 2: SURF Results.

	Keypoints1	Keypoints2	Maximum Distance	Minimum Distance
1	1382	9181	0.931924	0.105589
2	1382	8999	0.945038	0.101373
3	1382	9115	0.945038	0.101373
4	1382	9685	0.912624	0.090097
5	1382	10028	0.973946	0.089767
6	1382	10147	0.962871	0.086972
7	1382	10139	1.019178	0.072093
8	1382	10011	0.935232	0.111617
9	1382	9889	1.079836	0.134278
10	1382	10120	0.960981	0.110848

4.Conclusion

In this paper, we have implemented that tacking of two books with SIFT and SURF method in a video stream. We have also observed that success rate of the methods. The properties of the video stream is given in table 3.

Tablo 3: Properties of The Video Stream.

Resolution	Number of frame	Duration
1280*720	689	23 seconds

The total processing times have been calculated about four hour and a half. From the results of Tables 1 and 2 we can conclude that the running times of the SURF is slower than SIFT. But SURF has found more key point than SIFT. The maximum and minimum distances between keypoints have been measured to improve the methods. In case of distance between of two key point is two times bigger than minimum distance, the result has been disregarded. Thus, better results have been shown on the screen.

Fast Approximate Nearest Neighbor FLANN is used for matching process after keypoints have been detected. FLANN has shown better results than Brute Force Matching algorithm in terms of speed. Also, we have also observed that the resolution of the video streams has a great impact on the performance of the implemented algorithm.

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KOMPOZİT PANELLERDE CTP LEVHA VE ÇEKİRDEK KALINLIĞININ MEKANİK ÖZELLİKLERE ETKİSİ

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Günümüzde inşaattan lojistiğe kadar her sektörde yakıt tüketimini azaltmak, yapıların ağırlığını azaltmak gibi amaçlarla ağırlık azaltma ile ilgili pek çok çalışma yapılmaktadır. Bal peteği kompozitler düşük ağırlıkları ve ağırlıklarına oranla sahip oldukları yüksek mekanik dayanımları sebebi ile ağırlık azaltma çalışmalarında ilk akla gelen malzemelerden birisidir. Bu çalışmada yük taşımacılığında kullanılan taşıtlarda zemin uygulamalarında sıkça kullanılan alüminyum damla desenli saç ve hazır cam takviyeli polyester(CTP) levha kullanılarak üretilmiş bal peteği sandviç levhaların CTP levha kalınlığı ve çekirdek kalınlığı değişimi ile eğilme dayanımı arasındaki ilişki incelenmiştir.

Çalışma kapsamında 2,5 mm alüminyum damla desenli saç sabit tutularak 15 ve 20 mm kalınlığında hücre çapı 9 mm olan ve kalınlığı 70 mikron olan alüminyum bal peteği yapısı ile 2 mm ve 9 mm kalınlığında CTP levhalar kullanılarak üretilmiş bal peteklerinin üç nokta eğme testleri yapılmış, CTP levha kalınlığı ve bal peteği kalınlığı değişimlerinin dayanıma olan etkisi incelenmiştir.

Sonuç olarak CTP levha kalınlığındaki artışın dayanımı arttırdığı ancak bal peteği kalınlığının CTP Levha kalınlılığından dolayı oluşan artışa oranla mukavemeti çok daha fazla arttırdığı gözlemlenmiştir.

Keywords: Kompozit, CTP, Çekirdek, Bal Peteği, Eğilme Dayanımı

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KONUM BILGISI VE HAYATI SINYALLERIN APRS TABANLI TELSIZ HABERLEŞME SISTEMI ILE YAYINLANMASI

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Mevcut acil durum çağrı sistemleri, hücresel şebekeleri veya uydu haberleşmesini kullandıkları için kapsama alanı ve haberleşme maliyetleri açısından bazı problemler içermektedir. Özellikle acil durum çağrı sistemlerine ihtiyaç duyulan alanlarda, acil durum yerinin hızlı tespiti insan hayatı bakımından çok önemlidir. Bu çalışmada, kişiler için hayati sinyaller olarak nitelendirilebilecek nabız ve vücut sıcaklığı bilgileri, GPS uydularından alınan konum verisi ile birleştirilerek APRS protokolü ile amatör telsiz bandından yayın yapan bir cihaz tasarlanmıştır. Yapılan yayınlar, portatif PMR telsizleri ve amatör telsiz istasyonları tarafından alınabilir niteliktedir. Telsiz yayınlarının I-GATE'ler vasıtasıyla Internet üzerinden takip edilebilmesi mümkündür. Acil durum oluşması durumunda kimlik ve konum bilgisi sesli mesaj olarak da yayınlanmaktadır. Bu çalışma sonucunda tasarlanan sistem ile yaklaşık bir günlük batarya ömrüne ve açık alanda 5 km çapında yayın mesafesine ulaşılmıştır.

Keywords: APRS, telsiz haberleşmesi, gömülü sistemler

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KURUMSAL MİMARİLERDE NESNELERİN İNTERNETİ İÇİN GELİŞİME AÇIK YENİ BİR GÖREV VE ROL YÖNETİM SİSTEMİ TASARIMI

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Kullanım alanları gündelik hayatımızın bir parçası olmaya başlayan internete bağlı cihazlar (Nesnelerin İnterneti – IoT) kendilerine atanmış görevleri başarıyla yerlerine getirmektedir. Yazılım ve network mimarilerinde bu görevler bir defa tanımlandıktan sonra değiştirilmesi oldukça zor ve zaman almaktadır. Bununla birlikte IoT'ların görevleri için satın alınacak servis ve hizmet sağlayıcı kuruluşların değişimi de farklı yazılım mimarileri ile haberleşme maliyetleri getirmekte ve bu maliyetler kabul edilebilir sınırlar içerisinde değildir.

IoT'ların görev ve rollerinin yönetim maliyetlerini düşürmek, network yapılandırılması içerisinde, güvenlik politikaları dâhilinde, kurumsal mimarilerde yapısal değişikliklere neden olabilmektedir. Kurumların yazılım sistemlerinde yapılacak bu büyük değişiklikler geliştirme maliyetleri kadar test ve işletme maliyetlerini de artırmaktadır.

Temelde gerçek dünyadan veri toplamak amacıyla oluşturulan IoT'lar farklı görevleri, zaman ve konum bazlı rolleri kendi bünyesinde barındırmaktadır. Bu çalışmanın amacı bunun tam tersi olarak IoT cihazlarının görev ve rol yönetimlerini bir üst yapıda toplanmasıdır. Geliştirilecek bu yapıyla cihazlar sadece topladıkları veriyi belirtilen düğüme iletmekle sorumlu olacak ve gerekli tüm mimari kararlar ise bu üst yapı tarafından verilecektir. Elde edilen veri anlamlandırılarak sadece ilgili kişi ya da yazılım mimarilerine ulaştırılabilecektir. Maliyet tasarrufu sağlayacak bu model sayesinde; veri iletişim mimarisinde var olan donanım ve network yapılandırılması herhangi bir değişikliğe ihtiyaç duymaksızın IoT'ların kurumsal mimariler içerisinde rahatça kullanılabilmesini sağlayacaktır.

Keywords: Nesnelerin İnterneti, IoT, Kurumsal Mimari

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KÜRLEŞTİRİCİ MİKTARININ KOMPOZİT MALZEME ÜRETİMİNDE KULLANILAN FARKLI POLYESTER REÇİNELERİNİN MEKANİK VE FİZİKSEL ÖZELLİKLERİNE ETKİSİ

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Polimer esaslı kompozit malzemelerde matris malzemesi olarak kullanılan doymamış polyester(UP) reçineleri düşük maliyet, kısa kür zamanı, hava koşullarına ve kimyasallara direnç ve bu malzemeden üretilen ürünlerin çok iyi mekanik ve kimyasal özellikleri dolayısı ile tüm dünyada yaygın bir şekilde kullanılmaktadırlar. Polyester üretiminde genellikle doymamış asit olarak maleik, ortoftalik, izoftalik, tereftalik, vb. asitler kullanılmaktadır. Bu çalışmanın amacı; farklı oranlarda kürleştirici kullanımının polyester reçinelerin fiziksel ve mekanik özelliklerine etkilerini araştırmaktır.

Çalışma kapsamında polyester türü olarak izoftalik ve ortoftalik olmak üzere üç çeşit doymamış polyester(UP) reçinesi kullanılmıştır. Reçinelerin içerisine %1, %1.5, %2 ve %2.5 oranlarında kürleştirici ve tüm numunelerde %1 sabit oranında hızlandırıcı katılarak polyester reçine karışımları hazırlanmıştır. Bu reçine karışımlarının, fiziksel ve kimyasal deneylerle; jelleşme süresi, jelleşme sıcaklığı, peak exotherm sıcaklığı, viskozite, katı madde içeriği, stiren içeriği, çözünürlük parametresi ve kimyasal içerikleri belirlenmiştir. Tüm reçine numuneleri 1 ve 7 gün süre ile standartta belirtilen koşullarda bekletilmiş ve daha sonra bu numuneler üzerinde mekanik deneyler yapılmıştır. Mekanik deneyler ile; çekme deneyi, çekme E modülü, basınç dayanımı ve basınç E modülü, eğilmede çekme dayanımı ve eğilme E modülü, gerilme-birim deformasyon davranışı ve kopma uzaması parametreleri belirlenmiştir.

Deneysel çalışmalarda elde edilen sonuçlar karşılaştırmalı olarak değerlendirilmiş ve fiziksel ve mekanik özellikler açısından kompozit malzeme üretiminde kullanılabilecek en iyi performansa sahip reçine türü belirlenmiştir.

Keywords: Kürleştirici, Polyester, Kompozit, Reçine, Mekanik ve Fiziksel Özellik

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LEAN PRODUCTION IN TERMS OF CUSTOMER VALUE

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Abstract: In today's increasingly competitive conditions, businesses establish various strategies to meet all aspects of customer demands, reduce their costs and ensure their continuity. Generally, various applications are performed in accordance with decisions taken by the executive management of a company but they produce only temporary solutions. This application is generally in the form of reducing the cost. Reducing costs can undoubtedly be considered as a success in terms of business. However, it is difficult to maintain continuity and the functioning of the system. Because customer demand also varies continuously. Changing the production process according to the changing nature of demand and accordingly the products produced can put a business downturn. However, adopting of a lean manufacturing system and policies accordingly will improve the competitiveness of businesses. Businesses that depend on lean principles can perform production in accordance with the demands of their customers by reducing production costs because customer value lies on the basis of a lean system and all activities take place around this value. Therefore, the customer is a factor which directs and lights a lean production. The aim of this study is to examine the customer value in terms of lean principles.

Key Words: Lean Manufacturing, Customer Value, Lean Principles

1. Introduction

In relevance with the change and developments which occurred in world economy and technology, methods of manufacture as well have changed through the time. Especially in connection with the mechanization which is introduced by the industrial revolution, labor intensive manufacturing left its place to machine intensive manufacturing hence capital intensive manufacturing and this established the basis for the modern mass-production. However, at the time there were not any fully-functional accounting and costing management system and accordingly; management and controlling of such; has been a hard task. Especially in early 1900's; when Henry Ford discovered and applied the mass production method in car manufacture, the idea of manufacturing uniform products in large amounts, was in the agenda for the first time. This development resulted in development of the economies and manufacture systems. Thanks to this advancement, product costs have been reduced. Especially in this era; so as to be able to calculate the costs of products, the concepts of indirect cost and direct cost have been introduced, therefore the concept of product cost management concept came to scene. From that day on, systems of manufacture applied by the enterprises and accordingly, respective cost systems, have changed. However, none has been as effective as "Lean" (production).
Lean production and the lean accounting it introduced; have been successfully developed and (still) used by Toyota, the Japanese car manufacturer. These systems kept on their significance and timeliness. Basis for the lean production system which is also known as Toyota manufacturing system is simplification of "value stream costing" and all corresponding activities therefore minimizing the workforce and materials required for the performance of these processes, segregation of the manufacturing processes in schematic cells and cancelling out any elements which cause loss or doesn't create value. Lean production places human factor right in the middle of the system. In the system; the customer defines the value and those who work so as to establish the value; operate the system. Lean production also consists some Japanese philosophy-based patterns of behavior in it. That being said; within the duration from procurement to final delivery to the customer; lean production suggests to minimize stocks(inventories) therefore minimizing any relevant costs which would otherwise reflect on the customer price, meanwhile respecting the human factor as its first priority, the system continuously questions the processes, cancelling out any inefficient elements. It is likely that in the course of time, new methods of production will be developed and cost management will be performed more efficiently. However for now, it is obvious that the most clear and most efficient system is Lean production. Even if they cannot apply all the functions of the system, due to enterprises volume and means of production; at least various lean production

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system principles can be put into use, considering human the first priority, therefore the economic system yielding benefits for everyone.
In connection with the Lean production practices and positive outcomes; the system attracts a lot of attention, followed by popularity and inclination. This increase in interest has shown itself both in academic studies and the number of the enterprises which apply the system. In relevance with lean production and lean accounting, many definitions have been put forth.

2. Thinking And Applying It "Lean"

Lean production, adopted by Toyota at first place, is a system which is meant to prevent wasting. So as to prevent wasting; two principles of: zero stocks and zero error are adopted, present process and systems are subjected to continuous improvement. Basically what Lean production means is to reduce the duration of time between the products' manufacture and distribution and to deduct the wasting from the price (Ertaş and Arslan, 2010).
Manufacturing enterprises which carry on business in the last 20 years of time have adopted the principles of the idea of Lean production. While establishing this, they have been re-organized so as to enhance the customer response time i.e. by adopting the use of cellular scheme structure and stream of values (Fullerton, Frances and Widener, 2014). Lean production idea, brings along remarkable amounts of success stories and potential, for those who adopt this discipline (Merwe and Thomson, 2007).
Customer is the determining factor in lean system. Accordingly, the customers demand as per their needs and this will actuate the corresponding cells of the lean manufacturer. The communication is made by each cell signaling to a previous cell therefore making the system operational. As a result of the mentioned operation, taking into consideration the value created by the customers, the production at the previously determined amount and right on time. Due to the fact that there is no extra production; there will be no extra stocks created and any relevant costs shall be eliminated.

Transforming to lean system can be troublesome. Quitting the habits obtained from the traditional manufacturing and converting the operational units into lean production comes up as a time consuming and cost-increasing action, at first sight. That being the case, the enterprises which prefer this system will naturally face high initial, conversion related costs and hesitate about the conversion. What matters is to think and apply it "lean" and overcome mentioned distress. The enterprises which can manage this shall soon enjoy the benefits of the lean system.
Without "*leanification*" it is often impossible to perform analyses down to the roots and have an understanding of it. Accordingly, the concept of lean management exhibits a holistic view and suggests "*leanification*" of any management tasks. Accordingly the companies which adopt lean management concept; shall be in a tendency of "*leanification*" not only in manufacturing but in all areas (Can and Güneşlik, 2013).

3. Lean Principles

Lean is a system established on 5 simple stages and principles. These stages are; value, stream of values, flow, pulling and perfection (Özçelik and Ertürk, 2012).

Value: Starting point for lean thinking is value and the value can only be defined by the final customer. Value is the sum of the benefits presented to the customer. So as for the definition of "value" make any sense; it must be expressed in terms of a specific product(product and service) which meets customer's specific needs at a specific time and the value is created by the consumer (Maraşlı, Çoban and Topbaş, 2014). In defining the value, these questions are to be replied "What do customers want?, When and how they want?, Which specifications, capacities, compliance and price would be preferred by customers?" (Özçelik and Ertürk, 2012).
As can be seen; the customer is the factor which leads the Lean production and lean principles. At any stage of the manufacturing, the value requested by the customers, is aimed at. If an enterprise does not take the customer value into consideration, this clearly indicates that the conversion to lean system is incomplete.
Stream of values is the sum of the process and activities which are needed in the manufactured product's delivery to the customer, throughout the whole cycle (Duque and Cadavid, 2007). Stream of value analyses show that three different movements occur during the flow; a) the actions which create value in the way the customer wants. b) Those which don't create value but are compulsory due to present technic and production circumstances. c) Many other stages do not create any value and can be immediately removed (Özçelik and Ertürk, 2012).

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Basic principle for a Lean production system is to eliminate any processes which do not create benefits for the customer and are easy to be removed; and to continue the processes which create value but by cancelling out practices which cause any wasting.
Within the scope of Lean production concept; there are seven forms of wasting which are called *muda* in Japanese, and these must be eliminated. These points of wasting can be defined as follows.
Errors: Are the situations which require re-processing or cause the material to be wasted/scrapped.
Stocks: It is when available raw materials and semi-products at hand are more than needed.
Movement: The movements performed by people and the machines throughout the production cycle.
Unnecessary process: The actions which do not create value during the processing or use of materials or raw materials.
Excess Production: Manufacturing more than requested or desired amounts.
Transportation: Unnecessary or excess movements of the raw materials and materials which are present in the production line.
Waiting: During the production, materials or raw-materials' waiting aside due to various reasons.
As can be seen above, mentioned processes which can be called forms of wasting; which may occur during, before and after the production, may exist at an extent which can increase the product price. The customers do not want to undertake unnecessary costs. The purpose of a lean system in this context, is to eliminate wasting therefore simplifying the manufacture process meanwhile reducing the costs which occur accordingly. Due to the fact that the costs will have been reduced when the wasting is eliminated, the customer satisfaction shall be increased due to lower prices.
Enterprises which adopt mentioned kinds of Lean production also considering listed forms of wasting, can achieve desired profit figures as they don't waste anything from their overall capacity, and the customers pay the actual amount they would need to pay (Deran and Beller, 2014).

Flow: It is to arrange the value-drivers in sequence so as to provide proper flow of products for the customer (Aktaş and Kargın, 2011). Enterprises should try to create a continuous stream of values instead of heaps and clusters. The companies with traditional operational structure cannot obtain proper flow of values, accordingly an approach with lean-oriented teams is recommended (Duque and Cadavid, 2007). This is to say that it forms the basis for the activities from the beginning to the end of the flow process and at every stage. Therefore the flow should be sustained without fault.

Pulling: Unlike the principle of "pushing" in the conventional production methods, Lean production system suggests "pulling" actions. Pulling is the process through which the manufactured products are delivered to the customer without stopping (Stenzel, 2007). Accordingly; pulling system, is an element of the on time manufacturing and it does not perform any production work without signaling from downward-stream to the upward-stream (Balcı, 2011).
Lean teams, with their "pulling" system; through the stream of values towards meeting all orders; focus on stream of service and products. Lean teams, rather than optimizing a department or work center's performance; they provide stream of values on an overall-system basis (Debusk, 2012).
The system, as it gains functionality depending on the demands from the customer; the customer is in pulling status. If there is no demand of any kind; no cells within the flow system shall be actuated. In case of any demands; the system which starts from the demanding customer and extends to the provider shall be actuated and corresponding production shall be performed.

Perfection: As the lean practice is adopted by the enterprises, it becomes even more obvious that continuous improvement is a permanent process. Lean manufacturers adopt a policy of continuous development and renewal (Maraşlı, Çoban and Topbaş, 2014). This is such a belief that, improvement efforts never cease and the efforts keep on the discipline which is required for the development in the field (Duque and Cadavid, 2007).

3.1. Customer Value in Connection with The Lean Principles

Customer value is the most important subject of the plain philosophy and a plain enterprise which adopts it. Determining the customer value with regard to company and distributing the value to overall system and channeling the actions accordingly; are the most significant keys to success for lean enterprise.
Lean enterprises, continuously question the customer value for their every action. Right-on-time delivery, waste and scrap rates, complaints with the product and customer satisfaction criteria monitoring; underline the lean enterprises' value priority in view of the customer. These define issues such as meeting the customer demand and more (Özçelik and Ertürk, 2012).
For Lean management; positioning of the customer starts with designing of a product or service and continues with the after-sales support. So as for the customer-based lean management bi effective, the customers should be

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provided with maximal benefits with lowest spending. When it comes to defining the customer value: the focus is not on presenting an endless value to the customers, but on maximizing the customer value (Stenzel, 2007).
Cost is one of the problems at this point. If the costs of the products which are designed regarding the customer value, turn out to be higher than the calculated figures; so as for the costs to be reduced down to an amount which is acceptable for the enterprise, the design works should be continued before starting with the manufacturing process. The design is about the designing of the products involved as well as the designing of the production process, itself.
In a lean manufacture process, it takes a long time before the appearance of the benefits which occur due to advanced customer satisfaction, low amount of stocks, high product quality (Carnes and Hedin, 2005). Hence the basic principle of the customer satisfaction is designing of the production. Accordingly, reducing the amount of stocks which can be called "sunk cost" within this frame, therefore eliminating the corresponding scrap and faulty product costs, hence providing positive cash flow into the enterprise. As the system becomes more "lean" the product quality will increase and benefits maximization which can be considered as a customer value; shall increase. Because the customers wish to buy the products as per their needs and at the most reasonable cots. Hence they don't want to pay for unnecessary specifications and operational costs reflected onto prices.
Lean production process is all about creating value for the customer. Process and facilities can be labeled as those which add value and those which do not add value. Accordingly the enterprises prefer the costs which do not add any direct value in customer's view and use simple production techniques to reduce wasting (Ertürk and Özçelik, 2008).
Changing the point of view of the organization, Lean production shapes it towards a more customer oriented form hence maximizing the shares of the stakeholders' shares (Terzi and Atmaca, 2011).
The highest profitability for the enterprises is obtained via maximizing the consistent and uninterrupted production flow throughout the stream of values (Balcı, 2011).

3.2. Target Costing in Connection with the Customer Value

Conventional enterprises tend to focus on costs. Accordingly, managers of many public companies focus on the revenue and shares, which is a narrow point of view. Those are important points as well, but not the focus points for a lean organization (Maskell and Kennedy, 2007). This situation focuses more on the values of the company owners rather than that of the customer therefore failing to comply with the spirit of lean philosophy. Because the customer value underlies a lean system.
Customers are not interested in production cost of the service or product, function of the product is what matters for them. Greatest challenge an enterprise shall face; is to determine the product specifications which will create optimal value for its customers meanwhile creating competition advantage for the company. Customer point of view, in regard to lean accounting, develops with "targeted cost" method. Target cost management, establishes the value defined by the customer (Stenzel, 2007).
After determining the value in view of the customer, "target costing" method; continues with the targeted cost calculations required for stream of values which supports value for the needs of the customers and supports cash and profit for the needs of the enterprises. It is a strong method in actuating the lean thinking throughout the enterprise. Target costing method requires integration of the marketing, sales, product design, manufacture, engineering, purchasing etc. and directs everyone to remain focused on creating customer value (Ertürk and Özçelik, 2008).
For a company to be able to apply target costing approach, it must pass through below stages (Terzi and Atmaca, 2011):

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Scheme-1: Target Costing

UNDERSTANDING CUSTOMER REQUIREMENTS	1- Who is the customer? 2- Compare the customer requirements versus product specifications. 3- Customer satisfaction.
UNDERTANDING CUSTOMER VALUE	4- Specifications to meet customer requirements. 5- Balancing the customer value 6- Customer value of goods and products.
TARGET COSTS	7- Value and specifications. 8- Product and service target costs. 9- Target costs relating important elements
MANAGING CUSTOMER VALUE	10- Meeting the target costs for processes. 11- Continuous development.

Source: TERZİ, S. and ATMACA, M., (2011)

First stage in determining of the targeted costs is to establish customer definitions and specifying customer requirements and comparing these to the product specs therefore achieving customer satisfaction. After establishing customer value, product design and manufacture and then manufacturing follows. If the costs of the product defined by the customer values exceed the targeted costs, the product and manufacturing process designs continue, to reach targeted values. At this point, the purpose of the enterprise is to catch up with the target costs without sacrificing from customer value. Continuousity is to be provided after customer value in regard to cost and product and accordingly the customer satisfaction is obtained.

RESULT

Principal purpose of the traditional enterprises is to maximize the market value. However, maximizing the customer value is the factor which underlies the lean philosophy, and the purpose of the lean philosophy is to maximize the customer value accordingly. Besides it is not easy to adopt the new identity and accept total conversion is not easy. The services and products are based on customer value from design stage on. Therefore, production of the services and products which comply with customer-specified specs; designing of manufacturing tool and processes is required. The actions required by the conversion thereof can be listed as follows; eliminating of the works which do not create value if possible, and reducing such if not possible, increasing the quality level of the products, right-on-time delivery of the manufactured products, keeping low stock levels, taking into consideration the customer value during the designing of the services and products. The enterprises which manage to establish above conditions can rise to an advantageous position in competition wars of today. Accordingly we can say that the lean philosophy shall help the associations provide competition advantage in the market by cancelling out the works which don't create value therefore reducing the cost, providing ability to meet the changing customer demand, increasing the variety and quality of the products at a time when product life-cycles are getting shorter.

The enterprises have to determine long term strategies so as to ensure continuity and enhance their strength in the market in which they perform their business. If the determined strategies do not consist of complicated procedures and if the unnecessary works are eliminated and the enterprise is lean at the extent possible; this allows for decisional processes be easier and more flexible, and shorter feedback durations become possible. As a result of this; changing needs and demands of the customers become possible to be met in a short time, and in the final end comes the success for the enterprise: efficiency, profitability and activity. And this is only

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possible for the enterprises who take the lean philosophy for their basis and perform all their actions with the customer value set as their priority; shaping and applying all their processes accordingly.

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LEO STRAUSS'TA MODERNİTENİN KRİZİ VE KRİZİN ÇÖZÜMÜ

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Özet: Strauss, 20. yüzyılda yaşamış Yahudi asıllı bir politika felsefecisidir. Onun felsefesinin en önemli özelliklerinden biri modernite eleştirisidir. Çağdaşı birçok düşünür gibi o da Batı'nın derin bir kriz içerisinde olduğu düşüncesinden hareket eder. Bu krizin çözümü için klasik politika felsefesini göz önünde bulundurmamız gerektiğine dikkat çeker. Klasik politika felsefesi ile Platon, Sokrates ile onların takipçisi olduğunu düşündüğü Farabi ve Maimonides gibi birçok ismi kast etmektedir**.** Strauss'a göre Modern dönemle birlikte bu düşünürlerin görüşleri arasında kopuşlar gerçekleşmiş ve bu kopuşlar neticesinde Batı düşüncesi krize sürüklenmiştir. Klasiklerin çok farklı ve derin anlamlar yükledikleri doğal hak, doğa, erdem gibi kavramlar Modern dönemde ya göz ardı edilmeye ya da klasik anlamlarından çok farklı şekilde değerlendirilmeye başlanmıştır. Bu çalışma kapsamında klasik ve modern düşüncede ortaya çıkmış olan farklılıkların politik ve ahlaki sonuçlarının izleri sürülmeye çalışılıp modernitenin krizine dair genel bir çerçeve sunulmaya çalışılacaktır.

Anahtar Kelimeler: Doğa, doğal hak, erdem, Modern dönem-klasik dönem, kriz.

Giriş

Strauss'un Modern döneme dair düşünceleri ve eleştirileri çok çetrefillidir. O, modernitenin Machiavelli ile başlayan Rousseau ve Nietzsche uğrakları ile birlikte üç dalga şeklinde yayılan ve günümüze kadar gelen bir süreç olduğunu iddia etmiştir. Başka bir deyişle Strauss'a göre modernite, ilk dalgası Machiavelli, ikinci dalgası Rousseau ve üçüncü dalgası da Nietzsche ile başlayıp günümüze kadar etkisini gösteren bir süreçtir. Strauss'a göre dalga dalga yayılan ve kendisi de bir dalga olan modernitenin her bir dalgasının politik bir karşılığı vardır: Machiavelli'nin başlattığı ilk dalga Hobbes ve Locke aracılığıyla liberalizmin ifadesi olur (Hünler, 2000, s. 8), Rousseau'nun başlattığı ikinci dalga Kant ve Hegel aracılığıyla komünizme varır, üçüncü dalga ve aynı zamanda bizim zamanımızın dalgası ise Nietzsche ve Heidegger ile faşizme götürür (Hünler, 2000, s. 9).

Strauss'a göre modernitenin krizi modern politika felsefesinin krizidir. Ona göre Modern dönemle birlikte klasik düşünceden bir kopuş, politik ve ahlaki olanla ilgili birtakım kırılmalar yaşanmıştır. Strauss bu kırılmanın izlerini ilkin Machiavelli'de görür. Çünkü ona göre klasiklerle modernler arasında vuku bulan ilk önemli ayrılık Machiavelli düşüncesinde kendisini gösterir.

Modernite Krizi ve Krizin Çözümü

Machiavelli, klasikleri iki temel hususta eleştirir: Bunlardan ilki, premodern politika felsefesinin hiçbir zaman olmamış devletler ve prenslikler hayal ettikleri düşüncesinden hareketle onların insanın gerçekte "nasıl yaşadığı"na değil de "nasıl yaşaması gerektiği"ne odaklanmalarıdır. Bu noktada Machiavelli geleneksel politika felsefesinin idealist yaklaşımına karşı çıkmaktadır. Onun diğer görüşü ise şu şekilde ifade edilebilir: *Şans (fortuna)* güç ile kontrol edilebilecek bir kadındır. Bu görüşlerin ne ifade ettiğinin anlamak için Srauss'a göre klasik politika felsefesinin en iyi politik topluluk için bir arayış olduğu göz önünde bulundurulmalıdır. Bu rejim, *erdem (virtue)* pratiğini ya da insanın nasıl yaşaması gerektiğini gerçekleştirmek için en iyi olanak sağlayan rejimdir. Klasik politika felsefesine göre en iyi rejimin kurulması kontrol edilemez, ele geçirilemez *şans*a bağlıdır (Strauss, Three Waves Of Modernity, 1989, s. 84). Bu görüş klasiklerle modernler arasındaki bir diğer ayrılıkta radikal bir boyuta ulaşır. Bu farklılık doğa kavramına yüklenen anlamda görülmektedir. Machiavelli'nin önceki yazarların hayali devletleri olarak bahsettiği şey onun en azından dolaylı olarak reddettiği spesifik bir *doğa* algısına dayanmaktadır. Bu algıya göre tüm doğal varlıklar, en azından canlı olanların tümü, bir amaca, peşinde oldukları bir mükemmelliğe yönelmişlerdir. Her bir özel doğaya/türe göre bir de özel mükemmelleşme söz konusudur. Özellikle sosyal ve rasyonel hayvan olarak insan doğası tarafından belirlenen mükemmelleşme vardır. Doğa bir standart, insan iradesinden tamamen bağımsız bir standart sunar. Bu doğanın iyi olduğunu da vurgular. İnsan bütün içerisinde belirli bir yere, oldukça soylu bir yere sahiptir. Fakat o, bu yerde doğa gereği bulunur. O, bu yeri kendisinden kaynaklanmayan bir düzenden dolayı işgal eder. İnsan her şeyin ölçüsüdür demek onun her şeyin efendisi olduğunu söylemenin tam zıddıdır. O bütün içerisinde bir yere sahiptir, onun gücü sınırlıdır. Doğasından kaynaklı sınırları aşabilecek durumda da değildir (Strauss, Three Waves Of Modernity, 1989, s. 85).

Machiavelli düşüncesinde *erdem*, doğa itibarıyla var olamaz. Doğa insana bir ölçü sunmaz. İnsan kendisini doğanın ölçütü yapar. İyi ve kötü yalnızca bir devlet kurulduktan sonra tanımlanabilir (Merrill, 1998, s. 193)**.**

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Strauss'a göre bu Machiavellici temele son dokunuşu Hobbes yapmıştır. Bilindiği üzere Hobbes bizim sadece kendi ürettiğimiz şeyleri kesin bir şekilde bilebileceğimizi söylemiştir ve ona göre bilmek bir çeşit yapmak/üretmektir (Strauss, 1965, s. 174). Bu bakımdan tüm hakikat ve anlam, kökenini insanda bulur. Onlar insanın eyleminden bağımsız bir şekilde var olan bir kozmik düzene içkin değildir.

İkinci dalga Rousseau'nun erdemin değerinin düşürülmesinden duyulan memnuniyetsizlikle başlamıştır. Rousseau, Machiavelli ve Hobbes'ta olduğu üzere erdemin yaşamın korunması ve arzuların tatmin edilmesi şeklinde anlaşılmaya başlanmasını kabul edilemez olarak görür (Merrill, 1998, s. 194). Ancak Rousseau insanın doğası gereği politik hayvan olduğu şeklindeki klasik görüşe dönme adına Hobbes'un doğa durumu kavramını reddetmemiştir (Strauss, Doğal Hak ve Tarih, 2011, s. 303). O, bu konuda Hobbes ile hemfikirdir. Hobbes ve Rousseau arasındaki en temel farklardan biri onların doğa durumundan sivil topluma geçişe dair öne sürdükleri iddialarda yatmaktadır. Hobbes'a göre doğa durumundan toplum durumuna geçiş, basit bir şekilde karşılıklı olarak birtakım haklardan vazgeçişle insan güvenliğinin daha iyi bir duruma getirilebileceği ve bu yüzden de birlikte bir toplum oluşturmaları gerektiği sonucunu çıkaran bir grup yabani (savage) tarafından herhangi bir zamanda başarılmış olabilirdi. Rousseau bunun politik öncesi insan için imkânsız olduğunu görmüş ve bu geçiş işleminin uzun, tedrici bir sosyalleşme ve insanileşme süreci gerektirdiğine işaret etmiştir. O halde Hobbes ve Rousseau arasındaki temel değişiklik aklın yerini tarihin almasıdır. Rousseau düşüncesinde toplum rasyonel bir kararın değil tarihi bir sürecin sonucudur (Merrill, 1998, s. 195).

Rousseau'ya göre her insan doğa gereği özgürdür. Uzun bir tarihsel gelişim ile insan her ne kadar dili, ailevi ilişkileri ve diğer ilkel alışkanlıkları ve nihayetinde madencilik ve tarım sanatlarını edinmiş olsa da bu açık gelişmelere karşın iş bölümü (division of labor), mülk edinimi ve bunların beraberinde gelen tüm kötülükler de ortaya çıkmıştır (Merrill, 1998, s. 195). İnsanın tekrar mutlu olabilmesinin tek koşulu doğa durumunun ilk aşamalarında tatmış olduğu özgürlük ve eşitliği elde etmesine bağlıdır. Fakat bu doğa durumundakine eşit bir tatmin sağlamayacaktır. Doğal özgürlüğün ve eşitliğin bu yapay üretimi böylelikle toplumun ideali olur. Rousseau'nun bu probleme çözümü ise genel iradedir: Toplumun tüm üyeleri yapımına kendilerinin de katkıda bulunduğu yasalara eşit bir şekilde ve tamamıyla tâbi olmalıdır. Yasalardan, pozitif yasalardan daha yüksek bir yasaya, doğal yasaya kaçmanın herhangi bir yolu olmamalıdır. Çünkü böylesi bir girişim yasaların yönetimini tehlikeye atabilir. Pozitif yasanın kaynağı genel iradedir. Düzgün bir şekilde oluşturulmuş bir toplumda içkin olan böyle bir irade aşkın doğal yasanın yerini alacaktır (Strauss, Three Waves Of Modernity, 1989, s. 90-91). Genel irade fikri ile Rousseau *olgu (ıs)* ve *değer (ought)* ayrımını tamamıyla elemine etmiştir. Genel iradeyle yönetilen bir toplumda genel iradenin dikte ettiği ne varsa o olması gerekendir. Rousseau'nun yazılarında insan ilişkilerinde tarihsel sürecin önemine dair sunuşu temelde doğa durumuna doğru geriye bakıştır. O, politik öğretisi olan genel irade ile tarihsel doktrinini birleştirmemiştir. Bu birleştirme işi onun büyük ardılları Kant ve Hegel'in işiydi (Strauss, Three Waves Of Modernity, 1989, s. 91). Bu görüşe göre rasyonel ya da adil toplum, ideal olarak bilinen, genel iradenin hüküm sürdüğü toplum tarihsel süreç tarafından insanın onu gerçekleştirme niyetine bakmaksızın zorunlu bir şekilde gerçekleşecektir. Böylelikle modernitenin ikinci dalgası kültürün ya da toplumun mükemmelleşmesi umudunda doruğa ulaşır. Tüm insanların doğal arzularının yapay tatmini, tarihsel sürecin başlangıcının ideal, evrensel devlette son bulduğu bir toplumda sağlanır. Hegel'in felsefesinde insan artık modern projenin inşa edici efendisi değildir. Bu görev artık tarih ya da tinin bedene bürünmemiş/ruhani rasyonelliği tarafından gerçekleştirilmektedir (Merrill, 1998, s. 197). Böylelikle denebilir ki modernitenin ikinci dalgasında öne çıkan görüş tarihin dönüştürücü güç olarak aklın yerini almasıdır.

Üçüncü dalga tarihin keşfine yönelik tüm bir çabayla tarihin dışına çıkılamayacağına vurgu yapan Nietzsche ile başlamaktadır. Bu Hegel'in genel felsefesine bir karşı çıkış olarak görülebilir. Hegel evrensel, rasyonel ya da kaçınılmaz olarak zirvesine doğru giden ve tarihi yönlendiren bir spritüal süreç veya amaç hakkında konuştuğunda kendisinin bu sürecin dışında olduğunu varsaymaktaydı (Merrill, 1998, s. 199). Yani tarih üstü bir hakikati dile getirmiş olmaktaydı. Nietzsche'ye göre düşüncenin ve eylemin tüm ilkelerinin tarihsel olduğu görüşü, bu ilkelerin tarihsel silsilesinin ilerlemeci olduğu ya da tarihsel sürecin içsel bir yönelmişliğe sahip olduğu yönündeki temelsiz bir umutla zayıflatılamazdı. Hiçbir tarih üstü ideal ya da hakikat yoktur. Nietzsche'nin yıkıcı tarihsiciliği artık rasyonel yasanın otoritesine, bilimsel ilerleme beklentisine, tarihin sonuna yönelik bir mutlaklığa hiçbir şekilde yer olmadığını ilan etmekteydi. Bütün bunlardan sonra herhangi bir kılavuz ya da işaret olmaksızın duran insana kalan yaratıcı eylemdir. Böylelikle Nietzsche, insan potansiyelinden doğanın son kalıntısını da söküp atmıştır. (Merrill, 1998, s. 200) Bu görüşün uzantısı Strauss'un kendi döneminde pozitivizmle birlikte en baskın görüş halini almıştır. Fakat Strauss dönemindeki bu hâkim düşüncelere karşı koyma amacı gütmüştür. O, modernitenin kendi dönemine ilişkin dalgasına istinaden şunları söylemektedir: "Öğrendiğim hiçbir şey, özellikle de klasik biçimindeki 'doğal hakkı', hüküm süren pozitivist ve tarihsici göreceliğe tercih etme temayülümü sarsmamıştır." (Strauss, Doğal Hak ve Tarih, 2011, s. 10). Strauss'a göre doğal hak fikrini terk ederek ve bu terk etme sebebiyle, Alman düşüncesi tarihsel anlamı yarattı ve böylece tam tamına bir görecelilik tutumunu benimsedi (Strauss, Natural Right and History, 1965, s. 1). Bununla birlikte, doğal hak ihtiyacı bugün de yüzyıllardır hatta bin yıllardır olduğu kadar barizdir. Doğal hakkı reddetmek tüm hakların pozitif olduğunu söylemeye gelir ve bunun anlamı hakkın ancak ve ancak farklı ülkelerin yasa koyucuları ve mahkemeleri tarafından belirlendiğidir. Ancak "doğru/adil olmayan" yasalardan ya da "doğru

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olmayan" kararlardan bahsetmek açıkça manidar hatta kimi zaman zorunludur. Böylesi yargılarda bulunurken doğrunun ve yanlışın pozitif haktan bağımsız ve ona üstün bir ölçüsü, kendisine göndermede bulunarak pozitif hakka dair yargıda bulunabileceğimiz bir ölçü olduğunu kastediyoruz (Strauss, Natural Right and History, 1965, s. 2). Strauss'un liberalizme yönelik eleştirilerinin de farklı temellerde olsa da doğal hakkın reddinden kaynaklandığı söylenebilir. Liberallere yönelik eleştirisi genel olarak şu şekilde ifade edilebilir: (…) Buna rağmen yüce gönüllü liberaller doğal hakkın terk edilmesini sadece soğukkanlılıkla değil aynı zamanda rahatlamayla karşılarlar. Bunlar, içkin olarak iyi ya da doğru olanın hakiki bilgisini elde etme konusundaki yetersizliğimizin, bizi iyi ve doğru olan üzerine her fikri hoş görmeye ya da tüm tercihlerin ya da tüm "medeniyetlerin" eşit derecede saygıya layık olduğunu kabul etmeye mecbur bıraktığına inanıyor gibi görünürler. Tüm mutlakların bu tutkulu reddinin ardında, bir doğal hakkın; ya da daha kesin olarak, tek zorunlu şeyin farklılığa ya da bireyselliği saygı olduğu şeklindeki doğal hakka dair özel bir yorumun tanınmasını fark ederiz. Ama farklılığa ya da bireyselliğe saygı ile doğal hakkın tanınması arasında bir gerilim vardır. Liberaller doğal hakkın en liberal versiyonunun bile dayattığı farklılığın ya da bireyselliğin mutlak sınırları konusunda tahammülsüz hale geldikleri zaman doğal hak ile bireyselliğin bastırılmamış gelişimi arasında bir seçim yapmak zorunda kaldılar. İkincisini seçtiler. Bir kez bu adım atılınca, hoşgörü zıddına içkin olarak üstün gibi değil, ama birçokları arasında bir değer ya da ülkü olarak göründü. Başka bir deyişle hoşgörüsüzlük saygınlık bakımından hoşgörüden daha değersiz olarak değerlendirilemedi (Strauss, Natural Right and History, 1965, s. 5).

Klasik düşünce ile modernler arasındaki en temel farklardan bir diğeri de Strauss'un felsefesinde de çok ağırlık verdiği bir düşünce olan ezoterik-egzoterik yazma şeklinin modernlerce artık kullanılmamasıdır. Bu ayrım hem filozofun hem de toplumun bekasını koruma adına klasik düşünürlerce özellikle Platon tarafından elzem görülmüştür. Bu düşünce temelde felsefi hakikatin çoğu durumda toplumun genel yapısı ile çatışabilecek yapıda olmasından dolayı ihtiyatlı bir şekilde dile getirilmesi gerektiğini imler. Filozof ezoterik yazmanın gereği olarak bu tarzdaki görüşlerini satır aralarına gizlemelidir. Potansiyel filozof ya da dikkatli okuyucu bu satır aralarındaki hakiki öğretiyi keşfedebilecekken yığınlar metnin yüzeyindeki egzoterik öğretiyle yetinecektir. Dolayısıyla hem toplum hem de filozof yıkılıp yok olmaktan kurtulabilecektir (Staruss, On a Forgetten Kind of Writing, 1988, s. 222). Modern dönemde, özellikle Aydınlanma ile birlikte felsefeye dair bu algı değişmiştir. Orada felsefi bilgi toplumun tüm tabakalarına yayılması gerektiğine dair bir düşünceyle topyekûn bir aydınlanma hedeflenmiştir. İnsana ve insan aklına duyulan sonsuz güvenle toplumun çelişkilerden uzak, herkesin eşit ve özgür bireyler olarak birbirini tanıdığı bir düzen başka herhangi bir şeye referansa gerek kalmaksızın inşa edilebilecektir. Tabiri caizse cenneti yeryüzünde insan eliyle kurmayı hedeflemişlerdir. İki dönem arasındaki felsefeye dair görüşlerdeki bu farklılık esasında bunların *insan* anlayışları arasındaki farklılıktan kaynaklanmaktadır.

Klasikler, modernlerden farklı olarak bir anda toptan bir aydınlanmanın gerçekleşebileceğine inanmamışlardır. Çünkü insanın, özellikle filozof olmayan çoğunluğun sınırlılıklarının farkındaydılar. Bunlar modern dönemden farklı bir şekilde hedef olarak eşitlik ve özgürlükten ziyade erdemi koymuşlardır. Toplumun erdeme ulaşması ise özellikle Platon düşüncesinde görüldüğü üzere yöneticinin filozof olması durumunda mümkündür. Dolayısıyla klasiklerde filozof ve filozof olmayan, başka bir deyişle avam ve havas ayrımı söz konusudur. Bununla bağlantılı bir şekilde de hedef olarak seçilen şey modernlerden farklı olmuştur. Modernleri özellikle de Aydınlanmacı düşünürleri savundukları görüşe iten düşünce temelde insan aklına ve onun yapabildiklerine güvenden kaynaklanmaktaydı. Bu sebeple insan için tek kılavuz akıl olmalıydı. Modern dönemle birlikte yoğunlaşan kutsal kitap ve vahiy eleştirileri de bununla ilintilidir. İnsanın hayatını yönlendirmek için aşkın ya da ilahi bir kaynağa ihtiyaç duymadığına dair inançla hareket etmektedirler.

Dolayısıyla modern dönemle birlikte değişime uğrayan temalardan bir diğerinin akıl-vahiy çatışması ya da Strauss'un deyişiyle teolojik politik problemin ele alınışına dairdir. Strauss bu konuyu özellikle *The Mutual Influence Of Theology and Philosophy* adlı makalesi ile *Spinoza's Crituque of Religion* adlı eserinde tartışır. Hatta teolojik-politik problem olarak adlandırdığı bu tartışmanın kendisine Spinoza'dan miras kaldığı ve o ondan itibaren tüm yaşamı boyunca temel uğraşlarından biri olduğunu ifade eder. Spinoza eserinde kutsal kitap eleştirisi yaparak akıl lehine vahiy çürüttüğünü iddia etmişti. Fakat Strauss'a göre Spinoza bunu başaramamıştı. Aklı aştığını, deney ve gözlemin ötesinde olduğunu iddia eden bir alana dair açıklamalar aklın sınırları dâhilinde, deney ve gözlem temelinde çürütülemezdi. Dolayısıyla vahiy evrenin tüm gizemi çözülene kadar, eğer böyle bir şey mümkünse, bir ihtimal olarak varlığını sürdürecektir (Strauss, Spinoza's Critique of Religion, 1965, s. 28). Ancak modernler akıl lehine vahyi çürütme teşebbüsünde bulunarak birtakım aşırılıklar sergilemişlerdir. Klasiklerle modernler arasındaki en temel farklardan biri buydu. Klasikler için erdem temelde itidaldi ve onlar bu ikisinin, yani akıl ve vahyin dengeli bir şekilde varlığını sürdürebilmesi için çalışmışlardır.

Strauss'a göre akıl ve vahiy ya da Atina ile Kudüs Batı'nın köklerinde bulunan ve esasında birbiriyle çatışan iki unsurdur. Fakat bu çatışmanın yakından incelendiğinde rahatsız edici bir şey olmak bir yana Batı düşüncesine canlılığını veren bir şey olduğunu da görebileceğimizi söyler (Strauss, The Mutual Influence Of Theology and Philosophy, 1979, s. 111), bunlardan birini çıkarıp aldığımızda ya da birini diğeri adına ortadan kaldırmaya çalıştığınızda bu canlılık yerini krize bırakmaktadır.

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Değerlendirme

Strauss'un modernite eleştirisinde bulunurken bu dönemin karşısına klasik düşünceyi koyması, bize onun klasiklerin düşüncesini kimi yönleriyle modern dönemden üstün tuttuğu çıkarımını yapma hakkını verir. Strauss'un modernite dönemine ilişkin olarak eleştirilerinin en temelde klasik biçimiyle doğal hak kavramının terk edilmeye başlamasına ilişkin olduğunu bir kez daha belirtmeliyiz. Onun amacı antiklerden özellikle Platon ve Sokrates ile Ortaçağ'da İslam düşüncesinden Farabi'nin politika felsefelerini daha dikkatli değerlendirip doğal hak kavramına olan ihtiyacı gidermek gerektiğine ilişkindir. Bunların düşüncesindeki en temel husus erdemin itidal olduğu görüşüdür. Bu itidal düşüncesi onların öğretilerini ifade ederken de ihtiyatlı davranmaları gerektiği inancını doğurmuştur. Bu yüzden Platon, Farabi gibi düşünürler ezoterik yazma tarzını tercih ederek hakiki öğretilerini satır aralarına gizlemişlerdir. Bunlar modernlerin aksine dinin ya da vahyin toplumsal olarak çok önemli olduğunun bilincinde olarak akıl lehine onu ortadan kaldırmaya yönelik bir aşırılık sergilememişlerdir. Yine bunlarla paralel olarak insan kendi sınırlı doğasının farkında olsa da hep daha iyiye daha mükemmel olmaya yönelik bitip tükenmez çabasından vazgeçmemelidir. Bu ilkin akla duyulan sınırsız bir güven ile başlayan modern projenin hiççiliğe varan macerasında insana bir amaç verecek, onu nihilizmin boşluğundan kurtarabilecek bir hedef sunabilecektir.

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LIDAR DATA ANALYSIS WITH DIGITAL IMAGE CORRELATION (DIC) IN OBTAINING LANDSLIDE DISPLACEMENT FIELDS: A CASE OF GSCHLIEFGRABEN LANDSLIDE-AUSTRIA

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Abstract: Comparison of LIDAR datasets were shown as useful in obtaining information about displacement fields of active landslides. Iterative closest point (ICP) and digital image correlation (DIC) are two main approaches used for this aim. Whereas ICP is based on precisely matching point-clouds, DIC is based on cross-correlation of remotely sensed digital imageries. Although DIC is a popular application in fluid mechanics for quantifying flow velocity, its successful applications in estimating displacements resulted from landslides are available. Studies indicate that DIC is more suitable than ICP when computing displacements in the order of magnitude of several meters. DIC is applied to any raster dataset representing a surface property considering the specific advantages and disadvantages of these techniques. In the present study, DIC was applied for an active landslide (named Gschliefgraben) located in Upper Austria. Two time series of LIDAR data obtained in 11th February 2008 and 28th April 2008 was used. The precision of DEMs with 1*1m raster cell size is 20 cm (horizontal) and 15 cm (vertical). Because Gschliefgraben is a big landslide system, DIC analysis was only made for small part of landslide area located close to the crown (head). This part was selected because more activation was observed between two series with visual inspection. Within the study area two separate active parts were observed. According to results, between two time series, the mean displacement rates in these more active parts within study area were obtained 0.66 m (max. 2 m) with sub-pixel precision image matching.

Keywords: Digital image correlation, Displacement field, Landslide, LIDAR

Introduction

Understanding of landslides and their mechanisms is crucial for reduction of landslide hazard. Because landslides are responsible for human casualties, property damage and environmental degradation. Quantification of kinematics of the movement, mostly superficial displacements, is a way of monitoring of a landslide (Gili et al., 2000). Periodic acquisition and analysis of a series of observations over time are needed for monitoring landslides (Stumpf, 2013). Remote sensing is one of the most important technique used in landslide monitoring (Savvaidis, 2003), especially LIDAR systems have gained wider acceptance due to increasing availability, possibility of high density point clouds, and very high resolution 3D information of terrain with high accuracies (Baldo et al., 2009; Barnhart and Crosby, 2013; Jaboyedoff et al., 2012).

Comparison of LIDAR datasets have been shown as useful in obtaining information about displacement fields of active landslides. Iterative closest point (ICP) and digital image correlation (DIC) are two main approaches used for this aim (Daehne and Corsini, 2013). Whereas ICP is based on precisely matching point-clouds, DIC is based on cross-correlation of remotely sensed digital imageries. DIC is an image processing technique used to measure deformation by comparing two digital images (Take, 2015). This technique was originally developed in the field of experimental solid mechanics (Peters and Ranson, 1982). Although DIC is popular in fluid mechanics for quantifying flow velocity, beginning in the late 1990s, DIC was also noticed as well-suited technique to geotechnical engineering applications (White et al., 2001; Take, 2003; Sadek et al., 2003). Image correlation have currently become one of the most efficient techniques to determine horizontal ground displacements due to volcano (Walter, 2011), earthquakes (Van Puymbroeck et al. 2000), landslides (Delacourt et al., 2004; Aryal et al., 2012; Travelletti et al., 2012; Daehne and Corsini, 2013), glaciers (Kääb et al., 2005), ice flows or sand dune migrations (Rosu et al., 2014).

In the present study, two time series of LIDAR data obtained in 11th February 2008 and 28th April 2008 was used to apply DIC analysis in Gschliefgraben landslide. The precision of DEMs with 1*1m raster cell size is 20 cm (horizontal) and 15 cm (vertical). DIC analysis was applied by using image correlation software (CIAS), which matches offsets between two images based on normalized cross-correlation. DIC analysis was only made for small

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part of landslide area (about 10 Ha) located close to the crown (head) of landslide.

Materials and Methods

Study Area and LIDAR Datasets

Gschliefgraben landslide system, located in Upper Austria (municipality Gmunden), was selected as study area (Figure 1). The top, left, right, and bottom coordinates of the area in MGI/Austria GK M31: EPSG Projection are 306000.25, 35399.75, 38500.25, and 303899.75, respectively. Detailed information on this landslide, an earth flow amounting about 3.8 million m^3 accumulated solids, was well represented by Marschallinger et al. (2009). In the present study, two time series of LIDAR data obtained in 11th February 2008 and 28th April 2008 was used. The precision of DEMs with 1*1m raster cell size is 20 cm (horizontal) and 15 cm (vertical) (Figure 2).

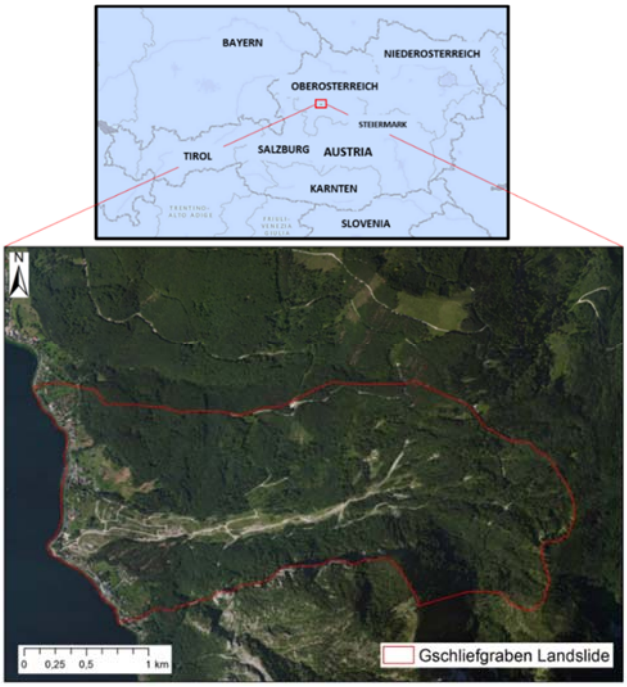

Figure 1. Location map of Gschliefgraben Catchment

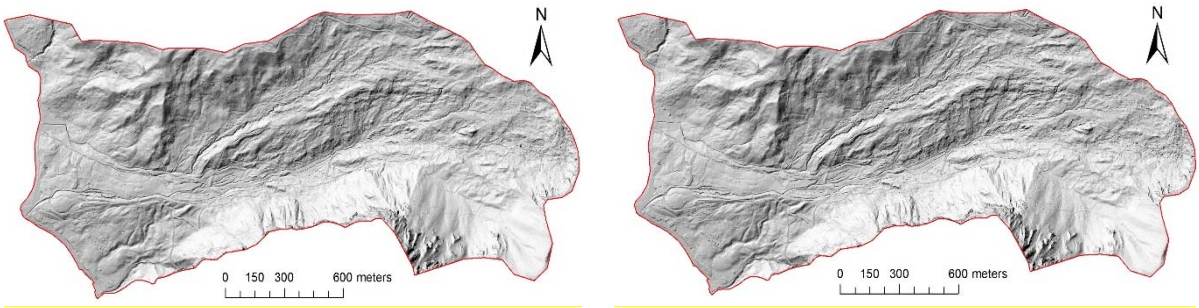

Figure 2. Shaded reliefs of LIDAR data: 11th February 2008 (left) and 28th April 2008 (right).

Digital Image Correlation

Digital image correlation (DIC) is a deformation measurement technique to obtain 2D/3D displacement field by correlating two image acquired at different time (Travelletti et al., 2012). The detailed description of cross-correlation applied to image can be found in the literature (Adrian, 1991). DIC uses pixel intensity values to calculate incremental displacements with subpixel accuracy (Take, 2015). The basic parameters of the correlation are the “sliding window”, the “search space” and “step” (Rosu et al., 2014). One of images of the series is chosen as a reference image. All images are divided into small rectangular regions consisting of NxN pixels (vary from 7x7 pixels to 70x70 pixels and even more) (Malesa et al., 2011). DIC algorithm is then tracking the position of each subset from the reference image in all other images of the series. Corresponding subsets are matched by

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finding the maximum of the normalized cross-correlation function coefficient. For each subset in-plane displacement vectors are then calculated. The basic working principle of DIC is given in Figure 3. In the present study, DIC was applied to image pairs of "hillshade" grayscale images, derived from LIDAR DTMs. Because Gschliefgraben is a big landslide system, DIC analysis was only made for small part of landslide area located close to the crown (head) (Figure 4). This area was selected because more activation was observed between two series with visual inspection. Within the study area two separate active parts were observed.

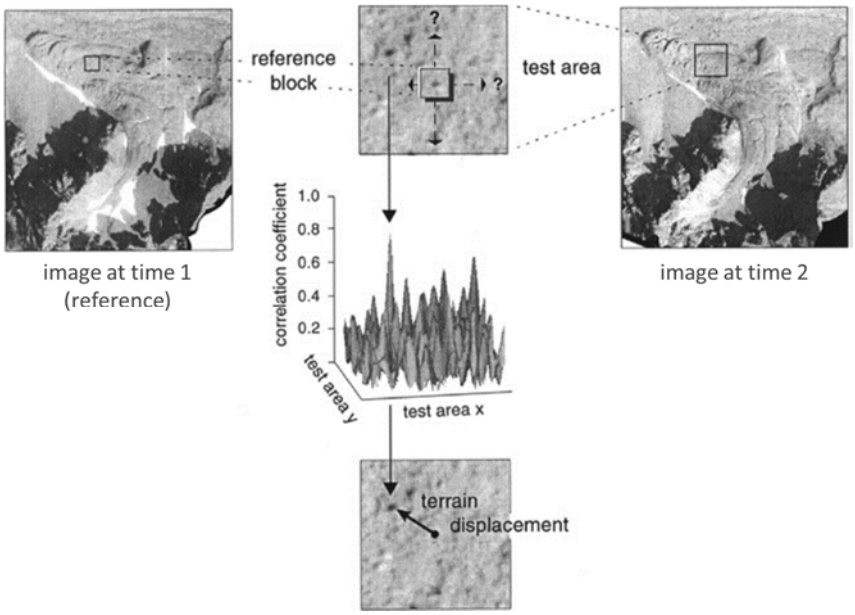

Figure 3. Schema of measuring surface displacements from two images acquired at different time by block-correlation techniques (Kääb and Vollmer, 2000)

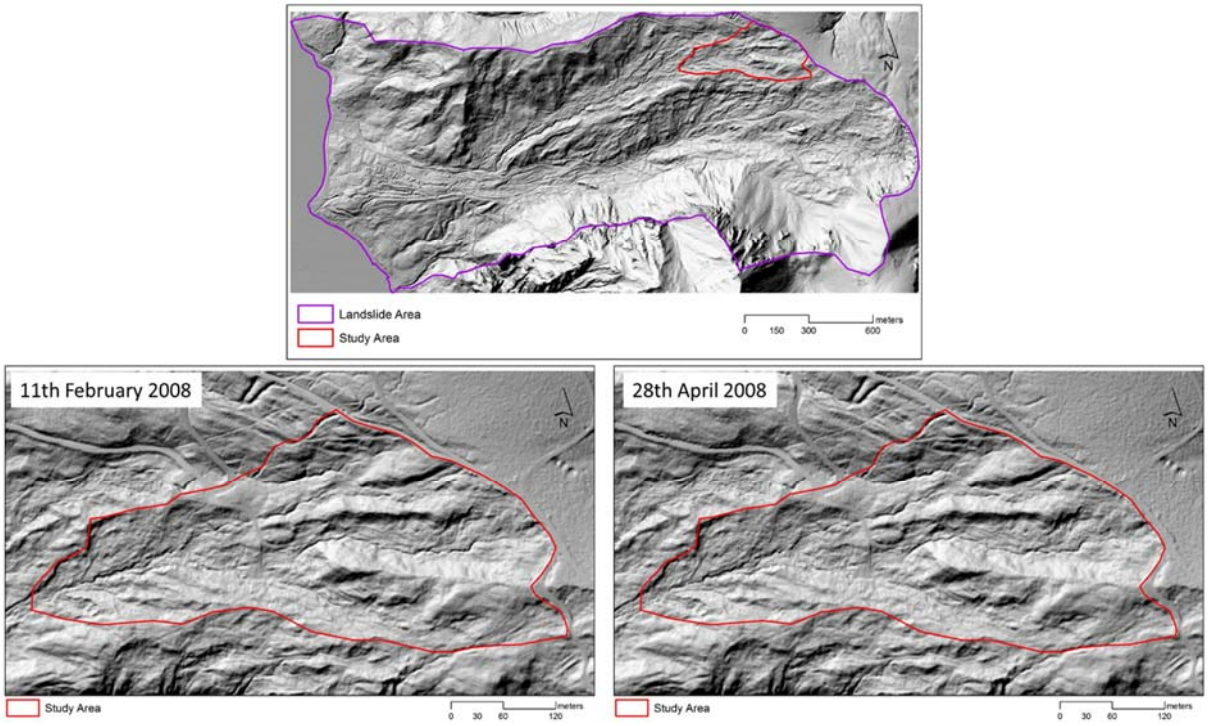

Figure 4. Selected active part of Gschliefgraben landslide for DIC analysis

DIC analysis was applied by using image correlation software (CIAS), which matches offsets between two images based on normalized cross-correlation. CIAS was originally written by M. Vollmer and A. Kääb (Kääb and Vollmer, 2000). The inputs (i.e. both images need to be exactly same resolution and to be single channel

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(grayscale). The output is ASCII list of offsets in Cartesian and polar coordinates and correlation coefficients. Measuring an individual horizontal displacement vector basically follows two steps (Kääb and Vollmer, 2000): (1) choosing image section with sufficient contrast in image at time 1, called as "reference block", (2) searching the corresponding image section within a sub-area in the image at time. The ground coordinates of central pixel within the reference block are known due to usage of already georeferenced data ("Geotiff"). The difference of coordinates of central pixel within reference block and coordinates of corresponding location of central pixel in test block where correlation coefficient is maximum provides displacement. The size of the test area has to be chosen according to expected displacement. Also, textural characteristics of the ground surface have to be taken in to account for choosing the size of reference and test blocks (Kääb and Vollmer, 2000). In the present study, size of reference block was 16, and size of test block was defined as 64. Then, results from DIC was compared with displacements estimated from tracking well-constrained morphological features on shaded relief images (Daehne and Corsini, 2013; Esparmer, 2010).

Results and Discussion

DIC analysis was used to determine displacement fields from two time series (11th February 2008 and 28th April 2008) of LIDAR data with 1 m resolution in Gschliefgraben landslide. Between two time series there are 77 days. Shaded relief data with 1 m resolution were generated before DIC analysis was applied. CIAS software was selected, even though there are many other options (such as Cosi-corr, DPIVsoft Matlab, etc.) to apply DIC, because CIAS enables the users to use Geotiff data which is georeferenced, thus any further step is not necessary to convert the results to real world units. In the present study, there is no field check or any GPS surveying, however clearly identifiable features over the moving mass were tracked via visual inspection was carried out to get displacement rates in order to compare DIC results. The results were obtained as compatible with manually identified displacements rates.

Study area selected for DIC analysis is 10.19 Ha and there are two more active parts clearly identifiable by visual inspection. DIC analysis provided high displacements within these 2 more active parts of landslide (depicted in Figure 5) as expected. According to results, between two time series, displacement rates within study area were obtained between 0-32.2 m with sub-pixel precision image matching. DIC provided displacements for 25445 points. The mean displacement was obtained as 0.23 m. In the study area, 51 of all points have displacements higher than 2 m of which mean of maximum correlation coefficient is less than 0.70. Of these points, only 3 points showed displacement more than 30 m, 10 points showed displacement more than 20 m, 21 points showed displacements more than 10 m, and 17 points showed displacements more than 2 m. These points were interpreted as unrealistic (extreme) values of displacements which are not compatible with real situation.

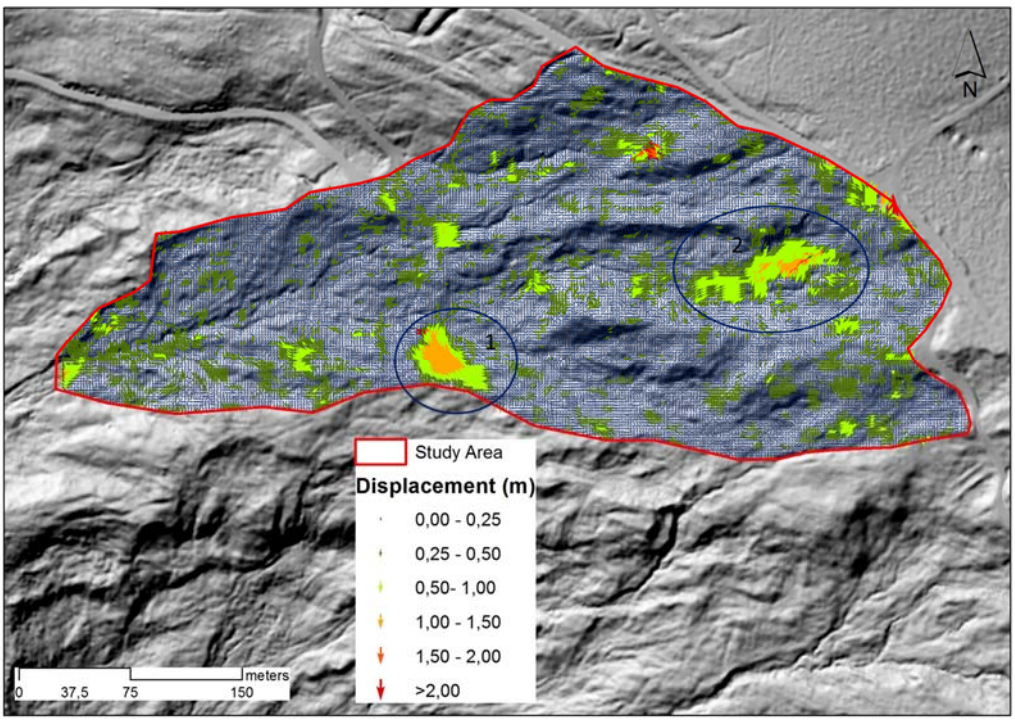

Figure 5. DIC results and two more active part of landslide (coded as 1 and 2)

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Displacements obtained from DIC in two more active parts, coded as 1 and 2 (see Figure 5), were given in Figure 6 and Figure 7. Between two time series, the mean displacement rates in these more active parts within study area were obtained 0.66 m (max. 2 m) with sub-pixel precision image matching. In first active part of landslide (code no 1), displacements were observed as mean of 0.86 m and also higher than 2 m of displacements available (red circle in Figure 6) was interpreted as unrealistic. Movement direction was observed as NW, as expected due to topography. As similar to 1 coded active part of landslide, higher than 2 m of displacements was interpreted as unrealistic in 2 coded active part of landslide. Mean displacement in the 2 coded active part of landslide was obtained as 0.64 m. The movement direction in this active part of landslide was observed as SW within the upper slope, and as W within the lower slope.

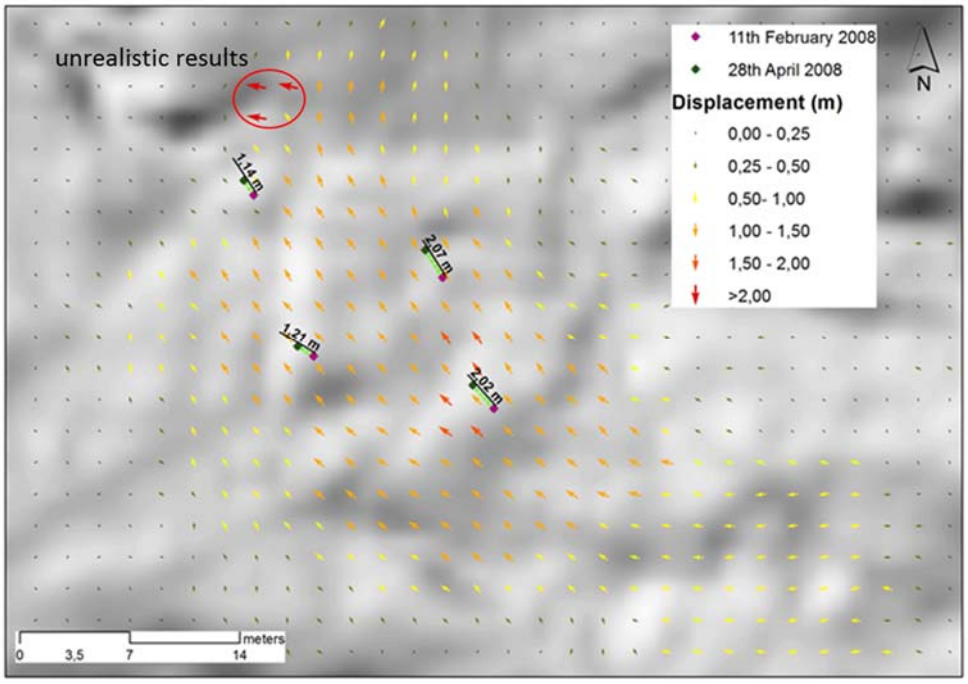

Figure 6. DIC results and displacements from manually tracked features on shaded relief within 1 coded active part of landslide

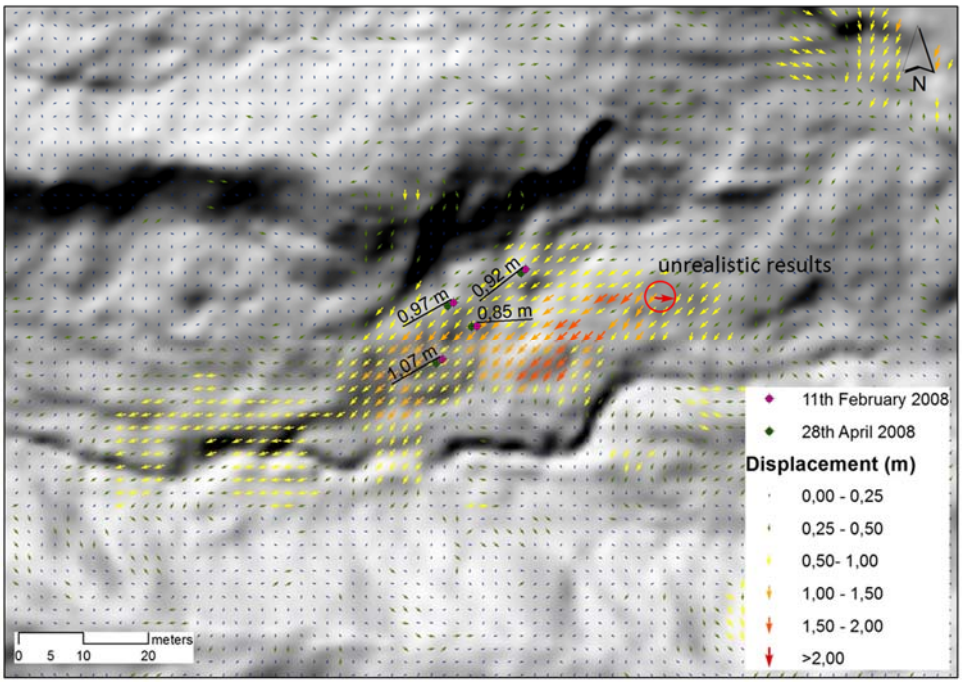

Figure 7. DIC results and displacements from manually tracked features on shaded relief within 2 coded active

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part of landslide.

Conclusion

Our study showed that the DIC analysis applied to shaded relief from LIDAR data can provide spatially continues, smooth, and compatible displacement fields with real situation. As Aryal et al. (2012) and Daehne and Corsini (2013) stated, the accuracy of DIC displacement measurements is of the order of a few meters, which might be an acceptable limit. The success of DIC applied to LIDAR data is closely related to presence of morphological features which must maintain their shape remaining identifiable in shaded relief maps (Daehne and Corsini, 2013). Because we couldn't have any information from field or any axillary data (such as GPS), the compatibility of displacements were evaluated by using displacements obtained by manual tracking of identifiable features over moving mass. Although the DIC analysis preferably requires having knowledge of displacement magnitude to constrain the parameters, the first-hand knowledge of displacement can easily be acquired by comparing positions of identifiable features over time (Aryal et al., 2012).

Acknowledgements

This study was granted by The Scientific and Technological Research Council of Turkey (TUBITAK) 2214/A-BIDEB Science Fellowship and Grant Program (Application No: 1059B141400900) and TUBITAK 2219-Post-Doctoral Research Scholarship (Application no: 1059B191500602). The authors would like to thank Gerhard Volk for supports in achieving data. In addition, special thanks to Forest Technical Service for Torrent and Avalanche Control (Section Upper Austria, Linz) for providing LIDAR data.

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LIQUEFACTION POTENTIAL AND POST-LIQUEFACTION SETTLEMENT OF SOMA WASTEWATER TREATMENT PLANT

Erdal UNCUOĞLU[1] Zülküf KAYA [2] Aykut EROL[3] Hacı Bekir KARA [4]

ABSTRACT

During 1953 Yenice-Gönen Earthquake, M_w=7.2, heavy damage was encountered in place around Yenice-Gönen and damage and casualties was occurred in central districts. According to official estimates, approximately 250 people killed, more than 8000 buildings including school, official buildings, mosques destroyed or heaviliy damaged. The local soil conditions was also one of the important factors in different structural damage patterns observed all around the city. Some structures can be collapsed due to soil amplification and some structures can be settled or tilted due to severe liquefaction of sands.

In this study, wastewater treatment plant construction site is selected as a case study to evaluate liquefaction potential of the site according to seismic risk analysis and peak ground acceleration, and to calculate settlements occurred after earthquake. Wastewater treatment plant construction area is located at the city of Manisa.

As a first step, local soil conditions at the site were examined using borehole logs, laboratory and in-situ test results. Liquefaction analyses were performed to take into account the soil conditions. Finally, earthquake-induced settlements were estimated based on Ishihara and Yoshimine (1992) procedure.

Keywords : Seismic risk analysis, liquefaction potential, liquefaction-induced settlement

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1. Introduction

The 1953 Yenice–Gönen earthquake occurred at 21:06 local time on 18 March in the province of Çanakkale and Balıkesir in the Marmara region at western Turkey. It had a magnitude 7.5 on the surface wave magnitude scale and a maximum felt intensity of IX (Violent) on the Mercalli intensity scale. According to Kandilli Observatory and Earthquake Research Institute, this earthquake's magnitude was announced as 7.2 and its epicenter coordinate were defined as 39.99°K ve 27.36°D. The earthquake which has 10 km focal depth, coordinate of epicenter point is located about 12 km northeast of Yenice. The quake occurred along the Yenice–Gönen Fault, which is a southern extension of the North Anatolian Fault Zone.

In this study, wastewater treatment plant construction site located at the city of Manisa is selected as a case study. As a first step, local soil conditions at the site were examined using borehole logs, laboratory and in-situ test results. Liquefaction analyses were performed to take into account the soil conditions. Finally, earthquake-induced settlements were estimated based on Ishihara and Yoshimine (1992) procedure.

2. Local Soil Conditions

The construction area is located at the city of Manisa, district of Soma. Four boreholes were drilled in the wastewater treatment plant construction area. The depth of each borehole was about 15.0 m. The layout of the wastewater treatment plant and locations of the soil borings made in construction area have been shown in Figure 1.

The idealized soil profile represented the construction area has been estimated based on interpretation of the subsurface conditions encountered in the borings. The idealized soil profile was summarized in the below and indicated in Figure 2.

0.00 – 0.25 m.	Topsoil
0.25 – 5.00 m.	Silty Sand (SM)
5.00 – 15.00 m.	High Plasticity Clay (CH)

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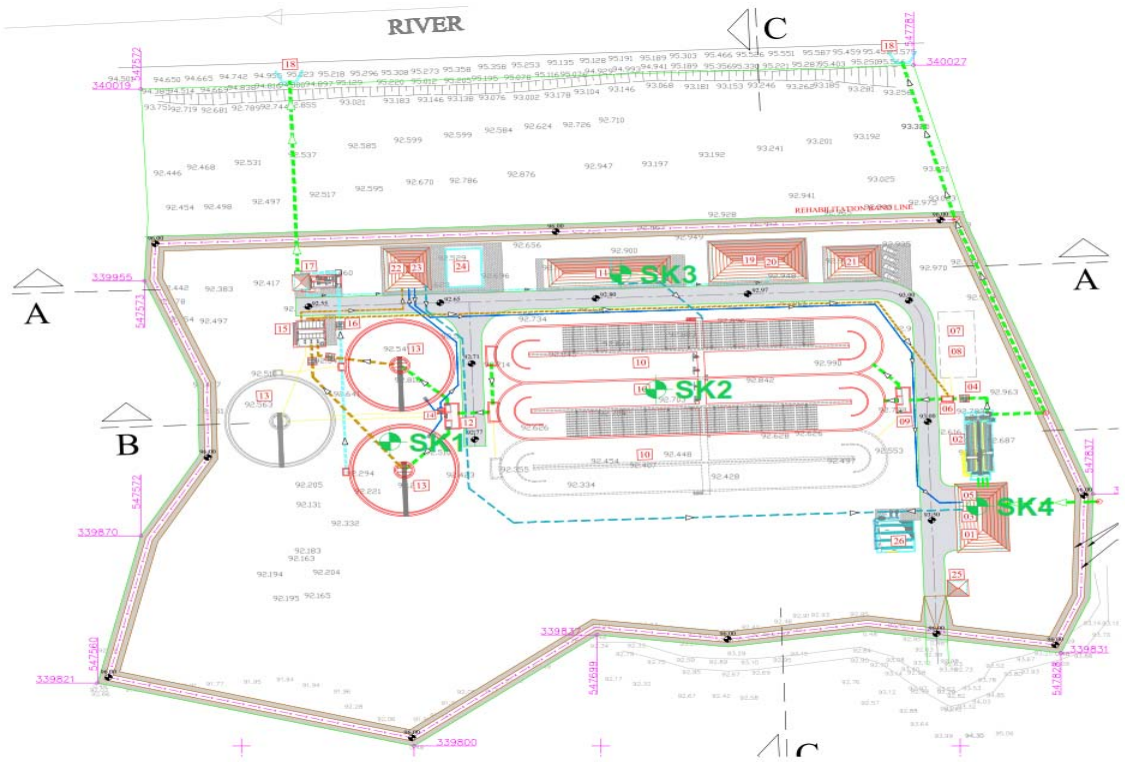

Figure 1. The layout of the Wastewater Treatment Plant and Locations of the Soil Borings

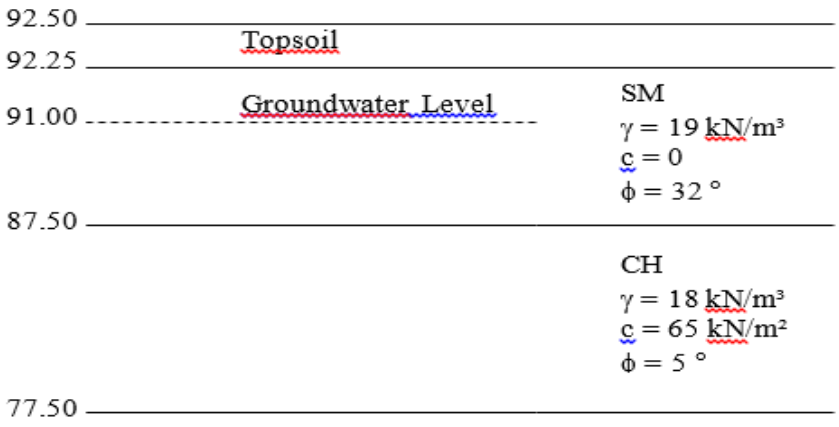

Figure 2. Idealized Soil Profile

The N values obtained from Standart Penetration Tests (SPT), the soil class considering the Unified Soil Classification System (USCS), fines content (FC) and unit weight (γ) of the layers in the profile with respect to the laboratory test results have been summarized for each of the borehole in Table 1. The groundwater level was encountered at the depth of -1.50m in the borings.

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The wastewater treatment plant consists of several constructions such as Aeration Tank, Sludge Dewatering Building, Secondary Clarifiers, Oil and Grease Holding Unit, Blower and Transformer Station, Screening and Inlet Pumping Station and Administration Building. The construction area is approximately 48.500 m².

Table 1. SPT-N Values and Laboratory Test Results for all Boreholes

Depth (m)	Borehole - SK1				Borehole – SK2			
	SPT-N	USCS	γ (kN/m³)	FC (%)	SPT-N	USCS	γ (kN/m³)	FC (%)
1.5	18	ML		54.1 (NP)	15	SM	19.0	16.9
3.0	18	SM	19.0	25.5	15			14.9
4.5	19				15			14.9
6.0	15	CH	18.5	93	14	CH	18.0	95.0
7.5	17				17			
9.0	18				18			
10.5	23				23			
12.0	22				UD			
13.5	28				25			
15.0	31				28			
Depth (m)	Borehole – SK3				Borehole – SK4			
	SPT-N	USCS	γ (kN/m³)	FC (%)	SPT-N	USCS	γ (kN/m³)	FC (%)
1.5	13	SM	19.0	35.2	18	GW	20.00	9.1
3.0	15				19	SM	19.0	14.9
4.5	15				23			14.9
6.0	24	CH	18.0	93.8	21	CH		95.1
7.5	20				24			
9.0	23				26			
10.5	25				27			
12.0	28				26			
13.5	30				31			
15.0	32				35			

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3. Seismicity of the Region

The town of Soma, Manisa is at I degree earthquake zone based on maximum acceleration according to Turkey Seismic Zoning Map prepared by the Ministry of Public Works and Housing and entered into force by the Council of Ministers via decision No. 96/8109 dated 18/04/1996.

The region is very complicated because of the ongoing tectonic earthquakes. The region has the high potential for earthquakes in the future. Earthquakes with larger than magnitude 3.0 between 1900-2015 in the town of Soma, Manisa and the area around it have been indicated in Figure 3.

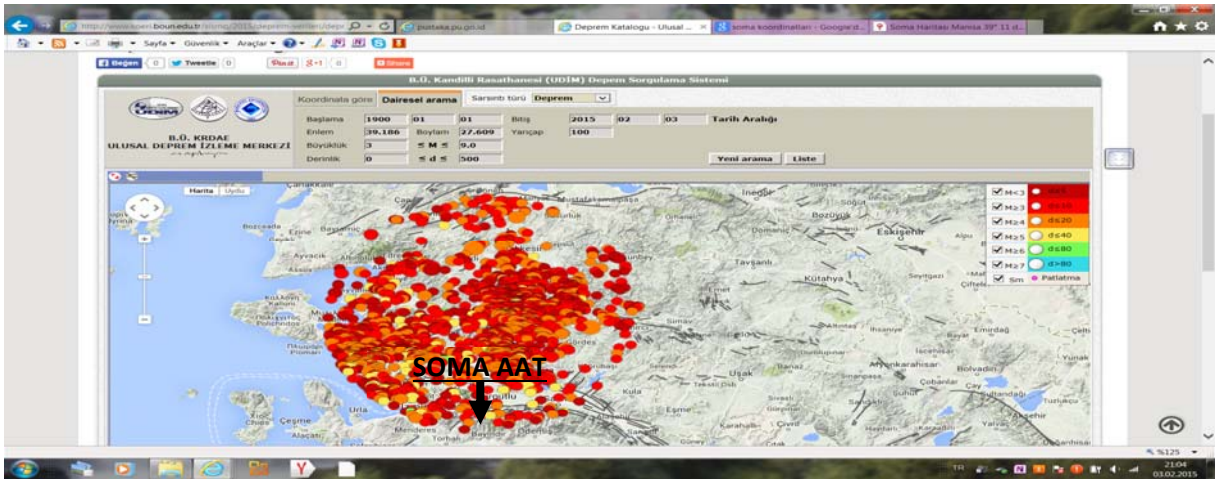

Figure 3. The Tectonic Map of the Town of Soma, Manisa and The Area Around It (Kandilli Observatory and Earthquake Research Institute - 03.02.2015)

3.1. Seismic Risk Analysis

Gutenberg - Richter described a methodology to estimate the magnitudes of earthquakes seem possible in the future based on the magnitudes of past earthquakes. In the seismic risk analysis, this method is used together with the Gumbel`s Annual Extreme Values Method. According to the method proposed by Gumbel, the distribution of the annual maximum earthquake magnitude is given by:

$$G(M) = e^{-\alpha e^{-\beta M}} \quad (1)$$

M: Magnitude of earthquake,

α, β: Regression coefficients,

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G(M): Probability of not exceeding the earthquakes having magnitudes more than M in one year.

Gutenberg-Richter (1956) proposed the following relationship which relates the earthquake magnitude to the total number of earthquakes in one year:

$$LogN = a - bM \quad (2)$$

a and b : Regressions coefficients,

N : The number of earthquakes with a magnitude of M or greater in one year

The relationships between the equations 2 and 3 are as follows (Tezcan, 1996).

$$\alpha = 10^{a}, \quad a = \text{Log}\alpha$$
$$\beta = b / \text{Loge}, \quad b = \beta\text{Loge}$$

$$N = \alpha e^{-\beta M} = -\text{LnG} \quad (3)$$

The relationship obtained with respect to the calculated values of the Log N and Magnitudes has been shown in Figure 4.

The maximum magnitude value which is possible to occur in a frequency period corresponding to 115 year has been estimated as M = 6.75 for the Soma Wastewater Treatment Plant construction area. The maximum magnitude value has been estimated based on the earthquakes with larger than magnitude 3.0 between 1900-2015 in the town of Soma, Manisa and the area around it using the equation given below.

$$\text{Log } N = 3.41 - 0.81M + \log T_r$$

Annual magnitude value observed mostly has been obtained as M = 4.20.

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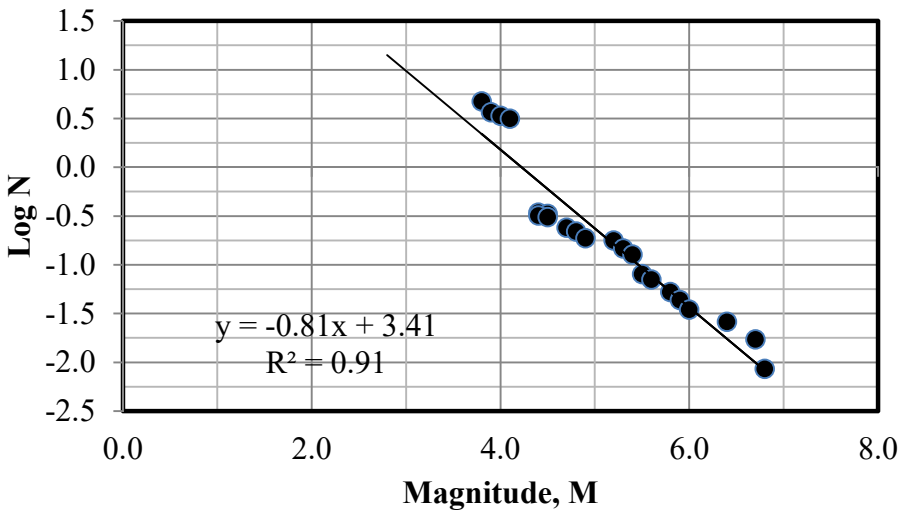

Figure 4. The Relationship Between Log N and Magnitüd

4. The Evaluation of Liquefaction Potential

The liquefaction analyses performed with the method mentioned above gave FS<1 for sand layers in all the four boreholes. The liquefaction potential of granular soils is usually evaluated using the simplified method proposed by Seed and Idriss (1971) using the soil parameters, PGA and Moment Magnitude (M_w). This procedure was modified and improved by Youd et al. (2001). Because of the town of Soma is located in first-degree earthquake zone, effective ground acceleration coefficient assumed as peak ground acceleration. Therefore, the value of effective ground acceleration has been taken as equal to 0.40g. The values of the safety factors against liquefaction obtained for the depths considered for the earthquake of which magnitude of 6.75 are given in the Table 2. As seen from Table 2, Silty Sand (SM) layers have liquefaction potential for the earthquakes of which magnitude is 6.75. On the other hand, liquefaction is not expected in High Plasticity Clay (CH) layers.

5. Determination of Settlements Following Liquefaction By An Emprical Approach

Liquefaction settlements at the investigation site were estimated for each of the four boreholes with the method proposed by Ishihara and Yoshimine (1992). The method is obtained by using the results of simple shear tests, which were utilized to establish a family of curves for various relative density (or SPT-N1) values with respect to factor of safety against liquefaction (FS) and volumetric strain (ε_v). Additional details are presented by Ishihara (1996).

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Table 2. The Results of the Liquefaction Analyses

SK NO	Sample Type	Depth (m)	USCS	$FS_{7.5}$	$FS_{6.75}$
SK-1	SPT	1.50	ML	1.09	1.43
SK-1	SPT	3.00	SM	0.75	0.99
SK-1	SPT	4.50	SM	0.67	0.88
SK-2	SPT	1.50	SM	0.78	1.02
SK-2	SPT	3.00	SM	0.58	0.76
SK-2	SPT	4.50	SM	0.52	0.68
SK-3	SPT	1.50	SM	0.82	1.07
SK-3	SPT	3.00	SM	0.61	0.80
SK-3	SPT	4.50	SM	0.54	0.71
SK-4	SPT	1.50	SM	0.82	1.07
SK-4	SPT	3.00	SM	0.73	0.96
SK-4	SPT	4.50	SM	0.65	0.85

Finally, the volume change was integrated with depth to determine the liquefaction induced settlements at the ground surface. The settlements assessed for SK1, SK2, SK3 and SK4 using this method are 3.0, 9.75, 9.90 and 5.40 cm, respectively. It should be noted that these settlements do not include the settlements in clay layers.

6. Conclusions

In present study, wastewater treatment plant construction site is selected as a case study to evaluate liquefaction potential of the site according to seismic risk analysis and peak ground acceleration, and to calculate settlements occurred after earthquake. Building settlements following Yenice–Gönen earthquake are investigated at a site in Manisa, Soma. The maximum magnitude value which is possible to occur in a frequency period corresponding to 115 year has been estimated as M = 6.75 for the Soma. Silty Sand (SM) layers have liquefaction potential for the M_w=6.75. The settlements of the ground surface on the order of 3.3 to 9.9 cm calculated with the method proposed by Ishihara and Yoshimine (1992).

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LOCAL SOIL CLASSIFICATION AND SEISMIC ZONATION STUDY BY UTILIZING ReMi METHOD AND BOREHOLE DATA IN ISPARTA BASIN

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Abstract: This study contains site classification of sediments in Isparta basin based on the current seismic code. Determination of S-wave velocity is very important in the soil classification survey. Among the several techniques of site investigation the ReMi method (Refraction Microtremor) allow the determination of the shear wave velocity profile. Hence, the Refraction Microtremor (ReMi) method is being used around the world by the geotechnical and geophysical community to determine shear-wave velocities. In this study we present refraction microtremors (ReMi) measurements done at sites underlain by different soil types in Isparta. The ReMi data were collected along N-S directional arrays and using standard refraction equipment employing 12 channels.

The project site is located in a region which has the potential seismic events along the Isparta tectonic lines. Sediment characteristics of the region were determined and soil profiles were characterized by ReMi method at different locations. Soil sediments in the Isparta basin will influence ground motions from earthquakes occurred seismic activity in region. Shear wave velocity profiles of these sediments are important for construction industry and urbanization site response in this region.

The geological characteristics of these sedimentary units were compared with the geological boring and seismic site characterization studies to classify the soil deposits. Consequently, the regional site classification map of Isparta basin considering site classes was assessed based on the average shear wave velocity (VS30) results and the shear wave velocity data and thickness of the surface layer based on the Vs values in the NEHRP.

Keywords: Isparta Basin, ReMi (Refraction Microtremor), Borehole, NEHRP

Giriş

Gelişen günümüz koşullarında yerel zemin bilgileri, mühendilik yapılarında deprem etkileri ve zararlarının önceden belirlenmesinde en önemli parametrelerinden birisidir. Bu sebep itibariyle de deprem mühendisliğinin üzerinde durduğu konuların arasında yer almaktadır. Deprem odağına aynı mesafede olmasına rağmen farklı zeminler deprem etkisine birbirlerinden ayrı etki sağlayabilirler. Bu durum özellikle 1985 Copala, 1995 Kobe, 1999 Kocaeli gibi depremlerde etkin bir şekilde gözlenmiştir. Gerek bu depremlerde gerekse farklı depremlerde zemin koşullarından kaynaklı etkinin varlığı birçok araştırmacı tarafından ortaya konulmuştur (Furuma ve Singh 2002; Özel vd. 2004; Hallier vd. 2008; Frankel vd. 2009).

NEHRP zemin sınıflaması kriterlerine göre zemin özelliklerinin belirlenmesinde en önemli bilgi kesme dalgası hızının belirlenmesidir. Jeofizik yöntemlerden ReMi (kırılma-mikrokırınım) tekniği, yeterli açılım ile 100 m derinliğe kadar kesme dalgası hızının elde edilmesinde son yıllarda aktif şekilde kullanılmaktadır (Louie 2001; Kanbur vd. 2008; Büyüksaraç vd. 2013; Barnard vd. 2015). Bu çalışmada, ülkemizin önemli tektonik elemanlarından biri olan Isparta açısının güneyinde kalan Isparta şehir merkezini kapsayan 12x15 km alanın makro ölçekte zemin sınıflaması yapılması amacı ile Tübitak projesi alınmıştır. Bu doğrultuda bölgeyi temsil eder nitelikte belirlenen 176 noktada ReMi yöntemi ile Vs dağılım ve Vs30 zemin sınıflaması haritaları hazırlanmıştır. Bölgede devlet su işleri tarafından kuyu kütük bilgileri ile çalışmadan elde edilen verilerin uyumluluğu incelenmiştir.

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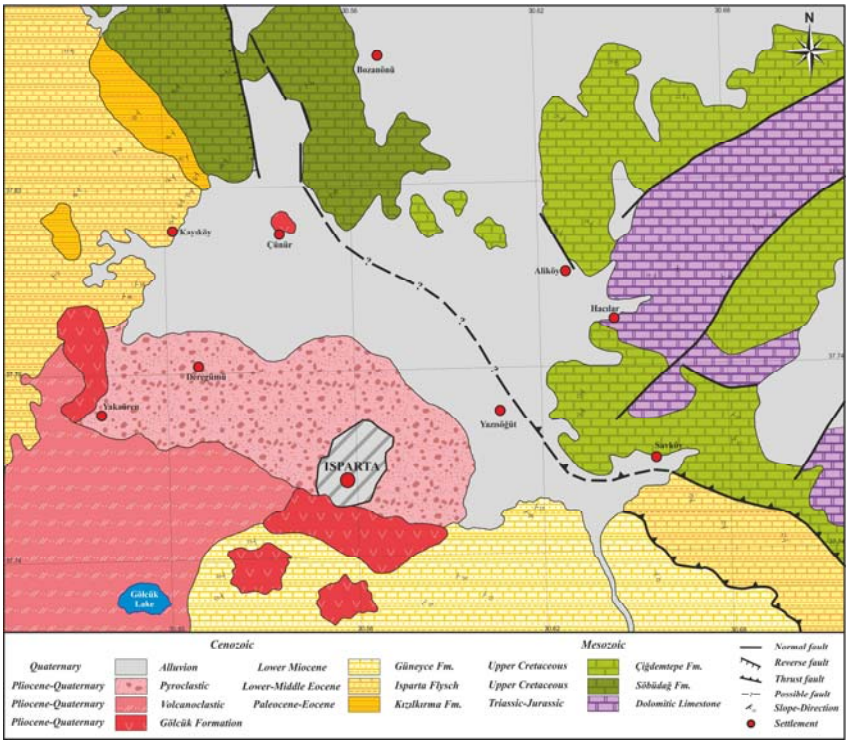
Çalışma Alanı ve Jeolojisi

Çalışma alanı olan Isparta ovası, temel olarak otokton ve allokton jeolojik birimlerden oluşmaktadır (Karaman 1990; Yılmaz 2010). Şekil 1'de proje kapsamında hazırlanan çalışma alanı ve yakın çevresinin jeolojik haritasında da görüleceği üzere otokton Davraz kireçtaşı, Söbüdağ kireçtaşı, Çiğdemtepe formasyonu, Güneyce formasyonu, Kızılkırma formasyonu, Gölcük volkanitleri ve Volkanik filişlerinin Isparta şehir merkezini çevrelediği, allakton alüvyon malzemenin ise ova düzlüğüne yayıldığı açıkça görülmektedir.



Şekil 1. Çalışma alanı ve yakın çevresi jeoloji haritası. (Olası fay olarak gösterilen yapı Demer vd. 2010'dan düzenlenmiştir)

Ovayı çevreleyen Eosen ve Kretase yaşlı kireç taşı üyeleri yer yer tabakalı masif görünümlü kireçtaşlarından oluşmaktadır. Düzlük alan içerisinde uzanan kuvaterner alüvyon malzeme çakıl, kum, kil ve silt içermektedir(Karaman 1990).

Materyal ve Metot

Bu çalışmada Isparta şehir merkezi ve yakın çevresinin Vs dağılım haritalaması ve zemin özelliklerinin belirlenmesinde jeofizik yöntemlerden ReMi tekniği kullanılmıştır. Teknik doğal gürültüyü enerji kaynağı olarak kullandığı için hızlı ve ekonomik bir yöntem olarak ön plana çıkmaktadır. Şekil 2 de dijital yükseklik haritasında (DYH) veri kazanımı yapılan 176 ölçüm lokasyonu sarı noktalar ile gösterilmiştir. Veri kazanım noktaları arası mesafe yaklaşık 1 km olmasına karşın yapılaşmanın yoğun olduğu şehir merkezinde bu mesafe 250 metreye kadar azaltılmıştır.

ReMi Yöntemi

Yüzey dalgası analiz yöntemlerinden birisi olan ReMi tekniğinin detayları ve uygulamaları literatürde yaygın birşekilde anlatılmaktadır(Louie 2001; Başokur 2007; Silahtar ve Kanbur 2015). Tekniğin metodolojisi Louie 2001 den özetle şu şekildedir;

a. τ-ρ dönüşümü,
b. verin τ-ρ ortamından Fourier dönüşümü ile ρ-f ortamına dönüştürülmesi,
c. Louie 2001 tarafınan gösterildiği gibi güç spektrumunun alınması olarak özetlenebilir.

Çalışmada kesme dalgası hızının (Vs) belirlenmesinde sinyal biriktirme özelliği bulunan 12 kanallı Geode Ultra-Light sismik cihazı kullanılmıştır. Literatürde bu tür çalışmalarda kullanılması önerilen 4.5 Hz P jeofonları alıcı olarak tercih edilmiştir(Louie 2001; Kanbur vd. 2008; Silahtar ve Kanbur 2015). 2 ms örnekleme aralığı, 32 s kayıt boyu uzunluğunda ve 10 m jeofon aralığınaki arazi verileri, ReMi spektral oranını yükseltmek amacı ile herbir ölçüm noktasında 10-12 arasında değişen tekrarlar ile gerçekleştirilmiştir (Şekil 3a). Veri kazanımı yapılan verilerin yukarda özetlendiği şeklide güç spektrumları alınıp spektrumlar üzerinde dispersiyon

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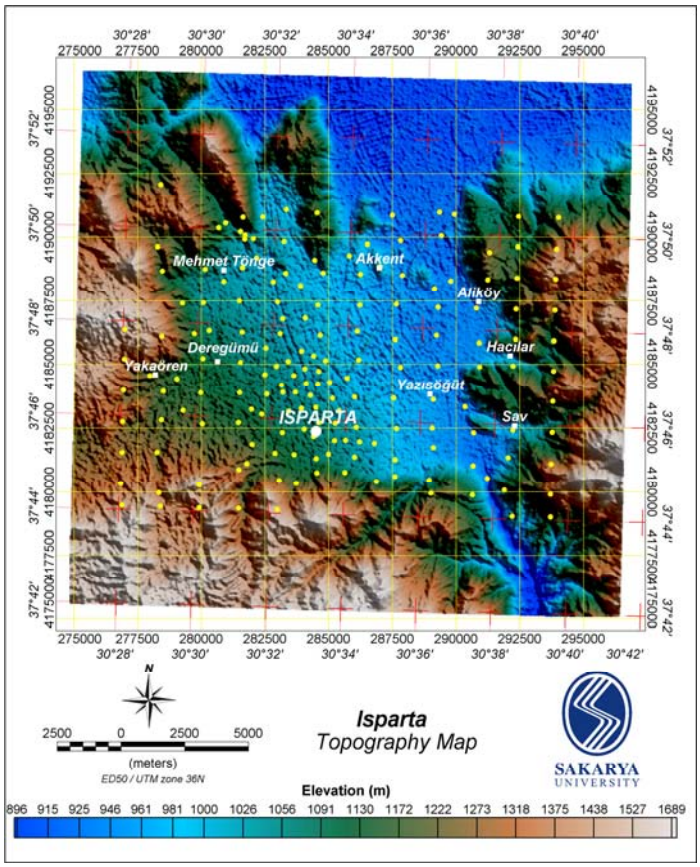
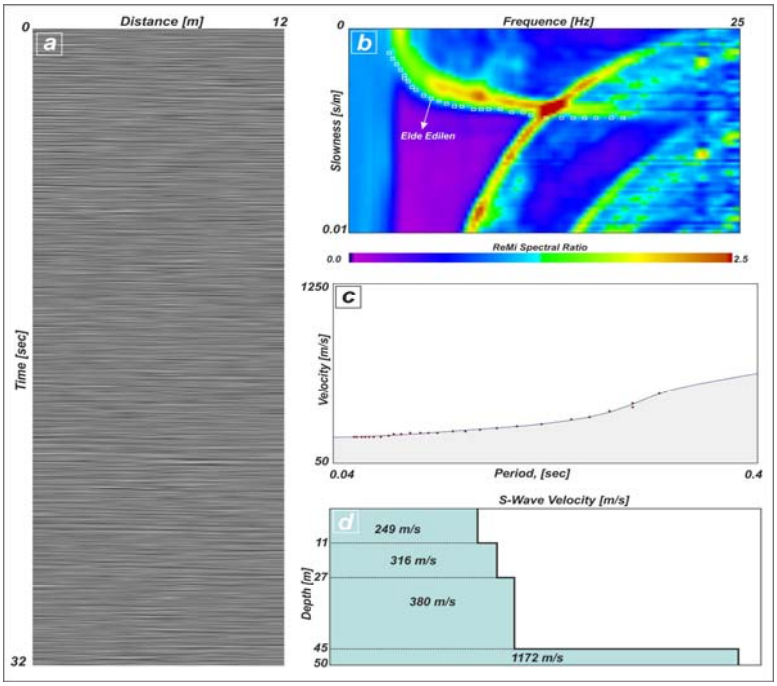


Şekil 2. Dijital yükseklik haritası ve veri kazanım lokasyon haritası (sarı noktalar ReMi veri kazanım noktalarını göstermektedir).

eğrileri seçimi gerçekleştirilmiştir (Şekil 3b). Bu dispersiyon eğrileri yinelemeli en küçük kareler yöntemi ile ters çözüme tabi tutulup(Şekil 3c) bir boyutlu derinlik-Vs hızı(Şekil 3d) değerlerine dönüştürülmüştür. 176 veri kazanım noktası için tüm işlem ayrı ayrı uygulanarak Vs dağılım bilgisi elde edilmiştir.



Şekil 3. ReMi veri işlem akış diyagramı a) Arazi verisi b) Güç spektrumu üzerinde dispersiyon eğrisi seçimi c) Ters çözüm işlemi d) 1 boyutlu derinlik-Vs kesiti.

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Bulgular

İnceleme alanından toplamda 176 noktada bir boyutlu derinlik-Vs bilgileri oluşturulmuştur. Elde edilen bu değerlerin Devlet Su İşleri tarafından bölgede açılan su sondajı kuyularının kuyu kütüğü bilgileri ile uyumlu olduğu görülmüştür(kuyu kütüğü bilgilerine bu çalışmada yer verilmemiştir).

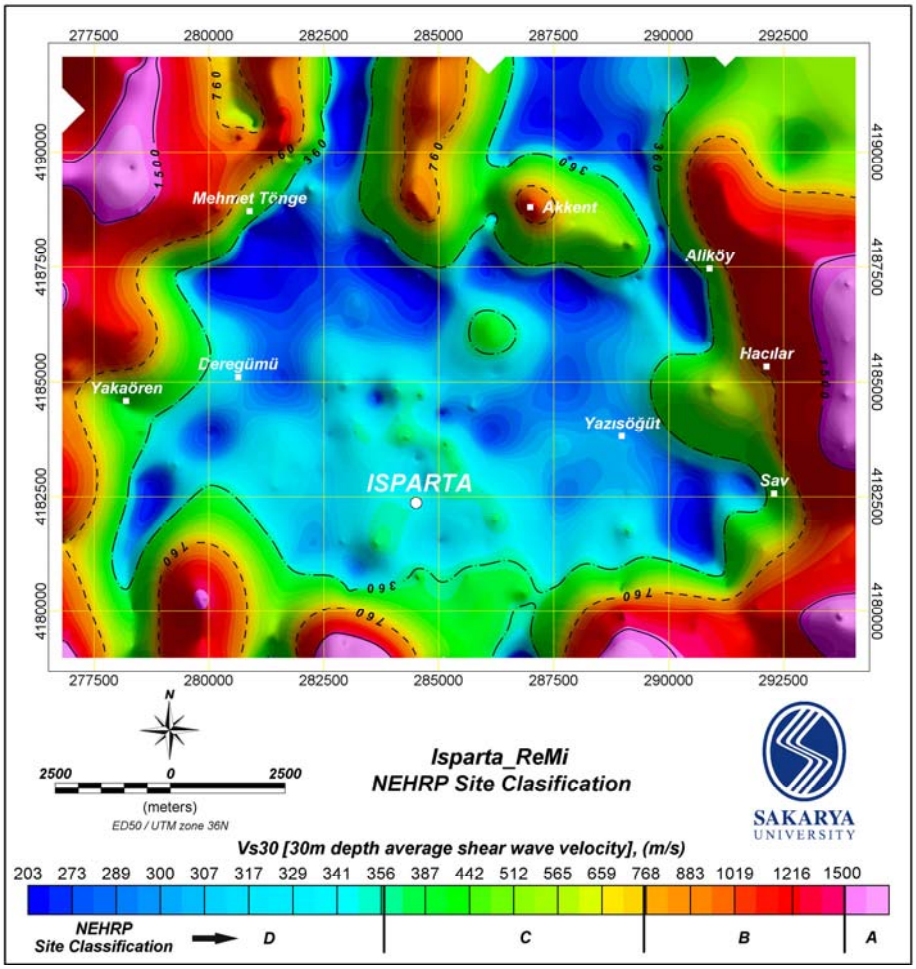
Tablo 1. NEHRP zemin sınıflaması kriterleri

Site Classification	Description	Index
A	Very hard rocks	Vs_{30} > 1500 m/s
B	Rocks	1500 m/s > Vs_{30} > 760 m/s
C	Hard or very hard soil, soft rocks	760 m/s > Vs_{30} > 360 m/s
D	Hard soil (sands, clays and gravels)	360 m/s > Vs_{30} > 180 m/s
E	Soft soil (clays and sands)	Vs_{30} < 180 m/s

Tablo 1 de belirtilen NEHRP kriterlerine göre zemin sınıflaması yapabilmek için aşağıda verilen eşitlik kullanılarak Vs30 (30 metre derinlik ortalama Vs hızı) dağılım haritası oluşturulmuştur(Şekil 4).

$$Vs30 = \frac{30}{\sum_{i=1}^{N} hi/vi}$$

Burda; hi tabaka kalınlığı, Vi hi kalınlığındaki tabakanın kesme dalgası hızıdır.



Şekil 4. Vs30 dağılım haritası

Şekil 4 üzerinde de görüldüğü üzere şehir merkezinin kurulu olduğu alanda zemin grubu D olarak ortaya çıkmıştır. Köy merkezlerinin bulunduğu (Aliköy, Sav,Yakaören, vb.) alanlar ise nispeten daha güvenli bir grup olan C

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sınıfı olarak belirlenmiştir. A ve B grubu zemin özellikleri yapılaşma ve yerleşimin olmadığı dağlık ve tepelik bölgelerde ortaya çıkmıştır.

Sonuçlar

Bu çalışmada Isparta şehir merkezi ve yakın çevresini kapsayan alanın makro ölçekte zemin sınıflaması yapılmıştır. Yüzey dalgaları analiz yöntemlerinden ReMi tekniği Vs bilgisinin elde edilmesinde 176 noktada uygulanmış ve inceleme alanının Vs30 dağılım haritası yapılmıştır. Bu haritalama üzerinde NEHRP kriterlerine göre zemin sınıflaması yapılmıştır. Çalışma alanında zayıf bir zemin özelliği gösteren D grubunun hakim olduğu ve olası yeni yapılaşma bölgelerinin bu alanlar içerisinde olması durumunda, mühendislik yapılarının güvenliğinin sağlanması için gerekli zemin iyileştirmelerin yapılması gerektiği ortaya çıkmaktadır.

Zemin sınıflamasında 360-760 m/s hız aralığındaki C sınıfındaki zemin grubu Isparta şehir merkezinde bulunan köy yerleşim alanları olarak dikkati çekmektedir. Şehir merkezine göre daha sağlam olan bu köy yerleri yapılaşmaya daha uygun alanlar olarak karşımıza çıkmaktadır.

Yapılaşmaya uygun olmayan dağlık ve tepelik alanlarda A ve B sınıfı zemin olarak belirlenmiştir.

Dört aşamalı projenin ikinci basamağını oluşturan bu çalışmadan elde edilen bu sonuçlar bölge için yapılacak senaryo deprem simülasyonu çalışmasına önemli veri kaynağı sağlayacaktır. İnceleme alanında makro ölçekte yapılan ilk çalışma olması açısından da elde edilen sonuçların gerek bundan sonra bölgede yapılacak araştırmalara ve gerekse bölgedeki yerel yönetime önemli katkılar sağlayacağı düşünülmektedir.

Teşekkür

Bu çalışma **TÜBİTAK 114Y836** numaralı proje kapsamında gerçekleştirilmiştir.

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LUMINESCENT DETECTION OF BACTERIAL ENDOSPORES VIA FUNCTIONAL HYBRID NANOMATERIALS

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Bacterial spores produced by bacterial cells are resistant to heat, pressure and radiation. [1] They are extensively consist of DNA, ribosomes and dipicolinic acid (DPA, %15 by dry weight). DPA provides to protect the bacterial cell's DNA as well as enables germination. [2] Detection of DPA concentration is very important in many application areas especially health and food industry. Many methodology have been developed over the past decades for DPA detection such as colorimetric assay, UV spectrometric method and immunological techniques. [3-5] Among them, fluorescence spectroscopy is more sensitive, convenient and an accurate process for DPA detection. Lanthanides have been frequently used for the fluorescent detection of DPA due to the having sharp-line like emission bands and long-lived excited states. [6] More recently, considerable attention has been devoted to hybrid nanomaterials for biosensors. Herein, fluorescent detection of DPA has been described using lanthanide chelated gold nanoparticles for the first time.

Keywords: Bacterial spores, gold nanoparticles, nanosensors.

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MARDİN'DE BİYOKLİMATİK KONFOR KOŞULLARI AÇISINDAN İDEAL TURİZM DÖNEMLERİNİN BELİRLENMESİ

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ÖZET: İnsanın dinlenme, eğlenme gibi etkinliklerinin bütünü olarak ifade edilen turizm üzerinde, iklimin etkileri oldukça büyüktür. İklim, herhangi bir alanda turizm faaliyetlerinin gerçekleşmesi için gerekli olan doğal çekiciliklerden biri olmasının yanında, turizm faaliyetlerinin cinsi, süresi, katılımcıların memnuniyeti gibi diğer olgular üzerinde de oldukça etkilidir.

Türkiye'nin Güneydoğu Anadolu Bölgesi'nde yer alan Mardin şehri, tarihi mekânları, geleneksel konut mimarisi, şehir dokusu, çarşıları, peyzaj ve manzara özellikleri, kültürel zenginlikleri ile son yıllarda turizm açısından önemi artan şehirlerimizdendir. Şehirde gerçekleştirilen turizm faaliyetlerinin büyük çoğunluğunu, atmosferik koşulların etkilerinin önemli ölçüde hissedildiği dış mekânlarda gerçekleşen etkinlikler oluşturmaktadır.

Bu araştırmada, Mardin Meteoroloji İstasyonunun 2009-2014 yılları arasındaki 5 yıllık dönemde saatlik sıcaklık, nisbi nem, bulutluluk, rüzgâr hızı, verileri kullanılarak Fizyolojik eşdeğer sıcaklık (PET) değerleri hesaplanıp Mardin şehir merkezinin biyoklimatik konfor koşulları belirlenmiş, yörenin iklim koşulları turizm açısından değerlendirilerek, yöreye gerçekleştirilecek turizm destinasyonları açısından ideal dönemler saptanmıştır.

Anahtar Kelimeler: İklim, Mardin, Biyoklimatoloji, Turizm Klimatolojisi, Fizyolojik eşdeğer sıcaklık

DETERMINING OF THE IDEAL TOURISM DESTINATION IN TERMS OF THE BIOCLIMATICAL CONDITION IN MARDIN CITY

Abstract: The climate has a huge impact on the tourism which is defined as the whole of human recreation and entertaintment activities. Climate which is the one of the most important natural charm aspect of the occurence of the touristic activities, effects the participant satisfaction, duration and type of touristic activities.

Mardin city is situated in South East Anatolia Region of the Turkey and Mardin with the historical areas, traditional residential architecture, urban texture, bazars, landscape and scenery features and cultural diversity has a increasing importance in terms of the tourism in the resent years. The majority of the tourism activities carried out in the city, consists of outdoor activities open to atmospheric conditions.

In this study, Physiological Equivalent Temperatures (PET) have been calculated with the using of the air temperature, relative humidity, cloudiness, wind velocity values, between 2009-2014 and bioclimatical condition of the Mardin city center has been determined. Climatical condition of the study area has been evaluated and the ideal terms have been defined in terms of the tourism destinations.

Key Words: Climate, Mardin, Bioclimatology, Tourism Climatology, Physiologically equivalent temperature

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MARKA SADAKATİNİN DEMOGRAFİK FAKTÖRLER BAĞLAMINDA DEĞERLENDİRİLMESİ (EVALUATION OF BRAND LOYALTY IN THE CONTEXT OF DEMOGRAPHICAL FACTORS)

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Tüketicilerin belirli bir markayı düzenli ve tutarlı bir şekilde satın alma eğilimi olarak tanımlanan marka sadakati rekabetin yoğun yaşandığı pazarlarda işletmelere rekabet avantajı sağlamaktadır. Müşteri sadakati, mal ve hizmet üreten işletmeler için oldukça önemli ve çok tartışılan bir konu haline gelmiştir. Tüketicilerin ürün veya hizmetle ilgili değerlendirmelerinde ve karar aşamalarında marka sadakati önemli bir rol üstlenmektedir. Bu nedenle marka sadakatini etkileyen faktörlerin belirlenmesi işletmeler açısından çok önemlidir. Çalışmada marka ve marka sadakatinin önemi incelendikten sonra tüketicilerin demografik özelliklerinin tüketicilerin marka sadakatleri üzerinde nasıl bir etki yaptığının belirlenmesi amaçlanmıştır. Çalışmaya yönelik hazırlanan anket, İstanbul'da yaşayan ve sürekli aynı beyaz eşya markasını kullanan 321 kişiye uygulandı ve anketler edit edildikten sonra kalan 300 anket analize tabi tutulmuştur. Frekans dağılımları, faktör analizi, güvenirlilik analizi ve t-testi analizi yapıldı. Yapılan analizler sonucunda tüketicilerin demografik faktörlerinden cinsiyet ve medeni durumun marka sadakati üzerinde etkili olduğu sonucuna ulaşılmıştır.

Keywords: Marka sadakati, yaş, gelir, medeni durum, cinsiyet, eğitim

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MDS CODES FROM POLYCYCLIC CODES OVER FINITE FIELDS

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Abstract: In this work, we construct polycyclic codes over finite fields by using linear algebraic methods. After the construction, we perform an exhaustive search by using polycyclic codes to obtain MDS codes over finite fields which have many applications in cryptography. The computer search results are presented at the end of the paper.

Keywords: Polycyclic Codes, MDS Codes, Finite Fields

1. Introduction

Polycyclic codes are the generalization of cyclic and constacyclic codes and were studied in (William, 1972) for the first time. In (Radkova, 2009) Radkova et al. studied the cyclic and constacyclic codes from a linear algebraic point of view. In this work, we construct polycyclic codes over finite fields by using same methods.Then we perform an exhaustive search by using polycyclic codes to obtain MDS codes over finite fields which have many applications in cryptography. The computer search results are presented at the end of the paper.

2. Polycyclic Codes

Polycyclic codes are the generalization of cyclic and constacyclic codes. We give the definition of polycyclic code.

Definition 2.1: A linear code C with length n over a finite field F is called polycyclic code induced by the polynomial $v(x)=v_0+v_1x+\cdots+v_{n-1}x^{n-1}\in F[x]$ such that if $c=(c_0,c_1,\cdots,c_{n-1})\in C$ then its $v-vector$ shift $(0,c_0,c_1,\cdots,c_{n-2})+c_{n-1}(v_0,v_1,\cdots,v_{n-1})\in C.$

Let $F=GF(q)$ and let F^n be the n-dimensiomal vector space over F with standard basis $e_1=(1,0,\ldots,0),e_2=(0,1,\ldots,0),\ldots,e_n=(0,0,\ldots,n).$
Then polycyclic shift with respect to a vector v is the following transformation:

$$\begin{array}{rccc}\tau_v: & F^n & \to & F^n \\ & (c_0,c_1,\cdots,c_{n-1}) & \mapsto & (v_0c_{n-1}+v_1c_{n-1},\cdots,c_{n-2}+v_{n-1}c_{n-1}).\end{array}$$

Then it has the following matrix

$$T_v=\begin{pmatrix}0 & \cdots & \cdots & 0 & v_0\\ 1 & 0 & \cdots & 0 & v_1\\ 0 & 1 & & \vdots & \vdots\\ \vdots & & \ddots & 0 & \vdots\\ 0 & \cdots & 0 & 1 & v_{n-1}\end{pmatrix}$$

with respect to tstansard basis. Note that the characteristic polynomial of T_v is $f(x)=x^n-v(x)$.

Let $gcd(n,q)=1$. Assume that $f(x)=x^n-v(x)=f_1(x)f_2(x)\ldots f_t(x)$ be the factorization of $f(x)$ into monic irreducible factors over F. Cayley-Hamilton Theorem states that the matrix T_v satisfies $f(T_v)=0$.

Now we consider the set of homogeneous equations

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$$f_i(T_v)x = 0, \quad x \in F^n \text{ for } i = 1,\ldots,t.$$

Let U_i be the solution space of $f_i(T_v)x = 0, \quad x \in F^n$. We denote $U_i = Kerf_i(\tau_v)$. Then each U_i is a subspace of F^n.

Then we have the following theorem:

Theorem 2.2: The following statements hold for the subspaces U_i of F^n:

(1) U_i is τ_v-invariant subspace of F^n;

(2) If W is a τ_v-invariant subspace of F^n and $W_i \cap W = U_i$ for $i = 1,2,\ldots,t$, then W_i is free τ_v-invariant and $W = W_1 \oplus \ldots \oplus W_t$;

(3) $F^n = U_1 \oplus \ldots \oplus U_t$;

(4) $dim_F(U_i) = deg(f_i) =: k_i$;

(5) $f_i(x)$ is the minimal polynomial of τ_v over U_i;

(6) U_i is the minimal τ_v-invariant subspace of F^n;

(7) For any subspace U of F^n, U is the direct sum of some of minimal τ_v-invariant subspaces U_i of F^n.

Then the following theorem is clear from the definition:

Theorem 2.3: A linear code C with length n over F is a polycyclic code with respect to some $v(x) \in F[x]$ if and only if C is a τ_v-invariant subspace of F^n.

Theorem 2.4: Let C be a linear polycyclic code with length n over F with respect to some $v(x) \in F[x]$. Then the following statements hold:

(1) $C = U_{i_1} \oplus U_{i_2} \oplus \ldots \oplus U_{i_s}$ for some minimal τ_v-invariant subspaces of R^n and $k := dim(C) = k_{i_1} + \ldots + k_{i_s}$, where $k_{i_j} = dim(U_{i_j}), \quad j = 1,\ldots,s$;

(2) $h(x) = f_{i_1}(x)\ldots f_{i_s}(x)$ is the minimal polynomial of τ_v over C;

(3) $dim(h(T)) = n - k$;\

(4) $c \in C$ if and only if $h(T)c = 0$.

Then we have the following result which explains how we construct pollcyclic codes over finite fields.

Corollary 2.5: $H = h(T_v)$ is a parity check matrix for the code C and $G = (g(T_v))^t$ is a generator matrix for the code C where $x^n - v(x) = f(x) = g(x)h(x)$. In this case, $g(x)$ is said to be the generating polynomial of the polycyclic code C.

3. MDS Codes

In this section we briefly explain the MDS codes and its applications in cryptography. The reader who wants more information about this topic may consult (Augot, 2014).

Definition 3.1: Let C be linear code over F_q with parameters [n,k,d]. C is said to be a MDS code if $d = n + k - 1$ is satisfied.

Definition 3.2: A matrix M is MDS if its concatenation with the identity matrix $G_M := [I_k \mid M]$ yields a

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generating matrix of an MDS code C.

MDS matrices are used in linear diffusion layers in cryptography. A linear diffusion layer of a block cipher is defined by an invertible matrix of size $k \times k$ over F_q. It takes $x \in F_q^n$ as a input and yields $y \in F_q^k$ as an output with $y = x \times M$.

The security of a diffusion layer is measured by its differential branch number and the linear branch number. The larger the two branch numbers are, the stronger a diffusion layer is. The diffusion layers with the optimal branch numbers are called being maximum distance separable. Optimal linear diffusion can thus obtained by using codes with largest possible minimal distance, namely MDS codes.

Several different techniques have been studied to obtain MDS matrices, a well known example being circulant matrices as used in the AES (Daemen, 1012) or FOX (Junod, 2004). Recently a new construction has been proposed: the so-called recursive MDS matrices, that were for example used in LED (Guo, 2011). These matrices have the property that they can be expressed as a power of a companion matrix C.

Definition 3.3: The companion matrix of monic polynomial $c(x) = c_0 + c_1 x + \ldots + c_{n-1} x^{n-1} + x^n$ is defined as the square matrix

$$T_v = \begin{pmatrix} 0 & \cdots & \cdots & 0 & c_0 \\ 1 & 0 & \cdots & 0 & c_1 \\ 0 & 1 & & \vdots & \vdots \\ \vdots & & \ddots & 0 & \vdots \\ 0 & \cdots & 0 & 1 & c_{n-1} \end{pmatrix}$$

Recently Augot et al. in [4] propose a fast algorithm which yields $k \times k$ square matrices whose k^{th} power of its companion matrices are MDS matrices. They obtain recursive MDS matrices by using shortened BCH codes.

4. The Link Between Polycyclic Codes and Recursive MDS Matrices

The matrix of a linear transformation of a polycyclic shift with respect to a polynomial $v(x) = v_0 + v_1 x + \ldots + v_{n-1} x^{n-1}$ and the companion matrix of a monic polynomial $x^n + v(x)$ same and as the following:

$$T_v = \begin{pmatrix} 0 & \cdots & \cdots & 0 & v_0 \\ 1 & 0 & \cdots & 0 & v_1 \\ 0 & 1 & & \vdots & \vdots \\ \vdots & & \ddots & 0 & \vdots \\ 0 & \cdots & 0 & 1 & v_{n-1} \end{pmatrix}$$

There is an obvious link between polycyclic codes and recursive MDS matrices. Augot et al.'s algorithm already finds the polynomials whose companion matrices are recursive MDS matrices. So we perform an algorithm as explained below:

1. Choose a field F_{2^s} and a code length n.
2. Take a polynomial $v(x)$ of degree $n-1$ form $F_{2^s}[x]$ from the previous algorithm results (Augot's Algorithm).
3. Compute the polycyclic codes with respect to $v(x)$ using the theory we just derive.
4. Decide if the polycyclic codes we obtain MDS code or not.

We run this algorithm by using computer algebra system MAGMA (Bosma, 1997) and we have seen that most of the codes we obtain is indeed MDS. We think it is worth to study on this topic deeper and more theoretical point of

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view. We present the result in a table.

Table 1: The Number of MDS and non-MDS Codes

s	n	Number of MDS Codes	Number of non-MDS Codes
4	4	256	0
4	6	384	0
5	10	4700	0
5	12	5610	30
6	6	7650	0
6	10	12720	0
6	14	15996	48

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MECHANICAL PROPERTIES OF TI-18NB ALLOY FABRICATED BY POWDER METALLURGY

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The applications of titanium (Ti) based alloys are widely used as orthopedic implants owing to the good formability, mechanical properties and potential applications. Moreover these alloys present the highest level of mechanical, fatigue and corrosion resistance. In the present study, Ti-18Nb shape memory alloys with different porosity were fabricated by powder metallurgy. The mixed elemental powders having compositions of Ti-18at%Nb were cold-pressed in a cylinder die of 10 mm diameter at 100 MPa, 150 MPa and 200 MPa, after that the green compacted samples were sintered at 1400 ºC for 2 h. The microstructure and mechanical properties of the Ti-Nb alloys were investigated using scanning electron microscopy (SEM), X-ray diffraction (XRD), and compression test. The results show that the porosity decreased with increasing green compact, and the ultimate compression increased up to 900 MPa with decreasing porosity. Also, the phases such as α, β and a small amount of α″ martensite are seen in the microstructure.

Keywords: Ti-18Nb alloy

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MERKEZİ ORTAK SINAVDA (TEOG) SORU SORULAN VE SORULMAYAN FEN BİLİMLERİ KONULARINI ÖĞRENME-ÖĞRETME SÜRECİNE İLİŞKİN ÖĞRETMEN GÖRÜŞLERİ

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Bu araştırmanın amacı; Türkiye'de 2013-2014 eğitim-öğretim yılından itibaren ortaokul 8. sınıf düzeyinde uygulanmakta olan Merkezi Ortak Sınav'da (TEOG) soru sorulan ve sorulmayan Fen Bilimleri dersi konularını öğrenme-öğretme sürecine ilişkin öğretmen görüşlerini incelemektir. Mevcut araştırma, nitel araştırma yönteminin olgu bilim desenine göre yürütülmüştür. Amaçlı örneklem olarak seçilen çalışma grubu, 2014-2015 eğitim-öğretim yılında Kayseri ili Melikgazi ilçesinde görev yapan dört Fen Bilimleri öğretmeninden oluşmuştur. Araştırmanın verileri, yarı yapılandırılmış görüşme ve yarı yapılandırılmış gözlem ile toplanmıştır. İçerik analizi yöntemi ile analiz edilen sonuçlar kodlar, temalar ve kategoriler oluşturularak verilmiştir. Araştırmada, bir fen konusunun sınavda sorulma durumunun öğretmenlerin motivasyonlarını, konuyu önemseme düzeylerini, ders işleme yöntemlerini, ders için yaptıkları ön hazırlık türünü, verdikleri ödev türünü ve ödev kontrolünü etkilediği sonucuna ulaşılmıştır. Ayrıca öğretmenlerin öğrencilerin ders içi motivasyonunu ve derse etkin katılımını sağlama gibi konularda sınav sonrası olumsuz yönde etkilendikleri de elde edilen sonuçlar arasındadır. Bu sonuçlara dayanarak gelecekteki araştırmacılar için önerilerde bulunulmuştur.

Keywords: Merkezi ortak sınav, Fen eğitimi, Öğretmen görüşleri

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MESLEK YÜKSEKOKULU İNŞAAT BÖLÜMÜ ÖĞRENCİLERİNİN MATEMATİKSEL YETERLİLİK ANALİZİ: KOCAELİ MYO ÖRNEĞİ

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Özet: Bu çalışmanın amacı, meslek yüksekokulu inşaat bölümü öğrencilerinin, lise ve meslek yüksekokulunda aldıkları matematik eğitimine ilişkin görüşlerini belirlemektir. Çalışmanın örneklemini, Kocaeli Meslek Yüksekokulu İnşaat Bölümün 2. sınıfında okuyan 72 öğrenci oluşturmaktadır. Veri toplama aracı, olarak 7 tane açık uçlu sorudan oluşan bir ölçek kullanılmıştır. Verilerin analizi, yüzde ve frekans değerleri hesaplanarak yapılmıştır. Bulgular, inşaat bölümü öğrencilerinin, hem lise dönemlerinde hem de ön lisans eğitimlerinde gördükleri matematik derslerinde genelde kullandıkları matematiksel formülleri ne olduğunu anlamadan ezbere kullandıklarını ve örnek ve uygulama çalışmalarında hangi matematiksel formülünü kullanacaklarına öğretmenlerinin çözdükleri örnekleri model alarak karar verdiklerini ifade etmişlerdir. Yüzeysel ve kavramadan öğrendikleri matematik kavramlarını kendi alanlarında etkili bir biçimde uygulayamadıklarını belirtmişlerdir.

Anahtar kelimler: matematiksel yeterlilik, meslek yüksekokulu, inşaat bölümü

Giriş

Eğitim, insanların en temel ihtiyaçlarından bir tanesidir. Devletler bu ihtiyacı karşılamak için değişik sistemler oluşturmakta ve zamanla bu sistemleri değişime ve yenilemeye tabi tutmaktadırlar. Bu sistemlerin üstün yanları olduğu gibi zayıf ve eksik yanları da olabilmektedir. Üzerinde en çok araştırma yapılan ve sürekli yeni eğitim öğretim yöntemleri geliştirilen alanlardan bir tanesi de matematik eğitimidir. Bilimin dili olarak tanımlana matematik, her zaman bireyler için vazgeçilmez bir alan olmuştur. Soyut bir yapıya sahip olmasından dolayı, matematiğin öğretilmesinde ve öğrenilmesinde her zaman zorluklar yaşanmaktadır (Baker, 1996; Dikici & İşleyen, 2004; Durmuş, 2004; Tall, 1993; Tall & Razali, 1993; Weber, 2001). Ancak yaşanan bu zorluklar, insan beynini kullanabilme ve geliştirebilme açısından gerekli olan ilişkilendirme, analiz etme ve üretme gibi özelliklerin en verimli kullanıldığı matematik öğretiminden ve öğrenimimden vaz geçmek doğru bir çözüm olarak görülmemektedir (Aksu, 1991)

Matematiğin kavramlarının bir biri ile bağlantılı ve öğrenmede süreklilik gerektirdiği düşünüldüğünde öğrencilerin lise döneminde aldıkları matematik eğitiminin yeterli düzeyde olmaması, onların üniversite öncesi hazır bulunuşluk seviyelerinin eksik olmasına dolayısıyla bu dönemde sıkıntılar yaşamlarına ve zorlanmalarına sebep olmaktadır (Fidan, 1986; Tuna & Kaçar, 2005; Yenilmez & Kalkmacı, 2008; Yılmaz & Sünbül, 2003). Üniversiteye giriş sınav sistemlerinin (YGS ve LYS) test tekniğini kullanması, zaman kavramına endeksli olması ve pratik çözüm yöntemlerini kullanmayı gerektirmesi, temel düşünce biçimlerini kullanmayı ön plana çıkarmaması yaşanan bu sorunlara temel oluşturmaktadır. Bununla birlikte Milli eğitimin lise programlarındaki temel amaçlarına bakıldığında durum pratikten çok farklıdır. Birinci temel amaç öğrencilere temel becerilerin kazandırılması, ikincisi öğrencilerin yükseköğrenime hazırlanmasıdır.

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Üniversitelerin fen ve matematik ağırlıklı bölümlerinde okuyan öğrencilerin bazı temel matematik konularını lise döneminde hiç görmedikleri ya da bu konular hakkında çok az bilgi sahibi oldukları belirlenmiştir.(Doğan Sulak ve Cihangir, 2002). Hazır bulunuşluk düzeyindeki bu eksiklikler öğrencilerin matematiğin soyut, teorik ve aksiyomatik yapısını anlamalarına engel olduğu dolayısıyla matematik ve matematiğin birçok kavramını kullanan bağlantılı derslerde zorlanmalarına sebep olduğu veya bu derslerde başarısız olmalarına etken olduğu söylenebilir. Bu çalışmanın amacı meslek yüksekokulu inşaat bölümü öğrencilerinin lise ve üniversitede verilen matematik eğitimine ilişkin görüşleri belirlemektir.

Yöntem

Araştırmanın örneklemi, Kocaeli üniversitesi Kocaeli Meslek Yüksekokulu inşaat bölümünde okuyan 72 öğrenciden oluşmaktadır. Bu öğrenciler 2014 yılında sınavsız geçişle bu bölüme yerleşmişlerdir. Araştırmada görüşleri alınan öğrencilerin tamamı her hangi bir meslek lisesinden mezun olduklarını belirtmişlerdir.

Verilerin toplanmasında, inşaat bölümü öğrencilerinin lise ve üniversitede verilen matematik eğitimine ilişkin görüşlerini belirlemek amacıyla veri toplama aracı olarak Baştürk (2005) tarafından geliştirilen bir öğrenci anketi kullanılmıştır. Anket, açık uçlu 7 sorudan oluşmaktadır.

Araştırmada elde edilen veriler betimsel analiz yöntemi kullanılarak çözümlenmiştir. Öğrencilerden elde edilen veriler incelenip analiz edilerek gruplara ayrılmış ve her bir soruya verilen yanıtlar yüzde ve frekans olarak sayısallaştırılmıştır.

Bulgular

1. Soruya İlişkin Bulgular

İnşaat bölümü öğrencilerinin *"Niçin matematik öğrenme ve öğretme ihtiyacı duyuyoruz?*" sorusuna verdikleri cevaplar incelendiğinde 5 farklı cevap kategorisinin olduğu belirlenmiştir. Cevaplara ait yüzdeler Tablo 1'de sunulmuştur.

Tablo 1: Öğrencilerin, Niçin matematik öğrenme ve öğretme ihtiyacı duyuyoruz? Sorusuna verdikleri cevapların dağılımı

	f	**%**
Matematik okul bitirmek ve bir iş sahibi olmak için gereklidir	70	97,2
Matematik çok önemli bir temel bilim dalıdır	66	91,6
Matematik günlük hayatta çok kullanışlıdır	54	75
Matematik anlaşılması zor bir derstir	52	72,2
Matematik öğrenmekten keyif duyuyoruz	33	45,8

Tablo 1 analiz edildiğinde, frekans sayılarının toplamı toplam öğrenci sayısını (72) aştığı görülmektedir. Bunun sebebi öğrencilerin soruya cevap olarak birden fazla gerekçe sunmalarından kaynaklanmaktadır. İnşaat bölümü öğrencilerinin neredeyse tamamı matematik dersini öğrenmelerinin en önemli gerekçesi olarak bu dersten başarılı olup üniversiteden mezun olmak olarak ifade ettiler (97%). Öğrencilerin yine çok büyük bir kısmının matematik dersinin temel bir bilim dalı olduğunun farkında oldukları söylenebilir(%91,6). Bu soruya verilen cevaplardan öğrencilerin matematiği zor bir ders olarak gördükleri (%72,2) ve dolaysıyla bu dersi öğrenmeyi çokta sevmedikleri söylenebilir (45,8%).

3. Soruya İlişkin Bulgular

İnşaat bölümü öğrencilerinin *"Üniversiteye başlamadan önce ve başladıktan sonra, matematik hakkındaki görüşleriniz nasıl?"* sorusuna verdikleri cevaplar incelendiğinde 5 farklı cevap kategorisinin olduğu belirlenmiştir. Cevaplara ait yüzdeler Tablo 2'de sunulmuştur.

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Tablo 2: Öğrencilerin, Üniversiteye başlamadan önce ve başladıktan sonra, matematik hakkındaki görüşleriniz nasıl? Sorusuna verdikleri cevapların dağılımı

	f	%
Lisede işlemsel pratik ve uygulamalı üniversitede işlemsel, teorik, ispatlı ve uygulamalı	72	100
Lisede daha anlaşılır ve daha kolay üniversitede daha karmaşık ve daha zor	61	84,7
Lisede konular daha az ve yüzeysel üniversitede daha fazla ve derinlemesine ele alınıyor	60	83,3
Lise ve Üniversite matematiğinin her ikisi de zor, karmaşık ve sıkıcı geliyor	40	55,5
Lise ve üniversite matematiğinin her ikisi de anlaşılır, bağlantılı ve zevkli	27	37,5

Öğrencilerin tamamının lise matematiği ile üniversite matematiğini işlemsellik-kavramsallık, pratiklik-teoriklik ve uygulamalı-soyutluk düzeylerinde tamamen farklı kategoride gördükleri anlaşılmaktadır (100%). Lisede konular tanım-örnek-uygulama formatında, üniversitede ise tanım-örnek-teorem-ispat-uygulama sıralamasında işlendiğinden, öğrencilerin lise matematiğini daha anlaşılır ve üniversite matematiğini daha zor ve karmaşık ifade ettikleri söylenebilir (84,7). Lise ve üniversite matematiğinin her ikisini de zor bulanların genelde bu dersi anlama ve öğrenme zorluğu çeken ve matematik başarı düzeyleri zayıf olan öğrenciler oldukları söylenebilir (55,5). Matematik başarı düzeyleri hem lisede hem de üniversitede yüksek olan ve derslere ilgili olan öğrencilerin her iki düzeydeki matematiği anlaşılır buldukları ve matematik öğrenmeyi sevdikleri görülmektedir (37,5%).

4. Soruya ilişkin Bulgular

İnşaat bölümü öğrencilerinin *"ÖSYS'de matematik sorularını doğru olarak cevaplayan bir öğrencinin üniversite öğreniminde başarılı olacağını söylemek her zaman mümkün müdür? Niçin*?" sorusuna verdikleri cevaplar incelendiğinde 5 farklı cevap kategorisinin olduğu belirlenmiştir. Cevaplara ait yüzdeler Tablo 3'te sunulmuştur.

Tablo 3: Öğrencilerin, ÖSYS'de matematik sorularını doğru olarak cevaplayan bir öğrencinin üniversite öğreniminde başarılı olacağını söylemek her zaman mümkün müdür? Niçin? Sorusuna verdikleri cevapların dağılımı

	f	%
Kesinlikle başarılı olur	10	13,8
Başarılı olur	14	19,4
ÖSYSE Sınav başarısı üniversiteye yansımayabilir	23	31,9
İki başarı birbirinden bağımsızdır	20	27,7
İki başarı birbirinden tamamen bağımsızdır	5	6,9

Öğrencilerin ÖSYS başarısı ile üniversite başarı arasındaki bağlantı konusunda hemfikir olmadıkları söylenebilir. Üniversiteye giriş sınavında matematik sorularını çözmedeki yüksek başarı puanının üniversite eğitimindeki başarıya yansıyacağı düşüncesini öğrencilerin çok paylaşmadıkları söylenebilir (33,2%). Bunun sebebi öğrencilerin üniversite giriş sınavındaki soruların kapsamı, bu soruların çözüm biçimleri ve sınav konularını öğrenme biçimleri olarak izah edilebilir. Yukarıdaki incelemede dikkat çeken diğer bir sonuç ise öğrencilerin ÖSYS'deki matematik başarısı ile üniversite eğitimindeki başarıyı birbirinden bağımsız görmemeleridir (34,6%). Bu durum meslek yüksekokulu inşaat bölümü öğrencilerinin her iki başarı arasında net bir görüşe sahip olmadıklarını göstermektedir.

Sonuç

Bu çalışmada meslek yüksekokulu inşaat bölümü öğrencilerinin matematik dersi hakkındaki görüşleri, ÖSYS' deki matematik başarı puanı ile üniversite matematiği başarısı kapsamında incelenmektedir. Öğrencilerin lisede ve üniversitede öğrendikleri matematik arasında kapsam ve öğretme yöntemleri açısından bir benzerlik görmedikleri sonucuna varılmıştır. Öğrencilerin her iki matematik dersine bakış açıları yukarıdaki sonucu

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destekleyecek biçimde bir birinden farklı olduğu görülmüştür. Öğrencilerin, lise matematiğini daha somut, anlaşılır ve basit, üniversite matematiğini ise daha soyut, karmaşık ve teorik buldukları sonucuna varılmıştır. Son olarak öğrenciler, ÖSYS matematik başarısı ile üniversite matematiği başarısı arasında bir bağlantı olup olmadığı konusunda kesin bir kanaate sahip olmadıkları sonucunu doğurmuştur.

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METAL HİDRÜR ESASLI HİDROJEN DEPOLAMA SİSTEMLERİNDE REAKTÖR TASARIMI VE OPTİMİZASYONU

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Özet: Mobil ve sabit hidrojen depolama uygulamaları için en avantajlı yöntem metal hidrürler olarak görülmektedir. Ancak metal hidrürlerde depolanan hidrojen miktarları hala istenilen seviyelere gelememiştir. Bu çalışmada metal hidrür reaktörlerde hidrojen depolanması önündeki bazı problemlerin giderilebilmesi ve verimli depolama parametreleri belirlenerek, daha verimli depolama sağlayacak çözüm yollarının incelenmesi amaçlanmıştır. Metal hidrür reaktörlerde hidrojen depolama parametreleri mühendislik programı kullanılarak geliştirilen sonlu elemanlar analizi ile incelenmiştir. Sonlu elemanlar analizi ile hidrojen depolama prosesine etki eden birçok parametre kombinasyonları oluşturularak sonuçlar detaylı olarak değerlendirilmiştir. Çeşitli kombinasyonların oluşturulduğu ve hidrojen depolama kapasitesine ve verimine etki eden parametreler arasında metal hidrür malzemesi, metal hidrür depolama tankının kanatçıksız veya kanatçıklı olması, kanatçıklı ise düz veya açılı kanatçık tasarıma sahip olması, hidrojen giriş basıncı, partikül boyutu ve genel ısı iletim katsayısındaki değişimler sayılabilir. Söz konusu parametrelerden elde edilen veriler bilgisayar ortamına aktarılmış, sonuçlar karşılaştırılarak optimum alaşım özellikleri ve hidrür reaktör tasarımları, debi ve şarj basınçları gibi parametreler arasındaki ilişkiler belirlenmiştir..

Keywords: Metal hidrür, tank tasarımı, hidrojen depolama

Giriş

Metal hidrür depolama metalleri ile ilgili araştırılan karakteristikler şarj/deşarj edilen hidrojen miktarı, metal hidrürün termal stabilitesi, şarj/deşarj kinetiği, termodinamik ve termofiziksel özellikler, kristal yapı ve segregasyon veya karbonizasyon gibi yüzey işlemleri olarak sıralanabilir. Özellikle reaksiyon hızını önemli ölçüde etkileyen parametrelerin basında alaşım özellikleri ve reaktör tasarımı gelmektedir. Metal hidrür esaslı hidrojen depolanmasında, şarj süresi ve reaksiyon ısısının uzaklaştırılması en önemli parametrelerdir. Yang vd, tasarım aşamasındaki ilerlemeleri incelemiş, optimal reaktör tasarımın metal hidrit sisteminin karakteristiklerinin ve uygulama gerekliliklerinin çok iyi bilinmesi gerektiğini belirtmiştir(Yang vd., 2003). Mellouli vd, metal hidrit tankı ve ısı eşanjöründe ısı ve kütle transferini incelemek için 2 boyutlu matematiksel model geliştirmiş, geometrik ve operasyonel parametrelerin (kullanılan malzeme, gözenek büyüklüğü, özgül yoğunluk vs) ve şarj prosesinin, verim üzerindeki etkilerini incelemiştir(Mellouli vd., 2009). Mellouli vd, kanatlı ve spiral tüplü ısı esanjörü ile 2-D matematiksel model geliştirmiş, metal hidrit depolama tankında ısı ve kütle transferi mekanizmalarını incelemiştir(Mellouli vd., 2010). Chung vd, ısı borusu kullanıldığı farklı konfigürasyonlarda $LaNi_5$ hidrür alaşımı kullanılan metal hidrit tankları tasarlamış, ısı borusu ilave edilmiş hidrür tanklarda, hidrojen şarjı ve deşarjı sırasından oluşan ısı transferinin iyileştirilmesi incelemiştir. Çalışmada oldukça büyük kapasiteli tanklar dahil olmak üzere, ısı boruları kolaylıkla montaj/demontaj edilebileceğini ve hidrojen şarj süresinde önemli oranda düşürülebileceğini göstermiştir(Chung vd., 2013). Kaplan, farklı şarj basınçlarında, doğal konveksiyonla soğutulan kapalı bir silindir, etrafında ilave kanatçıkların konulduğu hidrür reaktör ile etrafında suyun sirküle ettirilmesiyle soğutulan reaktör olmak üzere 3 farklı metal hidrit reaktör tasarımı üzerinde ısı transfer mekanizmasının şarj prosesi üzerindeki etkilerini incelemiştir. Hidrojen absorpsiyonu reaksiyonunun ekzotermik doğası gereği, su soğutmalı reaktörlerde şarj zamanı ve sıcaklık dağılımının lineerliği açısından en iyi sonuçları elde edilmiştir. Daha fazla hidrojenin direkt teması nedeniyle reaktör için giriş kısmına yakın bölgelerde sıcaklık artışı daha yüksektir. Hidrojen şarj basıncını arttıkça, aynı zaman diliminde reaksiyon sayısındaki artış nedeniyle, tüm durumlar için nispeten daha yüksek sıcaklık profili elde edilmektedir (Kaplan, 2009). Visaria vd [16], Hidrojen depolama reaksiyon süresini, ısı transfer oranı, soğutucu debisi, yüzey direnci, metal hidrit tabakalarının kalınlığı ve metal hidrit tozunun efektif iletkenliği parametrelerinin ısı transferine olan etkilerini analiz edebilmek için maksimum ısı oranı olarak boyutsuz iletkenlik parametresi tanımlamış, bu parametrenin yüksek olmasının, T_{max} metal hidrür sıcaklığında, ısı transfer hızının yüksek olmasına karşılık geldiğini belirtmiştir(Visaria vd., 2010). Kikkinides, dış yüzeyinde dairesel kanatlar bulunan, içinde soğutucu akışkanın aktığı ve çevresel bileziklere sahip hidrojen depolama sistemlerinin tasarımı, optimizasyonu ve modellemesinde genel matematiksel yöntemleri incelemiştir. Yapılan çalışmalar ve simülasyonlar, metal hidrit tankının dış yüzeyinde kanatların

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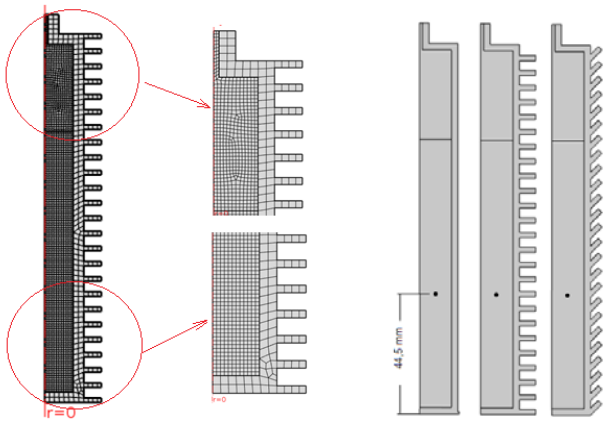
kullanılması ile standart $LaNi_5$ malzemeli sistemde % 90'lık hidrit kapasitesi için depolama zamanının %11'e kadar arttığını raporlamaktadır(Kikkinides, 2011). Askri vd [42], 2 boyutlu matematiksel model geliştirerek deneysel sonuçlarla birlikte analizler gerçekleştirmiştir. Bu modelde, tank duvarı ısıl kütlesinin hidritleme prosesindeki etkilerini incelemiş, duvar malzemesinin çelik ve pirinç olmasını karşılaştırmıştır. Bununla birlikte modelde ayrıca, dışarıda kanatları olan silindirik tank, soğutucu akışkanın sirküle edildiği eş merkezli tüpleri olan silindirik tank ve eş merkezli kanatlı silindirik tank seçenekleri ile bu tasarımların dinamik davranışlarını analiz etmiştir. Elde edilen sonuçlar, uygun bir tasarımla depolama zamanının %80 iyileştirilebildiğini göstermiştir. Yen vd [43] çalışmasında kullanılan reaktördeki sıcaklık dağılımını iyileştirmiş depolama tankı görülmektedir. Bu çalışmada, Hidrojen'i yönlendirme amaçlı gözenekli tüp de dikkate alınmış, böylece hidrit reaksiyonunun penetrasyon derinliğini arttırılmış ve absorpsiyon zamanının kısaldığı sonucuna varılmıştır (Yen vd., 2011). Bao vd [46], üç boyutlu model üzerinde Navier Stokes denklemleri üzerinden COMSOL v3.5a programı ile sonlu elemanlar analizi gerçekleştirmiştir. Metal hidrit reaktöründe hidrit absorpsiyon oranı, Yang vd (64) tarafından tanımlanmış olan ısı transfer kontrollü reaksiyon oranı r_h ile belirlenmektedir. Bu çalışmada, ihmal edilen ısı transfer akışkan sıcaklığının değişimin dikkate almak için boyutsuz N parametresi tanımlanarak Hidrojen absorpsiyon oranı üzerinde, ihmal edilen ısı transferi akış sıcaklığının etkisini incelenmiş, metal hidrit efektif ısı iletkenliğinin, ısı transfer akışkanı akış oranının ve temas direncinin metal hidrit reaktörlerinde performansın iyileştirilmesinde rol oynayan önemli faktörler olduğunu değerlendirilmiştir(Bao vd., 2013). Uchida vd [63], AB_2 ve AB_5 alaşımlarını 2 farklı tank konfigürasyonunda (plaka- kanatlı tip ve bölünmüş odalı tip, her tip için ısı eşanjör boru sistemli) deneyler gerçekleştirmiş, kanatlı tip sistemden alınan sonuçlarda şarj oranının, hidrit malzemesinin karakteristiğinden daha çok, büyük oranda tankın ısıl performansına bağlı olduğunu görmüştür(Uchida vd., 2002).

Yapılan çalışmalar incelendiğinde şarj süresinin ve depolanan hidrojen miktarının geliştirilmesi açısından, ısı borusu, içten/dıştan kanatçık, spiral ısı değiştiriciler, tüp içerisinde köpük malzeme, ısı borusu kullanımı gibi farklı tasarımlar deneysel ve analizlerle incelenmiştir. Bu çalışmada tüp et kalınlığı, açılı kanat kullanımı, hidrojen şarj basıncı, hidrür tane boyutu, $LaNi_5$ alaşımı içerisine Al ilave si gibi birçok paramtre COMSOL ticari yazılımı kullanılarak maematiksel olarak incelenmiştir.

Materyal ve Metod

Matematiksel modelde bulunan parçalı diferansiyel denklemlerin sonlu elemanlar metodu kullanılarak çözülmesi amacıyla COMSOL Multiphysics yazılımı kullanılmıştır. Modelde sabit olarak tanımlanan sistem parametreleri belirlenmiş, diferansiyel denklemler dışında bulunan fonksiyon ve korelasyonlar sistem değişkeni olarak tanımlanmış, çözüm esnasında sonuçların takip edilebilmesi amacıyla bazı noktalara ölçüm probları tanımlanmıştır. Ölçüm problarının tanımlandığı bu noktalarda denge basıncı, hidrojen kütle değişimi ve metal hidrürün farklı bölgelerindeki sıcaklık değerleri takip edilebilmektedir. Sonlu eleman yoğunluğu da parametrik olarak tanımlanmıştır. 'Mesh1' bölümünde, modellenen sistemin sonlu elemanlar prensibine göre mesh oluşturulmaktadır.



Şekil 1. Kanatçıksız, düz ve açılı kanatçıklı durumda Mesh Yapısı ve reaktör kesitleri

Özellikle düzgün bir yapıya sahip olan ve sistemin orta hacmini oluşturan bölge ile birlikte diğer bölgelere uygun mesh'ler tanımlanmıştır. Bu bilgiler, modellenen sistemde parametrik olarak kayıtlı durumdadır. Farklı bölgelerdeki mesh elemanlarının boyutlarının birbirleriyle süreklilik arz etmesi, sistemin modellenmesi ve çözümü açısından oldukça önemlidir. Hidrojenin metal hidrüre soğurulması ve serbest bırakılması işleminin modellenmesi oldukça karmaşık bir modelleme yaklaşımı gerektirmektedir. Gerçek duruma yaklaşabilmek ve oluşturulan modeli deneysel verilerle ilişkilendirebilmek amacıyla birden çok fiziksel denklemin bir arada değerlendirilmesi ve çözümünün gerçekleştirilmesi gerekmektedir [Nasrallah ve Jemni, 1997; Jemni ve Nasrallah, 1995a; Jemni ve Nasrallah, 1995b]. Bununla birlikte, bu denklemlerin birbirleriyle olan ilişkileri doğru

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modellenmeli ve çözücü algoritma ile olan uyumuna da dikkat edilmelidir. Matemeatiksel analizlerde kullanılan mesh yapısı ve hirdür rekatör kesitleri Şekil 1'de gösterilmiştir. Simülasyon çalışmasında, hidrojen ideal gaz olarak kabul edilmiş, ortam lokal olarak termal dengede, hidrür yatağın termo-fiziksel özellikleri sıcaklık ve Hidrojen basıncından bağımsız, denge basıncı değişiminde hidrojen konsantrasyonunun etkisi önemsiz, radyasyon ile ısı transferi ihmal edilmiştir. Metal hidrür ile Hidrojen arasında ısı dengesi varsayımına göre, katı ve gaz fazları için tek bir enerji denklemi tanımlanmıştır:

$$(\rho c_p)_s \ \partial T/\partial t + (\rho c_{pg})\, v_g .\Lambda T = \Lambda.(k_e\, \Lambda T) + m\,(\Delta H - T(c_{pg} - c_{ps}) \quad (1)$$

Denklemdeki son terim reaksiyon sırasında açığa çıkan ve soğurulan ısıyı göstermektedir. Katı ve gaz fazlarında tek yönlü ısı iletimi kabul edildiğinde, efektif spesifik ısı ve termal iletim katsayıları şu şekilde ifade edilebilir:

$$(\rho c_p)_g = \varepsilon p_g c_{pg} + (1-\varepsilon)\rho_s c_{ps} \quad (2)$$

$$k_g = \varepsilon k_g + (1-\varepsilon)\, k_s \quad (3)$$

Katı için kütle korunum dengesi şöyle tanımlanmıştır:

$$-\varepsilon\, \partial(\rho_s)/\partial t = -m \quad (4)$$

Momentum dengesi şu şekilde ifade edilmiştir:

$$\partial s(\rho_g) + \Lambda\, .\, (\rho_g v_g) = -m \quad (5)$$

Gözenekli yapı içerisinde gaz hızı Darcy denkleminden elde edilmiştir:

$$V_g = -\, K/\mu_g \ \ \Lambda\,(p_g) \quad (6)$$

Burada K, gözenekli yapı geçirgenliği ve μ_a gazın dinamik viskositesidir.

Absorpsiyon ve desorpsiyon işlemleri için kinetik denklemler aşağıdaki gibi ifade edilmiştir [Chung ve Ho, 2009]:

Absorpsiyon:

$$m = c_a \exp(-E_a/R_gT) \ \ \ln(p_g/p_{eq})\,(\rho_{ss}-\rho_s) \quad (7)$$

Desorpsiyon:

$$m = c_d \exp(-E_d/R_gT)\,(p_g - p_{eq}/p_{eq})\,(\rho_s-\rho_0) \quad (8)$$

Burada C deneysel olarak bulunan üstel sabit, E aktivasyon enerjisi, ρ_{ss} doygunluk durumunda metal hidrür özkütlesi ve ρ_o metal hidrür başlangıç özkütlesidir.

Hidrojen için kullanılan ideal gaz denklemi şu şekilde ifade edilmiştir:

$$P_g = (p_g M_g) / (R_g T) \quad (9)$$

Denge basıncı hesabı için Van't Hoff kuralı uygulanmıştır. Buna göre;

$$P_{eq} = \exp\,[\,\Delta H / (R_g T) \ \ - \Delta S/R_g \ \ + \ \ (\varphi \pm \varphi_0)\tan[\pi\,(x/x_f \ \ - \ \ ½] \pm \beta/2] \quad (10)$$

ΔH ve ΔS reaksiyon entalpi ve entropisini, R_g evrensel gaz sabitini, Ø, $Ø_0$ ve β deneysel eğim ve histeresis faktörlerini, x Hidrojen konsantrasyonunu temsil etmektedir. Denklemlerde bulunan ± işareti, absorpsiyon durumunda (+) ve desorpsiyon durumunda ise (–) olarak tanımlanmıştır.

Silindirik hacimli ve düz kanatçıklı tank için yapılan absorpsiyon prosesine ait deneysel çalışmalardan elde edilen sonuçlar, aynı tank geometrisinin modellenmesi ve COMSOL yazılımı ile simülasyonunun gerçekleştirilmesi sonrasında elde edilen sıcaklık, absorbe edilen H_2 miktarı ile karşılaştırıldığında benzer grafik eğrilerinin elde edildiği, birbirine yakın sonuçların elde edildiği görülmüştür. Örneğin, 4 farklı koordinatta elde elden deneysel sonuçlarda maksimum sıcaklık değeri 105 ºC mertebesinde ölçülürken, simülasyon çalışmasında her 4 farklı termokapıl noktasına ait sıcaklık değerlerinde de birebir eşdeğer sonuçlar elde edilmiştir. Deneysel çalışmada 20 ºC'ye ulaşma sürelerinin, analiz sonuçlarına göre kıyasla daha uzun olduğu gözlemlenmektedir. Diğer taraftan absorbe edilen hidrojen miktarı, deneysel çalışmada 0,4 g ölçülürken, analiz sonucunda bu değer 1,2 g mertebelerinde elde edilmektedir. Elde edilen sonuçlardaki bazı farklılıkların, deney şartlarındaki bazı ölçülemeyen olumsuzluklar (vakumlama veya şarj esnasında borularda, hortumlarda söz konusu olabilecek kaçak ve sızıntı, kullanılan bazı cihaz ve ölçüm ekipmanların yetersizliği, ölçüm aralıklarının daha hassas seçilememesi, sistemde laboratuar şartları nedeniyle azot tankı, hidrojen rezervuar tankının deney tesisatına dahil edilememesi gibi) ile açıklanabilir. Bu değerlendirmeler ışığında, simülasyon sonucu ve deneysel ölçümlerde elde edilen sonuçlar dikkate alındığında, modelleme ve simülasyon analizinin uygun olduğu görülmüştür. COMSOL yazılımı ile geliştirilen sonlu elemanlar modeline ait analiz sonuçlarının deneysel olarak elde edilen sonuçlarla karşılaştırıldığında, birbirlerini doğruladığı görüldükten sonra, sonlu elemanlar analizi ile hidrojen depolama prosesine etki eden birçok parametre kombinasyonları oluşturulmuştur.

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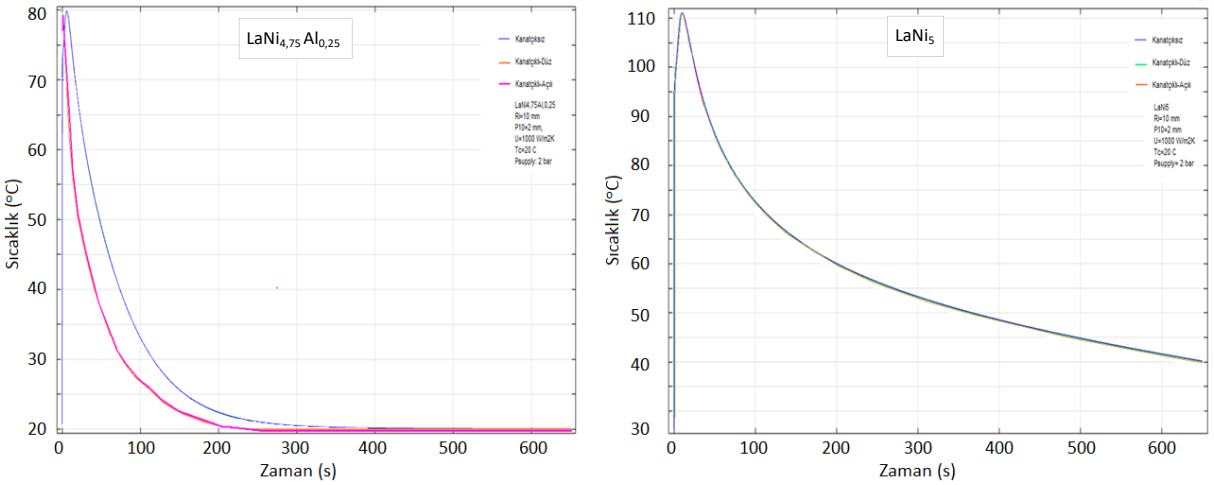
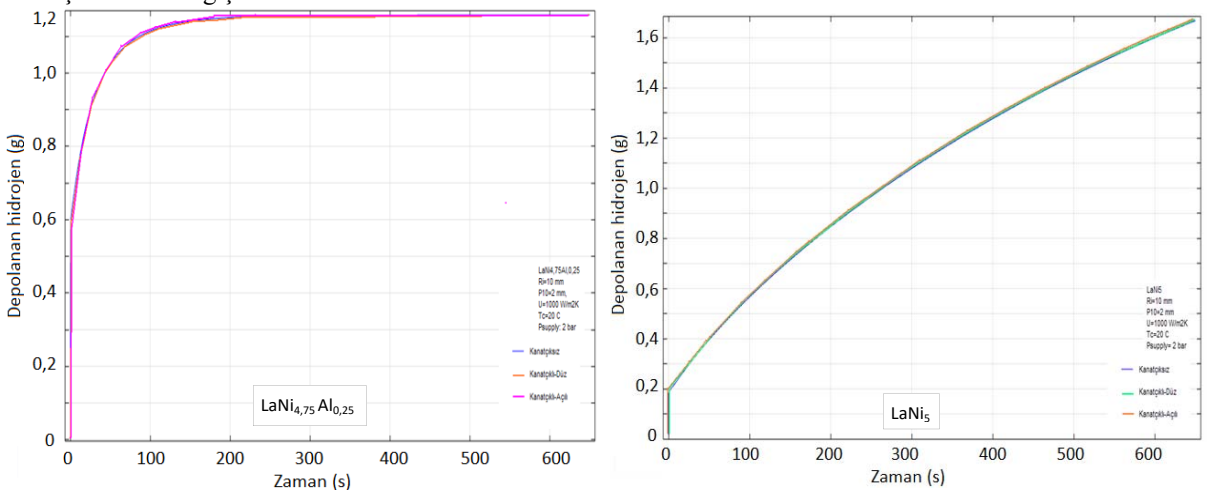
Bulgular ve Tartışma

Analiz değişkenleri olarak kanatçıklı, kanatçıksız ve açılı kanatçıklı reaktörler, hidrojen giriş basıncı, hidrür alaşım tane boyutu gibi parametreler kullanılarak hirür reaktörlerde hidrojen depolama analizleri gerçekleştirilmiştir. Değişken olarak depolama tankının kanatçıksız, kanatçıklı-düz ve kanatçıklı-açılı olmasının alındığı analizde, $LaNi_{4,75}Al_{0,25}$ ve $LaNi_5$ metal hidrür alaşımları için, 44,5 mm mesafedeki tank içi sıcaklık değerinin zamana göre değişimi sırasıyla Şekil 2'de verilmektedir. $LaNi_{4,75}Al_{0,25}$ kullanıldığında, tank içi sıcaklığın maksimum 80 °C değerine çıktığı, 300 s süresinde sıcaklığın 30 °C'ye düştüğü, yaklaşık 700 s mertebelerinde sıcaklığın soğutucu su sıcaklığı değeri ile dengeye geldiği, kanatçıklı tank tasarımında tank içi sıcaklık dağılımının daha iyi olduğu, maksimum sıcaklığın 75 °C'ye ulaştığı, sıcaklığın 200 s mertebelerinde soğutma suyu sıcaklığı ile dengeye geldiği, kanatçıkların pozisyonunun düz veya açılı olmasının belirgin bir farklılık oluşturmadığı görülmektedir. $LaNi_5$ alaşımı kullanıldığında ise sıcaklık yaklaşık 112 °C ulaşmıştır. $LaNi_{4,75}Al_{0,25}$ ve $LaNi_5$ metal hidrür alaşımları için, absorbe edilen hidrojen kütlesinin zamana göre değişimi grafikleri ve elde edilen sonuçlar Şekil 3'te verilmektedir. Kanatçıklı tankta absorbe edilen hidrojen miktarının, kanatçıksız tanka oranla 500 s mertebelerinde 0,03 g daha fazla hidrojen depoladığı, kanatçıklı durumlarda 600 s sonra 0,85 g absorbe edilen kütleye ulaşıldığı, kanatçıkların pozisyonunun düz veya açılı olmasının belirgin bir farklılık oluşturmadığı görülmektedir. Kanatçıklı veya kanatçıksız halde belirgin bir fark olmadığı ve $LaNi_{4,75}Al_{0,25}$ 200 s mertebelerinde maksimum 1,2 g hidrojenin absorbe edildiği $LaNi_5$ için ise 600 s sonunda 1,6 g hidrojen depolandığı görülmektedir.



Şekil 2. Depolama tankının kanatçıksız, kanatçıklı-düz ve kanatçıklı-açılı olması durumunda, 44,5 mm mesafedeki tank içi sıcaklık değişimi



Şekil 3. Depolama tankının kanatçıksız, kanatçıklı-düz ve kanatçıklı-açılı olması durumunda absorbe edilen hidrojen kütle değişimi

Değişken olarak 2 ile 35 bar aralığında hidrojen giriş basıncının alındığı analizde, elde edilen sonuçlar Şekil 4'te verilmektedir. Şekil incelendiğinde, hidrojen giriş basıncının artmasıyla tank içi sıcaklık değerlerinde önemli farkların oluştuğu, tank içi sıcaklığın maksimum $LaNi_{4,75}Al_{0,25}$ alaşımlarında 85 °C değerine çıktığı, Giriş basıncının 35 bar olduğu durumda, 5 bar basınç değeriyle kıyaslandığında, tank içi sıcaklık değeri 600 s sürelerde değil, 200 s mertebelerinde 0 °C soğutucu su sıcaklığı ile dengeye geldiği görülmektedir. Giriş basıncı değerindeki

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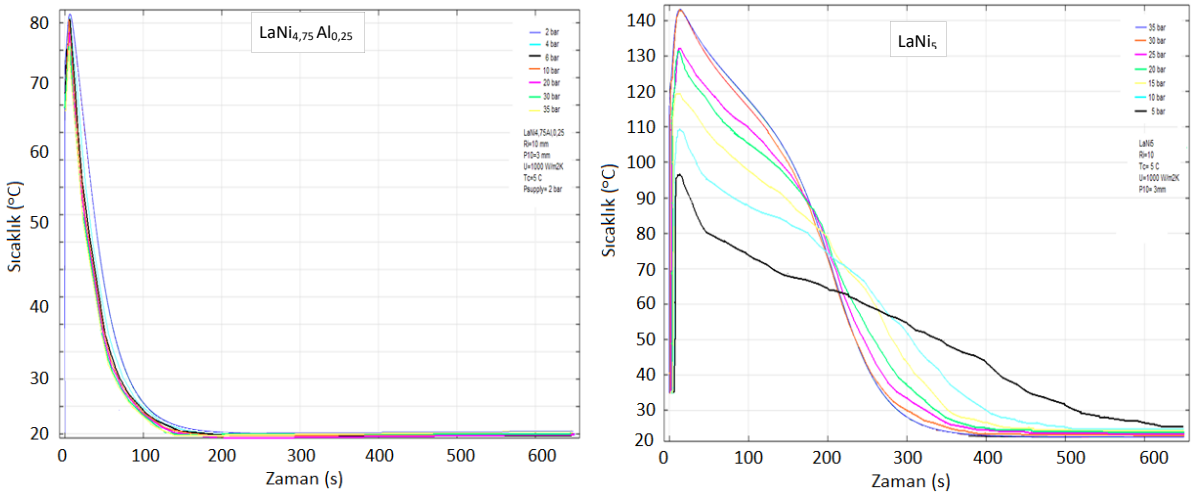
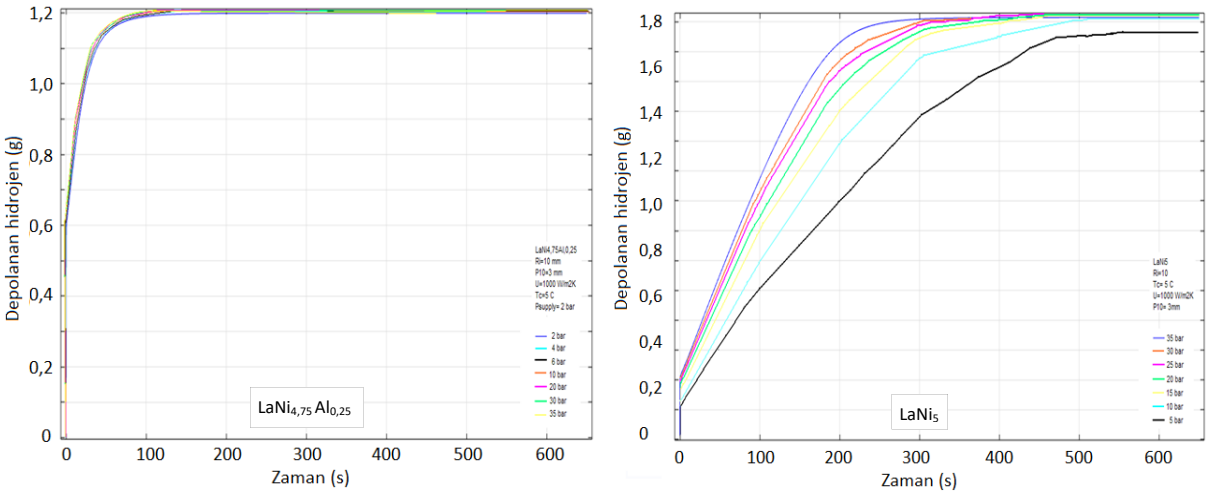
artışın tank iç sıcaklık dağılımında olumlu etki yaptığı, tank içi sıcaklığın maksimum 82 °C değerine çıktığı, giriş basıncının 35 bar olduğu durumda, 5 Bar basınç değeriyle kıyaslandığında, soğutucu akışkan sıcaklığına daha kısa süre içinde, 200 s yerine 140 s mertebelerinde ulaşılabilmekte olduğu görülmektedir. Şekil incelendiğinde giriş basıncı değerindeki artışın tank iç sıcaklık dağılımında olumlu etki yaptığı, tank içi sıcaklığın 5 bar basınçta maksimum 95 °C, 35 bar'da ise maksimum 135 °C değerine çıktığı, giriş basıncının 5'den 35 bar'a arttırılması durumunda tank iç sıcaklığının 20 °C'ye 700 s yerine 400 s mertebelerinde ulaştığı görülmektedir. $LaNi_5$ te ise maksimum 145 °C değerlerine çıktığı görülmüş, Al ilavesinin tankın soğumasında ve tank içi sıcaklık dağılımında önemli etkileri olduğu görülmüştür. $LaNi_{4,75}Al_{0,25}$ ve $LaNi_5$ metal hidrür alaşımları için, absorbe edilen hidrojen kütlesinin zamana göre değişimi grafikleri ve elde edilen sonuçlar, sırasıyla Şekil 5'te verilmektedir. Hidrojen giriş basıncının artmasıyla absorbe edilen hidrojen miktarında kayda değer farkların oluştuğu, giriş basıncının 35 bar olduğu durumda, 5 bar basınç değeriyle kıyaslandığında, absorbe edilen hidrojen kütlesinin, 600 s de $LaNi_{4,75}Al_{0,25}$ için 1,2 g olduğu belirlenmiştir. $LaNi_5$ içerisinde ise maksimum 1,8 g değerlerine ulaştığı görülmektedir. Hidrojen giriş basıncının artmasıyla absorbe edilen hidrojen miktarında kayda değer farkların oluştuğu, giriş basıncının 35 bar olduğu durumda, 5 bar basınç değeriyle kıyaslandığında 1,7 g yerine 1,8 g hidrojenin absorbe edildiği, üstelik 1,8 g kütleye, 470 s de değil 280 s mertebelerinde ulaşılabildiği görülmektedir.



Şekil 4. Farklı hidrojen giriş basınçlarında z=44,5 mm mesafedeki tank içi sıcaklık değişimi



Şekil 5. Farklı hidrojen giriş basınçlarında, absorbe edilen hidrojen kütle değişimi

Sonuç ve Öneriler

Hidrojen'in metal hidrit malzemesi yardımıyla etkin olarak depolandığı hidritleme prosesinde farklı metal hidrit malzemesinin deneysel ve analiz çalışmaları yapılmakta ve sonuçlar yayımlanmaktadır. Hidrojen'in depolandığı absorpsiyon prosesinde, tepkimenin gerçekleştiği depolama tankında çok kısa süre içerisinde büyük miktarlarda ısı ortaya çıkmakta, bu ısının etkin ve hızlı bir şekilde uzaklaştırılması, hidritleme prosesinin etkinliği açısından büyük önem taşımaktadır. Bununla birlikte kütle transferinin iyileştirilmesi, bu amaçla depolama tankı tasarımlarında uygun iyileştirmeler yapılması, hidrojen'in depolanması prosesinde önemli rol oynayan parametrelerdir. Bu amaçla iki farklı metal hidrit malzemesine ait termo-fiziksel özellikler dikkate alınarak, hidritleme prosesinde önemli olan tank tasarımı için kanatçıklı olmasının, Hidrojen giriş basıncının değişiminin,

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tankın dış yüzeyinde yer alan soğutucu akışkan sıcaklığı farklılığının, tankın iç yarıçapının, dolayısıyla iç hacminin ve et kalınlığında yapılacak değişikliğin, aynı zamanda sistemin yalıtımı ile birebir ilişkili olan genel ısı iletim katsayısının tank içi sıcaklık dağılımına, absorbe edilen Hidrojen'in kütlesine ve sistem denge basıncına nasıl ve ne şekilde etki ettiği, COMSOL yazılımı yardımıyla analiz edilmiştir. Söz konusu analizler incelendiğinde Hidrojen giriş basıncının, soğutucu akışkan sıcaklığı değerinin ve tank iç yarıçapnın oldukça önemli rol oynadığı, kanatçıklı tasarım ve genel ısı iletim katsayısı parametrelerinin nispeten daha düşük seviyede farklılık oluşturduğu, buna karşılık tank et kalınlığının depolama tankı üretilebilirliği, işçilik ve malzeme giderleri ile birlikte dikkate alınmasının gerektiği, partikül tane boyutu büyüklüğünün ise kendi içinde değil, ancak seçilen metal hidrit malzemesinin genel termo-fiziksel özellikleri ile birlikte hedeflenen değerlerde rol oynadığı sonucuna varılmıştır.

İleriki çalışmalarda; deneylerin yapıldığı ortam sıcaklığı sabit tutulmalı, reaktör malzemeleri hidrojen depolanan malzemeye yakın veya aynı malzemeden imal edilmeli, rektör malzemesi olarak ısı iletim katsayısı yüksek malzemelerin kullanılması, daha kısa sürede doldurulup boşaltılabilecek reaktör tasarlanması ve imalatı için, efektif ısı transfer katsayısını arttırmak adına farklı ısı değiştiricisi tasarımları; içten kanatçık, dıştan kanatçık, içten soğutucu akışkan, dıştan soğutucu akışkan, kullanımı gibi tasarımların birkaçının veya tamamının birlikte uygulanması, reaktörden istenilen debide hidrojenin alınması için, sabit uygulamalarda indiksiyon elektrikli ısıtıcılar gibi hassas sıcaklık kontrollü ısıtıcılar kullanarak optimum deşarj işlemleri sağlamak ve hareketli uygulamalarda taşıt motor atık ısısından yararlanmak gibi önemler alınarak çalışmalarda daha uygun sonuçlar alınabilecektir.

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METEOROLOJİK VERİLERİN YÜK PROFİLLERİ HESABI ÜZERİNDEKİ ETKİLERİNİN İNCELENMESİ

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Özet: Bu çalışmada yük profillerinin hesaplanmasında meteorolojik verilerden olan sıcaklık bilgisinin dikkate alınıp alınmaması durumlarına göre, elde edilen profiller arasındaki farklar incelenmiştir. Yük profillerinin doğru bir şekilde belirlenmesi, dengesizlik maliyetlerinin azaltılması açısından büyük öneme sahiptir. Türkiye'de bulunan Sakarya Elektrik Dağıtım Anonim Şirketi (SEDAŞ) tarafından sağlanan 2015 yılına ait saatlik sıcaklık ve mesken tüketim değerleri kullanılmıştır. Yük tahminleri için Çoklu Regresyon Analizi Modeli (ÇRAM) matematiksel modeli uygulanmıştır. Elde edilen matematiksel model kullanılarak saat ve sıcaklık bilgisine bağlı olarak tüketim değerleri tahmin edilmiş ve bu tüketim değerlerine göre yük profil katsayıları belirlenmiştir. Yük profil katsayılarının belirlenmesinde, saatlik sıcaklık değerlerinin birer Santigrat derecesi artım veya azalma adımları ile değişmesi olasılıklarına göre yük profilleri hazırlanmış ve aralarındaki farklar karşılaştırılmıştır. Sıcaklığa bağlı olarak elde edilen profiller incelendiğinde sıcaklık bilgisinin dikkate alınması halinde yük profillerinin daha doğru olarak elde edileceği anlaşılmıştır.

Anahtar Kelimeler: Kısa Dönem Yük Tahmini, Regresyon Analizi, Enerji Dağıtım Sistemi

Giriş

Elektrik enerjisinin üretim tüketim dengesinin sağlanması önemli bir konudur. Elektrik enerjisinin üretim iletim ve dağıtımında enerjinin depolanması çok zor olduğu için üretimin tüketim ve kayıpları karşılayacak değerde olması gerekmektedir. Üretim ve tüketim dengesi sağlanamadığı durumda dengesizlik maliyeti oluşmaktadır. Dengesizlik maliyetlerinin azaltılmasında en büyük etken yük tahminlerinin tutarlı yapılmasıdır. Türkiye'de dengesizlik maliyetleri ile ilgili çalışmaların merkezinde Enerji Piyasaları İşletme Anonim Şirketi (EPİAŞ), bulunmaktadır. EPİAŞ'ın başlıca amacı ve faaliyet konusu, piyasa işletim lisansında yer alan enerji piyasalarının etkin, şeffaf, güvenilir ve enerji piyasasının ihtiyaçlarını karşılayacak şekilde planlanması, kurulması, geliştirilmesi ve işletilmesidir. Yük tahminlerindeki isabet uzlaştırma açısından da önemlidir. Uzlaştırma, gün öncesi piyasası, dengeleme güç piyasası ve enerji dengesizliğinden doğan alacak ve borç miktarlarının hesaplanmasını kapsar. Yük tahminlerindeki hatalar piyasa fiyatlarını ve dağıtım şirketlerinin dengesizlik maliyetlerini etkilemektedir (EPİAŞ, 2016). Yük tahminlerini ifade eden profil katsayılarının daha doğu olarak belirlenebilmesi için bir çok farklı çalışmalar yapılmakta ve değişik yöntemler geliştirilmektedir (Francis et. al.,2015, Juan et. al.,2009, , Bujosa et. al.,2007, , Clements et. al.,2016). Elektrik güç sisteminde yük tahmini, dağıtım sisteminin planlanması ve dengede tutulması açısından çok önemli bir çalışma alanıdır. Sadece geçmişe dönük tüketim değerleri dikkate alınarak yapılan tahminler yeterli olmamaktadır. Meteorolojik veriler, müşteri çeşidi gibi faktörler de dikkate alınması gereklidir

(Samsher & Unde,2012, Song et. al.,2016) . Yük tahminleri genel olarak üç sınıfa ayrılmaktadır. Kısa dönem yük tahminleri, 1 saatlik süreden başlayarak bir haftalık süreye kadar olan tahminleri kapsar. Orta dönem yük tahminleri, bir hafta ile bir aylık süre arasında kalan sürelerdeki tahminleri içerirken, uzun dönem yük tahminleri ise bir yıldan daha uzun zaman dilimleri için yapılan tahminleri içerir (Panapakidis I. P. , 2016, Lee & Hong 2015, Shao et. al. 2015, Friedrich & Afshari, 2015).

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Yük tahminleri konusunda çok sayıda çalışmalar yapılmıştır. Abu ve arkadaşları bir sonraki yıl içindeki günün saatlik yük tahminini yapabilmek için çoklu lineer ve lineer olmayan regresyon uygulaması üzerinde çalışmış ve orta dönem yük tahminleri gerçekleştirmişlerdir(Shikhah& Aloquili 2011). Romera ve arkadaşları yaptıkları çalışmada yapay sinir ağları ve Fourier Serisi yaklaşımından faydalanarak aylık elektrik enerjisi talep tahmin hesaplaması yapmışlardır(Romera et. al. 2008) . Friedrich ve Afshari yaptıkları çalışmada, hava durumu koşullarının kısa dönem yük tahmini üzerindeki etkilerini incelemişlerdir(Friedrich & Afshari 2015) . Swaroo ve Abdulquder yaptıkları çalışmada güç sisteminin planlanması ve çalıştırılması amacı için yapar sinir ağları yöntemi kullanarak yük tahminlerinde bulunmuşlardır(Samsher & Unde,2012, Song et. al.,2016). Mandal ve arkadaşları yaptıkları çalışmada benzer gün yaklaşımını içeren yapay sinir ağları yöntemi ile değişik mevsim şartları dikkate alınarak birkaç saat sonrası için tahminlerde bulunmuşlardır (Mandal et. al. 2006).

Bu çalışmada Sakarya Elektrik Dağıtım Anonim Şirketi (SEDAŞ) tarafından Enerji Piyasası Düzenleme Kuruluna (EPDK) önerilen "Profil Katsayılarının Dengesizlik Maliyetlerine Etkisi ve Optimizasyonu Projesi" İsimli proje kapsamında 1 Temmuz – 30 Mayıs 2015 tarihleri arasında elde edilen mesken saatlik tüketim ve sıcaklık verileri kullanılması ile matematiksel modeller oluşturulmuştur. Bu model sayesinde sıcaklık ve saat bilgisi değişken olarak alınmak sureti ile istenilen sıcaklık ve saatte tüketilecek olan enerji değeri tahmin edilmiştir. Hissedilen sıcaklık değerlerinin 1'er ^{0}C derecesi azalması veya artması durumları dikkate alınarak her bir durum için profil katsayıları ayrı ayrı hesaplanmış ve profil katsayılarının belirlenmesinde hissedilen sıcaklık faktörünün etkisi ortaya konulmuştur.

Yük Profilleri

Dengeleme uzlaştırma gibi işlemlerde kullanılan ve 2016 yılında kullanılacak olan profil katsayıları dağıtım şirketleri tarafından hazırlanan 2015 yılı veri setleri kullanılmak sureti ile hesaplanır. Profil katsayıları ticarethane, tarımsal sulama, sanayi, aydınlatma, mesken gibi guruplara ayırılarak ayrı ayrı hesaplanırlar. Günlük mesken tüketimlerini ifade etmek üzere profiller hafta içi, hafta sonu ve resmi tatil günlerinin profilleri olarak sınıflandırılırlar. Hafta içi Pazartesi, Salı, Çarşamba, Perşembe, Cuma günlerindeki tüketimleri gösterir. Ancak Pazartesi gününün profili diğer hafta içi günlerinin profilinden farklıdır. Hafta sonu profilleri ise Cumartesi ve Pazar günü tüketimlerini ifade etmektedir. Tatil profili resmi tatil günlerindeki tüketimleri gösterir ve profilin ismi bayram olarak ifade edilir. Profil katsayıları saatlik enerji tüketimini ifade etmektedirler. Mesken Profil Katsayıları (MPK)'nın hesaplanması amacı ile SEDAŞ tarafından yapılan 2015 yılı enerji tüketim ölçümleri incelendiğinde mevsimsel etkiler nedeni ile bazı ayların MPK benzerlik gösterdiği anlaşılmıştır. Örneğin Sonbahar mevsimi olarak ifade edebileceğimiz Ekim –Kasım ayı MPK birbirine çok benzemektedir. Aralık Ocak Şubat ve Mart ayı benzer özellikli MPK kış mevsimini ifade etmektedir. İlkbahar mevsimi MPK olarak Nisan Mayıs aylarına ait verilerin dikkate alınmasının daha doğru olacağı belirlenmiştir. Yaz mevsimini ifade eden Haziran Temmuz Ağustos ayları için hazırlanan MPK'nın da birbirlerine çok benzediği görülmüştür. Bu çalışmada MPK hesaplanması için matematiksel modeller önerilmektedir. Matematiksel model hazırlanırken mevsimsel farklılıklar dikkate alınarak dört farklı model üzerinde çalışılmaktadır. MPK hesabında gün tipi profil katsayıları ayrı ayrı hesaplanır. MPK'nın hesaplanabilmesi için haftanın tüm günlerinin ve Resmi tatil günlerinin saatlik tüketim değerleri belirlenir. Pazartesi günlerinde kullanılan ortalama saatlik tüketim değerlerinin toplamı hesaplanır. Bu değer çok önemlidir. Çünkü profil katsayıları hesaplanırken tüm gün tiplerinin saatlik ortalama değerleri pazartesi saatlik ortalamalar toplamına bölünerek elde edilirler. Örneğin SEDAŞ tarafından "Profil Katsayılarının Dengesizlik Maliyetlerine Etkisi ve Optimizasyonu Projesi" İsimli proje kapsamında Eylül- Ekim 2015 tarihinde edilen mesken saatlik tüketim değerlerine göre hesaplanan MPK Tablo 1 de sunulmuştur. Bu profil katsayılarının hesabında sıcaklık bilgisi dikkate alınmamıştır. Eylül-Ekim 2015 mesken tüketim değerlerine göre elde edilen Sonbahar Mevsimi MPK Şekil 1 ile gösterilmiştir.

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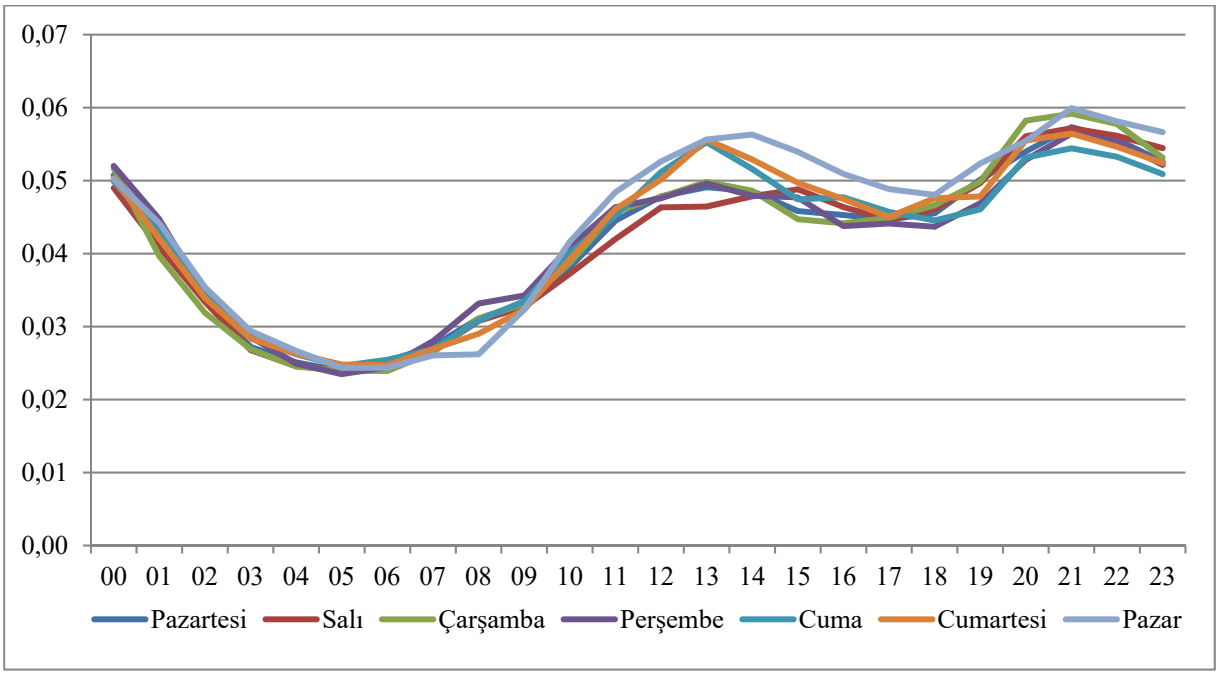
Tablo 1. Eylül Ekim 2015 Ölçüm Sonuçlarına Göre MPK

Gün saat	Pazartesi	Salı	Çarşamba	Perşembe	Cuma	Cumartesi	Pazar
00	0,0507	0,0490	0,0517	0,0520	0,0499	0,0503	0,0502
01	0,0432	0,0409	0,0396	0,0447	0,0427	0,0420	0,0441
02	0,0337	0,0334	0,0319	0,0344	0,0345	0,0339	0,0354
03	0,0272	0,0268	0,0269	0,0286	0,0285	0,0284	0,0294
04	0,0251	0,0246	0,0245	0,0249	0,0262	0,0263	0,0267
05	0,0239	0,0241	0,0240	0,0235	0,0246	0,0248	0,0244
06	0,0253	0,0244	0,0239	0,0244	0,0255	0,0247	0,0244
07	0,0273	0,0267	0,0265	0,0280	0,0269	0,0269	0,0261
08	0,0311	0,0308	0,0311	0,0332	0,0308	0,0290	0,0262
09	0,0333	0,0327	0,0331	0,0343	0,0335	0,0323	0,0323
10	0,0381	0,0372	0,0387	0,0409	0,0401	0,0392	0,0417
11	0,0445	0,0420	0,0457	0,0464	0,0452	0,0461	0,0484
12	0,0479	0,0463	0,0478	0,0476	0,0512	0,0502	0,0526
13	0,0491	0,0465	0,0498	0,0496	0,0553	0,0556	0,0556
14	0,0486	0,0479	0,0486	0,0479	0,0516	0,0529	0,0563
15	0,0458	0,0488	0,0447	0,0477	0,0474	0,0497	0,0540
16	0,0453	0,0464	0,0441	0,0438	0,0477	0,0475	0,0509
17	0,0447	0,0446	0,0449	0,0441	0,0457	0,0450	0,0488
18	0,0455	0,0461	0,0466	0,0437	0,0445	0,0476	0,0481
19	0,0501	0,0497	0,0499	0,0469	0,0461	0,0478	0,0524
20	0,0540	0,0561	0,0582	0,0528	0,0532	0,0555	0,0554
21	0,0573	0,0572	0,0592	0,0565	0,0544	0,0564	0,0599
22	0,0556	0,0561	0,0578	0,0554	0,0533	0,0546	0,0581
23	0,0526	0,0545	0,0531	0,0521	0,0509	0,0524	0,0566



Şekil 1. Sonbahar Profil Katsayılarının Gün Tipine Göre Değişimi

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Polinamik Regresyon Matematiksel Modeli

Regresyon analizi bağımsız değişkenler ile bağımlı değişken arasındaki ilişkiyi matematiksel olarak ifade etmek için kullanılan bir yöntemdir (Shikhah& Aloquili 2011). En küçük kareler yöntemi yöntemi en fazla tercih edilen bir regresyon yöntemidir(Orun&Karatekin, 2014). Bir tane bağımlı değişkene karşılık birden fazla bağımsız değişkenin bulunması halinde denklem elde edilmesi yöntemine Çoklu Regresyon Analizi (ÇRA) denir. Denklem 1 'de Lineer Regresyon modeli verilmiştir. $\tilde{Y}$(k),

$$\tilde{Y} = a_{00} + \sum_{i=1}^{\lambda} a_{1i}\, X_i(k) + \sum_{i=1}^{\lambda} a_{1i}\, X_{2i}^2(k) + \cdots + \sum_{i=1}^{\lambda} a_{mi}\, X_i^m(k), \quad k = 1,2,\ldots,N \tag{3}$$

Denklem 3 ile *m.* dereceden çok değişkenli polinomik regresyon analizi ifade edilmektedir (Aslan et. al., 2011). Hesaplanması gereken bilinmeyen katsayı değerler a_{ij} ile ifade edilmiştir. Gerçek değer olarak kabul edilen ölçülen değerler ile modelin hesapladığı tahmini değerler arasındaki farkların karelerinin ortalamalarının (Mean Squared Errors (MSE)) minimize edilmesi ile polinom katsayıları hesaplanır. Bu durum denklem 4 ve 5 ile ifade edilmiştir (Karaboğa N.,2015). *m.* dereceden polinom modeli hatanın karesinin hesaplanması ise Denklem 4 ile gösterilmiştir.

$$E = \sum_{i=1}^{N}[Y_i - \tilde{Y}_i)]^2 = \sum_{i=1}^{N}[\, Y_i - a_{00} - a_{11}X_{1i} - a_{12}X_{1i}^2 - \cdots - a_{1m}X_{1i}^m]^2 \tag{4}$$

$$\begin{pmatrix} a_{00} \\ a_{11} \\ \vdots \\ . \\ a_{1m} \end{pmatrix} = \begin{pmatrix} N & \sum_{i=1}^{N} X_{1i} \cdots & \sum_{i=1}^{N} X_{1i}^{m} \\ \sum_{i=1}^{N} X_{1i} & \sum_{i=1}^{N} X_{i1}^{2} \cdots & \sum_{i=1}^{N} X_{1i}^{m+1} \\ \vdots & \vdots & \vdots \\ \sum_{i=1}^{N} X_{1i}^{m} & \sum_{i=1}^{N} X_{1i}^{m+1} \ldots & \sum_{i=1}^{N} X_{1i}^{2m} \end{pmatrix}^{-1} \begin{pmatrix} \sum_{k=1}^{N} Y_i \\ \sum_{k=1}^{N} Y_i X_{1i} \\ \vdots \\ \sum_{k=1}^{N} Y_i X_{1i}^{m} \end{pmatrix} \tag{5}$$

Denklem 4 'de $\tilde{Y}_i$ matematiksel modeli tarafından hesaplanan değeri Y_i ise ölçüm sonucunda bulunan gerçek değeri ifade etmektedir. X_i ise bağımsız değişken değerlerini ifade eder. ÇRA ile Denklem 5 ve 6 da ifade edilen a_{00}, a_{11} ,a_{22} katsayıları belirlenir. Bu katsayıların belirlenmesi için Denklem 6 kullanılır. Denklem 6 ve 7 'de Y_i, üretilen saatlik enerji miktarını, X_1 saat olarak zaman değerini ve X_2 ise Santigrad derecesi olarak sıcaklık değerini ifade etmektedir [b-c-g20,21,22,23]. Denklem 7 ile elde edilen katsayılar denklem 6 de yerine yazıldığında enerji tüketimini zamana ve sıcaklığa bağlı olarak ifade eden matematiksel model elde edilir.

$$f(x) = a_0 + a_1 X_1 + a_2 X_2 + a_3 X_3 + \cdots + a_n X_n \tag{6}$$

$$\begin{bmatrix} N & \sum X_{1i} & \sum X_{2i} \\ \sum X_{1i} & \sum X_{1i}^2 & \sum X_{1i}X_{2i} \\ \sum X_{2i} & \sum X_{1i}X_{2i} & \sum X_{2i}^2 \end{bmatrix} \begin{bmatrix} a_0 \\ a_1 \\ a_2 \end{bmatrix} = \begin{bmatrix} \sum Y_i \\ \sum X_{1i}Y_i \\ \sum X_{2i}Y_i \end{bmatrix} \tag{7}$$

Matematiksel Model ile Yük Profillerinin Hesaplanması

Bu çalışmada, Matlab Programı kullanılarak elektriksel tüketimler için yük tahmini yapacak matematiksek modeller oluşturulmuştur. Modellerin oluşturulması için SEDAŞ bölgesinde 2015 yılı saatlik mesken elektrik enerjisi tüketimi ölçüm değerleri ve aynı saatlerde hissedilen sıcaklık değerleri kullanılmıştır. Modeller Güçlü En Küçük Kareler Yöntemi ÇRA yapılarak elde edilmiştir. Model oluşturulurken mevsimsel şartlar da dikkate alınmıştır. Yaz, sonbahar, kış ve ilkbahar mevsimleri için ayrı ayrı dört farklı model oluşturulmuştur. Ayrıca hissedilen sıcaklık ve günün saat bilgisi de modelde değişken olarak ele alınmıştır. Elde edilen modeller sayesinde, mevsim seçimi yapıldıktan sonra saat ve sıcaklık bilgisine göre tüketilecek elektrik enerjisi miktarı

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tahmin edilmektedir. Yaygın olarak model testi için kullanılan, Çoklu belirlilik katsayısı (R^2), hataların karelerinin ortalamalarının karekökü (Root Mean Squared Errors) (RMSE) değerleri her bir model için hesaplanmıştır. Böylece elde edilen matematiksel modellerin güvenirliliği test edilmiştir.

SEDAŞ enerji dağıtım bölgesi içerisinde yapılan ölçümlere göre benzer özellik gösteren aylar bir mevsim olarak kabul edilmiştir. Buna göre Kasım, Aralık, Ocak, Şubat ve Mart Kış Mevsimi, Nisan-Mayıs İlkbahar Mevsimi Haziran, Temmuz, Ağustos Yaz Mevsimi ve Eylül, Ekim ayları Sonbahar Mevsimi olarak dikkate alınmıştır. Bölgesel farklara göre mevsimleri ifade eden aylar farklılıklar gösterebilir bu durum mutlaka dikkate alınmalıdır. Buna göre Kış, İlkbaharı Yaz ve Sonbahar olmak üzere dört farklı matematiksel model elde edilmiştir. SEDAŞ Bölgesinde Eylül ve Ekim aylarının mesken tüketimleri benzer özellik taşıdığı ve diğer aylardan farklı olduğu görülmüştür. Bu durum Şekil 4 ile gösterilmiştir. Bu nedenle Sonbahar mevsimi mesken tüketimlerini tahmin etmek için matematiksel model oluştururken Eylül Ekim ayı tüketimlerinden yararlanılmıştır. Güçlü en küçük kareler yöntemi ÇRA polinomik model kullanılması ile mesken tüketimleri için mevsimsel matematiksel tahmin modeli Denklem 8 ile verilmiştir. a_{00}, a_{10} ,a_{01}, a_{20}, a_{11}, a_{02}, a_{30},a_{21}, a_{12}, a_{03}, a_{40}, a_{31}, a_{22}, a_{13} değerleri denklemin katsayılarını oluşturmakta olup mevsimsel şartlara göre ayrı ayrı hesaplanmış ve Tablo 2 , Tablo3, Tablo4, ve Tablo5 de verilmiştir.

$$z = a_{00} + a_{10}*x + a_{01}*y + a_{20}*x^2 + a_{11}*x*y + a_{02}*y^2 + a_{30}*x^3 + a_{21}*x^2*y + a_{12}*x*y^2 + a_{03}*y^3 + a_{40}*x^4+a_{31}*x^3*y+a_{22}*x^2*y^2+a_{13}*x*y^3+a_{50}*x^5+a_{41}*x^4*y+a_{32}*x^3*y^2+a_{23}*x^2*y^3 \quad (8)$$

Tablo 2. Kış Mevsimi Matematiksel Model Katsayıları

a_{00}	a_{10}	a_{01}	a_{20}	a_{11}	a_{02}	a_{30}	a_{21}	a_{12}
94.84	-32.08	4.529	8.051	-2.19	0.1621	-0.7619	0.2841	-0.05387
a_{03}	a_{40}	a_{31}	a_{22}	a_{13}	a_{50}	a_{41}	a_{32}	a_{23}
-0.007179	0.0314	-0.01465	0.00363	0.002364	-0.0004734	0.000276	-0.000054	-0.000113

Tablo 3. İlkbahar Mevsimi Matematiksel Model Katsayıları

a_{00}	a_{10}	a_{01}	a_{20}	a_{11}	a_{02}	a_{30}	a_{21}	a_{12}
71.92	-20.15	-1.54	5.365	0.5172	0.145	-0.4968	-0.06116	-0.03137
a_{03}	a_{40}	a_{31}	a_{22}	a_{13}	a_{50}	a_{41}	a_{32}	a_{23}
-0.0046	0.0199	0.00106	0.00438	-0.00005	-0.00029	-0.000029	-0.0001296	-0.0000027

Tablo 4 Yaz Mevsimi Matematiksel Model Katsayıları

a_{00}	a_{10}	a_{01}	a_{20}	a_{11}	a_{02}	a_{30}	a_{21}	a_{12}
-75.65	40.8	7.072	-5.22	-2.854	0.4405	0.2905	0.463	-0.09991
a_{03}	a_{40}	a_{31}	a_{22}	a_{13}	a_{50}	a_{41}	a_{32}	a_{23}
-0.01405	-0.00593	-0.0264	0.002986	0.003356	0.000041	0.0003618	0.0001797	-0.0001757

Tablo 5 Sonbahar Mevsimi Matematiksel Model Katsayıları

a_{00}	a_{10}	a_{01}	a_{20}	a_{11}	a_{02}	a_{30}	a_{21}	a_{12}
284.9	-97.04	-18.25	12.46	6.635	0.6139	-0.6187	-0.6024	-0.2389
a_{03}	a_{40}	a_{31}	a_{22}	a_{13}	a_{50}	a_{41}	a_{32}	a_{23}
0.000048	0.01657	0.009554	0.02348	0.0005145	-0.000241	0.0001976	-0.0005603	-0.000049

Sonbahar Mevsimi ÇRA matematiksel modeli ile sıcaklığa bağlı saatlik elektrik güç değerlerinin değişim Şekil 2 ile gösterilmiştir. Sonbahar Mevsimi Gün tipine bağlı saatlik güç değişimleri Şekil 3 ile gösterilmiştir. Sonbahar Mevsimi aylık tüketim değerleri ise Şekil 4 ile gösterilmiştir.

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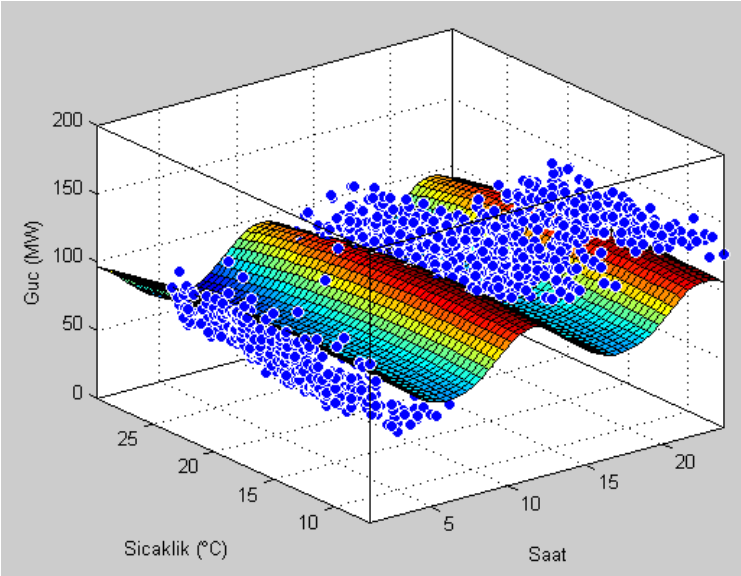
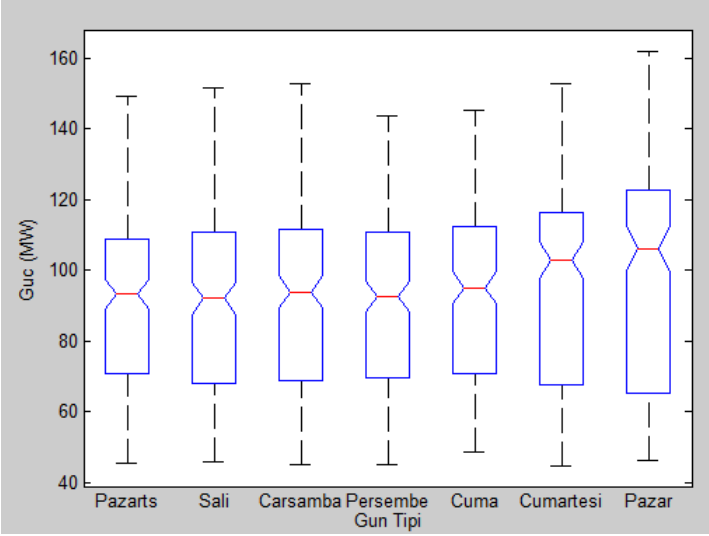
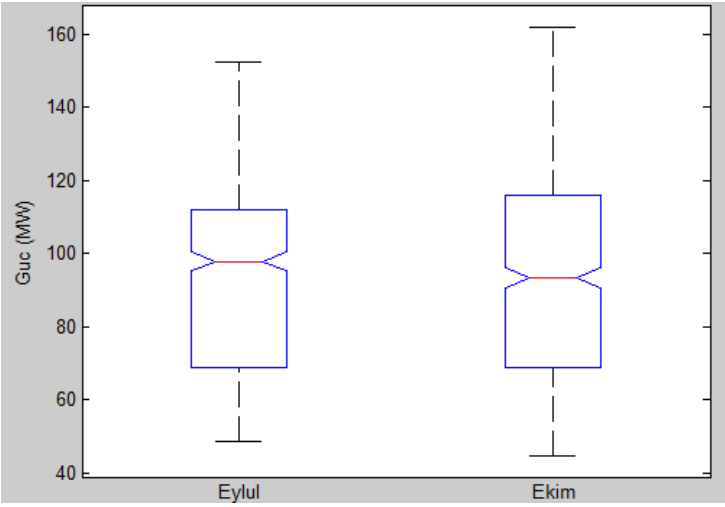


Şekil 2 Sonbahar Mevsimi Saatlik Sıcaklık Değerine Göre Tüketilen Güç Değerleri



Şekil 3 Sonbahar Mevsimi Gün Tipine Göre Tüketim Değerleri



Şekil 4 Sonbahar Mevsimi Aylık Tüketim Değerleri

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Denklem 8 ‘de , z ilgili sıcaklık ve saatte tüketilen elektrik enerjisi değerini, x ^{0}C olarak sıcaklık değerini, y ise günün hangi saatinde olduğumuzu ifade etmektedir. Modelin kabul edilebilir bir model olduğunu test etmek için denklem 9 ile ifade edilen çoklu belirlilik katsayısı hesaplanmıştır. Ayrıca model uygunluk testi için kullanılan ve Denklem 10 ile ifade edilen hataların karelerinin ortalamasının kara kökünü gösteren RMSE değeri de hesaplanmıştır. R^2 determinasyon katsayısını, *e,* hatayı, n değişken sayısını, veri sayısını ifade etmektedir

$$R^2 = \frac{\sum_{i=1}^{n}(Y_i - \bar{Y})^2 - \sum_{i=1}^{n} e_i^2}{\sum_{i=1}^{n}(Y_i - \bar{Y})^2} \tag{9}$$

$$RMSE = \sqrt{\frac{\sum (y_i - \hat{y}_i)^2}{n}} \tag{10}$$

R^2 değerinin 0-1 arasındaki R^2 değerinin 1’e yakın olması RMSE değerinin de 5’den küçük olması modelin uygun olduğunu göstermektedir. Denklem 8 ile elde edilen model için uygunluk testi değerleri hesaplandığında elde edilen değerler Tablo 6 de verilmiştir. Tablo 6 da sunulan değerler dikkate alındığında modelin güvenilir bir model olduğu anlaşılmıştır.

Tablo 6 Matematiksel Model Test Değerleri

Mevsim	R^2	*RMSE*
Kış	0.97	3.308
İlkbahar	0.89	5.71
Yaz	0.95	5.24
Sonbahar	0.97	4.55

Mevsimsel farklar dikkate alınarak 4 mevsim için dört farklı matematiksel model üretilmiştir. Matematiksel modellerin değişkenleri olarak saat ve hissedilen sıcaklık bilgileri olması düşünülmüştür. Mevsim seçiminin yapılmasından sonra saat ve sıcaklık değeri bilgisi girildiğinde ilgili mevsime ait herhangi bir gün tipi için tüketilen elektrik enerjisi miktarı tahmini saatlik olarak yapılmaktadır. Örnek olarak 2015 yılı Sonbahar mevsimi ölçülen enerji tüketim bilgileri kullanılarak elde edilen matematiksel model oluşturulmuştur. Üretilen model Denklem 8 ile verilmiştir. Bu model kullanılarak Eylül ayı pazartesi günü için tahmin edilen MPK, ölçülen sıcaklıkta ve saatlik sıcaklık değerlerinin 1’er ^{0}C artması durumlarına göre Tablo 7 ‘de verilmiştir. Eylül Ayı Pazartesi gün tipi için sıcaklık değişimlerinin de etkisini gösteren MPK değişimi grafik olarak Şekil 5 de sunulmuştur.

Eylül ayı pazartesi günü için tahmin edilen MPK, ölçülen sıcaklıkta ve saatlik sıcaklık değerlerinin 1’er ^{0}C azalması durumlarına göre Tablo 8 ‘de verilmiştir. Eylül ayı pazartesi günü için tahmin edilen MPK, ölçülen sıcaklıkta, saatlik sıcaklık değerlerinin 5 ^{0}C artması ve azalması durumlarına göre değişimi grafik olarak Şekil 5 de sunulmuştur. Eylül ayı Salı günü için tahmin edilen MPK, ölçülen sıcaklıkta, saatlik sıcaklık değerlerinin 5 ^{0}C artması ve azalması durumlarına göre değişimi grafik olarak Şekil 6 da sunulmuştur. Eylül ayı pazar günü için tahmin edilen MPK, ölçülen sıcaklıkta, saatlik sıcaklık değerlerinin 5 ^{0}C artması ve azalması durumlarına göre değişimi grafik olarak Şekil 7 de sunulmuştur.

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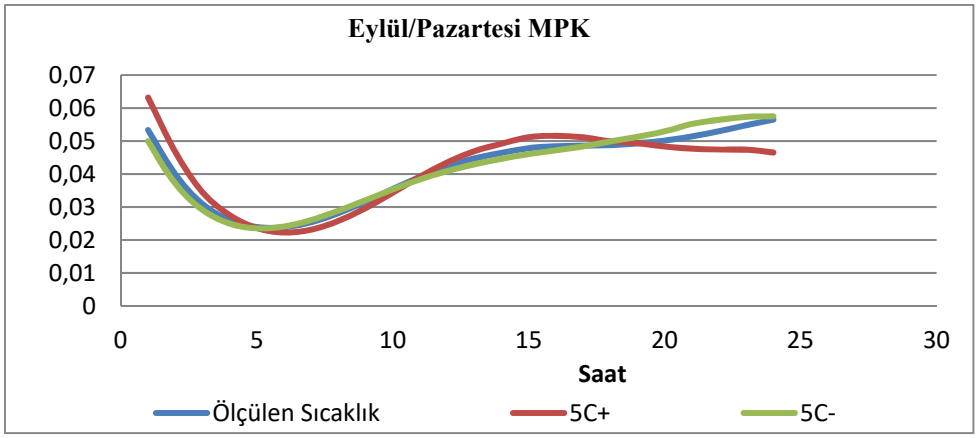
Tablo 7.Sıcaklık Artma Durumlarına Göre Matematiksel Model Tarafından Elde Edilen Eylül 2015 Pazartesi için MPK

Saat	Ölçülen Sıcaklık	1C+	2C+	3C+	4C+	5C+	5C-
00	0,053318	0,054763	0,056472	0,058444	0,060677	0,063173	0,049942
01	0,039934	0,040959	0,042145	0,043494	0,045007	0,046687	0,037069
02	0,030888	0,031435	0,032064	0,03278	0,033587	0,034492	0,029147
03	0,026099	0,026332	0,026587	0,026872	0,027194	0,02756	0,024977
04	0,023931	0,023883	0,023816	0,023741	0,023667	0,023604	0,023545
05	0,023869	0,023617	0,023324	0,022999	0,022655	0,022302	0,0241
06	0,025399	0,025026	0,0246	0,024133	0,023638	0,023125	0,026042
07	0,028178	0,027788	0,027343	0,026856	0,026338	0,025801	0,028867
08	0,031643	0,031327	0,030962	0,03056	0,030133	0,029691	0,032079
09	0,035438	0,035273	0,035071	0,034842	0,034596	0,034344	0,03533
10	0,039176	0,039207	0,039216	0,039211	0,039202	0,039197	0,038384
11	0,042321	0,042552	0,04278	0,04301	0,043251	0,043507	0,040896
12	0,044753	0,045144	0,045554	0,045985	0,046443	0,04693	0,042942
13	0,046376	0,046849	0,047364	0,047922	0,048523	0,04917	0,044604
14	0,047859	0,048407	0,049013	0,049674	0,050389	0,051156	0,046041
15	0,048402	0,048894	0,049459	0,050093	0,050791	0,051548	0,047192
16	0,04862	0,04897	0,049402	0,04991	0,050487	0,051124	0,048345
17	0,0487	0,048785	0,04896	0,049213	0,049537	0,04992	0,0499
18	0,049374	0,049259	0,049209	0,049213	0,049257	0,049332	0,051273
19	0,0501	0,049713	0,049355	0,049016	0,048681	0,048338	0,052913
20	0,051428	0,050734	0,050029	0,049297	0,048526	0,047701	0,055189
21	0,052947	0,052063	0,051079	0,04998	0,048753	0,047384	0,056412
22	0,054792	0,053768	0, 0052531	0,051065	0,049358	0,047398	0,057338
23	0,056455	0,055251	0,053667	0,05169	0,04931	0,046516	0,057472



Şekil 5 Sıcaklık artma ve azalma durumlarına göre Matematiksel Model tarafından elde edilen Eylül 2015 Pazartesi için MPK

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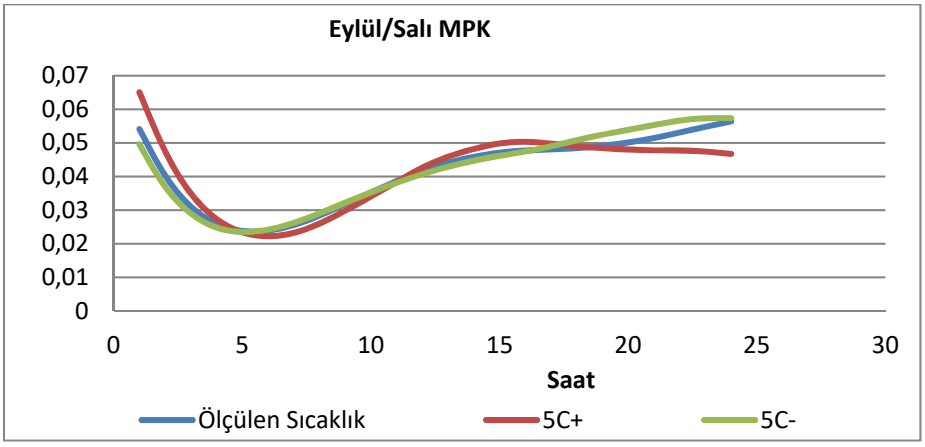
Tablo 8 Sıcaklık azalma durumlarına göre Matematiksel Model tarafından elde edilen Eylül 2015 Pazartesi için MPK

Saat	Ölçülen Sıcaklık	1C-	2C-	3C-	4C-	5C-
00	0,0533182	0,0521357	0,0512134	0,0505464	0,0501265	0,0499423
01	0,0399341	0,0390663	0,038352	0,0377859	0,0373611	0,037069
02	0,0308877	0,0304157	0,0300128	0,0296722	0,0293862	0,0291469
03	0,0260988	0,0258797	0,0256661	0,0254498	0,0252228	0,0249773
04	0,0239307	0,0239501	0,0239307	0,0238626	0,0237368	0,0235452
05	0,0238693	0,0240673	0,0242001	0,0242564	0,0242261	0,0241005
06	0,0253987	0,0257062	0,0259356	0,0260751	0,0261136	0,0260418
07	0,0281777	0,0284997	0,0287411	0,0288899	0,0289349	0,0288668
08	0,0316432	0,0318986	0,0320808	0,0321784	0,0321808	0,0320788
09	0,0354378	0,0355542	0,0356113	0,035599	0,0355078	0,0353298
10	0,0391757	0,0391133	0,0390108	0,0388599	0,038653	0,0383837
11	0,042321	0,0420801	0,0418228	0,0415432	0,0412359	0,0408961
12	0,0447531	0,0443762	0,04401	0,043651	0,043296	0,042942
13	0,0463763	0,0459443	0,0455523	0,0451991	0,0448835	0,0446039
14	0,0478588	0,04737	0,0469425	0,0465779	0,0462773	0,0460411
15	0,0484016	0,0479878	0,0476566	0,0474118	0,0472563	0,0471916
16	0,0486204	0,0483613	0,0481991	0,0481398	0,0481877	0,0483454
17	0,0487004	0,0487139	0,0488344	0,0490692	0,0494235	0,0499004
18	0,0493738	0,0495642	0,049841	0,0502134	0,050689	0,0512732
19	0,0501002	0,0505312	0,0510176	0,0515705	0,0521997	0,0529131
20	0,0514281	0,0521239	0,0528355	0,0535758	0,0543566	0,0551886
21	0,0529473	0,0537466	0,0544767	0,0551536	0,0557934	0,0564124
22	0,0547924	0,0556192	0,0562663	0,0567537	0,0571031	0,057338
23	0,0564547	0,0572948	0,0577904	0,0579653	0,0578482	0,057472



Şekil 6 Sıcaklık artma ve azalma durumlarına göre Matematiksel Model tarafından elde edilen Eylül 2015 Salı için MPK

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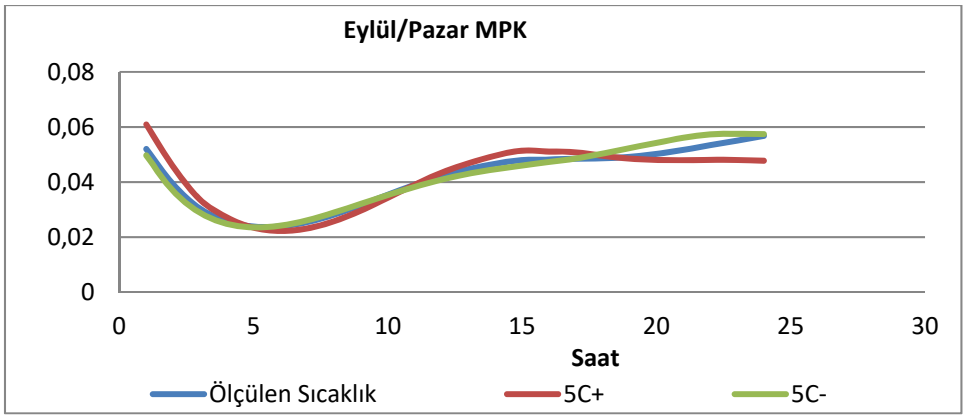

Şekil 7 Sıcaklık artma ve azalma durumlarına göre Matematiksel Model tarafından elde edilen Eylül 2015 Pazar için MPK

Sonuçlar

Yapılan çalışmada Türkiye Sakarya Elektrik Dağıtım Anonim Şirketi (SEDAŞ) tarafından yapılan Elektrik Enerjisi kullanım ölçüm değerleri ile geliştirilen matematiksel modeller kullanılmıştır. Metematiksel model ile mevsimsel şartlar da dikkate alınarak hissedilen sıcaklık ve günün saat bilgisine göre saatlik elektrik tüketilen güç değerleri tahmin edilmiştir. Tüketim tahminleri elektrik enerjisi enerjisi üretim tüketim planlamalarında büyük öneme sahiptir. İhtiyaç duyulan elektrik enerjisinin tahminindeki hatalar dengesizlik maliyetlerinin artmasına sebep olmaktadır. Dengesizlik maliyetlerini düşürmek için daha doğru tahmin yöntemlerine ihtiyaç vardır. Mevsimsel koşullar da dikkate alınarak ÇRA ile dört farklı matematiksel modeller geliştirilmiştir. Polinomik modellerin katsayıları Tablo2, 3, 4, 5 ile sunulmuştur. Yük profillerinin belirlenmesinde mevsimsel şartlara bağlı olarak geliştirilen dinamik modellerin kullanılmasının önemi ortaya konulmuştur. Geliştirilen modellerin güvenirliliğini gösteren değerler Tablo 6'da verilmiştir. Sonbahar mevsimi modeli sonuçları örnek olarak sunulmuştur. Modelin doğruluğunun test edilmesi için tahmin edilen Eylül ve Ekim ayı saatlik tüketim değerlerini kapsayan 1464 tahmin sonucu üzerinde bir hesaplama yapılmıştır. Hataların karelerinin ortalamasının kara kökünü gösteren RMSE değeri 4.551 olarak hesaplanmıştır. Literatüre ait çalışmalar incelendiğinde bu değerin 5 den küçük olması tahmin modelin güvenilir olduğunu göstermektedir. Ayrıca bir başka test yöntemi olarak da aynı model için R^2 determinasyon katsayısı hesaplanmış ve R^2 değerinin 0.9715 olduğu belirlenmiştir. Çıkan sonuç tahmin modelinin %97 güvenilir olduğunu göstermektedir. Örnek olarak ele alınan MYP hesabında meteorolojik verilerin etkisinin önemli olduğu görülmüştür. Tablo 7 ve Tablo 8 de hissedilen sıcaklık değerlerinin değişmesi halinde MPK değerlerinin de değişeceği görülmektedir. Sıcaklık bilgisinin 5 ^{0}C artması veya azalması durumunda MPK değerleri değişecek ve bu durumu dikkate almadığımız takdirde ihtiyaç duyulan elektrik enerjisi hatalı bir şekilde tahmin edilecektir. Farklı gün tipi olarak, Pazartesi, Salı ve Pazar günlerinin örnek olarak alınmış ve hissedilen sıcaklık değerlerinin değişmesi durumunda MPK değimleri e şekil 5 ,6 ve 7 de gösterilmiştir. MPK hesaplanırken sıcaklık tahminlerinin de göz önünde bulundurulması daha doğru tahmin yapılması için önemlidir. Dinamik modelin kullanılması durumunda dengesizlik maliyetlerinin azalmasına katkı sağlanacağını düşünmektedir.

Açıklamalar

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METHODOLOGY OF OPTICAL SPECTRAL ANALYSIS BY LIGHT EMISSION AND DETECTION

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The spectral analysis in applied optics is both technological and physical procedure. Our work provides a general methodology that takes into consideration the emission of light, interference filtering, and detection through nanostructures of ZnO on ITO substrates.

We present all theoretical and experimental aspects related with the emission and detection. The theoretical part was supported by practical work showing the procedure starting from the source to the detection of the spectrum. In order to show the results of spectral analysis steps we have used two spectroscopy devices UV-Vis, different sources, interference filters and samples.

Keywords: Spectral analysis, emission and detection of light, interference filtering

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MICROSTRUCTURE AND MECHANICAL PROPERTIES OF FRICTION WELDED IRON ALUMINIDES

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Abstract: Fe–40Al alloy were welded by the friction welding technique. Samples were welded for different welding time under a constant forging and friction pressure at 1000 rmp. Microstructures of the welds were examined by optical microscopy. The results showed that the welded samples were free of any pore or crack along the weld interface except for 3s. The micro hardness of the welded samples was measured. The strength of the welds was determined by the shear tests. It was observed that the shear strength of the welds depended on the welding time. The maximum shear strength was 466, 8 MPa.

Keywords: Iron aluminides, friction welding, shear strength

Introduction

Iron aluminides based on Fe_3Al and FeAl are excellent candidates to be used as structural materials for high-temperature service conditions. The advantages of these materials include their low cost, low density, and high sulfurizing and oxidizing resistance at high temperatures (Liu 1997, Stoloff 2000, Deevi 1997, Deevi 1998). These advantages have led to the identification of several potential uses, including heating elements, furnace fixtures, heat-exchanger piping, and sintered porous gas-metal filters, automobile and other industrial valve components, catalytic converter substrates and components for molten salt applications (Stoloff, 1998). However, these alloys have poor ductility at the room temperature, relatively poor high- temperature strength and creep resistance (McKamey, 1991). The development of a joining process is very important in the application of iron aluminides, but the study of welding and/or brazing iron aluminides is very limited in literatures. Welding of iron aluminides plays an important role in practical application of such alloys. Welding of iron aluminides is difficult due to its inherent low temperature ductility and poor weldability (Fasching 1995, Lee 2003). Friction welding is one of the available joining techniques, and it has been used successively in metals and alloys (Ozdemir 2005, Ateş 2007, Tao 2015, Della 2013, Winiczenko 2013, Kırık 2013). There has been several published works on the friction welding of Fe_3Al - FeAl type alloys. Sketchley et al. investigated the friction welding of Fe_3Al-based oxide dispersion-strengthened (ODS) alloy and B.J. Inkson et al. studied on friction welding of FeAl40 Grade 3 ODS alloy. They achieved good bonding (Sketchley 2002, Inkson 1998). In addition, author and co-workers reported the successful friction welding of Fe_3Al and dissimilar Fe–28Al alloy and AISI 316 L (Torun 2011, Çelikyürek 2011). In this paper, cast Fe-40Al alloys were welded by friction welding. Effect of welding time on the microstructure and mechanical properties of the cast Fe-40Al alloy were investigated.

Materials and Methods

The alloy Fe-40Al was prepared with vacuum arc melting under an argon atmosphere from iron and aluminum with 99.99 wt. % and 99.7 wt. % purity, respectively. The samples were homogenized at 1100 ◦C for 50 h and cooled in a furnace. Cylindrical cast alloy samples 8 mm in diameter and 50 mm in length were prepared. The friction welding experiments were carried out by a continuous-drive friction welding machine (Fig. 1) for 3, 5 and 7 s friction time under a constant rotational speed, a constant friction and forging pressure (Table 1). After welding, the welded samples were cut perpendicular to the welding interface. The surfaces of the welded samples were ground with 1200 grinding paper and polished with 1 µm diamond paste, then the samples were etched with a mixture of H_2O (30 ml), HNO_3 (30 ml), HCl (20 ml) and HF (20 ml). The microstructures were observed with light microscopy Microhardness values were measured on the welded samples by means of Vickers

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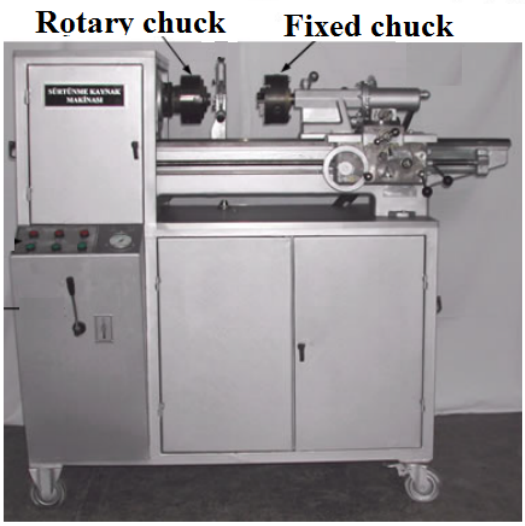

Figure 1.A continuous-drive friction welding machine

indenter with a load of 100 g. Shear tests were performed to determine the strength of the weld interface using an electromechanical universal test machine (Shimadzu AG-IS-250) at room temperature. A specially designed specimen holder was used to measure the shear strength. Three samples were tested for an each welding condition.

Results and Discussion

Flash formation was observed in all welded samples because of plastic deformation during welding. The friction time play an important role in flash formation. The burn-off increased with increase in friction time. More plastic deformation occurs because of the longer friction time, which produces higher heat in the weld interface. Thus, the burn-off (axial shortening) increases with the increase in plastic deformation (Table 1).

Table 1.Parameters of the friction welding.

Friction Speed (rmp)	Forging Pressure(MPa)	Friction Pressure (MPa)	Friction Time (s)	Burn-off (mm)
1000	140	140	3	4.2
1000	140	140	5	10.9
1000	140	140	7	18.5

Microstructural observation was carried out for the weld interface using an optical microscope. Fig. 2 shows the optical micrographs of the weld interface of welded samples for 3, 5 and 7 s.

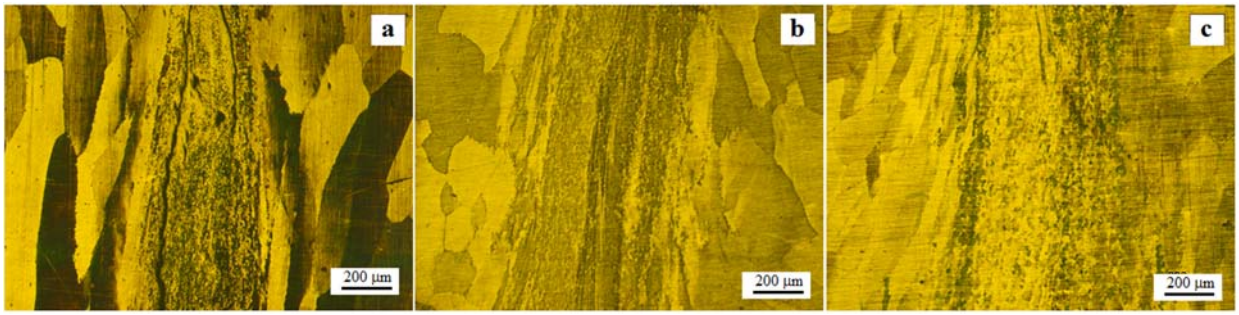

Figure 2. Optical micrographs of the weld interface of welded samples. a)3 s b) 5 s and c) 7 s.

As seen micrographs, the welded samples were of sound quality and they did not exhibit any voids or crack formation along the weld interface except for 3s. Two main regions are observable on the interface of all of the

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welded samples: a dynamically recrystallized zone with very fine grains and a plastically deformed zone. The width of the recrystallized zone for all of the welded samples was approximately between 400 and 600 µm. Micro hardness welded samples for 3, 5 and 7s is given in Fig. 3. According to the results of measurements, micro hardness profiles for all welding times are found to be similar.

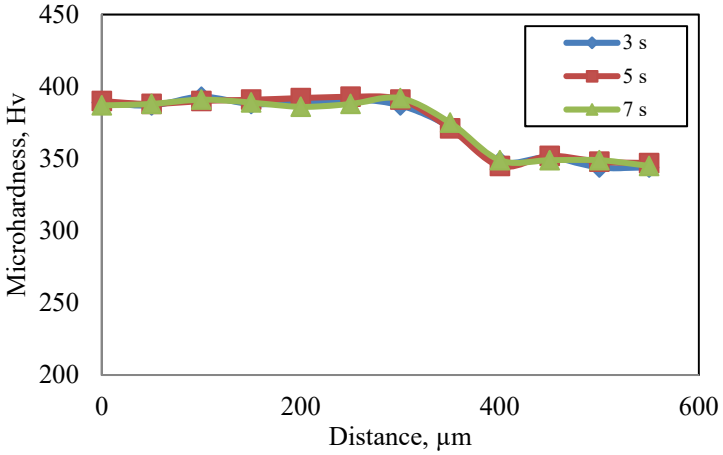

Figure 3. Micro hardness welded samples for 3, 5 and 7s

The shear strengths of welded samples were determined by using a specially designed testing apparatus. The shear of the welds and the base alloy are shown in Fig. 4. Test results demonstrated that the values of the shear strength of the welded samples were increase in increasing of the friction time. It can be said that the shear strength of welds was dependent on the friction time under the experimental conditions. The welded samples for 3s are not high enough to generate the required heat for friction welding. The shear strength of welded samples for 3s has lower due to voids at the weld interface. Test results demonstrate that the shear strength values of the welds are greater than the base metal. This situation shows that the structure with very fine grains formed due to dynamic recrystallization during the friction welding has more strength than the matrix.

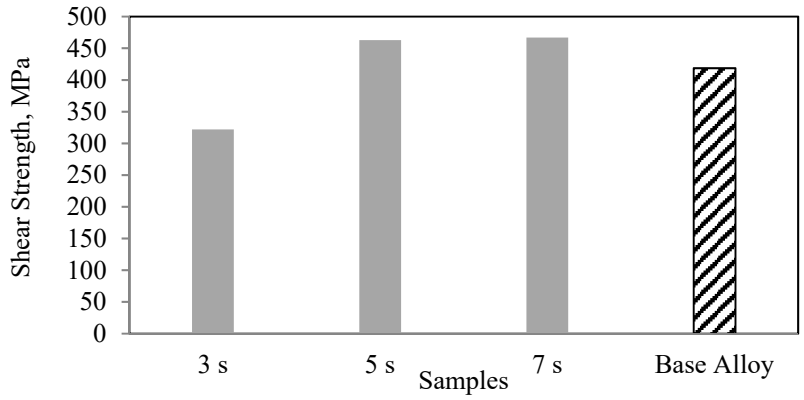

Figure 4. The shear of the welds and the base alloy

Conclusion

In this study, cast Fe–40Al alloy was welded under different conditions by friction welding method. Microstructure studies showed the presence of two different regions at the weld interface: the recrystallized zone and the deformed zone. There was variation in the width of the recrystallized zone and the deformed zone with an increase in the friction time. The micro hardness profiles for all the friction welding times. The shear strengths of the welds increased with increase in the process time. The maximum shear strength was 469,5 MPa.

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MİKRONİZE KALSİT VE PUZOLAN İÇEREN KENDİLİĞİNDEN YERLEŞEN BETONLARDA BASINÇ DAYANIMI TAHMİNİ

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Özet: Beton teknolojisindeki gelişmelere paralel olarak modern mühendislik yapılarında kullanılan betonların özelliklerinde de farklı beklentileri karşılayabilecek önemli performans artışları meydana gelmiştir. Bu önemli performans artışlarının hem reolojik hem de mekanik özellikler açısından en etkin görüldüğü beton türü kendiliğinden yerleşen betondur. Farklı tahmin yöntemlerinin kendiliğinden yerleşen betonların performansını belirlemek amacıyla kullanımına ilişkin çalışmalar literatürde daha sık yer almaya başlamıştır.
Bu çalışmada, yaygın olarak kullanılan yapay zeka yöntemlerinden olan bulanık mantık yaklaşımının ince agrega yerine %5 ve %10 oranında mikronize kalsit ve çimento yerine %20, %40 ve %60 oranında düşük kalsiyumlu uçucu kül içeren kendiliğinden yerleşen betonların basınç dayanımlarının tahmininde kullanılabilirliği araştırılmıştır. Çalışmada mikronize kalsit ve düşük kalsiyumlu uçucu kül ikamesinin yanı sıra betonların kür periyodu da girdi parametresi olarak kullanılmıştır. Sonuç olarak mikronize kalsit ve puzolan içeren kendiliğinden yerleşen betonların basınç dayanımlarının farklı kür sürelerinde yüksek oranda yaklaşıklıkla tahmin edilebileceği ve bulanık mantık gibi tahmin yöntemlerinin beton teknolojisinde kullanılabilirliği üzerine çeşitli çalışmaların faydalı sonuçlar verebileceği görülmüştür.

Anahtar Kelimeler: Bulanık mantık, Mikronize kalsit, Düşük kalsiyumlu Uçucu Kül, Kendiliğinden yerleşen beton

Giriş

Kimya alanında birçok gelişme kaydedilmesi ve polimer teknolojisinin ilerlemesi 80'li yılların ortalarından itibaren çok etkili akışkanlaştırıcıların keşfine sebep olmuştur. Yüksek oranda su kesme yeteneğine sahip bu akışkanlaştırıcılar aynı zamanda taze betonun işlenebilirliğini de önemli düzeyde arttırmaktadır. Yeni nesil akışkanlaştırıcıların sağladığı bu etki, bilim adamlarını taze betonun donatıların arasından kalıba yerleştirilmesi ve sıkıştırılması işlemini ortadan kaldırmak için araştırma yapmaya yöneltmiştir. KYB kavramının ortaya çıkışı da bu çalışmaların sonucunda olmuştur (Felekoğlu et al, 2004, Beycioğlu, 2013). KYB, taze haldeyken kendi ağırlığı ile sık donatılı dar ve derin kesitlere yerleşebilen, iç veya dış vibrasyon gerektirmeksizin kendiliğinden sıkışabilen, bu özelliklerini sağlarken ayrışma ve terlemeye neden olmadan kohezyonunu (stabilitesini) koruyabilen, çok akıcı kıvamda olan ve sertleşmiş haldeyken de yüksek dayanım ve dayanıklılık gibi özellikleri sağlayabilen özel bir beton türüdür. Klasik beton karışımından farklı olarak KYB'den taze halde iken beklenen özel performanslar nedeniyle; kimyasal katkı, viskozite arttırıcı katkı ve çok miktarda inert veya puzolanik mineral katkının tümünün veya bir kısmının kullanılması ihtiyacı doğmaktadır (Felekoğlu and Baradan, 2004).

Günümüzde mühendislik araştırmalarında yapay zeka yöntemlerinden biri olan bulanık mantık yaygın olarak kullanılmaya başlanmıştır (Şen, 2001). Bulanık mantık kavramına ait ilk adım 1965 yılında Lotfi A. Zadeh tarafından atılmış olup Zadeh yayımlamış olduğu makalede bunu bulanık mantık veya bulanık küme kuramı ile ifade etmiştir (Zadeh, 1965).Zadeh'e göre bulanık mantık genel özellikleri bakımından kesin değerlere dayalı düşünme yerine yaklaşık düşünmeyi kullanır ve matematiksel modellerden sonuç alınması zor olan sistemlerde oldukça kullanışlıdır. Zadeh'in bulanık mantık kavramını kontrol uygulamalarında kullanan ilk kişi Mamdani'dir. Mamdani bir buhar makinesinin kontrolünü sağlamak amacı ile bulanık mantığı kullanmıştır (Tiryaki and Kazan, 2007).

Materyal ve Yöntem

Bu çalışmada kapsamındaki bulanık mantık modellemesinde düşük kalsiyumlu uçucu kül ve mikronize kalsit içeren ve karışım dizaynları Tablo 1'de verilen kendiliğinden yerleşen betonlarda 7-28 ve 90 günlük kür uygulaması sonrasında elde edilen basınç dayanımı sonuçları kullanılmıştır (Beycioğlu and Aruntaş, 2014).

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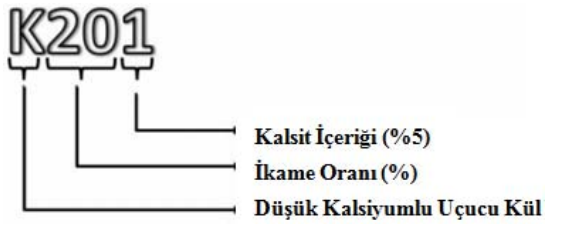
Tablo 1: Modelleme kullanılan basınç dayanımlarının elde edildiği beton karışım dizaynları

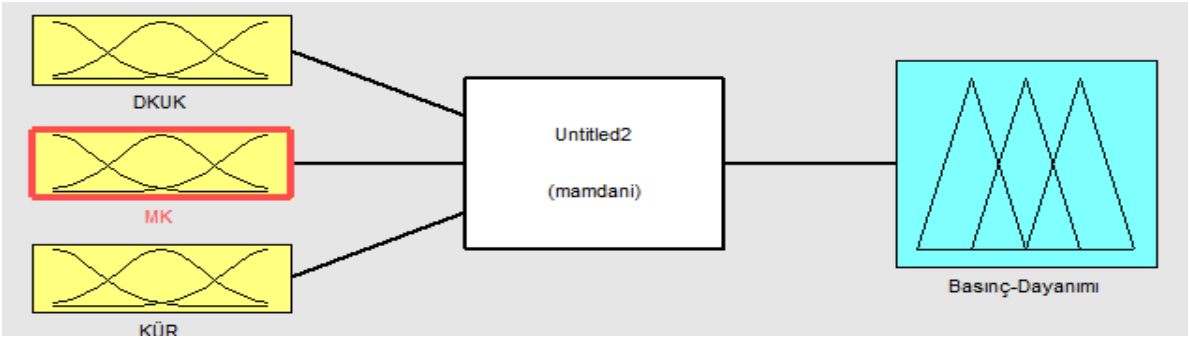
Karışım Miktarları (kg/m3)								
Kod	**S/B**	**Su**	**Çimento**	**DKUK**	**İnce Agrega**	**İri Agrega**	**Kalsit/Toplam agrega**	**Akışkanlaştırıcı**
R	0,335	167.5	500	0	1054	703	0/1757	6,5
K200	0,325	162,5	400	100	1036	691	0/1727	6,5
K400	0,305	152,5	300	200	1026	684	0/1710	6,5
K600	0,3	150	200	300	1004	669	0/1673	6,5
K201	0,325	162,5	400	100	984	656	86/1727	6,5
K401	0,305	152,5	300	200	975	650	86/1710	6,5
K601	0,3	150	200	300	954	636	84/1673	6,5
K202	0,325	162,5	400	100	932	622	173/1727	6,5
K402	0,305	152,5	300	200	923	616	171/1710	6,5
K602	0,3	150	200	300	903	602	167/1673	6.5

Tabloda görüleceği üzere tüm beton serilerinde beton karışımının içeriğini temsil eden bir kodlama kullanılmıştır. Kullanılan kodlamada düşük kalsiyumlu uçucu külü temsilen "K" kullanılmıştır. Kodlamanın ortasında bulunan iki rakam mineral katkının ikame oranını ve son rakam ise agreganın yerine kullanılan kalsiti temsil etmektedir. Kalsit için kullanılan rakamlardan "0" rakamı karışımda kalsit olmadığını, "1" rakamı karışımdaki toplam agreganın %5'inin kalsit ile yer değiştirdiğini, "2" rakamı ise karışımdaki toplam agreganın %10'unun kalsit ile yer değiştirdiğini simgelemektedir. Kullanılan kodlamaya ait bir örnek aşağıda verilmiştir.



Bulanık Mantık ile Modelleme ve Bulgular

Modellemede düşük kalsiyumlu uçucu kül, mikronize kalsit ve kür süresi girdi parametresi olarak kullanılmış ve 7-28-90 günlük basınç dayanımı değerleri ise çıktı olarak değerlendirilmiştir. Şekil 1'de verilen modelin genel yapısı üzerinde girdi ve çıktı parametreleri görülmektedir.



Şekil 1. Bulanık mantık modelinin genel yapısı

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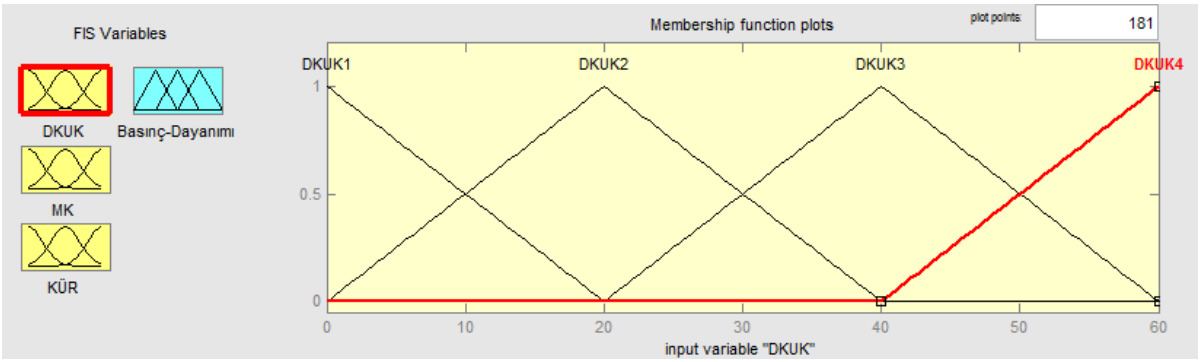
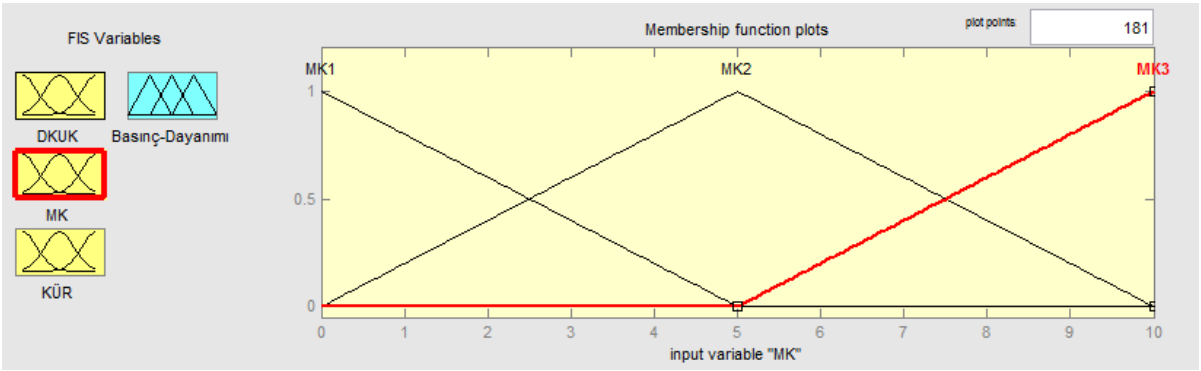
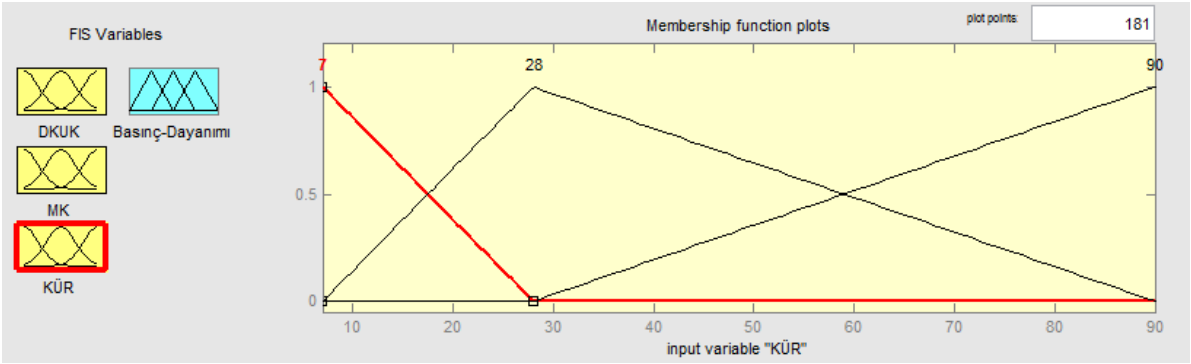
Girdi parametrelerinden düşük kalsiyumlu uçucu kül için DKUK1, DKUK2, DKUK3, DKUK4; mikronize kalsit için MK1, MK2, MK3, kür süresi için ise 7, 28, 90 olmak üzere üyelik fonksiyonları tanımlanmıştır. Model girdileri ve çıktıları için belirlenen üyelik fonksiyonları Şekil 2-3-4-5'de görülmektedir.



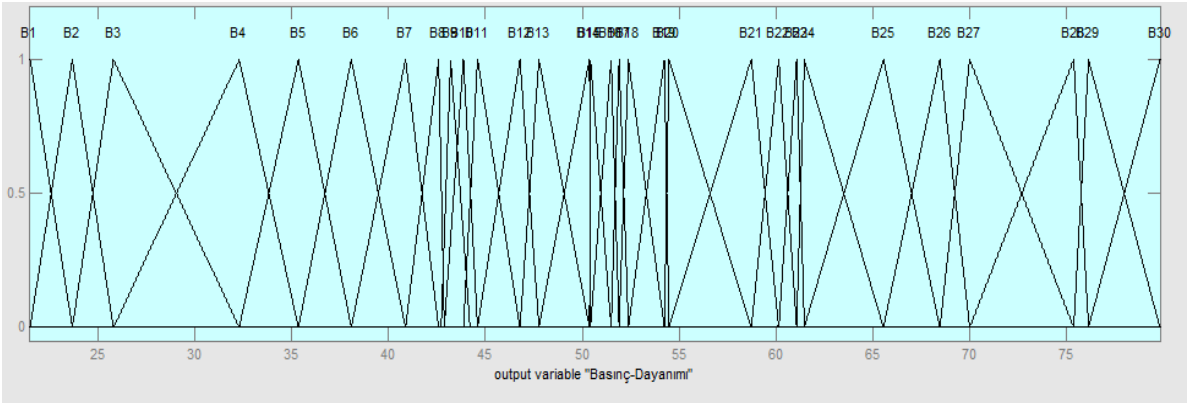
Şekil 2.Düşük kalsiyumlu uçucu kül girdisine ait üyelik fonksiyonları



Şekil 3. Mikronize kalsit girdisine ait üyelik fonksiyonları



Şekil 4. Kür süresi girdisine ait üyelik fonksiyonları



Şekil 5. Basınç dayanımı çıktısına ait üyelik fonksiyonları

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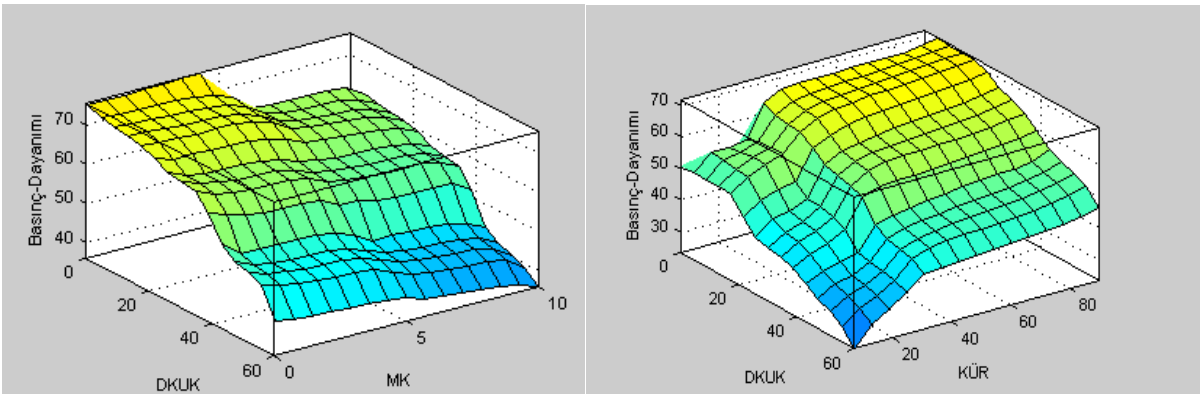
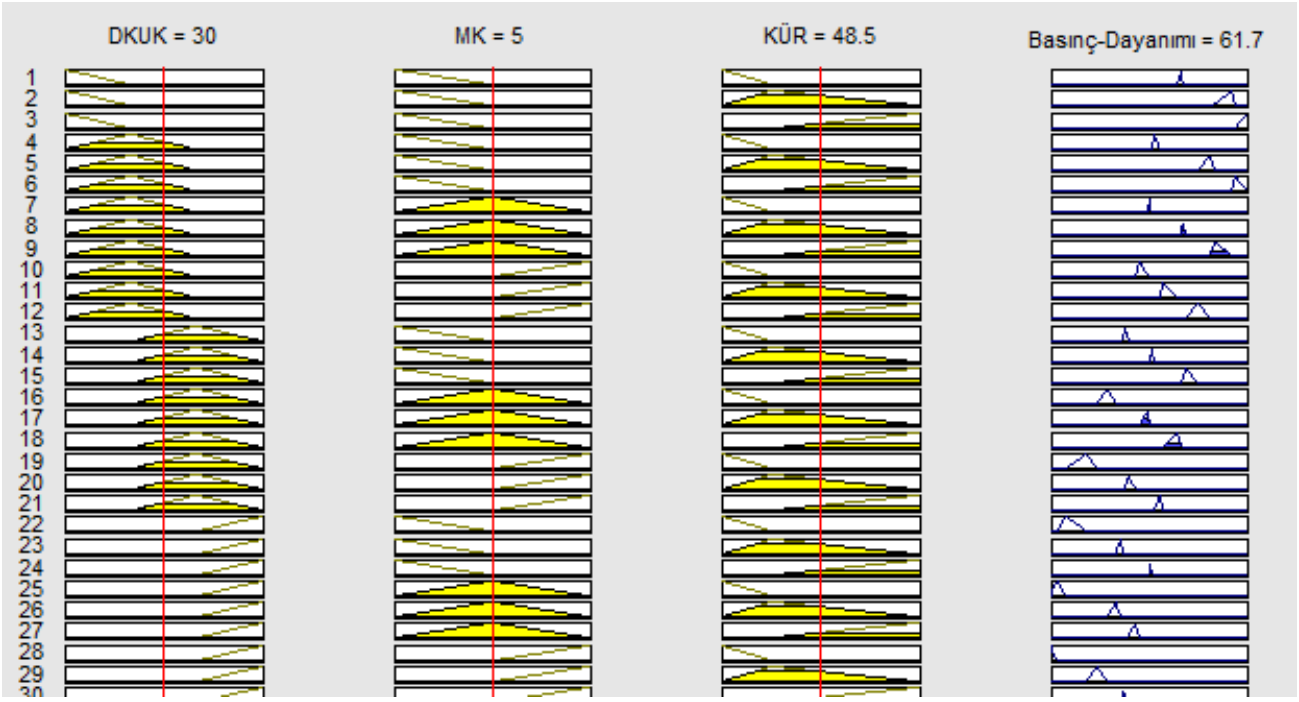
Bulanık mantık modellemede en önemli aşamalardan bir tanesi girdiler ile çıktılar arasındaki ilişkiyi doğru tanımlayabilmektir. Bu çalışmada girdiler ve çıktılar arasındaki ilişkiyi temsil edecek 30 farklı kural programa tanımlanmıştır. Tanımlanan kurallara göre girdiler ve çıktılar arasındaki ilişkiyi yansıtan ve girdi parametresi-çıktı değişimini ortaya koyan grafikler Şekil 6'da görülmektedir.



Şekil 6. Programda kurallara göre oluşan girdiler ile çıktı arasındaki ilişki grafikleri

Kuralların tanımlanmasından sonra modelin tahmin yeteneğini ortaya koymak için modele ait sonuçlar Şekil 7'de görülen durulaştırma ekranından alınmış ve deneysel olarak elde edilen basınç dayanımı sonuçları ile karşılaştırılmıştır.



Şekil 7. Modele ait sonuçları alındığı durulaştırma ekranı

Modele tüm deneylerin girdi parametreleri tek tek giriş yapılarak modelin tahmin sonuçları elde edilmiştir. Modelden elde edilen sonuçlar ile deneysel sonuçlar Tablo 2'de toplu olarak görülmektedir. Ayrıca model sonuçları ile deney sonuçları arasındaki uyumu gösteren korelasyon grafiği de Şekil 8'de görülmektedir.

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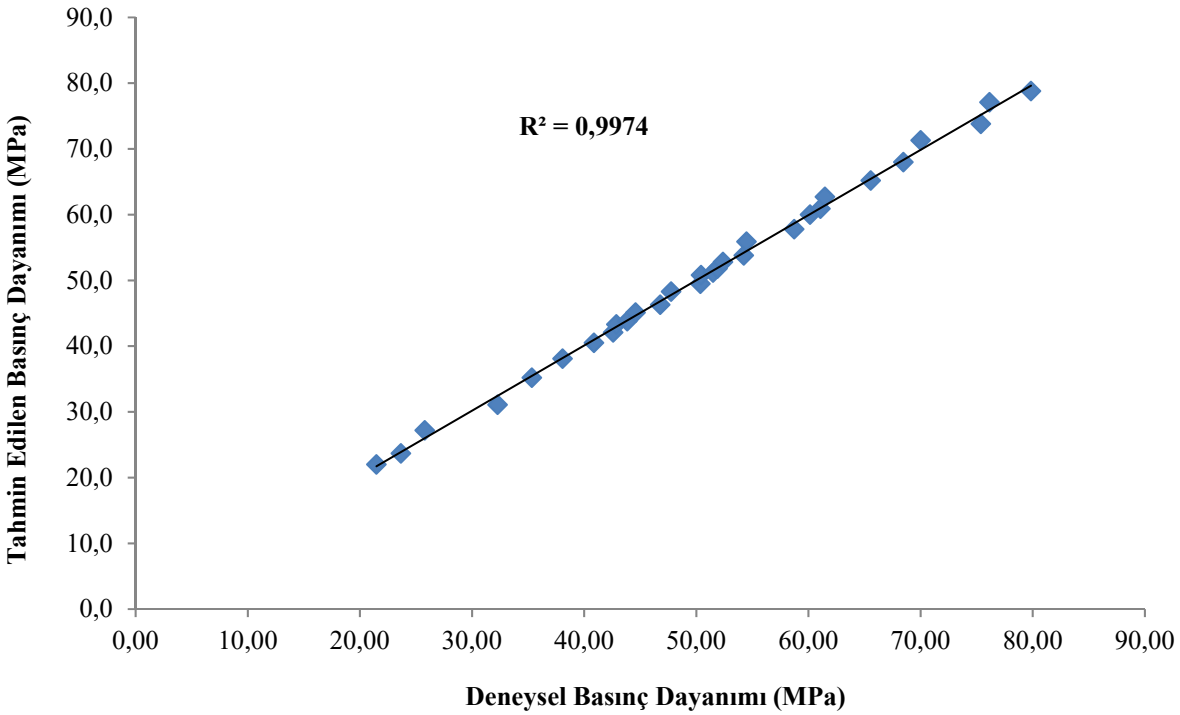
Tablo 1: Modelden elde edilen sonuçlar ile deneysel sonuçlar

Karışım	Basınç Dayanımı (MPa)					
	7 Günlük		28 Günlük		90 Günlük	
	Deneysel Sonuçlar	Model Tahmini	Deneysel Sonuçlar	Model Tahmini	Deneysel Sonuçlar	Model Tahmini
R	60,15	60	75,38	73,8	79,84	78,8
K200	52,38	52,8	68,47	68,0	76,15	77,1
K201	50,42	50,8	61,07	60,9	70,01	71,3
K202	47,76	48,3	54,48	55,9	65,56	65,2
K400	43,84	43,8	51,90	51,8	61,47	62,7
K401	38,07	38,1	50,37	49,5	58,73	57,8
K402	32,28	31,1	44,59	45,1	54,24	53,8
K600	25,78	27,2	42,58	42,1	51,49	51,2
K601	23,66	23,7	40,87	40,5	46,78	46,3
K602	21,48	22,0	35,34	35,2	42,87	43,3



Şekil 8. Model ve deney sonuçları arasındaki ilişkiye ait korelasyon grafiği

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Sonuç

Günümüzde en çok kullanılan yapı malzemelerinden biri olan betonun tasarım ve kalitesinin kontrolü aşamalarında basınç dayanımı, eğilme dayanımı, çekme dayanımı, aşınma dayanımı gibi birçok farklı parametre bulunmaktadır. Bu deneyler genellikle taze beton deneylerine kıyasla pahalı ve zahmetli deneylerdir. Bu deneylerin yapılmasının yanı sıra bu çalışma kapsamında araştırılan ve hala geliştirilen modelleme yöntemleri de kullanılmaktadır.

Bu çalışmada çimento yerine düşük kalsiyumlu uçucu kül ve agrega yerine mikronize kalsit ikamesinin kür süresine de bağlı olarak kendiliğinden yerleşen betonların basınç dayanımında meydana getirdiği değişiklikler, deneysel çalışmalar neticesinde elde edilen veriler kullanılarak modellenmiştir. Çalışmada gerçekleştirilen karşılaştırmada bulanık mantık modelinin 0,9974 gibi çok yüksek bir korelasyonla deney sonuçlarını tahmin edilebildiği belirlenmiştir. Sonuçlar bulanık mantığın mühendislik çalışmalarında kullanımı üzerine yapılacak araştırmaların faydalı olabileceğini göstermektedir.

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MİMARİ BÜROLARDAN HİZMET ALAN MÜŞTERİLERİN KARŞILAŞTIKLARI MİMARİ BÜRODAN KAYNAKLANAN SORUNLARA YÖNELİK ALAN ÇALIŞMASI; KAYSERİ

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Özet: Yapı sektörü içerisinde nitelikli bir yapının yapılabilmesi için yasal ve teknik donanım bakımından mimari proje oldukça önem taşımaktadır. Mimari proje için başvuran müşteri, farklı meslek ve yaş gruplarından olup eğitim seviyeleri de farklılık göstermektedir. Müşteri, mimari büroları akraba ya da tanıdık vasıtasıyla, tavsiye üzerine, bürolar üzerinde araştırma yaparak ya da rastgele bir seçim ile tercih etmektedir. Mimari proje alanında ise; uygulama projesi, takım proje, taslak proje, danışmanlık, iç mimarlık ve ihale dosyalarını hazırlamak gibi hizmetler için mimari bürolar ile müşteri iletişime geçmektedir. Mimari projenin oluşum, uygulama ve sözleşme aşamalarında bazı sorunlar yaşanabilmektedir. Bu sorunlar ve sorunlara bulunan çözümler müşteri ve mimari büroya bağlı olarak değişmektedir. Çalışma konusu kapsamında yapı sektöründeki müşteri ve mimari büro çalışanları arasındaki iletişimi Türkiye genelinde gözlemleyerek çalışma alanı Kayseri kenti seçilip anket çalışması düzenlenmiştir. Kayseri kenti özelinde müşterilerin mimari bürolar ile karşılaştıkları sorunların ortaya çıkarılması ve bu sorunlara yönelik çözümlerin ve önerilerin geliştirilmesi hedeflenmektedir. Çalışmaya örnek alınan Kayseri kenti özelinde müşteri ve mimari büro iletişimi üzerine yapılan bu araştırmanın yapı sektörü bazında ülke ölçeğine de geçirilerek sorunları ve çözümleri ortaya koymakta örnek olması hedeflenmektedir.

Anahtar kelimeler: Kayseri, Mimarlık, Büro, Müşteri

1. Giriş

Mimarlık, insanların barınma, dinlenme çalışma eğlenme gibi eylemlerini sürdürebilmelerini sağlamak ve yaşamlarını kolaylaştırabilmek için gerekli mekânları, işlevsel gereksinmeleri ekonomik ve teknik olanaklar kullanılarak estetik bir şekilde inşa etme sanatıdır. Yapıları ve fiziksel çevreyi tasarlama-inşa etme sanatı ve bilimine *mimarlık* denir (Wikipedia, 2015). Mimarlık (architecture) ve mimara (architect),kelime olarak bakıldığında; ilk bölümü, "baş" veya "en büyük" gibi sıfatlar anlamına gelen ve eklendiği ismi yükselten "arhi" kelimesinden ve ikinci bölümü de dilimizde "teknik" olarak yer eden ve "el ürünü", "yapma becerisi" anlamına

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gelen "tektoniki" kelimesinden oluşan eski Yunanca bir birleşik kelime "Arhi-Tektonik" den türetilmiştir (Ergöz, 2002). Mimar; yeryüzünü insan yaşamını sürdürmesine ve rahatlığına en uygun şekilde düzenlemek ile görevli kişi ve Imrah (mimarlık); insan yaşamını sürdürmesine ve rahatlığına en uygun şekilde düzenleme anlamlarına gelen bu kelimeler Türkçeye Arapçadan, mimar, imar, umur, mamur umran gibi bir birleri ile bağlantılı kelimeler şeklinde geçmiştir (Erdi, 2009).

Mimarlık da diğer meslek grupları gibi, insanlığın tarihi boyunca ve ona paralel olarak gelişimini sürdürmüştür. Mimarlık birçok evreden ve dönemden geçerek zaman içinde bir uğraşı alanı olmaktan çıkıp meslek dalına dönüşmüştür. Mimarlık pratiği, her dönemde genel kapsamda insanoğlunun "yapay çevresinin oluşturulması" ile ilgilense bile, mesleğin doğasında bulunan teknik ve sanatsal özelliklerden dolayı içinde bulunduğu devrin toplumsal, sosyolojik, kültürel ve ekonomik durumlarından da payını almıştır. Bunun yanı sıra mimari, teknolojik ve bilimsel gelişmelerden etkilenmiştir (Erdi,2009). Mimari pratik ise bir ofisin çeşitli projeleri gerçekleştirmek için örgütlenmesi olarak tanımlanmaktadır (Turgay, 2006).

Günümüzde mimarlık hizmetlerinin tanımına bakıldığında; uygulamaya, yapmaya, kabule ve imzaya mimarın yetkili olduğu, her türlü araştırma, danışmanlık, bilirkişilik, etüt, tasarım, plan, proje, resim ve hesapların hazırlanması ve bunların uygulanması ile her türlü denetim ve kontrollük hizmetlerine mimarlık hizmetleri denmektedir (TMMOB Mimarlar Odası Mimarlık Hizmetleri Şartnamesi, 2015). Mimarlık hizmetleri ele alındığında odanın hazırladığı hizmet şartnamesine göre mimarların müellif olduğu hizmet alanları; mimari tasarım hizmetleri, mimari uygulama ve yönetimi hizmetleri, mimari danışmanlık hizmetleri, mimari eğitim çalışmaları, diğer sanatsal çalışmalar olmak üzere beş başlık altında birleştirilir (TMMOB Mimarlar Odası Mimarlık Hizmetleri Şartnamesi, 2015). Mimarlık hizmeti bir yapının ortaya çıkış sürecinde mimar tarafından üstlenilen eylemlerin tümünü kapsamaktadır. Mimarlığın bir meslek olarak kabul edilmesi ve bir hizmet halini alması uzun yıllar süren karmaşık süreçlerin bir sonucudur. İnsan yaşamındaki karmaşanın artması, sosyal ve kültürel yapının, kavramların ve ihtiyaçların değişmesine paralel olarak mimarlık da değişmiştir (İşcan, 2011).

Yapı tasarım ve üretim sürecinde birçok aktör yer almaktadır. Bu aktörlerinden birisi de inşaat sürecinin çeşitli aşamalarında yer alarak ve farklı uzmanlık alanları arasında koordinasyon sağlayan ve kritik bir rol üstlenen mimarlık ofisleridir. Günümüz koşullarında her alanda olduğu gibi mimarlık hizmetleri alanında da kullanıcı ve müşterilerin etkisi yoğun olarak hissedilmektedir (Erbil, Akıncıtürk, 2010).

Turgay'a (2006) göre "*Mimar, müşteri ve diğer katılımcılar arasında yüz yüze iletişim süreci kolaylaştırmaya yardımcıdır. Tasarım sürecindeki herkesin; müşterinin, müteahhidin, mühendisin, orada yaşayacak olanların ve sürece katılan diğer kişilerin tasarım hakkında bir düşüncesi olabilmektedir. Mimara, bu noktada, bütün bu düşünceleri koordine etme işi düşmektedir. Sürecin merkezindeki kişi olarak mimarın yeteneği, eğitimi, koordinasyon gücü önemlidir. Mimari pratikte, tasarım tamamen katılımcıların talepleri doğrultusunda oluşmaz, ancak tasarım çözümlemeleri için bir çerçeve oluşturabilir*"(Turgay, 2006).

İyi bir mimarlık eserinin ortaya çıkabilmesinin bağlı olduğu etmenler; mimarın müşterisini iyi anlayabilmesi, iyi bir fikir alış verişi ve iyi bir iş birliğidir. Her müşteri kendine göre özeldir. Mimarlık ofisinin müşterileri; evli veya bekâr bir kişi, bir grup, ticari bir kuruluş ve/veya kamu sektöründen olabilir. Tüm bu müşteri tiplerinin ortak yanı; projelerinin tasarım sürecinde en iyi şekilde yönetilmesi, istek ve beklentilerinin dikkate alınması ve proje açısından var olabilecek herhangi bir kısıtlamanın düşünülmüş olmasıdır (Güzel Sen, 2006). Günümüzde mimar ve müşteri ilişkisi; müşterinin sorununu araştırmak, yatırımın gerekliliğini ve yere uygunluğunu araştırmak, yapının yapım koşullarını ortaya koymak, proje ve üretim organizasyonunu yapmaktır (Güzel Sen, 2006). Mimar ile müşteri arasındaki ilişki; müşterinin görerek ya da dokunarak satın almasıyla değil mimar-müşteri görüşmeleriyle ortaya çıkar. Sonuç ürün oluşuncaya kadar müşteri ne satın alacağını aynı şekilde mimar da ne satacağını bilemez. Mimarlık hizmetinde hem bir ürün oluşturulmakta hem de ürün meydana getirilirken hizmet sunulmaktadır (Pekdemir,2010).

Proje büyüklüğü, yapının yeri, yapım tekniği, tasarım özellikleri ve proje ekibinin niteliklerine göre her proje değişiklik göstermektedir. Projelerde değişen bu özelliklerden dolayı her proje farklıdır ve tektir. Kesin doğrusu olmayan, kendine özgü olan ve her projede yeni stratejiler geliştirilmesi gereken inşaat sektöründe müşteri ilişkilerindeki yönetimin uygulanması zorlaşmaktadır. İnşaat sektöründeki teknolojik değişimler, sosyal, ekonomik, politik, kültürel yönden değişen müşteri istekleri ve hızla büyüyen piyasa şartları müşteriyi bulma ve bulunan müşteride devamlılığı sağlama bakımından rekabete neden olmaktadır. Sürekliliğin sağlanabilmesi için her yeni proje ve müşteri için yeni yönetim modelleri geliştirilmesi önemlidir (Pekdemir,2010).

Bu çalışmada yukarıda bahsedilen gelişmeler ışığı altında müşteri ve mimari ofis arasındaki ilişki ele alınmıştır. Çalışmada; mimari hizmet veren bir ofisten müşterinin beklentisinin ne olduğu ve bu beklentilere cevap

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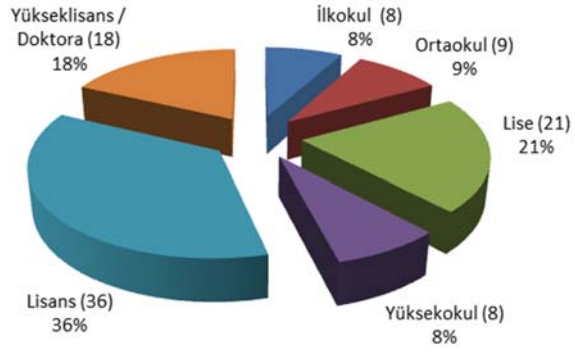
verilirken karşılaşılan problemler ya da olumlu yönler ortaya koyulmuştur. Mimar ve/veya mimari bürodan hizmet alan müşterilerin karşılaştıkları sorunlar ortaya koyularak mimari büroların bu sorunları bilip müşteriye yaklaşımını belirlemesi önemli görülmüştür. Çalışma, Kayseri kentindeki mimari bürolardan hizmet alan müşterilere yapılmıştır. Kayseri kenti ölçeğinde yapılan bu çalışmanın ülkede yapılacak konu üzerindeki diğer çalışmalara katkı sağlaması ve yol göstermesi umulmaktadır.

2. Materyal ve Metot

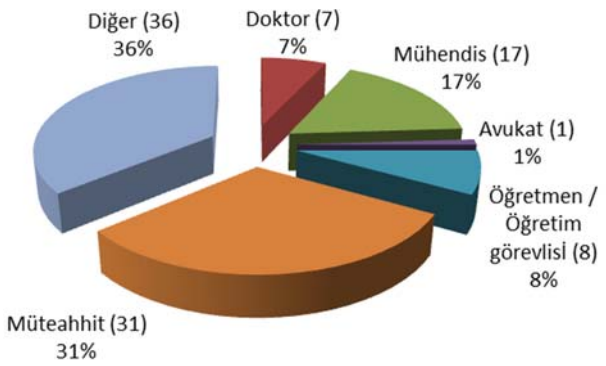
Bu çalışmada çoktan seçmeli anket uygulaması gerçekleştirilmiştir. Hazırlanan anketler, Kayseri'de mimari bürodan çeşitli konularda hizmet alan müşterilere yapılmıştır. Ankete farklı meslek gruplarından 100 kişi katılmıştır. Anket sonucu toplanan veriler, EXCEL programı yardımı ile istatiksel veri haline dönüştürülmüştür. Yapılan istatistikler ise anlaşılabilirliği ve okunabilirliği açısından grafiklerle ifade edilmiş ve sonuçlar yorumlanmıştır. Bu anket çalışmasıyla müşterilerin hangi aşamada mimari büroya ihtiyaç duydukları, mimari büroya, hangi yapı projesi için başvurdukları ve ne tür zorluklarla karşılaştıkları analiz edilmeye çalışılmıştır. Ayrıca müşteriye karşılaşabilecekleri sorunlar hakkında sorular sorulmuştur. Bu sorunların kendilerini nasıl etkilediğine dair cevaplarda ankette yer almıştır.

3. Bulgular

Yapılan anket sonucunda elde edilen bulgular, mimari büroya başvuran müşteri odaklı değerlendirilmiştir. Veriler, anket soruları bazında sıra ile incelenmiştir. Bu anket Kayseri'de 100 işverene yapılmıştır. Mimara ya da mimari bürolarla birlikte çalışan işverenler farklı eğitim seviyesine sahiptir. Yapılan anket çalışması ile işverenin %36'sının lisans, %21'inin lise, %18'inin yüksek lisans, %9'unun ortaokul, %8'inin ilkokul, kalan %8'inin yüksekokul düzeyinde olduğu belirlenmiştir (Grafik 1). Birçok farklı meslek gruplarından olan işverenlerin %31'inin müteahhit, %17'sinin mühendis, %8 inin öğretmen ve öğretim görevlisi, %7'sinin doktor, %1'inin avukat ve kalan %36'sının diğer meslek gruplarından olduğu söylenmektedir (Grafik 2).

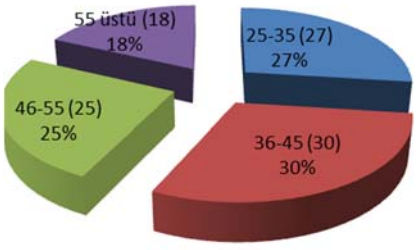


Grafik 1: Mimarlık bürosu müşterileri eğitim durumu

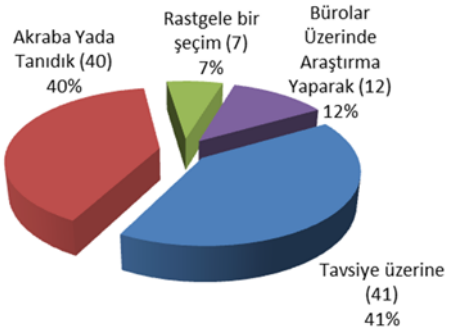


Grafik 2: Mimarlık bürosu müşterileri meslek grubu

Yapılan anketle işveren yaş grubunun %30'unun 36-45 yaş arası, %27'sinin 25-35 yaş arası, %25'inin 46-55 yaş arası, %18'inin de 55 yaş üstünde olduğu bulunmuştur (Grafik 3). İşveren mimari bürolar ile irtibata geçerken farklı yollar tercih etmektedir. İşverenin %41'i tavsiye üzerine, %40'ı akraba ya da tanıdık ilişkisi ile %12'si bürolar üzerinde araştırma yaparak tercihte bulunurken %7'si rastgele bir seçim yaparak mimari büro ile irtibata geçmektedir (Grafik 4).



Grafik 3: Mimarlık bürosu müşterileri yaş grubu



Grafik 4: Mimarlık bürosu müşterileri büro seçimi

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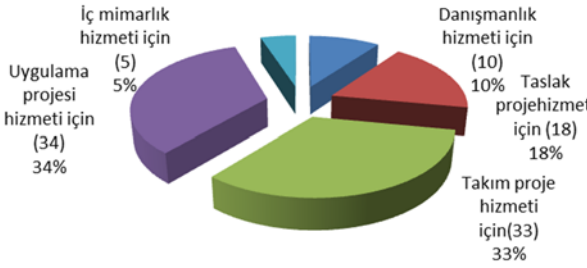
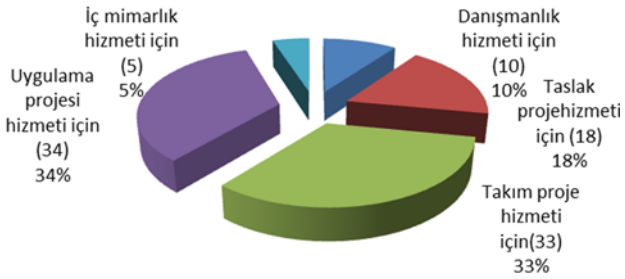
Mimari işin farklı çeşitleri vardır ve işveren farklı taleplerde bulunur. İşverene mimari büro ile hangi aşamada iletişime geçtiği sorulduğunda %34'ünün uygulama projesi hizmeti için, %33'ünün takım proje hizmeti için, %18 inin taslak proje hizmeti için, %10 unun danışmanlık hizmeti için, %5'inin de iç mimarlık hizmeti için irtibatta olduğu görülmüştür (Grafik 5). Mimari büroya bazı çalışmalarından dolayı belirli ücretler ödenmektedir. Bu ücretlerin %10'ununun danışmanlık hizmeti için,%18'inin taslak proje hizmeti için,%33'ünün takım proje hizmeti için, %34'ünün ise uygulama projesi için ödendiği görülmektedir (Grafik 6).

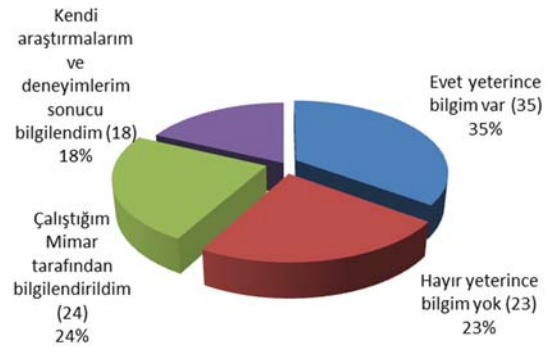


Grafik 5: Müşterilerin mimari bürodan talep edilen hizmetler dağılımı

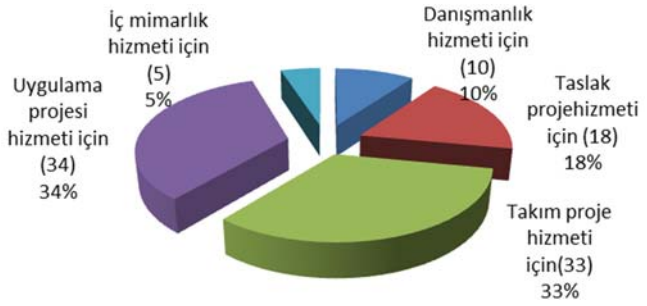


Grafik 6: Müşterilerin mimari büroya ücret ödenen hizmet türleri

Projenin taslak ve uygulama aşamasında mimarın görev ve sorumlulukları vardır. Proje sahiplerinin %35'lik kısmı bu görev ve sorumlulukları bilmekte,%23'lük kısmı yeterince bilgi sahibi olmamakta, %24'lük kısmı mimarlar tarafından bilgilendirilmekte olup %18'lik kısmı ise kendi araştırmaları ve deneyimleri sonucunda bilgi sahibi olduklarını belirtmektedir (Grafik 7). Projede bazı hizmet bedelleri alınmaktadır. Bu konuda proje sahiplerinin %22'lik kısmı danışmanlık ücreti ödememiş,%3'lük kısmı ücretin oldukça yüksek olduğunu, %23'lük kısmı yapılan iş için fazla olduğunu, %8'lik kısmı yapılan iş için az olduğunu, %44'lük kısmı ise ücretlerin normal düzeyde olduğunu belirtmiştir (Grafik 8).



Grafik 7: Müşterilerin aşamasında mimarın görev ve sorumluluklarını bilme dağılımı



Grafik 8: Müşterilerin mimarlık bürosuna ücret ödediği hizmet türleri

Mimari bürolara farklı yapı projeleri için başvurulmaktadır. Bunlardan %56'sının konut yapıları, %21'inin ticaret yapıları, %4'ünün kültür yapıları, %2'sinin spor yapıları, %5'inin dini yapılar, %6'sının kamu yapıları, %1'inin eğitim yapıları, %3'ünün konaklama yapıları olup %2'sinin ulaşım yapıları olduğu belirtilmiştir (Grafik 9). Mimari bürolarla yapılan sözleşmelerde bazı sorunlar yaşanabilmektedir. Sorun yaşandıysa bu sorunlar; ceza ödenerek ve sözleşme değiştirilerek çözülmüştür. Proje sahiplerinin %68'i sorun olmadığını her iki tarafın da sözleşmeye uyduğunu, %25'i çözümün karşılıklı anlaşarak sözleşmenin değiştirildiğini, %7'si büro seçimini değiştirdiğini belirtmiştir (Grafik 10).

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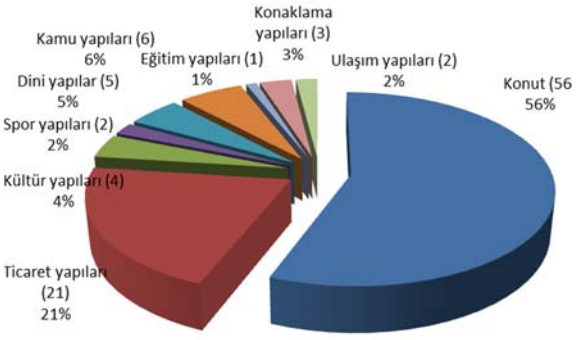
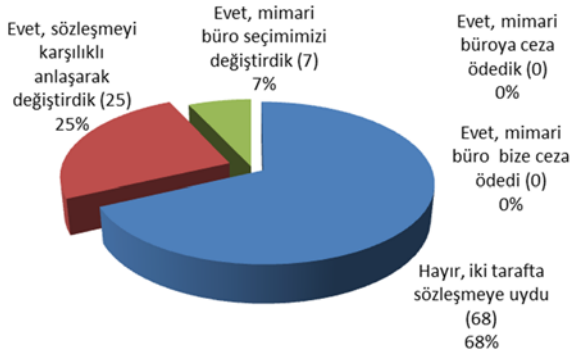
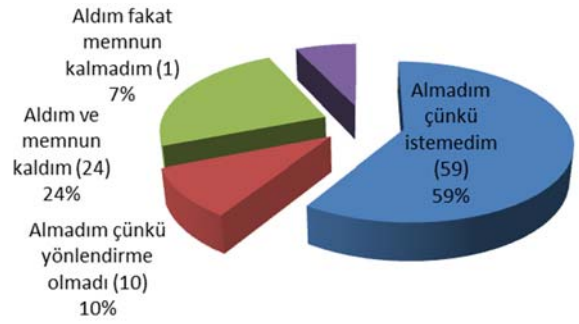


Grafik 9: Mimari büroya başvurulan proje tipleri dağılımı

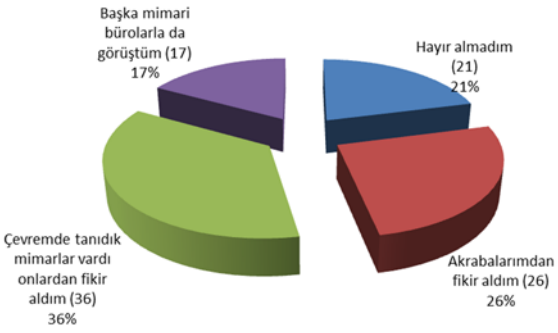


Grafik 10: Mimari büroyla yapılan sözleşmeye mimari büronun uyum durumu

Mimari bürolardan danışmanlık hizmeti; kişisel istekler veya yönlendirmeler doğrultusunda alınmaktadır. Buna göre mimari büro ile çalışan kişilerin %59'u danışmanlık hizmeti almak istemediklerini,%24'ü danışmanlık hizmeti alıp memnun kaldıklarını,%10'u yönlendirme olmadığından dolayı danışmanlık hizmeti almadıklarını %7'si ise alınan danışmanlık hizmetinden memnun kalmadıklarını belirtmişlerdir (Grafik 11). Projeye başlangıç aşamasında çalışılan mimari büro dışında birilerinden fikir alma durumu görülmektedir. Buna göre proje sahiplerinin %36'sı tanıdıkları mimarlardan, %26'sı akrabalarından, %17'si başka mimari bürolardan fikir aldıklarını belirtirken; %21'i ise fikir almadıklarını belirtmişlerdir (Grafik 12).

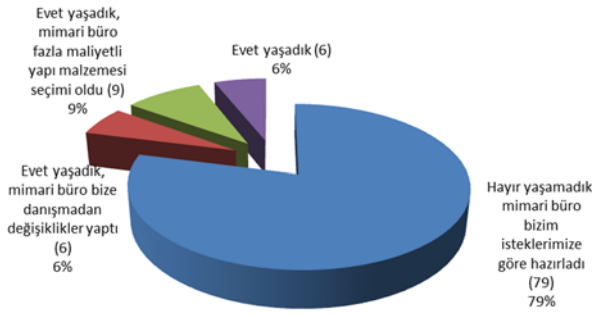


Grafik 11: Mimari bürodan danışmanlık hizmeti alıp almama durumu

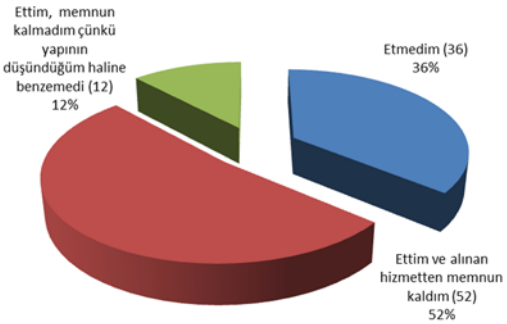


Grafik 12: Tasarım aşamasında mimari bürodan farklı bir kaynaktan fikir alma durumu

Mimari büro ile proje sahipleri arasında projenin çizimi aşamasında bazı anlaşmazlıklar yaşanabilmektedir. Buna göre proje sahiplerinin %79'u mimari büronun istekleri doğrultusunda çalıştığını ve sorun yaşamadıklarını belirtirken; %9'u fazla maliyetli malzeme seçiminden, %6'sı projede danışılmadan değişiklikler yapıldığından %6'sı ise çeşitli sebeplerden dolayı sorun yaşadıklarını belirtmişlerdir (Grafik 13). Mimari bürolarda projenin 3D (üç boyutlu) görselleri verilen hizmetler arasındadır. Buna göre proje sahiplerinin %52'si yapının 3D (üç boyutlu) görsellerini talep ettiklerini ve memnun kaldıklarını, %12'si talep ettiklerini fakat yapının düşünülen haline benzememesinden dolayı memnun kalmadıklarını, %36'sı ise bu yönde bir talepleri olmadıklarını belirtmişlerdir (Grafik 14).



Grafik 13: Projenin çizim aşamasında mimari büroyla yaşanılan anlaşmazlık durumu



Grafik 14: Mimari bürodan 3 boyutlu hizmet talep durumu

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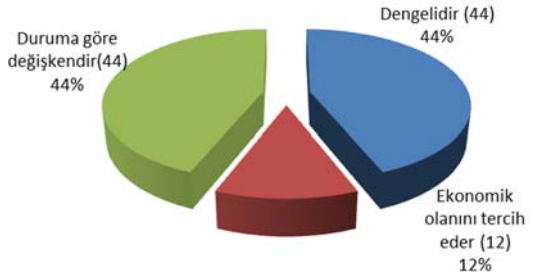
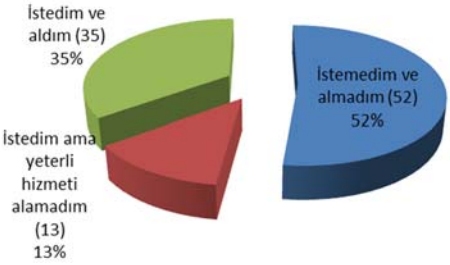
Mimari bürolar proje sahiplerinin istekleri doğrultusunda malzemenin kalitesi ve fiyatı konusunda tercih yapabilmektedir. Buna göre proje sahipleri büroların verdiği tercihler hakkında; %44'ü tercihlerin dengeli olduğunu, %44'ü tercihlerin duruma göre değişken olduğunu, %12'si ise çalışılan mimarı büroların ekonomik olanı tercih ettiklerini belirtmişlerdir (Grafik 15). Müşteriler yapıyla ilgili malzeme seçimlerinde mimari bürolardan hizmet almaktadırlar. Buna göre malzeme seçimi hizmeti konusunda istemeyen ve almayanlar %52, isteyip alanlar %35, istemiş olup alamayanlar %13 oranında belirlenmiştir (Grafik 16).

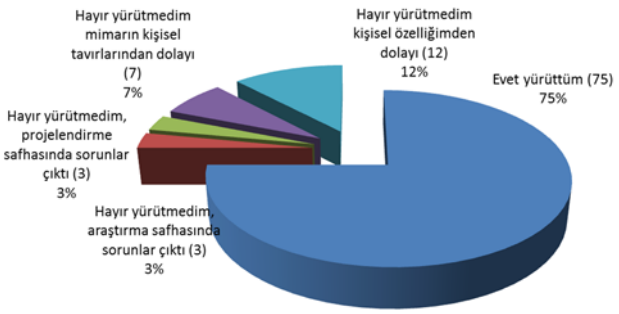


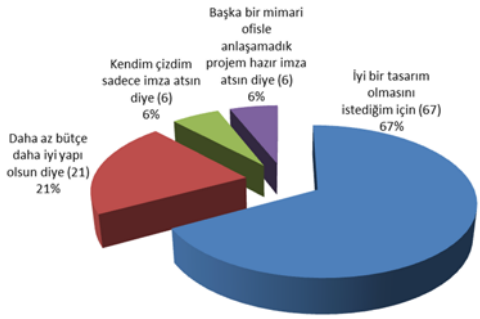


Grafik 15: Mimari büronun malzeme/fiyat tercihi

Grafik 16: Malzeme seçiminde mimari bürodan hizmet talep durumu

Projenin başlangıç aşamasından itibaren müşteriler; istekleri doğrultusunda mimari bürolar ile çalışmalar yürütür. Müşterilerin %75'i çalışma yürüttüklerini, %12'si kişisel özelliğinden dolayı çalışmayı yürütemediklerini, %7'si mimarın kişisel tavırlarından dolayı çalışma yürütmediklerini, %3'ü projelendirme safhasında sorunlar yaşadığını, %3'ü ise araştırma safhasında çıkan sorunlardan dolayı çalışma yürütmediklerini belirtmişlerdir (Grafik 17). Müşterilerin mimari bürolar ile çalışma sebepleri farklılık göstermektedir. Müşterilerin %67'si iyi bir tasarım olmasını istedikleri için, %21'i daha az bütçe ile daha iyi yapı yapılmasını istedikleri için, %6'sı kendi çizdiği mimari projeye sadece imza atılması için, %6'sı ise başka bir ofis ile anlaşamadıkları ve projenin hazır olup sadece imza atılması için mimari büro ile çalışmaktadırlar (Grafik 18).





Grafik 17: Projenin tüm aşamalarında mimari büroyla çalışmalar yürütülme durumu

Grafik 18: Mimari büroyla çalışılma sebepleri

Müşterilerin farklı projelerde aynı mimari büro ile çalışma durumu farklılık göstermektedir. Müşterilerin %42'si aynı mimari büro ile çalıştıklarını, %32'si her projede farklı büro ile çalıştıklarını, %20'si aynı proje tiplerinde aynı mimari büro ile çalıştıklarını, %6'sı ise aynı proje tiplerinde farklı mimari büro ile çalıştıklarını belirtmişlerdir (Grafik 19). Müşterilerin mimari bürodan aldıkları hizmetin iş bitim süresine sadık kalmaları; projenin yapım sürecinde önemlidir. Müşterilerin %63'ü mimari büronun söylenen zamanda projeyi teslim ettiklerini, %23'ü mimari büronun söylenen tarihten daha erken teslim etmesini istediği halde projeyi teslim etmediklerini, %14'ü ise mimari büronun projeyi söylenen zamanda teslim etmediklerini belirtmiştir (Grafik 20).

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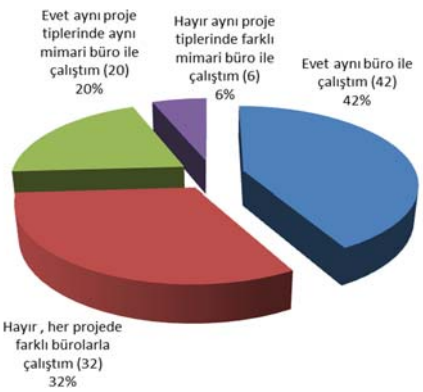
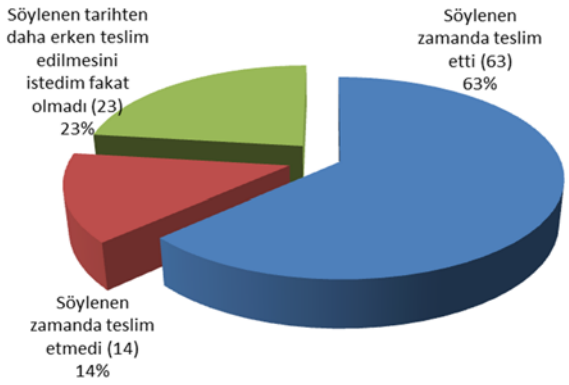
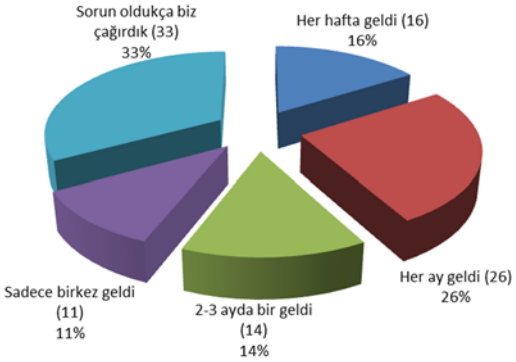


Grafik 19: Farklı projelerde aynı mimari büroyu seçme durumu

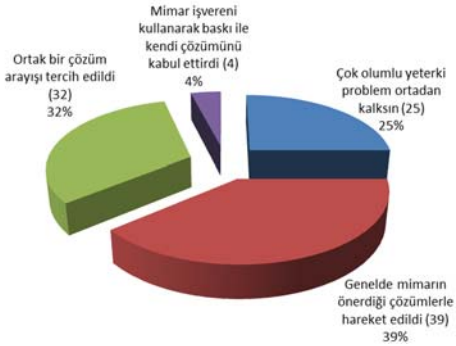


Grafik 20: Mimari büronun iş bitim süresine uyum durumu

Mimari ofislerin hizmetlerinden biri şantiye kontrolleridir. Buna göre mimari ofislerden hizmet alan kişilerin %16'sı her hafta geldiğini, %26'sı her ay geldiğini , %14'ü 2-3 ay da bir geldiğini , %11'i sadece bir kez geldiğini , %33'ü sorun oldukça çağırdıklarını belirtmektedir (Grafik 21). Mimari ofislerin hizmetlerinden biri sahada bir problem olduğunda, alternatif çözümleri değerlendirmektir. Buna göre mimari ofislerden hizmet alan kişilerin, %25'i mimarın problemin ortadan kalkması için olumlu davrandığını, %39'u genelde mimarın önerdiği çözümlerle hareket edildiğini, %32'si ortak bir çözüm arayışı tercih edildiğini, %4'ü mimar işvereni kullanarak baskı ile kendi çözümünü kabul ettirdiğini belirtmektedir (Grafik 22).

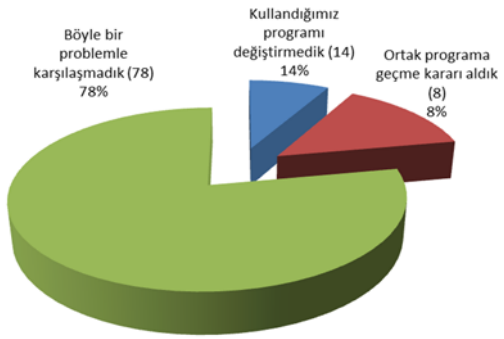


Grafik 21: Mimarın uygulama aşamasında şantiyeyi kontrol etme sıklığı

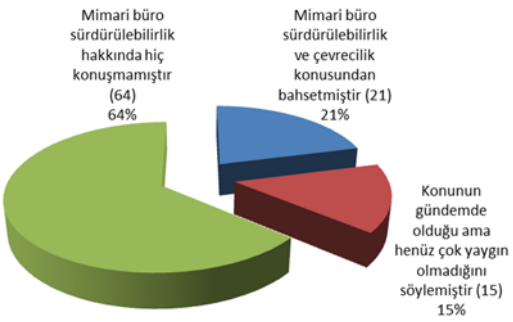


Grafik 22: Mimari büronun probleme karşı yaklaşım durumu

Kullanılan çizim programları mimari ofislerde farklılık göstermektedir ve kullanılan çizim programlarının uyuşmadığı durumlar ortaya çıkmaktadır. Böyle bir problemle karşılaşıldı mı sorusuna, %8'i ortak programa geçme kararı almadığını, %14'ü kullandığı programı değiştirdiğini, %78'i böyle bir problemle karşılaşmadıklarını belirtmektedir (Grafik 22). Sürdürülebilir tasarımlar çağımızın getirdiği, doğayı ve insan hayatını destekleyen çözümlerden biridir. Sürdürülebilir tasarıma mimari ofislerin yaklaşımı sorulduğunda, %21'i mimari büronun sürdürülebilirlik ve çevrecilik konusundan bahsettiğini , %15'i konunun gündemde olduğu ama henüz çok yaygın olmadığını, %64'ü mimari büronun sürdürülebilirlik hakkında hiç konuşmadıklarını belirtmektedir (Grafik 23).



Grafik 23: Kullanılan çizim programlarının mimari büroyla uyum durumu



Grafik 24: Mimari büronun sürdürülebilirlik kavramıyla ilgili olma durumu

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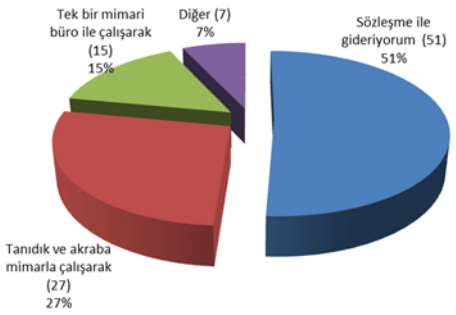
Mimari bürolarla anlaşmazlıklar söz konusu olabilmektedir. Mimari bürolarla çalışanlara sorulduğunda, %51'i sözleşme ile giderdiğini, %27'si tanıdık ve akraba mimarlarla çalışarak giderdiğini, %15' i tek bir mimari büro ile çalışarak giderdiğini, %7'si farklı çözümler sunduklarını belirtmektedir (Grafik 25).



Grafik 25: Mimari büroyla anlaşmazlıkların çözümünde izlenen yollar

4. Tartışma

Mimarlık büroları hizmet veren bürolardır. Toplum içerisinde hizmete ücret ödeme fikri çok kabul gören bir durum değildir. Bu çalışmada, müşterilerin mimari büroda yapılan ve toplum tarafından ücret ödenmek istemeyen hizmet sektörü içerisinde olan hizmetleri kabul etme ve bürolarla yaşanan problemlerin kaynağı araştırılmıştır. Akıncıtürk'ün (2010) "Mimarlık Ofislerinin Yenilikçilik Sürecinde; Kullanıcı ve Müşterilerin Stratejik Rolü Üzerine Kalitatif Bir Araştırma Deneyimi", Ergöz'ün (2002) "Mimarlık Mesleği ve İstanbul Teknik Üniversitesi Mimarlık Fakültesi Mezunlarının Mesleki Kariyeri Üzerine Bir Alan Çalışması", Erdi'nin (2009) ise "Mimarlık Meslek Pratiğinde Etik Değer Ve Sorumlulukların Değerlendirilmesi İçin Bir Yöntem Önerisi" mimarlık meslek pratiğine yönelik yapılan çalışmalar olarak bulunmaktadır. Bu çalışmalar, mimari büro-müşteri ilişkisine yönelik değildir.

Yapılan çalışmada ise müşteri baz alınarak ve müşterinin mimari meslek pratiği içerisinde olan hizmetlerden memnuniyet durumu araştırılmıştır. Çalışmada yer alan anket, mimarlık bürosu müşterisi olan 100 kişiye hazırlanan soruların sorulmasıyla gerçekleştirilmiştir. Bu çalışma ile Kayseri'de bulunan mimarlık bürosu müşterilerinin demografik yapısının nasıl olduğu, hangi tür işler için mimarlık bürosuyla çalıştıkları, bu çalışmalar sırasında karşılaşılan sorunların ve bu sorunlara çözümlerin neler olabileceği ortaya koyulmaya çalışılmıştır. Müşteriler, mimarlık bürolarına çoğunlukla iyi bir tasarım olmasını istedikleri için başvurmakta ve alınan hizmetten genelde memnun kaldıkları için başka projelerde de aynı mimarlık bürolarıyla çalışmaktadır. Mimarlık bürosunun seçiminde çoğunluğun mevcut bürolar üzerinde araştırma yapılarak değil akraba, tanıdık ya da tavsiye üzerine mimarlık bürolarını tercih etmesi, projenin ilerleyen aşamalarında iletişim problemlerine neden olabilmektedir.

Müşteriler, mimarlık bürolarına çoğunlukla uygulama ve takım projesi hizmetleri için başvurmuşlardır. Bu hizmetleri almak için talep ettikleri proje türü genellikle konut olurken, ticaret ve kamu yapıları bunu izlemektedir. Mimarlık bürosuna başvuran müşterilerin yarısından fazlası bürodan projenin 3 boyutlu ifadelerini talep etmektedir. Bu kişilerin bir kısmı ön projenin düşündüğü gibi olmadığını fark ettiği için hizmetten memnun kalmamaktadır. Projelerde kullanılacak malzemenin tercihi yapılırken müşterilerin büyük bir kısmı alınan hizmetten memnun kalmıştır. Projelerin teslim aşamasında ise yine bir kısım müşteri zamanla ilgili problem yaşarken, büyük bir kısmı zamanla ilgili bir problem yaşamayıp, projelerini zamanında teslim almışlardır. Tasarımı yapan mimarlık bürosunun uygulama aşamasında şantiyeyi yeterli sıklıkla ziyaret etmediği, genellikle sorun oldukça çağrıldığı gözlemlenmiştir. Projenin uygulama aşamasında olan problemlere mimarlık bürosunun yaklaşımı çoğunlukla olumlu olmaktadır ve genellikle mimarın önerdiği çözümle hareket edilmektedir.

Proje aşamalarında mimari büroyla oluşabilecek problemlerde müşteriler farklı çözümler tercih etmektedir. Müşterilerin çoğunluğu problemlerini sözleşme ile giderirken, bir kısmı problemlerini tanıdık ve akraba mimarla çalışarak bir kısmı da tek bir mimari büroyla çalışarak çözmeye çalışmaktadır.

5. Sonuç

Tarihi gelişim süreci içerisinde mimari büro kavramında gelişmeler olmuştur. Özellikle teknoloji ve getirileri ile mimari bürolara algılar değişmiştir. Çizim programlarının gelişim göstermesi, uygulamaya geçilmeden projenin son halinin görülebilmesi, insanların mimari büro algısını değiştirmiştir. Bunun yanı sıra mimari büroda

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kullanılan programların ve teknik personelin de gelişim göstermesi bu algının değişmesini desteklemiştir. Mimari büroların çağın gerektirdikleri forma ulaşması ve müşterilerin isteklerini karşılayabilmesi hedeflenmektedir. Mimari büro müşterilerinin eğitim seviyelerindeki artış büro algısını olumlu yönde etkilemiştir. Bu durum, mimari büro ile çalışanların müşteri ile arasındaki sorunların çözümünde olumlu etki göstermektedir.

Farklı yaş ve meslek gruplarına sahip müşterilerin genel olarak akraba ya da tanıdık vasıtası ile mimari büro seçtikleri anlaşılmaktadır. Farklı projeler için başvuran müşterilerin mimari bürolar, mimarların sorumlulukları ve ücretlendirmeler hakkında yeteri kadar bilgileri olduğu görülmektedir. Bunun sonucu olarak bürolarla müşteriler arasında yapılan sözleşmelerde genel olarak sorunlar yaşanmamakta, yaşanan sorunların çözümünde de karşılıklı anlaşmalar görülmektedir. Her ne kadar çözümler karşılıklı ise de üretim aşamasındaki denetimler gösteriyor ki mimarın hala müşteri tarafından "sorun oldukça şantiyeye çağırılma" fikrinde olması nedeniyle şantiye alanındaki sorumlulukların hem müşteri hem de mimar tarafından yeterince bilincinde olunmadığı görülmektedir. Şantiye alanındaki sorunların çözümünde genelde mimarın önerdiği çözümlerin tercih edilmesi denetim bilincinin önemini göstermektedir. Bunun yanı sıra mimari bürolardan talep edilen danışmanlık, avan proje, takım proje, resmi evrak, uygulama, iç mimari hizmetlerinin başka bir kuruluştan karşılanmasına gerek kalınmadan başta anlaşma yapılan bürolardan karşılandığı da görülmüştür.

Müşterilerin mimari ofislere başvurma sebepleri genel olarak iyi bir tasarım istemelerindendir. Bunun sonucunda; aldığı hizmetten memnun kalan müşterilerin, bir sonraki işlerde çalıştıkları mimari ofisleri değiştirmediği görülmektedir. Müşteriler, mimari bürolardan aldıkları danışmanlık, avan proje, takım proje, uygulama, iç mimari hizmetleri karşılığında ücret ödemeyi kabul etmektedirler. Bu ücretlerin, hizmetlere göre farklılık gösterdiği ve bu faklılıkların müşteriler tarafından normal düzeylerde olduğunun kabul edildiği görülmüştür.

Bu çalışma kapsamında; Kayseri özelinde mimarlık bürolarına başvuran müşterilerin, karşılaştığı projelendirme ve uygulama safhalarındaki sorunlar ele alınmıştır. Kayseri örnek alanında, yapılan bu çalışma ile büyük şehirlerin de dışında, Anadolu'da yer alan mimarlık büro müşterilerinin projelendirme ve uygulama safhalarındaki sorunlar ortaya koyulmaya çalışılmıştır. Yapılan çalışmanın bundan sonra yapılacak olan mimari bürolar ve müşterileri arasındaki sorunlar ile ilgili çalışmalara katkıda bulunması hedeflenmiştir.

Teşekkürler

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Özet: Finansman bir yapının oluşabilmesi için gerekli olan girdilerin başında gelmektedir. Finansman yönetiminin doğru yapılması sonuç ürüne beklenen maliyet ile ulaşmakta önemli bir rol oynamaktadır. dolayısı ile kaynakların doğru yönlendirilmesi yapı maliyetini etkilemektedir. Maliyeti etkileyen en önemli kriter ise malzemedir. Bir mimarın malzeme seçiminde sorumsuz davranması, yapı toplam maliyetini direkt etkileyen olgudur. Mimarın yapmış olduğu projede malzeme seçim kararlarını iyi belirlemesi gereklidir. Yapı üretiminde ekonomiyi sağlayabilmek için mimarın malzemeyi iyi tanıması ve maliyetini bilmesi, mimarın malzeme kullanım kararlarını etkilemektedir. Tasarım evresi ve uygulama projesi evresi de dâhil olmak üzere mimarın malzeme kararlarını doğru vermesi önemlidir. Bu durum dünyada olduğu gibi Türkiye'de de geçerlidir. Tanınır mimar olmak demek hiçbir zaman malzeme seçiminde serbest olmayı dolayısı ile maliyette sorumsuzluğu getirmemektedir. Tanınır mimar ve/veya mimari eserlerin maliyet incelemelerinin yapılması ile bu durum genele daha iyi aktarılmış olacaktır. Bu çalışmada Türkiye'nin öncü mimarlarından olan Sedad Hakkı Eldem'in belirlenen yedi tasarımı ele alınmıştır. Sedad Hakkı Eldem, modern mimarinin ülkede önde gelen temsilcilerinden olduğu çin çalışmaya konu olmuştur. Mimarın tasarımlarında seçtiği bazı malzemelerin tespitleri yapılmış ve günümüz birim fiyatları ile maliyetleri bulunmuştur. Belirlenen yapılarda bu malzemeler değiştirilmiş ve yerine modern mimariyi zedelemeyecek malzemeler uygulanmış ve yeni seçimlerin maliyetleri hesaplanmıştır. Yeni seçilen malzeme ve yapının orijinal kullanılan malzemesi arasındaki fiyat farkları ortaya koyulmuştur. Bu çalışma ile bir mimarın malzeme seçimi ile bina maliyetini ciddi biçimde etkileyeceği vurgulanmıştır. Çalışmanın malzeme seçimi ve maliyet konusunda alana katkı sağlaması umulmaktadır.

Anahtar Kelimeler: Malzeme, maliyet, Sedad Hakkı Eldem

GİRİŞ

Ülkede inşaat sektörü Cumhuriyetin ilanı ile gelişmeye başlayan bir sektördür. Cumhuriyetin ilk yıllarında demiryolu hatları ve büyük su projeleri ile başlayan inşaat sektörü, İkinci Dünya Savaşı'ndan sonra tırmanışa geçmiştir. Hukuk sistemi içerisindeki çeşitli kanunlarda inşaat kavramına farklı şekilde değinilmiştir. Medeni Kanun'un 652/1 Maddesine göre inşaat: Arsa-arazi üzerinde malzeme ve emek kullanımıyla inşa edilmiş ve düzenlenmiş varlıklardır. Medeni kanunda genel bir tanımlama yapılmıştır. Bu tanıma göre köprüler, liman tesisleri, inşa edilmiş su kanalları, binalar ve bunların eklentileri, duvarlar, demiryolunun traversleri, raylar, çeşmeler, abideler, su bentleri, maden galerileri, kanalizasyonlar, meydanlar, tüneller, kuyular vb. inşaat imalat kavramına girmektedir (Resmi Gazete, 2001). 3194 sayılı İmar Kanunu'nda ise "yapı" kavramı tanımlanmıştır. Bu tanıma göre; karada ve suda, daimi ve muvakkat, resmi veya hususi yer altı ve yer üstü inşaatı ile bunların ilave, değişiklik ve tamirlerini içine alan sabit ve müteharrik tesislerdir. (Özlü, Y., 2012)

Türkiye'de yapı sektöründe inşaata başlanmadan önce yapının yaklaşık maliyeti, toplam inşaat alanı ile birim m² inşaat maliyetinin çarpılması sonucu bulunur. Birim m² inşaat maliyeti ise Çevre ve Şehircilik Bakanlığı'nın her yıl yayımladığı yapı yaklaşık birim maliyet listesinden elde edilmektedir (Polat, A., 2005). Binalarda kaba ve ince iş olmak üzere iki maliyet hesabı yapılmaktadır. Bu nedenle inşaatlarda maliyet hesabı yaparken iki durum söz konusudur. Mimarlık için maliyet, binanın ne kadarlık bir bütçe ile yapılacağının hesaplanması işlemi olarak belirlenebilmektedir. Diğer bir ifade ile mimari projeden bitmiş bir bina elde etmek için ortaya konulması gereken finansal kaynaktır. Bina üretiminde ilk amaç, minimum maliyet ile maksimum faydayı sağlamaktır. (emlakwebtv, 2014)

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Bina maliyetinde, maliyet planlamasına mümkün olduğunca erken başlanması binanın sonuç kısmına gelindiğinde daha az maliyetle yapılmasını sağlamaktadır. Bina maliyetinin mümkün olduğunca ilk karar aşamasında verilmesi istenmektedir (Bostancıoğlu, E., 2006). Yapıma ayrılacak sermayenin yeterli olup olmadığı veya ayrılması gerekli kaynak miktarının bilinmesi ileri aşamalar için çıkacak sorunları ortadan kaldırmaktadır. İlk yatırım kararı, şematik tasarım, tasarımların geliştirilmesi ve uygulanması kararlarının doğru alınması, binanın maliyeti için olumlu sonuçlar çıkartmaktadır. Bina maliyetini düşürme şansının en yüksek olduğu evre ön tasarım evresi olarak görülmektedir (Bostancıoğlu, E., 1999). Tasarımın ilk evresinde maliyetin ne kadar olduğu bilinirse buna uygun seçimler ve tasarım çözümleri geliştirilebilmektedir. İlk yatırım kararı ve ön projeden çıkan sonuçların maliyet adına kesin olmadığı unutulmamalıdır. Binanın kesin maliyeti biten inşaat sürecinden sonra netleşmektedir. Bu bağlamda binanın tasarım kararının verilmesinden inşaat evresinin bitme sürecine kadar olan aşamada maliyet verileri toplanmalı, saklanmalı ve ileride kullanılmak üzere bilgiye dönüştürülmelidir.

Bina maliyetini etkileyen birçok etmen bulunmaktadır. Bunların başında binanın yapılacağı yer, binanın kat yüksekliği ve kat sayısı, bodrum katının olup olmaması, dış duvar tipi ve yapım teknolojileri gelmektedir (Bostancıoğlu, E., 2006). Aynı zamanda binada kullanılacak malzeme çeşitleri maliyeti önemli derecede etkileyen faktörlerin başında gelmektedir. Malzeme seçimi, binanın kat yüksekliği gibi etmenlere, binanın hangi işlevle kullanılacağı sonucu karar verilmektedir. Yani maliyeti etkileyen diğer bir faktör ise binanın işlevidir. Ayrıca binanın çevre uzunluğu, binanın yapım yılı, plan biçimi, iklimsel koşullar da maliyette etkili olmaktadır (Bostancıoğlu, E., 2006). Deprem kuşağında yer alması, taşıyıcı sistem çözümleri, zemin etütleri, projenin uygulanması ve denetimi de maliyeti arttıran etmenler olarak karşımıza çıkmaktadır (Özkan, Ö., Muratoğlu, Ö., 2005). Maliyet sadece binanın yapım sürecinde değil, yapım işlemi bittikten sonraki kullanım sürecinde de önemli olmaktadır. Seçilen malzemenin bakımı, onarımı, binanın işletme maliyeti de düşünülmelidir. Örneğin; ahşap, çelik ya da betonarme bir malzeme seçimi her bakımdan farklı sonuçlar ortaya çıkartmaktadır. Betonarme bir malzeme çoğunlukla sıva boya gerektirdiği gibi ahşap bir malzeme ise nemden koruma gerektirecektir (Bostancıoğlu, E., 2006).

Her dönem içerisinde inşaat projelerinin başarısı, işin zamanında ve planlanan maliyetle tamamlanmasına bağlıdır. Bina tipi, kat yüksekliği, kat sayısı, iklimsel koşullar, dış duvar tipi gibi etmenler önemli olsa da öncelikli olarak yapıda kullanılan tüm malzemelerin yapının maliyetini ne kadar etkilediği ve malzeme seçimine yapının ön tasarım evresinde karar verilmesinin önemi, bu çalışmada vurgulanmıştır. Maliyetin düşürülmesi bakımından, eldeki kaynaklara uygun tasarım yapılması ve alternatifler arasından en uygununun seçilmesinin önemi, bu çalışma ile ortaya koyulmaya çalışılmıştır. Maliyetin bina yapımındaki önemi çalışma içerisinde araştırılmış, özellikle malzeme seçimi açısından maliyeti etkileyen faktörler üzerinde durulmuştur. Çalışmanın bundan sonraki çalışmalara katkı sağlayacağı umulmaktadır.

MATERYAL VE METOD

Cumhuriyet dönemi mimarlığımızı etkileyen mimarların arasında olan Sedad Hakkı Eldem'in seçilen kendine has özellikleri olan 6 yapısı belirlenmiştir. Genel olarak seçilen mimari projelerin Eldem'in İstanbul'daki yapıları olmasına özen gösterilmiştir. Çalışmaya konu olan yapılarda farklı malzemelerin kullanılması, Sedad Hakkı Eldem'in öncü yapıları olması seçim alanının sınırlarını çizmekte etkili olmuştur.

Yaklaşık maliyet hesaplamasında, değiştirilmesi düşünülen malzemelerin birimi ile Çevre ve Şehircilik Bakanlığı ve Bayındırlık Bakanlığı'nın yayınladığı 2015 birim fiyat listesinden yararlanarak malzeme poz numaralarına göre birim maliyetlerin çarpılması sonucu, toplam seçilen malzemenin maliyeti bulunmuştur. Malzeme değişikliğine karar verilen yüzeylerin alan metrajı, elde edilen dwg formatlı dosyalar üzerinden hesaplanmıştır. Bu yapılırken belirlenen mimari projelerin çizimleri dwg ortamına aktarılmış ve sayısal ortamda ölçekli mimari projeler haline getirilmiştir.

Çalışmada, seçilen yapılarda kullanılan mevcut malzemelerin 2015 birim maliyet fiyatları ile maliyetinin ne olacağı hesaplanmıştır. Yapılarda kullanılması önerilen yeni malzemelerin birim m² inşaat maliyeti Çevre ve Şehircilik Bakanlığı'nın 2015 birim fiyat listesinden elde edilmiştir. 2015 birim fiyat listesinden bulunamayan malzemelerin birim maliyetlerinde ise piyasa araştırması sonucu ortak bir değer alınmıştır. Daha sonra elde edilen iki sayısal değer karşılaştırılmıştır.

SEÇİLEN MİMARİ PROJELERİN ÖZELLİKLERİ

Sedat Hakkı ELDEM'in seçilen "Rıza Derviş Köşkü" 1956-57 yılları arasında tasarlanmıştır. Yapı Büyükada/İSTANBUL'da bulunmaktadır. Betonarme strüktüre sahip yapı, 533,32 m² kapalı alan 110 m² açık çıkma olmak üzere toplam 643,32 m² alandan oluşmaktadır (Fotoğraf 1-2). Yapı manzara yöne denize göre konumlandırılmıştır. Ön bahçesinde kendine ait büyük bir havuzu vardır.

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Fotoğraf 1: Rıza Derviş Köşkü (flickr.com salt online, 2010)



Fotoğraf 2: Rıza Derviş Köşkü (flickr.com salt online, 2010)

Seçilen yapılardan "Suna Kıraç Yalısı", Sedat Hakkı Eldem tarafından 1965-1966 yılları arasında yapılmıştır. Boğaz'da, var olan bir yapının temelleri üzerine inşa edilen konut, iki kanadında yaşama ve yemek mekânlarının bulunduğu, merkezi sofalı geleneksel Türk Evi'nin bir yorumudur.

Vaniköy İskelesi'nde, mevcut bir binanın duvarlarından yararlanılarak inşa edilen yalının Vaniköy Camisi'nin yanında olması nedeniyle genel görünüşü ve kütlesi bakımından özel bir durumu olduğu söylenmektedir. Bahçesine bir yüzme havuzu, havuz pavyonu ve büyük bir limonluk inşa edilmiş, bahçe yolları mermer şeritler arasında tuğla kaplanmıştır(Fotoğraf 3). Mutfak ve şömine bacaları bahçe tarafında iki kuvvetli çıkıntı oluşturur. Duvarlarda eski taşıyıcılar kullanılmış bu da geçilen açıklıkları sınırlandırmıştır (arkiv.com, 2008). Betonarme strüktüre sahip olan yapı 763.2 m²'dir. Salonlar grubunun solunda iki kademe yüksekliğinde bir oturma köşesi vardır. Cephelerde renk ve malzeme açısından fazla çeşitlilik görülmemektedir. Malzeme olarak ahşap ve sıva cephe kullanılmıştır(Fotoğraf 4). Cephelerde bezeme yoktur. Yapıda değiştirilmek üzere incelenen malzemeler; bütün pencerelerde kullanılan ahşap panjurlar ve sıvalı yapı cephesidir. Var olan ahşap panjurlar yerine ahşap modern güneş kırıcılar; cephelerde sıvalı boya yerine de ahşap kaplama malzemesi kullanılmıştır. Günümüzde yaygın olarak kullanılan bu son yıllarda üretilen yeni malzemeleri yapıda kullanarak yalının çağdaş malzemelerle modern hale getirilmesini sağlamaktır.

Seçilen "Fethi Okyar Köşkü", Büyükada Eski Viranbağ'da mevcut bir kır evinin büyütülmesiyle oluşmuştur. Bu bina, mevcut eski bağ evine yapılan ilâveler ve tadilatla meydana gelmiştir. Büyükada'da çamlıklar arasında bulunan ev, her taraftan geniş bir manzaraya hâkimdir. İnşaatın önemli bir kısmı ahşap olan binaya geniş bir oturma salonu eklenmiştir. Ayrıca yapının önüne ve üç cephesine burayı çerçeveleyen balkon ilâve edilmiştir. Tüm evi çevreleyen ahşap veranda ve bir köşesi yuvarlatılmış geniş salon kütlesiyle yapıya yeni bir görünüm kazandırılmıştır (Fotoğraf 5). Verandanın zemini ahşap ızgara biçimindedir ve yağmur suyunu aşağıya geçirir. Evin önündeki setler, denize doğru birkaç kat ile bahçeye geçişi sağlar. Yapı yüzeyinde sıva ve dış cephe boyası bulunmaktadır. Dış cephe kaplaması uygulamada klinker tuğla kaplama ile değiştirilecektir.



Fotoğraf 3: Suna Kıraç Yalısı (arkiv.com, 2008)



Fotoğraf 4: Suna Kıraç Yalısı (arkiv.com, 2008)



Fotoğraf 5: Fethi Okyar Köşkü (arkiv.com, 2008)

Seçilen yapılardan "Şemsettin Sirer Yalısı" Yeniköy'de 1966-67 yılları arasında inşa edilmiştir. Üzerine oturduğu arsanın bitişik nizam olması sebebiyle dar bir cepheye sahiptir (Fotoğraf 6). Bu darlığa karşın yapının derinliği fazladır. Bu durum aynı zamanda 4 kot ile evin planının çözümünü getirmiştir. Ayrıca Şemsettin Sirer Yalısı'nın planı, tipik yalı veya konak özellikleri ile ilişkilendirilememektedir. Bitişik nizam içerisinde olması sebebiyle iki ana cepheye sahip olan yalının ön cephesi boğaza bakmaktadır (Fotoğraf 7). Ön cephenin ele alınışı geleneksel boğaz yalılarının özelliklerine ve ölçeğine uygundur. Yapı; klasik Eldem uygulamalarına sahiptir. Ön cephedeki geniş saçaklı çatı, çifte balkon ve saçak altına uzanan modüler bölümlenme buna örnektir doğramanın

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alüminyum olması yanı sıra büyük ölçüde meşe kaplama ve kafesler cephedeki ince çubuklar dekoratif amaçlıdır. Şemsettin Sirer Yalısı'nda cephenin baskın öğesi cam yüzeyler ve alüminyum doğramalardır. Bu sebeple bu malzemelerin değiştirilmesi uygun görülmüştür.

Seçilen yapılardan "Uşaklıgil Köşkü", Sedad Hakkı Eldem tarafından 1956-1957 yılları arasında tasarlanan yapı 409.3 m² dir. Yapı Emirgan/İstanbul'da bulunmaktadır. Betonarme karkas yapının plan, görünüş ve kaplama motiflerinde gridal düzen hâkimdir. Cephe ve pencerelerde prefabrike beyaz beton elemanlar kullanılmıştır (Fotoğraf 8). Giriş cephesinde malzeme olarak Marmara Mermeri, Rodos Çakılı ve Boğaz Taşı kullanılmıştır. Pencereler farklı boylarıyla ahşap ve beton ayaklı olarak projelendirilip yerinde modeller yapılmış, sonuçta ahşap çerçeveler tercih edilmiştir.



Fotoğraf 6: Şemsettin Sirer Yalısı (arkiv.com, 2008)



Fotoğraf 7: Şemsettin Sirer Yalısı (mimarlikmuzesi.org, 2005)



Fotoğraf 8: Uşaklıgil Köşkü (arkiv.com, 2008)

Seçilen yapılardan "Rahmi Koç Evi", Sedat Hakkı Eldem tarafından 1975-1980 yılları arasında yapılmıştır. Yüksek, eğimli bir arazi üzerinde on altı konutluk genel bir plan içerisinde bulunan yapıya yarım kat yüksekliğinden girilmektedir. Bahçe katındaki orta sofa karnıyarık şeklindedir, üst katla merdiven bağlantısı merkezindedir. Sofa, tüm tasarımın baskın karakteri olarak öne çıkar ve çatıdaki ışıklığıyla daha da vurgulanmıştır. Üst kat ana oturma mekânı olarak düşünülmüş, esas giriş ile havuz mekânı buraya bağlanmıştır (Fotoğraf 9). Orta sofası ve köşk oda gibi tanımlanmış kitaplığı ile plan geleneksel Osmanlı evi tipolojisinin özelliklerini taşır. Şömine ve mutfak bacaları Sedad Hakkı Eldem'in tasarladığı yalılarda sıkça kullandığı kuvvetli çıkıntılar şeklinde yapılmıştır. Strüktür sistemi betonarme olan evin iç ve dış mekân kaplaması ağırlıklı olarak ahşap ve betonarme olarak tercih edilmiştir (Fotoğraf 10). Ahşap malzeme, cephede çatı çıkmaları, kat çıkmaları ve pencere panjurları; iç mekânlarda tavan ve zemin kaplamasında kullanılmıştır. Orta sofaya açılan tavan ışıklığı, ahşap kaplama yapılarak orta sofa vurgulanmıştır. Aynı zamanda orta sofada bulunan oturma bölümü de ahşapla kaplanmış, zemin ve ışıklık ile bir bütünlük sağlanmıştır. Cephelerde, yapının içinde olduğu gibi sıva ve ahşap malzeme tercih edilen yapıda değiştirilmek üzere incelenen malzemeler; bütün pencerelerde kullanılan ahşap çatı çıkmaları ve parke kaplamalı sofa olarak seçilmiştir. Var olan ahşap çatı çıkmaları yerine sıva kaplama; sofada parke zemin kaplaması yerine mermer zemin kaplaması kullanılmıştır. Değiştirilen malzemelerle yapının daha sade bir görünüm kazanması amaçlanmıştır.



Fotoğraf 9: Rahmi Koç Evi (arkiv.com, 2008)



Fotoğraf 10: Rahmi Koç Evi (arkiv.com, 2008)

MİMARİ PROJELERİN GÜNÜMÜZ BİRİM FİYATLARI İLE MALİYETİ

ıvalı yüzeylerin günümüz birim fiyatı piyasa araştırması sonucu maliyeti, 21 TL olarak tespit edilmiştir. Yapıda kullanılan malzemenin günümüz birim maliyeti temel alındığında cephelerin toplam maliyeti 3.546 TL olarak hesaplanmıştır (Çizim 1). Rıza Derviş Köşkü'nün cephesinde kullanılan özgün malzemenin yerine günümüz çağdaş malzemelerinden Bazalt taşı kullanıldığında ortaya çıkan maliyet değişimi hesaplanmıştır. Bunun için yapının cephesinin metrajı çıkartılmış ve toplam yüzey alanının 168.9 m² olduğu belirlenmiştir. Bazalt taşının

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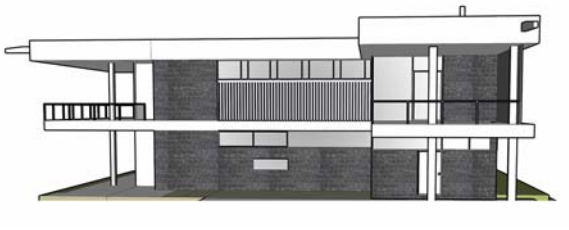
günümüz birim fiyatı piyasa araştırması sonucu 40,50 tl olarak tespit edilmiştir. Yapılan çalışmada 168.9 m² bazalt taşı metrajı birim maliyetler ile çarpılarak yapının cephesinin günümüz malzemeleri ile değiştirilmesinin toplam maliyeti 6,840 tl olarak hesaplanmıştır (Çizim 2).



Çizim 1: Rıza Derviş Köşkü sıvalı cephe görüntüsü



Çizim 2: Rıza Derviş Köşkü bazalt taşı ile değiştirilmiş cephe görüntüsü

"Suna Kıraç Yalısı" o zamanlarda yaygın olan sıvalı yüzey ve ahşap panjurların kullanılmasından dolayı günümüz yaygın malzemelerle değiştirilmesine karar verilmiştir. Ahşap panjur için cephe metrajı çıkartıldığında toplamda 196.2 m² kullanıldığı tespit edilmiştir (Fotoğraf 11). Yapılan piyasa araştırması sonucu, ahşap panjurun günümüz birim m² fiyatı 120 TL olarak belirlenmiştir. Yapının cephesinde kullanılan malzemenin günümüz birim fiyatı temel alındığında toplam maliyet 24.000 TL olarak hesaplanmıştır. Sıvalı boya için metraj hesabı çıkartıldığında toplamda 365.66 m² kullanıldığı tespit edilmiştir. Sıvalı yüzeylere ısı yansıtma özellikli boya yapılması günümüz birim m² fiyatı 17.04 TL olarak belirlenmiştir. Yapının cephesinde kullanılan malzemenin günümüz birim fiyatı temel alındığında toplam maliyet 6.229 TL olarak hesaplanmıştır. Suna Kıraç Yalısı cephesinde kullanılan özgün malzemenin yerine günümüz çağdaş malzemelerden olan ahşap cephe kaplama ve ahşap güneş kırıcı kullanıldığında ortaya çıkan maliyet değişimi hesaplanmıştır (Fotoğraf 12). Ahşap güneş kırıcı için yapının cephesinin metrajı çıkarılarak toplam yüzey alanının 196.2 m² olduğu belirlenmiştir. Ahşap güneş kırıcı malzemenin günümüz birim fiyatı piyasa araştırması sonucu kg fiyatının 15.45 TL olduğu tespit edilmiştir. 1 m²'nin de yaklaşık 1 kg olduğu hesaplanmıştır. Yapılan çalışmada 196.2 m² ahşap güneş kırıcı metrajı birim maliyetler ile çarpılarak yapının cephesinin günümüz malzemeleri ile değiştirilmesinin toplam maliyeti 9.267 TL olarak hesaplanmıştır. Ahşap cephe kaplama için yapının cephesinin metrajı çıkartıldığında ise toplam yüzey alanının 365.66 m² olduğu belirlenmiştir. Ahşap cephe kaplamanın günümüz birim fiyatı piyasa araştırması sonucu m² birim fiyatının 79 TL olduğu tespit edilmiştir. Çalışmada 365.66 m² ahşap cephe kaplaması metrajı birim maliyetler ile çarpılarak yapının cephesinin günümüz çağdaş malzemeleri ile değiştirilmesinin toplam maliyetinin 28.886 TL olduğu saptanmıştır.



Fotoğraf 11: Suna Kıraç Yalısı sıvalı yüzey ve ahşap panjur cephe görüntüsü



Fotoğraf 12: Suna Kıraç Yalısı ahşap cephe kaplaması ve ahşap güneş kırıcı cephe görüntüsü

"Fethi Okyar Köşkü" dış duvarlarının metrajı çıkarılmış yaklaşık değer 133,00 m² olarak bulunmuştur (Çizim 3). Yapı yüzeyinde sıva ve dış cephe boyası bulunmaktadır. Yapılan piyasa araştırmalarına göre günümüz dış cephe boyası birim fiyatı 17,04 TL olarak tespit edilmiştir. Yapının dış cephe boyası maliyeti günümüz birim fiyatı temel alındığında 2.266 TL olarak bulunmuştur. Fethi Okyar Köşkü'nün cephesinde kullanılan dış cephe boyası yerine, ahşap kolonatlı yapısına uyum sağlayacağı düşünülerek klinker tuğla uygulaması yapılmıştır (Çizim 4). Klinker tuğlanın günümüz birim fiyatı 28.00TL olarak tespit edilmiştir. Daha önce yapılan metraj hesabı ile

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klinker tuğlanın günümüz birim fiyatı çarpılarak yapının cephesinde uygulanacak değişimin toplam maliyeti 3.724 TL olarak hesaplanmıştır.

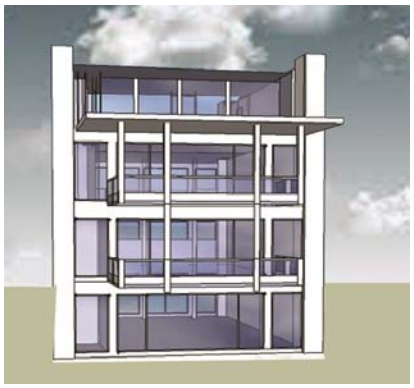


Çizim 3: Fethi Okyar Köşkü sıvalı yüzey cephe görüntüsü



Çizim 4: Fethi Okyar Köşkü klinker tuğla kaplamalı cephe görüntüsü

"Şemsettin Sirer Yalısı"nın cephelerinde kullanılan doğramaların alüminyum doğramadan pvc doğramaya çevrilmesine karar verilmiştir (Çizim 5-6). Bunun için cephe metrajı çıkarıldığında ön cephe için toplam pencere açıklığının 45 m² arka cephede ise 30 m² olduğu görülmüştür. Yapılan piyasa araştırmalarına göre pvc doğramanın birim fiyatının kg cinsinden 8.64 TL alüminyum doğramanın ise kg cinsinden 14.47 lira olduğu görülmüştür. Ön cephede alüminyum doğrama için 20-24kg/m² alınarak hesaplamalar yapılmış ve maliyeti 13.023 bulunmuştur. Arka cephede ise 8.682 TL bulunmuştur. Böylece toplam maliyet 21.705 bulunmuştur Ön cephede pvc doğrama için;16-18kg/m2 alınarak hesaplamalar yapılmış ve maliyeti 6.220,80 TL bulunmuştur. Arka cephede ise 4.147,2 TL bulunmuştur. Böylece toplam maliyet 10.368 TL olarak hesaplanmıştır.

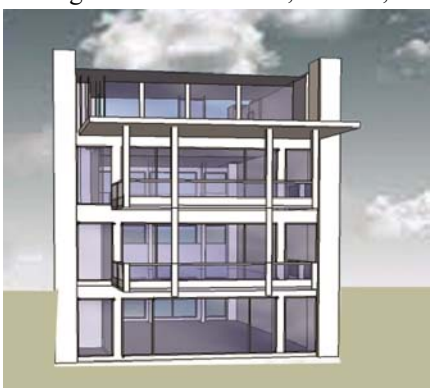


Çizim 5:Şemsettin Sirer Yalısı alüminyum doğrama pencere görüntüsü



Çizim 6:Şemsettin Sirer Yalısı pvc doğrama pencere görüntüsü

Şemsettin Sirer Yalısı'nın cephesindeki bir diğer değişiklikte ön cephede var olan cam yüzeylerin(Çizim 7) yerine yarısı tuğla kaplama(Çizim 8) yarısı cam yüzeyler oluşturulmak istenmiştir. Bunun için cephe metrajı çıkarıldığında ön cephede toplam pencere açıklığının 45 m², arka cephe toplam pencere açıklığının ise 30 m² olduğu görülmüştür. Yapılan piyasa araştırmalarına göre klasik ısıcam birim fiyatının m² cinsinden 45 TL, klinker tuğlanın ise birim fiyatının m² cinsinden 28 TL olduğu görülmüştür. Hesaplamalar yapıldığında tüm pencere yüzeylerinde klasik ısıcam uygulandığında 2.025 TL bulunmuştur. Yarısı tuğla uygulanıp diğer yarısı cam kullanıldığında ise 630+1.012,5=1.642,5 TL bulunmuştur.



Çizim 7: Şemsettin Sirer Yalısı cam korkuluk görüntüsü



Çizim 8:Şemsettin Sire Yalısı klinker tuğla korkuluk görüntüsü

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"Uşaklıgil Köşkü"nün cephe ve pencerelerinde prefabrike beyaz beton elemanlar kullanılmıştır. Giriş cephesindeki sebil çalışmaları. Malzeme olarak Marmara Mermeri, Rodos Çakılı ve Boğaz Taşı kullanılmıştır(Fotoğraf 13). Pencereler farklı boylarıyla ahşap ve beton ayaklı olarak projelendirilip yerinde modeller yapılmış, sonuçta ahşap çerçeveler tercih edilmiştir. 409.3 m² olan yapıda değiştirilmek üzere incelenen malzemeler; bütün pencere altlarında kullanılan ahşap kaplamalar ve Marmara mermeriyle kaplanmış zemin döşemesidir(Çizim 9). Ahşap kaplama yerine pencere altlarında kompozit kaplama uygulandığındaki değişimin toplam maliyeti ile zeminde Marmara mermeri yerine de ahşap parke kullanıldığındaki değişimin toplam maliyeti hesaplanmıştır. Yapılan piyasa araştırmalarına göre günümüz dış cephe ahşap kaplama birim fiyatı 57,55 TL olarak tespit edilmiştir. Yapının dış cephe boyası maliyeti günümüz birim fiyatı temel alındığında 5.266 TL olarak bulunmuştur. Uşaklıgil Köşkü'nün cephesinde kullanılan ahşap kaplama yerine, kompozit kaplama uygulaması yapılmıştır. Kompozit kaplamanın günümüz birim fiyatı 178,15 TL olarak tespit edilmiştir. Daha önce yapılan metraj hesabı ile kompozit kaplamanın günümüz birim fiyatı çarpılarak yapının cephesinde uygulanacak değişimin toplam maliyeti 16.307 TL olarak hesaplanmıştır.

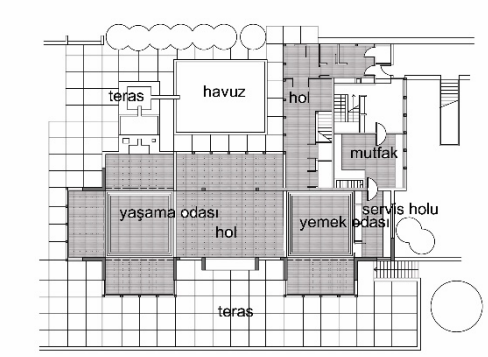


Fotoğraf 13:Uşaklıgil Köşkü orijinal cephesi

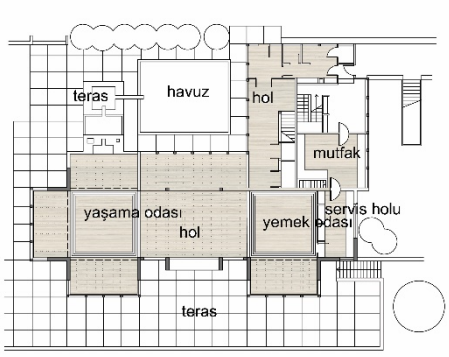


Çizim 9:Uşaklıgil Köşkü değiştirilen mazlemeler ile çizimi

İkinci olarak da değiştirilen malzeme zeminde kullanılan Marmara mermeridir (Çizim 10). Yapının Marmara mermeri maliyeti günümüz birim fiyatı 22 TL'dir. Toplam maliyet 19.119 TL'dir. Marmara mermerinin yerine ahşap parke uygulaması yapılmıştır (Çizim 11). Ahşap parkenin günümüz birim fiyatı 27,15 TL'dir. Toplam maliyet ise 23.620 TL'dir.



Çizim 10: Uşaklıgil Köşkü Marmara mermeri zemin döşeme çizimi



Çizim 11: Uşaklıgil Köşkü ahşap parke zemin döşeme çizimi

"Rahmi Koç Evi" orta sofa ve oturma mekânı zemin kaplamasında kullanılan ahşap zemin kaplama (Çizim 12) değiştirilmiş ve bunun yerine günümüzde yaygın olan mermer zemin kaplama malzemesi (Çizim 13) kullanılmıştır. Sofa ve oturma mekânları zemini toplam 323,25 m²'dir. Piyasa araştırması sonucu ahşap zemin kaplama (parke) m² fiyatı 24 TL olarak saptanmıştır. Sofa zemininde kullanılan parke kaplamanın toplam maliyeti 7.758 TL olarak hesaplanmıştır. Mermer yer döşemesi m² fiyatı 53 TL olarak saptanmıştır. Bu fiyata göre sofa zemin kaplaması için harcanacak mermer döşeme toplam maliyeti 17.172,25 TL olarak belirlenmiştir.

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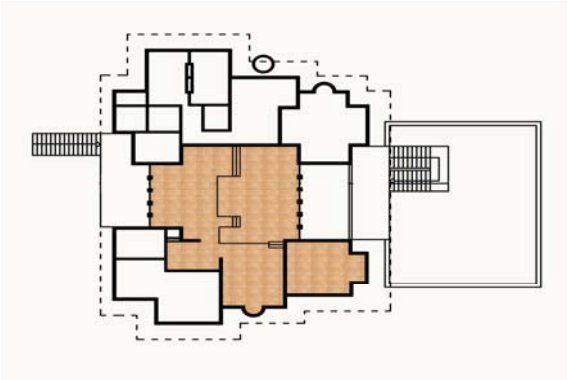
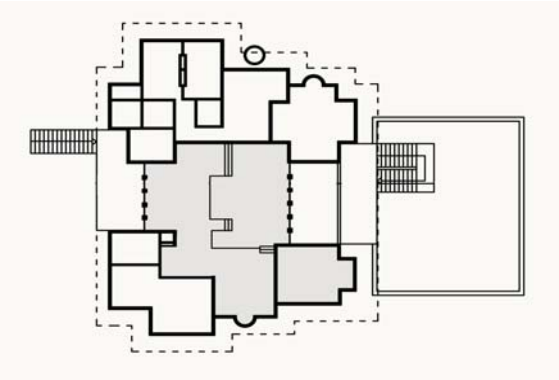
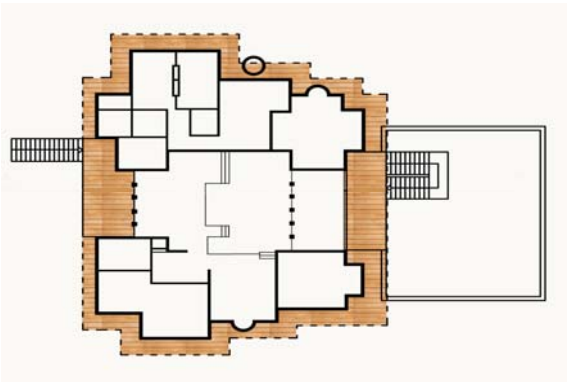


Çizim 12: Rahmi Koç Evi ahşap zemin kaplama çizimi

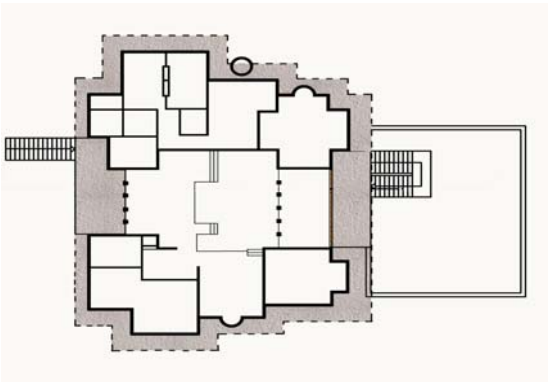


Çizim 13: Rahmi Koç Evi mermer zemin kaplama çizimi

İkinci olarak yapının ahşap çatı çıkmalarının (Çizim 14, Fotoğraf 14) yüzey alanı 117,75 m²'dir. Yapılan piyasa araştırması sonucu, ahşap cephe kaplamasının birim fiyatı 79 TL olarak belirlenmiştir. Çatı çıkmalarında kullanılan ahşap kaplamanın bu birim fiyat hesaplamasına göre toplam maliyeti 9.302,25 TL olarak hesaplanmıştır. Brüt beton, sıvalı veya eski boyalı yüzeylere, astar uygulanarak ısı yansıtma özellikli boya (Çizim 15, Fotoğraf 15) yapılması m² fiyatı 17 TL olarak saptanmıştır. Bu fiyata göre çatı çıkmaları için harcanacak sıva maliyeti 2.006,46 TL olarak belirlenmiştir.



Çizim 14: Rahmi Koç Evi ahşap çatı çıkmaları yüzey kaplama çizimi



Çizim 15: Rahmi Koç Evi sıva çatı çıkmaları yüzey kaplama çizimi



Fotoğraf 14: Rahmi Koç Evi ahşap kaplama çatı saçakları görünüşü



Fotoğraf 15: Rahmi Koç Evi sıva kaplama çatı saçakları görünüşü

Yukarıda belirlenen eski ve yerine seçilen yeni malzemelerin toplam maliyetine bakıldığında; Şemsettin Sirer Evi, Rahmi Koç Evi ve Suna Kıraç Yalısı'nda seçilen malzemelerin maliyetinde azalma görülürken Fethi Okyar Köşkü, Uşaklıgil Köşkü, Rıza Derviş Köşkü için seçilen malzemelerin maliyetinde artışa rastlanmıştır. Bu durum aşağıda tablo olarak verilmiştir (Tablo 1.).

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Tablo 1. Yapıların Eski Ve Yeni Malzeme Maliyet Kıyaslaması

YAPI ADI	YAPIM YILI	UYGULANAN BÖLÜM	ÖZGÜN KULLANILAN MALZEME	ÖZGÜN KULLANILAN MALZEME GÜNÜMÜZ TOPLAM FİYATI	SEÇİLEN MALZEME	SEÇİLEN MALZEME GÜNÜMÜZ TOPLAM FİYATI	MALİYETTE DEĞİŞİM DURUMU
Fethi Okyar Köşkü	1937	Cephe	Dış Cephe Boyası	2.266 Tl	Klinker Tuğla	3.724 TL	**ARTMA**
Uşaklıgil Köşkü	1956	Döşeme	Marmara Mermeri	19.139 Tl	Ahşap Parke	23.620 TL	**ARTMA**
		Cephe	Ahşap Kaplama	5.266 Tl	Kompozit Kaplama	16.307 TL	**ARTMA**
Rıza Derviş Köşkü	1956	Cephe	Sıva	3.546 Tl	Bazalt Taş	6.840 TL	**ARTMA**
Şemsettin Sirer Evi	1965	Cephe	Aliminyum Doğrama	21.705 Tl	Pvc Doğrama	10.368 TL	**AZALMA**
		Cephe	Klasik Isı Cam	20.250 Tl	Klasik Cam+Klinker Tuğla	16.425 TL	**AZALMA**
Rahmi Koç Evi	1980	Cephe	Ahşap Parke	9.302 Tl	Beton Sıva	2.006 TL	**AZALMA**
		Döşeme	Ahşap Kaplama	7.758 Tl	Mermer	17.172 TL	**ARTMA**
Suna Kıraç Yalısı	1966	Cephe	Sıva	6.229 Tl	Ahşap Cephe Kaplaması	28.886 TL	**ARTMA**
		Cephe	Ahşap Panjur	24.000 Tl	Ahşap Güneş Kırıcı	9.257 TL	**AZALMA**

SONUÇ

Yapı malzemesinin teknik imkânları ile mimari biçimlenme dolayısı ile mimari düşüncenin aktarımı gerçekleşmektedir. Soyut düşüncenin mimari bir yapıda somutlaşması malzeme ile olmaktadır. Malzeme her zaman belirleyici olarak formda ilk sıradadır (Mozaikçi, B., 2010).

Yapı malzemesi, bir yapıyı biçimlendiren, yapının bütününü oluşturan, tasarımın hayata geçirilmesini mümkün kılan eleman olarak tanımlanmaktadır. Yapıyı saran malzeme, yapının ekonomik durumunu doğrudan etkilemektedir. Yapının minimum maliyetle maksimum performansı gösterebilmesi için kullanılacak malzemede doğru seçimi yapmak önemlidir (Parlak Biçer, Ö., vd, 2015).

Günümüzde yapı üretiminde gerekli olan malzemeler için pek çok alternatif mevcuttur. Bu alternatifler içerisinden uygun seçimi yapmak mimarın sorumluluğundadır. Seçilen malzemenin özgün işleve, forma, üretim tekniğine ve fiziksel çevre verilerine uygun olması gerekmektedir.

Ekonomi ve konfor gereği yapı malzemelerinde yapılan tercihler farklılık göstermektedir. Kullanıcı talebine yönelik yapı tasarım yaklaşımları ve malzeme seçimleri değişmekte ve bu süreçte tabi ki en büyük rolü mimarın vereceği karar oynamaktadır.

Yapılan çalışmada; Sedad Hakkı Eldem'in farklı konumlarda, farklı zamanlarda yaptığı yapılardan örnekler seçilmiş, bu yapıların belirlenen bölümleri için metraj hesaplamaları yapılmış ve bu bölümler için malzeme maliyetleri, önerilen alternatif malzemeler dikkate alınarak birim maliyet yöntemi ile hesaplanmıştır. Bu hesaplamalar sonucu malzeme değişikliğinin maliyeti etkileme oranının malzeme türüne göre değişiklik gösterdiği belirlenmiştir. İncelenen yapılarda kullanılan mevcut malzemelerin seçimini etkileyen unsur genellikle tasarım kararını vurgulamak olmuştur. Bunu sağlayabilmek için tasarımın bütününde malzeme karakteri önemsenmiş ve değiştirilecek malzeme seçiminde etkili olmuştur. Sedad Hakkı Eldem Türkiye modern mimarlığının oluşmasında önemli katkıları olan bir mimar olmasına rağmen, yapılarında belirlediği ve Türk mimarisini vurgulayan malzeme seçimlerinde bina maliyetini düşünerek malzeme seçimini gerçekleştirmiştir. Çalışmada seçilen konutlar, her ne kadar üst gelir düzeyindeki müşteri profiline hitap eden yapılar olsa da bu yapıların yarısının malzeme seçimleri ekonomik bulunmuştur.

Bu çalışmanın sonucunda malzeme seçiminin ve maliyetinin yapının maliyetine direkt etkisi olduğu saptanmıştır. Çalışmanın mimari tasarım gerçekleştirirken malzeme seçiminin maliyete etkisinin önemi konusunda yapı alanına katkı sağlaması umulmaktadır.

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MİNİMİZİNG THE ENERGY OF THE VELOCİTY VECTOR FİELD OF CURVE İN R^3

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Abstract: The present paper considers all the unit-speed curve segments between two fixed points p and q in R^3. It obtain a condition for the critical curve of the problem of minimizing the energy of the velocity vector field among the family of all curves from p to q. It show that the condition can be expressed in terms of the curvature functions.

Keywords: Energy, Energy of a unit vector field, Sasaki metric

Introduction

The volume of unit vector fields has been studied by (Gluck and Ziller, 1986, Johnson, 1988, Higuchi, Kay and Wood, 2001) among other scientists. They define the volume of unit vector field X as the volume of the submanifold of the unit tangent bundle defined by $X(M)$. In (Wood, 1997), the energy of a unit vector field on a Riemannian manifold M is defined as the energy of the mapping $X: M \to T^1M$, where the unit tangent bundle T^1M is equipped with the restriction of the Sasaki metric on TM.

Generally, every geometric problem about curves can be solved using the curves'Frenet vectors field. Therefore, in (Altın, 2011), we focus on the curve C instead of the manifold M. For a given curve C, with a pair of parametric unit speeds (I, α) in a space R^n, on which we take a fixed point $a \in I$, we denote Frenet frames at the points $\alpha(a)$ and $\alpha(s)$ by $\{V_1(\alpha(a)), \dots, V_r(\alpha(a))\}$ and $\{V_1(\alpha(s)), \dots, V_r(\alpha(s))\}$ respectively. We calculate the energy of the Frenet vectors fields as well as the angle between the vectors $V_i(\alpha(a))$ and $V_i(\alpha(s))$, where $1 \le i \le r$. We observed that both energy and angle depend on the curvature functions of the curve C.

In this paper, we choose two points p and q in R^3. We obtain a condition for the critical curve of the problem of minimizing the energy of the velocity vector field among the family of all curves from p to q. We also prove that this condition can be expressed in terms of the curvature functions. For example the condition is realized for curves whose curvature functions is constant. An example is also provided to show that the curvature of the curve is linear.

Definition 1.1 A curve segment is the portion of a curve defined in a closed interval, (O'Neill 1966).

Theorem 1.1.(Frenet formulas) If $\alpha: I \to R^3$ is a unit speed curve with curvature $\kappa > 0$ and torsion τ, then

$$T' = \kappa N,$$
$$N' = -\kappa T + \tau B,$$
$$B' = -\tau N$$

Where $\{T, N, B\}$ is the Frenet frame on α (O'Neill 1966).

Proposition 1.1 The connection map $K: T(T^1M) \to T^1M$ verifies the following conditions.
1) $\pi \circ K = \pi \circ d\pi$ and $\pi \circ K = \pi \circ \tilde{\pi}$, where $\tilde{\pi}: T(T^1M) \to T^1M$ is the tangent bundle projection and $\pi: T^1M \to M$ is the bundle projection.

2) For $\omega \in T_xM$ and a section $\xi: M \to T^1M$, we have

$$K(d\xi(\omega)) = \nabla_\omega \xi.$$

Where ∇ is the Levi-Civita covariant derivative (Chacón , Naveira and Weston,2001).

Definition 1.2. For $\eta_1, \ \eta_1 \in T_\xi(T^1M)$ define

$$g_s(\eta_1, \ \eta_1) = < d\pi(\eta_1), d\pi(\eta_2) > + < K(\eta_1), K(\eta_2) >. \quad (1)$$

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This gives a Riemannian metric on TM. Recall that $g_s$is called the Sasaki metric. The metric g_s makes the projection $\pi: T^1M \to M$ a Riemannian submersion (Chacón , Naveira and Weston,2001).

Definition 1.3. The energy of a differentiable map $f: (M, <,>) \to (N, h)$ between Riemannian manifolds is given by

$$\varepsilon(f) = \frac{1}{2}\int_M (\sum_{a=1}^{n} h(df(e_a), df(e_a))\, \nu \tag{2}$$

where ν is the canonical volume form in M and $\{e_a\}$ is a local basis of the tangent space (Chacón , Naveira and Weston,2001 and Wood, 1997).

A Condition on Minimizing Energy of the Velocity Vector Field of a Curve in R^3

The following theorem characterizes a critical point of the energy of the velocity vector field of a curve in R^3

Theorem 2.1. Let α be unit speed curve in R^3 and α(a) = p, α(b) = q. Let us consider the collection of all curves segments from p to q in R^3 . If the energy of the velocity vector of α along one segment is less than that along any other segment, then the following equation is valid

$$\int_a^b \lambda(s)\kappa(s)\kappa'(s)ds = 0 \tag{3}$$

where κ is the curvature function and λ is the real-valued function n [a, b].

Proof. Let $\alpha: I \to R^3$ be a unit speed curve in R^3 and [a, b]⊂ I, α(a)= p, α(b) = q. There exists a real-valued function λ on [a, b], λ(s)=(s-a)(b-s), λ(a)=λ(b)=0 and λ(s)≠ 0 for all s∈(a, b). Let {T, N, B} be the Frenet frame field on α and

$$\lambda(s)T(s) = \big(v_1(s),\ v_2(s),\ \ v_3(s)\big), \qquad v_i: [a.b] \to R. \tag{4}$$

Let the collection of curves be

$$\alpha^k(s) = \big(\alpha_1(s)+k\ \ v_1(s),\ \alpha_2(s)+k\ \ v_2(s),\ \ \alpha_3(s)+k\ \ v_3(s)\big) \text{ for sufficiently small } k. \tag{5}$$

For k=0, α^0(s)=α(s) and λ(a)=λ(b)=0, we have v_i(a)= v_i(b)=0 . $1 \le i \le 3$ and $\alpha^k(a) = p,\ \ \alpha^k(b) = q.$ These results show that α^k is the curve segment from p to q.

Assume this collection $\alpha^k(s)$ =α(s, k) for all curves. The expression for the energy of the vector field T_k of α^k from p to q becomes $\mathcal{E}(T_k)$.

Now, let TC_k be the tangent bundle. So we have $T_k: C_k \to TC_k$, where $TC_k = \cup_{t\in I} T_{\alpha^k(t)}C_k$, $C_k = \alpha^k(I)$ and $T_{\alpha^k(t)}C_k$ denotes generated by T_k. Let $\pi: TC_k \to C_k$ be the bundle projection. By using equation (2) we calculate the energy of T_k as

$$\mathcal{E}(T_k) = \frac{1}{2}\int_a^b g_S(d\,T_k(T_k(\alpha(s,k)), dT_k(T_k\big(\alpha(s,k)\big))ds \tag{6}$$

where ds is the differential arc length. From (1) we have

$g_S(dT_k(T_k),\ dT_k(T_k))$= $< d\pi(\ dT_k(T_k)),\ d\pi(\ dT_k(T_k)) > + < K(dT_k(T_k)),\ K(dT_k(T_k) >$.

Since T_k is a section, we have $d(\pi) \circ d(T_k) = d(\pi \circ T_k) = d\big(id_{C_k}\big) = id_{TC_k}$. By Proposition 1.1, we also have that

$$K\big(dT_k(T_k)\big) = \nabla_{T_k}T_k = T_k' = \frac{\partial T_k}{\partial s},$$

giving

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$$g_S(dT_k(T_k),\ dT_k(T_k)) = \ < T_k,\ T_k > + < T'_k,\ T'_k >.$$

Using these results in (6) we get

$$\mathcal{E}(T_k) = \frac{1}{2}\ \int_a^b (< T_k, T_k > + \ < T'_k, T'_k >) ds \qquad (7)$$

Where $T_k = \frac{1}{w(s,k)}\frac{d\alpha}{\partial s}(\mathrm{s,\ k})$; $w(s,k) = \sqrt{< \frac{d\alpha}{\partial s}(\mathrm{s,k}), \frac{d\alpha}{\partial s}(\mathrm{s,k}) >}$, Suppose that $\mathcal{E}(T_k)$ is such a minimized energy for any "k" α(s, k) with α(s,0)=α(s). We calculate $\frac{\partial \mathcal{E}(T_k)}{\partial k}$ and evaluate at k=0. If $\mathcal{E}(T_k)$ is a minimizing energy, then k=0 should be a critical point of $\mathcal{E}(T_k)$. Supposing that $\frac{\partial \mathcal{E}(T_k)}{\partial k}|_{k=0} = \frac{\partial \mathcal{E}(T_0)}{\partial k} = 0$, from (7) we obtain:

$$\frac{\partial \mathcal{E}(T_k)}{\partial k} = \frac{\partial}{\partial k}\ [\ \frac{1}{2}\ \int_a^b (< T_k, T_k > + \ < T'_k, T'_k >) ds] = \ \frac{1}{2}\ \int_a^b \frac{\partial}{\partial k}\ \ [< T_k, T_k > + \ < \frac{\partial T_k}{\partial s}, \frac{\partial T_k}{\partial s} >] ds.$$

Since $< T_k, T_k > \ = 1$ we have $\frac{\partial}{\partial k}\ \ < T_k, T_k >= 0$ and we get

$$\frac{\partial \mathcal{E}(T_k)}{\partial k} = \ \frac{1}{2}\ \int_a^b \frac{\partial}{\partial k}\ \ < \frac{\partial T_k}{\partial s}, \frac{\partial T_k}{\partial s} > ds = \ \ \int_a^b (< \frac{\partial^2 T_k}{\partial s \partial k}, \frac{\partial T_k}{\partial s} > ds. \qquad (8)$$

We can write

$$\frac{\partial}{\partial s} < \frac{\partial T_k}{\partial k}, \frac{\partial T_k}{\partial s} > \ = < \frac{\partial^2 T_k}{\partial s \partial k}, \frac{\partial T_k}{\partial s} > \ \ + \ < \frac{\partial T_k}{\partial k}, \frac{\partial^2 T_k}{\partial s^2} >.$$

Thus, we can deduce,

$$< \frac{\partial^2 T_k}{\partial s \partial k}, \frac{\partial T_k}{\partial s} > \ = \ \ \frac{\partial}{\partial s} < \frac{\partial T_k}{\partial k}, \frac{\partial T_k}{\partial s} > - \ < \frac{\partial T_k}{\partial k}, \frac{\partial^2 T_k}{\partial s^2} >. \qquad (9)$$

Substituting (9) in (8), for, k=0,

$$\frac{\partial \mathcal{E}(T_0)}{\partial k} = \int_a^b [\frac{\partial}{\partial s} < \frac{\partial T_k}{\partial k}(s,0), \frac{\partial T_k}{\partial s}(s,0) > - \ < \frac{\partial T_k}{\partial k}(s,0), \quad \frac{\partial^2 T_k}{\partial s^2}(s,0) \ \ >] \mathrm{ds}$$

and

$$\frac{\partial \mathcal{E}(T_0)}{\partial k} = < \frac{\partial T_k}{\partial k}(s,0), \frac{\partial T_k}{\partial s}(s,0) > |_a^b \ - \int_a^b \ < \frac{\partial T_k}{\partial k}(s,0), \quad \frac{\partial^2 T_k}{\partial s^2}(s,0) \ \ > \mathrm{ds} \qquad (10)$$

From (4) and (5), we obtain,

$$\frac{\partial \alpha}{\partial k}(\mathrm{s,\ k}) = \lambda(\mathrm{s})\ \ T_k(\mathrm{s}) \qquad (11)$$

and

$$\frac{\partial \alpha}{\partial k}(\mathrm{s,\ 0}) = \ \alpha'(s) = \ T_k(\mathrm{s,\ 0}) \qquad (12)$$

Now we calculate the partial derivatives of (12) with respect to s and k; using Frenet formulas, we get

$$\frac{\partial T_k}{\partial s}(s,0) = \frac{\partial^2 \alpha}{\partial s^2}(s,0) = \alpha''(s) = T'(\mathrm{s}) = \kappa(s)N(s) \qquad (13)$$

and

$$\frac{\partial T_k}{\partial k}(s,k) = \ \ \frac{\partial^2 \alpha}{\partial s \partial k}(\mathrm{s,\ k}) = \ \frac{\partial^2 \alpha}{\partial k \partial s}(\mathrm{s,\ k}).$$

From (11), we have

$$\frac{\partial T_k}{\partial k}(s,k)|_{k=0} = \ \ \frac{\partial T}{\partial k}(s,0) = \lambda'(s)T(s) + \lambda(s)\kappa(s)N(s). \qquad (14)$$

It follows from (13) and (14) that

$$< \frac{\partial T_k}{\partial k}(s,0), \quad \frac{\partial T_k}{\partial s}(s,0) > \ = \lambda(s)\kappa^2(s).$$

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Considering the candidate function $\lambda(a) = \lambda(b) = 0$, we get:

$$< \frac{\partial T_k}{\partial k}(s,0), \quad \frac{\partial T_k}{\partial s}(s,0) > |_a^b = \lambda(b)\kappa^2(b) - \lambda(a)\kappa^2(a)=0 \qquad (15)$$

From (13), we get

$$\frac{\partial^2 T_k}{\partial s^2}(s,0) = -\kappa^2(s)T(s) + \kappa'(s)N(s) + \kappa(s)\tau(s)B(s) \qquad (16)$$

Therefore, (14) and (16) gives

$$< \frac{\partial T_k}{\partial k}(s,0), \frac{\partial^2 T_k}{\partial s^2}(s,0) > = -\lambda'(s)\kappa^2(s) + \lambda(s)\kappa(s)\kappa'(s) = [-\lambda(s)\kappa^2(s)]' + 3\lambda(s)\kappa(s)\kappa'(s). \quad (17)$$

Substituting (15) and (17) in (10), yields

$$\frac{\partial \mathcal{E}(T_k)}{\partial k}|_{k=0} = \frac{\partial \mathcal{E}(T_0)}{\partial k} = -\int_a^b ([-\lambda(s)\kappa^2(s)]' + 3\lambda(s)\kappa(s)\kappa'(s))ds=0$$

and

$$\frac{\partial \mathcal{E}(T_0)}{\partial k} = [-\lambda(s)\kappa^2(s)]|_a^b - 3\int_a^b \lambda(s)\kappa(s)\kappa'(s)ds=0$$

We are looking the candidate function $\lambda(a) = \lambda(b) = 0$, which given $[-\lambda(s)\kappa^2(s)]|_a^b = 0$ and

$$\frac{\partial \mathcal{E}(T_0)}{\partial k} = -3\int_a^b \lambda(s)\kappa(s)\kappa'(s)ds=0.$$

This completes the proof of the theorem. Any path that minimizes the energy function $\mathcal{E}(T_k)$ must satisfy equation (3). Note that the condition is necessary, but not sufficient; not every function that satisfies (3) will produce minimal energy. If α is geodesic then it will satisfy equation (3). The following is provided as an example. This
example will also demonstrate that the curvature of the curve is linear, given the aforementioned conditions.

Example. Let $\alpha: I \to R^3$, [0,1]⊂ I, α(0)= p, α(1) = q. If we can choose $\lambda: [0,1] \to R$, λ(s)=s(1-s), λ(0)=0, λ(1)=0 and $\lambda(s) \neq 0$ for all s∈(0, 1). Let the curvature function of α be $\kappa(s) = cs + d$ where c and d are real numbers. Using equation (3), we have

$$\frac{\partial \mathcal{E}(T_0)}{\partial k} = \int_0^1 \lambda(s)\kappa(s)\kappa'(s)ds = c(c + 2d) = 0.$$

If c=0 then κ constant, or c=-2d.

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MOBİL MÜŞTERİ İLİŞKİLERİ YÖNETİMİ

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Özet: Günümüzün müşteri odaklı pazarlarında müşteri ilişkilerini, müşteri ilişkileri yönetimi (MİY) (Customer Relationship Management - CRM) yardımıyla yönetmek işletmelerin başarısı için bir gereklilik olmuştur. MİY ile müşteri memnuniyeti, sadakati, karlılığı artırılırken, müşteri ile etkileşim iyileştirilir ve maliyetler düşürülebilir. MİY çerçevesinde kullanılan aracın müşteri ilişkileri yönetimi amaçlarının planlandığı şekilde gerçekleştirilmesinde önemli bir etkisi vardır. İnternet ve mobil cihazlar gibi dijital kanallar müşterilere her zaman, her yerde, kişisel olarak ve interaktif şekilde erişmek için güçlü kanallardır. Bu temel çalışmanın amacı mobil teknoloji ve mobil cihazların, müşteri ilişkileri yönetimi amaçlarını nasıl etkilediğini ikincil kaynaklara dayanarak incelemektir. Yapılan inceleme göstermiştir ki mobil MİY sağladığı faydalar ile MİY amaçlarını pozitif yönde etkileyebilmektedir. Örneğin, mobil MİY ile mümkün olan interaktif ve kişiselleştirilmiş müşteri ilişkileri, işletmelerin mevcut müşterilerini ellerinde tutmalarına ve müşteri sadakatini artırılmasına katkı sağlayabilir.

Anahtar Kelimeler: Mobil müşteri ilişkileri yönetimi (MİY), müşteri ilişkileri yönetiminin amaçları, mobil müşteri ilişkileri yönetiminin faydaları.

Abstract: In today's customer oriented markets, managing customer relations through the use of CRM (Customer Relationship Management) is a necessity for companies' success. Through CRM customer satisfaction, retention, loyalty, profitability are increased, customer interaction is improved and costs can be decreased. Obviously, the media used in CRM have an impact on the effectiveness of CRM objectives. Digital channels such as the Internet and mobile handheld devices are powerful channels to reach customers anytime, anywhere, personally and interactively. The aim of this basic research is to illustrate how the mobile technology and devices can affect the objectives of CRM based on the secondary sources. The results of the study indicate that mobile CRM brings along some benefits for companies that affect the CRM objectives positively. For example, interactive and personalized relationships with customers enabled by mobile CRM are of great importance for companies to retain customers and thereby to increase loyalty.

Keywords: Mobil customer relationship management, benefits of mobile customer relationship management, objectives of customer relationship management.

Giriş

Mobil teknolojilerdeki gelişmeler ve tüketiciler arasında mobil cihazların kullanımının yaygınlaşmasısı ile aktivitelerini desteklemek amaçlı mobil teknolojilerden ve cihazlardan faydalanan işletme sayısında bir artış söz konusu olmuştur. Mobil iş, günümüzde işletme literatüründe sıkça kullanılan bir kavram olmuştur. İşletmelerde mobil teknoloji ve cihazlarının kullanıldığı bir alan da müşteri ilişkileri yönetimidir. Mobil MİY yeni bir kavram olmamasına ve ilgili literatürde farklı çalışmalarda ele alınıp incelenmiş olmasına rağmen, mevcut çalışmaların büyük çoğunluğu mobil MİY'in tanımı, uygulaması ve benimsenip kullanılması ile ilgilidir (örn. (Sinisalo vd., 2005), (Sinisalo vd., 2007), (Grandhi & Chugh, 2012), (Mobile Marketing Association, t.y.), (Belachew vd., 2007)). İlgili literatürde mobil MİY'in faydaları ve bu faydaların MİY amaçları üzerindeki etkileri yeterince incelenmemiştir. Mevcut çalışma bu açığı kapamayı amaçlar. Bu bağlamda, öncelikle MİY tanımlanır ve daha önce yürütülmüş çalışmalar temelinde MİY'in amaçları tanıtılır. Takiben mobil MİY uygulamasının faydaları ele alınır. Daha sonra MİY amaçlarını gerçekleştirmede mobil araçların rolü açıklanır. Çalışma temel bulgular, çalışmanın sınırı ve olası araştırma alanlarının tanımlanması ile sonlandırılır.

Müşteri İlişkileri Yönetimi ve Amaçları

Deans (2004) MİY'i, işletmelerin müşterileriyle uzun dönemli ilişki kurmaları ve bu ilişkiyi yönetmeleri ile ilgili strateji olarak tanımlar. "*MİY müşteriyle yakın ilişkiyi öneren bir felsefe olarak ta belirtilebilmektedir. Bu felsefenin ana noktasını işletme tabanında bulunan mevcut ve potansiyel müşterilerin ihtiyaçlarını anlama ve sezebilme stratejisi oluşturmaktadır*" (Tiwana, 2001, s. 56). MİY, müşterileriyle ilişkilerini iyileştirmek yoluyla işletmelerin rekabetsel bir avantaj kazanmaları ve değer yaratmaları için işletmelere yardımcı olur (Toor, 2009). Bu

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açıklamadan da anlaşılacağı üzere MİY'in temel amacı uzun vadeli müşteri ilişkisi için müşteri ilişkilerini iyileştirmektir. Bu amaç aşağıdaki gibi alt amaçlara ayrılabilir:

- Müşteri memnuniyetini artırmak (Kim vd., 2003), (Burnett, 2001), (Xu vd., 2002),
- elde tutulan müşteri sayısını artırmak (Kim vd., 2003), (Dyche, 2001), (Swift, 2001), (Wilson vd., 2002),
- müşteri sadakatini artırmak (Xu vd., 2002), (Wilson vd., 2002), (Peppers vd., 1999),
- daha yüksek müşteri karlılığı (Burnett, 2001), (Dyche, 2001), (Wilson vd., 2002),
- iyileştirilmiş müşteri etkileşimi (Kim vd., 2003), (Peppers vd., 1999),
- azalan maliyetler (örn. pazarlama faaliyetleri ve satışlar ile ilgili azalan idari masraflar) (Ryals & Knox, 2001).

Bilişim teknolojilerindeki gelişmeler, müşteri ilişkileri yönetimi süreçlerinin İnternet ile entegre edilmesini ve basitleştirilmesini mümkün kılmıştır (Chang vd., 2005). Böylece elektronik MİY ortaya çıkmıştır. Mobil teknolojilerdeki gelişim ve mobil cihazların (örn. akıllı telefonlar, PDA'lar [Personal Digital Assistant]) yaygınlaşması mobil cihazların da MİY aktivitelerini (örn. satış yönetimi, pazarlama, satış sonrası hizmetler) desteklemek üzere kullanımına ve mobil MİY'in doğmasına yol açmıştır. Mobil MİY, bir işletme ile bu işletmenin müşterileri arasındaki müşteri ilişkilerinin kurulması ve yönetilmesi amacı için mobil cihazlar ile yürütülen satış, pazarlama ve müşteri hizmetleri aktiviteleri ile ilgili olan tek taraflı ya da interaktif iletişim olarak tanımlanır (Sinisalo vd., 2007). Mobil pazarlama, mobil satış otomasyonu ve mobil müşteri hizmetleri tipik mobil MİY aktiviteleridir (Schierholz vd., 2007).

Mobil cihazlar, MİY kapsamında kullanılan diğer kanalların (e-posta, televizyon, İnternet vb.) yapabildiklerini yapmalarının yanı sıra mobil olmalarına has özellikleri sonucu (Sinisalo vd., 2007), işletmelere aşağıdaki imkanları da sunabilmektedirler:

- İletişimin kişiselleştirilmesi: Müşteriler ile iletişim için mobil cihaz kullanımıyla sadık müşterilere bireysel bazda kişiselleştirilmiş hizmet sunmak mümkündür. Bu, işletme ile sadık müşterileri arasındaki duygusal bağı kuvvetlendirmek bakımından önemlidir (Sinisalo vd., 2007).
- İnteraktiflik: Mobil cihazları klasik araçlardan ayıran en önemli özellik, bu cihazların interaktif iletişime imkan vermesidir. Mobil cihazlar, işletmeler ve müşterileri arasında gerçek zamanda, iki yönlü iletişimi mümkün kılarlar (Belachew vd., 2007).
- İletişimde esneklik: Mobil cihazlar, özellikle kullanıcıların daima yanlarında taşıdıkları mobil telefonlar, müşterilere her yerde ve her zaman erişim imkanı sağlarlar (Sinisalo vd., 2007).

Mobil Müşteri İlişkileri Yönetiminin Müşteri İlişkileri Yönetimi Amaçları üzerindeki Etkileri

Yukarıda izah edilmiş olan mobil MİY özellikleri yine yukarıda açıklanmış olan MİY amaçlarının gerçekleşmesine katkı sağlayan bazı faydaları beraberinde getirir. Mobil MİY'in bahsedilen özelliklerine göre sağlayabileceği faydalar üç grupta toplanabilir:

İletişimin kişiselleştirilmesiyle elde edilebilecek faydalar: Bir işletme ile iletişime geçmeyi onaylayan müşteri, MİY veri tabanlarında kullanılmak üzere verilerini işletme ile paylaşır (Mobile Marketing Association, t.y.). Böylece müşterilerin satın alma davranışları ve tercihleri ile ilgili güvenilir veri elde edilebilir. Müşteri veri tabanı temelinde müşteri davranışının ve ihtiyaçlarının zaman içinde değişimini analiz ederek kişiselleştirme ve özelleştirme yapmak, uzun dönemli müşteri sadakati ve karlılığı oluşturmak ve korumak adına önemlidir (Amofah & Ijaz, 2005)

Kişiselleştirme ile sağlanan müşteriye özel muamale müşteri memnuniyetini artırır, müşterinin elde tutulması imkanını sağlar, dolayısıyla müşteri sadakatini pozitif yönde etkiler (Peppers vd., 1999). Artan müşteri memnuniyeti ve sadakati daha fazla satışı beraberinde getirebilir ki bu müşteri karlılığının artmasını da pozitif şekilde etkiler. Kişiselleştirme sayesinde artan müşteri memnuniyeti ve sadakati mevcut müşterileri elde tutmak ve yeni müşteri kazanmak için oluşacak maliyetleri düşürebilir (Grandhi & Chugh, 2012), (Amofah & Ijaz, 2005).

Mobil MİY ihtiyaç duyulan noktada içerik ve hizmet temin eder (Belachew vd., 2007) ve doğru mesaj ile doğru yerde doğru zamanda doğru kişilere ulaşmaya önemli katkı sağlar (Mobile Marketing Association, t.y.).

İnteraktiflik sonucu elde edilebilecek faydalar: Mobil MİY, sağladığı interaktivite ile müşteri etkilişiminin iyileştirilmesine doğrudan bir katkı sağlar. İnteraktif bir şekilde ilişkide bulunduğu işletme ile iletişim kurabilmek müşterinin memnuniyetini artıran, işletmelerin mevcut müşterileri elde tutma ya da yeni müşteriler kazanma

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çabalarına ve tüm bunlar dolayısıyla müşteri karlılığının artmasına da dolaylı olarak olumlu yönde katkı sağlayan bir husustur.

İletişimdeki esneklik sonucu elde edilebilecek faydalar: Mobil MİY, müşterilerin işletmelere kendileri ile ilgili bilgileri vermelerini, bunun karşılığı olarak işletmelerden ürünleri/hizmetleri ile ilgili ihtiyaç duydukları bilgileri her yerde ve her zaman alabilmelerini sağlar. Bahsedilen değer değişimi yoluyla kazanılan bilgi, müşteri ilişkileri yönetimi veri tabanına pozitif yönde katkı sağlarken pazarlama ve reklam faaliyetleri için güvenilir veri teminine imkan tanır (Mobile Marketing Association, t.y.).

Özetle, mobil cihazlar müşterilerle spontane, interaktif, doğrudan ve hedefli bir etkileşimi her yerde ve her zaman mümkün kılarlar (Zeng vd., 2003). Bu, mobil cihazları mevcut diğer kanalları (örn. e-posta) tamamlayan değerli bir müşteri ilişkileri yönetimi kanalı yapar.

Mobil MİY'i farklılaştıran özellikleri sonucu ortaya çıkan faydaların yanı sıra mobil MİY'in müşteri ilişkileri yönetimi amaçlarını etkileyen genel bazı başka faydaları da vardır.

Diğer faydalar: Yeni müşteri kazanmaya kıyasla mevcut müşterileri elde tutmak için oluşacak maliyetler genelde daha az olduğundan ve mobil MİY sadık müşteriler kazanmaya katkı sağladığından mobil MİY yeni müşteri kazanma kaynaklı oluşacak maliyetleri düşürmeye etki edebilir (Swift, 2001). Mobil MİY işletmelerin rakipleri karşısında kendilerini farklılaştırmalarını ve böylece rekabetsel bir avantaj elde etmelerine de katkı sağlar (Hoffman & Kashmeri, 2000), (Toor, 2009).

Sonuç

Bu çalışma mobil MİY'in faydaları ve söz konusu faydaların MİY'in amaçlarını nasıl etkilediğini araştırmıştır. MİY aktivitelerini desteklemek amaçlı mobil araçların kullanımı, işletmelerin müşterileri ile etkin şekilde etkileşimi için önemli bir kanal oluşturur. Mobil MİY, işletmeler için sundukları daha iyi müşteri servisi ile müşteri memnuniyetini, elde tutulan müşteri sayısını, müşteri sadakatini, müşteri karlılığını artırmayı ve MİY aktiviteleri ile ilgili maliyetleri azaltmayı mümkün kılar. Ancak mobil cihazların işletmelere bu avantajları tek başlarına değil, klasik kanallar ile etkin bir şekilde entegre edilmeleri sonrası sağlayabileceği unutulmamalıdır (Sinisalo vd., 2007).

Bu çalışma, MİY amaçlarının gerçekleştirilmesi için mobil MİY'in rolü hakkında genel bir bakış verir. Bu teorik çalışmadaki tespitler, gelecekte yürütülecek araştırmalarda somutlaştırılarak test edilebilir.

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MODEL OF ARCHITECTURAL LANDSCAPE CONFORMS TO ENVIRONMENT FOR AIR TEMPERATURE REDUCTION OF BUILDING ENVELOPE IN THAILAND

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Thailand is located in humid tropical climate and near the equator. Thus the average air temperature is high throughout the year. Environmental factors in the sun, wind and humidity affect residential buildings especially, heat from the sun is a main factor which leads to be a problem on heat inside the buildings (Prawewan Amornpong, 2001). Therefore, Installation air conditioning inside the buildings is the solution for this problem. By the way, from the study on the properties of plants it was found that plants have effective on blocking the sun's rays as well as they effectively maintain the air temperature in the area (Soontorn Boonyathikarn, 1999). So, planting trees to prevent the sun light, being as shades to reduce sun heat to the buildings should be an approach which could be adopted to decrease the use of air conditioning and also energy consumption in the buildings (Trungjai Buranasompob, 2000). This research was aimed (1) to study and create design guidelines on landscape model which conforms to the environment of sunlight and wind in the central region of Thailand and (2) to propose the guidelines on architectural landscape design and plants' setting around the buildings in 8 directions; North (N), Northeast (NE), East (E), Southeast (SE), South (S), Southwest (SW), West (W) and Northwest (NW). The results were found that the landscape model included the setting on plants is being as shades of all side of building envelope during 08.00-17.00 PM of the day throughout the year. These can reduce the air temperature of the building envelope as well as the average temperature inside the buildings decreased 3.95°C or 13.478% compared with the average exterior air temperature of the buildings throughout the year.

Keywords: Architecture, Environment, Landscape, Plants

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MODELLING APPROACHES OF PERFORMANCE EVALUATION OF HIGH QoS OF KERBEROS SERVER WITH DYNAMICALLY RENEWING KEYS UNDER PSEUDO CONDITIONS

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Abstract: In literature, some existing studies suggested different proposed approaches that interrupt temporary link/server access. Also, in order to find implications in terms of performance degradation, analytical models are used, as well as failures of the servers. Unlike previous studies, the failures of the servers are considered together with link/server interruptions for renewals. In this study, the authors mainly focused to develop a new framework for the existing authentication protocols by considering them in an unusual fashion. The performance degradations that may be caused by service interruptions are discussed with a new framework to model the interactions between the network and the authentication servers.

Keywords: Kerberos variance, Quality of Service, Performability modelling, Queueing analysis

Introduction

Last three decades use of networked computer system has been increased and become popular. Communication and distribution of large, confidential and classified information are also available electronically, which requires challenge to protect system, data as well as resources. The configuration of the system plays an important role in privacy and data integrity that affects the performance of the underlying networks. The system considered should have the ability to perform sufficient and legitimate access to resources, while considering the applied security resources.

Network authentication is one of the vital methods for network and information security communications. Kerberos which is based on Needham-Schroder Authentication Protocol (Needham1978) commonly used for this purpose. As stated in literature, Kerberos architecture is divided into two core elements Key Distribution Centre (KDC) and Ticket Granting Service (TGS) (Brennen2004). The KDC stores authentication information and uses it to securely authenticate users and services while TGS holds digital tickets to identify the network clients and servers. If an attacker can gain administrative access to the KDC, he would have access to the complete resources of the Kerberos realm. A masquerading TGS (any client) can impersonate the TGS of the network (Kirsal2007b). In addition, Kerberos exhibits some other vulnerabilities widely reported in the literature (Brennen2004).

The design of the proposed protocol, combines the properties of Kerberos and Key-Exchange protocols together, which was considered in developing a specific authentication protocol as part of a previously proposed framework (Kirsal2007a). This combined approach had been proposed to shut down external access to an enterprise network for a period of time to enable the distribution of randomly generated keys (Kirsal2007b), (Schneider1998). In research (Kirsal2007b), while authentication protocol was designed, intruder is modelled as well. While the protocol was modelled, renewing keys at various intervals was considered, in order to block potential intruders. Although the intruder had been given the power to attack, the protocol was successful in preventing replay attacks (Kirsal2007b), (Kirsal2008). Security protocols in distributed systems are time-sensitive. That is to say if time of decrypting messages are increased, intruders could be blocked and prevented. In (Kirsal2008), a new protocol is proposed based on the use of timestamps to delay decryption by potential intruders. Considering the key distribution, external network access is restricted for short time intervals (Kirsal2007b), and (Kirsal2008). This

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affects the performance of the network. For this purpose, an analytical model has been developed to evaluate the performability of the proposed approach (Kirsal2007b). While key distribution times depend on network characteristics such as size, and speed, the intervals between key renewals can be determined by the mean values of decryption times.

Related Works

In this section, frequent key renewal protocol, challenges of quality of service, and performability modelling for security protocols will be explain in detail.

Frequent Key Renewal Protocol

As stated in (Kirsal-Ever2013) the proposed protocol is based on frequent key renewal under pseudo conditions. the proposed approach was shutting-down external access to an enterprise network for a period of 140 seconds, to enable the distribution of randomly generated keys to users in a relatively secure way. Details are given in (Kirsal-Ever2013).

Quality of Service Challenges

Quality of Service (QoS) refers to the ability of a network to provide better, more predictable service. It is referred as selected network traffic over various underlying technologies, specifically wireless and mobile networks (Lowe1996), (Saravanan2006), (Song2005). Last two decades wireless and mobile networks have gained widespread popularity mainly because of their low cost and relatively high data rates. In this circumstances, issues with QoS becomes extremely important. In recent years, within the use of a wireless communication system, seamless time sensitive movement of audio and video are demanded by enterprises and users. However, interruptions may be caused because of implemented security mechanisms, which can cause degradation of performance for the traffic.

In addition, as stated in (Hua2004), interruptions in wireless and mobile systems cause the packet loss, latency, congestion and jitter, which are important QoS challenges. Latency is the time delay occurred in speech by the end-to-end user communication system. The lower the latency, the better the QoS (Balsamo2003), (Baghaei2004). In order to increase QoS in terms of packet losses, less interruptions, dedicated bandwidth and controlled jitter should be improved. Researches on good QoS showed that greater levels of interruption introduce more delay and require lower network latency (Lowe1996), (Hua2004).

The major constraint is end-to-end interruption. It requires the delay to be reduced through a packet network. To support traffic reliably and enhance the QoS in WLAN, a network must therefore be able to provide packet forwarding latency, jitter, guaranteed network bandwidth and capacity for communication during periods of network congestion (Kirsal-Ever2013).

Necessity of Modelling Security Protocols for Performability Modelling

Implemented security mechanisms in wireless communication systems are one of the main reason of service interruptions (Ever2009). The wireless variants of existing protocols may prefer to shut the communication while the critical key exchange processes are taking place. That would introduce significant delays, and increased number of request awaiting for authentication.

System or server interruptions depend on the system's nature and can have different impacts on the system performance. The system may not support the ongoing process or the packet efficiently due to the interruptions hence performance may degrade. In order to overcome this problem, availability and performance of the system should be considered together (Jiang2005). In (Trivedi1994) a unified performability and reliability analysis by using Markov Reward model (MRM) is presented. In (Kirsal-Ever2013) existing performability evaluation methods are considered for evaluation of security mechanisms from a performance point of view. A new framework has also been discussed for modelling the interactions between the network and the authentication servers.

Framework

The arrivals of jobs are assumed to be independent and follow Poisson distribution with rate λ. The service times of jobs are distributed exponentially with mean $1/\mu$. The Kerberos server considered can serve jobs only during its

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operative periods, which means that the key distribution is being taken place (the system is not shut) and the server is active during this process. The Kerberos server may suffer from failures and inter failure times are distributed exponentially with mean 1/ξ. At the end of this period, the server breaks down and requires an exponentially distributed repair time with mean 1/η. The distribution of time intervals between shutdowns are assumed to be exponentially distributed with given mean value 1/δ. When the system is shut, the server does not provide service to incoming request for an exponentially key distribution time which is given by 1/φ. This system can be modelled as follows:

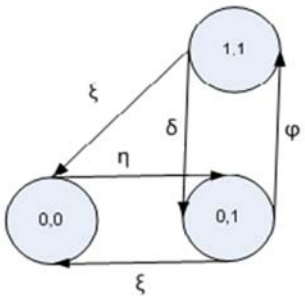

Figure 1. State diagram for availability of standalone Kerberos authentication server

The state (0, 0) denotes the event that the system is shut and the server is broken. In the state (0, 1) the server is not broken and the system is shut. Finally, the state (1, 1) represents the state where the server becomes operative since the system is not shut and the server is active. In case the server is broken in this stage, there is a direct transition from state (1, 1) to the state (0, 0). Therefore, it is assumed that the system is shut and key distribution does not take place while the server is nonfunctional.

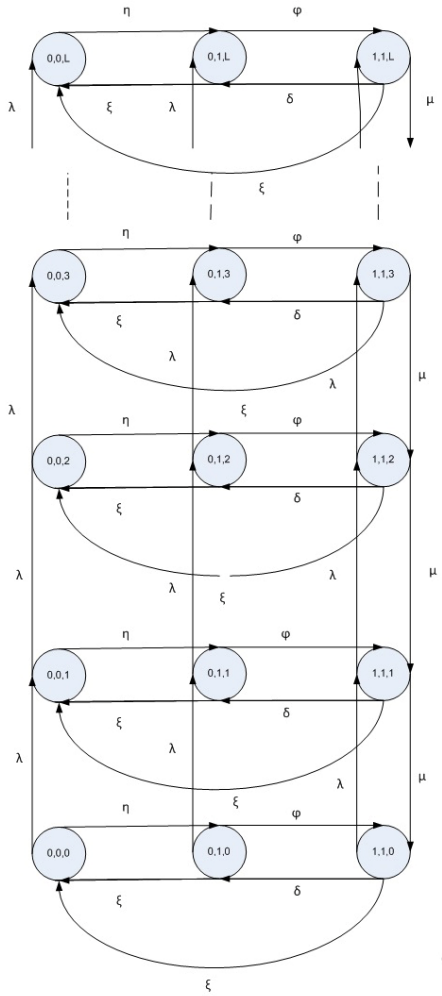

Figure 2. The state transition diagram for the performance and availability model of the system

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The system state can be represented by (i, j, k) where i is the system status, j is the number of active server and k is the number of jobs in the system. Please note that i and j can be maximum 1 since there is only one server considered for the proposed model. Therefore, in Figure 2, as long as jobs keep on arriving to the system, the system state changes one state upward until it reaches maximum number of jobs (L) in the system. The upward transition further than the state (i, j, k) is not possible since the jobs are blocked because of the limitation of L, where $k \leq L$. There is forward lateral transition from state (i, j, k) to the state (i, j+1, k) when the server is repaired. Once the system generates key, there is also forward transition from the state (i, j, k) to the state (i+1, j, k). There are two possible backward lateral transition from the state (i+1, j+1, k) to the state (i+1,j,k) and (i, j, k), when the system is shut and the server is broken respectively. Another backward lateral transition can be possible from the sate (i, j+1, k) to the state (i, j, k) in case the server is broken. Finally, when the server is operative, one job is served with a downward transition from the state (i+1, j+1, k+1) to (i+1, j+1, k).

The two dimensional process considered in (Kirsal-Ever2013) can be used for the Spectral Expansion solution method with the matrices A, B and also C as given below. Please note that the matrix A represents the lateral, the matrix B upward and also the matrix C downward transitions.

$$A = A_j = \begin{bmatrix} 0 & \eta & 0 \\ \xi & 0 & \varphi \\ \xi & \delta & 0 \end{bmatrix} \qquad B = B_j = \begin{bmatrix} \lambda & 0 & 0 \\ 0 & \lambda & 0 \\ 0 & 0 & \lambda \end{bmatrix} \qquad C_0 = (0),\ C = C_j = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & \mu \end{bmatrix}$$

Conclusions and Future Work

This paper is concerned with a modelling approach for performability evaluation of Kerberos servers which dynamically renew keys under pseudo-secure conditions as well as security variants over Kerberos authentication protocol as an example to service interruptions in wireless communication systems. As stated earlier, during key distribution, external access to the network is not allowed. The access restrictions happen for short intervals (Kirsal2007), (Kirsal2008). However, any link shut-down costs the network in terms of performance degradation. Therefore, it is essential to evaluate the impact of the proposed approach on system performance. The proposed approach in (Ever2009) also involves temporary interruption to link/server access where it has implications in terms of QoS degradation. Discussions on performance and availability evaluation of some security measures are provided.

Hence in order to enhanced QoS, the existing performance and availability modelling techniques used in the literature can be adapted to modelling of various security protocols considering the server behaviour as well as the characteristics of the networks. In order to evaluate the cost in terms of the degradation of system performance, an analytical method is used. Unlike the previous studies, the server failures are considered as well. Therefore, the approach presented in this study provides more realistic performability measures.

The model developed is highly flexible and it can be used for systems with various failure, repair, and renewal times and times between interruptions. The method can be extended for multiple Kerberos servers and for systems with backup servers especially for the KDC.

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MODELLING HYDRAULIC CONDUCTIVITY OF SOIL MIXTURES

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Abstract: Hydraulic conductivity is one of the most important properties to be determined for both saturated and unsaturated soils when studying with binary mixtures for use of impervious layer demands. However, determining hydraulic conductivity in laboratory may take much time. Thus, predicting the hydraulic conductivity is a very trending topic for especially timesaving purposes. This study is focused on understanding the hydraulic conductivity behavior of binary mixtures more than prediction. Numerical analysis was run on a flow program based on finite elements method for non-porous and porous grains embedded in a less pervious fine soil. The variety was depended on different mixture ratios for soils and different geometric combinations of grains which were located in the fine soil. The results were compared according to different mixture ratios and different geometric combinations. Finally, it's concluded that if the grains embedded in a less pervious soil were porous, then, the hydraulic conductivity of the mixture was affected due to the contact position of the porous grains. When the porous grains were located as if they were in contact to each other, the hydraulic conductivity of the mixture converged to that of the porous grains showing the lack of less pervious soil that it could not govern the hydraulic conductivity behavior.

Keywords: Hydraulic conductivity, soil mixtures, finite elements, porous grains

Introduction

In this study, it is aimed to make an assessment of ranges of the saturated hydraulic conductivity values of different types of bentonitic mixtures using finite element method (FEM). The hydraulic conductivity of a barrier material is determined from laboratory tests before application. However, these tests are time consuming which may last from several months to years, depending on the value of hydraulic conductivity. Thus, in addition to laboratory investigations, the hydraulic conductivity needs to be modeled as well. The modeling can help rapid assessment of the most suitable barrier material before laboratory tests, prediction of the long term hydraulic conductivity behavior of the selected material and determination of the parametric sensitivity of hydraulic conductivity.

There are limited modeling studies investigating the hydraulic conductivity of binary mixtures in the literature. Most of these studies are related to the modeling of the hydraulic conductivity of sand bentonite mixtures (SBMs) and some rare laboratory studies were done on zeolite bentonite mixtures (ZBMs). However, it is believed that hydraulic conductivity of bentonitic mixtures, including both non-porous and porous granules, such as SBMs and ZBMs, has not been modeled so far. The hydraulic conductivity of compacted clays is generally predicted by statistical models. There are numerous studies that estimate the hydraulic conductivity from correlation analysis which use basic soil index parameters (i.e. consistency limits, activity, clay content) as the independent variables (Benson et al., 1994; Benson&Trast, 1995). In contrast, modeling the hydraulic conductivity of SBMs is rather complex. This is because the amount of bentonite is relatively less than the amount of sand in the SBMs. Therefore, the hydraulic conductivity may be high or low depending on the bentonite content. In the case of low bentonite content, the hydrated bentonite particles are not evenly distributed within the pores, resulting preferential flow path along the inter-granular pores. On the other hand, bentonite starts to govern the hydraulic conductivity when bentonite content (BC) is high enough in the mixture. In this case, the inter-granular pores are blocked by bentonite particles and sand grains are started to dislocate from each other. Hence, the flow occurs between small pores of bentonite particles. Based on above explanation, it is clear that the pore network of the mixture is strongly dependent on bentonite property which directly influences the porosity and void ratio of SBMs. Thus, most of the studies reported in the literature consider these two parameters while modeling the hydraulic conductivity of SBMs (Chapuis, 1990; Kenney et al., 1992; Mollins et al., 1996; Sivapullaiah et al., 2000).

Chapuis (1990) reports hydraulic conductivity test results for 45 SBMs, having various BCs. The obtained hydraulic conductivity is poorly correlated to porosity alone. However, his predictive model suggests a good

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relationship between hydraulic conductivity and "efficient porosity" of the mixture, where pore space is available for fast-moving water between bentonite particles. Kenney et al. (1992) investigated hydraulic conductivity characteristics of SBMs in terms of void ratio. In their model, it is assumed that all water is associated with bentonite particles; sand is dry and act as impervious matrix in the mixture; and the fabric of bentonite is unaffected from sand grains. They stated that the hydraulic conductivity of SBMs is a function of bentonite void ratio and thus, bentonite hydraulic conductivity. Sivapullaiah et al. (2000) performed hydraulic conductivity tests on bentonite and SBMs. They applied regression analysis to the obtained results. Based on regression analysis, high correlation was obtained when the hydraulic conductivity is predicted from void ratio and liquid limit of the mixture. Abichou et al. (2004) suggested three pore network models; namely grain coating model (GCM), tube blocking model (TBM) and junction blocking model (JBM), to interpret the laboratory hydraulic conductivity results of SBMs. In the case of GCM, the pore tube diameters decrease as the thickness of the bentonite coating on the sand grains increases, resulting decrease in the hydraulic conductivity. They report similar trends for TBM and JBM. However, Abichou et al. states that the favorable comparisons with respect to hydraulic conductivity are obtained with GCM and JBM.

The laboratory test results presented in the literature revealed that ZBMs have higher hydraulic conductivity values than SBMs. This finding may be tied to a possible reason that is the water movement through zeolite grains and this behavior is the content of this study. The hydraulic conductivity behavior is modeled with Plaxflow Version 1.5, a modeling software using FEM, and the results are compared with the laboratory hydraulic conductivity test results. For comparison purposes with the test results, two different mixtures are modeled which represent SBMs and ZBMs. Sand grains are represented as impervious grains with zero hydraulic conductivity. In contrast, zeolite grains are represented with pervious particles. A range of hydraulic conductivity values are selected to study how the pervious grains affect the hydraulic conductivity of the mixture. The grain shape effect on hydraulic conductivity of binary mixtures was also investigated. Afterwards, the specific hydraulic conductivity value obtained from laboratory tests is selected to represent the zeolite grains in this modeling study. Finally, comparison of the laboratory and modeling results for SBMs and ZBMs are made and presented.

Materials and Methods

The binary soil mixture has two components: the coarse grains and the fine particles. Coarse grains indicate either non-porous granule such as sand or porous granule such as zeolite, whereas fine particles denote only clays, especially bentonites. Coarse grains (C) and fine-matrix (F) mixture (M) will be denoted by CFM corresponding to the universal representation of SBM (sand-bentonite mixture) and ZBM (zeolite-bentonite mixture). Plaxflow Version 1.5 was used while computing the modeled binary mixtures. To begin with Plaxflow, the model geometry should be defined first and then binary mixture components should be symbolized. Since permeameters used in hydraulic conductivity tests, have nearly 1:1 dimension on account of 10.16 cm diameter and 11.64 cm height, the aspect ratio (i.e. the length of vertical axis to the horizontal axis) of the model was set unity to get a symmetric geometry.

The mixture percentage in binary mixtures is generally interpreted in terms of weight ratio. However, in Plaxflow, the mixture percentage can only be defined in terms of area ratio. Therefore, the area ratio, expressed as the ratio of fine-matrix area to the total sample area, is converted to the weight ratio by multiplying the unit width and the respective unit weights of materials. The value given by CFM indicates the fine matrix percentage in mixture. For example, 20% CFM means that 20% of the mixture by weight is fine matrix.

The analyses were run for two different configurations of coarse grains. In the first configuration, "grains which are not in contact" case was considered and analyzed. This represents the case where coarse grains are dislocated from each other, because of high fine-matrix content (FC). For this purpose, all coarse grains were surrounded by fine matrix in the model. In the next configuration, the case of "grains which are in contact" was held and analyzed. This case considers the condition of low FC in the mixture. Note that the inter-granular void spaces are filled with fine matrix and there are no air spaces between the grains.

The Plaxflow analysis was initially run for the case of "grains which are not in contact" model. In order to investigate the influence of the grain shape in a binary mixture, regular (triangle, square etc.) and/or irregular (representing original soil granules) shapes were drawn inside the model geometry, simulating the coarse grains embedded in fine matrix in a binary mixture (Figure 1). As was mentioned, the grains can also be in contact with each other. For this case, the contacted grains formed a network along the cross section. Since contacted grains have higher hydraulic conductivity than that of fine-matrix then, the preferential flow paths occur through the granule network. In this case, the flow path through granules can either be single (Figure 1.a) or multiple (Figure 1.b) as shown with arrows in Figure 1. The upper limit of this network configuration can be modeled with a tube

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of coarse grain embedded in less conductive fine matrix at various FCs (Figure 2). Note that thin (Figure 2.a) and thick (Figure 2.b) tubes were drawn at the minimum and maximum allowable limits of grid spacing that was defined by user before, respectively. The analyses were run for different FCs by changing the tube width. This will lead the upper boundary for the hydraulic conductivity of binary mixtures.

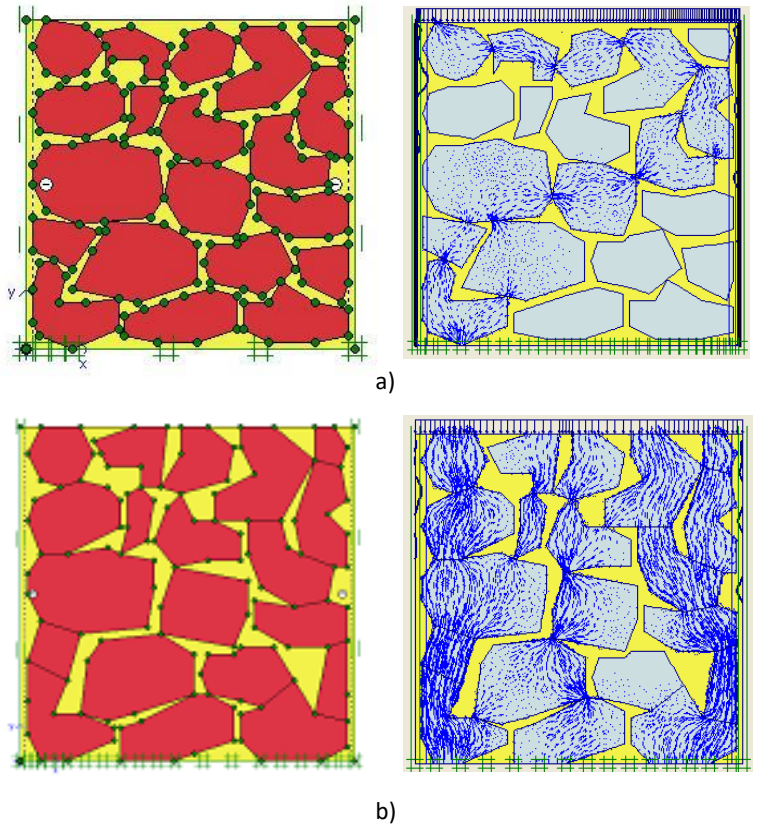

Figure 1. Two examples for the case of "grains which are in contact": visualization of a) single flow path and b) multiple flow paths, in analysis

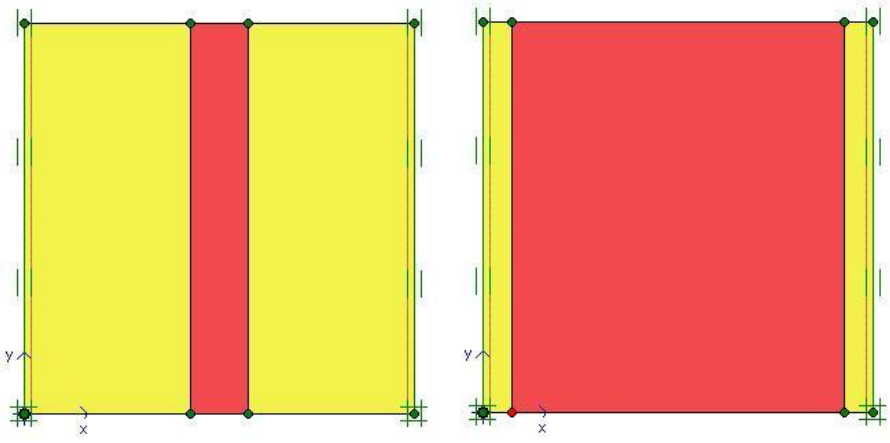

Figure 2. Representation of connected coarse grains with: a) Thin (high fine content) and b) thick (low fine content) tubes. Note that dark and light regions in the models represent coarse grains and fine matrix, respectively

When the binary mixture has low FCs (i.e. lower than 8%), it is probable that voids may occur due to the insufficient swelling of bentonite. These voids would result in preferential flow paths which would cause higher hydraulic conductivities. In order to simulate this condition, a very thin column was defined as a preferential flow path in the model (Figure 3) and the mixtures were run in Plaxflow. The model presented in Figure 3 had a

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bentonite content (BC) and flow path percentages of 6.5% and 3.5%, respectively. Coarse grain percentage of the model was 90%.

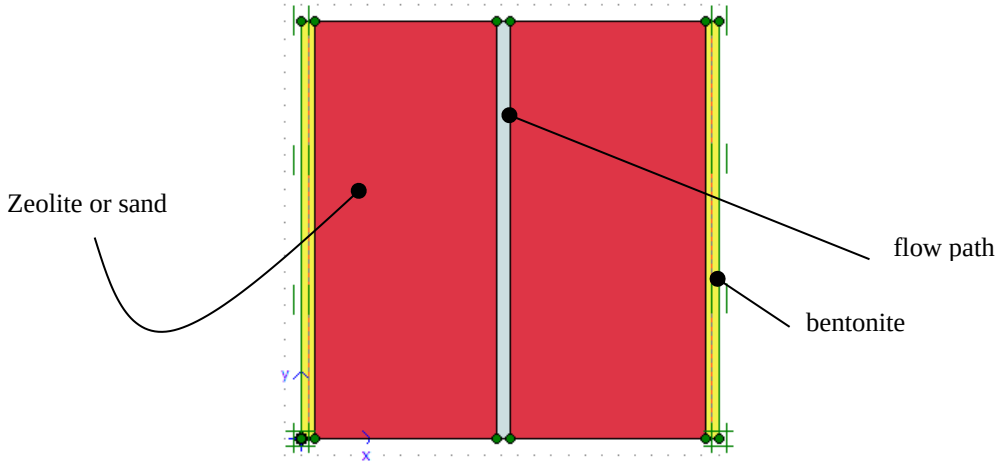

Figure 3. Representation of binary mixture with a preferential flow path

The hydraulic conductivity of the zeolite blocks was found to be 1.31 × 10^{-9} m/s in average (Durukan et al., 2013). Similarly Ören (2011) performed hydraulic conductivity tests on zeolite blocks, having various thicknesses. He showed an increasing trend with decreasing thickness of zeolite block and reports 10^{-9} m/s hydraulic conductivity for the specimen having 1 cm thickness. Therefore, the saturated hydraulic conductivity of porous granules was attained 1 ×10^{-9} m/s when analysis was conducted on ZBMs simulating porous grains-bentonite mixtures. The saturated hydraulic conductivity of fine-matrix is selected as 2 ×10^{-11} m/s, which is typical hydraulic conductivity of Na-bentonite (Chapuis, 1990; Kenney et al., 1992; Sivapullaiah et al., 2000). In a hydraulic conductivity test, the preferential flow rate is limited by the hydraulic conductivity of porous stones and/or geotextiles used at the up and bottom of the test specimen. In this study, geotextiles were considered. The hydraulic conductivity of geotextiles is reported to be in a range of 2x10^{-3} and 10^{-5} m/s. Thus, it is reasonable to use the average of these reported results (10^{-4} m/s) to represent the preferential flow in the model.

Results and Discussion

Grains which are not in contact results

The Plaxflow analysis were run for each shape of coarse grains and at various FCs for "non-porous grains which are not in contact" model. The lowest hydraulic conductivity values were obtained when the coarse grains had triangular shape. However, the hydraulic conductivities of all mixtures slightly differed from each other and were found to be independent of the shape of coarse grains. It can be said that fine matrix have the control of the hydraulic conductivity behavior of a binary mixture and the coarse grains embedded in the fine matrix can be said to increase the hydraulic conductivity of a binary mixture at most 20 times when the grains are not in contact.

The effect of porous grains to the hydraulic conductivity of the mixture is the main question of this study. For this purpose, a range of hydraulic conductivity values were given to the elements to notice its impact on the binary mixture's hydraulic conductivity when the "porous grains were not in contact". For simplicity, the model was the square grains embedded in fine matrix. Three FCs were used, they were 41%, 22% and 12%. The presentation which shows the ratio of binary mixture's hydraulic conductivity to the fine matrix haydraulic conductivity (k_{MIX}/k_F) as a function of CFM (%) having different ratios of coarse grains hydraulic conductivity over fine matrix hydraulic conductivity (k_C/k_F) is given in Figure 4. It is seen from Figure 4 that while the fine matrix percentage decreased the k_{MIX}/k_F in other words k_{MIX} increased. Besides, k_{MIX}/k_F also increased while k_C/k_F increased. However, this increase gradually decreased while k_C/k_F increased and stabilized when k_C/k_F was over 1000. Depending on the modeling results; it can be said that, when k_C/k_F exceeds three orders of magnitude, the overall hydraulic conductivity value held constant. Besides, k_{MIX} became stable around 5, 10 and 20 times of k_F for CFMs of 41, 22 and 12% respectively.

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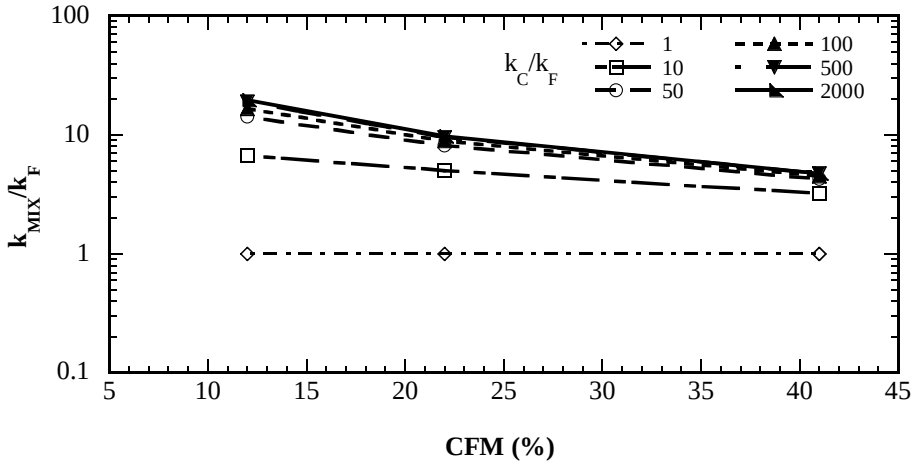

Figure 4. Variation of k_{MIX}/k_F as a function of fine content for different k_C/k_F values

Grains which are in contact results

Non-porous grains are selected to be simulating sand grains and hydraulic conductivity value was attained as "0" (zero) to sand. Porous grains are selected to be simulating zeolite grains and hydraulic conductivity value was attained as "10^{-9} m/s" to zeolite. The same model geometries were used as previously formed for CFM with non-porous Finally, mesh generation was made before running the finite element analysis. The hydraulic conductivity difference for CFM constituted both porous and non-porous grains converge at 100% FC. All results for both porous and non-porous mixtures are presented in Figure 5. The analysis were run both for "grains which are not in contact" and "grains which are in contact" cases depending on their BCs. The analysis results showed that there are three orders of magnitude less hydraulic conductivity with respect to CFM with porous grain obtained at low FCs, when non-porous coarse grain was used in the mixture.

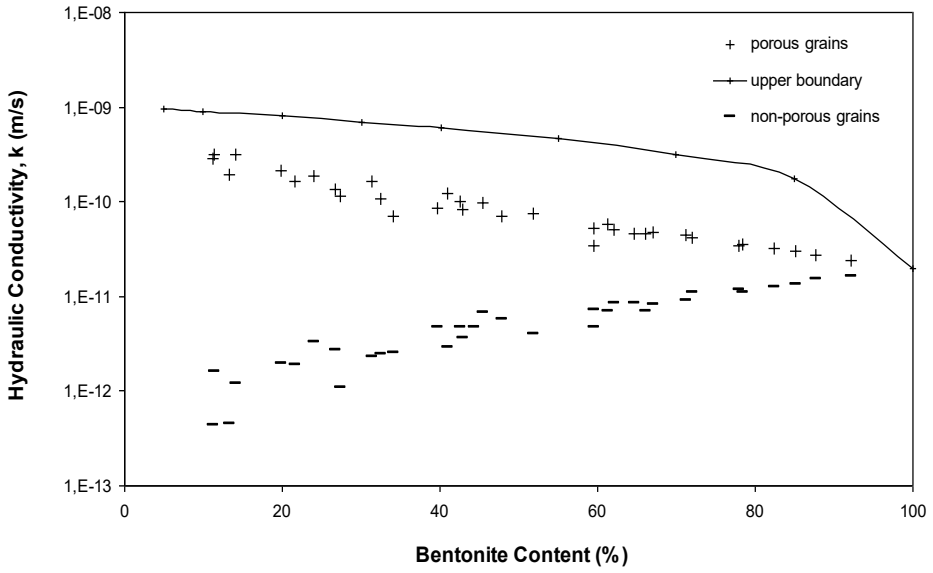

Figure 5. Modeling results of porous and non-porous grains in binary mixtures

Grains which have preferentia flow paths results

In literature, BCs more than 10% were considered as not likely to have preferential flow paths for SBMs (Cho et al., 2002; Yong et al., 1986). However, from the SEM photomicrographs of SBMs Abichou et al. (2002) showed that even 10% SBMs had voids. In addition, from several hydraulic conductivity tests, it is seen that BC of SBMs lower than 8% had relatively higher hydraulic conductivities showing that there were certain preferential flow paths (Kenney et al., 1992; Abichou et al., 2002). Moreover, the findings of the study of Ören et al. (2014) showed that 10% ZBMs could have preferential flow paths. Thus, in this study the ZBM samples having lower BC's than 10% was assumed to have preferential flow paths and modeled as well. Consequently, the upper limit was defined to be the hydraulic conductivities of these models. The comparison of the whole model results and

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literature laboratory data are given in Figure 6. The laboratory data fitted well to the modelling findings both for SBMs and ZBMs. The hydraulic conductivity of 10% ZBM samples are found to lay between the upper limit of ZBMs for grains in contact and the limit for preferential flow which shows that 10% ZBMs actually have voids causing transition of water and increasing the hydraulic conductivity.

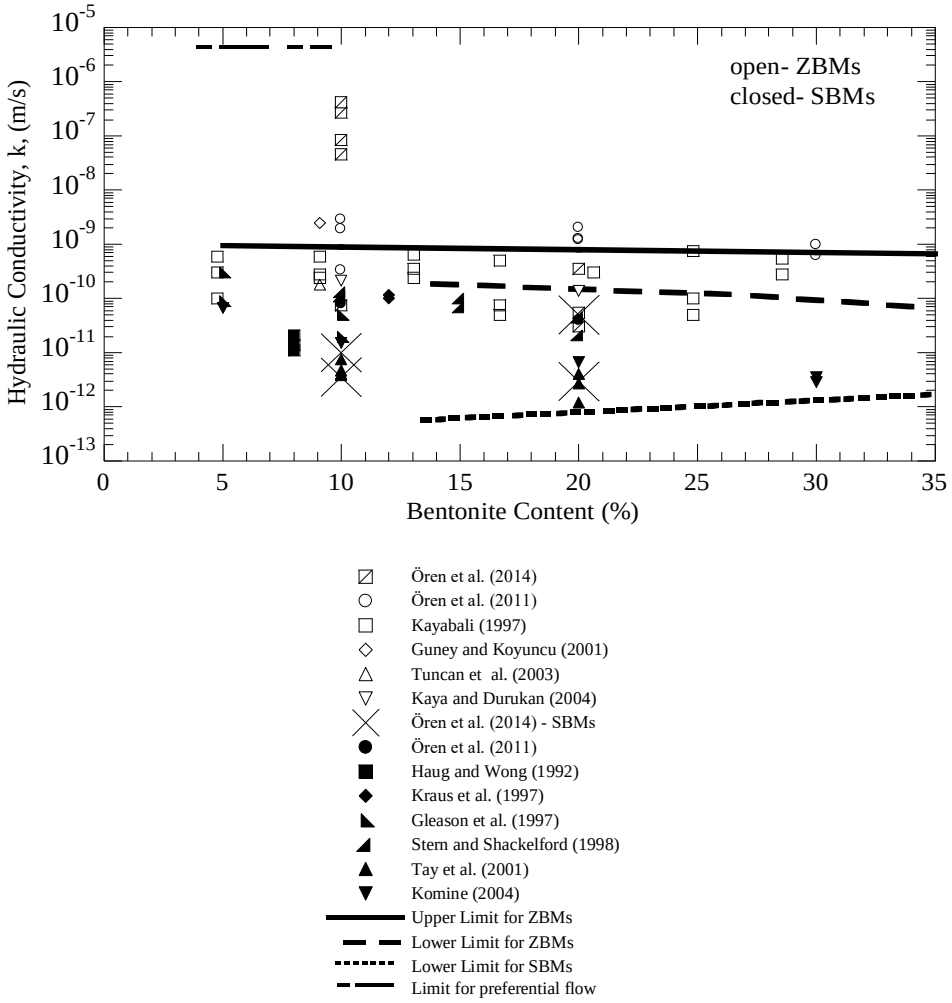

Figure 6. Literature hydraulic conductivity test results in comparison to modeling results for both porous and non-porous grains

Conclusion

A modeling study had been conducted on understanding the mechanisms controlling the hydraulic conductivity of ZBMs in comparison to SBMs. The modeling study investigated the zeolite in ZBMs and sand in SBMs as porous and non-porous grains respectively. During the modelling process, the hydraulic conductivity of zeolite and fine matrix as bentonite was assumed to be 10^{-9} m/s and 2×10^{-11} m/s, respectively, depending on the literature findings. Based on the obtained results in this study, the conclusions are drawn as the following;

- When the ratio of the hydraulic conductivity of the components in a binary mixture (which were not in contact to each other) exceeded three orders of magnitude, the mixture hydraulic conductivity value held constant as it was and did not change anymore.
- The grain shape did not have a notable effect on the hydraulic conductivity of binary mixtures. They differed at most 4 times.
- For porous grains embedded in fine matrix, it's concluded that the contact of the grains to each other had a significant influence on the hydraulic conductivity of binary mixtures.
- ZBMs and SBMs laboratory data clearly fitted the model formed by porous and non-porous grains which corresponded to zeolite and sand respectively. Some of the laboratory data of 10% ZBMs fall into the model boundary which had preferential flows. Showing that 10% ZBMs were insufficient for use of a liner.

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Sembolizm, 19. Yüzyılın ikinci yarısındaParnasizme (gerçekçiliğe) bir tepki olarak Fransa'da doğmuş bir sanat akımıdır. Bilindiği üzere Parnasizmin kaynağı pozitivizm ve bilimsel görüş ve gerçekler olmuştur. İnsanı ve toplumu sadece maddi gerçekliklere dayalı olarak açıklamaya çalışmış ve insanın iç dünyasını görmezlikten gelmiştir. Sembolistler bu anlayışa karşı çıkarak, duygusallığı ve insanın iç dünyasını açıklamaya çalışmışlardır. Varlıkların dış görünüşünden uzaklaşarak onun belli bir çerçeve içinde görmeye ve izah etmeyi amaçlamışlardır. Çünkü dış dünya gözlemlendiği, algılandığı, görüldüğü ve hissedildiği gibi yansıtılması gerektiği düşüncesindedirler.

Batı edebiyatında 1885-1902 tarihleri arasında en parlak dönemini yaşayan sembolizm akımı, Arap dünyasında ilk defa Lübnanlı edebiyatçıların ürünlerinde görülmeye başlanmıştır. Lübnan, nüfusunun bir kısmının Katolik Araplardan oluşması ve misyoner okullarının burada açılması sebebiyle, diğer Arap ülkelerine göre Batıyla, bilhassa Fransa ile çok erken dönemlerde temasa geçmiş ve tarih boyunca hep yakın ilişkiler içinde olmuştur.

Ayrıca Birinci Dünya Savaşı'ndan sonra gerek Lübnan, gerekse Suriye uzun bir dönem Fransız işgalinin altında kalmıştır. Her iki ülkenin entelektüelleri arasında Fransızca, Arapça'dan sonra kullanılan ikinci bir dil olmuştur. Bu da onlara Fransız edebiyatında yaşanan gelişmeleri yakından takip etme olanağı sağlamıştır. Böylece Boudelaire, Rimbaud, Mallarmé, Valéry, Paul Verlaine gibi Fransız sembolist şairlerin şiirlerinin yanı sıra eleştiri türünde ve edebiyat kuramları gibi pek çok eser Arapçaya çevrilmiştir Çevrilen bu eserler, Ebû Şebeke, Sa'îd 'Akl, Yûsuf Gassûb, Salâh Lebkî, Bişr Fâris, Emîn Nahle, Nakûlâ Feyyâd gibi dönemin genç şairleri tarafından büyük ilgi görmüştür.

Arap şiirin de gerek içerik, gerekse biçim yönünden yeniliğe gidilmesi gerektiğini savunan dönemin genç şairlerinin bu isteklerini karşılayan, sembolizm akımı olmuştur. Zira sembolist akım, şiirin klâsik kalıpları zorlaması sonucu ortaya çıkmıştır. Sembolistler, klâsik kalıpların musikiyi, ahengi, sezginin serbest çağrışımını, sembolün gizemini ve sanatkârın bunları elde etme hürriyetini engellediği düşüncesini taşıyorlardı. Onlara göre şiirin yapısı, önceden ve başkaları tarafından belirlenmiş olan değil, bilakis şairin dehası ve yeteneği ve bir ölçüde de şiirin muhtevası tarafından belirlenmelidir. Sembolistlerin bu yaklaşımı, serbest şiirin esas olmasını da beraberinde getirmiştir.

Arap edebiyatında sembolizmin ilk belirtileri, Mehcer edebiyatçıların romantik ürünlerinde görülmüştür. Maddî sıkıntılar, dinî ve siyasî özgürlükler nedeniyle Suriye ve Lübnan'dan Kuzey ve Güney Amarika'ya göç etmiş Mehcer şairleri, Arap şiirinin gerek şekil gerekse muhteva bakımından klâsik anlayışından kurtulması gerektiğini vurgulamışlardır. Bu grubun başını çektiği yenilikçi isimlerinden Cubrân Hâlîl Cubrân olmuştur. Cübran'dan sonra İlyâs Ebû Şebeke, Mîhâ'il Nu'ayme ve İliyyâ Ebû Mâdî'nin eserlerinde sembolü ustaca kullanarak sembolizmin Arap edebiyatında müstakil bir akım olarak gelişmesine zemin hazırlamışlardır.

Bu çalışmamızda, çağdaş Arap şiirinde sembolizmin doğuşuna zemin hazırlayan faktörler, sembolizm ilke ve nitelikleri, özellikleri, benzerlikler ve ilişkiler ilkesi, musiki/ ahenk, mitolojik semboller gibi konular incelenecek ve çeşitli şairlerin şiirlerinden örnekler verilecektir.

Keywords: Arap Edebiyatı, Sembolizm, Arap dili, Lübnan, Edebiyat akımları

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MULTI-WALLED CARBON NANOTUBES MODIFIED POLY(VINYL CHLORIDE) MEMBRANE COATED GLASSY CARBON ELECTRODE FOR IODIDE DETERMINATION

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Abstract: Considerable effort has been devoted to the design of electrodes for the direct and selective potentiometric determination of various species. Iodine and iodide compounds as essential micronutrient have important roles in brain function, cell growth, neurological activities and thyroid function. Therefore, its determination is an important analytical task.

Carbon nanotubesmodified electrodes, offering advantages of much lower ohmic resistances, very stable response, ease renewal of surface and not requiring internal filling solution, have led us to developeamulti-walled carbon nanotubesmodified glassy carbon iodide-selective electrodebased on a metal complex named [1,1′- bis(diphenylphosphino)ferrocene] dichloropalladium(II).The electrode exhibited linear response in the range of 1.0×10^{-1} -1.0×10^{-5} M with a slope of 59.6±1.1 mV/pI at pH 4.0. Additionally, SEM images of the membrane and impedance studies of the electrode were evaluated. Finally, the electrode was successfully utilized as an indicator electrode for the potentiometric determination of iodide content in pharmaceutical samples.

Keywords: Iodide-selective electrode, potentiometry, multi walled carbon nanotubes, iodide determination

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NÂMIK EKREM'İN *BAHÂR-I EDEB*'İNDE EDEBÎ TENKİT

Ekrem BEKTAŞ

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Özet: Nâmık Ekrem 1877-8 yılında Urfa'nın Birecik beldesinde doğmuştur. Asıl adı Mehmet Ekrem'dir. Ekrem, Tanzimat devrinin önemli şairi Nâmık Kemâl'e olan hayranlığından dolayı Nâmık ismini kullanır. Birecik Rüştiye'sinde eğitime başlayan Nâmık Ekrem, Halep İdadî'sinde yatılı öğrenci olarak öğrenimine devam eder. 1889-9 yılında İstanbul'a giden Ekrem, 1909 yılına kadar orada kalır. Rahatsızlığından dolayı hava değişimi amacıyla İstanbul'dan Birecik'e döner. Birecik'te, Meşrutiyet hakkında toplantılar düzenler. Kısa bir süre sonra İstanbul'a dönen Ekrem, değişik dergi ve gazetelerde yazılar yazar ve eserler neşreder.

1911 yılında Erzurum, Van ve Bitlis bölgesinde maarif müfettişliği göreviyle görevlendirilir. 1914 yılında da Kerkük İdadî Mektebi Müdürlüğüne atanır. Bu görevde iken yakalandığı tifo hastalığından kurtulamayarak 1917 yılında Kerkük'te vefat eder.

Nâmık Ekrem, şair, yazar, eğitimci ve fikir adamı gibi vasıflarıyla öne çıkan bir şahsiyettir. Meşrutiyet'in önemli savunucularından biri olan Nâmık Ekrem edebî ve ilmî birçok eser telif eder. Ekrem'in yazdığı edebî eserlerinden biri de *Bahâr-ı Edeb* adını taşır. Müellif, söz konusu eserin "Musâhabeler" başlıklı sohbet yazılarında, bazı edebî değerlendirmelerde bulunur. Ekrem, yeni yetişen şair ve yazarların yazılarında görülen imlâ, vezin, kafiye, Arapça ve Farsça tamlamalardaki hataları eleştiri konusu yapar ve tenkitçi kimliğiyle öne çıkar. Kısacası bu bildiride, Nâmık Ekrem'in *Bahâr-ı Edeb*'teki yazılarında dile getirdiği edebî tenkitler üzerinde durulacaktır.

Anahtar Kelimeler: Birecikli Nâmık Ekrem, Bahâr-ı Edeb, edebî eleştiri.

LITERARY CRITICISM IN NAMIK EKREM'S *BAHÂR-I EDEB*

Abstract: Namık Ekrem was born in 1877-8 in Birecik-Urfa. His real name is Mehmet Ekrem. Ekrem uses Namık as a name because of his admiration to Namık Kemal who was one of the important poets in Tanzimat reform era. Namık Ekrem began his education career in Birecik middle school and continued his school career as a boarding student in Halep High School. Ekrem went to Istanbul in 1889-9 and stayed the reuntil 1909. He turned back to Birecik in order to change the athmosphere due to his disease. He organise some meetings about constitutional monarchy (Meşrutiyet). After a while, Ekrem turned back to Istanbul and he wote for different journals and newspapers.

In 1911, he worked as an inspector of education in the area of Erzurum, Van and Bitlis. Then he was assigned to directorate of Kerkuk High School. During that mission, he caught typhoid and died in Kerkuk in 1917due to this illness.

Namık Ekrem was an inspirational person as a poet, writer, educator, and intellectual. Namık Ekrem who was one of the major proponents of constitutional monarchy (Meşrutiyet) compiled many literary works and treatises. One of his literal works is called *Bahâr-ı Edeb.* In this book, the writer did some literary critique in the chapter named "Musâhabeler". Ekrem criticised the spelling, prosody, rhyme, Arabic and Persian noun phrase errors in writings of new authors and poets and he is known his critic characteristics. To conclude, literary critiques done by Namık Ekrem in *Bahâr-ı Edeb* is discoursed in this declaration.

Keywords: Namık Ekrem from Birecik, Bahâr-ı Edeb, literary critique.

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Giriş

Nâmık Ekrem[1] çok yönlü bir kişiliğe sahiptir. O şair olduğu kadar, nasir, eğitimci, gazeteci, yayıncı ve aksiyon adamıdır. Nâmık Ekrem, II. Meşrutiyetin ateşli savunucularından biri olmasına rağmen edebiyat tarihimizde gereği gibi tanınmamaktadır. Bunun sebebi II. Meşrutiyetin güçlü sanatkârlarının gölgesinde kalmış olmasıyla izah edilebilir kanaatindeyim.

Ayrıca onun taşradan İstanbul'a gitmesi, kabiliyet ve sanat gücünü bir alanda değil de birçok sahada sarf edip eser vermiş olması da fazla tanınmamasına sebep olan etkenlerden bazılarıdır. Nâmık Ekrem, manzum ve mensur edebî eserlerden, ders kitaplarına; seyahat kitaplarından, tercüme eserlerine kadar birçok türde eser vermiştir. Nâmık Ekrem hakkında -dipnotta da belirtildiği üzere- hazırlanmış bir doktora çalışmasından başka ilmî bir çalışma yoktur. Urfa şairleriyle ilgili çalışmalarımızı sürdürürken böylesine velut bir müellifin bugüne değin gereği gibi tanınmamasını bir talihsizlik görerek şairin matbu olan bazı eserlerini lisans öğrencilerine bitirme ödevi olarak verdik. Hatta Ekrem'in manzum-mensur olarak kaleme aldığı *Bahâr-ı Edeb* (Bektaş 2014:)

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[1] Nâmık Ekrem 1877-8 yıllarında Urfa'ya bağlı Birecik beldesinde doğmuş olup asıl adı Mehmet Ekrem'dir. Babası, Âyânzâde Mehmet Sürurî Efendi'dir. Mehmet Ekrem, Nâmık ismini Tanzimat devrinin büyük şairi Nâmık Kemâl (ö. 1888)'e olan hayranlığından dolayı kullanmıştır.
Nâmık Ekrem, Birecik Rüştiye'sinde eğitime başlar. Burayı bitirdikten sonra Halep İdâdî'sine yatılı öğrenci olarak devam eder ve mezun olduktan sonra da kısa bir süre Birecik'te kalır. Eğitimine devam etmek üzere 1889-9 yılında İstanbul'a giden Nâmık Ekrem, Mühendishâne Mektebine kaydolur ve son sınıfa kadar okur. Son sınıfta iken öğretmen olmak için Dârü'l-mu'alimîn-i Âliye'deki derslere devam eder ve yapılan imtihanı başarı ile vererek buradan mezun olur. Ayrıca bu arada Makriköy Mekteb-i İdâdî'sinde de öğretmenlik yapar. Nâmık Ekrem'in İstanbul'daki hayatı 6 Ağustos 1909 tarihine kadar sürer. İstanbul'da bir handa ikamet ettiği için hastalanan Ekrem, yukarıda verdiğimiz tarihte hava değişimi maksadıyla İstanbul'dan ayrılır. Ekrem, 11 yıl ayrı kaldığı ailesi ve memleketini görmek için 16 günlük meşakkatli yolculuktan sonra 21 Ağustos 1909 tarihinde Birecik'e ulaşır. İki ay kadar Birecik'te kalır fakat burada da boş durmaz. Halkın II. Meşrutiyetin ilânından pek de haberdar olmadığını bir telgrafla Dâhiliye Nezareti'ne bildirir. İttihat ve Terakki Cemiyeti'nin Birecik'teki Kulübüne giderek halkı bilgilendirir.
Tekrar İstanbul'a dönen Ekrem, değişik dergi ve gazetelerde yazılar yazar ve eserler neşreder. Eserlerinde terakki, hürriyet, meşrutiyet, eğitim ve öğretim gibi konuları işler.
Şairliğinin yanı sıra eğitimci kimliğiyle de öne çıkan Nâmık Ekrem, sadece öğretmenlik yapmaz, müfettişlik görevlerinde de bulunur. 1911 yılında Erzurum, Van ve Bitlis bölgesi, maarif müfettişliği göreviyle görevlendirilir.
Nâmık Ekrem 1914 yılında da Kerkük İdadî Mektebi Müdürlüğü görevine atanır. Ancak şairin neden Kerkük'e gittiği hususunda bir bilgimiz yoktur. 3 yıl kadar müdürlük görevini sürdüren Ekrem, bu görevde iken yakalandığı tifo hastalığından kurtulamayarak 1917 yılında Kerkük'te vefat eder.
Velut bir şahsiyet olan Nâmık Ekrem'in kırk civarında eseri olduğu ifade edilir. Fakat bunların bir kısmı kayıp olduğu için günümüze kadar ulaşamamıştır. Yunus Ayata'nın tespitlerine göre Nâmık Ekrem'in eserleri şunlardır:

A) Mensur Eserleri:
1- Ders Kitapları
Fen Hülâsaları (1320), Ziraat Dersleri (1321), Fevâid (1322), Marifet (1322), Makâlât-i Güzîde (1323), Nuhbe-i Kavâid (1325), Fâideli Mesâil -Hesaba Dâir 1- (1326)
2- Seyahat Kitapları
Bir Tercüme Denemesi: Japonya Sularında (1321 Kont Bouvard'tan çeviri), Anadoluda Bir Cevelân (1326)
3- Diğer Kitapları
Dîbâce-i Aşkımdan (1903), Japonlar (1322), Lâyiha (1326/1910), Ahvâl-i Maarif (1326/1910), Âh! Vatan (1325/1909), Mebâhis-i Müfide (1325/1909), Bir Telgrafın Tefsiri (1325/1909), Maskat-ı Re'sim Yahut Birecik (1325/1909), İnkılap (1324)
B) Manzum-Mensur Karışık Eserler
Bahâr-ı Edep (1321/1905), Şi'r-i Hakîkat (1330/1914)
C) Manzum Eserleri:
Zevâhir-i Pejmürde (1321/1905), Yâdigâr (1325/1909), Zafer-i Hürriyet (1325/1909), Osmanlı Ordusuna "10" Temmuz Hâtırası (1325/1909-10)
Bir Mesnevi Denemesi: Hicrân (1326/1910)
Nâmık Ekrem'in hayatı hakkındaki bu kısa bilgiler, Dr. Yunus Ayata taradından Doktora tezi olarak hazırlanıp yayımlanan Âyanzâde Nâmık Ekrem -Eğitime Adanmış Bir Ömür- (Hayatı, Sanatı ve Eserleri) Asitan, 2009, Sivas, adlı eserden alınmıştır. Ayrıca bu çalışmada Nâmık Ekrem'in eserlerinin içeriği tanıtılmış ve bazı değerlendirmelerde bulunulmuştur. (Ayata 2009:)

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isimli eserini, Osmanlı Türkçesi dersinde öğrenciler istifade etsinler diye kısmî çevriyazısıyla birlikte tıpkıbasımını yayımladık. Bu bildirinin asıl konusunu da yayımladığımız *Bahâr-ı Edeb*'teki "Musâhabeler" (Bektaş 2014: 109-197) başlığı altında yer alan mensur yazılar oluşturur. Müellifin yer yer tekrara düştüğü ve periyodik olarak kaleme aldığı bu yazılarının toplamı yedidir. Ekrem bu yazılarında, bir münekkid gibi davranarak yeni yetişen şair ve yazarlara ders verir, onların yazdıklarını eleştirir ve bazı tavsiyelerde bulunur. Zaman zaman şiir felsefesini/poetikasını da nazara vererek şiir ile nesirde uyulması gereken kuralları hatırlatır.

Nâmık Ekrem'in tenkitçiliğini detaylı bir şekilde ortaya koymak ancak onun tüm eserlerinin incelenmesiyle mümkün olacağı kanaatindeyiz. Fakat şairin bu eserinde dile getirdiği veya eleştirdiği noktalar, edebiyat ilmiyle uğraşanlar için her zaman rehber niteliğindedir. Şairin *Bahâr-ı Edeb* adlı eserinde tespit ettiğimiz başlıklarla onun eleştirilerini ortaya koymaya çalışacağız:

1) Yeni Yetişen Şair ve Yazarların Eksiklikleri

Nâmık Ekrem, söz konusu yazılarında, yazar veya şair olmak isteyen gençlere tavsiyelerde bulunmayı ihmal etmez. Gençlerin neler yapıp nelere dikkat etmeleri gerektiğini dile getirir. Eline kalem ve kâğıdı alan yeni ediplerin/şairlerin ilk düşündükleri şeyin ünvan (başlık) olduğunu söyleyen Nâmık Ekrem, ünvan kelimesinin nakışlı, süslü ve cezb edici bir kelime olduğunu söyler. Diğer bir ifade ile nev-residegân, şöhret peşinde koştukları için çokça yazıp hemen tanınmak isterler. Oysa Nâmık Ekrem'e göre ilk önce eserin konusu çok yönlü olarak düşünülmeli, sonra seçilen konunun sağlayacağı fayda dikkate alınmalıdır. Yazılanların çok dikkatli bir şekilde mütalaa edilmesi, uygun olmayan kısımların değiştirilmesi, çıkarılması ya da tamamlanmasını önerir. Bütün bu hususlara dikkat edildikten sonra metne uygun bir başlık konulmalı görüşündedir. Böylece konu ile başlık uyumu sağlanmış olur.[2] Bu sayılanlar nazara alınmadan yazılmış bir metnin hatadan eksik olamayacağını ifade eder.[3]

Ekrem, edebiyat heveslilerinin "Şiir nedir? Edebiyat nedir? gibi çok iddialı konularda yazı yazmalarını eleştirir. Çünkü bu edebî türlerin tanımları bugüne kadar birçok kimse tarafından yapılmıştır. Bu yeni heveslilerin, yapılan tanımlara ilâve edecekleri bir şeyleri olmadığı gibi söylenenleri tekrar edip safsatadan öteye gidemeyecekleri görüşünü savunur.[4]

2) Edebiyatta İsti'dad-ı Fitrî

Nâmık Ekrem, bir insanın edip olabilmesinin ilk şartını "isti'dâd-ı fıtrî" yani doğuştan kabiliyet sahibi olmaya bağlar.[5] Ekrem, edebiyata hevesli yeni yetişen bir kimsenin, çok istekli bir şekilde çalıştığı, edebi kitaplar okuduğu ve edebiyatın kural ve kaidelerine uyduğu halde yazdıklarını zevk-i selim sahibi birine beğendiremeyip okuyucuda şevk, heyecan ve rikkat uyandıramıyorsa bunun yegâne nedeninin fitri kabiliyet yokluğu olduğunu söyler.[6]

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[2] "El-hâsıl âsâr-ı edebiyye nasıl yazılıyor; ser-levha-i eser ne demektir; mevzû' ile mutâbakat etmeli midir? Bunlara dâ'ir hîçbir fikir edinememiş. Yalnız yazıyor, şâ'ir, edîb olmak ğarâm-ı tıflânesiyle yazıyor. Hâme be-dest; 'âlem-i edebiyâtta dolaşıyor. Eee?... Ne yazabilecek bu nev-resîde-i tahsîl!… Mevzû'a göre 'ünvân intihâb edebilecek mi? Yoook! Nerede!..."

[3] "Noksân-ı tetebbu', kıllet-i mütâla'a, fıkdân-ı tahsîl ile yazılan her eser -nesir olsun, nazım olsun- şâ'ibeden, hatâdan sâlim olabilir mi? Hâyır!"

[4] "Yine bir dîğer heveskâr-ı edeb: [Şi'ir nedir? Edebiyât nedir?...] diye başlıyor. Ortaya, bî-ser ü bün, birçok safsatalar döküyor. Hâlbuki bunlar şimdiye kadar defa'âtle söylenmiş, işitilmiş… yazılmış hâyîde şeyler. Ve's-selâm. Hem küçücük bir iktdâr-ı kalemî ile şi'irin, edebiyâtın -ki havsala-i tıflâna sığışmaz- ta'rîf ve teşrîhine girişmek ne büyük bir cür'ettir?!.. Mes'elenin daha ğarâbeti şurasındadır ki: Muharrir-i nev-heves; [edebiyât nedir?] diyor, (edebiyât) kelimesinin elifî üzerine bir de şu (ء) işâreti vaz' ediyor. Bu ne olacak? 'Arabî kelimelerin de böyle kâlıptan kâlıba girecegine cevâz veriliyor mu imiş 'acabâ?."

[5] "Meselâ: Benim edebiyâta, onun riyâziyâta, ötekinin tıbba, daha ötekinin ressâmlığa… İşte böyle her ferdin başka bir cihete isti'dâdı ziyâde bulunur. Yoksa külliyen mahrûm-ı isti'dâd bir mahlûk tasavvur olunamaz.
Kâbiliyet-i fıtriyesinin cevlângâhı olan sâhada pûyân bulunanlar yorulmazlar, bıkmazlar. Belki bir ân akdem-i ser-menzil-i maksûda erişirler. Meslek sâhibi olurlar. San'at ve hizmetlerinde ihtisâs ederler. Rağbet, servet, kemâl kazanırlar.
Evet, bir insân; zîver-i i'tilâyı cilvegâh-ı isti'dâdında aramalıdır. Çünkü onun pertev-i ümîdi orada parlar. Gül-çehre-i şâhid-i terakkîsi orada gülümser.
Yoksa… Kâbilîyet-i meftûresinin 'aksi cihetine hareket edenler ne kadar âheste yürüseler bile yine çâbûk yorulurlar. Mesleklerinde eser-i mahâret göstermezler. Ğayretlerinisbetinde iş göremezler."

[6] "Evvela: [İsti'dâd-ı fıtrî olmalıdır.] nazariyesini kabûl edelim. Fi'l-hakîka bir nev-resîde-i tahsîl -defâ'atle görülmüştür- edebiyâta merâk ediyor. Hevesli hevesli çalışıyor. Edebî kitâplar, risâleler okuyor. Fakat mesâ'isi nisbetinde güzel yazamıyor. Yazdıklarını erbâb-ı zevk-i selîme begendiremiyor. Gerçi hatâsızca yazıyor, eserleri

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Nâmık Ekrem, *Bahâr-ı Edeb*'teki bir yazısında, şairlerin ne zaman şiir yazdıkları konusuna değinir. Ekrem, kimi şairlerin bahar mevsiminde, kiminin seher zamanında, kiminin de mehtaplı gecelerde kaleme sarılıp şiir yazdıklarını oysa gerçek şairlerin istedikleri zaman şiir yazabildiklerini ileri sürer.[7]

3) Lisan Öğrenme

Nâmık Ekrem, edebiyat heveslilerinin, fitrî kabiliyetten sonra sarf (kelime bilgisi) ve nahiv (cümle bilgisi) bilgisinden başka hiç olmazsa yeteri kadar Arapça ve Farsça öğrenmelerinin gereğini vurgular. Sadece Türkçe bilmenin edebiyat için yeterli olmadığını dile getiren şair, edebî ve faydalı kitaplarla meşgul olunması ve okunacak eserlerin de hoş, ahlâkî, üslûbu nazîk ve sade eserler olmasına dikkat edilmesi gerektiği kanaatindedir.[8]

Ekrem, edebiyatla uğraşanların, ayrıca Batının faydalı eserleriyle ilgilenmelerini ve Batı dillerinden en az biri özellikle de Fransızca'yı öğrenmelerini tavsiye eder.[9] Bütün bunları gerçekleştirmenin de uzun bir zaman gerektirdiğini söyleyen Ekrem, "*ihtimâm-ı ciddî, sebât-ı tahsîl*" ile insanın herşeyi öğrenebileceğini, bütün ilimlerin de çalışma ve gayretle elde edileceği tezini savunur.[10]

4) Eski Edebiyat

Nâmık Ekrem'in yazılarında, doğrudan Eski edebiyatı eleştirdiğine dair bir ifadesine rastlamıyoruz. Ancak Ekrem bir yazısında, artık "gazel-serâ (gazel okuma)"lık zamanının geçtiğini, klasik tarzda şiir yazmanın çok büyük kudret ve kabiliyete bağlı olduğunu, bu kudret ve kabiliyetin de gençlerde bulunmadığını ifade eder.[11] Zaten şairin yaşadığı devirde eski edebiyat toplumdan çekilmiş ve yerini bütün debdebesiyle yeni edebiyata bırakmak zorunda kalmıştır.

5) Şiir

Nâmık Ekrem, "Şiir nasıl olmalıdır? başlıklı yazısında, güzel teşbihlerle şiirin tanımını yapar ve şiirden ne anladığını izah eder:
"Şi'ir; hıyâbân-ı tabî'atın mîve-i şîrîn-i nefâsetidir.
Şi'ir; gülistân-ı fıtratın şükûfe-i 'ıtr-efşân-ı letâfetidir."[12]

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kavâ'id-i edebiyyeye sanâyi'-i lafziyye ve maneviyyeye bîgâne değil; lâkin her hissi okşamıyor. Her kâri'a, okuduğu zamân -zemînine göre- şevk ü inbisât, rikkât u teheyyüc veremiyor.
Bu neden? Niçin böyle oluyor?...
Vereceğimiz cevap: [İsti'dâd-ı fıtrîsi yok…]"

[7] "Hülâsa: Hakîkî şâ'irler istedikleri zamân yazarlar. Fikirleri hisleri cevelâna başladığı vakit şi'ir söylerler. Sâdırât-ı rûhiyyelerini, mahsûl-i hislerini kâğıd üzerine nakş etmek için ne infilâk-ı seheri ne de iltimâ'-i mihri gözetmezler. İhmirâr-ı şafaka, ibtisâm-ı kamere muntazır olmazlar. Rebî'in kudûmunu, güllerin inkişâfını da beklemezler. Vâridât-ı mülhemeyi yazarlar. Duygularını söylerler. İşte böyle söylenen şi'rlerdir ki ba'zan insânı ağlatır, rikkatlendirir, tehyîc eder. Ba'zan güldürür, neşvelendirir, raksa getirir."

[8] "Ma'lûmdur ki edebiyâtımızın esâsı: üç lisân üzerine kurulmuştur: 'Arabî, Fârisî, Türkî. Yalnız Türkçeyi güzel bilmek kifâyet etmiyor. 'Arabî, Fârisî lisânlarından da her hâlde behredâr-ı vukûf olmak lâzım. - [Yâ ba'zı nev-hevesân-ı edeb; 'Arabî, Fârisî hîç bilmiyorlar da yazıyorlar, bunlara ne diyelim?] gibi- bir su'âl vârid olursa... Cevâbımız hâzır: Evet, bunlar yazmağa yelteniyor, haydi yazıyorlar da diyelim. Fakat yazdıklarında ma'nâsızlıklar, kâ'idesizlikler eksik mi? Bîgânegî-i şîve, 'adem-i insicâm ve sâ'ireye ne kadar tesâdüf olunuyor! Bu da inkâr kabûl eder mi?... Hele bir de isti'dâd-ı fıtrîden mahrûm iseler!... Vay hâline o yazıların!… Artık hezliyyât denilmez de ne denilir onlara! Muhterem kâri'ler de mesrûdâtıma hak verirler zannederim."

[9] "Peki! Bir çocuğun isti'dâd-ı fıtrîsi var. Meh-mâ-emken 'Arabî, Fârisî de biliyor. Bitti mi? O, edîb olabilir mi? Hâyır, hâyır… Daha bitmedi. Biraz da âsâr-ı müfîde-i Garbîyeye imâle-i nazar etmeli. Garb edebiyâtından da bir fikir edinmeli. Bunun için de elsine-i ecnebiyyeden bir kaçını, yâhûd, hîç olmazsa, Fransızca'yı öğrenmeli…"

[10] "[Peki-a'lâ ya! Bunları ögrenmek müddet-i medîdeye mütevakkıf. Nasıl öğrenmeli?] gibi bir su'âl daha, belki, mütebâdir-i hâtır olur…
Cevâben deriz: İhtimâm-ı ciddî, sebât-ı tahsîl ile insân herşey'i öğrenebilir. Dünyâda hîçbir 'ilim yoktur ki sa'y u ğayretin elinden kurtulabilsin. Meğer ki ğayrette kusûr, 'adem-i sebât görüle..."

[11] "Bundan bir kaç sene evvellerine gelinceye kadar ara sıra hakîmâne gazeliyyât… yazılmış bunlar güzel, 'ulvî, şevk ve lezzetle okunur. Lâkin öyle gazelleri söylemek de büyük bir iktidâr ve isti'dâda mütevakkıf. Şimdiki yazanlarımızda hani o iktidâr?! Nerde o servet-i fikr ü hayâl!... Mâdâm ki o kudret ve kâbiliyet mefkûd. Mâdâm ki öyle şi'irler söyleyemeyecegiz… O hâlde yâve-gûluğu bırakalım. Hezl-perdâzlıktan vâzgeçelim. Hissî, nev-tarz neşîdeler yazmağa çalışalım. Daha iyi olmaz mı?"

[12] Şiir, mizaç/huy caddesinin, nefis tatlı meyvesidir. Şiir, fıtrat gül bahçesinin hoş kokular saçan çiçeğidir.

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Ekrem, şiir söylemek için insanın tabiatını zorlamasının bir anlam ifade etmediği görüşündedir. Şair, "şiir, insan mizacının çocuğudur" der. Yine şaire göre şiir, fıtrat bahçesinin açılmış çiçeği olmalı ki her kalbe her ruha zevk, rikkat, heyecan ve güzel şeyler bahş edebilsin.[13]

Şaire göre, şiirde ilk aranılacak şey mana ve ruhtur. Daha sonra şiirde incelik, ahenk, renk ve şiiriyet kokusu olmalıdır. Vezin ve kafiye ise sonra aranılacak hususlardır.[14]
Nâmık Ekrem, devrinde yazılan şiirlerde mana ve ruh aramaktan vazgeçildiğini kelime ve terkiplere bile dikkat edilmediğini söyleyerek şu soruları sorar:

> "İşte bakınız:
> [Bir güzel günde: Şûh u sevdâkâr
> Baktın ey zehre-i şeğaf-dîde!
> Handeler serperek, gülümseyerek
> Bu nazar-ı imtidâd-ı sâfiyle…]
> Hani kâfiye ?!"

Nâmık Ekrem, eli kalem tutan genç şairlerin, öğrenim ve mütalaa dönemlerinde şiir ve edebiyat ile ilgilenmelerini doğru bulmaz. Çünkü bu dönemde yazılan şiirlerin anlamsız ve tuhaf olduğunu ifade eder.[15]
Başka bir yazısında da Ekrem, genç ediplerin edebî kabiliyetlerini yanlış kullandıklarını hatta bu kabiliyetlerinin farkında olmadıklarını; oysa ileride bunların mükemmel birer şair ve yazar olabileceklerini nakleder.[16]

Ekrem, başka bir yazısında da şiirde aradığı hususları (ahenk, uyum, vezin sağlamlığı ve üslûp nazikliği) tekrar ederek bu özellikleri taşıyan şiirin ruhlara bûy-ı nezâheti (incelik kokusu) verdiğini söyler. Eğer bir şiirde yukarıda sayılan hususlar yoksa bunun şiir sayılamayacağı fikrini savunur.[17]

Nâmık Ekrem bu yazılarında sadece şairleri eleştirmez, nasirleri de (düz yazı yazanlar) eleştirir. Hatta nev-residegân diyerek kalem oynatan edipleri tenkit eder.

6) Üslûp

Ekrem, gençlerin önemli eksikliklerinden birini de aynı uslûbu tekrar edip durmaları olarak görür. Üslûbun zaman zaman değiştirilmesi gerekliliğinden bahseder. İfade şekline "yeni yeni renkler, farklı farklı incelikler ve güzellikler verilmeli" der. İster manzum ister mensur olsun aynı üslûp, aynı ifade ediş tarzı okuyucunun hoşuna gitmediği gibi bıkkınlık verir. Eserin konusu güzel olsa bile kelime ve üslûp tekrarı usandırır. Zevk-i selim sahibi kimseler bu hususları asla göz ardı etmez. [18]

7) Nâmık Ekrem'in Beğendiği Şair ve Yazarlar

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[13] "Şi'ir söylemek için cebr-i tabî'at büsbütün bî-fâ'idedir. Zâde-i tâb' olmalı. Şüküfte-i bâğzâr-ı fıtrat bulunmalı, ki her kalbe, her rûha zevk, rikkat, heyecân, incilâ gibi şeyler bahş edebilsin."
[14] "Şi'irde gerçi vehle-i ûlâda aranılacak şey: Rûh-ı me'âl ise de; incelik, âhenk, renk ve bûy-i şi'iriyyet bulunur, evzân ve kavâfîye de ri'âyet edilirse, şi'irin hüsn ü meziyetine renk ve revnak-ı dîğer 'ilâve edilmiş olmaz mı?"
[15] "Tahsîl ve mütâla'aya ihtiyâç zamânlarında şi'ir ve edebiyât ile uğraşmak -bî-me'âl şi'irler meydâna getirmek- tuhaf? Hem pek tuhaf görülür!"
[16] "Fakat nev-resîdegân-ı tahrîr, isti'dâd-ı edebîlerini sû-i isti'mâl ediyorlar. İleride her biri mükemmel bir edîb, gerçekten bir şâ'ir olabilecek nice nev-hevesân edîbimiz var ki… Bunlar mâlik oldukları kâbiliyyet-i meftûre-i edebiyyeden bî-haber… Beyhûde sa'y ile vakit geçiriyorlar. Daha doğrusu 'abesle iştiğâl ediyorlar… Ne gibi"
[17] Beni ağlatma 'arz-ı vuslat kıl!
Ne için sen, beni nizâr etdin
Dili âzâde-i melâmet kıl!
Ne için böyle hâksâr etdin
Ne için böyle dil-figâr etdin!...
mısrâ'larını nazar-ı mütâla'adan geçirelim: Ne diyor? Bir kaç def'a daha okuyalım; "Şi'ir"in rûhlara ilkâ etdigi bûy-ı nezâheti, biz bu mısrâ'lardan istişmâm edebilecek miyiz? Nerede?..."
[18] "Meselâ: Bir heveskâr-ı tahrîr:
[(Aslı)nın derd-i şevk-i 'aşkından:
(Kerem) oldum, (Kerem) gibi yanarım]
gibi udhûkeler/gülünecek şeyler, u'cûbelerle imlâ-yı sahâyif etse bunu kim okur? Okunsa bile bu safsatalardan ne lezzet hissolunur? Hîç!!.
[Küsme yârim, barışalım hep kabâhat bendedir.]
gibi 'Âşık Ömer'imsi birçok gazellerde görülüyor. Artık böyle gazelleri okuyup da zevk alana 'aşk olsun!..."

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Nâmık Ekrem'in beğenip de yazılarında ismini andığı şairlerden ilki A. Rahmî Beydir.[19] Ekrem, şairin "Mayıs Sabâhı" adlı manzumesini çok beğenir fakat şiirden örnek vermez. Yine kim tarafından yazıldığı belirtilmeyen Hz. Peygamberin övgüsündeki "Sitâyiş-i Peygamberî" isimli şiirin mükemmel olduğunu ifade eden Nâmık Ekrem, şiirdeki "ulviyyet ve kudsiyyet"in her şairin havsalasına sığmayacağını, "elfâzındaki insicâm ve letâfete, âhengindeki ihtişâm ve nezâhete" hayrân olduğunu söyler ve manzumeden bazı bölümleri örnek verir.[20]

Nâmık Ekrem, şiirde olduğu gibi nesirde de beğendiği yazarların ismini vermekten çekinmez. Ekrem, bu yazarları "gönül süsleyen sima, gönlün kabul ettiği başka bir tarz, ilim sahibi, bilgili, hürmete değer, gönülde taht kuran eşsiz tarz sahipleri" olarak görür. Bu yazarlar Hâlid Ziyâ (ö.1945), Safvetî Ziyâ (ö. ?) ve Ahmed Hikmet (ö.1927) Efendilerdir.[21]
Nâmık Ekrem, özellikle Halid Ziya'nın "kamçılarım" tabirini çok beğenir. Fakat nev-residegânın, üç beş manzume yazan müteşairin (şair geçinenler) bu kelimeyi anlamadığı gibi yerinde kullanmadıklarından yakınır. Hatta "çırpınmak, gıcıklamak, hırpalamak…" gibi kelimeleri, yerinde kullanılması şartıyla tavsiye eder.[22]

8) Kafiye Yanlışları

Tanzimat ve Servet-i Fünûn dönemlerinde şairlerin en çok tartıştığı konulardan biri de kafiyedir. Özellikle Recâi-zâde Mahmut Ekrem (ö.1914) ile Muallim Nâcî (ö.1893) arasındaki "abes-muktebes" tartışmaları (Kolcu 2007: 228-29), eski ile yeni şiirin bir nevi mücadelesi olup edebiyat tarihimizde önem arzetmektedir. Birecikli Nâmık Ekrem, ileri sürdüğü eleştirilerle, kafiyenin göz için olduğu görüşünü savunan Muallim Nâcî'nin izinden gittiği anlaşılır. Bu yönüyle şairimizin divan şiirinde savunulan kafiyeden yana tavır aldığını söyleyebiliriz.[23]

9) Dil Yanlışları

Nâmık Ekrem, *Bahâr-ı Edeb*'teki yazılarında en çok da dil yanlışları üzerinde durur. Ekrem hemen hemen her yazısında bu dil yanlışlarına değinir. İsim vermeden zamanın yeni yetişen şair ve yazarlarını eleştirerek Türkçeyi iyi kullanamadıklarını, gerek mensur ve gerekse manzum eserlerde hataya düşdüklerini ileri sürer. Şairin dile getirdiği hususları alt başlık şeklinde şöyle sıraladık:

A) Farsça Tamlamalar

Ekrem, yeni yetişenlerin Farsça isim ve sıfat tamlamalarını yanlış kullandıklarını örnek vererek eleştirir. Malum olduğu üzere, Farsça isim ve sıfat tamlamaları Arapça tamlamaları gibi muzaf (tamlanan) ve muzafün-ileyh (tamlayan) arasında uyum olmalıdır. Yani biri tekilse diğeri de tekil, biri müennesse diğeri de müennes olmalıdır. Ekrem bu konuda önce kuralı söyler. Sonra yapılan yanlışları doğrusuyla ve gerekçesiyle birlikte örnek vererek açıklar.

a) Muzaf-muzafün-ileyh İlişkisi

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[19] Bu şahıs hakkında kesin bir bilgi bulamadık.

[20] **"Sitâyiş-i Peygam-berî**

[Bir mihr-i hidâyetle münevver, mütemâdî
Ufk olmada meşhûn-ı füyûzât-ı nühüfte…
Bir müjde-i kudsî vererek derdi münâdî:
"Peygam-ber-i zî-şân-ı İlâhî budur işte…"
Kur'an'ı dedikçe: [Bırakın, şirk ü fesâdı;
Lebbeyk-zen-i tâ'at olurdu o bevâdî]

İşte diyebilirim ki bu da bir şi'ir, bir şi'r-i 'ulvî vü kudsîdir. Hem şi'ir de böyle olmalıdır. Rûhda ba'zan teheyyüc, ba'zan hüzn ü rikkat, ba'zen incizâb u hayret hâsıl etmelidir. Kalbde hiss-i 'ulviyyet, meyelân-ı bedâyi', perestiş-i mehâsin, hubb-i nezâhet beslemelidir."

[21] "…Mütefennin, ma'lûmâtlı şâ'irlerimizin, muhterem edîblerimizin tarz-ı bedî'-i dil-nişînlerini ta'kîb edelim! Ez-cümle Hâlid Ziyâ, Safvetî Ziyâ, Ahmed Hikmet Beyfendîlerinin üslûb-ı merğûb-ı müzeyyinlerini -hüsn-i sûretle- taklîd edecek olursak… Bizim için ne kadar iyi olur!"

[22] "Çırpınmak, gıcıklamak, hırpalamak… lafızları mevki'inde kullanılırsa pek güzel! Bir diyeceğimiz kalmaz. Lâkin bu gibi kelimelerin mevki'-i isti'mâllerini bilmek de 'amîk-i mütâla'a ve tetebbu'a muhtâç olduğunu unutmayalım. Yoksa her kaleme sarılan nev-resîde, her üç beş manzûme yazan müteşâ'ir bunların hüsn-i isti'mâlinde çoook güçlük çeker."

[23] "Birçok kelimelerde (ḥ) ile (ẖ) karıştırılıyor. Meselâ: (meshûr/sihirlenmiş, ḥûr, ḥafr/kazma, ḥazâkat/ustalık, ḥüzn…) gibi kelimelerde (ḥ) üzerine nokta konuluyor. Ve (maẖmûr, ḫaşîn, ḫâre) gibi lafızların (ẖ)larında nokta görülmüyor. Öyle bellenmiş, öyle yazılıyor. Eee; ya ma'nâ degişiyorsa, büyük hatâ olmaz mı?
Bir de "mübhem" ile "ârâm", "esrâr" ile "yer" nasıl takfiye ediliyor?"

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"Arabî masdarlardan Türkçede isti'mâl olunanlarının nihâyetlerinde (te) var ise bunlar hem müzekker hem mü'ennes bir sıfat alabilir."

-"safvet-i bâhire": "safvet-i bâhir" ikisi de câ'iz.

-"sükûn-ı dâ'ime" terkîbi yanlıştır; "sükûnet-i dâ'ime" demeli.

-"iktidâr-ı kalemiyye", terkîbi mutâbakatsızdır, "iktidâr-ı kalemî" demeli.

-"tedâvî-i lâzıme, tedâvî-i 'âcile…" gibi terkîbler de yanlıştır. "iktidâr, tedâvî…" kelimeleri müzekkerdir sıfatları niçin müennes olsun?

-"bir leyl**e**-i ğarrâ" yerine "bir leyl-i münevver" demek gerekir.

-"hâl-i ğunûdîsi (istirahat/uyumuş hali)" değil "hâl-i ğunûdunu",

-"nâzî-i yâr": "nâz-ı yâr" yazılmak münasiptir.

-"nevâzî-i dildâr": "nevaziş-i dildâr",

-"menâkıb**ât**-ı ğarâm" (sevda menkıbeleri)

-"müşâfeh**ât**-ı mezheb" (mezhebin yüz yüze konuşması) denilebilir mi 'aceb?!

-"deşt-i hâre": "deşt-i âteşîn" veya "deşt-i hâr",

-"'aşk-ı nâ'imî": (uyumaya mensup aşk),

-"rûh-ı sâhirî": (gece uyumayan ruh) terkîb-i tavsîfîleri de hatâlıdır. Zâten (nâ'im, sâhir) sıfat makâmında müsta'meldir. Bir de yâ-yi nisbî ilâvesine ne gerek var?" der.

-"mest-i sûr!" (düğün/sevinç sarhoşu) terkîbi manîdârdır.

Nâmık Ekrem, tamlamayı oluşturan kelimelerin yani muzaf ve muzafün-ileyhin aynı dilden olmasını önemser. Fakat Osmanlı Türkçesi'nde Arapça'nın bu kuralına pek de uyulmadığı bilinir. Hatta Türkçe kelimelerle Farsça tamlama oluşturulduğu da görülür (alay-ı Hümâyûn gibi). Şair şağıdaki örnekleri vererek eleştiride bulunur:

-"ıztırâbât-ı derûniyye: "ıztırâbât-ı kalbiye",[24]

-"sirişk-i lâmi'a": "sirişk-i nûrânî",

-"fevka'l-ümîd" denilemez. (ümîd) kelimesi Fârsîdir. Ne harf-i tâ'rîf ve ne de tenvîn kabûl eder. Buna bedel "fevka'l-me'mûl", denilse febihâ /ne güzel..."

-"ahvâl-i **nâ**-marziyye",

-"âfâk-ı **nâ**-mer'iyye" gibi terkîbler kural dışıdır. Farsça olumsuzluk edadıtı (nâ)'nın yersiz kullanıldığını ifade eder.

-"ahvâl-i ğayr-ı marziyye…" diyelim, daha muvvâfıktır.

b) Galat Terkipler

Osmanlı Türkçesi'nde galat kullanımların yaygın olduğu bilinir. Hatta "Galat-ı meşhur lügat-ı fasihten evladır." sözü durub-ı emsal hükmüne geçmiştir. Nâmık Ekrem bu konuda da bazı kullanımları eleştirir:

-"tırâzende-i hüsn": (güzel donatıcı) "hüsn-i tırâzende" (süsleyici güzel),

-"tâbende-i cemâl": "cemâl-i tâbende", (parlayan güzel) demenin daha uygun olduğunu söyler.

-"tarab-ı sâz": "tarab-sâz" (neşe ve sevinç veren, nağme düzen)

-"hüsn-i lâmi'a": (parlayan güzel) terkîbi de ğalattır. "Hüsn-i tâbân", "hüsn-i münevver", "hüsn-i ziyâ-bâr" gibi terkîblerden biri kullanılmalı.

-"kenâr-ı mâder" de ma'nîdârdır. "Âğûş-ı mâder" denilecek olsa şiirin veznine halel gelir. Bunu lisân-ı şi'ire vâkıf olanlar tecvîz etmezler.

-"nevâ-yi lâmi'a": (parlayan neva, ahenk) terkîbini kullanmakta ne mecbûriyet var?! der.

-"Bir tefelsüf-i perrân" (uçucu felsefe sözleri söyleme). İşte cicili bicili bir terkîb size... İşiniz yoksa anlamağa çalışınız.

-"Galeyânî-i hissiyât" terkibindeki (galeyân) kelimesinin âhirinde (ye) ne arar? Bî-lüzûmdur.

-"Müntesebîn-i erbâb-ı fünûndan biri…" ibâresinde dürüst bir ma'nâ anlayamadık. 'Acabâ "erbâb-ı fünûnun-âşinâlarından biri...] denilmek mi isteniliyor?

-"bahr-ı şîrîn-mezâk" (tatlı zevk denizi) yeni işitilen bir sıfat olduğunu dile getirir.

10) Farsça Kelimelere Arapça Ek Getirmek

Nâmık Ekrem, Osmanlı Türkçesi'nde normal karşılanan bazı tasarrufları eleştiri konusu yapar. Farsça "mâh, bahâr ve mâtem" gibi kelimelere Arapça "-iyyet" mastar ekinin getirilerek kullanılmasının uygun olmadığını söyler. Bunların yerine, aynı anlama gelen Arapça kelilerin kullanılmasını önerir. Örneğin "Mâtemiyyet"

[24] "Ba'zı âsâr-ı mensûrede görülen [ıztırâbât-ı derûniyye] terkîbi yanlıştır. Çünkü (ıztırâbât) 'Arabî, (derûn) Fârisî. Bunlar arasında mutabâkat câ'iz olamaz."

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kelimesini "Fârisî bir kelimenin âhirine (-iyyet) masdar alâmeti ilâve olunur mu hîç?!..." diyerek bu kullanımı yanlış bulur. [25]

11) Anlam Yanlışlıkları

Şair, yeni yetişenlerin, anlamı düşünmeden kelimeleri yerli yersiz kullandıklarını ifade ederek şu örnekleri verir:

-"bir eşi'a" (bir aydınlıklar):" bir şu'â"[26]
-"ahmerîn": (kızıllı),
-"asferîn": sarılı) gibi kelimelerin nihâyetindeki (în) fazla değil midir? diye sorar.
-"bir zerrâ'" (bir ekinci, ekin yapan, çiftçi) denilemez, kâ'ideten "bir zârî (bir çiftçi)" yâhûd "bir zirâ'atkâr" demeli.
-"perestîde-i kalb" (kalp sevgili),
-"nev-resîde-i hayâtıma" (hayatın yeni yetişeni),
-"nedîme-i rûhuma" (ruh arkadaşı) ifadelerini hezeyan olarak değerlendirir.[27]
-"teşfîye (iyileştirme) ve teşmîl" kelimelerine mukâbil "işfâ', ta'mîm" yazılmak muvâfık görülüyor.
-"sûzişter" olamaz! "sûzişînter" yazılmalı.

12) Arapça Kelime İle Türkçe Yardımcı Fiil Uyumu

Arapça isimlerin Türkçe yardımcı fiirlerle kullanımı çok yaygındır. Ancak her Arapça isme her Türkçe fiil getirilemez. Nâmık Ekrem haklı olarak, aşağıdaki örneklerin Türkçenin söyleyişine ve akıcılınağa uymadığını söyleyerek eleştirir:

-"ta'zîz kılacak" (izzetlendirme kıl-) ,
-"telzîz kılacak…": (lezzetlendirme kıl-)
-"Rüzgâr hafîf hafîf vezân ediyor"**:** (vezân oluyor.)
-"Vakit güzerân ediyor": (güzerân oluyor.)
-"sebkat eden" (geçme, ilerleme eden): "sebk eden" (ileri geçen, kazanan) olmalı.

13) Yanlış Edat Kullanımı

Ekrem, Arapça "a'lâ ve evlâ" gibi kelimelerin önlerine Türkçe "daha" edatı getirerek "daha a'lâ", "daha evlâ" gibi yazmak kural bilmemekten kaynaklandığını söyler.[28]

"Kat-ender-kat" denilemez. (ender) edâtı Fârsçadır, iki Türkçe kelimenin arasına sokuşturulamaz. (Kat kat) diyelim yine ma'nâ-yı te'kîd (pekiştirme) anlaşılır.

-"gün-be-gün", ta'bîri de böyledir. "Günden güne", denilirse ne hoş!
-"ey cânâ!" denilemez. "cânâ"nın nihâyetindeki elif harf-i nidâ (seslenme edatı)dır. (Ey) getirmeye lüzûm yok.

14) Yanlış Bağlaç Kullanımı

Yeni yetişenlerin "de" bağlacıyla "-de" ekini bile katıştırdıklarını oysa "de" bağlacının her zaman ayrı yazılması gerektiğini vurgular.

15) Arapça Kelimeleri Yanlış Telaffuz Etme

Alıntı kelimelerin Osmanlı Türkçesi'nde telaffuzu başlı başına bir mevzudur. Ekrem, vezinli olarak okunan Arapça kelimelerin Türkçe'de nasıl dikkat edilmeden kullanıldığına bir kaç örnek verir:

-"Avân" Arapça "ân" kelimesinin çoğuludur. Zamân gibi okunur "Âvân" şeklinde okunmamalıdır.
-Kandîl'in çoğulu "kanâdîl"dir, "kânâdîl" olamaz der.

Nâmık Ekrem, Türkçe kelimeleri herkes istediği gibi kullanabilir ancak Arapça kelimeleri istediği gibi kullanma salahiyetine/yetkisine sahip olmadığı görüşündedir. Mesela Arapça "mukmir" kelimesini yanlış kullanıldığını

[25] "Mâhiyye, bahâriyye...) misillü kelimelerin nihâyetlerine (ye) nereden geliyor? (Mâh, bahâr) kelimât-ı Fârsiyedendir. Bu sûrette isti'mâlleri câ'iz olamaz. Bunlara bedel 'aynı ma'nâda (rebî'iyye, kâmeriyye…) demiş olursak hoşa gitmez mi?"

[26] "Hele bir eşi'a: hîç denilemez… Kâ'ideten (bir şu'â') denilmeli."

[27] -"Güzelsin sevdigim bir nev-nihâlin ebr-i alından"
ma'nâ aranıldıkda: [Sevdigim! Sen, yeni bir fidânın al bulutundan güzelsin…] şeklinde nesre aktarılabilen mısradaki "al bulut/kırmızı bulut" ifadesinin anlamsız olduğunu mananın lafza feda edildiğini söyler.

[28] [A'lâ, evlâ] gibi kelimelerin evvellerine bir (daha) edâtı getirerek (daha a'lâ), (daha evlâ) sûretlerinde yazmak da kâ'ide nâ-şinâslık sayılır.

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söyler. Çünkü "mukmir" "ef'âl" bâbından "ism-i fâ'ildir" "tef'îl" bâbından "ism-i mef'ûl" şeklinde anlaşılmamalıdır. Bu tür yanlış kullanımlara özellikle şiirde dikkat edilmesinin gereğinden bahseder.[29]
Yine Arapça "tıbk, ayn ve ba'z" kelimelerinin kullanımına dair bir kural hatırlatır. Bir isimle birlikte kullanıldığında "tıbkı, aynı ve ba'zı" şekillerini örnekle izah eder.[30]

16) Çoğulun Çoğulu (Cem'u'l-Cem')

Nâmık Ekrem, Türkçe'de özellikle alıntı kelimelerde görülen çoğulun çoğulu kullanımının biçimsiz olduğunu söyler. Alıntılanan dilde çoğul olduğu halde Türkçenin çoğul eki olan "-ler, -lar" ekinin ilavesiyle bu durum ortaya çıkar. Bu kelimelerin bir kısmı dilimizde galat olarak kullanılmaktadır.

-"Ma'âlîyât" (yüksek fikirler, ululuklar) yerine "ulviyyât (yücelikler) kelimesinin daha uygun olduğunu dile getirir. Ma'âliyyât kelimesi çoğulun çoğuludur. Bu da (masârifât) gibi biçimsiz...

-"Melâ'ikeler, masârifler, 'ameliyâtlar..." kullanımı yanlıştır. [Melekler, masraflar, 'ameliyeler…] diyelim.

17) Arapça Kelimeleri Yanlış Yazmak

Edebiyat kelimesinin elifî üzerine hemze (ء) işâreti koyarak yazmak. Yine Arapça "lâkin" kelimesindeki elif yazılmadığı halde uzun okunuşundan dolayı bu kelimeyi (لاكن) şeklinde yazmanın yanlışına dikkat çeker.[31]

Sonuç

Görüldüğü üzere Nâmık Ekrem, yaşadığı devrin eli kalem tutanlarının yazılarında yaptıkları yanlışları görmezden gelmeyerek o yazıları dikkatle okur; kendince tespit ettiği imlâ, kelime ve kelime grubu yanlışlarını yazılarında işleyerek yeni yetişen gençlere yol gösterir. Nâmık Ekrem bu eleştirileri yaparken isim vermeden ve kimseyi incitmeden bir münekkit duyarlılığıyla tespitlerini ortaya koyar. Böylece yeni yetişen şair ve yazarlara yol göstererek muallimlik ve münekkitlik görevini deruhte eder.

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[29] Meselâ "*Bir leyl-i mukmirdeki âheng-i latîfî…*" bu mısrâda "mukmir" kelimesi "musavver" gibi okunsa manasız olur. "mürşid" gibi, doğru okunsa da vezin bozulur.
[30] "*Tıbk, 'ayn, ba'z" kelimeleri bir isme izâfe olunursa 'alâ-hâlihi (olduğu gibi) kullanır. Ba'zan ara yere elfâz-ı Türkîden biri girerse ('aynı, tıbkı, ba'zı) sûretlerinde isti'mâle cevâz verilmiştir.*
"Derler ki bu 'âlemde lisân, ***'aynı*** *bir insân"*
mısrâ'ında olduğu gibi. Kural bu."
[31] "Hele (lâkin) lafz-ı 'Arabîsini (lâkin) sûretinde yazmak ne kadar tuhaf!.. Türkçe kelimeleri, ne ise, istedigimiz gibi -bir dereceye kadar- isti'mâl ediyoruz. Ya bu gibi 'Arabî kelimelere dokunmağa ne salâhiyyetimiz vardır"

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NEAR-FAULT, FAR-FIELD GROUND MOTION EFFECTS ON THE EARTHQUAKE PERFORMANCE OF RC BUILDINGS CONSIDERING VARIOUS CONCRETE STRENGTHS

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Abstract: Earthquakes can cause a high risk in reinforced concrete (RC) structures. The reasons of the damage can be very various- the two of them are the distance between the buildings constructed in active faults and concrete strength. After Van Earthquake occurred on 23rd of October 2011 and 9th of November 2011 in Van, demolished or damaged buildings were determined. As a result, one of the most important reasons of damage was that concrete strength was too lower than the expected strength. As the distance from a structure to epicentre is near so the effects of near-fault earthquake motions on structures are bigger. The main purpose of this study is to examine the change of the structural performance of existing buildings having the same reinforced concrete (RC) load-bearing system but different concrete strengths in a seismic zone considering different distances to the epicentre. For this purpose, various concrete strengths have been selected among the reports which were prepared after Van earthquake and 1989 Loma Prieta earthquake accelerograms have been used in this study. Structural performances of three story buildings with three bays which have various concrete strengths and the different distances to epicentre are compared. Time history analyses of a multi-story building by mode superposition method are performed in the numerical solutions. The maximum internal forces and relative displacements in the scenarios are compared to evaluate earthquake performance of the frame systems. National specification TEC-2007 is used in the numerical analyzes and evaluations. According to the obtained numerical results, the distance from RC building which has different concrete strength to the epicentre has significant effects on the behavior of the RC load-bearing system.

Keywords: Concrete strength, Earthquake performance, Far-field effect, Near-fault effect, Reinforced concrete structure

FARKLI BETON DAYANIMLARINA SAHİP BETONARME YAPILARIN YAPISAL PERFORMANSINDA YAKIN FAY ETKİSİNİN ARAŞTIRILMASI

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Özet: Depremler betonarme yapılar için büyük risk yaratırlar. Betonarme yapılarda hasara yol açan sebepler çok çeşitli olmakla birlikte yapının beton dayanımı ve aktif faylara olan uzaklık bu sebeplerden bazılarıdır. 23 Ekim ve 9 Kasım 2011'de Van'da meydana gelen depremlerden sonra hasarlı ve yıkılan binalarda incelemeler yapılmış ve hasara sebep olan en önemli etkilerden birisi olarak, elde edilen beton dayanımının beklenenin çok altında çıkması gösterilmiştir. Yapının depremin odak noktasına (episentır) yakınlığı yakın fay etkisi olarak isimlendirilir ve eğer sistemde yakın fay etkisi mevcutsa yapının maruz kalacağı deprem etkisi de o kadar büyük olur. Sözkonusu çalışmanın amacı episentıra farklı uzaklıklardaki aynı taşıyıcı sisteme fakat farklı beton dayanımlarına sahip yapıların yapısal performanslarını ortaya koymaktır. Bu amaçla Van Depremi sonrasında yapılan çalışmalardan çeşitli beton dayanımları seçilmiş, Loma Prieta (1989) deprem ivme kayıtları kullanılmıştır. Üç katlı, üç açıklıklı, farklı beton dayanımlarına sahip ve episentıra farklı uzaklıklarda olan çerçeveler karşılaştırılmıştır. Sayısal çözümlerde mod birleştirme yöntemi dikkate alınarak zaman tanım alanında dinamik analizler gerçekleştirilmiştir. Gerçekleştirilen sonlu eleman analizleri sonucunda, deprem etkileri altında çerçevede oluşan en büyük kesit tesirleri ve rölatif deplasmanlar karşılaştırılarak binanın yapısal performansı değerlendirilmiştir. Çözümleme ve değerlendirmelerde DBYBHY-2007 kullanılmıştır. Elde edilen sayısal sonuçlara göre, farklı beton dayanımlarına sahip binaların depremin odak noktasına olan uzaklıklarının betonarme taşıyıcı sistem davranışı üzerinde belirgin etkilerinin olduğu görülmüştür.

Anahtar Kelimeler: Beton dayanımı, Betonarme yapı, Deprem performansı, Yakın fay etkisi.

Giriş

Türkiye dünyadaki aktif deprem kuşaklarından biri olan Alp-Himalaya Deprem Kuşağında yer almaktadır. Dolayısıyla ülkemizde yapılar için en büyük riski depremler oluşturmaktadır. Binalar henüz proje aşamasında iken deprem etkileri dikkate alınarak tasarım yapılmaktadır. Ancak, fayların türü, kırılma şekli, derinliği vb. etkenlere bağlı olarak depremlerin enerjileri dolayısıyla da yapılardaki etkileri değişmektedir. Bu etkileri indirgemek için fayları tanıyarak özelliklerini bilmek gerektirmektedir. Depremin yapılarda sebep olduğu etkiyi belirleyen en önemli faktörlerden biri de yapının depremin merkez üssüne olan uzaklığıdır. Merkez üssüne 10 km den daha yakın depremler yakın fay yer hareketi olarak adlandırılırken, daha uzaktakiler uzak fay yer hareketi etkileri olarak adlandırılmaktadır (Bayraktar vd., 2009). Deprem hareketi yapının zorlanacağı deprem kuvvetini oluştururken, yapının bu kuvvete karşı direnme kabiliyetinin de yeterli olarak tasarlanmış olması gerekmektedir. Ülkemizde son yıllarda 23 Ekim 2011 tarihinde Van'da yaşanan 7.1 Mw büyüklüğündeki deprem ile 9 Kasım 2011'de 5.7 Mw büyüklüğündeki depremler sonrasında büyük can ve mal kayıpları yaşanmıştır (Teknik Rapor, 2011). 604 kişi ölmüş, 4.152 kişi yaralanmış, 11.232 yapı hasar almış ve 60.000 kişi evsiz kalmıştır (AFAD, 2011). Yerinde yapılan incelemelerde bu yıkıcı etkiye sebepler ise yanlış projelendirme, hatalı işçilik ve yetersiz malzeme dayanımları olarak belirtilmiştir (Di Sarno vd.). Hasarlı yapılardan alınan karot numunelerin çıkarılamadan parçalandığı dolayısıyla beton dayanımlarının çok sıkıntılı olduğu da ifade edilmiştir. Söz konusu çalışmanın amacı farklı mesafelerden elde edilen deprem ivme kayıtlarını kullanarak betonarme çerçevelerin deprem performanslarının belirlenmesidir. Burada aynı geometri ve kesit özelliklerine fakat Van Depremi'nden sonra hazırlanan raporlardan seçilmiş farklı beton dayanımlarına sahip olan betonarme çerçeve sisteme farklı deprem kayıtları uygulanmıştır. Sayısal çözümlerde mod birleştirme yöntemi dikkate alınmıştır. Zaman tanım alanında dinamik analizler yapılmıştır.

Analitik Model

Söz konusu çalışmada fay etkilerinin ve beton basınç dayanımının binaların performanslarına olan etkileri ortaya koymak istenmiştir. Bu amaçla basit bir çerçeve sistem oluşturulmuştur (Şekil 1).

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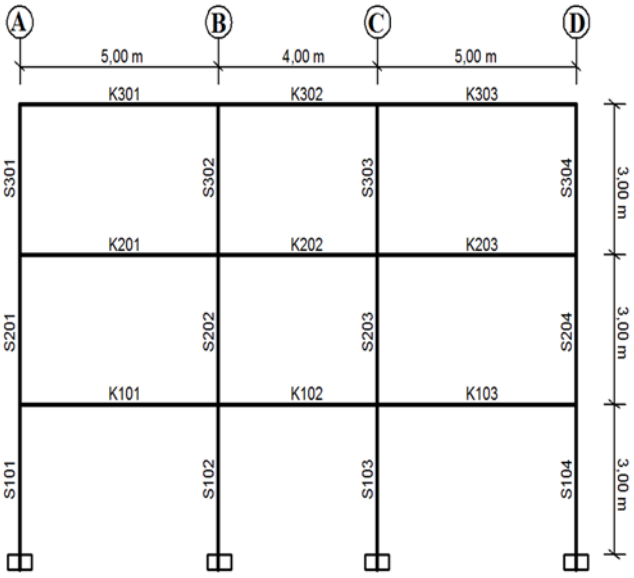

Şekil 1. Çerçeve genel görünüşü

Çerçevede, ikinci değişken parametre olarak beton basınç dayanımları değiştirilmiştir. Seçilen beton basınç dayanımları Tablo 1'de belirtilmiştir.

Tablo 1. Beton malzeme özellikleri

No	Basınç Dayanımı (MPa)	Elastisite Modülü (MPa)
1	20	28000
2	4.7	10840

Çerçevenin mevcut eski yapıları temsil ettiği düşünüldüğünden S220 sınıfı çelik kullanıldığı kabul edilmiştir. Çerçeve elemanlarının donatılarına ait özellikler de Tablo 2'de gösterilmiştir.

Tablo 2. Kolon ve kiriş donatı özellikleri

Eleman Tipi	Benzeri Elemanlar	Boyut (cm/cm)	Boyuna Donatı		Etriye	Paspayı (mm)
S 101	S104	40/40	8Ø16		Ø8/200	30
S 102	S103	50/50	10Ø16		Ø8/200	30
K101	K102 K103	25/50	770 mm^2 462 mm^2	770 mm^2 462 mm^2	Ø8/200	30

Deprem etkisi olarak yapıların faylara olan uzaklıkları baz alınmıştır. Merkez üssüne 10 km den daha yakın yapıların yakın fay, 10 km den daha uzak yapıların ise uzak fay etkisinde oldukları kabul edilmektedir (Bayraktar vd., 2009). Söz konusu çalışmada, diğer değişken parametre olan aktif faya uzaklığın yapıların deprem performansına etkisini ortaya çıkarmak için Loma Prieta (1989) Depreminin merkez üssüne 5.1 km, 24.2 km, 93.1 km uzaklıklardaki, aynı taşıyıcı kesit özelliklerine sahip yapıyı etkilediği varsayılmıştır. Dolayısıyla çerçevenin üç farklı mesafelerde ve iki farklı beton basınç dayanımına sahip olduğu kabul edilerek analizler yapılmıştır (Tablo 3).

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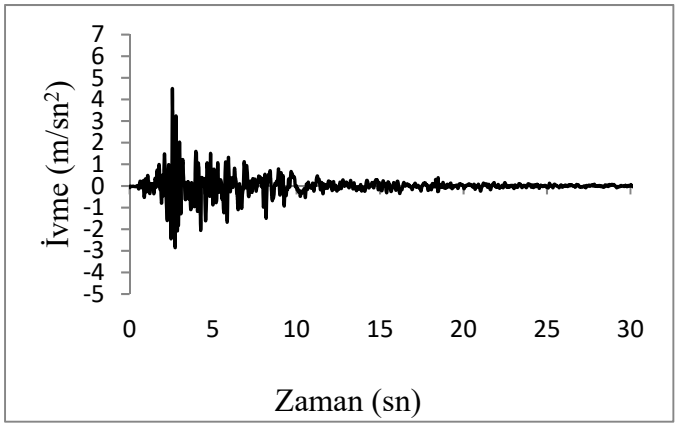
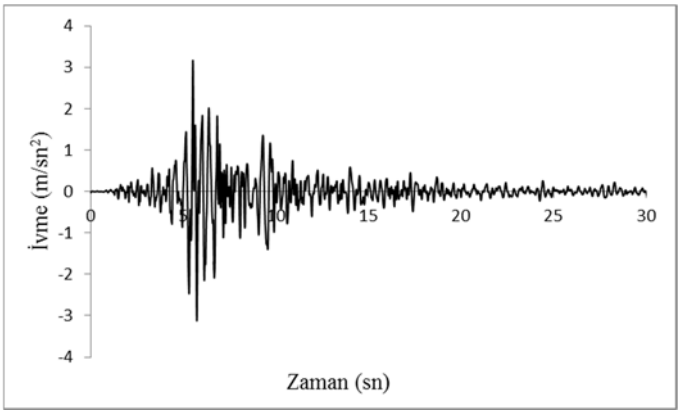
Tablo 3. Analiz senaryoları

Senaryo No	Fay Uzaklığı	Moment Büyüklüğü	Maksimum Yer İvmesi (g)	Beton Basınç Dayanımı (MPa)
Senaryo 1	5.1 km	6.9	0.644	20
Senaryo 2	5.1 km	6.9	0.644	4.7
Senaryo 3	24.2 km	6.9	0.226	20
Senaryo 4	24.2 km	6.9	0.226	4.7
Senaryo 5	93.1 km	6.9	0.124	20
Senaryo 6	93.1 km	6.9	0.124	4.7

Her bir senaryo için SAP 2000 programında zaman tanım alanında mod birleştirme yöntemi dikkate alınarak sonlu analizler yapılmıştır. Bu amaçla senaryolara ait çerçeveler programda modellenmiştir. Daha sonra çerçeve 17 Ekim 1989 tarihinde California'da gerçekleşen Loma Prieta depreminden alınan, merkez üssüne göre farklı uzaklıklardaki deprem ivme kayıtlarına (Şekil 2-4) maruz bırakılmıştır(Peer, 2013). SAP 2000 programında doğrusal çözümler yapılarak faya olan uzaklığa ve beton dayanımına göre çerçevede oluşacak hasar seviyeleri belirlenmiştir. Hasar sınıflandırması ise DBYBHY 2007 Bölüm 7'ye göre yapılmıştır.



Şekil 2. Loma Prieta depreminin 5.1 km için doğu-batı bileşenin ivme zaman grafiği



Şekil 3. Loma Prieta depreminin 24.1 km için doğu-batı bileşenin ivme zaman grafiği

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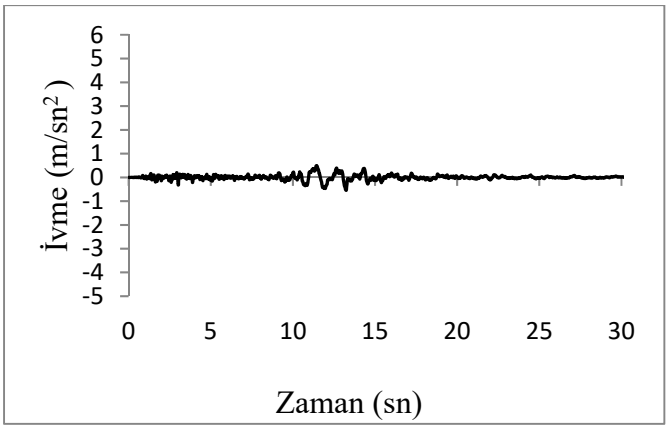

Şekil 4. Loma Prieta depreminin 93.1 km için doğu-batı bileşenin ivme zaman grafiği

Sonuçlar

DBYBHY 2007'ye göre binanın herhangi ardışık iki kat arasındaki yer değiştirme farkını ifade eden kolonların göreli kat ötelemeleri hasar sınırını belirlemektedir. Buna göre herhangi bir kattaki kolonun alt ve üst uçları arasındaki yer değiştirme farkının o kat yüksekliğine oranı 0.01'den küçükse Minimum Hasar Sınırı (MN), 0.01 ile 0.03 arasında ise Güvenlik Sınırı (GV), 0.03 ile 0.04 arasında ise Göçme Sınırı (GÇ) ifade etmektedir. Dolayısıyla katlar arasındaki yerdeğiştirme miktarları önem arz etmektedir. Deprem kuvveti altında senaryolarda meydana gelen yerdeğiştirmeler Tablo 4'de verilmiştir. Tablo 4 incelendiğinde; senaryolar arasında en büyük yerdeğiştirme 21.624 cm ile senaryo 2'de; en küçük yerdeğiştirme ise 1.214 cm ile 5 nolu senaryoda gerçekleşmiştir. Buna göre yerdeğiştirmenin büyük olmasının sebebi çerçevenin merkezüssüne yakınlığı yani yakın fay etkisi ile beton basınç dayanımının en küçük değer olan 4.7 MPa olmasıdır. (Şekil 7).

Tablo 4. Katlarda meydana gelen yerdeğiştirmeler

Senaryo No	Fay Uzaklığı	Beton Basınç Dayanımı (MPa)	1.Kat Yatay Yerdeğiştirmesi (cm)	2.Kat Yatay Yerdeğiştirmesi (cm)	3.Kat Yatay Yerdeğiştirmesi (cm)
Senaryo 1	5.1 km	20	6.356	13.886	20.002
Senaryo 2	5.1 km	4.7	7.895	14.998	21.624
Senaryo 3	24.2 km	20	1.335	3.327	4.189
Senaryo 4	24.2 km	4.7	1.402	3.389	4.296
Senaryo 5	93.1 km	20	1.214	2.668	3.783
Senaryo 6	93.1 km	4.7	1.225	2.762	3.982

DBYBHY 2007'ye göre belirlenen hasar sınıflarına ait değerler ise Tablo 5'de verilmiştir. Söz konusu tablo incelendiğinde en büyük göreli öteleme oranı 0.0263 ile Senaryo 1'de gerçekleşmiştir. Daha önceden de belirtildiği üzere öteleme oranı 0.01 Minimum Hasar Sınırı ile 0.03 Güvenlik Sınırı arasında kalmıştır. Bu sebeple kesit belirgin hasar almıştır. Bu hasarın sebebi ise yapının depremin merkez üssüne yakın olması ve beton basınç dayanımının çok düşük olmasıdır. Yakın fay haricindeki (Senaryo 1 ve 2) diğer bütün senaryolarda kesitlerdeki hasar Minimum Hasar Sınırından küçük değerler almıştır, dolayısıyla sistem minimum hasar bölgesindedir. Sonuçlar açıkça göstermektedir ki yapı depremin merkez üssüne ne kadar yakınsa, depremde göreceği hasar da o kadar etkilidir.

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Tablo 5. DBYBHY 2007'ye göre hesaplanan göreli kat öteleme oranları ve hasar sınıfları.

Senaryo No	Fay Uzaklığı	1.Kat Göreli Öteleme Oranı	2.Kat Göreli Öteleme Oranı	3.Kat Göreli Öteleme Oranı	Hasar Sınıfı
Senaryo 1	5.1 km	0.0211	0.0251	0.0203	MN<GV
Senaryo 2	5.1 km	0.0263	0.0236	0.0221	MN<GV
Senaryo 3	24.2 km	0.0044	0.0066	0.0028	<MN
Senaryo 4	24.2 km	0.0047	0.0066	0.0030	<MN
Senaryo 5	93.1 km	0.0040	0.0048	0.0037	<MN
Senaryo 6	93.1 km	0.0041	0.0051	0.0040	<MN

Deprem etkileri altında sistemin çözümlenmesi sonucunda herbir senaryoya ait bütün kesitlerdeki momentler incelenmiştir. Maksimum momentlerin ait olduğu kesitler belirlenerek Tablo 6 oluşturulmuştur. Tablo 6'ya göre, en büyük moment 1674 kNm ile senaryo 2'de ortaya çıkarken, en küçük moment ise 223.18 kNm ile senaryo 5'de ortaya çıkmıştır. Yine beklendiği üzere en büyük iç kuvvet yakın fay etkisinde ve en zayıf beton basınç dayanımına sahip olan senaryoda ortaya çıkmıştır. Buradan da açıkça görülmektedir ki, merkez üssüne yaklaştıkça moment değerleri de artmaktadır.

Tablo 6. Maksimum momentler ve ait olduğu kesitler.

Senaryo No	Maksimum Moment	Yeri
Senaryo 1	1568 kNm	S101,S102
Senaryo 2	1674 kNm	S101,S102
Senaryo 3	317.68 kNm	S101,S102
Senaryo 4	326.85 kNm	S101,S102
Senaryo 5	223.18 kNm	S101,S102
Senaryo 6	252.87 kNm	S101,S102

Söz konusu çalışmada, yakın ve uzak fay etkilerine maruz iki farklı beton dayanımına sahip betonarme çerçeve sistemlerin mod birleştirme yöntemiyle zaman tanım alanında çözümleri yapılmıştır. Tablolar incelendiğinde açıkça görülmektedir ki yapının depremin merkezüssüne yakınlığı arttıkça hasar seviyesi de artmaktadır. Ayrıca beton dayanımının düşmesi de davranışı olumsuz yönde etkileyen faktörlerin başında gelmektedir. Proje aşamasında aktif faylar incelenerek yapının faya yakınlığına dikkat edilmelidir. Şantiyede dökülen beton dayanımının projede belirtilen değerden az çıkmamasına dikkat edilmelidir.

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NEIGHBOR INTEGRITY OF HARARY GRAPHS

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Abstract: A network is a series of interconnected centers and transmission paths. A system like transportation, communication, computer, logistics, etc., constitutes a network. Failure of the links between stations, break down the centers, software faults on the network, hardware malfunctions, transmission errors that may occur in various centers affect the quality of service to be received over a network, more importantly, it causes a long interruption. In such a situation, to know the vulnerability, the resistance of the network to disruption of operation after the failure of certain stations or links until the system break down completely, is becoming important. A network can be modelled by a graph representing the centers by vertices and the links between the centers by edges. Various vulnerability parameters were defined in graph theory to study the vulnerability of the networks. Connectivity, integrity, toughness, tenacity, scattering number and rupture degree are some of the vulnerability parameters defined in graph theory. But in spy networks, if a spy or a station is revealed, then the adjacent stations cannot be trusted. Neighbor integrity is a vulnerability parameter that considers the neighborhoods and hence can be applied to the spy networks. The neighbor integrity of a graph G is defined to be $NI(G) = \min_{S \subseteq V(G)} \{|S| + c(G/S)\}$ where S is any vertex subversion strategy of G, and c(G/S) is the order of the largest connected component of G/S. In this study, we deal with the problem of computing the neighbor integrity of Harary graphs which are the graphs having maximum possible connectivity with the minimum number of edges and hence many researchers are interested in studying its stability properties.

Keywords: Graph Theory, vulnerability, neighbor integrity, Harary graphs.

Introducton

A network consists of centers and lines which connect the centers. A network can be divided into different networks or it can be formed by many sub networks. Failure of / break down the links between centers, failure of the centers, software faults on the network, hardware malfunctions, transmission errors that may ocur in various centers affect performance of a network more importantly. They can cause an interruption on the received service over a network for a long time. The resistance of the network to disruption of operation after the failure of certain stations or links until performance of the network completely stops is called vulnerability. To learn about the vulnerability of the network is very important for the network designers and network analysts. It provides the construction of the network to be designed both in the most appropriate way possible against the threat and in a manner which provides the reconstruction of the network exposed to a damage in a short time. There are different network topologies such as path, tree, star topology and each network topology has advantages and disadvantages. When a network topology need to be modelled mathematically, usage of graph theory emerges as one of the ways of modelling. In a network topology, a network can be modelled by a graph representing the centers by vertices and the links between the centers by edges. Various vulnerability parameters were defined in graph theory to study the vulnerability of the networks. These parameters can be evaluated by using the number of the elements that are not working, the number of the sub networks, and the number of elements in the remaining largest network that can still mutually communicate. Connectivity (Harary, 1969), integrity (Barefoot, 1987), toughness (Goddard, 1990), tenacity (Cozzens et al., 1995), scattering number (Jung, 1978) and rupture degree (Li, 2005) are some of the vulnerability parameters defined in graph theory. Some informations about the vulnerability of the network modelled by graphs can be obtained by using these graph parameters.

The basis of these parameters is the connectivity which is the minimum number of centers that must be removed to disconnect the network. Network designers and network analysts want to design a network which is more reliable or less vulnerable. So they want maximum possible connectivity whereas they want minimum number of edges for the lowest cost network.

For any fixed integers m and n such that $n \geq m + 1$, Harary constructed the class of graphs $H_{m,n}$ which are m-connected with the minimum number of edges on n vertices. So Harary graphs have the maximum possible

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connectivity with the minimum number of edges and hence many researchers are interested in studying its stability properties (Harary, 1962). Three cases are followed to create Harary graphs:

Case 1: If m is even, let $m = 2k$, then $H_{m,n}$ has vertices $0,1,2,\dots,n-1$, and two vertices i and j are adjacent if and only if $|i-j| \leq k$, where the addition is taken modulo n.

Case 2: If m is odd $(m > 1)$ and n is even, *let* $m = 2k+1$ $(k > 0)$, then $H_{m,n}$ is constructed by first drawing $H_{2k,n}$ and then adding edges joining vertex i to vertex $i + \frac{n}{2}$ for $1 \leq i \leq \frac{n}{2}$.

Case 3: If m is odd $(m > 1)$ and n is odd, let $m = 2k+1$ $(k > 0)$, then $H_{2k+1,n}$ is constructed by first drawing $H_{2k,n}$ and then adding edges joining the vertex i to $i + \frac{n+1}{2}$ for $0 \leq i \leq \frac{(n-1)}{2}$.

Note that under this definition, the vertex 0 is adjacent to both the vertices $\frac{(n+1)}{2}$ and $\frac{(n-1)}{2}$. Again note that all vertices of $H_{m,n}$ have degree m except for the vertex 0, which has degree $m+1$.

In particular, if a vertex loses its function in the security system or in spy networks then adjacent vertices become disfunctional in the same way. With this in mind, many neighbor vulnerability parameters were determined. One such parameter is the neighbor integrity. The concept of neighbor integrity was introduced by Cozzens and Wu in (Cozzens et al., 1996).

Let G be a simple graph without loops and multiple edges and let u be any vertex in G. The set $N(u) = \{v \in V(G); v \neq u, v$ and u are adjacent$\}$ is the open neighborhood of u and $N[u] = \{u\} \cup N(u)$ denotes the closed neighborhood of u. A vertex u in G is said to be subverted if the closed neighborhood of u, $N[u]$, is removed from G. A set of vertices $S = \{u_1, u_2, u_3, \dots, u_m\}$ is called a vertex subversion strategy of G if each of the vertices in S has been subverted from G. If S has been subverted from the graph G, then the survival subgraph is disconnected, a clique or an empty graph. The survival subgraph is denoted by G/S. The neighbor integrity of a graph G is defined to be

$$NI(G) = \min_{S \subseteq V(G)} \{|S| + c(G/S)\}$$

where S is any vertex subversion strategy of G and $c(G/S)$ is the maximum order of the components of G/S (Cozzens et al., 1996).

Neighbor Integrity of Harary Graphs

In this section, we investigate lower and upper bounds of the neighbor integrity for the three cases of the Harary graphs.

Theorem 1. Let $H_{m,n}$ be a Harary graph with $m = 2k$ and $n \geq 3$. Then the neighbor integrity of $H_{m,n}$ is

a) If $1 \leq k \leq \left\lfloor \frac{n}{2} \right\rfloor$, then

$$NI(H_{m,n}) = \begin{cases} \lceil 2\sqrt{n} \rceil - (2k+1), & \text{if } 1 \leq k \leq \dfrac{\sqrt{n}-1}{2} \\ \left\lceil \dfrac{n}{2k+1} \right\rceil, & \text{otherwise.} \end{cases}$$

b) If $k > \left\lfloor \frac{n}{2} \right\rfloor$, then $NI(H_{m,n}) = 1$.

Proof. It is obvious that $H_{m,n} \cong C_n^k$. Thus we have $NI(H_{m,n}) = NI(C_n^k)$.

a) For $1 \leq k \leq \left\lfloor \frac{n}{2} \right\rfloor$ we get $NI(H_{m,n}) = NI(C_n^k) = \begin{cases} \lceil 2\sqrt{n} \rceil - (2k+1), & \text{if } 1 \leq k \leq \frac{\sqrt{n}-1}{2} \\ \left\lceil \frac{n}{2k+1} \right\rceil, & \text{otherwise.} \end{cases}$

since it was proved by Cozzens and Wu in (Cozzens, 1998).

b) For $k > \left\lfloor \frac{n}{2} \right\rfloor$, $diam(C_n) = \left\lfloor \frac{n}{2} \right\rfloor \leq k$. Thus we get $C_n^k \cong K_n$. Therefore we obtain

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$$NI(H_{m,n}) = NI(C_n^k) = NI(K_n) = 1.$$

Theorem 2. Let $H_{m,n}$ be a Harary graph with $m = 2k + 1$ and n even, and let $n \geq (4k + 2)(2k + 2)$ and $k \geq 2$. Then the neighbor integrity of $H_{m,n}$ is

$$2\left\lceil\sqrt{n - (2k + 2)}\right\rceil - (2k + 1) \leq NI(H_{m,n}) \leq \gamma(H_{m,n}).$$

Proof. Let S be a subversion strategy of $H_{m,n}$ and let $|S| = r$.

If r vertices are removed from $H_{m,n}$, then we have at least $r - 1$ components and $c(H_{m,n}/S) \geq \frac{n-(2k+2)r}{r-1}$. Hence

$$|S| + c(H_{m,n}/S) \geq r + \frac{n-(2k+2)r}{r-1} \text{ and}$$

$$NI(H_{m,n}) \geq \min_r \left\{r - (2k + 2) + \frac{n-(2k+2)}{r-1}\right\}.$$

The function $f(r) = r - (2k + 2) + \frac{n-(2k+2)}{r-1}$ takes its minimum value at $r = \sqrt{n - (2k + 2)} + 1$. Consequently, we obtain

$$NI(H_{m,n}) \geq 2\sqrt{n - (2k + 2)} - (2k + 1).$$

As the neighbor integrity is integer valued, we round this up to get a lower bound and get

$$NI(H_{m,n}) \geq \left\lceil 2\sqrt{(n - (2k + 2)}\right\rceil - (2k + 1).$$

Fort he upper bound, let S be the minimum dominating set of $H_{m,n}$ and the domination number be $\gamma(H_{m,n})$. Then $N[S] = V(G)$ and therefore we have $c(H_{m,n}/S) = 0$. Since according to the definition we have $NI(G) \leq |S| + c(G/S)$, we obtain an upper bound as $NI(G) \leq \gamma(H_{m,n})$.

Theorem 3. Let $H_{m,n}$ be a Harary graph with $m = 2k + 1$ and n odd, and let $n \geq (4k + 5)(2k + 2)$ and $k \geq 2$. Then the neighbor integrity of $H_{m,n}$ is

$$2\left\lceil\sqrt{n - (2k + 3)}\right\rceil - (2k + 1) \leq NI(H_{m,n}) \leq \gamma(H_{m,n}).$$

Proof.. Let S be a subversion strategy of $H_{m,n}$ and let $|S| = r$.

If r vertices are removed from $H_{m,n}$, then we get at least $r - 1$ components and $c(H_{m,n}/S) \geq r + \frac{n-1-(2k+2)r}{r-1}$. Hence we obtain

$$|S| + c(H_{m,n}/S) \geq r + \frac{n-1-(2k+2)r}{r-1} \text{ and}$$

$$NI(H_{m,n}) \geq \min_r \left\{r - (2k + 2) + \frac{n-(2k+3)}{r-1}\right\}.$$

The function $f(r) = r - (2k + 2) + \frac{n-(2k+3)}{r-1}$ takes its minimum value at $r = \sqrt{n - (2k + 3)} + 1$. Consequently we get

$$NI(H_{m,n}) \geq 2\sqrt{n - (2k + 3)} - (2k + 1).$$

Since the neighbor integrity is integer valued, we round this up to get a lower bound and obtain

$$NI(H_{m,n}) \geq 2\left\lceil\sqrt{n - (2k + 3)}\right\rceil - (2k + 1).$$

For the upper bound, the proof is very similar to that of the previous theorem.

Conclusion

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Connectivity is a basic measure used to determine the vulnerability of a graph. And it is equal to the minimum number of vertices removed from the graph to make the graph disconnected. We always prefer a stable and durable network which has maximum connectivity. Increase in the connectivity also requires an increase in the number of edges but we prefer to use minimum number of edges for a lowest cost network. Ultimately, we have to balance the cost and stability. Harary graphs which have the maximum possible connectivity with the minimum number of edges provide this balance. In this paper we obtained lower and upper bounds for the neighbor integrity of the three cases of the Harary graphs.

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NEW CUFF BLADDER DESIGN USING A FEM 3D MODEL

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Abstract: The aim of this paper is focused on the generation, by using Ansys code, of a FEM 3D model, able to design a new cuff bladder. The work has its origin from the observation that commercial cuffs can produce considerably uneven around the arm pressure distributions. So it is born with the goal of designing a new cuff suitable both for generate a circumferential pressure distribution whose non uniformity is limited and known, and for be used without rotational or towards limitations. The code was validated in previous circumstances and here implemented by the insertion of the bladder in several configurations. The desidered configuration provides for a uniform pressure distribution around the arm. The Young's modulus was extrapolated from the measurements conducted on top forearm by Zheng (1999), taking account of the greater tissue thickness on the mid-arm. For this situation the occlusion pressure of the arterial vessel equal to 17300 Pa (≈ 130 mmHg) has been determined. Then, further 5 configurations, obtained by dividing the bladder in 2, 4, 8, 12 and 16 equal sectors, were analyzed. For each configuration, finally, it was evaluated the pressure required to occlude the arterial vessel in different positions. Regardless of the number of sectors the maximum error that can be made is always less than 1300 Pa (≈ 10 mmHg). This error may be automatically corrected in the NIBP monitor firmware.

Keywords*:* Arm-cuff FEM model, blood pressure measurement.

Introduction

In the bibliography it is well emphasized that numerous factors may influence the accuracy of blood pressure measurements. The use of a wrong bladder size to arm circumferences ratio is the most common cause of measurement inaccuracy. The specific bibliographic field is quite large and articulated, mainly including clinical measurements, recommendations of regulatory Bodies and researches about modeling and simulation. Numerous authors have highlighted the reading differences that it is possible to obtain comparing cuffs of different sizes.
Iyriboz et al. (1994) quantified the reading differences obtained using 12/23 and 15/33 cuffs. Bakx et al. (1997) determined the effects using cuffs having different width and length. Marks and Gronch (XX) came to the conclusion, based on the comparison between auscultatory and direct pressure measurements, that the measurement error can be minimized by using a bladder having width equal to 46% of the arm circumference. Jilek and Stork (2010) analyzed the influence of the bladder width during the use of the radial site. In Reid and Chantler (2002) the corrections made by Maxwell have been reported. Maxwell was one of the first to suggest in 80% the optimum ratio between the bladder length and the arm circumference.
The American Heart Association (AHA) (Pickering 2005) sets four cuff standard sizes, moreover it established that “the ideal cuffs should have a bladder length of 80%, and a bladder width of at least 40% of the arm circumference”. A width/length ratio of 1:2 appears to be optimal, especially regarding the insertion problem around the arm that smaller ratios might entail.
The European Society of Hypertension (ESH) (O’Brien 2003) advises the three cuffs mentioned by the British Hypertension Society (BHS) and refers to the dimensions standardized by the AHA.
Other authors have found that if the cuff bladder does not completely encircle the arm, the resulting not uniform pressure, can be an additional source of error depending upon the depth and the location of the artery. This aspect has been confirmed by King (1967) who found falsely high blood pressure readings when the bladder failed to encircle the arm. As evidenced by Bakx (1997) not always different experiences of blood pressure measurements lead to consistent conclusions.
Other sources of error due to the incorrect use of the cuff have been explored by Mersich and Jobbagy (2009). They state that the cuff length should cover the entire circumference of the arm. According to O'Brien (2003) they also suggest to affix the cuff as tightly as possible. Then they conclude their work stating that the cuff transfer functions differ considerably, regardless of size, when used in tight or loose mode of affixation.
Vallascas and Usai in the work (2014) showed that the circumferential pressure distribution is deeply uneven. This fact determines errors in pressure measurement in function of the cuff rotation angle relative to the recommended position. They also showed the variations in the pressure distribution as a function of the cuff affixation mode. When you consider the possibility of overlap of these two effects to the miscuffing, it is not unlikely that the errors can be up to ± 1300 Pa (≈10 mmHg). By what it is evident, not as much the need for emanation of the usage standards, underused in domestic operation of automated NIBP monitors, as the availability of easy to operate and reliable tools.

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In this paper the authors have focused their attention on the implementation of a 3D FEM model with the aim of designing a new cuff bladder able to limit the above highlighted negative aspects. More precisely a bladder that is suitable to: 1) completely surround the arm, 2) generate a circumferential pressure distribution whose not uniformity is limited and known, 3) be used without rotational or towards limitations. In fact, as shown in the following paragraph, all the commercial cuffs produce not uniform circumferential pressure distributions. This is due to the possibility that the bladder can generate lobes in order to locally load the arm.
This work is divided into several sections: the first is the introduction, the second section shows the circumferential pressure distribution measured by several commercial cuffs, the third one describes the FEM model and the forth shows the achieved results.

Pressure distributions exercited by the cuff on the arm

The determination of the circumferential distribution of pressure around the arm, during the blood pressure measurement process, was conducted using tools and methods described in the papers (Vallascas 2014) and (Vallascas 2015) to which the reader is addressed for more information. 25 different cuffs have been used, some of which are shown in Fig.1. All the cuffs have been identified by a cardinal number.



Figure 1. Cuffs object of the experimentation.

The arm circumference, on which the measurements were conducted, was measured equal to 260 mm on the cuff insertion site. The arm had been instrumented with 10 pressure sensors, Fig. 2, previously calibrated by comparison with an aneroid manometer that derives the traceability by a mercury differential U manometer.

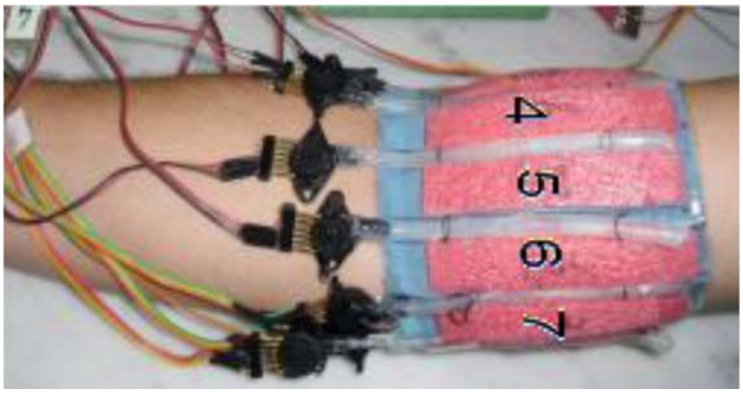

Figure 2. Arrangement of the sensors around the arm.

For each cuff, in order to make more visible the distribution of the pressure around the arm, it was decided to bring the values detected by the sensors in a circular diagram in correspondence of 130 mmHg of deflation pressure. The circular pressure diagrams for the cuffs marked by numbers 9, 10, 15 and 16, are shown, for demonstration purposes only, in Fig. 3.

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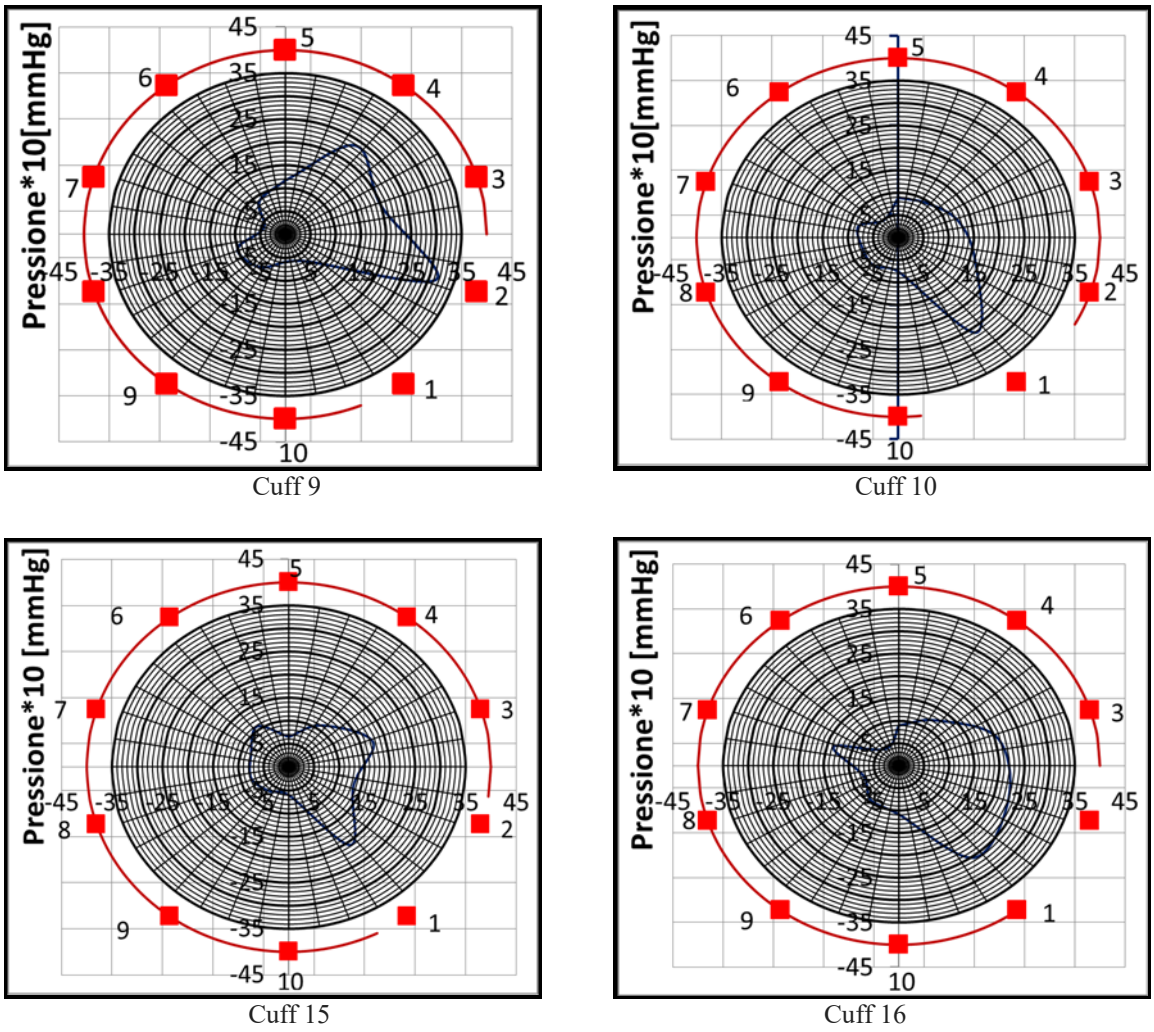

Figure 3. Pressure distributions in correspondence of 130 mmHg inside the bladder.

A red line indicates the bladder length. The red squares show the location of the pressure sensors. Sensor 5 is placed at the antecubital fossa, on the brachial artery, the other sensors follow every 36 degrees in clockwise. It is particularly evident the remarkable lack of uniformity in the pressure distribution around the arm.

FEM 3D Model

The FEM 3D arm simulation model was developed by using Ansys code. It is considered a quarter of the total volume, assuming the model symmetry both to the YZ plane (cross-section) and to XY plane (longitudinal section). In reference to the cross-section, quoted in Eycleshymer and Schoemaker (XX), a configuration built with a tissue with a circular section, placed in a uniform way around the bone and containing the brachial artery and the basilica vein, along the same diameter has been considered.

The arm tissue has been assumed homogeneous and elastic, this because, after the “pressurization” accomplished by the cardiac pump, the arm is able to resume the initial configuration. It has been molded as forming a set composed of skin, muscle, nerves and fat, all to be homogeneous, elastic and isotropic. A modulus of elasticity E = 19000 Pa was assigned to this set. The Young's modulus was extrapolated from the measurements conducted on the top forearm by Zheng (1999) taking account of the greater tissue thickness in correspondence of the mid-arm. However, it does not constitute a critical parameter because the design approach is comparative.

It is also wanted to keep the presence of the basilica vein inside of the tissue for a better correspondence to a real situation, in order to form a possible preferential breakdown point to facilitate the artery collapse.

The external bone diameter has been assumed equal to 28 mm, the external arm diameter has been considered equal to 108 mm, the artery inner diameter has been taken equal to 4 mm with a thickness of 0.6 mm, while the inner diameter of the vein has been assumed equal to 7 mm with thickness equal to zero. As mentioned, the analyzed structure concerns a quarter of the entire volume of the arm, and the following constraints and loads were applied to that.

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A uniform pressure of 100 Pa was imposed to the discharge zone of the arm. A pressure of 200 Pa is supposed within the vein. The condition of symmetry is applied both on the transverse surface, which contains the cuff, and on the longitudinal surface, while all the points of the cross section, on the shoulder side, were left without constraints. In all the sectors of the bladder the same pressure was applied.
In order to further reduce the number of the nodes and the number of the elements, only the bone outer surface, removing the whole volume has been considered. The rigidity has been imposed to the bone outer surface through the CERIG command.
The more complex numerical model consists of a total of 5 volumes, 76 areas, 170 lines, 117 key points, 453845 nodes and 295214 elements Solid92, plus 1 Target170 for the pilot node.
A static analysis for small deformations has been done. Various tests have been made, and it was verified that using the mesh level value, equal to 5, the numerical method allows to converge to the results in a range between 7 and 10 minutes of computation, using a 2 GHz portable PC with 4 GB of RAM and 220 GB of hard drive.

Method Results and Conclusions

The reference key points for the design of the new cuff bladder are: bladder length equal to the arm circumference, controlled formation of lobes and around the arm pressure distribution as uniform as possible. First an occlusion pressure of the arterial vessel was found equal to 17300 Pa (≈ 130 mmHg) for the ideal bladder[1]. Then the configurations shown in Fig. 4 were analyzed. They were obtained by dividing the entire bladder in 2, 4, 8, 12 and 16 equal sectors .

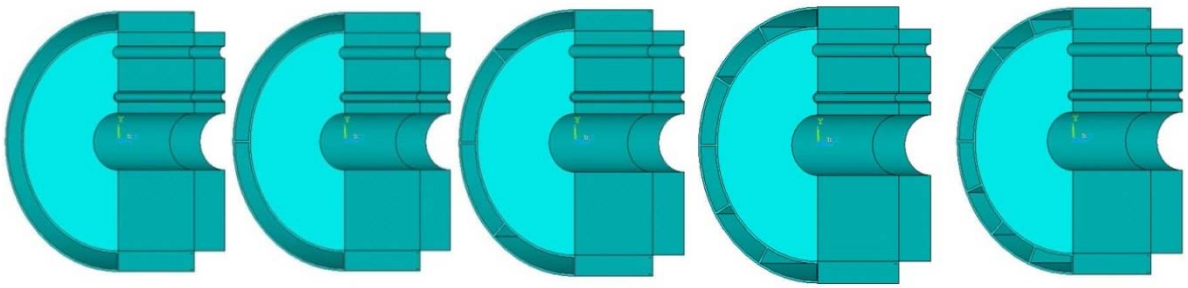

Figure 4. Drawings of the 5 analyzed configurations: 2, 4, 8, 12 and 16 sectors .

Then, to determine the maximum pressure variations that can occur by rotating the cuff it was necessary to reshape all geometries performing for each one a rotation of the middle sector, Fig.5.

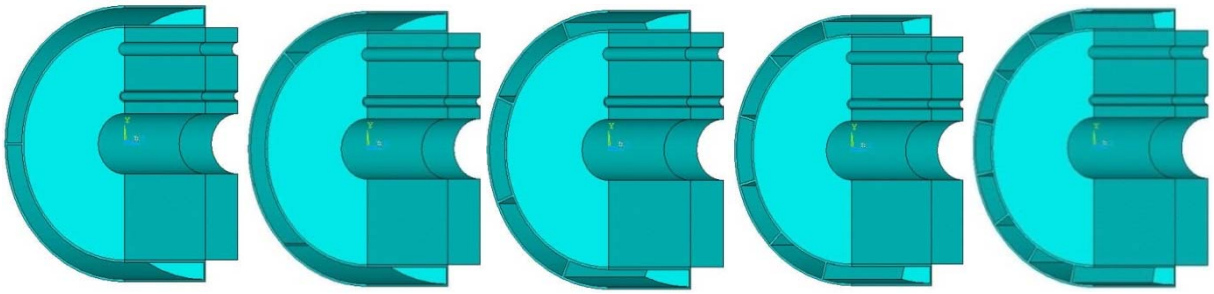

Figure 5. Drawings of half sector rotated configurations: 2, 4, 8, 12 and 16 sectors.

For each configuration the pressure required to occlude the arterial vessel in two extreme positions was evaluated. In Figs. 6a,b,c and 7a,b,c the total mechanical strain diagrams, according to Von Mises, in every cases, when the artery is completely occluded, are shown. The results obtained are summarized in the table 1.

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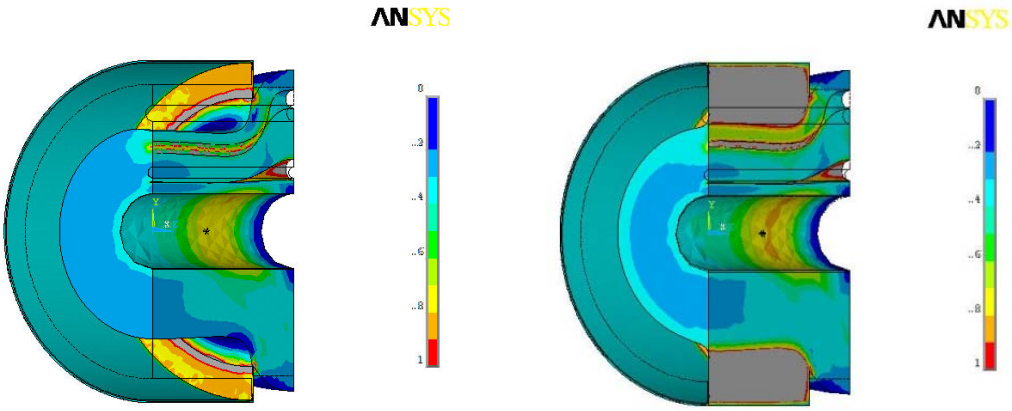
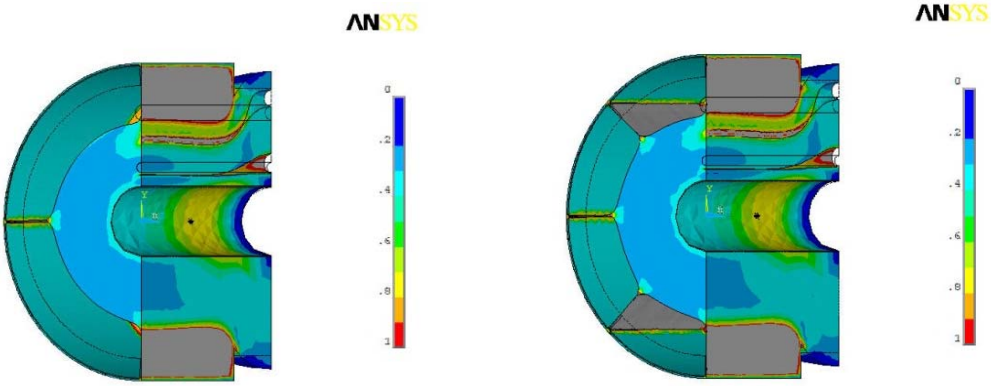


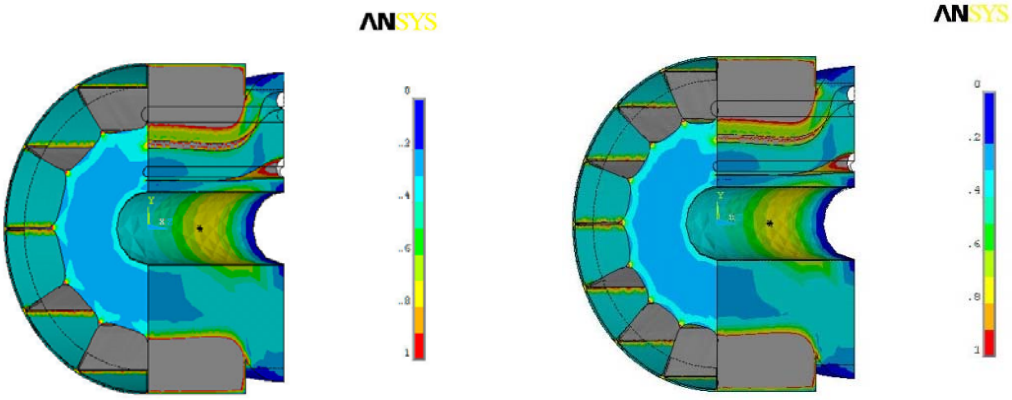
Vessel occlusion pressure = 17300 Pa **Vessel occlusion pressure = 17900 Pa**

Figure 6a. The Von Mises total mechanical strain distribution: 1 and 2 sectors.



Vessel occlusion pressure = 17800 Pa **Vessel occlusion pressure = 17700 Pa**

Figure 6b. The Von Mises total mechanical strain distribution: 4 and 8 sectors.



Vessel occlusion pressure = 18300 Pa **Vessel occlusion pressure = 18600 Pa**

Figure 6c. The Von Mises total mechanical strain distribution 12 and 16 sectors.

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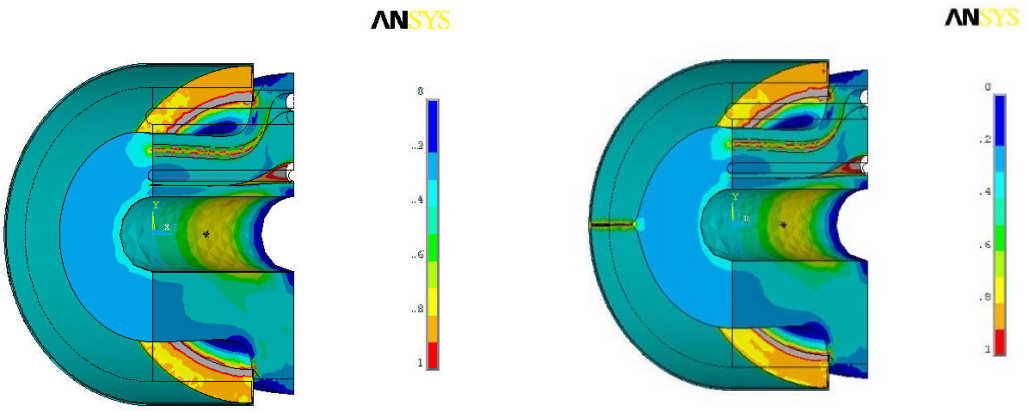
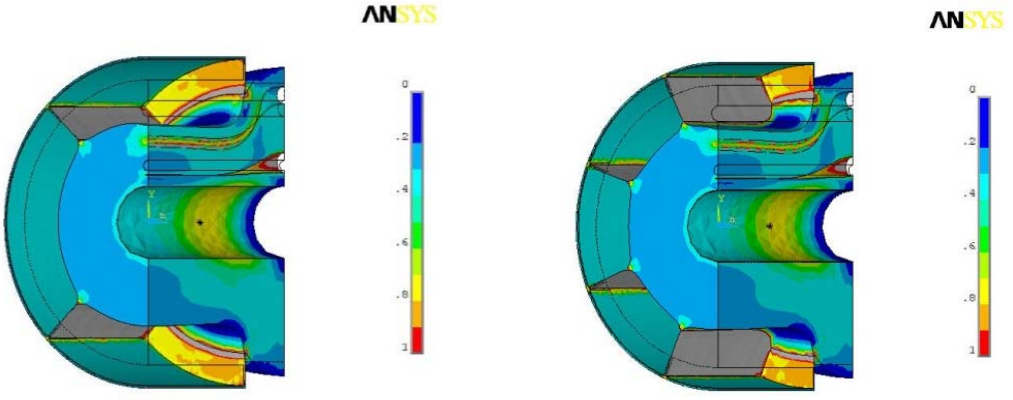


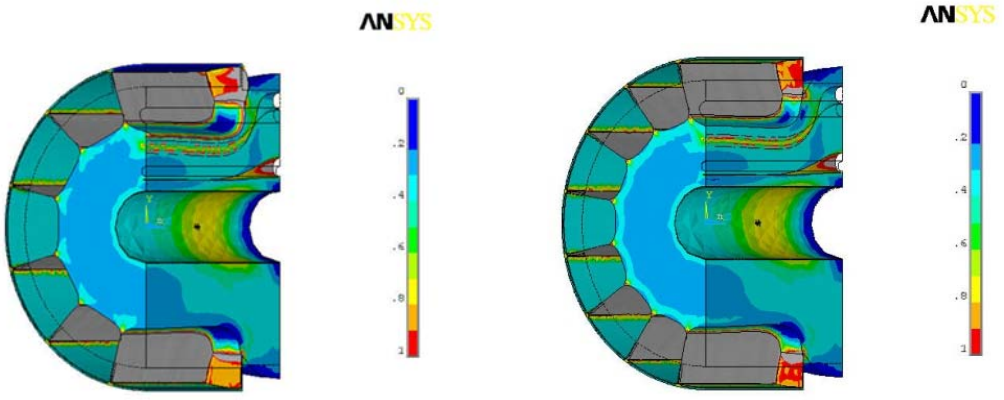
Vessel occlusion pressure = 17300 Pa **Vessel occlusion pressure = 17100 Pa**

Figure 7a. The Von Mises's strain distribution on the half sector turned configuration: 1 and 2 sectors.



Vessel occlusion pressure = 17100 Pa **Vessel occlusion pressure = 17500 Pa**

Figure 7b. The Von Mises's strain distribution on the half sector turned configuration: 4 and 8 sectors.



Vessel occlusion pressure = 18200 Pa **Vessel occlusion pressure = 18600 Pa**

Figure 7c. The Von Mises's strain distribution on the half sector turned configuration: 12 and 16 sectors.

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Table1. Occlusion pressures of the arterial vessel.

Sectors number	1	2	4	8	12	16
Not rotated [Pa]	17300	17900	17800	17700	18300	18600
Rotated [Pa]	17300	17100	17100	17500	18200	18600
Uneven [Pa]	0	800	700	200	100	0

Regardless of the number of sectors or the placement of the cuffs on the arm, the maximum error, with reference to the ideal cuff bladder[1], is always less than 1300 Pa (≈ 10 mmHg). Excluding the bladders with few sectors which could form secondary uncontrolled lobes, the other three configurations are preferred in order to be carried out. That one with eight sectors introduces a maximum error of about 400 Pa (≈ 3 mmHg). The others with twelve and sixteen sectors show a greater uniformity but are more complex to build.
In conclusion, the FEM simulation has allowed us to demonstrate that it is possible to realize a cuff bladder with controlled lobes, suitable to load about uniformly the arm. Namely it is able to avoid the formation of irregular, random lobes that can result in unknown errors during the domestic blood pressure measurement. It should also be emphasized that the error may be corrected automatically in the NIBP monitor firmware.

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NOVEL PHTHALOCYANINES BEARING 2-(BENZYLTHIO)ETHOXY POLY(*E*-CAPROLACTONE) UNITS: SYNTHESIS AND CHARACTERIZATION

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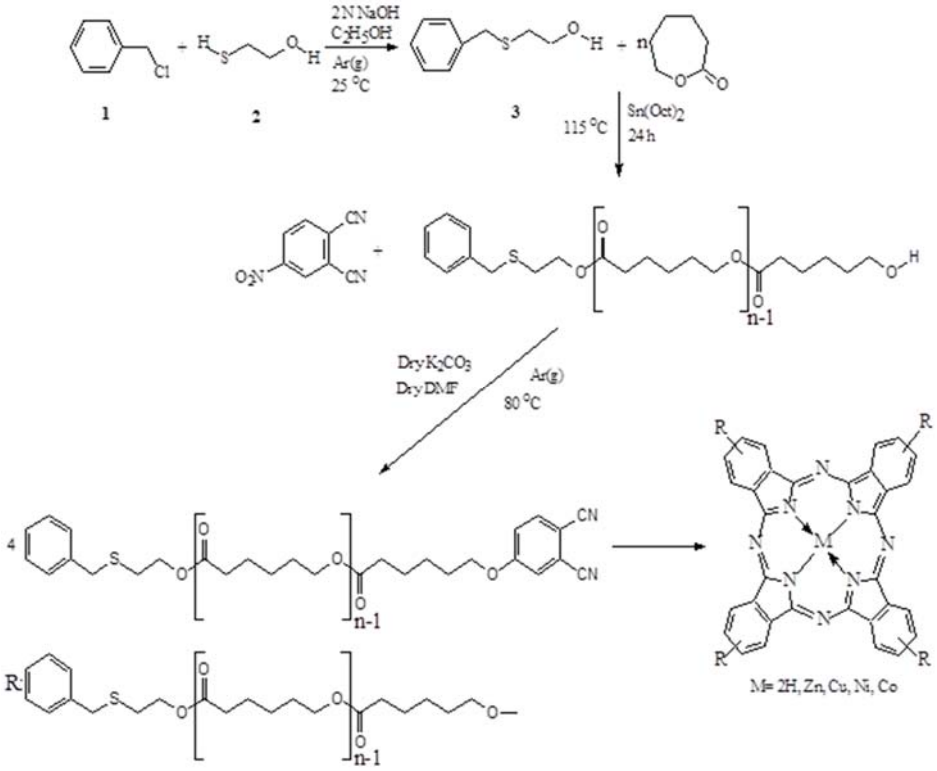
Abstract: In addition to being a versatile class of functional dyes, a great attention has been paid on phthalocyanine derivatives in many fields such as photodynamic therapy, liquid crystals, chemical sensors, catalysts for oxidative degradation, electrochromic displays, information storage systems, nonlinear optics, Langmuir-Blodgett films. In order to improve mechanical properties of phthalocyanine (Pc) moiety, the incorporation of these materials into polymeric structures as side chain, network or main chain is of interest [1]. To address pharmacological, biomedical, environmental and agricultural concerns, the issue of sustainability and ever-limited petroleum resources, aliphatic polyesters such as polyglycolide, polylactides, poly(ε-caprolactone) (PCL) have received considerable interests in polymer science [2].

In this work the ring-opening polymerization of ε-caprolactone initiated by 2-(benzylthio)ethanol was carried out in bulk at 115 °C in presence of stannous octanoate ($Sn(Oct)_2$) as a catalyst. The –OH end group of 2-(benzylthio)ethoxy poly(ε-caprolactone) was then converted into its corresponding the phthalonitrile derivative via a base-catalyzed nucleophilic aromatic nitro displacement of 4-nitrophthalonitrile in order to prepare its corresponding the phthalocyanine derivatives. The electrical conductivities of the polymers were measured in vacuum and in air-atmosphere. All the polymers have been characterized by UV-Vis, FT-IR and NMR spectral data and GPC, DSC, TGA techniques.



Scheme 1. Synthesis of novel phthalocyanines bearing 2-(benzylthio)etoxy poly(ε-caprolactone) units

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Acknowledgments
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ON THE HISTORY OF SOME LINEAR ALGEBRA CONCEPTS: FROM BABYLON TO PRE-TECHNOLOGY

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Abstract: Linear algebra is a basic abstract mathematical course taught at universities with calculus. It first emerged from the study of determinants in 1693. As a textbook, linear algebra was first used in graduate level curricula in 1940's at American universities. In the 2000s, science departments of universities all over the world give this lecture in their undergraduate programs.

The study of systems of linear equations first introduced by the Babylonians around at 1800 BC. For solving of linear equations systems, Cardan constructed a simple rule for two linear equations with two unknowns around at 1550 AD. Lagrange used matrices in his work on the optimization problems of real functions around at 1750 AD. Also, determinant concept was used by Gauss at that times.

Between 1800 and 1900, there was a rapid and important developments in the context of linear algebra. Some theorems for determinant, the concept of eigenvalues, diagonalisation of a matrix and similar matrix concept were added in linear algebra by Couchy. Vector concept, one of the main part of liner algebra, first used by Grassmann as vector product and vector operations. The term 'matrix' as a rectangular forms of scalars was first introduced by J. Sylvester. The configuration of linear transformations and its connection with the matrix addition, multiplication and scalar multiplication were studied first by A. Cayley.

After the 1900s, the improvement of linear algebra was more technique and in a way that more correlative with other disciplines of mathematics than past. Heisenburg used matrix algebra for quantum mechanics. Von Neuman and Turing introduced stored-program computers.

Keywords: linear algebra, history, matrix, vector, determinant, linear equation

Introduction

It is a general and an open-ended question that when and where did mathematics begin? The answer is depended on what do you mean by the word 'mathematics'? Then, we restrict 'mathematics' to logical-deductive tradition. In ancient times, written materials of new mathematical developments have come to known only in a few places (Avital, 1995; Boyer, 1985; Freudenthal, 1991; Jons, 1995 & Katz, 1995). As a scientific discipline, mathematical studies began in the middle of sixth century (Freudenthal, 1991 & Sfard, 1991). The old mathematical materials were registered in mathematical papyrus between 2500-1700 BC. The context in these material were designed with geometry as Pythagorean Theorem and some relations about lines. In the modern ages, mathematical developments had a periodic time points as the golden age of Islamic mathematics in the 11th century and renaissance mathematics in the 16th century.

According many mathematicians, we couldn't see a consensus on the history of linear algebra (Dorier, 2000; Freudenthal, 1991; Katz, 1995 & Kleiner, 2007). Some of them say that linear algebra history starts with matrix and the others say that main starting point is vector spaces. But we see a main linear algebra concept in these approaches that the formulation of linear system of equations and their solutions. In this study we give some basic points of the history of linear algebra concepts. The concepts are linear equations, matrices, determinants, vector spaces.

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Linear Equations

System of linear equations are not only the basic concept of linear algebra but also it has a wide using area in many sub branch of mathematics. Moreover, solving of linear equations with two or three unknown and 2-5 equations is a basic part of middle school algebra and college mathematics.

The study of system of linear equations first introduced by the Babylonians around at 1800 BC. For solving of system of linear equations, Cardan constructed a simple rule for two linear equations with two unknowns around at 1550 AD. Cardano (or Cardan), an interesting and colorful personality, published the mathematics book "Ars Magna". In this book, Cardano with Tartaglia first used the numbers which are known as complex numbers. Lagrange used matrices in his work on the optimization problems of real functions around at 1750 AD. Metric systems, some of mathematicians consider Lagrange as the founder of the metric systems, was used widely in the context system of linear equations. Also, determinant concept was used by Gauss at that times. He formulated the set of errors to be minimized as a system of linear equations.

In ancient China at BC, it was used different ways of solving system of linear equations system (Shen, Crossley & Lun, 1999). These solution methods were not fully different each other and some of them could be used only for two or three equations whit the same number unknowns. Also ancient Chinese made some correlations between the number equations and the number of unknowns for unique solutions and more than one solution. According to the authors, there are many examples, application problems and their solutions in the old text books.

Matrices

The history of matrix goes back to ancient times at BC. But we can say that the word "matrix" was not used clearly until 1855. İt was born from the formulating of the system of linear equations by English mathematician Sylvester. Sylvester and Cayley published their famous text on matrices at these times. In this text, they used matrices by means of system of linear equations (as seen below) and introduced some theories and relation in the context of matrix as matrix addition, multiplication and inverse.

$$X = ax + by + cz$$

$$Y = dx + ey + fz$$

$$Z = kx + ly + mz$$

and

$$(X, Y, Z) = \begin{pmatrix} a & b & c \\ d & e & f \\ k & l & m \end{pmatrix} (x, y, z).$$

Gauss gave some elementary formulations for solving system of linear equations but do it without using matrices. When the mathematicians focused on studying determinants, this motivation turned out to be the term 'matrix'. At the end of the 1900's, Matrices were used not simply for solving systems of linear equations, but also in concepts of liner algebra. Moreover, they have wide speared of using in physics, engineering and some social area as phycology. By the effective using of technology in linear algebra, all solution methods created by Cayley, Gauss, Sylvester moved backward benefiting them in linear algebra lectures.

Determinants

J.L. Dorier (2000) stayed that the concept 'determinant' was used separately in different two places in both Asia and Europe. Also Dorier stressed that in ancient times at BC for solving system of linear equations was benefited from some geometric figures as called counting boards to represent problems. Mikami (1974) claimed that a special version of determinant to solve nonlinear system of equations at 1700's. According to him, this solution method was formulated in a way that registered in a rectangular array the positions of coefficients of equations. Mikami redesigned this formulation from the historical text for 2x2 and 3x3 square matrices (figure1)

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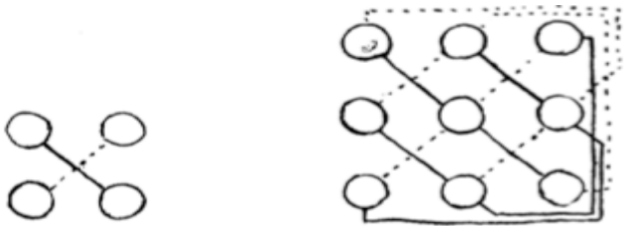

Figure 1. Mikami's redesign of determinant of matrices 2x2 and 3x3.

Determinants were used by Leibnitz, known as the founder of calculus, in 1700's. Lagrange used determinants in his working on Lagrange multipliers about maximum and minimum problems. In 1750's, Cramer formulated solution of some special system of linear equations, called 'Cramer's rule', and used determinant as a variable in this characterization.

$$\begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc$$

By analyzing historical text, we can say that there are four mathematical subject which are directly connected determinants; matrices, solution of system of linear equations, elimination of a matrix of a system of linear equations and linear transformations. But, it is not clear to give any definite connection between general determinant formulas and the other linear algebra subjects. After the Cramer, determinants of the square matrix were used first time as known modern characterization.

Vector Spaces

In geometrical format, vector spaces in R^2 and R^3 were firs represented by Descartes and Fermat. Italian mathematician Peano defined the known modern definition of vector space concept in 1900's (Katz, 1995). After Peana, another Italian mathematician Weyl used vector spaces more efficiently and attractively in his studies that registered 'vector spaces and transformations view' of linear algebra and 'our axioms characterize the basis of our operations in the theory of system of linear equations by composing the coefficients of the unknowns in a system of linear equations as vectors. Lebesgue used real function spaces as vector space in his work. After than Lebesgue, Hilbert and Banach formulated and developed functions spaces as 'Hilbert and Banach spaces'.

Bourbaki (1975) stayed that Hawkin suggested a reasonable and methodological presentation for the matrix theory, from starting with systems of differential equations by lagrange to theoretical presentation by Weierstrass. According to Baurbaki, the theory of vector spaces had the same methodological procedure. For the explicit formulation of vector spaces, studies on the systems of linear differential equations played basic role (Helgason, 977). As mentioned above, Piano made the axiomatic formal definition of vector spaces over real number fields. We understand that the study of differential equations helped to formulating of vector space concept. Bourbaki (1975) stated that the study of function spaces formulated by Hilbert, but he focused on the kernels of integral equations and generalizations of their matrices. Also, we can say that the difficulty and complexity of infinite vector space directed mathematicians to focusing on the finite dimensional vector spaces.

Famous Frenchman mathematician Galova used the finite dimensional vector spaces to formulate his famous theory called Galois Theory. The linear combinations of algebraic numbers was an extension of the rational numbers. This mean that the defining of vector space over the field of real numbers was a methodological result (Kiernan, 1971). Kiernan expressed that Dedekind motivated seriously at the structure of fields, the number theory. According to him, by the effect of this motivation, he formulated the similarity of algebraic numbers and algebraic function theory. He remarked that the vector space theory played an essential role for the modern reformulation of Galois Theory.

Result

It is not possible to give all historical developments with a research paper about linear algebra concepts. We only dealt with some basic point of linear algebra concepts in this paper. More general search could be available from history of linear algebra text books or research papers (Benzi, 2009, Dorier, 2000 & Kleiner, 2007). It is clear that there is a powerful connection between mathematics concepts especially linear algebra concepts. And we can see this connection in the ancient times in which mathematicians formulated or characterized this concepts. Maybe, mathematicians had become infatuated with the connection of the concepts of mathematics.

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OPEN GREEN SPACES FUNCTION IN DESTINATION BRANDING: THE CASE OF BARTIN

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Abstract: Open green spaces are greatly important for the creation of sustainable cities in social, cultural, economical and ecological sense. In our days, they have assumed other duties in diverse areas in addition to these properties including the creation of urban identity and destination branding. Destination branding is the indicator of the properties that differentiate that destination from other destinations and describe its natural, cultural and man-made properties. The aim of the study is to determine the principles of design for open green spaces focusing on branding and identity in the process of branding of cities on the special example of Bartın. The study has been carried out in the scope of a method consisting of five stages including literature review and obtaining data, analysis of existing open green spaces in Bartın City with land surveys, carrying out a questionnaire using the Analytical Hierarchy Process (AHP); evaluating all the data obtained and submitting the results and recommendations. In conclusion, open and green spaces are effective in the creation of destination branding and the identity of the city.

Keywords: Destination Branding, Open Green Spaces, Tourism

Introduction

Urban spaces comprise the building blocks, open green areas and roads connecting these spaces. Within the city, all the spaces without any buildings on them and water surfaces are considered as open areas, while urban areas largely covered with plantation areas arranged as parks, playgrounds, play areas, sporting areas or squares to provide the citizens with the possibility of active and passive recreation are defined as green areas (Yücel, Aslanboğa, Korkut, 2008). Open green areas have multiple functions in the city that can be outlined as follows: they provide balance for the city in physical sense (mass-space), act as buffers between different utilization areas including dwellings, trade and industry, clear the air, absorb noise and dust, contribute to the protection of biodiversity, provide the city with microclimatic properties, reduces the risk of flood and erosion, facilitate circulation, provides pedestrians with safe transport possibility, provide the possibility of active and passive recreation, , contribute to the esthetic appearance of the city, and are effective in the creation of city identity (Öztan, 1968; Selitsaniotis, Nikolaou, 2009; Ely, Pitman, 2014). Together with this, trees, shrubs, herbaceous, and aquatic plants used in green areas host animals, reduce the speed of rainwater, filter the rainwater and decreases carbon emission (Vegetation in the Built Environment, 2007).

In our days, the open green areas in cities serve not only for the habitants of cities, but also for domestic and foreign tourists. Tour operators organize city tours with touristic purposes to cover especially such spaces. For example, Central Park in New York, Güell Park in Barcelona, Hyde Park in London, Schönbrunn Palace Gardens in Vienna, Alhambra Palace Gardens in Spain, Spaniard Stairs in Rome, tulip gardens in Holland, Emirgan Woods in Istanbul, San Marco Square in Venice, and the Red Square in Moscow have all become attraction points for tourists. However, lately destinations with similar natural and physical characteristics are focusing on bringing their properties that will represent them and differentiate them from other destinations and becoming a brand. The purpose here is to increase their competition power and to attract more tourists.

In the Turkish Tourism Strategy 2023 also, importance of making cities with strong cultural and natural assets to become brands and making them attraction points for tourists is mentioned among the Tourism Strategies for strengthening the tourism sector (Anonymous, 2007). Not only products, but cities, regions or countries can have brands. Characteristics that must be possessed by a product brand are outlined below. The brand name must remind the benefits of the brand. Of the properties of the product, it must remind the action or color. It must be easy to say and remember. It must be distinguishing. It must not have a bad meaning in different countries or languages. Powerful brands have a word, a slogan, a color, a symbol and a story. All these elements are effective in giving an identity to a brand (Kotler, 2011).

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While branding a destination is similar to branding a product, there are also aspects that they differ. Destinations mostly attempt to become a brand by bringing their properties to the forefront to become attractive centers for tourists. Comprehensive market and consumer surveys are required to be successful when creating a brand. Determining the target markets and positioning the brands are important (Günlü, İçöz, 2004). Characteristics such as the landscape, zoning structure, infrastructure, identity and culture are effective for branding places (Vuignier, 2015).

The brand of a destination is formed by bringing together the brand elements including name, symbol, slogan, color, architecture, cultural inheritance, language, and myths and legends that defines a destination and differentiates it from others (Taşçı, 2007). Brand both ensure distinguishing a destination from other destinations and are the quality symbol of that destination. At the same time, it provides the destination with an identity, and ensures physical and psychological attraction of tourists to that destination (Yılmaz and Çizel 2000).

Identity comprises the elements that differentiate a place from others (Lynch, 1960). Identities of cities are formed based on the natural, socio-cultural and physical identity elements (Köylü, Kiper, 2007). According to Ocakçı (1994), elements constituting the city identity are listed as elements arising from natural, humane manmade sources. Identity elements arising from the natural environment are data including the topographic structure, climate, plant cover, geologic structure and presence of water. Humane data comprise the demographic structure, corporate structure and cultural structure, which can be listed as the population structure, attitudes of individuals, cultural accumulation and experiences, thoughts and expectations related to future, equipments and requests, political, managerial and legal structure and customs and traditions. Manmade environments include buildings, bridges, squares, parks and similar made to meet the requirements of individuals (Önem, Kılınçaslan, 2005).

Another purpose of destination branding is to develop a positive image for the destination (Taşçı, 2007). Tourists form a brand image in their minds depending on the brand identity. Destination's identity and image mutually affect each other. Destination identity is developed and re-structured based on this image. Destination image is critically important in the formation of the definitive and positive brand identity (Qu, Kim, Im, 2011). Image includes the identity formed by the elements used to distinguish that place from others. Identity represents individuality and not being the same with others. Image is formed by the looker. Destination must have some practical or emotional meaning for the looker (Lynch, 1960).

According to Evans (2012), two similar stages are seen in the branding of national, regional or local historical cities. In the first of these, architectural and cultural activity areas, public buildings, dwellings and commercial buildings, shopping centers, transport facilities are re-constructed, or the existing ones are renewed. In the second stage, city design including the public areas such as parks and open areas, squares, cultural, historical and creative areas and transport roads are improved (Evans, 2015).

Ensuring the satisfaction of tourists in issues including accommodation, security and cleaning is also important to be a powerful destination brand. Tourist who leaves the destination satisfied will strengthen the brand even more. With this reason, cooperation must be ensured between public and private sectors to provide for tourist satisfaction in different areas in the destination (Bordas, 2007).

Destination brand also bears an identity and is used as a marketing tool. Since TV and radio are mostly used as communication tools, importance of music and movies for the promotion of a destination is great. Creating brands for destinations and developing strategies to protect the images can be possible by making long-term plans and implementing them. At this stage, public entities and institutions at relevant locations, representatives of the private sector, nongovernmental organizations and local people must work together and in coordination (Günlü, İçöz, 2004). Providing economical support, developing branding strategies targeting the services for the local people and tourists and determining public policies can be possible depending on such potentials (Vuignier, 2015).

Urban quality and feeling of space are effective elements on branding. Urban quality means much more as compared to the physical characteristics of buildings, open green areas and roads. The urban quality is formed by bringing the architectural form, scale, squares, open green areas, landmark, vistas and similar together with the spatial psychology. In short, urban quality is closely related to the social, psychological and cultural properties of the destination (Montgomery, 1998).

In this context, the aim of this study is to determine the principles of design focusing on branding and identity for cities in branding process on the special example of Bartın. In this context, answers have been searched for questions such as "Why is the importance of the branding process for Bartın Province?", "What is the

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importance of open green areas in the branding process of Bartın Province? and "What can be done?" In conclusion, elements representing the city identity of Bartın have been determined and principles of design for open green areas have been suggested.

Materials and Methods

The main materials of the study comprise the open green areas in the Bartın city center and Bartın Province (Figure 1). Bartın Province is located in the Western Black Sea Region between 41°37' northern latitude and 32°22' eastern longitude. Its surface area is 2143 km^2, and the mean altitude is 25 m (Anonymous, 2008). Bartın Province is established on the plain formed by Kocaçay and Kocanaz Creeks that make the Bartın River. Bartın Province has 104 parks in varying sizes in the scope of open green areas. These parks have been built by the Bartın Municipality. These parks have areas such as sporting areas, playgrounds, resting places and jogging tracks (Bartın Municipality, 2014). Furthermore, old photographs of Bartın, land expeditions and data obtained through questionnaires have also been used as materials.

Since the Bartın Province has the potential of being a branded city with its civil architectural structures reflecting the Ottoman Period, shipyards for building of wooden yachts and boats, traditional handcrafts including "tel kırma" (traditional ornamentation technique special for Bartın) and local dishes in addition to its natural beauties, it has been selected as the subject matter of the study.



a b

Figure 1. a) Bartın's location (URL1, 2013).
b) Bartın's neighbors (URL2, 2013).

Methodology of the study has been determined after a review of the studies (Montgomery, 1998; Qu, H., Kim L. H., Im, H. H., 2011; Akpınar Külekçi, Bulut, 2012; Çelik, Gökçe, Koca, 2013) in the literature. In this frame, this study was carried out using a method consisting of five stages. The first stage was the literature review and obtaining the data. In this stage a literature review was carried out on domestic and foreign literature on subjects including open green areas and their functions, branding, destination branding, and the study area. Plans, reports and visual data related to existing open green areas were obtained from the Bartın Municipality, Directorate for Parks and Gardens. The second stage was analyzing the open green areas within the development zones of the Bartın Province with land surveys. In this stage, the then-current situations of open green areas included in the zoning sheets were analyzed on-site and observations were made. Six parks out of 104 in different sizes were included in the study. These parks were selected because they had many functions including playgrounds, sporting areas and resting areas and addressed the entire city. The third stage was the poll carried out using the AHP by the experts of the relevant stakeholders. According to Russell and Taylor (2003), AHP method is the listing of alternatives based on multiple criteria and using this list in selection. It will thus be possible to determine the brand identity and principles of design based on the questionnaire applied. Data obtained in the survey carried out by the author and colleagues (Çelik, Gökçe, Koca, 2013) were used when preparing the questions in the questionnaire. The reason for this was to determine the priority sequence of the data obtained for the identity of Bartın. It will be possible to develop the design criteria for the open green areas for branding based on this sequence. Stakeholders considered as relevant for the subject matter of the study and that the questionnaire is planned to the applied to included Bartın Provincial Governorship, Bartın Provincial Directorate of Environmental and Water Affairs, Bartın Provincial Directorate of Culture and Tourism, Bartın Municipality, Bartın University, Bartın Provincial Directorate of Environment and Urbanization and relevant professional chambers. The fourth stage was the evaluation of all the data obtained from a perspective of landscape architecture so as to overlap with the objective of the study. The fifth stage was preparation of conclusions and recommendations based on the literature review, land analyses and results of the questionnaire.

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Results and Discussion

In the frame of the functions of the open green areas in destination branding, findings obtained from relevant public entities and organizations and questionnaire are outlined below in two sections. These sections include the findings related to the Bartın City and open green areas and findings of the questionnaire.

Findings related to the Bartın City and open green areas: Bartın Province is located amongst Zonguldak, Karabük and Kastamonu Provinces and the Black Sea. City center is located in the hinterland, at a distance of 12 km to the sea. Economy of the city depends on animal husbandry and forestry. Bartın Province has four districts including the central district, Amasra, Ulus and Kurucaşile. Bartın has a marine climate with cool summers and warm and rainy winters. In the city, a natural protected area along the river banks and an urban protected area in the city center are present. Furthermore, there are 258 registered wooden houses in the central district (Anonymous, 2007).

Bartın Province has the properties of a destination with historical, cultural and natural potentials. These potentials allow diverse touristic activities. There are plateaus that serve mountain and highlands tourism including the mountains and plateaus of Uluyayla, Zoni and Ardıç. Furthermore, Mugada Lava Columns and Kastamonu-Bartın Küre Mountains National Park also serve various touristic activities including photo-safari, biking tours or bird observation with mountain tourism in the first place. Bartın has a past of 3000 years, and was first established by Gaskas in the 14th century B.C. Later, it was domineered by various kingdoms with Hittites, Lidia, Byzantine, Seljuk and Ottomans in the first place. While it was a district of Zonguldak in 1924, it was made province in 1991 (Bartın Municipality, 2014).

There are one hundred and four parks in different sizes in Bartın city that can be included in the scope of open green areas. Of these parks, Alibaysal Park, Gazhane Park, Karaçay Picnic Area, Sevgi Park, Municipality Park and Republic Square have been included in the study (Figure 2). These parks have sporting areas, playgrounds, resting areas, jogging tracks and similar areas, and they address the entire city (Figure 3). These parks have been built by the Bartın Municipality. Maintenance, repair and renewal works for parks are implemented by Bartın Municipality Directorate for Parks and Gardens.

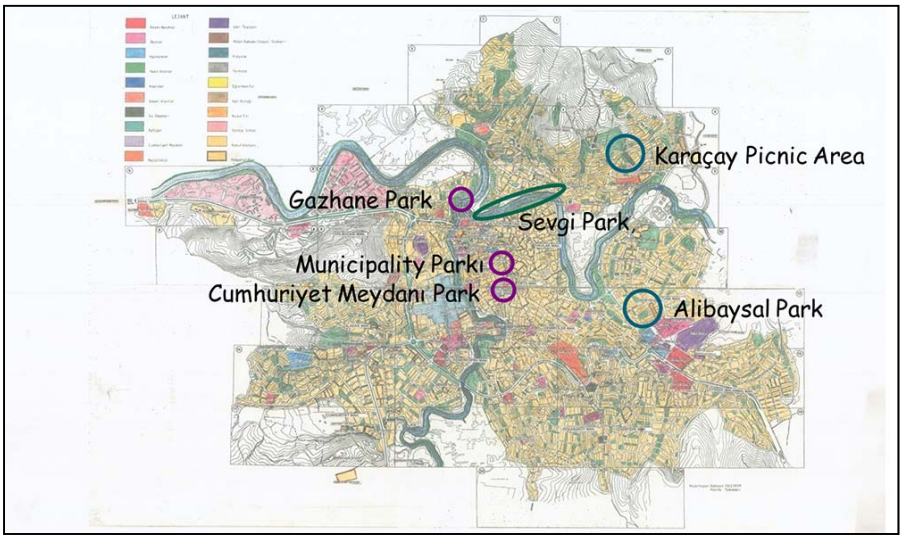

Figure 2. Open Green Areas of Bartın City.

A questionnaire was carried out in the aim of the study with the participation of experts in relevant stakeholders to determine the priority levels of elements representing the Bartın city using AHP. The design principles focusing on branding and identity special for the Bartın Province were determined based on data obtained from the questionnaire. Bartın Provincial Governorship, Bartın Provincial Directorate of Environmental and Water Affairs, Bartın Provincial Directorate of Culture and Tourism, Bartın Municipality, Bartın University, Bartın Provincial Directorate of Environment and Urbanization and relevant professional chambers are the relevant stakeholders that questionnaire will be applied to. A questionnaire was held on 10 experts from these public entities and organizations. Results of the questionnaire carried out using AHP are summarized below.

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Bartın River


Gazhane Park


Sevgi Park


Sevgi Park


Karaçay Picnic Area


Alibaysal Park


Cumhuriyet Square Rark


Municipality Park

Figure 3. Bartın River and parks included in the study.

The Expert Choice (EC) program was made use of for the use of AHP method and calculations. Priority order or weights were found for main criteria with the use of this program. The questionnaires carried out were

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considered as significant since the Consistency rates of questionnaires were found under 0,1. The purpose of the questionnaires was to determine the order of the main criteria. The identity components and brand components for Bartın Province, which are among the main criteria, are given in Table 1.

Table 1: Main criteria used in the questionnaire

IDENTITY COMPONENTS	BRAND COMPONENTS THAT CAN BE USED IN THE DESIGN		
	Color	**Symbol**	**Slogan**
Historical Buildings	Blue	Historical houses	City of rivers
River	Green	Strawberry	Amasra
Natural beauties (flora, fauna, endemic plant species, geologic formations, etc.)	White	Bartın River	City nested in nature
Strawberry festival	Yellow	Water balance	
Hıdrellez festival	Red	Falls	
Traditional handcrafts including "Telkırma"	Brown		
Presence of local dishes			
River running through the city			
A city nested in nature			

Experts were asked to make evaluations between the criteria with comparisons in couples based on the basic scales given in Table 2.

Table 2: Priority levels and definitions to be used in comparisons in couples between the criteria

Priority Levels	Value Definitions
1	Equally important
3	Important in medium level
5	Strongly important
7	Very strongly important
9	Definitely important
2, 4, 6, 8	Intermediary values

Experts from different professions including landscape architects, architects, urban and regional planners, tourism professionals, and communication and marketing experts working in relevant public entities and organizations participated in the questionnaire. All the participants have the opinion that open green areas are important in the creation of identity. Participants listed the parks they considered important among the open green areas in Bartın with the following order:, Gazhane Park, Sevgi Park, Karaçay Picnic Area, Municipality Park, Alibaysal Park and Republic Square.

The binary comparison matrix that the experts compared each basic criterion related to the identity components is given in Table 3. These values are attributed by the experts participating in the study.

Data obtained from Table 3 are summarized below. In this table, criteria given in lines are compared with the criteria in columns. These comparisons have been asked in the questionnaire in the form questions. Historical buildings have been attributed 5 points (strongly important) when compared to local dishes. However, when the criterion of historical building was compared with the criteria of natural beauties of the Bartın City, river running through the city and city nesting in nature, all these three criteria were attributed 5 points (strongly important). This value has been expressed as 1/5 because of the overlapping of lines and columns in the table. That is, importance of historical buildings is less when compared to these three criteria. Comparison of the criterion of river with the criterion of hıdrellez festival had given 5 points (strongly important) and the same with the presence of local dishes had given 3 points (important in medium level). The criterion of natural beauties of the city was attributed 7 points (very strongly important) when compared to the criteria of strawberry festival and hidrellez festival. Strawberry festival was attributed 5 points (strongly important) when compared to the criteria of river and hıdrellez festival. The traditional handcraft, "tel kırma" was attributed 7 points (very strongly

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important) when compared to the hıdrellez festival. The criterion of presence of local dishes was attributed 3 (important in medium level) when compared to hıdrellez festival. However, when presence of local dishes was compared with the criteria of river running through the city and city nested in natures, these two criteria were attributed 7 points (very strongly important) and these values were expressed as 1/7 in the table. In summary, experts considered the criteria of river running through the city and city nesting in nature more important as compared to criteria of presence of local dishes, hıdrellez festival, strawberry festival and "tel kırma".

Table 3: Binary comparison matrix for basic criteria

CRITERIA	Historical buildings	River	Natural beauties	Strawberry festival	Hıdrellez Festival	Tel kırma	Local dishes	River running in the city	City nesting in nature
Historical buildings	1	3	1/5	3	3	1	5	1/5	1/5
River	1/3	1	1/5	1/5	5	1/3	3	1/3	1/3
Natural beauties	5	5	1	7	7	5	5	1	1
Strawberry festival	1/3	5	1/7	1	5	1/3	3	1/3	1/5
Hıdrellez festival	1/3	1/5	1/7	1/5	1	1/7	1/3	1/7	1/7
Tel kırma	1	3	1/5	3	7	1	3	1/3	1/3
Local dishes	1/5	1/3	1/5	1/3	3	1/3	1	1/7	1/7
River running in the city	5	3	1	3	7	3	7	1	1
City nested in nature	5	3	1	5	7	3	7	1	1

When the identity components for Bartın that can be used in the design are sequenced by experts based on weight ratios, the criterion with the highest weight (0.195) was the criterion of "river running through the city". Other criteria were, respectively:

- Natural beauties (weight ratio 0,174),
- River (weight ratio 0,142),
- Historical buildings (weight ratio 0,133),
- City nesting in nature (weight ratio 0,119),
- Presence of traditional handcrafts including "Telkırma" (weight ratio 0,104),
- Presence of local dishes (weight ratio 0,055),
- Strawberry festival (weight ratio 0,041),
- Hıdrellez festival (weight ratio 0,014).

Data related to brands components that can be used in the design according to experts are given in figures below.

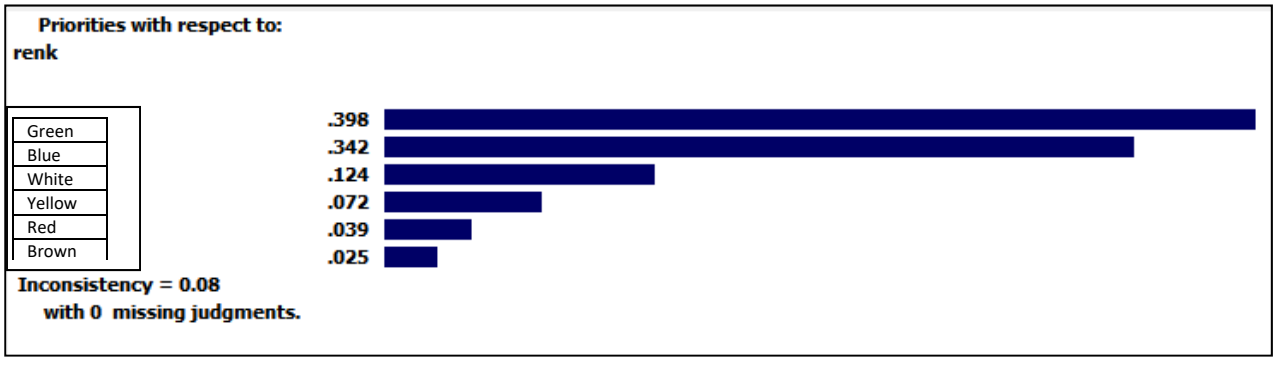

Figure 4. Weights attributed to color main criteria.

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Based on Figure 4, levels of priorities of color main criteria are sequences as green (weight ratio 0,398), blue (weight ratio 0,342), white (weight ratio 0,124), yellow (weight ratio 0,072), red (weight ratio 0,039) and brown (weight ratio 0,025). The sum of the weight ratios of criteria is "1". Since the TO shown in the lowest part of the screen is 0,08 < 0,1, the comparison is consistent. The first three colors considered by experts to represent Bartın are green, blue and white, in this order.

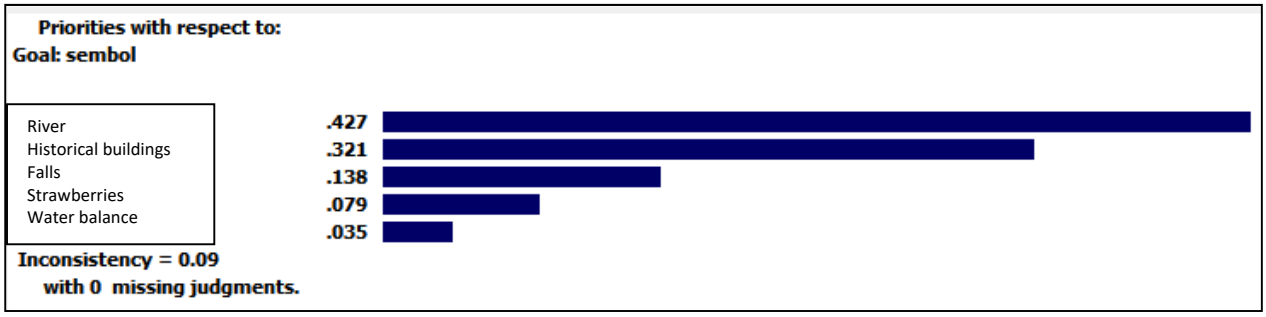

Figure 5. Weight values attributed to symbol main criteria.

According to Figure 5, priority levels for symbol main criteria are sequenced as the Bartın River (weight ratio 0,427), historical buildings (weight ratio 0,321), Falls (weight ratio 0,138), strawberry (weight ratio 0,079) and water balance (weight ratio 0,035). The sum of the weight ratios of criteria is "1". Since the TO shown in the lowest part of the screen is 0,09 < 0,1, comparison is consistent. Experts have selected the river, historical houses and the Falls as the symbols representing Bartın, in this order.

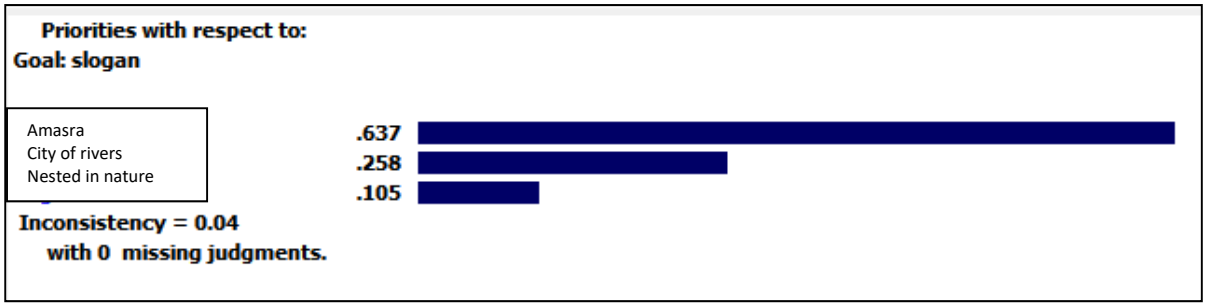

Figure 6. Weight ratios attributed to slogan main criteria.

According to Figure 6, priority levels for slogan main criteria are sequenced as Amasra (weight ratio 0,637), city of rivers (weight ratio 0,258) and city nested in nature (weight ratio 0,105). The sum of the weight ratios of criteria is "1". Since the TO shown in the lowest part of the screen is 0,04 < 0,1, comparison is consistent. Experts have selected Amasra, city of rivers and city nested in nature as the slogans that can be used in the logo representing Bartın, in this order.

In conclusion, each criterion has been compared with others in couples, and the matrix of this comparison has been considered satisfactorily consistent based on the AHP method. In the outline of all the results, the criterion "river running through the city" has the highest priority level with 0.195. Based on the color criterion, green has been found to be in the first place with 0,398 priority level. The most important criterion among the symbol criteria is the criterion of Bartın River and has a priority level of 0,427. Among the slogan criteria, the most important criterion is the criterion of Amasra with a priority level of 0,637.

Identity components and brand components for the Bartın province have been sequences based on the data obtained from the questionnaire. Based on these data, principles of design focusing on branding and identity for open green areas for Bartın are recommended as follows.

- Identity, color, symbol and slogan criteria obtained from the results of the questionnaire can be given as the definitive criteria for the design to be made for open green areas.
- Open green areas can be designed with nature as the theme.
- Photograph take areas can be created in the open green areas with the symbols of "Bartın River", "historical houses" and "Falls" as plastic objects.

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- Symbols can be used and slogans “Amasra”, “City of Rivers” and “City Nesting in Nature” can be written on flooring.
- Adventures parks with the theme of river can be constructed in playgrounds.
- Plant arrangements in green, blue and white colors can be designed.
- Designs can be developed for urban equipment elements in harmony with the identity, color and symbol components.
- Water element can be used together with plant arrangements.
- Bartın River can be made use of as a whole with its potential of transport and structure convenient for recreational organizations.
- Footing and jogging tracks, resting areas, photograph take points and playgrounds can be constructed along the Bartın River banks, and existing ones can be improved.
- Stands reflecting the civil architecture characteristics can be created in open green areas to sell traditional handcraft products and local dishes.
- Squares can be designed for open green areas to hold the celebrations such as strawberry festival or hıdrellez festival.
- The Bartın logo suggested based on the data obtained is presented in Figure 7.



Figure 7. The Bartın logo suggested (illustration by Murat Sarı, graphic drawing by Mustafa Semih Saraoğlu).

Revising the existing open green areas according to the recommended design criteria and developing the new designs also according to these criteria are important in the branding process of Bartın. Public and private sectors, nongovernmental organizations, Bartın University and local people must work together in a multidisciplinary fashion in order to achieve success.

Although Amasra had taken the first place among the slogans that could be used for branding of Bartın in the data obtained from the questionnaire, Amasra was not used in the suggested logo. The reason for this is that the element remembered first upon mention of Bartın was Amasra till today. However, the slogan “Bartın, City of Rivers” was used with the purpose of diminishing or wiping off this judgment and ensuring that Bartın will be called with its own name and branding with its own identity components and creating its new image. The branding strategies in tourism focusing on urban landscape have been determined for the Bartın City in the study of Çelik and other (2013). In the study carried out, the colors to be used in Bartın logo depending on focusing on natural beauties of Bartın have been determined by the majority of participants as blue for the river and sky and green for nature. No sequencing of criteria was asked in the questionnaire. This sequencing was made based only on the numerical superiority of the participants of the questionnaire. In the present study however, participants were asked to sequence colors. The same colors were preferred in this study also; however, order of colors has been changed. Green has taken the first place and blue has taken the second places in this study. A regards the slogan, including the word “Amasra” in the slogan as an important destination, which is considered as a strong aspect of Bartın, and “City of Rivers” since a river runs through the city has been preferred by the participants. Sequencing of the slogan was the same in the previous study and the present study. While river and natural beauties had been preferred as symbols in the first study, river and historical houses have been preferred by the participants of the questionnaire in this study. River has taken the first place in both studies as the symbol to

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represent Bartın. In this scope, uses focusing on the river and its surroundings must be developed in planning and design studies to be carried out for Bartın city landscape and open green areas, and the existing ones must be improved. Natural landscape elements included in the identity components of the Bartın City have taken their places in the front in both studies. Cultural landscape elements including historical houses, handcrafts, local dishes, strawberry festival and "Hıdrellez" festival are in the second place.

Conclusion

Open green spaces of the city, as well as many other factors are effective in the destination branding. Open green spaces are such spaces that serve the city both in functional and esthetic aspects. Use of natural and socio-cultural landscape elements reflecting the city identity for the design criteria of such spaces will positively affect branding. Increase in the recreational esthetic and physical values result in the increase in the attractiveness of cities or touristic destinations. Since branding gives rise to being preferred, national policies are being used lately for the branding of cities, regions and countries.

Furthermore, while branding imposes values on destinations such as quality and confidence, it also establishes positive relations with tourists to create brand dependence. Creating unforgettable travel experiences related to a certain destination is possible through the establishment of emotional connections between the tourist and the destination (Taşçı, 2007). Moreover, brand positioning activities must be supported by carrying out both qualitative and quantitative studies focusing on both tourism and its demand (market structure and tendencies and profiles of tourists, etc.). The entire sector including the public and private sectors and all the entities must act in cooperation action plans must be prepared and common strategies must be developed.

Lastly, the brand identity is formed together with the city identity during the destination branding. Open green areas are effective on both destination branding and creation of the city identity. Brand image is created together with identity.

As regards the brand image, the consumer/tourist attributes a meaning to the product/destination in his/her mind as a results of his/her experiences related to the product/destination and identifies with an object. Brand components, advertisements and similar issues are effective on perceptions of tourists. The short-term objective when creating the image is to influence the tourists, while the long-term objective is to be an assuring brand (Ak, Sağdıç, 2009).

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OPTIMAL HYDRAULIC DESIGN OF SEWER NETWORKS USING GENETIC ALGORITHM

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Abstract: Building a new sewer system network is an expensive investment. The complexity of the design and operations for trying to decrease the cost leads to the usage of the optimization techniques for the infrastructure design.
Urban sewer systems consist of manholes and pipes connecting manholes. The design of these systems can be investigated in two phases: network system and hydraulic design of the network.
In this study hydraulic optimization is performed using genetic algorithm to obtain the least cost and to get the most proper values of pipe diameters and slopes. Different genetic algorithm parameters have been tried and the algorithm is tried on a real project prepared by only engineering experiences.
The used sewer network is 8.253 m. long and having 158 intersection points and 204 lines. The total real cost without optimization is found to be 1.355.400,- TL while it has become 1.255.100,4- TL after hydraulic optimizations. When comparing the results of with and without optimization, it is seen that burying amount is approximately 6% less in with optimization. In some lines the diameters are less than being in the original project. All these cause a 7.4% decrease in the total real cost with using optimization.

Keywords: Genetic algorithm, Sewer networks, Optimization, Hydraulic Design

Introduction

Sewer systems are important facilities in urban living. Because it's directly related to public health and safety (Cetin and Yurdusev, 2013). Building a network that are containing manholes and pipes connecting manholes is costly. To decrease the network cost, optimization techniques are used for the infrastructure design. The design of sewer systems consists of two phases: network system (the plan) and hydraulic design of pipes in the network Weng et.al., 2005, Weng and Liaw, 2007, Tekeli and Belkaya, 1986, Moeini and Afshar, 2012, Haghighi, 2012) which includes calculating flows, velocities, pipe diameters, slopes and burying depths. Even many researchers have used many optimization techniques for hydraulic optimizations, genetic algorithm based on getting the least cost with several trials is mostly used.

Siriwardene and Perera, (2006), Afshar, (2006), Pianese et al., (2011), Brand and Ostfeld, (2011), Afshar, (2012), Haghighi and Bakhshipour, (2012), Cimorelli et.al., (2012), Ogidan and Giacomoni, (2015), Zimmer et.al, (2015), Afshar et.al, (2006) and Beraud et.al, (2010) are also used genetic algorithm for optimization. While some researchers used only genetic algorithm, some other researchers used it within hybrid algorithms. Weng et al., (2005), Weng and Liaw, (2007), Guo et.al., (2006), Pan and Kao, (2009), Rohani and Afshar, (2015) and Liang et.al, (2004) are also used genetic algorithm together with different algorithms.

In this study, hydraulic optimization by using genetic algorithm to obtain the least cost and to get the most proper values of pipe diameters and slopes is performed. Different genetic algorithm parameters have been tried while doing and the algorithm is tried on a real project prepared by only engineering experiences.

Materials and Methods

1. Optimization of Hydraulic Calculations

A software based on genetic algorithm is developed for hydraulic optimization. Elevation levels, lengths, flows and discharge points, pipe-types, diameters allowed to be used in the project, allowable minimum and maximum slopes, minimum and maximum burying depths and flow rates for each diameters, data about manholes, quantities

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necessary for estimations and also cost values of each issue that are information about manholes and pipes between manholes in the project are inputs of this program (Cetin, 2014). The network design and manhole places are taken from the real projects as it's being.

Genetic algorithm is a searching optimization technique depending on the natural selection. Performing cross and mutation operations on the population of N chromosomes, a new generation is got. By comparing total cost of the sewer system, the optimal solution is investigated. Formulas given below are used for the construction cost of sewage projects:

$$\text{Total Pipe Cost} = \sum_{i=1}^{N} L_i \times M_{pipe} \quad (1)$$

$$\text{Total Manhole Cost} = \sum_{i=1}^{N-1} h_{avg\_manhole\_i} \times M_{manhole\_to\_depth} \quad (2)$$

$$\text{Total Burying Cost} = \sum_{i=1}^{N} L_i \times h_{avg\_pipe\_i} \times M_{burying} + \sum_{i=1}^{N-1} h_{avg\_manhole\_i} \times M_{burying} \quad (3)$$

$$\text{Total Network Cost} = \text{Total Pipe Cost} + \text{Total Manhole Cost} + \text{Total Burying Cost} \quad (4)$$

Where N is the total number of line in the network, L_i is the distance between to neighbor manhole, M_{pipe} is the unit price per meter of a pipe, $M_{manhole\_to\_depth}$ is the unit price per a depth meter of a manhole, $h_{avg\_pipe\_i}$ is the average buried depth of each line, $h_{avg\_manhole\_i}$ is the average buried depth of each manhole, $M_{burying}$ is the unit price per a depth meter of burying.

The pipe diameter and the quantity of excavation that is defined as burying depth are two main elements effecting the cost directly. The burying depth is obtained by the slope of the pipe. So parameters of the hydraulic optimization are the pipe diameter (D) and the slope (S). Generated randomly D and S as binary values in the program with different lengths are used for each chromosome.

Binary values of diameters and slopes are decoded to real values as follows:

$$D_{calc} = D_{\min} + (D_{\max} - D_{\min}) * D_{random} \quad (5)$$

$$S_{calc} = \frac{1}{S_{\max} + (S_{\min} - S_{\max}) * S_{random}} \quad (6)$$

Where D_{min} is the minimum diameter value of allowable pipe diameters, D_{max} is the maximum diameter value of allowable pipe diameters, D_{random} is the real number value of randomly generated diameter, D_{calc} is the pipe diameter calculated from randomly generated diameter values, S_{min} is the minimum allowable slope value of calculated diameter D_{calc}, S_{max} is the maximum allowable slope value of calculated diameter D_{calc}, S_{random} is the real number value of randomly generated slope, S_{calc} is the slope value calculated from randomly generated slope values.

Adaptive strategy that is known as random values of the pipe diameter and the slope are checked before calculations to eliminate values ending with improper solutions and to reduce the calculation time is used in the algorithm (Haghighi and Bakhshipour, (2012), Pan and Kao, (2009)). Randomly generated values are replaced with the adapted diameter and slope values according to criteria to eliminate values ending with improper solutions.

2. Application of Genetic Algorithm

Population size, comparison values for tournament selection algorithm, elitism rates, crossover methods, crossover rates, mutation rates that are parameters of genetic algorithm are taken alternatively.

Tournament selection method that is randomly picking a small subset of chromosomes, two or three as tournament number, from the mating pool and then making "tournament" is preferred in the program. The tournament repeats for every parent needed (Haupt and Haupt, 2004). Uniform, single-point and double-point algorithms (Haupt and Haupt, 2004) are used for crossover operations. Selected crossover algorithm is used for both diameter and slope chromosomes according to their own bit-length.

In which chromosome and in which bit number mutation operation that is taking the opposite of the binary number

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in the chromosome will be performed are defined randomly. Mutation rate can be taken as constant (Siriwardene and Perera, (2006), Afshar, (2006), Pan and Kao, (2009), (Haupt and Haupt, 2004, Mitchel, 1999) or variable like linearly increased from a value (Haupt and Haupt, 2004, Mitchel, 1999) or linearly decreased from a value (Haghighi and Bakhshipour, (2012), Haupt and Haupt, 2004, Mitchel, 1999) during the genetic algorithm operation. To reduce the number of trials especially for mutation rates and to obtain the optimum value in less time, dynamic mutation rate method is used also in this study.

A minimum and a maximum mutation rates are chosen as control mutation rate values. When the program started, a minimum mutation rate is accepted as used mutation rate. At each generation calculations, the most proper cost value is compared with the previous proper cost value. If there is only %1 or less change in the cost value at adjacent 50 generations, used mutation rate is increased by %1. If the cost value at any generation is changed more than %1, the 50 generation control interval has started from the beginning and used mutation rate is decreased by %1. Mutation rate can be increased till the maximum mutation rate value while it can be decreased till the minimum mutation rate value by value of %1. (Cetin and Yurdusev, 2016-2)

All operations are repeated as 1000 times.

3. Case Study

To test the program, a sewer network taken from a real project is used in hydraulic optimization. The real project was designed with only engineering experiences as mentioned in Guo et.al. (2008). The cost obtained in the real project is compared with the cost value result obtained by hydraulic optimization program.

The used sewer network from a town in Turkey is 8.253 m. long and having 158 intersection points and 204 lines. The schematic view of the network is given in Figure 1.

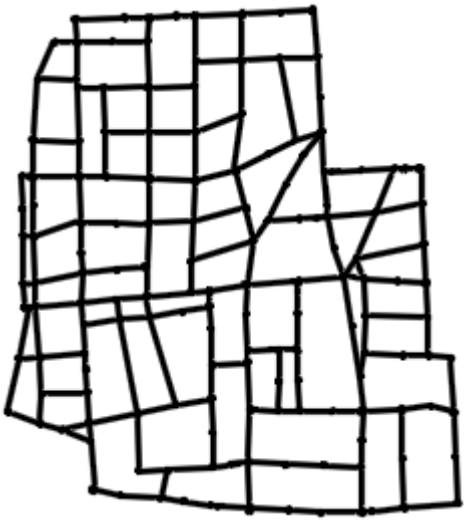

Figure 1. The schematic view of the network

Flow values, commercial pipe diameters that could be allowed to be used and allowable minimum and maximum slope values in lines, the minimum and the maximum allowable velocity values are taken from the original project. The original cost value obtained without any optimization technique is 1.355.400,- Turkish Liras (TL).

Different values for each genetic algorithm parameters are tried in this study and are shown in Table 1. The genetic algorithm parameters are 60, 80, 100, 120 and 140 for population size, %1, %2, %5 and %10 for elitism rate, 0,5 and 0,75 for tournament rate, uniform, single-point and double-points algorithms for crossover operation, %30, %50, %70 and %90 for crossover rates, %1, %2, %3, %5, %7 and %10 for mutation rates. Also dynamic mutation rate is taken into account as described before with minimum mutation rate %1 and maximum mutation rate %11, %1 increase in mutation rate, 50 generation for %1 or less change in the cost value. To compare the results of the dynamic mutation rate value and the other mutation rate values, the optimum mutation rate obtained from trials is not considered when taking the minimum and the maximum mutation rate values as %1 and %11.

After all combinations of trials being performed, it is observed that values of the population size as 80 (Figure 2), %2 as elitism rate value (Figure 3), 0,75 as tournament rate (Figure 4), single-point algorithm as crossover method (Figure 5), %70 as crossover rate (Figure 6), %2 as mutation rate (Figure 7) have the optimum solution for this

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project. Figures 2-7 show differences between different values of a genetic algorithm parameter. While having results for these figures, genetic algorithm parameters other than mentioned at each figure are taken as optimum values obtained after trials. For example, while trying different values (60, 80, 100, 120 and 140) for population size (Figure 2), optimum values of other genetic algorithm parameters such as %2 as elitism rate value, 0,75 as tournament rate, single-point algorithm as crossover method, %70 as crossover rate, %2 as mutation rate are taken.

Table 1: Genetic algorithm parameters used for hydraulic optimization

Generation number	1000
Ending	After all population
Bit number	According to different diameter and slope values
Population size	60, 80, 100, 120, 140
Elitism rate	%1, %2, %5, %10
Selecting Parents	Tournament
Tournament rate	0,50, 0,75
Tournament number	2
Crossover method	Uniform, single point, double points
Uniform	Each bit to offspring1 or offspring2 according to a random number
Single point	Cutting at a random number
Double points	Cutting at two random numbers
Crossover rate	%30, %50, %70, %90
Mutation rate	%1, %2, %3, %5, %7, %10
Dynamic Mutation Rate Use	Difference in the cost value at adjacent monotonous generations <%1

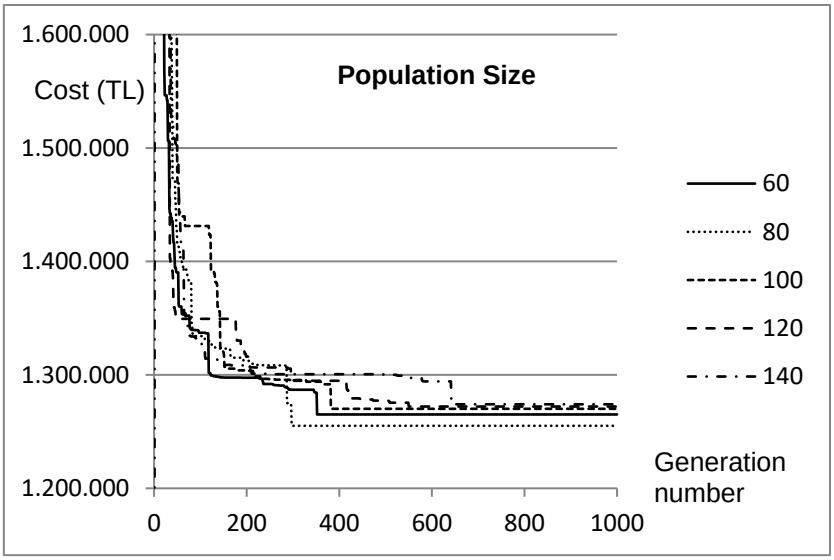

Figure 2. Comparison of population size

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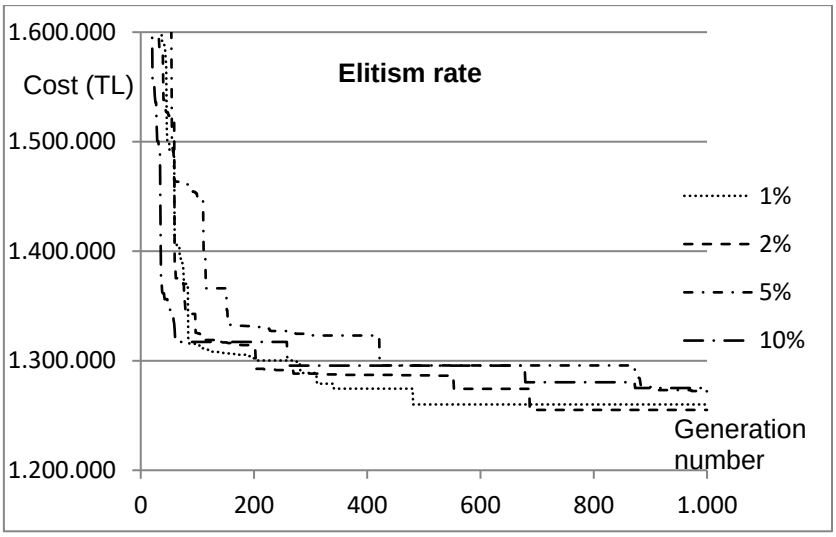

Figure 3. Comparison of elitism rate

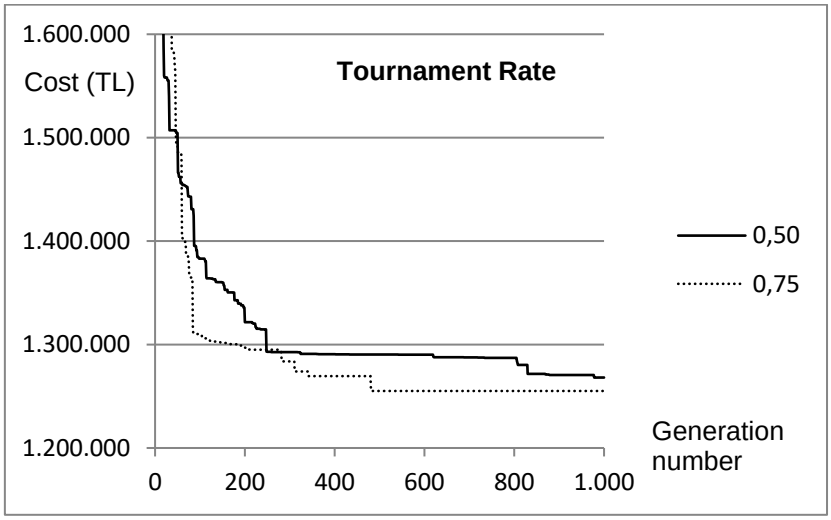

Figure 4. Comparison of tournament rate

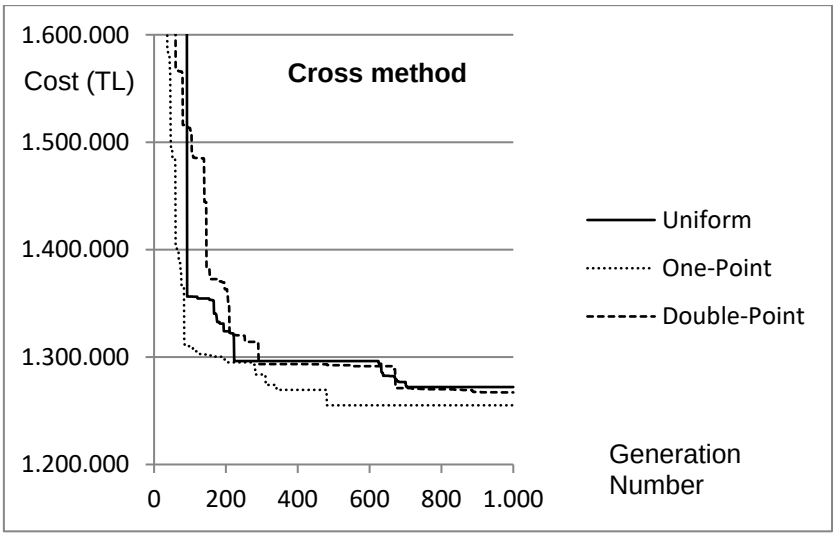

Figure 5. Comparison of cross methods

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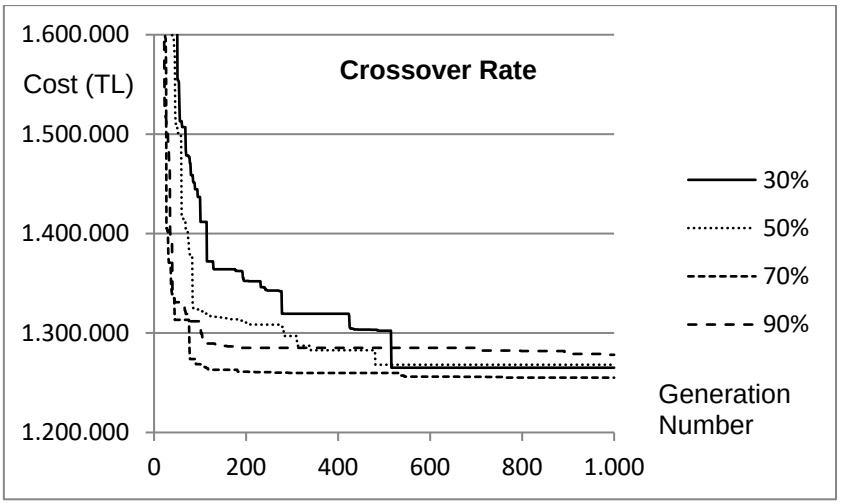

Figure 6. Comparison of crossover rate

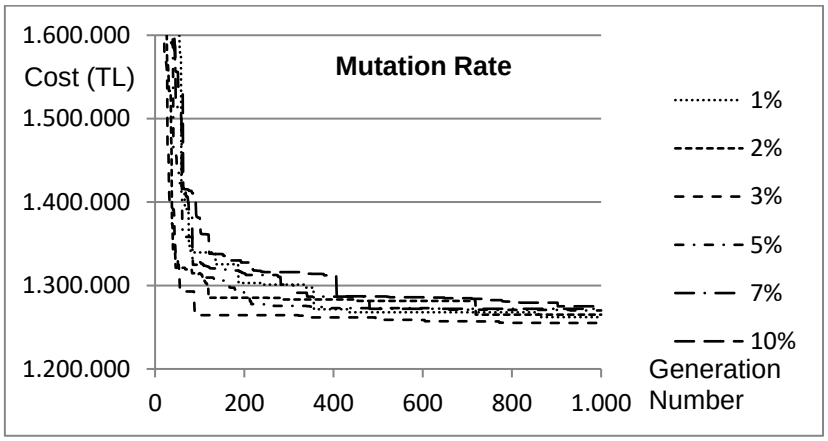

Figure 7. Comparison of mutation rate

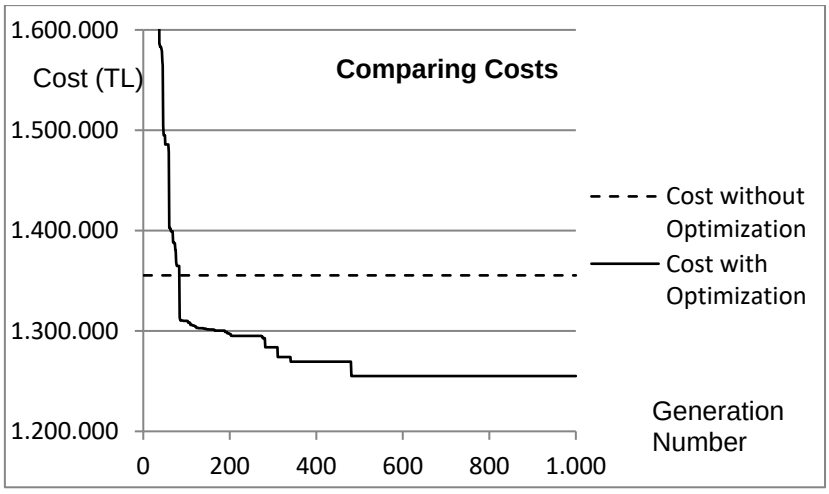

Figure 8. Comparing costs with optimization and without optimization

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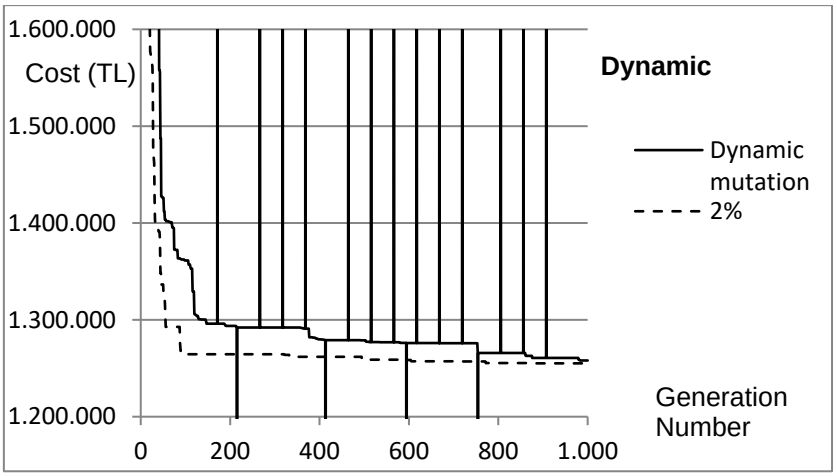

Figure 9. Comparison of constant mutation rate and dynamic mutation rate

Results and Discussion

The cost obtained by using hydraulic optimization is 1.255.100,4 TL while the original project cost obtained without any optimization is 1.355.400,- TL. This shows the optimization procedure integrated in hydraulic calculation has provided approximately 7.4% savings.

Trials on different genetic algorithms on the sample project, have shown that population size 80, elitism rate %2, tournament rate 0,75, single-point algorithm as crossover method, %70 crossover rate, mutation rate %2 are suitable for that project. Even though mutation rate %2 has just a little better result compared to the result of dynamic mutation rate, it is clear that to obtain the optimum mutation rate more than one trial should be performed.

When comparing the results of with and without optimization, it is seen that burying amount is approximately 6% less in with optimization. In some lines the diameters are less than being in the original project. All these cause a 7.4% decrease in the total real cost with using optimization.

Conclusion

The aim of this study is to get the optimum cost value of a sewage project by using genetic algorithm that is used for optimization of hydraulic design. All needed characteristics of sewer networks are taken into consideration. These characteristics are flows and discharge points, lengths, elevation levels, diameters allowed to be used in the project, allowable minimum and maximum slopes, pipe-types, minimum and maximum burying depths and flow rates for each diameters, data about manholes, quantities necessary for estimations and also cost values of each issue in the project and also the velocity formula needed for the flow velocity preferred by governmental offices.

Pipe diameters and slope values are main inputs to the algorithm developed for hydraulic optimization. These values are defined randomly. To reduce the calculation time of the program, random values of the pipe diameter and the slope are checked prior to calculations to eliminate values ending with improper solutions. With using cost formulas special to the project performed, the optimum pipe diameters and slope values are obtained. The developed program has run on a real project solved without optimization. Different methods and values have been tried for genetic algorithm parameters such as population size, comparison values for tournament selection algorithm, elitism rates, crossover methods, crossover rates, mutation rates during optimization operation.

The genetic algorithm parameters are 60, 80, 100, 120 and 140 for population sizes %1, %2, %5 and %10 for elitism rate, 2 for tournament number, 0,5 and 0,75 for tournament rate, uniform, single-point and double-points algorithms for crossover operation, %30, %50, %70 and %90 for crossover rates, %1, %2, %3, %5, %7 and %10 for mutation rates. To reduce the number of trials especially for mutation rates and to obtain the optimum mutation rate value in less time, a method called “dynamic mutation rate method” is also used in this study.

After all, the most optimum genetic algorithm parameters such as 80 as the population size, %2 as elitism rate value, 0,75 as tournament rate, single-point algorithm as crossover method, %70 as crossover rate, %2 as mutation rate have chosen for the project. Also it is seen from the results that the use of dynamic mutation rate is effective to get the most optimum genetic algorithm parameters and to obtain the optimum solution.

The outcome of this study has shown that, the cost value obtained with the developed program is less than the original cost value which means the algorithm developed is successful.

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OPTIMIZATION OF EFFECTS OF CUTTING PARAMETERS AND CUTTING TOOL PATH WIHT TAGUCHI GREY BASED

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ABSTRACT

In this study, an experimental investigation on surface roughness and cutting forces in milling of PMD 23 cold work-tool steel using multi-layered coated TiAlN cutting tools was presented. The influences of the feed rate, tool path strategy and depth of cut on surface roughness and cutting force were examined. In order to optimize the milling process, Taguchi Grey-based optimization method was used. The influence of each parameter on obtained results was determined by using analysis of variance (ANOVA). The relationship of the dependent parameters and independent parameters was modeled with Regression analysis. The optimal machinability of PMD 23 cold work-tool steel using multi-layered coated TiAlN cutting tool was successfully determined in this study.

Key Words: Cutting Path Strategies, Taguchi, Grey Relation Analysis, ANOVA, Regression Analysis

Introduction

Among the modern machining tools, CNC milling machines are extensively used in machining. Various CAM software programs are used for programming CNC milling machines. Tool path machining programs are introduced by using these programs while many forms are proposed such as one-way, zigzag, spiral, etc. for the machining form. Selection of these methods affects also machining time and surface quality of the machined material (Kris, 1999; Toh, 2004; Sotiris, 2009).

High-strength materials are achieved with the developments in materials technology. It is required to choose the suitable cutting tool among these materials in order to provide the maximum efficiency during machining (Kris, 1999; Nurul, 2008; Brandao, 2008; Koshy, 2002; Arsecularatne, 2006; Ghani, 2004; Abou-El-Hossein, 2007; Coldwell, 2003). Determination of tool material and cutting geometry is very essential. Efficiency is reduced when the machining conditions is non-standard, even if the suitable tool is selected. Theoretical studies should be carried out for each material to be machined and each type of cutting tools in order to provide high efficiency and be able to make economical machining (Kris, 1999; Toh, 2004; Nurul, 2008; Brandao, 2008; Tsao, 2002; Ghani, 2004). It is specified that determination and application of cutting tool strategies and movements are critical in milling of volume casts, aeronautical and cutting casts (Kris, 1999; Toh, 2004; Sotiris, 2009; Pateloup, 2004; Hinds, 2004; Göloğlu, 2008). Selection of the suitable cutting strategy and movement provides a reduced machining time and increased surface quality, tool life, production cost and efficiency. In particular, tool displacement types affect the cutting forces. It was indicated that tool displacement errors should be minimized in order to reduce the cutting forces occurred.

In this study, surface roughness and cutting forces were investigated experimentally in milling of PMD 23 cold work-tool stee (which is used in many fields such as cast and die manufacturing industry) by multi-layered coated TiAlN cutting tools. Effect of tool path, feed and cutting depths on surface roughness and cutting forces was examined. Taguchi Grey technique was used for optimization of the milling process. Also, a variance analysis (ANOVA) was used for determination of effect of each parameter on the results obtained. In conclusion, the relationship between the dependent and the independent variables was modeled with regression analysis.

Material and Method

Material

PMD 23 cold-work tool steels used in the mold industry in the industry. PMD 23 cold-work tool steel is high temperature stability, thermal conductivity toughness and wear resistance Specimens used in the experimental study are PMD 23 cold work-tool steel material and PMD 23 cold work-tool steel whose chemical compositions and mechanical characteristics are given in Table 1 and Table 2 respectively was used as the test specimen. In experiments, JOHNFORD VMC-850/550+APC CNC Fanuc 0T x-y-z axis CNC Milling Machine with a motor power of 30 HP was used.

Table 1. Chemical Composition of PMD 23 cold work-tool steel

PMD23	C	W	Cr	V
Based	1.30	6.40	4.2	3.10

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Table 2. Mechanical Characteristics of PMD 23 cold work-tool steel

Tensile Strength (Mpa)	Yield Strength (Mpa)	Elongation (%)	Density(kg/m^3)	Hardness(HB)
460	530-650	24	25-36	460

In experiments, following are used; JOHNFORD VMC-850/550+APC CNC Fanuc 0T x-y-z axis CNC Milling Machine, multi-layered coated TiAlN end-mill inserts, MAHR-Perthometer surface roughness tool for surface roughness measurement, KISTLER 9265B dynamometer for cutting force measurement, KISTLER 5019b type charge amplifier and DynoWare software for the analysis.

Method

Experiment was designed by using Taguchi technique. By this way, it has been possible to achieve more comprehensive results with less number of experiments. In this case, time and cost have been saved. As surface roughness of the surface to be measured and cutting force rates are required to be minimum in determination of the quality characteristics, the principle "the smallest is the best" was used for the quality values expected to be found as a result of the experiments. In this experimental study, tool path, feed and cutting depths were chosen as parameters. Multiple-layer TiAlN coated end-mills were used in all experiments and the parameters and their levels are presented in Table 2 while L9 experimental design and the surface roughness and cutting forces obtained from the experiments are given in Table 3. Experimental setup is sketched in Figure 1.

Table 1. Experimental Variables

Parameters	**(A) Tool Path**	**(B) Feed (mm/min)**	**(C) Cutting depth (mm)**
Level I	One-Way	150	0.25
Level II	Zig-Zag	200	0.50
Level III	Spiral	250	0.75

Table 3. L9 Experimental setup and surface roughness and cutting force values

Exp. No.	**Variables**	**(A) Tool Path**	**(B) Feed (mm/min)**	**(C) Cutting depth (mm)**	**Ra (µm)**	**Cutting Force (N)**
1	$A_1B_1C_1$	1	1	1	0,157	27,84
2	$A_1B_2C_2$	1	2	2	0,273	67,34
3	$A_1B_3C_3$	1	3	3	0,429	90,77
4	$A_2B_1C_2$	2	1	2	0,174	70,26
5	$A_2B_2C_3$	2	2	3	0,275	114,94
6	$A_2B_3C_1$	2	3	1	0,435	74,66
7	$A_3B_1C_3$	3	1	3	0,222	95,90
8	$A_3B_2C_1$	3	2	1	0,301	50,49
9	$A_3B_3C_2$	3	3	2	0,406	106,15

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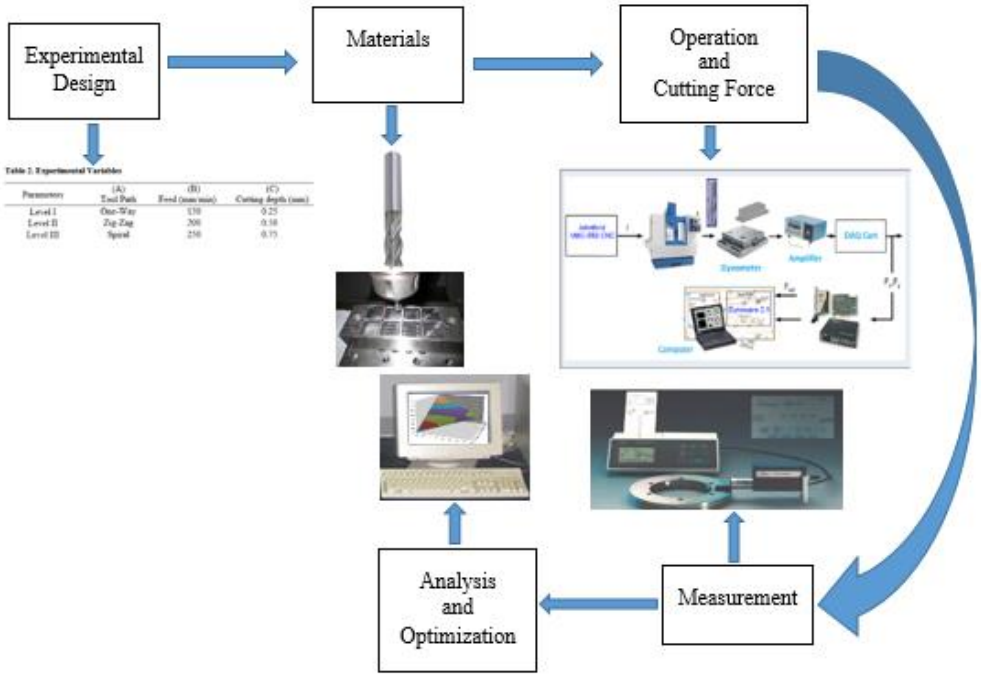

Figure 1. Experimental Setup

Taguchi Based Grey Relational Analysis Method

The obtained experimental results and the determined parameters were optimized with Grey Based Taguchi method. Using regression model, researches were carried out calculating an equation between dependent parameters and independent parameters. The Taguchi method uses a special design of orthogonal arrays to study the entire parameter space with a small number of experiments only.

Experimental design was done using Taguchi method. Hence, it has been possible to reach more comprehensive results with doing less experiment. In this sense, time and money have been used more efficiently [Chung-Chen, 2002, Venkatesan, 2014]. While only outcome is optimized in the Taguchi Method, multiple outcomes can be optimized in a Grey Relational Analysis [Kurt, 2012]. In this study, Taguchi Method was used in the experimental design step, Grey Relational Analysis Method was used in the optimization step.

Grey relational analysis optimization process was carried out in the following three steps [Kurt, 2012];

1. Normalization of experimental results (the lowest-the best)
2. Calculation the Grey Relational Coefficient
3. Calculation of the Grey Relational Degree
4. Determination of optimal experiment parameters

In the normalization step, the experimental results were normalized using the blow equation according to 'the lowest-the best'.

$$x_i(k) = \frac{\max y_i(k) - y_i(k)}{\max y_i(k) - \min y_i(k)} \qquad (2)$$

Where, $x_i(k)$ refers to the value at the i series and k row after normalization process, $\min y_i(k)$ refers to the minimum value at the i series, $\max y_i(k)$ refers to the maximum value at the i series and $y_i(k)$ refers to the original value at the i series and k row.

The step 2, Grey Relatinoal Coefficient was calculated via equation (3);

$$\xi_i(k) = \frac{\Delta min + \zeta \Delta max}{\Delta 0_i(k) + \zeta \Delta max} \qquad (3)$$

Here, ζ is a distinguishing coefficient between 0 and 1. $\Delta 0_i$ is the amount of deviation between the reference series and the normalization values. Δmin refers to the minimum value of the deviation sequence from the reference series and Δmax refers to the maximum value of deviation sequence from the reference series.

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The step 3, Grey Relational Degree was calculated by equation (4);

$$\gamma_i=\frac{1}{n}\sum_{k=1}^{n}\xi i\,(k) \qquad (4)$$

Results and Discussions

Grey Relational Analysis

Grey Relational Analysis Method was applied to the experimental results shown in Table 4, and the first step (normalization) results were given in Table 4.

Table 4. Normalization results

Exp. No.	Variables	Surface Roughness, Ra (µm)	Cutting Force (N)
1	$A_1B_1C_1$	1,000	1,000
2	$A_1B_2C_2$	0,583	0,546
3	$A_1B_3C_3$	0,022	0,277
4	$A_2B_1C_2$	0,939	0,513
5	$A_2B_2C_3$	0,576	0,000
6	$A_2B_3C_1$	0,000	0,462
7	$A_3B_1C_3$	0,766	0,219
8	$A_3B_2C_1$	0,482	0,740
9	$A_3B_3C_2$	0,104	0,101

Then, the deviations from the reference series were calculated and the results were given in Table 5.

Table 5. Values of the deviation from the reference value

Exp.No.	Surface Roughness, Ra (µm)	Cutting Force (N)
1	0,000	0,000
2	0,417	0,454
3	0,978	0,723
4	0,061	0,487
5	0,424	1,000
6	1,000	0,538
7	0,234	0,781
8	0,518	0,260
9	0,896	0,899

The Grey Relational Coefficients were calculated using the equation 2 and shown in Table 6.

Table 6. The Grey Relational Coefficients

Exp.No.	Surface Roughness, Ra (µm)	Cutting Force (N)
1	1,000	1,000
2	0,545	0,524
3	0,338	0,409
4	0,891	0,507
5	0,541	0,333
6	0,333	0,482
7	0,681	0,390
8	0,491	0,658
9	0,358	0,357

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The Grey Relational Degrees related to each experiment result was calculated and the experiments results were ranked in order from highest Grey Relational Degree to present in Table 7.

Table 7. Grey relational degrees of the factor levels for milling

Levels	(A) Tool Path	(B) Feed (mm/min)	(C) Depth of cut (mm)
Level 1	**0,636**	**0,745**	**0,661**
Level 2	0,515	0,515	0,530
Level 3	0,489	0,380	0,449

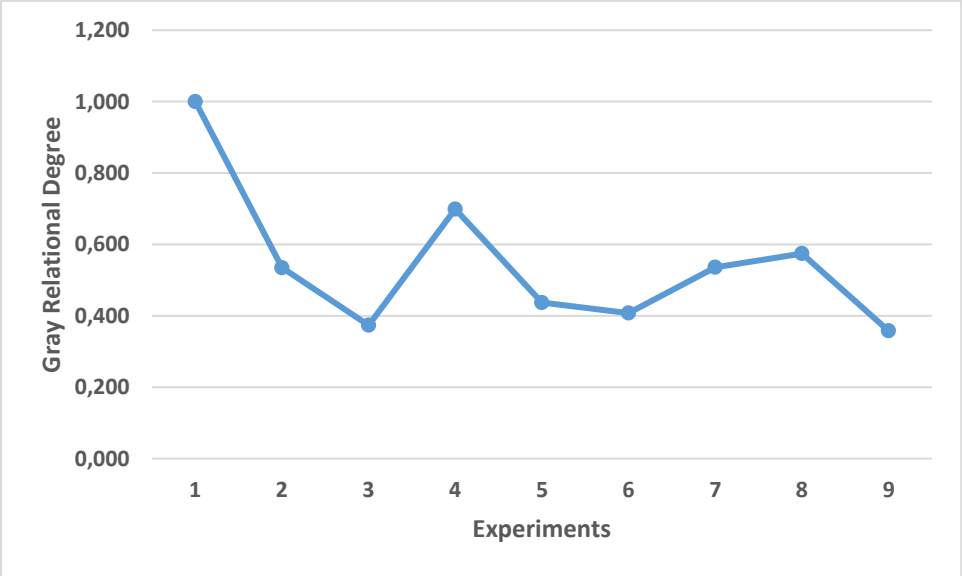

Figure 2. Grey Relational Degrees for each experiments

Variance Analysis

Nine experiments were performed in milling of PMD 23 cold-work tool steel by using three different factors at three different levels, and, at the end of each experiment, Ra respond values were found to be different from each other. Variance analysis was used in order to specify whether these variations are purely coincidental or they result from the factors and determine effect of each factor on the response. As given in Table 8, the most effective factor is the feed with a value of 98.04% in formation of roughness on the machined surface as a result PMD 23 cold-work tool steel machined by multiple-layer TiAlN coated end-mills cutting tools.

Table 8. ANOVA results depending on Ra values

Notations	Degree of Freedom	**Sum of Squares**	Variables	**F rate**	Percentage (%)
A	2	0,000839	0,000419	0,56	0,95
B	2	0,086550	0,043275	57,72	98,04
C	2	0,000891	0,000445	0,59	1,00
Error (e)	2	0,001500	0,000750		0,01
Total	8	0,089779			100

As given in Table 9, the most effective factor is the feed with a value of 63.95% in formation of cutting force on the machined as a result PMD 23 cold-work tool steel machined by multiple-layer TiAlN coated end-mills cutting tools.

Table 9. ANOVA results depending on N values

Notations	Degree of Freedom	**Sum of Squares**	Variables	**F rate**	Percentage (%)
A	2	1105,6	552,8	4,49	18,90
B	2	1003,1	501,6	4,07	17,13

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C	2	3741,5	1870,7	15,19	63,95
Error (e)	2	246,3	123,2		0,02
Total	8	6096,5			100

Regression Analysis

Linear regression analysis was used in order to generate the estimating equation between the control factors (tool path, feed and cutting depth) used for machining and that of respond (Mean surface roughness) and to be able to define the relationship between them. Ra equation obtained for this experimental study is given below.

Ra (μm) = 0,0236 + 0,0117 A + 0,120 B + 0,0055 C+ (ε) $R^2 = 0{,}965$ (3)

Cutting Force (N) = - 20,0 + 11,1A + 12,9B + 24,8C + (ε) $R^2 = 0{,}89$ (4)

where A: tool path, B: feed and C: cutting depth. Also, ε gives the error. R^2 value which is the coefficient of determination of surface roughness and cutting dorce equations were found as 0.965 and 0.89. R^2 value approaching 1 reflects proximity of estimation model to the real relationship and the case where an R^2 value equals to 0.8 and above is accepted as a strong relationship. As R^2 value in the estimating equation obtained from this study is above 0.8, it is within the acceptable limits and has a strong relationship.

CONCLUSIONS

Useful results were obtained from this study in which machinability of PMD 23 cold-work tool steel with multiple-layer TiAlN coated end-mills cutting tool was investigated. Criteria taken into account for machinability were surface roughness and cutting force. Three control factors (tool path, feed and cutting depth) which are considered to be effective for realization of these criteria at the most ideal conditions were chosen at three different levels and applied in the experimental study. Results obtained are summarized as follows:

- The most effective factor in machining of PMD 23 cold-work tool steel with multiple-layer TiAlN coated end-mills cutting tools is the feed for the surface roughness value occurred on the machined surface. The optimum value is obtained by taguchi based grey relational analysis when the machining parameters are as follows: one-way tool path, 150 mm/min feed and 0.25 mm cutting depth.
- As a result of the performed study, Taguchi optimization technique was found to be an efficient technique in experimental study of PMD 23 cold-work tool steel machinability and optimization of the parameters and provide respond values range at the desired rates.
- The issue with respect to which control factor has what significance level in obtaining the results from the experimental study was determined successfully by the variance analysis (ANOVA). According to that, feed is noticeable with a value of 98.04% in formation of roughness.
- The Ra and cutting force estimating equation were obtained with an accuracy of 96.5% and 89% by regression analysis for such an experimental study.
- When the obtained results are evaluated by also considering the literature, it is found that multiple-layer TiAlN coated end-mills cutting tools made positive contribution to machinability of PMD 23 cold-work tool steel and, in particular, accelerated the improvement of the cutting tool performance. Another result obtained from this study is that PMD 23 cold-work tool steel can be produced by dry milling with multiple-layer TiAlN coated end-mills cutting tools.

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ORTADOĞU BÖLGESİNİN JEOEKONOMİK AÇIDAN İKİ STRATEJİK ENERJİ KAYNAĞI: PETROL VE DOĞALGAZ

TWO STRATEGIC ENERGY SOURCE OF MIDDLE EAST REGION IN TERMS OF GEOECONOMIC PERSPECTIVE: PETROLEUM AND NATURAL GAS

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Özet

Bu çalışmada, Ortadoğu bölgesinin sahip olduğu enerji kaynaklarından petrol ve doğalgaz ele alınmış ve bu enerji kaynaklarının jeoekonomik açıdan önemi irdelenmeye çalışılmıştır. İlk medeniyetlerin kurulduğu bir alana tekabül etmesi ve üç semavi dinin (Musevilik, Hristiyanlık ve İslamiyet) çıkış yeri olması gibi faktörler, Ortadoğu bölgesinin her dönemde cazip bir bölge olmasına neden olmuştur. Ortadoğu'yu önemli kılan bir diğer faktör bölgenin sahip olduğu zengin yer altı kaynaklarıdır. 19.yüzyılın sonlarından itibaren petrol ve doğalgaz kaynaklarının bölgede tespit edilip kullanılması, bölgenin önemini daha da arttırmıştır. Dünyadaki petrol rezervinin %46'sı, doğalgaz rezervinin %44'ü Ortadoğu'da yer almaktadır. Ortadoğu, Dünyada üretilen petrolün yaklaşık %33'ünü üretmekte, üretilen bu petrolün büyük bir bölümü (%70) bölge dışına ihraç edilmektedir. Petrole göre az da bölgede üretilen doğalgazın bir bölümü de ihraç edilmektedir. Dolayısıyla dünya enerji talebinin karşılanmasında Ortadoğu bölgesi, dünyadaki en önemli havza konumundadır.

Dünya genelinde enerjiye olan ihtiyaç sürekli bir artış göstermektedir. Rusya enerji kaynakları ihraç eden bir ülke konumunda iken, ABD'nin yakın gelecekte kendi enerjisini sağlayabilecek bir noktaya geleceği tahmin edilmektedir. Ancak ABD Ortadoğu bölgesindeki enerji kaynakları ile ilgili birtakım stratejiler geliştirmektedir. Hızlı bir gelişme sürecine giren ve dolayısıyla enerjiye olan talebi hızla artan Hindistan ve Çin, bölgedeki enerji kaynaklarına yönelmektedirler. Öte yandan günümüzde olduğu gibi bundan sonraki süreçte de petrol ve doğalgaz ihtiyacının büyük çoğunluğunu dışardan karşılayan AB için Ortadoğu ve yakın çevresindeki enerji kaynakları daha anlamlı hale gelecektir. Rusya'nın zaman zaman AB ülkelerine ihraç ettiği doğalgazı siyasi ve ekonomik bir baskı aracı olarak kullanması da AB ülkelerini bölgedeki enerji havzalarına yöneltmektedir.

Günümüzde Ortadoğu bölgesi ve yakın çevresindeki (Kuzey Afrika ve Hazar Havzası) enerji kaynakları üzerinde hem bölgesel hem de küresel güçler arasında büyük bir jeoekonomik mücadele sürmektedir. Bundan sonraki süreçte de Ortadoğu bölgesi, dünya küresel güç rekabetinin en önemli sahalarından birini oluşturacaktır. Dolayısıyla Ortadoğu'nun jeoekonomik öneminin giderek artacağı ve buna bağlı olarak son yıllarda bölgede cereyan eden hadiselerin yoğun olarak devam edeceği tahmin edilmektedir.

Anahtar Kelimeler: Ortadoğu, Enerji kaynakları, Petrol, Doğalgaz, Jeoekonomi

Abstract

In this research two strategic energy source of Middle East region petroleum and natural gas are handled and geoeconomical importance of these resources are scrutinized. Being the homeland of first civilizations and birth place of three divine religions (Judaism, Christianity and Islam) made Middle East region attractive. Another important factor that makes Middle

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East significant is rich underground sources it possesses. As from the 19th century detection and usage of petroleum and natural gases increased the importance of the territory. In the world 46% of petroleum reserves and 44% of natural gas reserves are in Middle East. 33% of worldwide petroleum reserves are produced in Middle East, and 70% of produced petroleum are exported outside of the region. Compared to petroleum natural gas are exported very little to outside of the region. Therefore, Middle East region is one of the integral basin in terms of meeting energy demand.

The need for energy is continuously increasing worldwide. While Russia is an energy exporting country, it is expected that in the near future USA will be able to produce its own energy. Still USA building strategies about the energy resources in the Middle East. China and India with a rapid economic development turn to Middle East for their energy need. Besides, as in today, in the future energy resources in Middle East and surrounding will be important for EU since it is still a foreign dependent in terms energy. Because sometimes Russia uses natural gas as a political and an economic leverage against EU, EU tries to have a word about Middle East energy resources.

At the present, there is a great geoeconomical challenge between both national and international forces about energy sources in the Middle East and surroundings (North Africa and Hazar Basin). In the future Middle East region still will be one of the most integral competitive power region. Thereby, it is estimated that the geoeconomic importance of Middle East will increase and events as it continuos today will intensely go on.

Key Words: Middle East, Energy Resources, Petroleum, Natural Gas, Geoeconomy

1.Giriş

Ortadoğu bölgesi, doğal sınırlarla ayırt edilebilen coğrafi bir bölge özelliği taşımamaktadır. Ortadoğu bölgesinin sınırları bölge üzerinde etkin olmak isteyen ülkelerin amaçlarına göre değişiklik göstermektedir. Ortadoğu kavramı, batılı devletlerin çıkarları doğrultusunda ortaya çıkmış, zamanla bölge halkı tarafından da benimsenerek kullanılmıştır (Meriç, 1980:71). Günümüzde İngiltere'nin belirlediği sınırların daha fazla kabul gördüğü ve dolayısıyla Ortadoğu denilince bu sınırlar içerisinde kalan alanların akla geldiği bilinmektedir.

Batılı devletler 15.yüzyılın sonlarından itibaren Hindistan ve Çin'in zenginliklerine kavuşmak için yeni yollar aramaya başlamışlar ve Coğrafi keşiflerle Doğu Avrupa üzerinden veya Afrika'nın güneyinden geçen yolları keşfetmişlerdir. Ancak, bu yollar uzun olup, en kestirme yollar Osmanlı toprakları üzerinden geçiyordu. İngilizler seyahatleri sırasında Hindistan ve Çin ülkelerine *Uzakdoğu*, Osmanlı ülkelerine ise *Yakındoğu (Near East)* adını vermişlerdir. 1889'da Süveyş Kanalı'nın açılmasıyla yeni bir ticaret yolu açıldı ve İngilizler bu dönemde bölgeye Yakın Doğu yerine *Ortadoğu (Middle East)* adını verdiler (Özey, 2009:2-3).

Temelde *Ortadoğu (Middle East)* kavramının *Doğu (Şark; East)* ve *Yakındoğu (Near East)* kavramları gibi Batı merkezli ve sübjektif bir kavramlaştırmanın ürünü olarak ortaya çıktığı ve kullanım sahasına girdiği söylenebilir. Bu kavramlaştırmayı yönlendiren ana bakış, Avrupa'yı dünyanın merkezi olarak kabul eden ve dünyanın diğer bölgeleri bu merkeze olan uzaklıklarına göre *yakın, orta, uzak* şeklinde kategorize eden bakıştır (Dursun, 2003). *Ortadoğu* kavramı ilk olarak 1902 yılında Amerikan deniz tarihçisi ve stratejisti Alfred Thayer Mahan tarafından kullanılmıştır. Mahan, National Review'de yayınlanan "The Persian Gulf and International Relations" isimli yazısında, Arabistan ile Hindistan arasındaki bölgeyi ifade etmek için *Ortadoğu* kavramını kullanmıştır. Bundan sonra İngiliz gazetesi olan The Times gazetesinde "Ortadoğu'nun Problemleri" başlığı ile bazı makaleler yayınlanmıştır (Lewis, 1964:75; Dursun, 2005:1233). 1939 yılına kadar dar ve kapalı bir anlam taşıyan *Ortadoğu* kavramı bu tarihten itibaren İngiltere'nin resmi kaynaklarında kullanılmaya başlanmıştır (Özey, 2009:2-3).

Kuzey Afrika, Kafkaslar, Afganistan ve bazı kaynaklarda Orta Asya, Ortadoğu bölgesi içerisinde gösterilmektedir. Özellikle ABD bölgenin sınırlarını geniş tutmaktadır. Kuzey Afrika, Kafkaslar ve Orta Asya bölgeleri, coğrafi özellikleri itibariyle farklı olması nedeniyle kabul görmüş ve sınırları belli olan bölgelerdir. Ortadoğu kavramı dar anlamda Arabistan Yarımadası, Basra Körfezi ülkeleri, Mezopotamya, İran, Türkiye ve Mısır'ı içine alacak şekilde kullanılmaktadır (Dursun, 2003). Asya kıtasının güneybatısına tekabül eden bu bölge coğrafyacılar tarafından Güneybatı Asya olarak adlandırılmaktadır (Gözenç, 1996:4). Bugünkü Ortadoğu kuzeyde Türkiye, batıda Mısır, doğuda İran ve güneyde Yemen ülkeleriyle çevrili bölgeyi içine almaktadır. Günümüzde Ortadoğu; Türkiye, İran, Irak, Suriye, S.Arabistan, Kuzey Kıbrıs Türk Cumhuriyeti, Güney Kıbrıs Rum Kesimi, Mısır, Ürdün, Lübnan, İsrail, Filistin, Kuveyt, Bahreyn, Katar, BAE, Umman ve Yemen olmak üzere 18 devletten ibarettir (Özey, 2009:3-5). (Harita 1).

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Harita 1: Ortadoğu bölgesinin lokasyon haritası

Ortadoğu bölgesi jeostratejik konumu nedeniyle geçmişte olduğu gibi günümüzde de önemli bir bölge özelliğindedir. Ortadoğu bölgesinin cazip bir bölge olmasında çeşitli faktörler etkili olmaktadır. Medeniyetlerin beşiği olarak kabul edilen ve en eski yerleşmelerin kurulduğu bölgelerden biri olan Ortadoğu'da Asurlular, Urartular, Persler, Makedonlar, Araplar, Selçuklular, Eyyübiler ve Osmanlılar büyük devletler kurmuşlardır. Dolayısıyla insanlığın ilk ortaya çıktığı yerlerden biri olan bölge, ilk medeniyetlerin kurulduğu bir alana tekabül etmektedir.

Ortadoğu bölgesini önemli kılan bir diğer faktör üç semavi dinin (Musevilik, Hristiyanlık ve İslamiyet) çıkış yeri olmasıdır. Bölgede yer alan *Kudüs, üç dinin kutsal merkezi konumunda olup, bu yönüyle sadece bölgesel nitelikli bir bunalım alanı değildir. Küdus'te yaşanan sorun, dünyanın her tarafına yayılmış üç din mensubunun sorunu haline gelmektedir* (Davutoğlu, 2001). Dolayısıyla Ortadoğu bölgesi, yukarıda adı geçen üç semavi din mensupları için şimdiye kadar olduğu gibi bundan sonraki dönemlerde de önem arz eden bir bölge olacağı düşünülmektedir.

Günümüzde Ortadoğu'yu cazip kılan önemli faktörlerden biri de enerji kaynaklarıdır. 20.yüzyılın başlarından itibaren petrol ve doğalgaz kaynaklarının kullanılmaya başlanmasıyla bölgenin önemi daha da artmıştır. I.Dünya savaşından sonra bölgenin siyasi hayatında büyük ölçüde meydana gelen değişiklikler (Osmanlı devletinin zayıflaması ve yıkılması neticesinde yeni devletlerin kurulması gibi) ile Ortadoğu bölgesi, gerek politika ve strateji, gerekse petrol ve doğalgaz kaynaklarının varlığına bağlı olarak ekonomi alanında dünyanın en dikkat çekici bölgelerden biri haline gelmiş ve dolayısıyla bölge, büyük devletlerin siyaset ve ekonomi alanında bir rekabet sahasına dönüşmüştür (Öngör, 1965:1-2).

Ortadoğu bölgesi petrol, doğalgaz, kömür gibi fosil yakıtlar ile hidroelektrik, jeotermal, rüzgar, güneş enerjisi gibi alternatif enerji kaynakları bakımından zengin bir bölgedir. Ancak günümüzde bölgeyi küresel enerji sektörü açısından cazip hale getiren en önemli enerji kaynakları şüphesiz petrol ve doğalgazdır. Dolayısıyla bu çalışmada Ortadoğu bölgesinin iki stratejik enerji kaynağı olan petrol ve doğalgaz kaynakları, jeoekonomik[2] açıdan irdelenmiştir. Ortadoğu'daki petrol ve doğalgaz kaynakları, Hazar Denizi Havzası ve Kuzey

[2] Jeoekonomi, en kısa ve genel tanımıyla *bir bölge veya ülkenin, uluslararası ekonomik ve politik ilişkileri içerisinde coğrafya ve ekonomisinin teknolojik öğelerinin de dikkate alınarak stratejik kullanımıdır*. Jeoekonomiye asıl önem atfeden durum uluslararası alandaki güç mücadelelerindeki temel başvuru stratejisi olmasıdır (İnan, 2011:87).

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Afrika'daki kaynaklar ile birlikte değerlendirildiğinde bölgenin dünya enerji sektörü bakımından çok daha önemli bir merkez konumunda olduğu anlaşılmaktadır.

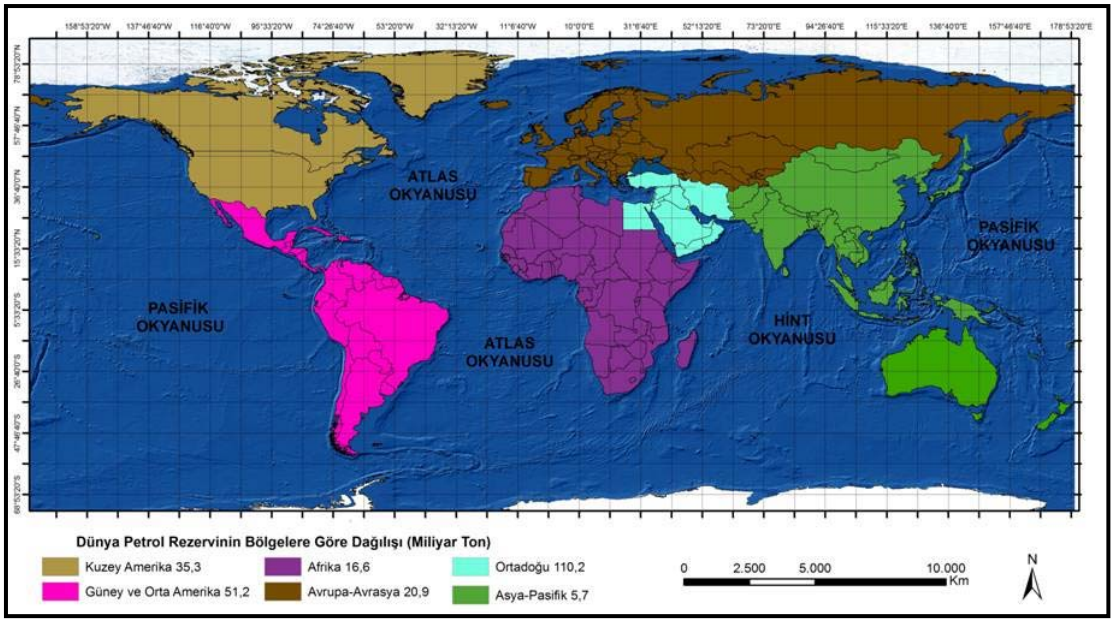
2. Ortadoğu'daki Enerji Kaynakları

Sanayi devrimi ile birlikte başlayan yoğun enerji kullanımı sanayinin gelişmesiyle sürekli artış göstermektedir. Günümüzde nüfusun artışına ve teknolojik gelişmelere bağlı olarak enerjiye olan talep artmaktadır. Özellikle gelişmiş ve hızlı kalkınma sürecine girmiş olan ülkeler, bütçelerinin en önemli kısmını oluşturan enerji kullanımı nedeniyle büyük miktarlarda enerji kaynaklarına ihtiyaç duymaktadırlar. Ülkelerin artan enerji ihtiyacı, insanları enerjinin tasarruflu kullanmaya ve yeni kaynak arayışlarına sevk etmektedir. Son yıllarda enerjiye en fazla ihtiyaç duyan ülkelerin büyük bir bölümünün kendi enerji kaynaklarının yeterli olmadığı, bu ihtiyaçlarını çeşitli enerji havzalarından karşılamaya çalıştığı görülmektedir.

Dünya enerji üretiminde petrol ilk sırada yer almaktadır. Petrolü daha önce tartışmasız en büyük enerji kaynağı olan fakat şimdiki payı düşen maden kömürü; üçüncü sırada da dünya enerji üretim ve tüketimindeki payını sürekli arttıran doğal gaz izlemektedir (Tümertekin ve Özgüç, 2012:350). Günümüzde dünyada tüketilen çeşitli enerji kaynakları içerisinde bu üç fosil kaynak en büyük paylara sahiptir. Nitekim petrol (%33), kömür (%30) ve doğalgaz (%24) kaynakları tüketilen tüm enerji kaynaklarının %87'si gibi büyük bir oranına karşılık gelmektedir (Türkiye Petrolleri Strateji Geliştirme Daire Başkanlığı, 2015:4). Dolayısıyla bu çalışmada Ortadoğu özelinde ele aldığımız petrol ve doğalgaz kaynakları dünya enerji tüketiminin yarıdan fazlasını (%57) karşılamaktadır.

2.1.Petrol

Dünyadaki petrol rezervleri belirli bölgelerde yoğunlaşmaktadır. 2014 yılı itibariyle dünya ham petrol rezervi toplamı 239,9 milyar tondur. Bu rezervinin yarıya yakını (%46'sı) Ortadoğu'da yer almaktadır. Dünya petrol rezervinin %21'i Güney ve Orta Amerika'da, %15'i ise Kuzey Amerika'da bulunmaktadır (Harita 2, Tablo 1, Şekil 1). Bu üç bölgenin toplam rezervinin oranı %82'dir. Petrol rezervi açısından Ortadoğu bölgesi ülkeleri iki kategoride ele alınabilir. Bunlardan petrol rezervi açısından zengin olan ülkeler Suudi Arabistan, İran, Irak, Kuveyt, Birleşik Arap Emirlikleri ve Katar'dır. Bu ülkeler içerisinde en büyük rezerve sahip olan ülke dünya petrol rezervinin %15.7'sini bulunduran S.Arabistan'dır. Bölgedeki diğer ülkeler petrol kaynakları açısından fakir olan ülkelerdir (Tablo 2).



Harita 2: Dünya petrol rezervinin bölgelere göre dağılışı (milyar ton)

Tablo 1: Dünya petrol rezervinin bölgelere göre dağılışı (milyar ton)

Ülke Adı	**2014**	**Oran (%)**
Kuzey Amerika	35,3	15
Güney ve Orta Amerika	51,2	21
Avrupa-Avrasya	20,9	9
Ortadoğu	**110,2**	**46**
Afrika	16,6	7
Asya-Pasifik	5,7	2

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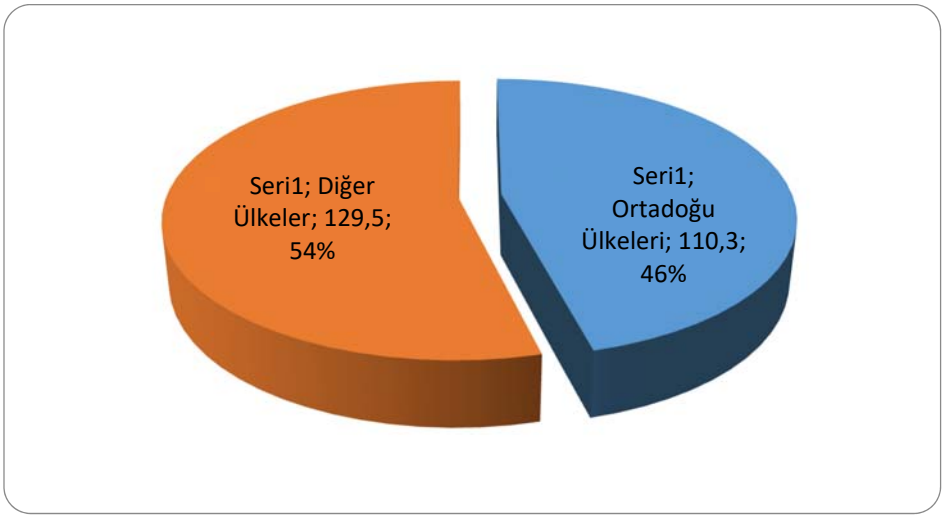
Dünya Toplamı	**239,9**	**100**

Kaynak: BP (2015).



Şekil 1: Ortadoğu ülkeleri ve diğer ülkelerin petrol rezervi (%)

Tablo 2: Ortadoğu'da petrol rezervi, üretimi ve tüketimi (2014)

Ülke Adı	**Rezerv (Milyar Ton)**	**Üretim (Milyar Ton)**	**Tüketim (Milyar Ton)**
Birleşik Arap Emirlikleri	13	167,3	39,3
Irak	20,2	160,3	
İran	21,7	169,2	93,2
Katar	2,7	83,5	10,1
Kuveyt	14	150,8	22,2
Mısır	0,5	34,7	38,7
Suudi Arabistan	36,7	543,4	142
Suriye	0,3	1,6	
Umman	0,7	46,2	
Yemen	0,4	6,6	
Diğer Ortadoğu Ülkeleri	0,1	10,5	76*
Ortadoğu Toplamı	**110,2**	**1374,1**	**421,5**
Dünya Toplamı	**239,9**	**4220,6**	**4211,1**
Ortadoğu'nun Dünya Toplamındaki Oranı (%)	**46**	**33**	**10**

Kaynak: BP (2015).
*Diğer Ortadoğu ülkelerinden Türkiye (38,3 milyon ton) ve İsrail (10,1 milyon ton) en fazla petrol tüketen ülkelerdir.

Dünya ham petrol rezervlerine ülke bazında bakıldığında rezervlerin Ortadoğu bölgesi ile Amerika Kıtasında yoğunlaştığı görülür. BP'nin 2014 yılı istatistiklerine göre dünya ham petrol rezerv sıralamasında Venezuela (%17,5) ilk sırada yer almaktadır. S.Arabistan (%15,7), Kanada (%10,2), İran (%9,3), Irak (%8,8), Rusya Federasyonu (%6,1), Kuveyt (%6,0), Birleşik Arap Emirlikleri (%5,8), Çin (%5) petrol rezervi açısından zengin olan ülkelerdir. ABD'nin petrol rezervi oranı ise %2,9'dur. Rezerv oranlarına göre ham petrol rezervinin yaklaşık %80'i Ortadoğu bölgesi, Venezuella, Kanada, Rusya Federasyonunda yer almaktadır. Bu oranlar da önümüzdeki yıllarda başta Ortadoğu bölgesi olmak üzere petrol rezervi zengin olan alanların jeoekonomik açıdan dikkatlerin üzerinde olacağı bölgeler olacağını göstermektedir.

Enerjiye olan talebin artışına bağlı olarak dünyada üretilen ham petrol miktarı da giderek artış göstermektedir. 2004 yılında toplamda 3904,8 milyon ton olan dünya ham petrol üretimi, 2014 yılında 4220,5 milyon tona yükselmiştir. 2014 yılı itibariyle en fazla üretim 1374,2 milyon ton (%33) ile Ortadoğu bölgesinde

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gerçekleştirilmiştir. Kuzey Amerika (%21) ve Avrupa-Avrasya (%20) bölgeleri petrol üretiminin fazla olduğu diğer bölgelerdir (Tablo 3). Ortadoğu bölgesi dışında ülke bazında petrol üretimine bakıldığında en büyük payın Rusya Federasyonu'nda (%12,7) olduğu görülür. Petrol rezervi %2,9 oranında olan ABD %12,3 oranıyla en fazla üretim yapan ikinci ülke konumundadır. Kanada (%5), Çin (%5), Venezuella (%3,8) petrol üretiminde önde gelen diğer ülkelerdir (BP, 2015). Dünya petrol üretiminin %33'ünü sağlayan Ortadoğu bölgesinde en fazla üretim yapan ülkeler S.Arabistan (543,4 milyon ton), İran (169,2 milyon ton), Birleşik Arap Emirlikleri (167,3 milyon ton), Irak (160,3 milyon ton) ve Kuveyt (150,8 milyon ton) gibi zengin rezerve sahip olan ülkelerdir (Tablo 2). Bu oranlara göre günümüzde ham petrol rezervinde olduğu gibi üretimde de Ortadoğu önemli bir merkez konumundadır. Petrol rezervi açısından zengin olan Ortadoğu ülkelerinin de içerisinde yer aldığı OPEC (Petrol İhraç Eden Ülkeler Örgütü) dünya petrol rezervlerinin dörtte üçüne (%75) sahiptir. OPEC'in üretimden aldığı pay ise %45 civarındadır (Öztürkler, 2009:76). Dolayısıyla küresel petrol ticaretinde OPEC'in, belirleyici bir rol oynadığı söylenebilir.

Tablo 3: Dünya petrol üretiminin bölgelere göre dağılışı (milyon ton)

Ülke Adı	**2004**	**Oran (%)**	**2014**	**Oran (%)**
Kuzey Amerika	660,2	17	866,8	21
Güney ve Orta Amerika	368	9	391	9
Avrupa-Avrasya	853,7	22	834,3	20
Ortadoğu	**1234,2**	**32**	**1374,2**	**33**
Afrika	409,8	10	357,5	8
Asya-Pasifik	378,9	10	396,7	9
Dünya Toplamı	**3904,8**	**100**	**4220,5**	**100**

Kaynak: BP (2015).

Bilindiği üzere enerji tüketimi, herhangi bir ülke veya bölge ekonomisinin en önemli performans göstergelerinden biridir. Enerji tüketimi, nüfus artışına ve dolayısıyla enerjiye olan ihtiyacın artmasına bağlı olarak sürekli bir artış kaydetmektedir (Karakaş, 2014:847). Bu bağlamda petrol tüketiminde sürekli bir artış olduğu görülmektedir. Nitekim, 2004 yılında 3870,8 milyon ton olan petrol tüketimi, 2014 yılında 4211,1 milyon tona yükselmiştir. 2014 yılı itibariyle dünya ham petrol rezervi toplamı 239,9 milyar ton ve yıllık tüketim miktarı 4211,1 milyon ton olduğu dikkate alındığında petrolün yaklaşık 57 yıllık bir ömrü olduğu ortaya çıkmaktadır.

Dünyada petrolün en fazla tüketildiği bölgeler Asya-Pasifik (%34), Kuzey Amerika (%24), Avrupa-Avrasya (%21) bölgeleridir (Tablo 4). Avrupa-Avrasya bölgesinde AB ülkeleri önemli birer tüketici konumundadırlar. Avrupa'nın (Rusya Federasyonu hariç) petrol tüketimi yaklaşık %15'tir. Ülke bazında petrol tüketimine bakıldığında ABD (%19,9), Çin (%12,4), Japonya (%4,7), Hindistan (%4,3) ve Rusya Federasyonu'nun (%3,5) en fazla petrol tüketen ülkeler olduğu görülür. Petrol rezervinin %46'sına sahip olan Ortadoğu bölgesinin petrol tüketim oranı %10'dur. Ortadoğu bölgesinde dünya petrol rezervinin %15,7'sine sahip olan S.Arabistan'ın tüketim payı %3,7'dir (BP, 2015). Petrol konusunda dikkat çeken en önemli hususlardan biri Rusya Federasyonu haricinde ABD, Çin, Japonya, Hindistan, AB ülkeleri gibi petrolü en fazla tüketen ülkelerin büyük oranda dışa bağımlı olmalarıdır. Dolayısıyla günümüzde olduğu gibi yakın gelecekte de petrole olan talebi sürekli artan bu ülkelerin başta Ortadoğu coğrafyası olmak üzere petrol rezervlerinin bulunduğu havzalar üzerindeki baskıları yoğunlaşarak devam edeceği öngörülmektedir.

Tablo 4: Dünya petrol tüketiminin bölgelere göre dağılışı (milyon ton)

Ülke Adı	**2004**	**Oran (%)**	**2014**	**Oran (%)**
Kuzey Amerika	1125,9	29	1024,4	24
Güney ve Orta Amerika	236,5	6	326,5	8
Avrupa-Avrasya	961,8	25	858,9	21
Ortadoğu	**306,3**	**8**	**431,7**	**10**
Afrika	105,5	3	140,7	3
Asya-Pasifik	1134,8	29	1428,9	34
Dünya Toplamı	**3870,8**	**100**	**4211,1**	**100**

Kaynak: BP (2015).

Ortadoğu bölgesi, dünyada petrolün yaklaşık %33'ünü üretirken, üretilen dünya petrolünün %10'unu tüketmektedir. Dolayısıyla bölgede üretilen petrolün büyük bir bölümünün bölge dışında tüketildiği

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anlaşılmaktadır. Nitekim, 2014 yılında bölgede üretilen 1374,1 milyon ton petrolün yaklaşık %30'u (421,5 milyon ton) bölge içerisinde tüketilirken, geriye kalanı (%70) bölge dışına ihraç edilmiştir (Tablo 2).

Dünya petrol ithalatı ve ihracatı bölge ve ülkelere göre farklılık göstermektedir. Sanayileşmiş ve enerjiye ihtiyacı hızla artan ve kendi kaynakları yeterli olmayan ülke/bölgeler ithalatın daha fazla gerçekleştiği alanlardır. ABD, Avrupa ve Japonya 2004 yılında petrolün %62'sini ithal etmiştir. 2014 yılına gelindiğinde bu üç bölgenin ithalatı %46'ya gerilemiştir. İthalatta en büyük düşüş ABD'de gerçekleşmiştir. Nitekim ABD, 2004 yılında dünya petrolünün %26'sını ithal ederken, 2014 yılında %16'sını ithal etmiştir (Tablo 5). Bunun temel nedenlerinden birisi ABD'nin son yıllarda şeyl (kaya) gazı başta olmak üzere kendi enerji kaynaklarını daha fazla kullanmaya başlamasıdır. Yeni alternatif enerji kaynaklarının devreye girmesi nedeniyle de ithalat oranları düşmüştür. Dünya petrol ithalatında yeni aktörlerin ortaya çıkmasının da yukarıda belirtilen ABD, Avrupa ülkeleri ve Japonya'nın ithalat oranlarının düşmesine neden olduğu söylenebilir.

Tablo 5: Dünya petrol ithalatı (bin varil /gün)

Ülke Adı	**2004**	**Oran (%)**	**2014**	**Oran (%)**
ABD	12898	26	9221	16
Avrupa	12538	25	12601	22
Japonya	5203	11	4333	8
Diğer Ülkeler	18651	38	30581	54
Dünya Toplamı	**49290**	**100**	**56736**	**100**

Kaynak: BP (2015).

Dünya petrol ihracat durumuna bakıldığında en fazla ihracatın petrol rezervlerinin fazla olduğu bölgeler ve enerji talebinin nispeten az olduğu gelişmekte olan bölgeler olduğu görülür. Ortadoğu ve yakın çevresi (Kuzey Afrika ve Hazar Havzası) en fazla ihracatın yapıldığı bölgedir. Ortadoğu bölgesi, 2004 yılında dünya petrolünün %40'ını (19630 bin varil/gün), 2014 yılında ise %35'ini (19761 bin varil/gün) ihraç etmiştir. İhracat miktarında az da olsa bir artış olmasına rağmen diğer bölgelerin daha fazla ihraç etmesi nedeniyle ihracat oranında bir düşüş yaşanmıştır. Günümüzde Ortadoğu, Eski Sovyetler Birliği ve Kuzey Afrika bölgeleri ihracatın yarısından fazlasını gerçekleştirmektedir (Tablo 6). Dolayısıyla fazla enerji tüketen ABD, Avrupa Birliği ülkeleri, Japonya, Çin, Hindistan gibi ülkelerin Ortadoğu ve yakın çevresindeki petrol kaynaklarına olan taleplerinin devam edeceği öngörülmektedir.

Tablo 6: Dünya petrol ihracatı (bin varil /gün)

Ülke Adı	**2004**	**Oran (%)**	**2014**	**Oran (%)**
ABD	991	2	4099	7
Kanada	2148	4	3535	6
Meksika	2070	4	1290	2
Güney ve Orta Amerika	3233	7	3929	7
Avrupa	1993	4	2293	4
Eski Sovyetler Birliği	6440	13	8932	16
Ortadoğu	**19630**	**40**	**19761**	**35**
Kuzey Afrika	2917	6	1762	3
Batı Afrika	4048	8	4431	8
Asya-Pasifik	4189	9	6223	11
Diğer Ülkeler	1631	3	481	1
Dünya Toplamı	**49290**	**100**	**56736**	**100**

Kaynak: BP (2015).

2.2.Doğalgaz

Ortadoğu'da bulunan enerji kaynaklarından biri olan doğalgaz rezervleri de dünya üzerinde dengesiz bir dağılış göstermektedir. 2014 yılı itibariyle dünya doğalgaz rezervi 187,1 trilyon m^3 'tür. Bu rezervin 81,6 trilyon m^3 'ü Ortadoğu'da yer almaktadır. Ortadoğu'daki doğalgaz rezervleri, Dünya doğalgaz rezervinin %44'üne tekabül etmektedir. Ortadoğu'dan sonra Avrupa-Avrasya en fazla doğalgaz rezervi olan ikinci bölgedir. Dünya doğalgaz rezervinin %31'inin (58 trilyon m^3) bulunduğu bu bölge içerisinde Rusya Federasyonu 32,6 trilyon m^3 ile en büyük paya (Dünya doğalgaz rezervinin %17,4'ü) sahiptir (Harita 3, Tablo 7, Şekil 2).

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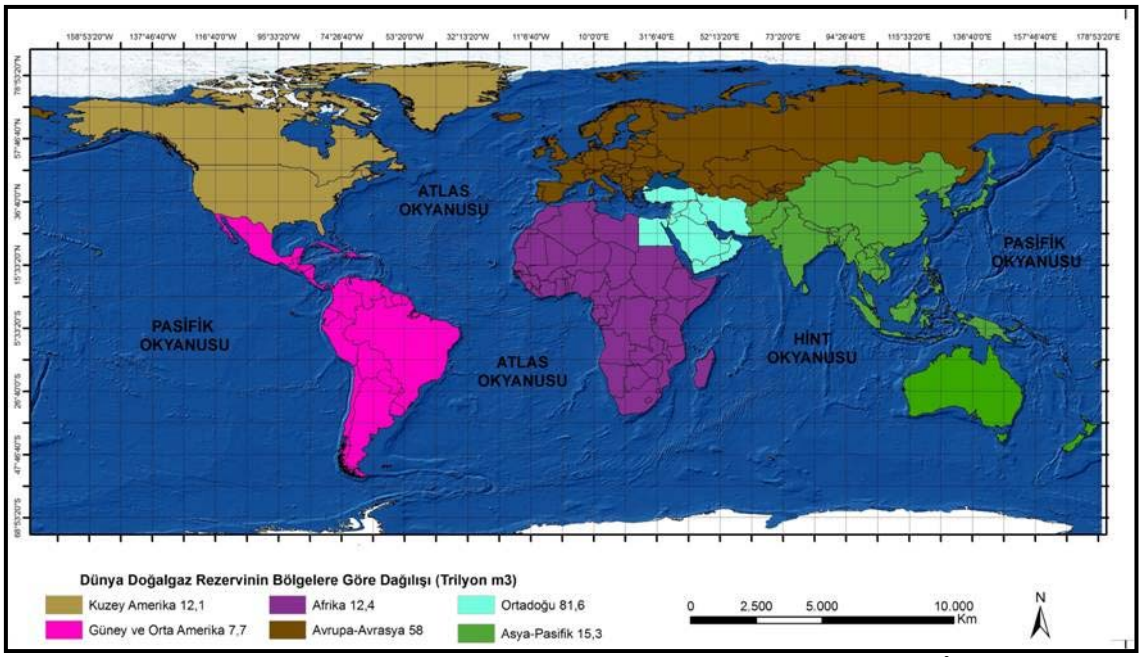
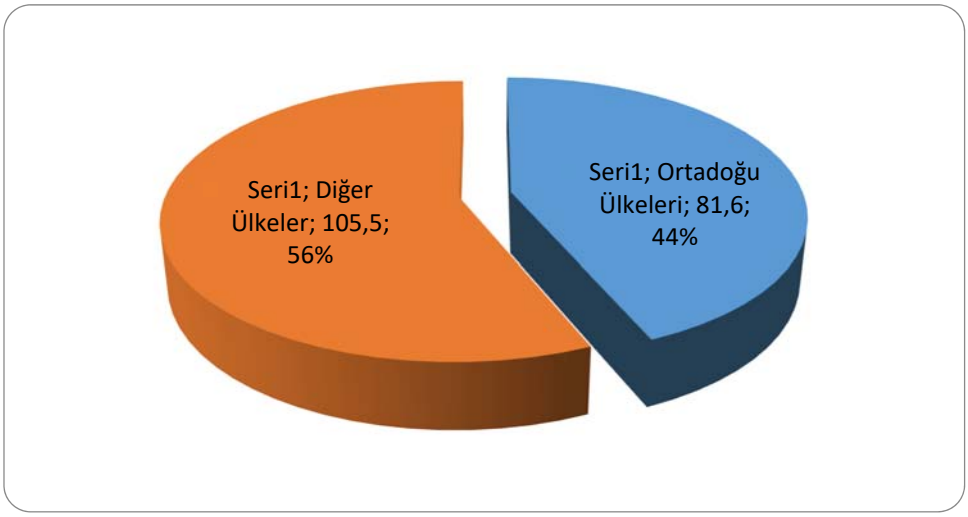


Harita 3: Dünya doğalgaz rezervinin bölgelere göre dağılışı (trilyon m^3)

Tablo 7:Dünya doğalgaz rezervinin bölgelere göre dağılışı (trilyon m^3)

Ülke Adı	**2014**	**Oran (%)**
Kuzey Amerika	12,1	6
Güney ve Orta Amerika	7,7	4
Avrupa-Avrasya	58	31
Ortadoğu	**81,6**	**44**
Afrika	12,4	7
Asya-Pasifik	15,3	8
Dünya Toplamı	**187,1**	**100**

Kaynak: BP (2015).



Şekil 2: Ortadoğu ülkeleri ve diğer ülkelerin doğalgaz rezervi (%)

Ortadoğu bölgesinde doğalgaz rezervi açısından zengin olan ülkeler İran ve Katar'dır. İran 34 trilyon m^3 ile en fazla doğalgaz rezervi olan ülkedir. Katar'ın doğalgaz rezervi 24,5 trilyon m^3 'tür. S.Arabistan, BAE, Irak gibi aynı zamanda petrol zengini olan diğer ülkeler ile Mısır doğalgaz rezervi bakımından nispeten zengin olan ülkelerdir. Diğer Ortadoğu ülkeleri ise daha az miktarda doğalgaz rezervlerine sahiptir (Tablo 8). Ülke bazında

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doğalgaz rezervlerine bakıldığında İran'ın (%18,2) ilk sırada yer aldığı görülür. İran ile birlikte Rusya Federasyonu (%17,4), Katar (%13,1), Türkmenistan (%9,3), ABD (%5,2) ve S.Arabistan (%4,1) dünya doğalgaz rezervi açısından önde gelen ülkelerdir. AB ülkelerinin doğalgaz rezervi %3, Çin'in doğalgaz rezervi ise %1,8'dir (BP, 2015). Bu bilgilere göre dünya doğalgaz rezervinin %60'tan fazlası (%62,4) Ortadoğu ve yakın çevresinde yer alan beş ülkede bulunmaktadır. Bu da jeopolitik ve jeoekonomik açıdan önemli bazı sonuçlar doğurmaktadır (Akpınar ve Başıbüyük, 2011:124).

Tablo 8: Ortadoğu'da doğalgaz rezervi, üretimi ve tüketimi (2014)

Ülke Adı	**Rezerv (Trilyon m^3)**	**Üretim (Milyar m^3)**	**Tüketim (Milyar m^3)**
Bahreyn	0,2	16,9	
Birleşik Arap Emirlikleri	6,1	57,8	69,3
Irak	3,6	1,3	
İran	34	172,6	170,2
Katar	24,5	177,2	44,8
Kuveyt	1,8	16,4	20,1
Mısır	1,8	48,7	48
Suudi Arabistan	8,2	108,2	108,2
Suriye	0,3	4,4	
Umman	0,7	29	
Yemen	0,3	9,6	
Diğer Ortadoğu Ülkeleri	0,1	7,7	101,1*
Ortadoğu Toplamı	**81,6**	**649,7**	**513,2**
Dünya Toplamı	**187,1**	**3460,6**	**3393**
Ortadoğu'nun Dünya Toplamındaki Oranı (%)	**44**	**19**	**15**

Kaynak: BP (2015).
* Diğer Ortadoğu ülkelerinden Türkiye (48,6 milyar m^3), İsrail (7,6 milyar m^3) en fazla doğalgaz tüketen ülkelerdir.

2014 yılı itibariyle dünyadaki doğalgaz rezervi 187,1 trilyon m^3, yıllık tüketim miktarı 3393 milyar m^3 (3,4 trilyon m^3)'tür (BP, 2015). Buna göre küresel doğalgaz rezervinin 55 yıllık bir ömrü vardır. Uluslararası Enerji Ajansının 2012 yılı raporuna göre dünyanın doğalgaz talebinin 2035 yılında 5,1 trilyon m^3'e ulaşacağı öngörülmektedir (IEA, 2012). Başta ABD olmak üzere son yıllarda konvansiyonel doğalgaz yanında konvansiyonel olmayan doğalgaz (şeyl gazı, kömür yataklı metan, sıkı kumtaşı gazı) üretimi de yapılmaktadır. 2035 yılında büyük bir bölümü şeyl gazından oluşan yıllık konvansiyonel olmayan doğalgaz üretiminin 1,7 trilyon m^3 olacağı tahmin edilmektedir. Buna göre 2040 yılına doğru konvansiyonel olmayan doğalgaz üretiminin toplam doğalgaz üretiminin yaklaşık %33'ünü karşılayacağı ortaya çıkmaktadır. Bu da doğalgaz piyasasında ABD'nin yanında, şeyl gazı rezervi olan diğer ülkelerin de söz sahibi olacağını göstermektedir.

Dünya doğalgaz üretimine bakıldığında talebe bağlı olarak sürekli bir artış kaydedildiği görülür. Nitekim, 2004 yılında 2711,3 milyar m^3 olan doğalgaz üretimi 2014 yılında 3460,6 milyar m^3 'e yükselmiştir (Tablo 9). Buna göre 10 yıllık bir süre içerisinde doğalgaz üretiminde %22'lik bir artış sağlanmıştır. 2014 yılı itibariyle doğalgaz üretiminin %75'i Avrupa-Avrasya (%29), Kuzey Amerika (%27) ve Ortadoğu (%19) bölgelerinde gerçekleşmiştir. Ülke bazında doğalgaz üretiminde başta gelen ülkeler ABD (%21,4), Rusya Federasyonu (%16,7), Katar (%5,1), İran (%5), Kanada (%4,7), Çin (%3,9), Norveç (%3,1), S.Arabistan (%3,1) ülkeleridir (BP, 2015).

Tablo 9: Dünya doğalgaz üretiminin bölgelere göre dağılışı (milyar m^3)

Ülke Adı	**2004**	**Oran (%)**	**2014**	**Oran (%)**
Kuzey Amerika	753,5	28	948,4	27
Güney ve Orta Amerika	134,7	5	175	5
Avrupa-Avrasya	1025,3	38	1002,4	29
Ortadoğu	**329,6**	**12**	**649,7**	**19**
Afrika	123,4	4	153,9	5
Asya-Pasifik	344,8	13	531,2	15
Dünya Toplamı	**2711,3**	**100**	**3460,6**	**100**

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Kaynak: BP (2015).

Dünya doğalgaz üretiminin % 19'unu sağlayan Ortadoğu bölgesinde en fazla üretim yapan ülkeler Katar (177,2 milyar m^3), İran (172,6 milyar m^3), S.Arabistan (108,2 milyar m^3), Birleşik Arap Emirlikleri 57,8 (milyar m^3) ve Mısır (48,7 milyar m^3) gibi zengin rezerve sahip olan ülkelerdir (Tablo 8). Günümüzde doğalgaz rezervinin %44'üne sahip olan Ortadoğu, üretimin %19'ünü karşılamaktadır. Bundan sonraki süreçte Ortadoğu bölgesinde, zengin doğalgaz kaynakları nedeniyle üretimin giderek artacağı ve dolayısıyla enerji talebi artan ülkelerin baskısına maruz kalacağı öngörülmektedir.

Doğalgaz tüketimine bakıldığında üretimle bir paralellik gösterdiği görülür. Dünya doğalgaz tüketiminin en fazla olduğu bölgeler Avrupa-Avrasya (%30), Kuzey Amerika (%28), Asya-Pasifik (%20) bölgeleridir (Tablo 10). 2014 yılı itibariyle Ortadoğu bölgesi tüketimde %15 oranıyla dördüncü sırada yer almaktadır. Doğalgaz tüketiminde ABD (%22,7), Rusya Federasyonu (%12), AB ülkeleri (%11), Çin (%5,4), İran (%5,2), Japonya (%3,3), S.Arabistan (%3,2), Kanada (%3.1), Meksika (%2,5) ve Katar (%1,3) başta gelen ülkelerdir (BP, 2015).

Tablo 10: Dünya doğalgaz tüketiminin bölgelere göre dağılışı (milyar m^3)

Ülke Adı	**2004**	**Oran (%)**	**2014**	**Oran (%)**
Kuzey Amerika	783,7	29	949,4	28
Güney ve Orta Amerika	119	4	170,1	5
Avrupa-Avrasya	1077,9	40	1009,6	30
Ortadoğu	**291**	**11**	**513,2**	**15**
Afrika	49,4	2	72,1	2
Asya-Pasifik	377,7	14	678,6	20
Dünya Toplamı	**2698,7**	**100**	**3393**	**100**

Kaynak: BP (2015).

Dünya genelinde olduğu gibi Ortadoğu bölgesinde de doğalgaz tüketimi sürekli bir artış göstermiştir. Nitekim, 2004 yılında bölgede 291 milyar m^3 olan doğalgaz tüketimi, 2014 yılında 513,2 milyar m^3'e yükselmiştir. Buna göre 2004 yılında dünya doğalgaz tüketiminin %11'i, 2014 yılında ise tüketimin %15'i Ortadoğu'da gerçekleşmiştir. Ortadoğu'da üretilen doğalgazın büyük bir bölümünün bölge içerisinde tüketildiği söylenebilir. Nitekim 2014 yılı itibariyle Dünya'da üretilmiş olan 3460,6 milyar m^3 doğalgazın %19'u bölgede üretilmiştir. Dolayısıyla petrolün aksine bölgede üretilen doğalgazın büyük bir bölümü bölgede tüketilmiştir (Tablo 9).

Doğalgaz ticaretinde petrolde olduğu gibi ithalat ve ihracatın yapıldığı ülke/bölgeler farklılık göstermektedir. 2014 yılı itibariyle doğalgaz ticareti 997,2 milyar m^3 olarak gerçekleşmiştir (Tablo 11). Bunun %67'si (663,9 m^3) boru hatlarıyla, geriye kalanı ise LNG ile gerçekleştirilmiştir. Doğalgaz ticaretinde Avrupa ülkeleri en büyük paya sahiptir. Nitekim bu ülkeler dünya toplam doğalgaz ithalatının %42'sini gerçekleştirmiştir. İhracatta Rusya (%20) ve ABD (%16) en büyük paylara sahiptir. Ortadoğu bölgesi ihracatın %16'sını karşılamaktadır. Ortadoğu bölgesi doğalgaz ticaretinde önemli bir bölge konumunda olmakla birlikte Rusya doğalgaz ticaretinde söz sahibi konumundadır. ABD de son yıllarda özellikle şeyl gazının devreye girmesiyle önemli bir ülke konumuna gelmiştir.

Doğalgaz ticareti için en önemli hususlardan biri üretilen doğalgazın tüketim bölgelerine naklidir. Bilindiği üzere doğalgaz, üretim alanlarından uzak bölgelere boru hatlarıyla (pipeline) ve tankerlerle taşınmaktadır. Denize kıyısı olmayan ülkeler için boru hattı taşımacılığı tek seçenektir. Bunun yanında denizaşırı doğalgaz ithalatı yapan ülkeler için de istisnalar dışında (Mavi Akım gibi) tanker taşımacılığı bir zorunluluktur. Tanker taşımacılığı yüksek maliyetli olduğu için zorunlu haller dışında fazla tercih edilmemektedir. Bu çerçevede LNG taşıyan tankerlerin kullandığı belli başlı geçitler ile boru hattı güzergâhları jeoekonomik ve jeopolitik bakımdan büyük öneme sahiptir. Örneğin hâlihazırda Rus doğalgazının AB ülkelerine naklinde Ukrayna birinci derecede önemli bir konumdadır. Türkiye ise Ortadoğu ve Hazar Havzası doğalgazını Avrupa ülkelerine akıtacak olan bir kısmı tamamlanmış, bir kısmı ise inşa ve proje aşamasında olan pek çok boru hattının düğüm noktasında yer almaktadır. Şüphesiz bu durum fırsatlar ve olanaklar kadar, bazı riskleri ve tehditleri de beraberinde getirmektedir (Akpınar ve Başıbüyük, 2011:131-134).

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Tablo 11: 2014 yılı itibariyle doğalgaz ithalatı ve ihracatı (milyar m^3)

	İTHALAT		İHRACAT	
	Boru Hattı	**LNG**	**Boru Hattı**	**LNG**
ABD	74,6	1,7	42,3	0,4
Kanada	21,8	0,6	74,6	0
Meksika	20,5	9,3	0	0
Trinidad ve Tobago	0	0	0	19,3
Diğer Güney ve Orta Amerika Ülkeleri	17,8	21,4	17,8	5,8
Fransa	27,4	7,1	1,1	0,6
Almanya	85	0	10,1	0
İtalya	46,9	4,5	0,2	0
Hollanda	23,2	1,1	44,1	0,6
Norveç	0	0	101,1	5,3
İspanya	15,4	15,5	0,6	5,1
Türkiye	41,1	7,3	0,6	0
İngiltere	32,9	11,3	10,6	0
Diğer Avrupa Ülkeleri	90	5,3	10,8	2
Rusya Federasyonu	24,2	0	187,4	14,5
Ukrayna	17,5	0	0	0
Diğer Eski Sovyetler Birliği Ülkeleri	32,1	0	69,3	0
Katar	0	0	20,1	103,4
Diğer Ortadoğu Ülkeleri	27,2	5,4	9,6	27,5
Cezayir	0	0	23,5	17,3
Diğer Afrika Ülkeleri	8,5	0	10,8	31,2
Çin	31,3	27,1	0	0
Japonya	0	120,6	0	0
Endonezya	0	0	9,5	21,7
Güney Kore	0	51,1	0	0,2
Diğer Asya-Pasifik Ülkeleri	26,5	43,9	20	78,6
DÜNYA TOPLAMI	**663,9**	**333,3**	**663,9**	**333,3**

Kaynak: BP (2015).

3.Sonuç ve Değerlendirme

Günümüzdeki kullanım miktarına göre petrolün 57, doğalgazın 55 yıllık bir ömrü olduğu ortaya çıkmaktadır. Yeni rezervlerin bulunması, şeyl gazının giderek yaygınlaşması ve alternatif enerji kaynaklarının yaygın kullanılmaya başlanması neticesinde petrol ve doğalgaz rezervlerinin ömrünün daha fazla olacağı tahmin edilmektedir. Ancak mevcut rezervler dikkate alındığında önümüzdeki yarım yüzyıl boyunca petrol ve doğalgaz kaynaklarının dünya enerji piyasasının gündeminde olacağı öngörülmektedir.

Dünyadaki petrol rezervinin (239,9 milyar ton) %46'sı, doğalgaz rezervinin (187,1 trilyon m^3) ise %44'ü Ortadoğu'da yer almaktadır. Ortadoğu bölgesi, dünya ham petrolünün yaklaşık %33'ünü üretmekte, üretilen bu petrolün büyük bir bölümünü (%70) bölge dışına ihraç etmektedir. Bölgenin dünya doğalgaz üretimindeki payı %19, tüketimdeki payı ise %15'tir. Dolayısıyla bölgede üretilen doğalgazın büyük bir bölümünün bölge içerisinde tüketildiği anlaşılmaktadır.

2014 yılı itibariyle dünya ham petrol rezervinin %15'ine sahip olan Kuzey Amerika tüketimde %24'lük bir paya sahiptir. Bu bölgede yer alan ABD'nin petrol rezervi %2,9, petrol tüketimi ise %19.9'dur. Avrupa'nın (Rusya hariç) petrol rezervi %0,6 iken petrol tüketimi yaklaşık %15'tir. Ham petrol rezervinin %5'inin yer aldığı Çin'de petrol tüketimi %12,4'tür. Petrol rezervinin %46'sına sahip olan Ortadoğu bölgesinin petrol tüketim oranı %10'dur. Ortadoğu bölgesinde dünya petrol rezervinin %15,7'sine sahip olan S. Arabistan'ın tüketimdeki payı %3,7'dir.

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Doğalgaz rezervinin %6'sının yer aldığı Kuzey Amerika'da, doğalgazın %28'i tüketilmektedir. ABD'nin doğalgaz rezervi %5,2, doğalgaz tüketimi ise %22,7'dir. Dünya doğalgaz rezervinin %17,4'ünün yer aldığı Rusya Federasyonu'nun doğalgaz tüketim oranı %12'dir. AB ülkelerinin doğalgaz rezervi %3, doğalgaz tüketim oranı %11'dir. Dünya doğalgaz rezervinin %1,8'inin yer aldığı Çin'in doğalgaz tüketimi %5,4'tür. Doğalgaz rezervinin % 44'üne sahip olan Ortadoğu bölgesinin doğalgaz tüketim oranı ise %15'tir. Ortadoğu bölgesinde %18,2 oranında doğalgaz rezervi olan İran'ın tüketim oranı %5,2, doğalgaz rezerv oranı %13,1 olan Katar'ın tüketim oranı %1,3'tür.

Görüldüğü üzere gelişmiş olan, petrol ve doğalgaz rezervi az olan ülkeler (Rusya Federasyonu haricinde) en fazla bu enerji kaynaklarını tüketen ülkelerdir. Özellikle ABD, AB ülkeleri ve Çin, hem ham petrol hem de doğalgaz tüketiminde en büyük paya sahip olan ülkelerdir. Petrol ve doğalgaz rezervi fazla olan Ortadoğu bölgesi ise tüketimin az olduğu bir bölgedir. Dolayısıyla bundan sonraki süreçte enerji talebinin karşılanmasında Ortadoğu bölgesi, dünyadaki en önemli havza konumundadır. Enerji ve hammadde konusunda ham petrol ve doğalgaza sahip olma bakımından tabiri caiz ise Ortadoğu coğrafyası ve ülkeleri bir üretim merkezi, AB ülkeleri ile ABD ve Çin birer tüketim merkezi olarak uluslararası alanda dikkati çekmektedir. Sahip olduğu enerji kaynakları nedeniyle Ortadoğu coğrafyasının sürekli olarak siyasi ve ekonomik istikrarsızlık yaşaması ve işgal ve savaşların da devam etmesi, gelecek yıllarda dünya enerji piyasasında ham petrol ve doğalgaz krizlerine sebep olacak gibi gözükmektedir (Elmas, 2012:35).

Öte yandan Ortadoğu bölgesi, nüfus yoğunluğunun düşüklüğü ve ekonomik kalkınma düzeyinin yetersizliği nedeniyle sahip olduğu enerji kaynakları rezervlerinin ve üretiminin az bir kısmını öz tüketim için kullanmakta, büyük bir bölümünü dünyanın diğer ülkelerine özellikle de ABD, AB ülkeleri ve Çin gibi gelişmiş ülkelere ihraç etmektedir. Özellikle Çin'in piyasa ekonomisi temelli yapısal dönüşümü ile içerisine girdiği ekonomik büyüme ve gelişme süreci, çok büyük oranda enerji kaynaklarına ihtiyaç duymasına neden olmuştur (Öztürkler, 2009:79). ABD'nin yanında gelişmiş olan ve enerji ihtiyacı sürekli artan AB ülkeleri, Japonya ve Çin enerji konusunda önemli stratejiler gelişmektedirler. Adı geçen ülkelerin üzerinde yoğunlaştıkları başlıca bölge de Ortadoğu'dur.
Bugün için en önemli gelişmelerden biri dünyada enerjiye duyulan ihtiyacın artmasıdır. Bu açıdan enerji çeşitli jeopolitik yaklaşımlara temel oluşturmaktadır. Günümüzde adı koyulmamış olsa da, "Enerji havzalarına ve iletim kanallarına hakim olan, dünyaya hakim olur" şeklinde ifade edilebilecek enerji hakimiyet teorisinin özellikle ABD tarafından uygulanmakta olduğunu söylemek mümkündür (Ural, 2009:132). ABD dünya genelindeki enerji kaynaklarına hakim olmak istemekle birlikte özellikle, Ortadoğu ve yakın çevresindeki enerji kaynaklarını kontrolünde tutmak istemektedir. Ortadoğu ve yakın çevresine egemen olabilecek ve böylece ABD'ye meydan okuma yeterliliğine sahip olacak bir rakibin ortaya çıkması ABD'nin üstünlüğünü devam ettirmesi açısından tehlikeli görülmektedir. Bu nedenle, ABD bölgedeki enerji kaynaklarını ve ulaşım yollarını kontrol ederek enerji bakımından bu bölgelere bağımlı olan ve gelecekte ABD'ye rakip olabilecek güçleri frenlemek istemektedir. Bu da enerji vanalarını kontrol ederek mümkün olabilecektir. ABD rakiplerini devre dışı bırakabilmek için bu bölgedeki enerji kaynaklarını rakiplerine kaşı bir silah olarak kullanmak istemektedir (Kuloğlu ve Salkaya, 2004:25).

Dünyanın ham petrol ve doğalgaz kaynaklarının yaklaşık yarısının Ortadoğu bölgesinde bulunması ABD'nin yanında AB ülkeleri, Çin, Hindistan gibi enerjiye olan talepleri hızla artan ülkelerin bu bölge üzerinde politikalar geliştirmeye devam edeceklerini göstermektedir. Önemli petrol ve doğalgaz rezervlerine sahip olan Rusya Federasyonu da bölge ile ilgili bazı stratejiler geliştirerek bölgedeki denkleme dahil olmaktadır.

Günümüzde Ortadoğu bölgesi ve yakın çevresindeki (Kuzey Afrika ve Hazar Havzası) enerji kaynakları üzerinde hem bölgesel hem de küresel güçler arasında büyük bir jeoekonomik mücadele sürmektedir. Bundan sonraki süreçte de Ortadoğu bölgesinin, dünya küresel güç rekabetinin en önemli sahalarından birini oluşturacaktır. Dolayısıyla Ortadoğu'nun jeoekonomik öneminin giderek artacağı ve buna bağlı olarak son yıllarda bölgede cereyan eden hadiselerin yoğun olarak devam edeceği tahmin edilmektedir.

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ORTADOĞU'DAKİ ENERJİ KAYNAKLARININ JEOEKONOMİK AÇIDAN DEĞERLENDİRİLMESİ

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Bu çalışmada, Ortadoğu bölgesinin sahip olduğu enerji kaynaklarının jeoekonomik önemi irdelenmeye çalışılmıştır. İlk medeniyetlerin kurulduğu bir alana tekabül etmesi ve üç semavi dinin (Musevilik, Hristiyanlık ve İslamiyet) çıkış yeri olması gibi faktörler, Ortadoğu bölgesinin her dönemde cazip bir bölge olmasına neden olmuştur. Ortadoğu'yu önemli kılan bir diğer faktör bölgenin sahip olduğu zengin yer altı kaynaklarıdır. 19.yüzyılın sonlarında petrolün bölgede keşfedilmesi, 20.yüzyılın ortalarında doğalgaz kaynaklarının tespit edilmesi bölgenin önemini daha da arttırmıştır. Dünyadaki petrol rezervinin %46'sı, doğalgaz rezervinin %43,6'sı Ortadoğu'da yer almaktadır. Ortadoğu, Dünyada üretilen petrolün yaklaşık %33'ünü üretmekte, üretilen bu petrolün büyük bir bölümü bölge dışına ihraç edilmektedir. Bölgede üretilen doğalgazın büyük bir bölümünün bölge içerisinde tüketildiği anlaşılmaktadır.

Dünya genelinde enerjiye olan ihtiyaç sürekli bir artış göstermektedir. Rusya enerji kaynakları ihraç eden bir ülke konumunda iken, ABD'nin yakın gelecekte kendi enerjisini sağlayabilecek bir noktaya geleceği tahmin edilmektedir. Türkiye, Hindistan, Çin gibi hızlı bir gelişme sürecine giren ülkelerin enerjiye olan talebi artmakta, dolayısıyla enerji açısından dışa olan bağımlılıkları da artmaktadır. Öte yandan AB enerji ihtiyacının %55'ini ithal etmektedir. Günümüzde petrol ve doğalgaz ihtiyacının büyük çoğunluğunu dışardan karşılayan AB'nin, 2030 yılında bu ihtiyacının daha fazla olacağı tahmin edilmektedir. Rusya'nın zaman zaman AB ülkelerine ihraç ettiği doğalgazı siyasi ve ekonomik bir baskı aracı olarak kullanması, AB ülkelerini Kuzey Afrika ile birlikte Ortadoğu'daki enerji havzalarına yöneltmektedir.

Günümüzde Ortadoğu bölgesi ve yakın çevresindeki (Kuzey Afrika ve Hazar Havzası) enerji kaynakları üzerinde hem bölgesel hem de küresel güçler arasında büyük bir jeoekonomik mücadele sürmektedir. Bundan sonraki süreçte de Ortadoğu bölgesinin, dünya küresel güç rekabetinin en önemli sahalarından birini oluşturacaktır. Dolayısıyla Ortadoğu'nun jeoekonomik öneminin giderek artacağı ve buna bağlı olarak son yıllarda bölgede cereyan eden hadiselerin yoğun olarak devam edeceği tahmin edilmektedir.

Keywords: Ortadoğu, Enerji kaynakları, Jeoekonomi

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ORTAÖĞRETİMDE MATEMATİK EV ÖDEVLERİ: ÖĞRENCİ GÖRÜŞLERİ

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Özet: Ödevler öğrencilere sorumluluk kazandıran, okulda öğrenile derslerin pekiştirilmesini sağlayan ve okul ile ev arasında köprü görevi gören sosyal ve bilimsel aktivitelerdir. Takviye niteliğindeki ev ödevleri öğrenme amaçlı iyi bir faktör olmakla birlikte, mutluluk ve ruhsal dengenin temel öğeleri olan iyi dinlenme, aile ve sosyal ilişkiler gibi akademik olmayan önceliklerle de uyum içinde yürütülmelidir. Bu çalışmada ortaöğretim öğrencilerinin matematik ödevleri hakkındaki düşünceleri araştırılmaktadır. Bu amaçla, 2015-2016 eğitim-öğretim yılında Kocaeli il merkezindeki ortaöğretim okullarından seçilen 185 öğrenci belirlenmiştir. Genel tarama modeli ile yürütülen araştırmada 20 maddelik bir ölçek kullanılmıştır. Araştırma bulgularına göre, öğrenciler ödevleri yaptıklarında hem öğrendikleri konuları pekiştirdiklerini hem de bir sonraki konuya daha kolay adapte olabildiklerini ifade ettiler. Öğrencilerin ödevleri yapmadıklarında ya da yapamadıklarında ise derslerde motivasyon sorunu yaşadıkları ve kendilerini huzursuz hissettikleri belirlenmiştir.
Anahtar kelimeler: ortaöğretim, ev ödevi, matematik dersi

Giriş

Öğrencilerin bireysel aktiviteleri olarak ifade edebileceğimiz ödev çalışmaları (ev ödevleri), eğitim öğretim faaliyetleri içerisinde her zaman vaz geçilmez bir bileşen olmuştur. Öğrenilen kavramların özümsenmesi, kavramların anlaşılıp anlaşılmadıklarının test edilmesi ve kavramların kalıcılığının sağlanması gibi temel amaçlarla öğrencilerden ödev çalışmaları yapmaları istenmektedir (Otto, 1950). Ödev çalışmalarının hedeflenen amaçlara erişilebilmesi için, ödev çalışma süresi, zorluk düzeyleri, sınıfta yapılan örnek ve uygulama çalışmalarına benzerliği, zorluk düzeyleri gibi birçok pedagojik noktaya dikkat edilmelidir (Kralovec, Buell, 2000). Üzerinde yoğunlaşma, düşünce faaliyetleri uygulama, araştırma-inceleme yöntemlerini uygulamaya uygunluk, neden-sonuç ilişkilerini içerme ve problem çözme yeteneklerini geliştirme gibi kişisel gelişimi destekleyen bileşenleri içermeyen ödev çalışmaları boşuna zaman kaybı olarak değerlendirilebilir (Cooper, 1989).

Öğretmen merkezli eğitim öğretim sisteminde ödev çalışmalarının, öğrenci merkezli sisteme göre çok daha anlamlı ve gerekli olduğunu söyleyebiliriz. Öğrenci merkezli sınıf uygulamalarında, öğrencilerin aktif, düşünen, analiz eden, tartışan, fikir yürütün ve fikirleri tartışan pozisyonda oldukları göz önüne alındığında, ödev çalışmalarında hedeflenen amaçların sınıf ortamında gerçekleştirildiği söylenebilir. Dolayısıyla, son 10 yılda Türkiye de uygulamaya konulan öğrenci merkezli eğitim sisteminde ödev çalışmalarının etkisinin, öğretmen merkezli sisteme göre daha az olduğunu söyleyebiliriz. Ödev çalışmaları hedeflenen amaçlara ulaşılabilmesi için aşağıdaki temel özellikler göz önünde bulundurularak hazırlanmaları gerekmektedir (Brown, Oke & F. E. Brown, 1982);

- Sınıfta öğrenilenlerin pekiştirilmesi,
- Bir sonraki konuya hazırlık özelliği taşıması
- Öğrencinin bireysel öğrenme yeteneğini geliştirmesi
- Ödev çalışmalarına karşı olumlu tutuma sahip olmayı güçlendirmesi
- Öğrencinin bilişsel özelliklerini güçlendirme

Ülkemizde, 1989 yılından beri yürürlükte olan, ders dışı etkinlik, eğitim-öğretim faaliyetlerinin kapsamı ve temel özellikleri ilgili bir yönetmelik (Yücel, 2004), ödev çalışmaları içinde temel alınabilir. Bu yönetmelikte geçen özellikler, Brown, Oke ve F. E. Brown (1982) tarafından ifade edilen özelliklerin biraz daha geniş kapsamlı versiyonu olduğunu söyleyebiliriz.

- ✓ Ödevi özenle yapma ve zamanında teslim etme alışkanlığı kazandırmak,
- ✓ Plan yapma bilgi ve becerisini geliştirmek,
- ✓ Gerekli bilgi, araç-gereç veya malzemeyi toplayabilmek ve bunları amacına uygun olarak kullanabilmek,
- ✓ Ödevin, çeşitli kişi ve eserlerden faydalanmakla birlikte, öğrencinin kendini geliştirmek maksadıyla bizzat yapması gereken bir görev olma şuurunu kazandırmak,

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- ✓ Ödev yapılırken yararlanılan kaynakları, kendisinden bilgi alınan kişileri belirleme alışkanlığı kazandırmak,
- ✓ İletişim kurabilme, kaynaklardan faydalanabilme ve kullanabilme alanlarındaki yeteneğini geliştirmek,
- ✓ Ödevde varılan sonuçların, kullanılan kaynak ve yöntemlere bağlı olduğunu fark ettirmek,
- ✓ Konulara, değişik açılardan bakabilme, danışabilme, tartışabilme ve soru sorabilme davranışları kazandırmak,
- ✓ Birlikte çalışma davranışı kazandırmak,
- ✓ Düşünce gücünü geliştirmek,
- ✓ Bilmediğini araştırıp bulmaktan ve öğrenmekten zevk almayı sağlamak,
- ✓ Gözlem, deney ve yeni buluşlara yönelik çalışmalar yapmaktan zevk almayı sağlamak,
- ✓ Başarmanın hazzını tatma duygusu kazandırmak

Bu çalışmanın amacı; ortaöğretim 10. sınıfta öğrenim gören öğrencilerin, matematik derslerinde verilen ev ödevleri hakkındaki tutum ve düşüncelerinin belirlenmesidir.

Yöntem

Bu çalışmanın örneklemini, Kocaeli il merkezinde, 5 farklı ortaöğretim okulunda 2015-2016 eğitim öğretim yılı güz döneminde öğrenim gören 185 öğrenci oluşturmaktadır. Araştırma verilerinin toplanmasında, betimsel tarama yöntemlerinden genel tarama modeli kullanılmıştır. Genel tarama modeli, "çok sayıda elemandan oluşan bir evrende, evren hakkında genel bir yargıya varmak amacıyla, evrenin tümü ya da ondan alınacak bir grup, örnek veya örneklem üzerinde yapılan tarama düzenlemeleridir" (Karasar, 1994). Veriler SPSS 15,0 istatistik paket programı yardımıyla t-testi ve F testi kullanılarak hesaplanmıştır. Çalışmada, öğrencilerden anket yoluyla veriler toplanmış daha sonra öğrencilerin ev ödevleri hakkındaki düşüncelerini belirlemek için random tekniğiyle 10 öğrenci seçilmiş ve bu öğrencilerle mülakat yapılmıştır.

Araştırmanın bağımlı değişkeni cinsiyet, bağımsız değişkeni ise ev ödevleri hakkındaki görüşlerdir. Araştırmanın veri toplama aracını belirlemek üzere bu alanda hazırlanmış olan anketler incelenmiş (Aladağ, Doğu, 2009; Cahit, Doğan, 2009; Fehrman, Keith, Reimers, 1987; Wildman, 1968 & Yücel 2004) ve bu incelemenin sonucunda öğrencilerin matematik ev ödevleri hakkındaki görüşlerini belirlemek üzere bir anket oluşturulmuştur. Anketin geçerliliği kapsamında ilgili alanda çalışan iki öğretim üyesinin görüşlerine başvurulmuş daha sonrada gerekli düzenlemeler yapılarak veri toplama aracına son şekli verilmiştir. Anketin Cronbach Alpha iç güvenirlik katsayısı 0,90 olarak hesaplanmıştır.

Anket derecelendirilmesi, beşli likert türünde (1) Kesinlikle Katılmıyorum, (2) Katılmıyorum, (3) Kararsızım, (4) Katılıyorum, (5) Kesinlikle Katılıyorum, şeklinde toplam 20 sorudan oluşmaktadır.

Bulgular

Araştırmaya katılan toplam 185 ortaöğretim 10. sınıf öğrencisinin cinsiyetlerine ilişkin sayısal değerleri; erkek öğrencilerin sayısı N=102 kişi (% 55,14), bayan öğrencilerin sayısı N=83 kişi (% 44,86) dir. (Tablo 1).

Cinsiyet	N	%
Erkek	102	%55,14
Bayan	83	%44,86
Toplam	185	%100

Tablo 1: Öğrencilerin cinsiyete göre dağılımları

Ortaöğretim öğrencilerinin matematik derslerinde verilen ev ödevlerine ilişkin görüşleri arasında cinsiyet değişkenine bağlı olarak anlamlı bir farklılık olup olmadığını belirlemek için bağımsız örneklemler için t-testi uygulanmıştır (Tablo 2).

Cinsiyet	N	X	Ss	Sd	T	P
Erkek	102	76,24	10,21	183	1,19	0,25
Kadın	83	77,46	9,53			

Tablo 2: Öğrencilerin cinsiyet değişkenine göre t-testi sonuçları (p>0,05)

Tablo 2'deki istatistiksel sonuçlar incelendiğinde, ortaöğretim 10. sınıf öğrencilerinin matematik derslerinde verilen ev ödevlerine ilişkin düşüncelerinin cinsiyete göre farklılaşmadığı görülmektedir (p>0,05).

Son olarak, araştırmada kullanılan anketin her bir maddesine ait aritmetik ortalama değerler aşağıdaki tabloda ayrı ayrı verilmektedir (Tablo 3).

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Anket soruları	Arit. Ort. (X)
Matematik ev ödevlerini yaparken çok mutlu oluyorum	3,44
Matematik ev ödevlerinin günlük hayat uygulamalarına yönelik olması benim ilgimi daha çok çekiyor	4,21
Alıştırma türündeki ev ödevleri matematik konularını daha iyi anlamama katkı sağlıyor	3,51
Ev ödevlerinin kontrol edilmesi öğretmen-öğrenci iletişimini pozitif yönde geliştirir	4,23
Matematik ev ödevlerini yaparken çok dikkatliyim	3,66
Matematik ev ödevlerinin derste çözdüğümüz örnek ve problemlere benzer olması durumunda, ev ödevlerini yapabileceğime inanıyorum	3,98
Matematik ev ödevleri, benim için diğer ödevlere göre daha öncelikli bir yere sahiptir	3,71
Matematik ev ödevlerini yapmam matematik sınavlarında bana çok olumlu katkı sağlıyor	4,15
Matematik ev ödevlerinin araştırma ağırlıklı olması matematik dersi hakkında pozitif düşünmeme sebep oluyor	3,68
Matematik ev ödevlerinin uygulamalı türden olanları daha çok dikkatimi ve ilgimi çeker	4,28
Matematik ev ödemlerinde internetten faydalanabilmem ben mutlu eder	4,12
Matematik ev ödevlerinin üretkenliğimi ve düşünce yapımı geliştirdiğini düşünüyorum	4,06
Matematik konularına ön hazırlık ev ödevleri öğrenme motivasyonumu artırıyor	3,92
Ev ödevlerinin matematik konularını anlamamda ve kavramamda etkili olduğunu düşünüyorum	4,17
Dönem ve yılsonu ödevlerimi matematik dersinden seçerim	2,81
Matematik ev ödevlerini yapmak analiz etme ve ilişkilendirme becerilerimi geliştirdiğini düşünüyorum	3,72
Matematik ev ödevlerinin öğretmen tarafından kontrol edilmesi çok önemlidir.	4,21
Matematik ev ödevlerine ilgi durumumuz öğretmenimizin kanaatini etkilediğini düşünüyorum	4,26
Araştırma ağırlıklı matematik ev ödevleri konuları daha iyi anlamama ve öğrenmeme katkı sağlıyor	3,61
Matematik ödevlerini yaparken motivasyonum üst düzeyde oluyor	3,12

Tablo 3. Anket maddelerinin ortalama puanları (Genel ortalama = 76,85)

Anketteki toplam 20 maddenin genel aritmetik ortalaması 3,84 olarak bulunmuştur. Bu değere göre orta öğretim 10. sınıf öğrencilerinin matematik dersi ev ödevleri hakkındaki tutumlarının olumlu yönde olduğunu söyleyebiliriz. 20 maddenin genel ortalaması 76,85 olarak hesaplanmıştır.

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20 madde içerisinde en yüksek ortalamaya sahip (4,28) maddenin "Matematik ev ödevlerinin uygulamalı türden olanları daha çok dikkatimi ve ilgimi çeker" olduğu göz önüne alındığında, öğrencilerin somut ve ne anlama geldiğini anladıkları ödevlerin, problemlerin ve konuların daha çok ilgilerini çektiği söylenebilir. Yine en yüksek ortalama puanlara sahip benzer iki anket maddesi, "Matematik ev ödevlerine ilgi durumumuz öğretmenimizin kanaatini etkilediğini düşünüyorum" (4,26) ve "Ev ödevlerinin kontrol edilmesi öğretmen-öğrenci iletişimini pozitif yönde geliştirir" (4,23) olarak belirlenmiştir. Öğrenciler, matematik ödevlerinde gösterdikleri performansların öğretmen tarafından dikkate alındığını ve matematik başarı puanlarını belirlemede değerlendirmeye katıldığını düşünmektedirler.

Araştırmadaki en düşün puana (2,81) sahip madde "Dönem ve yılsonu ödevlerimi matematik dersinden seçerim" olduğu görülmektedir. Bu puan değeri, öğrencilerin matematik dersine karşı tam bir özgüvene sahip olmadıklar şeklinde yorumlanabilir. Matematik ödevlerinin öğrencilerin kendi başına yapabilecekleri düzeyde olması, ve araştırma kaynaklarından kolay sonuca gidilebilir türde seçilmeleri, daha çok öğrenci tarafından dönem sonu ve yıl sonu ödevlerinin matematik dersinden seçilmesine sebep olabilir. En düşük puana (3,12) sahip diğer bir madde ise "Matematik ödevlerini yaparken motivasyonum üst düzeyde oluyor" odluğu görülmüştür. Bu motivasyon düşüklüğünün sebebi olarak, öğrencilerin yapamadıkları düzeyde ev ödevleriyle daha çok karşılaştıkları ve çözemedikleri yada zorlandıkları sorulara motive olmada sıkıntı yaşamaları olarak ifade edilebilir.

Sonuç

Ev ödevleri hemen hemen bütün ülkelerde ve bütün eğitim sistemlerinde eğitim öğretimin bir parçası olarak hep var olmuştur. Farklılık, ev ödevlerine yüklenen misyon ve ev ödevlerinin sistemin içinde var olma biçimidir. Bu çalışmadan elde edilen temel sonuçlardan bir tanesi, orta öğretim öğrencilerinin, öğretmenlerinin ev ödevlerini çok önemsediklerini düşünmeleridir. Diğer önemli bir sonuç ise öğrencilerin dönem ya da yıl sonu ödev tercihlerinde matematik dersini fazla tercih etmemeleridir. Öğretmenlerin ödevlerin amaç, kapsam ve işlevleri konusunda daha bilinçli davranmaları öğrencilerin tutumlarını pozitif yönde etkileyeceği aşikardır

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OSMANLI DEVLETİNDE ARAPÇILIK VE TÜRKÇÜLÜK DÜŞÜNCESİNİN ORTAYA ÇIKIŞI

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ÖZET

Osmanlı elitleri, devleti daha etkin ve güçlü kılmaya yönelik bir çaba olarak Batılılaşma hareketi ile birlikte ulusçuluk düşüncesinin de etkisi altına girmişlerdir. Osmanlı Devletinin en büyük iki etnik grubu olan Arap ve Türk kökenli elitler Osmanlıcılık ve İslamcılık ideolojilerinin geçerliliğini yitirmesi sonucunda etnik-ulusal temelli siyasal dayanışma biçimlerinin Batılılaşmada daha etkin bir siyasal model olacağına inanmaya başlamışlardır.

Hem Arap ve hem Türk kökenli Osmanlı reformcuları, ulusçuluk düşüncesinin Avrupalıların güçlenmesine ve ilerlemesine katkı sağladığını ileri sürmüşlerdir. Türk kökenli Osmanlı reformcuları, devletin bütün unsurlarını tek bir millet (Milleti Hakime - Egemen Millet) çatısı altında bir araya getirmeye çalışmışlardır. Buna karşılık Arap kökenli reformcular, Arap ulusunun merkezde olduğu İslamcı bir ideolojiyi ortaya atmışlardır. Esas olarak her iki düşünce Osmanlı Devleti"nin modernize edilmesi sürecinde ortaya çıkan ulusçuluk düşüncelerinden türemişlerdir. Her ikisinin ortak özelliği, Batı medeniyetinin egemen olduğu bir dünyada ilerleme ve gelişme sürecine ayak uydurmaya çalışmış olmalarıdır.

Çalışmada Arap ve Türk kökenli elitlerin ulusçuluk düşüncesini savunmasını sağlayan Batılı düşünsel yapılar ile almış oldukları Batı tarzı eğitimin etkisi ele alınmaktadır.

Anahtar Kavramlar: Batılılaşma, Arapçılık, Türkçülük, Ulusçuluk.

Giriş

19. yy'ın sonlarına kadar pek çok etnik ve dinsel cemaatten oluşan Osmanlı toplumuna mensup bir çok kişi kendisini Osmanlı Devletinin bir tebaası veya yurttaşı olarak görmüştür fakat yaşanan tarihsel olaylar (Balkanlarda Osmanlı Devletinden ayrılmalar) Osmanlı Devletinin elitleri arasında farklı bakış açılarının gelişmesine neden olmuştur. Osmanlı toplumunu oluşturan Müslüman ve gayrimüslim cemaatler arasındaki ulusçuluk düşünceleri birbirleri eşzamanlı olarak ortaya çıkmamışlardır. Dinsel özelliklerinden ötürü çoğunluğunu Hıristiyanların oluşturduğu Osmanlı Devletinin gayrimüslim cemaatleri Batılı tarzda ulusçuluk düşüncelerini Müslümanlara nazaran daha erken bir dönemde benimsemişlerdir.

Osmanlı Devletinde aydınlar arasında kimlik tartışmaları 19. yüzyıldan itibaren yoğun biçimde yaşanmaya başlamıştır. Özellikle Osmanlı toplumunu oluşturan en kalabalık Müslüman iki grup olan Araplar ve Türkler arasındaki ulusçuluk düşüncelerinin içeriği ve kapsamı oldukça karmaşıktır. Örneğin, Ahmet Mithat'a göre Türkler en az gelişmiş ve en az eğitilmiş gruptur bundan dolayı Mithat, Türklerin Avrupa'daki millet-devlet sistemine benzer bir şekilde örgütlenip, kültürel haklarına ve etnik özelliklerine sahip çıkmaları gerektiğine inanmıştır. Namık Kemal ise, Türklerin Osmanlı Devleti'nin kurulmasında ve korunmasındaki rolüne inanmasına rağmen, etnik kökene vurgu yapmamış, övünç kaynağının, devlete bağlılıktan ve İslamiyet'i gönülden desteklemekten geçtiğine inanmıştır. Yanı sıra, Osmanlı Devleti'nin devamının sağlanması yönünde bütün Müslümanların Türkleştirilmesi suretiyle birliğin sağlanabileceğini savunmuştur (Karpat, 2001:660). Buna

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mukabil Suriyeli Arap bir Hıristiyan olan Necip Azuri, Müslüman ve Hıristiyan Arapların ulusal bir Arap devleti altında birleşmeleri gerektiğini savunmuştur (Hourani, 1983:79).

Türk Ulusçuluğu

Tarihsel ve siyasal olaylar, Türk ulusçuluğunun bilimsel, edebi ve politik alanlardan geçerek geliştiğini göstermektedir (Kuran, 1995:155). Bilimsel alandan Türkçülük, Rusya'nın Orta Asya'yı işgal etmesi sonucunda, Türk aydınlarının dikkatini çekmesi ile başlamıştır. Orta Asya'da yaşayan Türk kökenli toplulukların Osmanlı Devleti ile akrabalığına vurgu yapılarak, Türkçenin önemi ve bu iki coğrafyadaki halkları birleştirme hayali üzerine kurgulanmıştır. Buradan hareketle Türk dili ve tarihi alanında pek çok çalışmalar yapılmış ve eserler yayınlanmıştır. Edebi alanda Türkçülük ile ilgili olarak, Türk milletinin kahramanlıkları ve devletlerinin üstünlüğü işlenmiştir. Politik alanda ise Türkçülük, dünya üzerinde yaşayan bütün Türklerin birliğini savunan politik bir ideoloji olarak savunulmuştur. Bu aşama ise Cumhuriyetin kurulmasından önce Jön Türklerin İttihat ve Terakki Hükümeti içerisinde örgütlenmesi ve bir sisteme bağlanması ile sonuçlanmıştır.

II. Abdülhamit 1877'de, Kırım Savaşı ve doğurduğu olumsuz koşulları gerekçe göstererek Kanuni Esasi'yi yürürlükten kaldırınca, Beyrut, Kahire ve Şam gibi Osmanlı Devletinin görece gelişmiş şehirlerinde; daha sonra Paris ve Londra gibi Avrupa kentlerinde II. Abdülhamit yönetimine muhalif çok sayıda cemiyetler kurulmuştur. Zamanla bu muhalefetin içerisinde yer alanlar "Jön Türkler" olarak tanınmıştır. Paris'te bir araya gelen Jön Türklerden oluşan bir grup, 1889 yılında İttihat ve Terakki Cemiyetini kurmuştur (Karpat, 1996:35). İttihat ve Terakki Cemiyeti, zamanla yönetime muhalif subay ve devlet memurlarından oluşan çeşitli grupları birleştirerek gücünü arttırmıştır. Bu birleşmeye Osmanlı Devleti sınırları içinde yaşayan hem Hıristiyanlar hem de farklı etnik yapılara mensup Müslümanlar da destek vermiştir. Hıristiyan azınlıklar kurulacak meşruti yönetim sayesinde bağımsızlıklarını kazanmak ümidiyle İttihat ve Terakki'yi desteklemişlerdir. Böylece Jön Türk hareketine destek verenlerin görünürdeki amaçları; Sultan II. Abdülhamit'in baskıcı yönetimine son vermek ve Kanuni Esasi ilkelerini tekrar yürürlüğe koymak suretiyle Osmanlı Devleti'nin bütünlüğünü korumak olmuştur (Davison, 1981:110).

İttihat ve Terakki Cemiyeti içinde örgütlenen Jön Türk hareketi, Genç Osmanlıların 1860-70 yılları arasında ileri sürdüğü Padişah'ın yetkilerini kısıtlayacak bir yönetim ve tüm Osmanlı tebaası azınlıklara kanun önünde eşitlik gibi siyasal yenilikleri savunmuştur (Ahmad, 1971:37). Hareketin önde gelenleri II. Abdülhamit'in baskısından kurtulmak amacıyla Avrupa'da çeşitli ülkelere iltica etmiştir. İlk kongrelerini 1902 yılında Paris'te II. Abdülhamit'e karşı olan muhalefeti birleştirmek amacıyla farklı din ve etnik yapılara mensup 47 üyenin katılımı ile gerçekleştirmişlerdir. Kongrede; hareketin amacının, II. Abdülhamit'i tahttan indirip anayasal yönetimi kurmak, büyük bir felaket ile karşı karşıya gelen Osmanlı Devleti'nin Türk, Arap, Arnavut, Ermeni, Makedonyalı, Rum, Kürt, Musevi ve diğer yurttaşların güçlerini bir araya getirerek dış müdahalelere karşı koymak olduğuna karar verilmiştir (Dündar, 2008:50).

1908'de II. Abdülhamit tahttan indirilip, Jön Tük Hareketi iktidarı ele geçirince, devletin ortak bir dilin birleştiriciliği etrafında yeniden yapılandırılması fikri belirginleşmiştir. Bu dilin Osmanlı Devleti'nde en etkin grup olan Türklerin dili olması gerektiğine vurgu yapılmıştır. Buna ilk tepkiler Şam'da eğitim görmüş bazı Müslümanlardan ve daha sonra Lübnanlı bazı Hıristiyan yazarlardan gelmiştir (Hourani, 364). Jön Türklerin etnik temele dayalı bir Türkçülüğü gündeme getirmesinin gerisinde, II. Meşrutiyet'in ilan edilmiş olması etkilidir. II. Meşrutiyet ile birlikte Osmanlı Devletinde parlamenter sisteme geçiş yapılmıştır. Ülkede seçimlerin yapılması ile sayıca az olan Türk unsurların meclisteki çoğunluğu, diğer çoğunluk gruplarına (Hıristiyan ve Müslüman Araplara) kaptıracağı endişesi artmıştır (Georgeon, 2006: 32). Bu konu ile ilgili Hüseyin Cahit Yalçın'dır fikirleri İttihat ve Terakki Cemiyeti'nin resmi yayın organı olan Tanin'de yayınlanmış ve dönemin Jön Türkleri arasında yayılmıştır. Yalçın (1908), 7 Kasım 1908 tarihli makalesinde, "Milleti Hâkime" kavramını ortaya atarak, Osmanlı toplumunda mutlak anlamda hâkimiyetin Türklerin elinde bulundurulması gerektiğini savunmuştur.

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20. yüzyılda Osmanlı Devleti'ni oluşturanların nüfusunun 22 milyon civarında olduğu tahmin edilmiştir. Nüfusun 10,5 milyonunu Arapların, 7.5'ini Türklerin, geri kalan 4 milyonluk nüfusun ise diğer etnik gruplardan oluştuğu ileri sürülmüştür (Antonius, 1945:104). İttihat ve Terakki Cemiyeti, Meşruti yönetim gereği ülkede yapılacak seçimlerde, nüfus yapısındaki bu dağılımın sonucunun Meclisi Mebusan'da Türklerin aleyhine bir tablonun oluşmasına yol açacağını hesap ettiğinden, ülke genelinde çoğunlukla Türk kökenlileri aday göstermek suretiyle seçimleri kendi lehine çevirmeye çalışmıştır.

Hüseyin Cahit Yalçın gibi Yusuf Akçura da, dönemin en geçerli siyasi oluşumunun etnik temele dayalı bir yapılanmadan geçtiğini savunmuştur. Bu doğrultuda, Osmanlıcılık ile İslamcılığın; Osmanlı tebaası olan Türkleri, Arapları, Rumları ve Ermenileri artık tek bir millet haline getirmeyeceğine işaret etmiştir. Türklerin çoğu Müslüman olduğu için, İslamiyet, Türk milletinin oluşumunda çok önemli bir unsurdur (1976:19). Batı'da ve laik eğitim kurumlarında eğitim gören, dönemin elitleri arasında bu düşünce geniş kabul görmüştür. Osmanlı Devleti'nin yönetimi altındaki farklı bölgelerde yaşayan Türk ve özellikle Arap elitleri bu düşüncelere daha fazla önem vermeye başlamıştır. Etnik ulusalcılığa dayanan bir birliktelik yavaş yavaş kendini hissettirmeye başlamıştır. İstanbul, Beyrut, Kahire, Kudüs ve Şam gibi önemli kentlerde bu fikirler açıkça dile getirilmiştir.

Jön Türk hareketinin düşünceleri ve uygulamaları, Osmanlı yönetimi altındaki diğer etnik grupları, özellikle Arapları iyiden iyiye endişelere sevk etmiştir. Çünkü Abdülhamit, kendisine bağlı ve sadık olacak bürokratik kadrolara farklı etnik gruplardan – özellikle Araplardan oluşan - pek çok yeni memurlar atamıştır. İttihat ve Terakki Cemiyeti, iktidara geldikten sonra II. Abdülhamit tarafından tesis edilen bürokratik kadroların çoğunu tasfiye etmiştir (Mansfield, 2000:32).

Arap Ulusçuluğu

Islahat hareketlerinin beklenen hedefleri gerçekleştirememesi, ıslahatların doğurduğu mali yükümlülükler ve Batı karşısında yaşanan askeri başarısızlıklar, Arap elitlerinin geçmişte atalarının ulaştığı zaferlere, yüksek kültür ve medeniyete katkılarına nostaljik bir bilinç geliştirmesine neden olmuştur. Arap elitleri, İslam'ın varlığını sürdürmesine ve Müslümanların tek bir çatı altında kalmasında büyük bir katkısı olan Osmanlı hanedanın askeri gücünü takdir etmekle birlikte, artık duraklama dönemine girdiğine ve git gide İslami ilkelerden uzaklaştığına dair kanaatler geliştirmişlerdir (Hourani, 1983:130). Arap elitleri arasında ulusalcı ve İslami düşünceler Türkçülükten önce ortaya çıkmıştır fakat İslami duygu ve düşüncelerin daha ağır basması ve ulus kavramının Batı kaynaklı olması, uzun bir süre çok az kişi tarafından benimsenmesine neden olmuştur.

Etnik temellere dayanan Arap ulusçuluk hareketlerinin ilkinin, 1875'li yıllarda Beyrut'ta bulunan Suriye Protestan Okulu bünyesinde kurulan bir derneğe dayandırılabilir Bu derneğin kurucularının tamamı Hıristiyan Araplardan oluşmuştur. (Antonius, 1945:101). II. Abdülhamit zamanında, Osmanlı merkezi yönetimine ve daha sonra İttihat ve Terakki Cemiyetine karşı en sert muhalefet Suriyeli Hıristiyan Araplardan gelmiştir. Suriyeli Arap elitler Osmanlı Devleti'nden ayrı bir Arap birliğinin kurulması gerektiğini savunmuşlardır. Özelikle Beyrut'ta faaliyet gösteren Amerikan ve Fransız misyoner okullarında yetişen Hıristiyan Araplar Batılı ülkeler ile yakın temaslar içerisine girerek Klasik Arap edebiyatının canlanması konusunda yoğun çalışmalar yapmıştır. Bunlardan en önemlisi İbrahim Al-Yaziji'dir. Al-Yaziji'ye göre; Arap kültür ve medeniyeti, Türklerin egemenliği altına girdikten sonra gerilemiştir (Dawn, 1961).

Balkan Savaşları sırasında Osmanlı Devleti'nin neredeyse bütün eyaletlerinde ekonomik sorunlar yaşanmış, savaşın maliyeti yüzünden vergiler attırılmış, borç talepleri ve savaşın maliyeti yükselmiştir. Sosyal ve ekonomik dengelerin bozulması sonucunda ürün fiyatlarında artışlar meydana gelmiştir. Pek çok vilayette bu duruma karşı protestolar ve hükümet aleyhine gösteriler düzenlemiştir. Bu koşullardan hareketle Arap bölgelerinde İttihat ve Terakki hükümetine karşı muhalif hareketler çoğalmış ve sonucunda özerklik veya bağımsızlık talepleri başlamıştır. Bunlara karşı İttihat ve Terakki Hükümeti, ülke genelinde baskıcı bir yönetim izlemiştir. Söz konusu talepleri savunanların bazıları idam edilmiştir (Kayalı, 1998:150). Bu ve buna benzer çeşitli olaylar sonucunda Arap elitleri, Türklere karşı hem dinsel hem de laik teoriler ileri sürmeye başlamışlardır. Arap halkının ilk Müslüman topluluk olduğunu ve geçmişte pek çok başarılar ve zaferler elde ettiğini iddia etmeye ve Arapların tarih sahnesindeki etkin konumlarını kaybetmelerinin suçlusu olarak Türkleri görmüşlerdir (Lewis, 1953).

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Muhafazakârlar Arap ise, İslami kaynaklardan uzaklaşılmış olmasının etkili olduğunu düşünmüşlerdir. Bu sebepten ötürü İslam'ın asli kaynaklarına ve İslam'ın geçmişte yaşanılan biçimlerine geri dönmenin, İslamiyeti tekrar yükselişe geçirmenin en doğru yol olduğunu ileri sürmüşlerdir. Müslümanların sorunlarını çözmenin yolunun Kuran'ı tekrar anlamaktan geçtiğini savunmuşlardır. Bu amaçla Araplara, Arapça olarak indirilen Kuran'ın iyi bir şekilde anlaşılabilmesi için Arap edebiyatı ve Arap dili kurallarını iyi öğretmek gerektiği fikri ön plana çıkmıştır. Arap modernleşmesini savunan bazı entelektüeller Osmanlı Devleti'nin Batı emperyalizmi karşısında zayıf düşmemesi için Osmanlı hanedanının desteklenmesi gerektiğini düşünmüştür. Türklerin halifeliğini (son zamanlarda özellikle halife olarak II. Abdülhamit'i) desteklemekle birlikte Arap asıllı bir halifenin seçilmesinin İslami kurallara daha uygun olduğunu ileri sürmüşlerdir (Birinci, 1990:223).

Türk ve Arap kökenli elitlerin siyasal bakımdan karşı karşıya gelmelerini sağlayan etkenlerin başında ise Batı kökenli düşüncelerin etkisi başat olanıdır. Batı ülkelerinde eğitim gören veya Batılı ülkeler tarafından Osmanlı Devletinin çeşitli şehirlerinde kurulan okullardan mezun olanlar liberal, özgürlükçü ve özellikle pozitivist akımlardan yoğun biçimde etkilenmişlerdir (Kayalı, 1998:31). Bundan dolayı modern zamanlara özgü etnik temelli siyasal bir birliktelik olarak bağımsız ulusal devletlerin kurulması gerektiği fikri yoğun biçimde savunulmuştur.

Sonuç:

II. Meşrutiyetin ilan edilmesinden sonra, iktidara gelen İttihat ve Terakki Cemiyeti, Osmanlı Devletinin Devletini geniş toprakları üzerinde merkezi bir yönetim tesis etmeye yönelik bir çaba sarf etmiş, Osmanlıcılık ve İslamcılık fikirleri yerine Türkçülüğü ön plana çıkarmıştır. Ayrıca Jön Türkler, devleti sekülerize etmeye ve devletin içerisinde çoğunluğu oluşturan Arapları yönetici gruptan uzaklaştırmaya çalışmışlardır. Bu durum ise Arap elitlerini, etnik ve dilsel kökenlerinin ön planda olduğu geçmişlerine ve Arap toplumlarını bir araya getirebilecek siyasal bir kurgu üretmeye yöneltmiştir.

Arap ulusalcılığının ilk savunucuları Hıristiyan Araplar veya Avrupa eğitim görmüş olanlardır. Türk ulusçuluğunun en ateşli savunucuları ise Rusya ve Avrupa'dan İstanbul'a gelen Türk kökenli göçmenler olmuştur. Her iki ulusçuluğun düşünsel arka planı ve siyasal teorisi ise Müslümanların Batı karşısında gerilemesine yönelik modern bir kaygıdan ve Batı karşısında yenik düşmekten kaynaklanan bir motivasyondan mülhemdir.

İlk olarak Balkan toplumları arasında etkili olmaya başlayan ulusçuluk akımı, Batılı ülkeler karşısında bütün kurumları ile zayıf düşmüş olan Osmanlı Devleti'nin zayıflamasına ve zaman içinde dağılmasına sebep olmuştur.

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OTIZM SPEKTRUM BOZUKLUĞU OLAN ÇOCUKLARDA GÖZLEYEREK ÖĞRENME

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Bu çalışma ile Otizm Spektrum Bozukluğu (OSB) olan çocuklarda gözleyerek öğrenmeye yönelik temel kavramları incelemek ve gözleyerek öğrenme düzeylerini belirlemeye yönelik yapılan araştırmalara ilişkin güncel bilgileri aktarmak amaçlanmıştır. Bu amaçla detaylı bir alanyazın taraması yapılarak ulaşılan OSB olan çocukların gözleyerek öğrenme düzeylerini inceleyen deneysel ve yarı deneysel araştırmaların yöntem, bulgu ve sonuçları belirlenen inceleme ölçütlerine göre incelenmiştir.

Bu çalışma kapsamında internet üzerinden ERIC, Ebsco Host, Academic Seearch Complete, Google Scholar veri tabanlarında "Gözleyerek Öğrenme ve Otizm Spektrum Bozukuğu (Observational Learning and Autism Spectrum Disorder)" anahtar kelimeleri ile bir alanyazın taraması gerçekleştirilmiş ve konuyla ilişkili 2000-2016 yılları arasında yayımlanmış makalelere ulaşılmıştır. Ulaşılan makaleler, belirlenen makale inceleme ölçütleri kullanılarak betimsel analiz yöntemi ile analiz edilmiştir.

Alanyazın taraması sonucunda ulaşılan makaleler, demografik ve yöntemsel özelliklerine göre incelenmiştir. Ayrıca gözlemciler arası güvenirliği bağımsız bir gözlemci tarafından yapılmış ve güvenirlik yüzdesi belirlenmiştir. Elde edilen tüm bulgular tablo ve grafikler yardımıyla görselleştirilmiş olup; sunum sırasında katılımcılarla paylaşılacaktır.

Keywords: Otizm Spektrum Bozukluğu, Gözleyerek Öğrenme

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OTOMOBİL KLİMALARINDA PCB SEVİYELERİNİN BELİRLENMESİ

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Özet: Poliklorlu bifeniller (PCB), Kalıcı Organik Kirleticiler (KOK) sınıfına ait önemli bir kirletici olarak son yıllarda çokça araştırılan bir kirletici grubudur. PCB'ler özellikle biyolojik birikim yapabilme ve kanserojen olmaları açısından çok önemlidir. Antropojenik faaliyetler sonucu havaya salınan bu kirleticiler toksik etkilerinin fark edilmesiyle birlikte 20. yy son çeyreğinden itibaren Amerika Birleşik Devletleri ve Bazı Avrupa ülkelerinde kullanımı kısıtlanmaya ve yasaklanmaya başlamıştır. Bu çalışmada farklı markalara ait 15 adet otomobil klimalarınının filtrelerinden alınan toz örneklerinde 15 poliklorlu bifenil seviyeleri incelenmiştir. Toplanan toz örnekleri GC-ECD (Agilent Technologies 5977A) ile analiz edilmiştir. Analiz sonuçlarında toplam PCB olarak en düşük 44,6 ng/g, en yüksek 3242 ng/g değer bulunmuştur.

Anahtar Kelimeler: Poliklorlu Bifeniller, İç ortam, Otomobil

1. GİRİŞ

Antropojenik faaliyetler sonucu havaya salınan Kalıcı Organik Kirleticilerin (KOK) toksik etkilerinin fark edilmesiyle birlikte çokça araştırılan bir kirletici grubu haline gelmiştir. KOK grubu içerisinde yer alan poliklorlu bifenil (PCB) bileşikleri fotolitik, biyolojik ve kimyasal bozunmaya karşı dirençli sentetik organik bileşikler olup, doğada uzun süre kalabilir ve uzun mesafeler boyunca taşınabilirler. PCB'ler termal kararlılığı yüksek, asit ve baza karşı dirençli bileşiklerdir.. 20. yy son çeyreğinden itibaren Amerika Birleşik Devletleri ve Bazı Avrupa ülkelerinde kullanımı kısıtlanmaya ve yasaklanmaya başlamıştır. Bu yasaklanma tedbirlerine rağmen kirlenmiş bölgelerden buharlaşma yoluyla ve atık yakma gibi nedenlerle atmosfere salınımları olabilmektedir. (Bozlaker vd.,2008; Breivik vd.,2002). Uzun yarılanma ömürlerine sahip olmaları PCB'lerin biyolojik olarak birikim yapmalarına, kalıcı olmalarına, toksik etki göstermelerine ve uzun mesafe taşınabilmelerine olanak sağlamaktadır.

PCB'ler, değişik karbon atomlarına bağlanmış iki benzen halkası ile tek bir zincirden oluşan kararlı organik kimyasallar arasında yer alan aromatik klorlu bileşik olarak kabul edilirler. Diğer organik kirleticilerle karşılaştırıldığında PCB'ler toprakta daha çok birikim yapmaktadırlar (Batterman vd. 2009). Şehir merkezleri, sanayi alanları, yaşamsal bölgeler ve yeşil alanlardır PCB konsantrasyonlarının yüksek konsantrasyonlarda bulunduğu bölgelerdir.
(Wang vd.,2008).

PCB'ler özellikle biyolojik birikim yapabilme ve kanserojen olmaları açısından çok önemlidir. Atmosfere atılan partikül veya gaz fazındaki PCB emisyonları, kısa veya uzun mesafeli taşınımla ve ıslak yada kuru çökelme ile atmosferden uzaklaşarak toprak, sucul ortam ve bitki örtüsünde birikirler. Sucul ortamda biriken bileşiklerin bir kısmı buharlaşarak sudan uzaklaşırken, bir kısmı sucul ortamda partiküllere tutunarak sedimentlerde birikir, bir kısmı da su canlılarında birikim gösterirler. Bitkilerde ve su canlılarında biriken bileşikler besin zinciri yoluyla insana kadar ulaşabilmektedirler (ATSDR, 2000). Toprakta biriken PCB bileşikleri toprağın organik fraksiyonuna çok sıkı tutunur ve yağmur suyu gibi etkenler olsa da toprakta çok fazla hareket etmez ve yıllarca toprakta kalabilir (Çetindamar vd., 2014). Tüm bu özellikleri nedeniyle 2001 Stockholm sözleşmesi kapsamında Kalıcı Organik Kirleticiler içinde "Ek A Ortadan kaldırılması söz konusu maddeler" grubuna alınarak kullanımı yasaklanmıştır. Türkiye sözleşmeyi 2001'de imzalamıştır. 2006 da hazırladığı eylem planı kapsamında 2025 yılına kadar tüm sorumluluklarını yerine getirmekle yükümlüdür (Dönmez 2012).

Dünya sağlık örgütü her yıl 2.4 milyon insanın hava kirliliği nedeniyle öldüğünü tahmin etmektedir Kirli havanın solunmasıyla astım ve kardiyovasküler hastalıklarına yakalanma riskleri artmaktadır. Birçok ülke hava kalitesi kontrol yasalarınıgüçlendirmekte ve otomobil içindeki emisyonlara daha fazla odaklanmaktadır (Müller vd., 2011). Kapalı ortamlar insanların zamanlarının yaklaşık %80-90'ını geçirdiği konutlar, okullar, resmi

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binalar, hastaneler, kütüphaneler, kapalı spor salonları, eğlence yerleri, otomobiller, metrolar, trenler, uçaklar vb. taşıtlardır. Günümüzde teknolojideki değişiklikler, doğal ürünlerden sentetik ve kimyasal ürünlere geçiş, yaşam biçimi değişiklikleri, yerleşim yerlerinin çalışma ortamlarına uzak olmasından dolayı araç içinde geçirilen süre artmıştır. Günümüzde şoförlerin ve yolcuların farkında olmadığı bazı tehlikeler vardır. Koltuklar, döşemeler, kol ve baş yastıkları, yer döşemesi, aksesuarlar, otomobil parfümleri ve plastikten yapılmış pek çok parça tehlikeli kimyasalları içermektedir.

Kapalı ortam hava kalitesine bağlı olarak ortaya çıkan sorunlar, Çevre Koruma Örgütü'nün (Environmental Protection Agency, EPA) toplum sağlığına zararlı çevresel etmenler içinde belirttiği riskler arasında 5. sırada yer almaktadır. İnsanların en fazla zaman geçirdiği kapalı ortamlar sırasıyla ev, işyeri ve otomobillerdir. Amerika'da yapılan bir araştırmada, araştırmaya katılanların büyük çoğunluğunun günde yaklaşık 100 dakikalarını otomobillerinde geçirdikleri belirlenmiştir. Türkiye'de özellikle büyük şehirlerde, işe gidiş ve dönüş saatlerinde otomobillerde geçirilen süre çok daha uzun olabilmektedir (Lagalante vd., 2011, Vaizoğlu vd, 2010).

2. MATERYAL METOD

2.1. Örneklerin alınması

Çalışmada otomobil klimalarında biriken toz örneklerini üzerinde PCB konsantrasyonunun belirlenebilmesi amacıyla 5 farklı markalardaki otomobillerin bakım süreçleri esnasında çıkartılan hava ya da polen filtreleri dış faktörlerden korunması amacıyla kapalı bir şekilde laboratuar ortamına getirilmiştir. Daha sonra laboratuar şartları altında temiz bir fırça yardımıyla toz örnekleri alınarak amber cam şişelerde buzdolabında saklanmıştır.

2.2. Numune hazırlama

Laboratuvar ortamında saklanan numunelerin hazırlığı için önce kalibrasyon çalışması yapıldı. Kalibrasyon için 15 izomerden oluşan PCB karışımı ve geri kazanım (recovery) standartı olarak sertifikalı 2,4,6-Triklorobifenil ve 2,2',3,4,4',5,5',6-Oktaklorobifenil izomerleri Absolute'dan temin edildi. Numuneler öncelikle kıl, çöp gibi maddelerden temizlenerek tartılmıştır.

Ekstraksiyon için 2 gr tartılan numunelere recovery standard enjekte edilerek 15 ml aseton:hegzan karışımı ilave edilip bütün gece oda sıcaklığında bekletildi. Ertesi gün numuneler ultrasonik banyoda 1 saat boyunca işlemden geçirildi. Örneklerin sıvı fazı alınarak üzerine hegzan ilave edilerek solvent değiştirme yapıldı ve sonrasında azot gazı altında önzenginleştirme işlemi için miktarları 1-2 ml'ye kadar düşürüldü.

2.3. Clean-up (temizleme)

Temizleme kolonu için silika jel, alumina ve susuz sodyum sülfat kullanılmıştır. Bu kimyasalların kolon için hazırlanması aşağıdaki gibidir:

Silika jel, 130 ^{0}C'de etüvde bütün gece (16 saat) bekletilir. Desikatörde soğutulduktan sonra balon jojoye alınır. Daha sonra deiyonize su ile ile ıslatılıp iyice çalkalanarak % 5 oranında deaktive edilir. Her 3 gr slica gel için 140 µL deiyonize su koyulur. İyice çalkalanır. Oda sıcaklığında karanlıkta 1 saat bekletilir ve daha sonra 12 saat içinde kolonda kullanılır.

Alumina ve sodium sulfate 450 C"lik fırında 6-7 saat yakılarak aktive edilir: Her 2 gr alumina için 125 µL deiyonize su koyulur ve %6 oranında deaktive edilmiş olur. Cam yünü ise hekzan ile yıkanıp süzüldükten sonra etüvde kurutulur.

Temizleme kolonunda (L: 20 cm, D:1 cm) sırasıyla 1 gr cam yünü, 3 gr slika jel, 2 gr alumina ve en üstte sodyum sülfat ile hazırlanır. Kolonlar GC derece saflığında 20 ml Dikolorometan ve arkasından 20 ml Petrolyum Eteri ile ön yıkama yapılarak solvent akış hızı 0,1 ml/sn olarak ayarlanır. Daha sonra önzenginleştirilme yapılmış örnek (2 ml) gas-tight şırınga ile kolona verilir. Örnek kolona verildikten sonra kolondan 50 ml petrolyum eteri geçirilerek PCB ve PBDE örneklerinin ayrılması sağlanır. Kolondan geçirilmiş olan PBDE ve PCB örnekleri önce rotary ile hacmi 5 ml düşürülür daha sonra azot gazı altında miktarları azaltlıp hegzan solventi ilav edilir. Örnekler 250 ul'ye kadar uçurulur, 250 ul kalan örnek viallerde GC analizi için buzdolabında bekletilir

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2.4. Analiz

Temizleme işlemi ile hazır hale getirilen örnekler, konsantrasyonlarının belirlenmesi amacıyla GC-ECD (Agilent Technologies 5977A) cihazında analiz edilmiştir. Cihazın kalibrayonu 15 hedef PCB bileşiği (Absolute 94567) ve 2 recovery stdandard için 6 farklı konsantrasyonda hazırlanmış kalibrasyon çözelti karışımları ile yapılmıştır. Kalibrasyon çözeltisi kondantrasyonları 25, 50, 100, 250 ve 500 µg/ml olarak hazırlanmıştır. Fırın sıcaklığı 80 C'de 2 dakika bekleme, 30 C/dak'lık artışla 200 C ye çıkıp en son 10 C/dakikalık artışla 310 C'ye çıkmıştır. 320 C'de 10 dakika beklemiştir. Enjeksiyon port sıcaklığı 300 C'dir. Analiz için HP-5MS kolon (30 m×250 µm×0.25 µm) kullanılmıştır.

Ektraksiyon ve temizleme işlemleri sonucunda PCB izomerlerinin geri kazanım oranları %80-%120 aralığında hesaplanmıştır. LOD değerinin belirlenebilmesi için şahit kütlesi 3 ile çarpılarak hesaplamalar yapılmıştır.

3. BULGULAR ve DEĞERLENDİRME

5 farklı marka (A-B-C-D-E) otomobil filtresinden alınan 15 adet numunede 15 adet PCB izomeri için (PCB18, PCB31, PCB28, PCB20, PCB52, PCB44, PCB101, PCB149, PCB118, PCB105, PCB153, PCB138, PCB180, PCB170, PCB194) toplam, ortalama ve ortanca değerler aşağıdaki gibidir. Sonuçlar Tablo 1'de verilmiştir

Tablo 1. PCB izomerlerine ait ortalama, ortanca, en düşük ve en yüksek değerleri

	ΣPCB	Ortalama	Ortanca
A1	2652,66	204,05	102,54
A2	1424,00	109,54	76,15
A3	125,14	9,63	2,91
B1	981,84	75,53	53,41
B2	848,02	65,23	28,78
B3	99,48	7,65	2,25
C1	3242,14	249,40	145,94
C2	240,87	18,53	18,53
C3	492,90	37,92	26,95
D1	296,72	22,82	12,86
D2	44,65	3,43	1,95
D3	1090,41	83,88	84,24
E1	2839,77	218,44	75,42
E2	408,19	31,40	29,30
E3	47,33	3,64	0,48

Tüm araba filtrelerinde PCB izomerlerine rastlanmıştır. PCB değerleri 3242,14 ile 47,3 arasında değişiklik göstermiştir.

Örnek toplanan arabaların her birinden 3 adet seçilerek marka bazında bir farklılık oluşup oluşmadığının belirlenmesi amaçlanmıştır. Analiz sonuçları markalar arasında kayda değer bir farklılık olmadığını göstermiştir. Klima tozları araba bakım servislerinden alındığından arabalara ait çok detaylı anket çalışması yapılamamakla beraber yaptıkları kilometreler değerlendirmede kullanılmak üzere istenmiştir. Bu veri ile yapılan korelasyon çalışmaları da çok net bir bulgu oluşturmamıştır.

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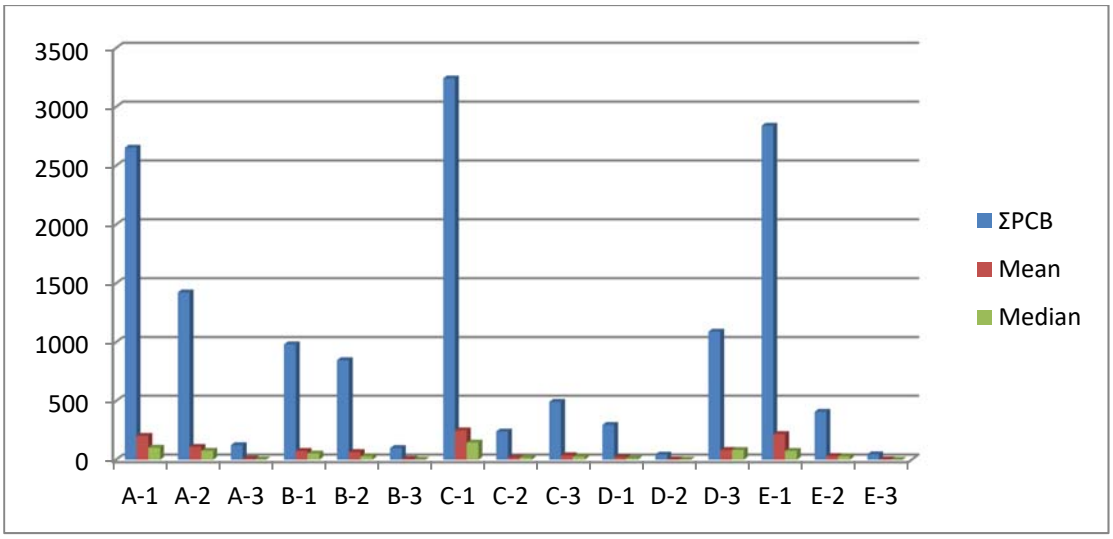

Şekil 1. PCB izomerlerine ait ortalama, ortanca, en düşük ve en yüksek değerleri grafiksel gösterimi

4. TARTIŞMA VE ÖNERİLER

Farklı mikroçevrelerde kalıcı organik kirleticilerin belirlenmesi son yıllarda sıkça çalışılan konular arasında yer almaktadır. Ev ve ofis klimalarının yanında araba klimalarında da bu tip tehlikeli kirleticilere yönelik araştırmalar mevcuttur ancak PCB bazında değerlendirme bulunmamaktadır. Arabalarda önemli sorunlardan biri olan PBDE lere yönelik çalışma hem araba içlerinden toplanan tozlarda hem de klima filtrelerinden toplanan tozlarda çalışılmıştır.

Bu çalışmanın devamında aynı toz örneklerinde PAH ve PBDE kirleticileri de bakılarak KOK kirleticileri daha kapsamlı bir biçimde ele alınacaktır. Aynı çalışma içerisinde ev ve ofis klimalarından toplanan örneklerde de PCB, PAH ve PBDE ler incelenerek KOK lara yönelik detaylı bir tarama yapılması amaçlanmaktadır.

Araba klimalarından elde edilen sonuçların daha verimli sonuçlandırılabilmesi için araçların kullanıldığı yoldan, araç içi detaylarına kadar çokça verinin toplanarak değerlendirilmeye katılması daha uygun olacaktır. Özellikle kamyon yakıtı olarak kullanılan bazı mazotların PCB seviyesini yükselttiğine dair çalışmalar bu şekilde daha net bir şekilde ortaya konabilecektir

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ÖĞRENCİLERİN KİŞİSEL BİLGİ GÜVENLİĞİ DAVRANIŞININ ANALİZİ

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Özet: Bilgi güvenliği, günümüz insanın en büyük sorunları arasında yer almaktadır. Son 10 yılda internet teknolojilerinin hızlı bir şekilde gelişimiyle tüm bilgi sistemleri internet ortamında çalışır hale gelmiştir. Kurumsal ve kişisel bilgilerin internet ortamında yer alması kolaylıkların yanında tehditleri de beraberinde getirmektedir. Genellikle kurumsal bilgi sistemlerinin ve verilerin bulunduğu ortamlar çeşitli yöntemler ile güvenli hale getirilmektedir. Fakat çoğunlukla kişisel bilgilerin bulunduğu ortamlar korumasız kalmaktadır. Bu durum kişisel bilgi güvenliği farkındalığının önemini arttırmaktadır.

Bu çalışmada kişisel bilgi güvenliği kavramları örnekler ile incelenmiştir. Ayrıca öğrencilerin konu ile ilgili görüşleri alınarak konu detaylandırılmıştır. Sonuçlar bölümünde kişisel bilgi güvenliği için bazı önerilerde bulunulmuştur.

Anahtar Kelimeler: Bilgi Güvenliği, İnternet, Davranış Analizi

GİRİŞ

Bilgi ve iletişim teknolojileri 21.yy insanının hayatında vazgeçilmez bir yere sahiptir. Sektörde yaşanan hızlı gelişmeler klasik hizmet sunumunu tamamıyla değiştirmiştir. Bilgi teknolojilerinin sunduğu kolaylıklar geri dönülmez bir şekilde kişileri teknolojiye bağlamış ve çoğu zaman hayatlarını kolaylaştırmıştır. Teknoloji ile yaşamak ve gelişmeleri takip etmek artık günümüz insanının yaşam tarzı haline gelmiştir. Özellikle son 5 yılda mobil teknolojilerin gelişmesi ile neredeyse tüm sektörler bu ortamlara taşınmıştır. Yakın gelecekte nesnelerin interneti, bulut bilişim, büyük veri, yeni internet protokolü (ip V6) gibi teknolojilerin kullanımı yaygınlaşacaktır. Yaşadığımız yüzyılın başından itibaren e-devlet, e-ticaret, e-bankacılık, e-öğrenme e-eğlence gibi hizmetler geliştirilmiş ve bilgilerin kâğıtlar üzerinde değil sunucular üzerinde dijital olarak saklanması sağlanmıştır.

Türkiye İstatistik Kurumunun verilerine göre, Türkiye'de 16-74 yaş grubunun bilgisayar kullanım oranı %54,8, İnternet kullanım oranı %55,9'dur. Hanelerin 2015 yılı Nisan ayında %96,8'inde cep telefonu veya akıllı telefon bulunurken, sabit telefon bulunma oranı %29,6 oldu. Aynı dönemde hanelerin %25,2'sinde masaüstü bilgisayar, %43,2'sinde taşınabilir bilgisayar ve %20,9'unda İnternete bağlanabilen TV bulunmaktadır. İnternet kullanım amaçları dikkate alındığında, 2015 yılının ilk üç ayında internet kullanan bireylerin %80,9'u sosyal medya üzerinde profil oluşturma, mesaj gönderme veya fotoğraf vb. içerik paylaşırken, bunu %70,2 ile online haber, gazete ya da dergi okuma, %66,3 ile sağlıkla ilgili bilgi arama, %62,1 ile kendi oluşturduğu metin, görüntü, fotoğraf, video, müzik vb. içerikleri herhangi bir web sitesine paylaşmak üzere yükleme, %59,4 ile mal ve hizmetler hakkında bilgi arama takip etmektedir (Hanehalkı Bilişim Teknolojileri Kullanım Araştırması, 2015). Ocak 2016 tarihi itibarıyla yaklaşık 28 milyon kayıtlı e-Devlet Kapısı kullanıcısı, 252 farklı kurumdan 1522 adet hizmeti İnternet üzerinden alabilmektedir (turkiye.gov.tr, 2016).

Elbette bu kadar büyük bir siber ortamda güvenlik ciddi bir sıkıntı haline gelmektedir. Sistemlerin hizmet dışı kalması ve/veya kötüye kullanımları sonucunda büyük ölçekli ekonomik zararlar, kamu düzeninin bozulması, can kaybı ve ulusal güvenlik zafiyetlerinin oluşması gibi durumlar söz konusu olabilmektedir.

Bilginin korunmasını sadece kurumsal olarak düşünmek en büyük hatalardan birisidir. Siber ortamda sadece kurumlar veya devletler bilgilerini saklamazlar. Bunun yanında milyarlarca kişisel internet kullanıcısı önemli oranda bilgi alışverişi yapmakta ve hizmet almaktadır. Sadece sosyal medya düşünüldüğünde bile 2.3 milyar aktif kullanıcısı olduğu tahmin edilmektedir. Her gün 1 milyon aktif mobil sosyal medya kullanıcısı dünyadaki ekosisteme eklenmektedir. Bu noktada bilgi güvenliği veya siber güvenlik kavramları önem kazanmaktadır.

Bilgi güvenliği en temel manada bilginin korunduğu bilgi sistemlerinin ve sistemin içerdiği bilginin yetkisiz erişimine, kullanımına, ifşa edilmesine, değiştirilmesine, incelenmesine, hasar verilmesine veya yok edilmesine karşı korunması ve buna ilişkin tedbirlerin bütünü olarak tanımlanabilir (Güngör, 2015).

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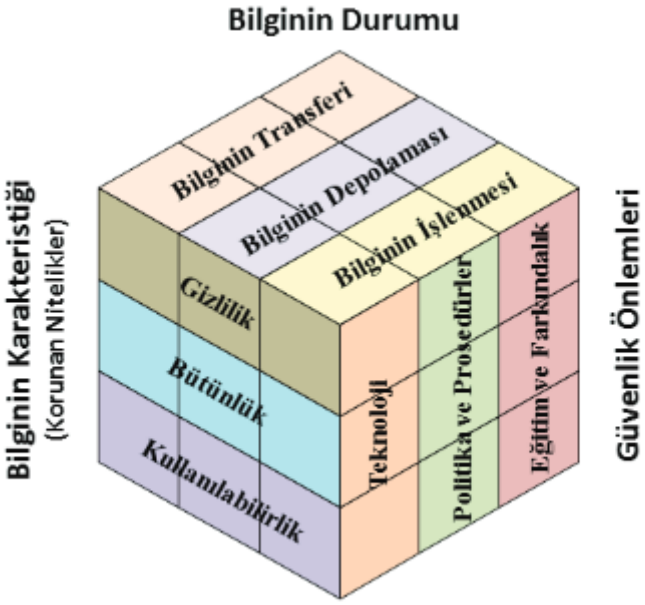
Bilgi güvenliğinin unsurlarının boyutlarını gösteren ve gruplandıran McCumber'in bilgi güvenliği modeli, 1991 yılından bu yana geçerliliğini korumuş ve daha sonra geliştirilen modellere de temel olmuştur. Buna göre bilgi güvenliği karakteristiği 3 ana temel üzerinde kurulur. Bunlar:

- Gizlilik: Bilginin yetkisiz kişilerin veya sistemlerin erişimine kapalı olması ya da bilginin yetkisiz kişilerce açığa çıkarılmasının engellenmesidir.
- Bütünlük: Bilginin yetkisiz kişilerce değiştirilmesi, silinmesi ya da herhangi bir şekilde tahrip edilmesi tehditlerine karşı içeriğinin korunmasıdır.
- Kullanılabilirlik: Bilginin ihtiyaç duyulduğu anda kullanıma hazır durumda olması anlamına gelmektedir.



Şekil 1 McCumber Bilgi Güvenliği Modeli *(McCumber, 1991)*

McCumber'in modeline göre güvenlik bilginin transferi, depolaması ve işlenmesi durumunda da sağlanmalıdır. Dolayısı ile sadece depolama esnasında alınan güvenlik önlemleri yeterli olamaz, tüm durumlar düşünülmelidir. Öte yandan McCumber geliştirdiği modelde güvenlik önemlerini de tanımlamıştır. Buna göre teknoloji, politikalar/prosedürler ve eğitim/farkındalık bilgi güvenliği için gerekli güvenlik önlemleridir.

SİBER ORTAM VE TEHDİTLER

Siber ortamda kişisel bilgi güvenliğini tehdit unsurları gün geçtikçe farklılaşmakta ve gelişmektedir. Bu sebeple bazı tehditleri ve ortamları tanımak önemlidir.

Sosyal Mühendislik

Sosyal Mühendislik, insanlar arası iletişimde ve insan davranışlarındaki açıkları anlayıp, kişilerin bilgilerini elde etmeyi veya kişilerin kimliklerine bürünmeyi sağlayan müdahalelere verilen isimdir. Başka bir deyişle kişilerin bilgilerine ulaşmak için kişilerin hassasiyetlerini kullanan bir yöntemdir. Sosyal mühendisliği kullanan saldırgan kimliği tespit edilmeyecek şekilde e-posta, sosyal medya, telefon gibi kanallardan hedefi ile iletişim kurar. Saldırgan sahte senaryolar uydurarak hedefinin bilgisine ulaşmak isteyebilir. Sıkça kullandıkları bir yöntem olarak, saldırgan güvenilir bir kaynak olduğu izlenimini vererek hedefin bilgilerini vermek zorunda olduğu hissini uyandırır. Bir başka yöntem olarak saldırgan yardım, eşantiyon ve ödül önererek bilgi talebinde bulunabilir. Saldırgan hedefi ile belirli süre iletişimde kalarak hedefin güvenini kazanarak açıklarını elde edebilir. Öte yandan saldırgan omuz sörfü (Shoulder Surfing) yöntemi ile hedefinin bilgilerini, izleme yöntemi ile elde edebilir. Örnek verilen sosyal mühendislik yöntemlerinde tek amaç hedefin bazı bilgilerini elde etmektir.

Virüsler

Bilgisayar virüsleri çalıştırıldığında bilgisayara zarar vermeyi veya bilgi çalmayı hedefleyen zararlı program parçalarıdır. Günümüzde virüsler çok hızlı bir şekilde her türlü dijital ortamdan rahatlıkla bulaşabilmektedir.

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Bilgisayar virüsleri, can sıkıcı mesajlar ile çalışmaları engelleyebilir, bilgilerin depolandığı disklerin bir bölümünü yada tamamını silebilir, dosyaları bozarak çalışmamasını sağlayabilir, kullanılan programların çalışmamasını sağlayabilir.

Solucanlar

Solucanlar virüsler gibi bilgisayarlara zarar vermeyi yada yavaşlatmayı hedefleyen yazılımlardır. Bu tip programlar bilgisayarda bir açık oluşturarak saldırganın uzaktan erişim ile denetimi ele almasını sağlayabilir, bilgisayar sisteminin internet, disk, bellek gibi kaynaklarını zorlayarak gereksiz şekilde harcama yapılmasına neden olabilir, bilgileri kopyalayarak saldırganlara iletebilir.

Trojan

Bilgisayarın kontrolünü saldırgana devretmek için yapılmış zararlı yazılımlardır. Herhangi bir ortamdan (İnternet, CD, DVD, taşınabilir bellek) yüklenen zararsız görünen yazılımların içerisinde gömülü olarak çalışan bu programlar bilgisayarın kontrolünü saldırganın alması için bir kapı açarlar. Bu şekilde bilgisayar içinde yapılan klavye tuşlamaları, ekran tıklamaları, web sitesi hareketleri gibi tüm aktivitelerin görünmesi saklanılarak, tüm bilgilerin saldırganın eline geçmesine olanak verilir.

Sanal Dolandırıcılık

Sanal dolandırıcılık, kredi kartı bilgileri, web sitelerinin şifreleri, kişisel bilgiler gibi tüm kurumsal veya kişisel verilerin elde edilmesi için hazırlanan bir dolandırıcılık türüdür. En sık rastlanılan sanal dolandırıcılık türü password (şifre) ve fishing (balık avlama) kelimelerinin birleşimi ile oluşturulan Phising yöntemidir. Bu yöntem ile saldırgan hedefe güvenli bir kaynaktan geliyormuş gibi bir mesaj iletin ve bilgilerini göndermesi veya bir bağlantıya tıklaması istenir.

BotNet, Zombi Bilgisayar

İnternet üzerinden yapılan saldırılara bilinçsizce dahil olan bilgisayarlara zombi bilgisayar denir. Yüklenen bir yazılım ile bilgisayar BotNet üyesi olur. Komut verildiğinde bilgisayar istemsizce hedefe saldırır. Kullanıcılar bilgisayarlarının BotNet üyesi olduğunu çoğu zaman anlayamazlar. Genellikle bir sunucuya yoğunluk yaratmak için yapılan saldırılar için kullanılır. BotNet'i kontrol eden yöneticinin komutu ile tüm bilgisayarlar tek bir hedefe saldırarak yoğunluk yaratır ve servis dışı bırakmaya çalışır. Aynı zamanda istenmeyen e-postalar göndermek için yine BotNet'ler kullanılmaktadır.

En riskli ortamlar

İnternet Bankacılığı

Günümüzde banka şubelerinden yapılan tüm işlemler internete erişebilen herhangi bir cihaz ile gerçekleştirilebilmektedir. Bilgilerin çalınması sonucunda kişilerin en fazla zarar gördükleri ortamdır. Bankalar günün getirdiği tehditlere karşı yeterli önlemleri almak durumundadır. Fakat yapılan araştırmalara göre başarılı saldırılar son kullanıcı düzeyindeki açıklardan kaynaklanmaktadır. Kullanıcıların yaptıkları ihmaller ve saldırganların uyguladıkları sosyal mühendislik yöntemleri sayesinde internet bankacılığı riskli bir ortamdır.

İnternetten Alışveriş

Tüketicilere sunulan önemli esneklikler dolayısı ile oldukça tercih edilen internetten alışveriş, internet bankacılığı gibi kullanıcıların kendi ihmalleri nedeniyle riskli bir ortamdır. Öte yandan alışveriş yapılan sitelerin altyapılarının güvenlik düzeyi doğrudan riski oluşturmaktadır.

E-Posta

Günümüzde neredeyse tüm yazışmalar e-posta aracılığı ile yapılmaktadır. Bu sebeple e-posta bilgilerini ele geçirmek saldırganların ilk hedefi olmaktadır. E-posta hesaplarının güveliğini arttırmak 21.yy insanının siber ortamdaki risklerini önemli derecede düşürmektedir. Kolay çözülebilir parolalar, istenmeyen e-postalar gibi tehditler riskleri arttırmaktadır.

İnternet Bağlantısı

İnternete erişmek için kullanılan kablosuz iletişim sunduğu eşsiz esneklikler ile vazgeçilmez olmuştur. Yeterli güvenlik ayarları yapılmayan internet bağlantısı, sinyale erişen herkese açık hale gelebilir. Bu durumda saldırgan rahatlıkla hedefin internet ağına dâhil olabilir. Bu durumda bağlantı hızı düşebilir, internet faturası artabilir ve daha kötüsü saldırganın yaptığı diğer saldırıların hukuki sonuçları internet ağı sahibine yıkılabilir. Yapılan araştırmalarda, saldırganlar planladıkları eylemleri başkalarının internet ağı üzerinden yapmaktadırlar. Bu ve benzeri nedenler ile internet bağlantı ortamları risk barındırmaktadır.

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Sosyal Medya

Sosyal medyanın gücü günümüzde tartışılamaz boyutlardadır. Neredeyse tüm kurumlar ve kişiler bilgilerini rahatlıkla sosyal medya üzerinden paylaşmaktadır. İnternet denildiğinde çoğu zaman sosyal medya siteleri akla gelmektedir. Sosyal medya ortamında 60 saniyede yüz binlerce paylaşım aynı anda yapılmaktadır. Çoğu insan özel bilgilerini sosyal medya siteleri üzerinde saklamakta ve/veya paylaşmaktadır. Son zamanlarda kullanım kolaylığı sağlamak için, internette tek kullanıcı hesabı mantığı ile tüm sitelerin kullanıcı hesapları en çok kullanılan sosyal medya hesapları ile eşleştirilmektedir. Bu sebeplerden dolayı sosyal medya ortamı kişisel bilgi güvenliği açısından ciddi risk oluşturmaktadır. Saldırganlar sadece zevk için bile hedeflerinin sosyal medya hesaplarını ele geçirmeye çalışmaktadır.

ÖĞRENCİ GÖRÜŞLERİ

Bu çalışmada 407 öğrenci ile görüşülerek bilgi güvenliği hakkındaki görüşleri alınmış ve derlenmiştir. Görüşmelerde Öğütçü'nün geliştirdiği ölçek kullanılmıştır (Öğütçü, 2010). %47'si kadın %53'ü ise erkek olan grubun %88'i 18-20 yaş aralığındadır. Öğrencilerin %91'i her zaman internet erişimi olduğunu beyan etmişler ve sadece %10'u son 3 yıldır yeni yeni interneti kullandığını diğerleri ise uzun zamandır internette zaman geçirdiklerini belirtmişlerdir. Grubun %96'sı daha öncesinde bilgi güvenliği ile ilgili bir eğitim almadığını veya tecrübe yaşamadığını ifade etmişlerdir. Öğrencilere bilgi güvenliği hakkında riskli davranışlar, korumacı davranışlar, suça maruz kalma ve tehlike algısı ile ilgili sorular yöneltilmiş ve cevapların dağılımı Tablo 1, 2, 3 ve 4'te verilmiştir.

Tablo 1: Riskli Davranış Ölçeği ile ilgili Soruların Frekans Dağılımları

Sorular	Her Zaman	Sık sık	Bazen	Nadiren	Hiçbir Zaman
Msn Messenger, GTalk, Skype ve benzeri sohbet programlarını kullanırım.	32%	20%	24%	20%	3%
Bir iletişim aracı olarak elektronik posta (e-mail) kullanırım.	24%	12%	22%	22%	19%
Kurumsal e-posta adresimi günlük işlerde de kullanırım.	33%	19%	19%	9%	20%
İnternette e-posta gruplarına üye olurum.	37%	15%	15%	19%	14%
Facebook, Twitter ve benzeri sosyal ağ sitelerini kullanırım.	20%	17%	11%	18%	34%
Sosyal ağlarda gönderilen uygulama davetlerini kabul ederim.	12%	13%	21%	19%	35%
İnternet bankacılığı kullanırım.	18%	15%	32%	17%	18%
İnternet üzerinden alışveriş yaparım.	17%	16%	24%	20%	23%
E-Vatandaşlık hizmetleri veren web sayfalarını kullanırım.	40%	22%	15%	11%	13%
İnternet üzerinden oyun oynarım	61%	16%	11%	3%	9%
İnternet üzerinden müzik, film, program ve dosya indiririm/kaydederim.	44%	24%	13%	13%	7%
İnternet üzerinden video/film izlerim.	26%	16%	28%	22%	8%
İnternet ortamında gerektiği durumlarda iletişim bilgilerimi paylaşırım.	29%	22%	28%	14%	6%
İnternet ortamında gerektiği durumlarda özlük bilgilerimi paylaşırım. (Ad, Soyad, Doğum Tarihi vb.)	29%	14%	30%	12%	14%
Bilgisayarımdaki dosyaları paylaşıma açarım.	19%	11%	16%	19%	35%
Halka açık internet erişimi olan yerlerde internet bankacılığı kullanırım.	9%	22%	12%	18%	38%
Parolalarımı başkalarıyla paylaşırım.	22%	13%	12%	17%	36%
Parolalarımı yazılı olarak kolay ulaşabileceğim yerlerde saklarım.	30%	19%	12%	16%	23%
Tanımadığım kişilerden gelen e postaları açarım, gelen ekleri indiririm.	12%	20%	24%	27%	17%

Tablo 2: Korumacı Davranış Ölçeği ile ilgili Soruların Frekans Dağılımları

Sorular	Her Zaman	Sık sık	Bazen	Nadiren	Hiçbir Zaman
Birden fazla elektronik posta adresi kullanırım.	21%	15%	19%	17%	28%
Bilgisayarımda orijinal (lisanslı) yazılım kullanmaya dikkat ederim.	35%	21%	18%	11%	14%
Virüs temizleme, casus yazılım önleme vb. programları kullanırım.	28%	20%	24%	8%	21%
Güvenlik duvarı, reklam önleyici vb. programlar kullanırım.	14%	19%	29%	15%	23%
İçerik filtreleme programları kullanırım	19%	18%	29%	8%	26%
E-posta filtreleme yazılımları kullanırım.	12%	14%	30%	23%	20%
İzleme yazılımları kullanarak internet üzerinde yapılan etkinlikler	28%	16%	27%	19%	10%

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hakkında bilgi sahibi olurum.					
Geçici internet dosyalarını ve web gezinti geçmişlerini incelerim.	20%	28%	22%	10%	20%
Herkesin kullanımına açık bir bilgisayardan ayrılmadan önce geçici internet dosyalarını ve Web gezinti geçmişlerini silerim	33%	18%	19%	19%	10%
Dosyalarımı şifrelerim.	23%	19%	25%	26%	8%
İnternet üzerindeki hesaplarımda kolay tahmin edilemeyecek şekilde karmaşık ve uzun şifreler kullanırım.	24%	10%	19%	14%	33%
Elektronik/ Mobil imza kullanırım.	29%	20%	22%	19%	10%
İnternet sitelerine girerken genellikle sık kullanılanlar listesini kullanırım.	31%	14%	18%	12%	25%
Bilgisayarım şifre ile açılır.	23%	16%	24%	23%	14%
Bilgisayarımda otomatik kullan özelliğini kapatırım.	14%	14%	23%	22%	27%
Girdiğim sitelerin SSL sertifikası olup olmadığına dikkat ederim.	15%	20%	24%	20%	22%
Parolalarımı sık sık değiştiririm.	14%	21%	25%	14%	26%
Kablosuz modem şifremi değiştiririm.	15%	18%	19%	23%	26%
Eğer aynı iletiyi birden fazla kişiye göndereceksem gizli (BCC) kısmını kullanırım	23%	26%	17%	12%	23%
Kullandığım programların güncellemelerini düzenli olarak yaparım.	12%	15%	24%	10%	40%

Tablo 3: Suça Maruz Kalma Ölçeği ile ilgili Soruların Frekans Dağılımları

Sorular	Her Zaman	Sık sık	Bazen	Nadiren	Hiçbir Zaman
Bilgisayar virüsleri nedeniyle sorun yaşadım.	12%	18%	10%	9%	52%
Online alışverişten dolayı maddi zarara uğradım.	16%	6%	12%	15%	51%
Kredi kartım kopyalandı.	8%	9%	13%	12%	58%
Kişisel bilgilerimi internette paylaştığım için sıkıntı yaşadım.	14%	7%	5%	12%	62%
Elektronik bankacılık kullandığım için maddi zarara uğradım.	14%	10%	7%	12%	57%
Kişisel bilgilerim iznim olmadan üçüncü şahıslarla paylaşıldı/ internette yayınlandı.	16%	12%	6%	10%	56%
İnternet üzerindeki hesaplarıma ait kullanıcı adım ve şifrem ele geçirildi.	7%	6%	12%	14%	60%
İnternette kimliği belirsiz kişiler tarafından şahsıma yönelik hakaret, tehdit, ahlaksız teklif aldım.	13%	8%	10%	5%	64%
Kumar içerikli siteler nedeniyle zarara uğradım.	6%	8%	17%	6%	63%
Sosyal ağ siteleri nedeniyle zarara uğradım.	17%	15%	4%	15%	49%
Arkadaşlık siteleri nedeniyle zarara uğradım.	15%	12%	9%	9%	55%
İnternette gezerken isteğim dışında şiddet ya da pornografik içerikli yayınlarla karşılaştım.	18%	11%	16%	12%	43%
Bilgisayarımdaki dosyalarım çalındı/silindi.	16%	11%	9%	16%	47%
Adıma sahte hesaplar açıldı.	18%	15%	11%	12%	44%
İnternet üzerinden yaptığım yazışmalar isteğim ve bilgim dışında başkaları tarafından izlendi, kaydedildi.	19%	14%	11%	9%	47%

Tablo 4: Tehlike Algısı Ölçeği ile ilgili Soruların Frekans Dağılımları

Sorular	Çok Tehlikeli	Tehlikeli	Az Tehlikeli	Tehlikesiz	Fikrim Yok
Virüs yazılımları	15%	22%	13%	27%	22%
Virüs koruma programları	14%	17%	13%	33%	24%
Casus programlar (Keylogger, Trojan vb.)	17%	13%	21%	34%	14%
Dosya paylaşım programları (Ares, Limewire vb.)	13%	18%	27%	24%	18%
ActiveX, Javascript vb. mobil kodlar.	9%	14%	29%	31%	17%
Web tarayıcıları (Internet Explorer, Mozilla Firefox, Google Chrome vb.)	10%	14%	26%	34%	16%
Sohbet programları (Messenger, ICQ vb..)	14%	10%	31%	31%	15%
İstenmeyen/ Spam / Junk e-postalar	11%	18%	33%	28%	10%
Online oyunlar	8%	13%	25%	42%	12%
USB/Harici bellekler	14%	23%	18%	35%	11%
MS Office uygulamaları (Word,Excel vb.)	13%	16%	22%	34%	14%
Klavye kullanımı	14%	20%	21%	32%	13%
Kopya/ Kırık/ Korsan program kullanımı	15%	22%	25%	24%	14%
Müzik/ Resim/ Film gibi materyallerin herhangi bir bedel ödemeden indirilmesi	11%	27%	26%	20%	17%

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Reklam içerikli e-postaların açılması	18%	15%	30%	21%	15%
Elektronik bankacılık kullanımı	17%	20%	29%	25%	9%
İnternet ortamında yabancılarla sohbet / bilgi paylaşımı	20%	12%	37%	23%	7%
İnternetten alışveriş yapılması	24%	18%	30%	21%	7%
Pornografik içerikli web sitelerine girilmesi	16%	17%	22%	37%	9%
Kumar, bahis sitelerine girilmesi	15%	24%	23%	31%	7%
Sosyal ağlara üye olunması (Facebook, Twitter vb.)	11%	14%	21%	46%	8%
Bluetooth kullanımı	12%	10%	32%	35%	11%
Kablosuz modem kullanımı	14%	11%	29%	34%	11%
İnternetten kontör yüklenmesi	12%	13%	30%	34%	11%
Kırık veya ücretsiz güvenlik programı kullanımı	16%	23%	25%	21%	15%
Bina girişlerinde güvenlik birimine nüfus cüzdanı veya sürücü belgesinin teslim edilmesi	21%	18%	28%	25%	7%
Kargo, GSM operatörü vs. gibi kuruluşlara nüfus cüzdanı bilgilerinin verilmesi	21%	27%	16%	17%	18%

SONUÇLAR

Siber ortam olumlu çok büyük imkanları beraberinde getirmekle beraber bir çok tehlikeyi de barındırmaktadır. İşletmeler ve devlet kurumları çoğu zaman asgari düzeyde gerekli önlemleri almaktadırlar. Fakat son kullanıcılar tehditler konusunda genellikle çözümsüz ve bilgisiz kalmaktadır. Çalışmada üniversite öğrencilerin bilgi güvenliği ile ilgili bilgi birikimi ve farkındalığı test edilmeye çalışılmıştır. Sonuçlardan da anlaşılacağı gibi öğrenciler siber ortamda tehlike barındırabilecek davranışlar sergilemektedir. Büyük çoğunluğu tehlikenin ne olduğunu ve tehdidin nereden geleceğinin farkında değillerdir.

Siber dünya durdurulamaz ve kontrol edilemez ölçüde büyümektedir. Elbette kişisel bilgi güvenliğini sağlamının teknolojik birçok yolu mevcuttur fakat eğitim ile farkındalık oluşturulmadan bilginin korunabilirliği neredeyse imkânsızdır. Bu sebeple özellikle lise ve üniversite çağındaki öğrencilere özel olarak bilgi güvenliği ile ilgili kurs ve dersler planlanmalıdır. Bunun yanında aşağıda verilen önlemler ile bilgi güvenliği temel düzeyde rahatlıkla sağlanabilir.

- İşletim sistemi, internet tarayıcısı ve çeşitli güvenlik yazılımları mutlaka kısa aralıklar ile güncellenmelidir.
- Yazılımların daima orijinal lisanslı olması gerekmektedir.
- Bilgisayar ve/veya akıllı cihazların teknik servis hizmetine verilirken bilgilerin ulaşılabilir olduğu göz önüne alınmalıdır.
- Veriler önem düzeyine göre birkaç yere yedeklenmelidir.
- Bankacılık bilgileri, kişisel önemli bilgi ve şifreler bilgisayar ortamında dosyalara kaydedilmemelidir. Eğer böyle bir durum zorunlu ise güvenli saklama yazılımları kullanılmalıdır.
- Arızalanmış her türlü akıllı cihaz, CD, DVD, bellek ürünleri atılacak ise mutlaka kullanılamayacak duruma getirildikten sonra atılmalıdır. Mümkünse imha edilmelidir.
- Hassas bilgilerin internet sohbet ortamlarında, e-posta, SMS gibi iletişim kanalları ile paylaşılmamalıdır.

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ÖĞRETMEN ADAYLARINDA BİYOLOJİK RİTİM VE UYKU KALİTESİNİN AKADEMİK BAŞARIYA ETKİSİ

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Özet: Biyolojik ritim; insanların, hayvanların, bitkilerin hatta mikroorganizmaların vücutlarının çalışmasını, bedensel aktivitelerini ve davranışlarını etkileyen döngüsel değişimlerin doğal ritmi olarak tanımlanmaktadır. Biyolojik ritim düzeninin bir kısmı doğa ve çevre olaylarından kaynaklansa da, birçoğu içsel periyodik değişimlerle ilgilidir. Kişilerin kendilerine özgü periyodik ritimlerinden biri de sirkadiyen ritimdir. İnsanlar önemli fonksiyonları gerçekleştirmek için günün doğru zamanını seçerken kendilerine özgü bu biyolojik ritmi kullanırlar. Öğrencilerin okul içindeki akademik faaliyetleri, sosyal ilişkileri, kısmi zamanlı işleri ve projeleri gibi faktörler biyolojik ritimlerini etkilemektedir. Öğrencilerin özellikle ara sınav ve final dönemlerinde biyolojik ritimleri değişebilmektedir. Çeşitli akademik çalışmalarda biyolojik ritmin fiziksel, mental ve sosyal sağlığı etkilediği belirlenmiştir. Bu çalışmanın amacı öğretmen adaylarının biyolojik ritimleri ve uyku kalitesi ile akademik başarı arasındaki ilişkiyi belirlemektir. Bu çalışma Eğitim Fakültesi Fen Bilgisi Öğretmenliği bölümünde öğrenim görmekte olan 99 öğrenci ile gerçekleştirilmiştir. Araştırma kapsamında öğrencilerin vize sınavları sonrasında biyolojik ritim ölçeği ve uyku kalitesi ölçeği uygulanmıştır. Aynı zamanda öğrencilerin iki hafta boyunca girdikleri sınavlarında elde ettikleri notlar değerlendirmeye alınmıştır. Biyolojik ritim ölçeğine göre öğrencilerin puan sabahçıl ve akşamcıl özellikleri arasında dağılım gösterdiği söylenebilir. Öğrencilerin yaklaşık yarısını sabahçıl olarak tanımlamasına karşın, sadece %36'sı kendini akşamcıl olarak tanımlamaktadır. Öğrencilerin uyku kalitesi indeksine göre kötü uyku kalitesine sahip oldukları söylenebilir. Öğrencilerin sadece %33'ü iyi uyku kalitesine sahiptir. Öğrencilerin vize notları puan ortalamaları ile uyku kaliteleri ve biyolojik ritimleri arasında anlamlı bir korelasyon bulunamamıştır.

Anahtar Kelimeler: Biyolojik ritim, sirkadiyen ritim, uyku kalitesi, akademik başarı

EFFECTS OF BIOLOGICAL RHYTHM AND SLEEP QUALITY ON PRE-SERVICE TEACHERS' ACADEMIC PERFORMANCE

Abstract: Biological rhythm is defined as the natural rhythm of circular changes of human, animals and even microorganisms which has an effect on body's working, physical activities and behaviors. Although some portion of the biological rhythm system depends on natural and environmental factors, much of it is related to internal periodical changes. One of the periodic rhythm of humans is Circadian rhythm. People use this specific rhythm when they choose the right time to perform important functions. Students' academic activities in school, social relationship, part time jobs and projects have an effect of their biological rhythm. Students' biological rhythms can change especially during midterm and final exams. In some papers it is argued that biological rhythm has an effect on physical, mental and social health. This research aim is to determine the relationship between pre-service teacher's biological rhythms, sleep quality and academic performance. This research was carried out with 99 students who study in Education Faculty Science Teacher Education program. After the exam period the students were asked to fill the biological rhythm scale and sleep quality index. Also the grades of students from midterm exams were recorded. According to the biological rhythm scale the points of the students were distributed among morning person and evening person type. Nearly half of the students identified themselves as morning person as well as only %36 of them as evening person. İt can be stated that students have poor sleep quality. Only %33 of the students have adequate sllep quality. A meaningful relationship between academic success and sleep quality and biological rhythm wasn't found.

Keywords: Biological rhythm, circadian rhythm, sleep quality, academic success

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Giriş

Evrende ve onun parçası olan dünyamızda bir düzen ve ritmin, üzerinde yaşayan canlılarda da biyolojik bir ritmin varlığı söz konusudur. İnsanlardaki zamana bağlı döngüsel değişiklikler yüzyıllardır gözlenmektedir (Waterhouse, 1999). İnsan organizması, fizyolojik olaylar, beslenme, metabolizma olayları ve yaşam alışkanlıklarına bağlı olarak gelişen günlük bir ritme sahiptir (Bayraktar & Kurtoğlu,2009).

Biyolojik ritim; insanların, hayvanların, bitkilerin hatta mikroorganizmaların vücutlarının çalışmasını, bedensel aktivitelerini ve davranışlarını etkileyen döngüsel değişimlerin doğal ritmidir (Marshall Cavendish Corporation, 2000). Biyolojik ritimler, düzenli çevresel değişmelerin vücut üzerindeki etkilerinin öngörülmesini sağlar. Dolayısı ile çevre tarafından oluşturulan bedensel değişikliklere olan yanıtın geribildirim mekanizmalarından farklıdır. Biyolojik ritimler birçok alanda, çevreye uyumu ve kontrolü sağlamaktadır (Çalıyurt, 2001). Biyolojik ritimlerin bir kısmı doğa ve çevre olaylarından kaynaklansa da birçoğu içsel periyodik değişimlerle ilgilidir (Kumar, 2002).

Kişilerin kendilerine özgü periyodik ritimlerinden biri de sirkadiyen ritimdir İnsanlar önemli fonksiyonları gerçekleştirmek için günün doğru zamanını seçerken kendilerine özgü bu biyolojik ritmi kullanırlar (Kumar, 2002). Sirkadiyen ritimler, yaklaşık bir gün süren ritimlerdir (Lat: circa=yaklaşık, dies=gün). İnsanın en belirgin sirkadiyen ritmi uyku ve uyanıklığın ritmik değişimidir. Erişkin bir insan günde ortalama 16 saat uyanıkken 8 saat uykudadır. Bunun dışında vücut metabolizma hızı da gün boyunca değişir. (Çalıyurt 1998).

Kleitman (1939), sirkadiyen tipi "sabahçıl tip", "akşamcıl tip" ve "ara tip" olmak üzere üç kategoride değerlendirilmiştir (aktaran; Pündük, Gür ve Ercan, 2005). Sirkadiyen tip sınıflamasına göre sabahçıl tipler akşam erken yatıp sabah erken kalkar, sabah saatlerinde kendilerini daha iyi hissederler. Sabahçıl tipler sabah saatlerinde akşam saatlerine göre daha iyi performans gösterirler. Akşamcıl tipler ise gece geç saatte yatar, sabah erken saatlerde uyanmakta zorluk çeker ve kendilerini günün öğleden sonraki saatlerinde daha iyi hissederler. Günün bu saatlerinde bedensel ve zihinsel etkinliklerinde daha iyi performans gösterirler (Tankova ve Buella, 1994).

Öğrencilerin okul içindeki akademik faaliyetleri, sosyal ilişkileri, kısmi zamanlı işleri ve projeleri gibi faktörler biyolojik ritimlerini etkilemektedir. Öğrencilerin özellikle ara sınav ve final dönemlerinde biyolojik ritimleri değişebilmektedir. Çeşitli akademik çalışmalarda biyolojik ritmin fiziksel, mental ve sosyal sağlığı etkilediği belirtilmiştir.

Meijer ve ark. (2000) öğrencilerin %43'ünün sabah kalkmada zorluk yaşadıklarını, %15'İnin uyku sorunları olduğunu ve %25'inin okulda dinlenmiş hissetmediklerini belirtmişlerdir. Uyku kalitesinin ve uyku düzeninin okuldaki faaliyetleri olumlu yönde etkilediğini aktarmışlardır.

Uykuyla ilgili alan yazında yer alan bulgular; uyku süresi yeterli olan öğrencilerin karmaşık matematik problemlerini yetersiz uyku uyuyan öğrencilerden iki kat daha iyi çözebildiklerini, uykuyla ilişkili solunum problemlerinin akademik başarı, dikkat, hafıza ve zeka üzerinde olumsuz etkisinin olduğunu ve davranış problemlerini artırdığını, sabah uyanmada zorluk yaşamayan öğrencilerin başarı motivasyonunun daha yüksek olduğunu, gece uyuma süresi ile akademik performans arasında pozitif bir ilişki olduğunu ve gece beş saatten daha az uyuyan öğrencilerin not ortalamasının daha düşük olduğunu göstermektedir (Koçoğlu ve ark., 2010).

Biyolojik, psikolojik, sosyal ve kültürel gereksinimleri olan insanın varlığını sürdürebilmesi için bu gereksinimlerinin karşılanması gerekir. Karşılanması gereken bu temel gereksinimlerden biri de uykudur (Özer, 2000; Öztürk, 2001). Uykunun insan ömrünün yaklaşık üçte birini oluşturduğu bilinmektedir (Özgen, 2001). Uyku, bireyi, yaşam kalitesini ve iyilik durumunu etkileyen, sağlığın önemli bir değişkeni olarak görülmektedir (Engin ve Özgür, 2004; Ertekin ve Doğan, 1999). Uyku kalitesi iyi olanlarla karşılaştırıldığında kötü uyku kalitesine sahip öğrencilerin fiziksel ve psikososyal sağlık problemlerini anlamlı şekilde daha fazla deneyimledikleri bildirmektedirler (Lund ve ark., 2010). Uyku bozuklukları beden ve ruh sağlığını, sosyal yaşamı olumsuz etkileyen, akademik başarıda ve iş verimliliğinde düşüşe, kazalarda artışa neden olabilen, sıklığı açısından dikkat çekici bir halk sağlığı sorunudur. Uyku kalitesinin tanımlanması ve nesnel olarak ölçülmesinin güç olduğu bildirilmektedir. Uyku kalitesi, uyku latensi, uyku süresi ve bir gecedeki uyanma sayısı gibi uykunun niceliksel yönlerini içerdiği gibi, uykunun derinliği ve dinlendiriciliği gibi öznel yönlerini de içerir (Lafçı, 2009). Üniversite öğrencilerinde uyku kalitesi fizyolojik ve psikolojik sağlığın korunması, verimliliğin artması açısından önemlidir (Aysan ve ark., 2014).

Uyku birçok fizyolojik süreci etkiler. Aynı zamanda bedenimizdeki fizyolojik değişikliklerin de uykuyu etkilediği görülür. Sirkadiyen değişiklikler, tıbbi, nöropsikiyatrik bozukluklar, çevresel koşullar ve ilaçlar gibi birçok etmen uykuyu etkilemekte ve uyku ile ilgili yakınmalara neden olmaktadır. Bir belirti olarak hemen hemen her hastalıkta karşılaşılan uyku sorunları, hekimlerin yıllardır üzerinde durduğu alanlardan birisidir. Ortaya çıkan uyku yakınmalarının; bireylerin günlük mesleki ve sosyal performanslarında, bilişsel işlevlerinde, yaşam kalitelerinde düşme ve olumsuz ekonomik sonuçlara neden olması, bu yakınmaların ciddi olarak ele alınmasını gerektirmektedir (Işık ve ark., 2008).

Uyku genç bireylerin sağlığında önemli yer tutar. Yetersiz uyku sağlık için tehdit oluşturmasının yanında bilişsel, psikomotor ve duygusal fonksiyonlarda azalmaya neden olur (Abdulkadiroğlu, Bayramoğlu ve İlhan, 1997; Orzech ve ark., 2011). Bu nedenle, yeterince uyku uyuyamayan öğrencilerin fiziksel, bilişsel ve duygusal olarak

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olumsuz etkilenmeleri söz konusudur. Ayrıca, öğrencilerde uykusuzluğun akademik başarıyı olumsuz etkilediği de bildirilmektedir (Curcio, Ferrara ve Gennaro, 2004). Bunun yanında uyku kalitesi kötü olan öğrencilerin dinlenmiş olarak uyanmadıkları ve derslerde uyukladıkları belirlenmiştir (Aysan ve ark.,2014).
Koçoğlu ve ark. (2010) ise ilköğretim 2.sınıf öğrencileri ile yaptıkları araştırma sonunda öğrencilerin uyku alışkanlıklarının ve uyunan çevrenin olumsuz özelliklere sahip olduğunu, öğrencilerin uyku sorunları yaşadıklarını ve bu durumların okul fonksiyonları üzerinde olumsuz etkisi olduğunu belirtmişlerdir.
Üniversite öğrencilerinde uyku sorunlarının sık görüldüğü ve uyku kalitelerinin kötü olduğu bilinmektedir. Öğrenciler üzerine yapılan çalışmalarda; uyumak için yatağa gitme zamanlarının düzensiz olduğu, yetersiz uyudukları, uyku kalitelerinin kötü olduğu, uykularını düzenlemek için sıklıkla alkol ve hatta reçetesiz ilaç kullandıkları, uyanık kalmak için de uyarıcılar kullandıkları ve hatta araç kullanırken uykuya daldıkları ya da uyku sorunları nedeniyle araç kazaları yaptıkları bildirilmektedir (Kang ve Chen, 2009; Taylor ve Bramoweth, 2010; Lund ve ark., 2010).
Yine öğrencilerin uykusuzluk sonucunda konsantre olmada zorlanma, yorgunluk, sinirlilik, anksiyete ve depresyon gibi sorunlar yaşadıkları bildirilmektedir (Fernández-Mendoza ve ark., 2009).
Ülkemizde ise üniversite öğrencilerinde uyku konusundaki çalışmalar sınırlıdır. Aysan ve ark.(2014), çalışmasında hemşirelik, tıp ve eczacılık fakültelerinde öğrenim görmekte olan öğrencilerin uyku kalitesinin kötü olduğu saptanmıştır.
Saygılı ve ark. (2011) tarafından yapılan çalışmada da üniversite öğrencilerinin uyku kalitesinin kötü olduğu bildirilmiştir. Mayda ve arkadaşları (2012) tıp fakültesi öğrencilerinde uyku kalitesini inceledikleri çalışmaları sonucunda, öğrencilerin yarısından fazlasının uyku kalitesinin kötü olduğu saptanmıştır.
Sarı ve ark. (2015) gerçekleştirdikleri araştırmada bir üniversite yurdunda kalan öğrencilerin %41,1'inin uyku kalitesinin düşük olduğu belirlenmiştir. Özellikle ilaç kullanan öğrencilerde kötü uyku kalitesine daha sık rastlanmıştır. Erkek öğrencilerde kötü uyku kalitesi sıklığına daha fazla rastlanmıştır. Aynı zamanda çalışmaya katılan öğrencilerin yaklaşık üçte birinin gündüz uykululuk sorunu yaşadıkları belirlenmiştir. Uyku sorunu yaşayan katılımcıların dörtte üçünün uyku kalitesinin kötü olduğu görülürken, uyku sorunu yaşamanın uyku kalitesinin kötü olması sıklığını 12,74 kat arttırdığı görülmüştür.

Amaç

Öğrencilerin okul içindeki akademik faaliyetleri, sosyal ilişkileri, kısmi zamanlı işleri ve projeleri gibi faktörler biyolojik ritimlerini etkilemektedir. Öğrencilerin özellikle ara sınav ve final dönemlerinde biyolojik ritimleri değişebilmektedir. Çeşitli akademik çalışmalarda biyolojik ritmin fiziksel, mental ve sosyal sağlığı etkilediği belirtilmiştir. Biyolojik, psikolojik, sosyal ve kültürel gereksinimleri olan insanın varlığını sürdürebilmesi için bu gereksinimlerinin karşılanması gerekir. Karşılanması gereken bu temel gereksinimlerden biri de uykudur. Uykunun insan ömrünün yaklaşık üçte birini oluşturduğu bilinmektedir. Uyku, bireyi, yaşam kalitesini ve iyilik durumunu etkileyen, sağlığın önemli bir değişkeni olarak görülmektedir. Uyku kalitesi bireyin uyandıktan sonra kendini zinde, formda ve yeni bir güne hazır hissetmesidir. Uyku kalitesinin tanımlanması ve nesnel olarak ölçülmesinin güç olduğu bildirilmektedir. Uyku kalitesi, uyku latensi, uyku süresi ve bir gecedeki uyanma sayısı gibi uykunun niceliksel yönlerini içerdiği gibi, uykunun derinliği ve dinlendiriciliği gibi öznel yönlerini de içerir. Uyku kalitesinin bozulması bireylerin duygu, düşünce ve motivasyonunun bozulmasına neden olabilir. Uyku kalitesi iyi olanlarla karşılaştırıldığında kötü uyku kalitesine sahip öğrencilerin fiziksel ve psikososyal sağlık problemlerini anlamlı şekilde daha fazla deneyimledikleri bildirmektedirler. Uyku bozuklukları beden ve ruh sağlığını, sosyal yaşamı olumsuz etkileyen, akademik başarıda ve iş verimliliğinde düşüşe, kazalarda artışa neden olabilen, sıklığı açısından dikkat çekici bir halk sağlığı sorunudur. Üniversite öğrencilerinde uyku kalitesi fizyolojik ve psikolojik sağlığın korunması, verimliliğin artması açısından önemlidir. Uyku kalitesi ve gündüz uykululuğun akademik performansta düşmeye neden olduğu bilinmektedir. Aynı zamanda alan yazında sirkadiyen ritimdeki bozulmaların ekstra strese neden olduğu belirtilmiştir.
Bu çalışmanın amacı öğretmen adaylarının biyolojik ritimleri, uyku kalitesi ve uyku düzenleri ile akademik başarı arasındaki ilişkiyi belirlemektir. Bu çalışma eğitim fakültesi fen bilgisi öğretmenliği bölümünde öğrenim görmekte olan adaylarla gerçekleştirilmiştir. Öğretmen adaylarının olası uyku bozuklarının, düşük uyku kalitesinin, biyolojik ritimlerinin ve bu faktörle akademik başarılarının ilişkisi olup olmadığının belirlenmesi, bu yönde düzeltici çalışmalara ışık tutacaktır. Özellikle kötü uyku kalitesi olan bireylerde uyku hijyeni eğitimleri düzenlenerek, uyku kalitelerinin artması sağlanabilmektedir.

Materyal ve Method

Bu araştırmada nicel araştırma modellerinden genel tarama modeli uygulanacaktır. Tarama modeli, Karasar (2008) tarafından "geçmişte ya da halen var olan bir durumu var olduğu şekliyle betimlemeyi amaçlayan araştırma yaklaşımı" olarak tanımlanmaktadır. Tarama modelinde; araştırmaya konu olan olay, birey ya da nesne, kendi koşulları içinde ve olduğu gibi tanımlanmaya çalışılmaktadır. Bu amaçla, önce her iki durumun belli değişkenler açısından ayrıntılı betimlemeleri yapılmakta, sonrasında ise ortak ölçütlere göre yapılan bu betimlemeler karşılaştırılmaktadır (Karasar, 2008).

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Araştırmada veri toplama amacıyla Öğülmüş ve ark. (2008) tarafından geliştirilen "Günlük Biyolojik Ritim Ölçeği" (GBRÖ) ve Buysse ve ark. (1988) tarafından geliştirilen "Pittsburgh Uyku Kalite İndeksi" (PUKİ) kullanılmıştır.

GBRÖ iki bölümden oluşan bir ölçme aracıdır. Ölçme aracının birinci bölümünde yaş, cinsiyet, bölüm/ program adı ve sınıf gibi kişisel bilgiler yer alırken ikinci bölümde likert tipi hazırlanmış 20 adet madde yer almaktadır. 21. Maddede ise "sabahçıl", "akşamcıl" tanımı yapılmış ve kendilerini hangi tipe yakın gördüklerini soran ölçüt maddedir. Bu maddeden alınan puanlar analizin dışında tutulmuş, ölçüt geçerliği için kullanılmıştır. Sabahçıl ve akşamcıl olma özelliklerinin birbirine zıt özellikler olması sebebi ile ölçek maddeleri çift kutuplu olarak oluşturulmuştur. Maddeler likert tipi hazırlanmış ve bir maddeden alınabilecek puan 1 ile 4 arasında değişmektedir. Maddelerden yüksek puan almak akşamcılık özelliğini temsil etmektedir. Bu doğrultuda ölçekteki 4, 5, 6 ve 20. maddeler tersten puanlanmaktadır (Öğülmüş ve ark., 2008).

PUKİ bireyde uyku kalitesini, uyku miktarını ve uykudaki bozulmaları değerlendirebilmek amacıyla Buysse ve ark. (1988) tarafından geliştirilmiştir. Ölçek; son bir aydaki uyku kalitesini değerlendiren, 19'unu kişinin kendisinin cevapladığı, beşini ise oda arkadaşının cevapladığı 24 sorudan oluşmaktadır. Kişinin kendisinin cevapladığı 19 soru; uyku kalitesi, uyku süresi ve uykuya dalma süresi, uyku ile ilişkili sorunları yedi alt başlıkta değerlendirmektedir. Her bir madde 0-3 puan arası değer almaktadır. Yedi alt başlıktan elde edilen 0-21 arası puan, toplam PİKU skorunu oluşturmaktadır. Beş ve altında elde edilen puan, uyku kalitesinin 'iyi' olduğunu belirtmektedir. Ölçeğin Türkçe geçerlik-güvenirlik çalışması Ağargün ve ark. (1996) tarafından yapılmış ve Cronbach alfa değeri 0,80 olarak hesaplanmıştır. Toplanan veriler bilgisayar ortamına aktarılarak güvenirlik analizleri, t testi, tek yönlü varyans analizi gibi istatistiksel teknikler kullanılarak analiz edilmiştir.

Bulgular ve tartışma

Çalışmaya toplam 113 öğrenci katılmış ama doldurulan ölçekler incelendikten sonra 99 adet değerlendirilebilecek ölçek olduğu görülmüştür.

Tablo 1: Araştırmaya katılan öğrencilere ilişkin demografik veriler.

Değişkenler		n	%
Cinsiyet	Kadın	80	80,8
	Erkek	19	19,2
Sınıf	2	61	61,6
	3	38	38,4
Toplam		99	100

Fen bilgisi bölümünde okuyan öğrencilerin büyük çoğunluğunun cinsiyetinin kadın olması sebebiyle çalışmaya katılan öğrencilerin büyük çoğunluğu (%80,8) da kadınlardan oluşmaktadır. Ders yoğunluğunun az olması sebebiyle 4. sınıf öğrencileri çalışmaya dahil edilmemiştir.

Tablo 2: Öğrencilerin GPRÖ puanları.

	Minimum	**Maximum**	**Ortalama**	**Standart Sapma**
GPRÖ	1,85	3,35	2,4692	,0296

Bu ölçekten alınan 1 puan sabahçıl özelliği, 4 puan akşamcıl özelliği temsil etmektedir. Öğrencilerin GPRÖ puanlarının ortalaması (2,46) araştırma grubunda sabahçıl ve akşamcıl özelliklere tam bir yığılma olmadığını göstermektedir. GBRÖ'den alınan puan cinsiyet ve sınıf değişkenlerine göre anlamlı bir farklılık göstermemektedir.

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Tablo 3: Öğrencilerin GPRÖ puanları.

	n	%
Tam bir "sabahçıl" sayılırım	12	12,1
"Sabahçıl" tipe daha yakınım	39	39,4
"Akşamcıl" tipe daha yakınım	29	29,3
Tam bir "akşamcıl" sayılırım	6	6,1
Diğer	13	13,1

Öğrencilerin %51,5'i kendilerini sabahçıl tipe yakın olarak tanımlamaktadır. Araştırma grubundaki tüm öğrenciler normal öğretim öğrencisi olduğu halde %35,5'ü ise akşamcıl tipe yakın olarak tanımlamaktadır.

Tablo 4: Öğrencilerin PUKİ puanları.

	Ortalama	Standart Sapma
Öznel uyku kalitesi	1,52	0,719
Uyku latensi	1,21	0,84
Uyku süresi	0,75	0,93
Alışılmış uyku etkinliği	0,09	0,38
Uyku Bozukluğu	1,54	0,62
Uyku ilacı kullanımı	0,12	0,47
Gündüz işlev bozukluğu	1,46	0,90
Toplam puan	6,70	2,56

PUKİ'de beş ve altında elde edilen puan, uyku kalitesinin 'iyi' olduğunu belirtmektedir (max. 21). Araştırmaya katılan öğrencilerin PUKİ puan ortalaması 6,70 olarak tespit edilmiştir. Üstelik öğrencilerin sadece %33'ü 5 ve altında puan almıştır. Dolayısıyla araştırmaya katılan öğrencilerin uyku kalitesi sorunları yaşadığı söylenebilir. PUKİ'den alınan puan cinsiyet ve sınıf değişkenlerine göre anlamlı bir farklılık göstermemektedir.

Tablo 5: Sınıflara göre vize puan ortalamaları

Sınav Puan Ortalamaları	Ort.	Std.sp.
2.Sınıf	67,48	9,22
3.sınıf	70,99	5,39

2. ve 3. sınıf öğrencilerinin aldıkları dersler farklı olduğu için ortalamalar genel olarak hesaplanmamış, sınıflar için ayrı ayrı hesaplanmıştır. Sınıflar arasında yaklaşık 3,5 puanlık bir fark bulunmaktadır.

Tablo 6: Akademik başarı ve GBRÖ-PUKİ İlişkisi

	GBRÖ	PUKİ
2.sınıfların not ortalaması	0,129 (sig 0,321)	0,109(sig 0,402)
3.sınıfların not ortalaması	-0,112(sig 0.502)	-0,054 (sig 0,749)

Sınıfların ortalamaları ve ölçeklerden elde edilen puanlar arasında ilişki olup olmadığının belirlenmesi amacıyla gerçekleştirilen korelasyon analizinde puanlar arasında anlamlı bir ilişki belirlenememiştir.

Sonuç

Öğrencilerin yarısı kendini sabahçıl tip olarak tanımlamaktadır. Kendini akşamcıl olarak tanımlayanların oranı %35' dir. Öğrencilerin GBRÖ puan ortalamaları 2,46'dır. Öğrencilerin %35lik bir kısmı akşamcıl ve bu duruma yakın olduklarını belirttikleri için bu durum özellikle sınav ve ders programlarında dikkate alınabilir.

Öğrencilerin PUKİ puan ortalaması 6,70'dir. Öğrencilerin büyük çoğunluğunun uyku kalitesinin düşük olduğu söylenebilir.

Öğrencilerin sabahçıl-akşamcıl durumlarının akademik başarıyı etkilemediği söylenebilir. Öğrencilerin uyku kalitelerindeki bozukluğun da akademik başarıyı etkilemediği söylenebilir. Literatürde özellikle uyku kalitesinin

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akademik performansı etkilediği yönünde çalışmalar bulunmasına rağmen, bu çalışmada GBRÖ ve PUKİ puanları ile öğrencilerin vize ortalamaları arasında anlamlı bir ilişki bulunamamıştır. Öğrencilerin %66'lık kısmının uyku kalitesi açısından sorunlar yaşadığı belirlenmiştir. Bu oranın düşürülmesi için uyku hijyeni eğitimleri düzenlenerek, öğrencilerin bu konudaki farkındalıkları arttırılabilir.

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ÖĞRETMEN ADAYLARININ GÖZÜYLE ÇOCUK HAKLARI

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Geleceğin öğretmenleri olacak sınıf öğretmeni adaylarının çocuk haklarına ilişkin farkındalıklarının, yeterlilik düzeylerinin, çocuk haklarını çocuklara kazandırmak için sınıf içi ve dışı gerçekleştirebilecekleri etkinliklerin ve kullanabilecekleri araç gereçlerin neler olabileceğini keşfetmek amacıyla gerçekleştirilmiş bu araştırma tarama modelinde betimsel bir araştırmadır. Araştırmanın çalışma grubunu, bir devlet üniversitesinde eğitim fakültesi sınıf öğretmenliği anabilim dalı üçüncü ve dördüncü sınıfında öğrenim görmekte olan 180 öğretmen adayı oluşturmuştur. Araştırmada veri toplama aracı olarak, araştırmacı tarafından geliştirilen açık uçlu anket formu kullanılmıştır. Araştırma verilerinin çözümlenmesinde nitel veri çözümleme yaklaşımlarından betimsel analiz tekniği kullanılmıştır. Araştırma sonucunda, sınıf öğretmeni adaylarının, çocuk hakları konusunda orta düzeyde bilgiye sahip olduğu belirlenmiştir. Öğretmen adayları toplumda ihlal edilen çocuk haklarını eğitim hakkı, çocuk istismarı, çocukların çalıştırılması, cinsel istismar, yaşama hakkı, oyun oynama haklarının engellenmesi, sağlık hakkı şeklinde belirtmişlerdir. Bununla birlikte öğretmen adayları ihlal edilen çocuk haklarına yönelik toplumda farkındalık yaratmak için halkın bilgilendirilmesi, seminer, afiş, radyo/TV, kamu spotu, konferans, broşür şeklinde etkinlikler düzenlenmesi gerektiğini vurgulamışlardır. Ayrıca, sınıf öğretmeni adayları; çocuk hakları konusunda bilgili olmanın ve farkındalık kazandırmanın sağlıklı bir toplumun oluşması ve gelişmesi için önemli olduğunu ve öncelikli olarak öğretmenlerin bu hakları geliştirici etkinlikler düzenlemeleri gerektiğini düşünmektedirler.

Keywords: Çocuk hakları, sınıf öğretmeni adayı, nitel araştırma

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ÖĞÜTÜLMÜŞ ATIK PETLER İLE ISLAH EDİLEN ZEMİNLERDE SERBEST ŞİŞME POTANSİYELİNİN DEĞİŞİMİ

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Özet: Kumlu ve siltli zeminler, boşluklarındaki hava ile suyun yer değiştirmesi sonucunda, hacim değiştirmeksizin su alabilirler. Killi zeminlerde ise, su muhtevasının artması sonucunda, kil taneleri birbirlerinden uzaklaşarak hacmi artıracak bir itki kuvvetini oluşturmakta ve hacimde şişme şeklinde artış meydana gelmektedir. Bu çalışmada ince öğütülmüş pet atıkları hacimce %15, %30, %45 ve %60 oranlarında killi bir zemin ile karıştırılarak zamana bağlı serbest şişme potansiyeli incelenmiştir. Çalışmalar sonucunda Pet oranının artmasıyla hem şişme miktarında azalma görülmüş hem de muhtemel şişmeye daha kısa zamanda ulaşıldığı görülmüştür.

Anahtar Kelimeler: Konsolidasyon, şişme basıncı, killi zemin, atık pet

Giriş

Zemin terimi, çok yumuşak, organik çökellerden killere ve kumlardan yumuşak kayalara kadar geniş bir aralığı kapsayan ve bu nedenle çok farklı mühendislik davranışları gösterebilen malzemeleri ifade etmektedir. Şişen zemin terimi ise, değişen su muhtevası koşulları altında, hacim değiştirme (şişme – büzülme) potansiyeline sahip olan zeminler için kullanılmaktadır. Kuru bir zemin, boşluklarındaki hava ile suyun yer değiştirmesi sonucunda, hacim değiştirmeksizin su alabilir. Bu durum genellikle kumlu ve siltli zeminlerde meydana gelmektedir. Şişme ise, su muhtevasının artması sonucunda, kil tanelerini birbirlerinden uzaklaştırarak hacmi artıracak bir itki kuvvetini gerektirmektedir (Yong ve Warkentin, 1975). Şişme, sadece su varlığı nedeniyle hacimdeki artış eğilimini değil, suyun kaybolması sonrasında hacimdeki azalmayı veya büzülmeyi de vurgulamaktadır.

Kurak ve yarı kurak bölgelerde, çoğu zeminin doğal su muhtevası, şişme meydana getirebilecek su muhtevası aralığının içindedir ve eğer bu bölgelerde şişen zeminler de mevcutsa, nem değişiklikleri hacim değişikliklerini beraberinde getirir. (Dif ve Bluemel, 1991; Hardcastle, 2003).Yağış ve nem açısından büyük mevsimsel değişikliklere maruz bu bölgelerde, şişen zeminler üzerine oturan çeşitli yapılarda; önemli hasarlar meydana gelebilir.

Şişen zemin problemleri ve bu zeminlerin yol açtığı hasarlarla ilgili olarak farklı ülkelerde bir çok çalışma yayınlanmıştır (Jones ve Holtz, 1973; Ruwaih, 1987; Chen, 1988; Nelson ve Miller, 1992). Bu çalışmalarda ifade edilen ortak görüş, bu zemin problemi nedeniyle tüm dünyada yılda milyarlarca dolarlık hasarın meydana geldiğidir. Şişme problemi nedeniyle meydana gelen hasarın; deprem, tayfun ve taşkınları içine alan doğal afetlerden daha büyük boyutta olduğu belirtilmektedir.

Şişme; litolojiye, kil kısmın yüzdesine, kil kısmın mineralojik bileşimine ve bu minerallerin kil zemin içerisindeki dizilim veya yönelimine bağlı olarak değişebilir (Thomas, 1998). Bir zeminin şişme potansiyelinin doğru şekilde tahmin edilmesi; şişme nedeniyle meydana gelebilecek hasarların engellenebilmesi için gerekli tasarım kriterlerinin veya zemin iyileştirme yönteminin seçilmesinde en önemli aşamadır (Popescu, 1979; Chen, 1988).

Plastik ve türevleri kolay üretimi, elde edilebilirliği, ekonomik oluşu, zamana ve yıpranmaya karşı dayanıklılığı nedeniyle günümüzde birçok alanda kullanımı artarak devam etmektedir. Kullanım işlevi sona erdikten sonra atık plastik ürün sınıfına giren bu ürünler ısı, nem ve diğer atmosferik etkilere dayanıklılığından dolayı yüzyıllarca doğada bozunmadan kalabilmektedirler. Plastik atıklar içinde en çok yer tutanlar Polietilen (PE), Polipropilen (PP), Polietilen Tereftalat (PET), Polivinil Klorür (PVC) ve Polistrendir (PS) (Gavela vd., 2004).

PET yoğunluğu 1.33-1.38 gr/cm3, maksimum kullanılabilir sıcaklığı 60°C ve orta sertlikte en çok kullanılan plastiklerden biri olup, termoplastik polyester reçinesi özellikteki bir ambalaj malzemesidir. PET Polyester; alkol, etilen glikol (EG), asit ve teraftalik asit (TPA)'ten oluşmuştur ve kimyasal ismi Polietilen Tereftalat (PET)'tır (Plastics Europe, 2008).

Dünyadaki yıllık plastik üretiminin % 8 ini PET oluşturur ve bu da yaklaşık 15 milyon tondur (Shen vd., 2010). Yıllık PET üretiminin 3,5 milyon tonu özellikle ambalaj sanayinde şişe ve kavanoz olarak kullanılmaktadır (Reis

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ve Carneiro, 2012). Smithers Pira' nın makalesinde küresel PET tüketiminin 2017 yılında yaklaşık 19,1 milyon ton olacağı öngörülmektedir (Brooks, 2012).
Son zamanlarda palastik atıklarla zeminlerin iyileştirilmesi ve güçlendirilmesi konularında birçok çalışma yapılmıştır (Kalkan, 2013; Tang vd., 2010, 2007; Akbulut vd., 2007; Cetin vd., 2006; Park and Tan, 2005; Pierce and Blackwell, 2003; Prabakar and Sridhar, 2002; Kaniraj and Havanagi, 2001; Santoni vd., 2001; Nataraj and McManis, 1997; Ranjan vd., 1996; Charan, 1995; Maher and Gray, 1990; Gray and Ohashi, 1983). Bu çalışmada ince öğütülmüş pet atıkları hacimce %15, %30, %45 ve %60 oranlarında killi bir zemin ile karıştırılarak zamana bağlı serbest şişme potansiyeli incelenmiştir.

Malzeme ve Yöntem

Deney çalışmalarında Niğde ilinin kuzeyinde Fesleğen yöresinde Üst Miyosen yaşlı Melendizdağı Tüflerinin alterasyonu sonucu oluşan MH tipi yüksek plastisiteli killi zemin kullanılmıştır (Şekil 1).



Şekil 1.Çalışmada kullanılan killi zemin.

Killi zemine karıştırılacak PET ise piyasada bolca bulunan memba suyu atık şişelerinin öğütülmesinden elde edilmiştir (Şekil 2).



Şekil 2.Çalışmada kullanılan öğütülmüş PET malzeme

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Killi zemine öğütülmüş PET % 15, %30, %45 ve %60 oranlarında karıştırılarak PET içeriğinin şişme potansiyeline etkisinin araştırılması için, optimum su içeriğinde kompakte edilmiş ve sıkıştırılmış bu karışımdan ödometre testleri için numuneler alınmıştır (Şekil 3).



Şekil 3.Çalışmada kullanılan killi Zemin ve öğütülmüş PET'in karıştırma aşamaları.(a) seçilen orandaki öğütülmüş PET ile killi zeminin karıştırılması, (b) karışımın optimum su içeriğinde kompakte edilmesi, (c) kompakte edilen karışımdan ödemetre ringi ile numune alınması, (d) ödometre cihazıyla karışımın serbest şişme potansiyelinin ölçülmesi

Araştırma Bulguları

Killi Zemin ve PET deney malzemesi (ASTM D 422-63), tane boyu dağılım yöntemine göre, kıvam limitleri (ASTM D 427-98) göre, zemin sınıflandırması ise Birleştirilmiş Zemin Sınıflandırması'na göre yapılmıştır (Şekil 4, Tablo 1).

Tablo 1. Killi zeminin kıvam limitleri ve Zemin sınıfı

Kil+Silt %	LL %	PL %	PI %	G_s	Zemin Sınıfı
62	53	30	23	2.69	MH

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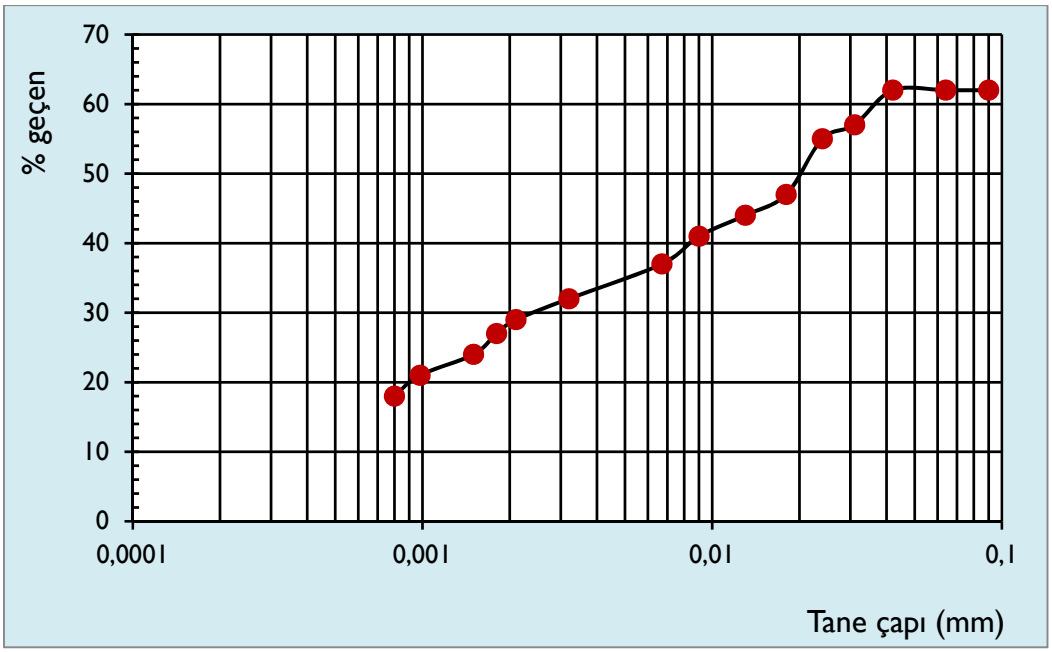
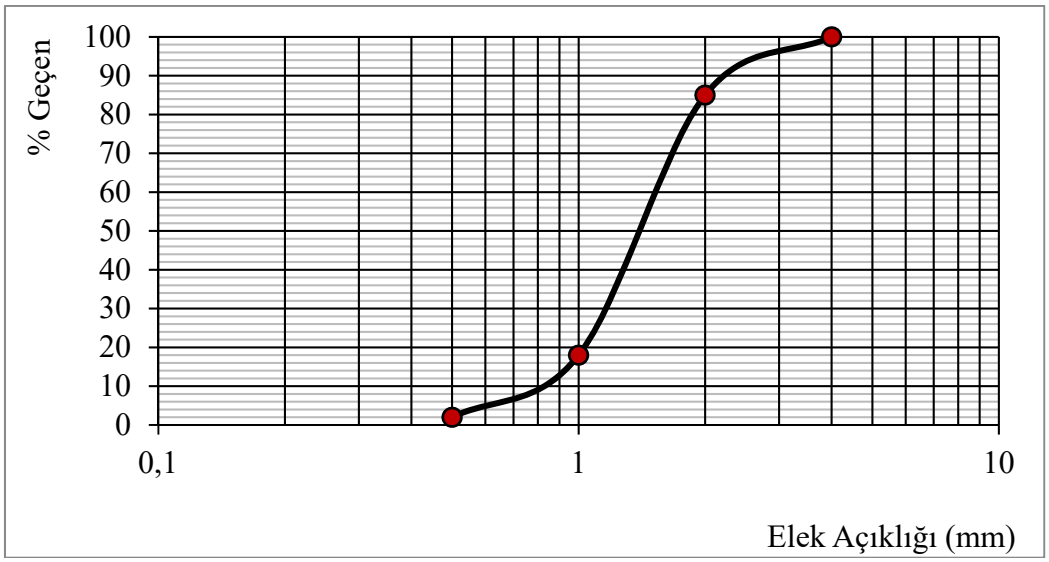


Şekil 4.Çalışmada kullanılan killi zeminin granülometri eğrisi.

Killi zemine katılacak öğütülmüş PET boyutu 0,5mm-4mm aralığında seçilmiştir (Şekil 5).



Şekil 5.Çalışmada kullanılan öğütülmüş PET'in granülometri eğrisi.

Kompaksiyon testlerinde killi zemine PET ilavesiyle optimum su muhtevasının ve kuru birim hacim ağırlığının azaldığı görülmüştür. Bunun nedeninin öğütülmüş PET'in esnek yapıda oluşu ve tane boyutunun 0,5 mm-4 mm aralığında seçilmesinden kaynaklandığı düşünülmektedir (Şekil 6).

Ödometre ile yapılan serbest şişme deneylerinde (ASTM D 698-00) her karışımdaki malzeme 1000 dakikada nihai serbest şişme kapasitesine ulaşmıştır. Karışımsız killi zemin nihai serbest şişme miktarı olan %1,60'a 1000 dakikadan daha uzun sürede ulaşmıştır (Şekil 7)

PET karışım yüzdesi arttıkça nihai şişme miktarına yaklaşık 1000 dakikada ulaşsa da şişme miktarında azalma meydana gelmektedir (Şşekil 8, 9)

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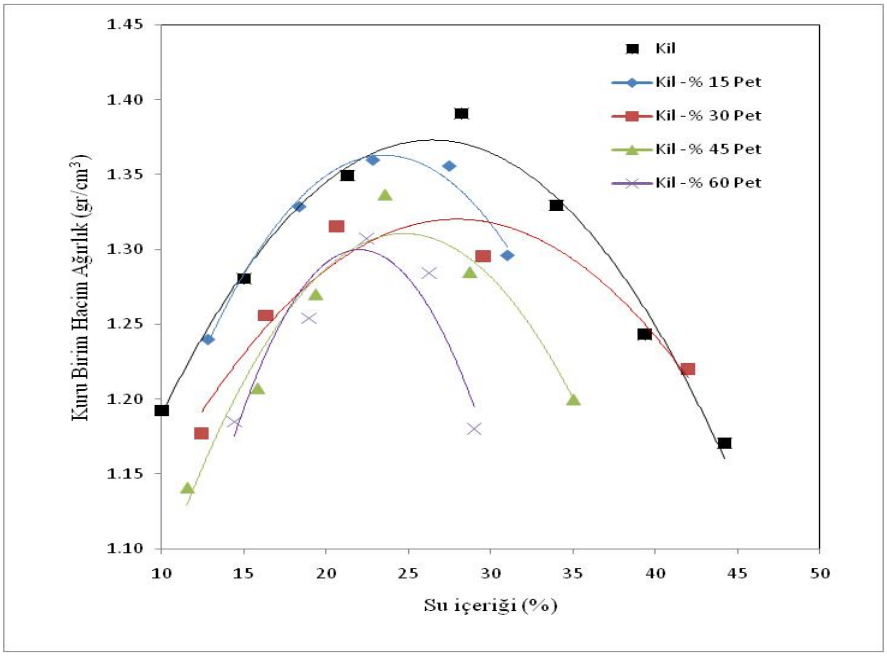
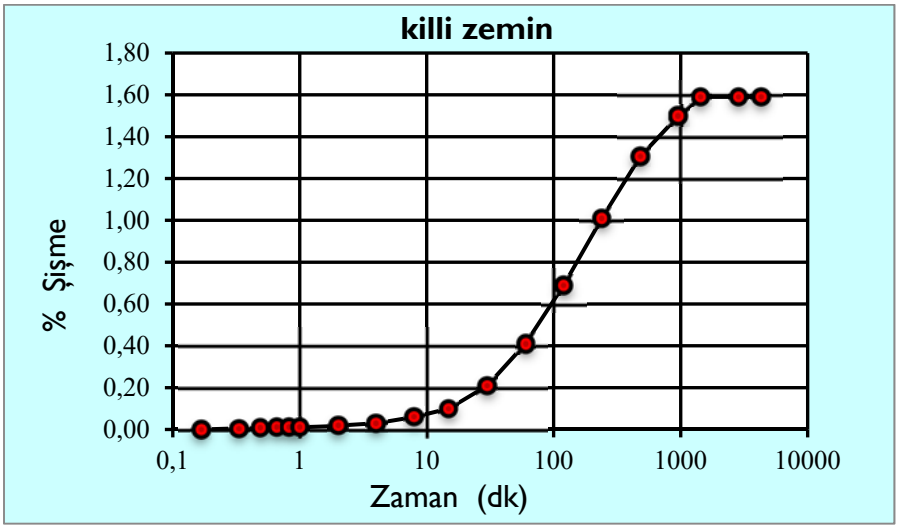
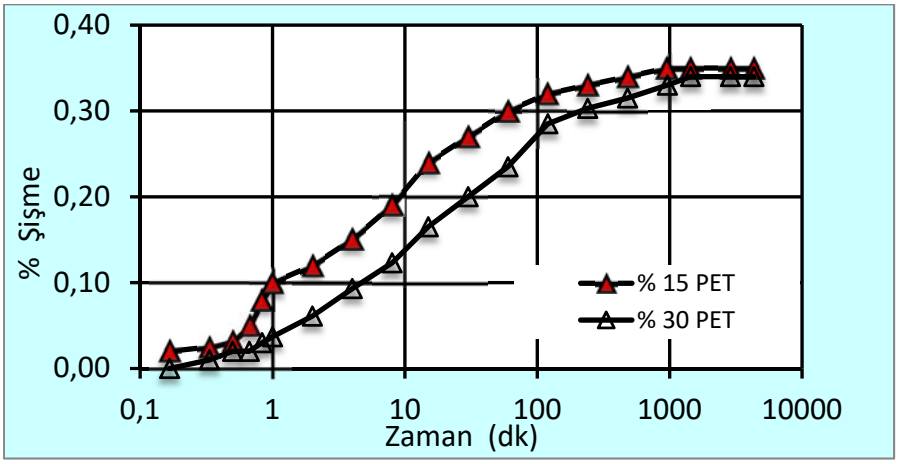


Şekil 6.Çalışmada kullanılan killi zemin ve öğütülmüş PET karışımlarının kompaksiyon eğrileri (Gunaydin vd.,)



Şekil 7. Çalışmada kullanılan killi zeminin zaman-serbest şişme ilişkisi.



Şekil 8. %15 ve %30 oranında PET karışımlı killi zeminin zaman-serbest şişme ilişkisi.

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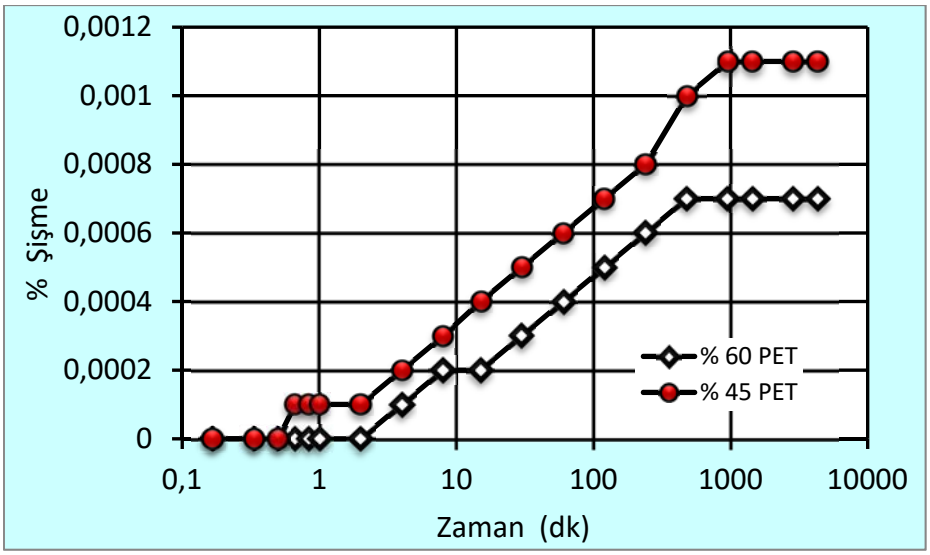

Şekil 9. %45 ve %60 oranında PET karışımlı killi zeminin zaman-serbest şişme ilişkisi.

Sonuçlar ve Öneriler

Kompaksiyon testlerinde killi zemine PET ilavesiyle optimum su muhtevasının ve kuru birim hacim ağırlığının azaldığı görülmüştür. Bunun nedininin öğütülmüş PET'in esnek yapıda oluşu ve tana boyutunun 0,5mm-4 mm aralığında seçilmesinden kaynaklandığı düşünülmektedir. Kuru birim hacim ağırlığının arttırılması için kullanılacak öğütülmüş PET'in tane boyutunun dolgularda kullanılacak zeminin iri tane boyutundan daha küçük seçilmelidir.

PET katkısız killi zemin nihai serbest şişme miktarına 1000 dakikada ulaşmakta ve bu oran % 1,60 olmaktadır. Killi zemindeki PET oranı arttıça nihai şişme süresine ulaşmada belirgin bir hızlanma gözükmese de, serbest şişme miktarında çok büyük azalma oluşarak % 0,0007 ye kadar düşmektedir. Bu sonuç katı atık PET'lerin öğütülerek özellikle karayollarında kaplama altı zemin dolgusuna karıştırılarak şişme ve büzülme en aza indirilebilir ve atık PET'in çevreye olan olusuz etkilerinin bertaraf edilmesine katkı sağlayabilir.

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PERCEPTIONS OF BUSINESS PROFESSIONALS TOWARDS MOBILE DEVICE USAGE

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Abstract:
In today's world, mobile devices became an inevitable part of our lives. The main purpose of this study is to find out perceptions of business professionals towards use of their mobile device in the workplace as well as at the business meeting settings. To understand business professionals' mobile phone usage at the workplace, an online survey was conducted with Turkish business professionals, who are members of Linked-in social network. Findings of the study indicate the fact that, mobile phone usage at work is positively welcomed in general. Respondents especially appreciate "the flexibility" and "the ability of doing a better job" through accessing corporate emails and other business apps outside official working hours and they strongly believe that "mobile phone usage at work is necessary". However, they slightly believe that their colleagues inappropriately use mobile phone at workplace. "Bringing phone to the meeting", "Excusing oneself to take a call", and "Checking time" are among the most appropriate mobile phone actions during the formal business meetings. On the other hand, "Checking a social media account", "Taking a call without excuse", and "Browsing Internet due to boredom" are seen inappropriate by most of the respondents.

Keywords: Bring-Your-Own-Device (BYOD), mobile phone usage, smartphone.

Introduction

Mobile technologies are promisingly evolving and becoming essential in our lives. Mobile device usage and smartphone ownership continues to increase in the world. Based on the Guardian research, China, India, U.S, Indonesia, Brazil, Japan, Russia, Mexico, Vietnam, Germany, and Turkey are the top countries where smartphone penetrations grow fastest and create the largest number of new owners (Arthur, 2014). Smartphone adoption continues to be more popular among 25-34 year olds and followed by 35-44 year olds segment in both US and Europe (ComScore, 2012). In today's world, mobile devices became an inevitable part of our lives. People now expect to access information anytime, anywhere, and in real-time. Fear of missing out, or FOMO in short, is the main driver behind our mobile addiction. Not to miss out from anything, 31% of mobile phone owners state that they never turn their phone off and 45% of owners rarely turn it off (Rainie & Zickuhr, 2015). Smartphones have been becoming so important that 42% of Turkish people indicate they would prefer to give up TV rather than their smartphones (Google Ipsos MediaCT, 2013).

Mobile technologies can be considered as one of the major forces that contribute to change in the way of doing business. Employees are increasingly becoming mobile, and they use mobile devices such as smartphones and tablets to do their work at the office, at home, and while traveling. Employees currently use their smartphones and tablets for the following work related activities: accessing employee intranet / portal, accessing to e-mail and/or calendar, reading or viewing documents, spreadsheets, or presentations, accessing social networking, watching video, taking work-related photos and/or videos, team portals, editing documents, spreadsheets, or presentations, web meeting, instant messaging, processor-intensive activities like analytics or modeling, videoconferencing, and company- or industry-specific application that is created by the company (Cisco Systems, 2012). Findings of the Ovum Multi-Market BYOD research shows employees appreciate flexibility of access to key tasks out of office

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hours and majority of them believe that accessing to corporate emails and content outside of office hours improves their ability to do their job well (Absalom, 2013).

The use of employee-owned devices in the workplace is clearly rising and companies are increasingly supporting the Bring-Your-Own-Device (BYOD) trend in order to save costs associated with providing devices themselves. BYOD is defined as "using a personal smartphone or tablet for any activity other than making calls or sending texts, therefore accessing corporate data" (Drury, 2012). Regardless of the company's location, size or industry, BYOD will be a common reality in the workplace (Symantec, 2013). A significant number of employees want to use a single device in all areas of their life. Ovum Multi-Market BYOD research indicates that approximately 57% of all employees worldwide are accessing corporate data in some form on a personal smartphone or tablet (Absalom, 2013). The findings of Rapid7 revealed that 64% of respondents allow personally-owned mobile devices to be used at work; however nearly half of all respondents indicated they were unaware of how many mobile devices on average each employee is using to access company data (Rapid7, 2013). Although "Always-on" access to corporate data is seen as more of a benefit; some companies do not allow personally-owned mobile devices to be used for work because of security risks.

Employees use their mobile phone during the business meetings that they attend. There are several studies on the use of mobile devices in the business settings such as business meetings (Broughton et al., 2010; Washington, Okoro, & Cardon, 2013; Bradberry, 2014; Wahla & Awan, 2014). While some people show tolerance for mobile phone use in business settings; some people think it's inappropriate and annoying to use mobile phone during business meetings. Three out of four people indicated that checking texts or emails is unacceptable behavior in business meetings; while 87% of people declared that answering a call is rarely or never acceptable in business meetings. Even at more informal business settings, the majority of people said that writing or sending a text message is inappropriate (Washington, Okoro, & Cardon, 2013). According to some research results, elder people with higher positions tend to approve mobile phone use in meetings less than their colleagues at lower positions do (Washington, Okoro, & Cardon, 2013; Bradberry, 2014).

In this study, perceptions of Turkish business professionals towards use of their mobile device in the workplace as well as at the business meeting settings will be analyzed. The Consumer Barometer Report (2015) results reveal that Turkey is the 6th country among the world regarding the personal internet usage and as first half of the 2015, mobile phone penetration rate reached to 92.9% in Turkey (Bilgi Teknolojileri ve İletişim Kurumu, 2015). It is obvious that smartphone penetration is on the rise in Turkey. Therefore it is worthwhile to analyze perceptions about the use of mobile device in business settings.

Research Methodology

The main purpose of this study is to find out perceptions of business professionals towards use of their mobile phone in the workplace as well as at the business meeting settings. To understand business professionals' mobile phone usage at the workplace, an online survey was conducted with Turkish business professionals, who are members of Linked-in social network, in June-July 2016. The main advantage of conducting the survey with the members of Linked-in social network is to reach people who are really business professionals. In this online questionnaire attitude toward mobile device usage in the business settings was measured with 14-item, five-point Likert-type scale (1= "strongly disagree" to 5= "strongly agree"), which is adapted from the study of Wahla and Awan (2014). The Cronbach's Alpha for this 14-item scale is 0.814; so it can be argued that scale reliability is quite high. Perceived appropriateness of mobile phone actions during formal business meetings was measured with 11 item, five-point Likert-type scale which is adapted from the study of Washington, Okoro, and Cardon (2013). This 11-item scale is highly reliable with a Cronbach's Alpha score of 0.862.

383 respondents answered the online questionnaire and 42 respondents who do not work currently are eliminated from the analysis. A total of 341 usable responses was gathered and demographic characteristics of the respondents are presented as frequencies and percentages in Table 1.

The distribution of gender groups are quite fairly distributed. Among the 341 respondents, 55.7% of the respondents consists of females while 44.3% consists of males. Majority of the respondents (55.1%) are between the ages of 30-39, 29% of respondents between the ages of 20-29, and finally 11.4 % of them are between the ages of 40-49. Regarding their occupations, 80.9% of respondents are working at private sector, while 15.8% of them are working at public sector. The majority of the respondents (51.9%) have graduate, and 38.1% of the respondents have bachelor degree.

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Table 1 Demographic profile of the respondents

		N	%			N	%
Education	Primary School	2	0.6	**Gender**	Male	151	44.3
	High School	12	3.5		Female	190	55.7
	2-years University	20	5.9	**Age**		**N**	**%**
	Undergraduate	130	38.1		Below 20	2	0.6
	Graduate	177	51.9		20 - 29	99	29.0
		N	**%**		30 - 39	188	55.1
Occupation	Private	276	80.9		40 - 49	39	11.4
	Public	54	15.8		50 - 59	12	3.5
	NGO	3	0.9		60 and over	1	0.3
	Other	8	2.4				

As it is illustrated in the Table 2, employers (9.4%), senior executives (10.9%), middle managers (27.6%), lower level of managers (13.8%), employees (20.8%), and teaching staff (15.5%) are among the participants of the online survey.

Table 2 Position of the respondents

Position	N	%
Employer	32	9.4
Senior Executive	37	10.9
Middle Manager	94	27.6
Lower Level Manager	47	13.8
Employee	71	20.8
Teaching Staff	53	15.5
Other	7	2.1
Total	341	100

Results and Discussion

Majority of the respondents (98.5%) who attended the survey own a smartphone. 70.6% of the respondents stated that they use their personally-owned mobile devices for both business and personal usage. Some of the respondents (21.9%) use two mobile phones, one is for personal purposes the other is for business use. While, 7.5% use corporate phone both for personal and work-related purposes. 37.5% of the respondents indicated that their work-related phone calls are paid by their corporation. When the respondents were asked whether their corporation allows them to use their personal mobile phone for work, 14.7% of the respondents told that it is not permissible.

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Respondents were asked 14 questions (see Table 3) about their attitude towards mobile device usage in the business settings. 9 of the scale items remarked with "R" in Table 3 were asked with negative statement towards mobile device usage, and then had been coded as reverse questions for the ease of analysis. The statements that respondents mostly agree with are "I like the flexibility of being able to access corporate emails and other business apps outside official working hours" (μ: 4.29), "Mobile phone usage at work is necessary" (μ: 4.23), "Being able to access corporate emails and other business apps outside official working hours enables me to do my job better" (μ: 4.17) and "Employer does not have a legal right to restrict use of mobile phone in office" (μ: 3.96). On the other hand, the statement that respondents least agree with is "I don't think my colleagues inappropriately use mobile phone at workplace" (μ: 2.63). And for the statements "Mobile phone usage does not cause distraction in workplace" (μ: 2.99) and "Personal mobile phone usage in staff and team meetings should be allowed" (μ: 2.92), people tend to neither agree nor disagree with a mean score near 3.

Table 3 Attitude toward mobile device usage in the business settings

	Mean	**Std. Dev**
I like the flexibility of being able to access corporate emails and other business apps outside official working hours	4.29	1.009
Mobile phone usage at work is necessary	4.23	1.019
Being able to access corporate emails and other business apps outside official working hours enables me to do my job better	4.17	1.127
Employer does not have a legal right to restrict use of mobile phone in office (R)	3.96	1.316
If my employer strictly bans use of mobile phone it will have negative impact on my morale	3.79	1.259
Supervisor does not have a responsibility to monitor the appropriateness of mobile phone usage (R)	3.77	1.385
Employer should not apply restriction on use of mobile phone in office timing (R)	3.75	1.254
Using mobile phone at work improve your efficiency	3.57	1.182
Mobile phones can be used for personal purposes at work (R)	3.37	1.301
Unproductive use of mobile phone like calls to friends and family will not be harmful for organization and employees' performance (R)	3.37	1.239
It is not necessary to make personal phone calls only during breaks and lunch time (R)	3.23	1.412
Mobile phone usage does not cause distraction in workplace (R)	2.99	1.342
Personal mobile phone usage in staff and team meetings should be allowed (R)	2.92	1.507
I don't think my colleagues inappropriately use mobile phone at workplace (R)	2.63	1.238

Table 4 illustrates the professionals' attitude towards mobile device usage in formal business meetings. The most acceptable actions are "Bringing phone to the meeting" (μ: 3.78), "Excusing oneself to take a call" (μ: 3.53) and "Checking time" (μ: 3.35). On the other hand, "Checking a social media account" (μ: 1.90), "Taking a call without excuse" (μ: 1.90) and "Browsing Internet due to boredom" (μ: 2.12) are not seen appropriate by most of the respondents.

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Table 4 Perceived appropriateness of mobile phone actions during formal business meetings

	Mean	Std. Dev
Bringing phone to the meeting	3.78	1.227
Excusing oneself to take a call	3.53	1.162
Checking time	3.35	1.341
Checking incoming calls	3.07	1.295
Writing text messages or emails	3.05	1.312
Reading text messages or emails	2.99	1.392
Using a mobile app	2.58	1.316
Making calls	2.44	1.439
Browsing Internet due to boredom	2.12	1.233
Taking a call without excuse	1.90	1.192
Checking a social media account	1.90	1.217

Conclusion

In this study, perceptions of business professionals towards use of mobile phone in the workplace as well as at the business meeting settings were analyzed. Findings of the study indicate the fact that, mobile phone usage at work is positively welcomed in general by most of the professionals. Professionals especially appreciate "the flexibility" and "the ability of doing a better job" through accessing corporate emails and other business apps outside official working hours and they strongly believe that "mobile phone usage at work is necessary". However, they slightly believe that their colleagues inappropriately use mobile phone at workplace. The use of mobile phone in formal meetings is questioned as well. To some extent, it is acceptable for professionals to bring phone to the meeting, excusing oneself to take a call and checking time. However, checking a social media account, taking a call without excuse and browsing Internet due to boredom are regarded as inappropriate in formal business meetings.

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PESTİSİT UYGULAMALARINDA KİŞİSEL KORUYUCU EKİPMANLARIN ÖNEMİ

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ÖZET

Tarımda pesitisit (tarım ilacı) uygulamalarının amacı kaliteli ve verimli tarım ürünleri elde etmektir. Pestisit kullanımı insan ve çevre sağlığını olumsuz etkilemektedir. Özellikle operatörlerin (pestisit uygulaması yapan kişiler) sağlığı risk altındadır. Operatörler ilaçlama sırasında pestisitlerden üç farklı şekilde etkilenmektedir. Bunlar; deri, solunum ve ağız yolu şeklindedir. Bu nedenle operatörlerin ilaçlama sırasında pestisitlerden etkilenmemesi için eldiven, yüz maskesi, uzun pantolon, uzun gömlek, bot vb uygun kişisel koruyucu ekipmanlar (KKE) kullanması gerekmektedir. Kişisel koruyucu ekipman; ilaç hazırlama, karıştırma-depo doldurma, ilaçlama sırasında ve ilaçlama sonrasında pestisit maruziyetini azaltmaya yardımcı olan ve insan sağlığını koruyan ekipmanlardır. Dünya'da ve ülkemizde pestisit uygulaması yapan kişilerin kişisel koruyucu ekipmanların önemi hakkında araştırmalar yapılmış ve ilaçlama yapan kişilerin KKE kullanımı konusunda bilinçlendirilmesi amaçlanmıştır.

Bu çalışmada, dünyada ve ülkemizde pestisit uygulaması yapılırken karşılaşılan sağlık sorunları, kişisel koruyucu ekipmanların önemi ve operatörlerin kişisel koruyucu ekipmanlara olan bakışı ayrıntılı olarak incelenecektir.

Keywords: Pestisit, İnsan sağlığı, Çevre Koruma, Kişisel Koruyucu Ekipmanlar

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PHENOLIC COMPOUNDS IN POMEGRANATE VINEGARS

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Abstract: Pomegranates are widely researched fruits for their nutritional and health benefits as well as their organoleptic properties. Pomegranate juices are rich in vitamins, minerals and phytochemicals. In addition, pomegranate juices contain potentially bioactive compounds and they are a great source of phenolic compounds such as flavonoids and phenolic acids. The use of second quality pomegranate for vinegar production can be a proper method to reduce losses due to discard of fruits. There has been growing interest in the beneficial health effects of certain fruits, wines and their by-products, like vinegars. In this study, the main phenolic compounds of pomegranate vinegars were determined by HPLC–DAD–ESI-MS. Diode-array detection (DAD) has been used for screening of the different classes of phenolic compounds, whereas MS and MS^n fragmentation data were employed for their structural characterization. Most of the compounds detected were mainly anthocyanins such as delphinidin, cyanidine and pelargonidine, and ellagitannins such as ellagic acid, punicalagin and punicaline. Additionally, phenolic acids were detected. Antioxidant activities of pomegranate vinegars were measured by using the DPPH (2,2-diphenyl-1-picryl hydrazyl) and ABTS (2,2′-azino-bis-3-ethyl-benzothiazoline-6-sulphonic acid) assays. The results showed strong correlations between antioxidative capacities and total phenolic content of pomegranate vinegars.

Keywords: Pomegranate vinegars; phenolic compounds; antioxidant capacity; DPPH.

Introduction

Modern life styles have driven consumers away from healthy dietary routines. In point of fact, their increasing concern about their health has prompted the industry to become involved in the need for food products which contribute to the prevention of illness. Pomegranate fruits are widely consumed fresh and in other processed forms as juice, jam, jelly, vinegar, wine, oil and in extract supplement. Actually, pomegranate fruits are a source of carbohydrates, minerals, crude fibres, and various biologically active compounds, such as vitamin C, and certain phenolic compounds as punicalagin, ellagic acid, gallotannins, anthocyanins (Zaouay et al., 2012). Brewed vinegar, a commonly used condiment of food, also has medicinal uses by virtue of its physiological effects, such as promoting recovery from exhaustion, regulating blood glucose, blood pressure, aiding digestion, stimulating the appetite, and promoting calcium absorption (Xu et al., 2007). Vinegar is traditionally produced from grapes by means of double fermentation (alcoholic and acetic acid). There are several advantages of using fruits for vinegar production, such as their health and organoleptic properties. The quality of vinegars changes according to the raw material, acidification system and ageing procedure (Tesfaye et al., 2002). The consumer demands for natural and high quality food products have increased the characterization and quality control these products (Cerezo et al., 2008). Nonetheless, there is no detailed information on phenolic and antioxidant properties of pomegranate vinegar. Therefore, the objectives of the present study were to evaluate phenolic profiles and antioxidant capacities of pomegranate vinegar. In addition, antioxidant capacity was measured using two common antioxidant activity methods (DPPH and ABTS).

Material and Methods

Samples and Chemicals

Pomegranate vinegar sample was obtained from domestic markets in Adana, Turkey. HPLC-grade solvents; methanol, acetonitrile, formic acid, and cyclohexane were purchased from Riedel-deHaen (Switzerland). All other reagents used were of analytical grade. Ultrapure water generated by the MilliQ system (Millipore, Bedford, MA) was used. Phenolic were obtained from Sigma-Aldrich (Steinheim, Germany).

LC-DAD-ESI-MS/MS analysis of phenolic compounds

Samples were filtered through a 0.45-µm pore size membrane filter before injection. An Agilent 1100 HPLC system (Agilent Technologies, Palo Alto, California, USA) operated by Windows NT-based ChemStation software was utilized; the HPLC equipment was used along with a diode array detector (DAD). The system

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comprised a binary pump, degasser, and auto sampler. The column used was a Phenomenex reversed-phase C-18 column (4.6 mm × 250 mm, 5 µm) (Torrance, California, USA). The mobile phase consisted of two solvents: Solvent A, water/formic acid (99.5:0.5; v/v) and Solvent B, acetonitrile/solvent A (60:40; v/v). Phenolic compounds were eluted under the following conditions: 0.5 ml min^{-1} flow rate with temperature set at 25 °C; isocratic conditions from 0 to 5 min with 0% B; gradient conditions from 0% to 5% B in 20 min; from 5% to 15% B in 18 min; from 15% to 25% B in 14 min; from 25% to 50% B in 31 min; from 50% to 100% B in 3 min; followed by washing and reconditioning of the column. The ultra-violet-visible spectra (scanning from 200 nm to 600 nm) were recorded for all peaks. Triplicate analyses were performed for each sample. The identification and assignation of each compound was performed by comparing retention times and UV spectra to authentic standards; and confirmed by an Agilent 6430 LC-MS/MS spectrometer equipped with an electrospray ionization source. The electrospray ionization mass spectrometry detection was performed in negative ion mode with the following optimized parameters: capillary temperature 400°C, N_2 12 L/min; nebulizer pressure, 45 psi (Kelebek et al., 2015a). Data gaining was performed using the Multiple Reactions Monitoring (MRM) method that solely monitors specific mass transitions during preset retention times.
Individual compounds were quantified using a calibration curve of the corresponding standard compound. When reference compounds were not available, the calibration of structurally related substances was used, including a molecular weight correction factor. The stock solution was diluted to a series of appropriate concentrations with the same solvent, and an aliquot of the diluted solution was injected into the HPLC apparatus for analysis. The limits of detection (LOD) and quantification (LOQ) under the present chromatographic conditions were determined at a signal-to-noise ratio (S/N) of about 3 and 10, respectively.

Measurement of antioxidant activity

DPPH Assay: 0.1 mL of diluted vinegar was mixed with 3.9 mL of DPPH solution (2.36 mg/100 mL methanol) and vigorously vortexed. The solution was held in the dark at ambient conditions for 15 min. The absorbance was measured at 517 nm by a UV-Visible spectrophotometer (Shimadzu UV-1201, Kyoto-Japan). Trolox calibration curve was used to calculate the antioxidant activity of the vinegar extracts and to express the antioxidant capacity in mM Trolox equivalent per l of vinegar. The mean and standard deviation were calculated for the three replicates.

ABTS Assay: The ABTS solution was created at a concentration of 7 mM and mixed with 2.5 mM of potassium persulphate, and stored after incubation at 23 °C in the dark for 12–16 h. The ready-made solution was diluted with 80 % methanol to measure an absorbance of 0.7±0.01 at 734 nm. Then, 3.9 mL of ABTS solution was added to 0.1 mL of the vinegar samples and mixed vigorously. Finally 10 min. were waited to ensure reaction and the absorbance was monitored at 734 nm. The calibration curve equations related to the Trolox standard were $y=0.0004x + 0.0089$ with $R^2= 0.9996$ for ABTS and $y=0.0004x + 0.0082$ with $R^2= 0.9995$ for DPPH within a concentration range from 5 to 150 µmol/L.

Results and Discussion

Phenolic compounds of pomegranate vinegar

The phenolic compounds belonging to different families were identified according to the information provided by HPLC-DAD-ESI-MS/MS analysis: retention time, λ_{max} in the ultraviolet region, molecular ion, main fragment ions in MS/MS, and tentative identification as listed in Table 1. A total of 23 compounds were identified, including six anthocyanins (delphinidin-3,5-glycosides, cyanidin-3,5-glycoside, pelargonidin-3,5-diglucoside, cyanidin-3-glycoside, pelargonidin-3-glycoside and cyanidin pentoxide), two hydrolysable tannins (galloyl hexose and digalloyl hexose), ten ellagic tannins (ellagic acid, HHDP-hexoside, ellagic acid-hexose, ellagic acid pentose, ellagic acid-deoxyhexose, galloyl-HHDP-hexose, bis-HHDP-hexose, digalloyl-HHDP-hexose, ellagic acid derivative and galloyl-HHDP-glycoside), two gallagyl esters (gallagyl-hexose and HHDP-gallagyl-hexose) and three hydroxycinnamic acids (caffeic acid-hexose, caffeic acid-hexose derivative and caffeic acid derivative). Composition of phenolic compounds in pomegranate vinegar was similar to fruit and juice of the fruit.

Anthocyanins are natural colorants belonging to the flavonoid family. LC-ESI-MS/MS MRM chromatograms of some of the identified anthocyanins in pomegranate vinegar were shown in Figure 1. As displayed in Table 1, the molecular ion and its fragments were used to confirm the identity of the anthocyanins isolated. The retention time 26.5 minutes, showed a molecular ion m/z 449, suggesting the presence of cyanidin-3-O-glucoside, which was confirmed by the fragment ion m/z 287, which corresponds to aglycone cyanidin.

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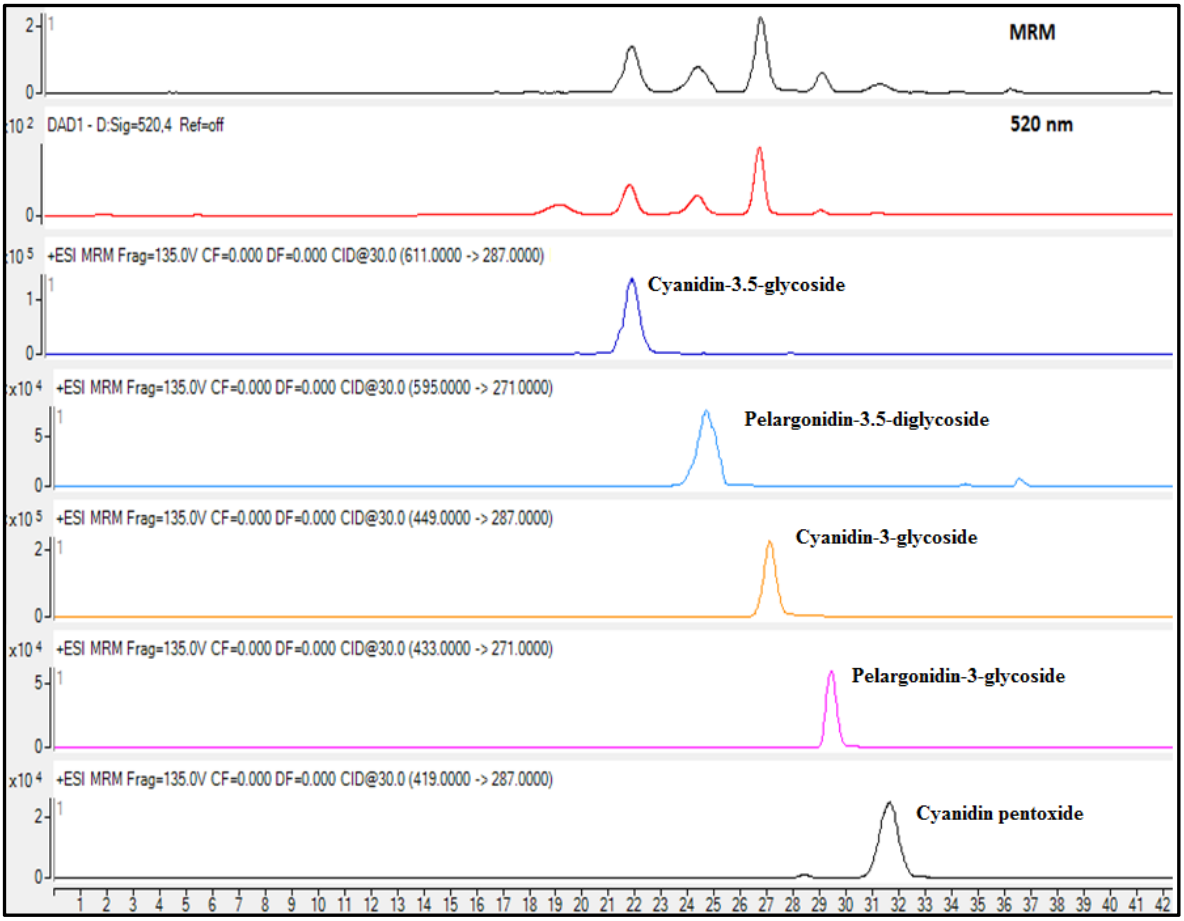

Figure 1. LC-DAD and LC-ESI-MS/MS MRM chromatograms of the identified anthocyanins. Peaks correspond to compounds in Table 1.

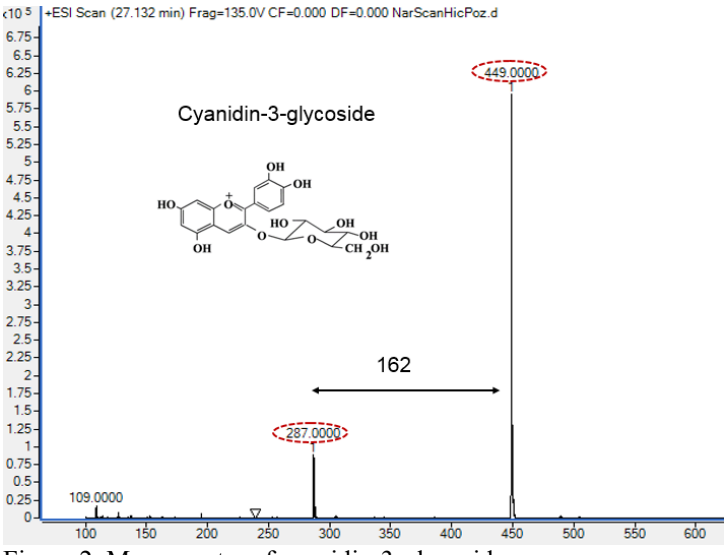

Figure 2. Mass spectra of cyanidin-3-glycoside

Anthocyanins are widely distributed among flowers, fruits (particularly in berries), and vegetables (Wang et al., 1997). Total amount of anthocyanins was found as 11.86 mg l^{-1} in pomegranate vinegar. In the study about functional constituents comparison of pomegranate juices after alcoholic and acetic acid fermentation by Ordoudi et al. (2011), total anthocyanin content of pomegranate vinegar was found close to fresh juice composition. This result displays that anthocyanins penetrate from the pomegranate to vinegar.

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Among the identified anthocyanins, cyanidin-3-glycoside was the major phenolic compound in vinegar followed by cyanidin-3,5-glycoside and pelargonidin-3,5-diglucoside as they constituted the large proportion of total anthocyanin content. These compounds have already been identified by previous studies in different parts of pomegranate. Cyanidin-3- glycoside (C3G), also known as kuromanin, is probably the most notable compound among the investigated cyanidin-glycosides. Generally, this compound exists as a free form that would be of sure benefit to its antioxidant activity. Due to their strong antioxidant properties, anthocyanins are of considerable interest to the scientific community and consumer market. The naturally electron- deficient chemical structure of anthocyanins makes them highly reactive toward free radicals and, consequently, makes them powerful natural antioxidants (Nasr et al., 1996; Gómez-Caravaca et al.,2013).

Ellagitannins were the most abundant group of the pomegranate vinegar phenolic composition. Ellagitannins and hydrolysable ellagitannins are both implicated in protection against atherogenesis, along with their potent antioxidant capacity. It has been suggested that ellagitannins may prevent chronic diseases such as cancer and cardiovascular diseases. These protective activities are attributed to both classes of phytochemicals, which are thought to provide antiproliferative, anti-inflammatory, and antioxidant activities and to function as glycemic regulators (Aviram and Rosenblat, 2013). Similar to our study, ellagitannins have been found as the major phenolic group of the pomegranate juice (Gómez-Caravaca et al., 2013). Among this group galloyl-HHDP-hexose was overwhelmingly the major compound having a concentration 11.10 mg l^{-1}. The compound followed by an ellagic acid derivative, bis-HHDP-hexose and galloyl-HHDP-glycoside with the concentration 8.18 mg l^{-1}, 6.90 mg l^{-1} and 6.23 mg l^{-1} respectively.

Gallagyl-hexose (punicaline) and HHDP-gallagyl-hexose (punicalagin) compounds were identified as gallagyl esters. Between these compounds punicalagin has the majority having a concentration of 13.90 mg l^{-1} (Fig 3). Among the phenolic compounds detected in the pomegranate, highest antioxidant activity was observed for punicalagin. This compound is also abundant in the fruit husk and during processing is extracted into pomegranate juice in significant quantities reaching levels of > 2 g/L juice (Gil et al., 2000).

Antioxidant activity of pomegranate vinegar

Antioxidant capacity was measured by two methods namely, ABTS and DPPH assays. The results were found as 9.78 mM Trolox/l vinegar using DPPH assay and 12.87 mM Trolox/l vinegar by ABTS assay in average while the maximum values were 9.84 mM Trolox/l and 13.01 mM Trolox/l respectively. As it can be seen from the results, ABTS assay stated better the antioxidant activity of phenolic compounds than DPPH assay as the method gave higher values. DPPH is a free radical scavenging method, being simple, rapid and repeatable, preferably used in determining the antioxidant activity of compounds. On the other hand, ABTS is used more in the food and agriculture industry which is clearly the better method for evaluating the antioxidant capacity of pomegranate vinegar (Kelebek et al, 2015b). Zaouay et al. (2012), studied antioxidant activity of different cultivars of pomegranates. In this research antioxidant activity of the fruits were detected between 11.24-21.52 µM Trolox/l with ABTS and 11.91-22.50 with DPPH methods. Likewise, a strong correlation was observed between phenolic contents and antioxidant activities. Ordoudi et al. (2014) determined the phenolic content and antioxidant activity of pomegranate juice, wine and vinegar in comparison of two methods (DPPH and CUPRAC). Reported results displayed that antiradical potential of pomegranate vinegar showed a decrease about 55% from the fruit juice. This loss can imply that radical scavengers may degrade during fermentation. This information also shows parallelism with our results. In the very same study, punicalagin and cyanidin-3-glycoside were reported to be the main contributors in antioxidant activity. Pomegranate vinegars are stated to have higher antiradical potential from apple vinegar whereas persimmon vinegars have the highest activity among this group (Sakanaka et al., 2007; Ordoudi et al., 2014).

Conclusion

In this study, the main phenolic compounds and antioxidant activities of pomegranate vinegars were determined by HPLC–DAD–ESI-MS. Various phenolics were determined in the sample and ellagitannins were responsible for the majority with a concentration of 44.42 mg l^{-1}.Ellagitannins are known to have beneficial effects to human health due their antioxidant activities. Punicalagin were the most abundant compound in overall phenolics, hence the highest antioxidant activity was observed for this compound. Antioxidant activities of pomegranate vinegars were measured by using the DPPH and ABTS assays. ABTS method was found to evaluate better the antioxidant activity of pomegranate vinegars. The results showed correlations between antioxidative capacities and total phenolic content of pomegranate vinegars. It is deducible that the change in antioxidant activity of pomegranate vinegars depends on the phenolic content and concentration of pomegranates. However, further researches are advised to have a better understanding in pomegranate vinegars.

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Table 1. HPLC-DAD-ESI-MS/MS identification of phenolic compounds

Peak	Compounds	λ (nm)	Precursor ion	Quantitative transition (m/z)	Amount (mg/l)
	Anthocyanins				
1	Delphinidin-3.5-glycoside	519, 277	627	627>303	0.74±0.01
2	Cyanidin-3.5-glycoside	513, 277	611	611>287	3.24±0.00
3	Pelargonidin-3.5-diglycoside	499, 274	595	595>271	1.00±0.00
4	Cyanidin-3-glycoside	516, 280	449	449>287	6.05±0.01
5	Pelargonidin-3-glycoside	503, 274	433	433>271	0.57±0.00
6	Cyanidin pentoxide	513, 277	419	419>287	0.24±0.00
	Total				**11.86±0.01**
	Hydrolysable tannins				
7	Galloyl hexose	375, 266	331	331>169	1.84±0.01
8	Digalloyl hexose	363, 264	483	483>331	0.81±0.01
	Total				**2.65±0.02**
	Ellagitannins				
9	Ellagic acid	367, 275	301	301>229	1.69±0.01
10	HHDP-hexoside	267	481	481>301	1.72±0.01
11	Ellagic acid-hexose	363, 252	463	463>301	1.59±0.01
12	Ellagic acid pentose	359, 255	433	463>301	0.66±0.01
13	Ellagic acid-deoxyhexose	360	447	447>300	1.31±0.01
14	Galloyl-HHDP-hexose	365	633	633>301	11.10±0.40
15	bis-HHDP-hexose	377, 253	783	783>481	6.90±0.07
16	Digalloyl-HHDP-hexose	272	785	785>633	5.04±0.03
17	Ellagic acid derivative	265	799	799>479	8.18±0.02
18	Galloyl-HHDP-glycoside	250	649	649>301	6.23±0.01
	Total				**44.42±0.37**
	Gallagyl esters				
19	Gallagyl-hexose (punicaline)	371, 262	781	781>601	3.05±0.01
20	HHDP-gallagyl-hexose (punicalagin)	378, 258	1083	1083>601	13.90±0.02
	Total				**16.95±0.02**
	Hydroxycinnamic acids				
21	Caffeic acid-hexose	293	341	341>179	6.76±0.55
22	Caffeic acid-hexose derivative	293	451	451>341	1.40±0.02
23	Caffeic acid derivative	260	299	299>137	1.26±0.01
	Total				**10.43±0.03**

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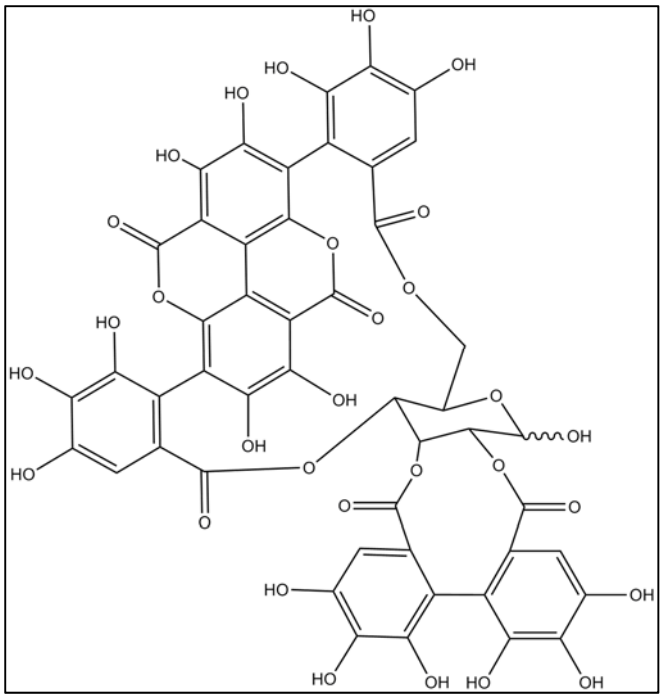

Fig 3. Structure of punicalagin, the major phenolic compound in pomegranate vinegar

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PHYSICAL AND ECONOMIC ANALYSIS OF THE POTENTIAL WIND ENERGY PLANT IN SINOP/ TURKEY

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Abstract

The use of renewable energy sources is rapidly increasing in the world and in Turkey. Wind energy from these sources, is more attractive to investors when compared to other renewable energy sources due to the installation and operation costs. Electrical energy from wind sources in the coastal area usually has production potential. For instance, if the wind map of Turkey is examined it can be seen that electrical energy production from the wind sources in the coastal area has production potential. Sinop, which is located in the Black Sea coastline, is an efficient point for wind energy investment because of its geographical structure. In this study, in order to be a model, potential points for the electric power from wind sources in the Sinop have been identified. Then, the scale and size of a potential power plant from wind energy which can be installed in Sinop have been investigated. Lastly, its installation and operation costs have been calculated.

Key words: Sinop province, Wind power plant, Physical Analysis, Economic Analysis, Renewable Energy

1. Introduction

Today, electric power is a kind of energy needed continuously as well as being the main input for industry and is an indispensable factor for quality of life (Saidur et al., 2011). Need for electricity is increasing with each day due to the rapid growth of human population in the world (Hepbasli and Özgener, 2004). Due to many factors such as depletion of fossil fuel resources on Earth, the rising costs of energy production and environmental pollution, it has been increased the orientation for new sources (Kenisarina et al., 2006*)*. Renewable energy sources are defined as the kind of energy sources which present in the next day due to the nature of its cycle even if it is consumed every day. Solar, wind, hydroelectric, geothermal, wave, ocean, hydrogen and biomass energy are some forms of renewable energy in this class (Acaroğlu, 2013). Being in many parts of world, having low cost, being clean, not being harmful to the environment are the some important features of these resources (Köse et al., 2004). In many countries in the world, a growing orientation toward these sources are in existence (Bacak et al., 2009). In these resources, wind energy has the most convenient forms in terms of commercial and feasibility (Oner et al., 2009). Therefore, in recent years many studies on wind energy have been done. Studies have generally focused on the importance, the potential and the evaluation of wind energy (Hayli, 2001, Bilgili et al., 2004, Togrul and Ertekin, 2011, Genç and Gökçek, 2009, Güler, 2009). Sinop that is located in the Black Sea coastline is considered to have efficient points for wind energy investments because of its geographical structure. In this study, in order to be a model, potential points for the electric power from wind sources in the Sinop have been identified. Then, the sc
ale and size of a potential power plant from wind energy which can be installed in Sinop have been investigated. Lastly, its installation and operation costs have been calculated.

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2. Materials and Method

Provincial Based Wind Energy Potential Atlas (REPA) is used as the main tool, in order to determine the place for the establishment of WPPs in our country (Anonim1, 2016). In Figure 1, shown the areas that are not suitable for HPP investments in Sinop (gray). In determination of prohibited areas; Hunting and Wild Animals and Their Habitat Protection Implementing Regulation, Procedures and Principles of Pest Combating Implementing Regulation (Anonim2, 2016) the Environmental Noise Assessment and Management Regulation (Anonim3, 2016) the Military Forbidden Zones and Security Zones Regulation (Anonim4, 2016) have been used. As the material in study, REPA point source information is used, that was obtained from the Ministry of Energy and Natural Resources Renewable Energy the Directorate General dated 27/02/2013 (Anonim1, 2016). In information of point sources, primarily the coordinates of a point is determined from REPA. Average wind speed and wind directions is determined on specified point, at 30-50-70-100 meters (m) heights (Anonim1, 2016).

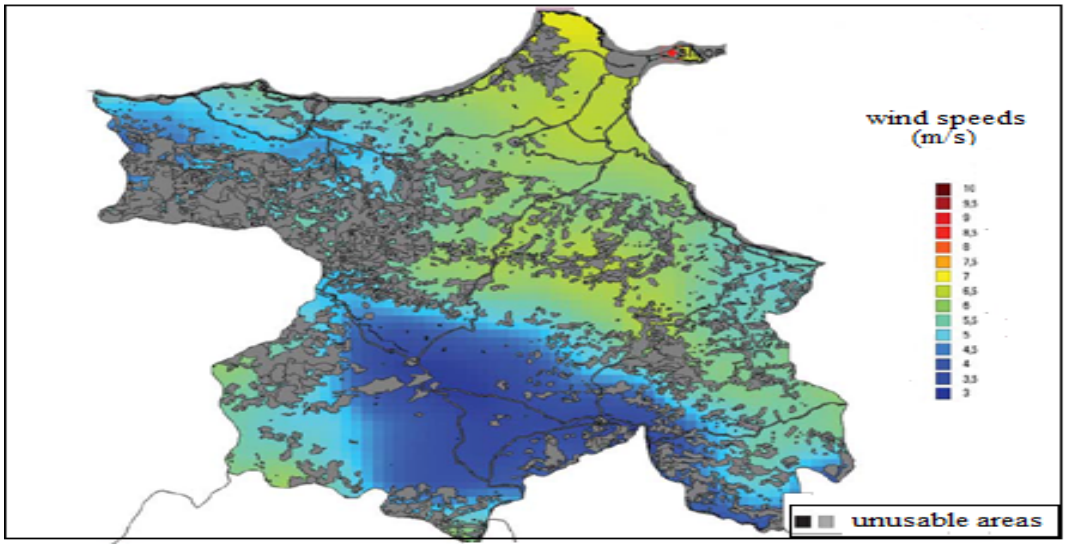

Figure 1: Wind Energy Potential Atlas (Anonim1, 2016).

In this height, the detected average wind speed and wind directions have been calculated with the Weibull distribution method (Anonim1, 2016). This distribution is composed with the scale and shape parameters is a two-parameter distribution (Anonim5, 2013). Weibull distribution function, which is in general form, is given in

$$f(v)=\left(\frac{k}{c}\right)\left(\frac{v}{c}\right)^{k-1}\exp\left[-\left(\frac{v}{c}\right)^{k}\right] \quad (1)$$

For wind speed. In this function, f (v), k and c shows the probability of observing wind speed v, Weibull shape parameter and reference value of wind speed respectively. C is also said Weibull scale parameter (Zeytinoğlu, 2009). Then the 50m and 100m annual power density (W / m²) and annual capacity factors (%) are obtained. In line with these values, electricity production has been calculated by taking up reference Suzlon S64 / 1000 turbine model at 50m height (Anonim1, 2016).

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While making an economic analysis, are taken into consideration of average investment cost which variable differ from as a nature of the establishment place, distance from the substation, pre-feasibility costs, and design costs etc. The average investment cost wind energy production is considered to be 1000-1200 US dollars / kW (Bayraç, 2011). If the number of turbines is less, the initial investment cost is more than about 10%
(Taşkın, 2013). Therefore, a 1 MW wind turbine has been recognized as a cost of US $ 1,320,000. The investment of working-life has estimated as a 25. year. Calculations have been made through two different funding models. Firstly, it has assumed invested as 100% elf-funded equity and calculations have been made. Secondly; it has been assumed invested 25% equity 75%. Credit and calculations have been made. Repayments totally 10 years, have been considered as 2 years grace period and 8 years payback period, and calculations have been to be paid annually. Credit financing model is based on data of the Energy Market Regulatory Authority (EMRA) (Erdem et al., 2015). Operating costs have been determined as 1.2% (Anonim6, 2016). The corporate income tax has been taken as base 20% (Anonim7, 2016). If the electricity has been produced within the scope of renewable energy sources (RES), sales price is taken 7.3 US $ / kW, and sales revenues have been calculated annually.

3. Results

Sinop, in the middle of the Black Sea, is located between 41 ° 12 'and 42 ° 06' north latitude and 34 ° 14 'and 35 ° 26’ east longitude (Anonim8, 2016). Altitude of the province from sea level is just 50m and longitude of province at Black Sea coastline is 175km long (Ceylan, 2010).

Sinop has been established between the two capes named Inceburun and Boztepe. Sinop as can be seen in Figure 2; is founded on a tombolo formed by a merging island and mainland (Ceylan, 2010). To as an example, suitable areas for installation of wind power plant in Sinop can be in figure 2.

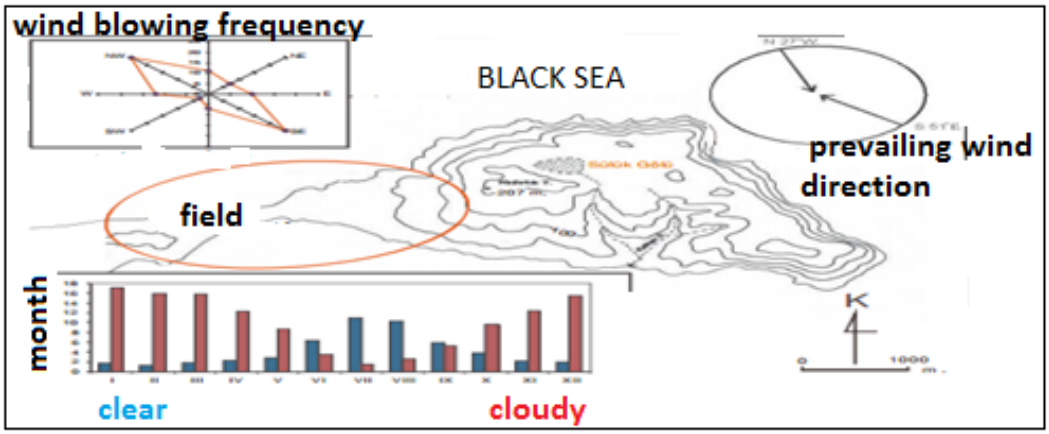

Figure 2: Sinop topography and wind direction (Şahin and Kaya , 2011).

Figure 3 illustrates the distribution of mean wind speeds of 50m. For economic investment, 7 m / s wind speed or over is required. Wind speed in areas with Yellow is 7 m / s. This rate is seen more dominant mostly in north-facing part of the Sinop coast.

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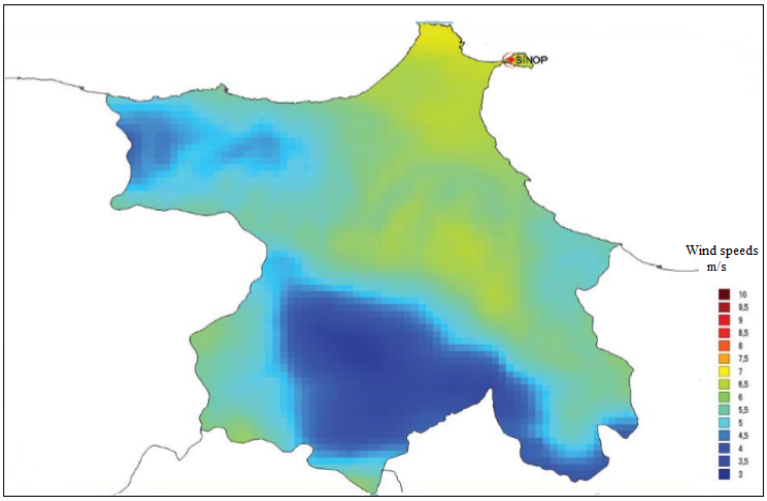

Figure 3: illustrates the distribution of mean wind speeds of 50m (Anonim1, 2016).

Although dominant direction is differ from seasons ,it's blows of annual average is northwest and %25.7 In Sinop, it was observed that dominant direction wind. Planning of the wind power plant depends mainly on the amount of energy that can be generated from the power plant site selected. In this study, a point has been determined in Sinop Dibekli village in North Latitude 42.0025513345238 Longitude 35.0127371674451 East coordinates. This point is at an altitude of 78m above sea level and the direction of the point is north-west (Anonim5, 2013).

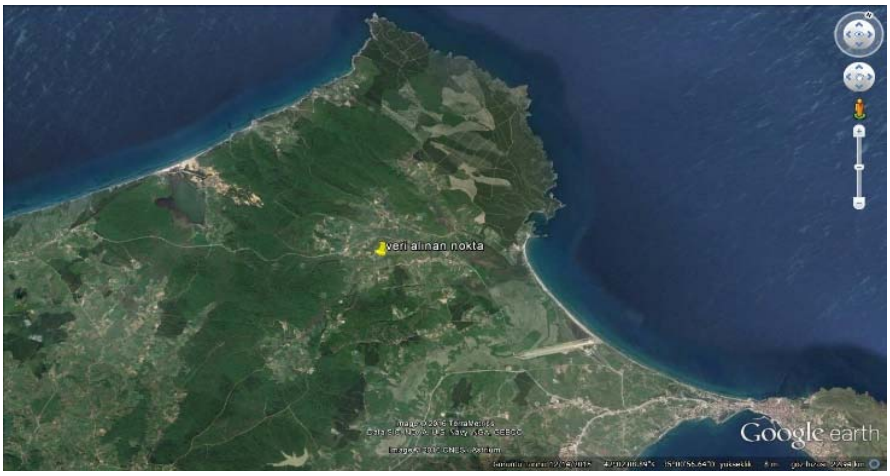

Figure 4: Is given the satellite view of point.

The construction of WPP, wind capacity factor is an effective distribution parameter as well as the wind speed distribution in Sinop, wind capacity factor distributions are shown in Figure 5.

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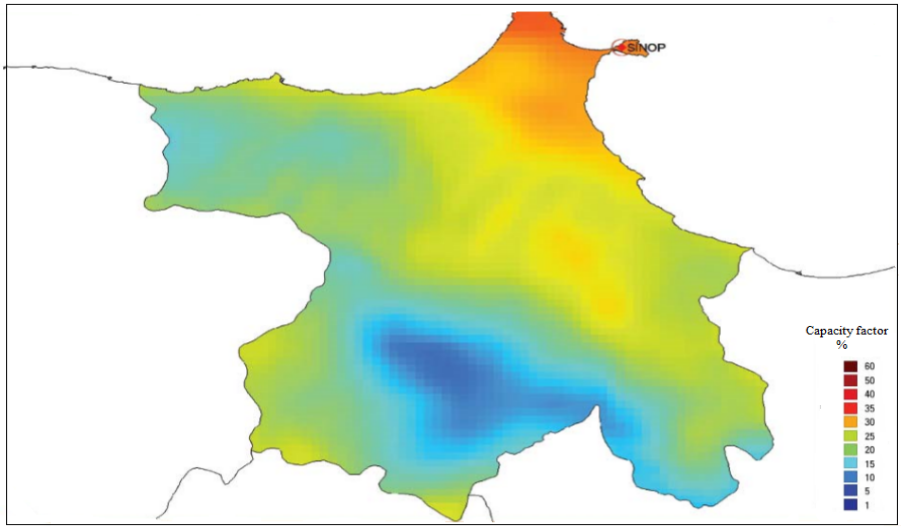

Figure 5: capacity factor distribution in 50m height (Anonim1, 2016).

The average wind speed of Sinop has been calculated as; 5.84 m / s at 30m, 6.42 m / s at 50m, 6,69 m / s at 70m, 6.99 m / s at 100m. With the rise from sea level, wind speed has increased directly proportional. In Figure 6, the prevailing wind direction and frequency information is shown for the relevant point.. In Figure 6, red color shows wind power and the blue color shows the wind blowing frequency. Prior to the installation of wind turbines, one of the important steps is to determine the prevailing wind direction. It is shown in Figure 6 that the prevailing wind direction for the province of Sinop is northwest (NW) and southeast (SE).

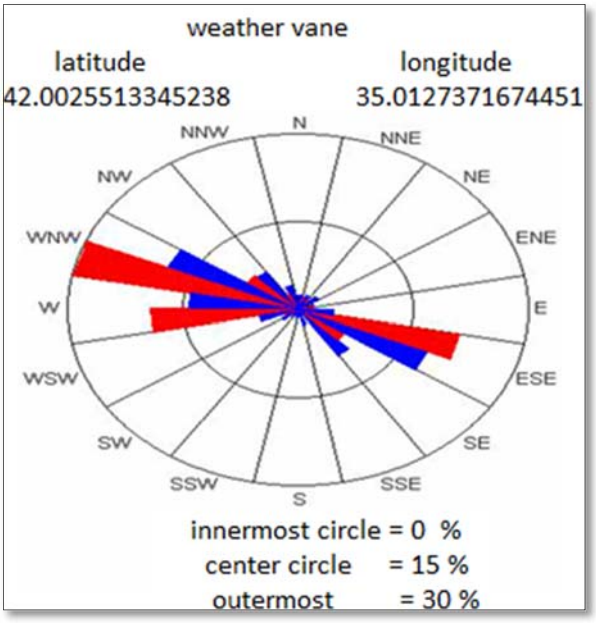

Figure 6: Dominant wind intensity of getting data (Anonim5, 2013).

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Weibull C-parameter is; 6.80532 at 30m, 7.24459 at 50m, 7.54666 at 70m and 7.87815 at 100m. Weibull scale parameter (c)'s, is observed to be high similar to the average wind speed at the same height. Weibull k-parameter is 2,12802 at 30m, 2,01701 at 50m, 1,94953 at 70m and 1,88172 at 100m.When the Weibull's parameter is high without too many changes at wind speed shows that the wind blows as a fixed. In wind's force line with the changes occurring in the day, the change in the average power density occur. For Sinop the annual power density 50m and 100m was recorded as 305.12 W / m², 421.27 W / m² respectively. Annual capacity factor; for 50m was realized as 32.471% (Anonim1, 2016). This value is an acceptable level for sustainable Economic WPP investment. For Sinop, energy production based on wind data taken at 50m height is calculated 2,844,492 kWh / year (Anonim5, 2013). Total paid corporation tax realized as 1.038.240 US dollars and it has been reduced from gross income. The net income has been calculated as USD 4,152,598 of WPP considered for establishment in Sinop.

4. Discussion

In this study, a point has been determined in Sinop Dibekli village in North Latitude 42.0025513345238 Longitude 35.0127371674451 East coordinates. It has been taken annual with speed and direction information of this point. With received data; average speed, direction and energy calculations were performed. It has been investigated as a sample can be installed in a wind power plant in Sinop installation and operating costs have been calculated. Resource (Anonim5, 2013) has been used for place selection of WPP which considered to be established in Sinop. While doing cost analysis at economic analysis are taken into consideration of the nature of the place was founded,distance from the substation,pre-feasibility costs,design costs and so on.It is assumed two different financing models as 100% equity and 25% equity - 75% investment credit would be done and calculations have been made.

In 100% self-owned investment; it has been estimated that fixed investment costs are $ 52,800 per year while annual operating costs are $ 15.840. Annual net profit after expenses are expected to be 97 478 USD. Total profit for 25 years for $ 2,436,958 is to occur, breakeven point will be the 9th year. In 25% equity,75% investment credit model, investment cost varies according to year, realizes as $ 195,360 annually between 3th and 12th years, other years realizes $ 13,200. The net profit calculated on the total income is estimated to be $ 1,605,358, excluding capital increase. The breakeven point is envisaged at 14. years, excluding the capital increase.

Conclusions

As a result of the study, it can be said making an investment using 100% equity would be more profitable WPP investment determined at the point of in Sinop Dibekli village, than 75% credit-based financing model.

For Sinop, energy production based on wind data taken at 50 m height, is calculated 2,844,492 kWh / year.

With the installation of wind power plants; they will reduce dependence on foreign sources to meet Turkey's energy needs and are expected to contribute to increased energy diversity.

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PHYTOCHEMICAL STUDY OF KAEMPFERIA ROTUNDA: FROM ETHNOMEDICINE TO DRUG DISCOVERY

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Kaempferia rotunda is a species under the Zingiberaceae family. The plants is widely found in Asian countries where it is commonly used as a food ingredient and in ethnomedicinal preparation.Thisstudy was conducted to isolate some bioactive compounds and to testas antioxidant, antimutagenic, and anticancer. Antioxidant was tested by DPPH method. Antimutagenic activity test was observed in vivo based on the number of micronucleated polychromatic cell erythrocytes (MNPCE) from male Balb-c mice (8-12 week) induced by cyclophosphamide. The in vitro cytotoxicity test was done on human cancer cell lines by MTT ([3-(4, 5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide] assay. In-vivo activity assay was done by xenografting female Balb C mice with human breast cancer T47D cell implantation into the mamae fat-pad. From the crude extracts and isolated compounds from *K. rotunda* showed significant antioxidant, antimutagenic, and cytotoxic activity against T47D breast cancer cell lines. In-vivo study showed of bioactive compounds from *K. rotunda* can repair breast tissue histopathology, and suppress c-Myc expression on mice with T47D breast cancer xenograft. The rhizome of *K. rotunda* have potential to develope as new drug from nature.

Keywords: Kaempferia rotunda; antioxidant; antimutagenic; cytotocix effects

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POLLEN MORPHOLOGY OF TWO MONOTYPIC SPECIES FROM APIACEAE GROWING IN TURKEY

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Apiaceae is represented by approximately 450 genera and 3700 species in the world. Turkey has the highest species density with 480 species in Asia and probably in the World.Apiaceae family in Turkey has 15 monotypic endemic genera. In this study, two monotypic species belonging to the family Apiaceae [1], *Crenosciadium siifolium* Boiss. et. Heldr. (endemic) and*Glaucosciadium cordifolium* (Boiss.) Burtt. et Davis were investigated pollen morphology for the first time by scanning electron microscopy (SEM), and the features of pollen grains were described and illustrated. Pollen morphology of the examined specimens exhibits some variation in size, shape and sculpture. The pollen grains of *C. siifolium* are isopolar, tricolpate. P (polar axis)/E (equatorial axis) 2.25-2.70 µm. The shape of pollen grains is perprolate and exine sculpturing is rugulate. The pollen grains of *G. cordifolium* are isopolar, tricolpate. P/E 1.80-2.05 µm. The shape of pollen grains is euprolate-perprolate and exine sculpturing is rugulate.

Keywords: Crenosciadium siifolium, Glaucosciadium cordifolium, Pollen, Apiaceae, Monotypic, SEM

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POLY (LINOLEIC ACID) GRAFT COPOLYMER IN METAL/POLYMER/SEMICONDUCTOR DIODE APPLICATIONS

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The conformity in electronic applications of novel poly(linoleic acid)-g-poly(caprolactone)-g-poly(t-butyl acrylate) graft copolymer as an active interfacial layer was investigated. For this purpose this polymeric material was coated between a silicon (Si) semiconductor and metal (Au) Schottky contact to obtain its improvement effect. The polymer was resolved in a solvent to spray by an electrostatic spraying system. The polymeric interfacial layer was coated basis on Si single crystal wafer by electrostatic spraying system after the metal ohmic contact formation on the back side of the Si wafer. About 200-300 nanometer in diameter nano fibers were obtained on Si wafer. Nanofiber characteristic of this layer was indicated through Field Emission Gun Scanning Electron Microscope (FEG-SEM) micrographs. Later, metal rectifying contacts have formed on these polymeric layers by a metal evaporator system in high vacuum conditions. Obtained metal/polymer/semiconductor (MPS) diodes' electrical characteristics have realized by current–voltage (I–V) measurements conducted in dark and various illumination intensity levels at room temperature. The main electrical parameters of these diodes such as series resistance, ideality factor, reverse saturation current and zero-bias barrier height of the structures were obtained from forward-bias I–V data.

Keywords: Graft Copolymer, Schottky Diode, Linoleic Acid, Electrical Properties

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POSTAL MARKET LIBERALISATION AND ITS IMPACT ON THE MAIL SUPPLY CHAIN: THE CASE OF TURKEY

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Abstract: As a candidate country for European Union membership, Turkey is on the way towards liberalising its postal market. Not only will such liberalisation introduce competition in the postal market in which Post and Telegraph (PTT) Corporation, was the monopoly, but also it will result in spreading out of the new entrants into the PTT Corp's supply chain in several ways. The literature has barely touched upon the impact of the technological substitution and incoming liberalisation on the supply chain of the Turkey's ex-monopoly. Providing examples from the ex-monopolies of the European Union, the purpose of this study is to examine the effects of the liberalisation of the postal market in Turkey on the PTT Corp's supply chain. The study highlights the ways in which the new entrants penetrate into the postal market using desk-based research. Moreover, it investigates the competition from a supply chain perspective.

Key Words: Liberalisation, Postal Market, Turkey, Supply Chain, Turkish Post and Telegraph Corporation, Mail

Introduction

Turkey, a candidate for the European Union (EU) membership, is adapting its bodies and legislation to the EU. The accession negotiations started in 2005 and Turkey aims to keep up with all the EU acquis, before the membership and even before opening chapters, to accelerate the negotiations (Ministry for EU Affairs, 2014). While the country was busy with reforms, EU started to liberalise its postal market gradually to complete the single postal market project in 1998 and finished it in 2013.

The liberalisation process aimed to open the postal market to competition and introduced Universal Service (US) for postal services, independent regulation authority and ways to compensate the US burden. With three directives along the way, the postal market was changed dramatically. Today, the EU postal market is mostly competitive and innovative. Ex-monopolies, mainly with Universal Service Obligation suffered from competition with supply chain disruption and technological substation in this period.

After the liberalisation, several EU country's examples illustrate that either the incumbent was forced to open its supply chain to the new entrants for a price less than the uniform one by regulation authorities or the new entrants bypassed it in the free market conditions. Additionally, with the declining mail demand and the competition, the incumbents lost market share and revenue.

All these developments in Europe will have reflections to the Turkish postal market. Already, the liberalisation process has begun, and Turkish postal legislation is affected by the European counterparts. Add to these; several acts came into force in recent years and more to come.

In the light of European experience about the liberalisation and competition, it would be possible to make some predictions about race and its effect on the PTT Corp.'s supply chain.

Using desk based research and EU member and company examples, objectives of this paper are:

- What would be the effects of liberalisation of the postal market to the PTT Corp.?, and
- How its supply chain would be affected by this process?

This paper gives insight information about the types of market entry in the EU postal market with illustrating the postal supply chain and Turkish market situation to address these questions. In the discussion part, the paper tries to stimulate the future situation in Turkey which the literature scarcely mentioned. Moreover, it highlights the competition on the mail supply chain and focuses on its effects on the supply chain.

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Types of market entry in the EU

The Postal sector as a network industry employs more than 1.2 million people across the Europe, and only the letter post itself accounts 0.34 of the GDP (European Commission, 2016a). It is a quite important part of the economy. As a consequence, the Europe has recently liberalised this market to acquire an efficient market and now many companies are competing in it. In this, the companies are operating their supply chain and the product's value chain plays an important part as well.

Jaag (2014) divides the postal value chain into four sections which are the collection, sorting, transport and delivery. He also emphasises that none of them are essential, and the competitors can duplicate it easily. As a result, the new entrants can enter the market quickly. On the other hand, De Donder (2006) argues that the delivery network is a bottleneck in the supply chain and needs the economies of scale to be profitable. Therefore, not so easily to duplicate. The postal supply chain can be simply illustrated as follows:

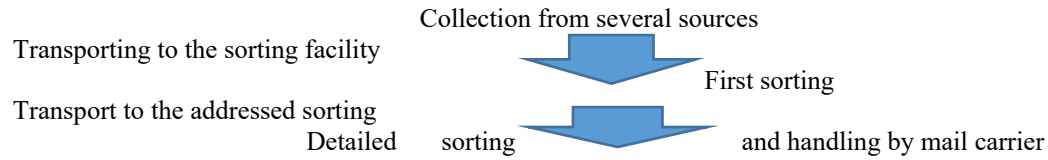

Figure 1 Source: the author.

Mail collection can be done from several places such as post boxes, post offices. Bulk mail customers tend to use the first sorting facilities directly. After first sorting, the mail goes to the secondary sorting places for the detailed sorting and there a mail carrier handles it.

EU published three directives (Directive 97/67EC), (2002/39/EC), (2008/06/EC) for the liberalisation of the postal market which led to a gradual liberalisation and opened it to the competition. The directives defined the universal service, liberalised it and created national regulation authorities (European Commission 2016b). The process was finished in the year 2013. All of them affected the mail supply chain illustrated above and allowed new entrants to compete with the incumbents. The mail supply chain disruption can be defined as follows:

- *Bypass*: It is the entry type that the new entrant bypasses the incumbent's supply chain where it is profitable and establishes its own. De Donder (2006) points out that it is usually not profitable to serve in the low-density areas, and new entrants choose to provide services to the high-density ones such as the major cities. The writer points out that doing this will cause economies of scale. Additionally, Schuster (2013) emphasise that supply chain infrastructure cost would be lower in the high populated areas. Therefore, after the liberalisation of the postal market, many new entrants started to compete in the high-density cities by bypassing the incumbent's supply chain.

Where the Universal Service obligation forces its provider to serve all of the countries without any discrimination, the new entrants are free of the USO and can serve in only profitable areas. This action is called "cream skimming". De Donder calls it as a selective bypass. The Royal Mail (US Provider of the U.K. competes in its big cities such as London and Manchester with TNT Post, the same competition occurs in Sweden by City Mail.

Quiros's (2011) study illustrates that there is a high correlation between the market opening, independent regulation authority and the efficiency increase. These factors lead to the second type of entry to the market by the regulations.

- *Access:* The second type of entry is access. The third directive (2008/06/EC) article 11a forces the countries to allow fair competition and to protect the user's rights by opening the postal infrastructure and the postal network to the new entrants without any discrimination. As a consequence, this article leads to *access* type of entry where the incumbent is forced to open its supply chain to the competitors. Mostly, it is linked with the cream-skimming effect where the new entrant uses incumbent's infrastructure to distribute the mail to the small populated areas while using its downstream supply chain where profitable. Villemeur et al. (2007) explain that as the competition only occurs in the downstream of the supply chain where the incumbent distributes the mail for a uniform price.

New entrants use access type of entry because of the cost advantage. The Uniform mail rates consist of all of the upstream and the downstream cost of the mail (Armstrong 2008). However, in access, only one part of the

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incumbent supply chain is used so the price would be lower than the uniform price. In this respect, if the cost of the one part of the supply chain is cheaper than the incumbent, the new entrant can acquire an advantage in the competition.

In Europe, access can be done to several postal infrastructures such as postcodes, post office boxes, delivery boxes, address database, change of access database, USP redirection and return services, downstream access (Wik Consult, 2013). Several countries allow different access levels, and it mostly depends on the regulation authority.

Case of Turkey

Legislation and the Current Situation in the Market

Turkey is updating its legislations for a more liberalised postal market and recently it changed some of the primary laws. One of this legislation is 6475 Postal Services Legislation. It came into force on the May 2013 and started the renewal process. With this, PTT Corp. became the postal monopoly by law and was assigned as Universal Service Provider. The reserved area is limitless now.

The company acquired many rights such as the monopoly on communication mail's all supply chain, letter of notification supply chain, Turkish Army's postal services and stamp services.

Additionally, BTK (Information and Telecommunication Technologies Authority) was assigned as the regulation authority to oversee the market and acquired the right to give the licence to operate in the postal market.

A compensation fund was established as the %2 of the revenue of all permit holders. Ministry of Transport, Maritime Affairs and Communications manages this fund, and it aims to compensate the Universal Service Cost of the PTT Corp. Most of the countries have Universal Service Fund. However, it is not usually activated by the authorities. As an example, Germany hasn't enabled the Universal Service Fund.

After this, in February 2016, The Postal Universal Service legislation came into force to define the Universal Service Obligation (USO) of the provider. It represents the USO, how to acquire money from the fund and the calculation of the US Cost.

So far, with these two legislations, PTT Corp. is the USP of Turkey and postal service monopoly. The gradual liberalisation is about to start. However, there is no mentioned weight limit which ensures the monopoly in the market.

BTK is still giving licenses for the incoming liberalisation. Until now, 28 company acquired the licence. Of them, four is for İstanbul, one for İzmir, one for Ankara and the rest is national licenses including PTT Corp.
Despite the current monopoly situation and the reserved area is not mentioned in the legislation yet, Some competitors have already active in the market especially in İstanbul and breaching the law using their cost advantage.

PTT Corp.

PTT Corp. is the government-owned postal monopoly of Turkey. Established in 1840, the postal giant employs around 40,000 people with more than 4482 offices in Turkey which are consist of self-operated stores and agencies.

There are three operation sides of the company First and the most important one is Post Division (1,500 million TL in 2014) which it creates most of its revenue. The others are Logistics Division (200 million TL) and Postal Payment system.

The postal division operates in a monopolistic market while the logistics sector conditions were liberal. Therefore, it can be seen that the postal market is critical for the company.
The addressed bulk mail demand is decreasing rapidly around 10%. On the contrary, the revenue is increasing mostly due to the price increasing and increase in the registered mail and the letter of notice.

Discussion

After the liberalisation, it could be seen that the supply chain of PTT Corp. will be disrupted by two type of market entry.

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In bypass type, the new entrants will choose big cities such as İstanbul, Ankara and İzmir. From these three, İstanbul will be the most important one because nearly all of the bulk mail customers such as banks and telecommunication companies based on there. Additionally, it is the densest area in the country. With the increase technological substitution, this would be a double revenue and volume loss for the company. So far, with the price increases, the amount lost seems to be compensated. However, after the liberalisation, it won't be easy to raise prices because of the competition. The Uniform Price tag could be an obstacle in this situation. It can be said that, as in United Kingdom or Sweden, the cream-skimming effect can be seen in İstanbul Ankara as well. It is also important that 4 of the 28 licences are for İstanbul only, and the competition is ready to start.

High competition means lower volumes because the market is not growing. These small amounts would make the incumbent's supply chain less profitable and it can even put the US in danger if the company can't compensate it with the E-Commerce increase.

The second disruption will come from the access type of entry. Where the new entrants find unprofitable to operate, they would use the incumbents supply chain. In this scenario, it would be mostly the downstream supply chain of the PTT Corp.. These would cause incumbent to lose more revenue because the price of the access would be lower than the uniform price.

Overall, the liberalisation will affect the PTT Corp.'s mail supply chain from two sides. First, the new entrant could bypass the incumbents supply chain and establish its own in densely populated areas. Second, they can use PTT Corp. supply chain where they find unprofitable such as downstream in the small populated areas. These facts could lead to loss of revenue. With the technological substitution, even the universal service would be in danger. PTT Corp.'s should, therefore, focus on more efficient and lean supply chain. It should also listen to customer expectations more carefully and design the post offices for that reason.

Conclusion and Further Study

While this study does not give an exact answer to the future event, it gives some clear answers about what would happen to the PTT Corp.'s supply chain in the case of liberalisation and the possible types of market entry using the examples from EU cases. If the policy makers knew what would happen to their supply chain and how to react it with a plan, it would be easier to compete and they can be ready for the incoming liberalisation. Therefore, this paper would fill the gap on the deregulation effect of the mail supply chain in Turkey and give additional options for policymakers. The further study would include the calculation of the future demand and prediction of the competition by using mathematical models.

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PRECONCENTRATION AND DETECTION OF SOME METALS WITH CLOUD POINT EXTRACTION VIA 5,7-DIIODO-8-HYDROXYQUINOLINE LIGAND BY USING USN-ICP-OES AND INTERNAL STANDARD TECHNIQUE

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In this study, a method was developed in order to preconcentration some heavy metal ions (Cu^{+2} Zn^{+2}, Ni^{+2}, Cd^{+2}, Co^{+2}, Pb^{+2}) in water samples via cloud point extraction and detected by using USN-ICP-OES (Ultrasonic Nebulizer Inductively Coupled Plasma-Optical Emission Spectrometry) technique. During this process, the metal ions which were complexed with 5,7 diiodo-8-hydroxyquinoline in Triton X-114 surfactant environment. Then, they were imprisoned in the mycelium, after phase separation via centrifuge, rich in surfactant phase and diluted with 2 M HNO_3 and determined by USN-ICP-OES technique. In order to reduce noise and errors internal standard was used. pH, surfactant concentration, ligand concentration, equilibration time, temperature and foreign ion effects have been searched for optimum conditions. LOD rates of the metals(Cu^{+2}, Zn^{+2}, Ni^{+2}, Cd^{+2}, Co^{+2} and Pb^{+2}) at optimum conditions (pH=7, 0.1 mmol L^{-1} 5,7-diiodo-8-hydroxyquinoline, 0.06 % (w/v) Triton X-114) were found as 0.076, 0.300, 0.081, 0.022, 0.033 and 0.049 µg L^{-1}. RSD % was determined between 2.08 % and 6.28 % (n=10). Developed method has been successfully applied to certified reference material and real water samples.

Keywords: Preconcentration; Cloud point extraction; Triton X-114; 5,7-diiodo-8-hydroxyquinoline; ICP-OES.

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PREDICTION OF ASH CONTENT FOR COARSE CLEAN COAL PREPARED WITH HEAVY MEDIUM DRUM BY ARIMA(1,0,1) MODEL

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Abstract: The aim of this research is to model the ash content of +18 mm clean coal product obtained by a heavy medium drum at Dereköy coal preparation plant in Turkey by a time series model. The drum was operated 355 days in 2010 and its one year of daily as-received ash content data of +18 mm clean coal was used for evaluation by an ARIMA time series model. The ash data was found non-normal distribution and to fit log-normal distribution well. The ARIMA(1,0,1) time series model determined for the log-transformed data was the best model to represent the ash content of +18 mm coal. This model was shown to be used conveniently within the 95% confidence interval for estimating the ash contents that will be produced in short time period.

Keywords: Coal preparation, heavy medium drum, ash content, lognormal distribution, ARIMA(1,0,1) model

Introduction

Coal is one of the most important energy sources in the world. Turkey has about 12.88 billion tons of coal reserves (Özbayoğlu, 2013). The 11.56 billion tons of these reserves are low quality lignite and the rest is bituminous coals (Özbayoğlu, 2013). Prior to usage of coals, it is necessary to remove some constituents which cause problems during their combustion process in terms of recovery and environmental aspects. This is done by applying coal preparation techniques. Coal washing is the most important method to improve coal quality. In general, coals are washed by using density differences between coal and ash bearing constituents. Depending on the particle size of coals, heavy medium drums and vessels are used for the coarsest coals, heavy dense cyclones are used for relatively fine coals and spirals are used for the fine coals treatment.

During the desired quality coal production, it is necessary to estimate the coal quality for near future and hence to model the coal quality data obtained. The data structures in nature obtained from mineral processing are suitable for time series modeling since data characteristics are random and probabilistic (Ketata and Rockwell, 2008; Ganguli & Tingling, 2001) and these continuous processes can be considered discrete processes (Trybalski & Cieply, 2000). Some examples of time series model applications on coal production have existed in the literature (Cheng, et. al., 1982; Ganguli & Tingling, 2001; Gleit, 1985; Huang, et., al., 2002; Taşdemir, 2012; Taşdemir, 2013; Taşdemir, 2016).

In this research, ash content data obtained from heavy dense drum device at Dereköy coal washing plant in Soma, Turkey were used. Previous studies that carried out for Dereköy coal preparation plant showed that ash content of coals could be modelled successfully by ARIMA(1,0,2) model for -0.5+0.1 mm clean coal product of spiral (Taşdemir, 2013), ARIMA(2,0,0) or AR(2) model for the -18+10 mm and -10+0.5 mm clean coal products of the first heavy dense cyclone (Taşdemir, 2016a and 2016b). In addition, moisture content and ash contents of -18+0.5 mm middling product of second heavy dense cyclone have been found to be modelled by ARIMA(1,0,1) and ARIMA(0,1,2) time series model respectively at Tunçbilek coal washing plant in Turkey (Taşdemir, 2012).

Since, there is no information about time series models in literature that can be used for the estimation of ash content for the coals prepared with heavy medium drums, this research aims to model ash content data of clean coarse coals produced by a heavy medium drum at Dereköy coal preparation plant. By using one year ash content data of +18 mm clean coals prepared by heavy media drum, the most suitable time series model that can be used for the prediction of ash content have been determined and actual ash contents are compared with ash contents predicted by ARIMA model.

Materials and Methods

Daily ash content of +18 mm coarse clean coals were obtained from Dereköy coal preparation plant in Soma, Turkey. The ash content data belong to 2010 year. Simplified flowheet of plant is presented in Figure 1. This flowsheet is modified from Şengül (2008). As seen, particle size of run of mine coals is first reduced to -150 mm and then screened by 18 mm sieve. The +18 mm fraction is washed by a heavy medium drum with two

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compartments. The cleanest coals are produced in the first compartment of drum and the materials which are sunk in the first compartment are send to second compartment to obtain middling and shale products. In this research, the ash content of +18 mm clean coal data was used. Sample point of this product is shown as star symbol in Fig. 1. The data 355 ash content data in total were used in this work.

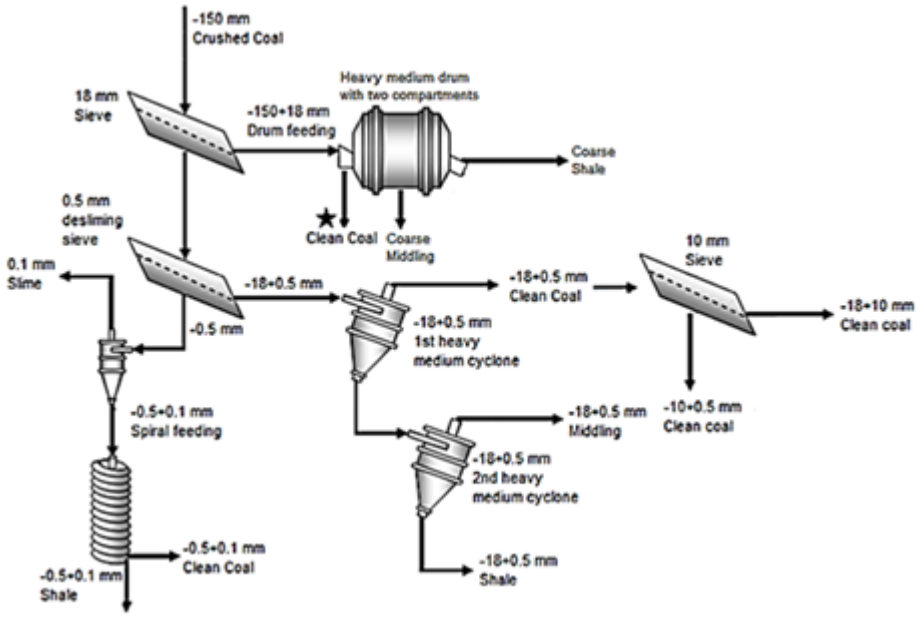

Figure 1. Flowsheet of Dereköy coal washing plant showing +18 mm coarse clean coal product of heavy medium drum which is shown as a star symbol. Modified from Şengül (2008).

The ash content data were evaluated by ARIMA(*p,d,q*) time series models. The model which gave the lowest AIC (Akaike information criterion) was chosen as the best describing time series model for the +18 mm clean coals. Many published books exist about data analysis by ARIMA models. Detailed information about ARIMA time series models and model selection methods can be found in books of Montgomery et al., (2008) and Montgomery & Runger (2011) therefore more information will not be presented again in detail here. Trial versions of Statgraphics XV and Minitab 16.0 software were used for determining of data properties and time series model.

Results and Discussion

Data Properties of +18 mm Ash Content Data

Summary of ash content of +18 mm data is given in Table 1.As seen in Table 1, average of one year ash content data produced by heavy dense drum is 12.85 with a standard deviation of 1.90. The standardized skewness and standardized kurtosis values can be used to determine whether the sample comes from a normal distribution. For a normal distribution, values of these statistics should be inside the range of -2 to +2. Standard skewness and kurtosis values of +18 mm coal ash content were 7.89 and 13.99 respectively. These results indicate that ash content data departure from normality significantly.

Table 1: Summary Statistics for the ash content of +18 mm clean coal

Count	355
Average	12.85
Standard deviation	1.90
Coeff. Of variation	14.78%
Minimum	8.41
Maximum	23.72
Range	15.31
Stnd. skewness	7.89
Stnd. kurtosis	13.99

Box-Whisker and histogram plots for +18 mm ash content are given in Fig. 2. These plots show that the data have important outliers

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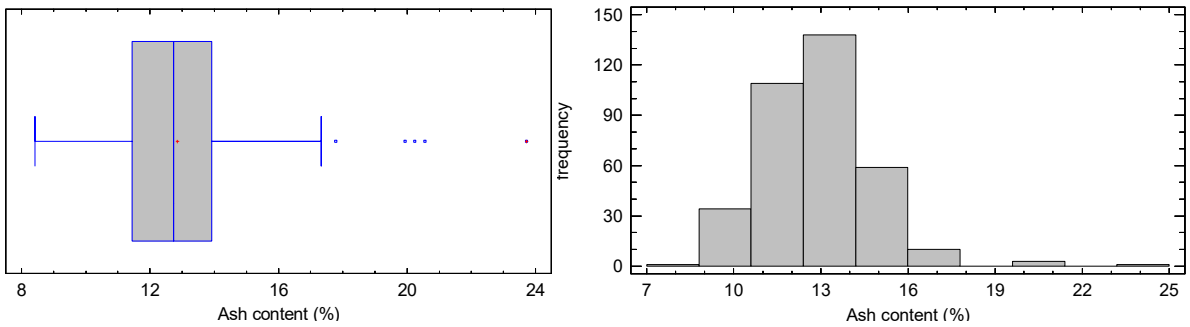

Figure 2. Box-Whisker and histogram plots for +18 mm ash content

Normal probability and symmetry plots of ash content are presented in Fig. 3. Whole plots in Fig. 2 and Fig. 3 support the information in Table 1. As seen in Box-Whisker plot in Fig. 2, there are many outliers and it can easily skew normally distributed data. This may be the reason for non-normality distribution of ash content data. Both normal probability plot and symmetry plots in Fig. 3 support this. The ash content data skewed to right (Fig. 3b) and Anderson-Darling (AD) test confirm non-normality since *p* value of AD test is <0.005 (Fig. 3a).

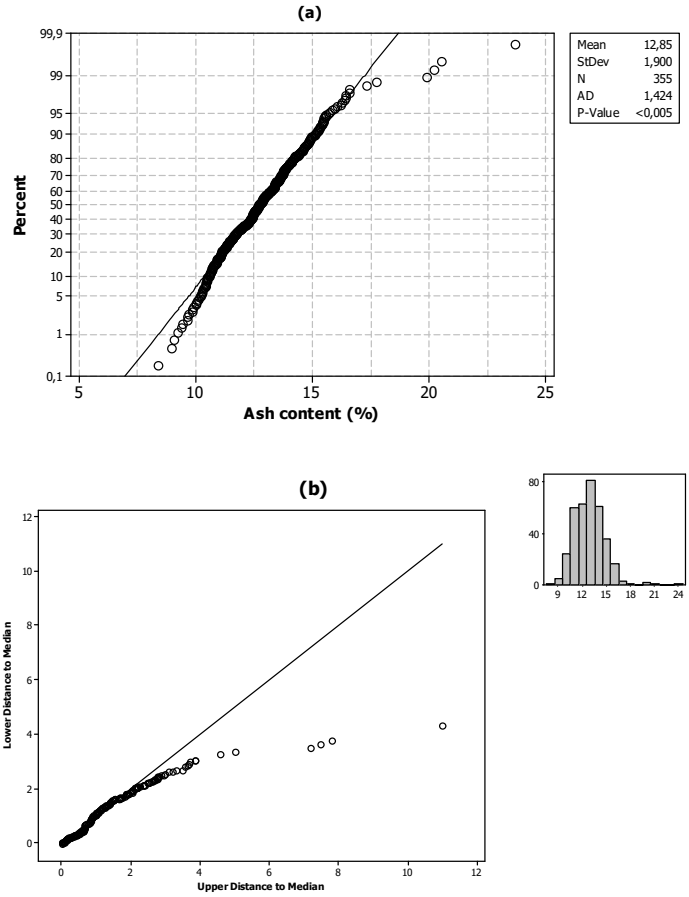

Figure 3. Normal probability (a) and symmetry (b) plots for +18 mm ash content

The ash content data were tested by some distribution functions and transformation methods. The probability plots of results obtained are given and compared with normal distribution plot and Anderson Darling (AD) test results in Fig. 4. Lognormal distribution, Box-Cox and Johnson transformation have *p* values higher than 0.05 (Figs. 4b, 4c and 4d). However, both lognormal distribution (Fig.4c) and Johnson transformation (Fig.4d) have the same *p* values of 0.176 and give better results than Box-Cox transformation (Fig.4b). In this research, lognormal distribution was chosen since it is more simple transformation method than Johnson transformation.

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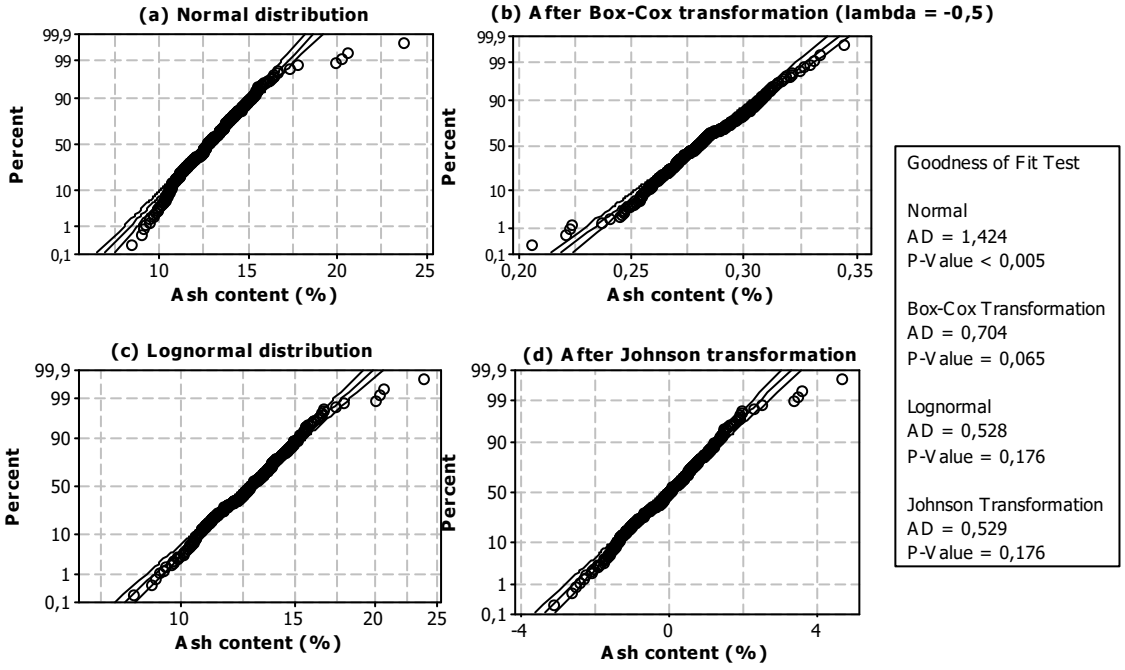

Figure 4. Probability plots for +18 mm clean coal with 95% confidence interval

Time Series Analysis of Ash Data

Time series plots of original and log transformed ash content data are comparatively presented in Fig. 5a and 5b respectively. Since original ash data do not obey normal distribution, log transformed ash content data in Fig. 5b will be considered during the determination of ARIMA(*p,d,q*) time series model. As seen the data are stationary indicating that there is no need to take any difference to make data stationary. Therefore, the *d* value is zero (0) in the ARIMA(*p,d,q*) model, i.e. the model will be ARIMA(*p,0,q*).

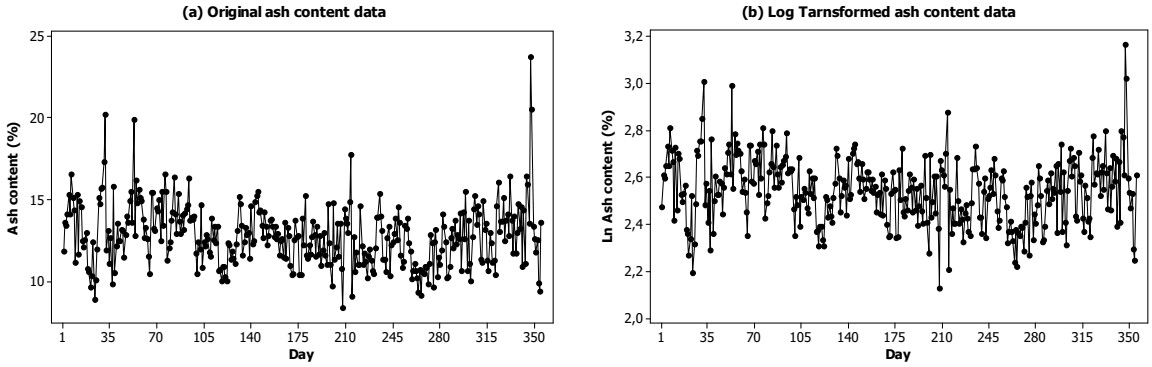

Figure 5. Time series plots of original (a) and log transformed (b) ash content data

Fig. 6 show scatter plot presenting the possible correlation of current log transformed ash data value (*T*) with its previous log transformed ash data (*T-1*). As seen clearly, there is a considerable correlation between two consequent ash data values. In order to determine the correlation degree, autocorrelation function (ACF) and partial autocorrelation function (PACF) plots were generated for 60 lags. The results of ACF and PACF plots with 5% significance level are shown in Fig. 7a and 7b respectively. According to PACF plot in Fig 7a, autocorrelation decays after few lags and then remains 95% confidence limits indicating the data stationary as determined previously. Fig. 7b shows that the ash content data have one important autocorrelation at first lag and then at the second lag. We estimated autocorrelation coefficients of ash content data at first lag is 0.388 and second lag is 0.325 (Fig. 7a). These results indicate that ash content data have considerable autocorrelation and should be taken into account.

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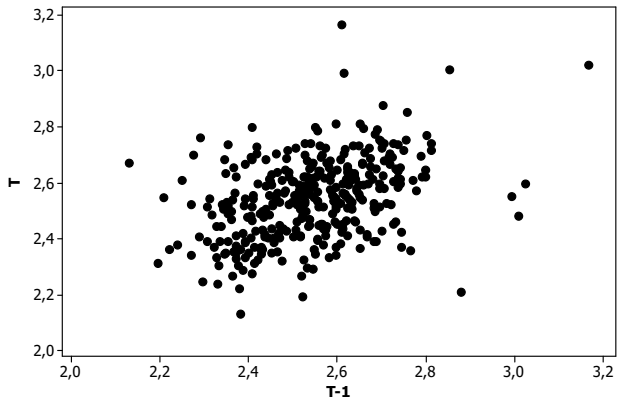

Figure 6. Scatter plot of ash content data, *T* versus *T-1*

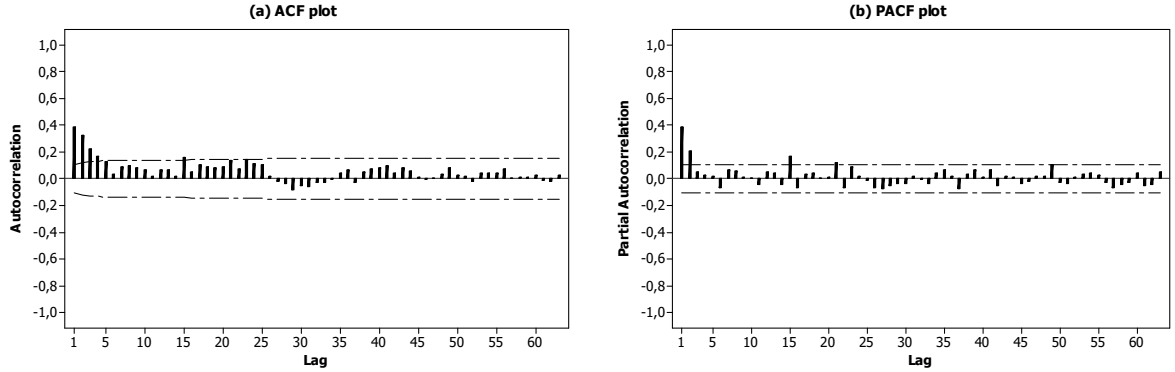

Figure 7. Autocorrelation function (ACF) (a) and partial autocorrelation function (PACF) (b) plots of log transformed ash content data with 5% significance limits

Table 2 compares the results of fitting different time models to the ash content of +18 mm clean coal data. As seen in Table 2, ARIMA(1,0,1) model is the lowest value of the Akaike Information Criterion (AIC), therefore it has been selected to generate the ash content forecasts. Parameters of ARIMA(1,0,1) model is shown in Table 3. Table 3 summarizes the statistical significance of the terms in the forecasting model of ARIMA(1,0,1). Terms with *p* values less than 0.05 are statistically significantly important at the 95% confidence level. The *p* values for the AR(1), MA(1) and mean terms were found less than 0.05, all of them are significantly different from 0 (Table 3). The estimated standard deviation of the input white noise equals 0.1289.

Table 2: Time series model comparisons for ash content estimation

Models	*RMSE**	*AIC*
ARIMA(1,0,1)	0.129306	-4.07425
ARIMA(2,0,0)	0.129393	-4.07289
ARIMA(2,1,1)	0.129451	-4.072
ARIMA(1,1,2)	0.129592	-4.06983
ARIMA(2,0,1)	0.129366	-4.06769

**: Root Mean Squared Error*

Table 3: ARIMA(1,0,1) Model summary

Parameter	*Estimate*	*Stnd. Error*	*t*	*p value*
AR(1)	0.768799	0.074445	10.3271	0.000000
MA(1)	0.46089	0.102183	4.51042	0.000009
Mean, μ_0	2.54279	0.015762	161.324	0.000000
Constant, δ	0.587895			

Estimated white noise variance (σ_a^2)= 0.0166; Estimated white noise standard deviation (σ_a)= 0.1289

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For a good time series model, the residuals should be independent and identically distributed (*i.i.d*). To determine these properties, diagnostic tests were carried out whether the residuals of the model obey normal distribution and have no autocorrelation to determine the model adequacy for the ash content data. Fig. 8 shows the normal probability ARIMA(1,0,1) model residuals. The model residuals fit the normal distribution very well according to the AD normality test result (*p*=0.640) (Fig. 8). Residuals were also controlled for the autocorrelation. The generated ACF and PACF plots for the model residuals within the 5% significance limits are presented in Fig. 9a and 9b respectively. As seen clearly, the autocorrelations are within the 95% confidence intervals suggesting that there are no autocorrelations between consecutive residual values. All these results indicate that the ARIMA(1,0,1) model is adequate enough to forecast ash content of +18 mm coals obtained by heavy dense drum.

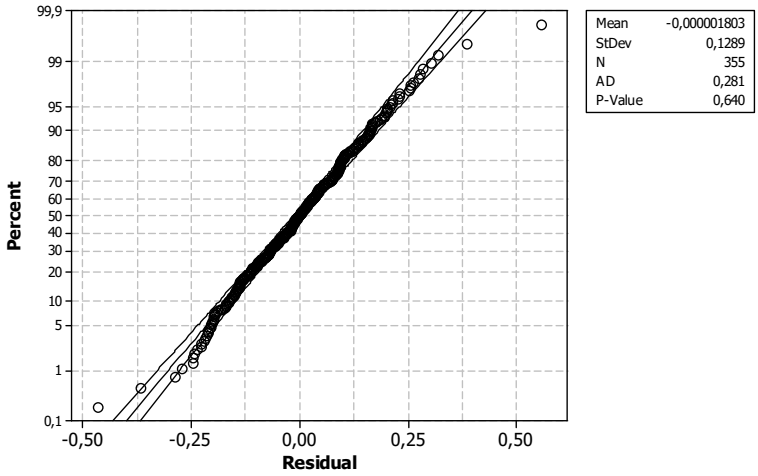

Figure 8. Residual normal probability plot of ARIMA(1,0,1) model for log transformed ash data

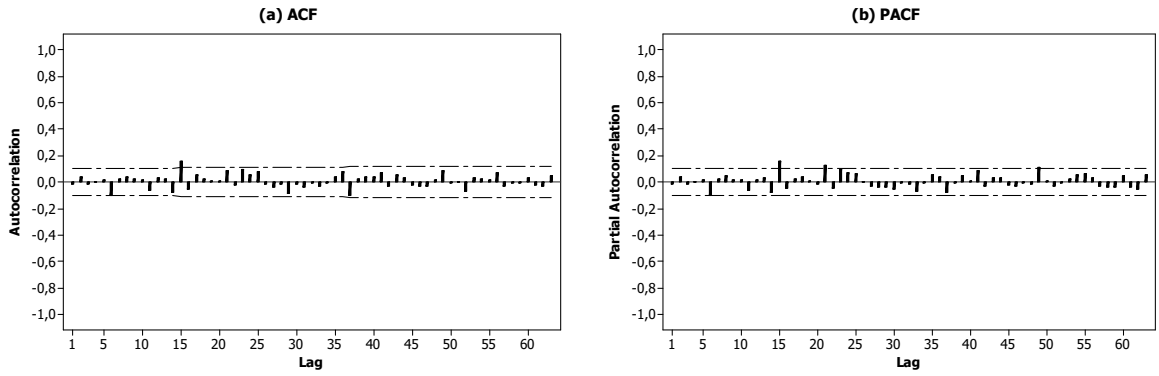

Figure 9. Autocorrelation function (ACF) (a) and partial autocorrelation function (PACF) (b) plots of residuals for ARIMA(1,0,1) model with 5% significance limits

As stated above, the ash content of +18 mm clean coal produced by heavy medium drum, X_t, can be modelled by ARIMA(1,0,1) or ARMA(1,1) model well. General description of ARIMA (1,0,1) model is (Castagliola and Tsung, 2005):

$$X_t = (1-\phi)\mu_0 + \phi X_{t-1} + \theta a_{t-1} + a_t \qquad (1)$$

Where X_t is the observation at time t=1, 2, ,…, a_t is the random noise or white noise at time =1, 2, ,… which is assumed to have mean of zero (0) and standard deviation of σ_a, ϕ is the autoregressive parameter of the model which corresponds to p term in the model, θ is moving average parameter which corresponds to q term in the model and μ_0 is the nominal mean of the process and δ is the constant calculated from $\mu_0(1-\phi)$, (Castagliola and Tsung, 2005).

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The ash content data can be modelled by applying ARIMA(1,0,1) process with $\mu_0 = 2.5428$, $\phi = 0.7688$, $\theta = 0.4609$, where the a_t have a normal distribution with mean of zero and $\sigma_a = 0.1289$. Therefore, the ARIMA(1,0,1) time series model that can be used for the ash content of +18 mm clean coal produced by heavy medium drum is:

$$X_t = 0.5879 + 0.7688X_{t-1} + 0.4609a_{t-1} + a_t \quad (2)$$

Where, X_t is the log transformed ash value at time, a_t is the random noise which have distribution of N(0, 0.1289). Fig. 10 shows the actual and forecasted log transformed ash contents by ARIMA(1,0,1) model (Eq. 2). There are good agreement between the actual and forecasted ash content values in Fig. 10. This result indicates that ARIMA(1,0,1) model determined is adequate enough for the near future prediction of ash content.

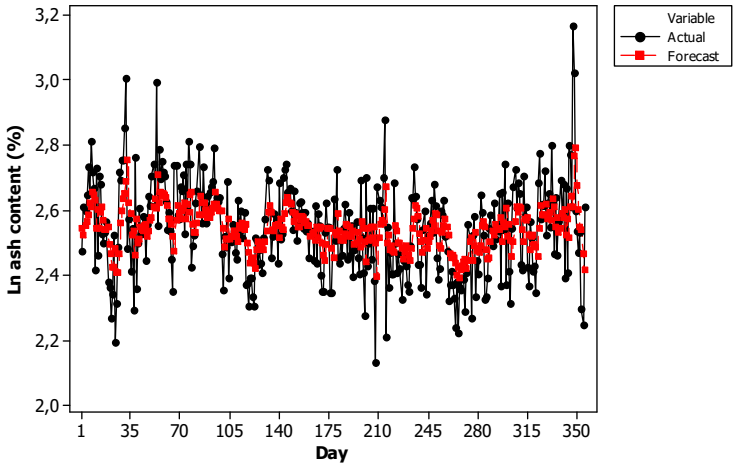

Figure 10. Actual Ln ash content versus forecasted ash content by ARIMA(1,0,1) time series model

Conclusion

Detailed examination of daily ash content of +18 mm clean coal product produced by heavy medium drum showed that ash content data obtained were not obey normal distribution due to the outliers. The ash content data were determined as skewed to the right. The normality can be achieved by both lognormal distribution and Johnson transformation. Since taking natural logarithm was easier than Johnson transformation, ARIMA time series model selection was applied log transformed ash values. No differencing operation was applied to ash data since the data were stationary with time. According to the AIC values of times series tested, the ARIMA(1,0,1) or ARMA(1,1) was determined the best time series model to forecast of ash content values for +18 mm clean coal product. The residuals of model have a distribution of $N(0, 0.1289)$ and no autocorrelation. Since the actual and forecasted ash values are good agreement, the ARIMA(1,0,1) model can be used conveniently for near future estimation of the ash content of +18 mm clean coal to be produced by heavy medium drum. It is suggested that time series models that can be used for the other quality characteristics of coal such as moisture, calorific value, sulphur content etc. can be developed to forecast them.

Acknowledgements

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PREPARATION OF ACTIVATED CARBON FROM APRICOT STONES WASTE AS LOW-COST ADSORBENT FOR REMOVAL OF FOOD DYE FROM AQUEOUS SOLUTION

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Abstract: Activated carbon is one of the most widely used adsorbents due to their high adsorption capacity. As a result, the demand for activated carbon is increasing. However, activated carbon is expensive which limits its large-scale application. A potential method to reduce its cost is to produce activated carbon from low-cost materials and methods. In this study, activated carbon as a novel adsorbent was prepared from low cost and locally available source such as apricot stones. The surface properties of this new adsorbents were identified with various techniques such as BET and SEM analysis. The use of activated carbon obtained from apricot stones prepared by KOH activation with microwave treatment for the removal of FD&C Red 40, from aqueous solitions at different adsorbent dosage, contact times and solution temperatures was investigated. FD&C Red 40 is used in food, pharmaceutical and cosmetics industries. The experimental adsorption equilibrium data were compared with the Langmuir, Freundlich, DR (Dubinin-Radushkevich) and Temkin isotherm models and the isotherm model parameters were determined. Pseudo-first-order and pseudo-second-order equations were fitted to the kinetic data, and the rate constants were evaluated. It was found that kinetics followed a pseudo-second-order equation. Thermodynamic study showed that the adsorption was a spontaneous and endothermic process.

Keywords: Activated carbon, Adsorption, Food Dye, FD&C Red 40, Isotherm, Microwave, KOH Activation, Apricot Stones.

Introduction

Dyes are widely used in food, textile, printing, leather, paper, dye, plastic, rubber, cosmetic, and automotive industries. There are more than 100,000 commercially available dyes with over 700,000 tons produced annually. It is estimated that more than 70,000 tons of dye are discharged from textile industries in the world every year. The discharged of colored wastewater causes serious environmental problems (Erdogan and Oguz Erdogan 2016). In addition, some dyes are classified as toxic or harmful chemicals and may cause allergies, irritation, and cancer in humans. For the removal of dyes from wastewater, adsorption methods are economical, successful, and efficient. Activated carbon is one of the most widely used adsorbents due to their high adsorption capacity. As a result, the demand for activated carbon is increasing. However, activated carbon is expensive which limits its large-scale application. A potential method to reduce its cost is to produce activated carbon from low-cost materials and methods. Various materials such as almond shells (Nabais et al. 2011), pistachio shells (Foo and Hameed 2011b), oil palm fruit bunches (Foo and Hameed 2011d), date Stones (Foo and Hameed 2011c), peanut hulls (Zhong et al. 2012), orange peels (Foo and Hameed 2012c), durian shells and jackfruit peels (Foo and Hameed 2012a), date sphates (Emami and Azizian 2014), cherry stones (Oguz Erdogan 2016; Erdogan and Oguz Erdogan 2016) and peach stones (Uysal et al. 2014) have been used in activated carbon production as dye adsorbents. In recent years, microwave heating has been employed for activated carbon preparation. The main advantages are the short activation time and lower energy consumption. The preparation of activated carbon under microwave radiation from sewage sludge, cotton stalks, bamboo, mangosteen, coconut shells and cherry stones by $ZnCl_2$ activation, H_3PO_4 activation, KOH activation, NaOH activation and K_2CO_3 activation were reported in previous studies (Deng et al. 2010; Liu et al. 2010; Yang et al. 2010; Foo and Hameed 2012b; Lin, Cheng, and Chen 2012; Erdogan and Oguz Erdogan 2016; Oguz Erdogan 2016).

The main objects of this study are: (i) to study the feasibility of using the activated carbon produced from apricot stones as a low-cost adsorbent for the removal of FD&C Red 40 dye , (ii) to determine the various parameters affecting sorption, such as contact time, amount of adsorbents and temperature, (iii) to determine the applicability of various isotherm models ((i.e., Langmuir, Freundlich Temkin and DR) to find out the best-fit isotherm equation, and (iv) to determine thermodynamic and kinetic parameters and explain the nature of adsorption.

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Materials and Methods

Adsorbate

The commercial food dye FD&C Red 40 ($C_{18}H_{14}N_2O_8S_2Na_2$, molecular weight 496.4 g/mol, C.I. 16045, λmax=500 nm, pKa= 11.4, chemical structure shown in figure 1) was supplied by Sigma-Aldrich. Distilled water was used to prepare all solutions.

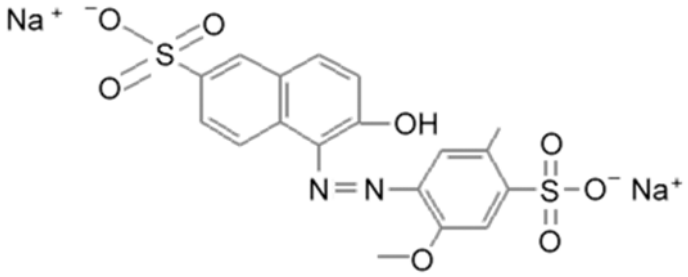

Figure 1. Chemical structure of FD&C Red 40.

Adsorption equilibrium studies

Adsorption of FD&C Red 40 on activated carbon was studied by batch experiments. Equilibrium adsorption studies were conducted in a set of 50 mL capped volumetric flasks containing different amounts of adsorbent weights in the range of 0.02-0.035 g/L, 20 mL initial concentrations of FD&C Red 40 solutions (150 mg/L). Flasks were shaken in a mechanical shaker (GFL 1086) at 100 rpm and different temperature (30, 40 and 50°C). After adsorption, samples were filtered and then the concentrations of FD&C Red 40 in the supernatant solution was analyzed. All concentrations were measured by using UV spectrophotometer (LaboMed Inc.) at 500 nm. The adsorption efficiency E is calculated using Eq. (1):

$$E = \frac{(C_0 - C_e)}{C_0} 100 \quad (1)$$

where C0 and Ce (mg/L) are the liquid-phase concentrations of dye at initial and equilibrium, respectively. The FD&C Red 40 uptake at equilibrium, qe (mg/g), was calculated using Eq. (2):

$$q_e = \frac{(C_0 - C_e)V}{W} \quad (2)$$

where V (L) is the volume of the solution, and W (g) is the mass of adsorbent used. The equilibrium data were simulated using the Freundlich, Langmuir Temkin and DR isotherm models.

Adsorption kinetics

Kinetic adsorption experiments were carried out by adding 0.02 g/L adsorbent to 20 mL of 150 mg/L FD&C Red 40 dye aqueous solutions at 30, 40 and 50°C at optimum pH. The uptake of FD&C Red 40 at time t, q_t (mg/g) was calculated by the following equation:

$$q_t = \frac{(C_0 - C_t)V}{W} \quad (3)$$

where C_t (mg/L) is the liquid-phase concentration of dye at time t (min).

In order to predict adsorption behavior of FD&C Red 40 on activated carbon, pseudo-first-order and pseudo-second-order kinetics equations which are described as Eqs. (4) and (5), respectively, were applied for modeling experimental data [6, 10-11]

$$log\left(q_e - q_t\right) = log\, q_e - \frac{k_1 t}{2.303} \quad (4)$$

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$$\frac{t}{q_t} = \frac{1}{k_2 q_e^2} + \frac{t}{q_e} \quad (5)$$

where k_1 (1/min) and k_2 (g/mg min) are the adsorption rate constants of the pseudo-first-order and pseudo-second-order, respectively.

Adsorption Thermodynamics

To describe thermodynamics behavior of the adsorption of FD&C Red 40 dye onto activated carbon, thermodynamics parameters including the change in free energy (ΔG°), enthalpy (ΔH°) and entropy (ΔS°) were calculated as per the following equations:

$$\Delta G° = -RTlnKc$$

$$lnK_C = -\frac{\Delta H^\circ}{RT} + \frac{\Delta S^\circ}{R}$$

where R is the universal gas constant (8.314 J/mol K), T is the temperature (K) and $K_C = C_{ads}/C_e$ is the equilibrium constant of the FD&C Red 40 adsorption equilibrium (which is a ratio of C_{ads}, the FD&C Red 40 concentration in the adsorbent, and C_e, the FD&C Red 40 concentration in the adsorbate.

Results and Discussion

The surface physical properties of activated carbon were characterized with an automated gas sorption apparatus using N_2 as adsorbate at 77.4 K. Nitrogen adsorption is a standart technique widely used for the determination of porosity of adsorbent. Figure 2 shows the pore size distribution from Density Functional Theory (DFT) of the activated carbon. The pore structure of the activated carbon was calculated by the t-method analysis from the adsorption branch of the nitrogen isotherms (Oguz Erdogan 2016; Erdogan and Oguz Erdogan 2016).

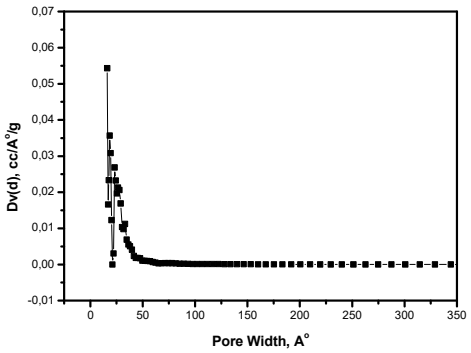

Figure 2. Pore size distribution of the activated carbon produced from apricot stones.

Table 1 shows the BET and Langmuir surface areas, total pore volume, micropore volume and avarage pore size for the produced activated carbon. The average pore size of the activated carbon was 26.99 Å with micropores and mesopores. The presence of micropores in combination with mesopores is expected to play significant role in adsorption of large molecule such as FD&C Red 40 dye.

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Table 1: Textural parameters of the produced activated carbon.

Properties	produced activated carb**on**
Brunauer-Emmett-Teller Surface Area (m^2/g)	1100
Langmuir Surface Area (m^2/g)	1780
Total Pore Volume (mL/g)	0.598
Micropore Volume (mL/g)	0.402
Average Pore Size (Å)	26.99
Microporosity (%)	67.2

The surface morphology was characterized by scanning electron microscopy (SEM). An image of the microstructures of the activated carbon is shown in Figure 3, showing many cavities and pores of various sizes and shapes.

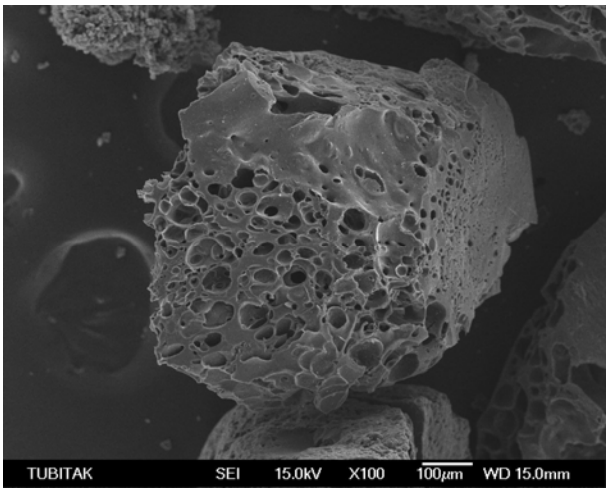

Figure 3. SEM micrographs for the apricot stones-derived adsorbent.

Figure 4 showed that the adsorption capacities at equilibrium (q_e) decreased with an increase in adsorbent dose from 0.02 to 0.08 g/L. This is explained as a consequence of partial aggregation, which occurs at high adsorbent amount resulting in decreased active sites. A similar phenomenon was reported by Huang et al., Rubin et al., and Nweke and Okpokwasili. In a batch of adsorption studies, the adsorption efficiency (E) increased from 49.59% to 73.06% when the adsorption dosage of activated carbon increased from 0.02 to 0.08 g/L at 40 °C. Similar results have also been observed in other temperatures. This finding agrees with the recent work by Huang et al. and Kosa et al.

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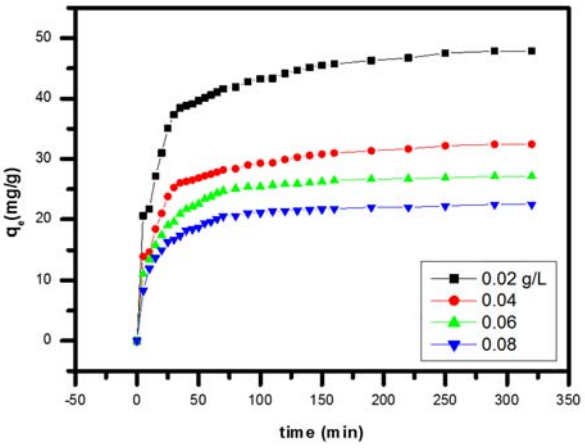

Figure 4. Effects of adsorbent dosage and contact time on the adsorptive uptake of food dye onto the apricot stones-derived adsorbent (conditions: C0=150 mg/L; temperature=40 °C).

The temperature dependence of FD&C Red 40 sorption onto apricot stones-based activated carbon was studied at optimum adsorbent dosage of 0.02 g/L. Figure 5 shows that the food dye adsorption increased with temperature, which may be attributed to the enhanced reaction rate with higher temperature. A possible explanation is that high temperature extends the pore volume and surface area and provides more chances for FD&C Red 40 dye to pass the external boundary layer and penetrate more easily. This corroborates the reports of our previous study (Erdogan and Oguz Erdogan 2016) . Similar behavior has been reported in the literature (Huang et al. 2015; Emami and Azizian 2014).

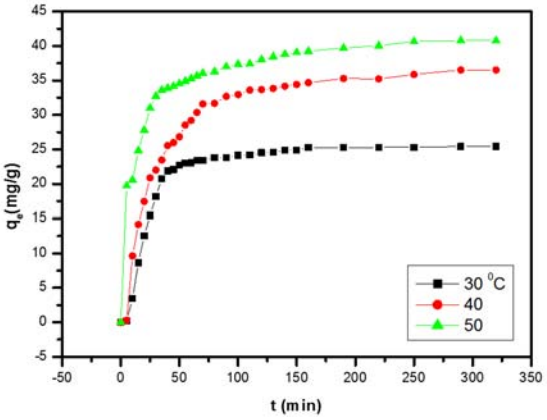

Figure 5. Effect of solution temperature on the adsorption food dye onto the apricot stones-derived adsorbent (conditions: W=0.02 g/L; C0=150 mg/L).

Adsorption Isotherms

The equilibrium adsorption isotherms are essential to the practical design and optimization of adsorption process. The adsorption isotherm describes how adsorbates interact with adsorbents. The equilibrium data of food dye adsorption on to activated carbon was explored using the isotherm model of Langmuir, Freundlich, DR and Temkin. The parameters obtained of the four isotherm models were calculated and represented in Table 2. The correlation coefficients descended in the order of: Langmuir> Freundlich> Temkin> DR. The results revealed that the adsorption of food dye on apricot stones-based activated carbon was best described by the Langmuir isotherm, indicating the adsorption was homogeneous and a monolayer was present.

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Table 2: Freundlich, Langmuir, Temkin and DR isotherm constants for the adsorption FD&C Red 40 onto apricot stones-derived adsorbent at 30 °C

Isotherms	Parameters		
Freundlich	K_F (mg/g)(L/mg)$^{1/n}$	n	R^2
	1.37	1.08	0.873
Langmuir	Q_0(mg/g)	K_L (L/mg)	R^2
	278.75	0.00218	0.888
Temkin	A (L/g)	B	R^2
	0.053	86.33	0.868
DR	qm(mg/g)	E(kJ/mol)	R^2
	48.55	15.09	0.833

Langmuir adsorption isotherm constant related to adsorption capacity, Q_0 were found as 278.75 mg/g. To confirm the favorability of the adsorption, the separation factor R_L was calculated by

$$R_L = \frac{1}{1+K_L C_0}$$

where the adsorption process to be either unfavorable ($R_L > 1$), linear ($R_L = 1$), favorable ($0 < R_L < 1$) or irreversible ($R_L = 0$). Here, the value of R_L was found to be 0.752, which further confirmed that the Langmuir isotherm was favorable for of food dye on the produced activated carbon. Similar observation was reported for the adsorption of methylene blue dye onto the safflower seed derived activated carbons (Angın et al. 2014). On the basis of obtained results, it can be concluded that this agricultural by product could react with KOH to make effective activated carbon. Similar behavior has been reported in the literature (Soleimani and Kaghazchi 2014). The value of the free energy estimated from the DR model for apricot stones-based activated carbon 8<E<16 kJ/mol indicating that sorption process follows chemical ion-exchange.

Kinetics of adsorption

Adsorption kinetics provides an understanding of the mechanism of adsorption, which in turn governs mass transfer and the equilibrium time. Food dye was adsorbed on activated carbon as a function of time. Pseudo first order and pseudo second order kinetic models were obtained at 30, 40 and 50 °C. The regression coefficients (R^2) were evaluated for both models. Kinetic parameters for the removal of food dye by low-cost activated carbon at 30, 40 and 50 °C for different amounts of adsorbent weights in the range of 0.02-0.08 g/L are presented in Table 3. The higher regression coefficients indicated that the pseudo second order model was a better fit than the pseudo first order model, suggesting the presence of chemisorption. The calculated q_e values obtained from the second order kinetics agree with the experimental q_e values better than the first order kinetics model, indicating adsorption following second order kinetics. The avarage value for k_2 0.00372, 0.00285 and 0.00299 at 30, 40 and 50 °C, respectively. This corroborates the reports of our previous study (Erdogan and Oguz Erdogan 2016). Similar behavior has been reported in the literature (Belaid et al., 2013).

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Table 3: Kinetic model parameters for the adsorption of food dye onto apricot stones-derived adsorbent at different temperature and adsorbent dosage.

			Pseudo first order			Pseudo second order		
T(°C)	m_{ads}(g/L)	$q_{e,exp}$(mg/g)	k_1(min)^1	$q_{e,cal}$(mg/g)	R^2	k_2(g/mgmin)	$q_{e,cal}$(mg/g)	R^2
30	0.02	43.10	0.0138	18.91	0.936	1.78E-3	44.42	0.999
	0.04	29.20	0.0142	13.13	0.963	2.63E-3	30.10	0.999
	0.06	26.31	0.0203	10.17	0.886	4.11E-3	27.23	0.999
	0.08	21.62	0.0233	7.70	0.914	6.37E-3	22. 26	0.999
40	0.02	47.87	0.0152	21.82	0.939	1.65E-3	49.43	0.999
	0.04	32.42	0.0153	14.78	0.940	2.44E-3	33.49	0.999
	0.06	27.14	0.0172	11.87	0.940	3.22E-3	28.15	0.999
	0.08	22.49	0.0159	9.15	0.920	4.07E-3	23.22	0.999
50	0.02	52.45	0.0168	23.33	0.928	1.76E-3	53.97	0.999
	0.04	35.53	0.0168	15.80	0.928	2.6E-3	36.56	0.999
	0.06	29.74	0.0154	11.32	0. 931	3.30E-3	30.59	0.999
	0.08	21.59	0.0168	9.61	0.929	4.28E-3	22.22	0.999

Adsorption Thermodynamics

The values of ΔH° and ΔS°were determined from slope and intercept or the plot of lnK_C vs 1/T are reported in Table 4. The negative values of ΔG° at different temperature studied, are due to the fact that the adsorption of food dye is spontaneous and feasible. The increase in the magnitude of ΔG° with increase in temperature showed an increase in the feasibility of adsorption at higher temperatures (Huang et al. 2015; Rahman and Sathasivam 2015). The positive value of ΔH° indicates an endothermic process which is supported by the increase adsorption of food dye with rise in temperature. The magnitude of ΔH° is very useful in describing the type of adsorption. If the heat of adsorption is between 2.1-20.9 kJ/mol, then the process is physical and if is between 20.9-418.4 kJ/mol, then the adsorption process is chemical. For the this study, the value of ΔH° is 23.874 kJ/mol, which indicate that the adsorption followed the chemical process. This was also supported by DR isotherm results with the 8<E<16 kJ/mol values of food dye onto activated carbon. Furthermore, positive values ΔS° are suggestive of increased randomness at the solid-solution interface during the adsorption process of the food dye on the active sites of adsorbent.

Table4: Thermodynamic parameters for the adsorption of food dye onto apricot stones-derived adsorbent

T(°C)	ΔG^0(kJ/mol)	ΔH^0(kJ/mol)	ΔS^0(J/mol)	R^2
30	-2.512	23.874	86.676	0.922
40	-2.998			
50	-4.258			

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Conclusion

Apricot stones-based activated carbon was used as the low-cost adsorbent to remove food dye from aqueous solutions at various temperature. The adsorption capacity of activated carbon for food dye increased while the temperature of solution was increased. Two kinetic models were tested to analyze the mechanism of adsorption and it was found that pseudo second order kinetic model agreed very well with the dynamic behavior for the adsorption of food dye onto activated carbon. The Freundlich, Langmuir, Temkin and DR isotherm models were used for the mathematical description of the adsorption of food dye onto activated carbon at various temperatures and the results suggested that the adsorption equilibrium data fitted well to the Langmuir model.

Thermodynamic constants were also evaluated using equilibrium constants changing with temperature. The negative value of $\Delta G°$ indicated the spontaneity and it confirm a favorable adsorption of food dye onto activated carbon. As the temperature increased from 30 to 50 °C, the positive values of $\Delta H°$ confirmed that the process was endothermic. The positive value of $\Delta S°$ suggested the increased randomness of the food dye adsorption onto apricot stones-based activated carbon. This study has revealed that apricot stones-based activated carbon can be used as a highly efficient and economically viable adsorbent for FD&C Red 40 dye removal from aqueous solutions.

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PROJE YÖNETİMİ STRATEJİ OLUŞTURMA ETKİNLİĞİNİ ARTTIRACAK BİR MODEL ÖNERİSİ

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ÖZET

Özet: Bu bildiride, proje yönetimi strateji oluşturma etkinliğini attıracak bir model üzerine yapılan çalışma sonuçları sunulmuştur. Süreçlerin görünürlüğünün ve bireyler arası iletişimin arttırılarak hedeflere daha kolay odaklanılması model ile amaçlanmıştır. Hedeflere odaklanmanın sağlanması neticesinde ise yönetimin daha etkin biçimde gerçekleşebileceği beklenmektedir.

Anahtar Kelimeler: Proje Yönetimi, Strateji Oluşturma, Proje Etkinliği, Strateji Hazırlık Düzeyi

Giriş

Küreselleşmenin hemen her alanda hissedilmesi neticesinde kurumların varlıklarını sürdürebilmeleri ancak daha etkin daha yenilikçi sistemler uygulamasına bağlı hale gelmiştir. Kurumlar tarafından icra edilen faaliyetlerin birer proje olarak ele alınarak en etkin biçimde yönetilmesi konusu ise mevcudiyetlerinin devamı noktasında hayati bir süreç olarak karşımıza çıkmaktadır. Her biri ayrı özellik gösteren projelerin yönetimi ise kendine has zorluklar içermektedir. Mevcut zorlukların üstesinden gelmek için uygulanan stratejiler bu noktada önem kazanmaktadır. Proje yönetimi esasları dahilinde strateji oluşturulmasına ilişkin konuların ve süreçlerin etkinleştirilmesi maksadıyla yapılan model önerisi çalışmanın esasını oluşturmaktadır.

Strateji nedir? Kapsamı ne olmalıdır?

Strateji kelime olarak Yunanca "stratos" (ordu) ve "ago'' (gütmek) kelimelerinden elde edilmiştir. Esas itibariyle ise belirli bir amaca ulaşmak için izlenen temel yol veya yaklaşım (Strateji Nedir [web], 2016) anlamını ifade etmektedir. Türk Dil Kurumu tarafından izlem (TDK [web], 2016) olarak Türkçeye çevrilmiştir. Strateji, Fransızca kökene sahip bir terim olup, bir ulusun veya uluslar topluluğunun barış ve savaşta benimsenen politikalara destek vermek amacıyla politik, ekonomik, psikolojik ve askerî güçleri bir arada kullanma bilimi ve sanatı olarak tanımlanmıştır (TDK [web], 2016) . Kelimenin kökeninden de kolayca anlaşılabileceği üzere strateji konusuna ilişkin ilk gelişmeler askeri alanda yaşanmıştır. Bu konuda dünyanın en eski strateji kuramları olarak kabul edilen Sun Tzu'nun düşünceleri Savaş Sanatı (Griffith, 1971) isimli kitapta toplanmıştır. "Mükemmellik her savaşta çarpışarak kazanmak değildir. En iyi strateji savaşmadan kazanmaktır. Akıllılar dövüşmeden kazanır, cahiller kazanmak için dövüşürler." (Demir, 2008) gibi daha çok askeri söyleme dayanan düşünceler ile strateji oluşturmaya ilişkin kuramların temelleri atılmıştır.

Stratejinin gelişimi ilk olarak kendini askeri alanda göstermiş olsa da ilerleyen süreçte diplomasi, politika, ekonomi, yönetim, teknoloji, lojistik gibi çok çeşitli alanlara yayılmış bir kavram olarak karşımıza çıkmaktadır. Stratejiye ilişkin olarak Johnson ve Scholes, pazar ihtiyaçlarını karşılamak ve menfaattarların beklentilerini tatmin etmek üzere, değişen çevre koşullarında kaynakların yönlendirilerek uzun vadede organizasyon için avantaj elde etmek üzere oluşturulan bakış açısı ve yoldur (Johnson&Scholes, 1999) şeklinde açıklama getirmişlerdir. Organizasyonun avantajları ele geçirme sürecinde faaliyetlerini projeler oluşturarak hayata geçirmesi gerekliliği ise net bir şekilde ortadadır. Uygulanacak projelerin belirli bir yöntem ve uzmanlık alanı olduğu ise sarihtir. Bu bağlamda proje yönetim aşamalarını belirli standartlar altında ve kalite anlayışı çerçevesinde gerçekleştirmeyi hedefleyen kurumlardan birisi olarak Project Management Institute önem kazanmaktadır (PMI [web], 2016). Bu kurum tarafından proje yönetiminde oluşturulacak stratejilerin kapsamını; pazar, iş ve müşteri ihtiyaçları, yasal ve sosyal gereklilikler ile teknolojik ilerlemeleri kapsayacak şekilde karar verilmesi konularını içerecek şekilde yapılmasının gerekliliğine değinilmiştir (PMBOK, 2000).

Stratejinin Elementleri

Modern stratejik düşüncenin kurucusu ve stratejik yönetimin babası olarak kabul edilen Rus asıllı matematikçi Igor Ansoff'un düşünceleri stratejilerin yönetilmesi hususunda önemli bir yol gösterici konumdadır (Livvarçin&Kurt, 2014). Hatta öyle ki onun bir takım fikirleri daha sonra bu alanda tanınan kişiler tarafından

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daha da belirgin hale getirilmiştir. Strateji yönetimi alanında saygın kişileri etkileyen fikirlerine genel olarak bakacak olursak rekabetçi avantaj, temel yetenekler, ürün ve pazar alanının net bir şekilde belirlenmesi olarak sıralayabiliriz. Igor Ansoff'un belirttiği bu düşünceler sırasıyla Michael Porter, Gary Hamel ve Coimbatore Krishnarao Prahalad, Tom Peters tarafından ele alınarak bir üst aşamaya taşınmaya gayret gösterilmiştir.

Stratejinin sahip olması gereken elemetler yine Ansoff tarafından 4 başlık altında belirlenmiştir. Bunlar sırasıyla ürün-pazar faaliyet alanı, büyüme vektörü, rekabetsel avantaj ve sinerji olarak sınıflandırılmıştır (Ansoff, 1957).

Stratejinin Sınıflandırılması

Micheal Porter tarafından rekabetçi avantajın şirketler tarafından sağlanması hususuna yönelik stratejinin sınıflandırılması oluşturulmuştur. Stratejik güç ve stratejik kapsamı içeren sınıflandırmanın, organizasyonların hedeflerine ulaşmak için uygulayacağı yöntemin belirlenmesinde önemli bir hususu teşkil etmektedir. Pazar koşulları ve organizasyonel yeteneklerin konumlandırılması neticesinde hedeflerin belirlenmesi maksadıyla üç çeşit strateji geliştirmenin mümkün olduğunu ifade etmektedir. Gerçekleştirilebilecek stratejilerin ise sektörün belirli alanına odaklanma ile sektör genelinde farklılaşma ve maliyet liderliği şeklinde olabileceği belirtilmiştir (Porter, 1980).

Stratejinin Görselliği

Belirsizliklerin hâkim olduğu olumsuz ortamdan kurtulabilmenin en etkili yöntemi şirketin sahip olduğu bütün becerilerini en etkin şekilde kullanabileceği bir strateji oluşturmaktan geçmektedir. Strateji oluşturma safhasında, görsel tablolar meydana getirmenin şirket amaçlarının belirlenmesi ve stratejik planların yapılması aşamalarında iletişimin sağlanması açısından çok büyük önem taşımaktadır. Stratejinin görselleştirilmesinde kullanılan adımlar sırasıyla görsel uyanış, görsel keşif, stratejik uygunluk ve iletişim olmalıdır (Kim&Mauborgne, 2002). Ayrıca görselleştirilen tablolarda rakiplerin konumlarını görme ve rekabet koşullarına göre strateji belirleme konusunda da yardımcı olmaktadır. Tablolarda mevcut ve muhtemel rakiplerin yatırım yapabileceği, gelişme sağlayabileceği alanları da görülebilir hale gelmektedir. Bu alanların değerlendirilmesi neticesinde kararın verilmesi çok daha etkili bir şekilde yapılabilmektedir. Yapılan değerlendirmeler sonucunda oluşturulacak stratejinin ise 3 adet etkili niteliğe sahip olması gerekmektedir. Bunlar sırasıyla odaklanma, farklılık ve etkili bir slogana sahip olmasıdır (Kim&Mauborgne, 2002).

Strateji Oluşturma

Bu bölüme kadar strateji nedir, kapsam nasıl olmalıdır, elementleri nelerdir, strateji nasıl sınıflandırılır ve stratejinin görselleştirilmesi neden ve nasıl yapılmalıdır süreçleri içinde stratejinin tarihsel gelişimi, çeşitleri, uygulanma alanlarına ilişkin çeşitli görüşlere yer verilmiştir. Ancak bu bilgilerin günümüz dünyasına uyarlanması gerekmektedir. Mevcut koşulların nasıl oluştuğu, dünyanın küreselleşme konjonktürü içerisindeki şartların değerlendirilmesi gerekmektedir.

1980 yılından itibaren çokuluslu şirketlerin ve doğrudan yabancı yatırımın faydalı olduğu görüşü teknoloji transferinin liberalleşmesine olanak sağlamıştır. Ticaretin liberalleşmesi ise, iç pazar odaklı doğrudan yabancı yatırımın bölgesel odaklı müşterek ağlara yönelmesi ile gerçekleşmiştir (Radosevic, 1999). Pazar imkânlarının artmasına paralel olarak rekabet edilecek firma sayısının da artması beklenen bir durumdur. Belirsizleşen, hızla değişim gösteren piyasa koşullarına uyum sağlamak ise hayati öneme sahiptir. Gerekli uyumun sağlanması konusunda şirketlerin uygulayacağı stratejiler ise daha fazla önem kazanmaktadır. Öyleyse strateji nasıl oluşturulmalı ve bu süreçte nelere odaklanılmalıdır?

Strateji oluşturmak için öncelikle strateji geliştirme süreçlerine dikkat edilmelidir. Milan Zeleny (2008) çalışmasında strateji oluşturma sürecini beş adımda ifade etmiştir. Organizasyonlar öncelikli olarak aktivite haritalarını oluşturarak hangi faaliyetlerde bulunduğunu belirlemelidir. İkinci olarak kıyaslama aşamasına geçmelidir. Bu aşamada müşteri istekleri, rakiplerin performansları, endüstri standartları ve kurumsal tutku konularını incelemelidir. Sonraki aşamada ise değer eğrilerine ilişkin grafik ve şemalarını oluşturmalıdır. Bu grafikleri hazırlamadaki amaç rakiplerden ayrışmaları bulmak ve farklılaşmaktır. Dördüncü adım değiştirilecek faaliyetlerin belirlenmesidir. Bu adımı gerçekleştirmek için öncelikle nelerin değişmeyeceğine karar verilmelidir. Ancak bu şekilde neleri değiştirmenin mümkün olduğu belirlenebilmektedir. Son olarak görevler ve hedefler net şekildeki ifadeler ile belirlenmelidir. İfadelerin hedeflere uygun saptanıp organizasyon içinde belirgin hale getirilmesi daha iyi iletişimi sağlamaktadır. Bu aşamalardan geçmeden oluşturulan tanımlamalar, gerçekleştirilmek istenen faaliyetleri tam olarak ifade edememektedir. Stratejilerin piyasadaki koşullara uyum sağlaması aşamasında öne çıkmış olan başlıca iki görüş mevcuttur. Bu görüşler Porter tarafından detaylı olarak incelenen rekabetçi avantaj ve Hamel ile Prahalad tarafından irdelenen temel yeteneklerdir.

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Beş Güç Analizi

Bu kavram piyasaya dayalı stratejiyi temel alarak, organizasyon dışından içine doğru geliştirilmiş biçimde Michael Porter tarafından ortaya koyulmuştur. Rekabet koşullarının belirli bir alanda faaliyet gösteren veya göstermek isteyen kişilerin stratejilerini belirlemeleri açısından öneminin çok fazla olduğunu belirtmiştir. Rekabetçi stratejiyi temel alan görüşlerini 5 güç analizi modelinde ifade etmektedir (Porter, 1990). Oluşturduğu modelde analiz edilmesinin önemine değindiği maddeler sırasıyla alıcıların ve tedarikçilerin pazarlık gücü, ikame ürünlerin ve yeni katılanların gücü ile rekabet olarak ifade edilmiştir. Beş başlık altında sade bir şekilde toplanan bu niteliklerin dikkatlice analiz edilmesi sonucunda sektörde yeni stratejilerin geliştirilmesi ve yeni sektöre girilmesine ilişkin kararların verilebilmesi mümkün olabileceği belirtilmiştir.

Temel Yetenekler

Bu kavram kaynağa dayalı stratejiyi temel alarak, organizasyon içinden dışarı doğru geliştirilmiş biçimde Hamel ve Prahalad tarafından ortaya koyulmuştur. Firmanın belirli bir alanda faaliyet gösteren diğer firmalara göre çok daha iyi ve güçlü olduğu beceri, uzmanlık ve yeteneklerin tümünü kapsamaktadır (Hamel&Prahalad, 1990). Temel yetenekler modeli ağaç metaforu üzerinden kurgulanmıştır. Ağacın kökleri şirketin sahip olduğu temel yetenek ve uzmanlığını, gövdesi şirket tarafından üretilen temel ürünü anlatmaktadır. Ağacın dalları şirket içindeki küçük iş birimleri olarak belirlenmiştir. Yaprakları şirket tarafından temel yetenek alanına dayanılarak üretilen nihai ürünleri göstermektedir.

Stratejinin Gerçekleşme Serüveni

Henry Mintzberg, Bruce Ahlstrand ve Joseph Lampel (2009) tarafından ortaya konulan modelde stratejilerin ancak bir kısmının planlandığı şekilde gerçekleştirilebildiği belirtilmektedir. Kavramsal modellerden gerçek hayata yakınsadıkça bu durumun ne kadar gerçekçi bir yaklaşım olduğu daha net bir şekilde görülebilmektedir. Strateji oluşturma safhasında hemen her detayın düşünülebilmesi pek mümkün değildir. Ancak düşünülebildiği varsayımını kabul etsek dahi piyasa koşullarının stabil durumda kalmasını beklemek pek olası bir durum değildir. Koşulların optimum düzeyde planlamaya dahil edildiği stratejilerin en kısa zamanda uygulamaya geçilmesi gerekmektedir. Aksi takdirde hedeflere ulaşmak için amaç olması gereken strateji oluşturma süreci başlı başına bir amaç haline gelebilir.

Bilme Yapma Farkı

Bilgi çağının bilgelik çağına doğru ilerlediği bu dönemde verilerin işlenmesi ve bunun sonucunda anlamlandırılması ile işlerlik kazanabilir hale dönüştürülmesi çok büyük önem taşımaktadır. Keşif, faaliyet ve açıklama şeklinde tekrarlanan araştırma döngüsünün ilerletilmesi, işlerliğe ulaşma konusunda katkı sağlamaktadır. Dijital çağda sanal gerçekliği gerçekmiş gibi algılamaya daha meyilli olduğumuz çıkarımından hareketle konuşmanın yapmaya eşdeğer olduğu gibi bir varsayıma kapılmaktayız (Zeleny, 2008). Şirketlerin de bu durumu destekleyici şekilde davranması sonucunda yöneticiler daha göz alıcı ve etkileyici sunumlar hazırlamak için fazladan zaman harcamaktadır. Ancak faaliyetlerin planlandığı sunumların, nasıl hayata geçirileceği konusundaki eksiklik devamlı surette artmaktadır. Zaten planların hayata geçişi aşamasında ne derece gerçekleştiği kısmını bir önceki başlık altında incelemiştik.

Hemen her alanda artık daha az tahmin edilebilir bir dünyada yaşamaktayız. Bu nedenden dolayı zaman alıcı analizler yapmaktan ziyade sürekli eylemde bulunmaya odaklanmalıyız. Gerçekleştireceğimiz eylemleri de belirli bir strateji çerçevesinde oluşturmalıyız. Çünkü strateji yaptıklarımızdır, yapacağımızı söylediklerimiz değildir (Zeleny, 2008).

Model Önerisi

Bu alanda yapılan araştırmalar incelendiğinde temel olarak piyasa ve kaynağa dayalı olmak üzere organizasyon içine ve dışına doğru iki yönde ilerleyen stratejilerin geliştirilmiş olduğu gözlemlenmektedir. Aslında bu iki yönünde birbirinden ayrılamayacağı, bu stratejilerin dinamik bir yapıda sentezinin gerekliliği üzerine strateji hazırlık seviyesinin belirlenmesini temel alan "Yol Modeli" oluşturulmuştur. (Şekil 1)

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Analiz / Yol	Pazar	Rakip	Teknoloji	Müşteri İhtiyaçları	Ürün Konumu	Üretim	Politika	Kaynak	Sosyal	Yenilik Yapabilme
Uçurum	x									
Dağ Yolu	x	x								
Engebeli	x	x	x	X						
Toprak	x	x	x	x	x	X				
Asfalt	x	x	x	x	x	x	x	X		
Otoban	x	x	x	x	x	x	x	x	X	X

Şekil 1. Model Önerisi "Yol Modeli"

Modelde 10 farklı analiz için sıralama yapılmış ve 6 çeşit yol ile ilişkilendirilmiştir. Kategorilendirilen yollar çeşitli kalite düzeylerini simgelemesi ve akılda kolay kalması maksadıyla bu şekilde bir tasnif yapılmıştır. Belirli bir yol için önerilen analizlerin minimum düzeyinden daha fazlasının analiz edilmesi sonucunda etkisinin artması büyüyen simgelerle temsil edilmiştir. Yol modelinin oluşturulmasındaki amaç sadece kavramsal olarak kalmanın ötesinde hem üretimi gerçekleştirilen/gerçekleştirilmek istenen ürünler hem de uygulamalar için standart hale getirilen hazırlık düzeylerinin belirlemesine imkân tanımaktır. Standartlaşma neticesinde strateji oluşturma sürecinde dikkat edilmesi gereken noktalar daha gözlenebilir hale gelecektir. Yol modeli kullanılarak süreçlerin tümündeki ilerlemelerin izlenebilmesi, geliştirmeye ihtiyaç duyulan noktaların kolayca tespit edilebilmesini mümkün hale getirmektedir. Sistemin bütün olarak değerlendirilmesinin yanı sıra onu oluşturan ve geliştiren stratejilere ilişkin verilecek kararlardaki belirsiz noktaların aydınlatılması da hedeflenmiştir.

Neden Yol Modeli Şeklinde Oluşturuldu?

Organizasyonun stratejisi, mevcut konumundan ulaşmak istediği hedeflere ulaşma sürecinin nasıl olacağına ilişkin sistemli görüşlerinin tümüdür. Aslında hedeflere ulaşmadaki stratejinin özünde izlenecek yol vardır. Bu yolu ulaşım için kullandığımız şekliyle inceleyecek olursak, ilk göze çarpan yol çeşitliliğinin çok fazla oluşudur. Bu çeşitlilik içinde gidilecek yolun kalitesi önem taşımaktadır. Yollardaki fazlaca dönemeç ve engelin yanı sıra diğer araçların yoldaki konum ve miktarı da yol seçiminde önem taşımaktadır. Hedefe ulaşmak ancak belirli bir süre sonunda gerçekleşebilir. Bu süreç yolun koşulları, hava şartları ve yolda giden kişinin maharetine bağlı olarak değişir. En önemli konu ise gidilen yol aynı olsa dahi hiçbir yolculuk diğer şartların değişmesinden ötürü bir öncekinin aynısı olamaz. Her yolculuğun kendine has özellikler taşıması sebebiyle her bir süreç dikkatli bir şekilde ele alınmalıdır. Organizasyonların da esasen yapmak istediği hedeflerine ulaştıracak yolu kullanmaktır. Piyasaya ilişkin bazı koşulların belirlenmesine karşın birçok ilave şart onu belirsiz ve düzensiz hale getirmektedir. Bu belirsizlik içinde gidilen yollardan sapma olması, yolun dışına çıkılması muhtemeldir. Ancak bu sürecin sürekli ve dinamik bir şekilde takip edilmesi neticesinde yolun kalitesi asfalttan toprağa düşmesi halinde onu eski haline nasıl getirebileceğimizi gösteren bir ölçek şeklinde değerlendirme imkânı bulması yol modeli ile mümkün hale gelebilmektedir. Bu ölçekten faydalanmak suretiyle organizasyonlar gittikleri ve varmak istedikleri yolları çok daha belirgin bir hale getirebilmektedirler. Çünkü seçtiğimiz strateji ilerleyeceğimiz yoldur.

Sonuç

Proje yönetiminde belirsizliklerin en aza indirilmesi ve yapılan faaliyetlerin görünür kılınarak yönetim etkinliğinin arttırılması maksadıyla "Yol Modeli" oluşturulmuştur. Süreçlerin standartlaştırılması ile bireyler arasındaki iletişimin arttırılması ve artan iletişim neticesinde hedefe odaklanmanın daha kolay yapılabilmesi hedeflenmiştir.

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PROPERTIES OF MORTARS USED IN OTTOMAN PERIOD HISTORICAL BUILDINGS; AN EXAMPLE OF DENIZLI İLBADE CEMETRY

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In this study, properties of masonry and plaster mortar used in the walls of the Namazgah Mosque and Dervish Lodge constructed in Denizli İlbade cemetery during Ottoman period are investigated. Basic physical, mechanical, hydraulic, micro, raw material, mineralogical and chemical properties of mortars are determined. All the investigated mortars show that they are lime mortars. Masonry mortars have pure lime and non-pozzolanic aggregate. Furthermore, they do not have hydraulic properties. Plaster mortars are produced with a combination of artificial pozzolan and pure lime and they have hydraulic properties. It is specified that plaster mortars are more competent than masonry mortars. It is concluded that plaster mortars's hydraulic properties are responsible for competence difference between plaster mortars and masonry mortar.

Keywords: Historical Building, Mortar Characteristics, Masonry and Plaster Mortar, Lime Mortar

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QUANTUM SHAPE KINEMATICS

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Abstract: Shape dynamics is a theory first proposed by Julian Barbour which states that physics happen uniquely in the reduced configuration space of a theory. So far, studies in the area have focused on gravitational systems. Here we first contemplate on the implications of this idea on quantum mechanics. We summarize the idea of shape dynamics and then give physical configurations of multi qubit systems. Our aim in the grand picture, is to initiate a research program translating classical shape dynamics to quantum realm.

Keywords: Shape Dynamics, Qubits, Relational Physics

Introduction

Mach's principle may refer to many ideas. Hermann Bondi and Joseph Samuel list eleven distinct versions of the Mach's principle that can be found in the literature (Samuel, 1997). We adopt the Julian Barbour's definition (Barbour, The Definition of Mach's Principle, 2010).

First of all there is the configuration space of a theory. By removing the gauge degree of freedoms we obtain the reduced configuration space of a theory where all degrees of freedom are physical. This space is called the *shape space*. The Mach's principle states that (Barbour, The Definition of Mach's Principle, 2010) a point and a direction or a tangent vector in shape space determine the evolution of the system uniquely.

According to classical shape dynamics, in the Newtonian N-body problem the physical configurations are obtained when the rotation and scale degrees of freedom are removed (Barbour, Shape Dynamics. An Introduction, 2011). Hence for one or two particles in an empty universe there is no degree of freedom. Non-trivial Shape dynamics apply to the cases of three or more particles. For an introduction to shape dynamics, reader may refer to (Barbour, Shape Dynamics. An Introduction, 2011) and (Mercati, 2014).

So far the studies on shape dynamics focused on gravitational (Henrique Gomes, 2015) and classical aspects such as the arrow of time (Julian Barbour, 2014). Beginning with this paper, we would like to initiate a research endeavor that investigates consequences of classical shape dynamics in quantum phenomena.

Shapes of Qubits

We discuss quantum shape kinematics of multi qubit systems beginning with the cases of a single and double qubit systems. In this section qubits do not occupy positions in spacetime. Hence they have only internal degrees of freedom.

Single qubit system

We consider there exists only one qubit in the Minkowski spacetime and nothing else. The quantum state of the particle can be written as:

$$|\psi\rangle = \alpha|\uparrow\rangle + \beta|\downarrow\rangle, \exists \alpha, \beta \in \mathbb{C}.$$

However by rotating the coordinates and multiplying with a complex number we can always map $|\psi\rangle \mapsto |\uparrow\rangle$. Therefore we conclude that for one qubit there is no physical degree of freedom apart from its mere existence.

Double qubit system

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Here we suppose there are two qubits in the universe. The basis vectors are $|\uparrow\uparrow\rangle$, $|\downarrow\downarrow\rangle$, $|\uparrow\downarrow\rangle$ and $|\downarrow\uparrow\rangle$. Because all we have is the angles between spins, the first two correspond to parallel spin case, $|parallel\rangle$, and the last two correspond to anti-parallel spin case, $|anti-parallel\rangle$. We can always rotate the state of first qubit into $|\uparrow\rangle$. Hence the direction of the first spin is used to fix a direction in space. The physical basis vectors are $|\uparrow\uparrow\rangle$ and $|\uparrow\downarrow\rangle$.

Multiple qubit systems

In this part we suppose there are N qubits in the universe. The basis vectors of the system are $|a_1\rangle \otimes |a_2\rangle \otimes \cdots \otimes |a_N\rangle$ where $|a_i\rangle$ for $1 \leq i \leq N$ can be either $|\uparrow\rangle$ or $|\downarrow\rangle$. Whatever the value of $|a_1\rangle$ we can always rotate it to $|\uparrow\rangle$. Hence we reduce one degree of freedom. We call the first qubit as *the reference qubit*. N qubit system has the degrees of freedom of $N-1$ qubit system. This is true for all $N \geq 1$.

Possible Objections

Interactions

One may object to this classification with the counter example of interacting two qubits via the Hamiltonian $-\gamma\overrightarrow{\sigma_1} \odot \overrightarrow{\sigma_2}$. The eigenstates of the systems are $|\uparrow\uparrow\rangle$,$|\downarrow\downarrow\rangle$ and $|\uparrow\downarrow\rangle + |\downarrow\uparrow\rangle$ with energy eigenvalue $-\gamma$, whereas the state $|\uparrow\downarrow\rangle - |\downarrow\uparrow\rangle$ has energy 3γ. The seemingly paradoxical point is that the states $|\uparrow\downarrow\rangle - |\downarrow\uparrow\rangle$ and $|\uparrow\downarrow\rangle + |\downarrow\uparrow\rangle$ have different energies though they should correspond to the same $|anti-parallel\rangle$ state vector.

We need to note that in order for two qubits to *interact*, we need to introduce additional structure. In quantum shape dynamics, time evolution should be reached by considering the whole state of the universe. It will be a holistic theory.

For simplicity suppose that the interaction between the qubits requires another qubit. All in all the system becomes a triple qubit system. Here the physical states are such that the additional qubit has always the state $|\uparrow\rangle$. Basis vectors are $|\uparrow\rangle \otimes |a\rangle \otimes |b\rangle$ where $|a\rangle$, $|b\rangle$ can be $|\uparrow\rangle$ or $|\downarrow\rangle$. It is now that the states $|\uparrow\uparrow\downarrow\rangle - |\uparrow\downarrow\uparrow\rangle$ and $|\uparrow\uparrow\downarrow\rangle + |\uparrow\downarrow\uparrow\rangle$ are physically different and there is no paradox for them having different energy values. The problem is solved once we take into account the whole system.

Choice of the reference qubit

The choice of the reference qubit, the qubit whose state is fixed, is arbitrary. By definition it has no dynamics, though it may evolve relative to subsystems.

Conclusion

In this study, we removed the rotation gauge degrees of freedoms from multi qubits systems and what have remained are the quantum shapes of the system. We observed that one qubit can be put in a fixed state by rotating the space, hence it has no degree of freedom. In the general case of an N qubit system, the degrees of freedom turned out to have the degrees of freedom of $N-1$ qubit system.

Future works may expand our discussion by including quantum shape kinematics of molecules or higher spin systems. Quantum shape dynamics solution for the Hydrogen atom would be an interesting example to see. It seems that there will be a difference on the formation of a single hydrogen atom in the universe compared to formation of $N \gg 1$ hydrogen atoms.

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RANDOMIZED RESPONSE TECHNIQUES AND ITS APPLICATION

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Randomized Response(RR) is an interview technique that is used when sensitive questions are asked and respondents are reluctant to answer directly. in surveys on sensitive topics, respondents may decide not to reply at all or to incorrectly answer. The main use of randomized response technique(RRT) is to encourage respondents to respond, and then to provide truthful response in such a way that the real status of the respondent can not be identified. So, RRT is designed to reduce both response bias and non-response bias in such surveys.Warner, for the first time, introduced the RRT for the proportion of a population characterized by a sensitive variable. Later, many versions of RRT have been developed that can deal with binary responses. In this paper, we introduce various RRTs for the estimation of population proportion of sensitive variable. We illustrate one of these techniques with an original survey. We present the results of the original survey and we find out RRT is an effective technique on studying sensitive topics.

Keywords: Randomized response techniques, sensitive question,efficiency

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REAL ESTATE VALUE CHANGES ACCORDING TO FACTOR OF URBAN TRANSFORMATION

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Urban areas are changing due to economical, social, cultural, physical and political reasons. In this process of change, it is important to increase the quality of life, restructure urban areas, reinvigorating economies of the cities, improve environmental values, and preserve historical values. In Turkey, urban transformation projects are being used as an important device in spatial planning applications to achieve these goals. However, the failure of distribution income which is constituted the dynamic of urban transformation studies have negative implications for the sustainability and eventual success of urban transformation in Turkey. Also determining real estate values objectively, truly and safely; is great importance for expropriations, land-area arrangements, taxing, distribution incomes, etc. process of the application.

In this study, urban transformation projects are examined with social, cultural and economical structure in the project process (before-after) in Meram Municipality one of the central districts of Konya/Turkey city. There are three completed, two continuing and three project phase urban transformation applications in Meram Municipality. Applications are investigated to get answer the questions of how, how much and what rate surrounding real estates' are effected from urban transformation. Also economical gainers and their rates are studied in the project areas.

In the studythese areas have become planned, high welfare level and proper for urban living. However people have had difficulty in adapting because of their cultural differences from new living environments. Also there has been a great increase in real estate values with urban transformation.

Keywords: Urban transformation, real estate valuation, economical

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RELATIONSHIP BETWEEN STOCK MARKET INDICES AND GOOGLE TRENDS

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Abstract: This study analyzes the relationship between stock market indices and Google trends. For this purpose, 12 stock market indices whose domestic market capitalization values are more than 1.5 billion USD were chosen. Their historical adjusted close values were collected in weekly basis for 2014 and 2015. Additionally, for the same period, weekly Google search data for those indices were collected. Results showed strong correlations between number of searches and rates of stock market indices. Correlation coefficients for relations are mostly positive which implies that the stock market indices are searched more while stock market values are increasing.

Keywords: stock market, stock market index, Google trends, search query

Introduction

Recent technological developments have connected people all around the world more than ever before and provide latest information about any progress instantly. People are likely to surf the web for information retrieval using search engines. Search engines have also been used for financial issues. Stock market movements are one of the popular topics that people especially investors want to monitor.

In June 2016, 70.16 percent of worldwide Internet users searched the web without bots using online search engine Google (NetMarketShare, 2016). It is claimed in literature that large scale online data can be the predictor of public perception on various contexts such as presidential elections (Tumasjan et al., 2010), commercial sales (Mishne & Glance, 2006; Choi & Varian, 2012), and influenza epidemics (Culotta, 2010). Thus, each rise or fall in stock markets may be reflected in Google searches by investors. The volume of queries in search engine can be used as a measure of investors' attention on the stock market (Da, Engelberg & Gao, 2011).

The volume of search queries for Dow Jones reached to eleven times greater than average search volumes when its volatility has become an almost record high of over 150% annualized on October 10, 2008 (Dimpfl & Jank, 2016). When Lehman Brothers disclosed bankruptcy in September 2008, the volume of Google searches on "Lehman" was 24 times higher than the average (Ramos, Veiga & Latoeiro, 2013). In November 2009, the number of submitted searches for "Dubai World" increased six-fold, when Dubai World rescheduled a debt due to accumulated losses (Ramos, Veiga & Latoeiro, 2013). After a year, when British Petroleum caused an environmental disaster in the Gulf of Mexico, the frequency of Google searches on "BP" became three-fold during this period (Ramos, Veiga & Latoeiro, 2013).

These facts show that financial actions may cause collective behavior in online environments. Therefore, the relationship between financial events and online behaviors has become an attractive topic for researchers. Various online data sources such as social media platforms and search engines were used to analyze different relationships. Twitter is one of the mostly used social media platform for this purpose. For instance, public mood states which were measured from Twitter were found as the predictive of changes in Dow Jones Industrial Average closing values (Bollen, Mao &, Zeng, 2011). Zhang, Fuehres and Gloor (2011) collected six-month Twitter feeds and analyzed collective hope and fear for each day. It is found that emotional tweet percentage significantly negatively correlated with Dow Jones, NASDAQ and S&P 500, but displayed significant positive correlation to VIX (Zhang, Fuehres & Gloor, 2011).

Online news sources are also analyzed whether they are the predictor of financial metrics. Gilbert and Karahalios (2010) used a blog dataset consisting a stream of all LiveJournal posts and shown that a broad index of mood from an online community has novel predictive information about the stock market. In another study, a positive correlation was found between the daily number of mentions of a company in the Financial Times and the daily transaction volume of a company's stock both on the day before the news is released, and on the same day as the news is released (Alanyali, Moat & Preis, 2013).

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Search engine queries are other sources of information that can be used as the predictor of fluctuations in stock market indices. It was found that weekly transaction volumes of S&P 500 companies were correlated with weekly search volume of corresponding company names (Preis, Reith & Stanley, 2010). In a sample of S&P 500 firms over the period 2005-2008, it was found that, over a weekly horizon, online search intensity reliably predicts abnormal stock returns and trading volume, and that the sensitivity of returns to search intensity is positively related to the difficulty with which a stock can be arbitraged (Joseph, Wintoki & Zhang, 2011). Bordino and his colleagues (2012) shown that daily trading volumes of stocks traded in NASDAQ-100 were also correlated with daily volumes of queries related to the same stocks. In another study, the volume of Google search queries were found as the predictor of foreign currency rates (Smith, 2012). Another interesting study in 2013 showed that there is a relationship between subsequent stock market moves and the historic data relating to politics or business from the search engine Google and online encyclopedia Wikipedia, as well as judgments from the service Amazon Mechanical Turk (Curme et al., 2014). In particular, they found that increase in search volume of the topics tends to precede stock market falls. Arditi, Yechiam, and Zahavi (2015) analyzed the relationship between stock-specific events and associated Google searches using daily data of 13 stocks from the Dow-Jones and NASDAQ100 indices, over a period of 4 trading years. They found a correlation between the magnitude of stock returns at the beginning of the period and the volume, peak, and duration of search generated during that period. That study revealed that losses improved the fit between people's search behavior and the extent of real-world events triggering the search (Arditi, Yechiam & Zahavi, 2015).

In this study, the relationship between stock market indices and Google trends is analyzed. Since previous studies have mostly focused on stock market indices in USA such as NASDAQ or S&P500, this study aims to analyze stock indices from different countries.

Materials and Methods

As it is mentioned before, the main aim for this exploratory study is to find out possible correlations between stock market indices and Google Trends for a period of two years, 2014 and 2015. For this purpose, the biggest stock markets were chosen according to their market capitalization. Thus, December 2015 market capitalization value of 1.5 million USD was chosen as the cut off point for market capitalization. Then, based on the World Federation of Exchanges Members statistics, 12 stock market indices from America, Europe and Asia were chosen with domestic market capitalizations listed in Table 1 (WFE, 2016).

Table 1: Chosen Stock Market Indices and Countries

Stock Market Index	**Country**	**Domestic Market Capitalization Value (Dec, 2015)**
NYSE	USA	17,786,787.40
NASDAQ	USA	7,280,752.17
Nikkei225	Japan	4,894,919.10
SSE Composite Index	China	4,549,288.00
LSE.L	England	3,878,774.20
Shenzhen Stock Exchange	China	3,638,731.30
Euronext 100	European Union	3,305,901.40
HKEX	Hong Kong	3,184,874.20
Deutsche Boerse AG	Germany	1,715,800.50
TMX Group Limited	Canada	1,591,928.60
SIX Swiss Exchange	Switzerland	1,519,323.50
S&P BSE SENSEX	India	1,516,216.70

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After stating the stock market indices for the study, the weekly adjusted close values of them were collected for a chosen time interval of 104 weeks, from first week of 2014 to last week of 2015. Since the trending search data for terms can be collected from Google Trends web site (GoogleTrends, 2016) in weekly time interval, the stock market data was collected in same proportion.

There are several sources in the World Wide Web for collecting finance data but for being consistent and reliable in the analysis, the most popular finance data source Yahoo Finance (YahooFinance, 2016) was chosen. The historical prices of the chosen stock markets were collected for 104 weeks from first week of 2014 to last week of 2015.

After collecting weekly stock market index data of those 12 biggest markets, the trending search data of them were gathered from Google Trend web site. In this perspective, the keywords were stated carefully for those stock markets. Accordingly, first of all, the official web sites of those stock markets were examined. Then, the official abbreviations of those stock market indices were used as trending data keyword. In fact, Google also informs users about the type of keyword while searching. Therefore, Google trend keyword type "stock exchange" and related country were chosen during trend data search.

Moreover, it should be stated that Google gives the search trend data in 1-100 scale. This means Google standardizes the search trend of the chosen term for the chosen time interval into a scale of 1 to 100. The most popular (trending) week is given a value of "100" and the others are declared accordingly.
Lastly, the main purpose of this study is to examine the possible predictive effect of Google trend on stock market indices. For this purpose, Google trend and following week's adjusted close values of stock market indices were gathered.

Results

Results showed the existence of correlation between adjusted closed values of stock market indices and their Google search volumes. Out of 12 separate correlations of different indices, 6 of them were positively correlated, 3 of them were negatively correlated and remaining 3 were not correlated with Google search volume data.

Table 2: Google Searching Trend vs. Adjusted Closed Values of Stock Market Indices

Stock Market Index	Country	Correlation Results		
		Pearson Correlation Coefficient	Significance (2 Tailed)	Direction of Relation
NYSE	USA	-0.076	0.445	-
NASDAQ	USA	-0.789	0.000**	Negative
Nikkei225	Japan	0.358	0.001**	Positive
SSE Composite Index	China	0.661	0.000**	Positive
LSE.L	England	-0.508	0.000**	Negative
Shenzhen Stock Exchange	China	0.211	0.033*	Positive
Euronext 100	Europe	0.452	0.000**	Positive
HKEX	Hong Kong	0.498	0.000**	Positive
Deutsche Boerse AG	Germany	-0.125	0.209	-
TMX Group Limited	Canada	-0.197	0.047*	Negative
SIX Swiss Exchange	Switzerland	-0.159	0.107	-
S&P BSE SENSEX	India	0.360	0.000**	Positive

* significant at 5% alpha level; ** significant at 1% alpha level

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When domestic results sorted in terms of their correlation values, the most significant and the correlated one appears as NASDAQ. This result shows that NASDAQ index has the most impact on Google in terms of peak and trough points. Another finding for NASDAQ is that the correlation is negative which explains that when people search NASDAQ more, the adjusted close value decreases.

SSE Composite Index with correlation value 0.661 follows NASDAQ as the second mostly correlated index. However, its direction of correlation is positive which means when people search this index more than the adjusted close score is also increasing.

LSE.L which is London stock market index is negatively correlated with a correlation value of -0.508. HKEX, Euronext 100, S&P BSE SENSEX, Nikkei225, and Shenzen stock market indices are significantly correlated with related Google search volume data in a positive manner. Lastly, TMX Group Limited is negatively correlated with a correlation value of -0.197.

Discussion and Conclusion

Search engine query data provides great insights into many areas such as presidential elections, commercial sales, and influenza epidemics. Financial issues have been also studied with the data from search engines. In this study, the relationship between adjusted closed values of stock market indices and the search volume of related indices has been investigated. For this purpose, correlation analysis between adjusted close values of 12 stock market indices, of which daily domestic market capitalization values are more than 1.5 billion USD, and Google search volume data for those indices has been applied for the two year period, 2014 to 2015 on weekly basis.

The results of the correlation analysis showed that out of 12 market indices, 9 of them were significantly correlated and 3 of them were not.

One of the uncorrelated indices was NYSE. This might be because of the global structure of NYSE where the investment funds in NYSE are more about global companies and firms rather than individual players. The other two uncorrelated indices were Deutsche Boerse and SIX Swiss Exchange. The reason for these results could be the effect of Euronext that has been formed as a merger of the Amsterdam, Brussels, and Paris Bourse, in order to take advantage of the harmonization of European Union financial markets and which has become the possessor of the market capitalization value in Europe. Hence foundation of Euronext might have decreased the attractiveness of these two indices and therefore has affected their correlations with the Google search volume data.

When the significantly correlated market indices are considered, it was seen that, in line with the previous studies (Curme et al., 2014; Arditi, Yechiam & Zahavi, 2015), there were negative correlations for indices that have dominancy in the stock market. These indices are NASDAQ, LSE.L and TMX Group Limited.

For other countries rather than USA, Canada and England, positive correlations were found between stock market indices and Google search volume data which implies when there is an increase in search volume this may indicate an increase in stock market indices.

The main limitation of the study is the weekly collection of stock market index value due to the weekly retrieval ability of Google search volume data. For this reason daily correlation analysis could not be applied.

In this study, Google search volume data was used as the predictor of stock market index which was measured one week after Google trends. In future studies, this analysis may be applied for other time horizons. On the other hand, only the names of stock market indices were used as the keywords in Google search queries. Other keywords such as names of companies related to those indices can also be used and their effect can be investigated.

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RELEVANT TERMS AND XML DOCUMENTS RELEVANT: RESEARCH AND EXTRACTION.

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Three classes of documents, based on their data, circulate in the web: Unstructured documents (.Doc, .html, .pdf, ...), semi-structured documents (.xml, .Owl ...) and structured documents (Tables database for example). A semi-structured document is organized around predefined tags or defined by its author.

However, many studies use a document classification by taking into account their textual content and underestimate their structure. We attempt in this paper to propose a representation of these semi-structured web documents based on weighted vectors allowing exploiting their content for a possible treatment. The weight of terms is calculated using: The normal frequency for a document, TF-IDF (Term Frequency - Inverse Document Frequency) and logic (Boolean) frequency for a set of documents. To assess and demonstrate the relevance of our proposed approach, we will realize several experiments on different corpus.

Keywords: Semi-structured web document, term weighting, term frequency, TF-IDF and logic frequency

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ROBUST NETWORK FLOW PROBLEM WITH TWO MULIPLICATIVE OBJECTIVE COEFFICIENT

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We consider the robust minimum cost network flow problem with two multiplicative objective coefficient under the interval uncertainty. In minimum cost network flow problem, we assume that the flow cost of an arc is the multiplication of two factors and the factors have independent uncertainty. Bertsimas and Sim have studied the robust problem with uncertainty of single objective coefficient. They show that an approximate solution can be obtained by solving nominal problems. The robust shortest path problem under the uncertainty of two multiplicative objective coefficient is performed by Kwon et al. In this paper, we give the counterpart of the robust optimization problem and we show that the inner problem can be transformed to a nominal minimum cost network flow problem under some conditions. And we show that an approximate optimal solution can be obtained by solving the nominal problems repeatedly. The uncertainty of two factors can be considered that they are not independent. Then we use the multiplication of the two factors as a single coefficient. To check the validity of the independent uncertainty, we give the comparison results between the two cases with randomly generated data.

Keywords: Robust optimization, minimum cost network flow

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RSSI BASED CLUSTERING ALGORITHM FOR WIRELESS SENSOR NETWORKS

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Abstract: Technological developments on wireless communication systems and sensors productivity-enhancing wireless sensor networks have led the development of new algorithms. Wireless sensor devices (nodes) were developed along with the use of these two cases, and data collected has been achieved forwarded to a central location. Studies in the literature were shown that, WSN (wireless sensor networks) systems are focused on the detection the position of the nodes in the network and worked for energy efficiency. One of the major activities in the wireless sensor network is to create their own organizing clusters with selected cluster head, each cluster can send the data. Cluster head selection is based on a random number that is above the threshold value is calculated by the addition of the number, etc. parameters of nodes in the network or having highest energy value. In this study, the cluster head selection is performed by calculating a distance between nodes in the cluster. Distance information is obtained from RSSI (Received Signal Strength Indicator). Each node in the network, all nodes can communicate with them on the record and finds the average RSSI level. The highest average per cluster node is selected and published in this case to the other node. The cluster head node will include its own cluster the node that is lower than the average RSSI. Cluster head selection and clustering process continues with iterations until all nodes clustering in the network. Experimental studies conducted with simulation program developed C # .net environment and network efficiency are investigated. In the results, the cluster is first created which settled in the center of the network, and the center population was determined to be more than others. In this case, a threshold value must be determined for correcting the data next to the average RSSI. So, accordingly the necessity of re-aggregation network is detected.

Keywords: RSSI, clustering, Wireless Sensor Network

Introduction

Wireless Sensor Networks (WSN) that on sensor, battery, processor and communication unit which is to collect data from the environment they have created networks of small nodes. Wireless Sensor Networks aim of Madiran delivered to the collection point of data collected from the environment. The studies in the literature on this topic can be collected in the localization and energy efficiency, data routing. One of the important work areas in WSN is to select a cluster head (CH) in self-organized clusters create their own clusters and each cluster can send the data. Clustering algorithms basic principle, the energy of the nodes in the network to select a CH in order to use the highest efficiency and the data are included in the set is based on its submission to him. If the selected cluster head transmits data from the central node.

Cluster head (CH) selection on the calculated energy to generate a random number with the participation threshold of parameters such as the number of nodes in the CH node or that the network is based on a high. But choosing themselves a CH node of a clustering algorithm clusters close to each other based on the distance from the node would lead to less energy will be more accurate than logically. When analyzed studies on the subject, which appears to be related to the selection algorithm Leach per cluster. LEACH algorithm was developed in 2002 by Heinzelman and CH selection was built. In another study that was made by Heinzelman in the same year, due to the not to be homogeneous distance between CH and nodes in cluster, the CH of the energy efficiency of the nodes has been mentioned is low (Heinzelman, 2002). There are studies about the measurement of the battery capacity with distance information and the distance estimation between nodes and determine the position of movable

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objects in confined spaces with RSSI. (Arias, 2004, Saxena, 2008, Chung, 2009, Wessels, 2010, Blumrosen, 2010, Faheem, 2010, Blumrosen, 2013, Chakrabortya, 2013, Zheng, 2011, Heurtefeux and Velois, 2012).

In a study conducted in 2015 by Kannan, RSSI value between the central station and node is taken and the average RSSI value has been calculated for the selection of CH. Energy levels and the average RSSI value of the node to obtain a threshold value are added together. If the average RSSI per cluster node is above this threshold value is selected. Clustering is carried out by the center (Kannan,2015).

An alternative method is presented for the selection of clusters head in the network with RSSI data in a study conducted by Fazackerley. Simulation studies related to work was performed and was compared with Leach algorithm. Nodes was calculated the average RSSI data from the node in around and gets the P_{fact} value. If P_{fact} value is above the predetermined value $RSSI_{thres}$ then this node is the CH node (Fazackerley, 2009).

As a result of analysis of the literature, RSS data between nodes in a wireless sensor network; routing the data transmitted to the central station, finding location of the nodes in the network and is used for the purpose of election of the head of the network cluster to cluster. In this study, a clustering algorithm is proposed for CH selection and clustering with RSSI values of the network. The proposed algorithm consists of two main parts. The first part, the selection of CH node will be the creation of clusters and the other. CH selection was provided with development of Kannan (2015) algorithm.

Materials and Methods

Cluster Head Selection

CH selection algorithm implemented at once spread to areas of the network has been developed in accordance with self-organizational approach. For CH selection, each node communicates with other nodes for obtaining average value of $RSSI_{avrg}$. Value $R\square SI_{avrg}$ is obtained by the equations given in Equation 1.

$$RSSI_{avrg} = \begin{cases} \sum_{k=1}^{n} \frac{RSSI_k}{n} & n > 0 \\ \infty & n = 0 \end{cases} \quad \text{(1) Kannan(2015)}$$

Here; n the number of nodes being communicated, the $RSSI_k$ value represents the RSSI value of *k.th* nodes. Nodes that calculate average $RSSI_{avrg}$ transmits their average to network. All nodes repeat the same process and records the average $RSSI_{avrg(i)}$ values from the other nodes. This is an average; it is likely to be the most effective parameters of the CH node. If $Node \quad RSSI_{avrg} < RSSI_{avrg(i)}$, $i.th.$ node becomes the CH node.

Clustering Algorithm

In this phase, the selected CH defines its own set. CH, compares the value of $CH_{RSSI_{avrg}}$with $RSSI_i$ values between other nodes that are stored in the memory. If $RSSI_i < CH_{RSSI_{avrg}}$, $i.th.$ node would be included in the cluster nodes. This process continues until all nodes clustering in the network. Clustering algorithm flow chart is given in Figure 1.

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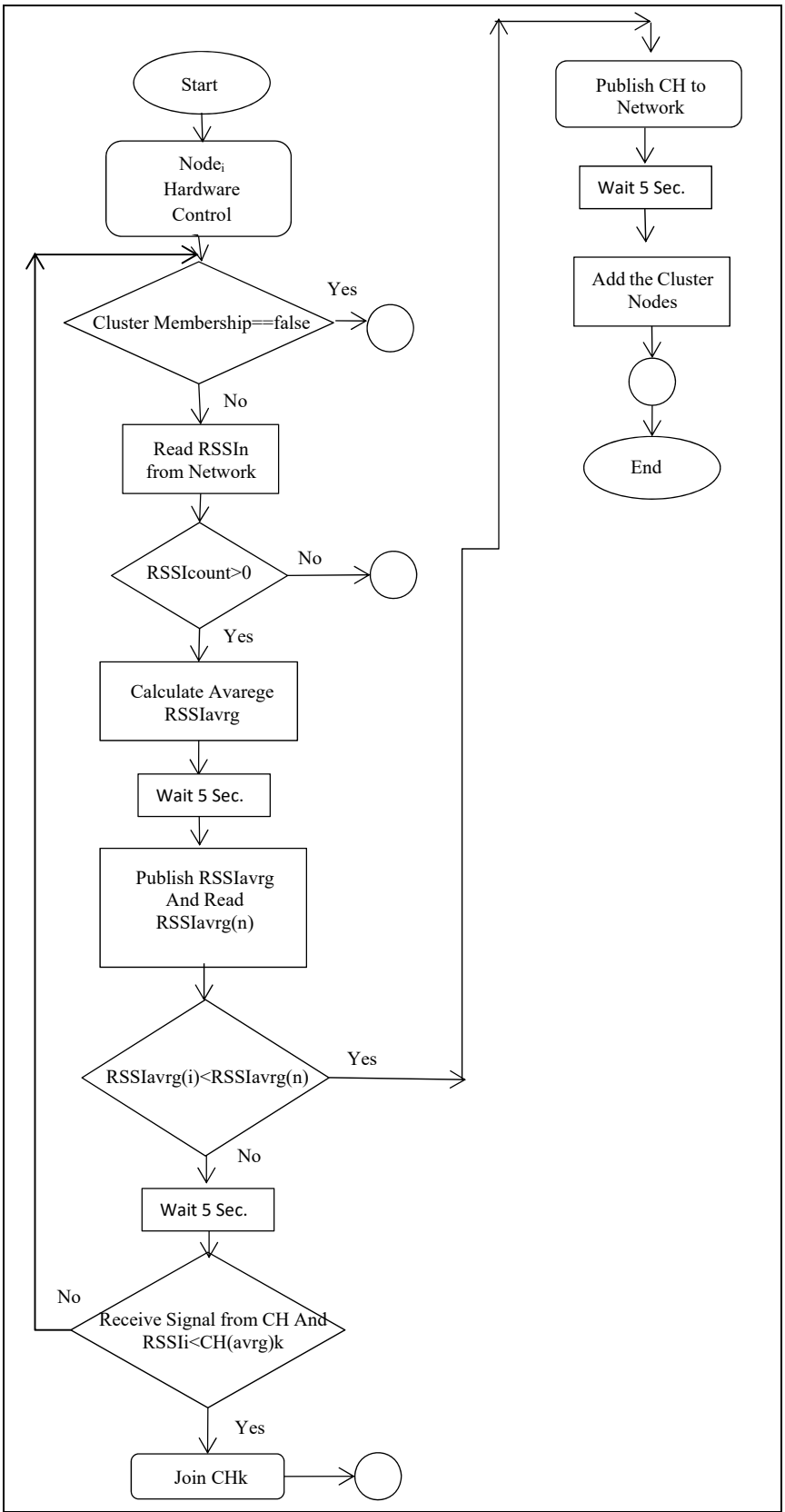

Figure 1. Flow Chart of Clustering Algorithm

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Results and Discussion

Experimental studies in order to see quick results of the algorithm are made by developed simulation program. Nodes are derived by adding the memory unit, the microcontroller and transmitter / receiver units. The register units are planned in the memory unit containing the identification information, the distances between other nodes and CH ID information. Randomly distributed nodes simultaneously employ algorithm specified in the Material and Methods section. Experimental studies were performed on four different networks consisting 10, 20, 50 and 100 nodes. Each node was assumed to be able to communicate there between. Distance between nodes is treated as RSSI data. CH selection and clustering capacity of 4 different networks consisting of 10, 20, 50 and 100 nodes is shown in respectively Figure 2, Figure 3, Figure 4 and Figure 5. Selected CHs in the network are indicated with a circle formed. Also cluster heads and with the number of nodes that are subject to them, and as Table 1, Table 2, are given in Table 3 and Table 4.

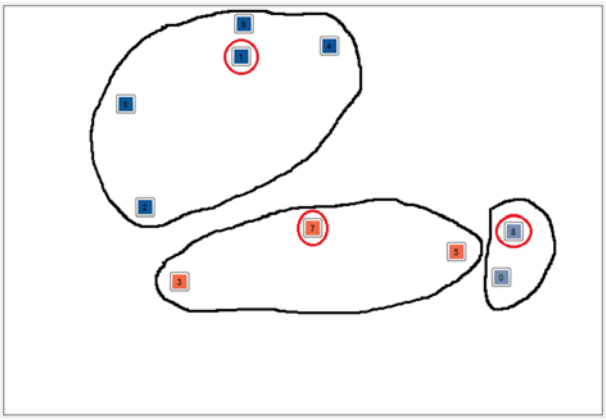

Figure 2. Network Map and Clustering with 10 Nodes

Table 1: Cluster Table with 10 Nodes

CH ID	CH Color	Cluster Members
7		3
1		5
8		2

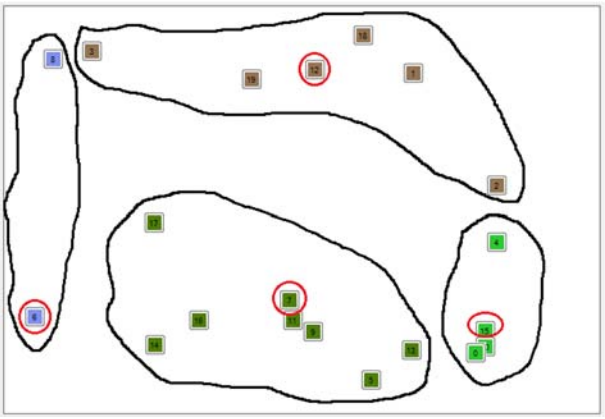

Figure 3. Network Map and Clustering with 20 Nodes

Table 2: Cluster Table with 20 Nodes

CH ID	CH Color	Cluster Members
7		8
12		6
15		4
6		2

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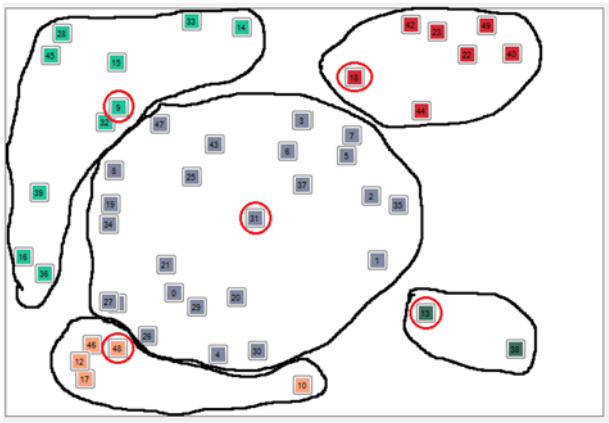

Figure 3. Network Map and Clustering with 50 Nodes

Table 3: Cluster Table with 50 Nodes

CH ID	CH Color	Cluster Members
31	31	25
9	9	10
18	18	8
48	48	5
13	13	2

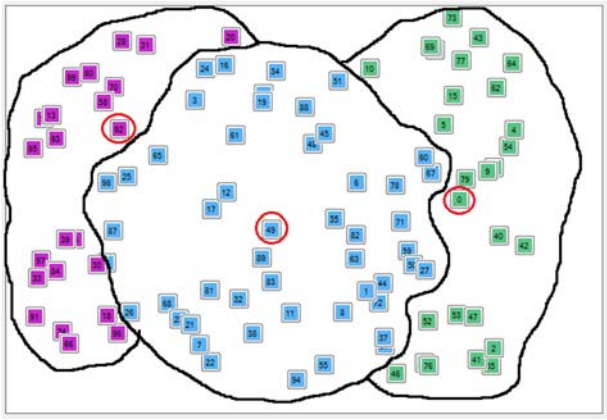

Figure 4. Network Map and Clustering with 100 Nodes

Table 4: Cluster Table with 100 Nodes

CH ID	CH Color	Cluster Members
49	49	50
0	0	27
92	92	23

The simulation results of clustering and network characteristics are examined, it is seen that in a number of different iterations of the network cluster. Looking at the corresponding table showing the distribution of the network node of the cluster was observed within the first iteration of the population is higher than others. This will increase the data density of traffic throughout the cluster and the CH job. It will also cause decreased efficiency of the network and will negatively affect the energy efficiency of nodes. Also, in previous iterations of the nodes included in a cluster, in subsequent iterations have been observed at a distance closer to the other CH is selected.

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Conclusion

In this study, an algorithm has been developed to selection of CH with RSSI values and clustering of the network. Algorithm results have been observed that in a successful by not leaving outside any node cluster in the network. However when node count increases in the network, the node populations of the first cluster were found to be too high of the others. In addition, the number of clusters to be created cannot be interfered with. In addition, the number of clusters to be created cannot be interfered with. For optimizing the number of nodes in the cluster to remove and eliminate these drawbacks, which must be on the set $Node \quad RSSI_{avrg} < RSSI_{avrg(i)}$ it has been identified the need to update the rules. In future studies, the desired number of clusters to be created, a threshold value is calculated using the number of nodes in the cluster so the network parameters to be included in the rules is planned to examine the clustering efficiency.

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SCALE-UP OF ZEOLITE MEMBRANES FOR DESALINATION

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The lack of sufficient available water resources has already affected every continent and thus represents a significant global problem. In the last years, desalination of sea- and brackish water to obtain sweet water in arid regions has gained a growing interest [1]. In this context, membrane distillation is able to efficiently treat also high concentrated brines, allowing to increase the overall fresh water production with respect to actual reverse osmosis plants [2].

For desalination purposes the MFI zeolite topology is appropriate having a pore size (about 5.5 Å) lower than the major kinetic diameters of different hydrated ions.

In this work, for the first time, tubular silicalite (MFI) membranes with a length of 30 cm were prepared using the secondary growth method coupled with the cross flow seeding procedure. Subsequently, the prepared membranes were characterized and then applied in desalination process by vacuum membrane distillation to verify if their performance was comparable to that of shorter membranes [3].

The obtained results showed that it is possible to reach a good reproducibility in the preparation of uncalcined defect-free membranes and a remarkable performance in desalination by VMD for feed salt concentrations in the range of 0.2 M-0.9 M.

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Keywords: MFI membranes; secondary growth; Scale-up; vacuum membrane distillation; desalination.

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SCREENING OF PKS/NRPS GENE REGIONS ON MARINE DERIVED ACTINOBACTERIA

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Abstract: Marine derived actinobacteria are very valuable organisms because of unique abillities. The goal of this study was to investigate potential of production bioactive metabolite from marine derived actinobacteria. Eight actinobacteria were screened by PCR based techniques. Results showed that many isolate positive for NRPS (62,5%) and PKS (37,5%) genes. According to the PCR screening marine erived actinobacteria from Black Sea have significant biosynthetic potential. As a results highlighted that marine sediments represented potential sources for discovery of bioactive secondary metabolites.

Keywords: PKS,NRPS, PCR screening, actinobacteria

Introduction

Actinobacteria are gram positive bacteria wih high G+C content. Actinobacteria are known for their unique ability to produce novel compounds of clinical and pharmaceutical importance (Li&Vederas,2009). Through the many actinobacterial genera, *Streptomyces*, *Micromonospora*, *Nocardiopsis*, and *Rhodococcus* are the most efficient producers of secondary bioactive metabolites (Reimer et al., 2015). Actinomycetes are found in a variety of habitats and are particularly abundant in soil. Because of the exhaustion of the usual terrestrial sources, the discovery rate of new compounds from actinobacteria has steadily decreased and the re-isolation of known compounds was subsequently increased. This progress has led to a declining trend in the discovery of unknown natural products derived from microorganisms (Khan et al., 2010; Lam, 2006; Watve et al., 2001) For this reason, efforts focused increasingly on expanding the isolation sources beyond just terrestrial soils.

The marine biosphere is one of the earth's richest innumerable habitats and is expected to be an excellent sampling point due to microbial diversity in the seawater and sediment (Berdy, 2005; Fenical and Jensen, 2006). It has been shown that marine actinobacteria species are physiologically and phylogenetically distinct from their terrestrial relatives, and were found to represent a rich source for novel, chemically multifarious bioactive secondary metabolites with potential applications in antimicrobial and anticancer therapy (Bull et al., 2005; Lam, 2006; Maldonado et al., 2005). Marine actinomycetes produced a multitude of novel lead compounds with medicinal and pharmaceutical applications (Becerril-Espinosa, 2013). Although research on marine actinobacterial natural products is still at its early stage compared to what is known about terrestrial relatives, the enormous potential of marine strains as producers of bioactive secondary metabolites has already been proven and till date it remains matchless (Lakshmipathy et al., 2010).

Various natural products belong to the chemical families polyketides and non-ribosomal peptides (Droghazi & Metcalf, 2013). Polyketide synthases (PKS) and nonribosomal peptide synthetases (NRPS) are multi-domain megasynthases that are involved in the biosynthesis of a large fraction of diverse microbial natural products known as polyketides and nonribosomal peptides, respectively (Donadio et al., 2007). Besides, PKS and NRPS gene region screening on genome use for determine bioactive secondary compounds. In this way, ability of bioactive compounds production of microorganism are determined (Pathom-Aree, 2006). Marine derived actinobacteria have PKS and NRPS pathways for secodary metabolite production. For this reason they have ability of production diverse components as terpens, terpenoids, polyketides, peptids, caprolactones, quinons and alkaloids (Solanki et al., 2008).

Marine derived actinobacteria that obtained from Black Sea sediments were investigated in terms of potency of secondary metabolite pruduction by using PCR based approach in this study.

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Materials and Methods

Actinobacteria strains

Eight marine derived actinobacteria strains that have antimicrobial activity in our lab were selected for PCR screening

DNA isolation

DNA isolation from actinobacteria was done by using Fast Spin DNA Isolation Kits (MP) with instruction manual.

PCR screening

i. NRPS gene region screening

Two primer sets A3F/A7R and ADEdom5/ ADEdom3 (Table 1) were used for PCR screening of NRPS gene region. All PCR reactions were performed 50 µl total volume. The PCR mixture was contained 10 µl 10X PCR buffer, 2 µl each primer (10 pM), 2 µl dNTPs (10 mM), 3 µl $MgCl_2$, 0.25 µl Taq DNA polymerase (5 U/µl; GoTaq Hot Start DNA polymerase), 1 µl genomic DNA, and 5 µl DMSO. To amplify the 450 bp segment encoding the NRPS, we used the primers ADEdom5 (5'- ACSGGCNNNCCSAAGGGCGT-3') and ADEdom3 (5'-CTCSGTSGGSCCGTA-3') (Busti, 2006). PCR conditions that after a 5 min incubation at 94 °C, 10 cycles (each of 1 min at 94 °C, 45 s at 50°C and 1 min at 72 °C) were followed by 20 cycles under identical conditions, except that the annealing temperature was raised to 55 °C. All PCR reactions were terminated with a 5 min elongation at 72 °C. To amplify the 700-800 bp segment encoding the NRPS, we used the primers A3F(5'-CSTACSYSATSTACACSTCSGG-3') and A7R (5'-SASGTCVCCSGTSCGGTAS-3') (Ayuso-Sacido, 2005). After a 5 min incubation at 94 °C, 30 cycles (each of 1 min at 94 °C, 1min at 58 °C and 1 min at 72 °C) All PCR reactions were terminated with a 5 min elongation at 72 °C.

ii. PKS gene region screening

K1F/M6R primers (Table 1) were used for PCR reactions. PCR reactions were performed 50 µl total volume and PCR mixture was contained 10 µl 10X PCR buffer, 2 µl each primer (10 pM), 2 µl dNTPs (10 mM), 3 µl $MgCl_2$, 0.25 µl Taq DNA polymerase (5 U/µl; GoTaq Hot Start DNA polymerase), 1 µl genomic DNA, and 5 µl DMSO. To amplify the 1200-1400 bp segment encoding the PKS, we used the primers K1F (5'-TSAAGTCSAACATCGGBCA-3') and M6R (5'-CGCAGGTTSCSGTACCAGTA-3') (Ayuso-Sacido, 2005). After a 5 min incubation at 94 °C, 30 cycles (each of 1 min at 94 °C, 2 min at 58 °C and 1.5 min at 72 °C) All PCR reactions were terminated with a 5 min elongation at 72 °C.

Table 1: Primers and their feature

primers	sequences	target gene	amplicon lenght (bp)	literature
K1F	5'-TSAAGTCSAACATCGGBCA-3'	PKS	1200-1400	Ayuso-Sacido, 2005
M6R	5'-CGCAGGTTSCSGTACCAGTA-3'			
A3F	5'-CSTACSYSATSTACACSTCSGG-3'	NRPS	700-800	Ayuso-Sacido, 2005
A7R	5'-SASGTCVCCSGTSCGGTAS-3'			
ADEdom5	5'-ACSGGCNNNCCSAAGGGCGT-3'	NRPS	450	Busti, 2006
ADEdom3	5'-CTCSGTSGGSCCGTA-3'			

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Results and Discussion

PKS and NRPS screening are used as a collateral strategy for discovering bacterial natural product diversity (Pathom-Aree, 2006). Because natural product diversity are a reflection of bacterial genetic diversity. Prescreening of these target genes are beneficial approach for determine to new and useful secondary metabolites (Ketela et al., 2002). In this study eight strains were used for PCR based screening. Firsty, NRPS PCRs were done using A3F/A7R primers sets and appropriate conditions (Table 1). But PCRs were not run. For this reason other primer sets were tried for NRPS. ADEdom5/ ADEdom3 primers (Table 1) were used for NRPS PCR and 5 positive bands (≈450bp lenght) were detected on %1 agarose gel (Table 2). K1F/M6R primers (Table 1) were used for PKS PCR and 3 positive bands (≈1200-1400bp lenght) were were detected on %1 agarose gel (Table 2).

Table 2: PCR results of target genes

Actinobacteria strain	PKS PCR (K1F/M6R)	NRPS PCR (A3F/A7R)	NRPS PCR (ADEdom5/ ADEdom3)
S1	-	-	-
S2	-	-	-
S3	-	-	-
S4	+	-	+
S5	+	-	+
S6	-	-	+
S7	+	-	+
S8	-	-	+

According to results, many isolate were found positive for NRPS (62,5%) and PKS (37,5%) genes. Besides PKS and NRPS were found with together some samples (37,5%). Thus this marine derived actinobacteria have a great potantial for production of bioactive secondary metabolites.

Conclusion

PCR screening of PKS or NRPS gene regions were not functional strategy. On the contrary of fermentation based studies, active compounds were not isolated at the end of the PCR screening. But prescreening of these gene regions were found very effective approach for genetic research. Results of PCR screening can use for upper studies. Also these results might be guide similar studies

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SEISMIC BEHAVIOR OF MULTI-STORY REINFORCED CONCRETE BUILDINGS WITH SHEAR WALLS ALONG THE PERIMETER OF BUILDING

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The use of reinforced concrete shear walls for seismic resistant design of multi-story, tall buildings is becoming a most efficient method. Most effective location of the shear walls in plan is along the perimeter of the buildings. These shear walls may have openings for Windows.

In this study, 5, 10, 20 and 30 story reinforced concrete buildings with frame and Frame and Shear Wall systems are modelled. The models are prepared 3 dimensionally. Analysis is performed with ETABS which uses the Finite Element Method. Response spectrum analysis and Equivalent static load methods are used for seismic load calculations.

The period, lateral displacement, shear force, bending moment, stiffness values are obtained from the analysis for all the models and compared with each other. The results are given in detail on graphs.

Keywords: Seismic Behavior, Reinforced Concrete, Shear Wall

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SENSÖR TABANLI YERLEŞKE OTOMASYON SİSTEMİ: İBEACON TEKNOLOJİLERİ YARDIMI İLE PERSONEL BİLGİ MOBİL UYGULAMASI

Sensor Based Campus Automation Systems: Staff Information Application on Smart Mobile Supported iBeacon Technology

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ÖZET

Akıllı telefonlar ile GPS uyduları sayesinde coğrafi konum bilgileri elde edilebilmektedir. Ancak GPS uydu sinyalleri kapalı olmayan alanlarda alınabilmektedir. Kapalı alanlarda ve sık ormanlık yerlerde uydu sinyalleri sağlıklı bir şekilde alınamadığından, GPS ile konum belirlemek olanaksız hale gelmektedir. Yeterli GPS sinyali alınamayan yerlerde konum bilgisi elde etmek için farklı yöntem ve teknolojiler geliştirilmiştir. Bu teknolojilerden birisi de bluetooth düşük enerji teknolojisi ile çalışan, belirli bir mesafeye kadar ayırt edici veriler (UUID, Majör, Minör) göndererek kapalı veya açık alanda konum belirlemede kullanılabilen iBeacon' lardır. Yapılan çalışmada iBecaon yardımı ile çalışma ofisi konumlarına göre öğretim elemanı ders programı, izin durumu, müsait olup olmadığı, uzmanlık alanı, özel mesajı vb. gibi birçok bilgi ofise yaklaşınca otomatik olarak elde edilebilmektedir. Sistem Android tabanlı mobil telefon bluetooth iletişim yardımıyla iBeacon'dan elde edilen UUID, Majör, Minör verileri kullanılarak istenen personel bilgileri sunucu bilgisayardan web servisleri yardımıyla elde edilerek gösterilmiştir. Personel, kendi akıllı cep telefonundan kendi bilgilerini ve durumunu güncelleyebilmektedir. Geliştirilen yazılım, iBeacon, android uygulaması, veri tabanından ve web servisi sunucusundan oluşan entegre bir sistemdir.

Anahtar kelimeler: Android, iBeacon, Web Servis, Bluetooth Low Energy, Kampus Otomasyon.

ABSTRACT

Location data is available thanks to mobile phones and GPS satellites however, its signals can only be received within open field. Since satellite signals cannot be received properly in closed areas or dense forests, determining location with GPS is impossible. Different methods and technologies have been developed to obtain coarse location data where GPS signals cannot be received. One of these technologies is iBeacon which operates with low energy technology and sends distinctive data (UUID, Major, Minor) up to a designated range used in open fields and closed areas. In the study conducted, information such as teaching staff syllabus, vacation status, availability, expertise, private messages etc. will be received automatically with proximity. The system is to show the data acquired from UUID, Major, Minor with the help of iBeacon to android based mobile phones via the web services of the server. Teaching staff will have the ability to input personal data via the his/him smart mobile phone/tablet. The software developed, is an integrated system of iBeacon, android application, database and web services server.

Keywords: Android, iBeacon, Web Service, Bluetooth Low Energy, Campus Automation.

GİRİŞ

Akıllı cep telefonlarının gelişmesi ile birlikte, kullanım alanları da artmıştır. Günümüzde cep telefonları; eğitim, sağlık, eğlence, sosyal medya, oyun, pazarlama, bilgi edinme gibi pek çok alanda kullanılmaktadır. Dolayısıyla cep telefonu pazarı en hızlı büyüyen sektörlerden biridir (IDC,2015). Andrew (2105) aktardığına göre cep telefonuna 2014 yılında 901 milyar dolar harcanmıştır ve bu hızla devam ederse 2019 yılına kadar bunun 1.2 trilyon dolar olacağı tahmin edilmektedir.

Akıllı mobil cihazların yaygınlaşması ile birlikte cihazların işlevsel özellikleri ve mobil uygulama programlarının çeşitliliği, etkinliği ve kullanım alanları artmıştır. Günümüzde akıllı cep telefonları; ışık, basınç, sıcaklık, yerçekimi, konum, jiroskop vb. gibi algılayıcıların entegre hale gelmesiyle, çevresi ile etkileşim kurabilen interaktif cihazlar halini almıştır. Bunun yanında elektronik bileklik, RFID (radio-frequency identification – radyo frekansı ile tanımlama), beacon gibi harici cihazlarla (giyilebilir cihazlar) da iletişim kurarak kendisine çok farklı kullanım alanları oluşturmaktadır. Cep telefonu konuma bağlı bilgi edinme teknolojileri kullanarak, yol tarifi, bilgi edinme, yakındaki bulma vb. gibi birçok farklı uygulama alanı bulmuştur.

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Halen cep telefonu ile konuma bağlı işlem yapmak için farklı tekniklerden yararlanılmaktadır. Bunlardan birisi; global konum belirleme (Global Positioning System -GPS) uyduları sayesinde bir-iki metre hassasiyetinde küresel konum belirleme işlemi yapılabilmektedir (Misra ve Enge, 2011). Ancak GPS uydu sinyalleri kapalı alanlarda yeterince alınamadığından, u gibi yerlerde konum bulma işlemi sağlıklı olamamkatadır (Gast,2014,p:3,6). Mobil telefon ile konum belirlemek için GPS sinyallerini yanında onun kadar hassas ölçüm yapamayan, kabaca yer belirlemek için baz istasyonları ve internet bağlantısından faydalanılmaktadır. Kapalı yerlerde hassas konum bilgisi elde edebilmek için beacon gibi teknolojilerden faydalanılır. Beacon Apple firması tarafından geliştirilmiş (iBeacon) bluetooth düşük enerji (Bluetooth Low Energy-BLE) teknolojisi ile iletişim kuran, belirli bir mesafeye kadar ayırt edici veriler (UUID, Majör, Minör) göndererek kapalı veya açık alanda konum belirlemede ve yaklaşım tabanlı uygulamalarında kullanılabilen elektronik bir cihazdır (Gast,2014). GPS ile daha çok neredeyim, Beacon ise mikro mesafeler (birkaç santimetreden birkaç metreye kadar), ne kadar yakınındayım için daha iyi sonuçlar elde edilebilir (Kohne ve Siech, 2014). iBeacon farklı amaçlar için kullanılabilmektedir. Köhne ve Sieck (2014), hava alanında birden çok kişinin valizinin, iBeacon teknolojileri kullanarak akıllı cep telefonu ile takibini gerçekleştirmişlerdir. Yang, Wang ve Zhang (2015), hastane kapalı ananında, servisler ve hasta odalarını konum bilgisine göre hasta bilgilerini elde edilmesi iBeacon teknolojisi ile yapmışlardır. Merode, ve diğ. (2015), çalışmalarında, kampüsün belirli noktalarına yerleştirilen iBeacon'lar ile konum hakkında cep telefonu üzerinden bilgi alınmasını sağlamışlardır. Li (2016) yüksek lisans tezinde hastanede hemşire ofisleri bina içi navigasyonu iBeacon teknolojileri yardımı ile gerçekleştirmişlerdir.

Bu çalışmada; kampus içerisinde açık/kapalı alanlarda, öğrencilerin veya misafirlerin akademik veya idari personel ofisine yaklaşınca, akıllı cep telefonu/tablet marifetiyle otomatik bilgi edinebilmesi sağlayan, bu bilgileri personel kendi akıllı cep telefonundan istediği zaman güncelleyebildiği dinamik bir yapı iBeacon teknolojileri kullanılarak web servisi destekli, Android tabanlı mobil uygulama geliştirilmiştir.

BEACON TEKNOLOJİLERİ

iBeacon cihazı Apple firması tarafından ilk defa 2013 World Wide Developer Conference (WWDC) duyurduğu Bluetooth Low Energy (BLE, Bluetooth 4.0) teknolojisini kullanan kendine özgü veri protokolü olan, yaklaşım temelli giyilebilir bir cihazdır. iBeacon, bir takım kimlik bilgiler içeren, tek yönlü sinyal yayan, bir adet yassı pil (saat pili) ile yıllarca çalışabilen, içerisinde işlemeci bulunan elektronik bir aygıttır (Şekil-1). Bluetooth 4.0 destekleyen, iBeacon algılama uygulaması olan herhangi bir cihaz, iBeacon kapsama alanına (bölgesine) girdiğinde çevresindeki iBeacon'ları algılayabilir.



Şekil-1. Estimote iBeacon yapısı (Blagdon, 2013).

Tablo-1'de görüldüğü gibi bir iBeacon veri protokolü toplam 25 Byte uzunluğunda veri ile temsil edilir (Köhne ve Sieck, 2014). Protokol verisini iBeacon üretici bilgisi ve içerik bilgisi olarak ele alırsak: Üretici bilgisi bölümünde; farklı üreticilere ait iBeacon ve farklı iBeacon tiplerini belirtir. Bu alanlar iBeacon ile işlem yaparken gerekli değildir. Daha çok ürün hakkında bilgi edinmek için kullanılır. iBeacon içerik bölümünde ise, herhangi bir iBeacon tanımlama bilgileri (ID) ile birlikte yayın mesafesini belirleyen *RSSI (Received Signal Strength Indication Mesaurement Power)* bilgileri mevcuttur. iBeacon veri formatını şu şekilde açıklayabiliriz;

Company ID (Üretici Firma Tanımlama Bilgisi): 16 Bit uzunluğundadır. iBeacon üreticilerinin kimlik bilgisini gösterir. iBeacon teknolojileri Apple firması tarafından lisanslandığından, farklı firmalar iBeacon üretmek için Apple tarafından üretici firma ID numarası almalıdır.

Type: Farklı tiplerde iBeacon üretilebilmesi için kullanılan 1 Byte uzunluğunda bir alandır.

Data Length: iBeacon içerik uzunluğunu belirtir. iBeacon içerik veri uzunluğu 21 Byte olduğundan buradaki değer 21Byte değerinin onaltılı sayı sistemi karşılığı olan 0x15'dir.

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iBeacon ile bir tanımlama yapılacaksa "beacon içerik verisi" alanında bulunan 21 Byte uzunluğunda, kimlik bilgisi (ID) olarak adlandırılan UUID, Majör, Minör verilerinden faydalanılır. Tablo-1'in son 21 Byte'lık alanı (RSSI hariç) bu iş için kullanılır. iBeacon içerik verisi için kullanılan veriler şu şekilde açıklanır;

Universal Unique Identifier (UUID): 128 Bit uzunluğunda ve eşsiz (unique) bir değerdir. Tanımlamada en üst kimliği ifade eder.

Majör: 16 bit uzunluğunda bir alandır. Bir alt kimliği veya grubu ifade eder. Bu alan 0 (reserve) hariç 1 ile 65535 arasında bir değer verilebilir. Başka bir deyişle Bir UUID altında 65535 farklı Majör alt grubu tanımlanabilir.

Minör: En alt grubu ifade eder. 16 bit uzunluğundadır. Dolayısıyla 1- 65535 arasında değer alabilir 0 değeri rezervedir. Her Majör değeri için 65535 farklı minör değeri tanımlanabilir.

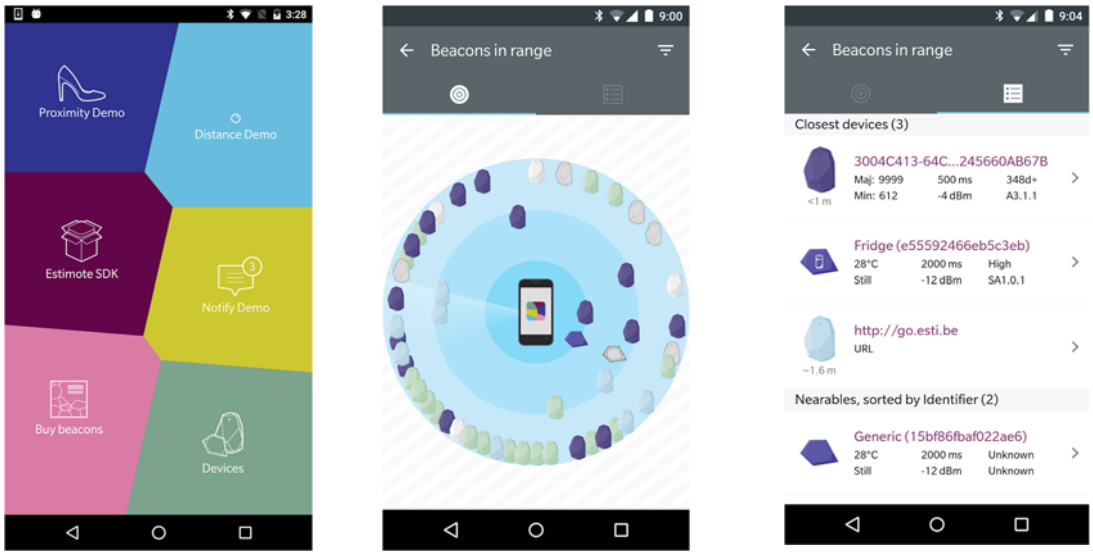
20 Byte uzunluğundaki iBeacon içerik verisi (UUID, Majör, Minör) ürün/personel kimlik tanımlaması için kullanılır. Tablo-2'de görüldüğü gibi UUID üst kimliği ifade eder. Öreğin;C743365A-C141-4C43-8A45-E258F7755D5B UUID değeri X firmasını temsil etmektedir. Majör değeri bir grubu ifade eder. Tabloya göre Majör değeri X firmasının illerdeki mağazalarını göstermektedir. Minör değeri ise her bir Majörün bir alt kimliğini temsil etmektedir. Tablo-2'ye göre Minör değerleri, X firmasının her ildeki; Giyim, Beyaz Eşya, Elektronik, Mobilya gibi alt gruplarını oluşturur. Örneğin; UUID: C743365A-C141-4C43-8A45-E258F7755D5B, Majör:2 ve Minör:30 şeklindeki kodlanmış bir iBeacon ID değeri, X firmasının Ankara şubesindeki Elektronik eşyayı gösterir. UUID, Majör, Minör kimlik tanımlama değerleri varsayılan olarak üretici firma tarafından belirlenmiştir. Ancak bu değerleri üretici firmaların özel uygulama yazılımları yardımıyla değiştirmek mümkündür. Yapılan çalışmada kullanılan Estimote marka iBeacon'ların UUID, Majör ve Minör değerleri, Estimote Android (Şekil-3) uygulaması (GooglePlay,2016) ile değiştirilerek kullanılmıştır (Şekil-7.B).

Tablo-1. iBeacon veri formatı yapısı.

Üretici bilgileri ile birlikte iBeacon içeriği						
Üretici bilgileri			Beacon içerik verisi			
Company ID(0x004C) 2 Byte	Type (0x02) 1 Byte	Data Length (0x015) 1 Byte	UUID 16 Byte	Majör 2 Byte	Minör 2 Byte	Measured Power 1 Byte

Tablo-2.X firması ürünleri iBeacon kodlaması

Konum		İstanbul	Ankara	İzmir	Adana
UUID		C743365A-C141-4C43-8A45-E258F7755D5B			
Majör		1	2	3	4
Minör	Giysi	10	10	10	10
	Beyaz Eşya	20	20	20	20
	Elektronik	30	30	30	30
	Mobilya	40	50	50	50



Şekil-3.Estimote Android-iPhone uygulaması arayüzü (GooglePlay,2016)

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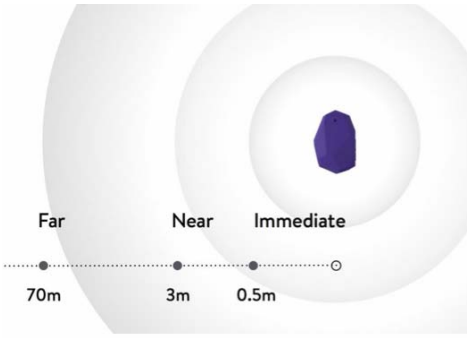
RSSI (Received Signal Strength Indication) Mesaurement power (8 bit): RSSI, iBeacon yayın alanı mesafesini belirlemek için kullanılır. Yüksek çıkış gücü daha uzak mesafe yayın alanı ancak daha kısa pil ömrü demektir. Sinyal yayma sıklığı ile ilgili olarak; daha sık sinyal daha kararlı çalışmayı getirir ancak daha fazla enerji tüketecektir. Bu değerler üretici firma özel uygulaması yardımıyla değiştirilebilmektedir. Çalışmada kullanılan Estimote marka iBeacon sinyal gönderme periyodu 100 ms ile 2000 ms arasındadır. Bu değer iPhone veya Android tabanlı akıllı cep telefonum/tablet üzerinde çalışabilen Estimote uygulaması (Şekil-3) ile izlemek ve değiştirmek mümkündür.

Bir iBeacon algılayıcı cihazın iBeacona olan mesafesini tam olarak hesaplamak tam olarak mümkün değildir. Bu yüzden tam bir mesafe hesaplamaktan daha çok; dibinde, yakınında, uzağında gibi ölçekler kullanmak daha uygundur. Dibinde (immediate): 0.5 metreye kadar olan mesafede, yakınında (near): 3 metre mesafeye kadar olan yayın alanı, uzağında(far): 70 metreye kadar olan mesafe ve 70 metreden daha uzak mesafede ise bilinmiyor (unknown) gibi ölçekler kullanılır (Şekil-2). Bu mesafeler arada herhangi bir engel yok ve açık alan için geçerlidir.



Şekil-2. Estimote iBeacon etki alanı (Estimote, 2016.B)

iBeacon Özellikleri

1. Apple firması lisanslıdır ve 2013 yılında ilk defa tanıtılmıştır.
2. Bluetooth Low Energy (Bluteooth 4.0, 2.4 GHz) iletişim sağlar.
3. BLE-Chip 'e sahip herhangi bir cihaz iBeacon olarak kullanılabilir. Örneğin: BLE-USB Stick, Ardunio board, Rasspberry ve hatta bir cep telefonu,
4. Eğer bir cihaz iBeacon olarak kullanılacaksa Apple firmasından lisans alınması gerekir.
5. ID ve mesafe ölçüm bilgisi RSSI olarak tek yönlü sinyal yayar.
6. iBeacon ile karşılıklı iletişime geçilemez. Sadece üretici firma uygulamaları vasıtasıyla UUID, Majör, Minör bilgileri gibi bir takım ayarlamalar yapılabilir.
7. Sinyal yayama periyodu (100 ms ile 2000 ms), bunun sıklığı pil ömrünü belirler.
8. iBeacon en az iOS 7.0 ve Android 4.3 versiyonlarını destekler.
9. Kapsama alanı açık alanda 70 m mesafeye kadar ulaşabilir.
10. RSSI ile iBeacon yayın mesafesi belirlenebilir.
11. iBeacon push notifications servisi vermez. Uygulama geliştirici belirli periyotlarla iBeacondan yayılan sinyallerini dinleyerek kendi push notification hizmetini oluşturarak buna göre hareket eder.
12. Halen Estimote, Qualcomm, BlueSense, Gelo, Glimworm vb. gibi ondan fazla iBeacon üretici firma mevcuttur (Nodes,2016).

ÇALIŞMA

Akademik veya idari personel ofislerin yaklaşınca personel hakkında, görevi, bölümü, uzmanlık alanı gibi bilgilerin yanında, a an için ofiste olup olmadığı, ofiste ise meşgul olup olmadığı veya meşguliyet durumu gibi bilgilerin kimseyi rahatsız etmeden elde edilmesi hem personel, hem de bilgi alacak kişi açısından önemlidir. Bilgi alınacak personelin ofisine yaklaşınca, akıllı cep telefonu marifetiyle hakkında bilgi edinilmesi sağlanarak, akademik veya idari personel gereksiz yere rahatsız edilmeden, kesintisiz çalışma ortamı oluşturulması ve aynı zamanda öğrenci veya misafirlerin de istedikleri kişi hakkında kimseye ihtiyaç duymadan bilgi edinmesi amaçlanmıştır. Bunun için; Estimote Proximity Beacons (Estimote,2016.C) cihazı kullanılarak kampus içerisinde kapalı alanlardaki, personel hakkında konuma bağlı yaklaşım esasına göre çalışan Android tabanlı akıllı cep telefonu ile bilgi edinmeyi sağlayan bir mobil uygulama geliştirilmiştir. Sistem genel olarak şu bileşenlerden oluşmaktadır;

- Estimote iBeacon
- Estimote SDK

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- Android Studio 2.1
- MS SQL server (Express)
- .NET web servisi

Çalışmada kullanılan iBeacon cihazı Estimote firmasının Proximity Beacon modelidir (Şekil-4). Bu model açık alanda yaklaşık 70 m yayın alanına sahiptir. Bunun yanında; NFC (Near Field Comminaction), motion (hareket), ısı (tempereture) sensörlerini de barındırmaktadır. Çalışmada üç adet iBeacon cihazı kullanılmıştır. iBeacon ile haberleşme ve ID okumak için Estimote SDK Andriod paketi Android Studio 2.1 ile entegre edilmiştir. Veriler yerel test sunucu üzerine kurulu MS SQL Express server tarafından tutulmaktadır. Android tabanlı akıllı cep telefonu ile SQL sunucu arasındaki veri akışı .NET web servisleri yardımıyla gerçekleştirilmiştir. Çalışmadaki sistem üç katmanlı bir mimariye sahiptir (Şekil-5).

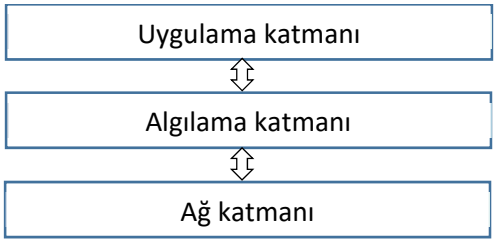
Ağ katmanı: Akıllı telefon/tablet ile .NET web servislerini kullanarak veri alış verişi yapabilmesi için gerekli internet bağlantı altyapısını oluşturur. İnternete bağlanma işlemi Wi-Fi veya xG diye adlandırdığımız 3G, 4.5G, 5G vb. kullanabilir.

Algılama katmanı: BLE teknolojisi kullanarak çevresindeki iBeacon sinyallerini algılayıp, bu sinyallerden elde edilen ID (UUID, Majör, Minör) verisini, uygulama yazılımında daha önce tanımlanmış personel bilgileri ile eşleştirip ekrandan listeler (Şekil-8.B).

Uygulama katmanı: Algılanan iBeacon ID bilgilerinden seçilen personel verisini web servisine gönderir ve web servisinden gelen bilgilerin arayüze aktarılarak gösterilmesini sağlar.

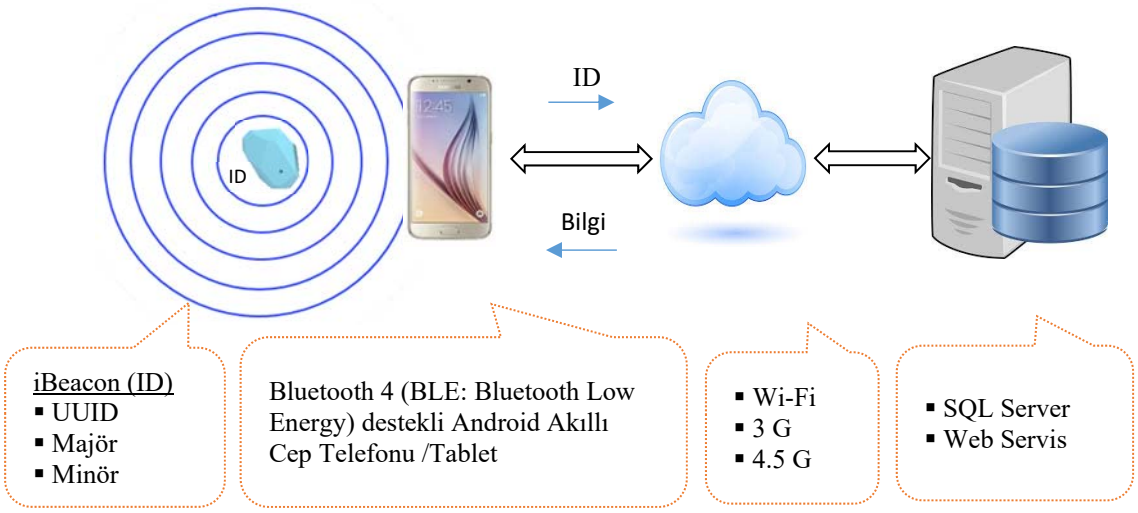


Şekil-4. Estimote iBeacon.



Şekil-5. Sistem mimarisi.

Çalışmada kullanılan sistemin mimarisi Şekil-6'da verilmiştir. Akıllı telefon/tablet beacon bölgesine girdiği andan itibaren beacon ID bilgileri algılanır. Eğer birden çok beacon alanlarının kesişim bölgesinde algılama yapılırsa, alanındaki tüm beconlar algılanarak uzaklıklarına göre, an yıkından en uzağa sıralanarak listelenir (Şekil-8.A). Algılanan ID'ler uygulama içerisinde kendisi ile eşleştirilen personel bilgileri ile birlikte görüntülenir (Şekil-8.B). Seçilen ID bilgileri internet altyapısı yardımıyla web servisi sunucusuna iletilir. Web servisi sunucusu bu bilgilerini çözümleyerek gerekli bilgileri SQL sunucudan çekip belirli bir düzende web servisi ile telefona geri gönderir. Gelen bu bilgiler cep telefonu kullanıcı arayüzünde gösterilerek işlem tamamlanır.



Şekil-6. Sistemin blok diyagramı.

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iBeacon Tarama Alanı (Region) Belirlenmesi

iBeacon algılaması yapılırken öncelikle tarama bölgesini (Region) belirlenmesi gerekmektedir. Bunun için Estimote SDK' da *Region* adında bir sınıf mevcuttur. Bu sınıf içerisinde *UUID, Majör* ve *Minör* değerleri kullanarak tarama bölgesi belirlenir. Bölge tanımlamak için;

Region **region** = new Region(**"**ranged region**"**, *UUID*, *Majör*, *Minör*);

Şeklinde bir kod kullanılabilir. Burada kullanılan *UUID*, *Majör* ve *Minör* değerlerine göre tarama bölgesi belirlenir. Tablo-3'de görüldüğü gibi Estimote firması tarafından üretilen iBeacon'ların tümü algılansın isteniyorsa *UUID, Majör, Minör* değerleri *null* olarak belirlenmelidir. Şekil-7.A de gösterildiği gibi belirli bir *UUID*, belirli bir *Majör* bölgesi algılanacaksa, *UUID* ve *Majör* değerleri belirlenip, *Minör* değeri olarak *null* verilir. Aşağıdaki kodda; en dar kapsamlı tarama bölgesini belirlemek için *UUID*, *Majör* ve *Minör* değerleri kullanılmış ve sonucu Şekil-7.B'de gösterilmiştir.

Region **region** = **new** Region("ranged region", UUID.fromString ("F106C03E-E677-361E-8B1B-AE2A157E9191"), 1, 101);

Tablo-3.iBeacon tarama bölgesi belirleme.

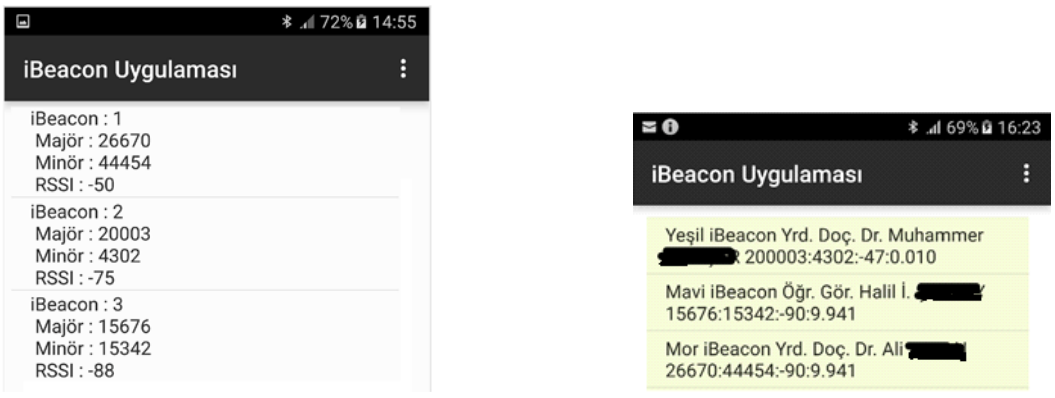
Algılama Bölgesi	UUID	Majör	Minör
Tüm Estimote iBecon'lar	*null*	*Null*	*null*
Belirli bir UUID bölgesi	*UUID*	*Null*	*null*
Bir UUID bölgesindeki, bir Majör alt alanı	*UUID*	*Majör*	*null*
Bir UUID bölgesindeki, bir Majör alt alanındaki belir bir Minör alanı	*UUID*	*Majör*	*Minör*



(A) (B)

Şekil-7. Farklı bölge taramış için algılama sonuçları.

Çalışmada iBeaconlar varsayılan UUID, Majör ve Minör değerleri ile kullanılmıştır. Yazılım içerisinde, Majör ve Minör değerli kullanılarak; yeşil iBeacon Yrd. Doç. Dr. Muhammer, Mavi iBeacon Öğr. Gör. Hail İ. ve mor iBeacon Yrd. Doç. Dr. Ali ile ilişkilendirilmiş ve bu iBeaconlar personel kapı dışlarına, renklerine dikkat edilerek yapıştırılmıştır. Seçilen personel odaları, iBeacon yayın mesafeleri birbiri ile çakışacak şekilde belirlenmiştir. Böylece bir personel odasına yaklaşınca üç iBeacon'da algılanarak, en yakından en uzağa doğru Şekil-8.B deki gibi listelenir. Burada en üstteki personel, bize konum olarak en yakın olan personeldir. Kullanıcı istediği personeli seçerek hakkında bilgi alabilir (Şekil-9). Uygulama kendisine iBeacon ataması yapılan kullanıcıyı, daha önceden sisteme tanıtılan telefon bilgilerinden, tanıyarak normal kullanıcılardan farklı olarak kendi bilgilerini güncelleme ekranını çağırma imkanı sunmaktadır. Böylece kullanıcı bazı bilgilerini güncelleyebilecektir (Şekil-10). Bu şekilde sistem, personel bilgileri sürekli dinamik tutma imkanı sunmaktadır.



(A) (B)

Şekil-8. Birden çok iBeacon algılanarak görüntülenmesi.

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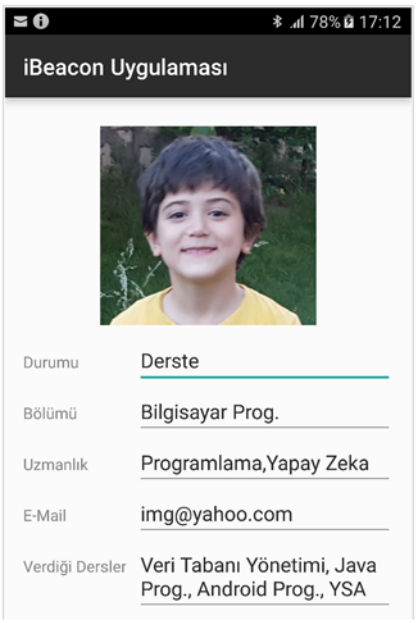
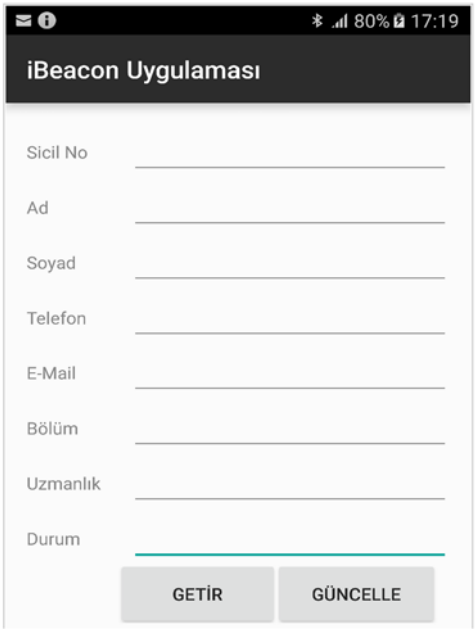


Şekil-9 Seçilen personel bilgisi görüntüleme.



Şekil-10. Kişisel bilgilerin değiştirilmesi.

SONUÇ VE ÖNERİLER

Bu çalışmada, iBeacon teknolojileri ve .NET web servisi kullanılarak BLE destekleyen Android işletim sistemli akıllı cep telefonu/tablet üzerinde çalışan bir Android uygulaması geliştirilmiştir. Sistem Samsung S6 Android 6.0.1 sürümü ile test edilmiştir. Sistem Estimote Proximity iBeacon modeli olan üç cihaz (üç farklı konum bilgisi) ile Android Studio 2.1 ve Estimod SDK kullanılarak geliştirilmiş ve çok yakın, yakın, uzak olarak ve iBeacon'lar aynı bölgede kullanılarak test edilmiştir. Uygulama ile; kampüs veya bina içerisindeki, akademik veya idari personel hakkında, konuma bağlı olarak (yaklaşınca) bilgi alınabilmektedir. Öğrenci veya misafir kampüsteki akademik veya idari personel hakkında herhangi bir yardıma ihtiyaç duymadan kendi cep telefonundan bilgi edinebilmektedir. Sisteme kayıtlı bir personel aynı uygulama üzerinden, normal kullanıcılardan ayırılarak, otomatik algılama ile kendi bilgilerini güncelleyebilecektir.

Sistem tehlikeli cihazlar için öğrencilere iş sağlığı ve güvenliği (İSG) kurallarını, kullanım talimatını, gerekli kişisel donanım ihtiyaçlarını, dikkat etmeleri gereken bilgileri her seferinde hatırlatarak kazaların azaltılması ve verimli çalışma imkanı sağlayacak şekilde geliştirilebilir. Bunun yanında; yemekhane giriş/çıkışları, öğrenci/personel devam takibi ve dezavantajlı grupların takibi için geliştirilebilir.

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SERAMİK SEKTÖRÜNDE İŞ ANALİZİ ve İŞ DEĞERLEMESİ

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Özet: İşletmelerde firmanın ücret konusunda izlediği yol sürekli sorgulanmaktadır. Çalışan kendi aldığı ücretten daha çok, aynı işi yaptığı kişiyle aynı ücreti alıp almadığını önemsemektedir. Uygulanan ücret politikası açık ve objektif ölçütlere dayandırılmamışsa, çalışanların kafasındaki belirsizlik onları rahatsız etmektedir. Sözü edilen durum gerçek ve etkin bir araçla yönetim ve çalışan taraflarının ikna edilmesini zorunlu kılmaktadır. Tüm bu belirsizliklerin önüne geçebilmek için de en uygun aracın iş değerlemesi olduğu söylenebilir.

Anahtar Kelimeler: Ücret Sistemi, Değerleme, Puanlama

Giriş

Dünyada arz-talep dengesi incelendiğinde, sanayi devriminden sonra firmalar ürettikleri her şeyi çok rahat bir şekilde satabiliyorken, alıcılar bazı ürünler için uzun süreler beklemek zorunda kalabiliyorlardı. Firmalar taleplere cevap verebilmek için verimlilik yöntemleri ile daha fazla nasıl üretirim sorusuna cevap aramaya başladılar. Piyasada daha fazla ürün olduğu zaman da müşteri seçim yapmaya başladı. Durum böyle olunca da firmalar daha az maliyetle üretim yapmaya çalıştılar. Ürün sayısı ve tercihi arttıkça, müşteriler artık ürünlerin kalitesini sorgulama başladı. Firmalarda ürünlerinin kalitesini arttırmaya yönelik çalışmalar başlattılar. Kaliteli ürün üretebilmede, fark yaratabilmede insan kaynakları faktörü ön plana çıktı. Çalışanın kendisini huzurlu hissettiği yerde daha verimli olduğu bilinen bir gerçektir. Bunun için de adil bir ücret sistemi olmazsa olmazdır.
Bu çalışmada da vitrifiye üretimi yapan bir seramik fabrikası incelenmiş, üretim ve yönetim aşamasında işler analiz edilmiştir. Yapılan işlerin değerlemesi yapılarak her bir iş için gerekli puanlar çıkarılmış ve adil bir ücret sistemi belirleyebilmek için bir altyapı oluşturulmuştur.

İş Analizi

İş analizi, bir işletmede yapılmakta olan işlerle ilgili bilgilerin toplanması, değerlendirilmesi ve örgütlenmesidir. Başka bir deyişle iş analizi, işletmede yapılacak her bir işin niteliği için genel durumu ve özellikleri, işin yapılacağı çevre ve çalışma koşulları hakkında bilgi toplanması, toplanan verilerin sistematik şekilde incelenmesi, değerlendirilmesi ve bunlara ilişkin bilgilerin yazılı hale getirildiği bir süreçtir.
İş analizi çalışmaları sonucunda; işin ne olduğu, çalışanın görevleri ve sorumlulukları ve ne gibi bilgi, kişilik ve zihinsel/fiziksel özelliklere sahip olması gerektiği tespit edilir. Bir iş analizinde:

- İşin gerekleri nelerdir?
- İş nasıl yapılır?
- İş ne zaman yapılır?
- İş nerede yapılır?
- İş neden yapılır? gibi sorulara cevap aranır.

İş Değerlemesi

İş değerleme, işlerin bir işletmedeki diğer işlerle karşılaştırılarak iş değerinin belirtilmesi ve buna uygun ücret yapısının tespit edilmesidir. İş değerleme, işlerin değerlerine uygun adil bir ücret düzeninin kurulmasını amaç edinmiştir(Eraslan, 2004).

İş Değerleme Yöntemleri

İş değerleme yöntemleri ana hatlarıyla iki temel gruba ayrılır. Bunlar sayısal olan ve sayısal olmayan yöntemlerdir. Sıralama ve sınıflandırma sayısal olmayan yöntemlerdir. Puanlama ve faktör karşılaştırması ise sayısal yöntemler arasındadır(Ataay, 1990; 23).

Bu çalışmada kullanılan teknik olan puanlama yöntemi, üretim birimindeki mevcut işlerin göreceli değerlendirilmesi sonucu, oluşan her bir işin faktörlere, alt faktörlere ve faktör derecelerine göre incelenerek puanlanması ve derecelenmesidir. Puanlama yöntemi iş değerleme yöntemleri içinde en çok uygulanandır ve

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ülkemizde yapılan birçok iş değerleme çalışmasında da başarılı uygulamaları görülmüştür. Faktör karşılaştırma yöntemi gibi analitik yöntem olan puanlama yöntemi ile işlerin değeri gerek nitelik, gerekse nicelik olarak daha ayrıntılı değerlendirilebilir. İşler puanlara göre değerlendirildiğinden anlaşılması ve uygulanması diğer yöntemlere göre kolaydır(Yıldız, 2006).

Puanlama Yönteminin Aşamaları
İşlerin puanlama tekniği uygulanması neticesinde işler birbirinden ayrılabilmekte ve her iş onun değerini veren bazı faktörler aracılığı ile değerlendirilebilmektedir. Puanlama Yöntemi uygulanırken aşağıdaki adımlar izlenmiştir:

1. İş Değerlendirme Grubunun Oluşturulması
2. Çalışma Planının Hazırlanması
3. Ön Etütlerin Yapılması
4. Eğitim Çalışmaları
5. İş Analizi Çalışmaları
6. İş Değerlendirme Puan Planının Tespiti

Uygulama

Uygulama vitrifiye üretimi yapan bir firmada gerçekleştirilmiştir. 1996 yılında, 15 dönümlük bir alan üzerine kurulan firmanın aylık üretim kapasitesi 50 bin parçadır.

Vitrifiye üretimi incelendiğinde üretimle doğrudan alakalı olan beş ana bölüm karşımız çıkmaktadır. Bunlar; ürünlerin tasarlandığı ve döküm yapılacak kalıpların hazırlandığı Alçı Kalıp Hazırlama Bölümü, döküm yapılacak çamurun ve pişmeden önce parlaklık vermesi için kullanılan sır maddesinin hazırlandığı Çamur ve Sır Hazırlama Bölümü, tezgahlar üzerinde kalıpların bulunduğu ve bu kalıplara dökümün yapıldığı Dökümhane Bölümü, pişmeden hemen önce son rötuşların yapılıp sır atıldığı Çamur ve Sırlama Bölümü ile son olarak bu yarı mamullerin pişirildiği Fırınlama Bölümüdür.

Çalışma yapılırken öncelikle üretim ve yönetim kademesi iki ayrı grup olarak düşünülmüştür. İş gereklilikleri ve puan sistemleri her iki grup için ayrı ayrı değerlendirilmiştir.

1.aşama:
İşletmenin organizasyon şeması göz önüne alınarak üretim ve yönetim aşamasındaki tüm işlerin iyi analiz edilmesi gerekmektedir. Birbiri ile kesişen işler göz önüne alınarak iş sayısını en az tutacak sayıda iş tanımları yapılmalıdır.

2.aşama:
Çalışmada ilk yapılan puan sisteminin nasıl kurulması gerektiğine karar vermektir. Bu koşullar belirlendikten sonra hangi madde için kaç puan verilmesi gerektiği bu işi yapan ekip tarafından, işi yapan kişilerle ve yöneticilerle görüştükten sonra belirlenmelidir.

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Tablo 1: İşletmedeki üretim bölümleri için puan sisteminin oluşturulması

FAKTÖR GRUPLARI	GRUP AĞIRLIKLARI	DERECELER				
I-MAHARET GRUBU	**(%40)TOPLAM PUAN:400**	**I**	**II**	**III**	**IV**	**V**
1.ÖĞRENİM veya TEMEL BİLGİ	(%15) 150 PUAN	30	60	90	120	150
2.DENEYİM	(%10) 100 PUAN	20	40	60	80	100
3.BECERİ	(%7,5) 75 PUAN	15	30	45	60	75
4.İNSİYATİF ve ÇARE BULUCULUK	(%7,5) 75 PUAN	15	30	45	60	75
II-SORUMLULUK GRUBU	**(%20)TOPLAM PUAN:200**	**I**	**II**	**III**	**IV**	**V**
5.MAKİNE-TAKIM ve DONANIM SORUMLULUĞU	(%5) 50 PUAN	10	20	30	40	50
6.MALZEME ve ÜRÜN SORUMLULUĞU	(%5) 50 PUAN	10	20	30	40	50
7.ÜRETİM SORUMLULUĞU	(%5) 50 PUAN	10	20	30	40	50
8.BAŞKALARININ İŞ GÜVENLİĞİNDEN SORUMLULUK	(%5) 50 PUAN	10	20	30	40	50
III-ÇABA GRUBU	**(%20)TOPLAM PUAN:200**	**I**	**II**	**III**	**IV**	**V**
9.ZİHİNSEL ÇABA	(%10) 100 PUAN	20	40	60	80	100
10.BEDENSEL ÇABA	(%10) 100 PUAN	20	40	60	80	100
IV-İŞ KOŞULLARI GRUBU	**(%20)TOPLAM PUAN:200**	**I**	**II**	**III**	**IV**	**V**
11.İŞİN DOĞURABİLECEĞİ	(%10) 100 PUAN	20	40	60	80	100
12.ÇALIŞMA KOŞULLARI	(%10) 100 PUAN	20	40	60	80	100
TOPLAM	**(%100)TOPLAM PUAN:1000**					

3. aşama:
Puan sistemi oluşturulduktan sonra en önemli aşama her bir çalışan için bu sistemin nasıl çalışması gerektiğidir. Puan verme noktasında işin içine her hangi bir duygusallık katılmaması çok önemlidir. Hangi puanın karşılığının ne olduğu titizlikle hazırlanmalıdır. İlk iki madde için şu şekilde örnek verilebilir:

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Tablo 2: Puan verme şartlarının belirlenmesi için örnek tablo

DERECE	1.ÖĞRENİM veya TEMEL BİLGİ	2.DENEYİM
1.Derece	İlköğretim mezunu olmak	1 yıla kadar
2.Derece	Lise mezunu olmak	1-4 yıl
3.Derece	MYO mezunu olmak	4-8 yıl
4.Derece	Fakülte mezunu olmak	8-12 yıl
5.Derece	Lisansüstü mezunu olmak	12 ve sonrası

4. aşama:
İşletmede tespit edilen her bir iş için iş analiz ve değerlendirme formu hazırlanarak bu işte gerekli olan puan hesabı üçüncü aşamada belirtilen örnekteki gibi yapılır.

Tablo 3: İş analiz ve değerlendirme formu örneği

İŞİN ÜNVANI:	TASARIMCI	**İŞİN TOPLAM PUANI**	545
İŞİN KISMI:	ALÇI KALIP HAZIRLAMA VE TASARIM		
İŞİN BÖLÜMÜ:	ALÇI KALIP	**İŞİN GRUBU**	5
İŞİN TARİFİ:	ÜRETİLECEK ÜRÜNE GÖRE MODEL KALIP VE TEKSİR KALIBININ HAZIRLANMASI. BU ÇALIŞMALAR YAPILIRKEN BİLGİSAYAR ORTAMINDA ÇALIŞILMASI VE GEREKLİ ÖLÇÜ VE TOLERANSLARIN BELİRLENMESİ		
KULLANILABİLECEK MAKİNE DONANIM ve MALZEMELER: BİLGİSAYAR, ÇİZİM KAĞITLARI, ÇİZİM MASASI			

SIRA NO	FAKTÖRLER	DEĞERLENDİRME		FAKTÖR DERECELERİNİN BELİRLENMESİNDE TEMEL UNSURLAR
		DERECE	PUAN	
	MAHARET GRUBU			
1	ÖĞRENİM veya TEMEL BİLGİ	**4**	**120**	Tasarım yapabilmek için hem bilgisayar hemde elle çizim yapabilecek öğrenimi görmüş olmak
2	DENEYİM	**4**	**80**	Tasarım bölümünde fiilen bir yıl çalışmış olmak
3	BECERİ	**4**	**60**	Tasarım yapabilmek için gerekli olan beceriye sahip olmak

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4	İNSİYATİF ve ÇARE BULUCULUK	3	45	İstenen özelliklerdeki ürünü tasarlamak için insiyatifi elinde bulundurmak
TOPLAM MAHARET GRUBU			**305**	

SORUMLULUK GRUBU

5	MAKİNE TAKIM ve DONANIM SORUMLULUĞU	3	30	Tasarım için kullanılan özel ekipmanlara dikkatsiz çalışma sonucu zarar vermek
6	MALZEME ve ÜRÜN SORUMLULUĞU	1	10	Malzeme ve ürün ile çalışılmaz
7	ÜRETİM SORUMLULUĞU	5	50	Zamanında yetiştirilmeyen tasarım özellikleri ile üretimin aksatılması
8	BAŞKALARININ İŞ GÜVENLİĞİNDEN SORUMLULUK	1	10	Diğer elemanlara zarar verebilecek bir durum söz konusu değildir
TOPLAM SORUMLULUK GRUBU			**100**	

ÇABA GRUBU

9	ZİHNİ GAYRET	4	80	Ürünlerin tasarımlarını yaparken bunu yapacak zihni gayreti göstermek
10	BEDENİ ÇABA	1	20	Bedeni çaba gerekmemektedir

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TOPLAM ÇABA GRUBU			**100**	
	İŞ ŞARTLARI			
11	İŞ TEHLİKESİ	**1**	**20**	İş tehlikesi bulunmamaktadır
12	İŞ YERİ ŞARTLARI	**1**	**20**	İş yeri şartları çalışmaya uygundur
TOPLAM İŞ ŞARTLARI			**40**	

5. aşama:
Her bir iş için puanlama yapıldıktan sonra üretim için her bir bölümün kendi içerisinde kıyaslaması yapılarak her bölüm kendi içerisinde değerlendirilir. Bu muhtemel bir hatayı önlemek ve işleri kıyaslamak için önemlidir.

Tablo 4: Her bölüm için grup puanlaması yapılması için örnek tablo

FAKTÖRLER	**BÖLÜM**	**ALÇI KALIP HAZIRLAMA VE TASARIM**					
	İŞİN İSMİ	**TASARIMCI**		**KALIP DÖKÜMCÜSÜ**		**ALÇI KALIP MEYDANCISI**	
	SIRA NO / **FAKTÖRLER**	**DEĞERLENDİRME**		**DEĞERLENDİRME**		**DEĞERLENDİRME**	
		DERECE	**PUAN**	**DERECE**	**PUAN**	**DERECE**	**PUAN**
MAHARET GRUBU	**1** Öğrenim veya temel bilgi	4	120	2	60	2	60
	2 Deneyim	4	80	3	60	2	40
	3 Beceri	4	60	4	60	3	45
	4 İnsiyatif ve Çare buluculuk	3	45	2	30	2	30
SORUMLULUK GRUBU	**5** Makine takım ve donanım sorumluluğu	3	30	2	20	2	20
	6 Malzeme ve ürün	1	10	2	20	2	20

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		sorumluluğu						
	7	Üretim sorumluluğu	5	50	2	20	3	30
	8	Başkalarının iş güvenliğinden sorumluluk	1	10	1	10	2	20
GAYRET GRUBU	**9**	Zihni gayret	4	80	2	40	1	20
	10	Bedeni gayret	1	20	5	100	3	60
İŞ ŞARTLARI	**11**	İş tehlikeleri	1	20	2	40	3	60
	12	İş yeri şartları	1	20	4	80	3	60
TOPLM PUAN	**MAHARET**		305		210		175	
	SORUMLULUK		100		70		90	
	GAYRET		100		140		80	
	İŞ ŞARTLARI		40		120		120	
	GENEL TOPLAM		**545**		**540**		**465**	

6. aşama:
İşletmedeki tüm işleri aynı tabloda değerlendirebilmek ve en yüksek-en düşün puanları görebilmek için tüm işler ve bu işler için gerekli puanlar hazırlanır.

Tablo 5: Tüm iş puanlarının küçükten büyüğe sıralanması

İŞİN SINIFI	**İŞİN ÜNVANI**	**İŞİN BÖLÜMÜ**	**İŞİN PUANI**
	FORKLİFT OPERATÖRÜ	ÜRETİM VE PAKETLEME	420
	AMBALAJLAYICI	PAKETLEME VE AMBALAJLAMA	420
	ETİKETÇİ	KONTROL	425
	KONTROLCÜ	KURUTMA	430
	DÖKÜMHANE MEYDANCISI-1	DÖKÜMHANE	435
1	TAMAMLAYICI	PAKETLEME VE AMBALAJLAMA	440
	ISKARTACI	ÜRETİM VE PAKETLEME	445
	TAŞIYICI	ÜRETİM VE PAKETLEME	450
	KONTROL VE DÜZELTME MEYDANCISI-1	DÜZELTME	460
	KURUTMA FIRIN MEYDANCISI	KURUTMA	460
	SIRLAMA MEYDANCISI	SIRLAMA	465
	KONTOLCÜ	KONTROL	465
2	ALÇI KALIP MEYDANCISI	ALÇI KALIP	465
	DÖKÜMHANE MEYDANCISI-2	DÖKÜMHANE	470
	KONTROL VE DÜZELTME MEYDANCISI-2	DÜZELTME	475
3	HAZIRLAYICI	ÜRETİM VE PAKETLEME	475
. . .	. . .	. . .	. . .

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7. aşama:
Son aşamada ise bu puanlar belirli gruplara ayrılarak her bir grup için ücret çalışması yapılmasına altyapı hazırlanmış olur.

Tablo 6: İş puanlarına göre grup oluşturulması

İŞ SINIFLARI	SIRALAMA (PUAN ARALIĞI)
1	420 - 440
2	445 - 465
3	470 - 490
4	495 - 525
5	530 - 555
6	560 - 600
7	605 - 615
8	620 - 625
9	630 - 645
10	650 - 690

Sonuç ve Öneriler

Konu ücret olunca, en iyi sistemlere sahip işletmelerde dahi çalışanların kendi aldığı ücretten şikâyet etmese bile, aynı işi yaptığını düşündüğü arkadaşını daha fazla ücret alıyor diye şikâyet ettikleri görülmektedir. Yapı itibarıyla, şirket hep daha az ücret vermek, çalışan ise hep daha çok ücret almak isteyecektir. Dolayısıyla amaç, mümkün olduğunca neye hizmet ettiği hem çalışan hem de şirket tarafından net olarak bilinen, şeffaf, adil ve doğru bir ücretlendirme sistemini oluşturabilmektir. İş değerleme yöntemlerinden birisi olan puanlama yönteminin bu amaca sağlıklı bir şekilde hizmet ettiği görülmektedir.

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SHEAR WAVE VELOCITY DETERMINATION FOR SILTY SAND SOILS

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Abstract: The resonant column test is commonly used in geotechnical earthquake engineering to determine the dynamic behavior of soils. Soil specimen is subjected a wave propagation under different frequencies and wave velocities are determined. In this study, shear wave velocities were measured for reconstituted silty sand samples. Samples were prepared at different relative densities and saturation degrees also test were performed under different confining pressures. The effects of these factors on the shear wave velocities were investigated by comparing the test results.

Keywords: Resonant Column Test, Shear Wave Velocity, Silty Sand

Introduction

When a stress is applied to a body, this effect is spread along the body by stress waves (Das, 2010). Waves are existing when an earthquake occur and pass to the ground mantle with causing some changes in the soil body. Waves are one of the research area due to the soil deformations and structural damages after the earthquakes. Wave velocities are determined at different soil types by using field tests and laboratory experiments. Laboratory experiments are dynamic triaxial test, resonant column test, torsional shear test and bender element test. Field tests are cross-hole test, down-hole test, seismic cone test and etc.

The resonant column test is commonly used in geotechnical earthquake engineering to determine the dynamic behavior of soils. During the resonant column test, a soil specimen is excited under torsional excitation at different frequencies. The velocity of the propagating wave and the degree of the material damping can be derived by measuring the motion. Therefore, the travel times of the shear (S) and the compressional (P) waves are measured on the test samples by using resonant column test device. There are too many study about wave velocity, dynamic soil behavior of soils and resonant column tests.

Baxter et al. (2008) performed a series of dynamic test on the non-plastic silts to develop a correlation between shear wave velocity and dynamic strength. Bartake and Singh (2007) determined the shear wave velocity of sandy soils by using bender element tests. Empirical equations in the literature were compared to the test results. Patel et al. (2008) investigated the shear wave velocity of granular soils and a new formulation was presented. They mixed sand and glass for the preparing test samples. Liquefaction strength of the partially saturated soils are studied by using compressional wave velocity and a relationship was given by Yang et al. (2004). Sugano and Yanagisawa (1992) investigated the all waves induced earthquakes with also relationships between waves and soil strength. And also they developed a new apparatus for the tests. Sykora (1987) presented a new correlation between shear wave velocity and shear modulus. He suggested that geological history, soil type, effective stress, relative density and saturation have great influence on the shear wave velocity. Alla (2009) studied shear wave velocity and liquefaction potential of the unsaturated soil. And also they conducted a series of experiment to determine liquefaction and shear wave velocity dependence. Kumar and Madhusudhan (2010) measured shear wave and compressional wave velocities of dry sand samples under different relative densities and confining pressures. They performed resonant column test for the experiments. Yang (2006) investigated the saturation effect on the shear wave velocity by using field tests. Field seismic test were performed and shear wave and compressional wave velocities were measured. Saturation effects were determined for rock and sandy soils. Andrus and Stokoe (2000) suggested a new procedure to find out liquefaction potential by using shear wave velocity. They prepared some graphs for finer sands, sandy gravels and silty clay type of soils. If the literature is analyzed, it can be easily seen that, shear wave velocity can be used to determine dynamic soil behavior and liquefaction potential.

In this study, the travel times of the shear (S) waves were measured by performing resonant column test. Reconstituted silty sand samples were prepared at different relative densities with confining pressures and saturation degrees. Factors effecting on the shear wave velocity of silty sand samples were investigated by comparing the test results. The results were shown in detail on the basis of laboratory experiments.

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Materials and Methods

All test steps were performed according to the ASTM D4015-07. Non-plastic and fine-grained silty sand soil was used for the experiments. Silty sand samples were obtained from the city of Eskisehir, Turkey. Basic soil characteristics are given in Table 1 and also grain size distribution curve is shown in Figure 1. In this study samples were prepared with 10 mm layers by using wooden compacter. The diameter and the length of the test samples are 70 mm and 145 mm, respectively.

Table 1: Properties of silty sand.

USCS	SW-SM
Coefficient of Uniformity, Cu	14,66
Coefficient of Curvature, Cc	2,45
Amount of Gravel	24%
Amount of Sand	66%
Amount of Silt-Clay	10%
Natural Unit Weight	17,8 kN/m^3
Plasticity	Non-Plastic

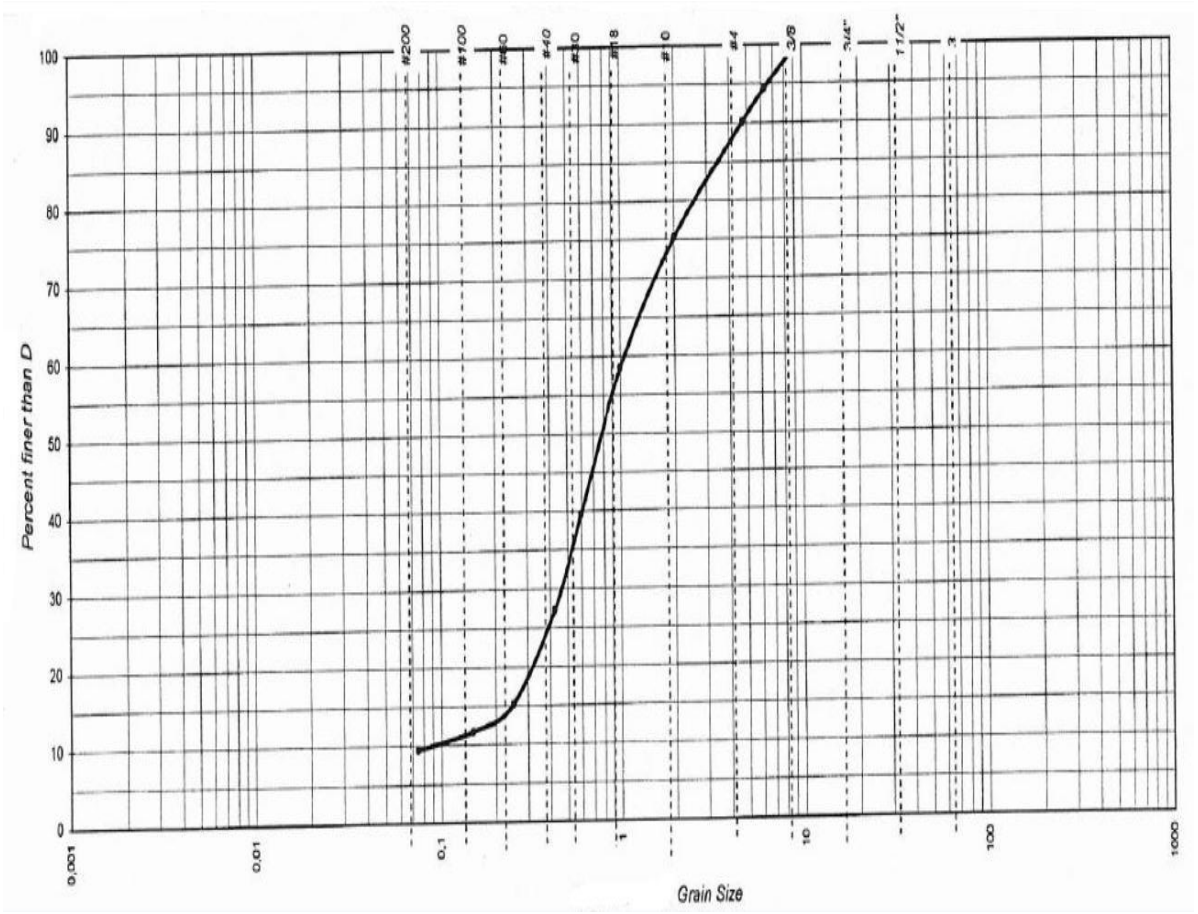

Figure 1. Grain size distribution curve of silty sand samples.

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In this study, modified GDS resonant column system was used to perform wave propagation tests. This system is using the fixed-free configuration. A cylindrical specimen is excited in torsion at its fundamental frequency by a drive system. The velocity of the wave can be easily measured. The resonant column system is shown in Fig. 2.



Figure 2. Resonant column test device.

Standard techniques were chosen for saturation and consolidation test steps. Different cell pressures were applied at different saturation degrees and relative densities. Cell pressure were chosen 100 and 200 kPa and saturation degrees were chosen as 40, and 100%. Relative densities were calculated from initial void ratios as 40, 60 and 80 %. All pressure values, saturation degrees, and relative densities were summarized in Table 2.

Table 2: Test details.

Test No	Relative Densities (%)	Saturation Degrees (%)	Confining Pressures (kPa)
Test A	40	40	100 - 200
Test B	40	100	100 - 200
Test C	60	40	100 - 200
Test D	60	100	100 - 200
Test E	80	40	100 - 200
Test F	80	100	100 - 200

Results and Discussion

After performing the resonant column tests, shear wave velocities were determined. S-wave velocities were found between 160 m/s and 240 m/s. Shear wave velocity of the soils are affected from relative density, confining pressure and saturation (Onur et al., 2012). As expected; results showed that confining pressure and relative density have great effect on the wave velocities. Wave velocities increased with increasing of confining pressure and relative density. On the other hand, wave velocities decreased with increasing of saturation degree but the range of differences were small. Results compared with previous studies about shear wave velocity in the literature. Table 1 gives typical values Vs for some soil types.

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Table 3: Typical values of Vs (Das, 2010).

Soil Type	Shear Wave Velocity, V_s
Fine Sand	90 – 150 m/s
Dense Sand	220 – 250 m/s
Gravel	180 – 230 m/s
Moist Clay	500 – 550 m/s
Granite	2130 – 3360 m/s

The calculated shear wave velocity values were given in Table 4. It can be seen from the results that test experimental study showed similar behavior with the results of the literature. In addition, some observations were found that silty sand samples having higher relative density showed higher shear wave velocities. Silty sand samples having lower confining pressures give lower shear wave velocity results.

Table 4: Test results.

Test No	Confining Pressures (kPa)	Shear Wave Velocity, V_s
Test A	100	173,9 m/s
Test A	200	196,8 m/s
Test B	100	160,0 m/s
Test B	200	184,1 m/s
Test C	100	197,6 m/s
Test C	200	227,2 m/s
Test D	100	180,5 m/s
Test D	200	207,2 m/s
Test E	100	205,2 m/s
Test E	1200	256,9 m/s
Test F	100	201,4 m/s
Test F	200	239,6 m/s

Conclusion

In this study resonant column device were used to determine the effects of the S-waves velocity of silty sand soils. For this purpose, the travel times of the shear (S) waves were measured on silty sand samples at different relative densities, confining pressures and saturation degrees. Factors effecting on the wave velocities of silty sand samples were investigated by comparing the test results. The study suggests that to determine the arrival times of the S-waves needs much more laboratory experiments and field test as well. In addition to observations, laboratory conditions can affect the test results. Field tests should be done by considering natural site-conditions.

Acknowledgements

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SHORT-TERM MULTI-STEP WIND SPEED PREDICTION USING STATISTICAL METHODS AND ARTIFICIAL NEURAL NETWORKS

İSTATİSTİKSEL METOTLAR VE YAPAY SİNİR AĞI KULLANARAK KISA DÖNEM ÇOK ADIMLI RÜZGÂR HIZI TAHMİNİ

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Abstract: Bu çalışma kapsamında Antalya ilinde deniz seviyesinden 2500 metre yüksekte yer alan TÜBİTAK T60 ulusal gözlem evi meteoroloji istasyonun Nisan 2016 itibariyle yapmış olduğu ölçümler PHP programlama dili kullanılarak web sitesi üzerinden derlenmiştir. Elde edilen rüzgâr hızı verileri istatistiksel ve yapay sinir ağı metotları kullanılarak incelenmiş ve meydana getirilen zaman serisi üzerinden ileriye yönelik rüzgâr hızı kestirimlerinde bulunulmuştur. Yapılan hesaplamalar ve gerçek veriler ile kıyaslamalar sonucunda incelenen ARIMA modelleri ile yapay sinir ağları arasında belirgin hata oranı farklılıkları tespit edilmiştir. Literatürde yer alan rüzgâr hızı tahmin çalışmaları genellikle sadece tek adım tahmin başarısı üzerinde yoğunlaşırken, önerilen çalışmada sık kullanılan tahmin metotlarının ileriye dönük 12 adım seviyesinde değerlendirilmeleri gerçekleştirilmiştir.

Keywords: Rüzgâr hızı tahmini, ARIMA, NAR, yapay sinir ağı, zaman serileri, kısa dönemli tahmin metotları

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SIMILAR AND DIFFERENT FEATURES OF SELF-SIMILAR GROUPS IN THE SENSE OF IFS AND TREE AUTOMORPHISM

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The notion of self-similarity of the automorphism group of a rooted tree is given in the papers of Sidki and Nekrashevych. Saltan and Demir define self-similar groups in the sense of iterated function system (IFS) and investigate the properties of these groups in detail. In this presentation, we give some relations between these two groups and compare them.

Keywords: Tree automorphism, iterated function system, fractal

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SOME NOTES ON THE PERIODICITY OF A NON-LINEAR DIFFERENCE EQUATION

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In this study, we investigate the nature of the periodicity of the non-linear difference equation , , where the initial conditions and are real numbers. In addition, long-term behaviour of the solutions of the equation is presented for certain initial conditions.

2010 AMS-Mathematical Subject Classification Number: 39A22; 39A23.

Keywords: Difference Equations, Boundedness, Periodicity, Eventual periodicity.

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SOME PROPERTIES OF THE HOMOTETIC MOTION: CHRACTERISTIC POINT AND MINIMAL ACTION

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ABSTRACT

The Kinetic energy formula of the point that mass equal m is

$$S = \int_{t_1}^{t_2} E_{kin}\, dt$$

In this equation, In case of m=1 , motion are defined as

$$S = \int_{t_1}^{t_2} (X'^T \dot{X}')dt$$

The principle of least action requires $S = min$. The point fullfill this called as charasteristic point.

By this point and integral coefficents minimal action are obtained homoteticaly as

$$2S_0(t_1, t_2) = I_T(t_1, t_2) - \frac{{I_{x_1}}^2(t_1, t_2) + {I_{x_2}}^2(t_1, t_2)}{I_R(t_1, t_2)}$$

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SOSYAL SORUMLULUK PROJELERİNDE BİR ARAŞTIRMA; ENGELLİ, ENGELSİZ BİRLİKTE YAŞIYABİLİYOR MUYUZ?

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Özet: Birçok engelli kişi, toplumun kendilerine olan yaklaşımlarından yakınmaktadır. Bireysel yaşamdan sosyal çevreye varıncaya dek, hayatın her alanında yer alan engelli vatandaşların bir kısmı hafif engelli, bir kısmı ise ağır engellidir. Ağır engelli kişiler, çoğu yaşamsal faaliyetini tek başlarına gerçekleştiremezken, hafif engelli kişiler bu anlamda biraz daha avantajlıdırlar. Kocaeli genelinde engellilerle birlikte yaşama kültürünü arttırmak ve engellilerin toplumun bir parçası olduğunu anlatmak ve engelli engelsiz toplumda beraber yaşandığını gösteren faaliyetlerle, belirlenen engelli engelsiz çocukların yer alacağı bir çalışma Türkiye Beyazay Derneği Kocaeli Şubesi işbirliği ile gerçekleştirildi. Engellilerle birlikte yaşama konusunda Kocaeli genelinde yaklaşık 2200 adet ilkokul, ortaokul ve lise düzeyindeki öğrencilere anket yapılmıştır. Bu çalışmada yapılan anket sonuçları yorumlanmış ve seçilen 100 adet engelli ve 100 adet engelsiz çocuğun yer aldığı çeşitli faaliyetler düzenlenmiştir.

Anahtar Kelimeler: Engelli Çocuklar , Anket Çalışması, Engellilerle Yaşam

Abstract: Many disabled people who approach them are close to the community. Individual life from the social environment until it reaches a portion of the light disabilities located with disabilities in all areas of life is severely disabled is a part. Severely disabled people, the most vital activities have achieved alone, mild impaired people are a little more advantageous in this respect. To increase the culture of living with disabilities across Kocaeli and to tell a part of the community of persons with disabilities and the activities showing that happened with disabilities barrier-free society, will take place the children unimpeded designated disability studies Beyazay Association of Turkey was held in Kocaeli branch cooperation. 2,200 units in primary schools across Kocaeli living with disabilities were interviewed students in middle school and high school level. In this study, interpreted the results of the survey and the various activities of the selected 100 and 100 disabled children takes place unimpeded are arranged.

Keywords: Disabled Children, Survey, Living with Disabilities.

Giriş

Türkiye'de özel gereksinimli çocukların kaynaştırma yoluyla eğitim görmelerine ilişkin gereklilikten söz eden ilk yasa 1983'te çıkarılan Özel Eğitime Muhtaç Çocuklar Yasası"dır ve bu yasada "engelli öğrencilerin engelli olmayan akranları ile birlikte eğitim görmeleri ve okul idaresinin konuya ilişkin önlemler alması" gerektiği açıklanmaktadır. 1988'de yayınlanan "Özel gereksinimli çocukların normal sınıflara kaynaştırılması yoluyla eğitimi" konulu genelgede ise kaynaştırma, uluslararası alanyazındaki tanımına uygun şekilde ele alınmış (Uysal, 2003), 1990'da düzenlenen XIII. Milli Eğitim Şura kararları doğrultusunda da 1991'de 1. Özel Eğitim Konseyi toplanarak kaynaştırma programlarının yaygınlaştırılması, bu programlarına alınan engelli öğrencilerin eğitiminin bireysel olarak planlanması, bu eğitimin alanında uzman kişiler tarafından verilmesi ve izlenmesine ilişkin bir karar alınmıştır. (Sucuoğlu 2004)

Birleşmiş milletler rakamlarına göre dünyada yaklaşık 500 milyon engelli insan vardır. Dünya Sağlık Örgütü dünya nüfusunun dörtte birinin hayatlarında bir çeşit engelle karşı karşıya olduğunu belirtir. Yapılan araştırmaya göre (tuik) ülkemiz nüfusunun %12'si engelli bireylerden oluşmaktadır. Farklı nedenlere bağlı oluşan engellilik temel olarak; zihinsel, görme, işitme ve konuşma, ortopedik ve süreğen olmaktadır. Engellilerin karşılaştıkları sorunların başında yoksulluk, eğitim, ulaşım, fiziksel çevre, konut gibi konular gelmektedir. Dünyanın her yerinde engellilerin çoğu toplumun yoksul kesimlerinden gelmekte ve yoksulluk içinde yaşamaktadır. Eğitimdeki eksiklik yoksullukla endeksli olarak ortaya çıkmaktadır. Bu sorunların haricinde en önemli olan sorun ise ailelerin ve çevredeki insanların engellilere bakış açısından kaynaklanmaktadır. Aynı araştırmaya göre, ülkemizde

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vatandaşların sadece %12,4'ü engellilere gereken ilgi ve yardımın gösterildiğini düşünmekte ve %28,6'sı kendilerinin engellilere gereken ilgi ve yardımı gösterdiğine inanmaktadır. (Pehlivanoğlu, 2012)

Engellilerin toplumla bütünleşmesinin önünde yoksulluk, eğitim, ulaşım, fiziksel çevre ve konut, rehabilitasyon ve istihdam gibi sorunlar yer almaktadır. Engellilerin özellikle çocuk yaşta yaşadıkları ayrımcılık daha etkin ve kalıcı olmakta, engelli çocukların kendilerine farklı davranılmasıyla ne kadar erken yaşta karşılaşırlarsa engelliliklerini o kadar erken benimsemektedirler. Bireyin fiziksel işlevlerindeki bozukluk ve bunların hareket yeteneğinde yarattığı eksiklik ve güçlük, onu toplumun diğer bireylerinden farklı kılar. Bu farklılık engellilerin yaşadığı ayrımcılığın asıl nedenidir. Bilindiği gibi her türlü ayrımcılığın temelinde farklı olmak vardır. Fiziksel işlevlerdeki bozukluklar ve bunların hareket yeteneği üzerinde yarattığı sınırlamalar bireyi toplumdan uzaklaştırır. Toplumsal destek sistemlerinin yetersizliği, toplumun dışlayıcı tutum ve davranışları da engelli bireyin topluma eşit bireyler olarak katılmasını önler. (Akçamete, Ceber 1999)

Dünyada olduğu gibi ülkemizde de engelli bireyler toplumun önemli bir bölümünü oluşturmaktadır. Günümüzde ülkemizde engellilerin toplumla bütünleşmesi yönünde sorunlar bulunmaktadır. Bu sorunlar engelli bireylerin içinde yaşadıkları toplumla bir bütünlük içinde yaşamalarını güçleştirmektedir. Bu tür sounlar engelli bireylerin kendilerini ifade etmelerine engel olarak düşük yaşam kalitesine neden olabilmektedir. Engelli bireylerin toplumla barışık bir şekilde yaşamalarını sağlamak adına herkesin bu konuda bilinçlenip engelli bireylere karşı önyargılarından arınması gerekmektedir. Bu çalışmada Türkiye Beyazay Derneği aracılığı ile engellilerle birlikte yaşama konusunda Kocaeli genelinde yaklaşık 2200 adet ilkokul, ortaokul ve lise düzeyindeki öğrencilere anket yapılmıştır. Yapılan anket sonuçları yorumlanmış ve seçilen 100 adet engelli ve 100 adet engelsiz çocuğun yer aldığı çeşitli faaliyetler düzenlenmiştir.

Yöntem ve Bulgular

Ülkemizde ve dünyada, dezavantajlı kesimler arasında yer almakta olan engellilere yönelik toplumuzda oluşan olumsuz algıyı yıkmak ve onlara yönelik ayrımı ortadan kaldırmaktır, Engelli ve engelsiz çocukların projeye aktif katılımı ile gelecek nesillerimizin engelsiz bir şekilde yaşayabilecekleri, birlikte üretebilecekleri, ortak çalışma alanları oluşturabilecekleri bir toplum oluşturulmasına katkı sağlamak amacıyla Kocaeli genelinde engellilerle birlikte yaşama kültürünü arttırmak ve engellilerin toplumun bir parçası olduğunu anlatmak ve engelli engelsiz toplumda beraber yaşandığını gösteren faaliyetlerle, belirlenen engelli engelsiz çocukların yer alacağı bir çalışma Türkiye Beyazay Derneği Kocaeli Şubesi işbirliği ile gerçekleştirildi.

Kocaeli ilimizde yaklaşık 2000 öğrenciye engellilerle ilgili ankete tabii tutularak onların engellilere yönelik algıları ve bu algıların değişkenliği tespit edilmiştir. İkinci aşamada anket sonuçları doğrultusunda bir psikoloğun, Dernek başkanı ve Aile ve Sosyal Politikalar Bakanlığı yetkilisinin de yer alacağı önyargıların yıkılmasını sağlamak adına öğrencilere "Önyargıların yıkılması Semineri" isimli seminerler düzenlenmiştir.

Engelli öğrencilerin sosyal hayata aktif katılımı sağlanması adına 50 engelli, 50 engelsiz öğrencilerimiz ve aileleri bir araya gelerek piknik, sinema, spor, tiyatro etkinlikleri gerçekleştirilmiştir. Tanışma ve kaynaşma faaliyetlerini güçlendirmek için ildeki okullar ziyaret edilmiştir. (http://www.birlikteyasiyoruz.com/?)

Table 1: Engelsiz öğrencilere yapılan anket

Soru	Evet /Olumlu	Hayır/Olumsuz
Hiç engelli bir arkadaşınız oldu mu?	%35	%65
Engelli arkadaşınızın olmasını ister misiniz?	%70	%30
Engellileri tanımak ister misiniz?	%90	%10
Engellilerle ilgili düşünceleriniz nedir?	%85	%15
Engelliler ile nasıl iletişim kuracağınzı biliyor musunuz?	%20	%80
Bir engelli ile karşılaştığınızda ne yaparsınız?	%80	%20

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Yapılan anket çalışmalarına göre öğrencilerin %31'inin engellilerle ilgili merak ettiği hiçbir şey olmadığı bildirmiştir. Bu sonuç kişilerin engellileri yeterince tanımadığı, anlamadığı, iletişime geçmediğini göstermektedir.

Engellilerle nasıl iletişim kurulabileceğini öğrenmek isteyip istemediklerini sorulduğunda ise %58,1'i Evet yanıtı vermiştir.

Sonuçlar ve Öneriler

Engelli olmak deyince ilk akla gelen işitme, konuşma, görme, yürüme engelli olmak. Benim aklıma bununla birlikte engelli olanların toplumsal yaşam içerisindeki sorunları geliyor. Hem engelli olmaktan kaynaklanan içsel sorunlar, hem de engelsizlerin neden olduğu dışsal sorunlar ve yeni engeller. Görünürde engelli olmayanların, engellileri göz ardı etmesi yüzünden etraflarına örülen ama görünmeyen duvarlar asıl engeli oluşturuyor.

Toplumuzda engellilere yönelik olumsuz bakış açısının ve önyargıların kırılması adına katkı sağlandı. Kocaeli'de engelli ve engelsiz öğrencilerin kaynaşması sağlanarak engellilerin yaşadığı zorluklarla ilgili ve engellilere nasıl davranılması gerektiği konusunda farkındalık oluşturulmasına yardımcı olundu. Engelli ve engelsiz öğrenciler arasında karşılık sevgi ve saygının yerleşmesi ve engellilerle birlilkte yaşama kültürünü geliştirilmesi sağlanarak engelli öğrencilerin sosyal hayata aktif katılımları sağlanarak çeşitli faaliyetler gerçekleştirildi.

Bu çalışma kapsamında Gelecek nesillerin engelli engelsiz birlikte yaşayabilecekleri, birlikte üretebilecekleri bir toplumun oluşmasına katkıda bulunulmaya çalışıldı. Beyazay engelliler Dernek çalışanlar ve üyeleri, kamu kurumları ile işbirliğinin ve fiziksel kapasitesinin geliştirilmesine katkıda bulunuldu.

Engellilere yol açalım, önlerine yeni engeller koymayalım ki, zaten varolan engelli halleriyle baş edebilsinler, toplumsal yaşam içerisinde yer alacak özgüvenlerini yitirmesinler. Onlara da yol açalım ki, yeteneklerinden, bilgi birikimlerinden, yaşam deneyimlerinden ve potansiyellerinden yararlanabilelim. İnsan vücudunun kan damarlarından birini nasıl yok sayamazsak, engelsizler ve engelliler olarak değil de, tüm toplum olarak hep birlikte varolalım ve zenginleşelim.

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SOURCES, RISKS AND REMEDIATION TECHNIQUES OF HEAVY METALS IN CONTAMINATED SOILS

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Soils polluted by the accumulation of heavy metals have become a global concern since 1990's due to increase in anthropogenic activities such as industrialization, high metal wastes, leaded gasoline and paints, fertilizers, sewage sludge, pesticides, wastewater, coal residues and atmospheric deposition. The most common heavy metals at contaminated areas are As, Cd, Pb, Hg, Cr, and Cu. Those metals are important and also have risks because they cause environmental contamination, and associate with health effects for humans. It is well known that such as As and Pb are not essential elements for the metabolic processes and they are associated with the problems of cancer risk, skin damage, kidneys, nervous and circulatory systems. Several technologies exist for the remediation of heavy metal contaminated soil.
These are replacement of contaminated soils, electro kinetic remediation, soil leaching, adsorption, phytoremediation, microbial remediation, animal remediation and other methods. The present paper focuses on whole soil remediation techniques for heavy metal contaminated sites in the developing countries where agriculture, urbanization, and industrialization are leaving a legacy of environmental degradation.

Keywords: Soil pollution, heavy metals, remediation techniques

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STABILISING ELASTIC NETWORKS WITH MULTI-AGENT SYSTEMS

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Multi-agent systems are regularly applied to problems such as transport scheduling, resource allocation, and networked systems, but have rarely been used to solve physical, mechanical problems. This paper describes an experimental test-bed to investigate the effectiveness of bottom up control of mechanical systems, in comparison with traditional top-down control requiring a fixed internal mapping of the system under control. The basic architecture was designed to be expandable to any degree of complexity, whilst allowing for a wide range of uncertainty to be encountered. Complex problems in real space involving connections, stresses and strains could subsequently be modelled, and are perfect candidates for exploration with autonomous intelligent agents. Discoveries in this field could have effects as far-reaching as improving the performance of axial compressors in jet propulsion and gas distribution.

Keywords: autonomous intelligent agents, complexity, uncertainty, Arduino microprocessors, servo motors.

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STAJ EŞLEŞTIRMEYE YÖNELIK KARAR DESTEK SISTEMI KAPSAMINDA GELIŞTIRILEN HAVACILIK STAJ YAZILIMI İNTERNET SITESI KULLANILABILIRLIĞINE İLIŞKIN BIR ARAŞTIRMA

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Meslek edinecek kimsenin geçirdiği uygulamalı öğrenme dönemi staj olarak tanımlanmaktadır. Staj sayesinde kişiler, akademik bilgilerini gerçek yaşamda kullanma ve deneme şansı bulurlar. Sivil havacılık eğitimi alanında da staj uygulamaları, teorik eğitimin pekiştirilmesine sağladığı katkılar nedeniyle oldukça önemli bir yere sahiptir.

Türkiye'de 2016 yılı verilerine göre sivil havacılık alanında eğitim veren toplam 33 yükseköğretim kurumunda, 12 program altında yaklaşık 3.600 öğrencinin her yıl zorunlu staj yapması beklenmektedir. Mevcut uygulamada staj eşleştirme işlemleri eğitim kurumları, işletmeler ve Sivil Havacılık Genel Müdürlüğü (SHGM) tarafından gerçekleştirilmektedir. Sivil havacılık eğitimine belirli standartlar getirmek amacıyla SHGM ile eğitim alanında düzenleyici bir kurum olan Yükseköğretim Kurulu (YÖK) arasında staj konusunda bir protokol imzalanmış ve yükseköğretim kuruluşlarında staj yazılımı uygulama takvimi kabul edilmiştir. Bu doğrultuda, Ateş, Yaman, Yalçınkaya ve Çukurbağ (2014) tarafından 27.05.2014 tarihinde imzalanan protokol ile toplam süresi 36 ay olarak tasarlanan ve Anadolu Üniversitesi Bilimsel Araştırma Proje Birimi tarafından 1403E101 numarası ile desteklenen "Sivil Havacılık Eğitiminde Ortak Staj Eşleştirme Yeterliliklerinin Belirlenmesi ve Staj Eşleştirmeye Yönelik Karar Destek Sistemi Önerisi" adlı bir proje geliştirilmiştir. Söz konusu proje kapsamında sivil havacılık alanında staj eşleştirme ve atamasına yönelik bir internet sitesi tasarlanarak http://havacilikstaj.anadolu.edu.tr/ adı altında yayına başlamıştır. İlgili internet sitesi, staj eşleştirme ve atamalarında Türkiye'de yükseköğretim düzeyinde sivil havacılık eğitimi veren kuruluşları, sivil havacılık öğrencilerini, havacılık işletmelerini ve staj eşleştirmelerine taraf olan diğer kurumları kapsamaktadır.

Bu çalışmada staj eşleştirmeye yönelik olarak geliştirilen havacılık staj yazılımı internet sitesinin kullanılabilirliğinin değerlendirilmesi amaçlanmıştır. Bu kapsamda Çakmak, Güneş, Çiftçi ve Üstündağ (2011) tarafından geliştirilen "İnternet Sitesi Kullanılabilirlik Ölçeği" çok kullanıcılı etkileşimli mevcut internet sayfasının kullanılabilirliğinin değerlendirilmesine uyarlanmıştır. Araştırmanın birinci bölümünde internet sitesi kullanılabilirlik ölçekleri literatür taraması verilmiştir. İkinci bölümde proje kapsamında geliştirilen internet sayfası bölümleri tanıtılmıştır. Araştırmanın uygulama bölümünde çok kullanıcılı etkileşimli mevcut internet sayfasının kullanılabilirliğinin değerlendirilmesine yönelik olarak uyarlanan İnternet Sitesi Kullanılabilirlik Ölçeği ve uyarlanan bu ölçek ile 1607 öğrenci, 52 işletme ve 80 eğitim kurumu ile yapılan anket sonuçları değerlendirilmiştir.

Keywords: Karar Destek Sistemleri, İnternet Sitesi Kullanılabilirlik Ölçeği, Staj Uygulamaları

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STANDART YAĞIŞ İNDEKSİ İLE KURAK DÖNEMLER ANALİZİ: MANİSA ÖRNEĞİ

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İklim değişikliği senaryolarına göre kuraklığın gelecekte özellikle ülkemizin de içinde bulunduğu orta enlemlerde daha da etkili olacağı tahmin edilmektedir. Kuraklığın başta insan olmak üzere tüm canlılar üzerindeki yıkıcı etkileri göz önüne alındığında bu doğal afetin getireceği olumsuz etkileri en az seviyeye indirmek için gerekli tedbirlerin önceden planlanması gerekmektedir. Bu planlamalarda havzalarda yaşanan kuraklıkların şiddetinin, zamansal ve alansal dağılımının belirlenmesi büyük önem taşır. Bu çalışmada, Standart Yağış İndeksi (SYİ) yöntemi ile Manisa-Merkez, Manisa-Salihli ve Manisa-Akhisar bölgelerinde kuraklık analizi yapılmıştır. Analizlerde 3 ve 12 aylık SYİ değerleri kullanılmıştır. Çalışma sonucunda Manisa bölgesinin kuraklığa karşı oldukça hassas olduğu, her üç ilçede de 1985, 1989,1992, 2001 ve 2007 su yıllarında çok şiddetli kuraklıkların yaşandığı, Ocak-Şubat-Mart aylarını kapsayan dönemde meteorolojik kuraklığın daha fazla görüldüğü ve bu mevsimsel kuraklık durumunun özellikle Salihli bölgesinde diğer bölgelere oranla daha sık ve daha şiddetli olduğu belirlenmiştir.

Keywords: Standart Yağış İndeksi (SYİ), kuraklık analizi, Manisa

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STATİK YÜK ALTINDA DEMONTE TİPİ KİTAPLIK RAFLARIN RİJİTLİK ANALİZİ

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Özet: Bu çalışmada, demonte tipi kitaplık raflarında kullanılan ahşap kompozit levhalar ile farklı bağlantı elemanların statik yük altında rijitlik analizi yapılmıştır. Deney örnekleri ahşap kompozit levhalardan, yonga levha ve orta yoğunlukta lif levhalardan (MDF) hazırlanmıştır. Bağlantı elemanı olarak trapez, plastik dübelli minifiks, metal dübelli minifiks, metal T bağlantı, pipo bağlantı ve ay bağlantı kullanılarak kitaplıklar üretilmiştir. Üretilen demonte kitaplıklar, kullanımları sırasında etkisinde kalabilecekleri kritik yükler dikkate alınarak 6 ay statik yük altında bırakılmıştır. Deneyler sonucunda en yüksek rijitlik katsayı değeri yonga levhadan üretilen trapez ve metal dübelli minifiks bağlantı elemanında 2,7; en düşük, MDF' den üretilen plastik dübelli minifiks, metal dübelli minifiks ve ay bağlantı elemanlarında 2,2 elde edilmiştir. Deney sonucu olarak; en iyi sonucun, MDF' den üretilen plastik dübelli minifiks, metal T bağlantı ve ay bağlantı elemanlarında, en kötü sonucun yonga levha dan üretilen trapez ve metal dübelli minifiks bağlantı elemanında olduğu tespit edilmiştir.

Anahtar Kelimeler: Demonte Tpi Mobilya, Statik Yük, Rijitlik.

THE ANALYSIS OF STİFFNESS OCCUR UNDER STATIC LOAD IN DEMONTE TYPE BOOKSHELVES

Abstract: In this study, the creep properties of demonte bookcases, which are produced with different fasteners and wood base materials were investigated. Samples of the experiment particleboard and medium density fiberboard (MDF) were used as wooden composites materials and trapez connector with metal parts, metal minifix connector with metal peg, metal minifix connector with plastic peg, metal T connector, pipe type connector, and corner fitting were used joints. Demonte bookcases were exposed to static loading for six months by considering the critic loads which could effect while in service use. According to the experiment results The highest stiffness value was obtained particleboard with trapez connector and metal minifix connector with metal peg combination 2,7 the lowest stiffness value was obtained medium density fiberboard (MDF) with metal minifix connector with plastic peg, with metal minifix connector with metal peg, and corner fitting combination 2,2. It was determined that the combination of medium density (MDF) with metal minifix connector with plastic peg, with metal minifix connector with metal peg, and corner fitting better than particleboard with metal minifix connector with metal peg combination

Key Words : Demonte Type Bookcase, Static Load, Stiffness.

Giriş

Mobilya imalatında genel olarak, kutu, çerçeve ve kombine üç temel konstrüksiyon kullanılmaktadır. Tablaların kullanıldığı mobilyalar kutu (panel) tipi, masif çerçevelerin yer aldığı mobilyalar çerçeve (iskelet) tipi, hem kutu hemde çerçeve tipinin birlikte kullanıldığı mobilyalar ise kombine konstrüksiyonlu mobilyalar olarak tanımlanmaktadır (Efe, 1994).

Mobilya konstrüksiyonların da çeşitli bağlantı ve bağlama teknikleri kullanılmaktadır. Rasyonel tasarımda, bağlantı elemanları ve birleştirme tekniklerinin kabul edilebilir mukavemet özellikleri önceden bilinmelidir (Efe, 1994).

Kaliteli bir mobilya tasarımında, mekanik özelliklere yüksek ve performansı iyi olan kompozit levhaların kullanılması gerektiğini belirtmektedir (Eckelman, 1999).

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Konstrüksiyonda uygulanan birleştirmelerin stabilizesi ve mukavemeti, mobilya sisteminin mukavemetini etkiler. Sağlam ve dayanıklı birleştirmelerin kullanılması taşımaları gereken yüke bağlı olduğunu belirtmektedir (Efe, 1998).
Mobilya kulanım esnasında maruz kalacağı yüklere güvenli bir şekilde direnç gösterebilmeli ve bu yükleri taşıyabilmesi için mühendislik tasarımın hassas ve doğru bi şekilde uygulanması gerekliğini belirtmektedir (Oflazoğlu, 2006).
Yükleme sonucu, malzemenin içinde meydana gelen gerilmeler ile şekil değiştirmeler arasındaki bağıntıların, mühendislik hesaplamalarında önemli bir yeri olduğu ve mühendislik uygulamalarında ise yükler altında doğacak olan şekil değiştirme ve gerilmelerin teorik olarak hesaplanabilmesi, o malzemeye ait gerilme deformasyon denkleminin deneysel olarak tayin edilmesi ile mümkün olabileceğini belirtmektedir (Erman, 1974).
Rafların sabitlenmesinde arkalıktan yapılan vidalamanın, ayrıca rafların sabitlenmesinde vidanın uzunluğu, ve kitaplığın ön cumbasına yapılan kalınlaştırmanın da rafların sehimini azalttığı belirtilmiştir. Elastikiyet modülü yüksek malzemelerin kullanılması ve levha kalınlığının artırılması mevcut tasarımların performanslarının geliştireceğini ve orta yoğunluklu lif levha (MDF) rafların, yongalevha raflarına göre daha dirençli olduğu belirtilmiştir (Denizli, 2001).
Ahşap esaslı kompozit levhalar ile ahşap kirişler arasındaki sünmeyi incelemişlerdir. Bu amaçla yonga levha, MDF ve kontrplak örnekleri ahşap kirişlere çivi ile birleştirilmiştir. Bu malzemeler içinden ençok sünme kontrplak, enaz sünmenin ise MDF levhasında oluştuğunu belirtmiştir (Jang, 1995).
Sünme ile yapılan bir araştırmada %30 luk bir yükleme sonucu toplam sünme iki yılsonunda elastik deformasyonun % 212‟ si kadar olmuştur (Pierce et all., 1985).
Yongalevha örnekleri dirençlerinin % 10 ve % 20‟si oranında yüklemeye maruz bırakılmışlardır. Deneylerde 15 günün sonunda; % 10 oranında yüklenen örneklerde toplam sünme, elastik deformasyonun % 48‟i, % 20 oranında yüklenen örneklerde toplam sünme, elastik deformasyonun % 53‟ü oranında olmuştur (Haygreen et all., 1975).
Kutu konstrüksiyonlu mobilya köşe birleştirmelerinde mekanik özellikleri ile iligili çalışmada, tutkalsız (demonte) birleştirmelerin tutkallı (sabit) birleştirmelere mukavemet açısından üstünlük sağladığını bildirmiştir (Şafak, 2006).
Kutu konstrüksiyonlu mobilyalarda minifiksli köşe birleştirmelerin moment taşıma performansların araştırıldığı çalışmada; malzeme çeşidi ve birleştirme elemanı ikili etkileşimine göre, çekme ve basınç deneylerinde en iyi sonucu metal dübelli kontrplak malzeme vermiş, en kötü sonucun ise metal dübelli yongalevha malzemede olduğunu bildirmiştir (Aslan, 2006).
“32 *mm* Kutu Konstrüksiyonlu Köşe Birleştirmeleri İçin Optimum Kavela Mesafeleri” adlı çalışmada yonga levha ve MDF köşe birleştirmeleri basınç ve çekme yükleri altında test edilmiştir. Basınç ve çekme testlerinde MDF köşe birleştirmeleri yonga levhadan daha dayanıklı olduğu belirtilmiştir (Tankut, 2005).
Bu çalışmanın amacı; demonte tipi kitaplıkların statik yükleme sonucu rafların rijitliklik katsayısını tespit etmek ve ayrıca kitaplık üretiminde kullanılan kompozit levha tipi ve birleştirmede kullanılan bağlantı elemanların, rijitlik katsayına etkilerin belirlenmesi amaçlanmıştır.

Materyal ve Metot

Ahşap Esaslı Kompozit Malzemeler

Deneylerde ahşap kompozit levha olarak, 18 mm kalınlığında yonga levha ve orta yoğunlukta lif levha (MDF) ve 4 mm kalınlığında orta yoğunlukta liflevha (MDF) kullanılmıştır.

Tablo 1’de ahşap esaslı kompozit levhaların fiziksel ve mekaniksel özellikleri verilmiştir (Bozkurt vd., 1987).

Tablo 1. Kullanılan malzemelerin fiziksel ve mekaniksel özellikleri.

Malzeme	Yoğunluk (gr/cm^3)	Rutubet (%)	Eğilme Direnci (N/mm^2)	Elastikiyet Modülü (N/mm^2)
MDF	0.62	7.1	32.12	2780
Yonga levha	0.58	6.9	16.58	1822

Tablo 1’de demonte tipi kitaplıkların üretiminde kullanılan ahşap esaslı kompozit levhaların fiziksel ve mekaniksel özellikleri verilmiştir. Mobilyanın mukavemeti kullanılan malzemelerin fiziksel ve mekaniksel özelliklerine göre değişim gösterebilir.

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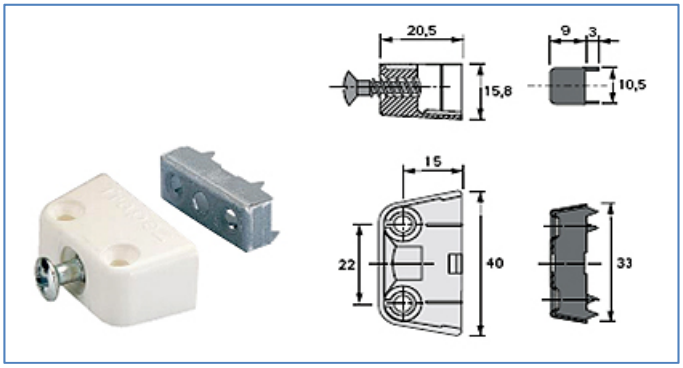
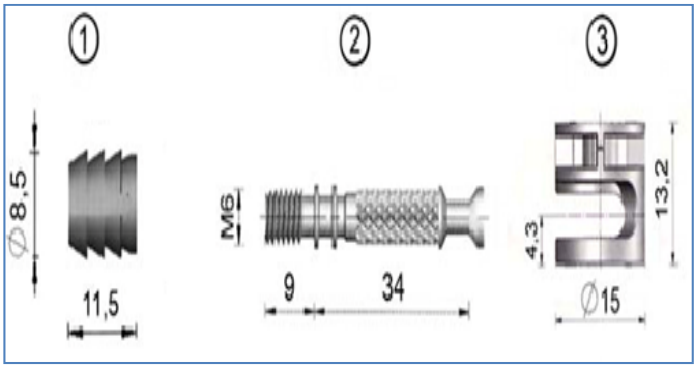
Bağlantı Elemanları

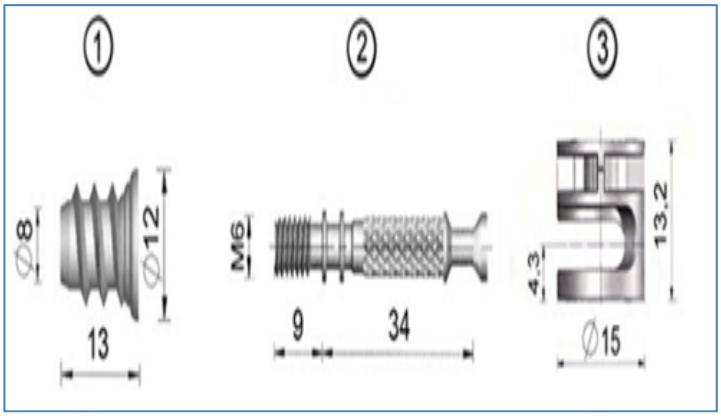
Demonte tipi kitaplıkların konstrüksiyonunda kullanılan bağlantı elemanları Şekil 1 ile 6 arasında gösterilmiştir (Hettich International, 2000).



Şekil 1. Trapez bağlantı elemanı (mm) elemanı (mm).



Şekil 2. Plastik dübelli minifiks bağlantı elemanı (1) Plastik dübel (2) Eksantrik mil (3) kafa (mm).



Şekil 3. Metal dübelli minifiks bağlantı elemanı (1) Metal dübel (2) Eksantrik mil (3) Kafa (mm).

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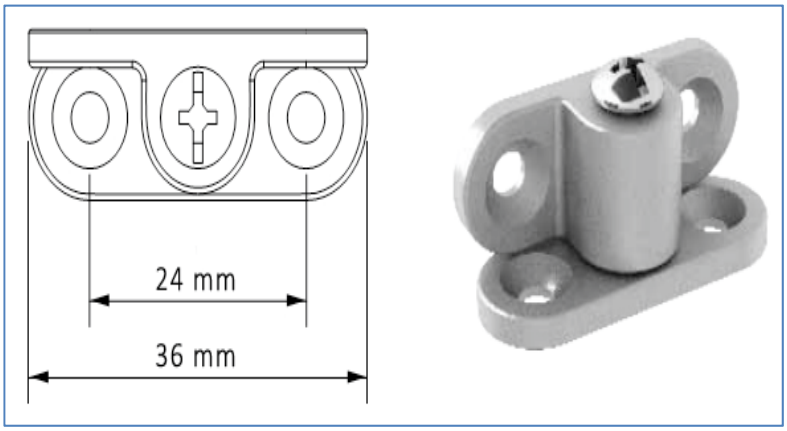
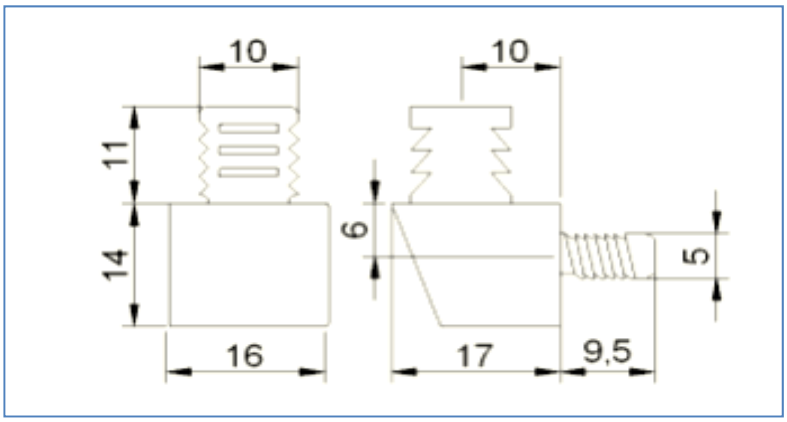
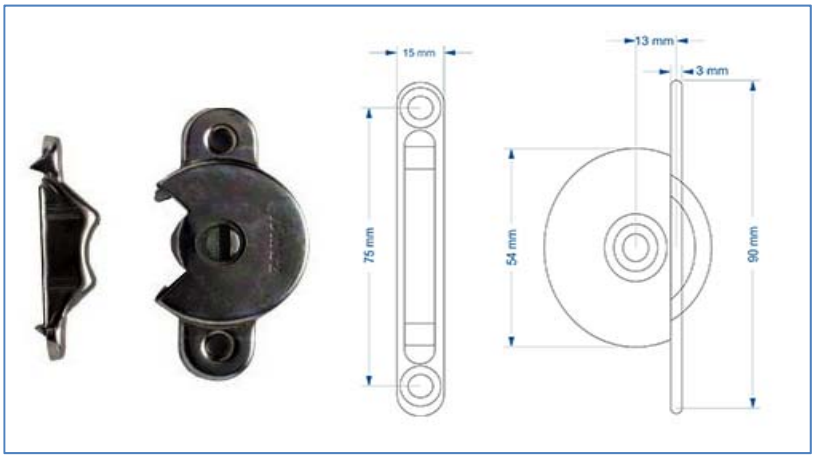


Şekil 4. Metal T bağlantı elemanı (mm).



Şekil 5. Pipo bağlantı elemanı (mm).



Şekil 6. Ay bağlantı elemanı (mm).

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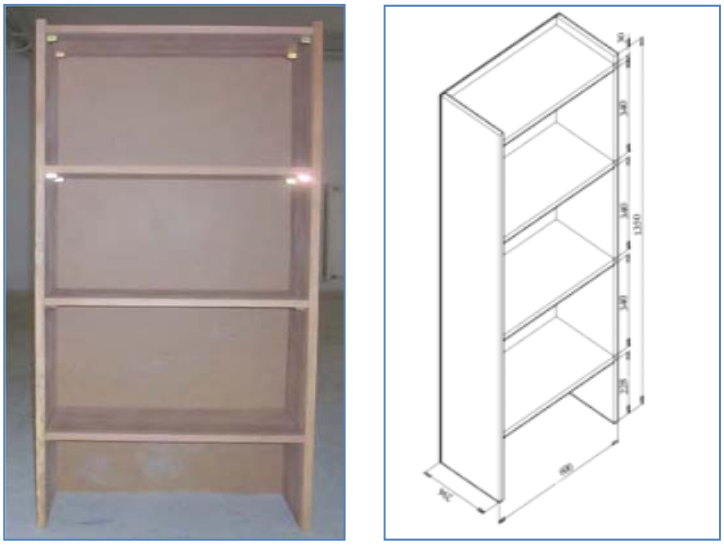
Deney örneklerinin hazırlanması

Deneylerde kullanılan demonte tipi kitaplıkların eleman listesi Tablo 2'de verilmiştir.

Tablo 2. Demonte tipi kitaplığın eleman listesi (mm).

Tabla Adı	Tabla Sayısı	MDF (mm)			Yonga levha (mm)		
		Boy	Genişlik	Kalınlık	Boy	Genişlik	Kalınlık
Yan Tabla	2	1350	290	18	1350	290	18
Üst Tabla	1	564	290	18	564	290	18
Alt Tabla	1	564	290	18	564	290	18
Raf	2	564	290	18	564	290	18
Arkalık	1	4×600×1350 mm ölçülerinde MDF					

Demonte tipi kitaplık yapımında 2 çeşit ahşap kompozit malzeme, yonga levha ve MDF Tablo 2'deki kesim listesine göre çizicili yatar daire makinesinda kesilmiştir. Montajı için gerekli delik işlemleri, çoklu delik makinesinda açılmıştır. Farklı bağlantı elemanları (trapez, plastik dübelli minifiks, metal dübelli minifiks, metal T bağlantı, pipo bağlantı ve ay bağlantı) kullanılarak bu parçaların montajı yapılmıştır. Arkalık, 3,5×16 vida kullanılarak sadece yan tablalara montajı yapılarak Şekil 7'de belirtilen ölçülerde kitaplıklar hazırlanmıştır.



Şekil 7. Demonte tipi kitaplık ölçüleri (mm).

Metot

Deney örneklerin hazırlanmasında 2 malzeme çeşidi ve 6 farklı bağlantı elemanı kullanılarak, 4 raflı kitaplıklar hazırlanmıştır.

Deney Öneklerine Yük Konulması

Deney yükü olarak ebatları 60×100×200 mm, ağırlığı 2600 gr, yeknesak ve homojen yapıda briket tuğlalar kullanılmıştır. Her bir rafa, rafın ön ve arka kenarından 50 mm içeride ve yan kenarından ise 32 mm olacak şekilde toplam 15 adet briket tuğlası yerleştirilmiştir. Biritish education standartlarına (BS4875;1975) göre mm^2 ye normal olarak 2,5 kg yük konulması ön görülmektedir. Şekil 8'deki demonte tipi kitaplıktaki her bir rafa toplam 39 kg yük ve toplam da dört rafa ise 156 kg yük konulmuştur.

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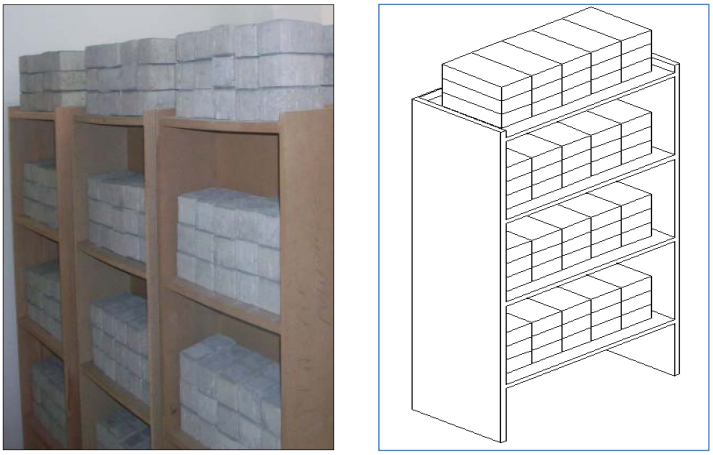

Şekil 8. Deney örneklerine yük konulması.

Sehim Öçülerin Alınması

Sehim ölçümlerinde, 0.001 mm hassasiyetinde ölçüm yapabilen Şekil 9'daki komparatörler kullanılmıştır. İlk önce kitaplık rafların yük konulmadan önceki sehim ölçümleri yapılmıştır. Daha sonra her bir rafa 39 kg yük konulup elastik deformasyonu saptamak amacı ile anlık sehim ölçümleri alınmış ve bu ölçümler 15, 30 ve 60 dakika arayla tekrarlanarak yapılmıştır. Sünme performansını saptamak amacı ile toplamda yüklü halde 180 günlük ölçüm yapılmış, ölçüm aralıkları ilk hafta her gün, daha sonra haftalık ve aylık ölçümler alınarak deneyler tamamlanmıştır.



Şekil 9. Komparatörler ile sehim ölçümlerin yapılması (mm).

Rijitlik

Rjitlik kelimesi İngilizcedeki karşılığı olan *Stiffness* den alınmıştır. Kelime itibariyle rijitlik, eğilmezlik veya bükülmezlik anlamına gelir (Lin, 1963). Düzgün yayılı yükle yüklenmiş basit ve ankastre kirişlerin statik olarakdeformasyon formülleri ve eğilme momenti diyagramları ile ilgili formüller verilmiştir (Şekil 10).

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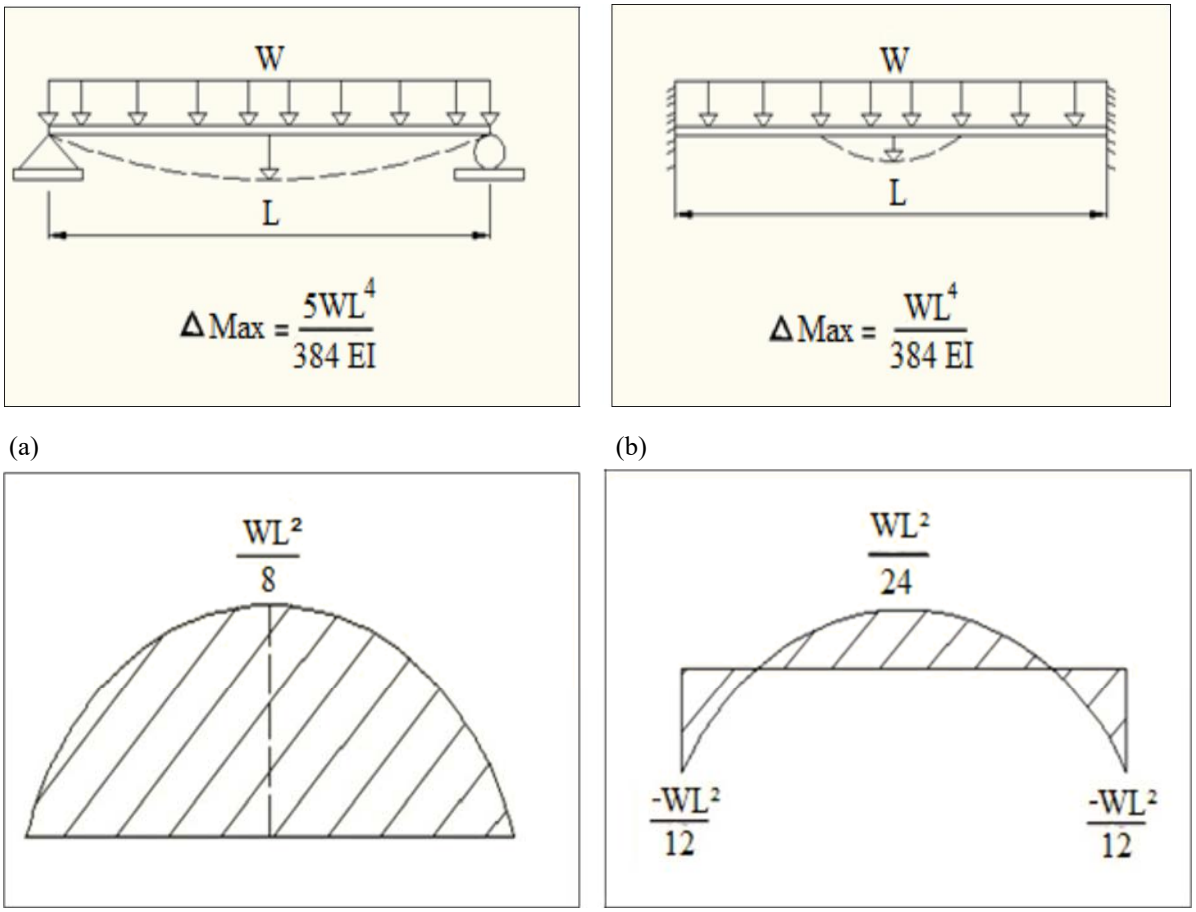

Şekil 10 Düzgün yayılı yükle yüklenmiş basit ve ankastre kirişlerin statik olarak deformasyon formülleri ve eğilme momenti diyagramları (a) Basit kiriş, (b) Ankastre kiriş, (c) Eğilme momenti diyagramı, (d) Eğilme momenti diyagramı (Denizli, 2001).

Statik yük altında rafın ortasında oluşan deformasyon miktarı Eşitlik 1 ve atalet momenti ise Eşitlik 2 ile hesaplanmaktadır (Denizli, 2001).

$$\Delta max = \frac{WL^4}{384EI} \qquad 1$$

$$I = \frac{bh^3}{12} \qquad 2$$

Δmax= rafın orta noktasındaki deformasyon (mm).
W= rafa uygulanan yük (kg).
L= raf uzunluğu (mm).
E= elastikiyet modülü.

I= atalet momenti.
b= raf genişliği (mm).
h= raf kalınlığı (mm).

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Rijitlik katsayısı *k* ile gösterilir. Bu değer 1 ile 5 arasında olup, 1 değeri rijit 5 ise rijit olmayan durumu göstermektedir. Rijitlik katsayısı Eşitlik 3 ile hesaplanmaktadır (Denizli, 2001).

$$k = \frac{\Delta max}{\Delta elastik} \qquad 3$$

k= rijitlik katsayısı.
Δmax = rafın orta noktasındaki deformasyon (mm).
Δelastik = Elastik deformasyon (mm).

İstatiksel Analiz

Deneylerden elde edilen veriler SPSS paket programında değerlendirilmiştir. Araştırma kapsamında incelenen etki faktörleri arasındaki farkın belirlenmesinde MANOVA varyans analizi kullanılmış ve gruplar veya kademeler arasındaki farkların anlamlı (P<0,05"e göre) bulunması durumunda Duncan testi uygulanarak değerler arasındaki fark karşılaştırılmıştır. Belirlenen ortalama, üst ve alt değerleri, varyans analizlerine ilişkin değerler, varyans analizinde anlamlı (%95 güven düzeyinde) bulunan gruplara ilişkin Duncan testine ait sonuçlar tablolar halinde verilmiştir.

Bulgular ve Tartışma

Denemeler sonucunda elde edilen rijitlik katsayı değerlerine değerler Tablo 3'de verilmiştir. En düşük rijitlik katsayı değeri 2,2 ile MDF plastik dübelli minifiks, metal T ve ay bağlantı elemanı kullanılarak imal edilen demonte tipi kitaplıklarda, en yüksek rijitlik katsayı değeri 2,7 ile yonga levha trapez ve metal dübelli minifiks bağlantı elemanı kullanılarak imal edilen demonte tipi kitaplıklarda belirlenmiştir.

Tablo 3 Kitaplıkların 6 ay statik yük altında oluşan rijitlik katsayı değerleri.

Malzeme Çeşidi	Bağlantı Çeşidi	Ortalama	Minimum	Maksimum	Standart Sapma
MDF	TÇ	2,3	1,7	2,8	0,22263
	MP	2,2	1,6	2,8	0,19846
	MM	2,4	1,9	2,9	0,1047
	T	2,2	1,6	2,7	0,27318
	P	2,3	1,8	2,9	0,13893
	AY	2,2	1,7	2,7	0,074
Yonga levha	TÇ	2,7	2,1	3,2	0,22263
	MP	2,4	1,8	2,9	0,19846
	MM	2,7	2,1	3,3	0,1047
	T	2,6	2,1	3,1	0,27318
	P	2,4	2,0	3,0	0,13893
	AY	2,6	1,7	3,2	0,074

(TÇ: Trapez, MP: Plastik Dübelli Minifiks, MM: Metal Dübelli Minifiks, T: Metal T Bağlantı, P: Pipo Bağlantı, AY: Ay Bağlantı).

Farklı bağlantı çeşidi ve malzeme çeşidi kullanılarak imal edilen kutu konstrüksiyonlu mobilyaların, rijitlik katsayı değerlerine ait MANOVA varyans analizi sonuçları Tablo 4'de verilmiştir.

Tablo 4. Rijitlik katsayı değerlerine ait MANOVA varyans analizi sonuçları.

Kaynağı	Serbestlik Derecesi	Kareler Toplamı	Kareler Ortalaması	F Değeri	P<%5
Malzeme Çeşidi (A)	2	0,992	9,099	0,496	1,623
Bağlantı Çeşidi (B)	6	1,436	0,010	0,239	0,784
Etkileşim A*B	12	2,24	0,008	0,187	0,611
Hata	63	19,245	0,003	0,305	
Toplam	84	1141,404	9,099		

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MANOVA varyans analizi sonuçlarına göre, malzeme çeşidi, bağlantı çeşidi ve bu faktörlerin karşılıklı etkileşimlerinin rijitlik katsayı miktarına etkilerinin 0,05 hata payı ile istatistiksel anlamda önemsiz olduğu tespit edilmiştir. Bu kapsamda farklılıkların gruplar arasında önem derecesini belirlemek için yapılan Duncan testi sonuçları Tablo 5, Tablo 6, Tablo 7'de verilmiştir.

Tablo 5 Faktörlerin rijitlik katsayı değerlerine ait Duncan testi sonuçları.

Etkileşimler	Ortalama	Homojenlik Grubu	Etkileşimler	Ortalama	Homojenlik Grubu
MDF-MP	2,2	A	YL-MP	2,4	A
MDF-T	2,2	A	YL-P	2,4	A
MDF-AY	2,2	A	YL-T	2,6	A
MDF-TÇ	2,3	A	YL-AY	2,6	A
MDF-P	2,3	A	YL-TÇ	2,7	A
MDF-MM	2,4	A	YL-MM	2,7	A

(TÇ: Trapez, MP: Plastik Dübelli Minifiks, MM: Metal Dübelli Minifiks, T: Metal T Bağlantı, P: Pipo Bağlantı, AY: Ay Bağlantı).

Bağlantı çeşidinin, rijitlik katsayı değerine ait ortalamaların karşılaştırılması Tablo 4,6'da verilmiştir.

Tablo 6 Rijitlik katsayı değerlerinde bağlantı çeşidine ait Duncan testi sonuçları.

Bağlantı çeşidi	X	HG
Plastik dübelli minifiks	2,3	A
Metal T bağlantı	2,4	A
Ay bağlantı	2,4	A
Pipo bağlantı	2,4	A
Trapez	2,5	A
Metal dübelli minifiks	2,5	A

Yapılan Duncan testi sonucuna göre uygulanan bağlantı çeşidi değerleri arasındaki farklılık %95 güven düzeyinde anlamsız olduğu tespit edilmiştir. Tablo 6'daki bağlantı çeşidine göre rijitlik katsayısı, trapez ve metal dübelli minifiks birleştirmelerden (2,5), plastik dübelli minifiks birleştirmeden (2,3), % 8 daha yüksek çıkmıştır. Bağlantı çeşidine ait elde edilen rijitlik katsayı ortalamaları Şekil 11'de gösterilmiştir.
Sonuç olarak Şekil 11'e göre plastik dübelli minifiks birleştirme elemanları, diğer bağlantı elemanlarına göre daha iyi performans göstermiştir..

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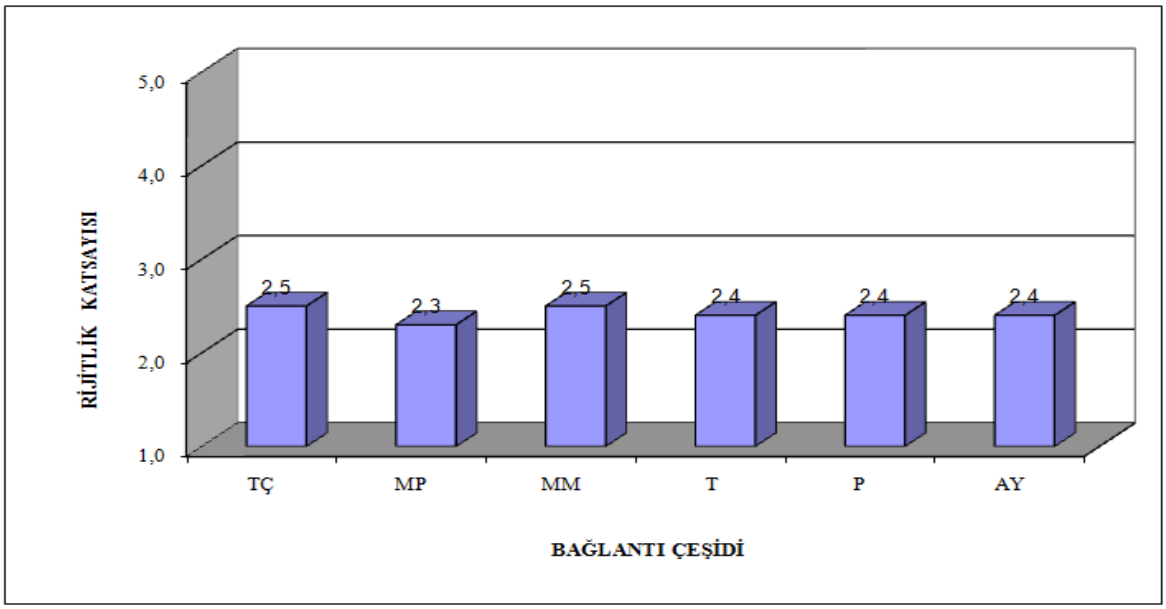


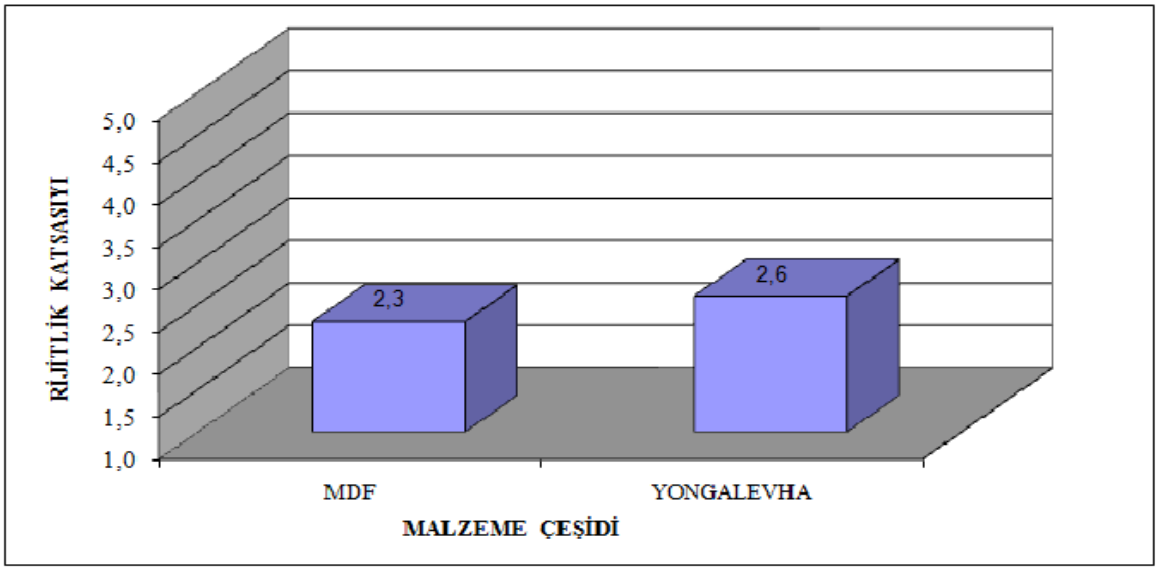
Şekil 11 Bağlantı çeşidi rijitlik katsayı değerlerine ait ortalamaların karşılaştırılması.

Malzeme çeşidinin, rijitlik katsayı değerine ait ortalamaların karşılaştırılması Tablo 7'de verilmiştir.

Tablo 7 Rijitlik katsayı değerin malzeme çeşidine ait Duncan testi sonuçları.

Malzeme çeşidi	**X**	**HG**
MDFLAM	2,3	A
YYLAM	2,6	A

Malzeme çeşidi değerleri arasındaki farklılık %95 güven düzeyinde anlamlı olduğu tespit edilmiştir. Farklı olan gruplar farklı homojenlik gruplarında Tablo 7'de gösterilmiştir. Malzeme çeşidine göre rijitlik katsayı değeri, yonga levha (2,6), MDF'den (2,3), % 13,04 daha yüksek çıkmıştır. Malzeme çeşidine ait elde edilen rijitlik katsayı değeri ortalamaları Şekil 12'de gösterilmiştir.



Şekil 12 Malzeme çeşidi rijitlik katsayı değerlerine ait ortalamaların karşılaştırılması.

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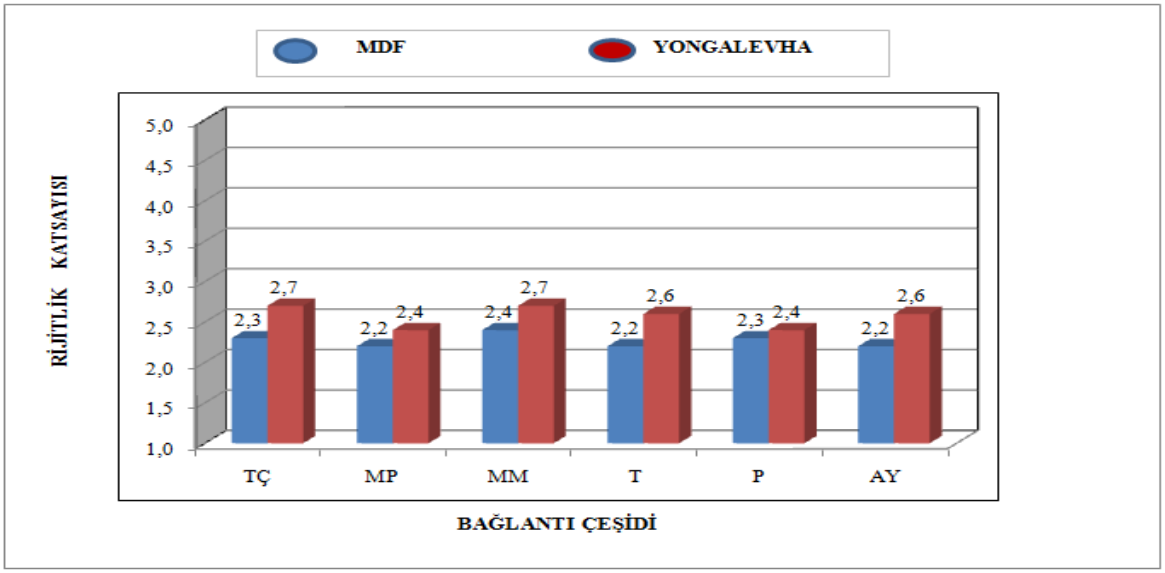
Bağlantı çeşidi ve malzeme çeşidi etkileşiminin sünme değerlerine ait ortalamaların karşılaştırılması Tablo 8'de verilmiştir.

Tablo 8 Bağlantı ve malzeme çeşidi etkileşimine göre rijitlik katsayı ortalama değerleri.

Bağlantı Çeşidi	**Malzeme Çeşidi**	
	MDF	Yonga levha
Trapez	2,3	2,7
Plastik Dübelli Minifiks	2,2	2,4
Metal Dübelli Minifiks	2,4	2,7
Metal T Bağlantı	2,2	2,6
Pipo Bağlantı	2,3	2,4
Ay Bağlantı	2,2	2,6

Bağlantı çeşidi ve malzeme çeşidi etkileşimi bakımından, en düşük rijitlik katsayı değeri 2,2 ile MDF ve plastik dübelli minifiks, metal T ve ay bağlantı bağlantı elemanı kullanılarak imal edilen kutu konstrüksiyonlu mobilyalarda, en yüksek rijitlik katsayı değeri ise 2,7 ile yonga levha ve trapez, metal dübelli minifiks bağlantı elemanı kullanılarak imal edilen kutu konstrüksiyonlu mobilyalarda belirlenmiştir. Yonga levha ve trapez, metal dübelli minifiks bağlantı elemanı kullanılarak imal edilen kutu konstrüksiyonlu mobilyalarda, MDF ve plastik dübelli minifiks, metal T ve ay bağlantı elemanı kullanılarak imal edilen kutu konstrüksiyonlu mobilyalardan % 22,72 daha yüksek çıkmıştır. Bağlantı çeşidi ve malzeme çeşidi etkileşimine ait grafik Şekil 13'de gösterilmiştir.



Şekil13 Bağlantı çeşidi ve malzeme çeşidi etkileşiminin rijitlik katsayı değerlerine ait ortalamaların karşılaştırılması.

Şekil 13 de görüldüğü gibi MDF panel kullanılarak yapılan kitaplık raflarında en iyi performansı plastik dübelli minifiks, metal T ve ay bağlantı bağlantı elemanları ile yapılan birleştirmeler, en kötü performansı ise metal dübelli minifiks bağlantı elemanı ile yapılan birleştirmeler vermiştir.
Yonga levha panel kullanılarak yapılan kitaplıklarda ise en iyi performansı plastik dübelli minifiks ve pipo bağlantı ile yapılan birleştirmeler, en kötü performansı ise trapez ve metal dübelli minifiks bağlantı elemanı ile yapılan birleştirmeler vermiştir.

Tartışma

Malzeme çeşidi bakımından; MDF, yonga levha'dan %13,04 daha rijit bulunmuştur.
Bağlantı elemanı çeşidi bakımından; plastik dübelli minifiks bağlantı elemanı trapez ve metal dübelli minifiks bağlantı elemanından % 8 daha rijit bulunmuştur.

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Bağlantı çeşidi ve malzeme çeşidi etkileşimi bakımından; MDF ve plastik dübelli minifiks, metal T ve ay bağlantı bağlantı elemanı kullanılarak imal edilen kutu konstrüksiyonlu mobilya, yonga levha ve trapez, metal dübelli minifiks bağlantı elemanı kullanılarak imal edilen kutu konstrüksiyonlu mobilyagöre % 22,72 daha rijit bulunmuştur.
Kutu mobilyaların köşe birleştirmelerinde mukavemet özelliklerinin belirlendiği çalışmada; MDF, Yongalevhaya göre % 20 daha rijit bulunmuştur (İyiiş 2009).
Kutu konstrüksiyonlu mobilyaların mukavemet özelliklerin belirlendiği çalışmada; MDF ile üretilen örnekler YL ve OKP ile üretilene göre yaklaşık % 8 daha rijit bulunmuştur (İmirzi 2008).
Kutu konstrüksiyonlu mobilyaların mukavemet özelliklerin belirlendiği çalışmada; birleştirme tekniği ve malzeme çeşidi ikili etkileşiminin rijitlik katsayı değerleri sonuçlarına göre; MDF ile üretilen kavelalı vidalı deney örnekleri yüksek rijitlik değeri vermiş, bunu MDF ile üretilen kavelalı birleştirme örnekleri izlemiştir (İmirzi 2008).
Bu sonuçlara göre; kutu konstrüksiyonlu mobilya tasarımında, malzeme açısından ekonomik kriterler de dikkate alınarak malzeme tercihi, MDF ve bağlantı elemanı tercihi ise plastik dübelli minifiks, trapez bağlantı bağlantı elemanın tercih edilmesi edilebilir.

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Stiffness Analysis under static load

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STRATEGIC DECISION SUPPORT SYSTEM BASED HYBRID MODELS FOR COLLEGES ENROLLMENT CAPACITY PLANNING: DESIGN & IMPLEMENTATION

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Abstract: This paper proposes a Hybrid Strategic Decision Support System (H-SDSS) for colleges' enrollment capacity planning. Three hybrid subsystems are combined for executing the task of decision making processes. The system includes students' track specified model, colleges' enrollment model and students' capacity forecast model. Data mining knowledge based rules and goal programming based methods are used for building the system. This H-SDSS is expected to help university decision makers for solving problems related to strategic decisions for enhancing university students' admission and enrollment capacity planning to satisfy future of higher educational demands as well as labor market needs.

Keywords: Strategic Decision, DSS, Goal programming, knowledge base rule, Data mining.

Introduction

DSS is an interactive computer-based system intended to help decision makers use communications technologies, data and documents, knowledge and models to identify and solve problems, to complete decision process tasks, and to make decisions. DSS enhances a person and group's ability to make decisions. DSS can be differentiated by the level of decision (Gutierrez, 2008): Strategic where the decision can be taken for two to five years, Tactical; where a decision can be taken within a few months up to two years, Operational; where a decision can be dealt within a few days or a few months, and Dispatching; where a decision can be taken just for some hours.

Standalone DSSs are limited performance and lacks efficiency specially with the fast growing in developed technology. The Hybrid DSS can solve these problems and improve the overall system performance. Hybrid DSS has been used in many specific areas and application such as medical care (Berner, 2009), finance (Kotsiantis, 2006), and architecture (Simmons, 2008). However, the literature did not cover well the HDSS in the area of Higher Education Management. The work proposed in this paper suggested a novel design and implementation for a hybrid strategies DSS. The architecture combines data mining approaches (Han & Kamber, 2006) as well as goal programming (Orumie & Ebong, 2014). This is expected to satisfy Higher Education institutions' decision makers for solving problems related to students' college admission and enrollment effectively and improving universities of achieving their goals for getting optimal capacity that satisfying their future needs.

Most of previous work are based on using single model DSS, and this lacks flexibility, adaptability, and capability. This paper introduces a novel H-SDSS based hybrid subsystem and integrated models for design and implementation for Colleges Enrollment Capacity Planning. The rest of the paper explains the following sections: literature survey, the architecture of the proposed H-SDSS system, the applied case study data resources and system implementation, the H-SDSS system results, and the conclusions, respectively.

Literature Survey

DSSs vary greatly in application and complexity, but they all share specific features. A typical DSS has four components (Power, 2008): data management, model management, knowledge management and user interface management. Decision making in a complex, dynamically changing environment is a difficult task that requires new techniques of computational intelligence for building adaptive, hybrid intelligent decision support systems (HIDSS). These hybrid systems combine several of Knowledge-Based Systems into one system (Kendal & Creen,

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2007). They achieve this combination either in a loose coupling, e.g. different modules in the same system use different methods, or in a tight coupling - methods are mixed at a low level, e.g. fuzzy neural networks or fully integrated systems. These are the most promising among standalone DSS. Since, they integrate the advantages of all the methods combined, e.g. dealing with both data and expert rules, using both statistical formulas and heuristics or hints.

Authors (Fong & etal, 2009) proposed a hybrid model of neural network and decision tree classifier that predicts the likelihood of which university a student may enter, by analyzing his academic merits, background and the university admission criteria from that of historical records. Authors (Kasabov & etal, 2016) proposed hybrid intelligent decision support systems and applications for risk analysis and discovery of evolving economic clusters in Europe. Authors (Chen & etal, 2012) proposed a hybrid DSS combining several data mining techniques using an improved weighted majority voting scheme (iWMV). Authors (Mansoul & etal, 2013) proposed a hybrid DSS for application on Healthcare. They used an approach based on using a multi-criteria decision guided by a case-based reasoning (CBR) approach. Authors (Balakrishnan & etal, 2013) developed A hybrid predictive system for retinopathy. They used data mining and case based reasoning (CBR). C5.0 was used to produce the decision tree whereas k-nearest neighbor and Hamming distance algorithms were used to select the three most similar cases for every new case entered into the system.

In this paper, it is proposed to use goal programming method for managing the integrated models subsystem, and using data mining knowledge based for managing the data driven subsystem. Goal programming (GP) is a branch of multi-objective optimization, which in turn is a branch of multi-criteria decision analysis (MCDA). GP is used to perform three types of analysis (Inflibnet , 2016): (1) Determine the required resources to achieve a desired set of objectives, (2) Determine the degree of attainment of the goals with the available resources, (3) Providing the best satisfying solution under a varying amount of resources and priorities of the goals. Data Mining (DM) is the process of collecting, searching through, and analyzing a large amount of data in a database, as to discover patterns or relationships (Han & Kamber, 2006). The most commonly DM methods used in this paper including: student's classification, clustering based on association discovery rules.

Materials and Methods

Figure 1 shows the components of the hybrid SDSS system proposed. The *model management subsystem* works as model driven based DSS, and it includes three integrated models: (1) Tracks Specified model (TSM), (2) Colleges Enrollment Model (CEM) and (3) Capacity Forecast Model (CFM) as explained in details in next sections. The *Data Management subsystem* works as data driven based DSS. The *Knowledge-Base Management Subsystem* can support any of these subsystems. It provides intelligence to augment the decision maker's own. It can be interconnected with the organization's knowledge repository Organizational Knowledge Base. Knowledge can be provided via web servers. Many artificial intelligence methods have been implemented in web development systems which are easy to integrate into the other DSS components as explained in next sections.

User Interface

The *User Interface Subsystem* allows the interaction between the computer and the decision maker. It is used by the user; is part of system; to communicate with and commands the DSS. The web browser provides a familiar and consistent Graphical User Interface (GUI) structure for most DSS. The decision maker; user or manager; can be an individual or a group, depending on who is responsible for the decision, and provides the human intellect. An intermediary allows a manager to benefit form a DSS. For example: University staff assistants have specialized knowledge about management problems and some experience with decision support technology. Expert tool users perform tasks that the problem solver does not have the skill or training to perform. University business analysts have a knowledge of the application area, a formal business administration education and considerable skill in using DSS construction tools. Facilitators control and coordinate the use of software to support the work of people working in groups, and are also responsible for the conduct of workgroups sessions.

The Data Management Subsystem (DMS)

It is connected to several internal and external databases for retrieving the necessarily data required. Five databases are dealt with as shown in Figure 1. (1) Web portal university database is used for retrieving students admitted data such as age, ID, nationality and GPA. (2) The university DB it is used for retrieving the preparatory rules, as explained in (Ragab & etal, 2014). (3) The graduated history DB which help for forecasting, as explained next. (4) The colleges DB used for retrieving enrollment criteria rules explained in (Ragab & etal, 2014). (5) Ministry of higher education DB is used for retrieving the key performance indicators (KPIs) according to future suggested plans that have to be satisfied.

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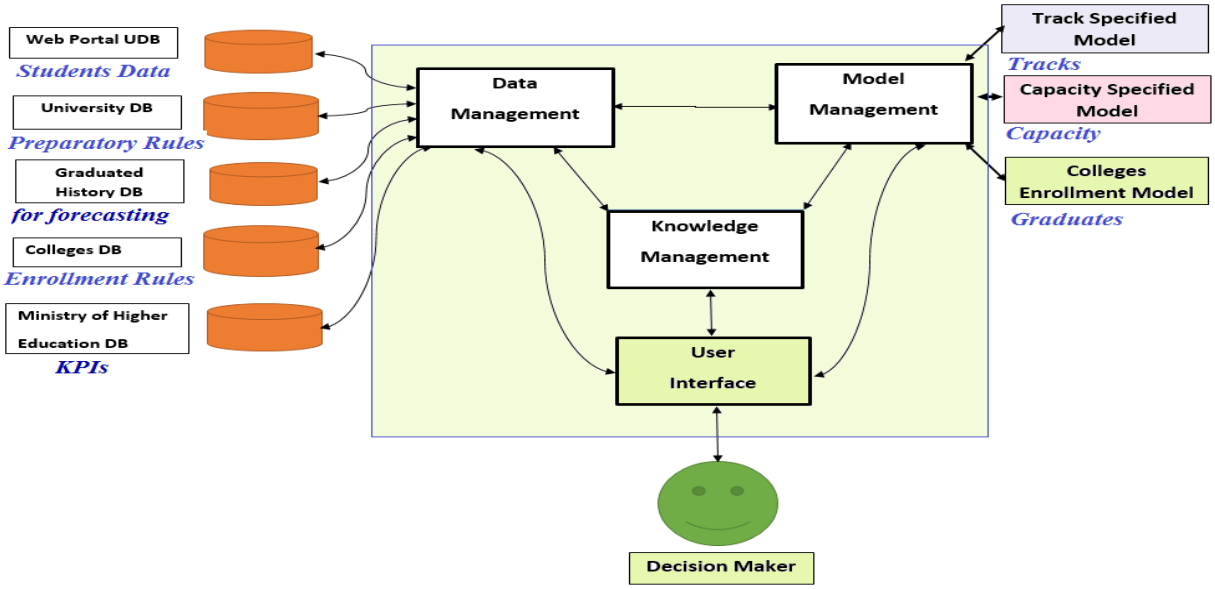

Figure 1. The architecture of the proposed SDSS.

The data Management Subsystem is implemented using data mining (DM) knowledge base rules as explained in (Ragab & etal, 2014). Where, C4.5, PART and Random Forest algorithms gave the highest performance and accuracy with lowest errors. Based on these results, the C4.5 algorithm is used in the implementation. Figure-2 shows a simplified diagram followed for implementing C4.5. A significant cleaning and transformation phase needs to take place so as to prepare the information for DM algorithm. The data we use to construct our DMS subsystem is based on Knowledge Discovery Association Rules. Web usage mining performs mining on student's web data, particularly data stored in logs managed by the web servers. The web log provides a raw trace of the students' navigation and activities on the site. In order to process these log entries and extract valuable patterns that could be used to enhance DMS subsystem and help in system evaluation.

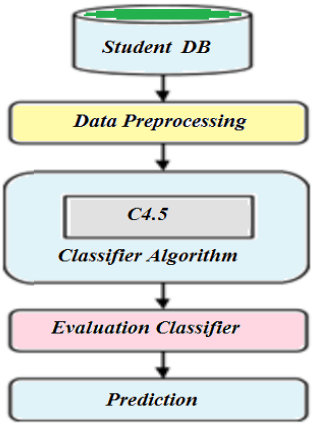

Figure 2. The C4.5 DM algorithm processing steps for implementing DMS.

The Model Management Subsystem (MMS)

It is implemented based on goal programming mathematical model explained in (El-Quliti & etal, 2016). The MMS is consists of three integrated models as follows:

(A) Tracks Specified Model (TSM)

The TSM is used for sorting the preparatory year tracks recommended for fresh students. It contains a sorter and a filter. The sorter used to sort students to several university study tracks available with 60% for Science tracks and 40% for Art tracks. The filter is used to re-arrange students onto two categories. Students who passed all courses successfully will go to college model to be enrolled to suitable colleges. Students who failed in any course are rejected and postponed for services when they are succeeded. The track model executes its' tasks based on the goal programming constrains shown in Table (1) and in the mathematical formulas shown in Appendix-Part (ii).

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(B) Colleges Enrollment Model (CEM)

The standard criteria that govern college allocation are based on fulfilling the following four criteria: (1) Success of all preparatory year courses. (2) Minimum score of college prerequisite courses must be satisfied. (3) Weighted Relative Rate must be satisfied. And (4) College capacity must be valid. The CEM contains two internal components; a Classifier and Allocator, respectively. The classifier categorizes students according to their gender and their qualifications. The allocator services students who succeeded in all preparatory year courses and enrolls students into colleges fairly according to the GPA and prerequisite qualified courses stated by specialized colleges. The CEM carries out these tasks based on the goal programming constrains shown in Table (2) and in the Appendix-Part (iii).

(C) Capacity Forecast Model (CFM)

The CFM uses goal programming formulas shown in the appendix to predict the future capacity expected for next upcoming years. For the proposed SDSS forecast purposes, the following goal attributes has been taken into consideration.

1. Annual growth rate for enrolled students.
2. Percentage of the total number of students enrolled in science and engineering programs.
3. Percentage of total enrollment in higher education regardless of age, to the total population in the age group of 18-23 years.
4. Accepted percentage in higher education from high school graduates.
5. Percentage of the total number of students in each discipline of education to the total faculty members.
6. Percentage of the total number of girls to the total number of boys in higher education.
7. Not violating the available resources.
8. Annual growth rate for graduated students.
9. Ratio of graduated students to those enrolled 5 years ago.

Relevant parameters and data for the model related to the applied case study explained in next section.

H-SDSS Case Study Data Specifications

Trusted sources of our applied case study input data included the following: (1) the Kingdom of Saudi Arabia (KSA) Ministry of Education Ninth Development Plan (2010-2014) that adopts the drive towards a knowledge based economy through focusing on human development and education (MHE, 2009, 2016). The main challenges of education are improving enrolment rates, reducing dropout rates at all levels of education, and enabling education to meet the demand of labor market. (2) The twenty-five-year plan (AAFAQ) for KSA Higher Education Development (MHE, 2016). (3) The statistical KSA universities data from the web during years 2004-2015 (ISD, 2014 & CDIS, 2016). Applying these data into the proposed system implemented, the results are obtained as explained next section. The mathematical model will cover the main objectives stated in the KSA Plan and that stated in KSA Strategic Plan (AAFAQ). It will be restricted to a-3 year planning horizon as an example for application, but it can be extended to longer time span with little modifications. To design the decision variables for the case study applied, it is necessary to represent all different problem attributes as defined in Table 1.

Table1: Problem attributes and their values.

Attributes	Values
y = Year of the plan	y = 1 for the first year of the next plan 2016, 2 for the second and 3 for the last year, y = 0 for the last year in the previous plan (current year, 2015), y= -1 for year 2014 and so on.
u = University	u = a university, $u \in$ U, the set of all universities in the country.
i = Status	E for Enrolled and G for Graduated
j = Gender	b for boys section and g for girls section
k = Education Program	m = a college in the medicine specialty, m $\in$ M, the set of all colleges in the Medicine specialty, s = a college in the Science & Engineering specialty, s $\in$ S, the set of all colleges in the Science and Engineering specialty, a = a college in the arts specialty, $a \in$ A the set of all colleges in the Arts specialty and T for the total number in all specialties M, S and A in all universities U.

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Table 2: The KPIs input parameters related to the applied case study.

Symbol	Meaning	Value
p_r^y	Annual growth rate for enrolled students in year y of the planned horizon.	4.5%
p_s^y	Percentage of the total number of students enrolled in science & engineering and medical programs to the total number of students enrolled in higher education in year y of the planned horizon.	60%
p_m^y	Percentage of the total number of students enrolled in medical programs to the total number of students enrolled in science & engineering and in year y of the planned horizon.	16.5%
p_p^y	Percentage of total enrollment in higher education regardless of age, to the total population in the age group of 18-23years in the same year y of the planned horizon.	50%
p_h^y	Accepted percentage in higher education from high school graduates in year y of the planned horizon.	55%
p_g^y	Percentage of the total number of enrolled girls to the total number of boys enrolled in year y of the planned horizon.	90%
Percentage of the total number of students in each discipline of university education to the total faculty (*F*) in that specialty in year y of the planned horizon is:		
β_M^y	Medicine	10 :1
β_S^y	Science & Engineering	17: 1
β_A^y	Arts	22:1
β_U^y	Total University	20: 1
q_r^y	Annual growth rate of the number of graduates for year y of the planning horizon.	7.2%.
q_d^y	The planned percentage of students who will complete their studies in year y of the planned horizon to the total number of students enrolled five years ago.	85%

Table 3: The input data in the year 2015, used as current year in the mode.

Symbol	Meaning	Value
$x_{E,b,T}^{y-1,U}$	Total number of boys enrolled in Saudi Arabia in all universities in year y-1 (2015 = last year of the previous National plan).	214,603
$x_{E,g,T}^{y-1,U}$	Total number of girls enrolled in Saudi Arabia in all universities in year y-1 (2015 =last year of the previous National plan)	199,185
$x_{G,b,M}^{y-1,U}$	Number of graduated boys in the Kingdom in year 2015 (medicine)	3,191
$x_{G,b,S}^{y-1,U}$	Number of graduated boys in the Kingdom in year 2015 (science & engineering specialty)	18,103
$x_{G,b,A}^{y-1,U}$	Number of graduated boys in the Kingdom in year 2015 (arts specialty)	13,851
$x_{G,g,M}^{y-1,U}$	Number of graduated girls in the Kingdom in year 2015 (medicine)	3,456
$x_{G,g,S}^{y-1,U}$	Number of graduated girls in the Kingdom in year 2015 (science & engineering specialty)	22,871
$x_{G,g,A}^{y-1,U}$	Number of graduated girls in the Kingdom in year 2015 (arts)	34,797

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Table 4: Input data related to the Kingdom of Saudi Arabia for different years.

Symbol	Meaning	Value in Year y		
		2015	**2016**	**2017**
N_C^y	Population of Saudi Arabia in the age of 18-23 years.	1,297,000	1,335,910	1,375,987
N_H^y	Total number of High school graduates.	404,742	422955	441988
N_b^y	Number of boys for bachelor Scholarships abroad.	22,644	24,908	27,399
N_g^y	Number of girls for bachelor Scholarships abroad.	8,477	9,325	10,257
B_u^y	Total Budget for a university u in a year y (in million SAR).	32,500	35,750	39,325
c_u^y	Average cost of one student in a university u in a year y (in SAR).	56,250	61,875	68,063
$F_{bM}^{y,U}$	Number of faculty in all universities (boys section, medical specialty)	7,425	8,168	8,984
$F_{g,M}^{y,U}$	Number of faculty in all universities (girls section, medical specialty)	4,433	4,876	5,364
$F_{b,S}^{y,U}$	Number of faculty in all universities (boys section, science and engineering)	19,346	21,281	23,409
$F_{g,S}^{y,U}$	Number of faculty in all universities (girls section, science and engineering)	8,658	9,524	10,476
$F_{b,A}^{y,U}$	Number of faculty in all universities (boys section, arts specialty)	9,431	10,374	11,412
$F_{g,A}^{1,U}$	Current number of faculty in all universities (girls section, arts specialty)	9,776	10754	11829
$F_{b,T}^{y,U}$	Number of faculty in all universities (boys section, all specialties)	37,245	40,970	45,066
$F_{g,T}^{y,U}$	Number of faculty in all universities (girls section, all specialties)	23,405	25,746	28,320
		Value in Year y		
		2011	**2012**	**2013**
$x_{E,b,M}^{y-5,U}$	Number of enrolled boys (medicine).	8,518	9,370	10,307
$x_{E,b,S}^{y-5,U}$	Number of enrolled boys in year y-5, y-4 and y-3. (science & engineering specialty)	93,807	103,188	113,506
$x_{E,b,A}^{y-5,U}$	Number of enrolled boys (arts specialty)	34,301	37,731	41,504
$x_{E,g,M}^{y-5,U}$	Number of enrolled girls (medicine)	7,114	7,825	8,608
$x_{E,g,S}^{y-5,U}$	Number of enrolled girls (science & engineering)	92,867	102,154	112,369
$x_{E,g,A}^{y-5,U}$	Number of enrolled girls (arts)	38,993	42,892	47,182

Relevant parameters and data for the applied case study are collected and presented in Table 2, (MHE, 2016). Table 3 represents the input data in the year 2015; which considered as current year y in the goal programming model. Table 4 represents the input data for different years needed in the mathematical model. Based on these defined attributes and equations, the results obtained are explained in section 6.

H-SDSS System Implementation

The hybrid integrated models subsystem is implemented based on goal programming method (El-Quliti, 2016). The enrollment part is presented in equations (1-57) shown in the Appendix. The graduation part are solved directly using the inequality relations (58-69). Relevant model parameters and data for the applied case study are represented in the Tables (1-4) in the previous sections. Figure 3 shows a simplified flowchart for the algorithm implemented. Details computations are explained in next sections.

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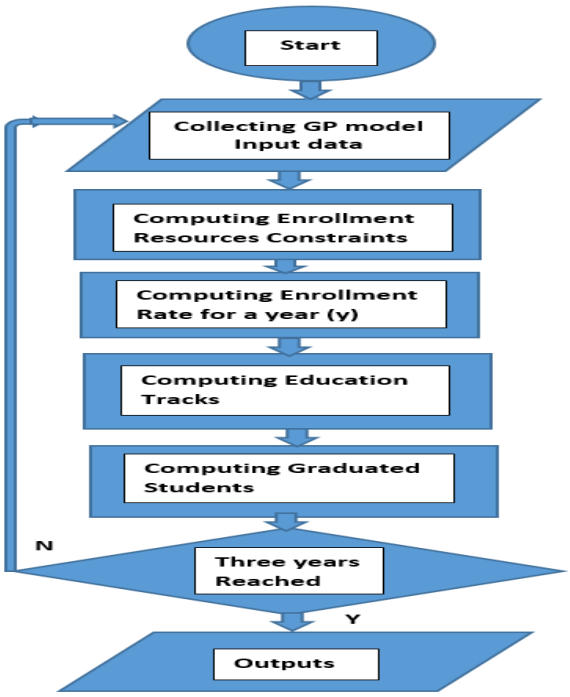

Figure 3. Simplified goal programming followed steps for the H-SDSS algorithm implemented.

Control the Education Tracks

The percentage of the total number of students enrolled in science and engineering and medical programs to the total number of students enrolled in higher education is more than or equal p_s^y and computed as shown in Appendix-part (ii-A). The percentage of the total number of students enrolled in medical programs to the total number of students enrolled in science and engineering is more than or equal p_m^y and computed as shown in Appendix part (ii-B). The Tracks Specified Model (TSM) executes these functions.

Control Students Enrollments and Graduation Rate

All the resources of the teaching process are collected in the total budget required for a University *u* that should not exceed a certain total limit of B_u^y at any year y of the planning horizon.

c_u^y = cost per student in a University *u* in a year *y*, and

B_u^y = Maximum budget for a university *u* in a year *y*,

The percentage of total enrollment in higher education regardless of age, to the total population in the age group of 18-23 years $\geq p_p^y$, and the accepted percentage in higher education from high school graduates in the same year $\geq p_h^y$. It is required to increase the enrollment of students in higher education with an average annual growth rate of p_r^y. The percentage of the total number of enrolled girls to the total number of enrolled boys in higher education $\geq p_g^y$. These values are computed as shown in Appendix part (iv). The number of graduates that will be increase with an average annual rate = q_r^y. Percentage of students who have completed their studies in a given year to the total number of students enrolled in universities five years before that year=q_d^y . These values are computed as shown in Appendix part (v). The Colleges Enrollment Model (CEM) and the Capacity Forecast Model (CFM) process these tasks.

Results and Discussion

Table 5 and Figure 4 show the predicted number of students enrolled and graduated in the years 2016, 2017 and 2018. Results show that the number of enrollment students increase regularly every year. So that decision makers has to take necessarily steps towards supplying required resources to cover this increase. The number of graduated students also increases regularly every year. This increased value has to be taken into consideration by labor market for offering qualified jobs suitable for the graduates excess. It is also noted that the average number of drop out students (E-G) is increases. This value is high and it should be taken care of by university decision makers to be reduced. And Higher Education Ministry plan recommended dropout rate should be within the limit of 1%.

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Table 5: Optimal solution for planning per year (*y*).

#	Meaning	Decision Variable	Year (*y*)		
			2016	**2017**	**2018**
1	Enrolled boys in medical	*EBM*	12,250	13,451	13,907
2	Graduated boys in Medical	*GBM*	7,240	7,965	8,467
3	Enrolled boys in science	*EBS*	54,856	56,612	69,936
4	Graduated boys in science	*GBS*	47,736	49,710	51,639
5	Enrolled girls in medical	*EGM*	9,325	10,244	11,465
6	Graduated girls in medical	*GGM*	6,047	6,651	6,954
7	Enrolled girls in science	*EGS*	46,729	52,044	53,003
8	Graduated girls in science	*GGS*	36,937	38,831	40,638
9	Enrolled boys in arts	*EBA*	34,907	41,629	43,566
10	Graduated boys in arts	*GBA*	29,156	32,071	34,328
11	Enrolled girls in arts	*EGA*	39,666	40,901	43,632
12	Graduated girls in arts	*GGA*	33,144	36,458	39,843

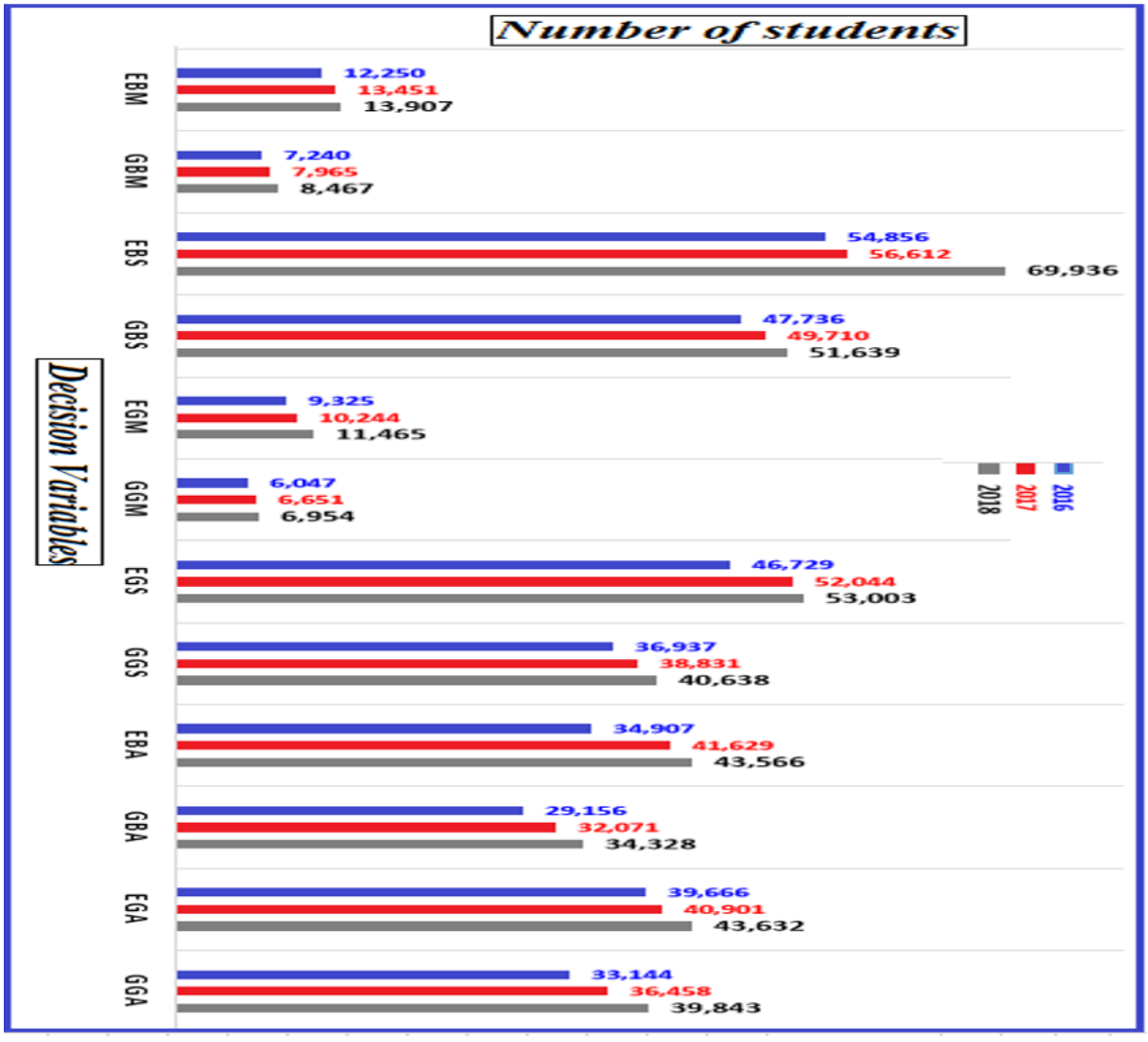

Figure 4. Enrollment and Graduated students predicted w.r.t years 2016-2018.

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Conclusion

This paper introduced a new architecture of hybrid strategic decision support system (HSDSS) that can be used efficiently for colleges' enrollment capacity planning. This can help university decision makers for tackling problems related to students' college enrollments as well as to suggest required facilities that are helpful to accommodate increasing future demands and needs. The HSDSS uses goal programming methods for predicting future capacity, as well as data mining knowledge base algorithms for determine students' suitable tracks and college enrollment that satisfying students' desires and university criteria. Results; of the applied case study; show that the number of graduated students increases annually. This can be reflected on labor market needs for offering *Science* related jobs with 60% and *Art* specialist related jobs with 40%, as Ministry of Higher Education in KSA plan recommended. In addition, results show that students' dropout also increases functional to the enrollments and this cause a problem. Hence, university decision makers have to take necessarily solutions to limit this increase, the recommended value hoped to be achieved is 1%.

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Appendix: Goal Programming Model Computing Equations.

i. Steps for computing Enrollment Rate (p_r^y)

(1) $\frac{\sum_{u\in U}\sum_{k\in K} x_{E,b,k}^{y,u} - \sum_{u\in U}\sum_{k\in K} x_{E,b,k}^{y-1,u}}{\sum_{u\in U}\sum_{k\in K} x_{E,b,k}^{y-1,u}} + d_y^- \geq \boldsymbol{p_r^y}$, y = 1, 2, 3.

(2) $\sum_{u\in U}\sum_{k\in K} x_{E,b,k}^{y,u} - \sum_{u\in U}\sum_{k\in K} x_{E,b,k}^{y-1,u} + d_y^- \geq p_r^y.(\sum_{u\in U}\sum_{k\in K} x_{E,b,k}^{y-1,u})$ y = 1, 2, 3. (1-3)

The **nonlinear** constraints is **linearized** by multiplying both sides with the denominator", then the right hand side will represent the number of students.

(3) $\frac{\sum_{u\in U}\sum_{k\in K} x_{E,g,k}^{y,u} - \sum_{u\in U}\sum_{k\in K} x_{E,g,k}^{y-1,u}}{\sum_{u\in U}\sum_{k\in K} x_{E,g,k}^{y-1,u}} + d_{y+3}^- \geq \boldsymbol{p_r^y}$, y = 1, 2, 3.

(4) $\sum_{u\in U}\sum_{k\in K} x_{E,g,k}^{y,u} - \sum_{u\in U}\sum_{k\in K} x_{E,g,k}^{y-1,u} + d_{y+3}^- \geq \boldsymbol{p_r^y}.\sum_{u\in U}\sum_{k\in K} x_{E,g,k}^{y-1,u}$, y = 1, 2, 3. (4-6)

ii. Computing Education Tracks

(A) Steps for Computing p_s^y:

(1) $\frac{\sum_{u\in U}\sum_{k=m,s} x_{E,b,k}^{y,u}}{\sum_{u\in U}\sum_{j\in J} x_{E,b,j}^{y-1,u}} + d_{y+6}^- \geq p_s^y$, $y = 1, 2, 3.$

(2) $\sum_{u\in U}\sum_{k=m,s} x_{E,b,k}^{y,u} + d_{y+6}^- \geq p_s^y.\sum_{u\in U}\sum_{j\in J} x_{E,b,j}^{y-1,u}$, $y = 1, 2, 3.$ (7-9)

(3) $\frac{\sum_{u\in U}\sum_{k=m,s} x_{E,g,k}^{y,u}}{\sum_{u\in U}\sum_{k\in K} x_{E,g,k}^{y-1,u}} + d_{y+9}^- \geq p_s^y$, $y = 1, 2, 3.$

(4) $\sum_{u\in U}\sum_{k=m,s} x_{E,g,k}^{y,u} + d_{y+9}^- \geq p_s^y.\sum_{u\in U}\sum_{k\in K} x_{E,g,k}^{y-1,u}$, $y = 1, 2, 3.$ (10-12)

(B) Steps for Computing p_m^y:

(1) $\frac{\sum_{u\in U}\sum_{k=m\in M} x_{E,b,k}^{y,u}}{\sum_{u\in U}\sum_{k=s\in S} x_{E,b,j}^{y-1,u}} + d_{y+12}^- \geq p_m^y$, $y = 1, 2, 3.$

(2) $\sum_{u\in U}\sum_{k=m\in M} x_{E,b,k}^{y,u} + d_{y+12}^- \geq p_m^y.\sum_{u\in U}\sum_{k=s\in S} x_{E,b,j}^{y-1,u}$, $y = 1, 2, 3.$ (13-15)

(3) $\frac{\sum_{u\in U}\sum_{k=m\in M} x_{E,g,k}^{y,u}}{\sum_{u\in U}\sum_{k=s\in S} x_{E,g,k}^{y-1,u}} + d_{y+15}^- \geq p_m^y$, $y = 1, 2, 3.$

(4) $\sum_{u\in U}\sum_{k=m\in M} x_{E,g,k}^{y,u} + d_{y+15}^- \geq p_m^y.\sum_{u\in U}\sum_{k=s\in S} x_{E,g,k}^{y-1,u}$, $y = 1, 2, 3.$ (16-18)

(C) Steps for Computing p_h^y.

$\sum_{u\in U}\sum_{j\in J}\sum_{k\in K} x_{E,j,k}^{y,u} + d_{y+18}^- \geq \max[(\frac{1}{5}.p_p^y.N_C^{y-1}), (p_h^y.N_H^{y-1})]$, y = 1, 2, 3 (19-21)

iii. Steps for computing Student-to-Faculty Ratio

(1) $\sum_{u\in U}\sum_{m\in M} x_{E,b,m}^{y,u} - d_{y+21}^+ \leq \frac{1}{t_M}.\beta_M^y.\boldsymbol{F_{b,M}^{y,U}}$, $y = 1, 2, 3.$ (22-24)

(2) $\sum_{u\in U}\sum_{m\in M} x_{E,g,m}^{y,u} - d_{y+24}^+ \leq \frac{1}{t_M}.\beta_M^y.\boldsymbol{F_{g,M}^{y,U}}$, $y = 1, 2, 3.$ (25-27)

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Continue Appendix

$$(3)\ \sum_{u\in U}\sum_{s\in S} x_{E,b,s}^{y,u} - d_{y+27}^{+} \le \frac{1}{t_S}.\beta_S^y\ .\boldsymbol{F_{b,S}^{y,U}}, y = 1, 2, 3. \quad (28\text{-}30)$$

$$(4)\ \sum_{u\in U}\sum_{s\in S} x_{E,g,s}^{y,u} - d_{y+30}^{+} \le \frac{1}{t_S}.\beta_S^y\ .\boldsymbol{F_{g,M}^{y,U}}, y = 1, 2, 3. \quad (31\text{-}33)$$

$$(5)\ \sum_{u\in U}\sum_{a\in A} x_{E,b,a}^{y,u} - d_{y+33}^{+} \le \frac{1}{t_A}.\beta_A^y\ .\boldsymbol{F_{b,A}^{y,U}}, y = 1, 2, 3. \quad (34\text{-}36)$$

$$(6)\ \sum_{u\in U}\sum_{a\in A} x_{E,g,a}^{y,u} - d_{36}^{+} \le \frac{1}{t_A}.\beta_A^y\ .\boldsymbol{F_{g,A}^{y,U}}, y = 1, 2, 3. \quad (37\text{-}39)$$

$$(7)\ \sum_{u\in U}\sum_{k\in K} x_{E,b,k}^{y,u} - d_{y+39}^{+} \le \frac{1}{t_M}.\beta_U^y\ .\boldsymbol{F_{b,T}^{y,U}}, y = 1, 2, 3. \quad (40\text{-}42)$$

$$(8)\ \sum_{u\in U}\sum_{k\in K} x_{E,g,k}^{y,u} - d_{y+42}^{+} \le \frac{1}{t_M}.\beta_U^y\ .\boldsymbol{F_{g,T}^{y,U}}, y = 1, 2, 3. \quad (43\text{-}45)$$

iv. Steps for computing Enrolled Girls-to-Boys Ratio ($\boldsymbol{p_g^y}$)

$$(1)\ \frac{\sum_{u\in U}\sum_{k\in K} x_{E,g,k}^{y,u}}{\sum_{u\in U}\sum_{k\in K} x_{E,b,k}^{y,u}} + d_{y+45}^{-} \ge \boldsymbol{p_g^y}, \text{y} = 1, 2, 3.$$

$$(2)\ \sum_{u\in U}\sum_{k\in K} x_{E,g,k}^{y,u} + d_{y+45}^{-} \ge \boldsymbol{p_g^y}.\sum_{u\in U}\sum_{k\in K} x_{E,b,k}^{y,u}, \text{y} = 1, 2, 3. \quad (46\text{-}48)$$

vi. Enrollment Resources Constraints

for c_u^y = cost per student in a University u in a year y, and

B_u^y = Maximum budget for a university u in a year y,

Then: $\sum_{u\in U}\sum_{j\in J}\sum_{k\in K} x_{E,j,k}^{y,u} - d_{y+48}^{+} \le \sum_{u\in U} B_u^y / c_u^y$, y = 1, 2, 3. (49-51)

v. Steps for computing number of Graduated Students

$$(1)\ \sum_{u\in U}\sum_{m\in M} x_{G,b,m}^{y,u} \ge \max\left[(1+q_r^y).\sum_{u\in U}\sum_{m\in M} x_{G,b,m}^{y-1,u}, \boldsymbol{q_d^y}.\sum_{u\in U}\sum_{m\in M} x_{E,b,m}^{y-5,u}\right], \text{y} = 1, 2, 3. \quad (52\text{-}54)$$

$$(2)\ \sum_{u\in U}\sum_{s\in S} x_{G,b,s}^{y,u} \ge \max\left[(1+q_r^y).\sum_{u\in U}\sum_{s\in S} x_{G,b,s}^{y-1,u}, \boldsymbol{q_d^y}.\sum_{u\in U}\sum_{s\in S} x_{E,b,s}^{y-5,u}\right], \text{y} = 1, 2, 3. \quad (55\text{-}57)$$

$$(3)\ \sum_{u\in U}\sum_{a\in A} x_{G,b,a}^{y,u} \ge \max\left[(1+q_r^y).\sum_{u\in U}\sum_{a\in A} x_{G,b,a}^{y-1,u}, q_d^y.\sum_{u\in U}\sum_{a\in A} x_{E,b,a}^{y-5,u}\right], \text{y} = 1, 2, 3. \quad (58\text{-}60)$$

$$(4)\ \sum_{u\in U}\sum_{m\in M} x_{G,g,m}^{y,u} \ge \max\left[(1+q_r^y).\sum_{u\in U}\sum_{m\in M} x_{G,g,m}^{y-1,u}, q_d^y.\sum_{u\in U}\sum_{m\in M} x_{E,g,m}^{y-5,u}\right], \text{y} = 1, 2, 3. \quad (61\text{-}63)$$

$$(5)\ \sum_{u\in U}\sum_{s\in S} x_{G,g,s}^{y,u} \ge \max\left[(1+q_r^y).\sum_{u\in U}\sum_{s\in S} x_{G,g,s}^{y-1,u}, q_d^y.\sum_{u\in U}\sum_{s\in S} x_{E,g,s}^{y-5,u}\right], \text{y} = 1, 2, 3. \quad (64\text{-}66)$$

$$(6)\ \sum_{u\in U}\sum_{a\in A} x_{G,g,a}^{y,u} \ge \max\left[(1+q_r^y).\sum_{u\in U}\sum_{a\in A} x_{G,g,a}^{y-1,u}, q_d^y.\sum_{u\in U}\sum_{a\in A} x_{E,g,a}^{y-5,u}\right], \text{y} = 1, 2, 3. \quad (67\text{-}69)$$

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STUDY ON TRIBOLOGICAL BEHAVIOR FOR NANO POWDER POLYMER BLENDS

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Abstract: Polymer technology is producing new solutions for recent needs day by day. The investigations about this subject have increased in recent years. Unused materials have been produced by adding the packing material to the polymer. The connection between the polymer and the core is known to have a big effect on the physical features of the material. Together with this, nano-material is one of the subjects that have been brought about. Nano materials compared to the ingot materials are a bit different and have superior mechanic, electrical, thermal, optics and chemical qualifications properties. In this study is the investigation of the effect of high-intensity polyethylene, which is filled with zinc oxide, magnesium hydroxide, calcium carbonate and silicon dioxide and the impact of this interface interaction on the wear various. High density polyethylene and zinc oxide, magnesium hydroxide, calcium carbonate and silicon dioxide have been mixed at % 5, %10, %15 and % 20 proportion. After the mixing activity the dehydrated materials have been changed into granule by the help of crusher and extrusive machine.

Keywords: Nanoparticle, Tribology, Composite

Introduction

Polymer technologies are generated rapidly. The chancing outcome polymer base new material which play an important role in engineering applications with their desired physical and mechanical properties.

The properties cannot satisfy the required properties for applications. Therefore we improve properties and to lower the cost of polymer products. Polymer composites have become attractive in polymer field. Therefore they are various advantages such as easiness in processing, cost effectiveness and excellent performance. These advantage is manifested over the metals as well as improved mechanical properties. Polymer composite has a special property of self-lubrication as well as low friction coefficient, better wear resistance, lower weight alternatives to other components. These make composites suitable in tribological applications [Sudepan, 2015; Wang, 2008; Rashimi, 2011].

Determined by the literature and the results of similar studies have been examined. Dhoka (2009) examined the effect of the addition of nano ZnO on silicone modified alkyd- based coatings with water based on the mechanical and heat resistance. In this study, nano- ZnO was added in different proportions. Contribute to the increase of the rate of increase has caused the wear rate

In a study conducted; PP - Mg (OH)2 which size is 50 nm were mixed. Mixing ratios caused the reduction of wear. The change in the wear rate of the material has been found to be associated on hardness value. [Saçaklı, 2011].

In another study performed, mechanical and wear behaviour of vinyl ester resins investigated the effect of nano silica filler. In this study, vinyl ester resin was mixed SiO2. This abrasion test was applied to the obtained material. Results of an increase in contribution rates indicate that the wear rate increases. Another study the ZnO nano-composites and aluminium were also examined and compared with SiO_2 and their wear rate comparison with other samples and there result values were found to be better than other nano-material filler composites [Elansezhian, 2011].

Methods

Wear rate that the fragment of material is determined by counting the amount by mechanical rubbing, scraping and erosion. The cylinder is wearing to polymer without overheating wherein the force applied is 10

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N. Test, according to the type of the sample, 10, 20 and 40 are made according to one of meters. The result of this operation indicates deliver the ratio of the wear resistance. This value is expressed as volume loss or abrasion [ASTM D638]. Figure 1 shows operating principle of the abrasion tester.

TS EN 12770 as a reference number, containing the abrasion test method, were used in the standard [6]. The device used in the assay is Devotrans brand. This device is located at Marmara University Faculty of Technology and Metallurgy Laboratory. (Fig. 2)

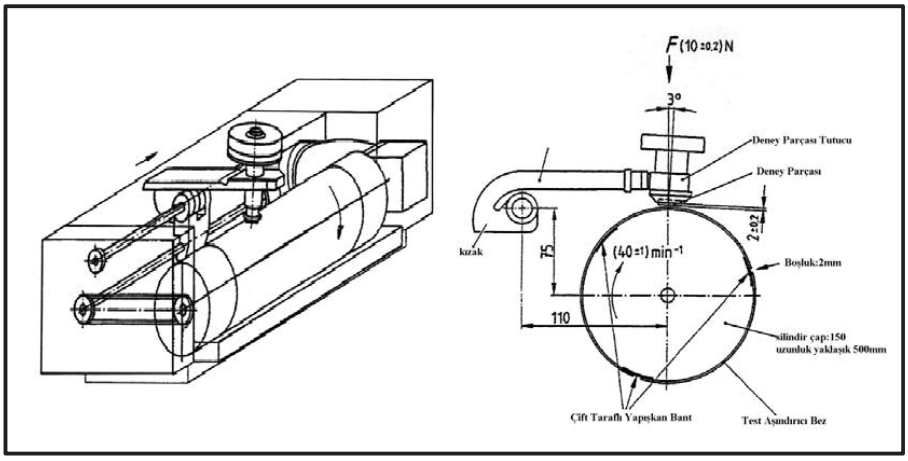

Fig.1. Operating principle of the abrasion test device.

According to TS EN 12770, TS 11007 standards test samples fabricated 4 mm thick and 16 mm diameter. The weight of the test sample is determined. Samples should be in full contact with the abrasive system.



Fig. 2. The abrasion test device

The device reaches 40 meters by 84 cycles. Thereafter the test stops and the part is ejected. And then the weight of the sample is determined. This process is repeated for 5 samples in TS 10731. Wear rate is calculated as follows in standards:

$$Wear \quad Rate = \frac{6m}{q.L.FN}$$

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Results and Discussion

The abrasion test result values are presented in Table 1. The results indicate that wear rate value of pure HDPE was identified as 0.000172 cm3/Nm. Material increase in the contribution rate caused by corrosion of the values were determined.

HDPE - ZnO nano-composite examination of the wear rate values which is 5% ZnO reinforced materials was 0.00018 cm^3 / Nm. This corrosion rate is seen that an increase in value arrive 4.6%. ZnO wear rate 10% contribution values has led to an increase of 16.3% (0.00020 cm^3 / Nm). 15% ZnO contributing which is metal-based materials was studied and the wear rate determined 0.00021 cm3/Nm, it increase 22.1% on wear rate ratio. Contribution of 20% ZnO grew by 27.9% in value of the wear rate 0.00022 cm^3 / Nm is. It was observed that the wear rate increases. Contribution of 20% ZnO grew by 27.9% on value of the wear rate (0.00022 cm^3 / Nm).

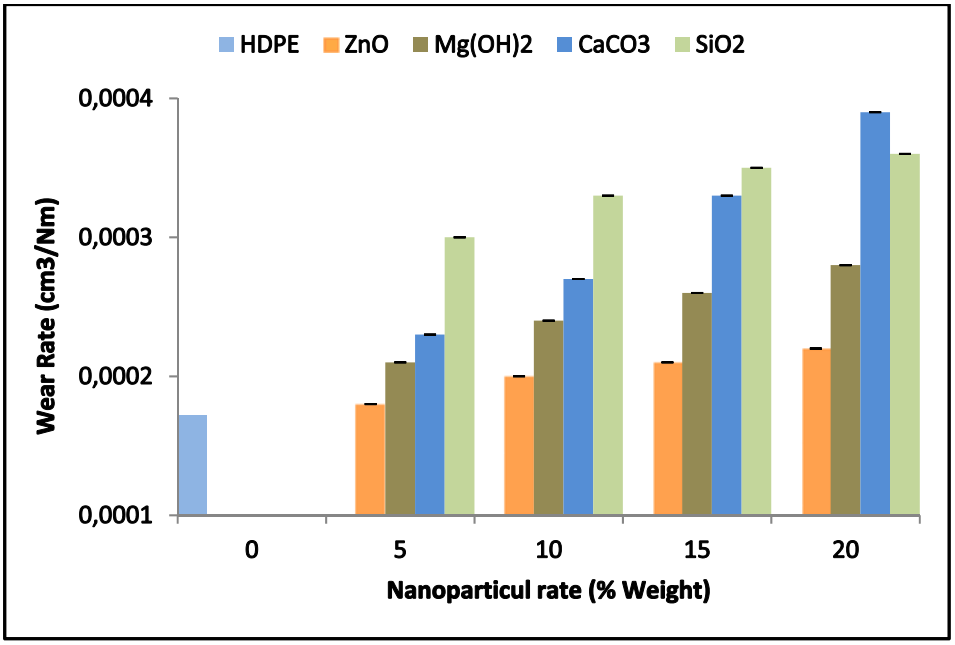

Fig. 3. Wear rate results

Metal materials such as ZnO, which class of Mg $(OH)_2$ addition of HDPE nano composite wear rate values are examined, depending on the surface roughness increased wear rate. Examined the contribution of 5% of this value, the wear rate of 22,1% was observed with the increase in 0.00021 cm^3/Nm. Additives 10% ZnO, the increase in wear rate is 39.5%. The wear rate of 15% ZnO increased 0.00026 cm^3/nm value (51.2%). In 20% of the additive reaches 0.00028 cm^3 / Nm seen.

Organic materials such as $CaCO_3$ and SiO_2 were found to contain high increase in the wear rate. HDPE - $CaCO_3$ contributing 5% of nanocomposite was determined as 0.00023 cm^3/ Nm, Wherein wear rate increased by 33.7%. Wear value with 10% fill rate increased by 57% and reached 0.00027 cm^3 / Nm. Contribution rate of 15% CaCO3 on the wear rate is 0.00033 cm^3 / Nm (91.9% increase). 20% $CaCO_3$ additive caused an increase in the rate of 127%. Here the value of wear rate cm3 / Nm 0.00039

HDPE - SiO_2 by mixing additives with the HDPE increases were observed very high in wear ratio. 5% SiO_2 added increased wear rate value 74.5% (0, 00030 cm^3/Nm). Wear value contribution of 10% SiO_2 was determined to be 0.00033 cm3/nm. Here increase in wear values as 91.8%. Attrition values of 15% of additives identified as 0.00035 cm^3/nm. This indicates an increase in the rate of 103.5%. Contribution rate of 20% indicate that increase wear value as 109.3% (0.00036 cm^3/nm).

Additives used in the study of the ZnO and Mg $(OH)_2$ depending on the contribution rates of nano-powders of the wear rate is understood that a linear increase. $CaCO_3$ and SiO_2 nano powder additives for wear rate was determined at the highest level in test groups.

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Conclusion

Wear is the loss of material from the rubbing surfaces and it's calculate quantity, by weight or volume or size reduction. Wear is the loss of material from the rubbing surfaces and it can be calculated quantity, weight and volume or size reduction. In this study; high density polyethylene incorporated nano powders were found to improve wear rate. Contribution rates have increased abrasion values. All material contribution rate, the highest values were observed in the highest wear. ZnO - HDPE composite materials for wear values increased about 20%. This increase were determined at Mg $(OH)_2$ at 27%, 109% in the addition of SiO_2, and 126% of $CaCO_3$ filler respectively.

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SÜSPANSİYON PARAMETRELERİNİN DEĞİŞİMİNİN ARAÇ YOL TUTUŞUNA ETKİLERİNİN İNCELENMESİ

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Özet: Gelişen teknoloji ile birlikte müşteri beklentilerinin artması, araç üreticileri arasındaki rekabeti arttırmıştır. Bu nedenle araç üreticileri ar-ge faaliyetlerine büyük yatırım yapmaktadır. Araç üreticileri satış adetlerini arttırmak için, düşük yakıt tüketimi, ağırlık azaltmanın yanı sıra sürüş konforu ve aracın yol tutuşuna da önem vermektedirler.

Bu çalışmada aracın yol tutuşunu etkileyen süspansiyon sistemi parçalarından olan yay ve damperin etkileri incelenecektir. Yay katsayısı ve damper sönümleme katsayıları yüzdesel olarak değiştirilerek aracın sürüş yol tutuşuna etkileri Adams/Car programında yapılan simülasyonlarla incelenmiştir. Değişen parametrelerin etkisini incelemek için Adams/Car programında ISO Lane Change, ivmelenme ve frenleme simülasyonları yapılmıştır. Çalışmada binek araç ve Formula SAE aracına bu simülasyonlar uygulanmış ve araç tipinin süspansiyon sistemi parametrelerine etkileri incelenmiştir.

Anahtar kelimeler: Yol tutuş, Adams/Car, ISO Lane Change, Formula SAE, yay, damper

Abstract: Increasing customer expectation along with advances in technology raised competition among Automotive Manufacturers. Therefore Automotive manufacturers widely invest in R&D activities. Manufacturers care about ride comfort and handling of the vehicle as well as lower fuel consumption and vehicle weight reduction.

In this study, spring and the damper, parts of suspension system that affect the handling of the vehicle, were examined. Spring coefficient and Damping coefficient were varied by percentage and effects of this variances to handling were analysed by simulations in Adams/Car software. In order to investigate effects of varying parameters, ISO Lane Change, acceleration and breaking simulations were run in Adams/Car software. Simulations were performed for passenger car and Formula SAE car individually and effects of car type to suspension system were invetigated.

Key words: Handling, Adams/Car, ISO Lane Change, Formula SAE, spring, damper

1.Giriş

Otomotiv sektöründe yaşanan gelişmeler ve otomotiv üreticileri arasında yaşanan rekabet dolayısıyla araçların sunduğu konfor ve performans ve her geçen gün giderek artmaktadır. Otomotiv ana sanayi şirketleri araçlarını geliştirmek için ar-ge faaliyetlerine çok büyük yatırım yapmaktadır. Bu yatırımlar araçlarda yakıt tüketimini azaltmayı, sürüş güvenliği arttırmayı, sürüş konforunu arttırmayı, sürüş zevkini arttırmayı gibi birçok farklı alanda yapılmaktadır.

Süspansiyon sistemlerin birbiriyle çelişen iki temel amacı vardır. Bunlar sürüş konforu ve yol tutuştur. Sürüş konforu, araçların seyir halindeyken aracın yol düzgünsüzlüklerinden gelen etkilerin yolcu ve sürücülere olan etkilerini belirler. Yol tutuş ise temel olarak aracın manevra alma kabiliyeti, ani manevralarda gösterdiği performans olarak bilinmektedir. Sürüş konforunda genel olarak beklenen daha yumuşak süspansiyon sistemi ile yol düzgünsüzlüklerinden kaynaklanan etkilerin sürücü ve yolculara iletilmesini engellemek, yol tutuşta ise daha sert süspansiyon sistemi ile aracın savrulmasının ve yan yatmasının az olmasını sağlamaktır. Bu çalışma süspansiyon sisteminin bu özelliklerinden yol tutuş üzerine yapılmıştır.

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1980'lerin ortalarında modelleme ve simülasyonu mühendislik uygulamaları için popüler kılan iki yazılım tipi ortaya çıkmıştır (Sayers 2010). Bu yazılım türlerinden ilki Matlab/Simulink gibi kullanıcılarına interaktif benzetim ortamı sunan programlardır. Diğeri ise Adams gibi mekanik çok gövdeli sistem simülasyonu yazılımlarıdır. Bu çalışmada Adams programı üzerinden sanal analizler yapılarak süspansiyon sisteminin etkileri incelenmiştir.

Çalışmada Adams programının araç süspansiyon sistemleri için özelleştirilmiş programı olan Adams/Car programı kullanılmıştır. Bu programda bir binek araç ve bir Formula SAE aracı için ISO Lane Change, ivmelenme ve frenleme simülasyonları yapılmış ve sonuçları karşılaştırılmıştır. Formula SAE aracı, uluslararası bir yarışma olan Formula Student/SAE yarışmaları için üniversite öğrencileri tarafından hazırlanan tek kişilik bir araçtır. Bu araçlardan Formula 1'de olduğu gibi yüksek performans, ani ivmelenme, viraj alma kabiliyeti gibi özellikler istenir. Bu nedenle binek araçlardan kullanım amacı yönüyle ayrılmaktadır ve kullanım amacının araç süspansiyonu üzerine etkileri ve sonuçları da bu çalışmada incelenmiştir.

2.Yol Tutuş

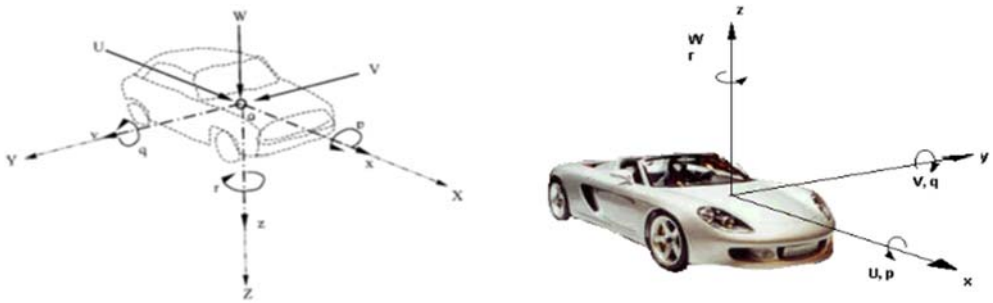
Yol tutuş, sürüş konforundaki dikey hareketlerden ziyade daha fazla yanal kuvvet ve ivmelerle ilgilidir. Taşıt dinamiğinde aracın yanal kuvvetlere karşı verdiği tepkiler ölçülmektedir.

1956 yılında William F.Miliken, David W.Whitcomb ve Leonard Segel yol tutuşun nicel ve teorik analizini birçok çalışma ile sunmuşlardır. Bu çalışmalardan elde edilen makaleler günümüzde hala taşıt hareketi ve kontrolü için referans olarak kullanılmaktadır. Miliken çalışmasında bu konu ile ilgili tarihsel bir genel bakış sunmuş ve ayrıca pek çok tasarım parametresinin etkilerini belirlemek için taşıt testlerine duyulan gereksinimden ötürü lastik tasarımının yol tutuş üzerindeki etkilerinin bilinemediğini belirtmiştir.

S.Hegazy, H.Rahnejat ve K.Hussain yol tutuş analizlerinde çok gövdeli dinamik yaklaşımı çalışmışlardır. Bu çalışma için kurulan model ''Double Wishbone'' tipi ön ve arka süspansiyon sistemleri, dişli ray tipi yönlendirme sistemi, taşıt gövdesi ve tekerleklerden oluşmaktadır. Model doksan dört serbestlik derecesine sahiptir ve modeli oluşturan elemanlar nonlineer bir karakteristik sergilemektedirler. Model Adams ortamında kurulmuştur ve yol tutuş analizlerini gerçekleştirmek için kullanılmıştır. Benzetimler ISO ve İngiliz standartları baz alınarak gerçekleştirilmiştir. R.W.Allen, T.S.Rosenthal, D.H.Klyde ve S.H.Hogue hafif bir taşıtın yanal/yönsel hareketinin bilgisayar benzetimi analizini çalışmışlardır. Bu yönsel harekete etki eden taşıt, tekerlek karakteristikleri ve manevra koşullarının bir çalışmasıdır.

2.1. Taşıt Eksen Takımları

Günümüzde araçların koordinatlarını tanımlarken iki adet koordinat sistemi kullanılmaktadır. Bu koordinat sistemleri ISO koordinat sistemi ve SAE koordinat sistemidir. Koordinat sistemleri aşağıdaki şekillerde gösterilmiştir.



Şekil 1. SAE koordinat sistemi (solda), ISO koordinat sistemi (sağda)

Koordinat sistemlerinde X, Y ve Z aksislerinin doğrultuları aynı fakat yönleri farklılık göstermektedir. Bu farklılıklar ilerleyen aşamalarda problemlere neden olabilir, bu nedenle araç üzerine çalışmalara başlanmadan hangi koordinat sisteminde çalışılacağı seçilmelidir.

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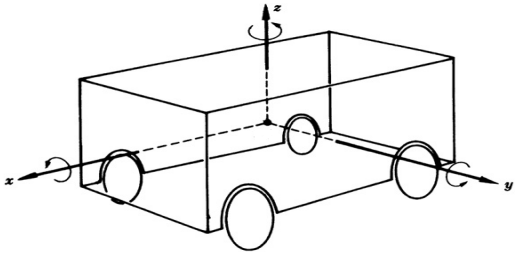
2.2. Taşıt Eksen Etrafındaki Hareketleri

Herhangi bir taşıtın dinamik davranışı çalışma esnasında ona etki eden kuvvetler tarafından belirlenmektedir. Bu kuvvetlerin kaynağı tekerlekler, yer çekimi ya da aerodinamik etkenler olabilmektedir (Abe 2009).



Şekil 2. Taşıt eksen takımı (Abe 2009)

Şekil 2'de görülen koordinat takımına göre taşıt gövdesi toplamda altı serbestlik derecesine sahiptir: Bunlar:

1- z ekseni boyunca dikey hareket
2- y ekseni boyunca yanal hareket
3- x ekseni boyunca boylamasına hareket
4- x ekseni etrafında yalpalama hareketi
5- y ekseni etrafında kafa vurma hareketi
6- z ekseni etrafında savrulma hareketi

Bu çalışmada 5 numaralı kafa vurma hareketi ve 1 numaralı dikey hareket incelenmiştir.

3. Materyal ve Yöntem

Bu çalışmada Adams/Car programı kullanılmıştır. Adams/Car programıyla ISO Lane Change, ivmelenme simülasyonları yapılmış ve kafa vurma hareketi ve şasinin dikey eksendeki yer değiştirme miktarı incelenmiştir. Bu simülasyonlarda yay ve damper katsayıları değiştirilerek sonuçlar karşılaştırılmıştır.

3.1.Adams/Car

Taşıt tasarımı ve analizi için özelleştirilmiş bir modüldür. Araçların tasarım ve geliştirilme süreçlerinde, standartlaşmış adımların otomatikleştirilmesi amacıyla geliştirilmiştir. (Anonim 1,2016)
Araç, birbirini tanıyarak birleşebilen alt sistemler (süspansiyon, direksiyon, tekerlek vs.) halinde oluşturulur. Bu alt sistemler bağımsız olarak incelenebileceği gibi, bütün araç modeli oluşturularak da incelenebilir. Alt sistemlere ait parçalar parametrik olarak oluşturulduğu için, çok kısa sürede farklı topolojileri analiz etme imkanı sunar.
Otomotiv alanında yaygın olarak kullanılan Adams/Car programlarının temel kabiliyetleri aşağıda belirtilmiştir.

- Kapsamlı şablon ve alt sistem kütüphanesi
- Kapsamlı analiz/sanal test kütüphanesi
- Esnek cisim analizi
- Ağır vasıtalara ait şablon ve alt sistem kütüphanesi
- Aktarma organlarının ayrıntılı olarak modelleme
- Tekerlek ve yol kütüphanesi
- İstenen fiziksel özellikte yol modelleme
- HIL simülasyonu (ESP, ABS vs. kontrol modelleri ile entegrasyon) (Anonim 2,2016)

3.2. Binek Araç Modeli

Bu çalışmada kullanılan binek araç 2560 mm dingil mesafesine, 1520 mm ön aks aralığı, 1594 mm arka aks aralığı ve 1200 kg araç ağırlığına sahiptir. Ayrıca kullanılan binek araç modelinin Adams/Car modelinin yay katsayıları ve damper sönümleme katsayıları sırasıyla şekil 3'de gösterilmiştir. Bu araç üzerinde ISO Lane

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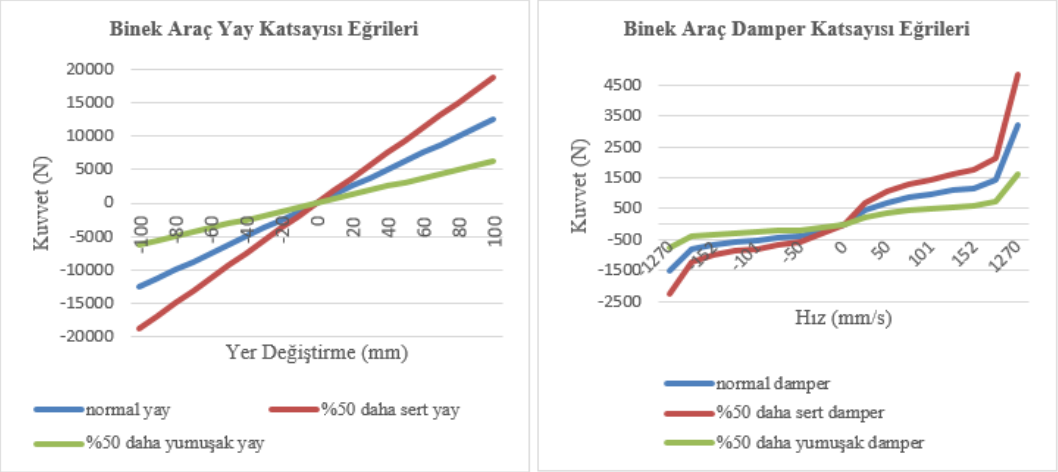
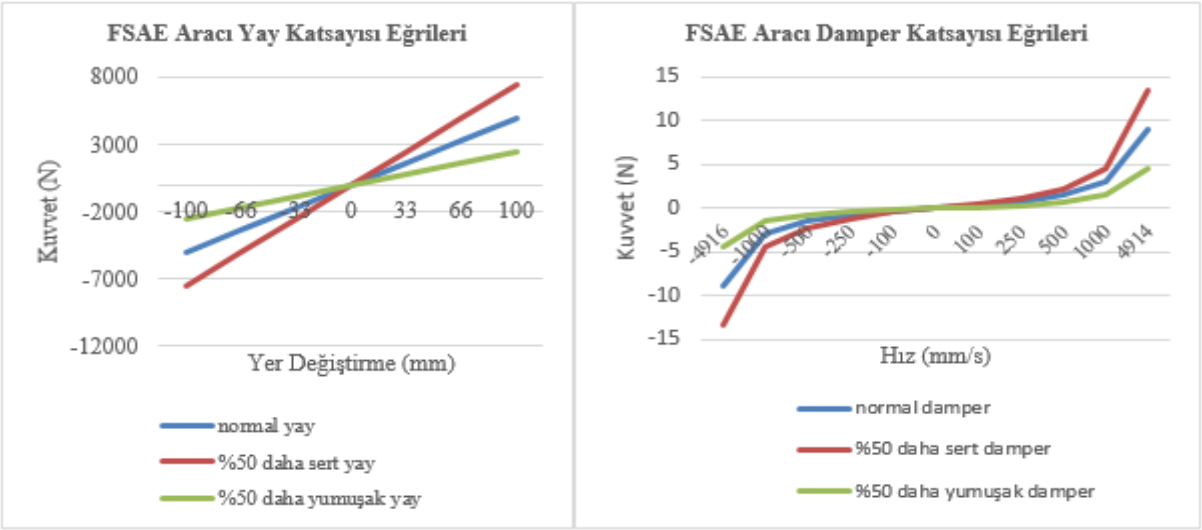
Change ve ivmelenme simülasyonları yay katsayısı ve damper sönümleme katsayıları değiştirilerek binek araç simülasyonları yapılmıştır. (Adams/Car)



Şekil 3. Binek araç yay katsayıları ve damper sönümleme katsayıları

3.3. Formula SAE Aracı Modeli

Bu çalışmada kullanılan Formula SAE aracı 1542 mm dingil mesafesine, 1400 mm ön aks aralığı, 1400 mm arka aks aralığı ve 200 kg araç ağırlığına sahiptir. Ayrıca kullanılan Formula SAE araç modelinin Adams/Car modelinin yay katsayıları ve damper sönümleme katsayıları şekil 4'de gösterilmiştir. Bu araç üzerinde ISO Lane Change ve ivmelenme simülasyonları yay katsayısı ve damper sönümleme katsayıları değiştirilerek binek araç simülasyonları yapılmıştır.



Şekil 4. Formula SAE aracı yay katsayıları ve damper sönümleme katsayıları

3.4. ISO Lane Change analizi

ISO Lane change analizi, trafikte araç sollamayı temsil eden simülasyondur. Bu simülasyonda düz bir yolda gidilirken ani bir manevra ile şerit değiştirilir ve sonrasında tekrar ani bir manevra ile aynı şeride geri dönülür. ISO Lane Change yol prosedürü ISO tarafından standart hale getirilmiştir ve bu standart yol Şekil 5'de gösterilmiştir. ISO Lane Change analizi 70 km/h'lik ilk hızla hem binek araç hem de Formula SAE aracı için yapılmıştır. ISO Lane Change analizinde her iki aracında ön ve arka süspansiyon sistemine ait yay ve damper katsayıları değiştirilerek bu katsayılardaki değişimin yalpalama (roll angle) açısındaki değişime etkisi incelenmiştir.

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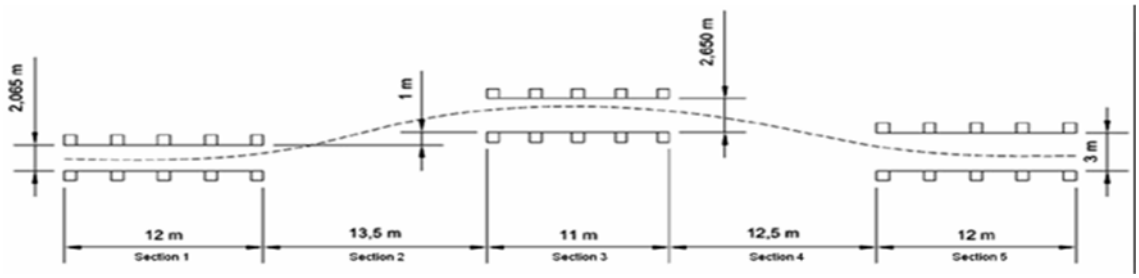

Şekil 5. ISO Lane Change parkuru (Anonim 3, 2016)

3.5. İvmelenme Analizi

İvmelenme analizi aracın düz bir yolda sabit bir hızda giderken bir anda ivmelenmesini temsil eder. İvmelenme analizi için bir standart yoktur, duruma göre veriler girilerek karşılaştırma yapılabilir. İvmelenme analizi binek araç ve Formula SAE aracı içinde aynı şartlarda yapılmıştır. Yapılan çalışmalarda araçlarda 10 km/h'lik giden araç, yedi saniye boyunca 0,5 G lik bir sabit ivme ile hızlandırılmaktadır. Her iki araç içinde yapılan bu analizde, kafa vurma açılarındaki (pitch angle) değişimler araçların ön ve arka süspansiyon sistemlerine ait yay ve damper katsayılarının %50'lik değişimleriyle incelenmiştir.

3.6. Frenleme Analizi

Frenleme analizi aracın düz bir yolda sabit hızla giderken sabit bir yavaşlama ivmesiyle yavaşlamasını temsil eder. Bu analiz için belli bir standart olmayıp değişik koşullarda yapılabilir. Bu çalışmada binek araç ve Formula SAE aracı içinde aynı şartlarda frenleme analizi yapılmıştır. Frenleme analizi başlangıçta 70 km/h'lik ilk hızla giden bir aracın 7 saniye boyunca 1G'lik yavaşlama ivmesiyle frenleme yapılmasıyla gerçekleştirilmiştir. Frenleme analizi sonucunda yay ve damper katsayıları değiştirilen binek ve Formula SAE araçlarının kafa vurma açılarındaki (pitch angle) değişimleri incelenmiştir.

4.Bulgular

4.1. ISO Lane Change

ISO Lane Change analizinde Formula SAE ve binek araç için analiz sonuçları bu kısımda incelenecektir. ISO Lane Change analizi binek araç ve FSAE aracı içinde 5 farklı durum için yapılmıştır. Bu durumlar, normal durum, %50 daha sert yaylı araç, %50 daha yumuşak yaylı araç, %50 daha sert damperli sönümleme katsayılı süspansiyon ve % 50 daha yumuşak damper sönümleme katsayılı süspansiyon sistemi olarak yapılmıştır.

Şekil 6'da binek araç için yapılan ISO Lane Change analizi sonuçları görülmektedir. Eğriler incelendiğinde en fazla yalpalama açısının yay katsayının %50 azaltıldığı durumda en az açının ise yay katsayısının %50 arttırıldığı durumda ortaya çıktığı görülmektedir. Diğer durumlar olan normal araç, %50 daha sert damper sönümleme katsayılı eğri ve %50 daha yumuşak damper sönümleme katsayılı eğri ara değerler sahip olduğu görülmektedir. Bu sonuçlara göre yalpalama açısını yay katsayısındaki değişimin daha fazla etkilediği görülmektedir.

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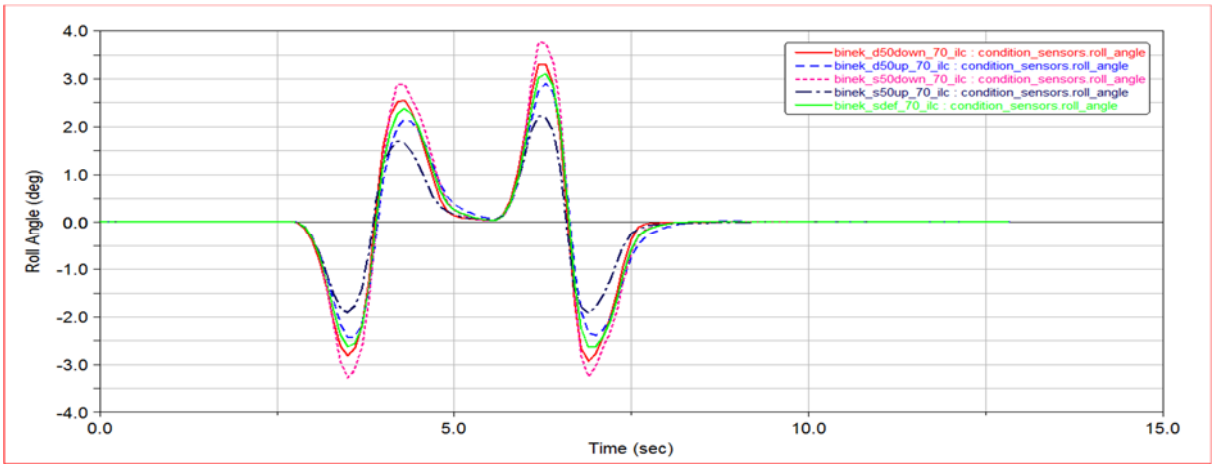
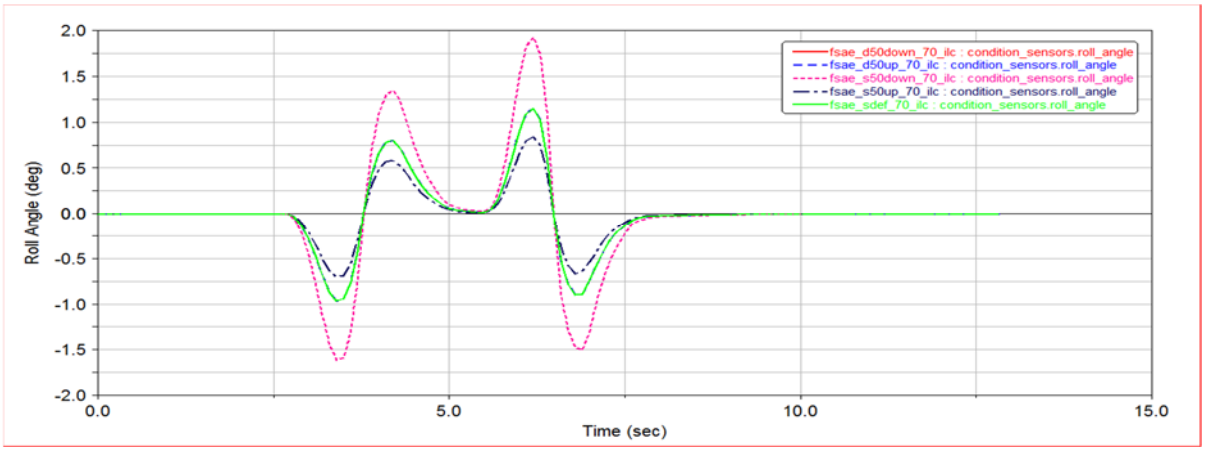


Şekil 6. Binek Araç ISO Lane Change Analizi Yalpama Açısı Eğrileri

Formula SAE için yapılan ISO Lane Change analizinin sonuçları şekil 7'de gösterilmiştir. Bu sonuçlara göre en fazla yalpalama açısının yay katsayının %50 azaltıldığı durumda en az açının ise yay katsayısının %50 arttırıldığı durumda ortaya çıktığı görülmektedir. Normal durum ve damper sönümleme katsayısındaki eğriler ise aynı değerlerdedir. Bu durum Formula SAE araçlarındaki damperin etkisinin binek araçlara göre daha az olduğunu göstermektedir. Diğer bir sonuç ise yalpalama açısında, yay katsayısı damper sönümleme katsayısına göre daha önemlidir.

Diğer bir önemli hususta yay katsayısını azaltmak arttırmaya oranla yalpalama açısına daha fazla etki etmektedir. Bu ise Formula SAE araçlarında sert yay kullanıldığı ve sertliği arttırmanın etkisinin az olduğu fakat sert yaydan yumuşağa geçince ise daha fazla etki ettiğinin göstermektedir.



Şekil 7. Formula SAE Aracı ISO Lane Change Analizi Yalpama Açısı Eğrileri

ISO Lane Change analizi sonuçları incelendiğinde binek araçta en fazla yalpalama açısının 3,77° iken Formula SAE aracında 1,93° olduğu görülmektedir. Bu durum Formula SAE gibi yüksek performans ve yüksek manevra kabiliyeti beklenen araçlarda daha sert yay kullanıldığı ve daha düşük yalpalama açısı oluştuğunu göstermektedir.

4.2. İvmelenme

İvmelenme analizi binek araç ve Formula SAE aracı için daha önceki açıklamalarda belirtilen şartlarda yapılmıştır. Bu analizde araçların kafa vurma açıları (pitch angle) incelenerek yorumlanacaktır.

Binek araç için yapılan ivmelenme analizi sonuçları şekil 8'de gösterilmektedir. Eğrilerde oluşan tepeler aracın vites değişimden kaynaklanan kafa vurma açısındaki değişimlerdir. Elde edilen sonuçlara göre en fazla kafa vurma açısı damper sönümleme katsayısının %50 azaltılması durumunda ortaya çıkmaktadır. İncelenen diğer durumlarda ise sonuçlar normal araç şartlarına yakın olarak ortaya çıkmaktadır.

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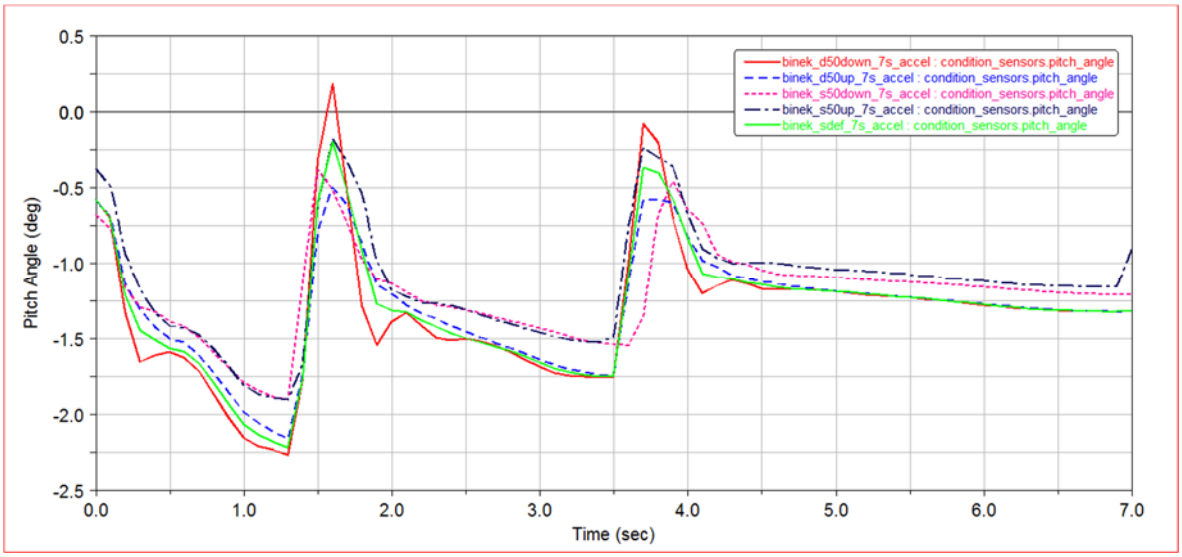
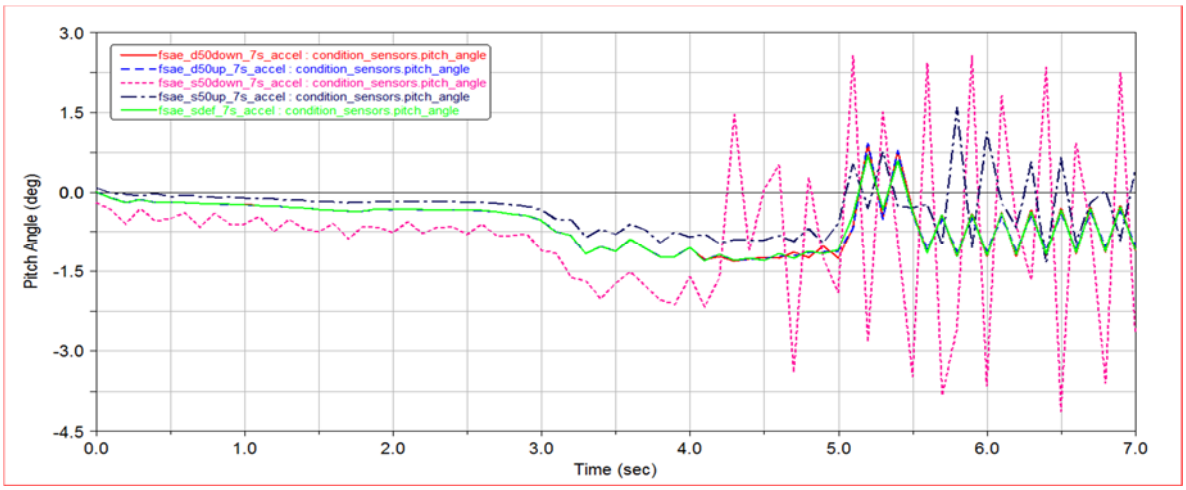


Şekil 8. Binek Araç İvmelenme Analizi Kafa Vurma Açısı Eğrileri

Formula SAE aracı için yapılan ivmelenme analizi sonuçları şekil 9'da gösterilmiştir. Sonuçlar incelendiğinde kafa vurma açısında damper sönümleme katsayılarındaki değişimlere göre yay katsayılarındaki değişimin daha fazla etkili olduğu tespit edilmiştir. Yay katsayısındaki sertleşme kafa vurma açısını düşürürken, yay sertliğini azaltmak ise kafa vurma açısını arttırmaktadır.



Şekil 9. Formula SAE Aracı İvmelenme Analizi Kafa Vurma Açısı Eğrileri

İvmelenme analizi sonuçları incelendiğinde binek araç için damper değişimindeki etki kısmen fazla olsa da yay ve damper etkileri benzer sonuçlar doğurmaktadır. Fakat Formula SAE Aracı incelendiğinde ise yaydaki değişimin etkileri dampere göre çok daha fazla olmaktadır.

4.3. Frenleme

Bu çalışmanın son analizinde binek araç ve Formula SAE Aracına frenleme analizi yapılmıştır. Frenleme analizinde de ivmelenmede olduğu gibi kafa vurma açısı (pitch angle) incelenmiştir.

Binek aracın frenleme simülasyonu sonuçları şekil 10'da eğriler halinde verilmiştir. Bu eğriler incelendiğinde en fazla kafa vurma açısı değişimi yay katsayısı değiştiğinde ortaya çıkmıştır. En yüksek kafa vurma açısı yay katsayısı arttırıldığında ortaya çıkarken en düşük değerler ise yay katsayısı düşürüldüğünde ortaya çıkmaktadır. Damper sönümleme katsayısındaki değişim ise normal araç ile benzer sonuçları göstermektedir.

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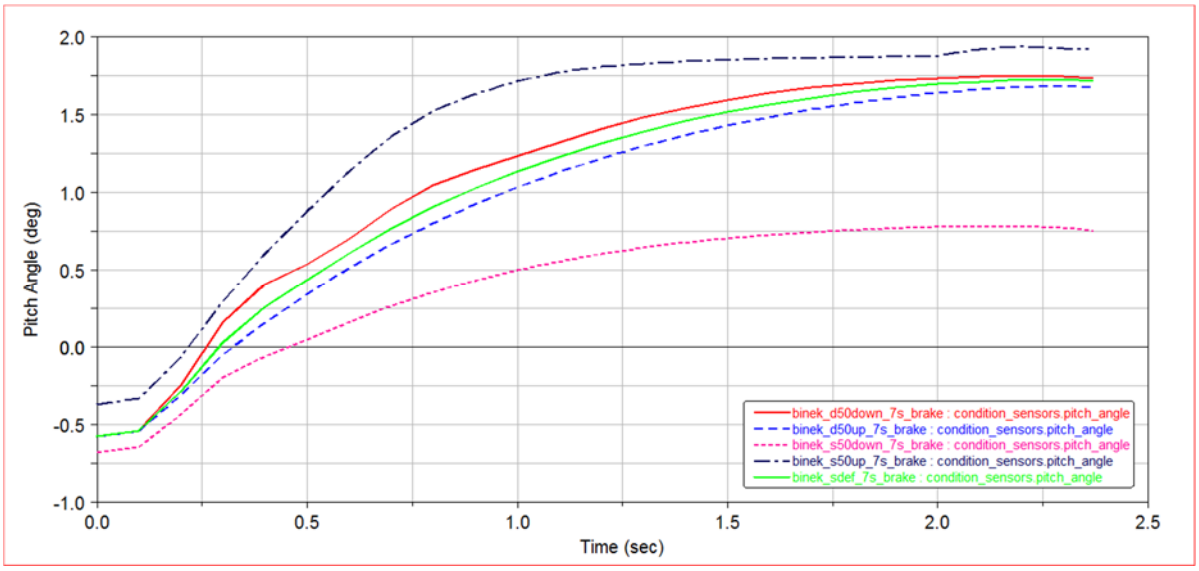
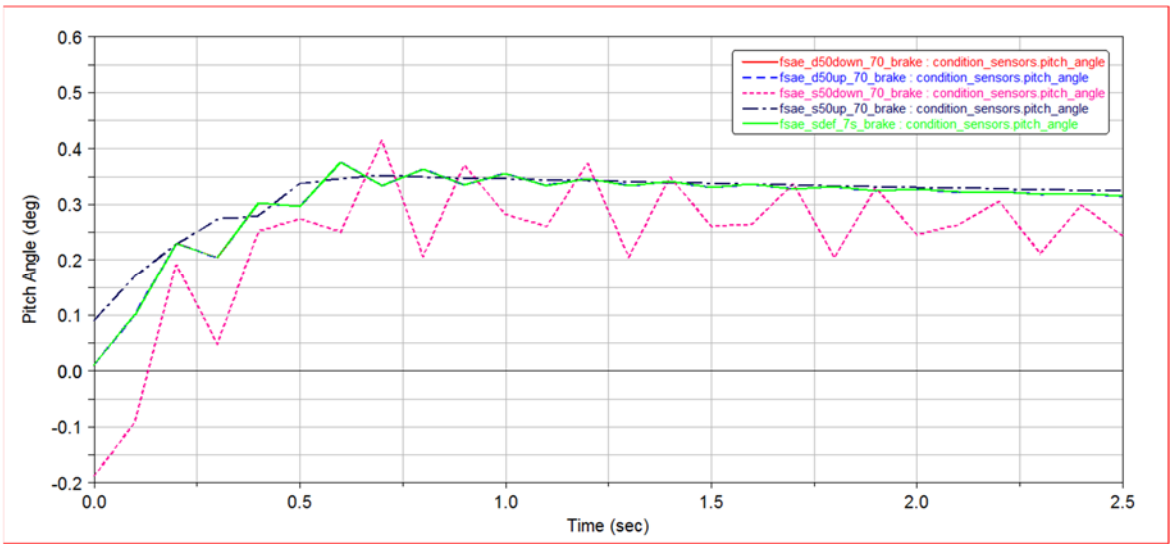


Şekil 10. Binek Araç Frenleme Analizi Kafa Vurma Açısı Eğrileri

Formula SAE aracının frenleme simülasyonu sonuçları şekil 11'de gösterilmiştir. Bu eğriler incelendiğinde yay katsayısının %50 düşürülmesinde en düşük seviyelere indiği görülürken diğer eğriler benzer karakteristiğe sahiptir. Yay katsayısının %50 arttırıldığı simülasyon sonucunda kafa vurma açısında düşük seviyelerde bir artış olmaktadır. Bu sonuçlara göre yay katsayısını düşürmenin frenlemede salınıma neden olduğu görülmektedir.



Şekil 11. Formula SAE Aracı Frenleme Analizi Kafa Vurma Açısı Eğrileri

Frenleme analizi sonuçlarına göre her iki araç tipi içinde kafa vurma açısında, yay katsayısındaki değişim damper katsayısındaki değişime göre daha fazla değişime neden olmaktadır. Yay katsayısını düşürmek daha az kafa vurma açısına neden olurken yay katsayısını arttırmak ise kafa vurma açısını arttırmaktadır.

5. Sonuçlar

Bu çalışmada binek ve Formula SAE Aracı için süspansiyon sistemlerinin yay ve damper katsayıları %50 oranında değiştirilerek; ISO Lane Change, ivmelenme ve frenleme simülasyonları Adams/Car programında yapılmıştır.

ISO Lane Change analizi sonuçları incelendiğinde her iki araç tipi içinde yay katsayısını değiştirmek damper katsayısını değiştirmeye göre yalpalama açısını değişimi açısından daha etkilidir. ISO Lane Change analizi için

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diğer bir çıkarım ise yay katsayısını arttırmak yalpalama açısını azaltırken yay katsayısını azaltmak ise yalpalama açısını arttırmaktadır. İki araç tipi kıyaslandığında Formula SAE aracı binek araca göre daha düşük yalpalama açısına sahiptir, bu durum sebebi ise Formula SAE aracından manevraları binek araca göre daha yüksek hızla dönmesinin hedeflenmesidir.

İvmelenme analizinde ise binek araç için yay ve damper katsayılarındaki değişim kafa vurma açısına benzer oranlarda etki ederken, Formula SAE aracında ise yayın kafa vurma açısına etkisi ise damperin etkisine göre daha fazladır. Yay katsayısını arttırmak ivmelenme analizinde daha düşük kafa vurma açısı oluştururken, yay katsayını azaltmak kafa vurma açısını arttırmaktadır.

Frenleme analizinde ise her iki araç içinde yayın kafa vurma açısına etkisi damperin etkisine göre fazladır. Bu etki binek araçta daha düzgün şekilde gözükürken Formula SAE aracında ise yay katsayısının düşürülmesi kafa vurma açısında dalgalanmaya ve daha büyük farklara neden olmaktadır. Dalgalanmanın sebebi ise Formula SAE aracının sert yaylara uygun olması ve yumuşak yaylarda stabilitesini yitirmesidir.

Genel olarak bütün sonuçlar incelendiğinde ISO Lane Change, ivmelenme ve frenleme analizlerinde yay katsayısını değiştirmek yalpalama ve kafa vurma açılarına damper sönümleme katsayısını değiştirmeye göre daha fazla etki etmektedir.

Bu çalışmada yay ve damper katsayıları değiştirilerek yol tutuşu üzerine etkileri incelenmiştir. Yay ve damper katsayılarının değiştirilerek araç konfor etkileri üzerindeki etkileri ve her iki amaca da uygun olan yay ve damper katsayıları değerlerinin bulunması için optimizasyon çalışmalarının yapılması gerekmektedir.

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SYNCHRONIZATION AND ANTI-SYNCHRONIZATION OF SPROTT J CHAOTIC FLOWS USING ONE STATE SLIDING MODE CONTROLLER

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Abstract: The goal of this study is to apply the synchronization and anti-synchronization of identical Sprott J chaotic flows by using a single sliding mode control signal. Time series, two-dimensional phase plots and three-dimensional phase plane of the Sprott J chaotic flow are presented graphically from its differential equations. A Lyapunov function is assigned for achieving that the sliding mode control signal guarantees the global asymptotic stability of synchronization and anti-synchronization error systems. Numerical simulations are demonstrated to verify the correctness of the theoretical results. Furthermore, they show that two identical Sprott J chaotic flows by starting from different initial conditions are effectively synchronized and anti-synchronized owing to a single state sliding mode controller.

Keywords: Sprott J Chaotic Flow, Sliding Mode Control, Single State Controller, Chaos Synchronization, Chaos Anti-Synchronization

Introduction

Chaotic systems are generally characterized by being very sensitive to their initial conditions and having a dense collection of points with almost periodic orbits. They are unstable and aperiodic which make them naturally harder to identify and to predict (Riaz & Ali, 2008). Since Lorenz (1963) firstly observed the chaotic trajectories from atmospheric dynamics, chaotic attractors have been discovered in chemical, financial, biological, and electrical systems. Chaotic systems are also used in many engineering fields such as secure communications, random number generators, and encryption systems.

Due to the sensitive dependence on the initial conditions, even two identical systems starting from slightly different initial conditions would evolve in time in a completely different manner. For making the states of a chaotic system track the desired chaotic trajectory, synchronization is applied. Synchronization has a significant role in chaotic secure communication. For a long time, it was believed that uncoupled chaotic trajectories cannot be synchronized. Pecora and Carroll (1990) showed that the synchronization of chaotic systems can be achieved. Then, chaos synchronization become one of the major issues in the control science. Anti-synchronization is an important type of synchronization that the states of synchronized system has the same absolute values but opposite signs of the master system. Several impressive methods for synchronizing and anti-synchronizing chaotic systems are proposed such as adaptive control (Al-sawalha, 2013), active control (Njah & Vincent, 2009), passive control (Zhou *et al.*, 2012), sliding mode control (Liu & Song, 2008; Jianwen *et al.*, 2010; Chen *et al.*, 2012; Hou *et al.*, 2012; Vaidyanathan, 2012a; Wang *et al.*, 2013), time-delay, linear, nonlinear feedback control (Liao & Chen, 2003; Li & Liao, 2006; Ikhlef & Mansouri, 2012), and backstepping design (Vaidyanathan, 2013; Loembe–Souamy *et al.*, 2015). Among them, the sliding mode control is one of the most preferred chaos synchronization and anti-synchronization techniques because of its efficiency. Sliding mode control design involves two steps: selection of a stable surface on which sliding motion should be restricted and selection of a control law which makes the switching surface attractive to the state/error space.

Sprott (1994) searched for simple chaotic systems by using a systematic examination of three-dimensional autonomous differential equations with quadratic nonlinearities and uncovered 19 distinct chaotic flows having either five terms and two nonlinearities or six terms and one nonlinearity. Including chaotic phenomena with simple structure makes the Sprott chaotic flows important for engineering applications. Synchronization of some Sprott chaotic flows has been investigated with active control (Xu, 2010; Vaidyanathan, 2012b), adaptive control (Vaidyanathan, 2011a; Vaidyanathan, 2011b; Vaidyanathan, 2011c; Vaidyanathan, 2012c), and linear coupling (Liu & Fei, 2006) methods. A state observer controller is assigned for the anti-synchronization (Liu *et al.*, 2009).

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In this study, the sliding mode control theory is applied to derive a single state control function to solve the chaos synchronization and anti-synchronization problem for identical uncertain Sprott J chaotic flows. According to the literature review, this is the first work that uses sliding mode control method for the synchronization and anti-synchronization of a Sprott chaotic flow.

The Sprott J Chaotic Flow

The differential equations of Sprott J system are described by

$$\begin{aligned} \dot{x} &= az, \\ \dot{y} &= -by + z, \\ \dot{z} &= -x + y + y^2, \end{aligned} \tag{1}$$

where x, y, z are the state variables and a, b are the parameters of the system (Sprott, 1994). The Sprott J system (1) has chaotic trajectories when $a = 2$ and $b = 2$ (Sprott, 1994). Its Lyapunov exponents are 0.076, 0, –2.076, and Kaplan-Yorke dimension is 2.037 (Sprott, 1994). This chaotic system has only one equilibrium point: $E(0, 0, 0)$. With the initial conditions $x_0 = 10$, $y_0 = 2.5$, $z_0 = 5.6$, the time series, two-dimensional phase portraits and three-dimensional phase plane of system (1) are shown in Fig. 1, Fig. 2 and Fig. 3, respectively.

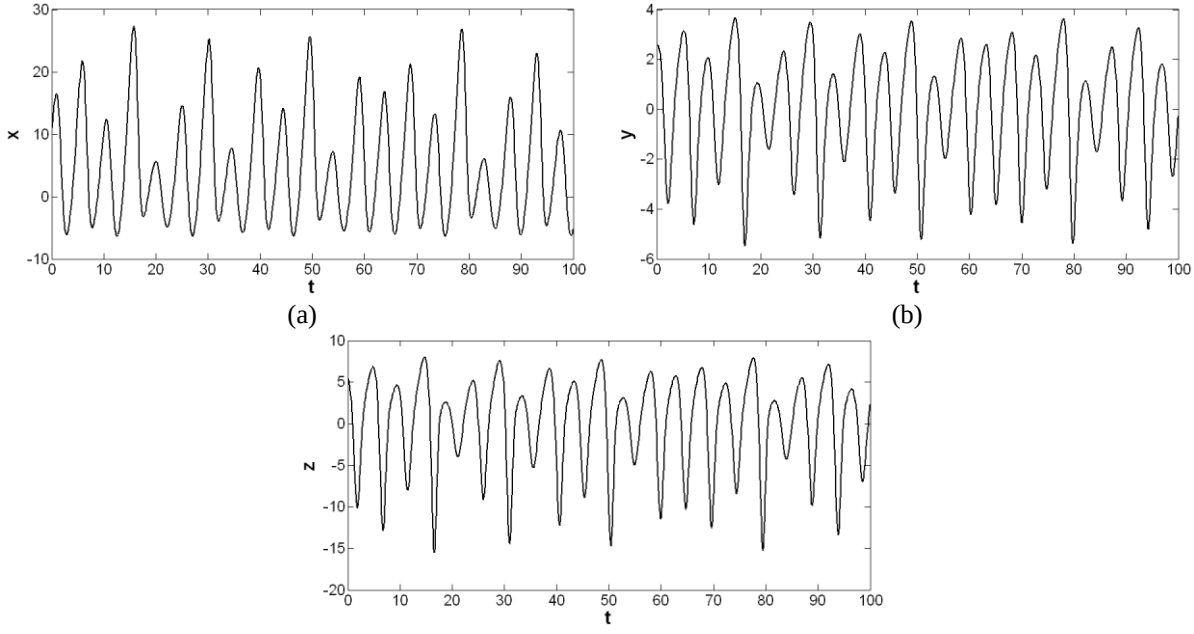
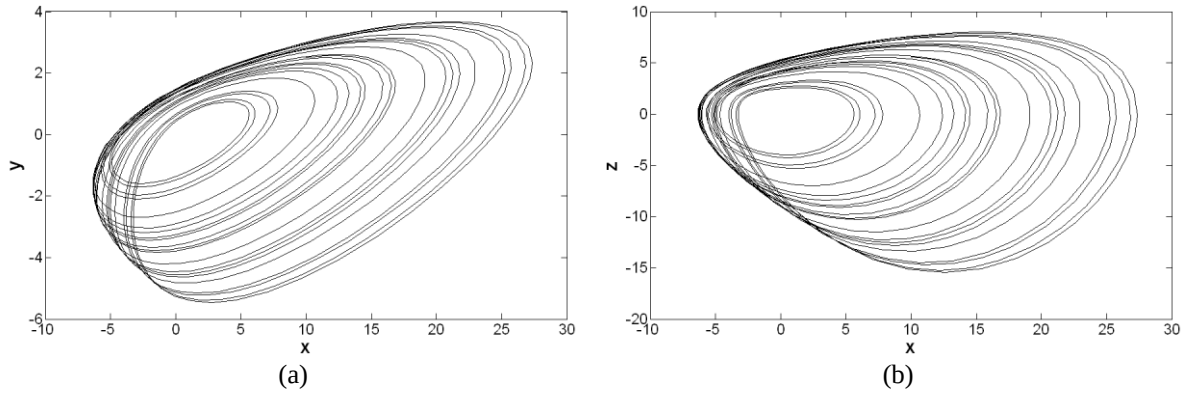


Figure 1. Time series of the Sprott J chaotic flow for signals (a) x, (b) y, (c) z.



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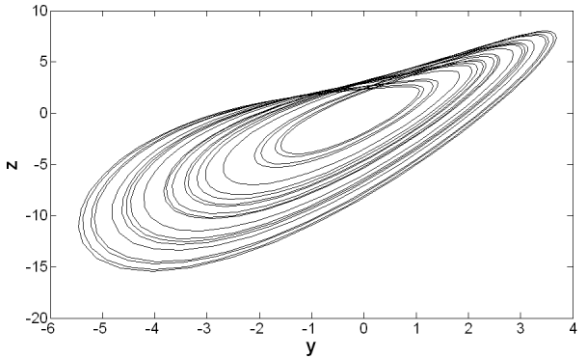

(c)

Figure 2. Two-dimensional phase portraits of the Sprott J chaotic flow in phase plot (a) *x*–*y*, (b) *x*–*z*, (c) *y*–*z*.

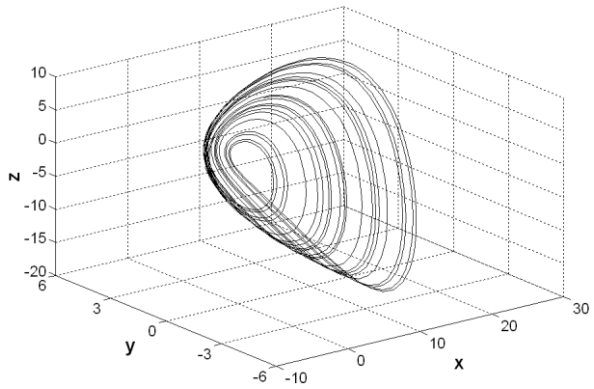

Figure 3. Three-dimensional phase plane of the Sprott J chaotic flow.

The Synchronization of Sprott J Chaotic Flows with Sliding Mode Control

In order to apply the synchronization, two identical Sprott J chaotic flows that have different initial conditions are considered where the master Sprott J flow is denoted by the subscript 1, and the slave Sprott J flow is denoted by the subscript 2. The master Sprott J chaotic flow is described by

$$\begin{aligned} \dot{x}_1 &= az_1, \\ \dot{y}_1 &= -by_1 + z_1, \\ \dot{z}_1 &= -x_1 + y_1 + {y_1}^2, \end{aligned} \tag{2}$$

and the slave Sprott J chaotic flow is described by

$$\begin{aligned} \dot{x}_2 &= az_2, \\ \dot{y}_2 &= -by_2 + z_2, \\ \dot{z}_2 &= -x_2 + y_2 + {y_2}^2 + u, \end{aligned} \tag{3}$$

where u in system (3) is the one state sliding mode control function to be constructed. The synchronization error is defined by $e_1 = x_2 - x_1$, $e_2 = y_2 - y_1$ and $e_3 = z_2 - z_1$. Then, the error dynamics are obtained as

$$\begin{aligned} \dot{e}_1 &= ae_3, \\ \dot{e}_2 &= -be_2 + e_3, \\ \dot{e}_3 &= -e_1 + e_2 + {y_2}^2 - {y_1}^2 + u. \end{aligned} \tag{4}$$

Now, the purpose of synchronization is to ensure the error system (4) asymptotically stable at the origin.

It can be seen from system (4) that when e_3 becomes zero, then $\dot{e}_2 = -be_2$. Therefore, when time goes to infinite, e_2 would converge to zero. An appropriate sliding surface can be designed as

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$$s = e_3 + k_1 e_1, \tag{5}$$

where k_1 is a positive constant parameter. The attainability condition for sliding mode is $s\dot{s} < 0$. Providing this condition, the sliding mode control function can be

$$u = e_1 - e_2 - {y_2}^2 + {y_1}^2 - k_1 a e_3 - k_2 s - k_3 \text{sign}(s), \tag{6}$$

where k_2 and k_3 are constant parameters. The 'sign' is a function where

$$\text{sign}(s) = \begin{cases} 1 & \text{for } s > 0, \\ 0 & \text{for } s = 0, \\ -1 & \text{for } s < 0. \end{cases} \tag{7}$$

The designed control function (6) guarantees that system (4) is held on the sliding surface $s = 0$. The sliding surface derivation gives

$$\dot{s} = -k_2 s - k_3 \text{sign}(s). \tag{8}$$

Let the Lyapunov function is chosen as $V = 0.5s^2$, then the derivative of V becomes

$$\begin{aligned} \dot{V} &= s\dot{s} \\ &= -k_2 s^2 - k_3 (s)\text{sign}(s). \end{aligned} \tag{9}$$

Since $s^2 \geq 0$ and $(s)\text{sign}(s) = |s| \geq 0$, $\dot{V} \leq 0$ when $k_2 > 0$ and $k_3 > 0$. These conditions make sure that the constructed sliding surface s would asymptotically stabilize to the zero synchronization error point. Hence, the synchronization of the Sprott J chaotic flows is completed with one state sliding mode controller.

The Anti-Synchronization of Sprott J Chaotic Flows with Sliding Mode Control

In order to apply the anti-synchronization, the master and the slave Sprott J chaotic flows in systems (2) and (3) are again considered. For determining the anti-synchronization errors, instead of subtraction, the master and slave systems are added. So, the anti-synchronization error is defined by $e_1 = x_1 + x_2$, $e_2 = y_1 + y_2$ and $e_3 = z_1 + z_2$. Then, the error dynamics are obtained as

$$\begin{aligned} \dot{e}_1 &= a e_3, \\ \dot{e}_2 &= -b e_2 + e_3, \\ \dot{e}_3 &= -e_1 + e_2 + {y_1}^2 + {y_2}^2 + u. \end{aligned} \tag{10}$$

Now, the purpose of anti-synchronization is to ensure the error system (10) asymptotically stable at the origin.

It can be seen from system (10) that when e_3 becomes zero, then $\dot{e}_2 = -b e_2$. Therefore, when time goes to infinite, e_2 would converge to zero. An appropriate sliding surface can be designed as

$$s = e_3 + k_1 e_1, \tag{11}$$

where k_1 is a positive constant parameter. The attainability condition for sliding mode is $s\dot{s} < 0$. Providing this condition, the sliding mode control function can be

$$u = e_1 - e_2 - {y_1}^2 - {y_2}^2 - k_1 a e_3 - k_2 s - k_3 \text{sign}(s), \tag{12}$$

where k_2 and k_3 are constant parameters.

The designed control function (12) guarantees that system (10) is held on the sliding surface $s = 0$. The sliding surface derivation gives

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$$\dot{s} = -k_2 s - k_3 \text{sign}(s). \tag{13}$$

Let the Lyapunov function is chosen as $V = 0.5s^2$, then the derivative of V becomes

$$\begin{aligned} \dot{V} &= s\dot{s} \\ &= -k_2 s^2 - k_3 (s)\text{sign}(s). \end{aligned} \tag{14}$$

Since $s^2 \geq 0$ and $(s)\text{sign}(s) = |s| \geq 0$, $\dot{V} \leq 0$ when $k_2 > 0$ and $k_3 > 0$. These conditions make sure that the constructed sliding surface s would asymptotically stabilize to the zero anti-synchronization error point. Hence, the anti-synchronization of the Sprott J chaotic flows is completed with one state sliding mode controller.

Numerical Simulations

In this section, numerical simulations are performed to show the synchronization and anti-synchronization of Sprott J chaotic flows by means of one state sliding mode controller. The fourth-order Dormand–Prince method with variable-time step is used in the numerical simulations. The parameter values of the Sprott J chaotic flow are considered as $a = 2$ and $b = 2$ to ensure the chaotic trajectories. The initial values of master system are taken as $x_0 = 10$, $y_0 = 2.5$ and $z_0 = 5.6$. For the slave system, they are taken as $x_0 = 12.5$, $y_0 = 3$ and $z_0 = 6.8$. The gains of sliding mode controller are chosen as $k_1 = 1$, $k_2 = 1$ and $k_3 = 0.1$. When the sliding mode controller is activated at $t = 20$ and $t = 30$, the simulation results of synchronization are demonstrated in Fig. 4 and Fig. 5, respectively. The synchronization errors are shown in Fig. 6.

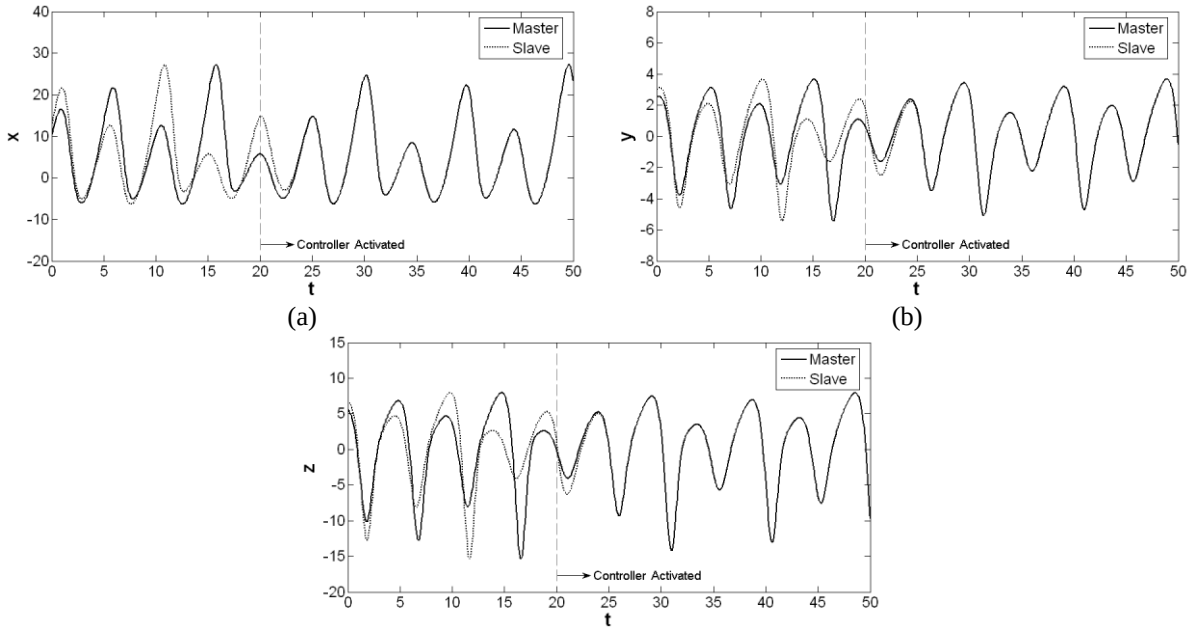
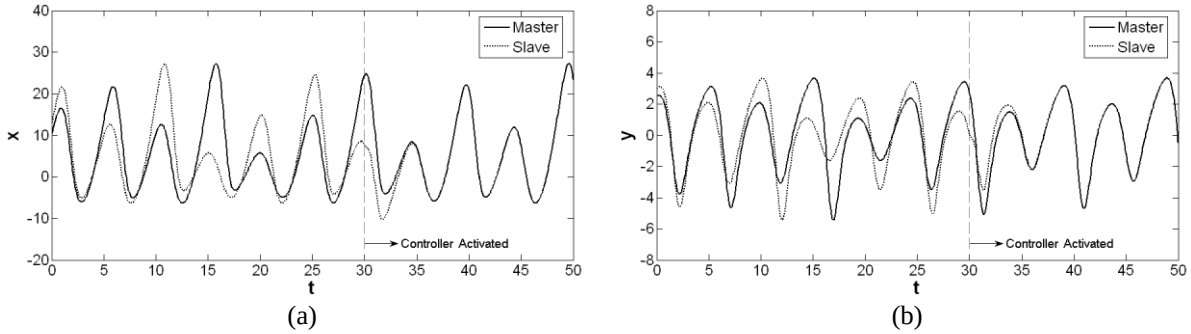


Figure 4. Synchronization time series of the Sprott J chaotic flows when the sliding mode controller is activated at $t = 20$ for signals (a) x, (b) y, (c) z.



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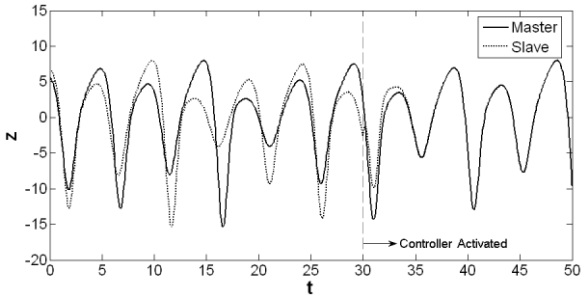
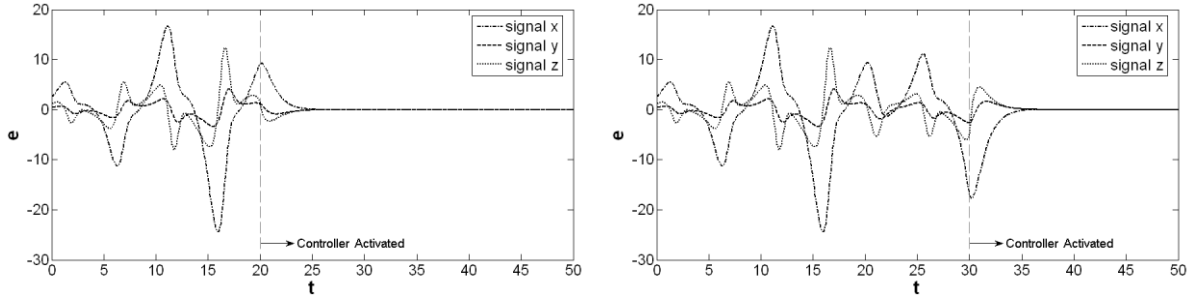


(c)

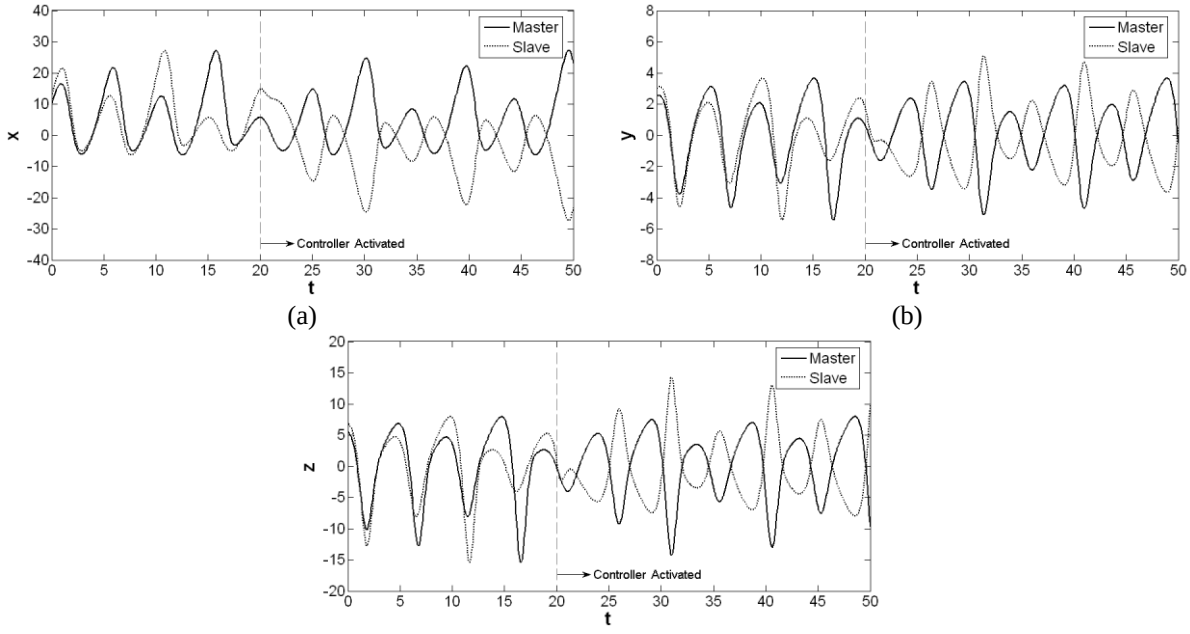
Figure 5. Synchronization time series of the Sprott J chaotic flows when the sliding mode controller is activated at t = 30 for signals (a) x, (b) y, (c) z.



(a) (b)

Figure 6. Synchronization errors of the Sprott J chaotic flows when the sliding mode controller is activated at (a) t = 20, (b) t = 30.

When the sliding mode controller is activated at t = 20 and t = 30, the simulation results of anti-synchronization are demonstrated in Fig. 7 and Fig. 8, respectively. The anti-synchronization errors are shown in Fig. 9.



(a) (b)

(c)

Figure 7. Anti-synchronization time series of the Sprott J chaotic flows when the sliding mode controller is activated at t = 20 for signals (a) x, (b) y, (c) z.

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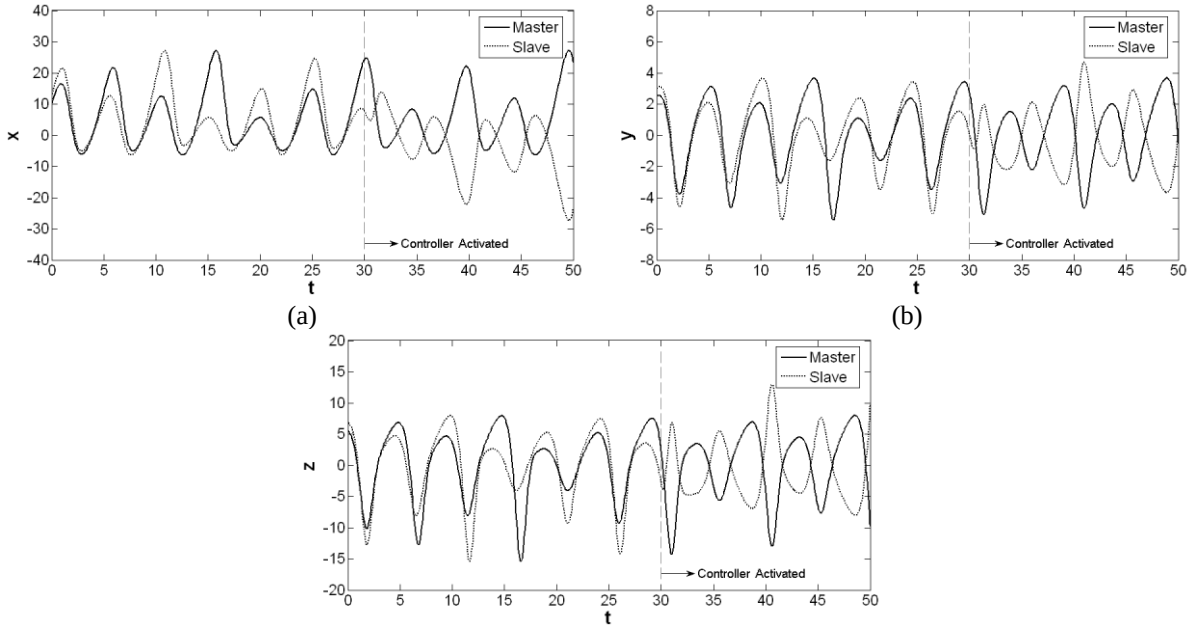

Figure 8. Anti-synchronization time series of the Sprott J chaotic flows when the sliding mode controller is activated at t = 30 for signals (a) x, (b) y, (c) z.

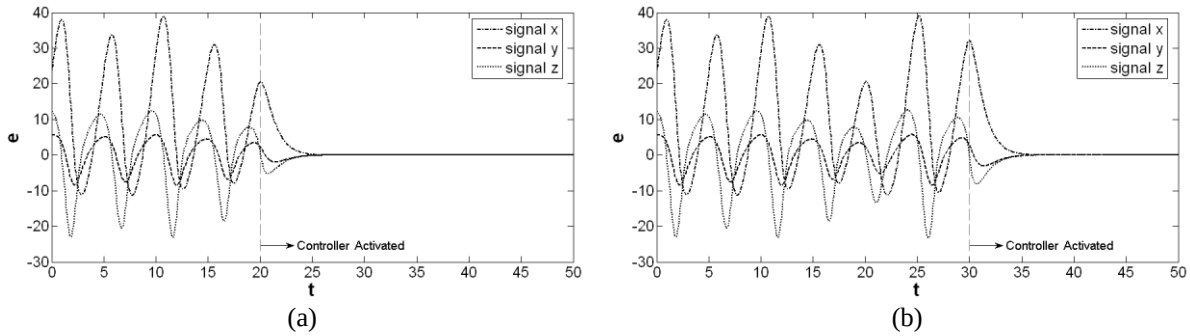

Figure 9. Anti-synchronization errors of the Sprott J chaotic flows when the sliding mode controller is activated at (a) t = 20, (b) t = 30.

As expected, the synchronization and anti-synchronization errors that are shown in Fig. 6 and Fig. 9 converge asymptotically to zero. Thus, the theoretical analyses are confirmed. As seen in Fig. 4 and Fig. 5, when the single state sliding mode controller is activated at t = 20 and t = 30, the synchronization between the master and the slave Sprott J chaotic flows is provided at $t \geq 26$ and $t \geq 36$, respectively. Besides, the anti-synchronization is also observed in 6 time periods in Fig. 7 and Fig. 8. Therefore, the simulation results also validate the effectiveness of proposed one state sliding mode controller.

Conclusion

In this study, the synchronization and anti-synchronization of two identical Sprott J chaotic flows is applied with the sliding mode control method. The stability of the Sprott J chaotic flow at zero synchronization and anti-synchronization errors is guaranteed by applying the appropriate single state sliding mode control functions based on Lyapunov stability theory. Numerical simulations are demonstrated to confirm the theoretical analyses of synchronization and anti-synchronization. The related in Figs. 4–9 have shown that a sliding mode controller provides the synchronization and anti-synchronization of Sprott J chaotic flows in 6 time periods after the controller is activated. Therefore, the proposed sliding mode control method works effectively when synchronizing and anti-synchronizing the Sprott J chaotic flows.

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SYNTHESIS AND CHARACTERIZATION OF DOPAMINE SUBSTITUE TRIPODAL TRINUCLEAR S-TRIAZINE COMPLEXES

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In this work, we aimed to synthesize and characterize a novel tridirectional ligand including three catechol groups and its novel tridirectional-trinuclear triazine core complexes. For this purpose, we used melamine (2,4,6-triamino-1,3,5-triazine) (MA) as starting material. 2,4,6-tris(4-carboxybenzimino)-1,3,5-triazine (II) was synthesized by the reaction of an equivalent melamine (I) and three equivalent 4-carboxybenzaldehyde. 4,4',4''-((1E,1'E,1''E)-((1,3,5-triazine-2,4,6-triyl)tris (azanylylidene))tris (methanylylidene))tris(N-(3,4-dihydroxyphenethyl)benzamide) L (IV) was synthesized by the reaction of one equivalent (II) and three equivalent dopamine (3,4-dihydroxyphenethylamine) (DA) by using two different methods. II, IV and nine novel trinuclear Cr(III), Mn(III) and Fe(III) complexes of (IV) were characterized by means of elemental analyses, 1H NMR, FT-IR spectrometry, LC-MS (ESI+) and thermal analyses. The metal ratios of the prepared complexes were performed using Atomic Absorption Spectrophotometry (AAS). We also synthesized novel tridirectional-trinuclear systems and investigated their effects on magnetic behaviors of [salen, salophen, salpropen Cr(III)/Mn(III)/Fe(III)] capped complexes. The complexes were determined to be low-spin distorted octahedral Mn(III) and Fe(III), and distorted octahedral Cr(III) all bridged by catechol group.

Keywords: Melamine, Salen, Salophen, s-Triazine

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SYNTHESIS AND CHARACTERIZATION OF SNO2 THIN FILMS DEPOSITED BY SPRAY PYROLYSIS TECHNIQUE

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Abstract

SnO_2 thin films have been synthesized on glass substrates by spray pyrolysis technique at substrate temperatures of 300 °C, 350 °C, 400 °C, 450 °C and 500 °C. The evolution of their structural, morphological and optical properties with substrate temperature was investigated. Thicknesses of the Co_3O_4 films were measured in the range of 250 – 498 nm using ellipsometer measurements. The crystallinity and microstructure of SnO_2 thin films have been investigated by x-ray diffraction (XRD). The XRD patterns have revealed that there are shifts of the d values (interplanar spacing) for the samples with respect to standard values. The macro strain and dislocation density vary with substrate temperatures. From field emission scanning electron microscopy results, all samples are compact, dense and adhered well to the substrates.The optical properties of the samples have been studied using the transmittance and reflectance measurements as a function of wavelength between 200 and 3000 nm. The optical band gap is direct and decreases from 3.95 to 3.71 eV as the substrate temperature increases from 300 °C to 500 °C.The refractive index and extinction coefficient as a function of wavelength for the films were investigated from reflectance data by applying the envelope method in the strongly absorbing regime. The optical behaviour of the material, such as dielectric constants (n, k, ε_1 and ε_∞), plasma frequency, ω_p, and carrier concentration, N_{opt}, was also evaluated.

Keywords: Tin oxide; Spray pyrolysis; Envelope method; Dielectric constants

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SYNTHESİS AND CRYSTAL STRUCTURE OF HG(II) COORDİNATİON POLYMER WİTH THE RİGİD 4,4'-ABPY

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Abstract

The new coordination polymer with saccharinate (sac) and 4,4'-azobispyridine (azpy), namely $[Hg(sac)_2(\mu\text{-azpy})_2]_n$ was synthesized and single crystal X-ray diffraction. Single crystal X-ray analysis reveals that sac ligand acts N-coordinated and 4,4'-abpy ligand exhibits as bridging ligand. In complex, the Hg(II) ion and all ligands are linked by coordination bonds and 4,4'-abpy ligands connect the Hg(II) centers forming a one-dimensional coordination polymer. In complex, the sac ligands N-coordinated to the Hg(II) ion and distorted tetrahedron geometry of Hg(II) ion is completed by bridging 4,4'-abpy ligands.

Keywords: 4,4'-Azobispyridine; Saccharinate complexes; Coordination polymers

Introduction

Saccharine is an important molecule in biological systems and forms a number of complexes with different metal ions rather easily. Moreover, it contains three functional groups, namely imino nitrogen, carbonyl and sulphonyl oxygen (Baran, 2005). All these properties make it a quite preferable ligand in coordination chemistry. The deprotonated form of this molecule, saccharinate anion, usually connected to the metal centers via negatively charged nitrogen atom (Bıyık, 2007). This mode is typically observed in the aquabis (saccharinato) complexes of transition metals (Baran, 2005). This type of metal saccharinates may be useful starting materials for the preparation of mixed-ligand saccharinate complexes. Our interest has been focused on metal–saccharin–azobispyridine system, in which azobispyridine plays an important role in the construction of supramolecular architectures organized by coordinated covalent or supramolecular contacts (such as hydrogen-bonding, π-π interaction etc.) (Li, 2001; Zhuang, 2006). Since, 4,4'-abpy possess a special structure with a larger π-bond conjugated system and two active nitrogen atoms, it is especially suitable to connect remote metal centers in the stepwise construction of polynuclear arrangements (Launay, 1991). 4,4'-abpy ligand has four possible sites of coordination, namely the two pyridine nitrogens and the two azo nitrogens. Pyridine nitrogens are much more accessible for coordination for sterical reasons.

Materials and Methods

All chemicals used were of analytical reagent quality. The 4,4'-abpy ligand was synthesized by oxidation of the 4-aminopyridine with NaOCl according to literature (Kirpal-Reiter method) (Baldwin, 1969). The X-ray diffraction data of complexes were collected with a Bruker Kappa Apex2duo diffractometer. The structures were

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solved and refined by full-matrix least-squares techniques on F^2 by using the SHELX-97 program (Sheldrick, 1997]. The absorption corrections were done by the multiscan technique. All non-hydrogen atoms were refined anisotropically. All non-water hydrogen atoms were included in the refinement process by using a riding model.

Results and Discussion

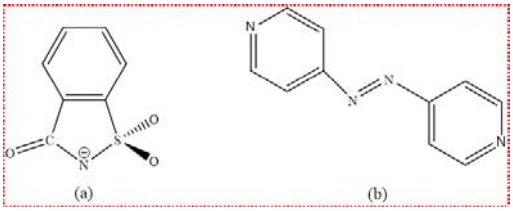
Experimental

Synthesis of 4,4'-azobispyridine

4,4'-abpy was prepared by oxidative coupling of 4-aminopyridine by hypochlorite, using Kirpal-Reiter method (Baldwin, 1969). Sodium hypochlorite (50 ml) was cooled in the solid CO_2-methyl alchol bath. A solution of 4-aminopyridine (2 g) in water was added dropwise to stirred hypochlorite solution. 10 minutes later the resulting deep red solution was immediately extracted with diethyl ether. The solvent evaporated and the solid was recrystallized from petroleum ether.

Synthesis of $[Hg(sac)_2(\mu\text{-}azpy)_2]_n$

For the synthesis of mixed-ligand saccharinate complex with Hg(II), it is a common strategy to apply $[Hg(sac)_2(H_2O)_4]\cdot 2H_2O$ as synthetic precursors. To prepare it, sodium saccharine was dissolved in water and added to the hot water solution of Hg_2SO_4 . The mixture was stirred at 80 °C for 3 h and then cooled to room temperature. The precipitate formed was filtered out and washed with water and dried in a vacuum. The complex was prepared by the direct reaction of 4,4'-abpy with this starting aqua-saccharinate complex in solution. A solution of 4,4'-abpy in ethanol was added dropwise to stirred aqueous solution of $[Hg(sac)_2(H_2O)_4]\cdot 2H_2O$. The mixture was heated under reflux for 2h and afterwards cooled to room temperature. After nearly a couple of weeks, well-formed crystals were selected for X-ray studies.



Scheme 1. (a) Schematic structure of saccharinate anion (sac); **(b)** Schematic structure of 4,4'-azobispyridine (azpy)

Description of Crystal Structures

A summary of crystallographic data, experimental details, and refinement results for the complex is given in Table 1. Selected bond lengths, angles and the hydrogen bonding geometry is given in Table 2.

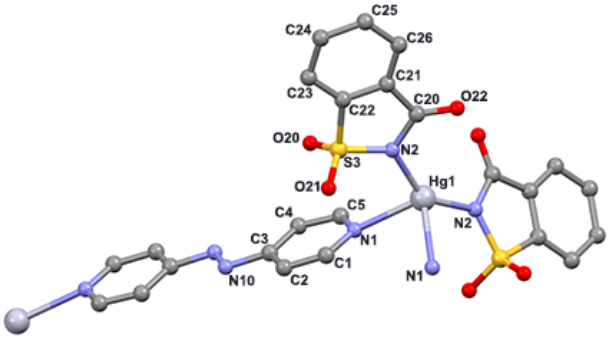


Fig. 1. The crystal structure of the complex showing the atom numbering scheme.

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The asymmetric unit of the complex contains one Hg(II) ion, two sac and two 4,4′-abpy ligands (Fig. 1). In complex, the 4,4'-abpy ligands bridge the Hg(II) centers through the nitrogen atoms to form a one-dimensional polymeric structure (Fig. 2.). The sac anions connects to the metal center via the negatively charged nitrogen atom.

Table 1. Crystal data and structure refinement parameters for complex.

Crystal data	Complex
Empirical formula	$C_{24}H_{16}N_6O_6S_2Hg$
Formula weight	749.13
Crystal system	Orthorhombic
T (K)	100 (2)
λ (Å)	0.71073
Space group	P c c n
a (Å)	19.697(2)
b (Å)	8.4999(8)
c (Å)	15.3059(15)
V (Å3)	2562.5(4)
Z	4
Dc (gcm^{-3})	1.942
μ (mm^{-1})	6.222
Measured ref.	2471
q Range (º)	2.61–30.50
Crystal size (mm)	0.34 × 0.20 × 0.04
Rint	0.0815
R, Rw[I>2s(I)]	0.0699, 0.0807

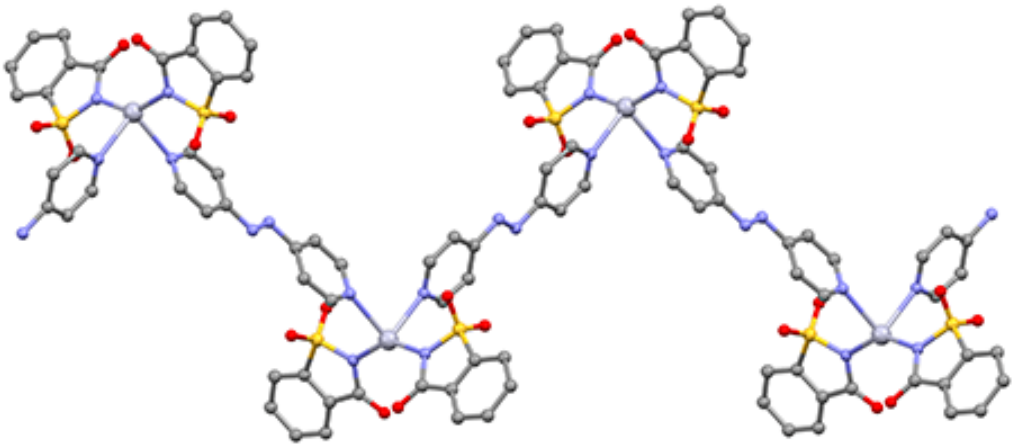

Fig. 2. View of the infinite 1D chain structure of the complex.

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Table 2. Selected bond distances and angles for complex (Å, º)

Hg1-N2	2.111(4)	Hg1−N1	2.399(4)
N2-Hg1-N2	145.0(2)	N2-Hg1-N1	108.23(13)
N2-Hg1-N1	97.04(13)	N1-Hg1-N1	87.24(18)

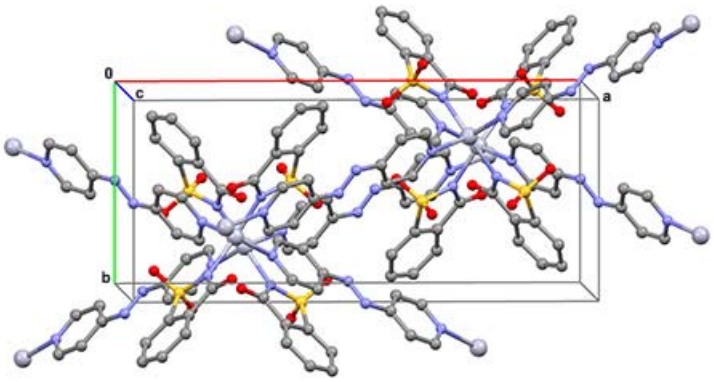

Fig. 3. View of the unit cell in the complex.

Conclusion

The new coordination polymer, $[Hg(sac)_2(\mu\text{-azpy})_2]_n$, was synthesized and structurally characterized by single crystal X-ray diffraction. Azobispyridine plays an important role in the construction of supramolecular architectures organized by coordinated covalent or supramolecular contacts.

Acknowledgements

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SYNTHESIS AND THEORETICAL STUDY OF 2,4-DIOXOPENTANOIC ACID DERIVATIVES (3A-C)

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The 2,4-dioxopentanoic acid derivatives **(3a-c)** wereobtained from the reaction of 4-acetyl-5-(1-naphthyl)furan-2,3-dione **(1)** with various nitrogenous nucleophiles **(2a-c)**. The structures of these newly synthesized compounds **(3a-c)** were determined from the FT-IR, ^{1}H and ^{13}C NMR spectroscopic data and elemental analyses. In addition to experimental analysis, quantum-mechanical calculations, such as E_{HOMO}, E_{LUMO}, □E, DM, MV, TNC, □, □, □, □, ω, SEZPE, of derivatives of (3*Z*)-3-{2-naphthyl[2-(4-nitrophenyl)hydrazino]methylene}-2,4-dioxopentanoic acid **(3a-c)** were carried out by using B3LYP method with basis set of the 6-311G(d,p) for gas phase and solvent phase (**see Scheme 1**).

Keywords: 2,4-dioxopentanoic acid derivatives, Nitrogenous nucleophiles, 2,4-dioxopentanoic acid, Quantum chemical calculations

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SYNTHESIS, CHARACTERİZATİON AND GLUTATHIONE REDUCTASE INHIBITORS STUDIES OF DINUCLEAR COPPER (II) COMPLEXES

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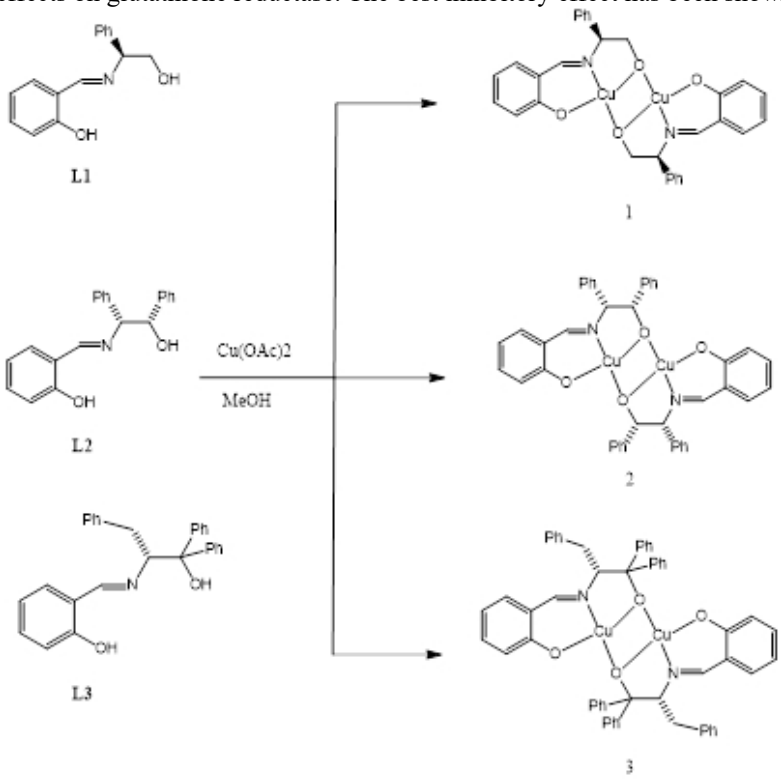
Abstract: Three dinuclear copper (II) complexes (**1**, **2** and **3**) of chiral Schiff bases prepared by reaction of *o*-hydroxybenzaldehyde and chiral amino alcohols (*S*)-(+)-phenylglycinol, (1*S*, 2*R*)-2-amino-1,2-diphenylethanol, and (*R*)-(+)-2-amino-1,1,3-triphenylpropanol have been synthesized and characterizated by using elemental analyses, FTIR, LCMS, magnetic susceptibility and conductivity measurement techniques. These compounds were examined for effects on glutathione reductase. The best inhibitory effect has been shown to complex 3.



Scheme

Acknowledgments

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SYNTHESIS, IN VITRO INHIBITION EFFECT AND STRUCTURE-ACTIVITY RELATIONSHIP OF NEW THYMOL DERIVATIVES ON CHOLINESTERASES

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Abstract: Alzheimer's disease (AD) is a progressive neurodegenerative disease and the most common form of dementia that affects aged people. Acetylcholinesterase is a hydrolase involved in the termination of impulse transmission at cholinergic synapses by rapid hydrolysis of the neurotransmitter ACh in the central and peripheral nervous system. Thymol is a main bioactive monoterpene isolated from many medicinal herbs, such as Thymus vulgaris, Monarda punctate and Origanum vulgare spp. Thymol has been widely used as an active anti-inflammatory ingredient, which can inhibit the isoproterenol induced inflammation in myocardial infarcted rats. Moreover, many studies have reported that thymol has various bioactivities, such as anticancer, anti-bacterial, and antioxidant properties. In this paper, a series of 12 novel thymol substituted carbamate derivatives (**2a-l**) was synthesized and their inhibitory activities on AChE and BuChE were evaluated. Among them, **2k** exhibited the strongest inhibition against AChE with an IC_{50} value of 2.498 µM, which was 183-fold more than that of thymol (IC_{50} = 458.23 µM). The structure-activity relationship were also investigated.

Keywords: Thymol, Cholinesterases, Inhibitor

Introduction

Thymol is a main bioactive monoterpene isolated from many medicinal herbs, such as Thymus vulgaris, Monarda punctate and Origanum vulgare spp. Thymol has been widely used as an active anti-inflammatory ingredient, which can inhibit the isoproterenol induced inflammation in myocardial infarcted rats, attenuate collagenase-induced osteoarthritis, and alleviate allergic airway inflammation in ovalbumin-induced Mouse asthma. Moreover, studies have reported that thymol has various bioactivities, such as anticancer, anti-bacterial, and antioxidant properties. Recent studies focusing on the neuroprotective activities of thymol have shown that it attenuates amyloid or scopolamine induced cognitive impairment in rats (Deng, 2015)

Numerous plants and their constituents have been reputed in traditional practices of medicine to enhance the cognitive function and to alleviate other symptoms of AD, including depression. Besides the *Salvia* species are known as a remedy for cognitive disorders, research on *Thymus vulgaris* essential oil also indicates their neuroprotective effects. Due to their small molecular size and lipophilicity, volatile constituents of essential oils and liberated volatile aglycones from glycosides are likely to readily cross the blood–brain barrier (Jukic, 2007).

Alzheimer's disease (AD) is a progressive neurodegenerative disease and the most common form of dementia that affects aged people (Ruiz, 2005). Acetylcholinesterase (AChE; EC 3.1.1.7) is a hydrolase involved in the termination of impulse transmission at cholinergic synapses by rapid hydrolysis of the neurotransmitter ACh in the central and peripheral nervous system. AChE inhibitors (AChEI) inhibit the hydrolysis of ACh improving both the level and of duration of neurotransmitter (Citron, 2004). Another cholinesterase, butyrylcholinesterase (BuChE; EC 3.1.1.8), primarily localized in plasma, liver and muscle tissues, able of hydrolyzing ACh and other acylcholines differs from AChE for tissue distribution and sensitivity to substrates and inhibitors (Wu, 2012). AChE inhibitors such as galantamine, rivastigmine, and donepezil are the main stay drugs for the clinical management of AD in the early to moderate stage (Catto, 2013).

In this study, a novel series of 12 thymol derivatives (**2a-l**) was synthesized and their inhibitory effects on AChE and BuChE were evaluated. Structure-activity relationship was also investigated.

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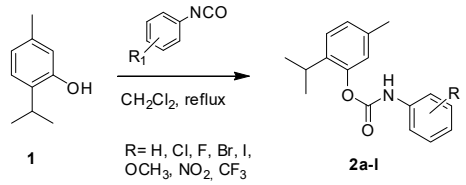
Materials and Methods

Synthesis of thymol derivatives: Thymol (1 mmol) was dissolved in CH_2Cl_2, then Et_3N (1 mmol) and isocyanate derivatives (1.25 mmol) were added to the solution, respectively. The mixture was refluxed for overnight, cooled and washed with water. The organic layer was dried over Na_2SO_4, and concentrated in vacuo. *2-isopropyl-5-methylphenyl-4-nitrophenylcarbamate (**2k**)*: ^{1}H NMR ($CDCl_3$, 300 MHz) δ/ppm: 1.21 (6H, d, J=7.0 Hz), 2.33 (3H, s), 3.05-3.10 (1H, m), 6.92 (1H, s), 7.07 (1H, d, J=8.0 Hz), 7.23 (1H, d, J=8.0 Hz), 7.53 (1H, s, NH), 7.59 (2H, d, J=9.4 Hz), 8.19 (2H, d, J=9.4 Hz); ^{13}C NMR ($CDCl_3$, 75 MHz) δ/ppm: 21.1, 23.4, 27.3, 118.3, 122.9, 125.4, 126.9, 127.9, 137.1, 137.6, 143.5, 143.8, 147.4, 151.8.

Anticholinesterase activity assays: Acetyl- (AChE) and butyryl-cholinesterase (BuChE) inhibitory activities of the synthesized compounds were determined according to Ellman's method (Ellman, 1961). The IC_{50} was determined by constructing an absorbance and/or inhibition (%) curve and examining the effect of five different concentrations. IC_{50} values were calculated for a given antagonist by determining the concentration needed to inhibit half of the maximum biological response of the agonist. The substrates of the reaction were acetylthiocholine iodide and butyrylthiocholine iodide. 5,5'-dithio-bis(2-nitrobenzoic) acid (DTNB) was used to measure anticholinesterase activity. Stock solutions of the compounds and galanthamine in methanol were prepared at a concentration of 4000 µg/mL. Aliquots of 150 µL of 100 mM phosphate buffer (pH 8.0), 10 µL of sample solution and 20 µL AChE ($2.476x10^{-4}$ U/µL) (or $3.1813x10^{-4}$ U/µL BuChE) solution were mixed and incubated for 15 min at 25ºC. 10 µL of DTNB solution was prepared by adding 2.0 mL of pH 7.0 and 4.0 mL of pH 8.0 phosphate buffers to a mixture of 1.0 mL of 16 mg/mL DTNB and 7.5 mg/mL $NaHCO_3$ in pH 7.0 phosphate buffers. The reaction was initiated by the addition of 10 µL (7.1 mM) acetylthiocholine iodide (or 0.79 mM butyrylthiocholine iodide). In this method, the activity was measured by following the yellow colour produced as a result of the thio anion produced by reacting the enzymatic hydrolysis of the substrate with DTNB. Also, methanol was used as a control solvent. The hydrolysis of the substrates was monitored using a BioTek Power Wave XS at 412 nm.

Results and Discussion

The synthetic procedures to obtain the target compounds **2a-l** are depicted in Scheme 1.



Scheme 1. Synthesis of novel thymol derivatives

The IC_{50} values for AChE and BuChE inhibitions are summarized in Table 1. IC_{50} values against AChE ranges from 2.498 µM to 288,46 µM. Compound **2k** exhibited the strongest inhibition against AChE with an IC_{50} value of 2.498 µM, which was 183-fold more than that of thymol (IC_{50} = 458.23 µM). Also, it approached that of galantamine (IC_{50} = 2.051 µM). Furthermore, most of the synthesized carbamate derivatives (**2a**, **2c**, **2d**, **2e**, **2f**, **2g**, **2h**, **2i**, **2j**, **2k**, and **2l**) exhibited better AChE inhibition (IC_{50} = 2.498 µM – 288,46 µM) than thymol, by 0.6-183 fold. All of the synthesized compounds inhibited BuChE. Compound **2a** exhibited the strongest inhibition against BuChE with an IC_{50} value of 1.65 µM, which was 137-fold more than that of thymol (IC_{50} = 226.13 µM). The following conclusions should be noted regarding the ChEs inhibitory data of Table 1: (i) Moving the fluorine atom at the phenyl ring from the meta-position to the para-position led to a major decline of the inhibitory activity for both ChEs (compared **2c** (R=3-F, IC_{50} = 88.52 and 3.85 µM for AChE and BuChE, respectively) and **2d** (R=4-F, IC_{50} = 288.46 and 405.15 µM for AChE and BuChE, respectively)). (ii) The same decrease of the inhibitory activities of **2a**-**b** was indicated against both ChEs with moving methoxy group from the meta-position to the para-position (compared **2a** (R=3-OMe, IC_{50} = 154.32 and 1.65 µM for AChE and BuChE, respectively) and **2b** (R=4-OMe, IC_{50} = n.a and 59.96 µM for AChE and BuChE, respectively)). (iii) The presence of chlorine atom at the meta-position of phenyl ring led to an increase of the inhibitory activity for both ChEs (compared **2e** (R=3,4-diCl, IC_{50} = 89.53 and 2.54 µM for AChE and BuChE, respectively) with **2f** (R=4-Cl, IC_{50} = 269.8 and 137.41 µM for AChE and BuChE, respectively)).

(iv) Moving the nitro group at the phenyl ring from the meta-position to the para-position led to a major decrease of the inhibitory activity for AChE (compared **2j** (R=3-NO_2, IC_{50} = 82.88 µM) and **2k** (R=4-NO_2, IC_{50} = 2.498 µM)). The opposite effect was observed for inhibition of BuChE (compared **2j** (R=3-NO_2, IC_{50} = 3.31 µM) and **2k** (R=4-NO_2, IC_{50} = 37.71 µM)) (v) Electron-donating groups (methoxy group) at the meta- position of the phenyl ring exhibited lower inhibitory activity than halogens and electron-withdrawing group for AChE (compared **2a** (R=3-OMe, IC_{50} = 154.32 µM) with **2c** (R=3-F, IC_{50} = 88.52 µM) and **2e** (R=3,4-diCl, IC_{50} = 89.53 µM) and **2j** (R=3-NO_2, IC_{50} = 82.88 µM)). On the contrary, methoxy group at the meta position increased

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the BuChE inhibitory activity (compared **2a** (R=3-OMe, IC_{50} = 1.65 µM) with **2c** (R=3-F, IC_{50} = 3.85 µM) and **2e** (R=3,4-diCl, IC_{50} = 2.54 µM) and **2j** (R=3-NO_2, IC_{50} = 3.31 µM)). (v) The inhibitor activity on both ChEs seems to be strongly dependent on the size and polarizability of the halogen substituent at the para-position of the phenyl ring (for size and polarizability, I > Br > Cl > F; for AChE inhibitory activity, **2h** (R=4-I, IC_{50} = 31.61 µM) > **2g** (R=4-Br, IC_{50} = 98.56 µM) > **2f** (R=4-Cl, IC_{50} = 269.80 µM) > **2d** (R=4-F, IC_{50} = 288.46 µM); for BuChE inhibitory activity, **2h** (R=4-I, IC_{50} = 4.77 µM) > **2g** (R=4-Br, IC_{50} = 107.22 µM) > **2f** (R=4-Cl, IC_{50} = 137.41 µM) > **2d** (R=4-F, IC_{50} = 405.15 µM)).

Table 1. In vitro inhibition IC_{50} values (µM) and selectivity of compounds **6a-l** for AChE and BuChE.

Compound	R	Yield (%)	Mp (°C)	AChE (IC_{50}, µM)[a]	BuChE (IC_{50}, µM)[a]	Selectivity index[b]
2a	**3-OCH_3**	42	182.6	154,32±1,745	**1,65±0,014**	0.01
2b	4-OCH_3	60	136.1	na	59,96±1,542	-
2c	3-F	73	111.3	88,52±1,253	3,85±0,457	0.04
2d	4-F	72	119.0	288,46±1,124	405,15±1,452	1.40
2e	3,4-diCl	74	113.5	89,53±1,248	2,54±0,568	0.03
2f	4-Cl	81	163.0	269,8±1,560	137,41±2,014	0.51
2g	4-Br	76	176.2	98,56±1,263	107,22±1,785	1.09
2h	4-I	74	179.6	31,61±0,952	4,77±0,748	0.15
2i	H	54	75.2	197,99±1,542	5,02±0,879	0.03
2j	3-NO_2	38	177.5	82,88±1,224	3,31±0,564	0.04
2k	**4-NO_2**	54	152.8	**2,498±0,012**	37,71±1,022	15.10
2l	4-CF_3	89	156.1	98,53±1,114	147,85±1,567	1.50
Thymol	**-**	**-**	**-**	**458,23±1,745**	**226,13±1,214**	**0.49**
Donezepil[c]	-	-	-	0.03±0.0005	4.66±0.503	155.30
Galantamine	-	-	-	2,051±0,011	18,13±0,457	8.84
Rivastigmine[c]	-	-	-	12,4±1,011	1,00±0,251	0.08

[a] IC_{50} values represent the means ± S.E.M. of three parallel measurements ($p < 0.05$).
[b] Selectivity index = IC_{50} (BuChE) / IC_{50} (AChE).
[C] (Kurt et al., Eur. J. Med. Chem., 2015)

Conclusion

A series of 12 novel thymol substituted carbamate derivatives (**2a-l**) was synthesized and their inhibitory activities on AChE and BuChE were evaluated. Among them, **2k** exhibited the strongest inhibition against AChE with an IC_{50} value of 2.498 µM, which was 183-fold more than that of thymol (IC_{50} = 458.23 µM). Additionally, **2a** exhibited the strongest inhibition against BuChE with an IC_{50} value of 1.65 µM, which was 137-fold more than that of thymol (IC_{50} = 226.13 µM).Generally, the presence of carbamate moiety at the thymol increased the both ChEs inhibition. This finding can provide guidance for researches to design new efficient ChEs inhibitors in the future works. The SAR revealed that the inhibitory activity of the synthesized compounds could also be affected by the type and position of the halogen and electron-donating and electron-withdrawing groups substituent on the phenyl ring. Overall these derivatives could be recommended as new chemotypes to develop new ChEIs for the treatment of AD disease by suitably modulating the substitution pattern also in the perspective of multifunctional anti AD agents.

Acknowledgments

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SYNTHESIS OF NAPHTHALENE DERIVATIVE LIGAND CONTAINING THE AZOMETHINE GROUP, AND ITS MN (II) AND ZN (II) COMPLEX AND INVESTIGATION OF FLUORESCENCE PROPERTIES

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The fluorescence properties of naphthalene and its derivatives are well-known for many years. Thus until today several naphthalene derivative of the ligand or complex have been synthesized. Schiff base complexes are an important group in this complex [1]. Naphthalene derivative of the Schiff base ligand and it's particularly Zn and Mn etc. complexes have the fluorescence, catalytic and selective synthesis properties [2].

In this study, the new type Schiff base ligands of naphthalene derivatives were synthesized and characterization via spectroscopic methods has been performed. Then Zn(II) and Mn(II) complexes were prepared using these ligands by known procedures. The spectra of the complexes have been obtained via FTIR and mass spectroscopy methods. In addition to these the fluoresans properties of the complexes have been attained and interpreted.

Keywords: Naphthalene, Schiff base, Fluorescence

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SYNTHETIC FIBER DYEING WITH SYNTHESIZED NOVEL DISPERSE DISAZO DYES CONTAINING METHYL (-CH3) GROUP AS AN AUXOCHROME AND THEIR COLOR PROPERTIES

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Azo dyes constitute a very important class of organic compounds. These compounds are commonly used in different fields of industry due to their various prominent properties. One of the most well-known industries for these dyes is textile owing to dyeing characteristics of these dyestuffs. In this study, novel heterocyclic disazo disperse dyes, substituted with methyl (-CH_3) group at their *o-*, *m-*, *p-* position, synthesizedand applied to poly (lactic acid), polyethylene terephthalate and polyamide 6.6 fibers. All applied synthesized disperse dyes resulted in yellow-red shades on studied fibers. Besides, the position of auxochrome group led to different colorimetric properties, color shades and exhaustion yields. Washing, perspiration, rubbing, sublimation, light, water, sea water fastness properties were generally in the commercially acceptable range. Overall, synthetic dyeing with novel heterocyclic disazo disperse dyes, substituted with methyl group (-CH_3) at their o-, m-, p-position, is applicable for textile industry in terms of color yields and fastness properties.

Keywords: Disperse dyes, color properties, exhaustion, fastness, methyl group, azo dye

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TACTİLE SENSOR DESIGN FOR LUMP DETECTION IN BREAST TISSUE

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Abstract

The purpose of this study is the development of a novel system for detection of breast tumors in non-invasive way that can be used by doctors or patients. Our study consist of two parts. The first part is a specialized sensor containing an inductive sensor inside of a tissue-like silicon rubber robotic fingertip and a square shaped multi-metal-array to increase sensitivity. The whole system designed as a probe which has compact design and mobility. The system provides 16-bit resonance impedance and 24-bit inductance values, enabling sub-micron resolution for position-sensing in application. The tissue-like silicon properties were simulated and the linearity of the probe design against the pressure was analyzed. Tissue-like silicon rubber has hyper-elastic specifications. Force-displacement analysis showed %100 linear behavior. Tissue-like rubber silicon has also elastomer properties. The stress-strain analysis was made for 8 different point that showed non-linear behavior. With the current probe design, our detecting system is easy to use for every patients and health clinicians due to its mobility and easy access for different clinical environment. For the second part, to measure our system performance's sensitivity and specificity, comparison simulations will be performed.
In the simulation experiments, tumor-like inclusions embedded in tissue-like cylindrical silicon samples to make Phantom tissue in Virtual environments (VEs) will be designed. In VEs, the tumor-like tissue samples will be used in a various combination of stiffness and depth in phantom tissues. In real phantom experiments, the simulated phantoms will be created by the same silicon-rubber in similar conditions. The system will be embedded with the camera for tracking the every movement of robotic fingertip. The camera will record every location information (x,y) and combine it with the relative stiffness value which is taken from the sensor. And the topographical information of the tissue-like phantoms turned in to 2-D image. Breast examination can be done by human hands which have unique mechanism to sense vibrations called Pacinian corpuscle (response 60-700 Hz) and these sensory systems can be measured around the 200 Hz. In clinics, even though the clinical procedures are performed by the experts, it's difficult to detect small tumors and quantify the shape, location and stiffness. Because of these difficulties, tactile imaging sensors need to be used for diagnosis. As a future study, human palpation performance will be compared by our novel tactile sensor design embedded on a robotic fingertip.

Key words: Medical imaging, tactile sensor, lump detection, breast tumor.

1. Introduction

In recent years Breast cancer is the leading cause of death in western women aged 35-54. It is expected to reach 1 in 7 women by the year 2000 (American Cancer Society, 1997). Survival rates are highest when it is detected early and still confined to the breast. According to the statistics reported in 2008, breast cancer diagnosis has been made with an estimated 1.38 million new cases (23 percent of all the cancers) and the second most common cancer worldwide in both sexes (J.Ferley, 2010). About 1,685,210 new cancer cases are expected to be diagnosed in 2016 and invasive breast cancer will be diagnosed in about 246,660 women and 2,600 men. An additional 61,000 new cases of in situ breast cancer will be diagnosed in women. Breast cancer is the most

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frequently diagnosed cancer in women (American Cancer Society, 1997). It is crucial to detect Breast cancer in early stages. There are many ways to detect Breast cancer. Breast self-examination (BSE), clinical breast examination (CBE), Mammography, Ultrasound and MRI have important role for detecting breast cancer.

Mammography is a low-dose x-ray procedure used to detect breast cancer at an early stage. Numerous studies have shown that early detection with mammography helps save lives and increases treatment options. However, like any screening tool, mammography is not perfect. For example, it can miss cancers, particularly those in women with very dense breasts, and also detects cancers that would never have caused harm, resulting in some over-diagnosis. And also differences in breast tissue, inefficient sensitivity, and small tumor size can cause false-diagnosis which can cause over-diagnosis. Some of the unwanted results of over diagnosis are increasing number of biopsies, higher-rate of invasive procedures, psychological effects of a patient and higher cost. Mammography is not recommended who is under 30 and have breastfed previous year. Because of the age breast tissue is dense and is hard to detect any cancerous tissue with mammography.

Magnetic resonance imaging (MRI) is a noninvasive method that reveals anatomical details in vivo and detects lesions for diagnosis. Although standard breast MRI cannot clearly delineate breast cancer, contrast-enhanced MRI enables the detection of breast masses with high sensitivity. MRI uses a powerful magnetic field and radio waves to produce images of the body. MRI is good at imaging dense breasts of younger women, breasts containing implants, which are often a problem for mammography owing to possible leak in the implant or rupture due to the squeezing, and smaller lesions often missed by mammography. MRI also helps to determine the stage of breast cancer. However, MRI requires the patient to lie down for half an hour to an hour and half without moving, which can be uncomfortable (Kuhl.JK, 1997). The identification of breast cancer using MRI is largely dependent on the enhancement of malignant lesions after IV administration of contrast agent, resulting in visible areas with both morphologic and kinetic features. However, enhancement on MRI is not limited to malignancies or discrete benign lesions of the breast (Müller-Schimpfle M ,1997, Reichenbach JR ,1999, Delille JP,2005). One of the main disadvantages of the MRI is that limiting specificity is the incidence of benign enhancing lesions and benign background enhancement that may be misdiagnosis that leading to an increased false-positive biopsy rate (Imaginis, 2001). Also during the MRI process patients have to lie down without a movement about half an hour which gives them discomfort and with the smallest movement the procedure needs to be repeated.

Ultrasound is a method that uses high frequency sound waves to detect tumors in tissue. There are several types of Ultrasound modes: B-mode, Doppler mode etc. B-mode capture reflected sounds and create and matrix format for the image (C.M. Sehgal,2006, C.F. Nemec,2007). And it can be used in pregnant women whom cannot use Mammography. And the results are depends on the experience of the clinical expert and the situation of the patient. Also clinical procedures have a standardization and interference in procedures have different results. In Doppler mode veins and tissue used for detecting tumors. Frequency shift calculated with the Doppler Effect so that flow can be estimated and visualize the breast tissue(D.O. Cosgrove,1993 , S. Raza,1997).

Microwave imaging and Elastography are used for breast cancer detection. Elestography detect different roughness between the tissues. Microwave imaging detect the dielectric constant and conductivity difference between the tissues (G.A. Ybarra, 2007).

Breast Self Examination and Computed Breast Examination uses human palpation. Human sensory feedback has a really important role in human interactions (B. Güçlü,2005, Bolanowski SJ,1988). Unlike the vision of that Human eyes provide us the sensory system in our body (haptic) can sense and respond in their own unique way

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towards to every interactions (Gescheider GA,1988, 2002). Haptic systems needs to obtain more data from sensory systems. Haptic system inputs; force, movement needs to be converted as an input/output form for interactions. Developing a sensor with a tactile feedback has some challenges. Vibrations and sensing has its unique values in human touch (M.Z Yıldız,20013, B. Güçlü,2005, Bolanowski SJ,1988, Gescheider GA,1988 & 2002) and making a prosthetic finger human-like modeling is a challenging area which has obstacles like sensing a high frequency vibrations. Human hands have unique mechanism to sense vibrations called Pacinian corpuscle (response 60-700 Hz) and these sensory systems can be measured around the 200 Hz (V. B. Mountcastle 1972, G. Westling 1987, A. J. Brisben 1999). Because of these challenges artificial sensing system development researches has been made which is named Tactile İmaging (TI).

Tactile imaging is a non-invasive procedure that used for detecting cancerous tissue. TI used for mapping the interested area with sensors. TI is superior to BSE and CBE because every examiner can sense different shapes and geometries in different areas so the results are quantative and subjective. Sensors can detect difference between the cancerous tissue and healthy tissue with different sensor types (A. Samani, 2003, P.S. Wellman, 1999, A. Sarvazyan, 1994). With TI size, shape and depth of the cancerous tissue can be detected. Geometric properties and stiffness vary between the benign and malignant tissues as reported in (A.R. Skovorda, 1995) and (T.A. Krouskop, 1998). TI is a method that newly exploited. There is a limited number of device that commercially available (Medical Tactile Inc, 2012). Some study groups work on different sensor types. Accelerometers (R. D. Howe, 1989), piezoelectric polymers (P. Dario, 1994, J. S. Son, 1994, Y. Yamada, 1994 , P. Dario, 1994) magneto-inductance (J. Vranish, 1986), and ultrasonic technologies (B. Hutchings, 1994) , (S. Ando, 1995) sensor array with the photo detector (] M. Ayyıldız, 2013). These sensors used variety of applications however those sensors have some fragile sensing mechanism. With the (Medical Tactile Inc, 2012) product a study has been made about 110 patient (V. Egorov, 2008) and a study has been made with the silicon model along with the patients (C.S. Kaufman, 2006). Their experiments was performed in two consecutive steps: 1) a general examination by linear sliding of the probe, and then 2) a local examination by making circular motions. If any suspicious tissue have seen then the second step performed.

In current design we propose single point tactile detection robotic fingertip embedded with the high resolution camera. The designed probe's every movement is going to be tracked with the camera. The high resolution inductive sensors value combined with the location information which is obtained from the camera. With this method the topographical shape of the interested area is going to be mapped. And 2-D image of the interested area will be revealed without any quantative results. For the experiment part tumor-like properties is going to be placed in tissue-like silicon rubber phantoms. The tumor-like tissue samples used in a various combination of stiffness and depth in phantom tissues. Every sample will be examined according to their relative stiffness. Human hands unique sensing mechanism to sense small objet. An expert clinician can detect some of the lumps in the soft tissue but most of them pass through without any detection. And human palpation can change according to every person which means the results will be subjective if any of the procedure only done by the human hands because of these challenges we designed a system with high sensitivity and specificity. After the ethical committee permission to make non-invasive human studies. The performance will be compared by human hands.

2. Materials and Method

2.1. Design of our TI system

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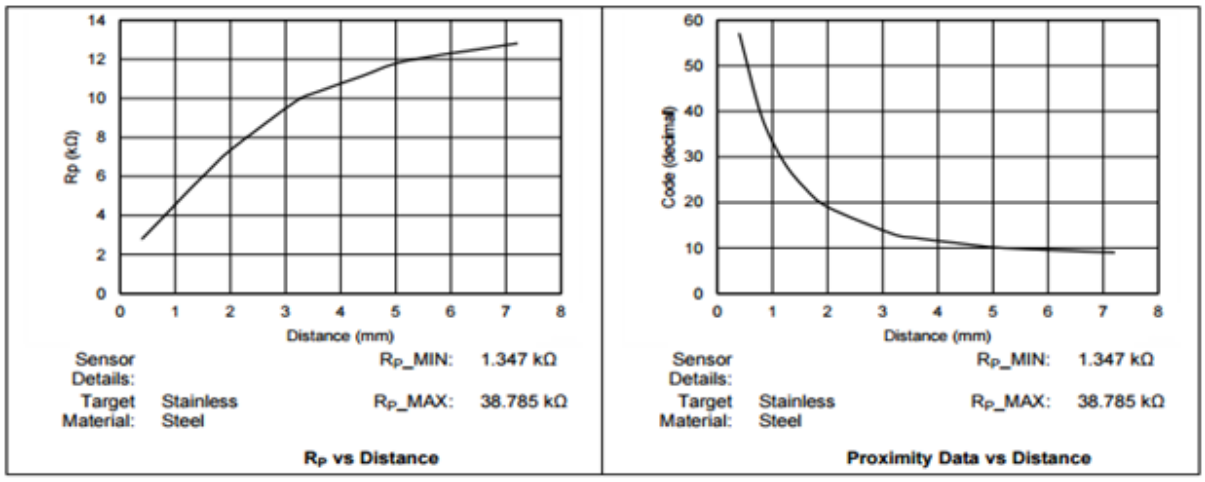
Our tissue-like silicon rubber robotic fingertip designed as a probe. Simulated all probe dimensions and materials are corresponding to the manufacturing technology and available materials on the market. The outer skeleton of probe is produced in 3D printer (thermoplastic polymer. In this part, we focused on design and analysis of a tactile probe molding and mechanical analysis by using Solid works program. SolidWorks is a solid modeler, and utilizes a parametric feature-based approach to create models and assemblies. The outer skeleton of probe we are fabricated in 3D printer (thermoplastic polymer). In this study we also needed a material that is similar to human skin on that part the device should come into contact with a cancerous tumor. But there are ethical and safety issues associated with obtaining alternative method human tissue. However after reviewing, we find dragon skin silicon on the market. Dragon skin silicones are used for a variety of applications ranging from creating skin effects and making production molds for casting a variety of materials. Due to the superior physical properties and flexibility, we decided to use this material in our project. It must be said that, it is used for medical prosthetics and cushioning applications. Particular focus was shown to find a robust tactile sensor that has the sensitivity and response to all tactile sensing modalities found in the human fingertip. Our TI system consist of %100 integrated sensor elements (TI LDC1000 EVM) arranged in a single point shape inductive sensor. The side length and the height of our TI sensor are 1.6 and 2.1 cm, respectively and sensor element is located in 1.4 cm of the silicon layer. Typical characteristic of the sensor shown in Figure 1 and Figure 2 shown the axial sensing of a sensor. Our sensor measures the parallel impedance of an LC resonator and has an Inductance-to-Digital Converter for the task. It accomplishes this task by regulating the oscillation amplitude in a closed-loop configuration to a constant level, while monitoring the energy dissipated by the resonator. The sensor element are powered by an external, regulated power supply (5V DC). Metal pieces was located above and bottom of the sensor and silicon tween them as shown in Figure 3 a



nd characteristics of tactile probe are in table 1. Inductive proximity sensors are used for non-contact detection of metallic objects. The system provides 16-bit resonance impedance and 24-bit inductance values, enabling sub-micron resolution for position-sensing to locate metal array inside of the silicon. After 10 mm of silicon the sensor is not capable of sensing the outside metals.

Figure 1. Typical characteristic of an inductive sensor.

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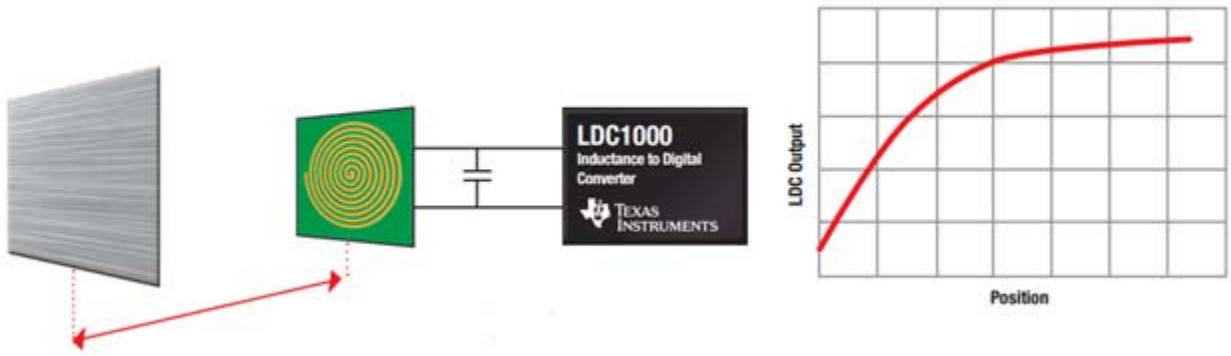

Figure 2. Axial sensing of a Sensor.

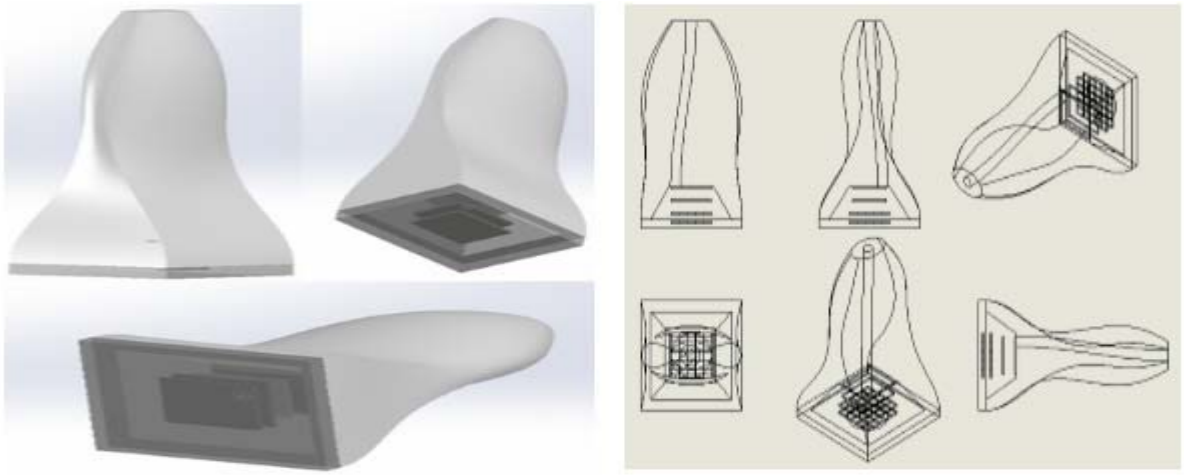

Figure 3. Geometric view of tactile probe/Metal array shape inside of a tissue-like silicon.

Table 1. Characteristics of tactile probe.

Thickness of silicon	19 mm
Dimension of large metal piece	16mm × 21mm × 1mm
Dimension of each small metal pieces	5mm × 5mm × 1mm
Dimension of sensor	16mm × 21mm × 1mm
Dimension of probe touch section	50 mm × 50 mm
Length of probe	94 mm
Total number of small metal pieces	50
Exoskeleton material	Thermoplastic polymer
Silicon material	Rubber

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In this system Data acquisition hardware acts as the interface between the computer and the outside world. It primarily functions as a device that digitizes incoming analog signals so that the computer can interpret them. Other data acquisition functionality includes the following:

· Analog input/output

· Digital input/output

· Counter/timers

· Multifunction - a combination of analog, digital, and counter operations on a single device

In this case our changeable value is Eddie current which happen to change when the metal array moved inside of the tissue-like silicon shown in Figure 4-5.

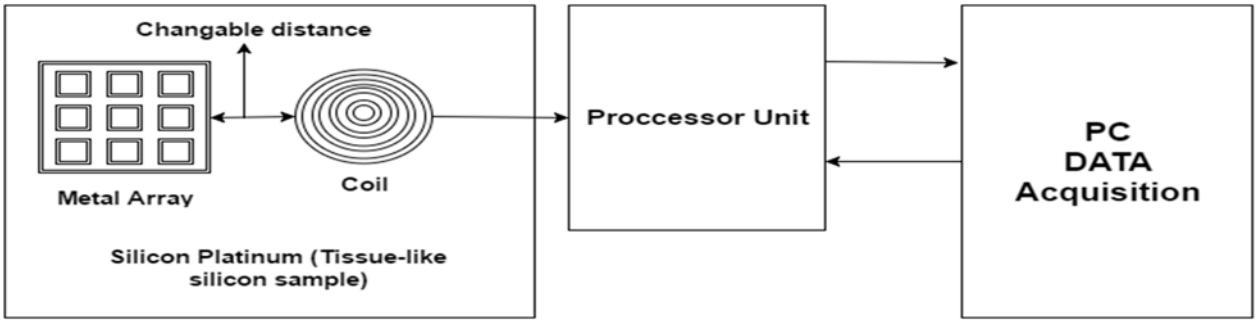

Figure 4a. Data acquisition units of the proposed TI system.

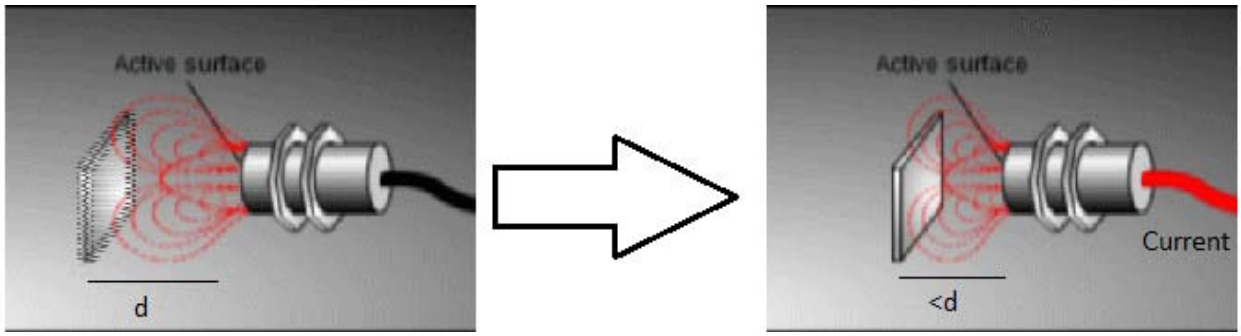

Figure 4b. Eddie current change due to metal array movement.

3. Results

In this section, the simulation results of the proposed sensor are shown. The silicon rubber that used in this study has the hyper-elastic material behavior and by the finite element method, stress and strain relations and displacement-force graphs were plotted. By giving the correct Poisson ratio from the datasheet of the materials to the software (Solid Works), the material showed isotropic linear property. Because the forces were quite low, the silicon rubber stay in the elastic region of the material. Therefore, a multilinear elastoplastic model was not chosen for the static analysis.

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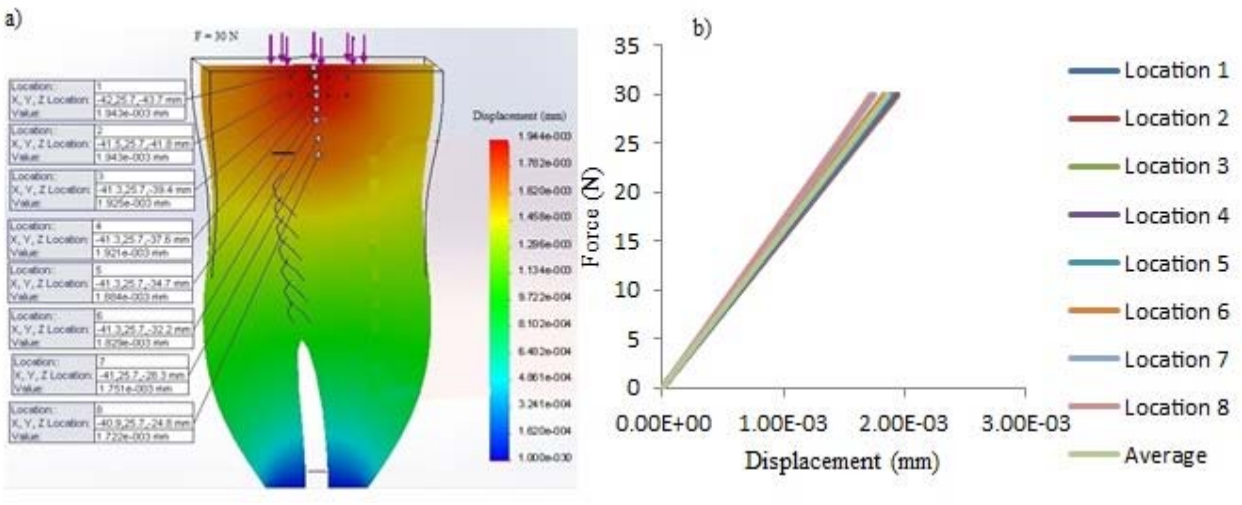

Figure 5. a) Static force (F =30 N) is applied to the silicon. b) Displacement graph of Dragon Skin silicon in the results of applied forces

Elastomers have the non-linear elastic stress-strain behavior and the term "elastomer" is basically used for materials which shows silicon-rubber properties. The reason for this behavior can be explained that, as it is shown on the stress-strain curve, the maximum force applied to the sensor is 30 N. This force is considered quite low level. Upon unloading this small force, there will be any permanent deformation on the material. In practice, this material behavior is considered as incompressible. On the Figure 6, the simulation results shows the stress-strain behavior of our sensor upon the applied forces between 0.1-30 N.

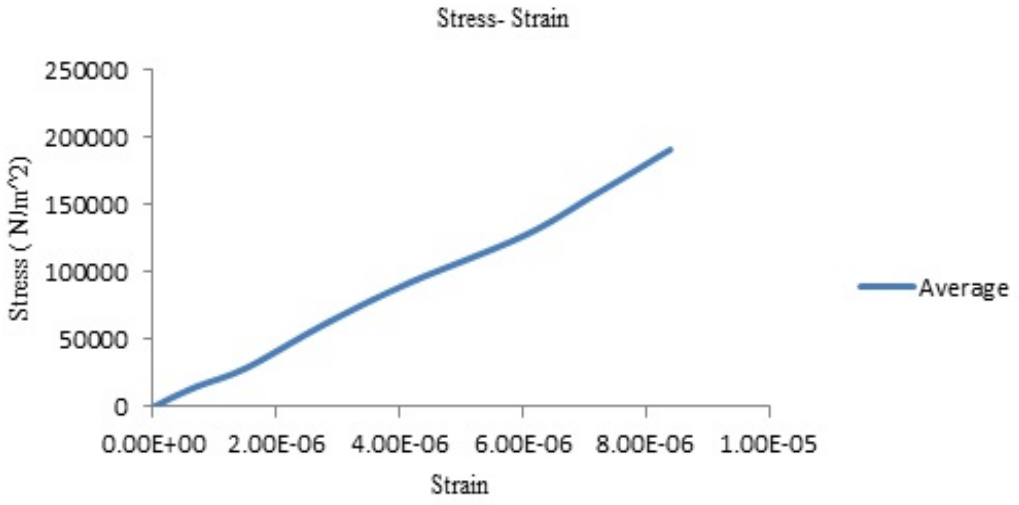

Figure 6. Dragon Skin silicon material behavior.

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Elastomers (like Dragon Skin is platinum silicon) typically have considerable strains at small loads (means a very low modulus of elasticity, for example just 30 N). The material is nearly incompressible, so the Poisson's ratio is very close to 0.5. Their loading and unloading stress-strain curve is not the same, depending on different influence factors (time, static or dynamic loading, frequency etc.). In Figure 7, all the stress-strain relation curves were shown for the different depths at the center of the sensor.

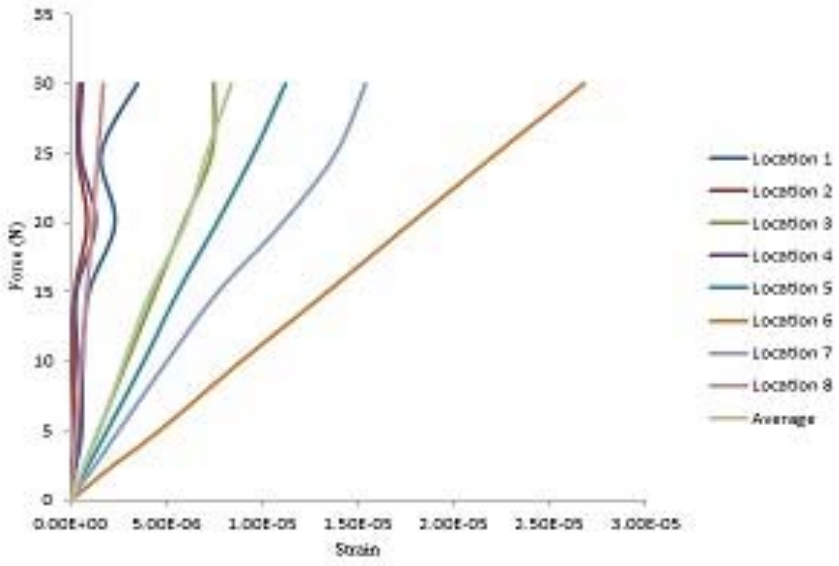

Figure 7: The results of strain in different applied forces to Dragon Skin (platinum silicone) material.

4. Discussion

We carried out our probe simulation in the SolidWorks, because the SolidWorks simulation uses the displacement formulation of the finite element method to calculate component displacements, strains, and stresses under external loads. In the SolidWorks analysis results non-linear hyperelastic materials behavior was observed. The analysis of rubber parts should be carried out using nonlinear stress analysis methods, due to their complex load deformation relationship. Due to the use of low loads, we thought in this area elastic behavior of materials would be remained on the upshot we use SolidWorks module for isotropic materials. In the next stage we are focused on design and analysis of multi module hyperelastic material models. In table 2, we will discuss how the different groups are studied and how we can do it.

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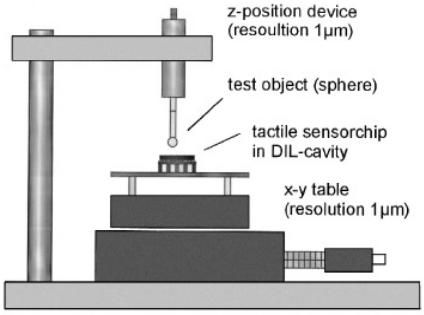
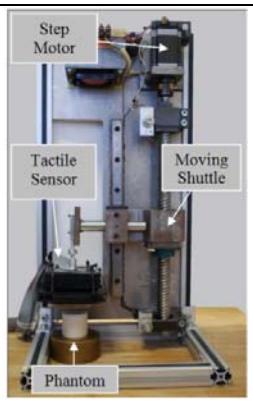
Ref.	Method	Figure	Explanation
M. Leineweber et al, 200.	New tactile sensor chip with silicone rubber cover		Actually, the tactile sensor was used in that paper is based on the FhG-IMS pressure sensor and it has advantage and disadvantage. Sensor output is equal to mechanical analysis but the sensor needs to be calibrated for all different geometry.
M. Ayyıldız et al, 2013.	Tactile sensor array with photodiode and tissue like phantom		Sensor array used with led potodetector and with this way the tissue like phantom can be mapped.

Table 2. Different study group that has made tactile sensor for lump detection.

Our current design have some advantages comparison to the other study groups that shown in Table 2. Tissue-like silicon rubber as shown in Figure.8 is 100% linear which means that after the acceptable force (0-30N similar to the human finger) the material will turn in to previous state of the matter. So it can be called as a finger-like probe that can be used numerous times. İnductive sensing is capable of sensing sub-micron changes in distance. And accurate sensing is possible with inductive sensing. With our design we can detect even the smallest particle because our sensor and metal array placed 0-0.5 cm distance to each other as shown in Figure.9. And isolated from the outside interference with our silicon properties which means even the smallest lump detection in soft tissues will be possible.

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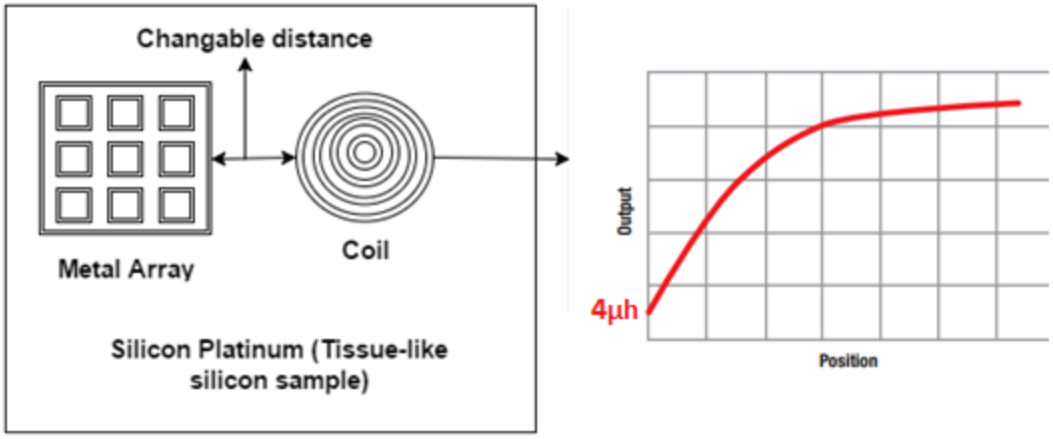

Figure 8. Because of our probe design The starting point of the sensor is 4µh and the our measurement points inside of the linear area of the sensor.

5. Conclusions

In this study, our choice to carry out the probe simulation was the SolidWorks, because the SolidWorks simulation uses the displacement formulation of the finite element method to calculate component displacements, strains, and stresses under external loads. In the SolidWorks analysis results non-linear hyperplastic materials behavior was observed. The analysis of rubber parts should be carried out using nonlinear stress analysis methods, due to their complex load deformation relationship. Due to the use of low loads, we thought in this area elastic behavior of materials would be remained on the upshot we use SolidWorks module for isotropic materials. In the next stage we are focused on design and analysis of multi module hyperelastic material models. These are directions in which we plane to continue our work.

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TEACHERS' VIEWS ON THE USE OF INTERACTIVE EDUCATION WEBSITES IN SOCIAL STUDIES CLASSES

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Abstract : This study aims to determine the views of teachers on the use of interactive education websites in social studies classes This study aims to determine interactive education websites used by teachers in social studies classes according to their views. Participants were asked about their opinions on the education websites they used in social studies classes, the benefits to students and teachers, and the problems encountered. The participants of the study were 18 classroom teachers working in the city center and districts of Afyonkarahisar Province in the spring term of the 2015–2016 academic year. Criterion sampling, a purposeful sampling method, was used to determine the participants. A phenomenological design, a qualitative research method, was used and data collection was conducted by using a Semi-Structured Interview Form prepared by the researcher. A content analysis technique was used to analyze the data. The data analysis showed that the interactive education websites used by the teachers in their classes were mostly Morpa Kampüs and Okulistik, Vitamin and partially, EBA. The study found that the teachers reported that the use of interactive education websites in social studies classes offers many benefits to teachers and students.

Keywords: Social studies, class teacher, interactive education websites

Introduction

Today, information and communication technologies are used intensively, and it is unquestionable that knowledge accumulation is increasing each passing day and it is necessary to make greater use of this resource. Along with globalization, the circulation of knowledge and the need to make better use of it have led to the development of information acquisition technologies, such as the Internet (Şahan, 2005). The Internet, the largest communication network used by individuals to acquire, produce and share information, has begun to be used in numerous fields such as education, healthcare, government, industry, and defense. The use of Internet in education has caused many changes. The use of the Internet is continually increasing and Internet-based education has gradually come into prominence. In Internet or Web-based education, teachers and students can connect to their class material via a computer connection, whenever they want and wherever they are. In Turkey, the aim is to form an association between education and technology, as necessities of the information age. In the 2010–2014 strategic plan (MNE, 2009), the Ministry of National Education aimed to enable all schools to have Internet access, to make information technology classes common, to prevent inequality in access to the Internet and, therefore to provide a student-oriented and project-based education for the use and dissemination of new technologies. It is inevitable that teachers will benefit from technology in their classes. Social studies education supported by technology plays an important role in obtaining information that is impossible in conventional classes, and in the acquisition of various skills. It is necessary for today's teachers to benefit from technology in order to increase primary school students' opportunities to learn in social studies classes, and to enable them to establish a connection between past, present and future (Mason, 2000). Today, children's use of technology and the Internet for education and entertainment is increasing. Students benefit from technology in many areas, such as Internet research, and access to videos, images, search engines, maps, social media and games. Because social studies contain the subjects of many disciplines, technology should be used in these lessons as much as possible.
Teachers can develop their students' global awareness, using various effective, appropriate and authentic educational technologies (Crawford and Kibry, 2008). In a study in which Brad et al. (2015) planned to teach social studies subjects via video games, an increase was observed in the children's skills of problem solving, motivation, interest and goal setting and planning. Also, it was found that students better understood concrete concepts and theories used in real life. Marcus et al. (2010), stated that movies play an important role in teaching historical subjects in social studies lessons and should be used by teachers as they enable students to acquire the skills of historical empathy, interpretation and analytical thinking.
In a study conducted by Yeşiltaş and Kaymakçı (2014) to determine the technological dimension of a social studies teaching program, it was found that these programs are structured in a way to provide the opportunity to use technological products in terms of their general purposes, content, learning–teaching processes and assessment–evaluation tools and methods. Having technological knowledge, as well as field knowledge and

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teaching skills, affects teachers' views on the inclusion of educational technologies in classes (Crawford and Kibry, 2008). The lack of knowledge and skill in the use of technology in social studies classes leads teachers to teach their lessons in conventional way. The teachers' use of technological applications in their lessons is associated with their skills and self-efficacy in using technology (Friedman and Heafnee, 2010). In Turkey, interactive education software has been produced that can incorporate video, images, documentaries, animations, cartoon movies, and caricatures on subjects in social studies and other education, in compliance with each grade level. The number of teachers who use this kind of software is increasing daily. This study aims to determine the views of teachers on the use of interactive education websites in social studies classes This study aims to determine interactive education websites used by teachers in social studies classes according to their views. Participants were asked about their opinions on the education websites they used in social studies classes, the adequacy of these educational websites, the benefits of using these websites to students and teachers, and the problems encountered. Answers were sought for the following questions:

1. What are the views of classroom teachers about the adequacy of different educational websites that they use in social studies classes?
2. What are the views of classroom teachers about the stage of the social studies class at which they use interactive education websites?
3. What are the views of classroom teachers about why they use different education websites in social studies classes?
4. What are the views of classroom teachers about the benefits to teachers of using different education websites in social studies classes?
5. What are the views of classroom teachers about the benefits to students of using different education websites in social studies classes?
6. What are the views of classroom teachers about difficulties they encounter while using different education websites in social studies classes?

Method

Research Design

A phenomenological design, a qualitative research method, was used in the study. Phenomenology examines the real nature of a phenomenon (Patton, 2014). The aim of phenomenological research design is to reveal the experiences and perceptions of individuals about a phenomenon and the meanings they attribute to it (Yıldırım and Şimşek, 2013). Phenomenological research defines the common or shared experiences about a phenomenon or concept (Creswell, 2015). It focuses on how individuals describe phenomena, what they think about them, how they perceive them and attribute a meaning to them. In this research design, in-depth interviews should be conducted with individuals who have directly experienced the relevant phenomenon, in other words, have experiences about it, in order to collect data (Patton, 2014). In the present study, the phenomenological design was considered as a method which provided an opportunity to assess the interactive education websites used by the teachers in social studies classes, to determine why and how they use them, and the problems they encounter and recommended solutions.

Participants (Study Group)

The participants of the study consisted of 18 teachers working in the city center and districts of Afyonkarahisar Province in the spring term of the 2015–2016 academic year. The criterion sampling method, a purposeful sampling strategy that enables all cases fulfilling some criteria to be selected, was used to determine the participants. Purposeful sampling methods are used to increase transferability in qualitative researches with the aim of revealing incidents and facts, and their features of variability (Yıldırım and Şimşek, 2013). In purposeful sampling, cases are selected for a study because they provide more information and they are enlightening. They can provide important explanatory information about the relevant phenomena studied. Cases that are rich in information provide more data for researchers (Patton, 2014). The criteria determined for participant teachers were as follows; working with fourth graders and participating voluntarily in the study. The effective factor in setting "working with fourth graders" as a criterion for classroom teachers was that there were several questions in the interview form about education websites used at this grade. Social studies classes are included in the fourth-grade curriculum in primary school, requiring the classroom teachers to work with fourth graders. The information about the 18 participants who constituted the study group is showed in Table 1.

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Table 1. Information about participants

Variable		f
Sex	Female	9
	Male	11
	Total	**18**
Seniority	0–10 years	4
	11–20 years	9
	21–30 years	3
	30 and above	2
	Total	**18**

Data Collection and Data Collection Tools

The data were collected using a Semi-Structured Interview Form which was developed by the researcher and consisted of 9 open-ended questions. In qualitative research, a semi-structured interview is a commonly used data collection method when the researchers want to analyze a subject in detail and to better comprehend the responses given (Harrell and Bradley, 2009). A Semi-Structured Interview Form with 11 open-ended questions was prepared on the basis of a literature review and given to three experts in different departments of a faculty of education in a state university who examined it to ensure its internal and external validity. These classroom teaching experts were asked to ensure the scope and face validity, and to check whether the questions in the interview form were clear and understandable, and that they involved the topic discussed. As a result of the expert review, two questions were judged to be inappropriate to the research topic and were excluded from the interview form. After the necessary adjustments were made in accordance with the experts' opinions and comments, an interview form consisting of 9 open-ended questions was developed. Later, a pilot interview was conducted with a classroom teacher. An assessment was conducted after this interview was written down, which showed that the questions were understood clearly by the participant.

Data Analysis

The content analysis technique was used to analyze the data. In content analysis, the data obtained in a study is subjected to an in-depth analysis, in order to develop concepts and themes. The process of content analysis consists of stages, including data coding, finding themes which divide codes into certain categories, the organization and description of data according to codes and themes, and the interpretation of findings (Yıldırım and Şimşek, 2013). The interviews were recorded by video camera and transcribed by the researchers. All of the written interview data were coded by two researchers. The interrelated codes were classified by their similarities and differences, and the researchers decided under which sub-themes the data would be grouped and presented. These sub-themes, which were associated with each other, were combined and inserted into the main themes presented in broader dimensions. The consistency between codes established by the two researchers was calculated using the formula, [Agreement / (Agreement + Disagreement) x 100] (Miles and Huberman, 1994). As a result of the comparison between codes, the consistency between encoders was calculated as 0.88. The fact that reliability calculations were found to be above 70% was regarded as reliable for the study (Miles and Huberman, 1994). Code names (T1, T2, T3 ...) instead of the teachers' names were used in direct quotation to support the results obtained.

Results

Information about the interactive education websites mostly used by the teachers in social studies classes is shown in Table 2. Later, the participants' comments and direct quotations about the adequacy of these websites were also presented.

Table 2. The most used interactive education websites in social studies lesson

The most used education websites	Frequency
Morpa Kampus	13
Okulistik	8
Vitamin	5
Eğitim Bilişim Ağı (Education Information Network)	2

As can be seen from Table 2, it was found that the interactive education websites mostly used in social studies classes were Morpa Kampus, Okulistik and Vitamin. The participants reported that these websites are compatible with the acquisitions in social studies teaching programs and they are quite adequate. Also, the participants emphasized that these interactive education websites are highly professional and they are

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appreciated by their students. Moreover, it was also reported that Eğitim Bilişim Ağı (Education Information Network) is not used often in social studies because its content is inadequate and complicated, and is incompatible with the acquisitions in social studies teaching programs and is not intended for primary school programs in particular.
The participant teachers reported that the websites such as Okulistik and Morpa Kampus are professional and commonly used in social studies classes. One of the participants, T4, said, "*The websites like Okulistik and Morpa, which were created more professionally, are important sources for me in social studies lessons, therefore I find them quite practical."* Another participant, T12, also said, *"The interactive websites that I use most in social studies and find useful are Morpa Kampus and Okulistik, respectively. These websites go in parallel with the subjects that we teach in lessons. I think they are adequate and it is easy to use them."*

The participants also emphasized that the other interactive education website used in social studies classes is Vitamin. One of the participants, T2, said that, *"My students are pleased when they see me opening Vitamin. Videos, images, and particularly exercises in this website work a lot for me. I find these websites adequate."*

Another participant, T1, reported that EBA does not have any content related to primary school programs and it is not used often in social studies and other classes because its usage is complicated compared to other websites. He/she said, *"The passwords of EBA were also given to us, but I cannot use this website because it is not yet adequate. The data in this website are inadequate because accurate and proper data for primary schools have not been uploaded to the website. I find Morpa Kampus adequate for those who want to use it in terms of visual aspects and information because it offers an opportunity to project books on the interactive whiteboards."*

From the teachers' views, it can be stated that they use mostly the Morpa Kampus and Okulistik education websites in social studies classes, and that the newly-developing EBA program is not preferred because it does not follow the lesson content and acquisitions exactly.

Information about the most commonly used and liked categories of the interactive websites in social studies classes is showed in Table 3.

Table 3. The most commonly used and liked categories of the interactive websites

The most commonly used and liked categories	Frequency
Audible and animated video lectures	16
Assessment exams	12
Homeworks	10
Interactive activities	8
Worksheets	8
Games	2
Music	2
Documentaries	2
Images	2

As shown in Table 3, the category most used by the teachers in social studies classes was audible and animated videos that are based on lectures. The classroom teachers were also found to use images, animations, assessment questions and activities.

One participant teacher, T15, reported using video lessons, saying that, *"There are video lectures created in accordance with each subject of the lessons and their acquisitions. First, I have students listen to these lectures. I deliver the subject by myself sometimes, by pausing the video lecture or after it ends, and reinforce the subject with questions."*

The participants also reported that they use assessment exams in particular. They emphasized that they use tests prepared for each unit or theme, subject screening tests prepared for each subject, and mid-term and end-of-year assessment tests. It was also reported that the assessment questions are so useful and professional that they facilitate the work of teachers. One of the participants, T2, said, *"I like assessment categories most on these websites. In the past, we were working hard and it was so difficult and time-consuming for us to prepare questions accurately according to subjects and units. The exam questions in these websites have been prepared and arranged so professionally that they attract the students' attention. I can easily reach the subjects that I deliver in the lesson. I use animations and exam questions categories a lot, particularly for social studies classes, because it is a verbal class."*

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Information about the most commonly used category of the interactive education websites in social studies classes is showed in Table 4.

Table 4. The most commonly used category of the interactive education websites in social studies classes

Stages of the lesson	Frequency
At all stages of the social studies lesson	**12**
Measurement and Assessment	**12**
Worksheets	6
Exercises	2
Tests	2
Subject revision	2
Drawing attention	**8**
Video	6
Music	2
Learning and teaching process	**7**
Lecturing	3
Animation	3
Games	1
Documentary	1

The participants reported that they use interactive education websites at almost all stages of the social studies lesson. In parallel with the results above, the teachers use interactive education websites mostly at the measurement and assessment stage of the social studies lesson. The participants reported that they use assessment exams (worksheets, exercises and tests) and audible and animated video lectures with the aim of subject revision at the end of the lesson. On this matter, one teacher, T6, said, *"I use these materials at the end of the lesson to reinforce what is learned and to make a general revision."* Another teacher, T18, said, *"I use these materials to conduct a revision at the conclusion stage of the lesson and to summarize the subject,"* while T9 said, *"I use these materials at the assessment stage of the lesson for the subject."*

The participants also reported that they use video and music in the second place to draw attention at the introduction stage of the class. One teacher, T15, said, *"I use these materials to attract my students' attention to the subject at the introduction stage of the lesson. I start the lesson sometimes with a song, narration or lecture-based videos. Afterwards, I proceed to the next stage with the textbook."*

The participants stated that they use video lectures, animations, games and documentaries in the learning and teaching process. On this matter, one teacher, T5, said, "*I use the education websites that enable students to become active and participate actively in the learning–teaching process, instead of following and listening to their teachers passively, at the development stage of the social studies lesson. I enable my students to watch the videos on these websites and do exercises. I use documentaries prepared for the social studies lesson, particularly regarding the subjects in the unit, 'I am learning my past'."*

Information about the subjects of the social studies lesson most commonly used in the interactive education websites is showed in Table 5.

Table 5. The subjects of the social studies lesson most commonly used in the interactive education websites

Subjects Used	Frequency
Turkish War of Independence	18
Elements of National Culture	16
Natural Disasters	16
Non-Governmental Organizations	14
Environmental Pollution	10
Developments in Science and Technology	10
National Holidays	9
Introducing other countries and cultures	3
Our individual differences	2

As can be seen in Table 5, the teachers stated that they use the education websites for almost all subjects. They also reported that they benefited mostly from the videos and documentaries related to the Turkish War of Independence within the context of history subjects in social studies classes. The participants also emphasized that they use animations and documentaries in particular for the subjects including elements of national culture,

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natural disasters, non-governmental organizations, environmental pollution, developments in science and technology, national holidays, introducing other countries and cultures and our individual differences. On this matter, one of the participants, T6, said, *"Social studies is a verbal lesson, thus I benefit from documentaries generally for historical subjects, especially regarding the Turkish War of Independence, but I also try to use these materials for almost all subjects such as natural disasters, cultural elements from past to present and environmental issues."*

Information about the benefits to the teachers offered by the use of interactive education websites in social studies classes is showed in Table 6.

Table 6. Benefits for teachers of interactive education websites

Benefits for teachers	Frequency
Enabling teachers to be prepared	16
Enabling teachers to prevent the lesson from being monotonous	14
Providing convenience	10
Enabling teachers to draw their students' attention more easily Enabling teachers to reach a large number of examples and images, and further information about the subject	9
Providing teachers with a large number of materials (video, animation, activity)	8
Increasing the teacher's control over the lesson	7
Enabling teachers to concretize the subjects	5
Enabling teachers to reach measurement and assessment sources easily	5

As can be seen in Table 6, the teachers reported that using these websites in social studies and other classes enables teachers to be well-equipped and better prepared for the classes. They also stated that these websites enable social studies classes to be more entertaining, and less monotonous, and that they make it easy for teachers to access the intended information. The participants also emphasized that these websites enable teachers to access relevant information, images, examples, videos, activities, tests and exam questions for measurement and assessment appropriate to each subject. It was also stated that the high number of these sources increases the control of teachers over the classes, enables the subjects to be reified, and improves the motivation of students.

One of the participants, T18, offered the view that these websites enable teachers to be better prepared, saying, "*We could not always access various sources while preparing for the lessons in the past, but now there are materials available, prepared in accordance with the class subjects. The availability of these materials, from video lectures to exam questions, facilitates our works and enables us to be prepared for the classes."* One of the participants, T3, reported that the interactive education websites offer convenience to teachers and assist them, and that they also provide teachers with a large number of material. He/she said, *"They make giving lessons easy for teachers. They provide teachers with a large number of materials and enable them to come to school prepared."* Another teacher, T16, said, *"They provide teachers with different and rich content. They provide us with educational materials which are prepared in accordance with technology."*

One of the participants, T14, reported that using interactive websites enables students to enjoy the class, helps teachers hold their students' attention, and it prevents the lesson from being monotonous. He/she said, "*If I use various games and animations in the lesson, it stops being monotonous. In this respect, I think these websites enable social studies lessons to be enjoyed and listened to with interest by the students; thus, our work gets easier."* On this matter, another teacher, T8, said, *"Using the lecture method, the students become distracted after a while; therefore, these websites become helpful for teachers by enabling them to provide lessons easily."*

One of the teachers, T2, stated that the interactive education websites concretize what teachers teach and enable them to increase their control over the lesson. He/she said, *"Their benefits are considerable if a teacher finds subject-oriented materials for what he or she wants to teach in these websites. They can deliver the abstract concepts in the lesson concretely by using these websites. Therefore, it facilitates the teachers' work, allows them to establish control over the lesson, offers diversity in lecturing and enables teachers to make lessons entertaining, rather than boring*. On this, another teacher, T11, said, *"Thanks to the activities on them, these websites are useful in making the lesson entertaining, giving concrete examples and holding the students' attention."*

One of the participants, T5, reported that the interactive education websites provide teachers with a convenient way to hold their students' attention by saying, "*I think that different education websites are very useful for teachers to teach social studies. They enable us to mentally prepare the children for the lesson and most*

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importantly, draw their attention to the subject. I also think that these websites help teachers enable students to comprehend what is taught..."

Information about the benefits to the students offered by the use of interactive education websites in social studies classes is shown in Table 7.

Table 7. Benefits for students of interactive education websites

Benefits for students	Frequency
Enabling permanent learning	15
Drawing attention	12
Leading to individual learning	10
Enabling students to be motivated	10
Enabling students to enjoy social studies classes	8
Enabling students to recognize that they can obtain information in different ways	
Enabling active participation	5
Learning to learn	4
Supporting the students with different learning styles	3
	2

According to Table 7, the participants reported that the use of interactive education websites in social studies classes has various benefits for students, such as enabling permanent learning, drawing their attention, leading them to individual learning, and enabling them to be motivated. They also stated that teaching the lesson by using these websites causes children to like it, enables them to learn the different ways of getting information whenever and wherever they want, and helps them to learn by experience. Moreover, they emphasized that these websites contribute to "learning to learn" by enabling students to access information whenever they want, at their own pace, and to assess themselves by activities and questions, and that they help teachers reach children with different learning skills. On this, one of the participants, ST5, said, *"Students have difficulty understanding abstract concepts. These websites deliver concepts by concretizing them and enabling permanent learning because they appeal to students in both visual and audial ways. Students can get information for their research assignments or preparation for the next class by themselves, without the help of their teacher thanks to different websites. I think these websites are also useful for students because they try to enable students to acquire information in different ways."*

Information about the difficulties encountered while using interactive education websites in social studies lesson is showed in Table 8.

Table 8. Difficulties encountered while using interactive education websites in social studies classes

Difficulties faced	Frequency
Internet outage and low-speed internet connection	15
Inadequate number of activities	10
Inconsistency between the acquisition requirements in the program and the content on the websites	5
Not updating the websites according to the changes in the program	4
Some of the websites require students to pay membership fees	2
The content and usage of some websites is complicated	2

As can be seen in Table 8, Internet outage and low-speed internet connection are the difficulties most faced by classroom teachers. Apart from these, they also reported that they encounter difficulties, such as inadequate number of activities for the subject, inconsistency between the acquisitions in the programs and the content on the websites, websites not reflecting promptly changes in the programs, some websites requiring students to pay membership fees, and the fact that it is complicated to use some websites.

One of the participants, T1, reported having difficulty connecting to the Internet. He/she said, *"I have always difficulty while opening websites, and sometimes I encounter difficulty with the Internet connection. Because of these problems, I fall behind in teaching subjects and I have to teach lessons in simpler way."* Another participant, T3, said, *"I have difficulty with slow Internet speed and outages."* One of the participants, ST5, reported on the inadequacy of content and activities: "*The difficulty that I most frequently encounter is that some of the websites are inadequate in terms of content. Although our textbooks have tens of acquisitions, it is*

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impossible to find a video or animation for each acquisition. I also encounter websites which are inadequate not only in terms of delivering lectures, but also educational games or assessment..."

Conclusion and Recommendations

This study aimed to determine teachers' views on the use of different interactive education websites in social studies classes This study aimed to determine the use of different interactive education websites in social studies classes according to the views of teachers. It found that teachers generally use these websites in their lessons and they find them adequate. This study also showed that these interactive education websites are highly professional and that they are appreciated by the students. Moreover, it was found that Eğitim Bilişim Ağı (Education Information Network), which is quite new for the primary school level, is not used often in social studies because its content is inadequate and complicated, and it is incompatible with the program acquisitions and it is not intended for primary school programs in particular. Açıkalın (2010) observed that teachers use websites in social studies classes.

The category on the interactive education websites most frequently used by the teachers for social studies classes was found to be audible and animated video lectures. Tests prepared for each unit or theme, subject screening tests prepared for each subject, and mid-term and end of year assessment tests are also other materials that teachers use most frequently. Moreover, assignments, interactive activities, worksheets, games, music, documentaries and images prepared in accordance with each subject on the interactive education websites are also used and preferred. In a study conducted by Çetin (2010), students reported that the high number of elements, such as activity, experiment, game and animation, within the content of classes delivered using web-supporting teaching methods, makes them happy; the high number of questions in the content provide reinforcement; and web-based teaching can be conducted without constraints in time and place. Based on the study results, the use of interactive education websites by teachers in their classes should be made more common and teachers should be encouraged to use them.

It was found that the teachers use the interactive education websites mostly for the subjects including the Turkish War of Independence, elements of national culture, natural disasters, non-governmental organizations, environmental pollution, developments in science and technology, national holidays, introducing other countries and cultures, and our individual differences. The participants reported that the use of documentaries about historical subjects and videos about natural disasters is effective. Furthermore, images and videos, which contain elements of national culture, and introduce non-governmental organizations and explain their activities within the context of current events, are also used in the lessons. Images for environmental pollution and videos for raising environmental awareness are also used. It is highly important for teachers to include interactive education websites within the content regarding different disciplines in social studies classes so that the social studies education becomes effective and efficient.

The participants reported that using interactive education websites in social studies classes and other lessons enables teachers to be well-equipped and better prepared, makes social studies classes more entertaining and prevents them from being monotonous, and offers convenience to teachers by enabling them to access the intended information more easily. Moreover, the participants emphasized that these websites enable teachers to access relevant information, images, examples, videos, activities, tests and exam questions for assessment appropriate to each subject, increase the control of teachers over the classes, enable the subjects to be reified, and increase the motivation of students.

In a study conducted by Çiftçi, Taşkaya and Alemdar (2013) to determine the opinions of classroom teachers on the Fatih Project, it was found that using Internet software and tablets in education facilitates teachers' access to information, offers a large number of materials and simplifies teachers' work in several aspects, and consequently helps them save time. All teachers should be oriented and encouraged to use these websites. Most of the teachers using EBA reported that the biggest contribution of the platform in terms of its positive effects on teachers is that it positively affects the motivation of students for the lesson because it increases visuality (Türker and Güven, 2016).

The teachers reported that the use of interactive education websites in social studies classes has various benefits for students, such as enabling permanent learning, drawing their attention, leading them to individual learning and encouraging their motivation. The participants also stated that teaching social studies classes by using these websites causes children to enjoy the classes, enables them to learn the different ways of getting information whenever and wherever they want, and helps them to learn by experience. In a study "Exemplary Social Studies Teachers Use of Computer-Supported Instruction in the Classroom," conducted by Açıkalın (2010), the participants emphasized that the use of computers in social studies classes facilitates students' work and enables

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them to learn faster. In the same study, most of the participants emphasized that the Internet is very useful because it enables students to gain global and multiple perspectives. In a study conducted by Heafner (2013), the teachers emphasized that it is absolutely necessary to use technology in social studies classes because it makes learning meaningful for children, motivates them to learn, enables them to learn in accordance with their own pace and interests, develops their research skills, and helps them learn by associating the social studies concepts with their lives. In an experimental study based on web-supported teaching, Çetin (2010) found that web applications improved the academic achievement of students significantly and increased their motivation towards the lesson.

Internet outage, inadequate number of activities and inconsistency between content and acquisition are the main difficulties faced by the teachers while using these websites. In a study titled "Secondary Social Studies Teachers' Perceptions of Effective Technology Practice," conducted by Heafner (2013), the participants stated that they experienced difficulties such as Internet outage in social studies classes, which causes loss of time while trying to follow curriculum. The sub-structural deficiencies in schools should be corrected to use these websites in an effective way. Also, the contents of these websites should be developed, organized and updated.

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TECHNOLOGICAL SUSTAINABILITY OF MOBILE LEARNING

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Abstract
This study aims to investigate and improve factors affecting technological sustainability of m-learning. In addition to literature review, an investigation based on interviews was conducted with 11 heads and systems experts of distance education centers to obtain the technological sustainability factors of m-learning. In order to understand the significance of these factors on m-learning sustainability, another investigation based on survey research was conducted with 75 system staffs from the universities which have m-learning facilities. The data analyzed and evaluated for a technological sustainability model of m-learning. The study may provide guidelines to m-learning initiatives for a sustainable mobile learning.

Keywords: mobile learning, m-learning, sustainability, technology

INTRODUCTION

In the last ten years, many educational institutions have started to give mobile learning which is defined as "intersection of online learning and mobile computing" by William (2003). The mobile devices which are used in m-learning can be listed as mobile device, like cellular phones, Personal Digital Assistants (PDA), smartphones, tablet PC etc. (Andronico et al., 2003). These devices are used for many instructional activities such as downloading and sharing document, collaborating on projects, reviewing coursework, preparing for exams, showcasing their work, sharing project results, reading (listening to) audio books, recording information, presenting projects; conducting research, saving their work, submitting work to the instructor etc. (Corbeil & Valdes-Corbeil, 2007). Although there are more advantages of online learning environments for both students and institutions, high dropout rate is a problem in online education (Bowers & Kumar, 2015).

This study aims to investigate the technologic dimension of m-learning sustainability and seeks to answer such research questions: What are the factors that can affect the technological sustainability of mobile learning? What is the current situation of the technological sustainability of m-learning at universities in Turkey?

LITERATURE REVIEW

Technological perspective of mobile learning sustainability has been handled in few studies. According to Stansfield et al. (2009), appropriate infrastructure & standards (cost effectiveness, systems security, adoption of open-source technologies), support for staff & users/students (adoption of open-source technologies, effective training, maintenance agreements in place), embracing innovation (identifying new trends, integration with mainstream programs, pro-active management) and testing and evaluation (rapid application development, clear technology requirements) are key issues of sustainable e-learning.

Ktoridou and Eteokleous (2005) address the technological aspects on their study. According to them, when mobile devices are compared with PC or desktops, mobile devices have advantages in terms of portability, transfer, usability, battery life, time, familiarity and youth lifestyle but have disadvantages in terms of functionality, expansion and upgrade, connectivity and interoperability, connectivity costs and security. Pea and Maldonado (2006) handled seven device features contributing to the rise in handheld use within schools and beyond: (1) size and portability; (2) small screen size; (3) computing power and modular platform; (4) communication ability through wireless and infrared beaming networks; (5) wide range of available multipurpose applications; (6) ready ability to synchronize and back-up with other computers; and (7) stylus driven interface.

Standards and architecture, tools and technologies, and functionality and uses are important factors from the technological view of e-learning (Conole, 2004). Kukulska-Hulme (2007) pointed out that "m-learning activity continues to take place on devices which are not designed for educational use, and that therefore usability issues are frequently reported". He gave some usability issues related to physical attributes as small screen size, heavy weight, inadequate memory and short battery life, network speed and reliability, and physical environment.

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Five broad categories of technology must be considered from technological viewpoint of m-learning; these are transport, platform, delivery, media technologies, and development languages (Attewell, 2005). Cobcroft (2006) handled mobile devices, wireless infrastructure, learning management systems (LMS) in his literature review into mobile learning in the university context. Sánchez and his colleagues (2013) investigated the factors that determine the acceptance of the WebCT learning system among students. The factors they investigated are technical support; computer self-efficacy; perceived ease of use; perceived usefulness; attitude; and system usage. The study revealed the importance of the technical support variable. Oinas-Kukkonen and Kurkela, V. (2003), stated that network accessibility is a main advantage of m-learning. So, it can be taken for inspection of its effect on sustainability.

From a technology viewpoint, restrictions that may impede m-learning sustainability as discussed by Maniar and Bennett (2007), include following eight aspects: small screen size and poor screen resolution, lack of data input capability, low storage, low bandwidth; limited processor speed, short battery life, software issues and interoperability, and lack of standardization. There are some technological challenges and limitation for mobile learning, lack of standards is one of them (Grohmann et al., 2005). Georgiev et al. (2006), also examine the technological challenges of transition from e-learning to m-learning in their study in terms of student, educators and developers. According to them, challenges are for developers:

- *less memory, less computing power, smaller screen size, absence (in most cases) of keyboard, etc.*
- *need to know very well all the abilities and downfalls of the particular mobile devices and communication technologies to successfully design and develop a mobile learning system.*

for educators:

- *need to know very well how to operate mobile devices,*
- *need to know what to require from the developers,*
- *need to know what the limits and abilities of such systems are,*
- *need to be also fluent with the modern communications devices used by their students.*

for students:

the different features of mobile devices compared to the personal computers

Mekuria (2009), studied on sustainability factors in mobile broadband technology and services. Some following questions are handled with the study: (1) Which technology is suitable for designing, activating and affordable delivery of relevant mobile broadband services? (2) Which technology provides easy to tools and protocols to create local mobile content and integrate it to the global web knowledge through mobile IP technologies? (3) Which technology has support to alternative energy usage and provides low power network topologies? (4) What is the contribution of such a technology deployment for the long term mobile-ICT development initiative and digital inclusion? (5) Which technology can give the needed spinoff and employment creation through mobile local content and service provision for social and economic development? (6) Which technology and/or combination of technologies, has the inherent capacity for long term industry support and sustainable service provision. (7) Which technology can provide the maximum spectral efficiency for a given licensed frequency area, by a network operator.

THEORETICAL FRAMEWORK AND HYPOTHESES

The sustainability items based on the factors in literature are combined with the items which are obtained from interviews and the factor analyses were applied to the sustainability items in order to group the items under some factors which will be the independent variables (Table 1).

Table 1 Literature-based and Interview-based M-Learning Sustainability Factors

Technological sustainability items of m-learning	**Technological sustainability factors of m-learning**
system security	Adequacy of Infrastructure & Standards
connectivity	
accessibility	
interoperability	
modularity	
memory adequacy*	

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quality standards	Evaluation and Improvements of Infrastructure & Standards
requirement specification	
expansion and upgrade	
maintenance	
testing	
availability of support for system use*	Technical Support for Staff, Instructor and Users
availability of support for connection problems*	
accessibility of support	
effectiveness of support	

*Interview-based sustainability items

After the factor analysis, a theoretical framework was developed to guide the study (Figure 1).



Figure 1 Theoretical Framework

The following hypotheses were established for this study:

H_1: Adequacy of infrastructure and standards will be associated with perceived general technological m-learning sustainability.

H_2: Evaluation and improvements of infrastructure and standards will be associated with perceived general technological m-learning sustainability.

H_3: Technical support for staff, instructors and users will be associated with perceived general technological m-learning sustainability.

H_4: Perceived general technological m-learning sustainability will be associated with perceived general m-learning sustainability.

METHODOLOGY

In this study, the literature was reviewed about current sustainability factors and an investigation was made in order to obtain additional sustainability factors from experts. A formal interview which consists of six predetermined and standardized questions, and comment area conducted with 11 heads or system staffs in distance education centers of universities.

Then, factor analysis was applied to group the items handled from both literature and interview. The items are collected under the titles: “Adequacy of Infrastructure & Standards”, “Evaluation and Improvements of I&S” and “Technical Support for Staff, Instructors and Users”.

In order to obtain data to understand the effects of these factors on technological m-learning sustainability, survey research conducted with system and support staff at distance education centers of universities. First part of the survey includes descriptive items like age and working year in m-learning environment. Another item is for understanding the accessibility to learning system from mobile devices. The second part of the form includes 15 Likert scale items for technological factors, 1 Likert scale item for general technological sustainability and 5 Likert scale items based on the definition of m-learning sustainability in recent study (Coskun-Setirek & Tanrikulu, 2015) for general m-learning sustainability. Totally 75 completed survey forms has been collected and analyzed for understanding the research questions.

RESULTS AND DISCUSSION

As a result of data collection process for technological sustainability issues, 75 valid responses have been collected. For the analyses of the data, descriptive analyses, reliability analyses, factor analyses, multiple regression analyses and linear regression analysis techniques were respectively used.

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Descriptive Analysis

In descriptive analysis, age and working year of staffs in mobile learning are analyzed. As shown in Table 2, 52% of the respondents of the survey part about technological issues are 20-30 years old and percentages of respondents whose m-learning experience more than 3 years is 44.

Table 2 Demographic Profile of Respondents

Age		<20	20-30	30-40	40-50	50>	Total
	Frequency	2	39	19	9	6	75
	Percent	2.7	52	25.3	12	8	100
Experience		<1	1-3 year(s)	3-5 years	5>		Total
	Frequency	15	27	18	15		75
	Percent	20.0	36.0	24.0	20.0		100.0

When the mean values of the issues are examined, it can be seen that all of them higher than the average value 3 (shown in Table 3). Each issue has value more than 3.5 except the quality standards with 3.41 mean values. The issues quality standards, requirement specification, expansion and upgrade, and maintenance have low mean values so these issues should be solved to increase the technological sustainability of that aspect. The higher mean values belong to accessibility, interoperability, connectivity, and availability of system use support issues. On the other hand, the value of perceived technological m-learning sustainability, 3.69, is higher than the value of perceived general m-learning sustainability, 3.44. It can be said that technological sustainability is in better condition than other dimension of m-learning.

Table 3 Descriptive Statistics of Variables

Technological Issues	N	Mean
system security	75	3.68
connectivity	75	3.84
accessibility	75	4.19
interoperability	75	3.89
modularity	75	3.63
memory adequacy	75	3.80
quality standards	75	3.41
requirement specification	75	3.53
expansion and upgrade	75	3.55
maintenance	75	3.57
testing	75	3.64
availability of system use support	75	3.88
availability of support for connection problems	75	3.60
accessibility of supports	75	3.68
effectiveness of support	75	3.80
Perceived General Technological M-learning Sustainability	75	3.69
Perceived General M-learning Sustainability	75	3.44

Reliability Analysis

Cronbach's Alpha analysis was used for finding the reliability values of each variable. According to Cronbach's Alpha analysis, as shown by Table 4, the overall value of Cronbach's Alpha was found as .925. According to Kline (2013), the reliability of the scale is quite high since it is more than .9.

Table 4 Reliability Statistics

Cronbach's Alpha	N of Items
.925	21

Factor Analysis

In this section, Exploratory Factor Analysis is used to classify the 15 sustainability aspects into certain groups. The reliability of the scale is high with the .925 Cronbach's alpha value. On the other hand, the subjects-to-

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variables ratio should be at least 5 and preferably 10 (Everitt, 1975). Corresponding ratio for this study is 6 and sample size is adequate for the analysis. When we took a rule of thumb into consideration, sample is found to be highly adequate for factor analysis with the .818 Kaiser-Meyer-Olkin Measure value (Table 5) because it is greater than .50 (a rule of thumb). In addition, the significance level of Barlett's Test (.000 as seen in Table 5) is below .001 therefore it is indicating sufficiently large correlations for principal component extraction and this test showed that the data is suitable for analysis.

Table 5 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.818
Bartlett's Test of Sphericity	Approx. Chi-Square	558.546
	df	105
	Sig.	.000

The Total Variance Explained table (Table 6) shows that 62.157% of the total variance is explained by classifying these 15 aspects into 3 components. Below 50% is interpreted as unsatisfactory by many researchers and 60% or more is preferred as a rule of thumb.

Table 6 Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.306	42.041	42.041	6.306	42.041	42.041	3.473	23.153	23.153
2	1.633	10.884	52.924	1.633	10.884	52.924	2.995	19.966	43.119
3	1.385	9.233	62.157	1.385	9.233	62.157	2.856	19.039	62.157
4	1.072	7.144	69.302						
5	.837	5.578	74.880						
6	.677	4.512	79.392						
7	.582	3.882	83.274						
8	.526	3.505	86.778						
9	.384	2.559	89.338						
10	.358	2.384	91.721						
11	.350	2.334	94.055						
12	.289	1.925	95.980						
13	.262	1.748	97.728						
14	.189	1.260	98.989						
15	.152	1.011	100.000						

With the Rotated Component Matrix, it can be determined which variables load together under which factor. According to the Rotated Component Matrix (Table 7), 15 aspects were classified into 3 components as specified in theoretical framework of the study. The first group under component 2 was named as "Adequacy of Infrastructure & Standards". The second group under first component was named as "Evaluation and Improvements of Infrastructure & Standards". The last group under component 3 was named as "Technical Support for Staff, Instructors & Users".

Table 7 Rotated Component Matrix

Technological Items	Component		
	1	2	3
system security	.401	.447	.285
connectivity	.429	.578	.206
accessibility	.397	.602	.180
interoperability	.331	.620	.219
modularity	.061	.827	.016
memory adequacy	.025	.817	.214
quality standards	.673	.398	.000

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requirement specification	.770	.068	.230
expansion and upgrade	.732	.107	.268
maintenance	.796	.196	.164
testing	.631	.207	.265
availability of system use support	.291	.087	.771
availability of support for connection problems	.341	.142	.781
accessibility of supports	.037	.203	.800
effectiveness of support	.199	.193	.735

As a result of the factor analysis, the items and the variables of the study are figured out in Figure 2.

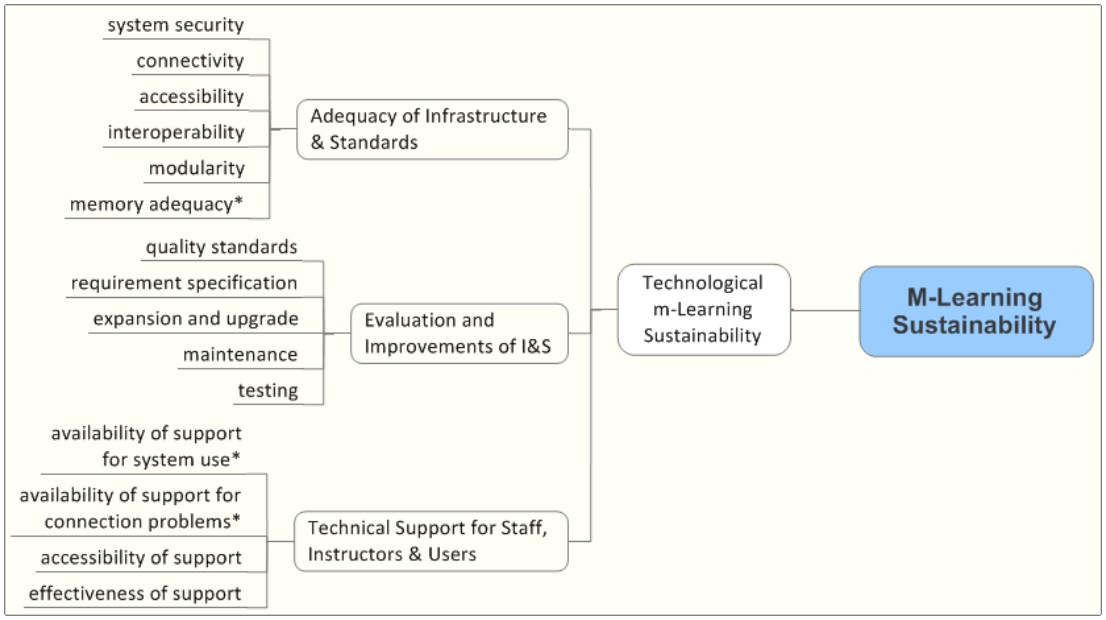

Figure 2 Technological Sustainability Items and Variables

Regression Analyses

For testing hypotheses 1, 2 and 3, a multiple regression analysis was constructed. The three influential variables "adequacy of infrastructure & standards", "evaluation and improvements of infrastructure and standards", and "technical support for staff, instructors and users" were used as independent variables, while perceived general technological m-learning sustainability was used as a dependent variable. The ANOVA table (Table 8) shows that F value of 30.116 having a significance level of 0.000 and the significance value is less than .05.

Table 8 ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	22.368	3	7.456	30.116	.000[a]
	Residual	17.578	71	.248		
	Total	39.947	74			

As seen in Table 9, the adjusted R^2 is .541 and .541 of the variance in the dependent variable is explained by the independent variables. Durbin-Watson value shows that there is 2.001 auto-correlation between the independent variables and it is between desired range of 1.5-2.5. So we can examine the hypotheses and coefficients.

Table 9 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.748[a]	.560	.541	.498	2.011

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a. Predictors: (Constant), adequacy of infrastructure & standards, evaluation and improvements of infrastructure and standards, and technical support for staff, instructors and users

b. Dependent Variable: perceived general technological m-learning sustainability

The results of regression analysis are presented in Coefficient table (Table 10). It shows that P-values of three independent variables are less than .05 and they are considered to have meaningful relationships with perceived general technological m-learning sustainability. Those factors are memory adequacy, investment, expansion and upgrade, and cost effectiveness. Therefore, all variables contribute significantly to the regression equation and hypotheses 1, 2 and 3 are supported by this test. The regression equation is specified as follows: PGTS = .651 + .364 X_1 + .256 X_2 + .272 X_3

Table 10 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.651	.326		1.998	.050
	adequacy of infrastructure & standards (X_1)	.364	.090	.367	4.064	.000
	evaluation and improvements of infrastructure & standards (X_2)	.256	.088	.271	2.907	.005
	technical support for staff, instructors and users (X_3)	.272	.083	.305	3.261	.002

a. Dependent Variable: Perceived General Technological M-learning Sustainability (PGTS)

For testing hypotheses 4, a linear regression analysis was used. The perceived general technological m-learning sustainability was used as independent variable, while perceived general m-learning sustainability was used as a dependent variable. As shown in ANOVA table (Table 11), F value is 76.475 and it has a significance level of 0.000 which is less than .05.

Table 11 ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25.827	1	25.827	76.475	.000[a]
	Residual	24.653	73	.338		
	Total	50.480	74			

a. Predictors: (Constant), Perceived General Technological M-learning Sustainability

b. Dependent Variable: Perceived General M-learning Sustainability

As seen in Table 12, R Square is .512 and the adjusted R^2 is .505 and independent variable explains .505 of the variance in the dependent variable. Durbin-Watson value shows that there is 1.769 auto-correlation between the independent variable and the dependent variable, and it is between desired range of 1.5-2.5. Therefore, the hypotheses and coefficients are can be examined.

Table 12 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.715[a]	.512	.505	.5811326	1.769

a. Predictors: (Constant), Perceived General Technological M-learning Sustainability

b. Dependent Variable: Perceived General M-learning Sustainability

Coefficients table (Table 13) presents the results of regression analysis of the Hypothesis 4. It shows that the P-value is less than .05 and there is a meaningful relationship between the perceived general technological m-learning sustainability perceived and the general technological m-learning sustainability. Therefore hypothesis 4 was also supported by the linear regression test.

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Table 13 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.470	.346		1.359	.178
	Perceived General Technological M-learning Sustainability	.804	.092	.715	8.745	.000

a. Dependent Variable: Perceived General M-learning Sustainability

The result of regression analyses were given in Table 16. All three issues which are adequacy of infrastructure & standards, evaluation and improvements of infrastructure & standards, and technical support for staff, instructors and users are considered to have meaningful relationships with the technological m-learning sustainability. In addition, there is a meaningful relationship between perceived general technological m-learning sustainability and perceived general technological m-learning sustainability.

Table 14 Result of Regression Analyses

Hypothesis	Factors	Coefficients			
		Beta	t	Sig.	Significant
	TECHNOLOGICAL M-LEARNING SUSTAINABILITY				
1	Adequacy of Infrastructure & Standards	.367	4.064	.000	Yes
2	Evaluation and Improvements of I&S	.271	2.907	.005	Yes
3	Technical Support for Staff, Instructors & Users	.305	3.261	.002	Yes
4	Perceived General Technological M-Learning Sustainability	.715	8.745	.000	Yes

*Significance at .1 levels.

The model for technological sustainability was developed after the analyses (as presented in Figure 3).



Figure 3 The Final Model for M-learning Sustainability

CONCLUSION

In this study, the aims are specifying the current situation of m-learning and identifying factors affect technological sustainability of m-learning.

The descriptive analysis inform about the current situation of the sustainability of m-learning at universities in Turkey. It is observed that quality standards, requirement specification, expansion and upgrade, and maintenance issues have minimum mean values so these issues should improve to increase the technological and general sustainability of that aspect. The maximum mean value belongs to accessibility, interoperability, connectivity, and availability of system use support issues. On the other hand, the value of perceived technological m-learning sustainability, 3.69, is higher than the value of perceived general m-learning sustainability, 3.44. Therefore, it can be said that technological sustainability is in better condition than other dimension of m-learning.

The result of regression analyses show that all three issues which are adequacy of infrastructure & standards, evaluation and improvements of infrastructure & standards, and technical support for staff, instructors and users are related with perceived general technological m-learning sustainability. Moreover, there is a meaningful relationship between perceived general technological m-learning sustainability and perceived general technological m-learning sustainability. Therefore all hypotheses 1, 2, 3, 4 were supported.

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The limitation of this study is that the investigation is geographically limited to Turkey. As a recommendation for future research, other dimension of the m-learning sustainability such as pedagogical, managerial, economical, psychological sustainability, etc. can be studied.

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TECHNOLOGY FOR PLANETARY SCIENCE AND EDUCATION

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This paper gives an overview of web-based visualization and data analysis technologies developed for planetary science and education showcasing large volume of remote sensing data collected by the National Aeronautics and Space Administration (NASA). NASA and other space agencies play an essential role in technology development and science education. The remarkable science discoveries, knowledge, and research are shared with audiences through a variety of technologies that contributes to improving teaching and learning, as well as enriching Science, Technology, Engineering and Math (STEM) efforts.

Keywords: Web-based Portal, Visualization, Data Analysis, Planetary Science, Technology, Education

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TESTS TO INCREASE RETENTION IN FIR WOOD

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Abstract: Wood material is a material which uses in almost every area of daily life of mankind, building materials, decoration, landscape studies until even from the cradle to the grave material. Exposed to especially outside weather conditions, despite the fact that in places that are naturally resistant to harmful biotic our species, according to impregnated in this un-impregnated materials the useful life is less than 70-80%. Especially in fast-growing trees that are commercial value, in large distribution area and outdoor use is inevitable application by impregnation. In impregnation power types like spruce and fir, to increase retention amount, -190 °C liquid nitrogen with treatment wood material and then applying pressure impregnation with impregnating increase significantly retention amount.

Keywords: Retention, fir wood, liquid nitrogen

Introduction

In the World and Turkey is rapidly declining forests and therefore become very important to using as efficient and durable of wood materials. One of the most important methods of use as the longevity of the wood is impregnated. Although natural resistance high tree species can survive over many areas of usage for many years, this period differ from in each environment and each tree species.

Impregnated wood materials are resistant to biotic and abiotic harmful, it is also an important building material for economic and aesthetic appearance. In the worldwide, Telecommunication poles, railway sleepers, cooling towers, supports poles, woodwork and exterior siding, roofing, fence posts, greenhouse equipment, sound barriers, highway guardrail, packaging containers, wood materials used in balconies and terraces, garage, city and garden the use of a water soluble preservative place of use such as editing has increased greatly in recent years. Impregnated wood materials with water-soluble wood preservatives are usually not a problem odor, after the impregnation process can be applied to surface treatments of wood materials and the use and handling are included in a more secure material (Kartal, 1998).

For the protection of the wood materials being tested various substances since 2000 years. In this regard, animal, vegetable and mineral oils are utilized. With the beginning of industrialization in Europe, the use of chemicals to protect the wood material has emerged. The results of the research, more than 250 were impregnated material for today. All wood preservatives must be the effect of reducing the surface tension of the wood, holder of the wood fibers feature and deeper penetrate (Bozkurt, 1993).

All tree species are not possible as equal to impregnate. Sometimes, the impregnates are able to penetrate deep in tree species, but it is difficult to penetrate some species (Bozkurt, 1993).

During the impregnation of the wood material occur two physical problems, how to get the air of jamming in the wood cells and how will flow in the cell fluids. In the Impregnations main flow way of Coniferous trees are the tracheids of tracheids and with the aid of bordered pits (Kurt, 2006). The bordered pits play a significant role in penetration into wood materials of impregnates in the coniferous trees (Wardrop, 1961).

Slahor et al., (1997) they conducted by poplar and maple extract on wood, ACQ-B impregnation with the impregnation process, effects on retention amount and penetration of impregnating agent temperature were investigated. According to result, it is determined that the penetration increase significant in statistical terms with rise from 80 °F to 180 °F of ACQ-B temperature.

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The purpose of the study, to increase the retention preservatives of some tree species of our country grows and difficult impregnated; before impregnation, in the bordered pit areas expand openings with liquid nitrogen treatment and this method increase amount of the preservatives by more infecting in the wood material.

Materials and Methods
Materials

Fir (*Abies Nordmanniana*) wood was chosen randomly from timber suppliers of Karabuk, Turkey. A special emphasis was put on the selection of the wood material. Accordingly, non-deficient, whole, knotless, normally grown (without zone line, reaction wood, decay, insect or fungal infection) wood materials were selected. As impregnation material was used Tanalith-E.

Methods

Preparation of Experimental Samples

Fir (*Abies Nordmanniana*) wood impregnation was performed according to method full-cell (Bethell) and with ASTM D 1413-07 (2007) standards. 12 % moisture wood samples were put into the impregnation boiler and were pre-vacuum process for a period 60 minutes to 760 mm Hg levels. Liquid nitrogen was added into the boiler and was applied for 30 minutes. In result of this process, prepared impregnation solution was transferred to the boiler and was applied 5 to 6 bar pressure for 60 minutes. After pressure period given the end of the impregnation, it was withdrawn from the boiler to impregnation solution and final vacuum were applied.

The amount ratio of retention *(R,* %) was calculated as follows:

$$R(\%) = \frac{Mdi - Md}{Md} \cdot 100 \qquad (1)$$

R (%) is *Mdi* is the dry mass after impregnation (kg), *Md* is the dry mass before impregnation (kg).

Mechanical Properties

Perpendicular to the fibers bending resistance experiments were performed according to TS 2474 (1976). Bending modulus of elasticity was determined as the TS 2478 (1976). The test samples were prepared as 20x20x320 ± 1 mm.

Results and Discussion

According to the results of retention (Table 1), the highest amount ratio of retention was found in samples exposed to liquid nitrogen in 30 minutes prior to impregnation.

Table 1: The amount ratio of retention in the samples unapplied and applied liquid nitrogen.

Groups	% Retention
Control	2.55 (1.22)[a]
Liquid Nitrogen applied	7.4 (2.16)

[a]The values in parentheses are standard deviation.

To undergo aspiration of the stiffer bordered pit is required larger strength (Comstock, 1968). Due to wood material change in the anatomic structure (bordered pit and cell wall) by treating with liquid nitrogen -196 °C (Physically expands in the volume of the frozen liquids) prior to impregnation, it has significantly increased preservative penetration.

The results of bending strength and bending modulus of elasticity are given in Table 2.

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Table 2: The results of bending strength and bending modulus of elasticity in the samples unapplied and applied liquid nitrogen.

Groups	Bending strength (N/mm^2)	Bending modulus of elasticity (N/mm^2)
Control	57.05 (3.44)[a]	4850 (848.53)
Liquid Nitrogen applied	55.44 (7.85)	4070 (1261.11)

[a]The values in parentheses are standard deviation.

According to the results of bending strength found 57.05 N/mm^2 for control samples and 55.44 N/mm^2 for Liquid Nitrogen applied samples and also, the results of bending modulus of elasticity found 4850 N/mm^2 for control samples and 4070 N/mm^2 for Liquid Nitrogen applied samples. It observed to not be statistically significant in samples exposed to liquid nitrogen in 30 minutes prior to impregnation.

Conclusion

In this study, the fir from difficult impregnated wood species was significantly increased in the amount of retention with liquid nitrogen treatment. With the less valuable wood species of difficult impregnated increase in the amount of preservative penetration, it may be used without reduction in mechanical properties against biotic factors in the areas at risk and also, physical life will be more than.

As a result,

1. The amount of retention increase 290 % liquid nitrogen applied samples compared to the control samples.

2. The bending strength and elasticity modulus of bending observe no statistical difference liquid nitrogen applied samples compared to the control samples.

3. The less valuable wood species of difficult impregnated will increase in the amount of retention and, sustainability and preservability of forests will be provided all over the world.

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THE CHARACTERISATION OF BIMETAL DISKS USED FOR THERMOSTATIC CONTROL AND OVER-TEMPERATURE PROTECTION

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Abstract: In this study, the two-layer bimetal disks used for thermostatic control and over-temperature protection were investigated for the effects of the shaping procedure and heat treatments on the instantaneous specific deflection of the temperature range.

A parametric study was carried out in which several mechanical disc shaping procedure and several heat treatments on differences in accuracy of switching temperatures were considered. As a result of this study, a simple thermo-mechanical shaping procedure was discovered for the accuracy of specific working temperature range. Also digital switching action was obtained for transducer used for thermostatic control and over-temperature protection.

Keywords: Bimetal, Thermostatic Bimetal, Thermostatic Control, Instantaneous Specific Deflection, Thermo-Mechanical Shaping.

Introduction

Thermostatic Bimetal is a composite material, made up of two or more metallic layers having different coefficients of expansion. When permanently bonded together, these layers cause the material to change its curvature when subjected to a change in temperature (Khadkikar 1993). This change of curvature, or bending, in response to temperature change, (flexivity), is a fundamental property of all Thermostatic Bimetals (Freyang 1996)

Thermostatic bimetal components both simple and complex are at the heart of numerous measuring instruments, regulation systems and safety devices. In heating and sanitary equipment, in electrical engineering systems and domestic appliances, in motor protectors, automobile fan controls, and as temperature compensators in television sets, and wherever a device must react to changes in temperature (Kantal 2008).

The uses of thermostatic bimetal components fall into four general classifications as follows (Howard 1942):

- Temperature Indication
- Temperature Control
- Control of function with temperature change over a range of temperature
- Control of function by auxiliary heating of the bimetal

The shapes of bimetallic elements vary depending on the application and include beams, disks, spiral helices, and U-shaped elements. Straight strips are the commonest form of bimetals, being the simplest and cheapest. When the available space is limited, a U shape can be employed. Spiral and helical bimetals convert temperature changes into a rotational movement or torque when the displacement is impeded. A spiral shape enables a large length of bimetal to be incorporated into a small volume, producing high sensitivity, limited only by strength considerations beyond a certain length. Bimetallic discs (shallow shells) reverse suddenly at a critical temperature which depends on the grade of bimetal employed and the geometry. They are used in numerous regulation devices and protection systems (Ziga 2013).

Thin and shallow bimetallic shells with suitable material and geometric properties have the characteristic of snapping-through into a new equilibrium position at a certain temperature. The result of such a fast snap-through of a bimetallic shell, acting as a switching element in a thermal switch, is the instantaneous shutdown of electric power and the machine (Henry 1972) The snap-through of the bimetallic shell is a dynamic occurrence that lasts a very short time and as such prevents the damaging sparking and melting of electric contacts and extends the life time of the thermal switch (Jakomin 2011)

A thermostatic bimetal shallow shells are constructed from a laminated composite of metals with different thermal expansion coefficients. They deform with changes in temperature (Kosel 2007). At least one bimetallic shallow shell is used in each device; however, there are some controls that use three of them. The bimetallic shallow shell

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performs a snap action at defined temperatures and produces enough force to open or close electrical contacts. The temperature at which a bimetallic shallow shell "snaps through" on heating is called the "break temperature" and the temperature at which it "snaps back" on cooling is called "remake temperature".

Bimetallic shallow shells have been developed by purely empirical means. A great deal of experimentation has been carried out over the past decade to improve performance, and the improvements have been remarkable (Batista 2007).

It has been said that "Bimetallic shallow shells lend themselves poorly to calculation. They are designed empirically, based largely on experience. More than any other form of bimetal, they require starting materials whose physical and mechanical properties are precise and uniform, with small thickness variations, and excellent surface quality and flatness" (Trostel 1996).

At low temperatures, bimetallic shallow shells have a concave shape which then snaps to a convex shape at high great enough to activate a switch or make an electrical contact mechanically. As is common in discontinuous phase changes, shallow shells show considerable hysteresis behaviour (Figure 1). With adequate materials and correct shaping, the lower and upper snap temperatures, TLS and TUS, respectively, can be adjusted within a wide range.

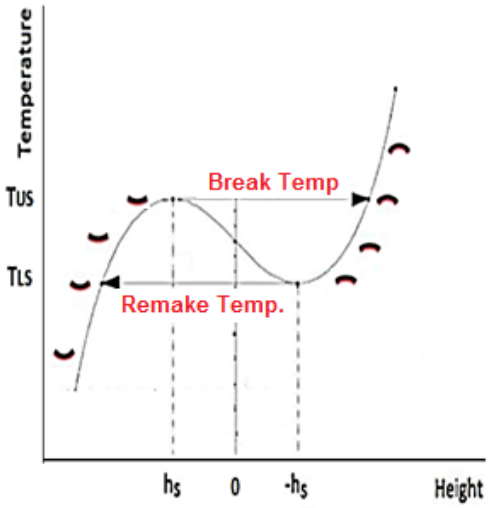

Figure 1. Qualitative characteristic of thermo-bimetal-snap disc.
The active steel layer is black and the passive invar layer is red (Ziga 2013)

The performance characteristics of the snap action disc are determined by a number of variables. These can be broadly classified into two groups: geometry and material variables. In order to optimise bimetallic shallow shell performance, it is necessary to define and understand these variables and identify the relative importance of each variable. Bimetallic shallow shell characteristics and variables are very specific, so the data about them cannot be easily found in literature. So, the effects of the shaping procedure and heat treatments of snap action disc on the instantaneous specific deflection of the temperature range will be investigated in this study.

Materials and Methods

In this study, manufacturing and calibration studies of the transducer using to control automotive engine temperature range to run on 86-94°C were performed. For this purpose, the test unit shown in Figure 2, was carried out design and production. The test unit is designed to simultaneously perform the control of 10 transducers and continuous stirring was applied to homogenize the oil temperature. At the same time the oil temperature is kept under control in the middle level of the oil in the tank by a precision thermometer.

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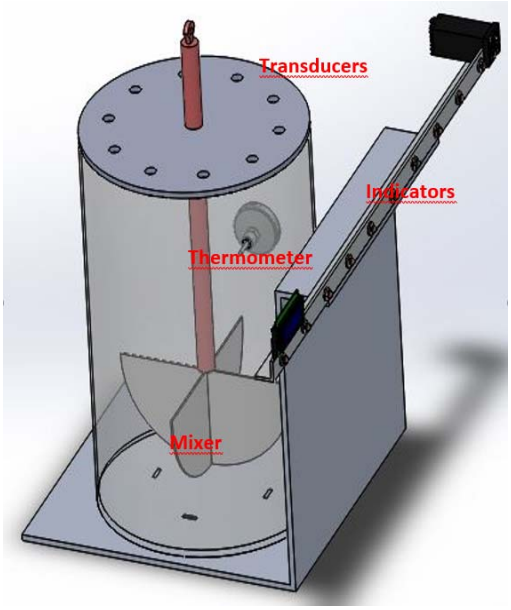

Figure 2. Test unit used in experimental studies.

A commercial bimetal strip was used for the manufacture of transducers. General properties of bimetal strip were given Table 1. The strip of bimetal material has a 0.2 mm thick and 25 mm wide was die cutted primarily in the form of a disk has a diameter 12.7 mm. Then, a hole has a diameter of 2 mm was die cutted to make it suitable for installation in disk from the centre as shown in Figure 3.

Table 1. The general properties of bimetal strip, used for manufacturing transducers

ASTM Type	TM2
High Expansion Alloy	Alloy P (72%Mn, 18%Cu, 10% Ni)
Low Expansion Alloy	Alloy 10 (36%Ni, Balance Fe)
Thickness	0,20 mm
Density	7.61 g/cm^3
Useful Deflection Temperature Range	-70 - 260 °C
Recommended Max. Temperature	430 °C
Specific Curvature (10-93°C)	39.1 x10^{-6} (mm/mm)/°C (Tolerance ±4%)
Specific Deflection	20.6 x10^{-6} (mm/mm)/ºC

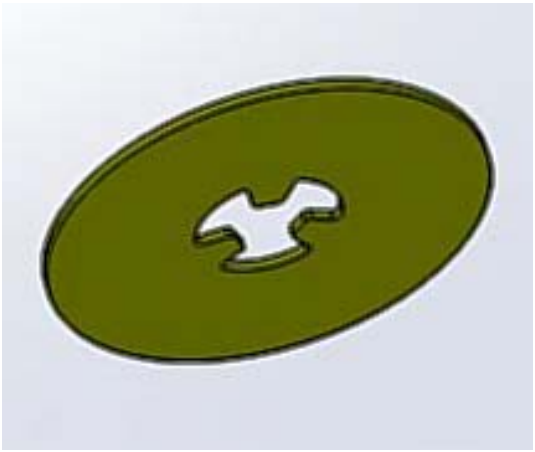

Figure 3. The schematic of the bimetal disc was die cutted for transducers

The parts of the engine temperature transducer (Figure 4a) and mounted transducers are shown in Figure 4b. The test unit was calibrated for the desired temperature range. The average values of every 10 measurements obtained from each transducer.

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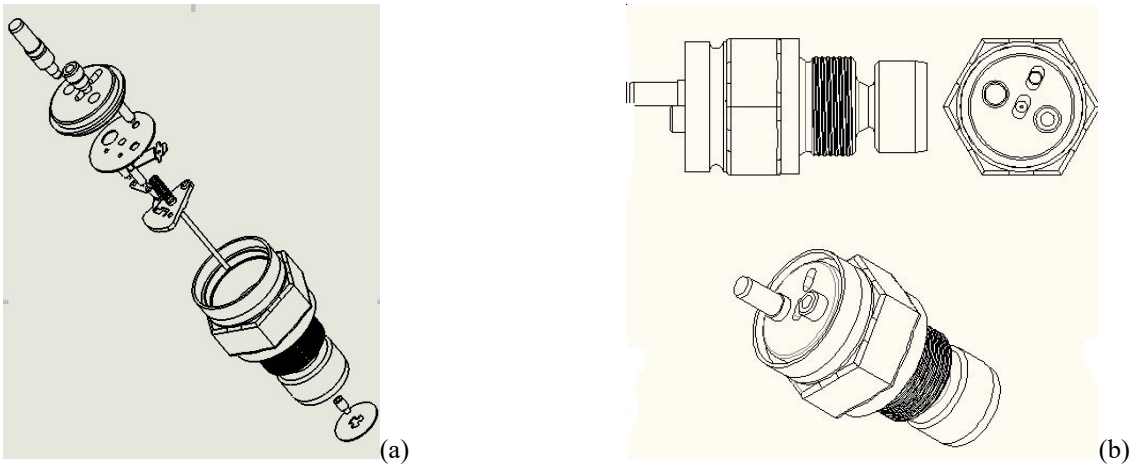

(a) (b)

Figure 4. The schematic of engine's temperature transducer used for experimental studies
a) The parts of transducer **b)** Mounted transducers

Results and Discussion

The performance of a particular bimetallic shallow shell can be summarized by the following process and material characteristics (Ziga 2013):

- Break temperature
- Remake temperature
- Force produced on snap through
- Shells life
- Temperature spread
- Specific thermal curvature of shell material

The break temperature (**The Upper Snap Temperature)** is the temperature at which a bimetallic shallow shell snaps from a concave to convex shape while being heated.

The remake temperature (**The Lower Snap Temperature)** is the temperature at which a bimetallic shallow shell snaps back from convex (broken shape) to concave shape while the blade is being cooled (Figure1). The difference between the break and the remake temperature is known as the "differential"

The test results of commercial bimetal strip used in transducers, the lower and upper snap temperatures, TLS and TUS, respectively, were given Table 2.

Table 2. Test results obtained from flat bimetal discs

Transducer	The Lower Snap Temperature (T_{LS}) (86±1ºC)	The Upper Snap Temperature (T_{US}) (94±1ºC)
S101	84.0	89.0
S102	83.0	88.9
S103	78.6	92.0
S104	84.0	90.0
S105	83.0	91.0
S106	87.0	98.5
S107	78.7	97.2
S108	92.8	95.4
S109	86.0	91.0
S110	86.0	98.0

Due to lack of the desired range of test results for the upper snap temperature and the most of the results are out of tolerance limit for the lower snap temperature, it was decided to form bimetal disc a shallow shell given in Figure 5. For this purpose, the bimetallic discs were loaded by a 3 MPa bending stress within 3 s to achieve desired shape has 0.50 mm height and 5º bending curvature.

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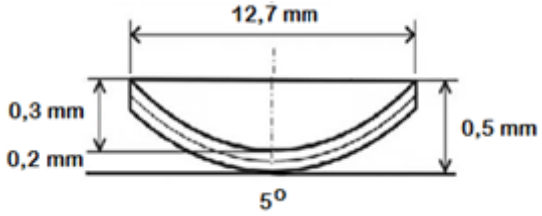

Figure 5. The schematic of the mechanically shaped bimetal shallow shell

After installation of transducers made of this shaped bimetal shallow shell were experimented in test unit. Obtained test result can be seen in Table 3.

Table 3. Test results obtained from pre-shaped bimetal shallow shell

Transducer	The Lower Snap Temperature (T_{LS}) (86±1°C)	The Upper Snap Temperature (T_{US}) (94±1°C)
S201	86.7	98.2
S202	87.6	91.5
S203	87.9	94.7
S204	87.5	91.0
S205	81.3	95.2
S206	82.0	95.4
S207	92.0	94.5
S208	89.5	89.6
S209	86.5	97.8
S210	85.6	93.5

Again because of the experimental results are not within the range to satisfy, it was decided to perform thermo-mechanical treatments to bimetal shallow shells. For this purpose, preformed discs heated to 350°C in a furnace then cooled in a stagnant air. After installation of transducers made of this shaped bimetal shallow shell were experimented in test unit. Obtained test result can be seen in Table 4.

Table 4. Test results obtained from preformed discs heated to 350°C in a furnace then cooled in a stagnant air.

Transducer	The Lower Snap Temperature (T_{LS}) (86±1°C)	The Upper Snap Temperature (T_{US}) (94±1°C)
S301	86.7	98.3
S302	88.0	92.0
S303	88.0	94.2
S304	87.3	91.5
S305	87.0	96.3
S306	82.4	96.3
S307	88.6	93.5
S308	86.7	90.0
S309	86.1	94.7
S310	86.2	94.9

Most of the experimental results are not within the tolerance limit, it was decided modify thermo-mechanical treatments. Firstly, preformed discs were heated to 350°C in a furnace then cooled immediately to -30°C. Then, discs were heated to 160°C in a furnace then cooled immediately to -30°C. This process was repeated 3 times. Obtained test result, after installation of transducers made of this shaped bimetal shallow shell were experimented in test unit, can be seen in Table 5.

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Table 5. Test results obtained from the preformed discs were heated to 350°C in a furnace then cooled immediately to -30°C. Then, discs were heated to 160°C in a furnace then cooled immediately to -30°C. (Repeated 3 times)

Transducer	The Lower Snap Temperature (T_{LS}) (86±1°C)	The Upper Snap Temperature (T_{US}) (94±1°C)
S401	84.6	97.1
S402	88.7	95.0
S403	87.6	91.3
S404	86.9	92.7
S405	84.3	93.2
S406	87.6	90.3
S407	86.7	89.8
S408	87.4	97.2
S409	85.6	95.0
S410	86.5	92.8

Again these experimental results are not within the range to satisfy, it was concluded that the angle of curvature on the bimetal disc is insufficient. To increase bending curvature and achieve the shape has 0.60 mm height, the bimetallic discs were loaded by a 3 MPa bending stress within 3 s (Figure 6).

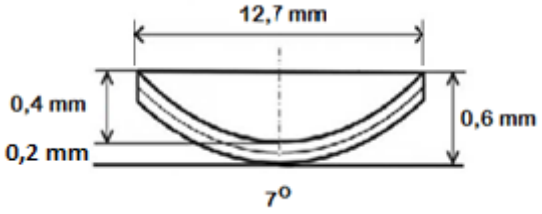

Figure 6. The schematic of the mechanically shaped bimetal shallow shell

After mechanical shaping, discs were heated to 350°C in a furnace then cooled immediately to -30°C. Then, discs were heated to 160°C in a furnace then cooled immediately to -30°C. This process was repeated 3 times. Obtained test result, after installation of transducers made of this shaped bimetal shallow shell were experimented in test unit, can be seen in Table 6.

Table 6. Test results obtained from the discs have 0.60 mm height and were heated to 350°C in a furnace then cooled immediately to -30°C. Then, discs were heated to 160°C in a furnace then cooled immediately to -30°C. (Repeated 3 times)

Transducer	The Lower Snap Temperature (T_{LS}) (86±1°C)		The Upper Snap Temperature (T_{US}) (94±1°C)	
	#10 repetitions	#50 repetitions	#10 repetitions	#50 repetitions
S501	86.0	85.1	94.0	93.5
S502	86.0	86.2	94.0	95.3
S503	86.0	86.7	94.0	94.0
S504	86.0	86.0	94.0	95.0
S505	86.0	87.1	94.0	93.6
S506	86.0	85.9	94.0	95.3
S507	86.0	87.1	94.0	93.6
S508	86.0	86.3	94.0	94.0
S509	86.0	86.0	94.0	94.5
S510	86.0	86.1	94.0	94.8

All transducers work at unique snap temperature. But as repetitions increase deflections from snap temperature increase. The life time of bimetallic shallow shells depends on repeatability and fatigue failure. The repeatability of bimetallic shallow shell performance characteristics under cyclic condition are of vital importance. If some significant deviation of any of these characteristics occur then appliances may not operate safely. After a sufficient number of cycles, bimetallic shallow shells will eventually fail due to fatigue. Premature failure of a bimetallic shallow shell could result in an unsafe appliance. Functional tests on controls and appliances are carried out as a matter of course to ensure the bimetallic shallow shells have sufficient fatigue life. These tests are also required to obtain necessary safety approvals for both controls and appliances.

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In order to accurate exact snap temperature action for 100 recapitulate without any fatigue deflection, we decided to perform mechanical shaping process is repeated twice then the details of heat treatment mentioned above was applied. Obtained test result can be seen in Table 7.

Table 7. Test results obtained from the sample discs shaped twice by mechanically shaping process and heat treated by above procedure

Transducer	The Lower Snap Temperature (T_{LS}) (86±1°C)		The Upper Snap Temperature (T_{US}) (94±1°C)	
	#10 repetitions	#100 repetitions	#10 repetitions	#100 repetitions
S601	86.0	86.0	94.0	94.0
S602	86.0	86.0	94.0	94.0
S603	86.0	86.0	94.0	94.0
S604	86.0	86.0	94.0	94.0
S605	86.0	86.0	94.0	94.0
S606	86.0	86.0	94.0	94.0
S607	86.0	86.0	94.0	94.0
S608	86.0	86.0	94.0	94.0
S609	86.0	86.0	94.0	94.0
S610	86.0	86.0	94.0	94.0

Even after 100 repetitions no fatigue deflection was observed at any transducers. So we assured the digital behaviour for exact snap temperature and for all transducers.

Conclusion

The unique property of flexivity that characterizes thermostatic bimetals allows these materials not only to sense the temperature but also to control it by making or breaking an electrical circuit. Although the design of a thermostatic bimetal primarily depends upon the expansion characteristics of the components, resistivity is also critical in some applications. In addition, the strength and fatigue properties, interface integrity, and residual stresses play a major role in determining the behaviour of thermostatic bimetal elements.

The characteristic properties of transducers using thermostatic bimetal materials depend of mechanical shaping and heat treatments as well as materials properties. In this study, the digital switching action behaviour for exact snap temperature were assured by way of residual stress control with the application of unique mechanical shaping process and thermal treatment to stabilize the mechanical properties.

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THE COLOR PREFERENCES OF CONSUMERS ON FURNITURE SURFACES

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Abstract: In this study, the color preferences of consumers were studied on the most applied three finishing types on the furniture surfaces. These are transparent finishing, staining, and opaque painting. In this direction, it was targeted to set forth the color preferences, which would be the basis for the user-oriented design applications. A personal interview survey was prepared for gathering data for this study. Some questions took place in the survey to determine color and finishing type preferences of consumers according to their different demographic and economic characteristics. It was contacted with a total of 479 consumers with the random sampling method. The consumers were potential furniture buyers and living in the central counties of Ankara, Turkey. The data collected by the survey were analyzed statistically and the results were interpreted. In conclusion, the color and finishing type preferences of the consumers on furniture surfaces show a variation according to demographic characteristics, such as age, gender, marital status, educational level and income level.

Keywords: Color preference, furniture design, consumer preferences, marketing, surface finishing

Introduction

Economic factors (income level, general economic situation, and financial structure), social factors (culture and sub-culture, social class, reference groups, roles and family), psychological factors (motivation, perception, attitudes, learning and personality) and personal factors (demographic and situational) are influential in the purchasing decisions of the consumers. Individuals expect a number of differences in product according to their characteristics, which stem from these variables. In connection with this, every product should be designed in a manner that would answer these expectations of the consumers. Product characteristics requiring differentiation related to furniture are functionality, reliability, durability and safety, led by being aesthetic. It is necessary to dwell upon the aesthetic characteristics, such as functionality, form, balance-proportion and texture, led by color, in order to be able to harmonize the characteristics of the product to the expectations of the consumers in the differentiation of products.

Selection, arrangement and application of color affect to the appearance of the furniture and add a meaning to the furniture, in general to the space where the furniture is used. There are meanings, such as vigor, warmth, coolness, mobility, tranquility, contentment, giving trust, peace, cleanliness, purity, etc. in the colors applied to space or furnishings, such as furniture. Furniture users are affected by this meaning, whether or not they are aware of it. Furthermore, there are differences in the color preferences according to the structural characteristics of the furniture users.

It is impossible to avoid the mutual influence of color and people, since every product and every space where these products would be placed would definitely be colored. For this reason, the colors of the spaces and furnishings should be suitable to the function of the space, the psychology of people and to the preferences of the people using these spaces. When the coloring of the furniture is viewed from this aspect, then whether or not the standard furniture should be "single-colored or multi-colored" and "which one of this color or colors would be used" confronts us as a very important problem that should be solved. Because according to the color preference of the consumers, different colors of the same model are sold in different quantities and an excessive production of a furniture with a color that is preferred less and offered on the market causes an increase in the levels of stock and consequently in costs.

Different finishing applications on the furniture surfaces, such as transparent finishing, staining, and opaque painting are also influential on the preferences of the consumers. The same consumer who likes a color in one type

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of finishing may not like it on a different finishing type. For this reason, the determination of color preferences according to the technique of finishing is also very important, especially for the enterprises producing standard furniture. The differences in color preferences are encountered in every kind of product produced for people, not only for furniture or furnishings. For this reason, the expectations of the consumers from the aspect of color in different products and spaces are determined and studies are being made on color preferences.

A color preference test aimed at the importance of color in clothing related to the uniforms of nurses was applied with a specially designed color placard to 50 children in the 4-6 years of age group, who were being treated in a hospital and the color preferences of the children in this age group were studied (Lin, et. al., 1997). The characteristics of every product in international circulation should be adapted to the cultural structure of the country to which it is sent. In a study aimed at the place and influence of color in the movie sector, the necessity of the colors of the movies produced in the United States being in conformance with the color preferences of the country to which they were circulated was stressed. Otherwise, the movie may not reach the envisaged sales volume with a drop in ticket sales (Lee, 2001). According to a study made on 123 university students in Ankara on the color preferences of university students, colors having the maximum intensity and brightness were preferred more. The ground-color is unimportant and blue is the most preferred color (Camgoz, et. al., 2002). According to a study made on British and Chinese test subjects related to their color perceptions, such as the warmth or coldness, lightness or darkness, modernity or classicalness of colors, there is not a significant difference in the perception of colors between men and women. However, there is a difference among the perceptions on the basis of countries. Some color perceptions (for example, warm-cold), show cultural independence (Ou, et. al., 2004). Furthermore, four principles are influential in the color preferences based on folklore and tradition. These are forming contrast, the fact that the color is used somewhere else, common preference and availability (Hutchings, 2004). Regional preferences are of extreme importance in the color selection in production based on international trade. The globalization of color selections and color trends first of all facilitates the activities of the companies working on painting and textile manufacturers. However, in every situation, the ethnicity and regional cultures are influential on color preferences (Roberts, 2002). The preferences of university students were studied by putting upper colors having a different tone, intensity and brightness on six ground colors having a maximum intensity and maximum brightness value. Completely intense and bright upper colors on completely intense and bright ground colors are still preferred. Blue is the most preferred color when the ground colors are not taken into consideration (Camgoz and Yener, 2001). According to another study in which the characteristics of preference of the colors applied in different areas were studied, a color that could be defined as being beautiful, select or warm on a chip, does not have the beauty, selectness or warmth as on the chip when it is applied to a cup, t-shirt, sofa or car. In this situation, it is incorrect to apply a color, which is preferred on any product, to another product to create the same effect (Lee, 2001). The effects colors make on people at different light levels and different lighting methods could change. Any product on which any color is applied in a production environment could assume any tone of that color connected to the light in the environment when it is brought to the place of usage. Sometimes this can reach an effect, which does not please the user. For this reason, it is necessary to study the effect of any color in different lighting environments prior to its application on the product and to apply to the product the color tones, which are suitable to the preference of the user (Leta, et. al., 2002). The lighting system used in a space not only affects the visual comfort of those living in that space connected to the concentration of light, it also affects the physiology and psychology of those people. Furthermore, the lighting design of a space should always be treated together with the coloring of the walls, floors and ceilings of that space. Besides this, the colors of the other furnishings, led by furniture, are also important for reflecting the light and the effect set forth is influential on the psychology of people (So and Leung, 1998). The finishing processes applied on the furniture surfaces are in seventh place among the eighteen factors, which are influential on furniture preferences. According to this, color is an important factor in the decision to purchase furniture (Karki, 2000).

As can be seen from the studies mentioned above, the colors applied on the product surfaces are extremely influential on the consumer preferences and on the decisions for purchasing. Accordingly, in this study, the finishing type and color preferences according to demographic characteristics of the consumers have been studied on furniture colored with different finishing types.

Materials and Methods

This study was planned in order to obtain the color preferences of consumers which shall form a basis for the consumer focused design applications.

A survey was conducted with the objective of setting forth the color preferences of the users with different demographic characteristics. Differently finished furniture surfaces were used in the evaluation of these color preferences. The data for potential furniture consumers were gathered from data collection form.

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The data collection form was composed of two parts: In the first part, questions aimed at determining some demographic characteristics of the furniture users, such as gender, marital status, age, educational level, profession, monthly family income and the number of individuals in the family. For the second part of the survey, the finishing applied on furniture with the objective of coloring was collected in three groups:

i. Transparent finishing: In this finishing technique, transparent finishes are used to protect the natural color and grain of wood. Finishes enhance the natural beauty of wood, protect it from excessive wear and abrasion, and make the surfaces easier to clean.
ii. Staining: Staining is extremely important to color harmony of furniture. Changing the kind and color of stain will make the same wood appear entirely different. For example, dark-red stain has been widely used in traditional mahogany furniture. Many people even today think of mahogany as a dark-colored wood. Actually, much contemporary mahogany furniture is light, honey-toned brown. Stains can also be used to make a less expensive wood look like a costly one. Gum, for example, is often stained to imitate mahogany (Feirer, 1970).
iii. Opaque (obscure) painting: In this kind of finishing, finishes totally obscures the wood grain with a coating and achieves a particular color decor.

Visual samples, on which these three finishing type have been applied, were prepared for participants to understand the questions of the survey more accurately. Those samples were shown to the participants at the moment of interviewing. The questions in the second group have been developed to determine the effect of the demographic characteristics on the finishing and color preferences of subjects.

As the area of sampling, 6 central counties (Altındağ, Çankaya, Keçiören, Mamak, Sincan, Yenimahalle) of Ankara Province in Turkey was selected due to the fact that it is the second largest province from the aspect of population density and due to the fact that it has people from all segments of the society because of migration. The set of participants were constituted from the potential furniture buyers visiting the furniture stores. Interviews were conducted on the first 5-person who came to a store in a street of the sampling and accepted to participate in the interview on Saturdays between the hours 10:00 and 18:00. After then, the interviewers passed through a new store by going ahead in clock wise direction on the street to interview with a new group of 5-person. It was interviewed with totally 479 potential furniture buyers selected from the samples environment. The data were obtained by 7 interviewers informed about the data collection forms. It was asked to the participants the question "Are the finishing type and color on furniture, important for you and if important, to choose their three favorite finishings and colors graded as the first, second and third." Numbers of participants according to the counties are given in Table 1.

Table 1. Number of participants according to the counties.

County	Number of Participants	County	Number of Subject
Altındağ	58	Sincan	42
Çankaya	128	Yenimahalle	90
Mamak	67	Keçiören	94
Total	***253***	***Total***	***226***
		Grand Total	***479***

The data were coded in Statistical Package for the Social Sciences (SPSS 17.0) for windows, and evaluated in frequencies, percentages and chi-square (X^2) analysis. Some of the demographic characteristics of the participants are given in Table 2.

Table 2. Some demographic characteristics of the participants.

Consumer Characteristics	N	%	Consumer Characteristics	N	%	Consumer Characteristics	N	%
Age			**Educational Level**			**Monthly Income (US$)**		
Less than 25 years of age	119	24.8	Primary School	55	11.5	Less than US$380	108	22.5
Between 25-35 years of age	183	38.2	High School	167	34.8	Between US$381-635	208	43.4
Between 36-45 years of age	97	20.3	Under Graduate	257	53.7	More than US$636	163	34.1
Over 45 years of age	80	16.7	**Gender**			**Marital Status**		
Total	**479**	**100**	Male	212	44.3	Married	291	60.8
			Female	267	55.7	Single	188	39.2

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Results and Discussion

In this section, the finishing type and the color preferences of the participants were evaluated according to their demographic characteristics, and the findings were given in tables. The existences of statistical relationship between the participant's preferences and various demographic characteristics of the groups were analyzed by using the chi-square(X^2) analysis. The relations among the variables were statistically analyzed and the results were interpreted. The tables, showing there was no relation between the variables, were not included in the text.

The Type of Surface Finishings and the Color Preferences Related to These Types of Surface Finishings

When the color preferences according to the type of surface finishings of the consumers are analyzed without taking into consideration any consumer characteristics and order of preference, it was observed that the brown color group of wood on the furniture with transparent finishing was the most preferred group with a share of 29.7% and this was followed with the red color group with a share of 25.3% and with the black color group with a share of 22.1%. Brown and its tones are the most preferred color type with a share of 24.7% on the furniture applied staining. These color preferences are followed by red and its tones with a share of 17.1% and with yellow and its tones with a share of 13.9%. On the furniture surfaces coated with opaque paints, brown is the most preferred color with a share of 24.9% and this is followed by blue and its tones with a share of 20.4% and by red and its tones with a share of 18.7% (Table 3).

There does not appear to be a significant difference in the general color preference tendencies in case any of the consumer characteristics are not taken into consideration, but the color preferences according to the finishing type are taken into consideration. On the furniture surfaces coated with transparent finishes, the brown color group wood types were in the forefront in all of the preferences in first, second and third places with 35.3%, 29.0% and 24.8%, respectively. On the furniture applied staining, brown and its tones were the colors preferred the most at 51.4% and this was followed by red and its tones at 23.0% and blue and its tones at 19.8%. On the furniture with opaque painting, the same order of preference emerges with different percentages. In this type of furniture as well, brown and its tones are the colors preferred the most at 44.9%, red and its tones are in second place at 23.2% and blue and its tones are in third place at 25.9% (Table 3).

Table 3. Color preferences of the consumers on the furniture according to the type of surface finishing and according to the order of preferences

Colors According to the Type of Surface Finishing		Order of Preference							
		First		Second		Third		Total	
		N	%	N	%	N	%	N	%
Transparent Finishing	White Color Group Wood	48	10	30	6.3	46	9.6	124	8.6
	Yellow Color Group Wood	46	9.6	75	15.7	84	17.5	205	14.3
	Brown Color Group Wood	**169**	**35.3**	**139**	**29**	**119**	**24.8**	**427**	**29.7**
	Red Color Group Wood	112	23.4	135	28.2	117	24.5	364	25.3
	Black Color Group Wood	104	21.7	100	20.8	113	23.6	317	22.1
Staining	White and its Tones	48	10	45	9.4	67	14	1,600	11.1
	Yellow and its Tones	42	8.8	81	16.9	77	16.1	200	13.9
	Black and its Tones	30	6.3	57	11.9	39	8.2	126	8.8
	Red and its Tones	52	10.9	**110**	**23**	84	17.5	246	17.1
	Blue and its Tones	33	6.9	67	14	**95**	**19.8**	195	13.6
	Brown and its Tones	**246**	**51.4**	64	13.4	45	9.4	**355**	**24.7**
	Green and its Tones	16	3.3	38	7.9	55	11.5	109	7.6
	Two Compatible Colors	12	2.4	17	3.5	17	3.5	46	3.2
Opaque Painting	Black	51	10.6	57	11.9	40	8.4	148	10.3
	Green	43	9	63	13.2	73	15.2	179	12.5
	Red	65	13.6	**111**	**23.2**	93	19.4	269	18.7
	Blue	70	14.6	99	20.6	**124**	**25.9**	293	20.4
	Brown	**215**	**44.9**	75	15.7	68	14.2	**358**	**24.9**
	Yellow	35	7.3	74	15.4	81	16.9	190	13.2

Note: The percentages of the columns were taken.

The Effects of the Demographic Characteristics on Consumer Color Preferences
The Effect of Age on Color Preferences on the Furniture Applied Transparent Finishing

The brown color group woods are preferred the most in all of the age groups when the general color preference tendencies are considered on the furniture surfaces coated with transparent finishing applications of the age groups separated as those who are younger than 25 years of age, those who are between 25-35 years of age, those who are

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between 36-45 years of age and those who are older than 45 years of age. The type preferred in second place from the aspect of color is the brown color group in those who are younger than 25 years of age and in those who are between 36-45 years of age and the red color group is preferred by those who are between 25-35 years of age and those who are older than 45 years of age. From the aspect of third preference, the yellow color group of wood type is preferred the most by those who are younger than 25 years of age, the brown color group of wood type is preferred the most by those who are between 25-35 years of age and the red color group wood type is preferred the most by those who are 36 years of age and older.

A significant difference was not found ($p>0.05$) among the color preferences according to age groups in the first and second preferences related to the furniture with transparent finishing and a significant difference was found ($p=0.028<0.05$) for the third preferences (Table 4). According to this, age was found to be ineffective in the first and second preferences on color preference on the furniture surfaces coated with transparent finishes and was found to be effective in the third preferences.

Table 4. The color (wood type) preferences according to age on the furniture applied transparent finishing

Age	Order of Pref.	White Color Group Wood		Yellow Color Group Wood		Brown Color Group Wood		Red Color Group Wood		Black Color Group Wood		Total	Results		
		N	%	N	%	N	%	N	%	N	%	N	x^2	SD	p
Less than 25	1	10	8.4	13	10.9	**33**	**27.7**	31	26.1	32	26.9	119	19,556	12	0.076
Between 25-35		26	14.2	20	10.9	**64**	**35.0**	40	21.9	33	18.0	183			
Between 36-45		10	10.3	10	10.3	**38**	**39.2**	19	19.6	20	20.6	97			
Over 45		2	2.4	3	3.8	**34**	**42.5**	22	27.5	19	23.8	80			
Less than 25	2	11	9.2	14	11.8	**42**	**35.3**	30	25.2	22	18.5	119	16,749	12	0.159
Between 25-35		10	5.5	29	15.8	47	25.7	**62**	**33.9**	35	19.1	183			
Between 36-45		8	8.3	17	17.5	**30**	**30.9**	20	20.6	22	22.7	97			
Over 45		1	1.3	15	18.8	20	25.0	**23**	**28.6**	21	26.3	80			
Less than 25	3	11	9.2	**29**	**24.4**	28	23.5	25	21.1	26	21.8	119	22,982	12	***0.028***
Between 25-35		11	6.0	26	14.2	**55**	**30.1**	41	22.4	50	27.3	183			
Between 36-45		9	9.3	16	16.5	19	19.6	**29**	**29.9**	24	24.7	97			
Over 45		15	18.6	13	16.3	17	21.3	**22**	**27.5**	13	16.3	80			

1: First Preference, 2: Second Preference, 3: Third Preference. Note: The percentages of the rows were taken.

The Effects of Age on Color Preferences on the Furniture Applied Staining

Brown and its tones are in the forefront as first preferences in all of the age groups at 48.7%, 53.6%, 50.5% and 51.3%, respectively, when the color preferences according to age on the furniture applied staining are analyzed. In the second preferences, red and its tones are in the forefront up to 45 years of age at 19.3%, 29.0% and 21.6%, respectively, and black and its tones are the second preferences of those older than 45 years of age. In the third preferences, white and red colors and their tones are preferred by those who are younger than 25 years of age at 18.5%, red and its tones are preferred by those between 25-35 years of age at 20.8% and blue and its tones are preferred by those between 36-45 years of age at 22.7% and by those older than 45 years of age at 25.0% (Table 5).

Table 5. Color preferences according to age on the furniture applied staining.

Age	Order of Pref.	White and its Tones		Yellow and its Tones		Black and its Tones		Red and its Tones		Blue and its Tones		Brown and its Tones		Green and its Tones		Two Compat-ible Colors		Total	Results		
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	x^2	SD	p
Less than 25	1	14	11.8	11	9.2	8	6.7	16	13.4	6	5.1	**58**	**48.7**	1	0.8	5	4.3	119	19,83	21	0.53
Between 25-35		21	11.5	11	6.0	8	4.4	19	10.4	15	8.2	**98**	**53.6**	7	3.7	4	2.2	183			
Between 36-45		7	7.2	11	11.4	7	7.2	8	8.3	7	7.2	**49**	**50.5**	7	7.2	1	1.0	97			
Over 45		6	7.5	9	11.2	7	8.8	9	11.2	5	6.3	**41**	**51.3**	1	1.3	2	2.4	80			
Less than 25	2	14	11.8	21	17.6	17	14.3	**23**	**19.3**	17	14.3	17	14.3	7	5.9	3	2.5	119	23,67	21	0.30
Between 25-35		19	10.4	30	16.3	15	8.2	**53**	**29.0**	27	14.8	19	10.4	13	7.1	7	3.8	183			
Between 36-45		7	7.2	16	16.5	8	8.2	**21**	**21.6**	15	15.5	16	16.5	11	11.3	3	3.2	97			
Over 45		5	6.3	14	17.4	**17**	**21.3**	13	16.3	8	10.0	12	15.0	7	8.7	4	5.0	80			
Less than 25	3	**22**	**18.5**	17	14.3	11	9.3	**22**	**18.5**	16	13.4	10	8.4	16	13.4	5	4.2	119	40,25	21	***0.007***
Between 25-35		22	12.0	33	18.1	15	8.2	**38**	**20.8**	37	20.2	15	8.2	22	12.0	1	0.5	183			
Between 36-45		11	11.3	9	9.3	7	7.2	13	13.4	**22**	**22.7**	17	17.5	9	9.3	9	9.3	97			
Over 45		12	15.0	18	22.5	6	7.5	11	13.8	**20**	**25.0**	3	3.7	8	10.0	2	2.5	80			

1: First Preference, 2: Second Preference, 3: Third Preference. Note: The percentages of the rows were taken.

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A significant difference was not found (p>0.05) among the color preferences according to age groups in the first and second preferences but a significant difference was found (p=0.007<0.05) in the third preferences (Table 5). In this situation, age was ineffective for the first and second preferences on the furniture applied staining and age was an effective factor for the third preferences.

The Effect of Age on the Color Preferences on the furniture Applied Opaque Painting

Brown and its tones were also the most preferred colors in all of the age groups on furniture surfaces on which opaque painting were applied at 42.9%, 45.4%, 45.3% and 46.3%, respectively. The distribution was not homogeneous in the second preferences. Those younger than 25 years of age and those older than 45 years of age preferred red and its tones in their second preferences, those between 25-35 years of age preferred blue and its tones and those between 35-45 years of age preferred yellow and its tones. As a third preference, those who are younger than 25 years of age preferred red and its tones at 22.7%, those older than 45 years of age preferred yellow and its tones at 22.5% and those in all of the other age groups preferred blue and its tones at 27.9%, 36.1% and 22.5%, respectively.

For all of the orders of preference on the furniture applied opaque painting, there was not a significant statistical difference (p>0.05) among the color preferences according to age groups. In this situation, it appears that age is not an effective factor on the color preferences on the furniture applied opaque painting.

The Effect of Gender on Color Preferences
The Effect of Gender on Color Preferences on the Furniture Applied Transparent Finishing

The brown color group wood was preferred by males at 36.3% and by females at 34.4% as their primary preferences when the color preferences of the consumers according to the gender are considered on furniture surfaces on which the transparent finishing was applied. As their second preferences, males preferred the red color group wood at 29.2% and females preferred the brown color group wood at 30.0%. As their third preferences, males preferred the red color group wood at 26.9% and females preferred the brown color group wood at 25.5% (Table 6).

In the statistical analysis made for determining whether or not gender was effective in color preferences on the furniture applied transparent finishing, it was determined that for all of the order of preferences, the differences between the color preferences of males and females were insignificant (p>0.05) (Table 6) and it was observed that gender is not a significant factor in color preferences.

Table 6. Color preferences according to gender on the furniture applied transparent finishing

Gender	Order of Pref.	White Color Group Wood		Yellow Color Group Wood		Brown Color Group Wood		Red Color Group Wood		Black Color Group Wood		Total	Results		
		N	%	N	%	N	%	N	%	N	%	N	x^2	SD	P
Male	1	13	6.1	17	8.1	**77**	**36.3**	56	26.4	49	23.1	212	8,691	4	0.069
Female		35	13.1	29	10.8	**92**	**34.5**	56	21.0	55	20.6	267			
Male	2	7	3.3	35	16.6	59	27.8	**62**	**29.2**	49	23.1	212	6,749	4	0.150
Female		23	8.6	40	15.0	**80**	**30.0**	73	27.3	51	19.1	267			
Male	3	23	10.8	31	14.6	51	24.1	**57**	**26.9**	50	23.6	212	3,494	4	0.479
Female		23	8.6	53	19.8	**68**	**25.5**	60	22.5	63	23.6	267			

1: First Preference, 2: Second Preference, 3: Third Preference. Note: The percentages of the rows were taken.

The Effect of Gender on Color Preferences on the Furniture Applied Staining

Brown and its tones were still the most preferred color at 46.3% in males and at 55.4% in females when the first preferences are taken into consideration. For the second preferences males and females preferred red and its tones at 23.6% and 22.5%, respectively. For the third preferences males and females preferred blue and its tones at 21.2% and 18.7%, respectively.

The differences among the color preferences according to gender in all the order of preferences are insignificant (p>0.05). According to this, gender is insignificant in the color preferences on the furniture applied staining.

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The Effect of Gender on Color Preferences on the Furniture Applied Opaque Painting

The color preferences on the furniture applied opaque painting are given in Table 7. According to this, it appears that brown and its tones are the first preference for males and females at 37.7% and 50.6%, respectively. Blue and its tones are the second preference of males at 24.1% and red and its tones are the second preference of females at 24.3%. Blue and its tones are the third preference of males at 26.9% and of females at 25.1%.

According to the data obtained at the end of the statistical analysis, there is a significant difference among the color preferences according to gender in the first preferences ($p=0.023<0.05$) and the differences for the second and third preferences were found to be insignificant ($p>0.05$) (Table 7). According to this, gender is an effective factor on the color preferences on the furniture surfaces applied opaque painting.

Table 7. Color preferences according to gender on the furniture applied opaque painting

Gender	Order of Pref.	Black and its Tones		Green and its Tones		Red and its Tones		Blue and its Tones		Brown and its Tones		Yellow and its Tones		Total	Results		
		N	%	N	%	N	%	N	%	N	%	N	%	N	x^2	SD	p
Male	1	25	11.8	19	9.0	35	16.5	31	14.6	**80**	**37.7**	22	10.4	212	12,129	5	***0.033***
Female		26	9.7	24	9.0	30	11.2	39	14.6	**135**	**50.6**	13	4.9	267			
Male	2	25	11.8	27	12.7	46	21.7	**51**	**24.1**	38	17.9	25	11.8	212	7,064	5	0.216
Female		32	12.0	36	13.4	**65**	**24.3**	48	18.0	37	13.9	49	18.4	267			
Male	3	15	7.1	33	15.6	42	19.7	**57**	**26.9**	35	16.5	30	14.2	212	4,091	5	0.536
Female		25	9.4	40	15.0	51	19.1	**67**	**25.1**	33	12.3	51	19.1	267			

1: First Preference, 2: Second Preference, 3: Third Preference. Note: The percentages of the rows were taken.

The Effect of Marital Status on Color Preferences
The Effect of Marital Status on Color Preferences on the Furniture Applied Transparent Finishing

The brown color group wood is the first preference in married people at 37.1% and in single people at 32.4%. As second preferences, married people prefer the red color group wood at 28.5% and single people prefer the brown color group wood at 31.4%. As third preferences, married people prefer the brown color group wood at 25.8% and single people prefer the black color group wood at 25.0%.

According to the statistical analysis, the differences among the color preferences emerging according marital status are insignificant ($p>0.05$) in all orders of preferences. According to this, marital status is not an effective factor on the color preferences on the furniture surfaces coated with transparent finishes.

The Effect of Marital Status on the Color Preferences on the Furniture Applied Staining

Brown and its tones are the first preferences of married people at 55.7%, red and its tones are their second preferences at 25.1% and blue and its tones are their third preferences at 23.7%. Brown and its tones are the first preferences of single people at 44.7%, yellow and its tones are their second preferences at 22.8% and white and its tones are their third preferences at 18.1%.

Differences in color preferences according to marital status in all of the orders of preference are insignificant ($p>0.05$). According to this, it appears that marital status is not an effective factor on color preferences on the furniture surfaces coated with stains.

The Effect of Marital Status on Color Preferences on the Furniture Applied Opaque Painting

Brown and its tones were the first preferences of married people at 50.2%, red and its tones were the second preferences at 25.1% and blue and its tones were the third preferences at 28.6%. Brown and its tones were the first preferences of single people at 36.7%, red and its tones were the second preferences at 20.2% and blue and its tones were the third preferences at 21.8% (Table 8).

The differences among the color preferences, which emerge according to marital status for the first preferences, are significant ($p=0.031<0.05$) and the differences are insignificant ($p>0.05$) for the second and third preferences (Table 8). According to this, marital status is effective on the color preferences for the first preferences and is ineffective for the second and third preferences.

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Table 8. Color preferences according to marital status on the furniture applied opaque painting

Marital Status	Order of Pref.	Black and its Tones		Green and its Tones		Red and its Tones		Blue and its Tones		Brown and its Tones		Yellow and its Tones		Total	Results		
		N	%	N	%	N	%	N	%	N	%	N	%	N	x^2	SD	p
Married	1	31	10.7	27	9.3	34	11.7	33	11.3	146	**50.2**	20	6.8	291	12,26	5	***0.031***
Single		20	10.6	16	8.5	31	16.5	37	19.7	69	**36.7**	15	8.0	188			
Married	2	30	10.3	35	12.0	73	**25.1**	66	22.7	38	13.1	49	16.8	291	9,04	5	0.108
Single		27	14.4	28	14.9	38	**20.2**	33	17.5	37	19.7	25	13.3	188			
Married	3	23	7.9	39	13.4	56	19.2	83	**28.6**	42	14.4	48	16.5	291	3,93	5	0.560
Single		17	9.0	34	18.1	37	19.7	41	**21.8**	26	13.8	33	17.6	188			

1: First Preference, 2: Second Preference, 3: Third Preference. Note: The percentages of the rows were taken.

The Effect of Educational Level on Color Preferences
The Effect of Educational Level on Color Preferences on the Furniture Applied Transparent Finishing

The first preferences of the primary school graduates were the brown color group wood at 50.9%, the second preferences were the black color group wood at 32.7% and the third preferences were the red color group wood at 30.9%. The first preferences of the high school graduates were the brown color group wood at 32.3%, the second preferences were the red color group wood at 32.9% and the third preferences were the brown color group wood at 26.8%. The first, second and third preferences of the university graduates were the brown color group wood at 33.8%, 30.4% and 24.5%, respectively. Among the university graduates, the black color group wood was also preferred at the same ratio as the brown, as their third preferences.

Differences among color preferences according to educational level in all orders of preferences are insignificant ($p>0.05$). According to this, educational level is not an effective factor on the color preferences on the furniture surfaces coated with transparent finishes.

The Effect of Educational Level on the Color Preferences on the Furniture Applied Staining

According to the color preferences connected to educational level given in Table 9, the first preferences of the primary school graduates were brown and its tones at 36.4%, their second preferences were red and its tones at 34.5% and their third preferences were blue and its tones at 34.5%. The first preferences of the high school graduates were brown and its tones at 53.8%, their second and third preferences were red and its tones at 21.5% and 19.8%, respectively. The first preferences of the university graduates were brown and its tones at 52.9%, their second and third preferences were red and its tones at 21.4% and 16.7%, respectively. However, in their third preferences, their red color preferences and their black and yellow color preferences were equal to each other at 16.7%.

Differences among the color preferences according to educational level for the first preferences on the furniture applied staining are significant ($p=0.012<0.05$), and the differences for the second and third preferences are insignificant ($p=0.05$) (Table 9). According to this, educational level is effective in the color preferences for the first preferences and it is ineffective for the second and third preferences.

Table 9. The effect of educational level on the color preferences on the furniture applied staining

Educational Level	Order of Pref.	White and its Tones		Yellow and its Tones		Black and its Tones		Red and its Tones		Blue and its Tones		Brown and its Tones		Green and its Tones		Two Compa-tible Colors		Total	Results		
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	x^2	SD	p
Primary	1	2	3.6	11	20.0	7	12.7	10	18.2	3	5.5	20	**36.4**	2	3.6	0	0.0	55	28,26	14	***0.012***
High School		18	10.8	12	7.2	6	3.6	21	12.6	13	7.8	90	**53.8**	4	2.4	3	1.8	167			
University		28	10.9	19	7.4	17	6.6	21	8.2	17	6.6	136	**52.9**	10	3.9	9	3.5	257			
Primary	2	2	3.6	6	10.9	3	5.5	19	**34.5**	7	12.7	10	18.2	5	9.1	3	5.5	55	19,56	14	0.145
High School		17	10.2	30	18.0	20	12.0	36	**21.5**	32	19.2	19	11.4	10	6.0	3	1.7	167			
University		26	10.1	45	17.5	34	13.2	55	**21.4**	28	10.9	35	13.6	23	8.9	11	4.4	257			
Primary	3	3	5.5	8	14.5	3	5.5	8	14.5	21	**38.2**	7	12.7	4	7.3	1	1.8	55	20,11	14	0.127
High School		24	14.4	26	15.6	12	7.2	33	**19.8**	31	18.6	12	7.2	23	13.7	6	3.5	167			
University		40	15.6	43	**16.7**	24	9.4	43	**16.7**	43	**16.7**	26	10.1	28	10.9	10	3.9	257			

1: First Preference, 2: Second Preference, 3: Third Preference. Note: The percentages of the rows were taken.

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The Effect of Educational Level on Color Preferences on the Furniture Applied Opaque Painting

The color preferences according to educational level on the furniture applied opaque paintings are given in Table 10. According to this, the first preferences of primary school graduates were brown and its tones at 38.2%, their second preferences were red and its tones at 21.8% and their third preferences were blue and its tones at 25.5%. The first preferences of high school graduates were brown and its tones at 44.8%, their second preferences were red and its tones at 28.1% and their third preferences were yellow and its tones at 24.0%. The first preferences of the university graduates were brown and its tones at 46.4% and their second and third preferences were blue and its tones at 24.9% and 28.0%, respectively.

Table 10. Color preferences according to educational level on the furniture applied opaque painting

Educational Level	Order of Pref.	Black and its Tones		Green and its Tones		Red and its Tones		Blue and its Tones		Brown and its Tones		Yellow and its Tones		Total	Results		
		N	%	N	%	N	%	N	%	N	%	N	%	N	x^2	SD	p
Primary	1	4	7.3	6	10.9	13	23.6	7	12.7	21	**38.2**	4	7.3	55	18,56	10	***0.046***
High School		13	7.8	21	12.6	23	13.8	28	16.8	75	**44.8**	7	4.2	167			
University		34	13.2	16	6.2	29	11.3	35	13.6	119	**46.4**	24	9.3	257			
Primary	2	11	20.0	7	12.7	12	**21.8**	11	20.0	9	16.4	5	9.1	55	17,54	10	0.063
High School		13	7.8	22	13.2	47	**28.1**	24	14.4	29	17.3	32	19.2	167			
University		33	12.8	34	13.2	52	20.3	64	**24.9**	37	14.4	37	14.4	257			
Primary	3	4	7.3	7	12.7	13	23.6	14	**25.5**	10	18.2	7	12.7	55	17,97	10	0.056
High School		17	10.2	18	10.7	36	21.6	38	22.8	18	10.7	40	**24.0**	167			
University		19	7.4	48	18.7	44	17.1	72	**28.0**	40	15.6	34	13.2	257			

1: First Preference, 2: Second Preference, 3: Third Preference. Note: The percentages of the rows were taken.

Differences among the color preferences according to educational level for the first preferences were significant (p=0.046<0.05) and the differences for the second and third preferences were insignificant (p=0.05) (Table 10). According to this, the educational level is effective on the color preferences for the first preferences and it is ineffective for the second and third preferences.

The Effect of Income Level on Color Preferences
The Effect of Income Level on Color Preferences on the Furniture Applied Transparent Finishing

The color preferences according to income level of the individuals, who were the subject of the survey, on the furniture surfaces coated with transparent finishes, are given in Table 11. According to this, the first preferences of the individuals who participated in the survey and who have an income of US$380 and less, were the brown color group wood at 44.4% and their second and third preferences were the red color group wood at 28.7% and 26.9%, respectively. The first preferences of those who have an income between US$381-635 were the brown color group wood at 38.5%, the second preferences were brown at 31.3% and the third preferences were the black color group wood at 24.0%. The first preferences of those who have an income of US$636 and above were the black color group wood at 28.8% and the second and third preferences were the brown color group wood at 31.3% and 29.4%, respectively.

Table 11. The wood type (color) preferences according to income level on the furniture applied transparent finishing

Monthly Income	Order of Pref.	White Color Group Wood		Yellow Color Group Wood		Brown Color Group Wood		Red Color Group Wood		Black Color Group Wood		Total	Results		
		N	%	N	%	N	%	N	%	N	%	N	x^2	SD	p
US$380 and less	1	15	13.9	10	9.3	48	**44.4**	24	22.2	11	10.2	108	22,64	8	***0.004***
Between US$381 - 635		20	9.6	18	8.6	80	**38.5**	44	21.2	46	22.1	208			
US$636 and above		13	8.0	18	11.0	41	25.2	44	27.0	47	**28.8**	163			
US$380 and less	2	5	4.6	22	20.4	23	21.3	31	**28.7**	27	25.0	108	9,52	8	0.300
Between US$381 - 635		12	5.8	26	12.4	65	**31.3**	64	30.8	41	19.7	208			
US$636 and above		13	8.0	27	16.6	51	**31.3**	40	24.5	32	19.6	163			
US$380 and less	3	6	5.6	23	21.2	22	20.4	29	**26.9**	28	25.9	108	10,04	8	0.262
Between US$381 - 635		24	11.5	40	19.3	49	23.6	45	21.6	50	**24.0**	208			
US$636 and above		16	9.8	21	12.9	48	**29.4**	43	26.4	35	21.5	163			

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According to the statistical analysis made, differences according to the different income groups in the first preferences among the color preferences were significant ($p=0.004<0.005$) and the differences in the second and third preferences were insignificant ($p>0.05$) (Table 11). According to this, the income level was effective on the color preferences in the first preferences and it was ineffective in the second and third preferences.

The Effect of Income Level on the Color Preferences on the Furniture Applied staining

The first preferences of the individuals who participated in the survey and who were in all of the income groups were brown and its tones at 43.5%, 50.0% and 58.3%, respectively. The second preferences in all of the income groups were red and its tones and at the same time, the preferences of the individuals who have an income level of US$636 and above were black and its tones. The third preferences of those having an income of US$380 and less, were blue and its tones at 23.1%, the third preferences of those having an income of US$381 - 635, were red and its tones at 21.2% and the third preferences of those having an income of US$636 and above, were blue and its tones and yellow and its tones at 19.0% each.

Differences according to the different income groups of the color preferences in all of the preferences were insignificant ($p>0.05$). According to this, the income level is ineffective on the color preferences on the furniture applied staining.

The Effect of Income Level on Color Preferences on the Furniture Applied Opaque Painting

The first preferences of those having an income of US$380 and less were brown and its tones at 40.7% and their second and third preferences were blue and its tones at 20.4% and 23.1%, respectively. The first preferences of those having an income between US$381 - 635 were brown and its tones at 47.1%, the second preferences were red and its tones at 25.0% and the third preferences were blue and its tones at 27.9%. The first preferences of those having an income of US$636 and above were brown and its tones at 44.8%, the second preferences were red and its tones at 24.5% and the third preferences were blue and its tones at 25.2%.

Differences according to the different income groups among the color preferences for all of the preferences on the furniture applied opaque painting were insignificant ($p>0.05$). In this situation, the income level of the individuals is not an effective factor on color preferences on the furniture coated with these type of surface finishes.

Conclusion

According to the findings, the type of surface finishings applied to the furniture surfaces and/or the color applied on these surfaces is important for the consumers. Furthermore, the opaque painting on the furniture surfaces is preferred less compared to the other finishing types. Accordingly, it can be deduced that the consumers seek a wood appearance on the furniture surfaces and that it is definitely necessary to take this wish into consideration in standard furniture production.

Brown and its tones are the most preferred colors in all kinds of surface finishings when the color preferences of the consumers are analyzed according to the type of surface finishing, without taking into consideration any consumer characteristics and orders of preference. This is followed by red, yellow, black and blue colors and their tones.

There is not much difference in color preferences and priorities given above, excluding extraordinary situations, when the general preferences emerging according to the general consumer characteristics, such as age, gender, education, marital status and income level are considered. Brown and red are still the first and second preference colors according to all of the consumer characteristics. Yellow, blue and black are in the forefront as the third preferences according to different consumer characteristics. Blue and its tones are the second preferences of males on the furniture applied opaque painting. Black and its tones are the second preferences of primary school graduates on the furniture surfaces coated with transparent finishes. Blue and its tones are the second preferences of university graduates on the surfaces coated with opaque painting. Black and blue colors and their tones are the first preferences for those who have an income of US$636 and above on furniture applied transparent finishing and staining and their preferring these is exceptional situations.

The fact that Beech and Pine are species of wood used a lot in Turkey, that furniture produced from these types of wood stems from the fact that beech in particular is suitable for finishing with every color and that they are put into the market as mahogany, walnut and hazelnut colors, could have been influential in the formation of a color culture in which brown and red are predominant. Furthermore, it is thought that the fact that the walls in housing

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estate and in the housing built by contractors is generally finished with white or light colored paint could be influential in the selection of these colors on the furniture surfaces for contrast. In the same manner, the use of pine wood materials with a natural color in construction, interior design and furniture could be effective in preferring yellow the most. The use of black a lot in office furniture in the past and the fact that the Wenge wood is used a lot more in the building of furniture in recent years could be effective in the preferences for black.

According to the statistical analysis made to determine whether or not consumer characteristics are influential in the preference of color, it was found that age was effective on the third preferences in all of the surface finishing applications, that income level was effective on the first preferences in the transparent finishing applications, that gender was effective on the first preferences in the opaque painting applications, that marital status was effective on the first preferences in the opaque painting applications and that educational level was effective on the first preferences in the staining and opaque painting applications. According to this, a market segmentation should be made according to the findings above for the color preferences of the consumers according to income level in the transparent finishing applications, according to gender, marital status and educational level in the surface finishings with opaque paints, and according to educational level in the staining applications. Color and finishing preferences of the consumers connected to the customer characteristics specified should be taken into consideration in the user-oriented design applications and in the design activities, which keep consumer satisfaction in the forefront.

It was determined that age was ineffective on the color preferences of the consumers in all of the surface finishing applications, that gender and marital status were ineffective on the color preferences of the consumers in the surface applications made with transparent finishes and staining, that educational level was ineffective on the color preferences of the consumers in the transparent finishing applications and that income level was ineffective on the color preferences of the consumers in the staining and opaque painting. In this situation, there is no need for special color applications according to these variables. The most preferred colors satisfy all of the consumers.

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THE COMPARISON OF ROBUST PARTIAL LEAST SQUARES REGRESSION METHODS (RSIMPLS, PRM) WITH ROBUST PRINCIPAL COMPONENT REGRESSION FOR PREDICTING TOURIST ARRIVALS TO TURKEY

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According to the World Travel & Tourism Council (WTTC), travel and tourism is the biggest industry in the world on virtually any economic measure, including gross output, value added, capital investment, employment and tax contributions. Tourism is a key ingredient in the economic development strategy of many developing countries such as Turkey. In regards to the total tourist arrivals to Turkey, it seems that the number of foreign visitors has accelerated rapidly in last decade. In 2004, Turkey attracted 17.5 million foreign tourists, which exceeded 41 million visitors in 2014. In existence of multicollinearity in the data set, the classical multiple linear regression analysis gives unreliable estimates for regression parameters and the variance of these parameters may be too large. Hence, in this case biased regression methods such as Principal Component Regression (PCR) and Partial Least Squares Regression (PLSR) are used. PCR and PLSR both fit a linear relationship between two sets of variables. They are the most popular regression techniques that they offer a good solution because they first reduce the dimensionality of the design matrix. SIMPLS algorithm is the leading PLSR algorithm because of its speed, efficiency and results are easier to interpret. However, both of the PCR and SIMPLS yield unreliable results when the data set contains outlying observations. Therefore, Hubert and Vanden Branden (2003) have been proposed the robust versions of these methods: robust PCR (RPCR) and a robust PLSR method called as RSIMPLS. Moreover, Serneels et al. (2005) have been proposed Partial Robust M-Regression (PRM) that it is a partial version of the robust M-regression. The aim of this study is to model the tourist arrivals (number of foreign tourists) to Turkey by using three popular biased robust RPCR, RSIMPLS and PRM methods in existence of both multicollinearity and outlier in the data set. Hence, the best model giving the best predictions of tourist arrivals is selected and the most important factors affecting the tourist arrivals to Turkey are determined.

Keywords: tourist arrivals, robust partial least squares regression, robust principal component regression

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THE COMPLEMENTARY ROLE OF BIOINFORMATICS IN ANALYZING THE FUNCTIONAL ASSOCIATION BETWEEN GTPASE ACTIVATING PROTEINS (GAPS) AND RAB GTPASES

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Proteins that contain the TBC (Tre2/Bub2/Cdc16) functional domain were shown to act as GTPase activating proteins (GAPs) for Rab G proteins involved in intracellular vesicular transport and fusion, membrane receptor recycling and cytokinesis. Of a special interest is the human Evi5 protein, a typical TBC domain-containing protein originally identified at the breakpoint of a constitutional chromosome translocation, in a patient with stage 4S neuroblastoma. Even though there are more than 50 human proteins predicted to have a TBC domain, and more than 70 already identified human Rab proteins, the specificity between Rab proteins and their respective TBC-containing GAPs is not well understood.

The present study combines biochemical and immunofluorescence microscopy techniques with bioinformatics protein sequence and conformation analysis, investigating the binding and functional specificity between the neuroblastoma Evi5 protein and Rab11, and between the highly homologous Evi5L protein and its potential activation target, Rab23.

Previous studies indicated that Evi5 is involved in the latest stages of cytokinesis, acting as a GAP for a subpopulation of centrosome-associated Rab G proteins. Immunoprecipitation studies determined that Evi5 physically interacts with Rab11, and immunochemistry experiments revealed that these proteins co-localize during cytokinesis at the midbody. Similar results also suggested a functional association between Evi5L and Rab23. Significantly, there was no physical interaction or co-localization between Evi5 and Rab23, or between Evi5L and Rab11. In an attempt to extrapolate these results on other putative pairs of TBC-containing GAPs and Rab proteins, the sequence and three-dimensional conformation of these four proteins is analyzed using bioinformatics resources.

Keywords: Bioinformatics, Cancer, Cell cycle, G proteins, Vesicular transport, Cytokinesis

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THE DISPENDED OF DRUG SET WITH STEROIDS FOR RELIEF ASTHMA SYMPTOM IN THE RATCHATHEWI DISTRICT, BANGKOK, THAILAND

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ABSTRACT
This objectives of this research were to 1) surveillance of steroids in antiasthma drug sets dispensing for asthma relief and 2) test for steroids in antiasthma drug sets from drugstores on the Ratchathewi district. The researcher were collected drug sets from 111 drugstores in the Ratchathewi district, Bangkok during 1 January to 30 March 2015. Analysis for detection of contained with steroids in drug sets by steroid test kits (Immunochromatography technique). The results found that 27 drugstores at 24.3 percent are dispended 7 drug sets to customer and found 6 samples contaminated of steroids at 85.7 percent of drug set samples. The advertising media for side effect from drug sets usage and steroids to increase knowledge incorrect health behavior for improve of self medication of people.

Keywords: Steroids, Dispense, Drug Set, Asthma Relief

INTRODUCTION

Steroid is a controlled substance according to Notification of Public Health, Subject: Special Controlled Drug. This means steroid distribution is restricted under Drug Act. B.E. 2510, section 4 which states that steroid can only be prescribed by licensed medical practitioner, veterinarian, or a drugstore that has a licensed pharmacist on duty at all time. Thailand's legal principle pertaining to the dispensing of drug set under Drug Act. B.E. 2510 section 75 bi amended by Drug Act. B.E. 2530 prohibits any person from dispensing a mixing of medications as one prescription intending to cure, to treat or to prevent one particular condition. The prohibition does not apply to licensed pharmacist, medical profession or licensed dentist who prescribes only to their patients or veterinarian who dispenses only for their patients (Drug Act. B.E. 2510, 2010). However, the problem of using drug set still persists in both Bangkok and other provinces. In provincial area, drug set can be purchased from any drugstore, grocery or even coffee shop. Most of drug sets obtained from sampling were intended to cure flu, to relieve body ace and pain or to lower weight. Each of them made up of painkillers, linking to mental side effects, anti inflammatory drugs, vitamins and acid reducing medicines. And almost every drug set includes some form of steroid drug because drug sets believe that steroid is potent to treat a wide range of medical conditions (Charoenphol, 1996).

Asthma is a chronic inflammatory disease of the airways that requires daily use of controller medication in most case. A course of oral corticosteroids may be used in severe asthma, but long-term steroid use should be avoided if possible (Edmunds, and Mayhew, 2013, p.210). Asthma was thought to be a disease mainly of impaired autonomic control of the airway lumen diameter, but it is now recognized that many physiological mediators are involved in the pathogenesis of an asthma attack, including interleukins, histamine, leukotrienes, prostaglandins and other cytokines and nitric oxide, as well as autonomic neurotransmitters (Bryant and Knights, 2015, p.611) Corticosteroids used to relieved asthma and Chronic obstructive pulmonary disease medications for oral medication is prednisolone (Edmunds and Mayhew, M, 2013, p.204). The environmental is important to reduce exposure to dust mites and cockroaches, to which many patients with asthma are sensitive. To limit exposure to dust mites, especially in the bedroom where they are most common, one should enclose pillows and mattresses in airtight polyurethane covers or use fiberfill products instead of down or foam pillows, remove carpeting (hardwood or linoleum floor is better) and curtains, wash sheets and stuffed toys (for pediatric patients) in hot water every week, and clean bedrooms frequently with a vacuum that has a high-efficiency particulate air filter (Rakel, 2007, p.348).

Corticosteroids are commonly used in the treatment of asthma because of their anti-inflammatory effects. In addition, corticosteroids increase the effects of adrenergic bronchodilators to prevent or treat bronchoconstriction and bronchospasm. In acute asthma or status asthmaticus unrelieved by inhaled beta-adrenergic bronchodilators, high dose of systemic corticosteroids are given orally or intravenously with bronchodilators for approximately 5-10 day (Frandsen and Pennington, 2014, p.279-280). The effects of glucocorticoids in human can cause give risk to diabetes mellitus, immune reaction suppression, perforation of the ulcer occurs, reduce bone production and may develop cataract or glaucoma (Greenstein, 2004; Clayton, 2007; Karch, 2008). Treatment with prednisolone may cause of central nervous system stimulation with anxiety, mood swings, insomnia and headache.

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Gastrointestinal complains include nausea, vomiting, increased appetite (Ascheenbrenner and Venable, 2012, p.1017)

Survey of drugstores' distribution of drug sets for body ace and pain dispensed in Ratchathewi district founded that 6 out of 95 samples contained steroid. Ratchathewi district is located in the heart of Bangkok, there should be no case of illegal distribution of steroid (Thongmuang and Sudjaroen, 2010). The similar survey was conducted in Study on Adulterantion of Steroids, Prednisolone and Dexamethasone in Traditional Thai Medicines on Hat-Yai, Songkhla. There were 200 samples were collected randomly from 54 stores during August to December 2008. Common adulterants, prednisolone and dexamethasone were examined in the samples by using thin layer chromatography (TLC) technique. The results showed that 4 samples were adulteranted with steroids as 2%, which high rick to find adulterant samples as 5.5% from all sources of Traditional Thai Medicines (Arandorn, Saclim, Vichayavoranan, Klaysatit and Dcj-adisai, 2010, p.20-30).

The another similar survey was conducted in Dusit district and founded 12 out of 38 drugstores illegally dispensed ace and pain drug sets containing steroid. These results are unexpected because both Ratchathewi and Dusit districts are located in the center of Bangkok where there should be no case of illegal steroid distribution left (Thongmuang and Sudjaroen, 2011). The survey of drugstores' distribution of drug sets in 7 districts, 18 sub-districts Pathum-thani province, Thailand on June to July 2010 from 24 drugstores and 25 grocery shops. There were 47 samples of drug sets found, 21 in drugstores, 26 in grocery shops. There were 14 samples of drug sets for common cold, 28 samples for muscle pain and 5 samples for pruritus. Steroid identification by the database for identification of oral corticosteroids and thin layer chromatography (TLC) showed that 28.6%, 46.2% and 80.0% of drug sets for common cold, muscle pain and pruritus contained steroids. The corticosteroids found in drug sets were dexamethasone and prednisolone (Maluangnon, Korsangruang, Chairop, Nopparsri and Jirasakpisan, 2014, p.1-14).

There are several methods to determined for the quantity of steroid (Dexamethasone and Prednisolone) such as; High Performance Liquid Chromatography or Thin Layer Chromatography (Thongyindee, 2004) in the form of Dexamethasone or Prednisolone tablet following pharmacopoeia (The United States Pharmacopoeia, 2009), or analyzing using Fourier transform infrared spectrophotometer and UV-visible spectrophotometer (Ruaysup, 2004) and this research was qualitative determined dexamethasone and prednisolone by immunochromatographic test kit from Bureau of Drug and Narcotic, Department of Medical Science, Ministry of Public Health, Thailand which was rapid and simply to perform with no prerequisite regarding laboratory equipments or laboratory skills (Matapatara and Likitthanaset, 2008) This objective of this research were to surveillance of steroids in asthma drug sets dispensed for asthma relief from drugstores in the Ratchathewi district, and evaluate situation of drug set with steroid drug usage.

MATERIALS AND METHODS

Sample collection: The drug sets were collected from 111 drugstores in the Ratchathewi district, Bangkok on January to March 2015. Name and location of 111 drug stores in the Ratchathewi district were provided from Food and Drug Administration, Ministry of Public Health**.**

The drug sets were brought and collected by students whom study in Department of Aesthetic Health Science, College of Allied Health Science, Suan Suandha Rajabhat University.

The conversation for drug sets dispended was asking for prescribed with asthma symptom such as obstructive pulmonary disease and cough with mucous plugs for a friend who belonging to student who's brought the drug set, each collected drug set were photo and labeled as individual data [Figure 1-6].



Figure 1 Sample 1



Figure 2 Sample 2



Figure 3 Sample 3



Figure 4 Sample 4



Figure 5 Sample 5



Figure 6 Sample 6

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Sample preparation and determination: This research was qualitative determined dexamethasone and prednisolone by immunochromatographic test kit from Bureau of Drug and Narcotic, Department of Medical Science, Ministry of Public Health, Thailand [Figure 7]. Each tablets of drug set were gridded and filled until met the blue line of the test tube. Reagent was dropped into tube with sample contained until met the red line of the test tube [Figure 8].



Figure 7 Test kit



Figure 8 Test tube

The suspending were mixed at list 3 minutes by vortex mixer homogeneously and standing for precipitated. The supernatant was dropped (4 drops) into the test well of Immunochrographic test kit and read the result rapidly and not longer than 10 minutes. The positive result was presented as one band at "T" region (Figure.9) and negative result was presented as two bands at "T" and "C" region [Figure 10]. Dexamethasone and prednisolone were used as positive control.



Figure 9 Positive result



Figure 10 Negative result

RESULTS AND DISCUSSION

The sampling was conducted between 1 January to 30 March 2015 by roll playing, a research staff member acted as a customer who wanted to buy only five asthma drug sets without prescription, for a friend who had asthma symptoms; chest pressure, coughing up sputum, and wheezing waiting for her at the dormitory. Their friends reported that they previously experienced asthma drug set, from nearby drugstore, and it was fast and effective.
The findings were presented 61 drugstores (60.5%) denied to dispended drug sets. Therefore, 7 drug stores (6.9%) were dispensed drug sets to our volunteers without the prescription [Table 1] and the significant findings showed that 6 of 7 samples (85.7%), were contained with steroids (dexamethasone or prednisolone). Although don't have the prescription from doctor, sellers from drugstores dispensed illegally drug sets with steroid to customer.

Table 1: Situation of drug sets dispensed from drugstores

Dispensing of drug sets	**Number of drugstores**
Denied to dispensed drug sets	61
Dispensed drug sets	7
Not reject to dispensed drug sets but dispensed single tablets	6
Not reject to dispensed drug sets but dispensed blister pack	27
Out of Service	10
Total	111

The positive result was present as only one band. The colors of positive results are different in all of samples because there are have different tablets in each drug sets, but in every sample were contained steroid tablet (dexamethasone and prednisolone). The solution of positive result of sample one was showed in pink color [Figure

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11], sample two was showed in blue color [Figure 12], sample three was showed in pink color [Figure 13], sample four was showed in yellow color [Figure 14], sample five was showed in pink color [Figure 15] and sample six was showed in yellow color [Figure 16],



Figure 11 The positive result of sample 1



Figure 12 The positive result of sample 2



Figure 13 The positive result of sample 3



Figure 14 The positive result of sample 4



Figure 15 The positive result of sample 5



Figure 16 The positive result of sample 6

Twenty-seven drugstores do not reject to dispensed drug sets but dispensed blister packs. The blister packs were present at Meptin (procaterol 50 mg) , Asmasolon (theophylline 125 mg) , Theotrim 200 (theophylline 200 mg) , Franol (theophylline 120 mg , Ephedrine 11 mg , pherobarbitone 8 mg) , Nuelin-SR200 (theophylline 200 mg) , Terbutaline 2.5 mg , Procaterol 50 mg , Violin (salbutamol 2 mg) [Figure 17-23].



Figure 17 Meptin



Figure 18 Asmasolon



Figure 19 Theotrim 200



Figure 20 Franol



Figure 21 Nuelin-SR200



Figure 22 Terbutaline



Figure 23 Violin

Theophylline is the most commonly used methylxanthine for the treatment of asthma. Common side effects of theophylline include central nervous system (CNS) excitation, tachycardia, CNS vasoconstriction and peripheral vasodilation, and dieresis. Selecting theophylline as the primary long-term control medication may be considered for an individual who cannot or will not use inhaled medication or in those unable to afford long-acting beta$_2$

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agonists (King and Brucker, 2011, p.591-592). Theophylline serum concentration need to be monitored closely owing to the drug's narrow toxic therapeutic range, individual differences in metabolism, and the effects of many factors on drug absorption and metabolism (Tierney, McPhee and Papadakis, 2006, p.231). In case of dispensing Nuelin-SR200 (theophylline 200 mg) from drugstore to use for relief asthma symptom may cause to this side effect.

Six drugstores do not reject to dispensed drug sets but dispensed single tablets. The single tablets was present at terbutaline 2.5 mg in white pill with 2.5 number in one side and with middle line in another side for all of drugstores [Figure 24].



Figure 24 Terbutaline 2.5 mg

Terbutaline is a relative selective beta$_2$ –adrenergic agonist that is a long-action bronchodilator. Dose of Terbutaline by oral are 2.5-5 mg every 6-8 hours, maximum dose are 15 mg per day (Abrams, Lammon and Pennington, 2009, p.716-717).

The important reason to denied for drug sets dispensing were presented 36 drugstores (59.0%) denied to dispensed drug sets as the reason for legal not allow to dispensed drug sets . Therefore, 9 drug stores (14.8%) denied to dispensed drug sets as the reason for they can dispensed if have the prescription from the doctor [Table 2] 8 drug stores (13.1%) denied to dispensed drug sets as the reason for drug sets usage is harmful to human system, 6 drug stores (9.8%) denied to dispensed drug sets as the reason for drug sets can be cause to adverse drug reaction and 2 drug stores (3.3%) denied to dispensed drug sets as the reason for out of medicine.

Table 2: Reason to denied for drug sets dispensing from drugstores

Reason to denied	**Number of drugstores**
Legal not allow to dispensed drug sets	36
Can be dispensed drug sets if have the prescription from doctor	9
Drug sets usage is harmful to human system	8
Drug sets can be cause to adverse drug reaction	6
Out of medicine	2
Total	61

The number of tablets for each set dispensed from drug stores in Ratchathewi district were various number [Table 3]. Three tablets per set were most dispensed as maximum number from 3 drugstores, Two of drugstores were dispensed 2 tablets per set and two drugstores were dispensed 4 tablets per set.

Table 3: Number of tablets per set dispensed from drugstores

Number of tablets per set	**Number of drugstores**
2	2
3	3
4	2
Total	**7**

CONCLUSION

The study found 6 drugstores in Ratchathewi district dispensed drug set contained with dexamethasone or prednisolone to customer on demand without asking for a prescription. However, 61 drugstores denied selling drug set as the reason for legal not allow to dispensed drug sets. Some pharmacists informed the staff about the danger of drug set which should not be used to relief asthma. They recommended using over the counter tablet or nasal spray instead. Some pharmacists even further informed the staff about steroid content and its side effect in drug set. This indicated that most of drugstores aware of an inappropriateness of drug set dispensing and concerned about the safety of public in drug consumption. In case of factors affecting to use drug sets of rural people in

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Pasaknoi Village Choengdoi Sub-district, Doi saket District, Chiang Mai Province on 1995 collected data from 11 people by informal interviewing. The results showed that affecting usage of drug sets were the easiness and convenience of usage, including confidence and satisfication in the efficacy of drug sets. Also they had heard about the good qualities of drug sets more than the adverse effects from neighbours, relatives and their past experiences. Drug set was easy to buy from the stores in vollage and the price was cheap and appropriate to their income (Kamai, 1995, p.49-52).

This study showed that even though the drug stores were located in Bangkok which is the capital and the most civilized city of Thailand, there still exist a number of cases of asthma drug set dispensing as evidenced by drugstores in Ratchathewi as the central district in Bangkok. These results are related with research of drug sets dispended with steroids of Thongmuang and Sudjaroen in 2011 (Thongmuang and Sudjaroen, 2011), Therefore the situation occur again in 2015 at Ratchathewi district where there should be no case of illegal steroid distribution left. The focal point is the finding of the distribution of drug set containing steroid, a controlled substance, without prescription. It is an inappropriate usage of steroid drug; unnecessary use and for wrong purpose of treatment.

For this reason, the Department of Public Health should be more tightly enforcing the steroid regulation, especially, to prevent a case of drug set dispending from a drugstore operating without a pharmacist on duty and a case of steroid dispensing without prescription. To improve the safety of drug usage among public and also to increase the public awareness of risk and harm form steroid in drug set, the Department of Public Health should publish and advertise to educate public about the side effects of steroids. And also at university undergraduate level, a health related class should be required for graduation in order to strengthen the knowledge in this field for young people who are the future of our country.

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THE ECAT SOFTWARE PACKAGE TO ANALYZE EARTHQUAKE CATALOGUES

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Abstract: Earthquakes are one of the most damaging natural disasters. Accordingly, earthquake phenomenon has been an important subject in seismology and earthquake engineering. In order to have insight on earthquakes, they have been compiled over the past years in databases called as earthquake catalogues. In seismic hazard studies, earthquake catalogues are of prime importance as they provide the most important features of earthquakes such as date, time, location, magnitude, depth etc. Accordingly, earthquake catalogues are often utilized to model seismicity. However, before such an implementation, earthquake catalogues need to be undergone several analyses such as seismic declustering, assessment of completeness periods and calculation of magnitude recurrence parameters. In order to perform these analyses, several software packages are available for users on different programming platforms. Vast majority of these software are only applicable to earthquake catalogues that are complete over the time period they extend. However, most of the earthquake catalogues are incomplete in terms of small and moderate size events particularly in the early years of instrumental period. This paper illustrates some of the useful features of the software package called as ECAT that is generated to compute completeness and magnitude recurrence parameters of earthquake catalogues whose completeness periods are unequal for different magnitudes.

Keywords: Earthquake Catalogue, Catalogue Completeness, Calculation of Magnitude Recurrence Parameters

Introduction

Turkey is located on a highly seismically active region where many devastating earthquakes take place. Only in the last 20 years, more than 10 earthquakes with $M_w \geq 6$ hit the country. Among them, in particular, Kocaeli and Düzce earthquakes served as a landmark for a better understanding of earthquake hazard and earthquake risk in Turkey. Accordingly, considerable effort has been given on assessment of seismic hazard on the basis of continually updated and improved seismic data. Considering seismic data, the contribution of earthquake catalogues in earthquake engineering is significant as the most important information on earthquakes such as location, time, magnitude and depth are compiled in these documents. Accordingly, seismic catalogues are often utilized to model and investigate seismic sources. To achieve this goal, however, further analysis steps such as seismic declustering, completeness analysis and magnitude-recurrence model analysis are essential. Considering these tasks, computer software is considerably necessary due to the utilized methods that either require back and forth computation or reapplication of the procedure several times for different sets of data and condition. Moreover earthquake catalogues are often lack of some small and moderate size events. This fact is mainly attributed to poor seismic networks in the early years of instrumental period. Accordingly, completeness periods of small, moderate or big size events in an earthquake catalogue may differ. Although there exist several methods to deal with the catalogues with unequal completeness periods, handy computer programs that incorporate such methods are either limited or not very well-known.

Recently, a national project supported by AFAD (Disaster and Emergency Management Authority of Turkey) has been completed with the collaboration of several universities and public institutions. As the final product, probabilistic seismic hazard maps for peak ground acceleration (PGA) and 5 % damped spectral acceleration (SA) at T= 0.2s and 1.0s were produced for 475- and 2475-year return periods considering the administrative borders of Turkey. These maps were generated by considering two different sets of seismicity models namely 1-area source model and 2-fault source + smoothed seismicity model that were developed under the light of the updated Turkish earthquake catalogue and active fault map of the region. In line with the demands encountered during the course of the project, a software package called as ECAT (**E**arthquake **C**atalogues **A**nalysis **T**ools) has been developed for assessing completeness periods of the Turkish earthquake catalogue and calculating magnitude recurrence parameters of earthquakes.

This study presents some of the useful features of the ECAT software that is applicable to earthquake catalogues

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with unequal completeness periods. In the first part of the paper, capabilities of the software will be presented overall while the developed tools will be addressed in the subsequent sections.

General capabilities of the ECAT Software Package

The ECAT software is developed by making use of MATLAB® programming language and it provides a user-friendly environment for earthquake catalogue operations while letting users filter events in terms of date, location, magnitude and hypocentral depth. The main window of the software is based on a map in geospatial format that covers Turkish territory and its surroundings. The opening window of the software first asks for a catalogue file in the desired file format. Accordingly, all the events in the catalogue are plotted on the map in the main window of the program. Figure 1 illustrates the general view of the main window of the ECAT software.

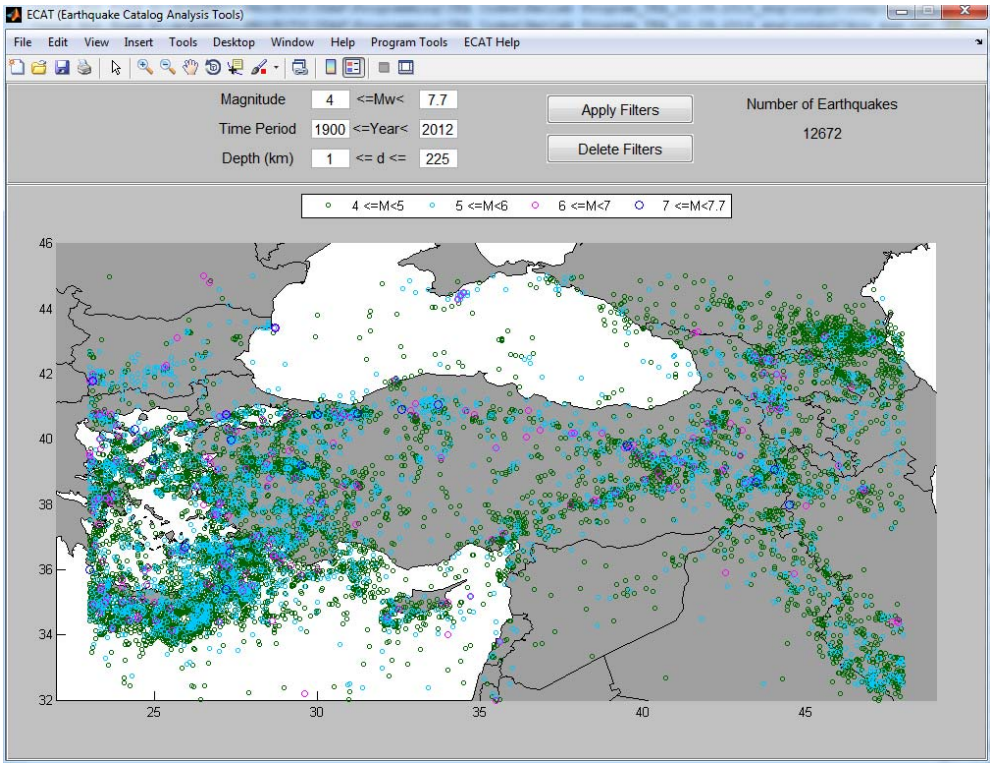

Figure 1. Main window of the ECAT software

As it can be seen in Figure 1, the earthquakes are plotted in terms of magnitude bins that are established with unit magnitude by default. On the upper panel, the extents of the selected catalogue are presented with upper and lower values in terms of magnitude, time and hypocentral depth. The user can limit and replot the earthquakes in terms these 3 constraints with the “Apply Filters” and “Delete Filters” buttons. Upon the each mouse click on “Apply Filter” and “Delete Filter” buttons, the earthquakes on the map are replotted. Similarly, the number of events that fulfil the selected criterion are automatically refreshed on the right hand side of the buttons.

The developed tools within the ECAT software are grouped under the “Program Tools” menu on the menu bar. Under the “Program Tools” menu, the tools for region selection, completeness analysis and magnitude recurrence analysis are available. The general view of the “Program Tools” menu and cascading view of the “Select Region” menu are given in Figure 2. The operations related with these tools will be presented in the following sections.

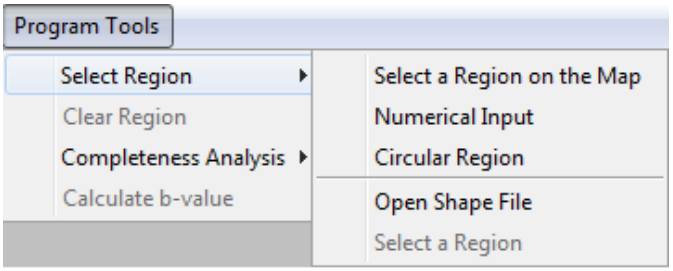

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Figure 2. The submenus under "Program Tools" menu

Selection of a region

The ECAT software provides 4 different options for region selection. As the first option under the menu, users can define a region with an arbitrary shape by selecting the "Select a region on the map" command. By this command any shape with any number of points can be defined by clicking on the mouse buttons. A sample view of a user-defined region is presented in Figure 3.

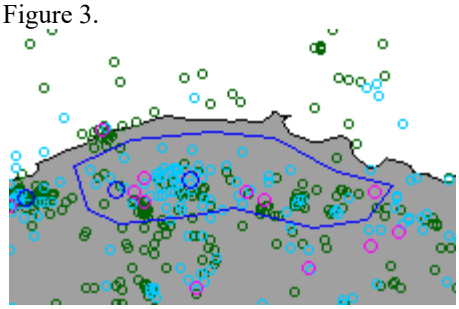

Figure 3. Region with an arbitrary shape

As the secondary option, users can define a rectangular region by selection the "Numerical input" command. Figure 4 illustrates the pop-up window where corner points of a rectangle can be entered.

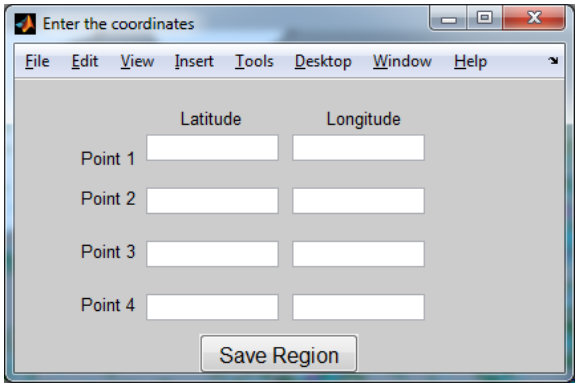

Figure 4. Rectangular region definition

The ECAT software also enables to define circular regions. By clicking on the "Circular region" option under the region selection menu, a pop-up window appears. On this window, users can define the central coordinates of a circle either by keyboard entry or mouse click on the main window. The radius of the circle is also defined on the circular region pop-up window.

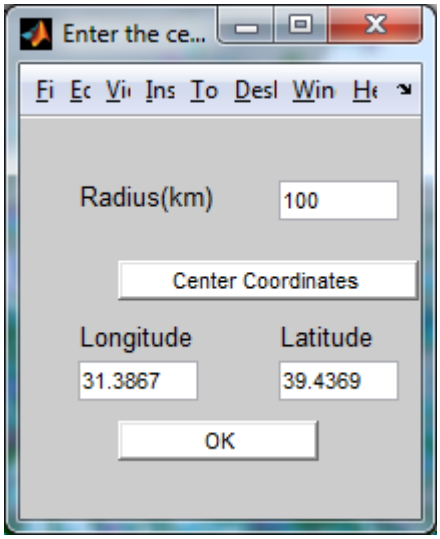

Figure 5. Pop-up menu for circular region selection

As the last option, region data can also be loaded from geospatial data files. Figure 6 illustrates a sample view of a loaded shape file that is plotted on top of the earthquake map. As it can be seen from the pop-up window appearing

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in front of the main window, the program allows users to select a region out of several regions. Thus, a loaded shape file does not necessarily have to incorporate single region data.

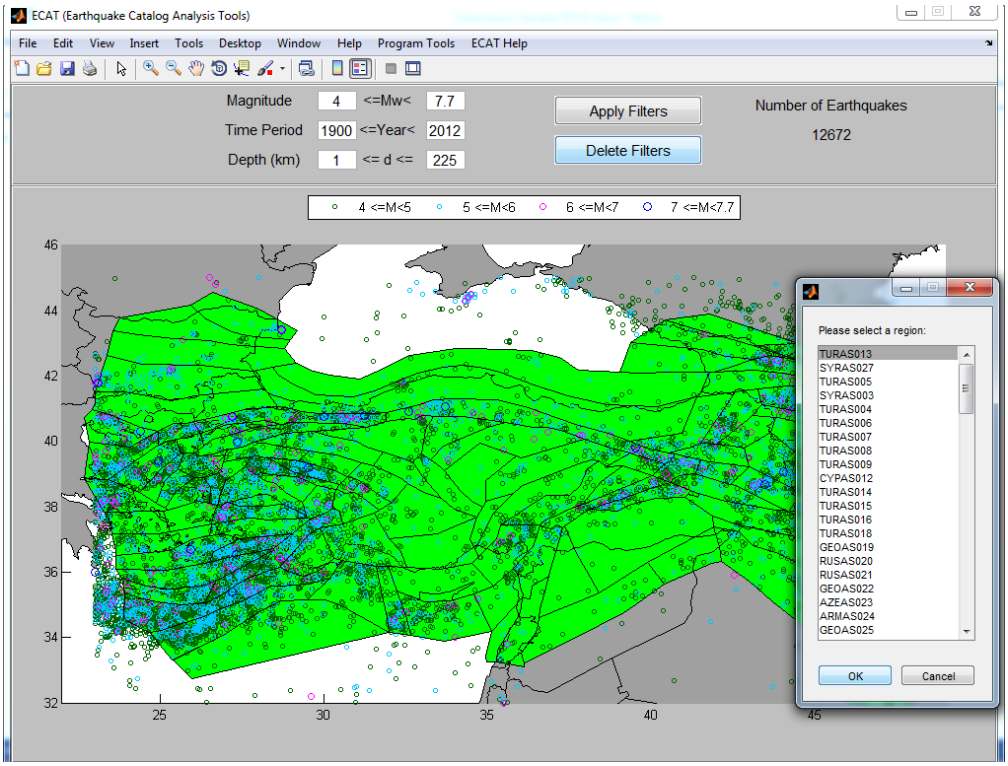

Figure 6. Selection of the region from a loaded shape file

After defining a region, users can proceed with the completeness analysis and magnitude recurrence relation tool.

Completeness Analysis Tool

As mentioned in the previous sections, earthquake catalogues are often lack of some events particularly in the early period of instrumental period. This fact complicates determination of completeness periods of catalogues as in this case one needs to investigate catalogue events in terms of subgroups of magnitude classes. Bearing on this idea, Stepp (1972) proposed a method to assess completeness periods of catalogues with unequal completeness periods. According to this method, the mean earthquake rate of each magnitude class is calculated for expanding time windows established from the last record backwards the first one. Then, scatter plots of standard deviation of the mean of the annual number of events are plotted against sample lengths for each magnitude class. Finally, completeness period of each magnitude class is assessed upon the stability of the estimates in the subintervals. The ECAT software enables users to decide on the duration of temporal window as well as magnitude interval to establish magnitude classes. The default values of these parameters are considered as 5 years and M_w 0.5 for time and magnitude increments respectively. The program also asks for lower, intermediate and upper magnitudes to be considered while constructing magnitude bins. Here, the intermediate magnitude is intended to separate moderate and big size events so that a single magnitude class can be established for big events regardless of the bin size. Figure 7 illustrates the main window of completeness analysis tool. On this window, users can zoom in and out on the plots and decide on the completeness periods of each magnitude class with the help of the auxiliary tools that can be utilized to draw/clear reference lines and trace on data.

The secondary method integrated into the ECAT software to assess completeness periods is based on the study by Mulargia et al. (1987). Similar to Stepp (1972) method, all selected earthquakes are grouped in terms of magnitude classes that are established according to the user's definitions. Then, cumulative number of events in each magnitude class is plotted against time starting from the first record towards the last one. Completeness period of each magnitude class is decided upon the stationarity of cumulative number of events. A sample plot of completeness analysis tool is illustrated in Figure 8 if the method by Mulargia et al. (1987) is selected.

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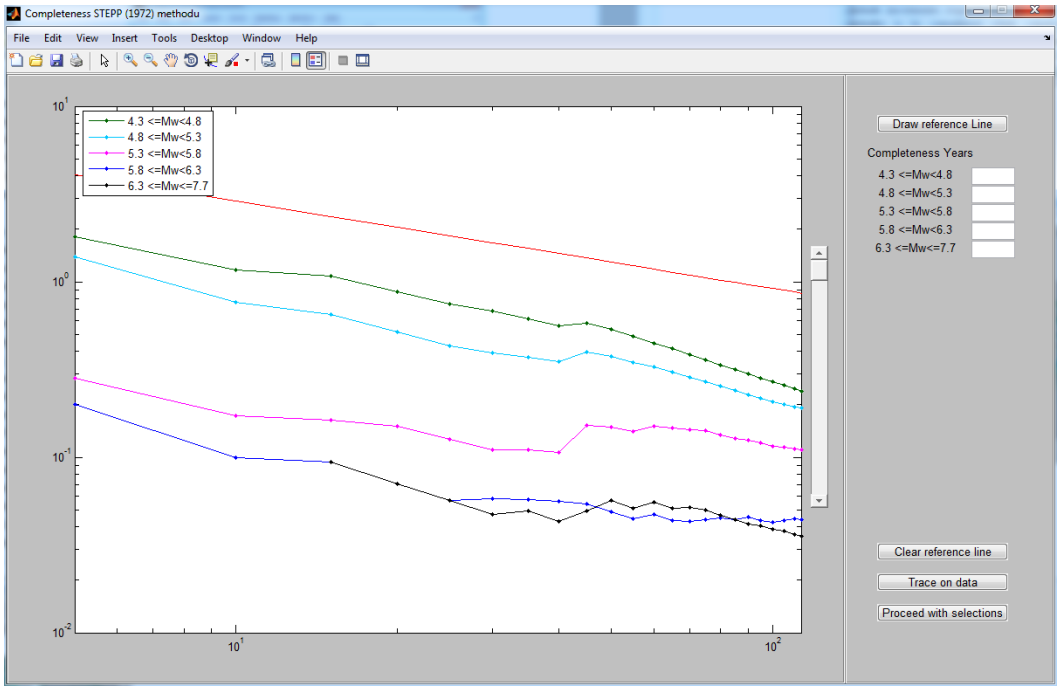

Figure 7. The main window of completeness tool for Stepp (1972) method

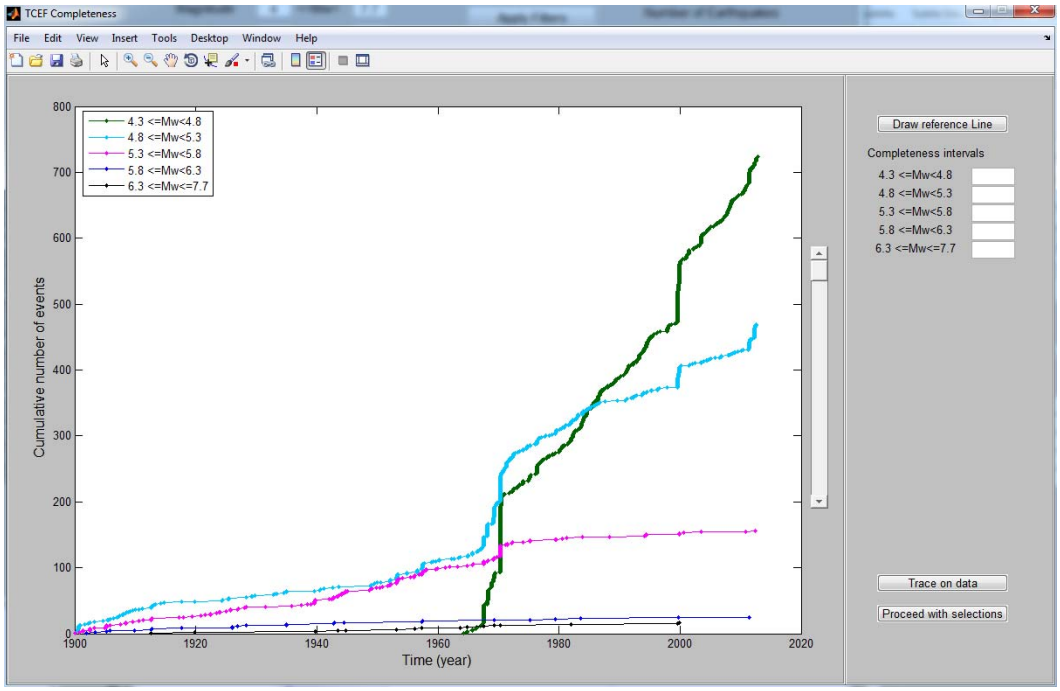

Figure 8. The main window of completeness tool for Mulargia et al. (1987) method

For both methods, completeness analysis is completed if "Proceed with selections" button is pressed. After this selection, the completeness analysis results are saved automatically as a text file under the main folder of the program. This file updates itself if the completeness analysis repeated. Once completeness analysis is completed, users can proceed with the magnitude recurrence tool.

Magnitude Recurrence Relation Tool

The ECAT software provides 3 methods for calculation of magnitude recurrence parameters. Among these methods, two of them can be applied to catalogues with unequal completeness periods. In the program, the magnitude recurrence tool can be accessed under the "Program Tools" menu. After choosing this tool, a pop-up window appears (Figure 9). On this window, the required inputs differ in accordance with the selected method.

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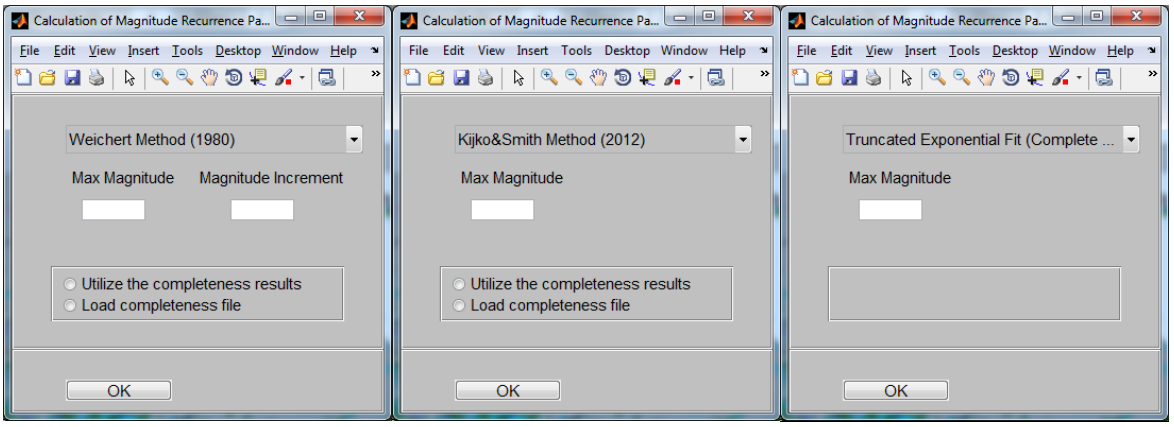

Figure 9. Appearance of the input window of magnitude recurrence tool in case (from left to right) Weichert (1980), Kijko and Smith (2012) and Truncated Exponential Fit method is selected.

According to Weichert (1980) method, maximum likelihood method is utilized to estimate magnitude recurrence parameters (ν and β) that are connected to the constants (a and b) of the Richter's (1958) equation (Eq. 1) for exponential distribution of earthquake magnitudes. Readers are referred to McGuire (1977) for the equivalent form of Eq.1 in case the equation is rearranged in terms of ν and β.

$$Log_{10}N(m) = a - bM \qquad \text{Eq.1}$$

As one can infer form Figure 9, for the case of Weichert (1980) method maximum magnitude and magnitude increment values are decided by the user. Here, the user can either utilize the completeness analysis results of the latest completeness analysis or load a previously saved completeness file. In this method, the magnitude increment that is utilized to construct successive magnitude bins is considerable important. According to Bender (1983), the magnitude increment must be kept small enough in order to not create bias in estimates. To this end, the value of magnitude increment is considered as 0.1 M as default. However, users can define values different than the default value. Another important parameter utilized in Weichert (1980) method is the maximum magnitude. It is well known that maximum magnitude has a great effect on magnitude recurrence parameters. In this sense, decision on maximum magnitude needs to be made under the light of state-of-art geological and seismological (McGuire, 1977). After deciding on magnitude related entries and selecting completeness file, maximum likelihood estimates of magnitude recurrence model is calculated. After that, the exponential fit is illustrated together with earthquake recurrence data on a new window as given in Figure 10.

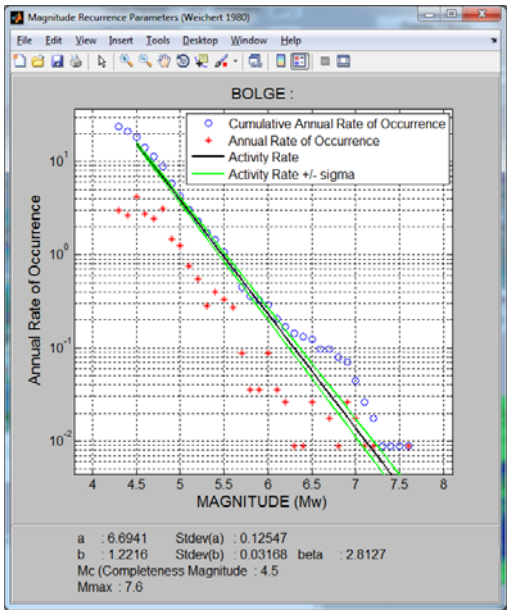

Figure 10. The fitted curve on earthquake recurrence data together with +/-1 σ

As the secondary method, users can utilize the method by Kijko and Smith (2012) to estimate magnitude recurrence parameters of the selected set of earthquakes. Similar to the pervious method, maximum magnitude is

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decided by the user. However, this method does not require any other input other than completeness data file. According to this method, selected set of earthquakes are divided into sub-catalogues so that each sub-catalogue established according to the completeness periods. Then, each sub-catalogue is treated as a complete catalogue and maximum likelihood estimates of recurrence parameters of each sub-catalogue are calculated on the basis of Richter's (1958) equation. The recurrence parameters of each sub-catalogue are then combined by a joint function and magnitude recurrence parameters are derived for the entire set of earthquake. The ECAT program does not provide a plot for the results if Kijko and Smith (2012) is utilized. The results are displayed on the command window.

As the final method, users can also select to proceed with truncated exponential fit option where selected earthquakes are considered as complete in each magnitude bin. Accordingly, the maximum likelihood estimates of magnitude recurrence parameters are calculated on the basis of Richter's (1958) relationship. A sample view of the fitted function is displayed in Figure 11 where circles red dots correspond to annual rate of occurrence and blue circles designate cumulative annual rate of occurrence.

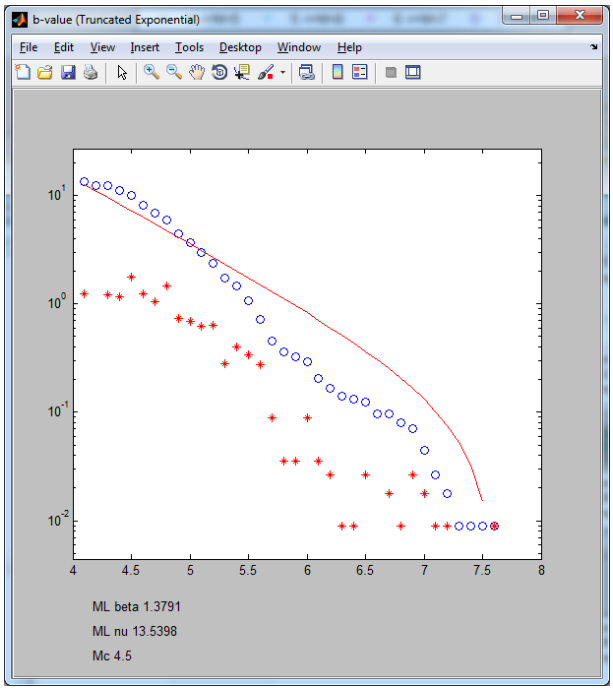

Figure 11. A sample view of fitted exponential curve in case truncated exponential fit option is selected

Concluding Remarks

This paper presents capabilities of the ECAT software that is developed to assess completeness of earthquake catalogues that have unequal completeness periods. In the recent version of the program, the completeness tool incorporates routines for Stepp (1972) and Mulargia et al. (1987) methods. The program also incorporates magnitude recurrence calculation tool that offers 3 methods to calculate maximum likelihood estimates of earthquake recurrence parameters. Among these methods, two of them are applicable to earthquake catalogues with unequal completeness periods. In the current version, the methods by Weichert (1980) and Kijko and Smith (2012) are integrated in the software. It is believed that the ECAT software will be a useful tool for researchers and engineers particularly for those who deal with earthquake catalogues that have unequal completeness periods.

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THE EFFECT OF COLD PLASMA TECHNIQUE ON SOME PATHOGEN MICROORGANISMS FOR MEAT PRODUCTS

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In this research, the effect of cold plasma on *Listeria monocytogenes* and *Staphylococcus aureus* inoculated on sliced pastirma was investigated. In the study, cold plasma which was produced using oxygen gas for 3 min (SP_1), oxygen gas for 5 min (SP_2), argon gas for 3 min (SP_3), argon gas for 5 min (SP_4), % 50-50 argon-oxygen gas for 3 min (SP_5), % 50-50 argon-oxygen gas for 5 min (SP_6), % 75-25 argon-oxygen gas for 3 min (SP_7) and % 75-25 argon-oxygen gas for 5 min (SP_8), was applied to pastirmas.

While moisture contents of samples which was applied cold plasma process were between 44,54-51,88 %, there were not any significant changes in pH values. Both moisture content and water activity values of pastirma samples decreased by the application of cold plasma process. The maximum decrease in a_w value was observed for SP_7 and SP_8 samples. SP_1 sample which was treated with pure oxygen had 0,99 malonaldehyde/kg and it was the highest TBA value after cold plasma treatment compared to the TBA values of other samples. There has been significant changes in color values L*a*b* of pastirma samples. While the lightness of pastirmas decreased, the redness and the yellowness of the samples increased. As a result of cold plasma process applied to pastirma samples inoculated with *Staphylococcus aureus* and *Listeria monocytogenes*, maximum 0,95 log cfu/cm^2 and 0,91 log cfu/cm^2 decreases were observed for *S. aureus* and *L. monocytogenes*, respectively. Moreover cold plasma process decreased TMAB numbers, yeast-mold numbers and psychrophile bacterium numbers in pastirma samples up to 1,41, 1,66 and 1,58 log cfu/cm^2, respectively. In this study, it was determined that cold plasma was effective on sensory properties. Color, appearance, flavor-aroma, texture and general discrimination points showed decrease compared to Control samples. This study showed that gas type and process period being used in cold plasma process was effective in inactivation of pathogens.

Keywords: Cold plasma, pathogen, pastirma, inactivation, inoculation, Listeria monocytogenes , Staphylococcus aureus

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THE EFFECT OF GEOMETRICAL (RADIATION) DAMPING ON SOIL-STRUCTURE INTERACTION PROBLEMS

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Abstract: In this study, it has been especially focused on geometrical damping with regard to the structure-foundation-soil interaction in order to examine the effect of the local soil conditions on the response of the structure subjected to seismic motion. The frequency dependent geometrical damping values corresponding to the lateral and rotational vibrations for the plane wave propagation problems were obtained in the case of clay soil with different plasticity and foundations embedment depth. The soil pattern and its geotechnical parameters were chosen from the Sakarya region. An analysis algorithm written by MATLAB code has been presented for the foundation-soil interaction problem based on impedance functions using in the substructure method. The importance of taking the soil-structure interaction into account in the computation process is emphasized to provide the earthquake safety of the engineering structures built on poor ground conditions in high seismic zones.

Key words: Substructure approach, impedance functions, geometrical damping, clay soil

YAPI-ZEMİN ETKİLEŞİM PROBLEMİNDE GEOMETRİK (RADYASYON) SÖNÜM ETKİSİ

Özet: Yerel zemin koşullarının deprem hareketine maruz yapının dinamik davranışı üzerindeki etkilerini yapı-zemin-temel etkileşimi açısından inceleyebilmek için bu çalışmada özellikle geometrik sönüme odaklanılmıştır. Düzlem dalga yayılım problemlerinde ötelenme ve dönme titreşim hareketine karşı gelen geometrik sönümün sismik kuvvetin titreşim frekansına bağlı değişimi temelin gömülme derinliğine ve farklı plastisite indisine sahip sert ve yumuşak olarak tanımlanan killi zeminler için elde edilmiştir. Zemin örnekleri ve geoteknik parametreleri Sakarya bölgesinden seçilmiştir. Temel-zemin etkileşim probleminin empedans fonksiyonlarına bağlı analizinde altsistem yaklaşımının kullanıldığı MATLAB kodunda yazılmış bir çözüm algoritması sunulmuştur. Depremselliği yüksek ve zayıf zemin koşullarında inşa edilecek önemli mühendislik yapılarının deprem güvenliğinin sağlanmasında yapı-zemin etkileşiminin hesap sürecine katılmasının önemi vurgulanmıştır.

Anahtar sözcükler: Altsistem yaklaşımı, empedans fonksiyonları, geometrik sönüm, kil zemin

Giriş

Depreme karşı davranışlarının önemli olduğu bilinen büyük ölçekli barajlar, nükleer güç santralleri, çok katlı rijit taşıyıcı sistemli konut binaları ve kule gibi ağır yapıların günümüzde aktif deprem bölgelerinde ve zayıf zemin koşullarunda kurulması zorunluluğu, üstyapı ile zemin arasındaki dinamik karşılıklı etki probleminin konusunu oluşturmaktadır. Zemin ortamının üstyapıya oranla çok rijit olduğu durumlar dışında, statik ve dinamik dış etkilere karşı üstyapı ve zemin her ikisi de şekil değiştirebilen sistemler olarak birlikte davranış gösterirler. Bu nedenle gerçek davranışın göz önüne alınabilmesi için zemin bölgesi de yapısal sistemin bir parçası olarak tanımlanmalı ve yapıyla beraber analiz edilmelidir. Sismik analizlerde yapı-zemin dinamik etkileşimi

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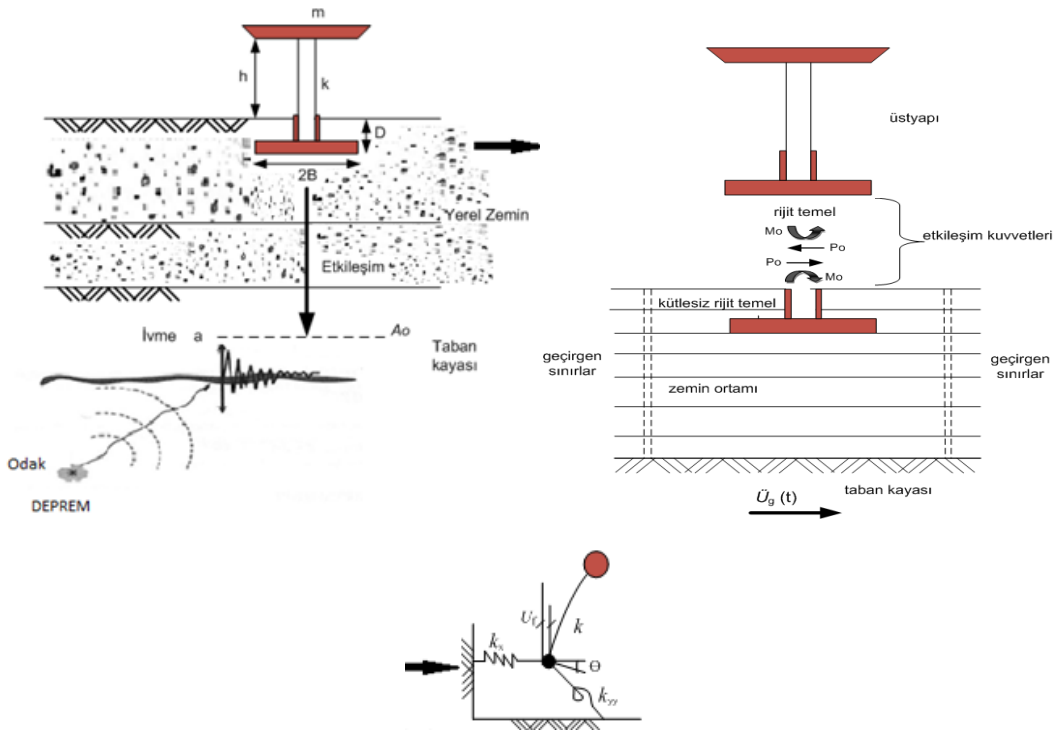
probleminin çözüm sürecine katılarak yapıların deprem performansları daha ayrıntılı bir şekilde ele alınarak, depreme karşı tam güvenlik doğruluk düzeyi yüksek matematik modeller ve sayısal yöntemler kullanarak sağlanabilmektedir.

Yapı-zemin etkileşim probleminin çözümünde alt-sistem yaklaşımının kullanılmasında, temel ortamının yapısal davranış üzerindeki etkisi, yarı uzay veya ana kaya tabanlı yatay tabakalı zeminin teorik olarak elasto-dinamik çözümüne dayanan sismik yükün frekansına bağlı eşdeğer yay ve söndürücülerle temsil edilmektedir. Bu konuda geniş bir frekans aralığı üzerinde empedans fonksiyonlarının kullanımıyla ilgili yüzeysel ve gömülü temellerin titreşimleriyle ilgili birçok çalışma yapılmıştır (Apsel ve Luco,1987; Çelebi ve Gündüz, 2005; Mylonakis vd.;2006; Çelebi vd., 2006). Bu alanda gerçekleştirilen çalışmalar da elastik zemin davranışı varsayımı altında değerlendirilmiştir.

Yapı-zemin dinamik etkileşimini dikkate almak için "mevcut binaların sismik rehabilitasyonu" isimli ASCE-41 yönetmeliğinde (bir önceki versiyonu FEMA 356) dikdörtgen temeller için statik rijitlik formülleri kullanılarak zemin davranışını temsil edecek statik rijitlik katsayıları her bir titreşim modu için hesaplanabilmektedir. Bu katsayılar bina modeline statik yay sabitleri olarak tanımlanmaktadır. Artımsal itme analizi ile yapı-zemin dinamik etkileşiminin irdelendiği birçok ortak çalışma rapor sonuçlarında problemin çözümünün elastik zemin davranışı ile sınırlı kaldığı görülmektedir (NIST GC 12-917-21 Report, 2012).

Bu çalışmada iki boyutlu betonarme köprü ayağının, oturduğu zeminle etkileşim probleminin sayısal modelinin analizi için altsistem yöntemi esas alınmıştır (Şekil 1). Bu yaklaşımda rijit temelin oturduğu zemin ortamının şekil değiştirme özelliği ötelenme ve dönme empedans fonksiyonlarına bağlı ifade edilmektedir (Pais ve Kausel, 1988). Yerel zemin koşullarının deprem hareketine maruz yapının dinamik davranışı üzerindeki etkilerini yapı-zemin-temel etkileşimi açısından inceleyebilmek için bu çalışmada özellikle geometrik sönüme odaklanılmıştır. Düzlem dalga yayılım problemlerinde ötelenme ve dönme titreşim hareketine karşı gelen geometrik sönümün sismik kuvvetin titreşim frekansına bağlı değişimi temelin gömülme derinliğine ve farklı plastisite indisine sahip sert ve yumuşak olarak tanımlanan killi zeminler için elde edilmiştir. Zemin örnekleri ve geoteknik parametreleri Sakarya bölgesinden seçilmiştir.



Şekil 1. Altsistem Yaklaşımı

Çözüm Yöntemi

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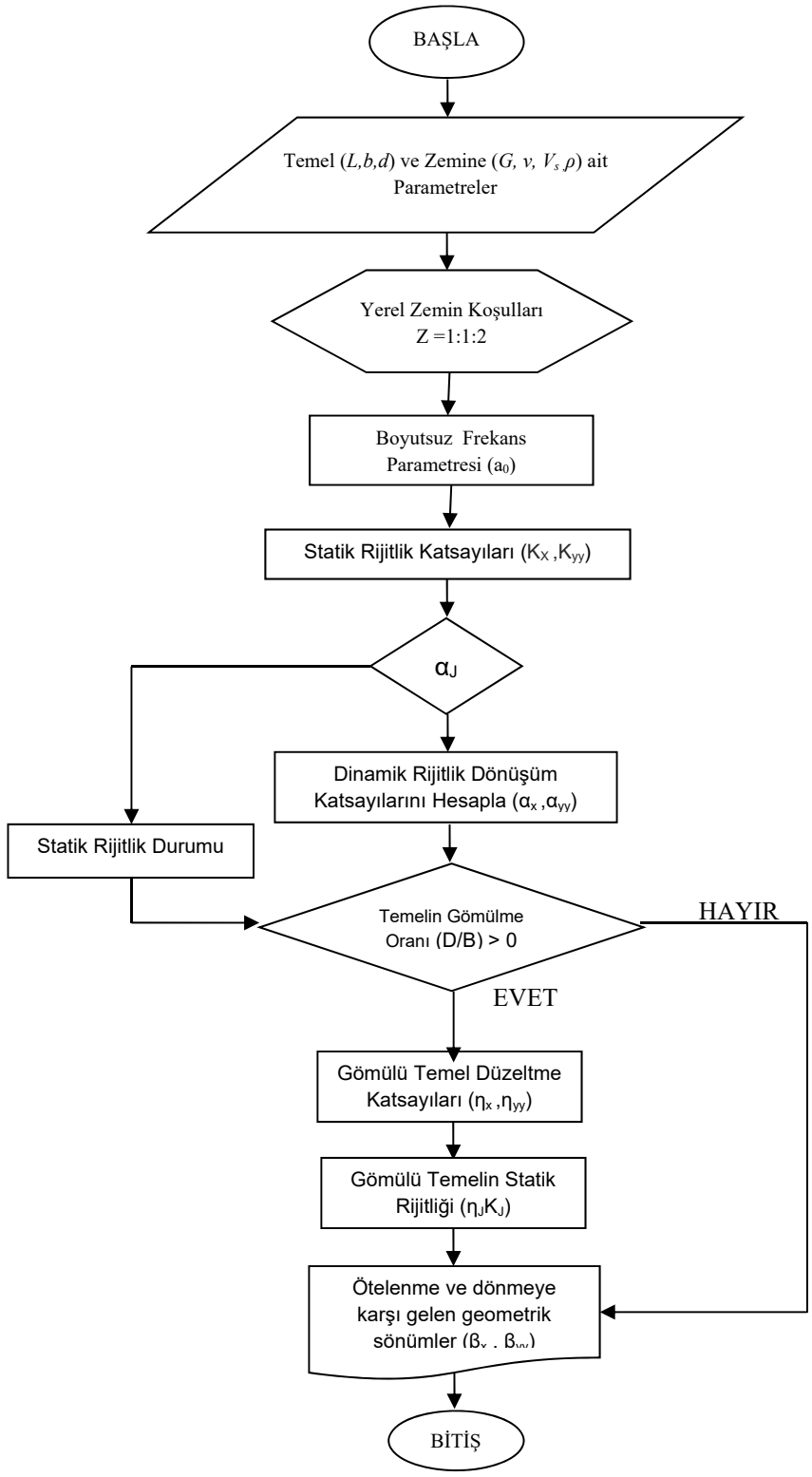
Altsistem yöntemine dayalı geliştirilen MATLAB çözüm algoritmasında, ötelenme ve dönme titreşim hareketine karşı gelen geometrik sönümün deprem yer hareketinin titreşim frekansına bağlı değişimi temelin gömülme derinliğine ve farklı kıvamlardaki killi zemin koşulları için incelenmiştir. Çözüm akışında, statik rijitlik (K_i), dinamik rijitlik düzeltme katsayısı (α_i) ve gömülü temel düzeltme katsayısı (η_i) ile ifade edilmektedir. Yapıyı titreştiren enerjinin zeminin sonsuzluğu nedeniyle kaybolmasını anlatan β_x ve β_{yy} x doğrultusundaki ötelenme ve y doğrultusundaki dönme sonucunda oluşan geometrik sönümlerdir.



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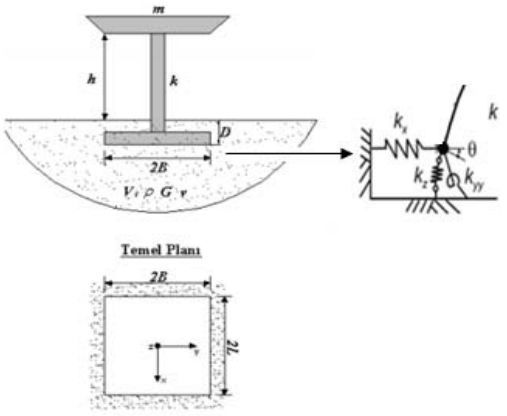
Şekil 2. Geometrik Sönümleri Hesaplayan Akış Şeması

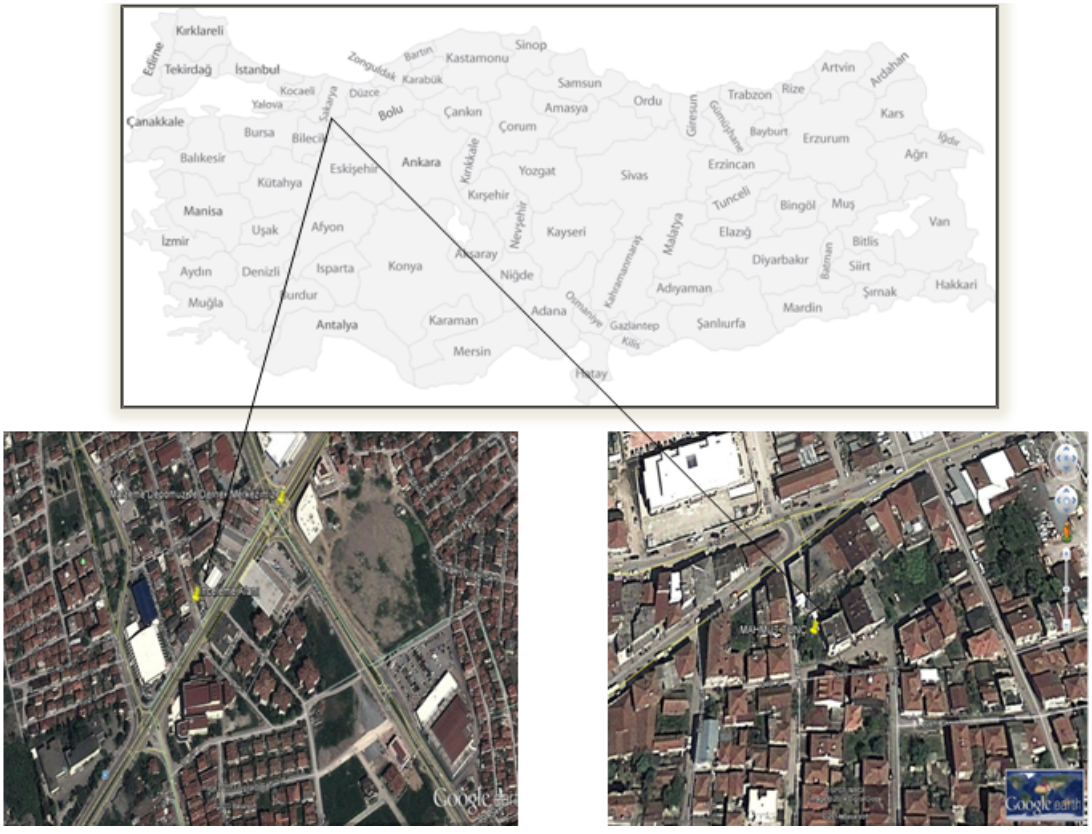
Sayısal Uygulama ve Tartışma

Sayısal uygulamada betonarme köprü ayağının oturduğu temel ortamı farklı kıvamlardaki sert ve yumuşak kil olmak üzere iki durum için incelenmiştir. Bu çalışmada, zeminin birim şekil değiştirmesine karşı gelen, histerezis döngü ile tüketilen enerjiyi temsil eden malzeme sönümünün empedans fonksiyonlarına etkisi dikkate alınmamıştır. Yapı-zemin etkileşim probleminin sayısal modeli için altsistem yöntemi kullanılmıştır (Şekil 3).



Şekil 3. Yapı-Temel-Zemin Ortak Sisteminin Genel Yapısı

Sayısal analizlerde Sakarya ili Adapazarı ilçesindeki Yağcılar ve Pabuççular Mahallesine (Şekil 4) ait temel etüt raporundan alınan zemin mekanik özellikleri kullanılmıştır (Gündüz ve Kurnaz, 2013 ve 2014). İki farklı zemine ait bilgiler Tablo 2'de verilmiştir.



Şekil 4. Yer Bulduru Haritası

Tablo 2. Farklı Kıvamlardaki Killi Zemin Ortamının Özellikleri

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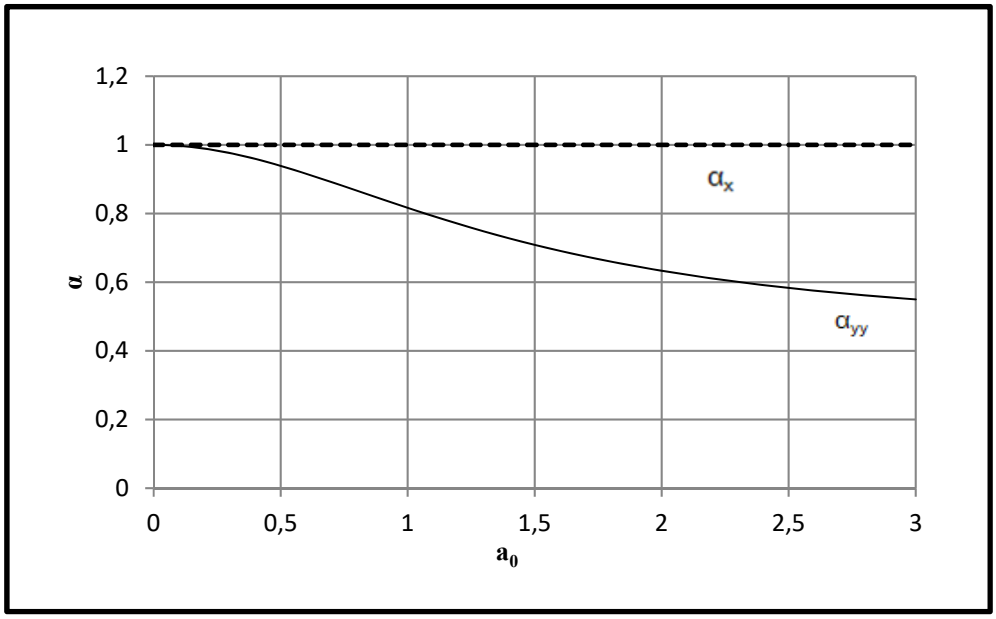
Parametre	Sembol	Birim	Sert Kil	Yumuşak Kil
Yoğunluk	ρ	ton/m^3	1.34	1.45
Kayma modülü	G	kN/m^2	46900	27800
Kayma dalgası	c_s	m/s	187	136
Poisson oranı	ν	-	0.30	0.468
Plastisite İndisi	PI	%	36	23
Elastisite Modülü	E	kN/m^2	122500	81500

Sayısal uygulamalarda kullanılan betonarme köprü ayağı modeline ait mekanik ve geometrik özellikler Tablo 3'de verilmiştir.

Tablo 3. Yapının Özellikleri

Parametre	Sembol	Birim	Büyüklük
Ağırlık	W	(kN)	500
Yanal ötelenme rijitliği	k	(kN/m)	100000
Yapının yüksekliği	H	(m)	10
Temel genişliğinin yarısı	B	(m)	4
Temel uzunluğunun yarısı	L	(m)	4
Zemine rijit bağlı sistemin periyodu	T	(s)	0.14
Açısal frekans	ω	(rad/s)	44.74

Şekil 5'de statik rijitlikten dinamik rijitliğe geçiş katsayısının boyutsuz frekans parametresine bağlı değişimi temel hareketinin ötelenme ve dönme bileşeni için gösterilmiştir. Ötelenme bileşeninin her iki farklı kıvamdaki kil için frekanstan bağımsız davranmaktadır. Dönme bileşenine ait geçiş katsayısı yüksek titreşim frekanslarında önemli derecede azalmaktadır. Kil zeminler için boyutsuz frekansın a_o=3 olması durumunda temelin dönme titreşimine karşı gelen dinamik rijitlik, statik rijitliğin nerdeyse yarı değerine kadar düştüğü elde edilen sayısal sonuçlardan görülmektedir.



Şekil 5. Dinamik Rijitliğe Geçiş Çarpanının α_x - α_{yy} Boyutsuz Frekans Parametresine Göre Değişimi

Temelin ötelenme ve dönme titreşim hareketine karşı gelen farklı kıvam endeksine sahip killerdeki geometrik sönümün titreşim frekansına bağlı değişimi yüzeysel (D/B=0) ve gömülü temeller (D/B=1) için ayrı ayrı elde

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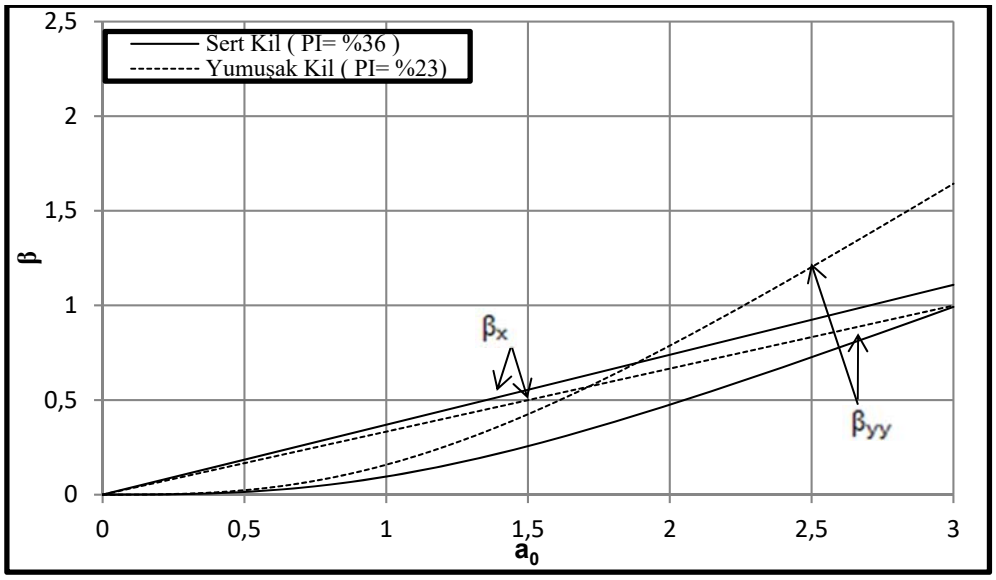
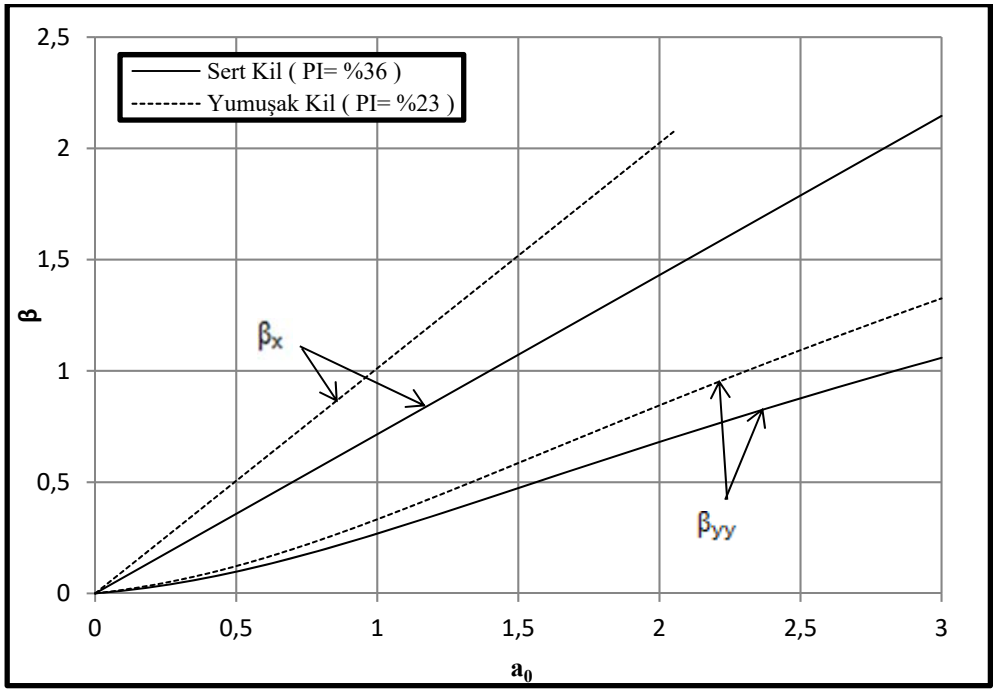
edilmiştir (Şekil 5-6). Kil zeminin plastisite indisi artıkça, yüksek frekans değerlerinde geometrik sönüm değeri temelin her titreşim modu için artmaktadır. Temelin gömülme derinliğinin geometrik sönümü önemli derecede değiştirdiği görülmektedir.



Şekil 6. Yüzeysel Temelin Ötelenme Ve Dönme Titreşimine Karşı Gelen Geometrik Sönümün β_x - β_{yy} Boyutsuz Frekans Parametresine Göre Değişimi (D/B=0)



Şekil 7. Gömülü Temelin Ötelenme Ve Dönme Titreşimine Karşı Gelen Geometrik Sönümün β_x - β_{yy} Boyutsuz Frekans Parametresine Göre Değişimi (D/B=1)

Sonuçlar

Altsistem yöntemine dayalı geliştirilen MATLAB çözüm algoritmasında, ötelenme ve dönme titreşim hareketine karşı gelen geometrik sönümün deprem yer hareketinin titreşim frekansına bağlı değişimi temelin gömülme derinliğine ve farklı kıvamlardaki killi zemin koşulları için incelenmiştir.

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Yapı-temel-zemin etkileşiminin dikkate alındığı özel mühendislik problemlerinin analizinde empedans fonksiyonlarına bağlı altsistem yaklaşımı kullanıldığında statik rijitlikler yüksek frekans değerlerinde yetersiz kalabilmektedir. Titreşim frekansına bağlı dinamik rijitlik terimlerini kullanılması daha doğru sonuçlar verecektir. Dinamik etkileşim problemlerinde temel ortamının toplam sönümü geometrik sönümden önemli derecede temelin gömülme derinliğine ve zemin koşullarına bağlı olarak etkilenmektedir.

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THE EFFECT OF HEAT TREATMENT ON MAGNETIC PROPERTIES OF RAPIDLY SOLIDIFIED MNAL ALLOY RIBBONS

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Abstract: The effect of heat treatment on magnetic properties of rapidly solidified $Mn_{54}Al_{46}$ alloy ribbons was studied. Melt spun $Mn_{54}Al_{46}$ alloy ribbons were heat treated at temperatures 500 ºC for 8, 10, and 12 hours, following a water quenching procedure. The heat treated and melt spun ribbons' magnetic properties were observed by vibrating sample magnetometer (VSM), the Curie temperatures were obtained from differential scanning calorimeter (DSC), and the microstructures were observed by optical microscope (OM). The better magnetic properties were obtained from the samples treated at 500 ºC, for 10 hours. The maximum energy product BHmax was obtained as 4.5 MGOe at 305 K, and the Curie temperature was found as 670 K. Increasing the heat treatment temperature deteriorates both the magnetic properties and Curie temperature. The magnetic properties were favored by τ phase which was detected by x-ray diffractometer. Increasing the heat treatment temperature affects the vicinity of τ phase by transforming into γ2 and β phases.

Keywords: Rapid Quenching, Magnetism, Phase Transformations, X-Ray Diffraction

Introduction

Magnetic materials have many important applications in energy production and utilization as well as numerous information science applications ranging from small, precise actuator motors to electronic storage media. The basic principles of magnetism can be explained by first explaining the different types of magnetism. The fundamental properties of magnetism arise from unpaired inner shell electrons which have an intrinsic spin. This spin gives rise to an individual magnetic moment attributed to each atom with these unpaired electrons.

Kono (Kōno, 1958), was discovered the metastable ferromagnetic τ phase, he studied about the composition of the MnAl alloy responsible for the presence, formation and the structure of ferromagnetic τ phase. He found that the ferromagnetic τ phase was in closed pack hexagonal (HCP) structure, this structure was a metastable phase. The ferromagnetic τ phase was obtained by quenching the ε-phase from high temperature by a martensitic transformation. The following studies were realized by Koch (Koch, Hokkeling, v. d. Steeg, & de Vos, 1960), and Zijlstra et al. (Zijlstra & Haanstra, 1966). Kenji (Kenji, Tadashi, & Yoshinori, 1970) added Boron in MnAl alloy to stabilize the metastable τ phase. More systematic approaches were done by Jakubovics (Jakubovics & Jolly, 1977) to explore the effect of the ferromagnetic phase and lattice defects to magnetic properties in detail.
Sakamoto (Sakamoto, Ibata, Kojima, & Ohtani, 1980) added C to MnAl alloy, and obtained the maximum energy product (BHmax) 4.1 MGOe.

There were numerous studies to stabilize the τ phase. In 1989 Sakka et al. (Sakka & Nakamura, 1989), was the first to produce Mn-Al-X (X = C, Ti, Ni, C, B melt-spun ribbons on single disk. He compared these ribbons with water quenched samples. The BHmax, and the magnetic susceptibility was found to be increased. The Ti, C, and B addition to ribbons increased the magnetic properties. The other studies were about the effect of grain size to magnetic properties Van Roy et al. (Van Roy, De Boeck, et al., 1995) conducted a detailed research on τ-MnAl structure and its magnetic properties, this study showed that the better magnetic properties could be obtained by 450 ºC, if the temperature raised up to 550 ºC, τ-MnAl structure transforms gradually to ε-MnAl. Van et al. (Van Roy, Bender, Bruynseraede, De Boeck, & Borghs, 1995) investigated the range of order of have a strong relationship with increase in magnetization of τ-MnAl ribbons.

Materials and Methods

In this study cast $Mn_{54}Al_{46}$ alloy and melt spun thin ribbons was produced and used, heat treatment was done at 500ºC for three duration time of 8, 10 and 12 hours. The effects of heat treatment on magnetic properties of this binary alloy were observed.

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The Mn, and Al metals of high purity were obtained from Sigma-Aldrich. The melting of alloying elements were done in Leybold-Heraus vacuum induction furnace, melting atmosphere was cleaned and sweep at least three times with argon.

The cast $Mn_{54}Al_{46}$ alloy chuck was cut into small pieces for melt spin process. The alloy was melted, and spout out with argon. The circumferential speed of rotating copper disk adjusted to 20 m/s. The schematic view of the melt spin apparatus was shown in Figure 1(Wang & Mitra, 2014). The ribbons were 300 μm thick, and 3 mm wide.

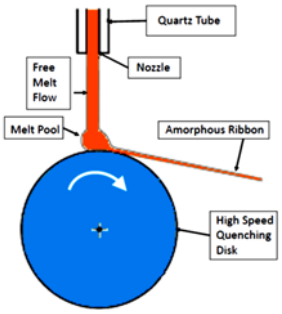

Figure 1. Schematic view of melt spin apparatus (Wang& Mitra, 2014)

Crystal structures were determined by X-ray diffraction (XRD; Philips PANalytical X'Pert-Pro) using Cu-Kα radiation.
Heat treatment procedures were performed on samples of the as-melt spun $Mn_{54}Al_{46}$ alloy sealed in quartz tubes following a vacuum assisted argon sweep procedure to protect against oxidation during heat treatment. The heat treatment sequence was 500ºC, for three duration times of 8, 10 and 12 hours. After each heat treatment interval, the magnetic properties of each of the vacuum-sealed sample were analyzed. Magnetic measurements were carried out using a superconducting quantum interference device magnetometer (SQUID; Quantum Design MPMS) at 305 K. The Curie temperature of the samples were obtained from Perkin-Elmer Diamond DSC with a scan rate of 5ºC/min.

The microstructures of both melt spun and cast samples were taken with Olympus PMG-3 metallurgical microscope. The microstructures were evaluated with Kameram software.

Results and Discussion

XRD results showed that the vicinity of τ phase occurs with increasing the heat treatment temperature, but further increase in temperature results with undesired transformation of τ phase into γ2 and β phases which deteriorates the magnetic properties. The XRD patterns of melt spun sample, heat treated at 500ºC for 10 hrs was given at Figure 2.

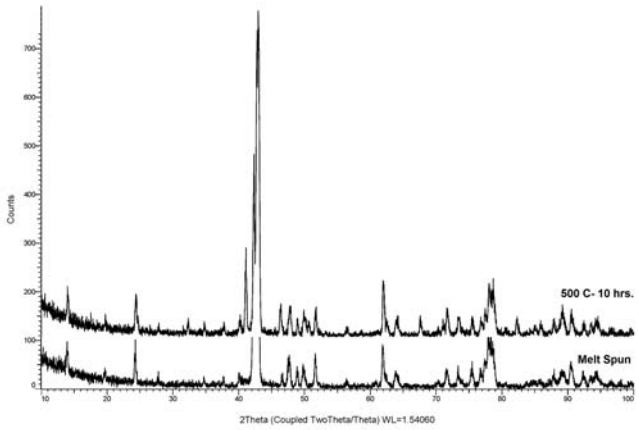

Figure 2. XRD of melt spun and heat treated at 500ºC for 10 hrs melt spun ribbons.

Magnetic measurements were determined from SQUID; Quantum Design MPMS, at 305 K. The hysteresis curves revealed that ribbons treated at 500ºC for 10 hrs have relatively high magnetic strength which gives maximum energy product of BH_{max} value of 4.5 MGOe at 305 K, a reasonable value for a permanent magnet. The hysteresis

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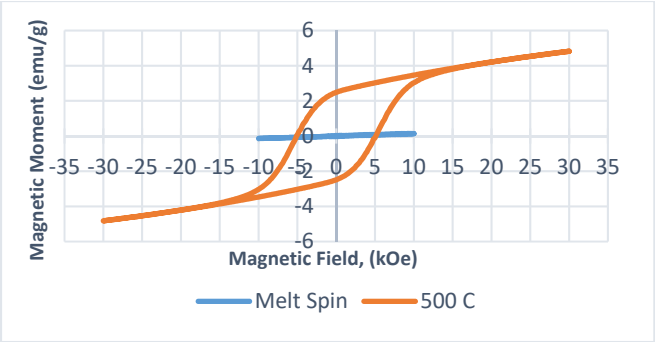

Figure 3. Magnetic hysteresis of Melt spin and heat treated at 500ºC for 10 hrs melt spun ribbons at 305 K

curves for both melt spin and heat treated at 500ºC for 10 hrs melt spun ribbons were given at Figure 3. The Curie temperature was obtained as 670 K from Perkin-Elmer Diamond DSC with a scan rate of 5ºC/min.

The microstructures of both heat treated at 500ºC for 10 hrs. cast alloy and melt spun ribbons were compared at Figure 4. Figure 4a shows as cast and heat treated at 500ºC sample, Figure 4b shows the heat treated at 500ºC melt spun ribbon's microstructure. The grain size of as cast and heat treated samples were pretty higher than the melt spun and heat treated samples. The quenching effect of melt spinning procedure highly obvious.

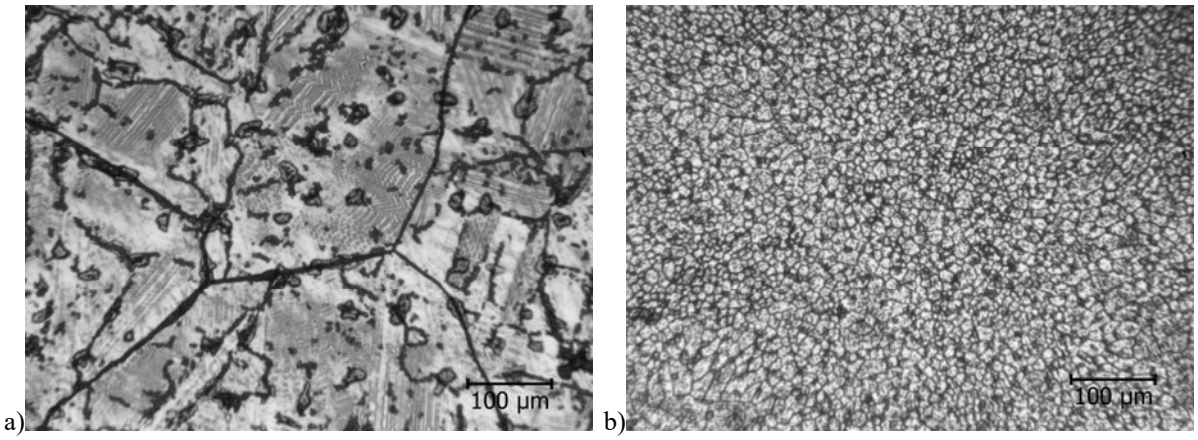

Figure 4. a) Cast and heat treated sample, b) melt spun and heat treated sample, both heat treated at 500ºC for 10 hrs

From XRD results it is seen that the heat treatment temperature increase worsening the magnetic properties due to transformation of τ phase into γ2 and β phases. The magnetic strength is highly related with τ phase, which is ordering the crystal structure together with the effect of rapid quenching the fine grain size is not sufficient therefore a heat treatment should be realized to start the formation of τ phase. The time for optimum magnetic properties limited with 10 hours, exceeding the 10 hours also promotes the formation of γ2 and β phases.

The magnetic properties as seen from Figure 3 shows a characteristic curve for a permanent magnet for melt spun and heat treated sample. The fine grain size have no effect on the magnetic properties therefore a heat treatment should follow melt spin procedure. The hysteresis curve shows that solely melt spun sample have no giant hysteresis, but after heat treatment the arrangement magnetic domains and also in our case the vicinity of τ phase, promotes the magnetic properties up to 4.5 MGOe maximum energy product achieved.

Conclusion

The production of binary magnetic $Mn_{54}Al_{46}$ alloy was successful. The production steps including casting, melt spinning, and heat treatment. The optimum magnetic properties was obtained from the melt spun ribbons heat treated at 500ºC for 10 hrs. However this alloy group had been an early studied alloy, by the discovery of modern production methods may have positive effect on production of hard to produce alloys.

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THE EFFECT OF METAKAOLIN ADDITIVE ON FLY ASH – BASED GEOPOLYMER FOAM PROPERTIES

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Abstract: In this study, the production of fly ash – based geopolymer foam was investigated. The fly ash obtained from Kütahya – Tunçbilek thermal power station and it was used as the raw material in the production of examples. Metakaolin was used as substitute material and it is added to the mixture obtained by calcining kaolin clay at 700 ºC in laboratory conditions. NaOH and sodium silicate solution were used as alkaline activator for made geopolymer foam medium. The aluminium powder added in order to increase the porosity of the material body in the prepared mixtures. The thermal curing processes were applied to the prepared mixtures for the geopolymerisation process. Then, the physical properties such as water absorption, density and porosity with compressive strength of the samples were determined. As a result, the effect of metakaolin additive on fly ash – based geopolymer foam properties were investigated.

Keywords: Geopolymer, Foam, Fly ash, Metakaolin.

Introduction

Geopolymer is one of the recent technologies developed with the aim of reducing the use of cement binder in concrete production. Leading the drive for seeking an alternative product to cement, this topic has gained popularity in the studies of researchers. Geopolymerization process carried out for the production of geopolymer involves reaction between aluminosilicate material and alkali solutions. When aluminosilicate materials used in the production of geopolymer are selected from industrial waste products, they cause much lower carbon dioxide emissions than cement does (Mo, 2016). In comparison to the use of cement, geopolymer products can lead to a reduction up to 64% in carbon dioxide emissions (McLellan, 2011).

Geopolymers was first developed in the early eighties by Joseph Davidovits. However, it is not possible to define geopolymerization process concisely in order to explain it. Geopolymerization is a complex process which has not been fully understood to this day (Davidovits, 1982). Therefore, taking into account each and every assertion defining this process, we can first state that geopolymers are incipient polymeric compounds. According to the monomer hypothesis, geopolymerization refers to a simple reaction mechanism involving condensation polymerization of ortho-sialiate ions. Geopolymers are three dimensional inorganic polymers comprising several semi crystalline phases and an amorphous series with Si-O-Al linkage. Si^{4+} and AI^{3+} cations with oxygen linkage in bridges in the structure of such polymer form tetra-hedral coordination. The negative charges on AlO^{4-} groups are balanced by alkali cation (generally sodium (Na+) or potassium (K+) ion) (Izquierdo, 2009; Cioffi, 2003).

Geopolymerization is a geosynthetic reaction of alumino-silicate minerals in a strong alkaline medium at low temperatures (Part, 2015). The three most widely used classes of materials in the geopolymerization process are calcined clay, coal slag and fly ash. In other words, the primary sources of geopolymer raw material are kaolin clay the geologic origin of which is in the form of rock and volcanic ash, while the secondary sources are industrial waste or sub-products such as fly ash and granulated blast furnace slag (Duxson, 2008). Although calcined clays, predominantly metakaolin, are widely used in the synthesis of geopolymer, they give rise to high water demand and high porosity in the production of concrete due to their plate-shaped particles and therefore they are not very suitable materials. Other types of the raw material are more suitable for the synthesis of two-part geopolymer (Hwang, 2015).

Recent studies on this subject indicate that although the use of flash metakaolin geopolymer as an effective binder in place of Portland cement in concrete causes the material to have a highly porous structure, the material has better mechanical properties than Portland cement concretes (Raphaelle, 2016). Another study (Duan, 2016) aims at expanding the use of waste iron ore tailings in geopolymers and reports that 20% replacement by fly ash is optimum. In another study, recyclable scrap-tyre rubber is added to geopolymer concrete with the aim of achieving low CO_2 emissions as well as recycling scrap-tyre rubber which is a serious environmental problem. In another study, fly ash is used as a binder and activated with sodium silicate and sodium hydroxide. The study shows that the replacement of fine aggregate by rubber in the samples up to 5% by volume is possible (Park, 2016). As can be

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seen, studies carried out these days aim at producing resistant as well as light geopolymer materials and improving the physical properties of geopolymer concretes rather than improving their mechanical properties. The most effective method for this purpose is using foam concrete. Foam concrete refers to a type of a light concrete with high void ratio formed with or without the addition of a cement binder and a fine aggregate. Foam concrete was first patented by Aylsworth and Dyer in 1914 and then by Bayer and Erikkson in 1923. However, its use as a light construction material has become more popular in recent years (Ramamurthy, 2009; Zhang, 2014).

Some of the recent studies conducted on geopolymer foam concrete use oil palm shell as a lightweight coarse aggregate, palm oil fuel ash or low calcium fly ash as binders in concrete. The results of the oil palm shell foam geopolymer concrete morphology indicate that oven curing periods lead to the formation of a more dense and homogeneous geopolymer matrix, which results in higher compressive strength. The positive correlation of the foam volume with the water absorption and sorptivity points to a reduction in concrete strength. In addition, oil palm shell foam geopolymer concrete gains early strength of up to 87% of its 28-day compressive strength as a result of oven curing (Liu, 2016).

In another study, foamed geopolymer is synthesized with Class F fly ash, sodium hydroxide (NaOH) and the foaming agent, sodium hypochlorite (NaCIO), and then cured at 90 °C. The study investigates the formation of foamed geopolymer at the rates of NaCIO/fly ash whose NaOH/ fly ash effect has been predetermined. The rate of NaCIO/fly ash is kept constant at 0.50 composition while that of NaOH/ fly ash is changed in the range of 0.16 to 0.24. It is reported that the formulations in the study can be used to manufacture materials suitable for construction applications such as light and refractory insulation, interior wall or ceiling panels (Böke, 2015).

Geopolymer foam is used for concrete synthesis with partial replacement of slag by fly ash and mechanical mixing of pre-formed foam and Class F fly ash. Concretes with density of about 720 - 1600 kg /m3 and 28-day compressive strength of about 3–48 MPa are produced. The geopolymer foam concretes exhibit better thermal insulation properties (thermal conductivity in the range of 0.15 to 0.48 W/mK) than the Portland cement foam concretes which have the same density and strength. The compressive strength of the geopolymer foam concrete increases at room temperature with a partial replacement of slag by fly ash, however, leads to significant shrinkage and strength loss at high temperature (Zhang, 2015).

In this study, fly ash and metakaolin materials were activated with alkaline solution consisting of NaOH and sodium silicate solution in order to produce geopolymer material. Immediately afterwards, aluminium powder was added to the geopolymer matrix body at the beginning of the geopolymerization process to carry out foaming process and this way geopolymer foam samples were prepared.

Materials and Methods

Fly ash (FA) supplied from Tunçbilek Thermal Power Plant (Kütahya – TURKEY) was used as raw material in the production of the samples for geopolymer foam synthesis. Metakaolin clay supplied from a private company operating also in Kütahya – TURKEY was sintered at 700 ºC to obtain metakaolin (MK) material which was used as replacement material in this study. Table 1 presents the results of XRF analyses of the fly ash and the metakaolin (MK) materials.

Table 1. Chemical (XRF) composition of fly ash and metakaolin.

Oxide (%)	SiO_2	Al_2O_3	Fe_2O_3	MgO	Na_2O	K_2O	SO_3	CaO	K.K.	Toplam
Metakaolin	54.76	37.71	0.89	0.28	0.20	1.35	0.04	0.46	2.87	98.56
Fly ash	55.60	21.34	9.61	4.49	0.16	1.87	0.64	3.09	1.03	97.86

Table 2. Materials used in geopolymer foam production.

Sample	MK replacement rate	FA (g)	MK (g)	Aluminium powder (g)	NaOH (g)	SS* (g)	Liquid/Binder rate (gr/gr)
G1	% 40	120	80	0.6	50	100	0.75
G2	% 45	110	90	0.6	50	100	0.75
G3	% 50	100	100	0.6	50	100	0.75

*SS: Sodium silicate solution.

Fly ash and metakaolin were dry-mixed for the preparation of the geopolymer foams and then alkaline solution consisting of a mixture of 15M NaOH and three-module sodium silicate solution was added to the dry mixture and

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mixed for 1 more minute. Afterwards, aluminium powder was added to the geopolymer mixture and mixed for another 15-20 seconds. The mixtures were then cast into 50 x 50 x 50 mm metal molds. 10 minutes later, the samples were cured at 80 ºC for 1 hour in order to accelerate the geopolymerization mechanism. Table 2 demonstrates the materials used in the production of the geopolymer foam and Table 3 demonstrates the chemical properties of the materials.

Table 3. Properties of alkali activators.

Sodium silicate solution (SS)	Sodium hydroxide (NaOH)
Na_2O: 26.98 (%) SiO_2 : 8.77 (%) H_2O: 64.25 (%)	M: 40 g/mol NaOH ≥ 99,0 (%)

After curing, the samples were removed from the molds the day after and kept in the laboratory environment until the day of the experiment. Figure 1 displays the images of the samples.



Figure 1. Geopolymer foams cast into molds.

The Archimedes principle could not be fully implemented in determining the physical properties of the geopolymer foam samples due to low bulk density. Therefore, the apparent volumes of the geopolymer foam samples were calculated using a digital compass after the determination of the oven-dry weight and saturated dry-surface weight of the samples in order to identify their physical properties. The physical properties of the samples were determined using these values and in accordance with the equations given in TS EN 772-4 (2000) and TS EN 771-1 (2005) standards. Mechanical tests of the samples were carried out using a computer controlled automatic pressure testing machine in accordance with TS EN 196-1 (2002). Findings section presents the average values of three 7-day samples from each sample group.

Results and Discussion

The findings obtained from the geopolymer foam samples are shown in Figure 2 and Figure 4. The apparent porosity rates of the samples ranged from 32.60 % to 44.11 % and the porosity values decreased with an increase in the metakaolin (MK) replacement. It was determined that an increase in the MK replacement in the sample body led to a more smooth outer body surface and that the apparent porosity rates decreased as a result of a decrease in the rates of open pores (Figure 2a). Water absorption rate of the geopolymer material was quite high. Considering the fact that under normal circumstances, water absorption rate of fly ash is about 50 % and it can be dry-pressed, we can state that the water absorption rates of the samples significantly increased owing to the voids in the material. The water absorption rates of the geopolymer foam materials ranged from 69.83 % to 80.66 %. An increase in the MK replacement in the material body led to a reduction in the water absorption rates (Figure 2b).

With the addition of aluminium powder into the material body during geopolymer foam synthesis process, foaming in large volumes occurred in the mixtures with a large amount of FA material. However, in the aftermath of the foaming in large volumes, precipitation occurred in the material after a certain time. High rate of MK replacement was performed in order to prevent precipitation. An increase in the MK replacement led to a decrease in the samples' bulk density values which ranged from 466.9 kg/m^3 to 546.8 kg/m^3 (Figure 3a). As was the case for the bulk density values, the apparent density values of the material also decreased with an increase in the rate of

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MK replacement. The apparent density values of the samples ranged from 692.8 kg/m^3 to 978.4 kg/m^3 (Figure 3b).

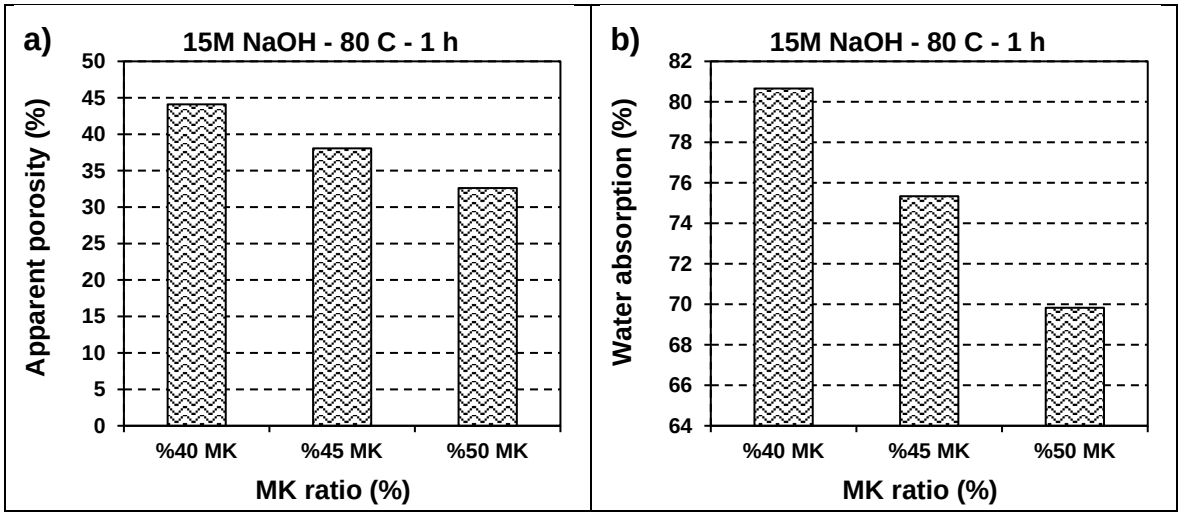

Figure 2. Apparent porosity and water absorption rates by weight of geopolymer foam samples.

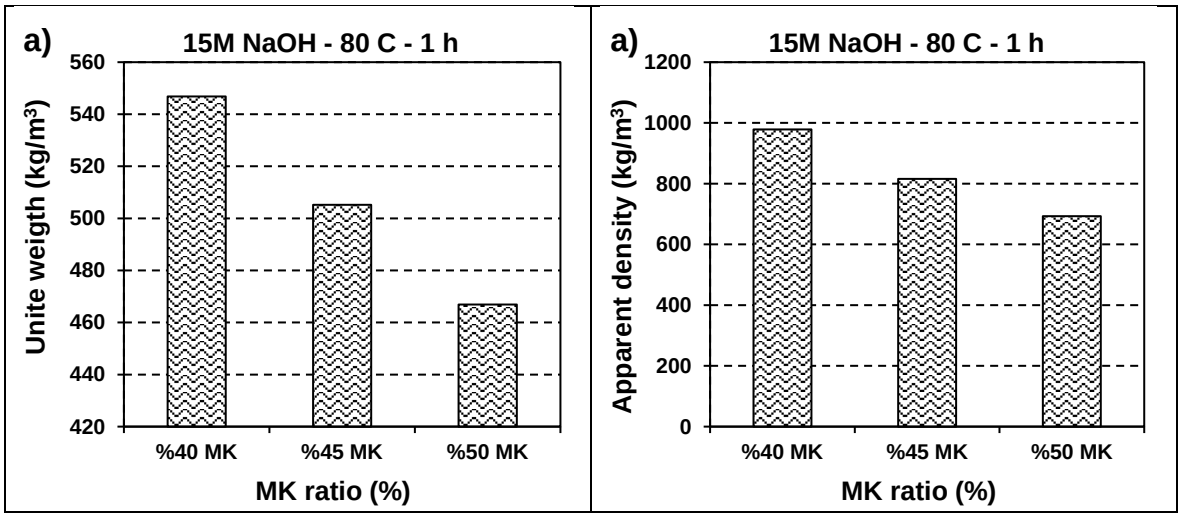

Figure 3. Bulk density and apparent density values of geopolymer foam samples.

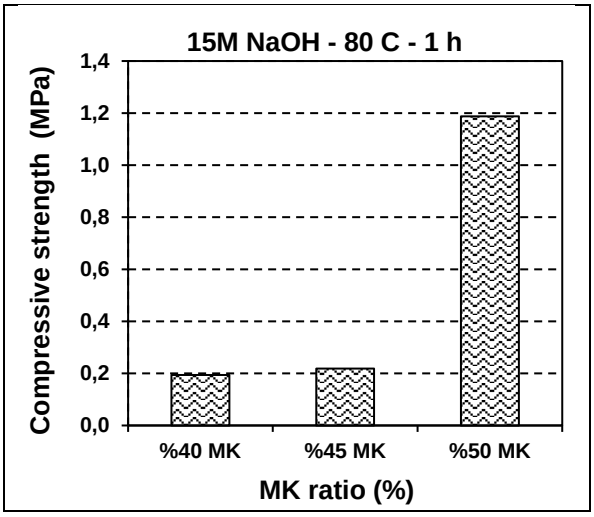

Figure 4. Compressive strength of geopolymer foam samples.

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Figure 4 demonstrates the compressive strength values of the geopolymer foam samples. Evaluation of the data indicates that an increase in the rate of MK replacement led to an increase in the compressive strength values of the geopolymer foam samples. The highest compressive strength value (1.19 MPa) was obtained from the samples with the replacement of fly ash by MK by 50 %

Conclusion

The results obtained from this study investigating the production of fly ash -based geopolymer foam are as follows;

- In case of low levels of MK replacement rate in the synthesis of geopolymer foam, precipitation occurs in the geopolymer foam samples.
- It is observed that following foaming process, high rates of KM replacement prevent precipitation in the material and that no deformation occurs in the geopolymer foam with MK replacement by 40% or above.
- Geopolymer foams with high rates of fly ash develop a weak structure. Due to this weak structure, thermal curing process applied to geopolymer foams should be improved.
- This study which involved preliminary investigations of the production of geopolymer foam clearly shows that further optimization studies are needed. If compressive strength values of geopolymer foam materials with high porosity and low bulk density can be brought to a certain level through optimization studies, it will pave the way for the use of this material in the field of thermal insulation.

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THE EFFECT OF RESERVOIR LENGTH ON THE EARTHQUAKE BEHAVIOR OF ROLLER COMPACTED CONCRETE DAMS

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Abstract: Finite element analysis is an effective method for evaluating roller-compacted concrete (RCC) dams in the earthquake zone and investigating earthquake response of RCC dams. The primary aim of this research is to inspect the effect of various reservoir lengths on the earthquake response of a selected RCC dam under strong ground motion effect. This study presents two-dimensional earthquake response of Cine RCC dam considering geometrical and material non-linearity in time-history analyses. The Drucker-Prager material model is used in the materially non-linear analyses for concrete and also foundation rock. The reservoir length of RCC dam is modeled respectively as half, itself, two times, three times, five times and ten times of the dam height. The dam–reservoir-foundation interaction is modeled by the contact-target element couples. The hydrodynamic pressure of the reservoir water is modeled with two dimensional fluid finite elements based on the Lagrangian approach. 1999 Duzce Earthquake acceleration records are considered in all dynamic analysis. According to non-linear time history analyses, the horizontal displacements and principle stress components are compared and evaluated.

Keywords: Contact-target element, Hydrodynamic pressure, Lagrangian approach, Roller-compacted concrete dam.

Introduction

People have always tried to live around water resources from past to present Because water is very important to survive people and other lives. People have needed water for a lot of purpose until humanity. The settlers around water resources have used water for storing, drinking and irrigation in many eras. Furthermore, settlements away from water supplies have always many problems. They were not obtainable water every time and every place. Dams are the most important buildings for storing water, water protection and the buildings play very important role for obtaining of energy and continuing of people's daily lives. Dams can prevent uncontrolled water. Dams can reduce consumption of fossil fuels for electricity production. Roller compacted concrete (RCC) dams have been widely used by all world countries since the 1980s. DSI (state hydraulic works) which is responsible for realization of water resources development projects in Turkey is completed 204 large dams and 339 small dams until today. 111 large dams and 159 small dams are under construction in Turkey.

The investigators usually focused on the thermal analysis of RCC dams because thermal cracking may create a leakage path to the downstream face that is aesthetically undesirable. Noorzaei et al. (2006) performed thermal and structural analysis of Kinta RCC gravity dam, which is the first RCC dam in Malaysia, using the developed two-dimensional finite element code. Then the authors compared predicted temperatures obtained from the finite element code with actual temperatures measured in the field using thermocouples installed within the dam body and they found them to be in good agreement. Jaafar et al. (2007) developed a finite element based computer code to determine the temperatures within the dam body. According to performed thermal analysis of a RCC dam changing the placing schedule can optimize the locations of maximum temperature zones. Bayraktar et al. (2010) investigated the effect of reservoir length on seismic performance of gravity dams to near and far-fault ground motions. Abdulrazeg et al. (2010) performed three dimensional coupled thermal and structural analysis of roller compacted concrete dams. They assessed crack development within the dam body using the proposed crack index.

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This method remarkably reduces the total number of elements and nodes when the dam height was increased. Zhang et al. (2011) simulate and analyze the temperature field and thermal stress of certain RCC gravity dams in cold regions using the material properties of roller-compacted concrete by three-dimensional finite element relocating mesh method. As a result, the authors indicated that superficial insulation prevented surface cracks from forming. Kartal et al. 2012 investigated three-dimensional earthquake analysis of roller-compacted concrete dams.

In this study, two-dimensional earthquake response of Cine RCC dam is investigated for six different cases. The reservoir length of RCC dam is modeled respectively as half, itself, two times, three times, five times and ten times of the dam height. The two dimensional fluid finite elements based on the Lagrangian approach is utilized to obtain the hydrodynamic pressure effect of the reservoir water. Contact-target elements are used in dam-foundation-reservoir interfaces. No separation friction case is considered between dam and foundation. Nonlinear time-history analyses are carried out to obtain earthquake response of the dam. Geometrically and materially nonlinear analysis were made for this purpose. Fixed boundary conditions are considered in the numerical solutions. Numerical solutions indicate that the horizontal displacements increased by increasing reservoir length and hydrodynamic pressure effect. In addition to this, principal tensile and compressive stresses increased by reservoir length. When reservoir length extended, greater displacements and stresses appeared in the upstream side of the dam.

Formulation of Dam-Foundation-Reservoir Interaction by the Lagrangian Approach

The formulation of the fluid system based on the Lagrangian approach is presented as following (Wilson and Khalvati, 1983; Calayır 1994). In this approach, fluid is assumed to be linearly compressible, inviscid and irrotational. For a general two-dimensional fluid, pressure-volumetric strain relationships can be written in matrix form as follows,

$$\begin{Bmatrix} P \\ P_z \end{Bmatrix} = \begin{bmatrix} C_{11} & 0 \\ 0 & C_{22} \end{bmatrix} \begin{Bmatrix} \varepsilon_v \\ w_z \end{Bmatrix} \tag{1}$$

Where P, C_{11}, and ε_v are the pressures which are equal to mean stresses, the bulk modulus and the volumetric strains of the fluid, respectively. Since irrotationality of the fluid is considered like penalty methods (Zienkiewicz and Taylor, 1989; Bathe, 1996), rotations and constraint parameters are included in the pressure-volumetric strain equation (Eq. (1)) of the fluid. In this equation P_z, is the rotational stress; C_{22} is the constraint parameter and w_z is the rotation about the cartesian axis y and z.

In this study, the equations of motion of the fluid system are obtained using energy principles. Using the finite element approximation, the total strain energy of the fluid system may be written as,

$$\Pi_e = \frac{1}{2}\mathbf{U}_f^T \mathbf{K}_f \mathbf{U}_f \tag{2}$$

where $\mathbf{U}_f$ and $\mathbf{K}_f$ are the nodal displacement vector and the stiffness matrix of the fluid system, respectively. K_f is obtained by the sum of the stiffness matrices of the fluid elements as follows,

$$\begin{aligned} \mathbf{K}_f &= \Sigma \mathbf{K}_f^e \\ \mathbf{K}_f^e &= \int_V \mathrm{B}_f^{eT} \mathrm{C}_f \mathrm{B}_f^e \mathrm{dV}^e \end{aligned} \tag{3}$$

where C_f is the elasticity matrix consisting of diagonal terms in Eq. (1). B_f is the strain-displacement matrix of the fluid element.

An important behavior of fluid systems is the ability to displace without a change in volume. For reservoir and storage tanks, this movement is known as sloshing waves in which the displacement is in the vertical direction. The increase in the potential energy of the system because of the free surface motion can be written as,

$$\Pi_s = \frac{1}{2}\mathbf{U}_{sf}^T \mathbf{S}_f \mathbf{U}_{sf} \tag{4}$$

where $\mathbf{U}_{sf}$ and $\mathbf{S}_f$ are the vertical nodal displacement vector and the stiffness matrix of the free surface of the fluid system, respectively. $\mathbf{S}_f$ is obtained by the sum of the stiffness matrices of the free surface fluid elements as follows,

$$\left.\begin{aligned} \mathbf{S}_f &= \Sigma \mathrm{S}_f^e \\ \mathbf{S}_f^e &= \rho_f g \int_A \mathrm{h}_s^T \mathrm{h}_s \mathrm{dA}^e \end{aligned}\right\} \tag{5}$$

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where h_s is the vector consisting of interpolation functions of the free surface fluid element. ρ_f and g are the mass density of the fluid and the acceleration due to gravity, respectively. Besides, kinetic energy of the system can be written as,

$$T = \frac{1}{2}\dot{\mathbf{U}}_f^T \mathbf{M}_f \dot{\mathbf{U}}_f \tag{6}$$

Where $\dot{\mathbf{U}}_f$ and $\mathbf{M}_f$ are the nodal velocity vector and the mass matrix of the fluid system, respectively. $\mathbf{M}_f$ is also obtained by the sum of the mass matrices of the fluid elements as follows,

$$\left.\begin{aligned} \mathbf{M}_f &= \sum M_f^e \\ \mathbf{M}_f^e &= \rho_f \int_V H^T H dV^e \end{aligned}\right\} \tag{7}$$

where H is the matrix consisting of interpolation functions of the fluid element. If (Eq. (2), (4) and (6)) are combined using the Lagrange's equation (Clough and Penzien, 1993); the following set of equations is obtained,

$$\mathbf{M}_f \ddot{\mathbf{U}}_f + \mathbf{K}_f^* \mathbf{U}_f = \mathbf{R}_f \tag{8}$$

where, $\ddot{\mathbf{U}}_f$, $\mathbf{U}_f$ and $\mathbf{R}_f$ are the system stiffness matrix including the free surface stiffness, the nodal acceleration and displacement vectors and time-varying nodal force vector for the fluid system, respectively. In the formation of the fluid element matrices, reduced integration orders are used (Wilson and Khalvati, 1983).

The equations of motion of the fluid system, (Eq. (8)), have a similar form with those of the structure system. To obtain the coupled equations of the fluid-structure system, the determination of the interface condition is required. Since the fluid is assumed to be inviscid, only the displacement in the normal direction to the interface is continuous at the interface of the system. Assuming that the structure has the positive face and the fluid has the negative face, the boundary condition at the fluid-structure interface is,

$$U_n^- = U_n^+ \tag{9}$$

where U_n is the normal component of the interface displacement (Akkas et al., 1979). Using the interface condition, the equation of motion of the coupled system to ground motion including damping effects are given by,

$$\mathbf{M}_c \ddot{\mathbf{U}}_c + \mathbf{C}_c \dot{\mathbf{U}}_c + \mathbf{K}_c \mathbf{U}_c = \mathbf{R}_c \tag{10}$$

in which Mc, Cc, and Kc are the mass, damping and stiffness matrices for the coupled system, respectively. $\mathbf{U}_c, \dot{\mathbf{U}}_c, \ddot{\mathbf{U}}_c$ and $\mathbf{R}_c$ are the vectors of the displacements, velocities, accelerations and external loads of the coupled system, respectively.

NUMERICAL MODEL OF CINE RCC DAM

The Model of Cine RCC Dam

Cine dam, located approximately 16km southeast of Cine, Aydın, was constructed in 2010 by General Directorate of State Hydraulic Works (Fig. 1) (DSI, 2015). It was established on Cine River. This dam was projected as a roller compacted concrete dam. The reservoir is used for irrigation and energy purposes. The dam crest is 372.5m in length and 9m wide. The maximum height and base width of the dam are 136.5 m and 142.5 m, respectively. The maximum height of the reservoir water is considered as 98.77 m. The annual total power generation capacity is 118 GW.



Fig. 1. Cine Roller Compacted Concree Dam

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Material Properties of Cine Dam

The two-dimensional finite element model of Cine dam is modeled considering two layered foundation rock. One of this begins from crest level to base of the dam body. The other begins from the base of the dam body to bottom of the foundation. The material properties of Cine roller compacted concrete dam body and foundation are given in Table 1.

Table 1. Material Properties of Cine RCC dam

	Material Properties		
	Modulus of Elasticity (GPa)	Poisson's Ratio	Mass Density (kg/m³)
Concrete (Dam)	30	0.20	2530
Rock (Lower Foundation Soil)	25	0.18	2800

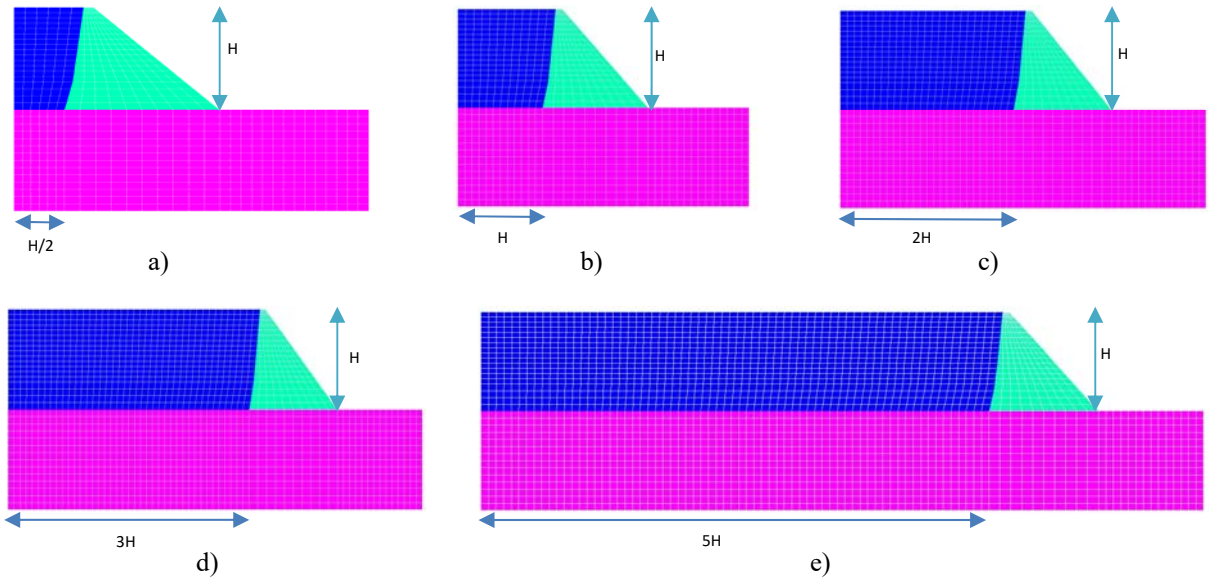
Finite Element Models of Cine Dam

This study considers two-dimensional finite element models of Cine RCC dam (Fig. 2). In this model, if the height of the dam is indicated as 'H', the foundation soil is extended as 'H' in the transverse river direction, downstream direction and gravity direction. Besides, reservoir water model is extended as following Table 2. Numerical analysis were performed for these six cases.

Table 2. Numerical analysis

Cases	*Reservoir length*
Case 1	H/2
Case 2	H
Case 3	2H
Case 4	3H
Case 5	5H
Case 6	10H

Fluid and solid element matrices are computed using the Gauss numerical integration technique (Wilson and Khalvati, 1983).



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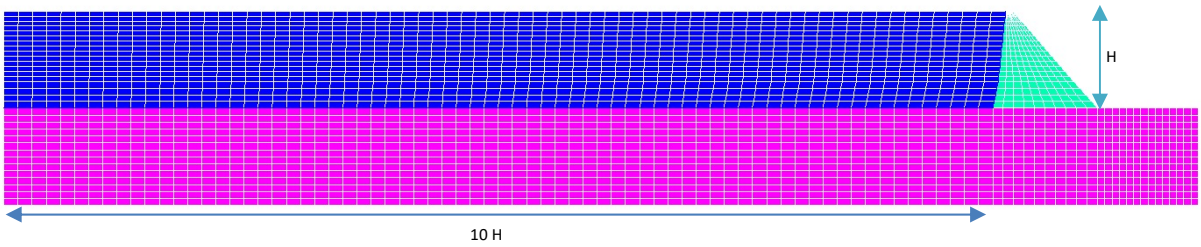

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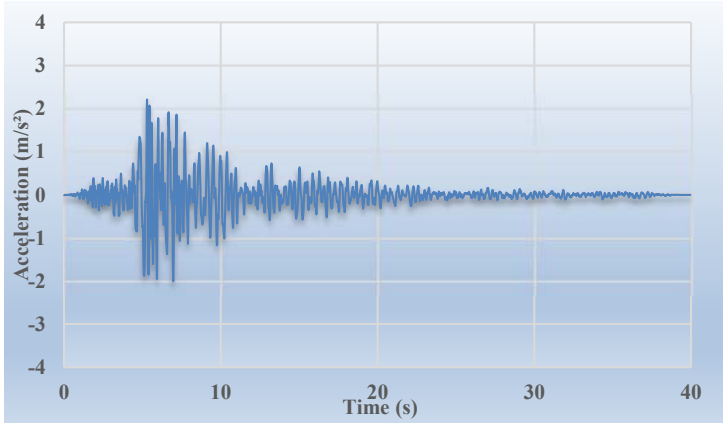
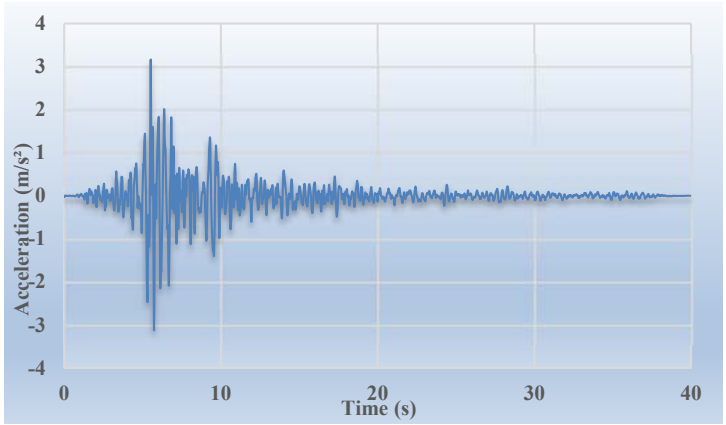
Fig. 2. Finite Element Models of Cine RCC dam

Strong Ground Motion Effects

This study investigates the earthquake response of Cine RCC Dam subjected to strong ground motion. Different reservoir length cases are taken into account in the numerical solutions. The north-south and vertical components of the 1989 Loma Prieta earthquake (Fig. 3) are utilized in analyses. Earthquake analyses are performed during 39.96 second. Nonlinear time-history analyses were performed using Ansys (2016). In the non-linear time history analyses, the time interval is used as 0.01 in different water level case. Rayleigh damping is used in time-history analysis. Therefore, first six vibration frequencies are considered to calculate Rayleigh damping constants using initial boundary conditions (Rayleigh and Lindsay, 1945; Chopra, 1996). Besides, Newmark algorithm was employed in numerical solutions.



a) Vertical component



b) North-South component

Fig 3. 1989 Loma Prieta Accelerograms

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Numerical Analysis and Results

This study presents earthquake behavior of Cine RCC dam considering north-south and vertical components of 1989 Loma Prieta earthquake. Earthquake analyses are performed during 39.96 second. Numerical analysis was investigated for six different cases. If dam body height supposes as H, reservoir length is modelled as the following (Table 2). Numerical analysis is performed for each cases.
Solutions are shown in Fig. 4-6. According to these solutions, the smallest displacement is approximately 4.7 cm at dam crest for Case 1. However, the maximum displacement is 7.4 cm at dam crest for Case 6 (Fig. 4). So this solution is clearly shown that when reservoir length extends, higher displacements are obtained.

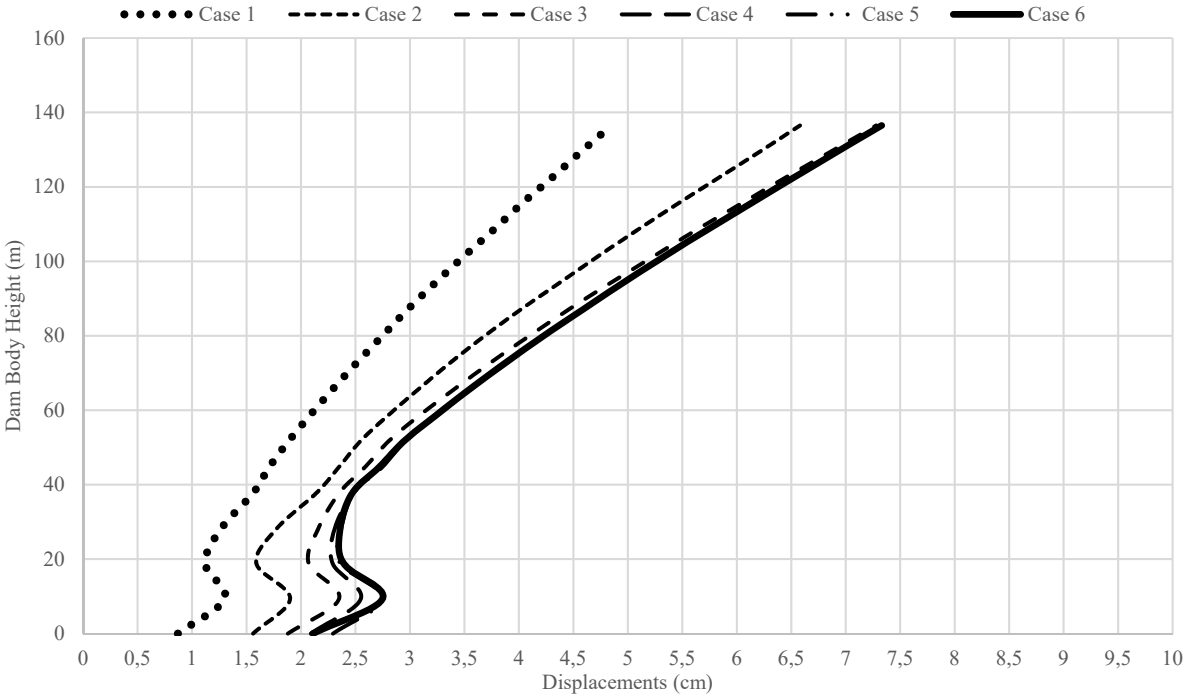

Fig. 4. Horizontal Displacements

The principal tensile and compression stresses are shown in Fig. 5-6. The maximum principal compression stress is approximately 9900 kN/m^2 at bottom of dam for Case 6. The minimum principal compression stress is 7350 kN/m^2 for Case 1 (Fig. 5.). The effect of reservoir length clearly appeared from these solutions.

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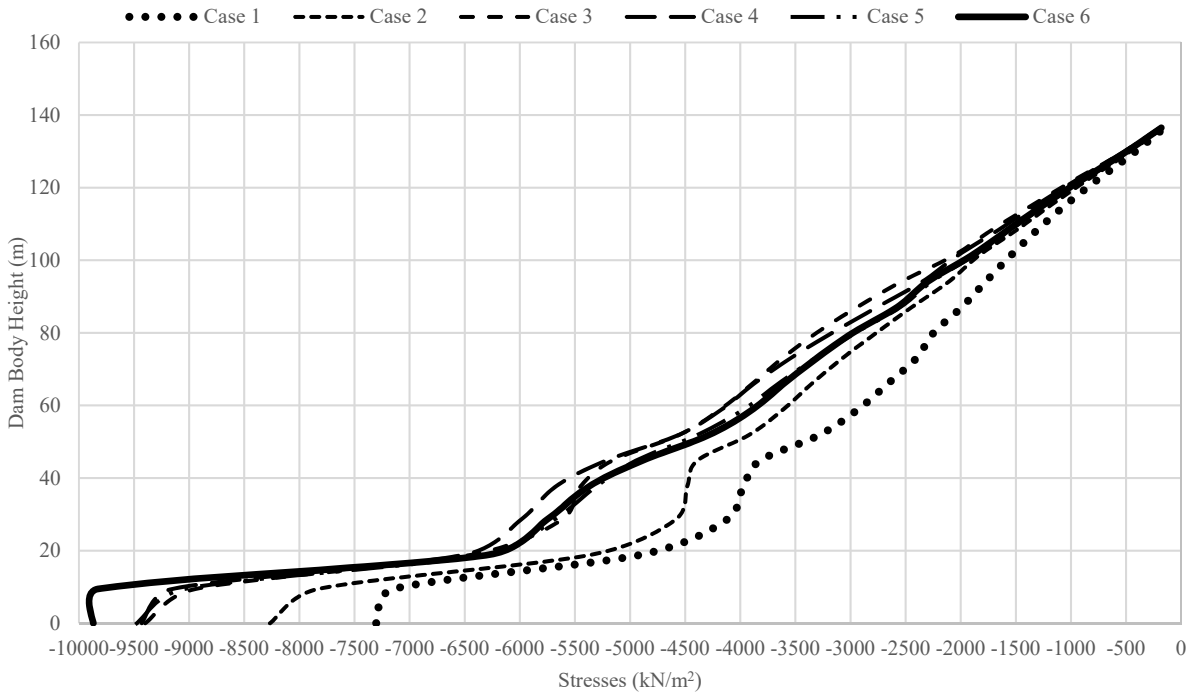

Fig. 5. Principal Compression Stresses

The maximum principal tensile stress is approximately 1950 kN/m^2 for Case 6 and the minimum principal compression stress is 7350 kN/m^2 for Case 1 at bottom of dam body (Fig. 6.). It clearly appears from Fig. 6 that if reservoir length extends, the principal tensile stresses increase by dam height.

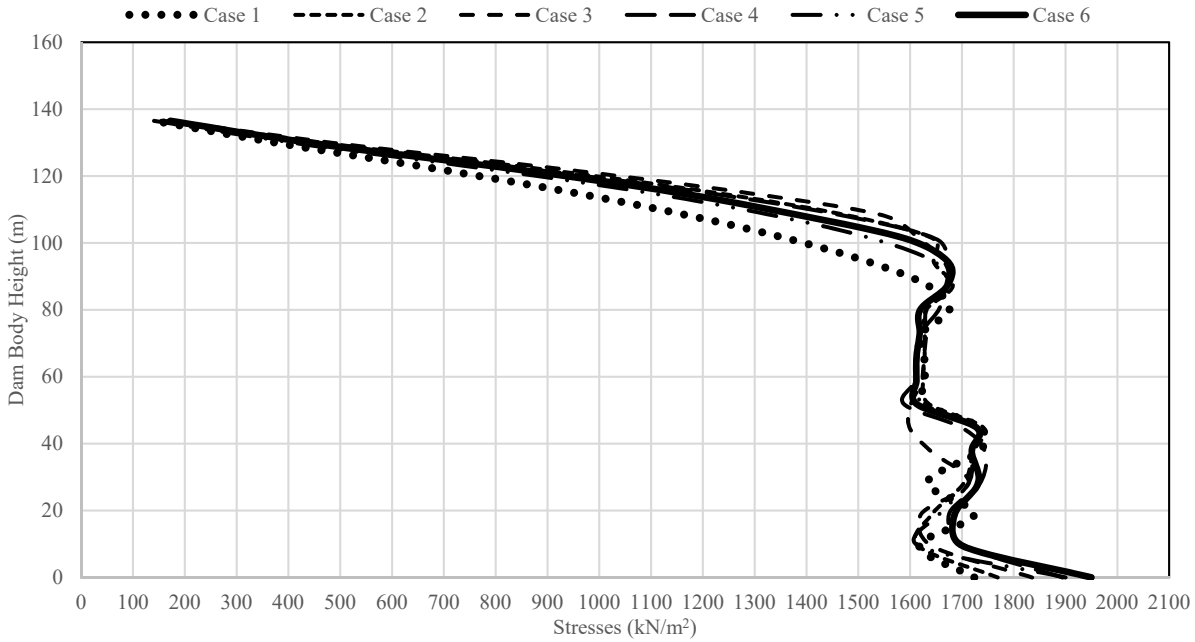

Fig. 6. Principal Tensile Stresses

Conclusion

Investigation of the effect of different reservoir length on the earthquake behavior of RCC dams is very important to observe the response of the dam. According to performed numerical solutions, if reservoir length extends, horizontal displacements increase. In additional this, nonlinear analyses clearly refer that the principle tensile and compressive stresses decrease the upper side of the dam body compared to bottom of the dam body.

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When reservoir length extended, principal stresses and compression stresses increase. This solution shows that effect of reservoir length on behavior of dam.

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THE EFFECTS OF DENSIFICATION AND HEAT TREATMENT ON THERMAL CONDUCTIVITY OF FIR WOOD

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Abstract: The goal of this study was to determine the effect of densification and heat treatment on thermal conductivity properties of fir (*Abies bornmulleriana* Mattf.) wood. Fir wood specimens were densified with compression ratios of 25% and 50%, and at 100 °C or 140 °C. Then, the heat treatment was applied to the fir specimens at 185 ºC and 212 ºC for 2 hours according to ThermoWood® method. The study results showed that, densification and thermal treatment applications was effected thermal conductivity of the fir specimens. The thermal conductivity increased based on compression ratios and temperatures in the densified specimens. The thermal conductivity in the compressed specimens at high ratio (50%) was found higher than other specimens. After densification, additionally, thermal conductivity increasing on the radial surface was higher compared to the tangential surface. After heat treatment, thermal conductivity of the all specimens decreased significantly depending on the increase in treatment temperature. Particularly, the heat-treated fir specimens at 212 °C may considerated where thermal insulation is important.

Keywords: Fir Wood, Densification, Heat Treatment, Thermal Conductivity

Introduction

The properties of wood depend on its chemical and structural characteristics. These can be changed using different and/or new wood modification techniques. Thus, wood can be made more resistant to destructive environmental factors (Bami and Mohebby, 2011). The mechanical properties of wood positively correlate with its density, and the mechanical strength can be improved by increasing the density. An increment of density is particularly important for low-density wood species (Laine et al., 2013; Sandberg et al., 2013). Wood can be densified by applying mechanical high-pressure compression with heat and/or steam. In addition, wood can be densified by saturating its pore volume with natural or synthetic resins (Kamke, 2006; Kutnar et al., 2008). A main disadvantage of mechanically densified wood is the recovery of its initial dimensions after exposure to water or heat (Seborg et al., 1956; Morsing, 2000; Blomberg et al., 2006; Pelit et al., 2014, 2016). One of the wood modification processes whose usage is increasing day to day and which are performed for extending their usage fields by enhancing some properties (stability, durability, etc.) of wood, is heat-thermal treatment.

The heat treatment process results in a modification in the molecular structure of the wood and thus improves its performance. The properties potentially improved by heat treatment are: biological resistance to fungi and insects, low equilibrium moisture content, increased dimensional stability with respect to the decrease in contraction and expansion, increased resistance to weathering, and increased thermal insulation capacity (Korkut and Kocaefe, 2009). On the other hand, the density and mechanical strength properties of heat-treated wood decrease due to mass loss and thermal degradation of the wood structure (Bekhta and Niemz 2003; Yıldız et al. 2006; Korkut et al., 2008; Pelit et al., 2015; Perçin et al., 2015). The decline in the strength properties of wood is the primary disadvantage of the heat treatment application. This situation restricts the sectors in which heat-treated wood may be used (Boonstra 2008).

As it is known, wood material that has a wide usage area as a natural raw material is a good insulator because of its structure (Aytin et al., 2016). Thermal conductivity of a material can be defined as the rate of heat transfer through a unit thickness of the material per unit area per unit temperature difference. The thermal conductivity of a material is a measure of how fast heat will flow in that material. A large value of a thermal conductivity indicates that the material is a good heat conductor, and a low value indicates that the material is a poor heat conductor or insulator (Şahin Kol and Sefil, 2011). The thermal properties of wood are affected by various factors. The more important influencing factors are species, density, moisture content, direction of heat flow (anisotropy), inclination of grain, and relation of volume or thickness of the sample to moisture content (Suleiman et al., 1999). In addition,

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have an influence on thermal conductivity of wood material factors like kiln-drying operations, glueing of wood, preservation impregnation, hot pressing of wood based composites, and wood thermal degradation (Şahin Kol, 2009). In light of literature informations, the purpose of this study was to determine the thermal conductivity properties of the fir (*Abies bornmulleriana* Mattf.) wood specimens modified by densification and heat post-treatment applying.

Materials and Methods

Wood material

In this study, Uludağ fir (*Abies bornmulleriana* Mattf.) wood were used. The fir tree were supplied as logs from a lumber yard in Düzce, Turkey. The sapwood was cut from the logs with an automatically controlled band saw. Rough-scale planks were formed, the cuts being determined by considering the annual rings parallel to the surface (tangent section) and the sample dimensions. Attention was paid to ensure that no rot, knot, crack, color, or density differences were present in the specimens (TS 2470, 1976). The specimens were initially subjected to natural drying to approximately 12% moisture content, and then were cut to the dimensions of 420 × 95 mm (length-longitudinal direction × width-tangential direction) and two different thicknesses 26.7 and 40 mm (radial direction). Before the densification process, the specimens were held in a conditioning cabin (RH 65 ± 3% and 20 ± 2 °C) until they reached a stable weight (TS 2471, 1976).

Thermo-mechanical densification and heat treatment

The thermo-mechanical densification process was done with a hydraulic press at compression ratios of 25 and 50%, with temperatures of 100 and 140 °C for 10 min. After thermo-mechanical densification, heat post-treatment was carried out on the wood specimens to provide dimensional stability. The heat treatment was conducted under the protection of water vapor at the temperatures 185 and 212 °C for 2 h. The thermo-mechanical densification and heat post-treatment processes have been described in detail in a previous study by the authors (Pelit et al., 2016). After heat post-treatment, specimens remained in a conditioning cabin (RH 65 ± 3% and 20 ± 2 °C) until they reached a stable weight (TS 2471, 1976). The densified and heat treated specimens were then cut into smaller specimens in the dimensions of 100 × 20 × 20 mm^3 (longitudinal direction × tangential direction × radial direction). Test specimens were prepared in a number sufficient to accommodate 10 repetitions (n=10) for each variable.

Measurement of thermal conductivity

Thermal conductivity values of fir specimens was determined according to ASTM C 1113-99 (2004) by using hot-wire method. Measurements were made using QTM 500 (Quick Thermal Conductivity) device which is a product of Kyoto Electronics Manufacturing, Japan. PD-11 box probe sensor (constantan heater wire and chromel-alumel thermocouple) was used. After the completion of the device calibration, measurements performed on the surface of each sample for a period of one minute.

Statistical analyses

The MSTAT-C package program was used for statistical evaluations. Analysis of variance (ANOVA) was performed between factors, and differences between Duncan test results and mean values were compared when significant differences were detected within obtained data. Therefore, success ranking among the factors included into the experiment was determined by separating them into homogeneous groups according to Least Significant Difference (LSD) critical values.

Results and Discussion

Analysis of variance results of thermal conductivity values of fir wood specimens thermo-mechanically densified and heat treated are given in Table 1.

Table 1: Analysis of variance results for thermal conductivity values

Factors	Degrees of freedom	Sum of squares	Mean square	F-value	Level of significance ($P \leq 0.05$)
Measuring surface (A)	1	0.007	0.007	200.2131	0.0000*
Densification (B)	4	0.028	0.007	189.6054	0.0000*
Interaction (AB)	4	0.010	0.002	66.7987	0.0000*
Heat treatment (C)	2	0.070	0.035	947.1696	0.0000*
Interaction (AC)	2	0.000	0.000	5.0091	0.0073*
Interaction (BC)	8	0.001	0.000	2.6475	0.0082*

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Interaction (ABC)	8	0.001	0.000	4.8366	0.0000*
Error	270	0.010	0.000		
Total	299	0.128			

*Significant at 95% confidence level

According to analysis of variance results; measuring surface, densification, and heat treatment factors on thermal conductivity values of fir wood specimens and their reciprocal interactions were found to be significant ($P \leq 0.05$). Mono comparison results of Duncan test, which was conducted by using LSD critical value at measuring surface, densification and heat treatment level, are shown in Table 2.

Table 2: Mono comparison results of Duncan test for thermal conductivity values at measuring surface, densification and heat treatment level

Measuring surface	Mean	HG	
Tangential section	0.1280	b	*LSD* ± 0.002273
Radial sections	0.1379	a*	
Densification	**Mean**	**HG**	
Undensified	0.1172	e	*LSD* ± 0.003595
100 ˚C / 25%	0.1291	d	
100 ˚C / 50%	0.1410	b	
140 ˚C / 25%	0.1327	c	
140 ˚C / 50%	0.1448	a*	
Heat treatment	**Mean**	**HG**	
Untreated	0.1497	a*	*LSD* ± 0.002784
185 ˚C	0.1365	b	
212 ˚C	0.1127	c	

HG: Homogeneous group; *: the highest value

According to the results of the comparisons in Table 3, thermal conductivity value of fir wood specimens was higher in radial sections (0.1379) than tangential section (0.1280). Regarding densification conditions, the highest thermal conductivity value (0.1448) was found in the specimens densified by compression 50% at 140 ºC and the lowest (0.1172) in the undensified specimens. As for the heat treatment level, the highest thermal conductivity value (0.1497) was seen in the untreated specimens, while the lowest (0.1127) was in the specimens subjected to heat treatment at 212 ºC. Multiple comparison results of the Duncan test conducted by using the LSD critical value at measuring surface-densification-heat treatment trio interaction level are given in Table 3.

Table 3: Comparison results of Duncan test for thermal conductivity values at measuring surface-densification-heat treatment trio interaction level

Densification	Heat treatment	Measuring surface					
		Tangential section			Radial sections		
		Mean	SD	HG	Mean	SD	HG
Undensified	Untreated	0,1393	0,007	hı	0,1324	0,008	ijk
	185 ˚C	0,1243	0,004	kl	0,1114	0,004	no
	212 ˚C	0,1019	0,003	pq	0,0937	0,002	q
100 ˚C / 25%	Untreated	0,1406	0,009	ghı	0,1524	0,008	cde
	185 ˚C	0,1298	0,004	jkl	0,1333	0,006	ij
	212 ˚C	0,1046	0,007	op	0,1140	0,006	mn
100 ˚C / 50%	Untreated	0,1552	0,009	bcd	0,1591	0,006	abc
	185 ˚C	0,1424	0,004	fgh	0,1489	0,004	defg
	212 ˚C	0,1140	0,002	mn	0,1262	0,002	jkl

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140 ˚C / 25%	Untreated	0,1445	0,008	efgh	0,1559	0,008	bcd
	185 ˚C	0,1212	0,003	lm	0,1496	0,003	def
	212 ˚C	0,1032	0,008	op	0,1215	0,003	lm
140 ˚C / 50%	Untreated	0,1506	0,009	cdef	0,1669	0,008	a*
	185 ˚C	0,1404	0,004	ghı	0,1635	0,008	ab
	212 ˚C	0,1078	0,004	nop	0,1400	0,006	hı
				LSD: ± 0.008805			

SD: Standard deviation; HG: Homogeneous group; *: the highest value

According to results shown in Table 3, the highest thermal conductivity value (0.1669) was obtained in radial section of specimens without heat treatment that were densified by compression 50% at 140 ºC, and the lowest value (0.0937) was obtained in radial section of the specimens for which heat treatment was applied at 212 ºC and they were undensified. Thermal conductivity values of densified specimens increased depending on compression ratio and temperature. Thermal conductivity values was highest at each measured section of 50% compressed specimens. In terms of compression temperature, the highest thermal conductivity values was obtained from specimens compressed at 100 °C for the tangential section and specimens compressed at 140 °C for radial section. After compressing process, the thermal conducitivity values increased up to %11 on tangential section and up to %26 on the radial section compared with control specimens. The higher increase of thermal conducitivity on the radial section (surface) is related with compression of specimens at radial direction. In addition, the increase of thermal conductivity can be explained by decrease of void volume (porosity) and increase of density of fir specimens. In the denfication process, it was determinated in previous studies that the void volume of wood decreased and the amount of cell wall per unit volume increased according to compression ratio (Blomberg et al., 2005; Ünsal et al., 2011; Ülker et al., 2012; Arruda and Menezzi, 2013; Pelit et al., 2014). The thermal conductiviy of wood is closely related with the density and porosity. It was reported that thermal conductivity increases proportionally with density and increases in inverse proportion to the porosity (Suleiman et al.,1999; Rice and Shepard, 2004; Şahin Kol et al., 2008; Örs and Keskin, 2008).

Thermal conductivity decreased in all heat treated specimens. In addition, the increase in the temperature of the heat treatment significantly decreased thermal conductivity values. However, the thermal conducitivity values of densified (especially on the radial seciton) specimens influenced less by the application of heat treatment than control specimens. In the previous studies conducted in parallel to this study, it was determined that the values of equilibrium moisture content (Pelit et al., 2016) and air-dry density (Pelit et al.,submitted for publication) of heat-treated fir wood specimens decreased depending on the increase of heat. In addition, it was reported that the hygroscopicity, equilibruim moisture content (EMC) and density of heat-treated specimens decreased (Tjeerdsma and Militz, 2005; Esteveset al., 2007; Boonstra, 2008; Esteves and Pereira, 2009; Korkut and Kocaefe, 2009; Aydemir et al.,2011; Pelit et al., 2014; Aytin et al., 2015; Kocaefe et al., 2015). After heat treatment process, the significant decrease in the thermal conductivity values can be explained by the reduction in the EMC and density. The results are compatible with the literature (Şahin Kol and Sefil, 2011; Aytin et al., 2016). In literature stated that there is a very strong correlation between moisture content and thermal conductivity and the thermal conductivity increases with increasing moisture content. Because the thermal conductivity of water is much higher than wood (Gu and Hunt, 2007;Şahin Kol, 2009; Şahin Kol and Sefil, 2011).

Conclusion

After densification precess, thermal conductivity values of fir specimens increased depending on the compression ratio and temperature. The thermal conductivity values was higher in the specimens compressed at high ratio (50%). In terms of compression temperature, the highest thermal conductivity values was obtained from specimens compressed at 100 °C for the tangential section and specimens compressed at 140 °C for radial section. The thermal conductivity values of densified specimens increased up to 11% on tangential section and up to 26% on the radial section compared with control specimens. After heat treatment process, thermal conductivity values of all specimens decreased significantly depending on the increase of the process temperature. However, the thermal conducitivity values of densified specimens (particularly in the radial section) influenced less by the application of heat treatment compared with control specimens.

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THE EFFECTS OF EDUCATIONAL DRAMA ON THEORY OF MIND SKILLS IN EDUCABLE INTELLECTUAL DISABILITY STUDENTS

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The aim of this research was to investigate the effect of educational drama on theory of mind skills in 13 *educable intellectual disability*students aged 16-19 years from government high schools located in Istanbul, Turkey.The research was designed in experimental model which was based on pre-test and post-test. To evaluate the theory of mind skills in *educable intellectual disability*students by applying the Sally Ann (Wimmer & Perner, 1983; Leslie & Frith, 1988); "Smarties" test (Perner, Leekam, & Wimmer, 1987), Chocolate bar test (Flobbe, Verbrugge, Hendriks, & Krämer, 2008) and "Strange Stories Test" (Happé, 1994)that were translated and adapted to the Turkish language by Girli (2010). During the application of programme, all students had been applied drama activities related to selected words for 3 months. *The results of this study indicated*that *educable intellectual disability*students were promoted their theory of mind skills by using drama programme

Keywords: Theory of mind- Drama-,intellectual disability

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THE EFFECTS OF SOCIAL MARKETING EFFORTS ON CONSUMERS: THE ICE BUCKET CHALLENGE

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Abstract: Marketers try to create behavioral changes by sending messages to the customers. Sometimes various institutions and governments also present some messages in order to raise awareness on social issues. These kind of marketing efforts are associated with social marketing. Social marketing campaigns involve messages such as giving up smoking, avoid using alcohol etc. In this study, it is aimed to determine the major effects of social marketing efforts on consumers' behaviors and thoughts. In order to find out these effects, the Ice Bucket Challenge campaign was employed. In this research content analysis was applied to evaluate the consumers' thoughts in Turkey. For that purpose, various dictionaries such as "Eksi Sozluk", "ITU Sozluk" and "Uludag Sozluk" were used. Frequency analyses were performed to analyze the consumers' thoughts about Ice Bucket Challenge. At the end of the study it was determined that Ice Bucket Challenge campaign influenced the consumers in different ways.

Keywords: Marketing, Social Marketing, Consumers

Introduction

Especially in recent years, firms and associations have started to focus on the long term benefits and the welfare of the society. These key points affect the marketing activities of the businesses. Social marketing gets more importance in the marketing programs of the firms. Social marketing campaigns enable to attract the attention of the customers to the topics related with social subjects such as giving up smoking, drawing attention to healthy nutrition, discouraging society from drinking alcohol and drugs, environmental protection etc. In other words, for the well-being of society, marketers have started to promote some ideas as well as goods and services. At this point, proper planning of social marketing campaigns, which can easily draw the attention of the consumers become more important. This study investigates how social marketing campaigns affect the consumers' thoughts, beliefs and attitudes in Turkey. To determine these effects well-known social marketing campaign, the Ice Bucket Challenge is used. The study reveals the influences of the Ice Bucket Challenge campaign on consumers. For this purpose, most famous dictionaries such as "Eksi Sozluk", "ITU Sozluk" and "Uludag Sozluk" were used to introduce the thoughts of the consumers. The remainder of the paper is organized as follows. First, social marketing is introduced. Next, it is highlighted how and for which purposes Ice Bucket Challenge campaign is publicized. Further, content analysis is used in order to state the consumers' thoughts and feelings about the campaign. Finally, the results and the impacts of the campaign are highlighted.

Social Marketing

Social marketing is the concept appeared in the early 1970s. In the emergence of this concept; Levy, Zaltman and Kotler have contributed a lot. They advocated that by the help of the social marketing programs, it is possible for consumers to adopt the social ideas that the businesses try to present. As a matter of fact, the major aim of the social marketing efforts is to influence the target consumers' behavior to increase the welfare of the society (Saunders, Barrington & Sridharan, 2015).

By the late 1960s and early 1970s, health sector have benefited from the social marketing efforts. In the 1980s, especially health promotion campaigns were frequently used to promote health. Furthermore, many campaigns were emerged such as anti-tobacco campaign, campaigns related with obesity etc. (Singaiah & Laskar, 2015)

In the literature it is possible to find several definitions on social marketing. According to Kotler and Zaltman (1971: 5) "social marketing is the design, implementation and control of programs calculated to influence the acceptability of social ideas and involving considerations of product planning, pricing, communication, distribution, and marketing research." Andreasen (1995: 7) defined that "social marketing is the application of commercial marketing technologies to the analysis, planning, execution and evaluation of programs designed to influence the voluntary behaviour of target audiences in order to improve their personal welfare and that of society." Lefebvre (2013: 4) stated that "social marketing is the application of the marketing discipline to social

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issues and causes that provides a framework for developing innovative solutions to social problems that have long perplexed and frustrated us."

The keys of creating successful social marketing programs require focusing on the major benchmarks, including the following:

- Behavior change
- Consumer research
- Segmentation and targeting
- Exchange
- Competition
- Marketing mix

Behavior change is one of the aims of social marketing efforts. The major goal of the social marketing effort is to create behavioral changes after the campaign was presented to the target consumers. Besides, formative research must be made to understand the values of the consumers. Focus groups, interviews are some of the data collection methods in consumer research. This research enables to pretest the intervention elements with the target group. Segmentation and targeting are the important parts of the social marketing efforts since target group is selected according to the various segmentation variables like age, income etc. An exchange criterion is also important to reveal the motivating factors. It is known that the motivating factors can be either tangible or intangible. In other words, after participating to a social marketing campaign consumer can gain rewards or only personal satisfaction can be provided after the attendance. Competition is the benchmark related with analyzing the internal and external forces that creates the behavioral changes. The last criteria, marketing mix, is related with the application of marketing mix elements such as product, price, place and promotion (Stead, Gordon, Angus & McDermott, 2007; Luca & Suggs, 2010).

It is understood that social marketing activities are more different from business marketing activities. The reason is that in business marketing, artificial preferences are the main subject of the marketing activities whereas in social marketing society's welfare and beliefs get more importance in the marketing activities of the businesses. In other words, social marketing is the efficient and striking way of creating society's concern to the social issues and also can be regarded as a good option in performing the social objectives (Kotler & Zaltman, 1971).

The Ice Bucket Challenge

Ice Bucket Challenge is an important campaign started on July 2014 to create awareness on amyotrophic lateral sclerosis (ALS) disease. ALS is the motor neuron disease which causes the muscles to be damaged. In ALS, sensory nerves work well whereas the patients cannot be able to command voluntary muscles (Handa & Ebisawa, 2008).

The aim of the Ice Bucket Challenge campaign was either donating money to ALS Association or uploading a video on social media. To promote awareness of this disease, plenty of people have dumped a bucket of ice and water on their heads.



Figure 1. The Ice Bucket Challenge Campaign.

Ice Bucket Challenge Campaign is the interesting way to draw people's attention to ALS disease. The campaign has attracted many people's attention and more than 17 million people share their videos in social media. Hereby, 440 million people watched these videos a total of 10 billion times. Especially the celebrities have important contributions in attracting interest to the campaign all over the world. Owing to this campaign, ALS Association has received $ 115 million in 2014 (http://www.alsa.org/about-als/, 27.06.2016).

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Results and Discussions

A content analysis was used in order to investigate the consumers' thoughts about Ice Bucket Challenge. To determine these thoughts online dictionaries such as "Eksi Sozluk", "Uludag Sozluk" and "ITU Sozluk" were used. Content analysis is a research methodology that is used to codify the existing texts according to fewer content categories (Stemler, 2001).

The population of the study is Turkish online dictionaries whereas the sample of the study includes three most popular Turkish dictionaries called "Eksi Sozluk", "Uludag Sozluk" and "ITU Sozluk". These dictionaries were searched according to the keyword "Ice Bucket Challenge". Entries between July 2014 and October 2014 were taken into consideration just because these dates are the most popular times of the campaign. It was determined that 585 entries were made between this period of time (Table 1).

Table 1: Number of the Ice Bucket Challenge entries in online dictionaries between July 2014 and October 2014.

Dictionary	**Number of the Entries**
Eksi Sozluk	298
Uludag Sozluk	127
ITU Sozluk	160
Total Entries	**585**

In the study three basic questions were examined. These questions can be listed as follows:

- What are the feelings of the consumers about the Ice Bucket Challenge Campaign?
- How the consumers' feelings about the Ice Bucket Challenge Campaign change within the considered time interval?
- Which phrases are frequently encountered in entries related with the Ice Bucket Challenge Campaign?

The descriptive statistics about the first question is given in Table 2. Entries for each dictionary were grouped as "positive feelings", "neutral feelings" and "negative feelings". It is found that the majority of the dictionary authors have negative opinions about the campaign. Among the dictionaries analyzed, "Uludag Sozluk" entries are found to have the highest number of negative entries while "Eksi Sozluk" contains the lowest number of negative entries. On the other hand, "Eksi Sozluk" has the highest number of positive feelings among all. Besides, it is shown that the minority of the dictionary authors have neutral feelings about the Ice Bucket Challenge Campaign.

Table 2: Feelings of the consumers about Ice Bucket Challenge.

Dictionary	**Positive Feelings**		**Neutral Feelings**		**Negative Feelings**	
	n	**%**	**n**	**%**	**n**	**%**
Eksi Sozluk	98	32,9	52	17,4	148	49,7
Uludag Sozluk	16	12,6	19	15	92	72,4
ITU Sozluk	40	25	38	23,8	82	51,2

The dictionary entries were also analyzed in terms of cumulative counts. The following figures (Figure 2, Figure 3, and Figure 4) illustrate the line plots of cumulative counts related to positive, neutral and negative feelings. In these figures, horizontal axes refer to the sequence of dictionary entries in chronological order while the vertical axes indicate the cumulative counts. It is observed that positive feelings are shown to be dominant nearly in all dictionaries in former entries. However, in latter entries, negative feelings tend to surpass the others. This can be explained that the campaign was found to be creative and attractive by society in the beginning. However, as time passes, the campaign was criticized due to some negative aspects such as waste of time, waste of water and regarding this campaign as a show especially after the attendance of celebrities.

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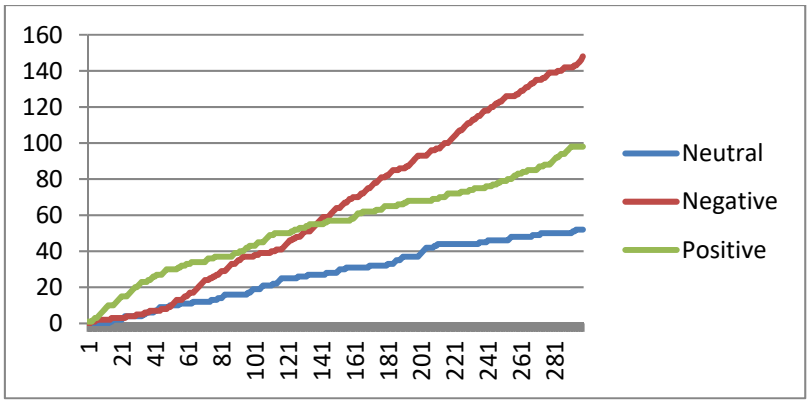

Figure 2. Cumulative count of the feelings for "Eksi Sozluk".

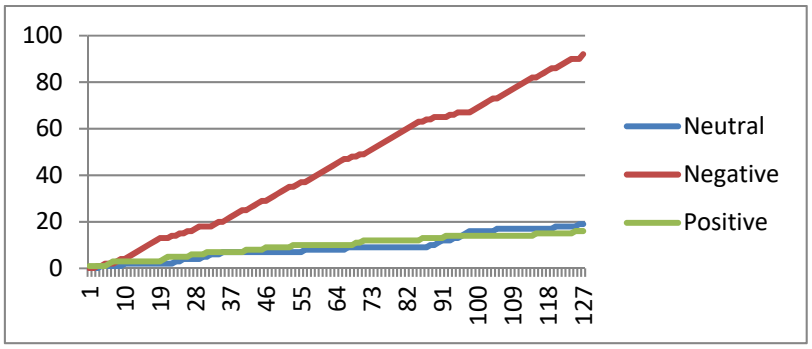

Figure 3. Cumulative count of the feelings for "Uludag Sozluk".

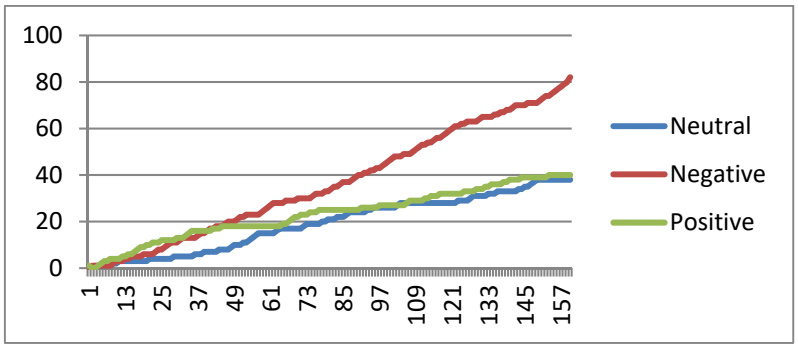

Figure 4. Cumulative count of the feelings for "ITU Sozluk".

The frequently used phrases were analyzed to answer the last research question. The phrases were determined after a preliminary work and chosen as distinguishing as possible. The list of phrases and their frequencies for each online dictionary are shown in Table 3. "Raise awareness" is the most encountered phrase among the entries of three dictionaries. On the other hand, "social responsibility project" is the rarely encountered phrase. The phrases such as "raise awareness", "fun" and "charity" can be observed as the most frequently encountered phrases taking place in positive feelings. Similarly, "show", "advertisement" and "waste of water" are the prominent phrases contained within negative feelings.

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Table 3: Frequently used phrases about Ice Bucket Challenge.

Phrases	Eksi Sozluk	ITU Sozluk	Uludag Sozluk	Total
Raise Awareness	57	45	27	**129**
Fun	48	21	15	**84**
Charity	37	14	11	**62**
Show	23	23	12	**58**
Advertisement	31	8	12	**51**
Admirable	37	9	4	**50**
Popular	14	13	10	**37**
Sensibility	22	5	7	**34**
Trend	10	3	5	**18**
Waste of Water	11	5	0	**16**
Bad	10	1	0	**11**
Unnecessary	2	2	5	**9**
Efficient	4	2	0	**6**
Social Responsibility Project	0	3	0	**3**

Conclusion

Social marketing has an important role to attract the awareness of the society to the social problems and issues. In this study, Ice Bucket Challenge was examined to state the society's feelings about the campaign. For this purpose, three famous online dictionaries called "Eksi Sozluk", "ITU Sozluk" and "Uludag Sozluk" were analyzed. It was found that 26% of the entries have positive opinions about the campaign while 55% and 19% of the entries have negative and neutral opinions, respectively. It is revealed that the general opinion converges to negative feelings about the campaign. The negative feelings reflected by the dictionary authors are mainly based on excessive water usage, turning out to be a show instead of a campaign etc. On the other hand, it is appeared that the campaign has several positive aspects such as drawing attention to a disease, collecting donations etc. As a future work, involving the large variety of dictionaries (national and international) might be useful to enrich the present study and following similar studies.

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THE EFFECTS OF THE CONSTITUENTS ON THE MECHANICAL PROPERTIES OF THE POLYESTER MATRIX COMPOSITES REINFORCED WITH CALCITE PARTICULATES

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Abstract: The Polyester based polymer matrix composites (PMC) were produced using calcite particulates in size of 100□m. The effects of the amount of the curing agent (hardener) and catalyst (fastener) on the mechanical properties of the polyester and composites produced with these polyesters were investigated. The mechanical properties were determined by three point bending tests and the hardness measurements. Additionally, the effects of the particulate ratio used as reinforcing were revealed. The results showed that the flexural stress and strain of the composites are reduced with increase in reinforcing amount. The amounts of the curing agent and catalyst used for polymerization affected the mechanical properties. The strength of the polyester matrix and composites were degreased with increasing curing agent and catalyst amount whereas the flexural strains were increased.

Keywords: Polymer matrix composites, Artificial marble, Strength, Hardness

Introduction

The polymer matrix composites have been used widely in the all areas of the technology. The polymeric materials can be categorized in three main group; thermoplastics, thermosettigs and elastomers. In that three group thermosettins are in liquid phase before polymerization whereas thermoplastic are in solid phase at the ambient temperatures. Thus, the thermoplastics need to be melting in forming processes whereas thermosettings do not. All kind of polymers can be used as matrix and generally particles and fibers are used as reinforcement in micro and nano-scale. The thermosetting polymers, beside other advantages, can be infiltrated into the reinforcement materials easily, formed in a simple mould and polymerized at the room temperature. These properties make them more advantageous for composite production.

One of the most important difficulties on the composite production is to provide a good bonding between the matrix and reinforcement at the interface. The matrix material should be infiltrated in the reinforcement and could have good wetting properties. Most of the thermosetting polymers can provide both requirements with the lot of reinforcement materials at the same time.

As a thermosetting polymer, unsaturated polyester can be polymerized at the room temperature using curing agents and catalysts. The natural and synthetic fibers, particles, fabrics and also wasted fabrics can be used as reinforcement thus, increases the mechanical properties of the polymer. The reinforcement type and shape, the distribution of the reinforcements, amount of the reinforcement, homogeneity and orientation of the reinforcement all affect the mechanical and physical properties of the composites.

The artificial marble is a polymer matrix composite reinforced (or filled) with marble powder, and widely used in construction and architecture industry. In this study, ERCO E-6 cast type unsaturated polyester was used as matrix material including Cobalt 6% as curing agent (hardener) and MEK-P as catalyst (fastener) in different ratios. The reinforcement material was calcite powder in size of <100 □m. The effects of the both matrix constituent amounts and reinforcement amount on the mechanical properties of the composites were determined.

Materials and Methods

Polyester matrix composites were produced using calcite particulates. As a matrix ERCO E-6 cast type unsaturated polyester was used. The reinforcing material (or filling material) was calcite powder in size of <100 □m. Polyester is a thermosetting polymer. Before casting unsaturated polyester was poured in a cup. Then Cobalt 6% was added (wt.% 1, 2 and 3) and then the mixture was blended. Standard Cobalt 6% is an abbreviation for the compounds cobalt napthenate and cobalt octoate, usually supplied as a 6% solution. These compounds are promoters used in the curing of polyester and vinyl ester resins with methyl ethyl ketone peroxide (MEK-P) type catalysts. The purpose of cobalt-based promoters is to speed up the curing reaction of polyester and vinyl ester resins and allow them to cure at room temperature. The cobalt-based promoter helps the catalyst to start the chemical reaction between the resin and styrene monomer and form a cured solid. The exact amount of promoter added to the resin

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will depend on the resin used, the temperature in the workshop and the gel time desired. Usually 0.1 to 1% (based on the mass of resin) of cobalt 6% type promoter is added. (poliya, 2016). Eventually, MEK-P was added (wt.% 2 and 4) and the mixture was blended in a short duration and casted in a mold which was produced using RTV silicon in dimensions of 20X20X200mm^3. MEK-P is a catalyst used in the composites industry for polyester and vinyl ester resins. It reacts with the resin to turn it from a liquid to a solid (cure it). MEK-P is organic peroxide. Since these compounds are unstable in their pure form, they are mixed with inert compounds to form the catalysts used in the industry. Whilst various types of catalysts are available to cure polyester and vinyl ester resins for room temperature cure. (poliya, 2016). The castings were cured at the room temperature for 25 minutes.

While producing composites first of all unsaturated polyester and calcite powder (wt.% 33, 50, and 67) were blended homogeneously. Then Cobalt was added and blended again, eventually MEK-P was added and blended in a short time. Mixture was casted immediately and cured at the room temperature for 25 minutes.

The microstructures of the composites were characterized using optical light microscopy. The mechanical properties of the polyester matrix and the composites were determined by three point bending tests. The flexural strengths and strains were determined. The effects of the Cobalt, MEK-P, and calcite amounts on the mechanical properties were revealed. Three tests were carried out for all samples and the arithmetic average was calculated.

Results and Discussion

Some of the optical microstructures of the composites are shown in figure 1. As seen in figures the calcite particulates were distributed in the polyester matrix homogeneously. The homogeneous distribution of the particles is very important for composites reinforced with particles. Also it is seen on the micrographs that the amount of the pores in the both polyester matrix and composites is negligible.

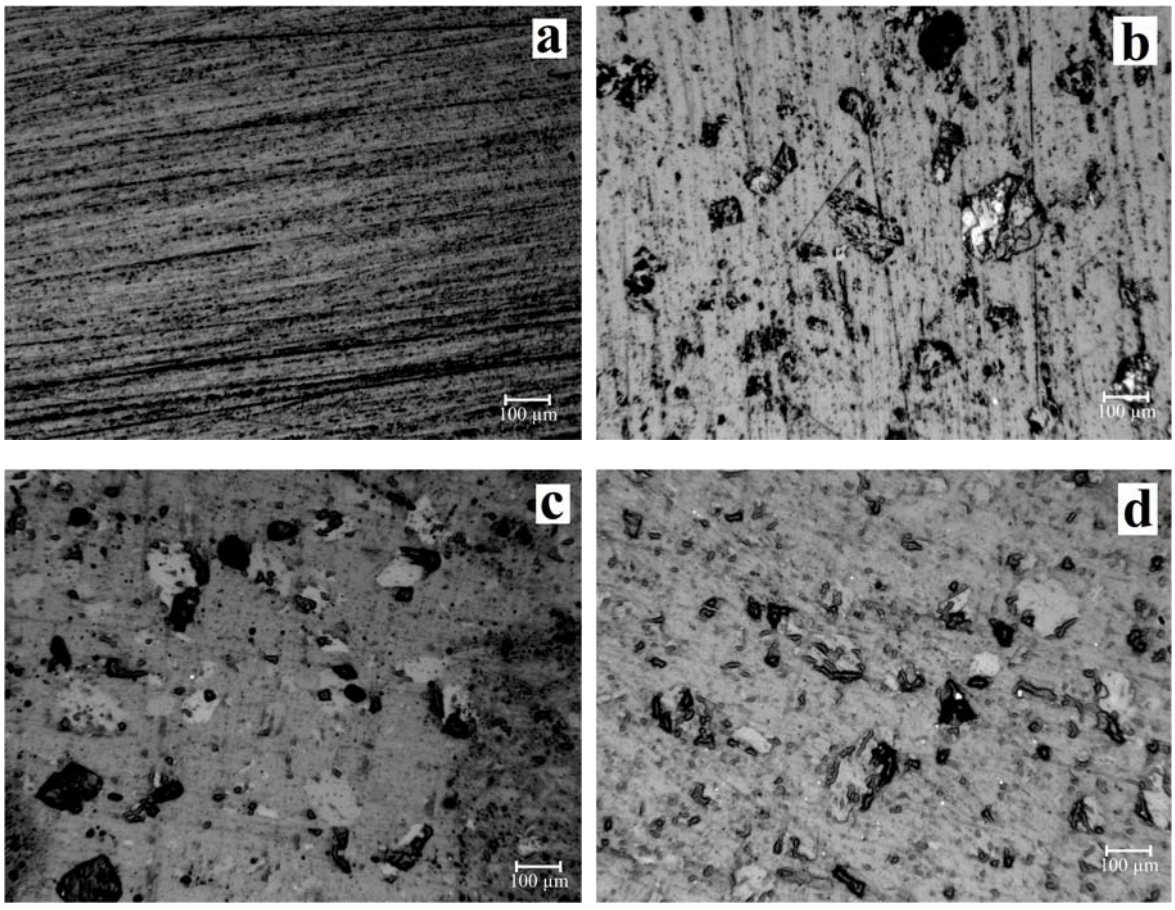

Figure 1. The optical micrographs of the polyester matrix and composites. a) polyester matrix including 2% Cobalt and 4% MEK-P, b) composite reinforced with 33%calcite, including 2% Cobalt and 4% MEK-P, c) composite reinforced with 50%calcite, including 1% Cobalt and 2% MEK-P, d) composite reinforced with 66%calcite, including 3% Cobalt and 2% MEK-P.

Figure 2 shows the effects of the constituents on the flexural strengths of the polyester matrix and composites. The flexural strengths were determined using max. bending forces. Both the polyester matrix and its all composites

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exhibited brittle fracture. The polyester matrix exhibits higher flexural strength than all the composites. The addition of the particles to the polyester was resulted in a reduction in strength. The flexural strength of the composites was reduced with increase in particle ratio. The increase in the amount of the Cobalt resulted a reduction on the flexural strength for both polyester matrix and all the composites also. Minimum flexural strength was obtained with the 2% MEK-P ratio.

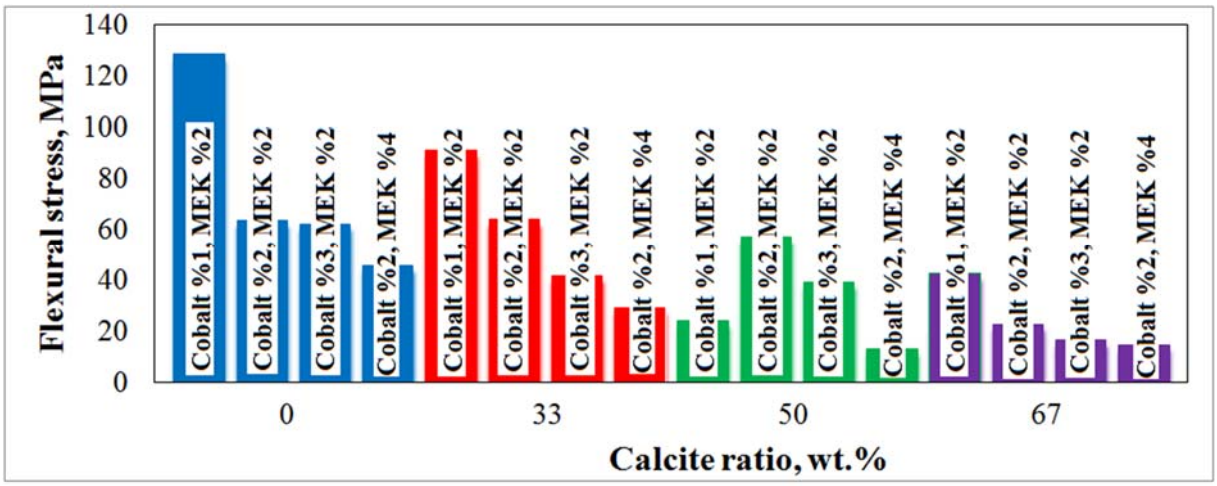

Figure 2. The effects of the constituents on the flexural strengths of the polyester matrix and its composites reinforced with calcite particulates in various ratios.

The flexural strains (deflections) of the polyamide matrix and composites were given in figure 3. The tested samples were approximately in dimensions of 20X20x200 mm^3. The diameters of the supporting pins and loading pin were 30 mm and 10 mm respectively. The support span (distance from centre of the supporting pins) was 100 mm. The deflection amount express the deform ability of a brittle material before fracture. As seen from the figure that all the composites exhibit higher deflection than the polyester matrix. Especially the composites including more than 50 % reinforcement have a high deflection. The reinforcement amount of the composites is very affective on the deflection. The Cobalt amount is also affective but, not increases the deflection, contrary has decreasing affect.

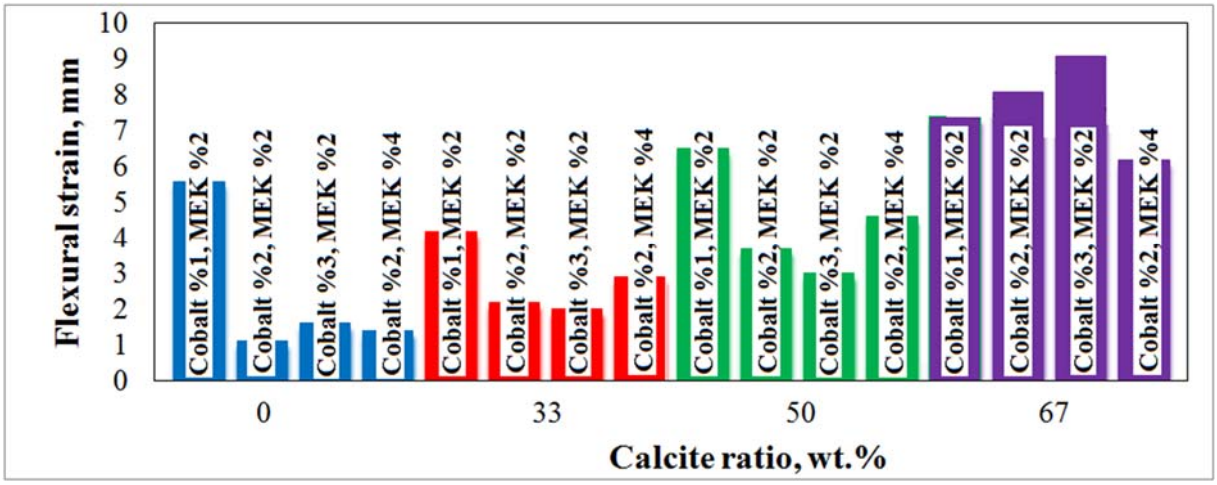

Figure 3. The effects of the constituents on the flexural strains of the polyester matrix and its composites reinforced with calcite particulates in various ratios.

Conclusion

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The artificial marbles are produced using the polyester and the calcite powder. The calcite powder is a filling material and is used to reduce the price, supply a favorable hardness and enough chemical resistance. The mechanical properties of the artificial marbles are important and should be determined. The particle size, amount and distribution can affect the mechanical properties for composites reinforced with particles. According to the results of this work, the calcite which was added to the polyester matrix reduces the strength of the matrix instead of increase. This founding shows that the particles do not contribute to the strength, because there was not a strong bonding between the polyester matrix and calcite particles at the interface. The increase of the particle amount results a reduction for the strength because of reduction on the matrix area at the section. Contrary, the deflection amounts of the composites are higher than the matrix, and deflection is increased with increasing particle amount.

Acknowledgements

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THE EFFECTS OF WORKPLACE FRIENDSHIP ON JOB INVOLVEMENT

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Abstract: This study aims to investigate the assumed direct relationships between workplace friendship and job involvement. Data for the sample was collected from 63 employees working in Karabuk University School of Foreign Languages via survey method. Hierarchical regression analyses was conducted to test the hypotheses. The results show that friendship opportunity and friendship prevalence were positively related to job involvement and friendship prevalence has a bigger effect on job involvement than friendship opportunity. Theoretical and applied implications are discussed.

Keywords: Friendship Opportunity, Friendship Prevalence, Job Involvement

Introduction

This article discusses the effects of the workplace friendships on job involvement. What is more, we argue that workplace friendships have a significant role on the employees' job involvement through friendship opportunity and friendship prevalence.

Work and workplace provide opportunities to human beings to productively channelize energy and create something useful and meaningful and fulfill many of their needs. In this sense then both work and workplace are critical factors in creating purpose and focus in human life (Singh et al., 2012).

It's very common that working people spend much more time at their workplace than their homes. Working hours may vary but people usually work from 9:00 in the morning till 6:00 in the evening. Thus, working people meet other employees more than anyone else even their close friends, family members or neighbors in a week or month. So the relationships between employees at work become very important for the employers and for the company itself for reaching the organizational goals. As a result, close or distant friendships among employees can be a real advantage or disadvantage for the organizations.

Human beings have a social nature. They always try to be in contact with other people and to make relationships. Friendships develop in all kinds of settings. This happens all the time and in all parts of life, including work (Kiesel, 2011). If you've worked with the same company for several years, you've probably built many friendships. Some of your coworkers might be close friends, while others are individuals with whom you might share a weekend story on Monday morning. A friendship at work can become a powerful networking tool or a toxic relationship (Swales, 2015). Effective employment relations are vital to the workplace, whether at the time of recruitment, during an employees' tenure or at the time of separation. Employers, managers, employees and their representatives are all key players in this relationship. Where the employment relationship breaks down, conflict can occur (Wanrooy et al., 2011). To sum up, workplace friendships are often viewed as a positive aspect of organizational culture, but they can also be the cause of discomfort for employees and inefficiency in the organization (Morrison and Nolan, 2007).

THEORETICAL FRAMEWORK

Workplace Friendship

Many work settings are also social environments. Workers interact with their supervisors and co-workers about job-related matters, such as the job tasks that need to be done and the best way to accomplish these tasks. In addition, workers interact frequently about nonrelated job tasks, such as the weather, current events, and leisure pursuits. Because the workplace can often be a social environment, it has the potential to promote the formations of friendships (Chadsey and Rusch, 1988).

The workplace has become a uniquely important site for the building of cooperative and constructive social ties across lines of group identity and social division. Workplace cooperation, sociability, and solidarity all play a role in promoting these ties, and all of those emerge out of basic features of human psychology and basic

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imperatives of human labor in a modern economy (Estlund, 2003). Relationships are important, as they are the mechanism through which we work. Organizations are built on people with skills and resources, and relationships are the links between those people. Good relationships are an investment, and a valuable tool which we use to help attain our work goals. In contrast, bad relationships are a liability. They can be emotionally draining and divert mental energy from work. Dealing with bad relationships can take up valuable time and lead to stress which in turn undermines work performance (Clydesdale, 2013).

Workplace friends share superordinate goals (to fulfil their interdependent work tasks), and workplace contacts have broad institutional support (the backing of managers, owners and the law). Moreover, given the time spent at workplaces, contacts are frequently personal and intimate. Functional and cognitive interdependencies and interpersonal contacts coincide in the prediction that diverse workplaces will generate diverse friendship networks (Kokkonen et al., 2015). In addition, friends at work also form a strong social support network for each other, both personally and professionally. Whether rooting for each other on promotions, consoling each other about mistakes, giving advice, or providing support for personal situations, comradeship at work can boost an employee's spirit and provide needed assistance (Rioardan, 2013). On the other hand, traditionalists argue that pals have no place at the office for a number of reasons. Friendship between colleagues can blur decision making, they say, making difficult decisions more complicated and leading to distractions or inappropriate behavior (Clark, 2013).

Workplace friendship is related not only to employee perception of people, but probably to perception of jobs, and thus affects employees' work motivation (Mao et al., 2012). In fact, it is sometimes hard to overcome the challenges of managing workplace friendships. Workplace friendships represent potential threats to the self-concept of friends if they obtain differential organizational outcomes; they involve the exchange of resources which are incompatible; and they represent contrasting norms of reciprocity. The emotional bond between colleagues may not overwhelm the competition they face over who will get promoted. Indeed, business challenges may be exacerbated by the friendship with rival or debtor. Workplace friendships bring benefits but may also intensify some relational costs (Ingram and Zhou, 2008).

Friendship opportunity, friendship prevalence are the two main subtitles of workplace friendship. Workplaces are the habitat for making friends. When people get a new job they normally meet new people and begin to know each other as they are together nearly more than 6 hours a day. Although workplace friendship depends on voluntary actions, workplaces offer lots of opportunities to socialize and to make friends. Since friendship is a close, mutual and voluntary dyadic relationship workplace is naturally related to opportunities for friendships in the workplace (Bornstein and Lamb, 2011). Song (2006) concluded that friendship opportunity and quality of friendship have a positive impact on work attitudes and not only do workplace friendships create alternatives to the negative effects often seen in working relationships, but workplace friendships can contribute to the positive aspects of a working relationship.

In organizations, patterns of friendship may vary by status, shared experiences, and interests (Kiopa, 2013). The prevalence of friendship(s) is expected to increase when the co-workers trust each other and spend time as much as after work. However, workplace friendships can lead to an increase in job satisfaction, job involvement, positive organizational commitment, longevity on the job, social support, communication and coordination, can enable shared values, and experiences and for the organization, workplace friendship increases institutional participation, motivates employees to better serve the organizational purpose, establishes supportive and innovative climates, and increases organizational productivity (Song, 2006).

After all, workplace friendship involves more than people merely acting in friendly ways or being mutual acquaintances: There must be trust, liking, and shared interests or values, too. Workplace friendships are sometimes limited to certain spheres of work or work-related leisure (such as having a "lunch" friend). Workplace friends usually are able to articulate what they like about another person or what they enjoy doing together ("What I like most about [working with] you is that …"), even though the relationship includes instrumental considerations as well ("I like you, and I need you, too") (Berman et al., 2002).

Job Involvement

Workplace friendships directly impact both job satisfaction and job involvement and friendship opportunities are associated with increases in job satisfaction, job involvement, and organizational commitment (Riordan and Griffeth, 1995). Job involvement plays a significant role basically on role segmentation and time and attention devoted to the job role at workplaces. There is an important link between the workplace friendships and job involvement at workplaces -the better the quality of workplace friendships, the better the job involvement and performance will be at the organizational level.

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According to the Business Dictionary the definition of the job involvement is "The degree to which an employee is engaged in and enthusiastic about performing their work. Business managers are typically well aware that efforts to promote job involvement among staff tend to pay off substantially since employees will be more likely to assist in furthering their company's objectives" (Business Dictionary: 2015). Job involvement is the degree to which a person is identified psychologically with his work, or the importance of work in his total self-image (Lodahl and Kejner, 1965). Liao and Lee (2009) defined job involvement, "the extent to which a person's self-esteem depends on his or her work efficiency" (p.24).

The job involvement concerns the degree to which employees identify themselves with their job. It may be influenced by the level of satisfaction of one's needs- intrinsic or extrinsic (Gilkar and Darzi, 2013). Disengaged employees are an unfortunate reality in the workplace, and poor leadership is often to blame (Kim and Mauborgne, 2014). On the other hand, affectively job involved employees tend to do their jobs more eagerly and they generate behaviors that facilitate good human relationships for their organization (Ueda, 2012).

As noted by Jayawardanaa et al., (2013), job involvement represents a key factor influencing employees' levels of perceived organizational support and job satisfaction. Job involvement represents a cognitive and emotional identification by individual employees with their job. For highly involved employees, their jobs are connected with their identities, interests and life goals. Highly job-involved employees are more likely to be prepared to reciprocate the organizational benefits and supports provided to them, to exert extra efforts to ensure that organizational goals are achieved. They may also experience high levels of task identity, task significance and job autonomy. On the other hand, low job-involved employees are more likely to leave the organization, withhold work effort or 'engage in various undesirable on-the-job activities'.

Involved employees can use their insights to improve their jobs directly and jobs with a high degree of employee involvement might increase satisfaction. In conclusion, satisfied workers are more likely to increase participation in high-involvement practices and establishments with satisfied workers may be more likely to adopt new programs (Mohr and Zoghi, 2008).

The Effects of Workplace Friendship on Job Involvement

The importance of the link between workplace friendship and job involvement has been recognized recently in previous studies. The feelings of friendship affect the performance of the workplace. The personal relations in the workplace are associated with the higher level of job involvement. Workplace friendship increases institutional participation, motivates employees to better serve the organizational purpose, establishes supportive and innovative climates, and increases organizational productivity, job satisfaction and job involvement (Song, 2006). Workplace friends give each other more real job information/viewpoints and accept each other's information/viewpoints more than workplace acquaintances do, i.e., others with only a work relationship and workplace friendship has a positive relationship with perceived job significance and job involvement (Mao et al., 2012).

A friendly atmosphere within an organization, making the entire workforce enthusiastically work together in order to achieve individual employees' as well as organizational goals and it directly affects the level of the job involvement of the employees positively. Thus, employees with high job involvement are more focused towards their jobs, likely to have less turnover and leaving intensions and are more motivated to stay with the organization. They grow in expertise and thus become even more valuable to their employer and the organization. Employees with high levels of job involvement make the job a central part of their personal character and focus most of their attention on their jobs (Mohsan et. al., 2011). More involved persons also feel more competent and successful at work, believe that their personal and organizational goals are compatible, and tend to attribute positive work outcomes to their internal and personally controllable factors (Liao and Lee, 2009).

We expect that workplace friendship has effects on the job involvement and we examine the friendship opportunity and friendship prevalence greater detail in the following sections.

H1: Workplace friendship will be positively related to job involvement.
H1a: Friendship opportunity will be positively related to job involvement.
H1b: Friendship prevalence will be positively related to job involvement.

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MATERIALS AND METHOD

Sample and Procedure

Data were collected from the employees' working in Karabuk University School of Foreign Languages via face to face survey. Surveys were distributed to 78 employees and all employees were invited to participate. From 78 employees 63 participants choose to participate and completed the questionnaire. Participants represented staff roles like teaching staff, manager and administrative staff. The questionnaire assessed demographic variables, dimensions of workplace friendship and job involvement. Participants were %51 male and %49 female. %73 working as teaching staff, %6 working as manager and %21 working as administrative staff. %9.5 high school or vocational school graduate, %65 college or university graduate and %25.5 master or doctorate graduate. %5 working in the university 1 year or less, %31.5 working in the university between 2 to 3 years and %63.5 working in the university more than 3 years.

Measures

Questionnaire was prepared in Turkish. Participants responded to all items using 5-point Likert scales (1 = strongly disagree to 5 = strongly agree) with items coded such that a higher score indicated a greater amount of the focal construct.

Items to measure *Workplace Friendship* were derived from Nielsen et al.'s (2000) study. Workplace friendship was measured along two dimensions: friendship opportunity and friendship prevalence. Six items were used to measure friendship opportunity and six items were used to measure friendship prevalence. A sample item for friendship opportunity is 'I have the opportunity to get to know my coworkers' and a sample item for friendship prevalence is 'I have formed strong friendships at work'. The Cronbach's alpha obtained for friendship opportunity was 0.94 and for friendship prevalence was 0.95. A Cronbach's alpha obtained for the workplace friendship scale was 0.93.

Job Involvement was measured by Kanungo's (1982) ten-item scale. A sample item for this scale is 'Most of my interests are centered around my job'. The Cronbach's alpha obtained for this measure was 0.93.

RESULTS

Prior to testing the hypotheses, separate confirmatory factor analyses were performed to examine the construct validity of the studied constructs (Tabachnick and Fidell, 2007). Several fit indices were used to assess model adequacy (Hair et al, 1998; Brown, 2006; Byrne, 2010; Kline, 2011), namely chi-square ($\chi 2$), the Root-Mean-Square Error of Approximation (RMSEA), the Goodness of Fit Index (GFI), the Normed Fit Index (NFI), the Tucker-Lewis index (TLI) and the Comparative Fit Index (CFI). RMSEA scores below 0.08 and GFI, NFI, TLI and CFI values above 0.90 represent a good fitting model.

In the analysis concerning workplace friendship, results suggest that the two-factor model had an acceptable fit with the observed data, $\chi 2(51)= 56.713$, RMSEA= 0.04, GFI= 0.88, NFI= 0.93, TLI= 0.99, CFI= 0.99. In the analysis involving job involvement, the model fit statistics were acceptable, $\chi 2(26)= 31.483$, RMSEA= 0.05, GFI= .91, NFI= 0.92, TLI= 0.98, CFI= .99.

Additionally, the convergent and discriminant validity was assessed of the scales by the method outlined in Fornell and Larcker (1981). For convergent validity, the composite reliability (CR) and the average variance extracted (AVE) were calculated in order to determine whether the measurement variable was representative of the related construct. All AVEs in Table 1 were 0.61 or higher, and exceeded the cutoff value of 0.50 (Fornell and Larcker, 1981; Hair et al., 1998), and all CRs were 0.93 or higher and exceeded the cutoff value of 0.70 (Fornell and Larcker, 1981; Hair et al., 1998). These results provided evidence for convergent validity of each of the constructs involved in the research model of this study.

The evidence of discriminant validity can be demonstrated when measures of conceptually different constructs are not strongly correlated among themselves as compared to similar constructs. In order to evaluate the discriminant validity, the square root of the AVE in each construct is compared with the correlation coefficients between two constructs (Fornell and Larcker, 1981; Hair et al., 1998). The square root AVE in each construct that appear on the diagonal in parentheses in Table 1 was larger than any correlation between the associated construct and any other construct. These results provided evidence for discriminant validity.

The means, standard deviations, zero-order correlations, and reliability estimates (α) for the measures used in the study are reported also in Table 1. As seen in this table, zero-order correlations were all in the expected direction and the internal consistency for each measure was above the 0.70 as recommended by Nunnally and Bernstein

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(1994). In addition to this, correlations between measures never exceeded 0.85, suggesting that no bivariate multicollinearity exists between scales (Kline, 2011).

Table 1. Descriptive Statistics

	Mean	SD	α	CR	AVE	Correlations						
						1	2	3	4	5	6	7
1.Gender	1.50	0.50	-	-	-	-						
2.Staff Role	1.47	0.82	-	-	-	0.03	-					
3.Education	3.12	0.65	-	-	-	0.19	-0.41**	-				
4.Tenure	2.58	0.58	-	-	-	0.39**	-0.05	0.18	-			
5.Friendship Opportunity	3.62	0.84	0.94	0,94	0,72	-0.01	-0.11	0.25*	0.24	**(0.86)**		
6.Friendship Prevalence	3.38	1.03	0.95	0,94	0,73	0.01	-0.27*	0.29*	0.04	0.50**	**(0.85)**	
7.Job Involvement	3.38	0.89	0.93	0,93	0,61	0.05	-0.16	0.17	0.08	0.53**	0.71**	**(0.78)**

*p<0.05; **p<0.01; N=63, The square root of the constructs' AVE appear on the diagonal in parentheses

Hierarchical regression analyses were conducted to test the hypotheses (Table 2). Because they may affect the variables and relationships of interest, gender, staff role, education and tenure were included as control variables.

Table 2. Hierarchical regression analysis examining the effects of workplace friendship on job involvement

	Job Involvement	
	Step 1	Step 2
	β	β
Control Variables		
Gender	0,02	0,08
Staff Role	-0,12	-0,01
Education	0,11	-0,09
Tenure	0,05	-0,02
Independent Variables		
Friendship Opportunity		**0,25***
Friendship Prevalence		**0,61****
F Value	0.67	11.65**
R^2	0.04	0.55
Adjusted R^2	-0.02	0.50
ΔR^2		0.51**

*p<0.05; **p<0.01; N=63

Hypotheses 1a predicted that friendship opportunity would be related to job involvement. As shown in Table 2, friendship opportunity was significantly and positively associated with job involvement (β=0.25, p<0.05). Thus, Hypotheses 1a was supported.

Hypotheses 1b predicted that friendship prevalence would be related to job involvement. As shown in Table 2, friendship prevalence was significantly and positively associated with job involvement (β=0.61, p<0.01). Thus, Hypotheses 1b was supported.

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DISCUSSION

This study was conducted to determine the relationship between workplace friendship and job involvement. For this purpose, data for the sample was collected from 63 employees working in Karabuk University School of Foreign Languages via survey method and the hypotheses were tested by hierarchical regression analyses.

The results of this study confirm and extend prior findings that workplace friendships influence individual and organizational outcomes (Nielsen et al., 2000; Kiesel, 2011; Mao et al., 2012; Asgharian et al., 2013). First, prediction relating to the direct effect of friendship opportunity on job involvement was confirmed. These findings suggests that when a job allows employees to talk with one another on the job and to establish informal relationships with other employees at work, employees are more likely to be committed to their organization identify themselves with their jobs. Second, study findings confirm the direct effect of friendship prevalence on job involvement. That is, when co-workers trust each other and spend time as much as after work, they are more likely to be committed to their organization identify themselves with their jobs. These results were similar to that of prior studies (Riordan and Griffeth, 1995; Nielsen et al., 2000; Morrison, 2004).

The findings of this study also showed that the effect of friendship prevalence on job involvement is greater than the effect of friendship opportunity. This finding shows that while the friendship opportunity is an important predictor of job involvement, spending more time and building trust between employees play a greater role for employees to identify themselves with their job.

This study was conducted on full-time employees labored in a university setting. Thus, the present findings have important implications for university organizations. Universities should be aware that by improving the friendship in working environment, employees will be more committed to their jobs and their organization. Friendship within the work environment may be severely underrated and underutilized as a condition for individual and organizational effectiveness (Riordan and Griffeth, 1995). But, as mentioned by Song (2006), workplace friendship motivates employees to better serve the organizational purpose and increases organizational productivity, job satisfaction and job involvement.

There were a number of limitations to the current study. First, the sample used for the analysis consists of just 63 people. So it limits the generalizability of the findings. Second, data were collected at a single point in time. Thus, the use of cross-sectional research design limits the ability to make causal relationships among the study variables. Future research can rely on experimental or longitudinal designs and provide more convincing evidence on causation.

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THE EVALUATION OF ENVIRONMENTAL ENGINEERING EDUCATION PROGRAMME -A CASE STUDY OF BURSA ULUDAG UNIVERSITY FROM TURKEY

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ABSTRACT
Environmental Engineering Education Programme (EEEP) has grown and expanded over the past 30 years across universities in Turkey. After being established the first Environmental Engineering Department (EED) in 1978, today there are 36 universities which offer environmental engineering undergraduate study country-wide. There is a growing demand in Turkey for qualified environmental engineers and the available EED's in Turkey have become capable of meeting this demand of the country. EEEP in Turkey, at the both undergraduate and graduate level, has been a visible and widely available study option in the past three decades. The knowledge and interest in these programmes may vary across universities but the basic components remain the same. All curricula offer units from the basic subjects, general environmental subjects, water-related subjects, other environmental subjects, global environmental subjects, etc. A bachelor's degree in environmental engineering typically takes four years to complete. The EED was established at Uludag University (UU) as a graduate program in 1991. This programme was began offering undergraduate programs in 1992. The department today has 21 academic staffs and about 400 students. UU undergraduate programme received accreditation by Association for Evaluation and Accreditation of Engineering Programs (MÜDEK (in Turkish)) in 2011. Numerous courses both on Environmental Sciences and on Environmental Technology are offered at the graduate and undergraduate level. All curricula offer units from the basic subjects, general environmental subjects, water-related subjects, other environmental subjects, global environmental subjects, etc. This paper summarizes the EEEP of the EED at UU and its location among the other 36 departments in Turkey. Hence, the education programmes of existing departments have been compared and the evaluation of the results and related suggestions are given in this study.
Keywords: *Academic staff, Education, Environmental engineering, Teaching, Undergraduate-graduate level.*

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Introduction

The Environmental Engineering Department which is one of the 8 departments in the Faculty of Engineering of Uludag University, was established in 1991-1992 academic year. The department today has 21 faculty members and about 421 students at the undergraduate level. Each year about 70 new students are enrolled in the Environmental Engineering Department. These students are selected based on their results of a general University entrance examination. Environmental Sciences and Environmental Technology are the two main sub-departments of the Environmental Engineering Department. Numerous courses both on Environmental Sciences and on Environmental Technology are offered at the graduate and undergraduate level.
This paper summarizes the curriculum development and missions of the Environmental Engineering Department at Uludag University. Also, the basic characteristics of the undergraduate and graduate program are reviewed from the point of view of sustainable production.

Environmental Engineering Program

A bachelor's degree in engineering is required for all entry-level engineering jobs. It is important to select a program that is accredited in Environmental Engineering. Accredited environmental engineering programs usually provide broad studies in the physical, chemical, and biological sciences in Turkey. Some graduate level programs are also available in Environmental Engineering.

Admission Requirements

Admissions requirements for undergraduate environmental engineering departments include a solid background in mathematics (algebra, geometry, trigonometry, and calculus) and science (biology, chemistry, and physics), and courses in English, social studies, Atatürk's Principles and The History of Turkish Renovation I-II and

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computer and information technology. Bachelor's degree programs in environmental engineering typically are designed to last 4 year. In a typical 4-year college curriculum, the first 2 years are spent studying mathematics, basic sciences, introductory engineering, Atatürk's Principles and The History of Turkish Renovation I-II and social sciences. In the last 2 years, most courses are in engineering, usually with a concentration in one branch. For example, the last two years of an environmental program might include courses in solid waste management, treatment plant design, hydraulic design, and hazardous waste management.

Courses of Study

Environmental Engineering Departments have an interdisciplinary character which requires knowledge in many fields of science, including physics, chemistry, hydrology, geology, and biology. Undergraduate students of Environmental Engineering Department of Uludağ University take courses that cover these fields including microbiology, organic chemistry, hydrology, engineering geology and others.

The concept of total quality control (TQC) is applicable to academics. To test the end product of academics is not as easy as to test the end product of an industry. Tardy studies are required to test ''graduates'' who are the end products of an educational institute. Uludağ University Environmental Engineering Department has started a study to have an accreditation in 2011. An accreditation study and an evaluation procedure have been requested from Association for Evaluation and Accreditation of Engineering Programs (MÜDEK). MÜDEK is recognized by the Higher Education Council of Turkey as the National Quality Assurence Agency in accrediting engineering programs. MÜDEK is a full member of European Network for Accreditation of Engineering Education. With 25 years of experience in undergraduate education, the Environmental Engineering Department today has fulfilled the MÜDEK (2011) accreditation criteria and has been accredited by MÜDEK since 2011.

Curriculum of the Program

The curriculum of the Department is planned to provide students with a solid professional education. The basic mission statement of the Uludağ University Environmental Engineering Department is "Environmnetal Engineering Department undertake to make original researches in the environmental area, to provide training in continuous improvement approach, to train engineers armed with the information to understand and solve problems in the field, based on ethical values , with self- refreshing approach and able to work as a team, who can lead in the area and to serve the community in environmental issues". In order to fulfill these missions and to reach its goals the following basic teaching program in the undergraduate and graduate education is applied.

The curriculum in Uludağ University Environmental Engineering Department topics has wide provisions. There are some courses on engineering science such as statics, fluid mechanics and thermodynamics. There are several compulsory courses as well as technical elective courses expose students to problem-solving in the technical context and to more global issues and societal context. The students are also required to take ten credits of social elective courses that provide a much broader perspective on the role of engineers in society. Courses in the junior and supper division courses focus on environmental engineering applications and problem-solving exercises.

There are some compulsory laboratory courses (CEV 2030 Environmental Microbiology, CEV 2025 Environmental Chemistry, etc.) in the curriculum. Students have chance to obtain hands-on laboratory techniques, data collection and analysis. In some courses the experiments have been designed for the students to work in a team or individually. The team is encouraged to do the experiment, interpret the data and write a technical report on the findings independently.

Apart from CEV4006 Graduation Project that students take during their senior year, there are also two design courses which they take during junior and senior years (CEV 3074 Environmental Engineerıng Project I and CEV 4101 Environmental Engineerıng Project II). Due to the importance of the design in engineering education and the Graduation Project has been extended to two semesters from 2016-2017 academic year. During the course CEV 4101 Environmental Engineerıng Project II students have to work in teams and design a multidiciplinary Project. This course is usually a very challenging course for students because it makes the student to create multidisiplinary projects and work in teams. At the end of the courses, the teams write a final report on the projects and prepare an oral presentation to a jury. The jury consists of 3 faculty members from the Department.

After the course is over, students would have gained the knowledge of solving a design problem, improving communication skills, and an understanding of the professional and ethical responsibility of an engineer. The students also learn the importance of life-long learning aspect during this design process.

The curriculum of Environmental Engineering Department has been given in Appendix 1. In this program the total number of credits for the following groups of courses and their percentages are given as follows.

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Math and Basic Sci.	**60 ECTS ***	**25% of total**
Atatük's principals and history of revolutions I-II, Soc. Sci.	31 ECTS	13% of total
Departmental Courses	149 ECTS	62% of total
Total	240 ECTS	

*European Credit Transfer System - ECTS

Employment

Environmental Engineers work in a wide variety of industries, including chemical, pharmaceutical, water/wastewater treatment, mining, and manufacturing, and can be involved in hazardous waste remediation, air pollution control, facilities planning, and environmental consulting.
As the trend of regulation changes from pollution cleanup to prevention, environmental engineers will have to shift their focus to public health, an area of growing concern. But trends in environmental protection and regulation constantly change, so environmental engineers must keep abreast of a range of environmental issues to ensure steady employment.

Conclusions

Environmental engineering education has grown, expanded and evolved into a unique area of engineering over the past decade.
Environmental engineering is different from any classical engineering discipline because it is multidisciplinary in nature, covering a broad range of topics from engineering and science, to economics and humanities, etc. It is not enough to take an existing programme and add on environmental units, and then call it environmental engineering. This method may appear to be the quickest and most economical way of developing a new programme but, according to the authors, it has resulted in many problems and failures.
The basic characteristics of the undergraduate program of the Environmental Engineering Department at Uludag University has been reviewed. The Environmental Engineering Department today has fulfilled the MÜDEK accreditation criteria and accredited by MÜDEK.
Some of the most important points emphasized in the courses are problem-solving in the technical and societal context, working in a multidisciplinary team and life-long learning.
An understanding of sustainable development is delivered to the students during several courses taken from the Department.

References

MÜDEK (2013) Association for Evaluation and Accreditation of Engineering Programs Criteria.
MÜDEK (2016) Report of Enviromental Engineering Department.
http://cevre.uludag.edu.tr/new/Web page of Uludag University Environmental Engineering Department,

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Appendix 1

ULUDAĞ UNIVERSITY
2015-2016 SEMESTER
CURRICULUM

FACULTY/COLLEGE/CONSERVATORY: ENGINEERING FACULTY
DEPARTMENT/ PROGRAM: ENVIRONMENTAL ENGINEERING DEPARTMENT

I. SEMESTER / FALL SEMESTER						**II. SEMESTER /SPRING SEMESTER**					
		WEEKLY COURSE HOUR						**WEEKLY COURSE HOUR**			
CODE	**COURSE TITLE**	**T**	**A**	**L**	**ECTS**	**CODE**	**COURSE TITLE**	**T**	**A**	**L**	**ECTS**
ATA101	ATATURK'S PRINCIPALS AND HISTORY OF REVOLUTIONS I	2	0	0	2	ATA102	ATATURK'S PRINCIPALS AND HISTORY OF REVOLUTIONS II	2	0	0	2
TUD101	TURKISH LANGUAGE I	2	0	0	2	TUD102	TURKISH LANGUAGE II	2	0	0	2
YAD101	FOREING LANGUAGE I (ENGLİSH I)	2	0	0	2	YAD102	FOREING LANGUAGE II (ENGLİSH II)	2	0	0	2
YAD111	FOREING LANGUAGE I (GERMAN I)	2	0	0	2	YAD112	FOREING LANGUAGE II (GERMAN II)	2	0	0	2
YAD121	FOREING LANGUAGE I (FRENCH I)	2	0	0	2	YAD122	FOREING LANGUAGE II (FRENCH II)	2	0	0	2
MAT1071E	CALCULUS I	3	2	0	6	MAT1072E	CALCULUS II	3	2	0	6
FZK1071E	BASIC PHYSICS I	3	0	2	6	FZK1072E	BASIC PHYSICS II	3	0	2	6
CEV1023	TECHNICAL DRAWING	2	1	0	3	CEV1024	STATICS – STRENGHT	3	0	0	3
CEV1029	ENVIRONMENTAL POLLUTION AND ECOLOGY	2	0	0	3	CEV1026	COMPUTER AND INTR.PROGRAMMING	2	1	0	2
CEV1031	INTRODUCTION TO ENVIRONMENTAL ENGINEERING	2	0	0	3	CEV1030	ENVIRONMENTAL QUANTITATIVE ANALYSIS	2	0	2	5
CEV1033	GENERAL CHEMISTRY	2	1	0	3						
ELECTIVE COURSES						**ELECTIVE COURSES**					
AREA ELECTIVE						AREA ELECTIVE					
NON-AREA ELECTIVE						NON-AREA ELECTIVE					
						ELECTIVE COURSES **36 ECTS AREA ELECTIVE** **15 ECTS NON-AREA ELECTIVE COURSES COMPULSORY**					
	TOTAL CREDITS				**30**		**TOTAL CREDITS**				**30**

III. SEMESTER / FALL SEMESTER		**IV. SEMESTER /SPRING SEMESTER**	
	WEEKLY COURSE HOUR		**WEEKLY COURSE HOUR**

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CODE	COURSE TITLE	T	A	L	ECTS	CODE	COURSE TITLE	T	A	L	ECTS
MAT2083	CALCULUS III (DIFFERENTIAL EQUATIONS)	3	2	0	6	ISG202	OCCUPATIONAL HEALTH AND SAFETY II	2	0	0	2
CEV2025E	ENVIRONMENTAL CHEMISTRY I	2	0	2	5	CEV2024	HYDRAULICS	2	2	0	4
CEV2027	MICROBIOLOGY	2	0	2	6	CEV2026	ENVIRONMENTAL CHEMISTRY II II	2	0	2	4
CEV2033E	FLUID MECHANICS	2	1	0	5	CEV2028	ENVIRONMENTAL ENGINEERING THERMODYNAMICS	2	0	0	3
ISG201	OCCUPATIONAL HEALTH AND SAFETY I	2	0	0	2	CEV2030	ENVIRONMENTAL MICROBIOLOGY	2	0	2	4
						CEV2032	STATISTICS	2	0	0	3
						CEV2036E	PHYSICAL UNIT OPERATIONS of ENVIRONMENTAL ENGINEERING	2	1	0	4
						CEV2038	ENVIRONMENTAL ENGINEERING	2	0	0	3
ELECTIVE COURSES						**ELECTIVE COURSES**					
AREA ELECTIVE		2	0	0	3	AREA ELECTIVE		2	0	0	3
NON-AREA ELECTIVE		2	0	0	3	NON-AREA ELECTIVE		2	0	0	
	TOTAL CREDITS				**30**		**TOTAL CREDITS**				**30**

V. SEMESTER / FALL SEMESTER						**VI. SEMESTER /SPRING SEMESTER**					
		WEEKLY COURSE HOUR						**WEEKLY COURSE HOUR**			
CODE	**COURSE TITLE**	**T**	**A**	**L**	**ECTS**	**CODE**	**COURSE TITLE**	**T**	**A**	**L**	**ECTS**
CEV3023E	CHEMICAL OPERATIONS of ENVIRONMENTAL ENGINEERING	2	0	1	5	CEV3028	WATER TREATMENT	2	1	0	5
CEV3025	BIOCHEMICAL PROCESSES	2	1	0	4	CEV3030	WASTEWATER ENGINEERING	2	1	0	5
CEV3027	WATER QUALITY AND CONTROL	2	1	0	3	CEV3032E	AIR POLLUTION CONTROL ENGINEERING	2	0	0	4
CEV3029	WATER SUPPLY AND SEWAGE	2	2	0	4	CEV3034	SOLID WASTE MANAGEMENT	2	1	0	4
CEV3031	AIR POLLUTION	3	0	0	5	CEV3074	ENVIRONMENTAL ENGINEERING PROJECT I	0	4	0	3
ELECTIVE COURSES						**ELECTIVE COURSES**					
AREA ELECTIVE		4	0	0	6	AREA ELECTIVE		4	0	0	6
NON-AREA ELECTIVE		2	0	0	3	NON-AREA ELECTIVE		2	0	0	3
	TOTAL CREDITS				**30**		**TOTAL CREDITS**				**30**

VII. SEMESTER / FALL SEMESTER		**VIII. SEMESTER /SPRING SEMESTER**	
	WEEKLY COURSE		**WEEKLY COURSE HOUR**

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		HOUR									
CODE	**COURSE TITLE**	**T**	**A**	**L**	**ECTS**	**CODE**	**COURSE TITLE**	**T**	**A**	**L**	**ECTS**
CEV4041E	INDUSTRIAL POLLUTION and CONTROL	2	1	0	4	CEV4042	ENVIROMENTAL MODELLING	2	1	0	4
CEV4043E	MARINE OUTFALL SYSTEMS	2	0	0	3	CEV4046	SOIL AND UNDERGROUND WATER POLLUTION	2	1	0	4
CEV4047	TREATMENT OF WASTEWATER SLUDGES	2	0	0	3	CEV4006	GRADUATION PROJECT*	0	4	0	5
CEV4101	ENVIRONMENTAL ENGINEERING PROJECT II	0	4	0	3	CEV4106	SEMINAR	0	1	0	1
CEV 4105	SUMMER PRACTICE-I	0	0	0	4	CEV4112	SUMMER PRACTICE II	0	0	0	4
CEV4107	PREPERATION TO FINAL PROJECT	0	0	0	1						
ELECTIVE COURSES						**ELECTIVE COURSES**					
AREA ELECTIVE (3 COURSES)		6	0	0	9	AREA ELECTIVE (3 COURSES)		6	0	0	9
NON-AREA ELECTIVE		2	0	0	3	NON-AREA ELECTIVE		2	0	0	3
	TOTAL CREDITS				**30**		**TOTAL CREDITS**				**30**

Doküman KOD:RİT-FR-OİD-12 Revizyon No:04

	ECTS
Total Elective Courses Credits :	**51**
Total Graduation Credits:	**240**
Total Elective Courses Credits Ratio	**0,23**

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THE IMPORTANCE AND ESTABLISHMENT OF THE INDICATORS FOR ENERGY SAVING AND CARBON REDUCTION FOR AUTOMOBILE AND MOTORCYCLES

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Abstract: At present, Taiwan is short of indigenous energy, over 98% of energy supply depends on import (Tsai, 2005). As Taiwan's national income increases gradually, the traffic network is improved increasingly, and the demand of the automobile and motorcycles for the imported energy increases continuously, the important issue for the moment is to establish the automobile and motorcycle fuel saving accomplishment development indexes. The purpose of this study is to know the automobile and motorcycle fuel saving accomplishment and to evaluate its importance. This method uses related references and Fuzzy Delphi Method of expert questionnaire to discuss the automobile and motorcycle fuel saving accomplishment. As confirmed by the experts, the major factor aspects pushing the automobile and motorcycle fuel saving accomplishment include "fuel saving cognition", "fuel saving affection" and "fuel saving skill". There are 17 indexes and 56 items. The mean value of importance is 0.7166, the important indexes and consensus value are fuel saving skill (0.72789), fuel saving cognition (0.71098) and fuel saving affection (0.71092). It is obvious that the automobile and motorcycle fuel saving shall start with the fuel saving skill aspect. The factors of automobile and motorcycle fuel saving accomplishment can provide reference for the automobile and motorcycle users and competent authorities to develop automobile and motorcycle fuel saving accomplishment training and learning.

Keywords: fuel saving accomplishment, Fuzzy Delphi, fuel saving cognition, fuel saving affection, fuel saving skill

I. Introduction

With the aggravating extreme climate over the world, the trend of global warming and climate change has been scientifically verified as the result of human activities (Intergovernmental Panel on Climate Change [IPCC], 2007), especially the high CO_2 emission from burning fossil fuels. Therefore, multiple experts indicate that the promotion of energy education depends on building an effective communication mechanism, so as to enhance the citizens' environmental awareness, changing the attitude toward living and exercising specific environmentally friendly actions (Chedid, 2005; Dias, Mattos, & Balestieri, 2004; Zografakis, Menegaki, & Tsagarakis, 2008).

1. Research Background and Motives

At present, the traditional oil reserves are being exhausted over the world, the international oil situation fluctuates, the oil price risk increases and the alternative energy has not yet be found, Taiwan's energy development is confronted with rigorous challenges. The power source of the present automobile and motorcycles is derived from burning fossil fuels (e.g. diesel oil, gasoline, liquefied petroleum gas), so it is inevitable to produce a great deal of CO_2. With the rising environmental considerations and the greenhouse gas reduction specification in the "Kyoto Protocol" adopted at the "Framework Convention on Climate Change", Japan Kyoto, 1997, various countries restricted the use of petroleum to some extent, and made related laws to control the consumption of fossil fuels, so as to reduce the production of greenhouse gases including CO_2. In

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addition, various countries concentrate on pushing fuel saving and carbon emission reduction, increasing the energy efficiency for automobile and motorcycle fuel saving and carbon emission reduction has become a global consensus. The automobile and motorcycle fuel saving management policies and encouragement measures are used as important strategies for greenhouse gas reduction.

The fuel saving education is obviously important for enhancing our people's attitude and behavior of automobile and motorcycle fuel saving. The traditional delphi requires more than three times of scale survey and revision, taking much time, and the larger the number of surveys is, the higher is the cost (Wu, 2005). If the Fuzzy Delphi is used, and the expert opinions are integrated by triangular fuzzy number, only one survey is required, not only reducing the cost, but also expressing the fuzziness and uncertainty of human thinking, the objectivity of scale is enhanced. Convenient use, even automatic presentation of the cognition, affection and skill about energy saving and carbon reduction in daily life will contribute to enhancing the energy saving accomplishment.

Therefore, the automobile and motorcycle fuel saving accomplishment development index is the important subject at present in the view of this study. The analysis is based on literature review and Fuzzy Delphi Method, hoping to find out the strategy for pushing the automobile and motorcycle fuel saving and carbon emission reduction, so as to provide reference for developing the decision on fuel saving and carbon emission reduction, guiding the automobile and motorcycle drivers to the new accomplishment of fuel saving and carbon emission reduction, so as to implement the promise of carbon emission reduction to the world and to build a sustainable Taiwan.

2. Research Questions

The research questions include:

1. What aspects does the automobile and motorcycle fuel saving accomplishment scale have? What is the weight of each aspect? Which aspect has the highest weight?
2. What indexes does the automobile and motorcycle fuel saving accomplishment scale have? What is the weight of each index?
3. Which index has the highest weight among all the indexes? Which indexes have the highest weight in each aspect?

3. Research Purposes

According to the research background and motives, the purpose of this study is to use Fuzzy Delphi Method to develop an automobile and motorcycle fuel saving accomplishment scale for the middle school and college student owners who have just obtained a driver's license. The fuel saving knowledge will be popularized in the middle school and university education from the angle of effective automobile and motorcycle fuel saving, so as to implement the fuel saving and carbon emission reduction policy to enhance our people's accomplishments of fuel saving and environmental protection, responding to the global environment where the oil reserves are exhausted increasingly and the climate changes rapidly.

II. Research Method

The fuzzy Delphi selects the importance of items of the automobile and motorcycle fuel saving accomplishment questionnaire scale, the experts fill in it and express their opinions. The revision is made according to the expert advice, the experts' consistent view is obtained. The advantages include fully expressing individual opinion, the expert opinions have the same value, being free from personal power and position. This study uses triangular fuzzy number to integrate multiple experts' opinions, free of repeated surveys. This integration method uses the preference relation of each participant to build the personal fuzzy preference relation, so as to obtain the overall preference relation. The technology is used to design the scale for a subject, the expert group expresses opinions. Afterwards, the expert opinions are collected and organized to obtain the group members' consistent view (Wang and Wang, 2006).

1. Research Subjects

This study invited 16 industrial and academic experts to evaluate this scale. The experts are professionals of automobile and motorcycle field. The expert background is shown in Table 2. Most of the experts have automobile or motorcycle repair and maintenance Grade B certificate or above, and have enough automobile and motorcycle teaching seniority and experience. The experts to fill in the scale have further understanding of automobile and motorcycle fuel saving and carbon emission reduction, the interference in the scale reliability and validity is reduced.

Table 1

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Expert background

No.	Name	Unit	Remarks	No.	Name	Unit	Remarks
1	Yuan-hsing Wang	Trainer, Automotive Repair Division, Training and Employment Center, Bureau of Labor, Kaohsiung City Government		9	Chien-pin Chang	Director, Automotive Division, Salesian Technical School Tainan, Taiwan	
2	I-chung Wu	Director, Automotive Division, National Chia-yi Industrial Vocational High School		10	Sheng-mao Chang	Chair, Industrial Technology Education, National Kaohsiung Normal University	Retired
3	Tsung-lin Wu	Director, Extension Education Section, Southern Taiwan University of Science and Technology		11	Chen-chang Chang	Director, Yulon Motors INFINITI Specialized Factory	
4	Chun-neng Lin	Director, Automotive Division, Kao-Yuan Vocational High School of Technology & Commerce		12	I-feng Yeh	Director, Kaodu Motor Inc., Jiuru LEXUS Specialized Factory	
5	Wen-ching Cheng	Director, Automotive Division, National Cishan Agricultural & Industrial Vocational Senior High School		13	Tzu-lin Tsai	Lecturer , Southern Region Training Center, Training Institute,Directorate General of Highways, M.O.T.C.	
6	Chen-li Chen	Director, Automotive Division, Chung Shan Industrial & Commercial School		14	Chen-chung Liu	Training Manager of volvocars	
7	Chin-tsan Chen	Assistant Professor, Department of Mechanical Engineering, Nan Kai University of Technology		15	Yung-cheng Cheng	Director, Extension Education Section, Lichih Senior High School	
8	Ching-fen Chen	Kao-Yuan Vocational High School of Technology & Commerce Guidance director (Former director of the automobile division)		16	Chun-tsai Su	Chief (Assistant Manager), of Service Department, HOTAI MOTOR CO., LTD TOYOTA, LEXUS	

2. Research Tools

This study uses Fuzzy Delphi Method to evaluate the evaluation factors in automobile and motorcycle fuel saving and carbon emission reduction. The expert questionnaire is used for research, so as to integrate expert opinions reasonably and objectively. The Fuzzy Delphi Method is an expert forecasting method, as well as one of group decision methods, it can extract the advantages of questionnaire survey and meeting. The purpose of questionnaire is to evaluate the importance order rank in the evaluation sheet, there are 0~10 ranks, higher score represents higher importance. The double triangular fuzzy numbers of Fuzzy Delphi Method are used for gray zone test, the expert group's opinions are analyzed. After the "automobile and motorcycle fuel saving accomplishment" questionnaire filled by the experts is analyzed by Fuzzy Delphi Method, the threshold is screened, so as to select the appropriate evaluation factors.

Table 2

Major factor aspects of automobile and motorcycle fuel saving accomplishment and reference source

Research classification		Research variables	References
Fuel saving cognition	Memory	1.1.1Description of oil consumption of vehicles using the same fuel, small c.c. vehicles perform better than large c.c. vehicles in fuel saving and carbon emission reduction.	Bureau of Energy (2014).
		1.1.2Opening the door windows before startup in the strong sunlight to reduce the temperature inside the vehicle rapidly before the air conditioning is turned on can reduce the fuel consumption and the carbon emission.	Teng, M.E.(2011.03). Tsai, W.P.(2012.09). Bureau of Energy (2011).

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	Comprehension	1.2.1Evading strong sunlight during fueling and not to spill the fuel and fastening the tank cap after fueling can reduce the fuel evaporation and waste, the fuel consumption and carbon emission may be reduced.	Bureau of Energy (2014).
		1.2.2When the vehicle weight load is reduced (non-original vehicle's fittings, e.g. top holder and top cargo box), the engine load can be reduced and the vehicle fuel efficiency can be increased, the fuel consumption and carbon emission may be reduced.	Teng, M.E.(2011.03). Tai, C.H. (2011.07). Tsai, W.P.(2012.09). Bureau of Energy (2011). Bureau of Energy (2014).
		1.2.3When the vehicle is running at a high speed, keeping the windows closed when the speed per hour is higher than about 60km/hr can reduce the wind resistance coefficient, the fuel consumption and carbon emission may be reduced.	Teng, M.E.(2011.03). Bureau of Energy (2011).
	Application	1.3.1The automobile and motorcycle with a jet engine can depart without idle warming, the normal working temperature of engine is reached by slow running and slow speed, the fuel consumption and carbon emission can be reduced.	Teng, M.E.(2011.03). Tai, C.H. (2011.07). Bureau of Energy (2011). Bureau of Energy (2014).
		1.3.2The vehicle runs at constant speed as possible, running at a steady speed of 40-50km/hr downtown, running at a high steady speed of 80-90km/hr, driving at an economic speed can reduce the fuel consumption and carbon emission.	Teng, M.E.(2011.03). Tai, C.H. (2011.07). Bureau of Energy (2011). Bureau of Energy (2014).
		1.3.3The depth above standard tire tread depth 1.6mm can reduce the fuel consumption and carbon emission.	Lai,T.L.(2014.01).
		1.3.4The vehicle tire pressure within the computing range recommended by the original manufacturer's standard can reduce the friction resistance, unnecessary tire wear is reduced, the fuel consumption and carbon emission can be reduced.	Teng, M.E.(2011.03). Tai, C.H. (2011.07). Tsai, W.P.(2012.09). Bureau of Energy (2011). Bureau of Energy (2014).
	Analysis	1.4.1Selecting appropriate gasoline for the automobile and motorcycle can reduce the fuel consumption and carbon emission. Inappropriate fuel is likely to cause engine carbon knock and fuel waste.	Bureau of Energy (2014).
		1.4.2Additional ethyl fluid (gasoline additive) for the automobile and motorcycle can clean the oil nozzle carbon deposit and increase the oil injection efficiency, the fuel consumption and carbon emission can be reduced.	
		1.4.3The addition of engine oil treatment (oil additives) to the automobile and motorcycle can reduce the internal wear of engine and enhance the lubricating effect, the fuel consumption and carbon emission can be reduced.	Bureau of Energy (2014).
	Integration	1.5.1In terms of the automobile designs of the same model, the hydrogen fuel cell vehicle performs better than general gasoline vehicle in fuel saving and carbon emission reduction.	
		1.5.2In terms of the automobile designs of the same model, the electric vehicle performs better than general gasoline vehicle in fuel saving and carbon emission reduction.	Fang,J.Y.(2012.05). Margaret. A. Walls (1996).
		1.5.3In terms of the automobile designs of the same model, the hybrid vehicle (e.g. fuel-electric vehicle) performs better than general gasoline vehicle in fuel saving and carbon emission reduction.	Liu,T.C.(2013). Bureau of Energy (2014).
	Appraisal	1.6.1In terms of the vehicles of the same model and displacement, the GDI engine performs better than general injection engine in fuel consumption and carbon emission.	Liu, T.C.(2013).
		1.6.2In terms of the vehicles of the same model and displacement, the diesel car performs better than general gasoline car in fuel saving and carbon emission reduction.	Bureau of Energy (2014).
		1.6.3In terms of the vehicles of the same model and displacement, the car performs better than recreational vehicle in fuel saving and carbon emission reduction.	
		1.6.4In terms of the vehicles of the same model and displacement, the car performs better than sports car in fuel saving and carbon emission reduction.	
		1.6.5In terms of the vehicles of the same model and displacement, the jet engine performs better than carburetor engine in fuel saving and carbon emission reduction.	Lin,Y.C.(2004). Badih A. Jawad¸ Thomas V. Kuzak¸ (2000).
		1.6.6In terms of the vehicles of the same model and displacement, the lightweight vehicle performs better than nonlightweight vehicle in fuel saving and carbon emission reduction.	Liu,T.C.(2013). Li, P.T.(2009).
Fuel saving affection	Acceptance	2.1.1Maintaining and overhauling vehicle regularly as required can reduce the fuel consumption and carbon emission.	Fan, S.F.(2012.01). Teng, M.E.(2011.03). Tai, C.H. (2011.07). Bureau of Energy (2011).

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		2.1.2Listening in the road condition from traffic broadcast station at any time during driving to know the real-time traffic condition, so as to take necessary measures and choose smooth roads, the fuel consumption and carbon emission can be reduced.	Bureau of Energy (2014).
		2.1.3The light-colored vehicle has lower air conditioning load than deep-colored vehicle, the fuel consumption and carbon emission can be reduced. (In the strong sun, maximum surface temperature difference between car bodies in different colors is 20℃)	Bureau of Energy (2014).
	Response	2.2.1Not mounting additional electrical equipments which increase the generator load on the vehicle is helpful to fuel saving and carbon emission reduction.	Teng, M.E.(2011.03). Tsai, W.P.(2012.09).
		2.2.2Thermostatical control and appropriate temperature setting of automobile air-conditioning system can reduce the fuel consumption and carbon emission.	Bureau of Energy (2011).
	Evaluation	2.3.1If a relatively long parking is required during driving, the engine shall be shut down to avoid idle motion, the fuel consumption and carbon emission can be reduced.	Bureau of Energy (2014).
		2.3.2Planning the optimum route before departure, evading rush hour and congested sections to avoid wasting time, the fuel consumption and carbon emission can be reduced.	Teng, M.E.(2011.03). Tsai, W.P.(2012.09). Bureau of Energy (2011). Bureau of Energy (2014).
	Organization value	2.4.1Arranging "fuel saving driving" training for drivers can reduce the fuel consumption and carbon emission.	Tsai, T.H.(2008).
		2.4.2Safe driving and protecting the passengers can reduce the fuel consumption and carbon emission.	Huang,H.H.(2011.11). Teng, M.E.(2011.03). Tai, C.H. (2011.07). Chang, M. F.& Horowitz, A. J. (1980). Bureau of Energy (2011).
		2.4.3Using the original manufacturer's automobile and motorcycle tires and not mounting tires with low flatness ratio (aspect ratio) are helpful to fuel saving and carbon emission reduction.	Tai, C.H. (2011.07).
	Setting	2.5.1In terms of the vehicles of the same model and displacement, the front-wheel drive transmission system has the best performance in fuel saving and carbon emission reduction. (front-wheel drive > four-wheel drive > rear wheel drive)	Liu,T.C.(2013).
		2.5.2In terms of the vehicles of the same model and displacement, the CVT performs best in fuel saving and carbon emission reduction. (CVT > MT > AT)	Liu,T.C.(2013).
		2.5.3New vehicle appreciation can refer to the oil consumption test data sheet in the "Fuel Economy Guide" published periodically by Bureau of Energy, Ministry of Economic Affairs, choosing the vehicle with better fuel efficiency performs best in fuel saving and carbon emission reduction.	Bureau of Energy (2014).
Fuel saving skill	Perception	3.1.1Treading on the brake pedal lightly during deceleration to keep a safe distance to the vehicle ahead can reduce the fuel consumption and carbon emission.	Tsai, W.P.(2012.09). Teng, M.E.(2011.03). Tai, C.H. (2011.07). Evans, L. (1979).
		3.1.2In terms of the spark plugs of different materials, the spark plug made of iridium alloy has higher sparking voltage than that of general materials, the fuel consumption and carbon emission can be reduced.	
		3.1.3Using the original manufacturer's automobile aero kit during high speed running can reduce the fuel consumption and carbon emission. (e.g. tractor trailer nose air deflector and automobile chassis air deflector can reduce wind resistance during running)	Tai, C.H. (2011.07). Bureau of Energy (2011). Bureau of Energy (2014).
		3.1.4Using automobile sheathing paper can reduce interior temperature, the fuel consumption and carbon emission can be reduced.	Yao, M.(2011).
	Response trend	3.2.1The vehicle with variable valve mechanism functional unit can reduce the fuel consumption and carbon emission.	Liu,T.C.(2013).
		3.2.2The vehicle with functional unit of electric steering engine can reduce the fuel consumption and carbon emission.	Liu,T.C.(2013).
		3.2.3The vehicle with functional unit of off-cylinder can reduce the fuel consumption and carbon emission.	Liu,T.C.(2013).
		3.2.4The automobile and motorcycle with functional unit of idling stop can reduce the fuel consumption and carbon emission.	Lai, T.L.(2012.03). Liu,T.C.(2013).
		3.2.5The diesel common rail injection (CDI) engine reduces the fuel consumption and carbon emission compared with general gasoline engine.	Liu,T.C.(2013).
		3.2.6The vehicle with functional unit of lean combustion can reduce the fuel consumption and carbon emission.	Liu,T.C.(2013).

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Following response	3.3.1Not placing any sundries on the vehicle following the automobile design lightweighting principle can reduce the fuel consumption and carbon emission.	Liu,T.C.(2013).
	3.3.2The automobile and motorcycle driving can follow the vehicle energy saving manual and video fuel saving driving pattern made by Bureau of Energy, Ministry of Economic Affairs, the fuel consumption and carbon emission can be reduced.	Bureau of Energy (2011). Bureau of Energy (2014).
Skill	3.4.1Stepping on the gas lightly during acceleration, smooth start and acceleration, to avoid frequent shift and sudden acceleration, sudden deceleration and arbitrary lane change, the fuel consumption and carbon emission can be reduced.	Tsai, W.P.(2012.09). Teng, M.E.(2011.03). Tai, C.H. (2011.07). Bureau of Energy (2011).
	3.4.2Changing gear appropriately with running speed and load, not overloading the engine, keeping the engine speed slow (1500~2000 rpm), and driving at a high gear can reduce the fuel consumption and carbon emission.	Tsai, W.P.(2012.09). Tai,C.H.(2011.07). Hooker, J. N. (1988). Bureau of Energy (2011). Bureau of Energy (2014).
	3.4.3Be aware of the traffic flow condition ahead, mild and smooth turning, operating the engine brake instead of general brake as possible during deceleration, the fuel consumption and carbon emission can be reduced.	Bureau of Energy (2011). Bureau of Energy (2014).
	3.4.4Making sure the hand brake is released before driving can reduce the fuel consumption and carbon emission.	Bureau of Energy (2014).
	3.4.5The fine tire tread performs better than massive tire tread on general black top in fuel saving and carbon emission reduction.	Teng, M.E.(2011.03). Tai, C.H. (2011.07).
Complex response	3.5.1The brake system is repaired, adjusted, changed and cleaned according to the original manufacturer's warranty specifications, the brake pad wear can be reduced, and the running resistance is reduced, the fuel consumption and carbon emission can be reduced.	Bureau of Energy (2014).
	3.5.2The four wheels are aligned as per the original manufacturer's specification, the fuel consumption and carbon emission can be reduced.	
	3.5.3Preventing the exhaust pipe from being choked by oil sludge that reduces the horsepower, the fuel consumption and carbon emission can be reduced.	Bureau of Energy (2014).
Creation	3.6.1LED energy-saving bulb for the automobile and motorcycle can reduce the fuel consumption and carbon emission.	Lin, C.H.(2011).
	3.6.2Streamlined automobile and motorcycle shape with low wind resistance coefficient can reduce the fuel consumption and carbon emission.	

Source: Compiled by this study

3. Data Analysis

The data of the recovered scales are processed. This study sent out 16 scales, and recovered 16, the recovery ratio is 100%. The experts select the importance level of each item in the scale, the defuzzification value of each initial index is worked out. The Fuzzy Delphi consistency test "Fuzzy Delphi scale" has 56 items, including fuel saving cognition, fuel saving affection and fuel saving skill aspects. The evaluation index (defuzzification value) is screened by threshold greater than 0.6, the item greater than 0.6 is reserved; that smaller than 0.6 is deleted.

4. Research Process

First, the research subject is determined as automobile and motorcycle fuel saving accomplishment. Afterwards, related references are discussed. The scale is prepared according to the references, reviewed by the research members to guarantee the suitability and readability of item, the face validity test is completed. When the Fuzzy Delphi expert members are determined, the expert members exchange and correct opinions on the scale, so as to guarantee the specialty and correctness of items, the expert validity is completed. It is reviewed by the instructor after correction, then the Fuzzy Delphi scale survey is implemented. The experts evaluate the importance level of each item. Afterwards, the defuzzification values of aspects and items are calculated, and the consistency is tested. The scale is corrected according to the test result.

III. Research Results

According to the data of questionnaire survey scale, the "fuel saving cognition", "fuel saving affection" and "fuel saving skill" are analyzed by Fuzzy Delphi Method of expert questionnaire. This questionnaire is graded by experts and scholars, who fill in the most straightforward observation value, based on this observation value, the threshold (S) is determined according to the research purpose, so as to decide whether or not to delete the factors. If the geometric mean of a factor is greater than or equal to the threshold ($M \geqq S$), this factor is accepted as evaluation factor, otherwise ($M<S$), this factor is deleted. This study refers to the geometric mean (0.6) of

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consensus importance of all potential influence factors, and considers the criteria validity after screening and the operability of the future handling problem, so the screening threshold (S) is defined as 0.6. Finally, the experts eliminate the potential influence factors with consensus importance value smaller than 0.6, the index screening result is 1) 6 indexes in fuel saving cognition (0.711) aspect, i.e. memory (0.709), comprehension (0.620), application (0.699), analysis (0.673), integration (0.802), evaluation (0.763); 2) 5 indexes in fuel saving affection (0.711) aspect, i.e. acceptance (0.701), response (0.755), evaluation (0.769), organization value (0.655), setting (0.675); 3) 6 indexes in fuel saving skill (0.728) aspect, i.e. perception (0.731), response trend (0.751), following response (0.717), dexterity (0.779), complex response (0.699), creation (0.689), all the 17 indexes conform to the threshold. It is found that the item defuzzification values in the indexes of various aspects mismatch the threshold. The screening result is "1.2.1 evading strong sunlight during fueling and not to spill the fuel and fastening the tank cap after fueling can reduce the fuel evaporation and waste, the fuel consumption and carbon emission may be reduced " total value (0.555), "1.3.3 the depth above standard tire tread depth 1.6mm can reduce the fuel consumption and carbon emission." total value (0.437), "1.4.3 the addition of engine oil treatment (oil additives) to the automobile and motorcycle can reduce the internal wear of engine and enhance the lubricating effect, the fuel consumption and carbon emission can be reduced" total value (0.582), "2.4.2 safe driving and protecting the passengers can reduce the fuel consumption and carbon emission" total value (0.450), all of them are smaller than 0.6. The four items have not reached the threshold, they are deleted. The defuzzification values of the other items are greater than 0.6, so reserved.

IV. Conclusion and Suggestions

This study combines fuzzy theory with Fuzzy Delphi Method to develop an automobile and motorcycle fuel saving accomplishment scale. According to the experts' visual consensus importance value sequencing, the experts' evaluation on automobile and motorcycle fuel saving is that the "fuel saving skill" is the most important among the aspects, the "integration" automobile design is the most important among indexes; "in terms of the vehicles of the same model and displacement, the lightweight vehicle performs better than nonlightweight vehicle in fuel saving and carbon emission reduction" is the most important among the items, so as to provide reference for the automobile and motorcycle users and related competent authorities to develop the automobile and motorcycle fuel saving accomplishment training and learning.

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THE IMPORTANCE OF ONTOLOGY IN SOFTWARE ENGINEERING EDUCATION PROGRAMS

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Abstract: Since late 1970s (Yordon Structured Design, DeMarco Structured Analysis) and early 1980s (Structured System Analysis and Design Method -SSADM) to early 1990s (Booch Method), software developing methodologies have planned to model system building. As the real world problems became more complex and software industry became more complicated, software engineering education has been a necessity as a separate discipline. The Guide to the Software Engineering Body of Knowledge (SWEBOK) was published in 2004 after the description of a sequence of software engineering standards. These standards began to be specified in 1976 by IEEE Computer Society. On the other hand, the radical changes on the context of software problems arose object technology. The revolution of object technology took many years. As the consequence of different practices, a new software development approach Model-Driven Engineering (MDE) developed by Object Management Group (OMG) focused on models as the primary artifacts for development process. The processes have been implemented with transformations mapping information from one model to another. The integration of knowledge in different models depends on the existence of explicit declarative semantic models. Therefore, increasing diversity and complexity of information gave rise to increasing interests on ontologies. These formal domain models have been linked to each other on the Web. The linked ontologies provide shared terminologies for different applications. In 2013, the Knowledge Areas (KAs) in SWEBOK 3.0 have also been rearranged according to these complications of the real world problems. Formal and informal solution techniques, latest development methods and new technologies have been included to guide the software engineering education programs.

Keywords: Ontology, Semantic Web, Model Driven Engineering SWEBOK, Knowledge Area

Introduction

In 2009, Tim Berners Lee at TED conference explained the importance of Linked Data as follows[1]: "At the present day, the huge amount of data, in other words open data, must be combined each other as a different system or technology. It is required to give meaning to everything to obtain the required solution. This is the semantic web movement and Wikipedia is the first project of that movement". Knowledge based applications on MDE uses ontologies to share the information (Gruber, 1993; Uschold &Gruninger,1996; Parreiras& Gröner& Walter et.al. ,2013). Although the primary applications on ontology have been accepted as the research area of the artificial intelligence experts, it came into a part of industrial software engineering applications on the solution today's software problems. One of the knowledge areas of the Software Engineering education program on SWEBOK taxonomy (Bourgue & Fairley, 2014) is Mathematical Foundations KA and it supplies well understood solutions to the real world problems with an unambiguous logic. The search of the formal systems related with the completeness, in other words preciseness is the basis of discrete mathematics. Since the software problems for different applications requires distinct abstraction, Mathematical Foundations is a separate KA of the software engineering undergraduate programs. Software Engineering Models and Methods as another KA of the SWEBOK taxonomy defines the modelling as an abstraction of any software component, and this component has more than one abstractions. The aggregation of these abstractions compose the software model. When the developed model has been reused, coherence with the new context will be verified by the inferences constituted from simplifications (abstractions).

Ontology is a conceptualization corresponding to any domain as machine readable entities, attributes, and well understood rules, in other words axioms (Gruber, 2008; Tobias, 2011; Aßmann &Andreas&Christian, 2010). Various ontologies that have aimed at modelling the concepts support to reuse and to extend these independently

[1] https://www.ted.com/talks/tim_berners_lee_on_the_next_web?language=en

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developed ontologies. Information modelling as one of the modelling types of Software Engineering Models and Methods KA is an abstraction as semantical, in other words conceptual knowledge model and it includes the senses, properties and constraints that formalize the real world outlook of knowledge. Finally, standard knowledge representation for semantic web can be determined by intelligent access to the heterogeneous and distributed information with better interaction of human-computer on the web. It is not possible to implement this using UML diagram that is one of the structural modelling types of the same KA (Software Engineering Models and Methods).

Logic based knowledge representation used widely for ontology languages is represented by Description Logic (DL). (Sowa, 2008; Krötzsch&Simancík&Horrocks, 2014), and it belongs to the same KA of SWEBOK taxonomy. First order predicate logic supplies the modeling of all relationships among the objects as set elements. For example, World Wide Web Consortium (W3C) has been defined by DL syntax with the class/concept constructors of OWL2 (Web Ontology Language)[2]. Disambiguation of the ontological studies can also be obtained by semantic definitions which the complexity has been reduced. This is possible with theoretically well-defined reasoning algorithms and well explained formal properties. eScience, geographical investigations, engineering, medicine, biology, defense industry projects are some of the application domains that the ontologies have extensively been used. Software engineering education programs must be a separate discipline since the concepts summarized above. In this study, the reasons of teaching ontology in undergraduate software engineering programs due to the need to huge data for present day software products have briefly been explained.

Software Engineering Undergraduate Programs

The number of software engineering department in Turkey has been 16 in the 2015-2016 academic year. Three of them with the inclusion of Technology Faculty Departments are at Karadeniz Technical, Fırat and Celal Bayar Universities. Three of the foundation universities are held in North Cyprus (Doğu Akdeniz, Lefke and Yakın Doğu Universities), one is in Ankara (Atılım University), two are in Izmir (Izmir Ekonomi and Yaşar Universities) and one is in Mersin (Toros University). In Istanbul there are six Software Engineering Departments at the Universities Bahçeşehir, Beykent, Maltepe, Aydın, Işık and Sabahattin Zaim. Since the number of software engineering departments have rapidly increased in the last 10 years, it is important to prepare and to update the education programs of software engineering departments. The first study about the organization of software engineering undergraduate programs began in 1987 with the conference "The Conference on Software Engineering Education and Training - CSEET". These conferences devised by SEI (Software Engineering Institute) repeated with different periods, until they were completely complemented. Another important study to prepare the education programs is the project SWEBOK started in 1998. This project aims to the software engineering standards supported by IEEE (Altan, 2010). SWEBOK Guide released in 2004 was composed of 10 KAs. This guide has been expanded in parallel with the raise of problem sizes to appraise the software engineering on the world measurement. Table 1 shows all KAs with the reorganized 5 KAs. The undergraduate programs at software engineering departments must be updated in accordance with the new requirements since the comprehensive complexity of the software problems (Altan, 2015). Moreover, to distinguish software engineering undergraduate programs from computer engineering undergraduate programs, it is important to realize the KAs in SWEBOK guide.

Table 1 : SWEBOK 3.0 Knowledge Areas (KAs)

1	Software Requirements (2004)
2	Software Design (2004)
3	Software Construction (2004)
4	Software Testing (2004)
5	Software Maintenance (2004)
6	Software Configuration Management (2004)
7	Software Engineering Management (2004)
8	Software Engineering Process (2004)
9	Software Engineering Models and Methods (2004)
10	Software Quality (2004)
11	Software Engineering Professional Practice (2013)
12	Software Engineering Economics (2013)
13	Computing Foundations (2013)
14	Mathematical Foundations (2013)
15	Engineering Foundations (2013)

Since a special emphasis is put on the information sector both in our country and in European countries in accordance with Europe 2020 Targets, software engineers will increasingly be demanded persons. Moreover

[2] http://www.w3.org/TR/owl2-profiles

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researches show that the software sector gets possession the most labor force when compared with other sectors. We also know that information and telecommunication technologies contributes the maximal productivity on all over the world. In this context, young graduates can employ at all domains from social media, business, and economics to education and production sectors to apply present-day technologies; besides they can develop new software products and new application domains. On the other hand, it is a fact that well-qualified labor supply is insufficient in Information Technology (IT) industry in Turkey. Although the sector employs 160,000 persons, more than half of them are the labor force with poor quality (Türkiye Bilişim Derneği, 2016). Furthermore, digital data will get around to 40 billion terabyte since the considerably growing data annually obtained from device, sensor, geographic applications, web and social media. Big data as a new concept arose from this huge increment beside the usual data sources, and the IT sector made an investment to the new technological developments to obtain consequences semantically. The fundamental reason of this research comes from the management of big data.

The Challenges on Software Engineering

The main problem of the software engineers is to produce working software artifacts according to the customer needs, in time and within the budget. This is the fundamental software quality criteria on the evolution of software engineering discipline. Software crisis gradually have been increasing since the first software products developed. In 1995, the Standish Group[3], a small IT Research Company, published "The CHAOS Report" about over 8,000 software projects. Each project was accepted to be successful if it met all the software product quality criteria. While only 16.2% of the projects were successful and 31.1% of projects were cancelled. 52.7% of them were challenged. Any project has usually been confirmed as canceled before delivered anything; in other words, before completion or never implemented. The challenged projects were either completed or operational with over-budget, over-schedule and/or estimate fewer featured. Standish Group 2015 CHAOS Report gives us 29%, 19%, 52% results for successful, cancelled and challenged projects sequentially. More than 50,000 projects around the world ranged all project sizes including re-engineering implementations give the similar results with the first CHAOS Report. During the 21 years software developing methodologies have changed to cope with the complex real world problems. Cancelled and challenged IT Projects are higher in Standish Group Reports than in other reports since the detailed evaluation criteria reflects the critical quality problems with software.

At the present time, the customers demand the products with more functionality delivering in shorter time. Moreover traditional software development processes starting with waterfall projects and the evolution of waterfall by time as prototyping, incremental, spiral and unified processes became a challenging issue for software engineering discipline. Too many requirements and scope changes, lack of management skills, much development costs than planned, lack of technical skills, unessential system anymore are other causes of unsuccessful software projects. By time three measurements on time, on budget, on satisfaction to succeed a project increased to six adding the measurements on target, on goal and on value. This is the success criteria of the Project Management Institute (PMI) that most of the project management processes have been doing from the PMBOK Guide (4. Edition)[4] since 2012. Team working and skill level of the team members are important issues for a software project. However, most organizations don't emphasize enough in increasing the skills of their people. The collection of basic behaviors about how people work together is another success factor nowadays software projects. On the other hand, the users must be involved in the project starting from the requirements elicitation at the all developing phases of the product[5]. Optimization and organization of the projects reduce project overhead and business capability increases[6].

Software development is the process of generating software through successive phases. This process includes not only the actual writing of code, but also the preparation of requirements, the design of what is to be coded, and the confirmation of what is developed to meet the objectives (Presman, 2014; Sommerville, 2011). Before system development methods came into being, the development of a new system or any product was often carried out by using the experiences and intuitions of the management and technical personnel. As the complexity of software products long ago made the need clear for some kind of development process, the waterfall model recorded in 1970 as the first public life cycle model. Since then, waterfall model describing linear and sequential development method has been a popular version of the software development life cycle for software engineering. Figure 1 shows the distinct goals of the waterfall for each development phases. Agile solutions have emerged as a perfect approach for the software development. These projects have firmly been

[3] www.standisshgroup.com
[4] http://www.pmi.org/
[5] http://agilemanifesto.org
[6] www.chaostuesday.com

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shared with users and delivered continuously (Braude &Bernstein, 2010). Furthermore, the solutions of some software problems can be achieved by model based engineering frameworks, and the usage of frameworks supply the abstractions in a lower level than others.

The basics of the software development processes must be given as individual courses in the software engineering undergraduate programs. The lectures can be carried out both in department electives and in core courses of the curriculum structure. This property distinguishes the computer engineering undergraduate program from software engineering education programs.

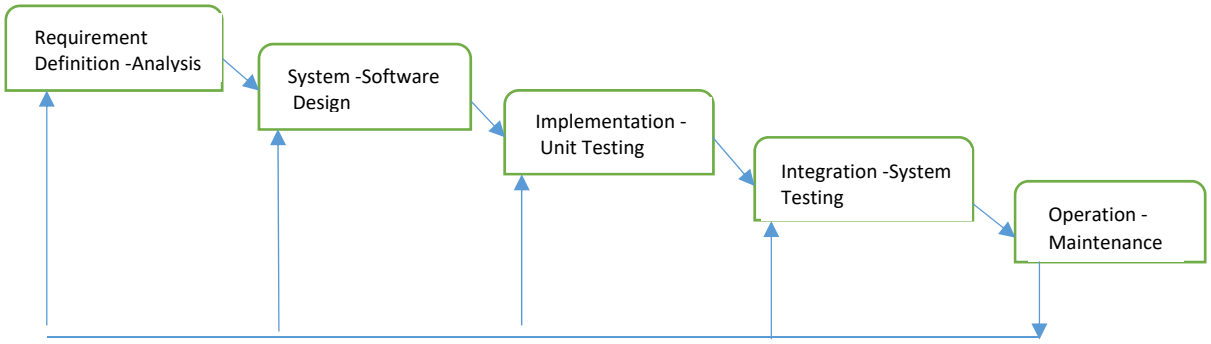
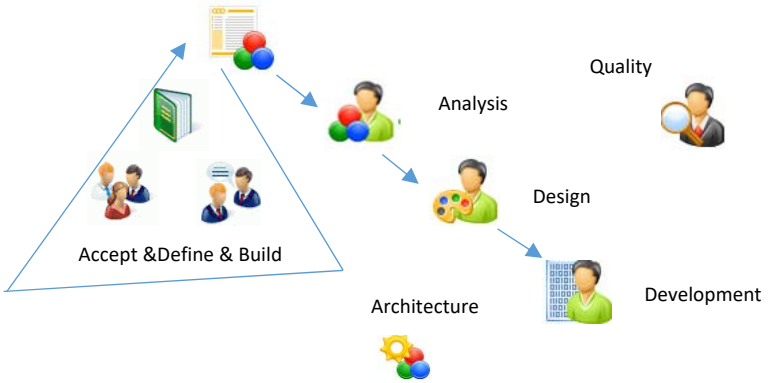


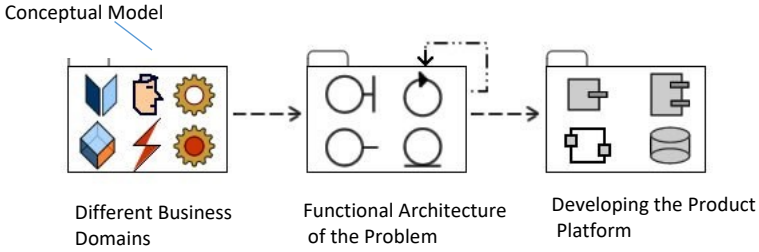
Figure 1: General overview of waterfall model

Model-Driven Software Development as a Software Engineering Paradigm

Model-Driven Software Development is a branch of software development approach based on the idea of developing software from domain-specific models (Perisic, 2014; Küster,2011). The primary aim of this development technique is to increase the productivity and maintainability of software. These can be achieved by raising the abstraction levels of physical system represented in a general purpose language. Such development processes are called as domain-specific models written in high level. Therefore developers can concentrate on application logic rather than the complexity of low-level implementation details. This is contrast to traditional software development practices where modelling is commonly used for documentation. Moreover, communication purposes and the final product broadly differs from the models representing the problem. We can not only distinguish the differences between procedural and declarative software engineering processes, we can also see the abstraction levels and the platforms to be integrated in Figure 2. The abstract syntax has been used at each abstraction level in Figure 2-b. The developers describe the problem and its solution at different abstraction levels using model based engineering.



a) General Overview to Agile and Phase Software Development Models



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b) Model Driven Engineering Processes as Bottom-Up with work-units defined by their role on targeted artifact

Figure 2: Phase Based Modern Software Models and Model Driven Software Engineering

Model Driven Engineering (MDE) describes tasks directly from development flows. Therefore, a declarative and bottom-up approach is implied contrary to the activity based top down development processes. The effects are built-in and derived processes instead of textual and graphical developing phases of the activity based models. In Figure 3, we can clearly see the transition from conventional development processes to more effective processes. Domain-specific models constitute requirements-driven and architecture centric development approach (Figure 2-b) instead of document-based and code-centric problem solutions (Figure 2-a)

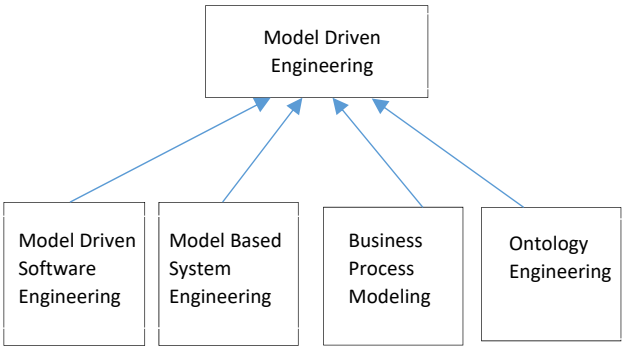

Figure 3: Models Relationships of Model Based Engineering

Model Driven Architecture (MDA)[7] developed by Object Management Group (OMG) is the special case of Model Based Software Engineering, and it is divided into three models as Computation Independent Model (CIM), Platform Independent Model (PIM), and Platform Specific Model (PSM) (Figure 4). CIM has to be used to clarify the problem domain focusing on the environment and the specific requirements of the system. Briefly, the structural details of the product are hidden at this layer. Fine grained artifacts of this layer can be descripted as events and communications, objects and features, processes and activities and objects and agents. These are defined independently and followed as PIM. PIM is input to model the problem. At this phase, the developers define functional architecture of the system by specific technologies. All the information needed is symbolized with boundaries, controls, entities and services to describe the behavior of the system in a platform independent way by different platforms. The solution results as PSM. To constitute specific components of the developing system, PSM is applied to the convenient technologies. PSM combines the specifications in the PIM with the details that specify how the system uses a particular type of platform. Fine-grained artifacts of this layer is middleware, clients, servers, databases as specific platform characteristics. To get the well-defined software product, it is important not to confuse these three layers (Stahl & Völter, 2006).



Figure 4: Architectural Layers of MDA with respect to abstractions

INCOSE (International Council on Systems Engineering) defined its 2020 vision as Model Based Systems Engineering, thereby announcing systems engineering as an independent discipline which works in conjunction with software engineering. This view approves the existence of formal description languages in domain-specific conceptual modelling in software engineering. Any description language as a text-based language, which acquires from discrete mathematics and first order propositional calculus, constitutes the conceptual modelling

[7] http://www.omg.org/mda/presentations.htm

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as an intermediate phase prior moving from the visual solution towards programming language solution (Altan, 2015).

Semantic Extraction of Ontologies

In his PhD theses Parreiras (2011) predicts that the software engineering domain will depend on the dependency between MDE and ontology technologies. In fact, real-world elements form the structure of models and language semantics comprise metamodels as a step of MDE. The second step is transformations between languages. UML (Unified Modelling Language) and OWL are two examples of the transformation languages. Ontology as an explicit, formal and declarative semantic model gives the integration of knowledge and services (Bunge, 1977). While UML has extendibility and modularity properties, these attributes has not been presented in most OWL languages. Ontology is also an urgency to develop contemporary software systems since the inclusion of huge knowledge. Basic introduction to knowledge and ontology is given in Sowa's book (2000). Logical languages, frame based languages and graph based languages are three different representation style of knowledge (Baclawski& Kokar& Kogut et.al, 2002). The first language expresses knowledge in terms of logical statements. An example of such knowledge representation is Knowledge Interchange Format (KIF). The second classification is similar to object oriented database languages. The last one includes semantic networks and conceptual graphs. Sowa as one of the pioneers of conceptual graph theory proposed to create a logical system to represent natural language semantics, and defined it being a graph representation for logic based semantic networks. It is also a compromise between a formal language and a graphical language. First order logic semantics has been used to translate the graphs. The modern frame-based systems denote the implementation of knowledge base (KB) systems and DL that can be applied in several areas cover the theoretical aspects (Baader et.al., 2003). We can integrate model driven development and semantic web using OWL ontologies, for example Protage[8]. Therefore, the resulted object design patterns will reduce the complexity and will increase the productivity. The templates which are the form of knowledge base also supply the reliability. A standard DL knowledge base consists of ABox and TBox components. The ABox contains extensional knowledge about the domain of interest. In other words, it is possible to assert the individuals with ABox axioms. TBox is a concept definition, that is, the definition of a new concept in terms of other previously defined concepts. In other words it is possible to determine the relationships between objects with TBox axioms. The following example describes a simple domain ontology about online library records in terms of DL[9].

Lecturer ⊑ ∃isMemberOf.University ∏ ∃writes.Article ∏ ∃teaches.Course	[TBox Axiom]
Course⊑ ∃ isArrangedby.Department	[TBox Axiom]
University ⊑ ∃isLocatedIn.City	[TBox Axiom]
University(Beykent,KavramVacationSchool,Sakarya),Department (computerEngineering)	[ABox axiom]
Article(computer science)	[ABox axiom]
Lecturer (Zeynep Altan), University (Beykent), City (Istanbul)	[ABox axiom]
isLocatedIn (Beykent,Istanbul), teaches(ZeynepAltan, computerEngineering)	[ABox axiom]
isMemberof (ZeynepAltan, Beykent)	[ABox axiom]
writes(ZeynepAltan, computerScience), Lecturer(Ali A.)	[ABox axiom]
isLocatedIn (Ali A., ¬Kavram), isLocatedin(Ali A., ¬Sakarya)	[ABox axiom]

Based on the KB above, any user may search all lecturers at Beykent University with the following DL query:

∃isMemberOf.{Beykent}

The answer of this request is *Zeynep Altan* in case of short KB. The conclusion also includes the lecturer *Ali A.* for the complete KB. We have to close the domain of a class with an example. We accepted that the class

[8] http://protegewiki.stanford.edu/wiki/Protege_Ontology_Library#OWL_ontologies

[9] It has been accepted the class hierarchy of the ontology has previously been constituted.

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University is equivalent to the set of other defined individuals. Moreover, we can assert that university of the article is the same as university of the lecturer as the following:

course(?x) ∧university(?y)∧article(?z)∧ isMemberOf(?x,?y) →isArrangedby(?x,?z) →isLocatedin(?y,?z)

It is possible to reuse and extend these templates. When we define the super class, for example University class, it includes all universities in all cities of the studied countries. In other words, it includes a list of existing individuals of this type. This superclass and its rule is*MemberOf* is usable for other types of university domain. For example, for student relationships, Erasmus programs etc. Finally, the templates can be reused in other ontologies

Conclusion

Complex software systems play an important role in business and everyday life. Since the technologies and practices in the informatics area are increasingly developing, the education programs on software engineering need to include both technical and non-technical abilities with details for the industrial software engineering. Therefore an essential task in teaching software engineering is the incremental improvement and enhancement of courses. The complexity and evolution of software engineering education is an indisputable reality; therefore more transparent and traceable problem solving methods are valuable than traditional ones. MDE is one of the contemporary approximation to develop software products unlike traditional development techniques which tend to be code-centric. As a present day example, the usage of models at all levels of the software development life-cycle can be emphasized by MDA standard. This change in software engineering has impacted both the construction way of the software products and the teaching way the software engineering education. Moreover software engineering standards have a significant emphasis on body of knowledge that should be integrated in a software engineering curriculum. Besides, KAs in SWEBOK plays the most important role in updating education programs. In this paper, the impact of the MDE approach has been explained on software education. As a constituent of MDE, semantic web techniques enable new software engineering capabilities. It is possible to identify various ontologies based on all phases of software life cycle and their application scope. Because of the attractively of OMG's MDA software development approach, new KAs in SWEBOK must definitely be added to the software engineering undergraduate programs without delaying.

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THE IMPORTANT COMPONENT OF VOCATIONAL AND TECHNICAL EDUCATION: VOCATIONAL SCHOOLS

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Abstract: Nowadays, the constant improvement of science and accordingly, the technology's renewing itself have been affecting the education process of the countries. Therefore, educational institutions and the curricula carried out at these institutions have to be suitable to the conditions of the time. The needs of the society and employment areas of the country should be considered, especially in the improvement of the vocational and technical education programs, and qualified intermediate staff should be trained and introduced to the industry. Vocational schools, which operate to train the intermediate staff needed by the industry, take on an important task in this field. In order for the vocational and technical education system in Turkey to be in the conjuncture of the developing world, and with the adequacy and quality to meet the requirements of the labor market, university-industry collaborations should become prevalent, the participation of the enterprises to vocational education should be ensured, and the quality of education in vocational schools must be improved by exchanging information with the countries where vocational education systems are implemented.

Keywords: improvement, vocational, technical, education

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THE INTERACTIVE LEARNING OF INTEGRATING ANIMATION GAME WITH KINECT SYSTEM FOR SENIOR WITH MILD ALZHEIMER

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ABSTRACT：Alzheimer's disease is one of the common problems for the elders. Some mild symptoms of the Alzheimer's might be misinterpreted as normal circumstances because of aging, leading to the procrastination of treatment process. Affected people would have a hard time managing activities of daily living and forget roads back home, which may jeopardize their live safety. Because the patients barely leave their homes, it may place significant burdens for patients themselves and caregivers.

This interactive game of this projects focuses on Flash, with the help of Kinect motion sensor of Microsoft, making a combination of software and hardware. The skeletal tracking feature of Kinect enables users to control the mouse and other objects through human body, which allows the elders to play some simple games at home. The researcher also used easy questions to observe whether the elders have problems of Alzheimer's, and further to facilitate their brain functions.

The interactive memory learning game for the elders – with the application of Kinect, was developed in this research. The motion sensor camera of Kinect makes human body become a game controller, which provides interactions for the memory match game. With the availability of Kinect, television, and computers, seniors with mild Alzheimer's can facilitate their hand control and limb movements through simple commands. The memory game could enhance brain stimulation for seniors with mild Alzheimer's and decelerate aging process, bringing about effects of sport and entertainment.

Keywords: Alzheimer's disease, Kinect, Kinesthetic system, Flash, Interactive learning

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Chapter 1

1.1 Research Background

Alzheimer's disease is one of the most common types of dementia and the typical beginning symptom is dysmnesia. The patient will forget events which happened just now (short-term memory is poor), and early memory (long-term memory) is relatively not affected in the early period of the disease. When a relatively mild dementia occurs, the recent memory often forgets daily things, when it becomes severer, he forgets a friend's name, phone number, direction, etc., and often forgets to return to do the outstanding work due to other distractions.

Microsoft's Kinect can rely on the change of human's body skeleton to judge the extent of human motion and detect gestures according to the finger's posture so as to achieve more subtle judgment, the corresponding response is made in accordance with the judgment of the change of the depth value, the provided virtual images are like personal experience, and what is used is the inseparable relationship between human's body movement and hands, for example, touch, pressing buttons and induction are all technologies of the development of hand movements.

1.2 Research Motives

With the coming of aging society, the problem of life caring for dementia patients constantly appears in communities and families. In the early period of dementia, it is difficult for family members to distinguish whether the forgetfulness of parents is normal aging or disease, and they may fail to know the disease even it becomes moderate degree, as the appearance of the patients are the same as ordinary persons. The elderly with dementia often forget how to go home, leading to family members often looking for them everywhere, many families are afraid of the elderly with dementia going out alone once again, because of which the elderly with dementia often sit for a whole day in the home. As family members are busy with housework, the elderly with dementia have no object to speak to, which causes the memory of dementia patients to decline gradually.

With the popularization of TV video game system, almost every family member can play TV video game system in today's society, the age of the game also rises gradually along with the popularization of TV video game system, and the game types also gradually increase; so animation game is combined with Kinect to produce the game of "Memory Test in Interactive Learning among Dementia Patients", matched with Kinect device of TV video game system, and the game is operated with the body without the need to carry on any manipulation, which can not only use the brain to think about the topics in the game, but make the body move around.

1.3 Research Purposes

This research uses Flash animation to produce interactive learning game of "Memory Game of Dementia Patient", the purpose is to produce the interaction with memory game with Kinect dynamic camera released by Microsoft with the concept of body controller to use simple Kinect operation to make the elderly patients with mild dementia:

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1. Use body to control to promote physical movement
2. Use memory games to improve brain agitation
3. Help the elderly with mild dementia to slow down the speed of decline in memory
4. Achieve movement in body and achieve the effect of entertainment.

Chapter 2 Literature Review

2.1 What is Dementia?

Dementia is not a single disease, but a combination of a group of symptoms (Syndrome), mild symptoms not only include the loss of memory, but affect other cognitive functions, including language ability, space perception, computing power, judgment ability, abstract thinking ability, concentration and other various aspects of functional degradation, and meanwhile interference behavior, personality change, delusion or hallucination and other symptoms may appear, the severe degree of which is enough to affect the interpersonal relationship and the ability to work and so on. Usually, the first symptom found in patients is the frequent forgetting what has happened recently, and then they have difficulty dealing with daily life, work and rest, and the work they are familiar with in the past. The patients themselves may have personality change, behavior change, loss of judgment, finding no proper words to express themselves, thinking obstacle or inability to follow some instructions.

The main symptom of dementia is the loss of memory, we are often forgetful, but the forgetfulness of dementia is different from that of ordinary people; their memory loss is continuous and progressive but not occurs once in a while. These can affect the function of their work or family, sometimes they can not find the way home, and what is more severe is that they will forget how to wear clothes, eat or take a bath and other human's basic life ability.

2.2 Introduction in Relation to Kinect

2.2.1 Hardware

Kinect has three lens, and the lens in the middle is RGB color camera, which is used for recording color images. The lens on the left side and the right side are 3D structure optical depth sensor composed of infrared transmitter and infrared CMOS camera, which is used to extract in-depth data (the distance between the object in the scene and the camera). The highest resolution of color camera is 1280*960, and the highest resolution of infrared camera is 640*480. Kinect is also matched with focus tracking technology, the motor in the base will rotate as the focused object moves, and the maximum elevation upwards and downwards is positive and negative 27 degrees. Microphone Array is built in Kinect, which collects sound simultaneously through four microphones, the noise is eliminated after comparing, and the sound collection, speech recognition and sound source localization are made through it.

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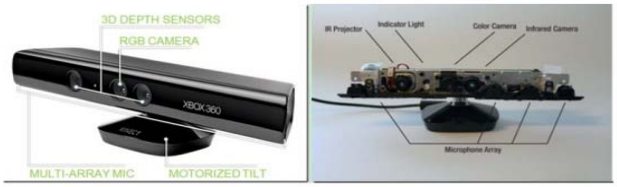

Figure 1, Kinect Sensor

2.2.2 Software

Kinect for SDK v1.7

Kinect integrates the continuous field depth snapshot of Windows sensor from Kinect to establish complete 3D model. SDK 1.7 also includes new Kinect interactive functions, including natural man-machine interface control for the support of pushing and pressing (push to the button) (clip pan) and grasping and transferring, multiple people interaction and reorganization of gesture folding and unfolding: turn on and turn off hand recognition.

2.3 Interactive Learning

The application of Kinect is very extensive, which can be used in the operation and interaction of computer games, through body movement learning and game type learning, the operation of general carriers also have demand for interaction in order to avoid the touch of control system, housewives avoid using their hands with food residue to turn over electronic recipes while cooking, and simulation training, cognitive ability detection inspection, remote diagnosis and treatment, etc. in medical treatment.

In the learning application, such simple interesting physical interaction activities and games can be used and such method can also be used to achieve actual practice for dynamic learning topics such as dance, martial arts, sports and physical coordination, etc., and movement information relating to the learners can be collected as analytical skills and the data analysis on the coordination and fitness ability, thus further providing advanced personal body interaction learning tutoring.

Chapter 3 Research Method

3.1 Research Process

3.2 Software and Hardware Demand and Development Environment Establishment



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The demand for software and hardware in the development of Kinect application program is as follows, the operating system must use Microsoft Windows 7 operating system due to the need of software operating environment, and both 32 bit and 64 bit are available; hardware part needs CPU of dual core 2.66GHz and over 2GB RAM, supports display card of DirectX 9.0c or above and at least one Kinect sensor; software part uses Visual Studio 2010 or Visual C# 2010 Express to write program code, NET Framwork 4.0 environment and install Kinect SDK for Windows. It is suggested to install Microsoft DirectX9 as the skeleton detection part may be used.

3.2.1 Installation of Kinect for Windows SDK v1.7

For the installation of Kinect for Windows SDK, please do not connect Kinect with computer, and meanwhile Visual Studio 2010 is closed up to avoid the failure of installation. Load according to 32 or 64 operating system and install the corresponding Kinect SDK. Restart once again after the completion of installation so as to correctly identify environment variables needed by Kinect SDK.

3.2.2 Installation and Testing of Kinect Sensor Drive Program

Before the installation of Kinect sensor drive program, network connection shall be confirmed to be normal. After connecting Kinect sensor with external power supply, then connect it with USB plug of the computer, and the system will automatically download and install necessary drive program after the steps mentioned above are completed.

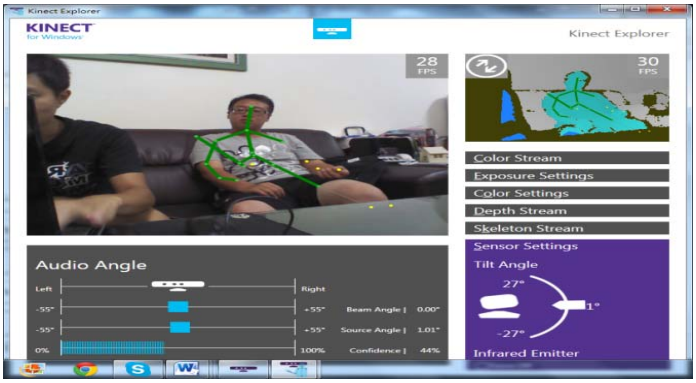

Figure 2. Start Kinect Explorer-WPF Program for Test

3.3 Adjustment of Motor Elevation

Use instruction
Right hand: move, change the position of mouse
Left hand: rise high, press down left button

Figure 3. Use and Instruction Interface of Mouse Control

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3.4 System Structure

System mainly contains Kinect, Kinect for windows v1.7, Flash and C#; Kinect is responsible for sensing surrounding environment information and sending it to the computer, Kinect for windows v1.7 receives the environment information sensed by Kinect and executes actual mouse operation indication, computer integrates all the data to make decision on Flash game operation, and the whole system structure is shown in Figure.

3.5.2 Design Idea

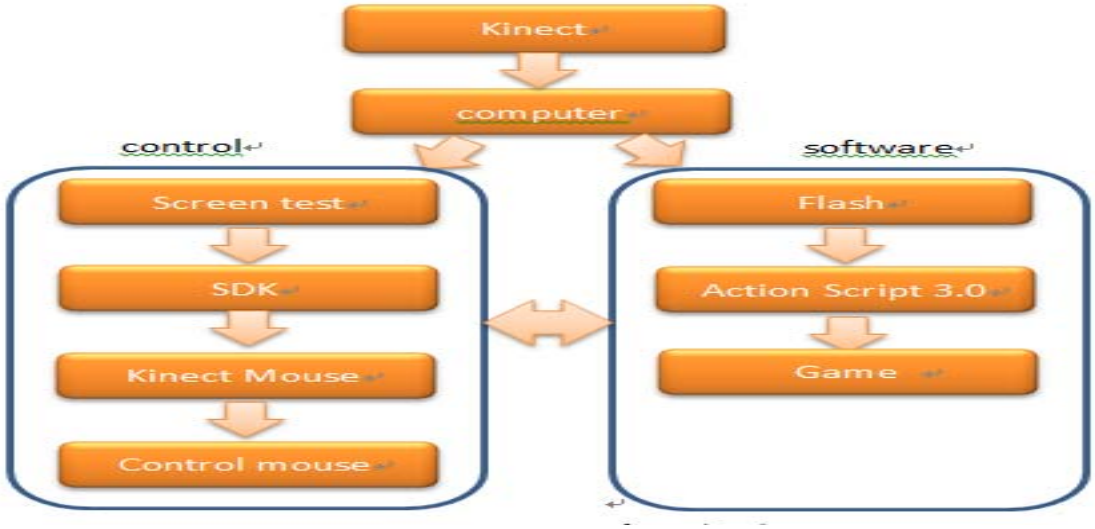

Figure 4 System Structure

Alzheimer's disease is the problem concerned by the whole world at present and its early symptoms occur mostly in people of more than 65 ages, but people of about 20-30 may have such symptoms due to the current way of life and pressure. The symptoms of Alzheimer's disease include irritability, aggressiveness, emotional ups and downs and loss of long-term memory, and our concept is mainly to use the mode of interactive games to help dementia patients train brain to strengthen the memory.

3.5.3 Improvement of Life

As the cases of dementia of elderly people increase year by year in our society, which causes troubles for a lot of families, besides, dementia leads to the memory of patients decline gradually, interactive learning game of "Dementia Kinect Interaction Game" is designed for patients with mild dementia, as the family members dare not make patients with dementia go out alone, they can only stay at home for a long time, or they must wait for their family members to accompany them to go out when they have spare time; while we produce interaction learning games to make patients with mild dementia think about the topics in the game and move bodies to operate TV video game to realize the activation of brain cells of patients and the movement of patient's body to slow down the decline of memory, this can make family members not afraid that patients have no speech objects at home when they are busy.

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3.6 Internal Program

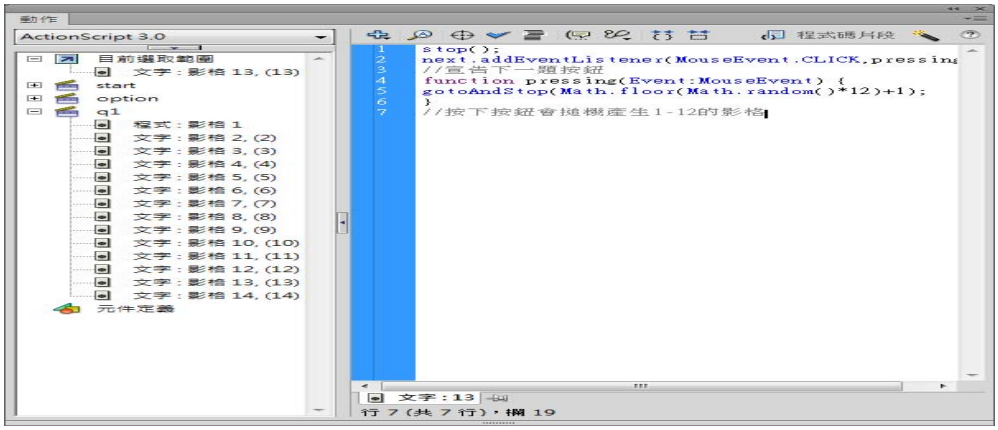

Figure 5. Adobe flash Program

3.7 Game Operation

Currently we make a measurement on the distance between Kinect device and operators, device angle and height so as to realize the best effect when operators are controlling mouse, but not make the mouse flap, nobody should stand behind the operators, Kinect mouse control is to capture hand movements of persons, so in case of two or more persons, the hand movements of the other person will also be caught, which will cause disorder of mouse.

Kinect layout height: about 64cm

Kinect elevation angle: 7 degrees

Distance between Kinect and operator: about 3.27 meter



Figure 6. Game Menu

Chapter 4 Conclusion and Future Studies

Kinect device is to combine computer to develop interactive learning system, this research uses flash software as the interactive operation mode of main game Kinect for the game. The main programming language of Kinect is C# program, Kinect is used to control the mouse and operate flash game, Kinect is connected to flash through continuous attempts, lastly the mouse control program is first started in the computer, the Kinect is used to operate flash game, the interaction learning in this plan which makes dementia patients test animation games in combination with Kinect has achieved initial effect, this research plans to present the game in future with 3D form, 3d max modeling software and Unity game engine platform are used to produce and develop works to make the pictures presented more delicate, this program has successfully completed interaction game learning system, which has preliminary growth space for the health of dementia patients.

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(body is controller，Kinect how-it-works？)

*http://www.oldpeople.org.tw/ugC_Care_Detail.asp?hidCareCatID=4 (*ROC old Fu promote Union*)*

8.http://www.metatale.com/livinglab/ (Chengchi digital content Teaching Program of Huang Xinjian Blogs)

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THE INTERPRETATION OF THE SKILLS OF THE STUDENTS IN MATH DEPARTMENT FOR USING MATH IN REAL LIFE: A CROSS – AGE STUDY

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Today, math is not perceived as a collection of the abstract concepts and skills necessary to be learned just like in the past; but as "the information that occurs with the process of problem solving and interpretation that is based on the modeling of the reality and again, the skills that develops within this process" as defined by De Corte (2004, s.279). In accordance with this understanding, the purpose of teaching math has become to provide mathematical aptitude and form the skill of being able to use math in necessary conditions conveniently (Altun and Memnun, 2008).

When the results of PISA and TIMSS being the studies with the widest scopes regarding the use of math are examined, it is seen that the real-life usage levels of the children and youngsters having their education in our country specially are too low when compared to other countries. The number of the studies regarding the concept of using math at higher education level is very little. Starting from this; in the current study, it has been tried to observe how the students of the department of math in the faculty of science and literature use the pure math they learn in the real life conditions by studying together with them. In addition; within the scope of the study, the assessment of the skills in using math has been provided by considering them together with the variables of class level, gender and academic achievement.

The method of case study has been used in the study; and it is also called as the cross-age study because the consideration and comparison of the math-using skills of the students taking place in different class levels are conducted. The study has been carried out with a total of 24 students selected with the method of random sampling and consisting of 6 ones each from every class level of Ordu University Science and Literature Faculty Math Department. 8 ea. open-ended real life problems (MKDBP) have been formed for the purpose of observing the math-usage skills of the students taking place in the study. In the analysis of the data; four different DPAs (Graded Scoring Scale for Reasoning Skills (MBDPA), Graded Scoring Scale for Problem Solving Skills (PÇDPA), Graded Scoring Scale for Regression Skills (İBDPA) and Graded Scoring Scale for Modeling Skills (MoBDPA)) under the name of Graded Scoring Scale for Math-Usage Skills having been developed by the researchers have been used. The expert comments and reliability analyses have been taken into consideration in the validity and reliability of the mentioned assessment tools and the reliability coefficients for the mentioned graded scoring scales have been calculated as respectively P1= %81, P2= %79, P3= %79 and P4= %82.

As a result of the study; it has been seen that while the students are able to use the problem solving and regression skills under the problem conditions that are not complex so much, they are not able to use the reasoning and modeling skills successfully in general of the study. When the successes of the students are considered according to the level of the classroom, it has been observed that the math usage skills of the senior students are higher than other students; but the mentioned difference is meaningful only for the problem solving and modeling skills. According to the attained data; it could be cited that the 4th grade students are able to use the problem solving skills more successfully when compared to the 3rd grade students and they are able to use the modeling skills more successfully when compared to the 2nd and 3rd grade students. It has been observed that there are not meaningful differences among the math usage skills of the students according to the variable of academic success; and the math usage skills of the male students are at higher level when compared to those of the female students according to the variable of gender.

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Within the direction of the results attained from the study; it is suggested that different courses that shall be planned regarding the usage of the math as an obligation or as an elective course at both undergraduate and graduate levels in the educational programs of the mentioned faculties be added within the scope of the fact that the students studying in the science and literature faculty should have the skills, knowledge and idea about the useful side of math.

Keywords: Using mathematicss, real life

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THE LABORATORY IMPLICATIONS BASED ON ARGUMENTATION OF PRE-SERVICE SCIENCE TEACHERS

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Abstract: The purpose of current study is to determine the effect of laboratory implications based on argumentation on the pre-service science teachers' logical thinking abilities and critical thinking tendencies. The sample group of the study consists of a total of 64 pre-service teachers (32 for the experimental group, 32 for the control group) who are in their fourth year in the Science Education Program at a state university. The pre-test/ post-test control group experimental design model was used that current research. In the experimental group, the experiments were conducted using worksheets based on argumentation, whereas in the control group the experiments were conducted in the form of a close-ended experiment. In this quasi-experimental designed research, the "Logical Thinking Abilities Test" and "The California Critical Thinking Disposition Inventory" were used as data collection tools. As a result of this study, it was found that the logical thinking ability and critical thinking tendency levels of the experimental group were higher than those of the control group. Accordingly, it can be argued that laboratory activities conducted with argumentation-based worksheets are more effective than laboratory activities conducted with the use of close-ended experiment in terms of developing logical thinking abilities and critical thinking tendencies on the part of pre-service science teachers.

Keywords: Pre-service science teachers, argumentation, science laboratory implications

Introduction

As is known, it is vital to design a learning environment based on research-inquiry in order to provide students with permanent learning. In a leaning environment based on research and inquiry, students ask questions, formulate arguments and structure information by supporting their arguments with proofs (Günel, Kıngır and Geban, 2012). The teacher helps students to develop their high level cognitive skills such as analysis, synthesis and evaluation by providing a suitable environment in which students can make scientific debates (Duschl and Osborne, 2002). In the study they carried out to support the use of argumentation teaching by teachers in a scientific context, Simon, Erduran and Osborne (2006) stated that motivating students for the process and occupational development of the teachers might have an impact on the quality of argumentation. Specifically, scientific debates have recently become a notable practice (Driver, Newton and Osborne, 2000). One of the reasons for this is that students can carry out studies which are similar to those of scientists and have the opportunity to structure information in the way scientists do in the teaching environments in which scientific debate strategies are used (Brown, Collins and Duguid, 1989). In addition, the fact that students think about the link between the argument that is formulated during scientific debates and the proof put forward to support this argument will improve their abilities of critical thinking (Erduran, Ardaç and Güzel, 2006). As a result, the students will have the opportunity not only to learn scientific concepts but also to appreciate the nature of science (Driver et al., 2000). With this in mind, Keys, Hand, Prain and Collins (1999) devised the approach of learning science based on argumentation as a learning and teaching approach based on written and oral argumentation which allows students to experience the processes that scientists go through while solving real-life problems they face and which provides the students with the opportunity to structure information during this process in science classes. There are various definitions as to what an argument means. Toulmin (1958) defines argument as an assertion and demonstrating its validity. Driver et al. (2000), on the other hand, defines argument as an individual or a group activity, a social activity done through thought or writing. While argument defines as claims, data, grounds and the backings contributing to an idea, argumentation signifies compiling these constituents (Simon, Osborne and Erduran, 2003). It is striking that Toulmin model is frequently used in the

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studies conducted in recent years. Toulmin model is comprised of six elements. While data, claims and grounds are the main elements of an argument, backing, qualifiers and rebuttals are auxiliary elements. In Toulmin's model, grounds verify the course from the data to the result, whereas the backings are assumptions that demonstrate the validity of grounds (Jimenez-Aleixandre and Pereiro-Munoz, 2002). The main structure of this model has been formulated as because (data) is…… in terms of ……. (grounds), then ……. (backing); therefore, ……. (result). Zohar and Nemet (2002) expressed that argumentation plays an important part in science education in that it encourages scientific thinking and development of a qualified conceptual understanding in students. Teaching argumentation skills in science classes as a way of developing reasoning skills has been a focal point of studies on science education that adopt argumentation (Acar, 2008).

Numerous studies conducted in the field of science education conclude that integration of argumentation into the education and training environments may benefit students in many respects (Berland & Reiser, 2011; Sampson & Clark, 2011). In the study carried out by Çetin, Kutluca and Kaya (2013), it was concluded that, at the end of the process, there is an increase in the quality of the argumentation performed by the students involved in the process of argumentation as compared with the beginning of the process. Also, the researchers stated that students can formulate more quality arguments and can learn science concepts more effectively thanks to the science classes based on argumentation. Especially, the presentation of argumentation in combination with laboratory is invaluable with regard to science education. In this way, students will both have the opportunity to put theoretical knowledge into practice in laboratory environment and find the chance to debate their arguments with their friends in their groups. Laboratory practices based on argumentation are a strategy devised by Sampson, Grooms and Walker (2011). In this practice, students try to explain a problem, a phenomenon or an observation by working in small groups. While doing this, they design their own experiment settings, share their results with other groups in a certain format and get feedback from their peers. Groups reassess their views and try to explain different views in the light of feedbacks they get. The students are asked to write any hypothesis/claim in small groups in a laboratory environment and to design an experiment with regard to this and also they are asked to discuss their own designs with other groups (Osborne, Erduran and Simon, 2004). In addition, the groups are expected to prepare reports while sharing their results. Moreover, the students get the chance to be evaluated by their teachers/instructors or their peers by being observed during the process. During evaluation, how students form arguments such as claim, data, backing (qualifier), grounds (proofs), limiters, rebuttals (exceptions) is of importance. In such practices, there are also some reasoning activities in which students express especially how the proofs and the explanation are connected. When the body of literature is examined, we come across studies with regard to argumentation based laboratory practices (Demircioğlu, 2008). Demircioğlu (2011) carried out a study to examine the effect of laboratory education based on the approach of "Argument Based Inquiry" during "General Physics Laboratory III" classes on the academic success of pre-service science and technology teachers, their tendencies towards discussion, scientific process skills and their level of argumentation. The study concluded that laboratory education based on the approach of "Argument Based Inquiry" increases the academic success and scientific process skills of pre-service science and technology teachers as compared to traditional classes, but it doesn't provide any change as to their tendency towards discussion. During the implementation of the study, the quality of argumentation was seen to increase in the reports of the students in the experimental group, while the quality of argumentation does not change in the reports of the students in the control group.

When the body of literature especially in our country (in Turkey) is examined, we see that the positive effects of argumentation based practices on high level mental skills (such as scientific process skills, critical thinking skills, logical thinking skills etc.) are mentioned and the studies scrutinizing these skills (Aydın and Kaptan, 2014; Çınar, 2013; Demiral, 2014; Gültepe, 2011, Koçak, 2014; Şahin, 2016; Tonus, 2012; Tümay, 2008) stand out. However, a study that deals with the development of critical thinking disposition and logical thinking skills which lead to the development of the skills in students mentioned above through argumentation based learning practices does not exist. With this in mind, we aim to study the effects of argumentation based laboratory practices on the logical thinking skills and critical thinking disposition of pre-service science teachers. To this end, we have formulated two hypotheses and tested these hypotheses. These hypotheses are as such:

1. There is a significant difference between the logical thinking skills of the pre-service teachers in the experimental group to whom argumentation based laboratory practices were applied and that of the pre-service teachers in the control group to whom close-ended experiments were applied and the difference is in favour of the experimental group.
2. There is a significant difference between the critical thinking disposition of the pre-service teachers in the experimental group to whom argumentation based laboratory practices were applied and that of the pre-service teachers in the control group to whom close-ended experiments were applied and the difference is in favour of the experimental group.

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Method

In this study, a quasi-experimental design with a pre-test post-test control group was used. The experimental design classified as test model is a quantitative research model "which is directly controlled by the researchers and in which the desired data are produced with the aim of identifying cause-effect relationships" (Karasar, 2011).

In experimental studies, terms such as participants or study group are preferred instead of population and sample because the aim of experimental studies is to demonstrate the circumstances that are studied rather than generalize (Sönmez, 2005). Within this context, the term of study group was preferred in this study rather than population-sample. The study group of this study is comprised of the students who are attending the Department of Science Teaching for Elementary Schools in the Faculty of Education in Afyon Kocatepe University during the spring semester of the 2015-2016 academic year. The study group is made up of 64 pre-service teachers in their senior year (4th year) who are either in experimental group or in control group.

Data Collection Tools:

"Logical Thinking Ability Test (LTAT)" and "California Critical Thinking Disposition Inventory (CCTDI)" have been used in this study as data collection tools.

"Logical Thinking Ability Test (LTAT)" was devised by Tobin and Capie (1981) and was adapted to Turkish by Geban, Aşkar and Özkan (1992). The test consists of 10 questions, 8 of which are multiple-choice questions, which measure the abilities of defining and controlling variables, calculating probability, developing relations and using ratio. The first 8 multiple-choice questions each have one correct answer and an explanation that leads to this correct answer. In order for the answer to be rendered correct, both the answer and the explanation must be correct. The last two questions which are not multiple-choice ones certain probabilities must be stated in full. The highest point one can get on this test is 10. The reliability of the test is 0.81. In this study, it has been found out that the KR-20 coefficient obtained in the pre-test results of LTAT is 0.61.

"California Critical Thinking Disposition Inventory (CCTDI)" was originally formulated by Facione, Facione and Giancarlo in 1998 as a Likert-type scale comprised of 75 items. The validity and reliability studies of the scale in its translated form into Turkish were conducted by Kökdemir (2003). It was noted that the structure of factors that constitute CCTDI which was reduced to 51 items are not very different from its original form, that some items were moved between factors and that two factors were combined into one. The scale is comprised of 51 items and 6 sub-scales in total (Truth-seeking, Open-mindedness, Analyticity, Systematicity, Self-confidence, Inquisitiveness). "Analyticity" of these sub-scales expresses watching out for situations which tend to be problematic, logical thinking in tough problems and using objective evidence. "Open-mindedness" signifies an individual's being tolerant of different approaches, his/her taking others' views and ideas into consideration while making decision and be mindful of his/her own mistakes. "Inquisitiveness" means an individual's disposition to obtain information and to learn new things without expecting any gain from this. "Self-confidence" refers to the confidence a person has in his/her own logical thinking processes. "Truth-seeking" measures the disposition to evaluate different ideas. "Systematicity" refers to the disposition to use a decision-making strategy based on information and that follows a specific method; in other words disposition to making research in an organised, planned and careful manner. This new form of CCTDI has an internal consistency reliability of 0.88 and the total variance that the scale explains is 36,13. The internal consistency coefficient of CCTDI used in this study has been found to be 0.85.

The Implementation Process

The participants in the study group are made up of two groups, one experimental group (n=32) and one control group (n=32). Before the implementation process, "Logical Thinking Ability Test (LTAT)" and "California Critical Thinking Disposition Inventory (CCTDI)" were applied to both groups as a pre-test. During the implementation process, worksheets based on argumentation were used in the laboratory activities of the experimental group, while close-ended experiment techniques were used in the laboratory activities of the control group. While preparing the worksheets based on argumentation, experiments that would attract students' attention were especially chosen. 8 activities were made during the implementation process. When the process was completed, "Logical Thinking Ability Test (LTAT)" and "California Critical Thinking Disposition Inventory (CCTDI)" were applied this time as a post-test.

Analysis of the Data

The data obtained was analysed with the help of statistics packet program in order to compare the results of the pre-test and the post-test. Independent sample t-test was used to determine the differences between the post-test

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scores of the pre-service teachers which was aimed at identifying the logical thinking abilities of the pre-service teachers in the experimental group and the control group. Similarly, independent sample t-test was used to determine the differences between the post-test scores with regard to the critical thinking disposition of the pre-service teachers in the experimental group and the control group.

Findings

In this section, we have examined whether there are significant differences in the logical thinking ability and critical thinking disposition between the experimental group in which open-end argumentation based laboratory applications were used and the control group in which close-ended experiment technique was used and the results have demonstrated in tables in detail. It has been found out that the data obtained from LTAT and CCTDI scales has a normal distribution. Therefore, unrelated samples t-test and related samples t-test were used in the analysis of the data.

Table 1 shows the independent samples t-test results regarding the pre-test scores that the students in the experimental group and the control group got on LTAT.

Table 1. Independent samples t-test results of the pre-test scores that the students in the experimental group and the control group got on LTAT.

Test	Groups	N	Mean	SD	t	P
LTAT	Experimental (Pre-test)	32	6.59	1.68	-0.483	0.631
	Control (Pre-test)	32	6.84	2.39		

When we examine Table 1, we can note that there isn't a statistically significant difference between the LTAT pre-test scores of the students in the experimental group and the control group.

Table 2 shows the independent samples t-test results regarding the pre-test scores that the students in the experimental group and the control group got on CCTDI.

Table 2. Independent samples t-test results of the pre-test scores that the students in the experimental group and the control group got on CCTDI.

CCTDI sub-scales	Groups	N	Mean	SD	t	P
Analyticity	Experimental (Pre-test)	32	57.84	6.37		
	Control (Pre-test)	32	59.56	6.65	-1.06	0.295
Open-Mindedness	Experimental (Pre-test)	32	46.78	8.55		
	Control (Pre-test)	32	47.71	6.85	-0484	0.630
Inquisitiveness	Experimental (Pre-test)	32	38.75	6.26		
	Control (Pre-test)	32	41.28	4.33	-1.879	0.065
Self-Confidence	Experimental (Pre-test)	32	24.78	4.75		
	Control (Pre-test)	32	26.37	5.24	-1.275	0.207
Truth-Seeking	Experimental (Pre-test)	32	25.43	4.55		
	Control (Pre-test)	32	25.81	4.46	-0.332	0.741
Systematicity	Experimental (Pre-test)	32	26.53	3.12		
	Control (Pre-test)	32	25.68	4.47	-0.875	0.385
CCTDI	Experimental (Pre-test)	32	220.12	20.91		
	Control (Pre-test)	32	226.43	17.27	-1.316	0.193

When we examine Table 2, we can see that there aren't any statistically significant differences between the pre-test scores of the students in the experimental group and the control group with regard to the sub-scales of CCTDI and the overall scale.

Table 3 demonstrates the paired samples t-test results in terms of the pre-test post-test scores on LTAT of the students in the experimental group.

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Table 3. Paired samples t-tests results in terms of the pre-test and post-test scores on LTAT of the students in the experimental group.

Test	Groups	N	Mean	SD	t	P
LTAT	Experimental (Pre-test)	32	6.59	1.68	-1.180	0.247
	Experimental (Post-test)	32	7.09	1.51		

When we examine Table 3, we see that there aren't any statistically significant differences between the pre-test and the post-test scores that the students in the experimental group obtained on LTAT.

Table 4 shows the paired samples t-test results with regard to the pre-test scores that the students in the experimental group obtained in CCTDI.

Table 4. Paired samples t-test results with regard to the pre-test scores that the students in the experimental group obtained on CCTDI

CCTDI sub-scales	Groups	N	Mean	SD	t	P
Analyticity	Experimental (Pre-test)	32	57.84	6.37	-1.884	0.069
	Experimental (Post-test)	32	60.28	5.97		
Open-Mindedness	Experimental (Pre-test)	32	46.78	8.55	-0.299	0.767
	Experimental (Post-test)	32	47.25	5.58		
Inquisitiveness	Experimental (Pre-test)	32	38.75	6.26	-3.303	0.002*
	Experimental (Post-test)	32	43.84	5.91		
Self-Confidence	Experimental (Pre-test)	32	24.78	4.75	-2.266	0.031*
	Experimental (Post-test)	32	27.15	3.42		
Truth-Seeking	Experimental (Pre-test)	32	25.43	4.55	-0.422	0.676
	Experimental (Post-test)	32	26.00	5.70		
Systematicity	Experimental (Pre-test)	32	26.53	3.12	-0.918	0.366
	Experimental (Post-test)	32	27.46	3.94		
CCTDI	Experimental (Pre-test)	32	220.12	20.91	-2.868	0.007*
	Experimental (Post-test)	32	232.00	17.81		

*p<0.05

When we examine Table 4, we can see that there are statistically significant differences in favour of the post-tests between the pre-test and post-test scores of the students in the experimental group in the "Inquisitiveness" and the "Self-confidence" sub-scales of CCTDI and in the overall scale.

Table 5 shows the paired samples t-test results regarding the pre-test and post-test scores that the students in the control group got on LTAT.

Table 5. Paired samples t-test results regarding the pre-test and post-test scores that the students in the control group obtained on LTAT

Test	Groups	N	Mean	SD	t	P
LTAT	Control(Pre-test)	32	6.84	2.39	-.158	.876
	Control(Post-test)	32	6.93	1.79		

When we examine Table 5, we can see that there aren't any statistically significant differences between the pre-test and the post-test scores that the control group students obtained on LTAT.

Table 6 exhibits the paired samples t-test results regarding the pre-test and the post-test scores that the control group students obtained on CCTDI.

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Table 6. Paired samples t-test results regarding the pre-test and the post-test scores that the control group students obtained on CCTDI

CCTDI sub-scales	Groups	N	Mean	SD	t	P
Analyticity	Control (Pre-test)	32	59.56	6.65	-0.174	0.863
	Control (Post-test)	32	59.71	4.26		
Open-Mindedness	Control (Pre-test)	32	47.71	6.85	-0.575	0.569
	Control (Post-test)	32	48.62	5.64		
Inquisitiveness	Control (Pre-test)	32	41.28	4.33	-0.860	0.396
	Control (Post-test)	32	42.40	6.45		
Self-Confidence	Control (Pre-test)	32	26.37	5.24	-0.173	0.864
	Control (Post-test)	32	26.56	2.92		
Truth-Seeking	Control (Pre-test)	32	25.81	4.46	-0.595	0.556
	Control (Post-test)	32	26.50	5.21		
Systematicity	Control (Pre-test)	32	25.68	4.47	-1.679	0.103
	Control (Post-test)	32	27.59	4.19		
CCTDI	Control (Pre-test)	32	226.43	17.27	-1.926	0.063
	Control (Post-test)	32	231.40	16.82		

When we examine Table 6, we see that there aren't any statistically significant differences between the pre-test and the post-test scores that the students in the control group obtained in the sub-scales of CCTDI and the overall scale.

Table 7 shows the independent samples t-test results regarding the post-test scores that the students in both the experimental group and the test-group obtained on LTAT.

Table 7. Independent samples t-test results regarding the post-test scores that the students in both the experimental group and the test-group obtained on LTAT

Test	Groups	N	Mean	SD	t	P
LTAT	Experimental (Post-test)	32	7.09	1.51	0.377	0.708
	Control (Post-test)	32	6.93	1.79		

When we examine Table 7, we can see that there aren't any statistically significant differences between the scores that the students in the experimental group and the control group obtained on LTAT.

Table 8 shows the independent samples t-test results regarding the post-test scores that the students in the experimental group and the control group obtained on CCTDI.

Table 8. Independent samples t-test results regarding the post-test scores that the students in the experimental group and the control group obtained on CCTDI

CCTDI sub-scales	Groups	N	Mean	SD	t	P
Analyticity	Experimental (Post-test)	32	60.28	5.97	0.433	0.666
	Control (Post-test)	32	59.71	4.26		
Open-Mindedness	Experimental (Post-test)	32	47.25	5.58	-0.979	0.331
	Control (Post-test)	32	48.62	5.64		
Inquisitiveness	Experimental (Post-test)	32	43.84	5.91	0.929	0.357
	Control (Post-test)	32	42.40	6.45		
Self-Confidence	Experimental (Post-test)	32	27.15	3.42	0.745	0.459
	Control (Post-test)	32	26.56	2.92		
Truth-Seeking	Experimental (Post-test)	32	26.00	5.70	-0.366	0.716
	Control (Post-test)	32	26.50	5.21		
Systematicity	Experimental (Post-test)	32	27.46	3.94	-0.123	0.903
	Control (Post-test)	32	27.59	4.19		
CCTDI	Experimental (Post-test)	32	232.00	17.81	0.137	0.891
	Control (Post-test)	32	231.40	16.82		

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When we examine Table 8, there aren't any statistically significant differences between the post-test scores that the students in the experimental group and the control group obtained in the sub-scales of CCTDI and on the overall scale.

Conclusion

This study aims to identify the effects of argumentation based laboratory practices on the logical thinking ability and the critical thinking disposition of pre-service science teachers. In parallel with this aim, implementation process was conducted on the 64 pre-service teachers who are attending the Department of Science Teaching in this study in which quasi-experimental design with a pre-test and post-test control group was used. Before the implementation process, "Logical Thinking Ability Test (LTAT)" and "California Critical Thinking Disposition Inventory (CCTDI)" were applied to both groups as a pre-test. As a result of the analyses conducted, it was found out that there wasn't a statistically significant difference in the pre-test scores that the students in the experimental group and the control group obtained on LTAT. Similarly, it was observed that there aren't any statistically significant differences between the pre-test scores that the students in the experimental group and the control group obtained on the sub-scales of CCTDI and the overall scale. In the study which was carried out with 32 pre-service teachers in each of the experimental group and the control group, close endedf experimental techniques were used in the laboratory activities of the control group, while argumentation based worksheets were used in the laboratory activities of the experimental group. At the end of the 8-week long implementation process, measuring tools were used as post-test. It was found out that there isn't a statistically significant difference in the pre-test and pot-test scores that the students in the control group obtained on LTAT, the sub-scales of CCTDI and overall CCTDI. Likewise, it was seen that there isn't a statistically significant difference in the pre-test and the post-test scores that the students in the experimental group obtained on LTAT. On the other hand, it was observed that there are statistically significant differences between the pre-test and post-test scores that the students in the experimental group obtained on the "Inquisitiveness and "Self-Confidence" sub-scales of CCDTI and the overall scale and the differences are in favour of the post-tests. When the post-test scores that the students in the experimental group and the control group obtained on LTAT and the sub-scales of CCDTI and overall CCDTI were compared, it was also observed that there aren't any statistically significant differences between the scores.

A significant difference in logical thinking ability of the students in the experimental group and the control group did not emerge as a result of the argumentation based laboratory activities. It can be assumed that this outcome arose because the 8-week implementation process was not enough. This is because argumentation based laboratory practices are not what students are accustomed to. When we take the fact that close-ended experiments or open-end experiments without argumentation are conducted in laboratory classes into consideration, it is true that it will take pre-service teachers to get used to this new practice. When the body of literature is studied, we can see that logical thinking skills are dealt with rather than logical thinking ability in the studies carried out with regard to argumentation. For instance, the study conducted by Aydın and Kaptan (2010) concludes that while the logical thinking skills of the pre-service teachers aren't significantly affected in classes in which the argumentation is readily presented, the logical thinking skills of the pre-service teachers are significantly affected in the group that had an argumentation based class.

We have concluded that there isn't a statistically significant difference between the post-test scores that the students in the experimental group and the control group obtained on the sub-scales of CCTDI and the overall scale. This conclusion we have made corresponds to the conclusion that there isn't a statistically significant difference in the critical thinking disposition between the post-test scores of the students in the experimental group and the control group which was drawn in a study titled the effects of argumentation based science learning on the success of the pre-service teachers in the subject of solutions and their critical thinking disposition conducted by Koçak (2014). Similarly, the study carried out by Qing, Jing, Yazhuan, Ting and Junping, (2010) demonstrates that a statistically significant difference between the average scores that the experimental and the control group students obtained with regard to their critical thinking disposition does not exist. We can see that, among the studies that deal with the argumentation based learning approach, there are also studies that examine the effects on critical thinking skills apart from critical thinking disposition. One such study is the experimental study that Çınar (2013) carried out argumentation based science teaching for 5th graders. This study also concluded that there isn't s significant difference between the experimental group and the control group students with regard to the development of their critical thinking skills.

Although there isn't a significant difference between the experimental group and the control group in this study, a significant difference in the critical thinking disposition of the students in the experimental group emerged at the end of the process of argumentation based laboratory activities. Especially, the strikingly significant difference in the Inquisitiveness and Self-confidence makes us think that argumentation based laboratory

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practices attract the attention of the pre-service teachers and that it helps them gain self-confidence over time. When we study the body of literature, we see that the studies dealing with argumentation practices focus on critical thinking skills rather than critical thinking disposition. Within this context, we can cite the study conducted by Eirexas and Jiménez Aleixandre (2007) as an example to this in that it deals with skills rather than disposition. In the study mentioned above, students were encouraged to put forward their arguments in written and oral debates and its was observed that the critical thinking skills of students improved thanks to these debates at the end of the implementation process. In parallel with this, Tümay (2008) conducted the study in "Chemistry Teaching with a Focus on Argumentation" classes which aimed to examine the growing understanding of argumentation in science and science education that pre-service chemistry teachers have. At the end of the implementation process, it was concluded that teaching with a focus on argumentation is an effective way of improving the thinking skills of pre-service teachers. In a study conducted by Gültepe (2011), it emerged that the teaching approach based on scientific discussion is more effective than traditional teaching approach in improving critical thinking skills of students. Tonus (2012) found out that there is a significant difference between the pre-test and the post-test measuring critical thinking skills of the students after the argumentation process. In the study in which Şahin (2016) examined the effects of Argumentation Based Science Learning approach (ABSL) on the academic success, metacognition and critical thinking skills of gifted students, it was found out that there is a statistically significant difference in favour of the experimental group when the results of critical thinking skills tests were compared. The results obtained from these studies have parallels with each other.

In this study, logical thinking ability test and critical thinking disposition inventory were used with a view to identifying the effects of the argumentation based laboratory activities of pre-service teachers on high level thinking. In other studies to be carried out in the future, logical thinking skills and critical thinking skills tests directly aimed at skills rather than ability or disposition could be used. This study was carried out for a period of 8 weeks. In order to better identify the effects of argumentation based laboratory practices, longer-termed studies spanning a whole academic year could be conducted. Quantitative research method was used in this study. Mixed method studies could be designed in future studies to be conducted by integrating qualitative aspects.

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THE LENGTH-WEIGHT RELATIONSHIP AND CONDITION FACTOR OF ANGORA LOACH, OXYNOEMACHEILUS ANGORAE (STEINDACHNER, 1897) INHABITING KILIÇÖZÜ STREAM IN KIZILIRMAK RIVER BASIN (CENTRAL ANATOLIA-TURKEY)

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Abstract: In this study, length-weight relationship (LWR) and condition factor (K) of Angora loach, *Oxynoemacheilus angorae* (Steindachner, 1897) was determined. The 103 specimens were sampled from Kılıçözü stream in 2014. The length and weight of specimens varied between 3.5 and 9.8 cm and 0.38 and 6.58 g, respectively. Length-weight relationships for female, male and all samples were found as $W= 0.01056.TL^{2.896}$ ($r^2= 0.923$), $W= 0.00963.TL^{2.940}$ ($r^2= 0.978$) and $W= 0.00987.TL^{2.929}$($r^2= 0.963$), respectively. LWRs indicated isometric growth in female, male and all samples. The values of Fulton's condition factor (K) ranged from 0.699 to 1.246 for females and from 0.654 to 1.072 for males.
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Keywords: Angora loach, Length-weight relationship, Condition factor, Kızılırmak River, Turkey.

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THE NEUTRON MACROSCOPIC CROSS SECTIONS CALCULATION OF SOME MINERALS BY USING FLUKA MONTE CARLO METHOD

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Abstract: Because of neutrons are uncharged particles, they are powerful in terms of penetration into the material. Recently shielding is an important issue because of neutrons which have many applications today do not harm living tissue. Different compounds, alloys and composites are usually preferred against neutrons as shielding material. The aim of this project is to determine minerals(Veatchite($Sr_2B_{11}O_{16}(OH)_5*(H_2O)$, Sussexite($Mn^{+2}BO_2(OH)$ and Vimsite($CaB_2O_2(OH)_4$),based new shielding materials against neutron particles using by Fluka Monte Carlo method and then to obtain neutron total macroscopic cross sections and several shielding parameters by experimentally.

Key words: Neutrons, Macroscopic Cross Section , Fluka Monte Carlo

1 .Introduction

Ordinary time, the neutron shielding effects of materials were examined for nuclear reactor shielding design and many shielding experiments and calculations were performed to obtain the removal cross sections of the materials. The neutron attenuations of materials were evaluated with the cross sections. After that, benchmark or mock-up experiments on the multi-layer problem to confirm the shielding characteristics or to evaluate analysis accuracy were reported recently, the need to transport spent nuclear fuels is increasing due to the current limited storage capacity. Considering that the existing storage facilities will be full by 2016, a national policy for spent fuel urgently needs to be established Nowadays, the application field of neutron particles has increased and new scientific studies about discovering materials with higher performance that the material which are already used and can be used as a shield against neutrons has been prepared. A fast neutron loses their energy basically by the elastic crashes with atomic nucleus. In recent years, there has been rapid growth of electron accelerator based neutron sources for medical and industrial applications because of their compactness (Patil B.J.,Chavan ,S.T,Pethe S.N.,Krishnan R.,Dhole S.D.,2010) .In this study, neutron shielding for mineral appearance is seen in Figure-1(a,b,c) http:\\www.mindat.org; http:\\webmineral.com\data).

A neutron can come to the thermal balance with the centre periphery of the atom by reaching 0.04 eV energy at ambient temperature after a lot of crashes. In these contributions, it is always valid as a simple and clear way to

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use Fluka Monte Carlo simulation techniques. It is possible to work intuitively on a neutron ray reaching the thermal balance.



a) Vimsite



b)Sussexite



c)Veatchite

Fig1. Neutron Shielding For Materials .(http:\\www.mindat.org; http:\\webmineral.com\data)

2. Methodology of the Monte Carlo FLUKA

Monte Carlo codes are extensively used for probabilistic simulation of various physical systems .These code are widely used in calculations of neutron radiation shielding and gamma ray transport in materials (Wielopolski L.,Song,Z.,Orion,I,Hanson A.L.,Hendrey,G.,2005).Monte Carlo methods are very different from deterministic transport methods. Deterministic methods, the most common of which is the discrete ordinates method, solve the trans port equation for the average particle behavior The other hand, Monte Carlo does not solve an explicit equation, but rather obtains answers by simulating individual particles and recording some aspects of their average behavior .Monte Carlo is well suited to solving complicated 3-D time-dependent problems (Bremister,J.1993,). FLUKA code is a sub-program of the Monte Carlo code .It is a general purpose tool for calculations of particle transport and interactions with matter, covering an extended range of applications (Korkut,T. ,Karabulut, A.,Budak ,G. et al..,2012).Fluka is a multipurpose transport Monte Carlo Code ,for calculations of particle transport and interactions with matter from electron and proton accelerator shielding to target design, calorimetry ,activation, dosimetry ,detector design ,ADS systems ,neutrino physics ,radiotherapy ,shielding design etc. Therefore , Fluka is a tool that is constantly employed in the majority of CERN applications where energy deposition has to be calculated through beam-matter interactions ,as well as for radiation protection and shielding simulations . Fluka program works with Fortran Software written with machine code. The developments of Fluka program started with being used for Monte Carlo application for protons with high energy by J. Ranft and H. Geibel in 1962..Monte Carlo technique is randomly number selection technique from one or more probabilistic distribution in a special trial or simulation study(Hançerlioğulları ,A. 2006).The Mcnp code was used for reactor designs and calculations. the Monte Carlo simulation code Geant developed at CERN , allows the simulation of the particle shower generation and propagation inside a medium with a complicated geometry or composition. To follow hadrons inside matter, Geant is interfaced to Fluka ,Gheisha and Micap codes. In particular ,MICAP allows the simulation of neutron propagation and interaction within an energy region from 20 MeV down to 10^{-5} eV The flux calculation has been completely carried out in the framework of the FLUKA Monte Carlo code(Battistoni ,G., Ferrari A.,Montraruli T.,Sala P.R.,2003; Battistoni, G., Francesco, B. ,Markus, B., Mauro C. ,et al..,2011). The Fluka

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collaboration ensures the constant update of the code with the most advanced physics and features .Fluka is based, as far as possible, on original and well tested microscopic models. Due to microscopic approach to hadronic interaction modeling. FLUKA features a combinatorial geometry which is constantly enhanced in order to cope with new demands for more complex detector descriptions .The FLUKA simulations are carried out for a detailed description of an ideal calibration set up, exposing the detector only to direct collimated and monochromatic neutron beams avoiding any diffused radiation contribution(Borio di tigliole,A.,Cesana ,A.,Dolfini R.et al.,2001).

3.Shielding Applications and Material

The development of medical technology and medical equipment using radiation has played a key role in the diagnosis and treatments of many diseases .In particular, the utilization of radiation for invasive procedures, such as angiography ,has been expanded so that the exposure of patients and medical staff to radiation also tends to increase, making individual radiation protection a very important issue(Seon-Chil ,K.,Kyung-Rae ,D.,Woon-Kwan,C.,2012). Shielding must be provided around a reactor to protect both personnel and material. Shielding that is adequate for neutrons and gamma rays will also stop alfa and beta particles. The weight of shielding to be used is almost independent of the shielding material itself. This study aims to evaluate the neutron shielding effects of tree materials, Veatchite , Sussexite and Vimsite by using a neutron source. Properties of minerals are shown table- 1. The attenuation effects through shielding materials were investigated for various thicknesses of the materials. Neutrons are uncharged particles are powerful in terms of penetration into the material. Neutrons, which has many applications today .In shielding design it is often useful to perform a first assessment of the required shielding thickness by using a simplified approach based ,for example ,on a point nsource line of sight model, to be verified at a more advanced stage of the project with a Monte Carlo simulation ia a more realistic geometry of the facility(Agosteo S.,Magistris M.,Mereghetti, 2007).Neutron sources are more important in neutron shield measurements. The neutrons originate from spontaneous fission and from some (a,n) reactions in the source materials. The spontaneous fission and (a,n) neutron source terms are dependent on the kind of isotope and the decay time .For the prevent harm living tissue, shielding is anImportant issue.There are different compounds, alloys or composites are preferred against neutron particles using like shield.The purpose of this study was to shield against neutron radiation can be used as a material in three different mineral containing boron and hydrogen, and the evaluate of interaction these minerals with 4.5 MeV energy neutron using Monte Carlo simulation method. Neutron shielding is most effective is the nucleus of the shield material has about the same mass as the neutron. This makes hydrogen rich materials excellent neutron shits. It needs also to be something to absorb the neutrons, boron being the poison of choice .Conversely gamma shielding requires neutrons with very high mass. Were it not for the presence of the neutrons, depleted or native uranium would be the best choice (in fact depleted uranium is commonly used as shielding material for X-ray machines and radiography sources), but since neutrons and uranium shielding would be counterproductive, lead is used instead. This nuclear code enables the use of possibility for particles from thermal energy neutrons to all other particles having energy and extensive radiation ranges.

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Table1: Properties of minerals(http:\\www.mindat.org; http:\\webmineral.com\data).

Properties	**Vimsite**	**Sussexite**	**Veatchite**
Formula	$(CaB_2O_2(OH)_4)$	$(Mn^{+2}BO_2(OH))$	$(SR_2B_{11}O_{16}(OH)_5*(H_2O)$
Color	Colorless	white, green pink,straw yellow	Colorless, Pearl White
Density	2.54 gr/cm^3	3.12gr/cm^3	2.62gr/cm^3
Diaphaneity	Transparent	Translucent	Transparent
Hardness	4-Fluorite	3-Calcite	2-Gypsum
Luster	Glassy	Pearly	Vitreous-Pearly
Streak	White	White	White
Cleavage	Perfect	Perfect	Perfect
Locality	Siberia-Russia, Buriatia	South Africa, Kalahari	USA,TickCanyon, Losangeles,Califonia
Molecular Weight	CaO % 34.67, B_2O_3%43.05, 22.28 % H_2O	MnO %61.82 ,B_2O_3 %30.33 H_2O %7.85	SrO % 31.73%, B_2O_3 % 9.65 H_2O %58.62
Magnetism	no	no	no
Radioactivity	no	no	no

4 .General Equation for calculating shielding

In simplest form shielding involves interposing distance and materials between the source and recipient of radiation. Design considerations and the calculation of resultant dose complicate the problem. To gain some insight into shielding into shielding calculations we shall consider an oversimplified situation which involves a point source of radiation (National Council on Radiation Protection and Measurements,1977).
According to the inverse-squre law, the ,the intensity of radiation on the surface of a sphere of radius R will be where P is the source strength(number of particle

$$I=P/4\Pi R^2 \qquad (1)$$

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If we place enough distance between ourselves and the source, the intensity of radiation will be reduced to safe levels .However ,if we place material between ourselves and the source, we can take advantage of a collimated beam of gammas. The intensity of radiation follows an exponential curve

$$I=I_0\, e^{-\mu x} \qquad (2)$$

where μ is linear absorption coefficient and has dimensions of reciprocal centimeters. A mass absorption coefficient may be defined by $\mu_m = \mu/\rho$, Equation -2 then becomes where D is the absorber thickness.

$$I=I_0\, e^{-\mu_m D} \qquad (3)$$

For a sphere of radius R ,If put X=R, equation-2 will became

$$I=I_0\, e^{-\mu R} \qquad (4)$$

applies strictly to a collimated beam and only when scattered radiation is removed from the beam .In a thick shield such as that equation -4 would give a low result because some of the radiation is backscattered into the path. When primary neutrons dominate the shielding situation, the shielding transmission ratio for neutrons,

B_n, can be derived from the neutron fluence rate,$Ø_0$ The various types of interactions of neutrons with matter are combined into a total macroscopic cross sections value (Korkut,T.,Karabulut, A.,Budak ,G. et al.., 2012;. Korkut,T ,Korkut,H., Karabulut, A ,Budak ,G.2011).

$$\sum_{TOTAL} = \sum_{fission} + \sum_{capture} + \sum_{scatter} + \ldots\ldots\ldots \qquad (5)$$

The fundamental purpose of radiation shielding is to reduce the dose-equivalent index from all sources of radiation that converge on a particular reference point, so that the dose-equivalent index rate at the reference point does not exceed the applicable H_m or dose-limit value mathematically, this can be stated as follows:

$$\dot{H}_{Ld} \leq \dot{H}_m \qquad (6)$$

Where, $\dot{H}_{Ld}$ is the sum of dose-equivalent index rates at the reference point, $\dot{H}_m$ is the applicable H_m or dose-limit rate and Fj is the maximum absorbed dose rate or particle fluence rate from the j th, ,Bj is the shielding transmission ratio for the radiation from the jth source,T is the occupancy factor of the area represented by the reference point ,Kj is dimension-converting constant pertaining to radiation from the jth source.Dj is the distance between the jth radiation source and the reference point .

$$\dot{H}_{Ld} = \sum_{ji} \frac{Fj\ Bj\ T}{Kj Dj^2} \qquad (7)$$

Monte Carlo methods can calculate directly the self-shielding factor taking into account the multiple scattering. The resonance self-shielding factor ,T r_{es}(R),in wires of radius R, is defined as the ratio between the reaction rates per atom in the real sample and in a similar and infinitely diluted sample,.

$$T_{res}(R) = \frac{\int_{c1}^{c2} \phi(C)\sigma(C)dE}{\int_{c1}^{c2} \phi 0(C)\sigma(C)dE} \qquad (8)$$

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where $\phi 0(C) \propto \frac{1}{C}$ is the original no-perturbed, epitermal neutron flux per unit energy interval inside the infinitely diluted sample, $\phi(C)$,represents the perturbed epithermal neutron flux inside the real sample, $\sigma(C)$,denotes the (n,γ)cross-section ,and C_1 and C_2 are ,respectively ,the lower and the upper limits around the resonance energy C_{res} (Gonçalves,I.F., Martinho,E.,Salgado J.,2001; Gonçalves,I.F.,Martinho,E.,Salgado J.,2001).

4. Calculations

In this study the effects of cross section for high performance materials such as Veatchite, Sussexite and Vimsite were calculated, and also the parameters of the neutron armor of these materials were measured .There are many advantage using materials having hydrogen and boron in terms of neutron shielding technology because the neutron shielding capability depends heavily on the hydrogen concentration .As a shield material against neutron the interactivities with neutron particles with 4.5 MeV by the Fluka simulation method of three different minerals containing boron and hydrogen. A Comparison of double differential fluency predicted by FLUKA at various at a neutron energy. The Isotope production are shown in Fig 2-4 . The effectiveness of different types of neutron shielding for the ATLAS forward region has been studied by means of Monte Carlo simulations and compared with the results of an experiment performed at the CERN PS (Ṡtekl ,I.,Pospısil S.,Kovalenko, V.K et al.,2000.)

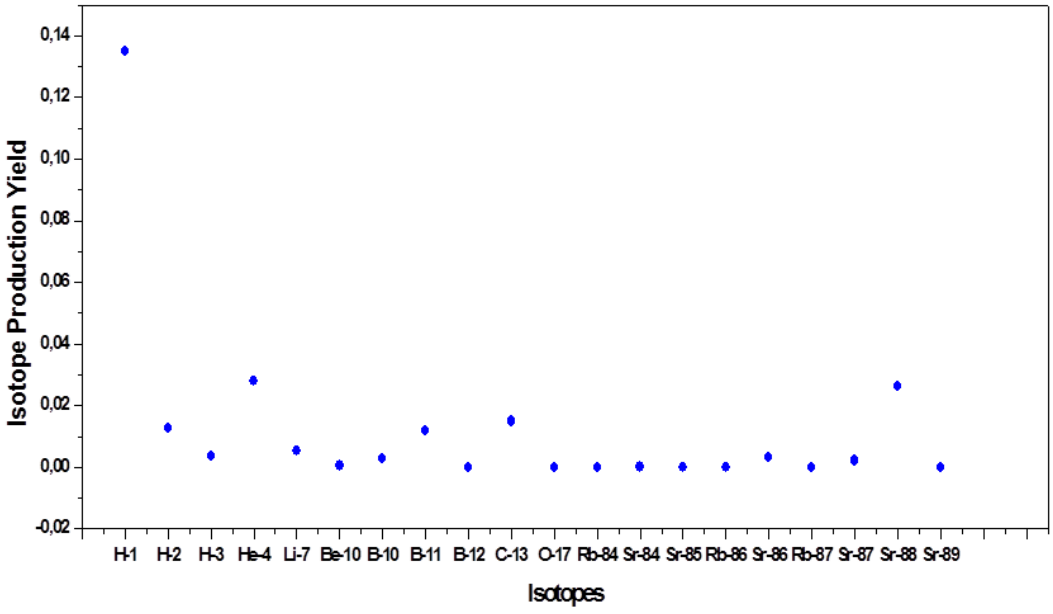

Fig2. Isotope production for mineral Veatchite

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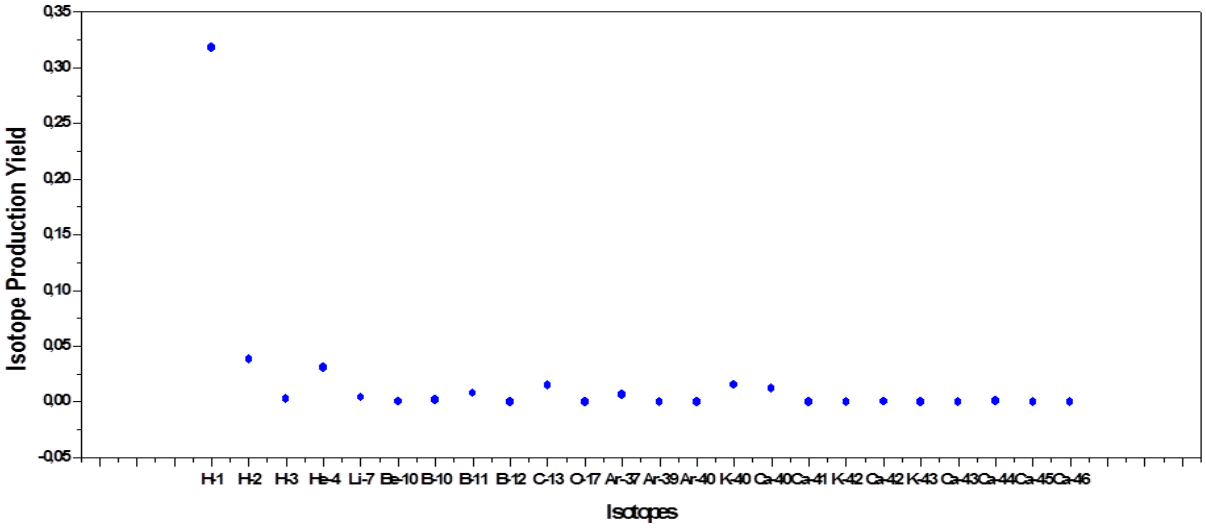

Fig3. Isotope production for mineral Vimsite

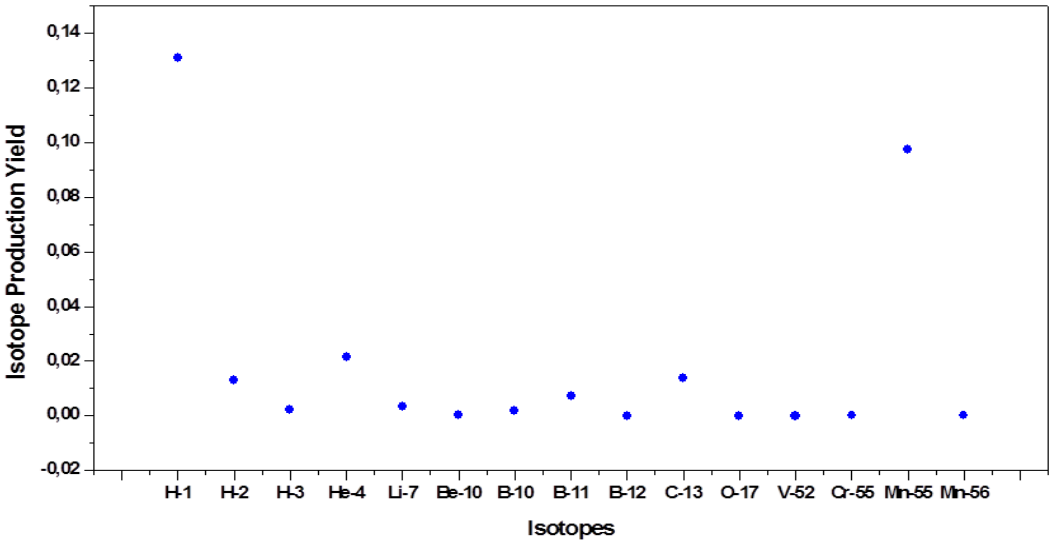

Fig4. Secondary radiation curve for mineral Vimsite

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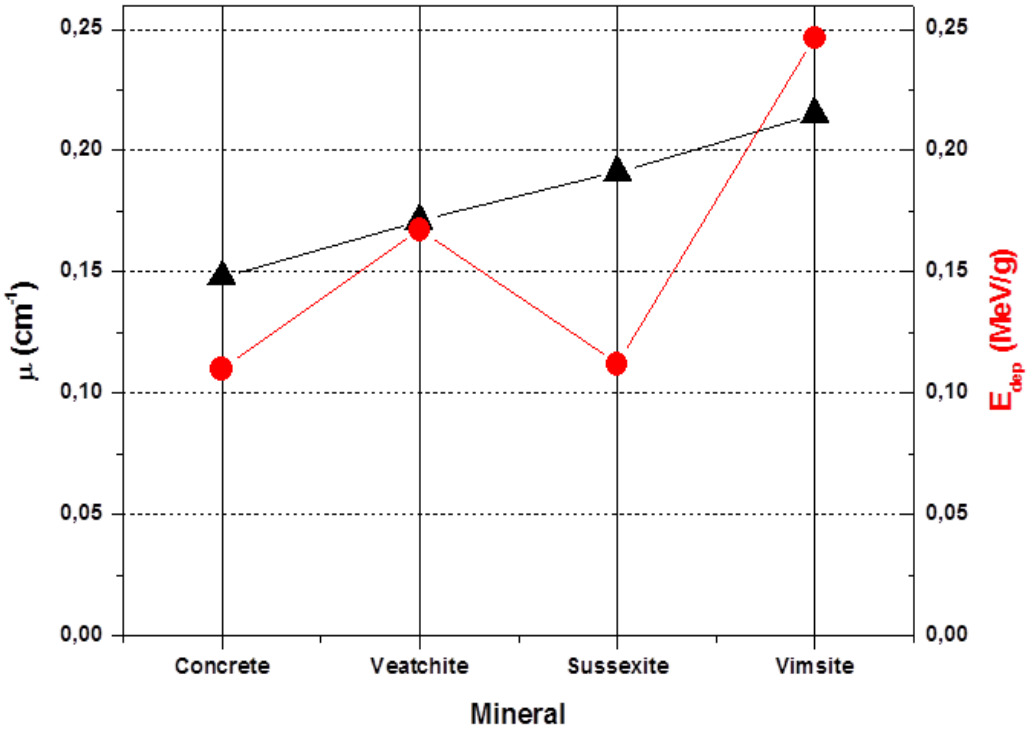

Fig5. Compared neutron absorption cross sections minerals and concrete

5 .Results and Conclusions

In our working, we have investigated fast neutron shielding properties of Vimsite , Sussexite and Veatchite samples simulation process. The results of this investigation have provided new information about the total macroscopic cross sections ,secondary radiation , neutron flow absorbed doses and deposited energies by low energy neutron interaction of fast neutrons through materials including different amounts of boron and hydrogen atoms per unit volume. Absorbed dose per primary particle(in GeV/g) by samples calculated over Fluka. Simulation results are shown Fig-5. According to these results, the highest performance among the minerals is vimsit for the neutron shielding .Interaction of three different boron-containing mineral particles and 4.5 MeV energy neutron were simulated by Monte Carlo techniques .As a result of simulation studies minerals isotope production rates for the neutron radiation, flows and secondary curves were obtained. As a result of interactions has not found radioactive isotopes. It also was not detected in the secondary radiation with high stream. Evaluation of the total macroscopic cross sections for neutron shielding minerals (μ) and the stored energy values were determined. For frequently used in studies of neutron shielding concrete were calculated of the same values.Al three minerals has been identified as a better neutron shield material than concrete.

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THE RECENT INCREASE IN THE USE OF MORNING-AFTER PILL AND THE DECREASE IN THE AGE OF THE FEMALE CONSUMERS IN IRAN

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Abstract - Morning–After Pill has been the subject of many of the recent scrutiny in the scientific world. This magic pill, which acts as an 'emergency contraception' (Del Bo, 2012), is gaining worldwide popularity due to its convenience and highly effective result orientation, but it is also raising questions regarding its functionality and social moral standing. The proponent researchers defend it claiming that it is not the same as abortion for the simple reason that it prevents implantation of the Zygote to the uterine lining thus acting prior to the actual pregnancy. The opponent scientists on the other hand, argue its gray area of ambiguity compromising sound ethical and medical traditions. Furthermore, the quick, easy, no accountability, and the effective nature of this pill overshadows the side effect, consumer education, as it does not sever as sound traditional practices ignoring such needs as awareness before consumption practices (Del Bo, 2012).

Plan B has been dubbed as a safer, more convenient, and even, at times, a better moral choice compared to abortion. This conclusion stems from the fact that medically; pregnancy does not occur until the zygote (the fertilized egg) has implanted itself to the uterine wall. Maximum efficiency and productivity of this pill dictates that the first pill of Plan B must be taken immediately right after unprotected intercourse and the second pill to be consumed within twelve hours of such sexual encounter (Abell, 2009). Therefore, if no pregnancy has occurred, the use of the Morning-After Pill does not constitute an abortion. This claim or philosophy may be ethically or morally acceptable; however, consumer's inaccessibility to information about this drug jeopardizes their health and mental wellbeing.

A structured one on one interview survey research method based on the adaptation from the Grounded Theory (Smith & Biley,1997) will be used for the purpose of data collection on the increased usage of the Morning-After Pill and female consumers' decrease in age. The demographic locations for data collection will be legal and licensed pharmacies in two major metropolitan cities in Iran, where pharmacists disperse the pills based on physician's prescription.

The alarming increase in the usage of the 'Morning-After Pill' and decrease in the age of female consumers in Iran creates an atmosphere of ethical, moral, and health crisis. The absence of organizations such as the Food & Drug Administration (FDA) or any other pharmaceutical regulatory agencies in countries like Iran makes consumers much more vulnerable to ignorance and lack of knowledge thus leading to uninformed decision making. This paper aims to reflect the concerns discussed above; however, it does not aim to take sides on whether the Morning-After Pill should be banned.
Keywords: Morning after pill**,** plan B, contraceptive, abortion

The purpose of this study was to investigate the recent increase in the consumption of Morning After Pill (Also known as Plan B) and the decrease in the age of the female consumers in two major cities in Iran. Plan B or "The Morning-after Pill" is an emergency contraceptive used by females as a secondary option to prevent pregnancy. The process is that after a woman has had unprotected sex or if the primary birth control has failed, plan B is to be administered. "The Morning-after Pill" is not intended to be used as birth control, as it is emphasized by its literature it is to be consumed as an emergency or back up plan only. Plan B (One-Step type) is available over-the-counter without a prescription (mayoclinic.org). Morning–After Pill (Plan B) has been the subject of some recent scrutiny in the scientific world. This magic pill, which acts as an 'Emergency Contraception' is gaining worldwide popularity due to its convenience and highly effective result orientation, but it is also raising

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questions regarding its functionality and social-moral standing. The proponent researchers defend it claiming that it is not the same as abortion for the simple reason that it prevents implantation of the zygote to the uterine lining thus acting prior to the actual pregnancy (Abel, 2009). The opponent scientists on the other hand, argue its gray area of ambiguity compromising sound ethical and medical traditions. Furthermore, the quick, easy, no accountability, and the effective nature of this pill overshadows the side effects and consumer education. This does not sound as traditional as some scientists would like it to be, where consumers' need to know is compromised (Del Bo, 2012).

Plan B is also marked as a safer, more convenient, and even, at times, a better moral choice compared to abortion. This conclusion stems from the fact that medically; pregnancy does not occur until the zygote (the fertilized egg) has implanted itself to the uterine wall. Maximum efficiency and productivity of this pill dictates that the first pill of Plan B must be taken immediately right after unprotected intercourse and the second pill to be consumed within twelve hours of such sexual encounter (Abell, 2009). Therefore, if no pregnancy has occurred, the use of the Morning-After Pill does not constitute an abortion. This claim or philosophy may be ethically or morally acceptable to some scientists; however, consumer's inaccessibility to information about this drug jeopardizes their health and mental wellbeing.

RESEARCH METHODOLOGY

Methodology **–** This particular research was conducted based on a qualitative type of study. For the purpose of collecting data on the increased usage of the "Morning-After Pill" in young female consumers in Iran, the methodology used was "Grounded Theory" (Smith & Biley,1997). In that fashion, theoretical constructs were induced from data sources gathered in two metropolitan cities in Iran: Tehran and Shiraz as they symbolize the modern living and social modernity. The demographic locations for data collection were legal and licensed neighborhood pharmacies, where pharmacists disperse the pills without physicians' prescription or any enforced regulations. The pre-study interview and the self-report questionnaire were designed for the purpose of extracting information in the areas of consumer's age, gender, repetition, consultation, and other pertinent data to help with the research findings. Further details on the data collection may be found in the data collection section of this paper.

Sample Population **–** The researchers sample population were licensed pharmacist in mid to high socioeconomic neighborhoods located in urban metropolitan areas, where traffic for such activities of birth control purchase or morning after pill could be expected. These pharmacists were first scouted, had a pre-test interview for potentiality of being a good sample, and had a confidentiality/consent form signed to be part of this study. Among these pharmacists in such neighborhood, 25 pharmacies were chosen based on the fact that per preliminary interviews they had accepted to participate in this research studies. Out of 25 pharmacists, who participated in this study 10 were chosen in Shiraz and 15 from Tehran, the capital city of Iran. Several of the pharmacists had requested to be paid a consultation fee for their time spent, and as part of the research grant they were compensated.

Data Collection **–** Data collection was based on combining a one-on-one interview with a questionnaire style information gathering method. In total, there were 14 questions, which nine were designed based on Likert scale, four formatted on open ended structure, and one requiring a Yes/No response. The type of questions asked were designed to extract information regarding the following subjects:

- Increase in sales of the pills
- Sale and the method of purchase
- Age of consumer
- Gender of consumer
- Trend of consumption in the past three decades
- Whether a prescription is necessary or not
- The presence of consultation before and after the purchase

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After questionnaires and one-on-one interviews were conducted, the researchers carefully examined the data for possible errors or other types of mistakes. All but one pharmacist had answered the questionnaires impeccably and with great detail.

LITERATURE REVIEW

The type of hormones used in the Morning-After Pill, particularly Plan B is levonorgestrel, which is progestin and does not contain estrogen. Other morning-after pill may contain both progestin and estrogen (Duramed Corp. @ www.go2planb.com). These type of hormones have been found in birth control pills for a long time and are not necessarily harmful if taken as instructed. The mechanism in which Plan B works is that the pill interferes with the natural processes of a female's ovulation by either delaying or preventing it; therefore, it does not appear to cause abortion (Abel, 2009). Although, there are side effects connected to morning-after pill that include nausea, headache, abdominal pain, vomiting, and dizziness that could last up to 24 hours.

According to Plan B website, there are approximately 2.7 million unplanned pregnancies each year in the United States, which 54 percent of them end in abortion ("When things don't,"2008). Plan B and pills of the same nature claim to help prevent an abortion; although, the main goal is not to get pregnant at all whether by avoiding sexual encounters, using a bright control, or resorting to emergency pills by preventing the conception to take place (as "Plan-B" claims) to accomplish this task.

The above argument stems from the fact that Plan-B pill if taken no later than 72 hours after an intercourse, acts as a barrier to conception, which means it will prevent the zygote (fertilized egg) from implanting to the uterus, thus no abortion has occurred. Scientifically speaking, the pill acts before the embryonic stage occurs, which absolves the responsibility of being an abortion facilitator. On the other hand, the conscientious and philosophical argument begs to differ on the debate that life starts at conception, so does the pill interfere with the natural process of a Zygote on its way to implantation? This viewpoint dubs the process of intercepting the zygote as unethical and immoral.

These questions and many more are raised by moral watch dogs that Plan-B is intervention in the post-fertilization process, thus offering this pill over the counter and as an easy way out may be immoral and unconsciousness. In that case, what is the moral responsibility of the pharmacist and does he or she have a right to conscientiously object to selling it? In that case, a more moral and conscious scientist would act on a zero probability that Plan-B is harmful to both the female and the natural process of fertilization (Del Bo, 2012).

RESULTS and FINDINGS

The result of the study reflected that consumption as reported by Pharmacies on the number of pills per year are as follows:

- 3 Pharmacies Reported Above 3000 Pills Per Year
- 11 Pharmacies Reported 2000-3000 Pills Per Year
- 10 Pharmacies Reported Under 2000 Pills Per Year
- 1 Pharmacy Reported Under 1000 Pills Per Year

The data above shows that approximately 50% of the pharmacies participating in the study report a consumption of over 2000 pills a year. It only takes one pill for "Plan B" to work, which leads to the conclusion that there are either repeat costumers or each customer uses more than one pill per year. In addition, 12 pharmacies reported the consumers are repeat and only 2 pharmacist reported consultation is offered, which means 48% of customers are repetitive. Furthermore, 76% of pharmacies reported an increase in the consumption from last decade, but all agreed there was a trend in the use and consumption of the younger age consumer. Interestingly, several of the pharmacist reported there are as many male customers as females.

Specific Results – The reported data above, certainly reflects that there has been a clear increase in the demand for the emergency pill as the age of the consumer has decreased. This certainly reiterates the hypothesis that there is a correlation between the increased use of Morning-After Pill and the decrease in the age of the female consumers in Iran. The study results in endorsing the hypothesis and reinstating the fact that demand for emergency pill has gone up as the consumer age has declined.

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Unanticipated Results – The surprising element in the data collection was the fact that there has been an increase in the number of males, who purchase the pill. There may be reasons to why a male consumer would purchase the pill instead of the female pertaining to cultural taboos, embarrassment, shyness, or other reasons not disclosed. This area would be an interesting topic to further investigate for the fact that perhaps the female consumer has some moral or philosophical issues with being seen purchasing the emergency pill. If this is indeed true, then Del Bo (2012) may very well have a valid argument regarding the morality and philosophy of such consumption and the role of the pharmacist in this dilemma.

Significant Findings – All pharmacists except for one unanimously agreed that there has been an increase in the usage of the pill in the past several decade and this escalation has been steady. Two pharmacists did not answer this question; however, in their previous questions related to the consumption they had indicated an increase in the trend. The unanimous agreement makes a strong point in the increase in consumption. In responding to the open ended questions, in general the pharmacist agreed that it would be useful for consumers to receive an education on the use of Morning-After Pill.

DISCUSSION AND RECOMMENDATIONS

The alarming increase in the usage of the 'Morning-After Pill' and the decrease in the age of female consumers in Iran creates an atmosphere of ethical, moral, and health crisis.
The absence of organizations such as the Food & Drug Administration (FDA) or any other pharmaceutical regulatory agencies in countries like Iran makes consumers much more vulnerable to ignorance and lack of knowledge thus leading to uninformed decision making. This research reflects some of the concerns discussed above; however, it does not aim to take sides on whether the "Morning-After Pill" should be banned in such countries. Objectively, the research study aims to bring awareness to the lack of regulations, consumers' opportunity for education, lack of access to proper literature, and governmental proper policies in such countries as Iran. Although, it is noteworthy to mention this is not unique to Iran, as previous literature has shown that this type of problems is prevalent in other parts of the world as well.

The other prominent problem found through this research study is the fact that pharmacist do not offer consultation to consumers neither before nor after purchase. Furthermore, consumers do not ask for literature, consultation, advisement, or any other type of informational guidance. As cited in many of the websites, where the morning after pill is sold, the side effects may include bleeding, uterine complications, hormonal difficulties, and irregular menstrual period. At any rate, any of these side effect could have a life long impact on the female consumer's health, well being, and future re-productive attempts. These serious side effects combined with rapid decrease in the age of consumer makes for an undesirable and lethal combination. The researchers of this study certainly would like to urge for more studies on the consumer behavior and lack of education offered by the medical field particularly in less advanced societies. The final conclusion is that there is a dire need for global and worldwide education on drug uses, consumerism, regulations, and drug safety.

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THE REFLECTION OF URBAN POVERTY ON CHILD POVERTY

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Abstract: The most active and vulnerable subjects of the problems and challenges in urban areas are children. Urban areas impact child development negatively. In various studies conducted, it has been proven that child development and behaviour formation are determined by the spaces interacted with rather than the intelligence and character. Therefore, the environment with which the child interacts plays a crucial role in child development and growing to be healthy individuals. This study aims to identify the negative impacts of shortcomings in the planning of spaces and the lack of psycho-social support in this processes as well as the negative impacts of urban poverty on children based on the interaction between children and urban areas in order to ensure high benefit of children. This study has been prepared within the scope of literature review. As the result of literature review conducted, it has been identified that the risk of facing poverty and being affected by poverty is higher among children compared to adults. Furthermore, it is stated that poverty experienced during childhood could often be the indicator of poverty to be experienced during adulthood, as well.

Keywords: Urban Poverty, Child Poverty, Urbanization, Child Welfare

Introduction

The phenomenon of urbanization which emerged after industrialization depending on migration from rural to urban, has led to reveal urban poverty as a multidimensional concept. globalization that came in view with urbanization, has extended the sphere of influence of poverty. The globalization, the neoliberal policies and privatization emerged with urbanization has extended the syphere of influences. It, also has spread and increased urban poverty.

Problems such as social and economic inequalities, structural problems, inadequate urban policies, lack of sanitation, low education levels, unemployment, deficiencies of housing and social integration are among the most important causes of urban poverty. Urban poverty is also the source of many social problems as inability to adapt to the urban areas in terms of social, cultural, economic and psychological aspects, squatting, dysfunction of urban transformation and urban design process, the growth of the informal sector, the increase in crime rates, increase in domestic and communal violence, the inability to prevent the street working children and child labor. The children.are the most active and the most defenseless subject of urban space difficulties and problems. The aim of this study is reveal the negative effects of urban poverty on children. This study was prepared within the literature research. As a result of the literature research, it is reported that the risk of encountering poverty and its negative effects is higher for children than adults.. Moreover, it is stated that the poverty in the period of childhood, may be a heraldist of poverty in adulthood.

Urban poverty-stricken children become improvished in terms of biopsychosocial aspects. Poverty and impossibleness, which caused by urbanization process, can prevent access to the most basic services such as education, nutrition, health. A lot of problems, which resulted from reflections of urban poverty on child poverty, such as opportunities of inequality, social exclusion, social injustice, security-deprived neighborhoods, the differences between living conditions, can cause deprivation, developmental disorders and permanent damage in children's inner world in many aspects. According to result of child welfare researchs, all of this problems have led to serious violation of right because of countries that accepted convention on the rights of the child and have the child protection system.

Literature Review

1. Poverty

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Poverty is an old but recently discovered social problem description of which changes depending on the period. Zastrow (1991) identifies two approaches to describe poverty.

The first one is *absolute poverty (in a narrow or traditional sense)* which is described as failure to meet vital needs (such as eating, drinking, clothing and sheltering that will prevent death and enable survival) required to live and to support yourself and your family due to lack of money. The UN Criteria describe absolute poverty threshold as Access to Food, Sheltering, Clean Drinking Water, Hygiene, Health, Education, Information and Services ensuring the continuation of human life while the World Bank describes it as daily intake of minimum 2400 calories.

The second suggested concept is *relative (in a broader sense) poverty*. This concept, in addition to the basic needs stated above, refers to the state of failure to reach to the traditional living standards of the society and lagging behind. This situation reflects the failure to reach the lowest living standard. It only appears when individuals compare their living standards with another's.

Brody (1970), on the other hand, divided poor people into three categories including upper class, middle class and lower class.
In this classification, *upper class* represents poor individuals who do not necessarily have low level of income and whose current income amount equals to the special needs; *middle class* represents poor individuals who have low level of income and who are below the minimum living standard (generally large families); and *lower class* represents poor/ (Poor Poor) individuals who survive with social assistance payments.

Two important concepts related to poverty are income poverty and human poverty. Income poverty is described as the state of failure to achieve sufficient income level in terms of meeting required basic needs of the individual or household in order to survive or meet the minimum living standard. Human poverty, on the other hand, is handled as a concept including absolute and relative poverty descriptions and having a more comprehensive meaning. This concept, accepted by the United Nations, emphasizes the requirement of having financial, political, social and cultural opportunities to meet basic needs in addition to the monetary opportunities with the aim of ensuring human development and living a humane life. As a result of this approach, poverty appears to be a multi-dimensional concept. Human poverty is defined as the situation with lack of education opportunities, malnutrition, short lifespan, lack of employment opportunities, insufficient mother and child health, fear of future, catching preventable diseases, lack of freedom and lack of basic human competencies such as power (Kaya, 2011:37-38).

Amartya Sen, who provides one of the most important conceptualizations regarding poverty, explains that it is possible to handle poverty with both absolute and relative poverty approaches. While economic development defines and measures development through national income increase per capita based on the level of income and consumption, *"human development approach"*, which does not deem an income-oriented development understanding appropriate, places people in the centre of development emphasizing the expansion of all economic, cultural, political and social preferences and options of individuals. In this approach, while increase in the income levels of individuals is accepted as an important factor and a prerequisite for development, it is stated that improvement in the income level is insufficient solely to measure actual welfare, and increase in the health services, education and social safety, etc. directly contributes to the life quality and increasing this quality (Sen, 2004: 202). *Capacity approach* creates a multi-dimensional perspective for human welfare. Rather than concentrating on people's income levels and expenditures, this approach concerns about the question "what is equality" included in political philosophy by focusing on "what people can" and "what they can be" in an effective way. (Nussbaum, 2005; Robeyns, 2005).

Poverty concept is directly related to the unmet needs of individuals or children. Each unfulfilled need constitutes a poverty component. According to Barker, poverty represents the elements desired to be obtained in terms of physical, spiritual and social aspects in order for individuals to continue their lives, maintain their good positions and fulfil their tasks (2003: 56). Deficiencies regarding physical, psychological, economic, cultural and social elements required by individuals to maintain their lives and good positions and to function properly constitute their problems. Therefore, problems are defined by needs.

Poverty problem is faced especially by the elderly, disabled, women and children both in developed and developing countries.

Another important issue is the way of measuring poverty. There is not a standard approach to identify and describe

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poverty. Discussions on poverty are generally conducted through the measurement of national and international comparisons by benefiting from the reasons of poverty. When poverty are measured in terms of monetary aspect, income increasing policies are considered as solutions. International organizations, on the other hand, handle poverty in a multi-dimensional way especially based on the United Nations human rights (Vandemootele, 2000).

2. Urban Poverty

Urban areas, beyond a physical concept, are the places ensuring shelter, psycho-social interaction and development (such as socialization, playing, gaining self-confidence and feeling safe) while contributing to social interaction and development.

Urbanization phenomenon emerging depending on the migration from rural to urban areas after industrialization caused the appearance of urban poverty which is a multi-dimensional concept.

According to the World Bank, Urban Poverty is described as "limited access to employment opportunities and income, insufficient and unsafe sheltering and services, violence, unhealthy environment, limited or lack of social protection mechanisms and limited access to education and health services". (Zülfikar, 2010:11).

Eight different factors impacting urban poverty are defined as follows (Dinçoflaz, 2009:34-35):

- Insufficient income,
- Insufficient and unstable resource availability,
- Insufficient sheltering,
- Insufficiency of public infrastructure services,
- Deprivation of social safety,
- Failure to sufficiently protect poor people in the functioning of legal system,
- Ineffectiveness and weaknesses of poor people in decision-making processes,
- Silence of poor people.

Alternate poverty (poverty-alternately) is another poverty concept closely related to urban poverty. Alternate poverty (poverty-alternately) represents the increase in wealth and welfare levels of certain groups over others as a result of citizenship and unequal power relations among poor people living in urban areas (Kocatepe, 2011:28). In alternate poverty, poverty is handled within a process on the basis of social relations. According to this concept, poor individuals using right sources and channels transfer their poverty to other poor newcomers. In this approach, poor individuals living in the urban areas rent out or sell the lands they occupied to the poor people recently migrating to the urban areas and therefore, they get rid of poverty and transfer their poverty to the newcomers in time (Işık and Pınarcıoğlu, 2009: 79).

Urban poverty may cause many problems such as irregular urbanization, unplanned growth, triggering socio-economic impossibilities, failure to achieve healthy living conditions, deprivation of public services, exposure to urban safety problems and to the risks in the urban breakdown areas (such as negligence-abuse-drug addiction-violence-being forced to commit crime) and many other impossibilities.

3. Needs of Children and Child Poverty in Urban Sense

It is possible to define children, whose physiological, psychological, cognitive, social and cultural needs cannot be met, who cannot obtain rights defined within the scope of the UN Convention on the Rights of the Child (such as living, participation, protection and development) and fall behind the welfare system, as *Poor Children (child poverty).* Poverty is experienced both in developed and developing countries. Therefore, international organizations such as the World Bank and the United Nations carried out various researches on this issue. When poverty is analysed in more detail, it is observed that it manifests the biggest and the most important impacts on children. Child development is prevented by poverty. Those who experience poverty during childhood are under a higher risk of facing poverty in the future, as well. Due to the vicious cycle emerging at this point, poverty is transferred to the upcoming generations (Durgun, 2011).

Poverty and deprivation concepts in the children's lives cause failure to meet needs of the child. While reviewing the literature, Maslow's (1954) hierarchy of needs model regarding human needs, Max-Neff's (1991) human scale

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development, Peet and Bossel's (2000) ethics-based system model regarding basic needs as well as models for gender needs appear prominent in the proper identification of children's needs. Being aware of children's needs is important in terms of designing and identifying the features of an urban space in line with the development processes of children. In accordance with the United Nations Convention on the Rights of the Child, each child has 4 basic needs and rights, namely "living, participation, protection and development". Each child needs feeding, sleeping, moving and to be protected in order to develop as of the moment they were born. In addition, children have basic spiritual needs such as loving, to be loved, to be looked after, feeling successful and sufficient and gaining freedom like other individuals (Uçar, 2013, p. 15). Researchers such as Piaget, Montessori and Werner emphasize in their studies that interaction of children with the environment constitutes the basis of development, and the environment includes measurable physical components on cognitive-perceptual development. Considering that children use observation, exploration, trial and error methods while learning, it is a widely accepted truth that they need a physical environment with various resources (Kirazoğlu, 2012, p. 16).

4. Relation between the Child and City/Space

Spaces hosting daily life, especially the housing areas, do not serve only as shelters but also as natural stages where social interactions and relations are experienced. Differences between the living spaces identify the life quality in terms of accessibility or inaccessibility to public services. Repetition of opportunities and lack of opportunities in the spaces and their results bear important consequences for children living there (Erder,2002:26-30; Ümit,2007:103) Impacts of the spaces on the structure and functioning of society and on children cannot be underestimated. Experiences, emotions, hopes and concerns of children are shaped through spaces (Philo, 2000). As we cannot think children apart from their social relations, it is also not possible to think them apart from the spaces where these relations are shaped (Sibley, 1995). Therefore, the relation of children with the spaces refers to their socialization area beyond a physical space where they establish social relationships and gain social experiences (Moss and Petrie, 2002).

Physical environment and urban spaces (particularly open areas) that children interact with play an important role in child development and growing to be healthy individuals (Zomervrucht, 2005). Physical environment of children includes various active open areas and spaces such as the sheltering area and its surroundings, school and playgrounds in parallel to their physical, perceptive, emotional and social development. These spaces mainly shape children's both social and private lives. However, urban spaces pose dangers for children as a result of decrease in open areas and increase in traffic density and safety problems due to disordered housing caused by rapid and unplanned urbanization. Due to these dangers, children are deprived of open areas and streets where they freely move and develop. This spatial deprivation negatively impacts the development process, personality formation, behaviours, attitudes and reactions of children. Improving life quality of children, whose social, cultural and perceptive development is negatively affected by the reflection of problems caused by urbanization to the spaces, is of crucial importance for the future of the society (Al-Khalaileh, 2004; Tandoğan, 2014: 19-20).

Needs of an adult have an hierarchical structure. Human needs are ranked in the order of importance as biological needs, safety, sense of belonging, bonding, prestige, self-actualization (improving skills) and intellectual, emotional and aesthetic needs (Maslow, 1968). Apart from adult needs, one of the basic vital needs of children is playing. Playing contributes to children's physical development, socialization, perception of life, personality formation and transfer of the culture to the next generations (Çukur, 2009).

For children feeling the challenges of living in urban spaces the most, it is quite important to build child-oriented structures and conduct policies, implementations and designs in urban planning in line with children's needs. Therefore, child-friendly city concept is frequently emphasized and relevant activities are conducted with the aim of making urban spaces more habitable for children. *Child-friendly city* refers to a space with qualities contributing to the physical, psychological and social development of children so that they would become self-valuing individuals in the future. In physical terms, urban spaces should arouse positive feelings among children, provide opportunities for game activities, make them feel safe and an equal part of the society along with other individuals through the behaviours of adults (Churchman, 2003). Furthermore, child-friendly city aims to ensure that "children citizens" are active in the decision-making processes regarding the urban areas they live in; are able to express their desires and thoughts about the urban area; participate in family, society and social life; meet their basic needs such as health, education and sheltering; benefit from healthy water and health services at the maximum level; are protected against abuse, exploitation and violence; walk on the streets safely; meet and play with their friends; have green areas with animals and plants; live in a clean environment; participate in cultural and social activities; and have access to all services regardless of their race, religion, income, gender and disabilities (Unicef, 2004: 1)).

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Conclusion and Discussion

The most active and vulnerable subjects of the problems and challenges in urban areas are children. Urban breakdown areas in the centres or periphery of urban areas, which do not have healthy living conditions and public services and where urban safety problems and poverty reach dangerous levels, may cause developmental disorders and damages in the inner worlds of children in many aspects. These problems caused by urban insufficiency can also be reflected in children's lives by transforming into serious problems such as negligence, abuse, violence, being forced to commit crime, exclusion, othering and impossibilities, and these can cause irreversible severe traumas. As a result of these, children may create insecure bonds with the environment and society; feel hatred, grudge and anger; and many other behavioural disorders such as aggression, stress, loneliness and introversion may arise, and their tendency to fight/conflict may increase. Furthermore, they may be forced to be engaged in illegal affairs and commit crime in order to eliminate social and spatial inequalities they experience in their own way, to fight poverty and to survive.

Realizing required arrangements and practices to make children's living environment more *"child-friendly";* in other words " informative, guiding and advocate " is important in terms of creating spaces that can answer the needs and desires of children. The social and spatial arrangements should be made to get the most basic rights, social integration and healthy development to children. Moreover, while studies about the urban policies and child welfare including the all children are ongoing, safe environment should be provided on every child , based on 'participation, protection, development and survival rights', focusing on the 'social justice and equal opportunities' as stated by United Nations Convention on the Rights of the Child (UNCRC).

Urban areas should provide physical spaces supporting social interaction, equal opportunities, accessibility, self-esteem and cultural identity where children can meet their basic needs such as social justice, equality, sheltering, education, health and playing in accordance with the UN Convention on the Rights of the Child. Besides, children's needs, expectations and desires should be met, and they should be provided with safe environments in the developmental periods. Institutions and civil society organizations responsible for urban safety, urban policies and welfare of children have to carry out comprehensive legislation, policy and planning activities based on social justice, equality, participation of children, children's rights and human rights. Furthermore, it is required to include scientists, academicians, local governments, trade associations, employers and social politicians in these activities to carry out inter-disciplinary professional team works handling children along with their needs using an integrated approach.

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THE RELATIONSHIP BETWEEN CHILD AND URBAN SAFETY: CHILD-FRIENDLY SAFE CITIES

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Abstract: The main concern of this study is urban areas open to risks despite the child's need for a safe and healthy environment in the childhood, lack of urban safety in the streets which are the socialization area and playground of the child and failure to develop child-friendly urban policies that can solve this safety problem. The aim of the study, on the other hand, is to identify the lack of safety for children using urban areas full of dangers during their developmental period, their needs of protection, failure of urban areas to provide safe environment for children and the shortcomings of child welfare system in this regard. This study handles current academic publications, current news and data from the international non-governmental organizations through children's rights and child-friendly perspective within the scope of literature review.

Anahtar Kelimeler: Child-Friendly Cities, Urban Safety, Child Welfare,

Introduction

In the scope of the Convention on the Rights of the Child and the Child Protection Law, it is an obligation to protect each child within the borders of Turkey against all risks, support their developmental processes, ensure child welfare under the modern childhood paradigm beyond the basic needs and provide safe living environment on the basis of rights-based approach and social justice approach. Despite these obligations in the legal legislation, policy processes and on paper, it is known that the situation is not quite like this in practice and on the contrary, the majority of children are facing serious problems such as poverty, abuse, drug addiction and violence, and that urban areas trigger these problems.

Literature Review

1. About Childhood

1.1. Childhood Concept and Modern Childhood Paradigm

In accordance with Article 1 of the Convention on the Rights of the Child, a child is described as; "For the purposes of the present Convention, a child means every human being below the age of eighteen years unless under the law applicable to the child, majority is attained earlier." Although the age of majority varies depending on the country, each person under the age of 18 is generally considered a child. Children are individuals; they have equal status with adults as a part of humankind. They are not the property of parents and the government. Healthy development and active participation of children are quite important for the future of all cities or communities. Children start the life as fully dependent individuals; however, they grow and develop with the assistance of adults to gain independence. They do not have only physical needs but also cognitive, emotional, social, psychological and physiological needs. Their dependence and developmental situations make them more sensitive, and therefore;

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they are affected more by the environmental conditions, poverty, insufficient sheltering, environmental pollution and other negative conditions compared to adults (UNICEF Innocenti Research Centre, 2004, p. 5).

According to Uçar (2013), prevailing child paradigm of the 20th century is based on three basic assumptions:

a. Children are different from adults; or children constitute a special biological category.
b. Children need to be prepared -raised- for adulthood or adulthood is an acquisition.
c. Child raising responsibility belongs to adults or the government (Uçar, 2013,p. 36).

1.2. Children's Rights

Turkey put the UN Convention on the Rights of the Child (CRC), which grants rights to "each child" without distinction of any kind, such as race, colour, sex, language, political, national, ethnic or social origin, property, disability, birth or other status, into effect in 1994. Protection of children against discrimination, ensuring their participation and looking after high benefit of children are under the responsibility of the Government. There as 4 fundamental rights including "*living, participation, protection and development*" that should be granted to children.

The UN Convention on the Rights of the Child ensured quite significant developments such as

- setting the ground for the preparation of Child Protection Law,
- meeting the needs of children, supporting their socialization, ensuring the improvement of their skills, recognizing and valuing their rights, preventing violation of their rights, strengthening their capacities, protecting children against dangers/risks and supporting their bio-psycho-social development.

1.3. Children's Needs

Being aware of children's rights is important in terms of designing and identifying the features of a child-friendly urban space.

Each child needs feeding, sleeping, moving and to be protected in order to develop as of the moment they were born. In addition, children have basic spiritual needs such as loving, to be loved, to be looked after, feeling successful and sufficient and gaining freedom like other individuals (Uçar, 2013, p.15). During their development, children have certain needs such as dependency, socialization and obtaining information regarding their environment (1st Istanbul Child Congress, Istanbul Child Report, 2000, p. 65).

Researchers such as Piaget, Montessori and Werner emphasize in their studies that interaction of children with the environment constitutes the basis of development, and the environment includes measurable physical components on cognitive-perceptual development. Considering that children use observation, exploration, trial and error methods while learning, it is a widely accepted truth that they need a physical environment with various resources (Kirazoğlu, 2012, p. 16).

Furthermore, while reviewing the literature to analyse the needs of children, it is observed that Maslow's (1954) hierarchy of needs model, Max-Neff's (1991) human scale development, Peet and Bossel's (2000) ethics-based system model regarding basic needs as well as conceptualizations for gender needs are of crucial importance.

2. Child-Friendly Urban Design

2.1. Relation between the Child and Space

Child-friendly environment concept does not only refer to the natural environment or constructed environment but also to the physical, psychological, economic, political and cultural environment. These environmental criteria determine the outline of children's lives based on physical, psychosocial, cultural, economic and even political existence. On the other hand, they are based on human rights and democracy to a certain extent (Horelli, 2007, quoted by Tandoğan, 2011).

Spaces hosting daily life and particularly housing areas do not only serve as shelters but they also determine the life quality in terms of differences between spaces people live in and accessibility or inaccessibility to public services.

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Repetition of opportunities and lack of opportunities in the spaces and their results bear important consequences for children living there (Erder, 2002:26-30; Ümit,2007:103). Physical environment and urban spaces (particularly open areas) that children interact with play an important role in child development and growing to be healthy individuals (Zomervrucht, 2005). Experiences, emotions, hopes and concerns of children are shaped through spaces (Philo, 2000). Relation of children with the spaces refers to their socialization area beyond a physical space where they establish social relationships and gain social experiences (Moss and Petrie,2002).

2.2. Child-Friendly City

All people, social interactions, economic, political and social structures determining the wellbeing of children are experienced in certain spaces. Well-being of children is limited with the spaces they are interacting with. Children's living areas and neighbourhoods represent a space where they establish social relationship networks and experience cultural interaction beyond just a physical environment they reside in. Therefore, physical and social features of the residence have a determining role in the wellbeing of children (Semerci et al., 2012).

Children need areas where they can gain and reflect their unique experiences in the urban spaces. Existence of children in urban spaces is an inevitable element in creating healthy, lively and happy urban spaces as well as it is a requirement for their physical and mental development (Aitken, 2001). In other words, child-friendly urban area is a space supporting physical and social development of children so that they would become adults looking after their urban spaces in the future. In physical terms; children should like and feel safe in the urban spaces and in symbolic terms; urban design, planning and behaviours of adults should convey the message that children are an equal part of the society along with other individuals (Churchman, 2003, quoted by Kirazoğlu, 2012, p. 59).

Kytta (2003) developed a model with two fundamental criteria to identify whether a space is child-friendly. These criteria are free movement of children and meeting their desires, needs and expectations. Nordström (2010) identified that children rather conceptualize child-friendly city concept in these 3 aspects: “safety and security”, “urban and environmental qualities” and “basic services such as health and education”. (quoted by Severcan, 2015, p. 146,149).

Haikkola and Horelli (2002) determined 10 aspects of child-friendly urban spaces in their study through the eyes of children:

1) Housing and sheltering
2) Basic services such as health, education and transportation
3) Participation
4) Safety and security
5) Family, relative, friend and neighbour circle
6) Urban and environmental qualities
7) Existence and distribution of resources
8) Ecology
9) Sense of belonging and continuity
10) Good governance (quoted by Severcan, 2015, p. 145-146

Child friendly city foresees a good administrative system looking after children's rights and is obliged to realize organizations and activities required to ensure active participation of children in the city management and decision-making mechanism through all service units in the province, to evaluate all relevant decisions through the perspective of children's rights and to grant the right of equal access to all basic services (Çocuk Dostu Şehir Projesi Uygulama Yönergesi, 2006:2). Child-friendly city refers to a city where voices, needs, priorities and rights of children become an indispensable part of public policies and implementations. Actually, it is possible to consider such a city also as a human-friendly city. (Korkmaz, 2006, quoted by Topsümer, 2009, p. 9).

Furthermore, the most important issue in the relation between child and city is games. Urban outdoor areas such as playgrounds play a crucial role in the physical, perceptive and mental development of children. When there are even common parking lots of buildings, there should certainly be common playgrounds and recreation areas allocated for children. Children's desires should be listened and their opinions should be taken into consideration while making decisions affecting them. If children would not be aware of the results and impacts of their opinions, then their participation in urban design would not be realistic and meaningful.

However, urban spaces pose dangers for children as a result of decrease in open areas and increase in traffic

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density and safety problems due to disordered housing caused by rapid and unplanned urbanization. Due to these dangers, children are deprived of open areas and streets where they freely move and develop. This spatial deprivation negatively impacts the development process, personality formation, behaviours, attitudes and reactions of children.

2.3. Child-Friendly Street

Child-friendly cities should include child-friendly streets. Streets are one of the public spaces used by children the most. Therefore, child-friendly streets should be organized to be able to think about a child-friendly city. Streets are the social centres of towns and cities, meeting points for protests, stages of oppression and places where children acquire their very first knowledge about the world and neighbours meet each other (Appleyard, 1981, p. 1). Streets are common living spaces. Social behaviours are formed in outdoor spaces more than indoor spaces. In outdoor spaces, individuals have the opportunity to feel that they belong to a certain community; streets, squares and arranged spaces serve also as communication areas (Bal, 2005, p. 3).

3. Child, Safety and Urban Safety

"Safety" criterion formed using (Kiss 2.0) is handled in two parts as social safety and traffic safety. *Social Safety:* Social safety can be ensured with the existence of people on the streets or with the direct view of streets from houses. In this way, children would feel safe. Jacobs (1993) underlined the relation between the number of people using streets and social safety as follows: A properly used street is a safe street. An empty street is generally unsafe." (Jacobs, 1993, p. 54).

Regarding “urban safety”, there are two different aspects to be taken into consideration. First of all, urban safety concept recalls safety need arisen during the urbanization process and the relevant strategies developed. Looking through this perspective, urban safety, first of all, includes an urban safety perception different from the rural one and relevant services (Kosiak 2003: 7). "Safe city" concept has always been considered as an indicator of civilization, and "urban rights" were born with the improvement of human rights in modern times. Safe cities can be seen as spaces where crimes are actively fought, offenders cannot take shelter, opportunities for committing crime are not provided, unplanned housing does not exist, people show determination and will to reach to the level of contemporary civilizations and feel happy, meet their needs and have high living standards (Derdiman, 2014: 273).

Regarding these points, safety engineering should focus on the issues related to ensuring the highest possible protection of each space, either open or closed, against crimes, implementing procedures and measures to minimize the possibility of committing crime in line with safe architectural designs and then, warranting a structure or habitation approval/license (Derdiman, 2013: 47, 48). On the condition that it is safe, allowing children to go to the grocery store or spend time on the streets increases their self-esteem and sense of belonging while ensuring socialization with their peers and inhabitants of the neighbourhood.

In addition, trust rather than safety concept should be placed in the centre in cities, and trust-building policies should be aimed rather than safety policies.

Conclusion and Discussion

As a result of the literature review conducted, it was identified that safety level of urban areas is insufficient, they pose many risks and children suffer from urban safety deprivation the most in the society.

For children feeling the challenges of living in urban spaces the most, it is quite important to build child-oriented structures and conduct policies, implementations and designs in urban planning in line with children's needs. Therefore, child-friendly city concept is frequently emphasized and relevant activities are conducted with the aim of making urban spaces more habitable for children. Realizing required arrangements and practices to make children's living environment more "*child-friendly*"; in other words " *informative, guiding and advocate* " is important in terms of creating spaces that can answer the needs and desires of children.

A child-friendly city refers to an urban area or local government system endeavouring to reflect children's rights in urban daily life. Urban areas where children's voices, needs, priorities and rights become an

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indispensable part of public policies and implementations are child-friendly. Therefore, such an urban area is also a human-friendly space.

It also refers to a space with qualities contributing to the physical, psychological and social development of children so that they would become self-valuing individuals in the future. In physical terms, urban spaces should arouse positive feelings among children, provide opportunities for game activities, make them feel safe and an equal part of the society along with other individuals through the behaviours of adults (Churchman, 2003). Their aim is to ensure that children participate in family, society and social life; meet their basic needs such as health and sheltering; benefit from healthy water and health services at the maximum level; are protected against abuse, exploitation and violence; walk on the streets safely; meet and play with their friends; have green areas with animals and plants; live in a clean environment; participate in cultural and social activities; and have access to all services regardless of their race, religion, income, gender and disabilities. (Unicef, 2004, p. 1; Sivri Gökmen, 2013, p. 822).

Urban areas should provide spaces supporting social interaction, equal opportunities, accessibility, self-esteem and cultural identity where children can meet their basic needs such as social justice, equality, sheltering, education, health and playing in accordance with the UN Convention on the Rights of the Child; and they should ensure that safe environments meeting the needs, expectations and desires of children are available.

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THE RELATIONSHIP BETWEEN LANGUAGE LEARNING STRATEGY, L2 PROFICIENCY AND LEARNING VARIABLES OF KOREAN HIGH SCHOOL STUDENTS

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This study aims to see how Korean high school students use English learning strategies and to unveil the relationship among L2 proficiency, language learning strategies and other learning variables such as student's curriculum tracks. the self-assessment of English proficiency, the length of English learning, the length of attending private English education and the interest in English. Based on Strategy Inventory for Language Learning(SILL), a kind of self-report questionnaire developed by Oxford(1990), a total of 121 surveys were collected from male Korean high school students, and their responses were statistically analyzed using Pearson's product moment correlation, Multivariate analysis of variance(MANOVA), and Binominal logistic regression. The results indicated that the correlation between language learning strategies and learning variables was low and that there was no statistically significant difference in L2 proficiency among groups divided by the frequency of students' language learning strategy use. In addition, only the social strategy showed statistically significant difference among student's curriculum tracks and the degree of language learning strategy use did not adequately explain students' interest in English learning. Further pedagogical implications and future research suggestions are provided.

Keywords: language learning strategy, SILL, language learning variables

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THE RELATIONSHIP BETWEEN WATER QUALITY AND SOCIO-ECONOMIC DEVELOPMENT

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Although ¾ of our world is covered with water, the amount of water suitable for human use is very limited. The amount of fresh water is 2.5% of the total water stocks on earth. 0.3% of this amount consists of the fresh water sources suitable for human use and ecosystem. Water is one of the fundamental components of blood and body fluids of human. Water, which is required for vital activities, should be provided in the form containing no unhealthy materials or chemical content that is harmful for human. For meeting the fundamental needs of human and ecosystem, the water quality is as important as the amount of water. In water source management, besides the amount of water, also the importance paid to the quality of water should be immediately increased. Low-quality water causes many economic, social, environmental and health problems. The fact that the water stocks will be scarcer in upcoming years will lead the water-related problems and costs to increase. Socio-economic development depends on the quality of water. Non-good water quality poses risk for human and ecosystem health. Thus, worsening water quality threatens the socioeconomic development. The ecosystem health has traditionally been the subject of rich/developed countries and the environmental movements there. But, the increasing awareness about the importance and dimensions of the benefits and services of ecosystem allows it to be considered as a component of socioeconomic development and discussed also in poor countries as an important topic.

Keywords: Water, Water Quality, Socio - Economic Development

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THE RELATIONSHIP OF PERCEPTION OF PREGNANCY RISK, ANXIETY, AND SPOUSAL SUPPORT IN PRIMIGRAVIDAS

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Abstract: This study aims to identify the relationship between perception of pregnancy risk, anxiety, and spouse support in primigravidas. A sample of 160 primigravidas was recruited from two obstetrics and gynecology hospitals in Korea. The data were analyzed using descriptive statistics, t-test, ANOVA, and correlation analysis. There were statistically significant differences in perception of pregnancy risk according to age in general and obstetric characteristics ($t = 2.03$, $p = .043$). There were also statistically significant differences in spouse support scores according to age ($t = 3.82$, $p = .001$), job ($t = 2.57$, $p = .011$), and prenatal education ($t = -2.72$, $p = .007$). Perception of pregnancy risk and spouse support were correlated with anxiety ($r = .416$, $p < .001$; $r = -.176$, $p = .026$). Primigravidas over 35 years old need enhanced perception of pregnancy risk. There is need for education about Knowledge of High Risk Pregnancy.

Keywords: PERCEPTION, PREGNANCY RISK, ANXIETY, SUPPORT

Introduction

Perception of pregnancy risk refers to a pregnant woman's awareness of danger to the health of the fetus or herself due to a pregnancy-specific disorder (Richter, Parkes, & Chaw-Kant, 2007) and is a personal and subjective assessment of pregnancy risk as general risk is perceived differently by different people (Shim, 2009). Perception of pregnancy risk is affected by personal belief, attitude, judgment, and emotion as well as psychological aspects and socio-cultural factors involved in the perception of risk in a certain situation (Heaman & Gupton, 2004; Bayrampour, Heaman, Duncan, & Tough, 2013). A previous study showed that pregnant women with a higher perception of pregnancy risk were more likely to use a healthcare management facility, be motivated to seek prenatal health management, and give consideration on childbirth locations and more eagerly followed decisions, recommendations, and procedures prescribed by doctors for medical intervention (Bayrampour et al., 2013).

Recently, age at first childbirth has been increasing not only in Korea but also in many other countries (Carolan, 2013). The incidence rates of pregnancy complication, congenital disorder, and genetic defect are reported to have increased with the increase in age at first childbirth (Korean Association of Obstetricians and Gynecologists, The, 2010; Hwang, Kim, Yoon, & Lee 2011; Carolan, & Nelson, 2007), and, thus, special attention should be paid to pregnancy at an older age. The International Federation of Obstetrics and Gynecology (FIGO) defines pregnancy at the age of 35 or older as high-risk pregnancy and recommends that high-risk pregnancy be dealt with seriously because of a high likelihood of unfavorable pregnancy outcome (Park, Lim, & Han, 2009; Hwang, 2013; Nordeng, Ystrom, & Einarson, 2010). In Korea, too, healthcare costs for pregnant women of 35 or older have been increasing every year, accounting for 31.7% of the total use of national health insurance service in 2008 (Hwang, Kim,Yoon, Lee, 2011). Accordingly, attention at the societal level needs to be paid to pregnancy at an older age. Recently, to address the low birth rate in Korea, the government started to provide financial support for external fertilization, which has caused an increase in the rates of multiple pregnancies, preterm labor, and low weight birth (Korea National Statistical Office, 2012; Health Insurance Review & Assessment Service, 2015). Low-weight newborn babies are reported to have a much higher rate of premature death and have a much higher likelihood of disability or illness in life (Kim, Lee, Park, Whang, & Kim, 2009; Park, 2006). Accordingly, an investigation of the perception of pregnancy risk in pregnant women at an older age can provide important basic data for prenatal care. Moreover, research has never been conducted to examine the level of perception of pregnancy risk during the prenatal period or to identify associated factors; hence, research is needed to provide basic data (Atkinson, S.J. & Farias, M.F, 1995)

Of factors associated with perception of pregnancy risk, state anxiety is fear of pregnancy itself, and such anxiety works in combination with several other factors such as the pregnant woman's past experience, interpersonal relationships, and current status (Sung, Ju, & Ju, 2003; Chung, Kim, Ryu, & Na, 2002). Accordingly, anxiety level in a pregnant woman can be an important indicator for perception of pregnancy risk (Heaman & Gupton, 2004; Bayrampour et al., 2013; Gupton, Heaman & Cheung, 2001).

In addition, the level of spousal support may be correlated with perception of pregnancy risk. Spousal support is the most familiar and effective support system for a pregnant woman (Park, 2007; Chun, 2014; Koblic, 2010), and, therefore, it should be recognized as an important aspect before prenatal care is provided to a pregnant woman

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(Bryanton, Gagnon, Johnston, & Hatem, 2008).
Accordingly, in the present study, we aimed to examine the perception of pregnancy risk of primigravidas in the childbirth environment, which is a change from their normal environment, to identify associated factors, and ultimately, to provide basic data for pre- and postnatal care programs to predict potential pregnancy risk and manage problems that may occur during pregnancy.

1. Study objectives

The purposes of the study were to examine the levels of perception of pregnancy risk, anxiety, and spousal support and to investigate the relationships among them. The specific objectives were as follows: first, to examine study participants' general and obstetric characteristics; second, to examine participants' perception of pregnancy, anxiety, and spousal support; third, to analyze participants' perception of pregnancy, anxiety, and spousal support according to their general and obstetric characteristics; and fourth, to investigate correlational relationships of perception of pregnancy risk, anxiety, and spousal support.

Methods

1. Study design

The present study was a descriptive correlational study conducted to examine the perception of pregnancy risk, anxiety, and spousal support in primigravidas and to investigate the relationships of the factors.

2. Study participants and the sampling method

Data were collected between March and May of 2016 after the study was approved by the G University Institutional Review Board (GIRB-A16-Y-0001). To recruit study participants, we first contacted the chiefs and the nursing departments of hospitals and obstetrics and gynecology offices located in J city of G province and explained the study objectives. After they signed a written consent form, we recruited participants from primigravidas who visited the outpatient clinic of the hospitals or the obstetrics and gynecology offices for a check-up. The study was conducted with the contacted primigravidas who understood the study objectives and volunteered to participate in the study. All participants were told about study ethics, their rights to withdraw from the study at any time, confidentiality, and anonymity. The questionnaire took approximately 15 minutes to fill out, and a completed questionnaire placed in a sealed envelope was collected by the researcher.
The sample size required for correlational analysis was 134 with the assumptions of an α level of 0.05, power of 0.95, and a medium effect size of 0.3, as estimated by using the G*power 3.1 program (Faul, Erdfelder, Buchner & Lang, 2009). Considering a dropout rate of 20%, a total of 160 primigravidas were recruited.

3. Research instruments

1) The Perception of Pregnancy Risk Questionnaire (PPRQ)

Perception of pregnancy risk refers to a pregnant woman's subjective feeling, intensity, attitude, and opinion in regard to pregnancy. The concept includes risk perception in both general and specific areas of pregnancy and the assessment of risk regarding both herself and the baby.
To measure perception of pregnancy risk, we used the PPRQ where 9 items were in the form of a visual analogue scale. Each item was scored on a scale ranging from 1 point (“never”) to 10 points (“very likely”); total scores ranged from 9 to 90 points, and a higher score indicated a higher perception of pregnancy risk (Heaman, Gupton, & Gregory, 2009). When the PPRQ was developed, the value of a reliability measure, Cronbach's α, was .87. The instrument was translated into Korean and then back-translated into English and permitted for use by the authors.

2) Anxiety

Anxiety is differentiated into two types, trait and state anxiety. Of those, state anxiety refers to a feeling of anxiety arising from self-assessment of how one feels in a specific time (Hahn, Lee & Chon, 1998). In the present study, state anxiety was defined as the assessment of how concern, tension, nervousness, and worry are felt “here and now” and was measured using the STAI-YZ, a 20-item scale for state anxiety developed by Hahn, Lee, Chon, and Spielberger (2000). Each item was measured on a 4-point Likert scale where 1 meant “never” and 4 meant “very much,” and total scores ranged from 20 to 80. A higher score meant a higher level of perceived anxiety. The value of Cronbach's α was .92 at the time of the development of the instrument.

3) Spousal support

In the present study, spousal support was defined as an aspect of social support established in a spousal relationship

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and was measured with a 22-item instrument tested for reliability and validity. The instrument was originally developed by Park (1985) and was revised by Kim (2008). Each item was measured on a 6-point Likert scale where 1 meant ″never″ and 6 meant “always,” and total scores ranged from 22 to 132. The higher the score, the stronger the spousal support. The value of Cronbach′s α was .94 and .96 when it was revised (Kim, 2008).

4. Data analysis

Data were statistically analyzed with SPSS Windows version 21.0 in the following manner.
First, frequencies and percentages were computed for participants' general and obstetric characteristics. Second, the means and standard deviations were computed for the levels of perception of pregnancy risk, anxiety, and spousal support. Third, t-test and ANOVA were performed to analyze the levels of perception of pregnancy risk, anxiety, and spousal support according to participants' general and obstetric characteristics. Fourth and finally, Pearson correlation coefficients were computed to investigate the correlational relationships of pregnancy risk, anxiety, and spousal support.

Results

1. Participants' general and obstetric characteristics

Of the total sample of 160 primigravidas, 124 (77.5%) were under 35 while 36 (22.5%) were over 35, and all were married (100%). Regarding educational level, 108 (67.5%) had received education at the college level or higher. Regarding occupation, 82 (51.2%) did not have a job while 78 (48.8%) did. Regarding income, 74 (46.3%) had an income over 3 million won while 57 (35.6%) had an income between 2 and 2.99 million won. Regarding marital satisfaction, 154 (96.3%) were satisfied with their marriage. With regard to obstetric characteristics, 125 (78.1%) had no experience of miscarriage while 35 (21.9%) had had one or more miscarriages, and a large number of participants had not received prenatal education (n = 105, 65.6%). As many as 151 out of 160 (94.4%) had not received infertility treatment for the current pregnancy. No disease had occurred during the current pregnancy in 142 (88.7%), and 147 (91.9%) did not have any disease before the current pregnancy. With regard to gestational age, in descending order, 97 (60.6%) were 28–42 weeks along, 37 (23.1%) were 15–27 weeks along, and 26 (16.3%) were 1–14 weeks along (Table 1).

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Table 1: Primigravidas General and Obstetric Characteristics (N=160)

Characteristics &	Categories	N (%)
Age	<35	**124(77.5)**
	>35	**36(22.5)**
Married status	married	**160(100)**
Religion	yes	**52(32.5)**
	No	**108(67.5)**
Education	≤ high school	**23(14.4)**
	≥ college	**137(85.6)**
Job	yes	**78(48.8)**
	no	**82(51.2)**
Income	<100	**6(3.7)**
(10,000 won)	100-199	**23(14.4)**
	200-299	**57(35.6)**
	≥ 300	**74(46.3)**
Marital Satisfaction	satisfaction	**154(96.3)**
	Not satisfied	**6(3.7)**
Abortion experience	yes	**35 (21.9)**
	No	**125(78.1)**
Prenatal Education	yes	**55(34.4)**
	No	**105(65.6)**
Infertility treatment	yes	**9(5.6)**
	No	**151(94.4)**
Onset disease during pregnancy	yes	**18(11.3)**
	No	**142(88.7)**
Previous pregnancy disease	yes	**13(8.1)**
	No	**147(91.9)**
Gestational age	1-14 week	**26(16.3)**
	15-27week	**37(23.1)**
	28-42week	**97(60.6)**

2. PPRQ, anxiety, and spousal support in primigravidas

The mean score for perception of pregnancy risk was 24.96 ± 12.28 (possible range: 9–90) with a minimum score of 9 and a maximum score of 66. The mean score for anxiety was 38.45 ± 9.45 (possible range: 20–80) with a minimum score of 20 and a maximum score of 76. Finally, the mean score for spousal support was 97.95 ± 13.32 (possible range: 6–132) with a minimum score of 55 and a maximum score of 119 (Table 2).

Table 2: The Degree of Anxiety, Spouse Support, PPRQ (N = 160)

Variable	Range	Minimum	Maximum	M±SD
PPRQ	9- 90	9	66	24.96±12.28
Anxiety	20-80	20.00	76.00	38.45±9.45
Spouse's Support	6-132	55.00	119.00	97.95±13.32

3. PPRQ, anxiety, and spousal support according to general and obstetric characteristics of primigravidas

The analyses conducted on the PPRQ, anxiety, and spousal support according to the participants' general and

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obstetric characteristics showed the following results. The level of perception of pregnancy risk significantly differed by age (t = 2.03, p = .043); the mean score for the PPRQ was 26.02 ± 13.03 in those under 35 and 21.33 ± 8.41 in those over 35, showing that primigravidas under 35 had a higher perception of pregnancy risk. Anxiety level did not show a statistically significant difference across any general or obstetric characteristics. Level of spousal support differed significantly depending on age; the mean score was 100.03 ± 12.05 in those under 35 and 90.77 ± 15.09 in those over 35 (t = 3.82 p = .001), showing a higher level of spousal support in younger primigravidas. Additionally, level of spousal support was higher in the primigravidas with a job than in those without (100.67 ± 12.25 and 95.35 ± 13.84, respectively; t = −2.57, p = .011) and, additionally, in the primigravidas who received prenatal education than in those who did not (101.83 ± 10.41 and 95.91 ± 14.24, respectively; t = −2.72, p = .007).

Table 3: The Degree of PPRQ, Anxiety, and Spouse Support According to General and Obstetric Characteristics (N = 160)

General & obstetric characteristic	Categories	N(%)	PPRQ		Anxiety		Spouse's Support	
			M±SD	t/ F(*p*)	M±SD	t/F(*p*)	M±SD	t/F(*p*)
Age	<35	124(77.5)	26.02±13.03	2.03(.043)	38.66±9.83	.528(.598)	100.03±12.05	3.82(.001)
	>35	36(22.5)	21.33±8.41		37.72±8.11		90.77±15.09	
Marital status	married	160(100)	-		-		-	-
Religion	yes	52(32.5)	25.86±12.22	-.639(.524)	39.55±9.63	-1.02(.308)	98.80±13.79	-.564(.574)
	No	108(67.5)	24.53±12.35		37.92±9.36		97.53±13.14	
Education	≤ high school	23(14.4)	22.00±14.03	-1.22(.223)	39.63±11.22	.629(.530)	94.77±17.09	-1.20(.230)
	≥ college	137(85.6)	25.44±11.97		38.26±9.17		98.45±12.62	
Job	yes	78(48.8)	25.70±11.46	-.738(.461)	37.93±9.60	.678(.499)	100.67±12.25	-2.57(.011)
	No	82(51.2)	24.26±13.05		38.95±9.34		95.35±13.84	
Income	<100	6(3.7)	23.33±11.67	.349(.790)	34.50±5.68	.980(.404)	100.33±10.38	1.22(.303)
	100-199	23(14.4)	23.65±14.48		40.52±8.70		98.95±10.42	
	200-299	57(35.6)	26.22±14.67		39.08±10.00		95.26±15.57	
	≥ 300	74(46.3)	24.54±9.42		37.64±9.45		99.51±12.31	
Marital satisfaction	satisfaction	154(96.3)	24.66±11.94	1.57(.118)	38.29±9.43	1.11(.268)	97.98±13.05	-.177(.859)
	Not satisfied	6(3.7)	32.66±19.01		42.66±10.01		97.00±20.83	
Abortion experience	yes	35 (21.9)	27.71±14.98	-1.50(.135)	38.37±10.91	.06(.952)	100.42±12.04	-1.24(.214)
	No	125(78.1)	24.20±11.37		38.48±9.05		97.25±13.62	
Prenatal education	yes	55(34.4)	26.27±13.19	-.971(.333)	39.52±10.18	-1.03(.301)	101.83±10.41	-2.72(.007)
	No	105(65.6)	24.28±11.79		37.89± 9.05		95.91±14.24	
Infertility treatment	yes	9(5.6)	24.77± 8.31	.048(.962)	38.11±9.67	.112(.911)	97.66±13.39	.065(.948)
	No	151(94.4)	24.98±12.50		38.47± 9.47		97.96±13.36	
Onset disease during pregnancy	yes	18(11.3)	29.16±15.79	-1.54(.124)	40.94±10.67	-1.18(.237)	97.11±13.55	.283(.778)
	No	142(88.7)	24.43±11.73		38.14±9.28		98.05±13.34	
Previous Pregnancy disease	yes	13(8.1)	21.30±10.30	1.12(.264)	34.23±10.32	1.69(.093)	98.46±97.90	-.14(.886)
	No	147(91.9)	25.29±12.42		38.82±9.32		97.90±13.58	
Gestational age	1-14weeks	26(16.3)	24.92±12.37	.369(.692)	41.76±9.45	2.45(.089)	98.00±12.29	.633(.532)
	15-27wees	37(23.1)	26.45±13.58		36.48±7.83		95.83±15.58	
	28-42wees	97(60.6)	24.41±11.83		38.31±9.86		98.74±12.70	

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4. Correlations between PPRQ, anxiety, and spousal support

The correlational analyses showed that the higher the PPRQ score was, the higher the level of anxiety was ($r = .416$, $p < .001$), and the higher the level of spousal support was, the lower the level of anxiety was ($r = -.176$, $p < .026$; Table 4).

Table 4: Correlation between PPRQ, Anxiety, and Spouse Support Variable (N = 160)

Variable	PPRQ r(*p*)	Anxiety r(*p*)	Spouse's Support r(*p*)
PPRQ	-	-	-
Anxiety	.416(.000)	-	-
Spouse's Support	-.013(.867)	-.176(.026)	-

Discussion

The study was conducted to examine the levels of perception of pregnancy risk, anxiety, and spousal support in primigravidas and investigated the relationships among them. The results showed that the level of perception of pregnancy risk was, on average, 24.96 points (possible range: 9–90) and differed significantly by age ($t = 2.03$, $p = .043$). The primigravidas under 35 showed higher levels of perception of pregnancy risk and spousal support compared to those over 35. In addition, the level of spousal support was significantly higher in the primigravidas with a job and in those who received prenatal education.

The primigravidas over 35 had a significantly lower perception of pregnancy risk compared to those under 35, which suggested that, in Korea, primigravidas over 35 may not have an appropriate perception of pregnancy risk. Because the perception of pregnancy risk among primigravidas has never been measured or studied in the literature, making a direct comparison is difficult. However, according to Je and Choi (2014), who measured the knowledge of high risk pregnancy in unmarried women over the age of 30, the level of knowledge was low with an average score of 55.5% for correctly answering questions about high-risk pregnancy, which would influence their perception of pregnancy risk. Additionally, a study with primigravidas and multigravida has shown that pregnant women over 35 had a lower perception of pregnancy risk compared to nurses or other medical staff and argued that approaches to raise perception of pregnancy risk had been insufficiently studied (Heaman et al., 2012a). Based on these studies, we believe that there is a need for educational or promotional programs for pregnant women over 35 to develop an appropriate perception of pregnancy risk (Je & Choi, 2014). Pregnant women who appropriately perceive pregnancy risk are more likely to follow medical intervention, recommendation, and treatment and to use a healthcare management facility, all of which lead their health behavior in a positive direction. Accordingly the concept of perception of pregnancy risk has recently been recognized as critical (Bayrampour et al., 2013). Therefore, for pregnant women at an older age to predict potential health problems during pregnancy and handle various complications well, a variety of educational methods should be explored to give them an appropriate perception of pregnancy risk (Wang, 2014), and interventional methods should also be developed. Moreover, the health of a pregnant woman determines the lifetime health of the fetus. Accordingly, a national policy is needed with regard to educational support for and promotion toward pregnant women at an older age.

In the present study, the mean score for anxiety in the primigravidas was 38.45 (possible range: 20–80). Kim and Choi (2014) conducted their study using the same instrument as in the present study to measure anxiety levels in pregnant women under and over 35 and reported that the mean anxiety score was 40.90 in those under 35 and 41.79 in those over 35, a finding similar to ours. In the present study, we also observed that, the higher the level of anxiety, the higher the perception of pregnancy risk ($r = .416$, $p < .001$). The finding was similar to that of another study in which the same instrument was used for primigravidas and multigravida, showing that, the higher the level of pregnancy-related anxiety, the higher the perception of pregnancy risk ($r = .46$, $p < .001$; Bayrampour et al., 2013). These findings suggest that anxiety is a critical factor influencing perception of pregnancy risk.

As described above, anxiety was positively correlated with perception of pregnancy risk, but it was negatively correlated with spousal support ($r = -.176$, $p = .026$). Additionally, the level of spousal support was significantly higher in the primigravidas under 35 ($t = 3.82$, $p = .001$), with a job ($t = -2.57$, $p = .011$), and with prenatal education ($t = -2.72$, $p = .007$). In the total sample, the mean score for spousal support was 97.95. A notable finding is that the primigravidas under 35 had a higher score than those over 35, and, accordingly, a variety of interventional programs to improve spousal support for elderly primigravidas should be developed (Chang, 2001). No previous study has measured spousal support separately in primigravidas under and over 35, nor have any reported a correlation between perception of pregnancy risk and spousal support, which makes precise comparison difficult. However, a study with marriage-based female immigrants reported a finding similar to that of the current

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study: the higher the level of spousal support, the lower the level of state anxiety (Kim, Lim & Jeong, 2013). Considering that pregnancy and childbirth are a process a couple goes through together, not an event for the pregnant woman alone, spousal support is a very important factor in perception of pregnancy risk.

In summary, the number of primigravidas over 35 is increasing, and because they are classified as women with high-risk pregnancy in obstetrics, the number of high-risk pregnancies is also increasing (Whang et al., 2011). However, the level of perception of pregnancy risk was lower in the primigravidas over 35 compared to those under 35. In order for pregnant women over 35 to handle various pregnancy complications that may occur after pregnancy and prepare for healthy pregnancy and childbirth, they should be able to appropriately assess pregnancy risk, and there should be greater opportunities for them to receive information regarding perception of pregnancy risk and relevant education. Additionally, effective nursing interventional programs are needed to achieve these outcomes. Moreover, given that anxiety increased in the primigravidas with a higher perception of pregnancy risk and decreased in those with stronger spousal support, various interventional programs should be developed to raise spousal support for pregnant women over 35. In addition, considering that the health of a pregnant woman at an older age determines the lifetime health of the newborn baby, multi-faceted promotions and policies supporting them should be developed at the government level.

A limitation of the study is that we studied only a few factors affecting perception of pregnancy risk, and it is suggested that future research should investigate various factors affecting perception of pregnancy risk by including many other potentially influential variables and by examining the perception of pregnancy risk in elderly primigravidas as well as pregnant women with pregnancy complications.

Conclusion

This study was conducted to examine the levels of perception of pregnancy risk, anxiety, and spousal support in primigravidas over 35 and the relationships between the factors as the number of pregnant women over 35 is increasing in society. The study results showed that perception of pregnancy risk was lower in the primigravidas over 35 compared to those under 35, suggesting that there should be greater opportunities for pregnant women at an older age to receive information regarding perception of pregnancy risk and relevant education to help them appropriately assess their perception of pregnancy risk. To do so, effective nursing interventional programs should be developed, and multi-faceted promotional efforts should be made at the government level. Additionally, it was observed that perception of pregnancy risk was significantly higher in the primigravidas whose anxiety levels were higher whereas anxiety decreased in those with stronger spousal support. Accordingly, various interventional programs should be developed to raise spousal support in pregnant women over 35.

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THE USE OF WEB 2.0 PLATFORM AS A COURSE SCHEDULE: THE EXAMPLE OF YOUTUBE

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Abstract: YouTube is a social platform which has monthly more than 1 billion users today, and which is used for several different purposes such as acquiring information, learning new things and spending good time. This sharing platform is used for students to interact with other users, and for uploading assignments of Computer Programming students on YouTube who receive day time and evening education at the Kırklareli University Vocational School of Technical Sciences. With the questionnaire which has been conducted as a result of total 70 students using this method, the outcome of the implementation has been attempted to be determined.

Keywords: Social Network, YouTube, Educational Technologies on Vocational Education, Genuine Methods and Techniques of Education

INTRODUCTION

Increasing number of individuals who prefer communication, information or for joy, time which spend on Internet increases each day. According to statistics of Statista internet sites (2016), increasing number of social media users, spend on social network sites most of this time. According to digital report the share of We Are Social web sites (2016) number of social media users in Turkey are 42 million people and the users spend time of average 4 hours and 14 minutes on Internet via pc or tablet in a day. The average time spent on social media users in Turkey are determined 2 hours and 32 minutes per day. (2016)

According to Aslanyürek and his colleagues (2015), use of smart phones widely and service providers of GSM spread Internet services, hence persons access to the Internet with mobile phones has made it possible. In parallel with this development, a social media developer provides applications for Smartphone, with people's mobile phones have provided access to social media. According to We Are Social Digital (2016); the number of people actively using social media via mobile devices increases 13 percent than last year in Turkey. This situation provides that people can easier, faster and seamless way to access to social networking sites.

Social Networks provides for users that introducing themselves in social platform, building a social network environment, to communicate with other users and move on (Ellison, Steinfield & Lampe, 2007), sharing the content they creating (photograph, video, blog etc.), creating a profile to contain their personal information, photographs, and videos, the way to communicate with foreigners and finally exploring new friendship (Wang and ark., 2010). Social Networks is important tools for sharing daily events and news, according to Gülbahar and her colleagues. (Gülbahar, Kalelioğlu & Madran, 2010).

Concept of web 2.0 is used synonym as concept of social media. (Lenhart, Purcell, Smith, & Zickuhr, 2010). O' Reilly said that web 2.0 is not packaged software, web 2.0 is a data source of enriched with more and more the use of the people and web 2.0 is the trusted environment as developers to users in the platform. Nowadays, Web 2.0 technologies which are often used in studies conducted in the field of education are blog, wiki, podcast, sites of sharing videos and networks. (Davies& Merchant, 2007; Griffiths& Wall, 2011; Kuzu, 2007; Meyer, 2010; Usluel&Mazman, 2009). The difference web 2.0 technologies relates with the amenities they offering their users. (Baran, 2013). A video sharing site that uses this technology is Internet site which named YouTube.

YOUTUBE

YouTube where is users uploading their own videos, watching other people 's videos , interpreting them, they sharing personal and / or subscribing to the official video channel, and major social networking sites on YouTube is a video sharing site that allows viewing of the current video. It's established by Chad Hurley, Steve Chen, and Jawed Karim three old employee of PayPal at 14 February at 2005. According to web site named Alexa, YouTube is the second most used websites in Turkey and The World. Moving from this property purposed of education was thought using for reinforcing elements for learning lessons. Video sharing sites of TeacherTube and SchoolTube inspired after its development.

TeacherTube: a video sharing site where teachers share videos about education (Thiyagu, 2010). American teachers James Smith is co-founder of the TeacherTube. This site allows teacher - student communication and

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vocational training of teachers of the same subject any place in the world. TeacherTube can be defined as a site that contains only educational videos. This site is a good example for concept of distance learning. It includes videos of primary, secondary, high school, and college level from; physics, literature, geography, English, history, math and many areas. (Erbasan, 2016)

SchoolTube is a video sharing site to educational area based on students. It is a platform located of education contents of prepared from teachers or students, classroom activities, extracurricular activities, etc., it is an important social network which services to education areas.

PLACE THE SOCIAL NETWORKING AND YOUTUBE APP IN EDUCATION

Hazar (2011) put forth that especially Social Networks is extensively used by students' level of secondary and high school, most of these students think, social Networks are important source of various topics and socializing circles. Bilen and his colleagues (2014) point out that generally students use social Networks purpose of keep on social relationship , utilization rates in order to support their academic work (about lectures) is really low.

It has not been seen in Turkey that a study done by supporting learning from social networks YouTube in type of field research studies. It can support the training of nurses was seen in study named"NursingEducation2.0: YouTube'' using the YouTube video sharing platform (Skiba, 2007).

Thiyagu said that in his study, it can be used as a training tool use of web 2.0 tools such as Google Earth, Google Maps, iGoogle, Skype, TeacherTube, SchoolTube, Boolify, Picasa, Flickr.

Vijayakumar (2011) has said that useful results will come to use of YouTube or TeacherTube videos by the level of the students who to put into action by writing a second language in order to create a brainstorming.

Son (2011) use applications of YouTube, SchoolTube and TeacherTube, inside of references sharing tools, when he determine for online references of learning language.

Mulen and his colleagues (2008) in their study talk about that; students in middle school in the art class use of YouTube app and the results. Mulen and his colleagues say it may be beneficial use of TeacherTube and YouTube because of these reasons YouTube can be accessed without a user count and necessary of restrict the search results for students and then in order to display more relevant results.

Burke and his colleagues say it may be use as an effective learning method that students create online video as a group Project.

RESEARCH AND METHOD

In this study it is requested to do applications via use of one of the sharing video sites YouTube followed subjects in the lessons of governance system from students. In this way, it is provided to apply the topics which learned in the class within maximum period of a week, and were asked upload on the video sharing website YouTube. While students doing these applications at the same time they create videos that consist of voice narration through a program that records video screen. In this site every students create a channel themselves. They have opened their own channels; they upload their audio video they have prepared. Every week during the class, videos uploaded to video sharing sites YouTube are watched via the channels they opened in their name. Constructive criticism is done to themselves about their videos via lecturer and friends following up courses. Thanks to this experiment, they can help the other users via their channels. Before that, they had to use other channels for learning.

Survey is done to students who being educated vocational school of technical science department of computer programming. 70 students enrolled in the course, volunteers have answered the questionnaire as 90%. . The survey questions prepared by researchers established literature compiled. In this survey, questions directed about social-demographic level and use of YouTube, the question style is test and type of Likert. Our survey, two demographic variables, the 9-point Likert scale and including 12 consists of 23 questions based on the YouTube experience. The data analyze via SPSS 21 statistic program Frequency analysis, Mann Whitney U and Kruskall Wallis test. The confidence intervals used in this study is 95 percent

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RESULTS

The findings obtained as a result of frequency analysis performed is as follows.

58.7% of the students who participated in our study were men, 98.4% for the first time taken the course,% 85.7 of the previously watched video on YouTube to learn something new, and previously 69.8% not adding video to open the YouTube channel, it has been identified.

The students who participated in our study, 88.9% of YouTube video by adding homework grade given can the idea of mind has never come, and 95.2% this application has learned YouTube on how a canal, using the% to 65.1 Bandyca program to capture video their choice was determined.

The students who participated in our study, found that exciting of 54.0% of the video capture, the video captured the 95.2% he knows homework will be assessed as grade, 73.0% lecturers of, he thinks monitored until the end of the captured videos, 92.1% is effective in learning the lessons of the captured video, and 58.7% wants another lesson to be treated the same technique course, have been identified.

The students who participated in our study; 88.9% of the video captured to be useful for other people and did not think to remove this video of the recent 87.3%, were identified. 'To upload videos to YouTube, it gave me time' statement on the participation of 33,3%, and 'to upload videos to YouTube, gave me enthusiasm' expressed in that hesitant 41.3%, has emerged.

Students who participated in our study, 'To upload videos to YouTube, offers a more objective evaluation of the possibility of the lecturers' statement on the participation of 55.6%, 'to upload videos to YouTube, DVD-flash memory as hardware rescued from carry with me' expression of 44.4% fully participated,

'To upload videos to YouTube, my interest in the course consistently high kept' statement to attended of 46.0%, and 'videos to upload to YouTube, course helped me become more successful' statement on attended of 52.4%, were identified.

The students who participated in this study; 'To upload videos to YouTube, my courage broke' the statement certainly not participating of 31.7%, 'to upload videos to YouTube, has caused excitement and stress' statement to not attended of 36.5%, and 'videos to upload to YouTube, was hampered to show my skills related' statement to not attended of 39.7% was determined.

Is there any effects of sex?

Students have different gender affects the success of the course, causes excitement and stress during loading YouTube homework.

YouTube and who do not add videos by creating an account?

If students open an account on YouTube and upload homework videos before that test, they are more successful their lessons, if not, students specify that breaking their courage.

Is there any difference between from who think to get homework degree on YouTube and who do not think to get homework degree on YouTube?

It was determined, students rid of to carry equipment such as video- flash driver and some of students are more successful in their lessons.

Is there any effects to learn opening a channel on YouTube?

Students learn how to create an account on YouTube and students rid of to carry equipment such as video- flash driver.

Is there any effects to make voiced presentations on YouTube?

The results of the study, it gave time to students to upload homework videos to YouTube, it kept students interest high and continuous to lesson, and lecturer can evaluate objectively.

According to Kruskal Wallis Test; The results of the study, it gave time to students to upload homework videos to YouTube, it kept students interest high and continuous to lesson, and lecturer can evaluate objectively.

Is there any effects the videos of on YouTube is watched by lecturer till the end?

It is understood, lecturer watch the videos uploaded on YouTube till the end, and Students aware of that. It was determined, it gave time to students to upload homework videos to YouTube, it kept students interest high and continuous to lesson.

Is there any effects to process the lesson with same method for another lesson too?

It was determined it gave time to students to upload homework videos to YouTube, it kept students interest high and continuous to lesson.

Is there any effects of benefit for other people of students' videos?

The results of the study, it gave time to students to upload homework videos to YouTube, it kept students interest high and continuous to lesson, and lecturer can evaluate objectively at the same time students more successful of their courses

Is there any effects to remove videos from YouTube?

It gave time to students to upload homework videos to YouTube, it kept students interest high and continuous to lesson, and lecturer can evaluate objectively at the same time students more successful of their courses.

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DISCUSSION

Technology is integral part in our life with the increase in smart phones and their developed applications. Our interest increase with that rate. Social network are used by students of middle and high age.

Students of Kırklareli Vocational School of Technical Science use video sharing site YouTube of web 2.0 tools for purposed strengthen in lesson of content management system. , the survey is done to students end of the term, data of survey are analyzed by SPPS 21 statically program.

Use for syllabus platform of Web 2.0: questions of Likert scale in example of YouTube;

- it does not affect the results how many times taken lessons
- there is not a significant difference from students of watch the videos purposed to learn new things or not watching
- there is no effect difference of program to taping video on YouTube
- it is awared by students, the videos of taping on YouTube is examined as homework notes
- Videos of taping on YouTube are efficient to learning lessons aware of all students.

When the results is examined

- the difference of sex effects the success of lesson
- students who not open an account or not type video on YouTube, feel stress and excitement during the uploading their homework's
- uploading the homework's provides more successful
- students rid of to carry their DVD- flash driver
- When they upload their homework's, it kept students interest high and continuous to lesson, and lecturer can evaluate objectively at the same time students more successful of their courses.
- lecturer watch the videos uploaded on YouTube till the end, and Students aware of that
- Videos on YouTube are beneficial for other users.

CONCLUSION

It was determined at the end of the study, supporting to teaching process cause of, students of Kırklareli University of Technical Sciences Vocational School learn efficient and successful, students are more active, to facilitate the learning process, students think that piece of the teaching process via YouTube.

The results of the study, Social Networks can be integrated into the education system and social Networks can be increased the effectiveness, cause of the students have such a thought. For this purpose, YouTube can be supported as a supportive tool learning lessons for practice-based courses such as Web Project Management, Application Development, Introduction the Programming, and in this way, the success of the course can be increased. In this topic, lack of study is expected to necessary to increase the study.

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THEORETICAL AND EXPERIMENTAL VIBRATION ANALYSES OF BRIDGE WINGS ON LARGE SHIPS

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In this paper, the ship bridge extensions called “Bridge Wing” which are one of the most critical areas of importance to ship vibration are studied. The natural frequencies and mode shapes of these extensions which are modelled with different angles, are determined with finite element analysis. Furthermore, these bridge wing models are prepared on computer and the results obtained by finite element analysis are verified by experimental modal analysis. Besides, the results obtained from different bridge wing designs are compared and effects of design properties on the results are emphasized.

Keywords: Ship Vibration, Finite Element Method

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TİCARİ ARAÇ SÜRÜCÜ KOLTUĞUNUN DİNAMİK KONFOR ANALİZİ İÇİN BİR SONLU ELEMAN MODELİNİN OLUŞTURULMASI

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Özet: Bu çalışmada bir ticari araç sürücü koltuğunun dinamik konfor analizinin bilgisayar ortamında yapılabilmesi için uygun bir sonlu eleman modelinin hazırlanması ve bu modelin doğrulanması ele alınmıştır. Çalışmada dinamik konfora etki eden koltuk elemanları öncelikle tek tek daha sonra da gruplar halinde analiz edilerek elemanlar üzerinde yapılan fiziksel testlerden elde edilen sonuçlar karşılaştırılmıştır. Hazırlanan model, koltuk üzerinde yapılacak konfor testlerini fiziksel olarak laboratuvar ortamında gerçekleştirmeye gerek kalmadan sonlu elemanlar yöntemine dayalı bir yazılım kullanarak oldukça iyi bir yaklaşıklıkla analiz etmeye imkan vermektedir.

Anahtar kelimeler: Ticari araç sürücü koltuğu, dinamik konfor, sonlu elemanlar yöntemi

CREATION OF A FINITE ELEMENT MODEL FOR DYNAMIC COMFORT ANALYSIS OF COMMERCIAL VEHICLE DRIVER'S SEAT

Abstract: In this study, creation of a suitable finite element model to dynamic comfort analysis of a commercial vehicle driver's seat in computer and verification of this model were discussed. Seat elements that affect the dynamic comfort first one by one, then in groups were analyzed and compared the results obtained from physical tests. Prepared model gives the possibility to analyze tests performed on seat comfort by using a software based on finite element method without the need to perform physically in the laboratory.

Keywords: Commercial vehicle driver's seat, dynamic comfort, finite element method

Giriş

Sürücü koltuklarında dinamik konfor, kullanıcının sürüş esnasındaki konforuna ait bir tanımlamadır. Dinamik konfora etki eden en önemli etkenler arasında ses, titreşim ve sertlik parametreleri sayılabilir. Dinamik konfor değerlendirmesinde sürüş esnasında yoldan gelen titreşimlerin ne kadar azaltılarak yolcuya aktarıldığına bakılır ve burada önem arz eden unsurlar; koltuğun maruz kaldığı titreşim, bunun sürücüye etkisi ve koltukta bulunan sönümleyici elemanların özellikleridir.

Yeni bir koltuk üretiminde konfora ait değerlendirme yapmak için genellikle iki yol izlenir. Bunlardan birincisi koltuğu prototip olarak üretip testler yardımıyla değerlendirme yaparak çıkan sonuca göre prototipte değişiklikler yapıp testleri tekrar etmek, ikincisi ise koltuğa ait bir sonlu eleman modeli hazırlayarak bu model üzerinde yapılan analizlerle fiziksel bir ürün ortaya çıkarmadan koltuğun konfor değerlendirmesini yapmaktır (Ergün, 2016).

Bu yöntemlerden ikincisi hem daha hızlı hem de daha az maliyetli olan çözümdür. Koltuk için doğru bir sonlu elemanlar modeli oluşturmak için koltukta bulunan tüm parçaların detaylı olarak incelenmesi ve mekanik özelliklerinin bilinmesi gerekmektedir.

Literatürde koltuk konforuna dair yapılan çalışmalara bakıldığında, bunların önemli bir bölümünün üretilmiş koltuklar üzerinde yapılan testlere dayalı olduğu görülmektedir. Niekerk ve ark. (2002), koltuğun dinamik konforunu ölçmek için farklı koltuklar üzerinde objektif ve sübjektif ölçümler yapmışlar, toplam 16 farklı koltuk modeli kullanılan çalışmada sübjektif değerlendirme için 6 farklı denek kullanmışlardır. Kyung ve ark. (2007),

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taşıt koltuklarında sürücünün sürüş esnasındaki konfor ve konforsuzluğunu değerlendirmek için 27 denek üzerinde, 2 farklı araç ve her bir araç için 2 farklı koltuğu test etmişlerdir. Bouazara ve ark. (2009) ise pasif ve aktif süspansiyona sahip iki farklı sürücü koltuğunun titreşim analizlerini yaparak, bu koltuklara ait dinamik modelleri oluşturmuşlardır. Konfor analizine ilişkin çalışmalarda üretilmiş koltuk üzerinden alınan verilerle yapılan değerlendirmelerin yan ısıra koltuğa ait sonlu eleman modeli oluşturarak sayısal verilerin bu model üzerinden elde edildiği çalışmalar da bulunmaktadır. Siefert ve ark. (2008), bir otomobil koltuğunun statik ve dinamik konforunu incelemek için sonlu elemanlar modeli kurmuşlar, bu modelin doğruluğunu sağlayarak, bilgisayar ortamında koltuk konforu için optimizasyon çalışmaları yapmışlardır. Verver ve ark. (2004) ise, yine bir otomobil koltuğunun konfor analizini yaparken kullanılacak sonlu elemanlar modelinin hazırlanma aşamalarını açıklamışlar, bu çalışmayla koltuğun tasarım aşamasındayken konfor parametrelerinin incelenebilmesini amaçlamışlardır. Çalışma sonunda elden edilen sonlu elemanlar modelinin koltuğun tasarım aşamasında konfor analizlerinin yapılmasına olanak sağlayacağı ve bu sayede koltuk üretilmeden olası konfor problemlerinin önlenebileceği vurgulanmıştır.

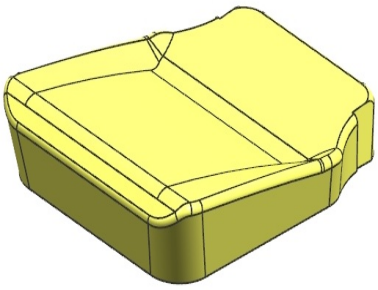
Yapılan bu çalışmada ise; tasarlanmış bir sürücü koltuğu üzerinde konforu etkileyecek bileşenler belirlenerek öncelikle fiziksel testler yardımıyla bu bileşenlerin mekanik özellikleri belirlenmiştir. Elde edilen mekanik özellikler bileşenlerin ayrı ayrı sonlu elemanlar modelinin kurulmasında kullanılmıştır. Komple koltuk sonlu elemanlar modeli hazırlanana kadar sünger ve çelikler gibi hammadde testleri, amortisör ve körük gibi satın alınan ürün testleri ve bu bileşenlerin birlikte kullanıldığı yarı komple testleri yapılıp bu testlerden elde edilen tüm veriler sonlu elemanlar analizleriyle doğrulanmıştır. Fiziksel testler ve sanal analizlerden elde edilen değerler karşılaştırılarak; sonlu elemanlar yöntemiyle kurulan modelin doğruluğu kanıtlanmıştır.

Koltuk Bileşenleri

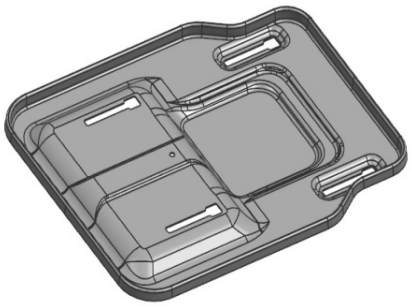
Çalışmada öncelikle tasarlanan koltuk üzerinde konfora etkisi olabilecek elemanların bağımsız olarak mekanik özellikleri irdelenmiştir. Mekanik özellikler fiziksel testler yardımıyla elde edilmiştir. Yapılan fiziksel testlerle aynı sınır şartları altında sonlu elemanlar modelleri kurularak analizler yapılmıştır. Bu analizlerle bağımsız parametrelerin doğru bir şekilde sonlu elemanlar modelinde tanımlandığı ispatlanmıştır. Birinci aşamada mekanik özellikleri belirlenen bağımsız parametreler; çelik iskelet yapısı, amortisör, hava körüğü ve süngerdir. Koltuk bileşenlerinin bağımsız olarak incelenmesinden sonra yarı komple koltuk modelleri analizlerine geçilmiştir. Bu aşamada komple koltuk modeli iki ayrı gruba bölünerek, birinci aşamada elde edilen verilerin ortak olarak kullanıldığında da beklenen sonucu verip vermediği incelenmiştir. Konfora etkisi olan parametreler dikkate alınarak komple koltuk iki ana yarı kompleye ayrılmıştır. Bu yarı komplelerden ilki oturak süngeri, kumaşı ve oturak taban sacından oluşan “oturak süngeri yarı komplesi”, diğeri ise koltuk iskeleti ve iskelet üzerinde bulunan süspansiyon ve hava yaylarını içeren “oturak iskeleti yarı komplesi”dir.

Oturak Süngeri Yarı Komplesi

Oturak süngeri yarı komplesi için koltuğun süngeri, kumaşı ve bunların bağlandığı oturak sacını içeren yapı kullanılmıştır. Tasarlanan oturak süngeri Şekil 1’deki geometriye sahiptir ve 45 gr/lt yoğunluktaki malzemeden üretilmiştir. Şekil 2’de geometrisi gösterilen oturak sacı ise 1.2 mm kalınlığında DC04 derin çekme sacından üretilmiştir. Seçilen yarı komple grubu sabit bir zemine oturtularak üzerinden dikey yönde bir aparat vasıtasıyla basma testi yapılmıştır. Kullanılan aparat Şekil 3’de gösterildiği gibi bir insanın kalça formunu simgeleyen standart bir geometriye sahiptir.



Şekil 1. Oturak süngeri modeli



Şekil 2. Oturak sacı modeli



Şekil 3. Kalça formu

Test sabit bir hızda, yaklaşık 100 kg yüke ulaşana kadar yapılmış ve 3 kez tekrar edilmiştir. Şekil 4’de kalça formunun uygulanma şekli gösterilmiştir. Testler sonucunda elde edilen kuvvet – deplasman eğrileri Şekil 5’de gösterilmiştir. Grafikten de görüleceği üzere 100 kg yük altında oturak süngeri yarı komplesinde ortalama 31.5 mm deplasman oluşmaktadır.

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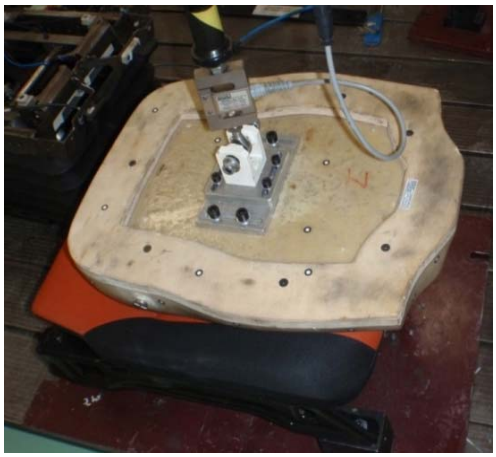
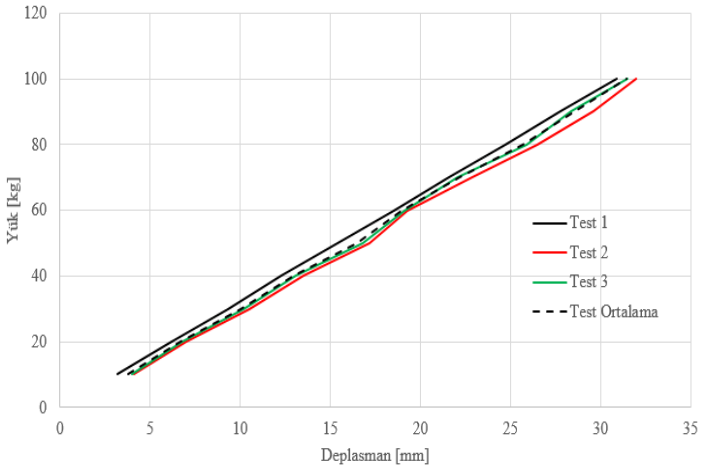
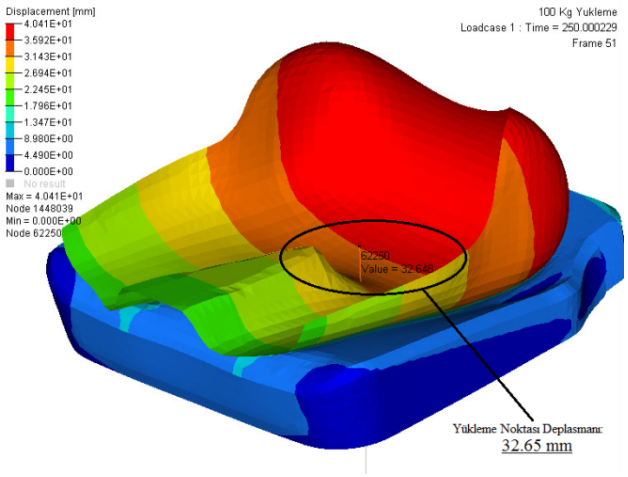


Şekil 4. Kalça formu basma testi



Şekil 5. Oturak süngeri yarı komplesi basma testi sonuçları

Oturak süngeri yarı komplesi için gerçekleştirilen bu fiziksel test için aynı sınır şartlarında sonlu elemanlar modeli kurulmuş ve aynı fiziksel testte olduğu gibi 100 kg'lık bir yükleme uygulanmıştır. Yapılan analiz sonucunda sonlu elemanlar modelinde oluşan deplasman değeri Şekil 6'da gösterilmiştir.



Şekil 6. Oturak süngeri yarı komplesi basma testi sonlu elemanlar analizi sonucu

100 kg yük uygulanan sonlu elemanlar analizi sonucunda oturak süngeri yarı komplesinde yükleme noktasında 32.65 mm deplasman oluşmuştur. Fiziksel testlerden elde edilen ortalama deplasman değeri ise 31.5 mm idi. Bu sınır şartlarında ortaya çıkan sonuçlar incelendiğinde sanal ve fiziksel testler arasında 1.15 mm'lik bir fark olduğu ortaya çıkmaktadır. Bu değer sonlu elemanlar modelinin, bu sınır şartlarında % 96.3' lük bir doğruluk oranına sahip olduğunu göstermektedir.

Oturak İskeleti Yarı Komplesi

Koltuk oturak iskeleti; amortisör, hava körüğü, makaslı yükseltme iskeleti ve diğer bağlantı elemanlarından oluşan yarı kompledir. Bu aşamada montajlanan koltuk iskeleti ile testler ve analizler yapılmıştır. Bu yarı komple; koltuk süngeri ve oturak süngeri çıkarılmış komple koltuğu temsil etmektedir. Yarı komple üzerinde yapılan fiziksel testlerde koltuk rijit bir platform üzerine konularak, belirli bir bölgeden 5 x 50 cm ölçülerinde bir plaka yardımıyla basıya zorlanmıştır. Şekil 7'de oturak iskeleti yarı komplesi ve test aparatları görülmektedir. Yükseklik ayarı en üst konumda iken sabit bir hızda yaklaşık 100 kg civarında yüke ulaşılana kadar basma yükü uygulanmıştır. Testler üç kez tekrar edilmiş ve sonucunda Şekil 8'de gösterilen kuvvet – yer değiştirme eğrilerine ulaşılmıştır. Şekilden de görüldüğü gibi 100 kg yük altında oturak iskeleti yarı komplesi ortalama olarak 4 mm yer değiştirmiştir.

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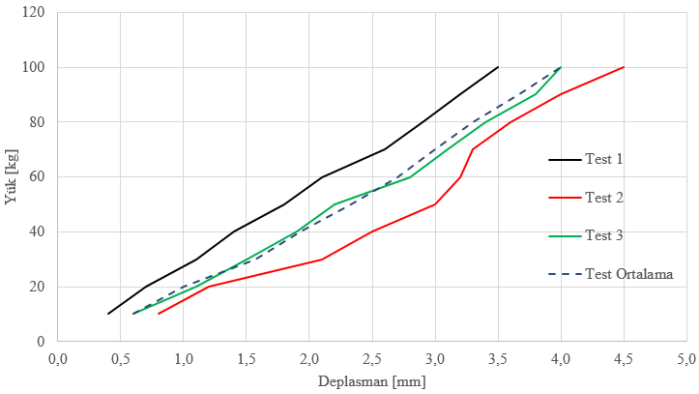
Şekil 7. Basma testi düzeneği

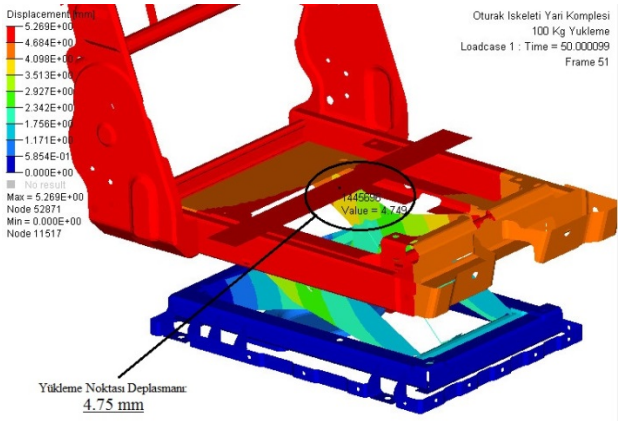


Şekil 8. Basma testi sonuçları

Oturak iskeleti yarı komplesinin sonlu elemanlar modeliyle doğrulanması, içerisinde fazla bağımsız parametre olduğu için önemlidir. Özellikle hava körüğü ve amortisör aynı anda etkileşim halindedirler. Yarı komple için hazırlanan sonlu elemanlar modeli Şekil 9'da gösterilmiştir.



Şekil 9. Sonlu elemanlar modeli



Şekil 10. Basma testi sonlu elemanlar analizi sonucu

Oluşturulan sonlu elemanlar modeline fiziksel testtekine benzer bir aparat yardımıyla 100 kg yük uygulanmıştır. Şekil 10'da sonlu elamanlar analiz sonucu gösterilmiştir. 100 kg yük uygulanan sonlu elemanlar analizi sonucunda oturak iskeleti yarı komplesinde yükleme noktasında 4.75 mm deplasman oluşmuştur. Fiziksel testlerden elde edilen ortalama deplasman değeri ise 4 mm idi. Bu sınır şartlarında ortaya çıkan sonuçlar incelendiğinde sanal ve fiziksel testler arasında 0.75 mm'lik bir fark olduğu ortaya çıkmaktadır. Bu değer sonlu elemanlar modelinin, bu sınır şartlarında % 82'lik bir doğruluk oranına sahip olduğunu göstermektedir.

Komple Koltuk Çalışmaları

Bu aşamada prototip olarak hazırlanan komple koltuk ile testler yapılmış ve koltuğun dinamik konforuna ait veriler ortaya konmuştur. Ayrıca bu testler sonlu elemanlar yöntemiyle yapılan analizlerle tekrar edilerek koltuğa ait komple koltuk sonlu eleman modelinin elde edilmesine olanak sağlamıştır. Koltuğun dinamik konfor analizleri için; prototip olarak üretilen koltuk üzerinde, bozuk bir yol girişini temsil eden sabit genlikli giriş sinyali etkisi altında sürücü konforunun ölçülmesi ve yorumlanması gerekmektedir. Sürüş esnasında yoldan gelen titreşimlerin sürücüye etkisini incelemek için koltuğa dikey titreşim testi uygulanmıştır. Sürücü konforu açısından 5-20 Hz arasındaki frekanslara sahip titreşimler daha önemlidir. Bu nedenle, konfor değerlendirmesi için 5, 10 ve 15 Hz'lik sabit frekanslı ve genlikli periyodik girişlerle testler yapılmıştır.

Koltuk ilk olarak 5 Hz frekansta sinüzoidal bir giriş sinyaline maruz bırakılmıştır. Koltuk tabanına koyulan ivmeölçer yardımıyla giriş genliğinin zamana bağlı değişimi Şekil 11'de gösterilmiştir. Grafikte kırmızı renkteki eğri giriş sinyalinin filtrelenmiş halini göstermektedir. Koltuk tabanından alınan değerler aynı zamanda sarsıcı cihaza girilen değer ile aynıdır.

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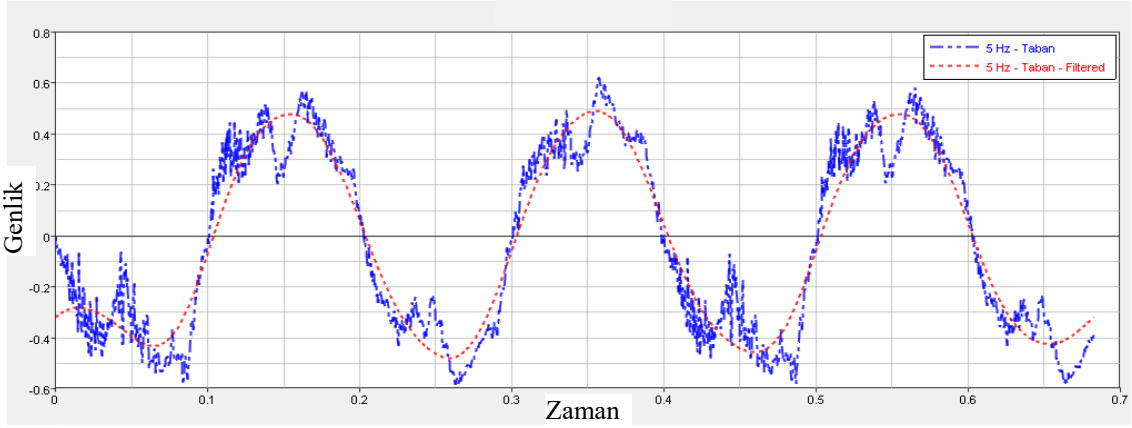
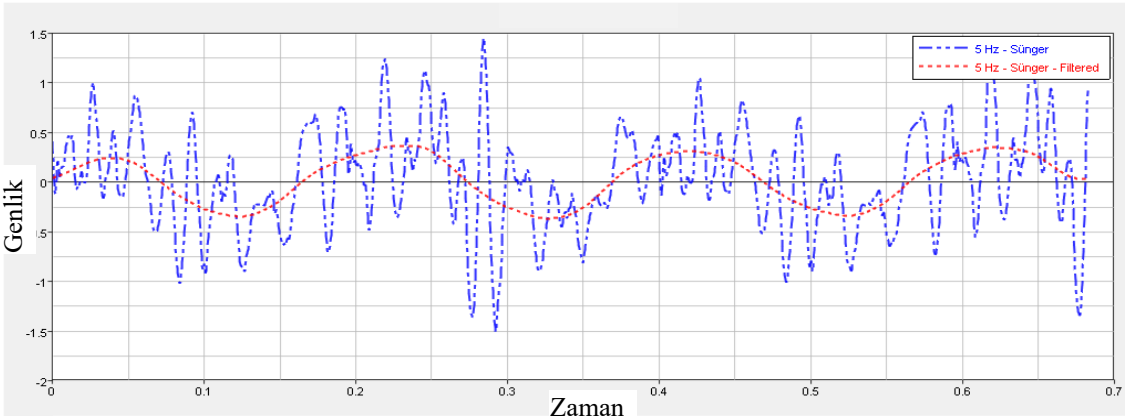


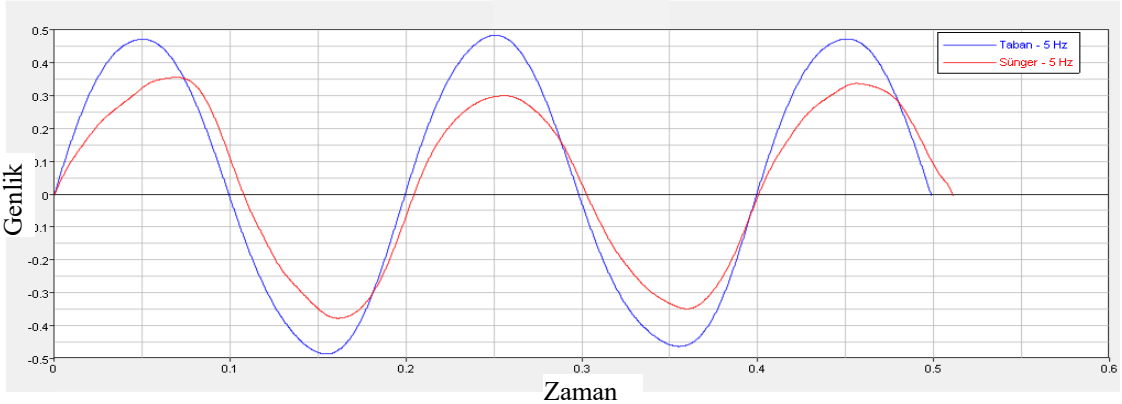
Şekil 11. Koltuk tabanına uygulanan 5 Hz'lik ivme girdisi

Aynı frekans bandında sünger üzerinden de ölçüm yapılmıştır. Bu ölçümün amacı tabandan gelen titreşimin büyüklüğünün sürücüye gelene kadar ne kadar azaldığını gözlemlemektir. 5 Hz bandında yapılan titreşim testi sonucunda sünger üzerinde ölçülen titreşim genliğinin zamana bağlı değişimi Şekil 12'de gösterilmiştir.



Şekil 12. Koltuk süngeri üzerinden ölçülen 5 Hz'lik ivme çıktısı

Yapılan ölçümler 5 Hz frekansında sabit genlikli periyodik bir girişe maruz kalan koltuğun sürücüye ne kadar titreşim aktardığını ortaya koymaktadır. Taban ve sünger üzerinde ölçüm yapılırken farklı zamanlardan örnekleme metoduyla değerler alındığından elde edilen eğrilerin tepe noktaları farklı zamanlarda görülmektedir. Eğrileri karşılaştırmak için genliğin sıfır olduğu noktalar referans alınarak filtrelenmiş eğriler tekrar düzenlenerek Şekil 13'de gösterilmiştir.



Şekil 13. 5 Hz'lik giriş sonucunda taban ve sünger üzerindeki ivme karşılaştırılması

Yukarıdaki grafikten görüldüğü gibi 5 Hz frekansındaki periyodik bir girişte taban ve sünger üzerinden okunan değerler farklıdır. Bu fark koltuğun sönümleme kabiliyetini ortaya çıkarmaktadır. Eğrilerin genlik pik değerlerini karşılaştırdığımızda girişteki genliğin 0.486 çıkıştaki genliğin ise 0.302 birim olduğu görülmektedir. Bu değerlere göre koltuğa gelen titreşimin etkisi %37.9 oranında azaltılarak sürücüye aktarılmıştır.

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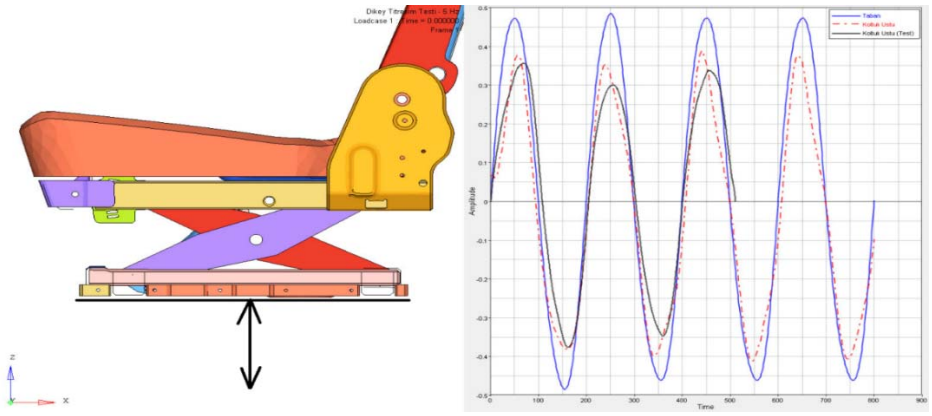
Aynı testler 10 Hz ve 15 Hz frekans bandında tekrar edilmiş, taban ve sünger üzerinden okunan pik değerleri karşılaştırıldığında koltuğa gelen titreşim etkisinin sırasıyla %35.6 ve %25.5 oranında azaltılarak sürücüye aktarıldığı görülmüştür. Farklı frekanslarda yapılan bu testler sonucunda koltuğun sönümleme kabiliyetinin %25-38 arasında olduğu belirlenmiştir.

Komple koltuğa yapılan dikey titreşim testleri koltuk için hazırlanan sonlu eleman modeli üzerinde de tanımlanmıştır. Yapılan sonlu elemanlar analizi sonucunda 5 Hz frekansındaki periyodik bir giriş sinyali için sünger üzerinden okunan değerler sarsıcı testinden elde edilen değerlere yakın çıkmıştır. Taban ve süngerden alınan verilerin genlik pik değerleri-karşılaştırıldığında girişteki genliğin 0.486 çıkıştaki genliğin ise 0.320 birim olduğu görülmüştür. Bu değerlere göre koltuğa gelen titreşimin etkisi bu frekans değeri için %34.1 oranında azaltılarak sürücüye aktarılmıştır.



Şekil 14. 5 Hz'lik dikey yönlü titreşim analizi sonuçları

Şekil 14'de sünger üzerinden okunan ivme değeri için hem analiz hem de test sonucu aynı grafik üzerinde gösterilmiştir. Grafikte mavi renkli eğri tabandan ölçülen giriş sinyalini, kırmızı renkli eğri analiz sonucunda elde edilen koltuk üstüne ait ivme değerlerini ve nihayet siyah renkli eğri ise sarsıcı testinden elde edilen yine koltuk üstüne ait ivme değerlerini göstermektedir. Grafikten de görüldüğü üzere, hazırlanan sonlu eleman modeli dinamik şartlar için fiziksel testlere oldukça yakın değerler vermektedir.

Sonuçlar ve Değerlendirme

Bu çalışmada koltuğa ait doğru bir sonlu elemanlar modeli kurmak için nasıl bir yol izlenmesi gerektiği açıklanmıştır. Elde edilen bu model hem koltukta kullanılabilecek yeni hammadde ve ürünlerin etkisini görebilmek için kullanılabilecek hem de yasal gereklilikler ve üretici firma kültüründe mevcut farklı test beklentilerinin analiz edilmesinde kullanılabilecektir.

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TIYOFEN HALKASI İÇEREN YENI SÜBSTITÜE İMIDAZO[2,1-B][1,3,4]TIYADIAZOL TÜREVLERININ SENTEZI, KARAKTERIZASYONLARI, ANTIFUNGAL AKTIVITELERININ DEĞERLENDIRILMESI VE MOLEKÜLER DOCKING ÇALIŞMASI

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Bu çalışmada, imidazol ve 1,3,4-tiyadiazol halkalarını birlikte içeren imidazo[2,1-b][1,3,4]tiyadiazol türevlerini sentezlemek, çeşitli spektroskopik yöntemlerle karakterize etmek ve bu bileşiklerin antifungal aktivitelerini teorik ve deneysel olarak araştırmak amaçlandı. Bu amaç için ilk olarak tiyofen-2-asetonitril'in tiyosemikarbazit ile olan reaksiyonundan yüksek verimle 5-(tiyofen-2-ilmetil)-1,3,4-tiyadiazol-2-amin sentezlendi. Daha sonra hedef bileşikler olan imidazo[2,1-b][1,3,4]tiyadiazol türevleri (4-12), 5-(tiyofen-2-ilmetil)-1,3,4-tiyadiazol-2-amin'in fenasil bromür türevleriyle (3a-i) olan reaksiyonlarından orta-iyi verimlerle (52-69%) sentezlendi. Sentezlenen tüm bileşiklerin yapıları IR, ^{1}H NMR, ^{13}C NMR, elementel analiz, kütle spektrosokpisi ve X-ray analiz (7, 8, 10 nolu bileşikler) teknikleri kullanılarak aydınlatıldı.

Imidazo[2,1-b][1,3,4]tiyadiazol türevlerinin (4-12) antifungal aktiviteleri, molecular docking ile, 3u7b *F. oxysporum f. sp. lycopersici* protein yapısını kullanılarak teorik olarak incelendi.

Son olarak da sentezlenen tüm bileşiklere *in vitro* koşullarda antifungal aktivite testleri uygulandı. İnhibisyon çapları, inhibisyon yüzdeleri ve LD_{50} dozları belirlendi. Elde edilen teorik ve deneysel aktivite sonuçlarına göre sentezlenen tüm bileşiklerin orta-iyi derecede antifungal aktivite gösterdikleri belirlendi.

Keywords: 2-Amino-1,3,4-tiyadiazol; İmidazo[2,1-b][1,3,4]tiyadiazol; fenasil bromür; Antifungal aktivite; Moleküler docking.

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TOKAT – RESTORATION OF THE CARAVANSARAY OF PAZAR MAHPERI HATUN

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Abstract: One can easily find in the city centre of Tokat and nearby towns the fine examples of Anatolian Turkish architecture belonging to the period of Seljuk such as mosques, shrines, baths, fountains, khans and caravansarays which served distinctive functions. Many pieces of art have been regenerated through proper methods of restoration with the contributions of well-informed local authorities and with the awareness of preservation of historic and cultural heritage and desire to transfer them to the future. After the Battle of Manzikert (1071) the Seljukians of Turkey ruled over some parts of Anatolia who attached importance to trade infrastructures building caravansarays, bridges and sebils (wells and fountains) on trade roads and turned Anotolia into Turkish-Islamic nation.

The construction of Seljukian caravansarays, which were the foundation of Anatolian Economy, started during the ruling of Sultan Kılıç Arslan II (1155-1192) and devoloped in a very short time spreading caravansarays all accoss the trade roads of Anatolia. Caravansarays played improrttant role on development and continuity of transit trade in the Anatolian geography as described in the resources of Seljukian period such as inscriptions, literary works and travel books. Carvansarays, magnificient structures with their specific architecture and decoration, were considerably modern stopover destionations according to the conditions of the period. Considering the historical caravansarays as cultural entities to be preserved, it is vital to document and preserve them as well as transfer them to next generations preserving their material, technical and architectural features by means of proper methods of restoration. In this study, a detailed structural survey of the Caravansaray of Mahperi Hatun has been made and projects of restoration and restitution have been prepared. Following this, scientific evaluation and reporting studies were carried out as well as reconstruction and reinforcement processes were selected in the context of intervention types applicable to cultural premises which need to be preserved. In the light of prepared projects and scientific data obtained thereafter, the unusable materials have been selected to be removed from the structure and inventory of the materials has been recorded. However, the usable materials have been enumarated and stockpiled in order to be reused. The study remains faithful to the building survey. In accordance with the inventory of unusable materials, most characteristacly similar natural stones to be used in the materials have been brought from Tokat quarry so as to be applied.

Keywords: Building Survey, Restoration, Caravansaray, Seljuk, the Caravansaray of Mahperi Hatun

Introduction

In the 11th and 12th century the Seljuks, who conquered Anatolia, founded here the Anatolian Seljuk Empire and to strengthen their sovereignty and economy on their newly won land they started to develop commercial activities (Önge, 2007). In this context, they didn't just built orderly roads, walkways and bridges to safely connect the towns, markets and trade routes of their big country, but they also founded certain mansions (ranges), public houses and caravanserais to ensure the absolute safety of their trade journeys (Akok, 1974). The Seljuks, who built various caravanserais and madrasahs in many parts of the country also put great importance on the expansion of the trade routes in Anatolia. This way Anatolia became the haunt of crowded trade caravans and one of the most important centers of world trade.

This prepared study is based on the Tokat-Pazar Mahperi Hatun Caravanserai, which is one of the Seljukian caravanserais that reached our time. The first part contains definitions about the caravanserais that were

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established because of the interest in trade of the Anatolian Seljuks. In short, concepts such as operating systems and basic planning elements have been analyzed. The second part tries to explain the used methods for the restoration of the Tokat - Pazar Mahperi Hatun Caravanserai. The third part describes the work steps that have been carried out while working on the Tokat - Pazar Mahperi Hatun Caravanserai. The last part however shows today's status of the Tokat - Pazar Mahperi Hatun Caravanserai by using the information of part two and three.

CARAVANSERAI

The word caravanserai derives from the Farsi word kârban (caravan) and saray (palace). Caravanserais are non-profit institutions that have been built on the main roads between cities for accommodation of caravans and passengers. Although it is not quite possible to say where the first caravanserais have been established, some sources say that caravanserais are based on ribats (Akıl,2006). Two caravanserais in Asia that have been built by the Turks and are called ribat belong to the Ghaznavid and Kara-Khanid Khanate dynasty. Their architecture and plans became later examples for the caravanserais built by the Seljuks (Günel,2010).

Operating System and Plan Samples of the Caravanserais in Anatolia:

The caravanserais that received their essence from solidarity and humanity survived until today thanks to the foundation system and are commercial buildings for the public benefit established on roads. Caravanserais were generally built 8-10 hours (35-40 kilometers) by foot away. The stay up to three days in caravanserais was completely free. Expenses were paid by the Sultans, Lords and their foundations.

Kilij Arslan II started a program that transformed the Anatolian Seljukian caravanserais into cornerstones of the economic policy in order to establish trade in Anatolia, create a connection to the Asian trade routes and to lead them to the Mediterranean and Black Sea ports. The building of caravanserais also continued in the Ottoman Empire after the Seljuks. Caravanserais built during the Ottoman period show to main plan types:

1) Closed caravanserais without courts: A square or rectangle building with only one door forms the basis of the plan. The windows are small and high. The raised benches on either side of the entrance axis serve for accommodation of the guests. The middle part is for animals or cargo.

2) Open caravanserais with courts: This type divides the stables and service departments around the yard and the inside accommodations for the passengers at night. Usually there is a water fountain in the middle of the court (Akıl,2006).

Caravanserais are ostentatious structures with thick and tall walls. Along the boundary walls and at the corners there are strut towers. The main door is called crown door and it is possible to find examples of the beautiful Seljukian stone dressing on these doors (Korkmaz,2009). The stone dressing can usually be found on the frame. The crown door, niches, windows, arches and wall edges are architectural pieces that are used for stone adornments. The crown doors, which catches one's eye between the plain walls, give the feeling as if they are inviting the visitors inside. Limestone is used for most of the structures, sometimes at various colors and tones, sometimes only one color and sometimes a few of them together. Marble was rarely used. Inscriptions and plates with the names of the architects are also placed on the crown doors and the structures walls. The virtuosos also left unique signs and marks on the walls of the structure. Picture-1 A map of the caravan routes that was made via the so far detected Seljukian caravanserais.

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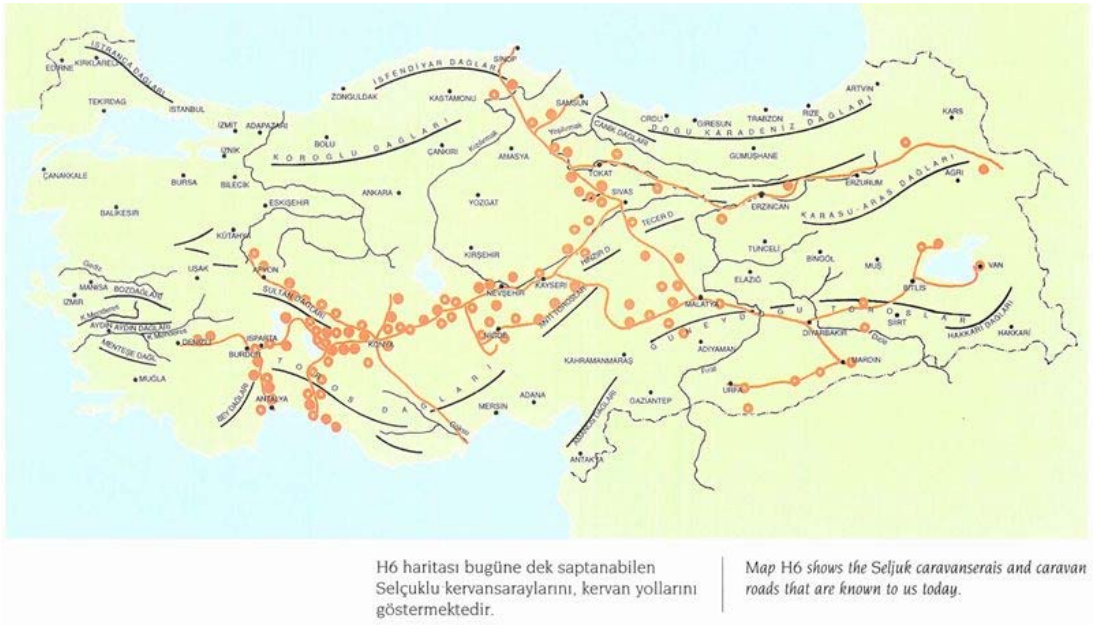

Figure -1: Seljukian caravanserais, caravan routes (Source; Niğde Culture Inventory)

TOKAT-PAZAR MAHPERİ HATUN CARAVANSERAI

Established on the Amasya-Tokat road, 1 km east from the district Pazar, near the Yeşilırmak River; according to two inscriptions the "public house" has been built by Sultan Melike Mahperi Hatun and was finished in the year 636/ 1238-39. (Picture-1). Hall 19.50x28 m (10 stone pedestals), the court is 33x34 m big (Özerkin,1965). Figure 2 shows the site plan of the caravanserai.



Picture -1. Tokat / Pazar Mahperi Hatun Caravanserai



Figure 2: Pazar / Tokat Mahperi Hatun Caravanserai Site Plan

The caravanserai consists of two different sections, one summer and one winter section. The summer section consists of a cloister that is surrounding the court and the parts behind it. The winter section however is divided into three parts by two rows of pillars, the pendentive is covered and completely closed to the outside. The caravanserai consists of cut stones and is rectangular planned. The
entrance door is very pompous, has a rectangular shape and stands inside a pointed arched niche. There is a construction inscription above the entrance door. The door inside the niche stands inside a round arch and consists of alternatively different colored stones. It resembles the portals of Anatolian Seljukian madrasahs and caravanserais. The roof of the caravanserai is completely destroyed but the portal and outer walls survived in a good condition until today (www.e-tatih.org,2015).

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Picture-2; Tokat - Pazar Mahperi Hatun Caravanserai Main Entrance Facade (Foundations General Directorate-Tokat District Directorate)



Picture-3; Tokat - Pazar Mahperi Hatun Caravanserai Main Entrance (Foundations General Directorate-Tokat District Directorate)



Picture-4; Tokat - Pazar Mahperi Hatun Caravanserai Open Inner Court (Foundations General Directorate-Tokat District Directorate)



Picture-5; Tokat - Pazar Mahperi Hatun Caravanserai Main Entrance of the Inner Court (Foundations General Directorate-Tokat District Directorate)

RESTORATION DECISIONS AND APPLICATION

A scientific restoration begins with an analytical study. This study is carried out from three angles:

a. The historical angle,
b. The aesthetical angle,
c. The technical angle (in terms of structure and construction.)

All three studies are handled at three levels:

a. Interaction of the building with the environment;
b. Totality of the structure;
c. Details of the structure (Kuban,2003).

These repairs on ancient structures are named restoration and are carried out according to type and degree of intervention in order to protect them and extent their life. While restoration means to bring back the original state of the structure to a certain extent and make it stronger in order to ensure that it will last longer, the process also contains the repair, the maintaining of the old or the giving of a new function. Giving the structure its old function back or creating a new one for it ensures the use of the structure which is an important part of the conservation culture. It is very rare that the structure is transformed completely back to its original state (reconstruction), this is why mostly the protection of the present is intended. Because of these reasons the scope of the repair/completion

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works is closely linked to the damage ratio of the structure and to the desired restoration level (Yılmaz,2012). This caravanserai on the Tokat-Turhal-Amasya caravan route in the district Pazar of the province Tokat was built by the wife of Sultan Kayqubad I, Mahperi Hatun in the years 1238-1239. The structure was built completely out of fine cut stones. Figure 3 given below shows the building survey of the structure.

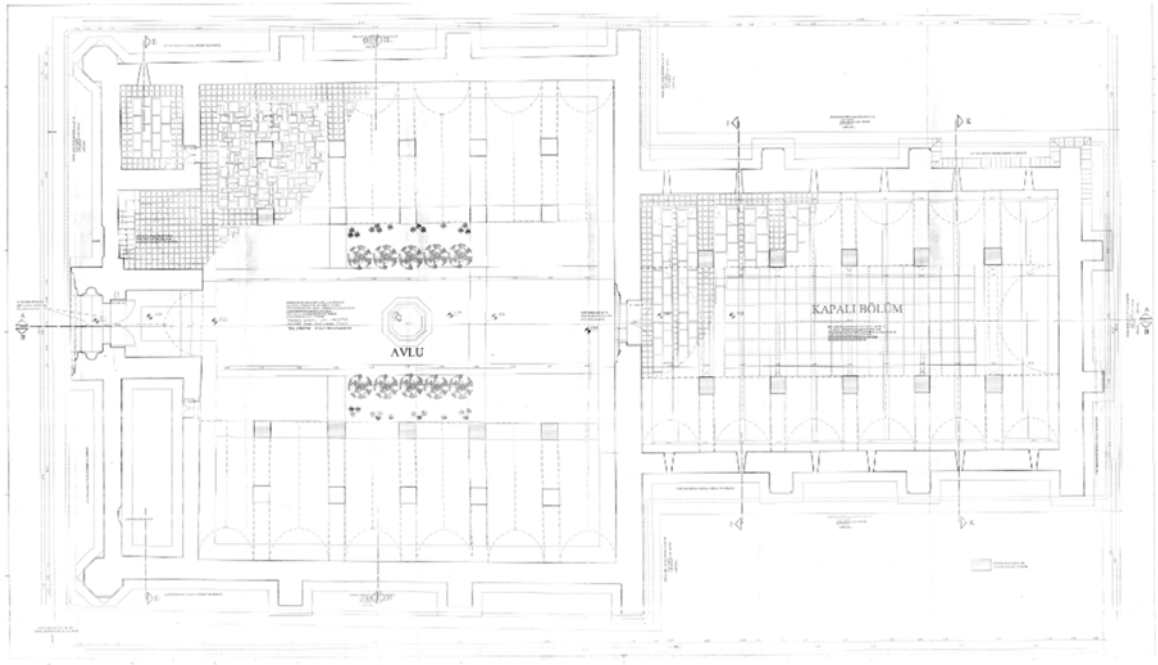
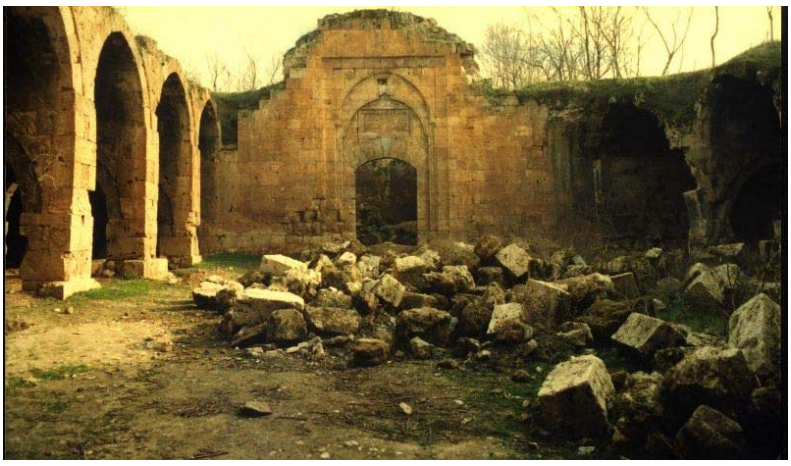


Figure- 3; Tokat - Pazar Mahperi Hatun Caravanserai Building Survey

Like seen in the building survey of the Mahperi Hatun Caravanserai, the bearing stands of the pendentive arches on the right and left of the court have become extremely damaged over the years (Picture 6).



Picture-6; Tokat - Pazar Mahperi Hatun Caravanserai Open Inner Court (Foundations General Directorate-Tokat District Directorate)

Walls and Struts

Bearing walls in historic building are generally made out of cut stone, rough stone, rubble stone, bricks or alternating materials (stone+bricks) and loads from the structure are conducting a continuous basis. The cross-sectional dimensions of the walls together with the oblique loads on it are determined by considering the earthquake loads. The thickness of the walls in historic masonry structures are chosen very big when compared to the self-weight of plane walls. In order to compare the vertical and horizontal loads of the wall they need to act as a whole.

The bearing walls of the Mahperi Hatun Caravanserai was built with cut stones. The bearing walls, which make up a big part of the outer periphery of the structure was preserved in its original form and was only cleaned up.

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Walls with missing or insufficient parts were restored according to the building survey. Appropriate stones that fit the texture of the structure were supplied by the quarry in the center of Tokat and by manufacturing them properly the loads provided by the structure were transmitted to the basis (Picture-7). To ensure integrity of the wall, stones were connected with mortar, seam and wood/wrought iron beams on different levels. Some parts of the wall were strengthened with struts so they would withstand the loads from the oblique roof.



Picture-7; Tokat - Pazar Mahperi Hatun Caravanserai Open Outer Walls (Foundations General Directorate-Tokat District Directorate)

Pendentives

Pendentives are architectural elements that connect a series of arches in a row, which then forms a corridor. This way it is possible to create a sturdy but light foundation to carry the upper structure. In historic structures they were used to create a closed volume in rectangular areas.

In the Mahperi Hatun Caravanserai part of the pendentives in the open court and all of the pendentives in the closed area were damaged or collapsed. The pendentives were manufactured by creating supporting molds and they were strengthened with adhesive mortar and wrought iron beams (Picture-8, Picture-9).



Picture- 8; Tokat - Pazar Mahperi Hatun Caravanserai Closed Court Pendentive Manufacture



Picture-9; Tokat - General View of the Pazar Mahperi Hatun Caravanserai Open Inner Court Pendentives

Arches

Arches are architectural elements that are connected to a semicircle or arc-shaped center lock stone, rise up on two feet on which they bear the weight of the upper wall and create an opening with the desired space. The arches here are used as junction points between the pendentive feet and the outer walls of the structure and are located above the main entrance of the structure, the entrance of the open court and the door between the open and closed court (Picture-10/Picture-11). Because they were generally in a better shape than the pendentives, simple refuting and stones in bad shape were switched out and the transfer of the dome load to the main wall, which is their main task, was made safer.

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Picture-10; Tokat - General View of the Pazar Mahperi Hatun Caravanserai Main Entrance Door



Picture-11; Tokat - General View of the Pazar Mahperi Hatun Caravanserai Pendentive Arches

MAHPERİ HATUN CARAVANSERAI APPLICATION REPORT

A restitution project was prepared according to the presented sources of the said structure, old photographs, information given by the Foundations Tokat District Directorate, new photographs and studies performed on site. Regarding the closed court, pendentive ruins and the exterior wall facades surrounding the structure were used to determine the laying tracks of the pendentive feet (Figure-4).

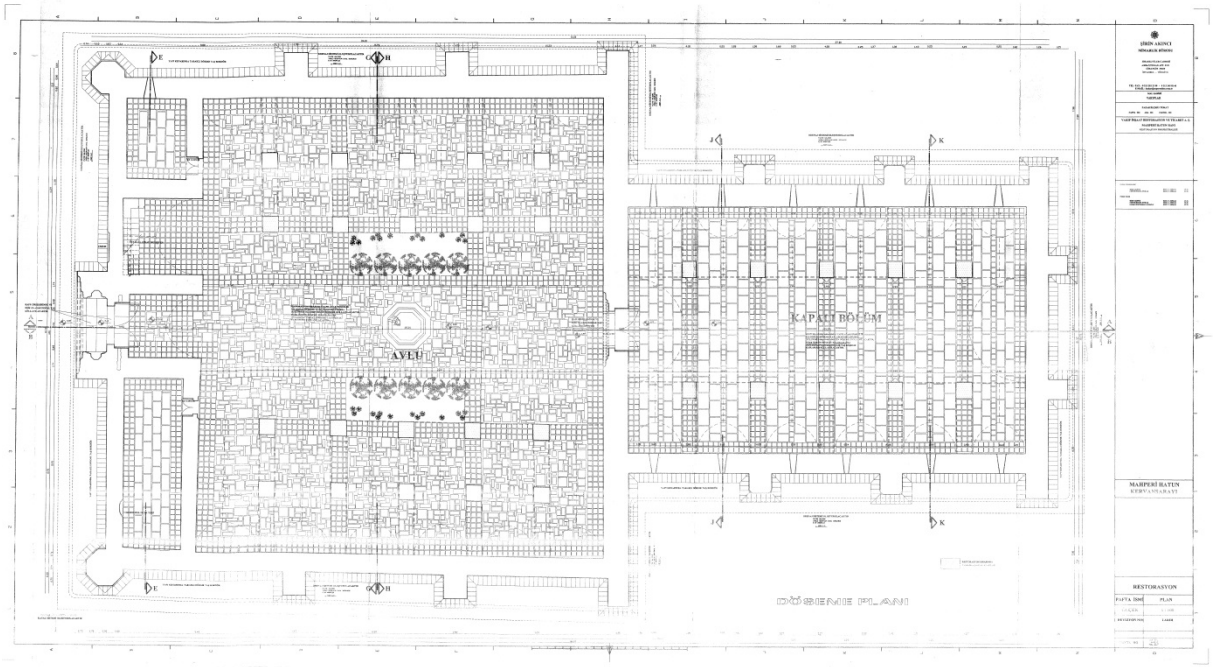

Figure- 4; Tokat - Pazar Mahperi Hatun Caravanserai Restitution Project

By using part of the surviving wall of the closed court, the location and height of the present windows could be calculated (Picture – 12). Because of the height difference of the closed and open court, a concrete floor and stairs were created(Picture – 13).

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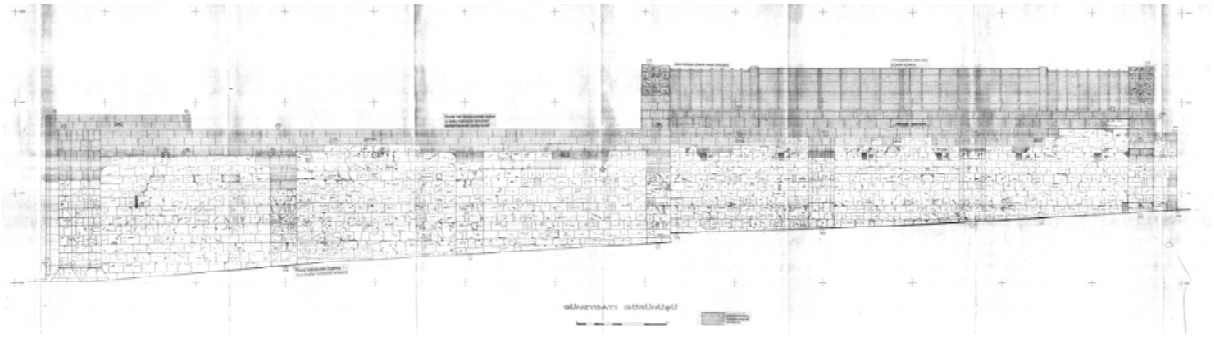

Figure-5; Tokat - Pazar Mahperi Hatun Caravanserai South-West Facade



Picture-12; Tokat - Pazar Mahperi Hatun Caravanserai Height Difference of the Open and Closed Court

The closed court was built in correspondence with the restitution project, which was prepared according to old traces, photographs and bibliographies, with stones from the quarry in the center of Tokat. During the building of the pendentives and the formation of the arches, mortar was used between the stones and iron blades were used as support and connections.
e the inner court of the structure was in better shape than the closed court, application decisions were taken more easily in line with the restitution project. Surviving pendentive ruins were saved and completed with appropriate stone material. Completely destroyed pendentives however were rebuilt in line with the restitution project. The structure system and ruins revealed, that the pavement is made out of stones. Thus the height differences of the structure were evened out with concrete and covered with stones (Picture-13).



Picture-13; Tokat - Pazar Mahperi Hatun Caravanserai Inner Pavement Application

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3.3. USED METHODS

By evaluating the ruins of the Mahperi Hatun Caravanserai and the obtained documents, a restoration project was prepared in line with the prepared restitution project. The stone basis of the building was present and by cleaning up the ruins it was strengthened with appropriate brickdust mortar and cut stones with the same properties of the original material. Present walls of the caravanserai however were numbered, removed and put aside about to be masoned again. Usable stones were separated and insufficient material was substituted with appropriate material by the quarry in the center of Tokat in order to mason the walls (Picture-14). Missing pieces were replaced by new material with the same properties. Since some gutters were in good shape they were used again. Because no wood material was left, new elements were manufactured according to the project.



Picture-14; Tokat - General View of the Pazar Mahperi Hatun Caravanserai

After placing stone blocks for regional repairs of regional/local cracks, the gaps were filled with an appropriate mortar injection. For the repair of fine cracks and cracks and gaps in thick walls the best method is to use a mortar injection with similar properties of the wall. Instead of the renewal of some elements, present elements were repaired and stainless steel was placed in the junction points.

Different from the original structure both parts (Inner court and closed court), the floor and the roof were isolated and protected against water. First the top of the pendentives were filled with light material and the whole structure was covered with stone pavement. The top of the closed court however was covered with polycarbonate material, so it doesn't lie heavy on the structure, and the arched iwan part was covered with lead material. Considering snow and rain falling on the structure, the stone pavement was created beveled and with gutters the water drain was ensured. The Roof Surface of the Mahperi Hatun Caravanserai (Picture-15).



Picture-15; Tokat - General View of the Pazar Mahperi Hatun Caravanserai Roof

4. CONCLUSION AND EVALUATION

The Seljukian caravanserais are formed with art, culture, aesthetics, need, material and construction techniques, are located on historical trade routes and are part of our cultural heritage that needs to be kept alive. Seljukian masterpieces that survived until our days are about to lose their battle against time because of destruction and

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degradation. Considering the condition of the structure, great importance has been placed on the protection of authenticity, traditional material and application of the technical and constructional system.
By determining that the bearing systems of the Mahperi Hatun Caravanserai consist of cut stone, which was found out via traces identified during the project phase and information of eyewitnesses, the structure was returned to its original sate.

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TORNALAMADA MEYDANA GELEN TIRLAMA TİTREŞİMLERİN YÜZEY PÜRÜZLÜLÜĞÜNE ETKİSİNİN İNCELENMESİ

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Özet: Bu çalışmada, AISI 4140 çeliği herhangi bir ısıl işleme maruz bırakılmadan tornalama işlemi gerçekleştirilmiştir. Kesici takım olarak, sermet kalitesindeki iki farklı talaş kırıcı form a sahip kesici uçlar ve ona uygun takım tutucular kullanılmıştır. Kesme parametreleri üretici firma kataloğundan seçilmiştir. CNC torna tezgahında AISI 4140 ıslah çeliğinin kuru tornalanması sonucunda meydana gelen tırlama titreşimleri, kesici takım tutucu üzerine bağlanan MPU6050 6 eksen ivme ve gyro sensörünün, Arduino Mega mikrodenetleyicisi aracılığıyla anlık verileri kaydedilip grafiksel analizi yapıldıktan sonra, sonuçlar yüzey pürüzlülüğü ölçüm cihazında çıkan Ra değerleri ile bağlantıları kurulup karşılaştırılmaları yapılmıştır. Oluşturulan bu sistemde grafiksel analizi yapılan değerler yüzey pürüzlülüğü ölçüm cihazından alınan Ra değerleri ile örtüştüğü ve talaş kırıcı formların tırlama titreşimi ile Ra değerine etki ettiği gözlemlenmiştir.

Anahtar Kelimeler: Yüzey pürüzlülüğü, Titreşim, Mikrodenetleyici, Arduino, İvme ve gyro

Abstract: In this study, steel AISI 4140 has been turned without any heating process. As cutting tools it has been used cermet quality which have two different chipbreaker forms and tool holders are fitted. Cutting parameter have been chosen from producer's catalogue. Chatter vibrations which have been occured by dry turning on lathework bench MPU6050 6 axis acceleration and gyro sensor which are tied cutting tool holder, after data is recorded and analysed grapically via Arduino Mego microcontroller, results have been connected and compared to Ra values which are taken from surface roughness machine. In this system, scores that have been analysed graphically match up with Ra values taken from surface roughness machine and chipbreaker forms affect chatter vibration and Ra values.

Key Words: Surface roughness, Vibration, microcontroller, Arduino, Acceleration and gyro

1. Giriş

Talaşlı imalat, imalat sektöründe vazgeçilemez üretim metotlarından birisidir. İmalat yöntemleri ile elde edilen ürünün ölçü ve geometrik tamlığının yanında yüzey pürüzlüğü kalitesinin de istenilen değerlerde olması önem oluşturmaktadır. Yüzey pürüzlülüğü yapısı, iş parçası, kesici takım özellikleri, işleme parametreleri ve işleme yapılan tezgah ile doğrudan alakalıdır. İmal edilen parçanın mekanik ömrü, kullanıldığı yerdeki etkenlere karşı dayanımı yüzey pürüzlülüğü ile de alakalıdır. Yüzey pürüzlülüğünün tahmininde iş parçası ile kesici takım arasındaki titreşimi kullanmak da mümkündür.

Bir cismin denge konumun da periyodik olarak yaptığı harekete mekanik titreşim denir. Titreşim takım tezgahlarında, istenmeyen gereksiz bir enerjidir. Titreşimin imalat sırasında ortaya çıkan çeşitleri mevcuttur. Bunlar genel olarak serbest titreşimler, zorlanmıs titreşimler, kendi kendini uyaran titreşimler, yenilenebilen titreşimler, termomekanik titreşimler ve mod çiftlemesi olarak adlandırılır.

Takım ve iş parçası arasındaki bağıl hareket, doğal frekanslı bir sistemdir, takım tezgahlarında ki işleme sırasında yüzeye ve kesici takıma zarar verebilir. Bu hareket kabul edilen limitlerin üzerinde olursa buna tırlama denir ve ortaya çıkan tırlama kötü yüzey sonuçlarına, düşük ölçü tamlığına, takım aşınmalarının artmasına, takım kırılmasına ve dolaylı olarak tezgâh ömrünün kısalmasına yol açar.

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Tırlama araştırmaları kesme işlemleri esnasında kararlılığı etkileyen en kritik faktörün talaş kalınlığı olduğunu göstermiştir (Kayhan ve Budak (2004)).

Hahn (1953) yaptığı çalışmada metal kesme işleminde meydana gelen zorlanmış titreşimlerde periyodik dalgalanmaların frekansının iş mili hızıyla orantılı olduğunu, fakat kendiliğinden-doğan titreşimlerde periyodik dalgalanmaların iş mili hızından bağımsız ve tabii frekansla orantılı olduğunu açıklamıştır.

Tlusty ve Polacek (1963), yaptıkları çalışmada, minimum ağırlıkta tezgâhın yüksek kararlılığına sahip olması için kendiliğinden-doğan titreşimin, tezgâhın karakteristiklerine etkisini incelemişler. Sunulan teoride, tezgâhtaki değişmelerin titreşim üzerindeki değişmelere nasıl etki ettiği belirlemişlerdir.

Wu ve Liu (1985), metal kesme dinamiğinin analitik modellenmesi üzerine yaptıkları çalışmada kesme işlemi esnasında oluşan kesme kuvvetlerinin belirlenmesi için bir analitik yaklaşımla, kendiliğinden-doğan titreşimin matematik modeli geliştirmişlerdir.

Lee ve arkadaşları (2001), yüksek hızla frezeleme sırasında oluşan kesme kuvvetleri ve bu esnada oluşan titreşimleri incelemişler. Normal kesme hızlarında yapılan işleme şartlarında oluşan kuvvetlerin ve işleme parametrelerinin tespit edilmesinin kesme parametrelerinin incelenmesinde yeterli olacağını belirtmişlerdir. Ancak, yüksek hızla işlemede yeterli olmadığını bildirmişlerdir. Yüksek hızla işleme şartlarında işlenen parçaların geometrik tamlığı ve yüzey kalitesi kesme sırasında oluşan titreşimlerin etkisinin büyük olduğu ve bu şartlarda yapılan işlemenin gerçek anlamda incelenip irdelenerek benzetim edilebilmesi için titreşimlerinde dikkate alınmasının gerekli olduğu vurgulamışlardır.

Ghani ve Choudhury (2002) tarafından yapılan çalışmalarda, kesme parametrelerinin ve takım üzerindeki titreşimin, yüzey pürüzlülüğüne ve serbest yüzey aşınması üzerine etkisi deneysel olarak incelenmiştir. Kesme hızı, ilerleme hızı ve talaş derinliğinin artırılmasıyla serbest yüzey aşınması hızlandığını ortaya koymuşlardır.

Neşeli ve Yaldız (2007), tornada takım geometrisine bağlı olarak meydana gelen tırlama titreşimlerinin yüzey pürüzlülüğüne etkisini incelemişler. Bunun için üniversal torna tezgahında, değişik yaklaşma açıları (60°, 75°, 90°) ve talaş açıları (-3°,-6°,-9°) kullanılarak, kuru kesme şartlarında AISI 1040 çeliği üzerinden 0.5 mm derinliğinde talaş kaldırmışlardır. Deneysel çalışmada, yaklaşma açısının artması ve negatif talaş açısının azalması tırlama titreşiminin artışına sebep olmuş, yüzey pürüzlülük değerinin de tırlama titreşimine bağlı olarak arttığı gözlemlemişlerdir.

Altınkaya ve Güllü (2008), AISI 316 paslanmaz çeliğin takma uçlu parmak freze ile işlenirken, kullanılan kesici uç üzerindeki talaş kırıcı formun kesici kenar üzerindeki aşınmaya ve yüzey pürüzlülüğüne etkisi incelenmişlerdir.

Bu çalışmanın amacı aynı kalite ve firmaya ait, farklı talaş kırıcı formlardaki kesici uçların sabit kesme parametreleri altında, tornalama işlemi tabi tutularak meydana gelen tırlama titreşiminin, ivme ve gyro sensörü kullanarak, Arduino Mega mikrodenetleyicisi sayesinde verilerin grafiksel analizinin yapılması ve yüzey pürüzlüğü değerleri ile karşılaştırılmasıdır.

2. Deneysel Çalışma

Deneyler de AISI 4140 ıslah çeliğine farklı talaş kırıcı formlara sahip aynı özellikte iki kesici takım kullanılarak, L300 CNC Torna tezgahında talaş kaldırmak suretiyle gerçekleştirilmiştir. Malzeme boyutları Ø22x150 mm olarak belirlenmiştir. AISI 4140 ıslah çeliği herhangi bir ısıl işleme maruz bırakılmadan tornalama işlemi gerçekleşmiştir. Numunelerin kimyasal özellikleri, Çizelge 2.1 de verilmiştir.

Çizelge 2.1 AISIS 4140 ıslah çeliğinin kimyasal kompozisyonu

C	Si	Mn	Pmax	Smax	Cr	Mo	V
0,38-0,45	0,15-0,40	0,50-0,80	0,035	0,035	0,90-1,20	0,15-0,30	-

Deneyde Korloy marka sermet kalitesinde ki CN2000 kodlu, eşkenar dörtgen formunda, kesici uç boşluk açısı 7°olan DCMT 11T308-C25 ve DCMT 11T308-HMP numaralı farklı talaş kırıcı formlara sahip kesici uçlar ile bu uç formuna uygun Korloy firmasına ait SDZCR/L B136 numaralı takım tutucular kullanılmıştır. Şekil 2.1 ve şekil 2.2 de kesici uçlara ait talaş kırıcı formlar gösterilmiştir.

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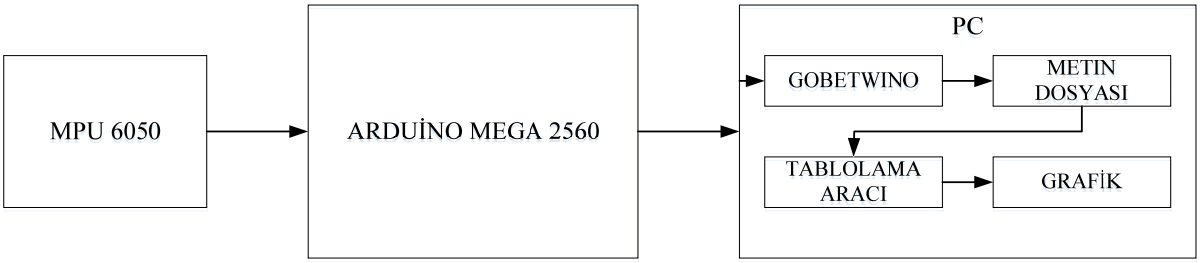
Şekil 2.1 DCMT-HMP kodlu kesici uç



Şekil 2.2 DCMT-C25 kodlu kesici uç

Deneyler sırasında soğutma sıvısı kullanılmamıştır. Kesici uçlar bir sefer kullanılarak iki punta arasına bağlanan her bir numunenin puntaya yakın tarafından 50 mm' lik boyuna tornalama işlemi yapılmıştır. Kesme işleminin parametreleri firma kataloğundan belirlenip her iki uç tipi için geçerli olan değerlerler seçilerek sabit tutulmuştur. Talaş derinliği 1mm, kesme hızı 210 m/dak, ilerleme değeri ise 0,3 mm/dev. değerleri kullanılmıştır.



Şekil 2.3. Uygulamanın Blok Şeması

İşleme sırasında meydana gelen tırlama titreşim sinyalleri, kesici takım üzerine bağlanan MPU6050 6 eksen ivme ve gyro sensörünün, Arduino Mega mikrodenetleyicisi aracılığıyla verileri Gobetwino programı sayesinde anlık olarak PC 'ye aktarılmış yaklaşık 5 dakikalık işleme süresince kaydedilmiştir. İvme ölçer sensör, takım tutucu üzerine kataloğunda belirtilen toleranslar dahilinde özel yapıştırıcı kullanılarak sabitlenmiştir. Böylece sensörden alınabilecek en hassas veriler alınmaya çalışılmıştır. MPU6050 ivme ve gyro sensörü insansız hava araçlarında da kullanılan hassas bir sensör olup üç boyutlu hareketleri Arduino Mega mikrodenetleyicisi sayesinde °/s ile m/s cinsinden işlenmesine olanak sağlamaktadır. Alınan verilerin grafiksel analizi yapılarak parçanın işlem sonrası pürüzlük ölçüm cihazından alınan verilerle kıyaslanması sağlanmıştır. İşlenen numunelerin yüzey pürüzlülük değerlerini ölçmek için Hommel Testter T500 pürüzlülük ölçüm cihazı kullanılmıştır.

3. Deneysel Bulgular

Bu çalışmada farklı talaş kırıcı forma sahip aynı kalitedeki iki kesici ucun, talaşlı imalat sonucu meydana gelen tırlama titreşiminin, yüzey pürüzlülüğünü nasıl etkilediği, ivme ve gyro sensörü ile Arduino Mega mikrodenetleyici sayesinde araştırılması yapılmıştır. C25 kodlu talaş kırıcı forma sahip kesici uç ile yapılan talaşlı imalat sonucu alınan verilerin grafiksel analizi yapıldığında ham gyro değerleri şekil 3.1 de, ivme değerleri de şekil 3.2 de gösterilmiştir. Hommel Testter T500 pürüzlülük ölçüm cihazı ile yapılan ölçümlerde ise Ra değeri 1.1 µm, Rz değeri 8.2 µm , Rmax değeri de 12.2 µm çıkmıştır.

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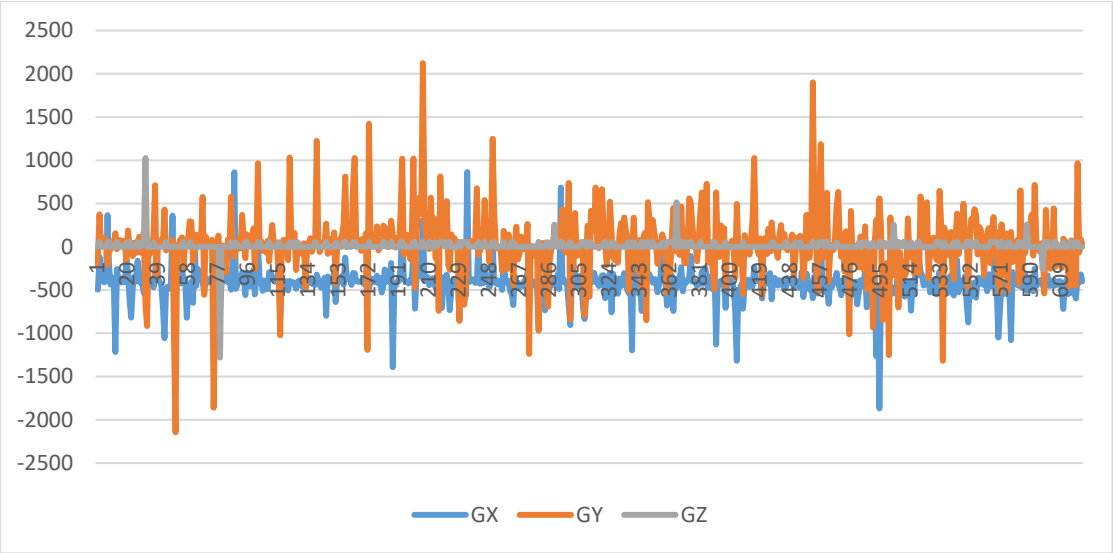
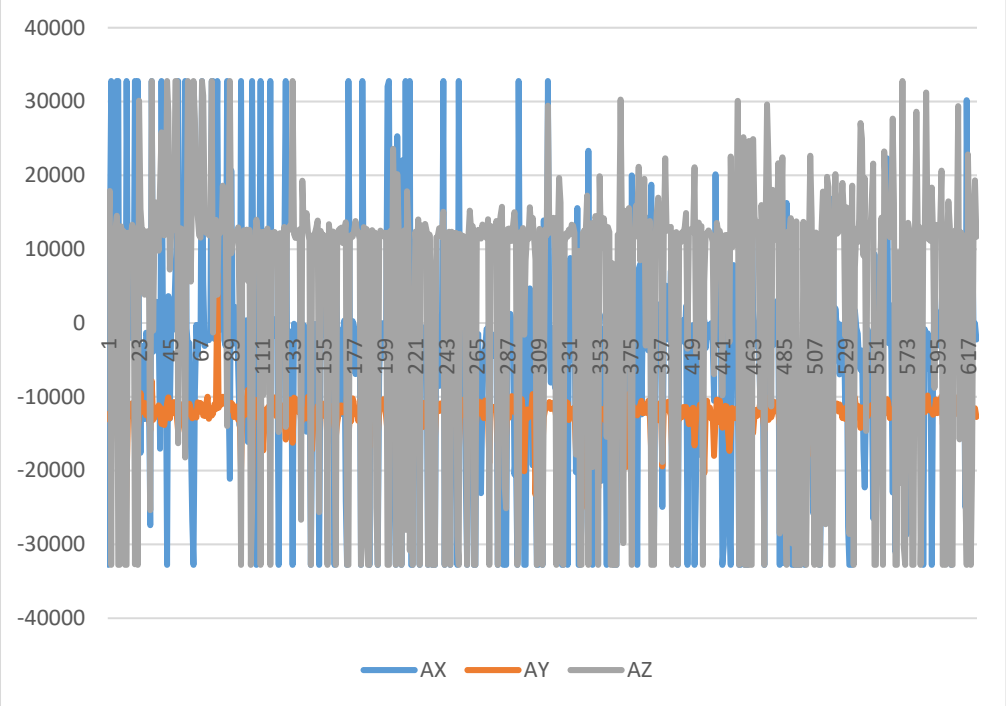


Şekil 3.1 Gyro değerleri.



Şekil 3.2 İvme değerleri.

HMP talaş kırıcı forma sahip kesici uç ile yapılan talaşlı imalat sonucu alınan verilerin grafiksel analizi yapıldığında gyro değerleri şekil 3.3 de, ivme değerleri de şekil 3.4 de gösterilmiştir. Hommel Testter T500 pürüzlülük ölçüm cihazı ile yapılan ölçümlerde ise Ra değeri 0.9 µm, Rz değeri 6.4 µm, Rmax değeri de 8.8 µm çıkmıştır.

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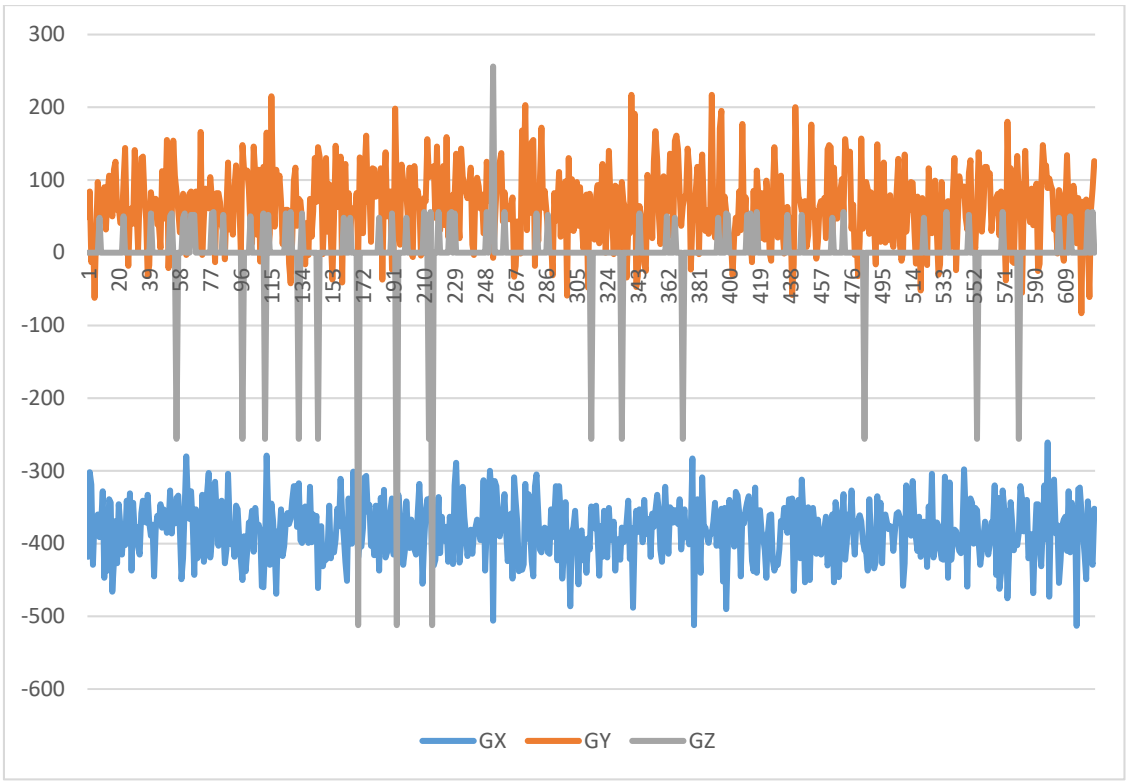
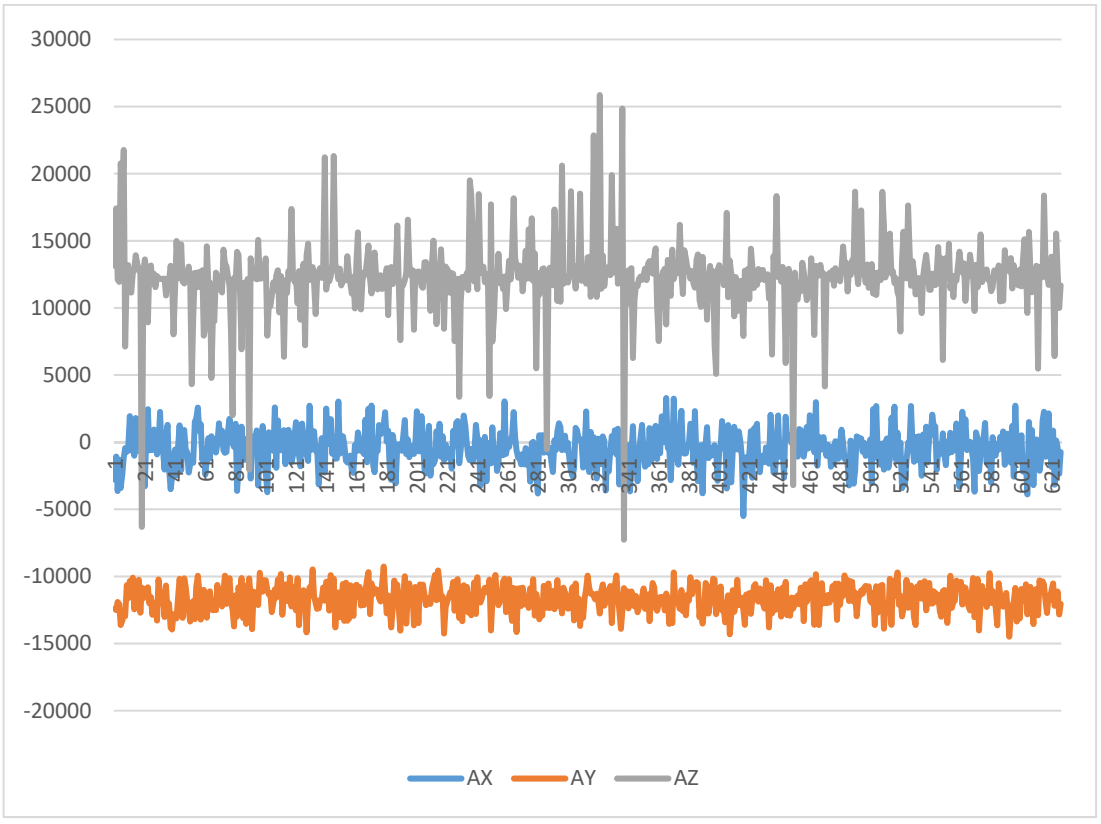


Şekil 3.3 Gyro değerleri.



Şekil 3.4 İvme değerleri.

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4. Sonuçlar

- MPU6050 6 eksen ivme ve gyro sensörünün, Arduino Mega mikrodenetleyicisi kullanılarak anlık verilerinin PC üzerine kaydedilmesi ile yapılan grafiksel analiz, tornalama sırasında ortaya çıkan tırlama titreşimleri hakkında bilgi vermiştir
- İş parçası üzerinde oluşan yüzey pürüzlülüğü (Ra) değerinin ölçülmesi sonucunda, pürüzlülüğün işleme sırasında meydana gelen tırlama titreşimi oranı ile orantılı ve ölçümlerin başarılı olduğu sonucuna varılmıştır.
- Aynı özellikteki farklı talaş kırıcı formlara sahip kesici uçlar ile yapılan talaşlı imalattan elde edilen sonuçlara bakıldığında, talaş kırıcı formların numunelerde farklı tırlama titreşimleri meydana getirdiği, bununda farklı yüzey pürüzlülük değerlerine neden olduğu ortaya çıkmıştır.

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TORQUE AND FLUX RIPPLE MINIMIZATION OF DTC CONTROLLED IM BY USING FUZZY LOGIC DUTY-RATIO ESTIMATOR AND HYBRID FLUX OBSERVER

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Abstract: Direct Torque Control (DTC) drive allows direct and independent control of flux linkage and electromagnetic torque by the selection of optimum inverter switching tables. There is no need for any complex transformation of current or voltage. However in the conventional DTC induction motor drive there are torque and flux ripples, since none of the inverter switching vectors is able to generate the exact stator voltage required to produce the desired chances in the electromagnetic torque and stator flux linkage. In this study, we propose a method to reduce torque and flux ripples. Two steps were carry out for this purpose. The first step is to use duty-ratio. A selected inverter switching vector not for the entire switching period as in conventional DTC, but only for a part of the switching period which is defined as the duty ratio, δ and by using zero switching vector for the rest of period. The duty ratio determines the average input voltage to the induction motor during the application of each switching vector as δVdc. The duty ratio of each switching state is a non-linear function of the electromagnetic torque error, stator flux-linkage error and a function of the position of the stator flux-linkage space vector. In that case fuzzy-logic based duty-ratio control can be used because of it is difficult to model its non-linear structure. The second step is to use hybrid flux observers. The hybrid flux observer uses two model for high and low speeds. Accurate stator flux estimation is obtained by using the stator voltage equation at high speeds, but low speeds accurate stator flux estimation is obtained by the rotor voltage equation. The proposed method is simulated via using MATLAB Simulink and compared to conventional DTC results. Comparing results suggest that the proposed method reduced the ripples in electromagnetic torque, stator flux linkage, stator currents and speed. Motor parameters, reference flux and torque values of motor and load torque value of conventional and proposed methods are arranged to be same for the comparison.

Keywords: Induction Motor, Direct Torque Control, Duty-Ratio Control, Hybrid Flux Observer, Torque and Flux ripple.

Introduction

Direct torque control method (DTC) is a vector control system because it allows calculating motor's flux and torque with the help of measurable magnitudes by motor parameters. The method is based on applying a switching series, which shall directly eliminate errors, which shall occur in torque, through the reference given as value and the calculated flux, to the power switching elements in the inverter (Vasudevan, 2004).

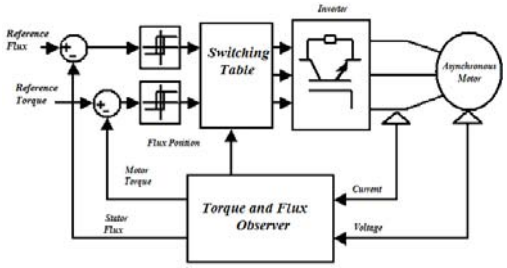

Fig. 1. DTC method block diagram

$$v_{s\beta} = R_s i_{s\beta} + \frac{d\psi_{s\beta}}{dt}, \quad v_{s\alpha} = R_s i_{s\alpha} + \frac{d\psi_{s\alpha}}{dt} \tag{1}$$

$$\psi_{s\alpha} = \int (v_{s\alpha} - R_s i_{s\alpha})dt, \quad \psi_{s\beta} = \int (v_{s\beta} - R_s i_{s\beta})dt \tag{2}$$

$$M_e = p\left(i_{s\alpha} i_{s\beta} - i_{s\beta} i_{s\alpha}\right), \quad \left|\vec{\psi}_s\right| = \sqrt{\left(\psi_{s\alpha}^2 + \psi_{s\beta}^2\right)} \tag{3}$$

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This may be realized by using motor model on the α-β axis set. Stator flux, torque and stator flux sector zone may be calculated with the help of currents and voltages measured in the motor's stator as mentioned above equations (Depenbrock, 1988).
To accomplish switching process, one of the 8 different voltage vectors consisting of 8 different switching is selected as seen in Figure 2. Vi (Sa, Sb, Sc) (i=0,1,2…7) Besides 6 switching levels, there are V0(0,0,0) and V7(1,1,1) levels not producing a voltage at the output when they are applied. Table 1 may be useful to determine that the flux in which zone.

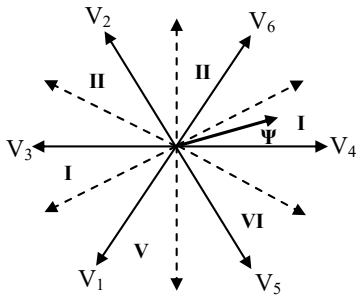

Fig.2 Switching Positions of DTC

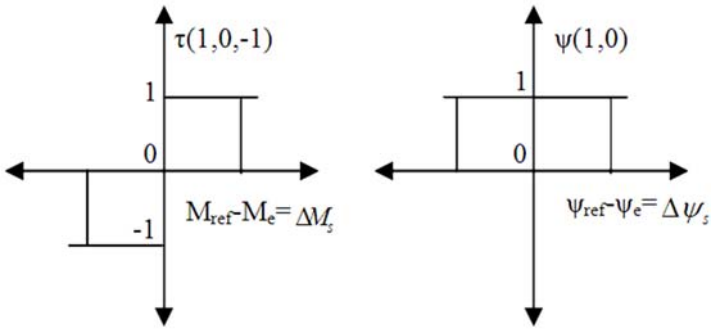

Fig.3 Hysteresis blocks which are Flux and torque error

Figure 3 is hysteresis block schema on which flux and torque errors are applied. Flux and torque errors are applied on hysteresis blocks and the signs produced by these blocks are used in addressing switching board. Hysteresis band widths are symbolized with and for flux and torque respectively. Table 1, which is seen below, shows switching logics when the motor is desired to rotate clockwise and counter-clockwise (Sarioglu, 2003).

Table 1: Optimal Switching Logics For Motor Rotating

		θ(1)	θ(2)	θ(3)	θ(4)	θ(5)	θ(6)
ψ =0	τ =1	V_5	V_1	V_3	V_2	V_6	V_4
	τ =0	V_7	V_0	V_7	V_0	V_7	V_0
	τ=-1	V_6	V_4	V_5	V_1	V_3	V_2
ψ =1	τ =1	V_1	V_3	V_2	V_6	V_4	V_5
	τ =0	V_0	V_7	V_0	V_7	V_0	V_7
	τ=-1	V_2	V_6	V_4	V_5	V_1	V_3

Material and Methods

In the conventional DTC induction motor drive a voltage vector is applied for the entire switching period and this causes the stator current and electromagnetic torque to increase over the whole switching period. Thus for small errors, the electromagnetic torque exceeds its reference value early during the cycle, and continues to increase, causing a high torque ripple. A solution can be obtained where the ripples in the torque and flux can be reduced by employing a selected inverter switching vector not for the entire switching period, as in the conventional DTC induction motor drive, but only for a part of the switching period (which is defined as the duty ratio, δ) and by using the zero switching vector for the rest of the period. The duty ratio is selected to give a voltage vector whose average over the switching cycle gives the desired torque change, thus resulting in reduced torque ripples(Vas, 1989).

The duty ratio of each switching state is a non-linear function of the electromagnetic torque error and stator flux-linkage error, and it is also a function of the position of the stator flux-linkage space vector. Thus it is difficult to model this non-linear function. However, by using a fuzzy logic based DTC system, it is possible to perform fuzzy logic based duty-ratio control, where the duty ratio is determined during every switching cycle. In such a fuzzy-logic system, there are two inputs, the electromagnetic torque error ete=teref - te and the stator flux linkage position ρs . The output of the fuzzy-logic controller is the duty ratio(δ). The fuzzy-logic duty-ratio estimator is shown in Fig.4. The fuzzy logic controller is a Mamdani-type of controller and contains a rule base. As shown Table II There are 18 simple rules and there are only a minimal number (three) fuzzy sets used for two input variables and also for the three output variables; these are small, medium and large.

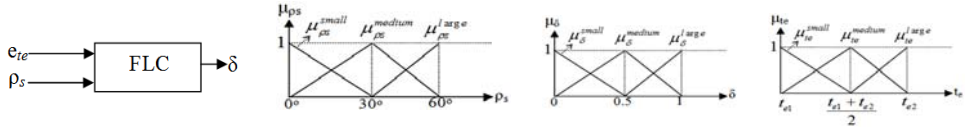

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Fig. 4. Fuzzy-logic duty-ratio estimator, and membership functions

The hybrid flux estimator uses two models; a stator-voltage-equation-based model and also a rotor-voltage-equation-based model. Such an estimator utilizes the fact that at high speeds, accurate stator flux estimation can be obtained by using the stator voltage equation, but at low speeds accurate stator flux estimation can be obtained by using the rotor voltage equation. it is also possible to improve the estimation of the stator flux linkages with this method (Vas, 1989).

Designing Of The Simulink Model And Simulation Results

Both of control systems are realized in Matlab/Simulink. Fuzzy Logic Duty-Ratio Estimator and Hybrid Flux Observer based direct torque control Simulink schema of induction machine in Matlab/Simulink is shown in the Figure 5. Figure 6 and Figure 7 show us comparing torque, flux loop, and current respectively.

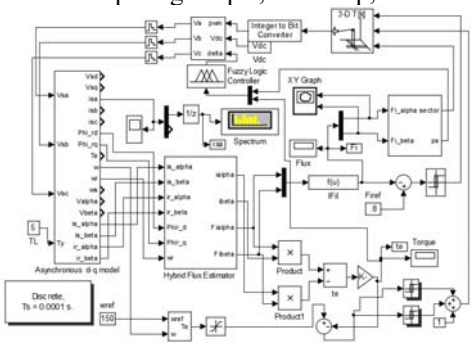
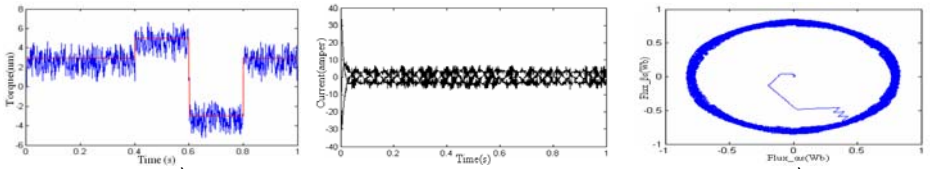
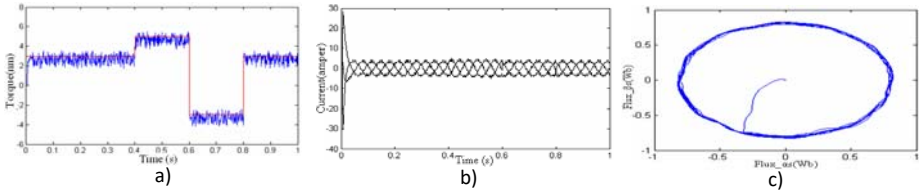


Fig. 5. Proposed DTC Matlab/Simulink Schema



a) b) c)

Fig.6 Conventional DTC a)Torque b)Current c)Flux Loop



a) b) c)

Fig.7 Proposed DTC a)Torque b)Current c)Flux Loop

Conclusion

Fuzzy Logic Duty-Ratio Estimator and Hybrid Flux Observer based direct torque control method is compared to conventional direct torque control. The DTC and the Fuzzy Logic Duty-Ratio Estimator and Hybrid Flux Observer based DTC method are simulated and the comparison of their performances is presented. The ripples in electromagnetic torque, stator flux and stator currents reduced by the duty-ratio-controlled DTC.

Acknowledgements

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TORSIONAL BEHAVIORS OF HOLLOW CIRCULAR GLASS/EPOXY COMPOSITE SHAFTS WITH DIFFERENT ORIENTATION ANGLES

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Abstract: In this study, the torsional stresses of circular hollow shafts manufactured from composite materials were examined at different orientation angles. For circular hollow composite shafts; glass fiber were used as the fiber materials, while epoxy resin was used as the matrix material. 80mm, 200mm and 250mm-long-composite shafts of different inner diameters were used. The hollow composite shafts were manufactured at θ=45°, 60°, 75°, 80°, 88° orientation angles through the filament winding method. The mechanical torsion tests of circular hollow composite shafts were separately repeated for each sample. The obtained results were evaluated among themselves in terms of the length of the shaft, the diameter of the shaft and the orientation angle, after which they were transferred to the graphics.

Keywords: Composite shafts, Filament winding, Orientation angle, Torsion test

Introduction

Apart from the fact that shafts, which are used in every field of technology, are among the most important power transfer elements, they are exposed to tensile, compression, bending and torsional stresses due to their operational characteristics. Since shafts transmit power from one machine element to the other, they become exposed to torsional stress, which is the most hazardous one of all. Since shafts are exposed to bending due to the elements found on the top of them as well as being exposed to torsion due to rotating, the calculations are generally made according to combined stresses, and accordingly, their constructions and designs are performed. However, hollow shafts are usually preferred in the cases in which lightness (weightlessness) is required, which, then, causes weakness in strength/endurance by almost 6%; yet, 25% of lightness is achieved. For this reason, hollow shafts are quite frequently used, particularly in automotive industry and in aviation and space industries. The following studies were found when a topic-related literature review was made. Bert and Kim carried out an analytical solution to compute torsional buckling of composite drive shafts. They calculated the torsional buckling load of composite drive shafts with various lay-ups with good accuracy by considering the effect of off-axis stiffness and flexural moment. Their theory can predict the torsional buckling of composite drive shafts under pure torsion and combined torsion ad bending [1]. Chen and Peng performed numerical simulation using a finite element method to study the stability of composite shafts under combined loading conditions. The predicted the critical axial load of a thin-walled composite drive shaft under rotation [2]. Kim et al. manufactured hybrid shaft which had stainless steel surface and composite core. Carbon/epoxy layers were laid in to the steel tubing. They found that hybrid shaft had less tilting angle and higher natural frequency compared to that of non-hybrid steel shaft [3]. Kim and Lee studied the performance of hexagonal, elliptical lap and adhesively bonded circular joints. Adherents were carbon fiber epoxy and steel shafts. Among three joints investigated, hexagonal joint was the best fo torque transmission. The double lap joint performed better than single lap joint. Hexagonal single lap joint and circular double lap joint performed almost the same [4]. Kim et al. conducted both experimental and numerical study to predict behaviour of the adhesive-bonded composite shaft. Carbon and glass composite tubes are joined together using adhasive bonding. Various length of bonding has been investigated. It was reported that the bonding length of 16 mm and larger was enough for 3500 Nm toque capacity. The yoke thickness, diameter of shaft, and adhesive thickness were 4,8 mm, 90 mm and 0,2 mm, respectively [5]. Hahn and Erikson, used pin and glue together to transfer load between thin-walled torsion test specimen. Studies regarding torsional behaviour of composite tubes are very limited. They studies usually report the result of few isolated torsional test. However meaningful conclusions can only be drawn by conducting adequate number of tests. Hence easy gripping methods needed for the torsion tests of composite tubes [6]. Soden et al. performed a number of experiments to determine the failure and strength of

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E-glass/epoxy tubes with various winding angles of the fibres. They obtain theoretical failure envelopes by using lamination theory and netting analysis, and predicted the initial and ultimate failure loads satisfactorily [7]. Mistry et al. investigated the effect of the winding angle on the strength of GRP pipes using finite element analysis, and predicted first ply failure loads and an optimal angle close to 80°, instead of 55°, as reported by netting analysis elsewhere for internal pressure loading [8,9]. Caroll et al. presented the rate-dependent behaviour of ±55 filament wound glass/epoxy tubes under biaxial loading [10]. Swanson et al. studied the failure of hand layed uo quasi-isotropic carbon/epoxy laminates subjected to biaxial stress. They suggested a maximum fiber strain failure criterion, a progressive failure model that incorporates ply stiffness changes and a nonlinear model for the matrix shear response. Failure tests, involving torsional shear combined with axial tension or compression of unidirectional hoop wound cylinders, were also carried out to examine matrix failure under multiaxial stress conditions [11, 12]. Fujii et al. investigated the strength and nonlinear stress/strain response of plain woven glass fiber laminates, fabricated using the wet winding technique, under biaxial loading, and also estimated the strength using the Tsai-Wu and Tsai-Hill criterion and 2nd Piola-Kirchhoff stress [13, 14]. Ferry et al. studied the fatigue damage of both bending and torsion loading on unidirectional glass-fibre/epoxy composite bars, observing that damage processes occurred throuhgh the fibre failure, delamination and matrix cracking. These authors concluded that damaging occurred by several complex processes, depending on both the ratio between bending and torsion stresses and the ratio between minimum and maximum stresses [15].

Materials and Methods

Within the scope of this study, glass (600 gr/m2) was used as the fiber material, whereas epoxy was used as the matrix material. Dimensionally; composite shafts of 80mm, 200mm and 250mm in size, with Do=17mm-outer diameter and Di=12mm and 13mm-inner diameters were used.

I.Manufacturing method

In this study, the method referred to as the filament winding method in the literature, which is the most commonly-used one, was applied as the manufacturing method (Fig. 1). The glass fibers were wound over the rollers in the form of three layers at the orientation angles, θ=45°, 60°, 75°, 80°, and 88°. The manufactured circular hollow composite shafts were designed in given lengths according to ASTM standards and were made available for torsion tests, again, in accordance with ASTM standards (Fig. 2).



Figure1: Filament winding machine



Figure2: A test specimens of glass/epoxy

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Experimental Studies

The circular hollow circular composite shafts manufactured from 80mm, 200mm and 250mm-long glass/epoxy material with Di =12mm and Di =13mm inner diameters, which consisted of three layers, were subjected to torsion tests separately. The torsion tests were performed at room temperature through the location-type Shimadzu AG-X universal device with 250 kN load cell

Results and discussions

A. Effects of orientation angles on torsion stress

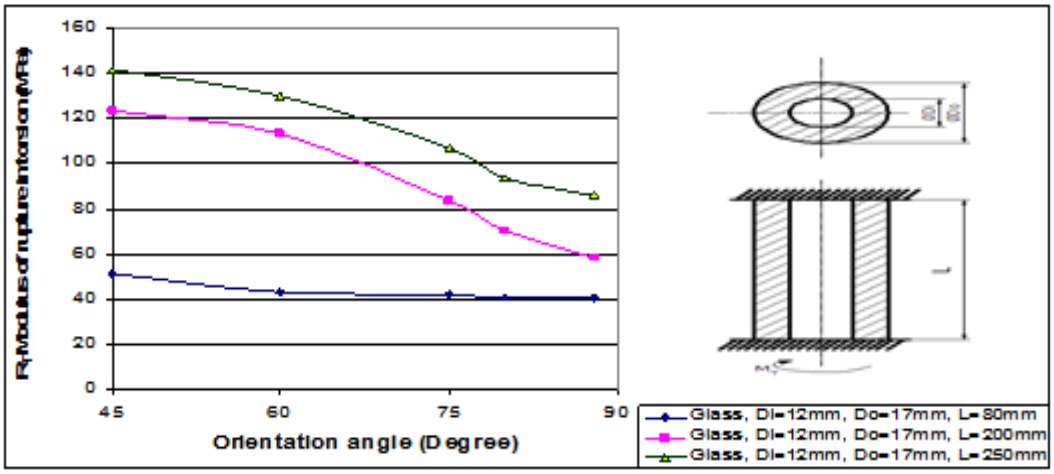

Figure 3: Torsion stress- orientation angle and length curve of glass for torsion stress

The values of modulus of rupture in torsion of hollow circular glass/epoxy composite shafts were analyzed according to the orientation angle. Accordingly;

As will be seen in the graphics; it was observed that as the orientation angle of the fiber increased, the values of the modulus of rupture in torsion of glass/epoxy composite shafts decreased (Fig. 3).

It was seen that the modulus of rupture in torsion had reached the maximum value when it was at 45° orientation angle (Fig. 3). Separately, since the number of translocations among the fibers will increase once the orientation angle is extended, the values of modulus of rupture in torsion diminishes, as well

B. Effects of wall-thickness on torsion stress

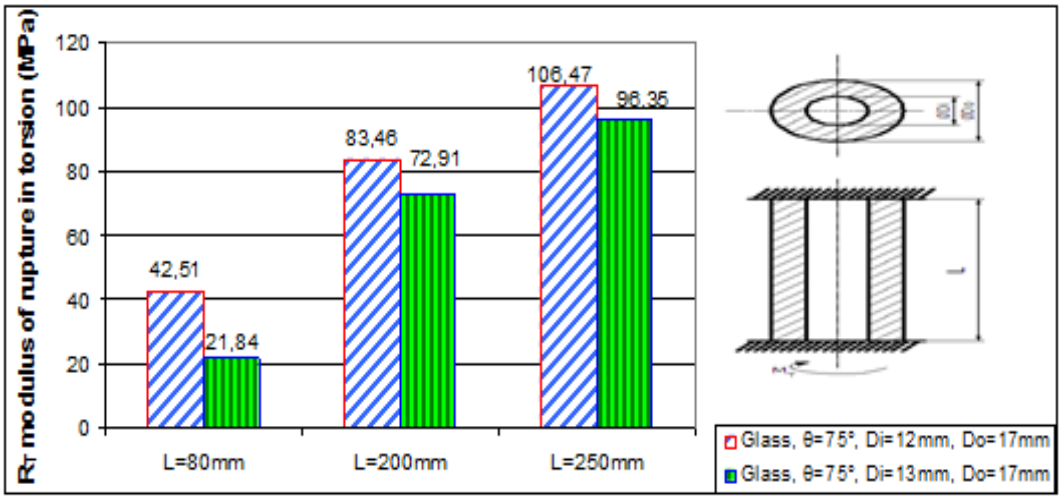

Figure 4: Effects of wall-thickness for glass on torsion stress

The values of modulus of rupture in torsion of hollow circular glass/epoxy composite shafts were analyzed according to the wall-thickness. Accordingly;

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It was seen that the values of modulus of rupture in torsion of the circular hollow glass/epoxy composite shafts with the inner diameter Di=12mm, and at θ=75° orientation angle, which were in different lengths, were higher than the values of modulus of rupture in torsion pertaining to those with the inner diameter Di=13mm (Fig. 4).

It was ascertained that the values of modulus of rupture in torsion of the hollow circular composite shafts had also increased as the wall thickness increased (Fig. 4). The reason for this is that the endurance/resistance values drop down because the rate between the outer and inner diameters declines, in other words, because the wall thickness diminishes.

Therefore, it can also be seen in the graphics that the wall thickness in the hollow circular composite shafts, as it diminishes, will pose a risk in terms of all the stresses. The shear stresses in all the loaded (non-hollow) circular composite shafts increase in a linear way, from the center of the shafts towards their surface. In other words, the shear stresses take 'zero' value at the center of the shafts but reach the maximum value while they move towards the outer surface. However, the minimum shear stress in the circular hollow composite shafts reaches the maximum value, starting from the inner diameter value towards the outer diameter.

C. Effects of lengths of reinforcement material on torsion stress

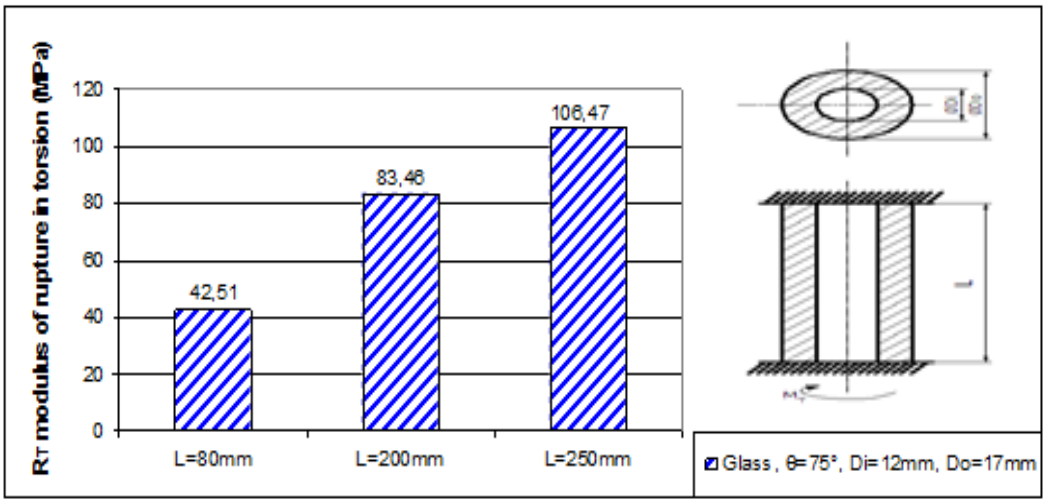

Figure 5: Effects of length of specimens for glass on torsion stress

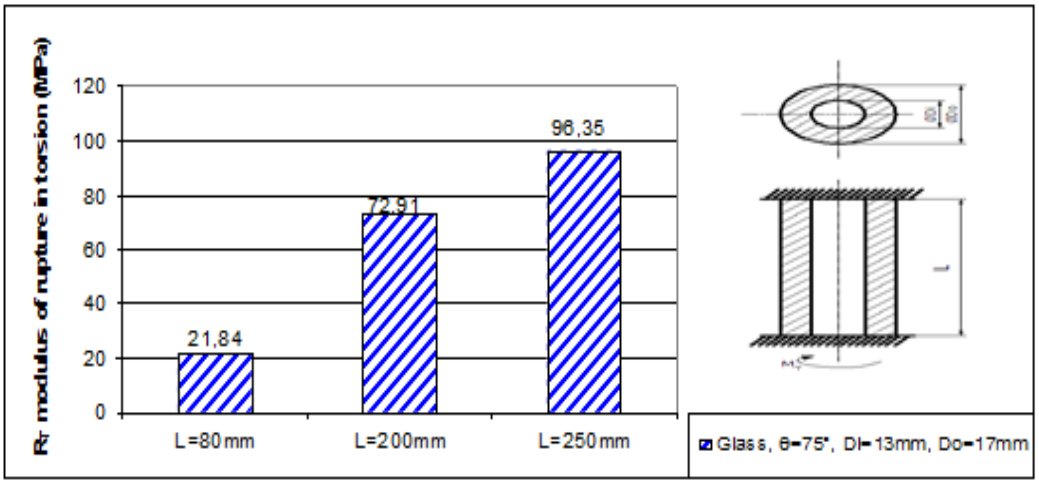

Figure 6: Effects of length of specimens for glass on torsion stress

The values of modulus of rupture in torsion of hollow circular glass/epoxy composite shafts were analyzed according to the lengths of the reinforcement materials. Accordingly;

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It was seen that as the lengths of glass/epoxy hollow circular composite shafts increased, the values of modulus of rupture in torsion also increased (Fig. 5, 6). As the lengths of the hollow circular composite shafts increase, the degree of the rotational angle increases, as well. Hence, the endurance/resistance values increase as the shaft length increases.

It was observed that the glass/epoxy composite shaft of L=250mm-length, at θ=75° orientation angle, and with Di=12mm-inner diameter had reached the highest values of modulus of rupture in torsion (Fig. 5).

when the lengths of the hollow circular composite shafts were increased the values of modulus of rupture in torsion also increased. The reason for this is the fact that the torsion angle is in direct proportion to length.

Conclusions

In this study, the torsional stresses of hollow circular shafts manufactured from glass/epoxy composite materials were examined at different orientation angles. Composite shafts of different lengths and different inner diameters were used. The hollow composite shafts were manufactured by being wound on the rollers at θ=45°, 60°, 75°, 80°, 88° orientation angles through the use of the filament winding method. Each hollow circular composite shaft that was manufactured was subjected to torsion tests. The significant results were obtained from the torsion tests that mentioned below.

The torsional stress values drop down due to the fact that the number of translocations among the fibers will increase as the orientation angle extends. It was seen that the modulus of rupture in torsion of the glass/epoxy composite shafts has reached the maximum value at 45° orientation angle.

It was determined that as the orientation angle of the fiber extended, the modulus of rupture in torsion of glass/epoxy composite shafts declined.

when the lengths of the hollow circular glass/epoxy composite shafts were increased the values of modulus of rupture in torsion also increased. The reason for this is the fact that the torsion angle is in direct proportion to length.

It was determined that the modulus of rupture in torsion of the glass/epoxy hollow circular composite shafts had increased as the wall thickness increased.

The shear stresses in hollow circular glass/epoxy composite shafts increase in a linear way, starting from the inner diameter of the shafts towards the outer surface of the shaft; in other words, the shear stresses take ‘zero’ value at the center of the shafts but reach the maximum value as they move towards the outer surface.

Acknowledgements

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TOZ METALURJİSİ ve SICAK EKSTRÜZYON PROSESLERİ İLE ÜRETİLEN AA7075-SİC$_P$ KOMPOZİTLERİN AŞINMA ve KOROZYON DAYANIMINA T73 ISIL İŞLEMİNİN ETKİSİ

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Özet: Bu çalışmada, toz metalürjisi ve sıcak ekstrüzyon prosesleri kullanılarak üretilen T/^ısıl işlemli AA7075-SiC metal matrisli kompozitlerin, aşınma ve korozyon dayanımı incelendi. Bu amaçla; AA7075 alüminyum alaşım tozlarına farklı boyut ve oranlarda SiC partikül (SiC$_p$) ilave edilerek elde edilen toz karışımları Ø35x30 mm boyutlarında preslendi. Preslenmiş kompaktlar 480 °C'de, 12 mm çaplı çubuklar halinde ekstrüze edildi. T73 yaşlandırma prosesi, çözeltiye alınıp ardından su verilen numunelere iki kademeli aşırı yaşlandırma işlemi şeklinde uygulandı. Kompozitlerin mekanik özellikleri sertlik ve adhesif aşınma testleri ile belirlenirken, korozyon dayanımları farklı sürelerde uygulanan EXCO korozyon testleri ile tespit edildi. Deneysel sonuçlar, SiC$_p$ içeriğinin artmasına bağlı olarak kompozitin sertlik ve aşınma direncinin de arttığını gösterdi. SiC partikül ilavesi AA7075 alaşımının korozyon dayanımını arttırırken, artan partikül boyutu ile birlikte kompozitin korozyon dayanımı düşmüştür.
Anahtar Kelimeler: AA7075; Kompozit; Ekstrüzyon; Aşınma; Korozyon

EFFECT OF T73 HEAT TREATMENT ON WEAR AND CORROSION RESISTANCE OF AA7075-SiC$_p$ COMPOSITES PRODUCED BY HOT EXTRUSION AND POWDER METALLURGY PROCESSES

Abstract: In this study, wear and corrosıon resistance of T73 heat treated AA7075-SiC$_p$ composıtes produced by hot extrusıon and powder metallurgy processes were investigated. For this purpose, various size (8, 32 and 82 µm) and ratio (wt.%10 and %15) of SiC particle were added into AA7075 aluminum alloy powders, then Ø34x30 cylindrical blocks are produced by pressing. The pressed compacts were extruded at 480 °C as 12 mm dia round bars. Then, T73 overaging treatment was performed in two stages. Mechanical properties of AA7075 alloy and composites samples were determined by microhardness and adhesive wear tests. Corrosion resistance of samples were determined by EXCO corrosion test in different periods. Resuts show that that the hardness and wear resistance of composites increased with SiC$_p$ addition. EXCO corrosion tests show that corrosion resistance of AA7075 alloy increased with SiC$_p$ addition and, corrosion resistance of composites decreased with increasing SiC particle size.
Keywords: AA7075; Composite; Extrusion; Wear; Corrosion

Giriş

Alüminyum alaşımlarından 7xxx serisi, genellikle düşük yoğunluk, yüksek dayanım, süneklik, tokluk ve yorulmaya karşı direncinden dolayı yapısal uygulamalarda, uzay ve havacılık sanayinde yaygın olarak kullanılan malzemedir (Güleryüz, 2011). 7075 alüminyum alaşımları Al-Zn-Mg-Cu ihtiva etmesi sebebiyle farklı ısıl işlemlere maruz bırakılarak mekanik özellikleri iyileştirilerek ticari olarak kullanıma sunulmuştur. Bu ısıl işlemlerin başında T6 ısıl işlemi gelmektedir. 7XXX serisi aluminyum alaşımları, yüksek sertlik ve mukavemet sağlayan T6 temper durumunda korozyona karşı oldukça duyarlı olduğundan, geçmiş yıllarda bu alaşımların korozyon direncini iyileştirmek amacıyla, T73 olarak bilinen aşırı yaşlandırma işlemi geliştirilmiştir (Baydoğan, 2004).

Sahip oldukları yüksek tokluk ve dayanımları nedeniyle son yıllarda alüminyum esaslı kompozitlere olan ilgi oldukça artmıştır (Sun et al., 2013). Al-Zn-Mg-Cu alaşımları sahip oldukları yüksek sertlik ve kırılma tokluğu (Jin et al., 2013), düşük yoğunluk (Ronki et al, 2011, Yang et al, 2013), iyi işlenebilirlik, kaynaklanabilirlik ve stress korozyon çatlak direnci (Ronki et al., 2011) gibi özelliklerin süper kombinasyonuna sahip olup havacılık ve otomotiv endüstrisinde tercih edilen malzemelerdir (MacAskill et al, 2009, Taleghani et al, 2014, Rendigs et al, 1997, Williams et al, 2003). Alüminyum esaslı kompozitler toz metalürjisi prosesleri ile üretilebilmekte ve sıcak

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ekstrüzyonla şekillendirilebilmektedir. Toz metalurjisi farklı özelliklere sahip malzemelerin çeşitli oranlarda karıştırılmasını ve malzeme özelliklerini kontrol etmeyi nispeten daha kolay hale getirmiştir (Sun et al., 2013).

Bu çalışmada, SiC partikül takviyeli AA7075 metal matrisli kompozitlerin aşınma özelliklerine partikül boyut ve miktarının etkisi incelendi. Bu amaçla, AA7075 alüminyum alaşım tozlarına farklı boyut ve oranlarda SiCp ilave edilerek elde edilen toz karışımları silindirik bloklar halinde preslendi. Preslenen toz kompaktlar sıcak ekstrüze edildi. T73 ısıl işlemi uygulanan çubuklara sertlik ve aşınma testleri uygulanarak sertlik, aşınma ve korozyon dayanımları karşılaştırıldı.

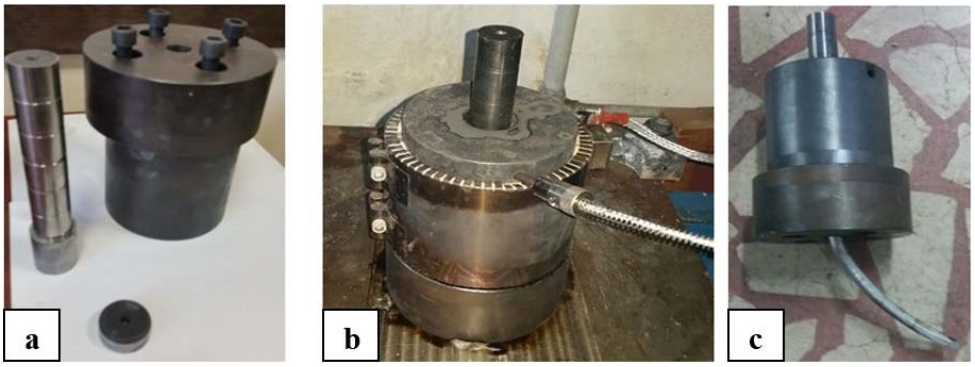
Deneysel Çalışma

Kompozit üretiminde matris malzemesi olarak 200 mesh altı (<74 µm) partikül boyutuna sahip ve kimyasal kompozisyonu Tablo 1'de verilen AA7075 alaşım tozları kullanıldı. Takviye elemanı olarak ortalama partikül boyutu 8, 32 ve 82 µm olan SiCp kullanıldı. Kompozit numuneleri elde etmek amacıyla AA7075 alaşım tozlarına ağırlıkça %10 ve %15 SiCp ilave edildi. Homojen bir karışım elde etmek amacıyla tozlar üç eksenli karıştırıcıda (Turbula T2F) 45 dakika süreyle karıştırıldı.

Tablo 1. AA7075 alaşımının kimyasal bileşimi

Elementler	Al	Zn	Mg	Si	Cu	Cr	Mn	Fe	Zr	Na	P	S	Cl	K
% Ağırlık	Kalan	4,78	1,84	0,24	1,45	0,25	0,26	0,23	0,023	0,32	0,03	0,04	0,28	0,05

AA7075 alaşım ve SiC_p takviyeli tozların 350 MPa basınç altında tek eksenli olarak preslenmesi ile toz metal kompaktlar elde edildi. 35 mm çapında ve yaklaşık 30 mm yüksekliğindeki soğuk preslenmiş kompaktlar kalıp içerisinden çıkarılmadan Şekil 1'de görülen ekstrüzyon kalıp düzeneği ile 480°C'ye ısıtılıp 1 saat bekletildikten sonra 12 mm çaplı çubuklar halinde ekstrüze edildi (Şekil 1-c). Ekstrüzyon işleminde malzemenin akışını kolaylaştırmak ve daha iyi yüzey kalitesi elde etmek amacıyla kalıp yüzeyleri yüksek sıcaklık dayanımlı kalıp ayırıcı gres yağı ile yağlandı. Ekstrüzyon işleminden sonra AA7075 alaşım ve kompozit çubuklar kesilerek aşınma ve korozyon testleri için numuneler elde edildi.



Şekil 1. Ekstrüzyon kalıbı a) Kalıp parçaları b) Kalıba ısıtıcının bağlanması c) Ekstrüzyon

AA7075 alaşım ve kompozit malzemelerin mekanik özelliklerinin yanı sıra korozyon dayanımlarını iyileştirmek amacıyla standart T73 ısıl işlemi uygulandı. T73 ısıl işlemi, 480 °C'de 2 saat bekletilerek çözeltiye alınan numunelere su verme ve ardından önce 110 °C'de 8 saat ardından 175 °C'de 8 saat olmak üzere iki aşamada gerçekleştirildi.

AA7075 alaşım ve kompozit numunelerin yoğunlukları Redwag AS 220 R2 marka model hassas terazi ve yoğunluk kiti kullanılarak arşimed prensibine göre ölçüldü. Sertlik değerleri Brinell sertlik olarak HBW 2.5x31,25 standardında ve QNESS Q250M makro sertlik ölçüm cihazı kullanılarak tespit edildi. Aşınma deneyleri standart pin-on-disk tipi aşınma cihazı kullanılarak 40 N yük altında, 1000 metre mesafede ve 1 m/s'lik kayma hızında gerçekleştirildi. Aşınma testinde, AISI 52100 çeliğinden imal edilmiş 58-60 HRc sertliğine sahip aşındırıcı disk kullanıldı. Numunelerin aşınma miktarları deney öncesi ve deney sonrası 10^{-4} g hassasiyetinde yapılan ağırlık ölçümleri ile tespit edildi. Mikro yapı ve aşınma yüzeyleri Carl Zeiss Ultra Plus Gemini Fesem tarama elektron mikroskobu (SEM) kullanılarak incelendi. Numunelerin korozyon dayanımını belirlemek amacıyla AA7075 alaşımları için ASTM G34-79 standardında kimyasal bileşimi verilen (234 g/l Sodyum klorür, 50 g/l Potasyum nitrat ve 6,3 ml/l Nitrik asit) EXCO çözeltisine 4, 8 ve 16 saatlik periyotlarda daldırılan numunelerde meydana gelen ağırlık kayıpları ile malzemelerin korozyon dayanımları belirlendi.

Sonuçlar ve Tartışma

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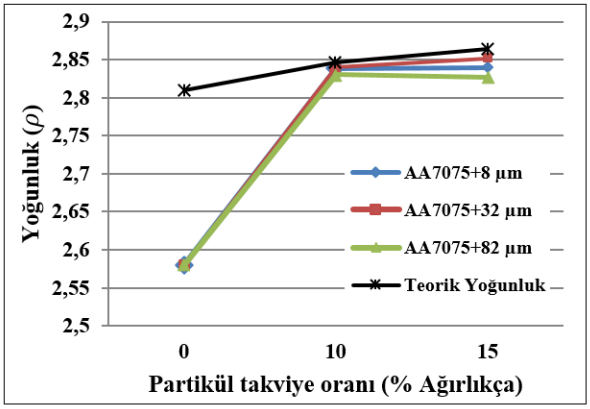
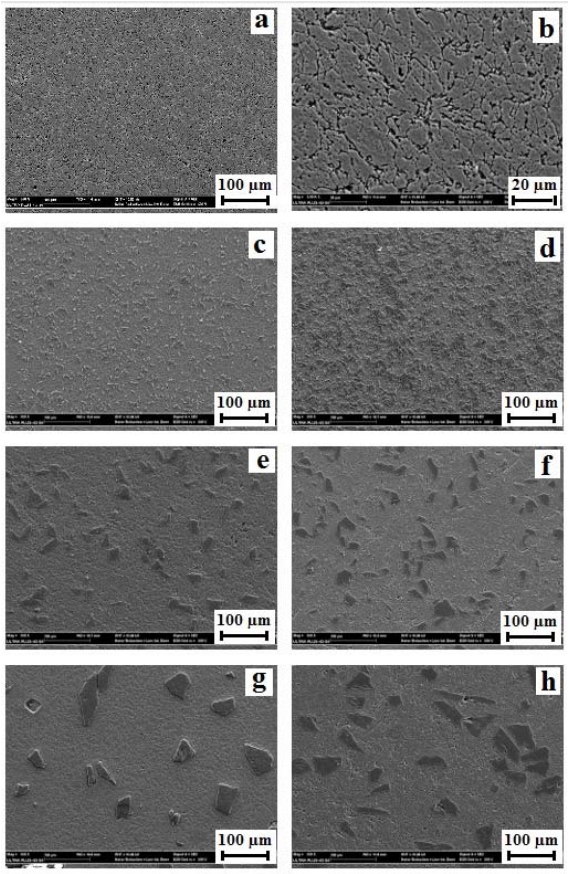
Ekstrüze edilen AA7075 alaşım ve kompozit numunelerin yoğunluk değerleri Şekil 2'de verilmiştir. Teorik yoğunluk olarak ifade edilen tam yoğunluk değer grafiği ile karşılaştırıldığında AA7075 alaşım numunelerin yoğunluk değerleri oldukça düşükken (≈ 2,6 g/cm^3), %10'luk partikül ilavesi ile birlikte tam yoğunluk değerlerine yakın sonuçlar elde edilmiştir. Partikül takviye oranı %15 olduğunda yoğunluk değerlerinde azda olsa bir düşüş meydana gelmiştir. Elde edilen sonuçlar alaşım numunelerin gözenek oranının kompozit numunelere göre daha yüksek değerlerde elde olduğunu ortaya koymaktadır. Şekil 3'te verilen mikroyapı görüntüleri de bu sonucu doğrulayacak niteliktedir. AA7075 alaşım numunelerin SEM görüntülerinde (Şekil 3-a,b) küçük ve büyük boyutlu gözenekler belirgin bir şekilde görülürken, kompozit numunelerde gözeneklerde belirgin bir azalma gözlenmiştir. Ayrıca kompozit numunelerde partiküller homojen bir dağılım göstermiştir.



Şekil 2. AA7075 alaşım ve kompozit numunelerin yoğunlukları



Şekil 3. AA7075 alaşım ve kompozit numunelerin mikroyapısı
a-b) AA7075 alaşımı, c-d) 8µm %10-15, e-f) 32µm %10-15, g-h) 82 µm %10-15

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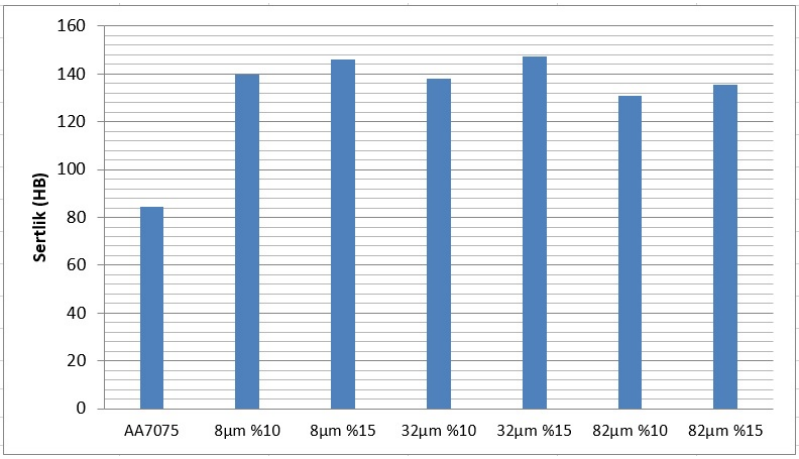
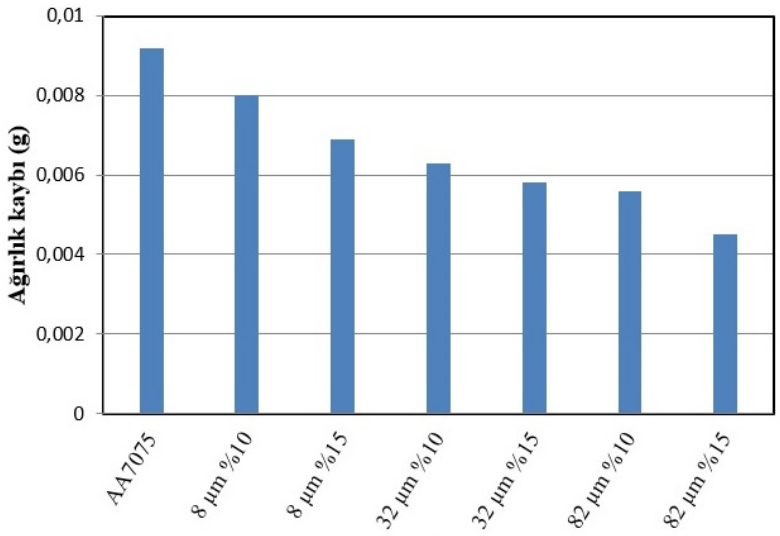
Şekil 4'te alaşım ve kompozit numunelerin sertlik değerleri grafik olarak verilmiştir. Alaşım ve kompozit numunelerin sertlik değerleri karşılaştırıldığında SiC_p miktarının artışına bağlı olarak kompozitlerin sertliğinde de artış meydana gelmiştir. Bu durumu Kang et al. karışımlar kanunu ile açıklamaktadır [12]. Kanuna göre matris yapıya göre daha sert olan partiküllerin miktarı arttıkça kompozitinde sertliği artmaktadır. Ayrıca Şekil 4'de göre 8 ve 32 µm boyutlu partikül takviyeli kompozitlerde sertlik değerleri birbirine yakın değerlerdeyken, 82 µm partikül takviyeli kompozitlerde sertlikte bir miktar azalma meydana gelmiştir. Bu durumu El-Kady et al. iki şekilde açıklamaktadır. Birincisi sertliğin yumuşak ve sert ara yüzey arasındaki daha büyük ara yüzey alanına bağlı olduğu. İkincisi ise, iri taneli sert parçacıklar ile matris ara yüzeyindeki kusurlar yük altında kolaylıkla kırıldığından sertlik değerlerinde azalma meydana gelmektedir [11]. AA7075 alaşım numunelerde ise sertliğin oldukça düşük değerlerde elde edilmesinde gözenekli yapının da etkisi vardır.



Şekil 4. T73 ısıl işlemli AA7075 alaşım ve kompozit numunelerin sertliği

Aşınma testleri sonucu meydana gelen ortalama aşınma miktarları Şekil 5'te verilmiştir.



Şekil 5. T73 ısıl işlemli AA7075 alaşım ve kompozit numunelerde aşınmaya bağlı ağırlık kaybı grafiği

Grafik incelendiğinde en yüksek aşınma kaybı AA7075 alaşım numunelerde meydana gelirken, partikül boyut ve oranlarının artışına bağlı olarak aşınma kayıplarında kayda değer azalma meydana gelmiştir. Aşınma sonuçları yapıya eklenen partiküllerin aşınma direncini arttırdığını göstermektedir. Matris yapıya ilave edilen partiküllerin neden olduğu sertlik artışı, kompozitin aşınma direncinde de artışa neden olmaktadır. Aşınma numunelerindeki ağırlık kaybı, SiC_p miktar ve boyut artışına bağlı olarak azalma göstermektedir. Seramik partiküllerle matris yapı arasındaki zayıf kimyasal bağın yanı sıra partikül boyutunun küçülmesine bağlı olarak azalan temas yüzey alanı, matrisle partikül arasındaki mekanik bağ kuvvetini de zayıflatmaktadır. Azalan mekanik bağ kuvveti, partiküllerin matris yapıdan kolayca ayrılarak aşınma miktarının artmasına neden olmaktadır. Aşınma yüzeylerine ait SEM görüntüleri Şekil 6'da verilmiştir. Aşınma yüzeyleri incelendiğinde AA7075 alaşım numunelerde daha düzgün ve

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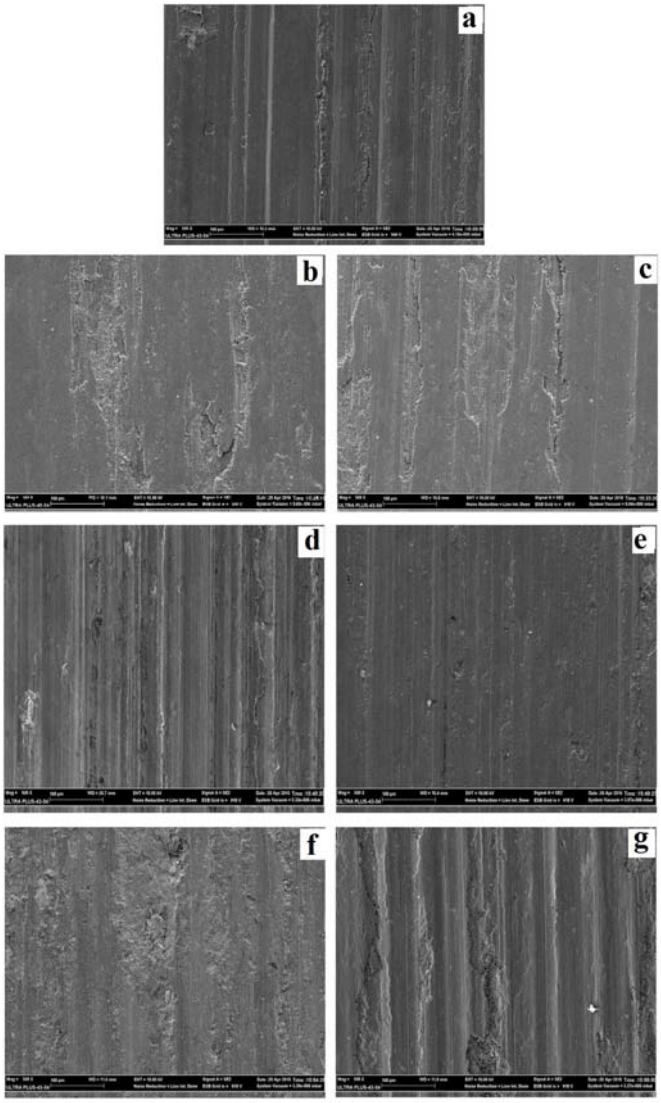
oluk şeklinde aşınma yüzeyi gözlenirken, MMK numunelerde adhesif aşınmanın yanı sıra yapıya ilave edilen partiküllerin neden olduğu abrasif aşınma mekanizmalarının da meydana geldiği görülmektedir.



Şekil 6. AA7075 alaşım ve kompozit numunelerin aşınma yüzeyleri
a) AA7075 alaşımı, b-c) 8µm %10-15, d-e) 32µm %10-15, f-g) 82 µm %10-15

EXCO çözeltisi ile 4, 8 ve 16 saatlik periyotlarda yapılan korozyon testleri sonrası alaşım ve kompozit numunelerde meydana gelen ağırlık kayıpları Şekil 7'de görülmektedir. Genel olarak korozyon sonucu meydana gelen malzeme kaybı korozyon test süresinin artışına bağlı olarak artarken, en yüksek korozyon kaybı alaşım numunelerde meydana gelmiştir. Kompozit numunelerle karşılaştırıldığında alaşım numunelerdeki korozyon kaybındaki artış numunelerin sahip olduğu gözenekli yapı ile açıklanabilir. Gözenekli yapı korozyona uğrayan yüzey alanını arttırmanın yanı sıra korozyon çözeltisinin malzemeye daha kolay nüfuz etmesini sağlamaktadır. Kompozit numunelerdeki korozyon kayıpları değerlendirildiğinde, 16 saatlik korozyon testi sonrası en düşük korozyon kaybı 8 mikron partikül takviyeli numunelerde meydana gelirken en yüksek korozyon kaybı 82 mikron partikül takviyeli numunelerde meydana gelmiştir. Alaşım numunelerde olduğu gibi kompozit numunelerdeki korozyon kaybındaki artış komzpozitteki gözenek miktarının artışı ile açıklanabilir. Kompozit numunelerdeki gözenek miktarı artan partikül boyutu ve miktarı ile artmaktadır. Gözenek miktarındaki bu artış korozyon miktarında da bir artış meydana getirmektedir. Kompozit numunelerde korozyon kayıplarındaki azalmanın bir diğer nedeni ise yapıya eklenen partiküllerin korozyona uğrayan AA7075 alaşımı ile korozyon çözeltisinin temas yüzey alanını azaltmasıdır. Artan yüzey alanı korozyona maruz kalan yüzey alanını arttıracak dolayısıyla da korozyon sonucu meydana gelen ağırlık kaybı da artacaktır.

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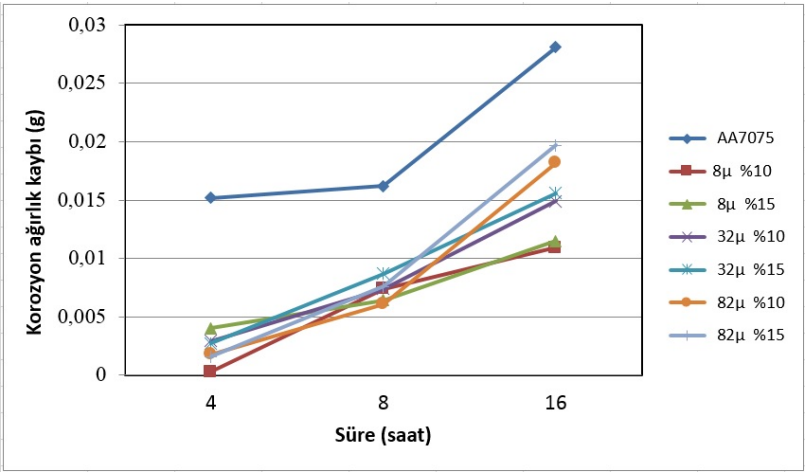

Şekil 7. T73 ısıl işlemli AA7075 alaşım ve kompozit numunelerde korozyon kaybı

Sonuçlar

AA7075 alaşım tozlarına farklı boyut ve oranlarda SiC_p ilavesi ile elde edilen toz karışımlarının soğuk preslenmesi ve sıcak ekstrüzyonu ile AA7075-SiC_p kompozitler başarı ile üretilmiştir. AA7075 alaşım numunelerde yaklaşık 2,6 g/cm^3 yoğunluğa ulaşılırken, partikül takviyeli kompozitlerde yoğunluk oranı 2.8 g/cm^3'ün üzerine çıkmaktadır. Matris yapıya ilave edilen SiC_p ilavesinin artışına bağlı olarak kompozitin sertlik ve aşınma direncinde artış meydana gelmiştir. SiC partikül ilavesi AA7075 alaşımının korozyon dayanımını arttırırken, artan partikül boyutu ile birlikte kompozitin korozyon dayanımı düşmektedir.

Teşekkür

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TREATABILITY OF FOOD INDUSTRY WASTEWATER BY $O_3/UV/H_2O_2$ ADVANCED OXIDATION PROCESSES

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Abstract

In this study, treatability of wastewater from manufacturing of potato chips was examined by $O_3/UV/H_2O_2$ process which is among advanced oxidation processes. Chemical oxygen demand (COD) and absorbance parameters were evaluated to determine the efficiency of the process. All experiments were performed at a constant room temperature (20 ± 2 ° C) with 1 L sample of wastewater. As UV light source, 2 x 2.2 W low-pressure mercury lamps were used. The effects of O_3 concentration (0-20 ppm), pH (3-11), H_2O_2 concentration (0 to 45 mM) and time (10-90 min) were investigated in ozone oxidation studies. In the experimental study, the highest COD removal efficiency was 92%, at the experimental conditions of pH 5, 15 ppm O_3 concentration, 11.25 mM H_2O_2 concentration and 70 minutes. The highest removal efficiency of absorbance was found as 91% at the experimental conditions of pH 9, 5 ppm O_3 concentration, 11.25 mM H_2O_2 concentration and 70 minutes. In the experimental conditions of pH 5, O_3 concentration at 5 ppm, H_2O_2 concentration at 11.25 mM and 70 minutes reaction time, removals of COD and absorbance were achieved as 79% and 90% respectively. Also removal of color and odor has been clearly observed at the end of the experiments conducted by $O_3/UV/H_2O_2$ process.

Keywords: Food industry wastewater, potato chips process wastewater, $O_3/UV/H_2O_2$, advanced oxidation process

1. Introduction

Among other agricultural products, potato is a widely used raw material for food industry. There are a lot of types of processed potatoes like potato chips, frozen french fries, dehydrated diced potatoes, dehydrated mashed potatoes, potato flakes, potato starch, potato flour, tinned white potatoes and pre-peeled potatoes (Hung et al., 2006; Ersahin et al., 2011). The stages of potato chips processes are; receiving raw materials, storage of the raw materials, extracting the stone, bark peeling, selecting and cutting, slicing, washing, frying, salting, extracting defect, coating and packaging (Dalzell, 1994). During manufacturing of potato chips, slices and shredded potatoes especially major processing steps are washing, peeling and blanching operations uses big volumes of water (Malladi and Ingham, 1993).

Potato chips process wastewater is considered as having high pollution load due to its content like high concentrations of carbohydrates, starches and proteins which are responsible for high suspended solids, chemical oxygen demand and biochemical oxygen demand (Malladi and Ingham, 1993; Hadjivassilis et al., 1997; El-Gohary et al., 1999). Therefore, this wastewater might be only discharged into the municipal sewage system after reducing its pollutant amounts to discharge limit (Kobya et al., 2006). Potato chips process wastewater has significant ratio of readily biodegradable organic matter content and thus biological treatment processes are applicable for this wastewater (Dalzell, 1994).

Several types of biological treatment, electrocoagulation and biogas processes have been investigated for treatment of potato chips process wastewater. These include the use of two stage biological treatment (Özturk et al., 2003), anaerobic and aerobic treatment (Zoutberg and Eker, 1999; Senturk et al., 2010; Austermann-Haun and Seyfried, 1992), electrocoagulation (Kobya et al., 2006), biogas production (Barampouti et al., 2005), products recovery (Catarino et al., 2007), optimization of a biological process (Mishra et al., 2004) and biogas and energy recovery (Musluoglu, 2010).

In recent years, new process methods have been explored for efficient treatment of various industrial wastewaters with low operating costs. Advanced Oxidation Processes (AOPs) are among these new methods. AOPs including ozone-based homogeneous processes, for instance O_3, O_3/UV and $O_3/UV/H_2O_2$ are used as effective alternatives. The ozone has recently occurred as a treatment technology for the removal of contaminants in water degradation by hydroxyl radical (OH•) that is used as an oxidant in the AOPs (Hoigné

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1998; Andreozzi et al., 1999). Ozone, which is having high selectivity and reactivity for organic compounds, is a strong oxidizer (Litter, 2005). Among AOPs, ozonation and ozonation in combination have been shown to be effective in the treatment of wastewater such as the olive mill wastewaters (Benitez et al., 1999), the winery wastewater (Lucas et al., 2010), the cork manufacturing industry (Benitez et al., 2003; Lan et al., 2008), pretreatment of hospital wastewater (Arslan et al.,2014), effluent organic matter (Audenaert et al., 2013), pharmaceutical (Im et al., 2012; Vogna et al., 2004), surfactant (Rivera-Utrilla et al., 2006), linear alkyl benzene (LAB) industrial wastewater (Zangeneh et al., 2014).

In this work, the effectiveness of $O_3/UV/H_2O_2$ process was investigated for the treatment of potato chips process wastewater. The effects of initial pH, hydrogen peroxide amount, ozone concentration and reaction time were examined. The effect of process on the reduction of chemical oxygen demand (COD) and absorbance were evaluated.

2. Materials and methods

2.1. Materials

The wastewater used for this study was supplied from a wastewater treatment plant of potato chips process facility. Wastewater samples were taken from the outlet of the anaerobic treatment. COD, pH, conductivity, temperature, color, absorbance, total suspended solids (TSS), nitrite, nitrate, ammonia, sulphate and chloride parameters were analyzed for wastewater characterization studies as shown in Table 1. All analyses were performed according to the Standard Methods (APHA, 2005).

Tablo 1. Characterization of potato chips process wastewater

Parameter	**Arithmetic average**
pH	7.7
Conductivity (mS/cm)	3.43
Temperature (^{0} C)	24.33
Color (Pt-Co)	1691
Absorbance (abs) -338 nm	3.62
TSS (mg/L)	145
Nitrite (mg/L NO_2^--N)	0.23
Nitrate (mg/L NO_3^--N)	3.16
Ammonia (mg/L NH_3)	103
Sulphate (mg/L)	135
Chloride (mg/L)	112
COD (mg/L)	504

2.2. Ozonation System

The experimental set-up for ozone treatment system consisted of ozone generator, ozone monitor and reaction tank in Figure 1 (Arslan et al., 2014). The reaction tank had UV lamps in it and UV light source 2 x 2.2 W low-pressure mercury lamps were used. The ozonation experiments were conducted in a batch reactor (made of Pyrex

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glass) with a volume of 2L. The ozone, which is required for the reaction, is produced by ozone generator using oxygen in the air. Ozone is fed into the reactor by means of a diffuser which is located in the reactor bottom. At the beginning of the reaction, 1L potato chips process wastewater was added into the reactor and then $O_3/UV/H_2O_2$ experiments were performed with the addition of H_2O_2 prior to ozonation. Hydrogen peroxide (Merck, 30% w/w) was used as an oxidant. Liquid samples were periodically taken from the reactor to determine the absorbance and COD removal efficiency of the wastewater.

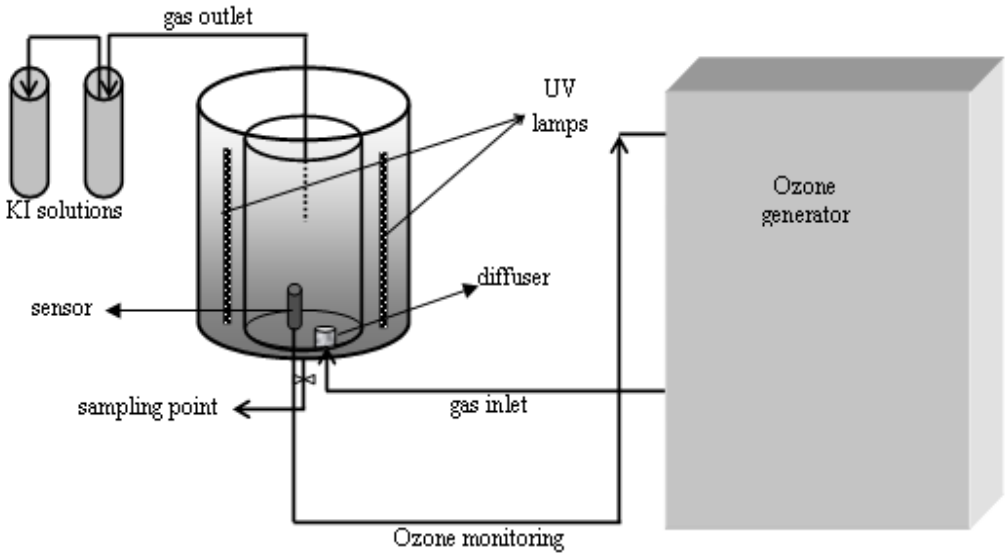

Figure 1. Experimental set up of ozonation system

2.3. Principal of $O_3/UV/H_2O_2$ process

Photooxidation and mineralization of organic pollutants occur by hydroxyl radicals in $O_3/UV/H_2O_2$ processes. H_2O_2 initiates decomposition of the ozone with electron transfer under the UV irradiation and OH• radicals are produced at the end of this reaction (Huang et al.,1993; Zayas et al., 2007). The following reactions are performed in this process (Domenech et al., 2001):

$$O_3 + H_2O_2 \rightarrow \cdot OH + O_2 + HO_2\cdot \quad \text{(very slowly)} \qquad (1)$$

$$H_2O_2 \rightarrow HO_2^- + H^+ \qquad (2)$$

$$HO_2\cdot \rightarrow \cdot O_2^- + H^+ \qquad (3)$$

$$HO_2^- + O_3 \rightarrow O_3^- + HO_2\cdot \qquad (4)$$

$$\cdot O_2^- + O_3 \rightarrow O_3^- + O_2 \qquad (5)$$

$$O_3^- + H^+ \rightarrow HO_3 \qquad (6)$$

$$HO_3 \rightarrow \cdot OH + O_2 \qquad (7)$$

$$O_3 + \cdot OH \rightarrow O_2 + HO_2\cdot \qquad (8)$$

$$O_3 + HO_2\cdot \rightarrow 2O_2 + \cdot OH \qquad (9)$$

The reactions of organic contaminants occurring by ozone, increase the rate of oxidative cleavage together with the effect of OH• radicals formed by the addition of hydrogen peroxide. $O_3/UV/H_2O_2$ process accelerates the formation as photochemical of OH• radicals. This process is used in the treatment of industrial wastewater (Legrini et al., 1993).

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2.4. Analysis

Concentration of COD was measured by using the chemical oxygen demand analysis, according to the standard methods for the examination of water and wastewater (APHA 2005). In the experimental study, a spectrophotometer (HACH-LANGE Dr 5000) was used to determine the absorbance and a digital pH-meter (HACH, HQd) was also used for pH measurement. 6N H_2SO_4 and 6N NaOH were used to adjust the pH.

3. Results and discussion

3.1. Effect of pH

All experiments were performed with 1L potato chips process wastewater sample. Experimental studies were performed intervals at pH 3, 5, 7, 9, 11. The effects of pH on the change in UV absorbance and removal of COD are shown in Figure 2 and 3.

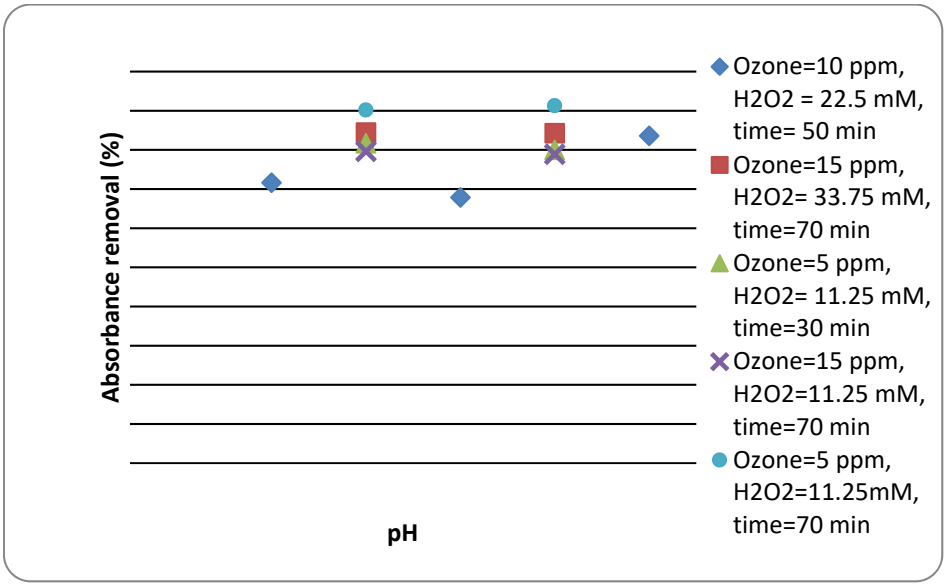

Figure 2. Absorbance removal efficiency versus pH values

Fig. 2 shows that at pH 5 and 9, the highest ratios of percentage change in UV absorbances were 90 % and 91 %, respectively. The lowest ratio was found at pH 7. The low pH reactions efficiencies depend on ozone concentration, H_2O_2 amounts and reaction time. According to previous studies, ozone decomposition rate is preferred by the formation of hydroxyl radicals at higher pH values (Zangeneh et al., 2014).

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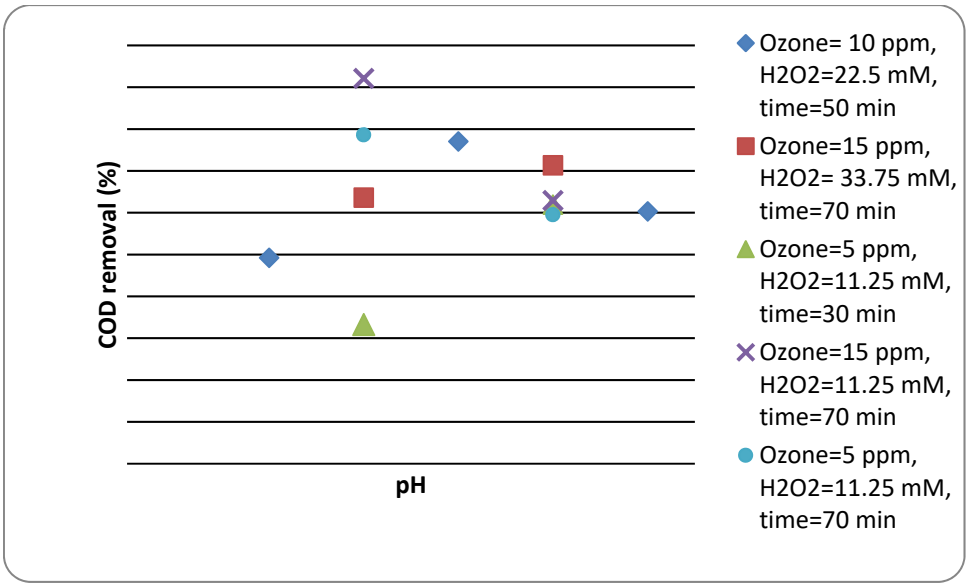

Figure 3. COD removal efficiency versus pH values

As shown in Fig. 3; at pH 5 and pH 7, COD removal efficiencies were 92% and 77%, respectively. COD removal efficiency of 92 % occured under the experimental conditions of pH 5, 15 ppm ozone concantration, 11.25 mM H_2O_2 amount and 70 min reaction time.

3.2. Effect of reaction time

Experimental studies were performed at intervals of 10, 30, 50, 70, 90 minute reaction times. The effects of reaction time for absorbance and COD removal efficiencies are shown in Figure 4 and 5.

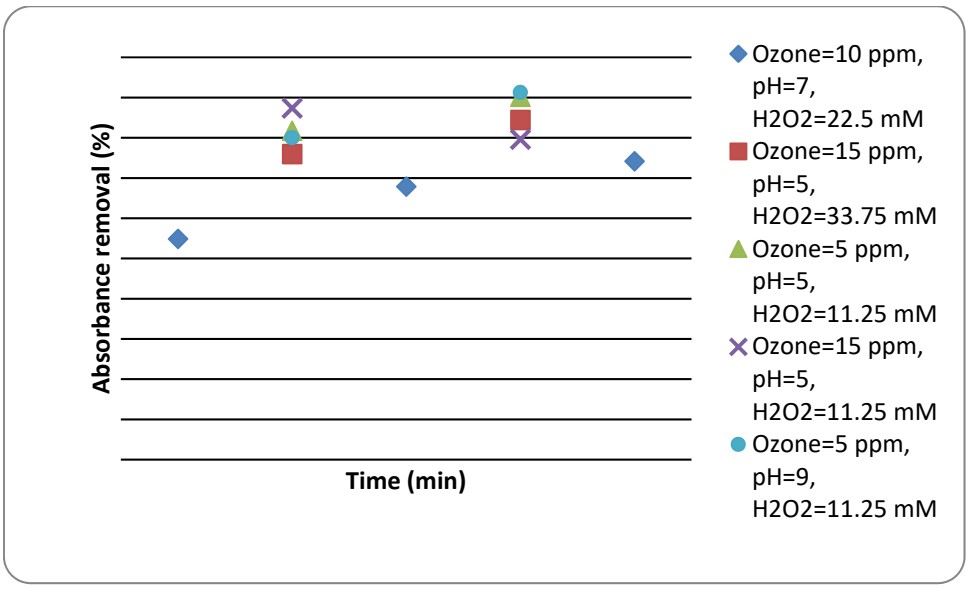

Figure 4. Absorbance removal efficiency versus reaction time

Fig. 4 shows that 30 and 70 min reaction times efficiencies of the ratio of percentage change in UV absorbance were highest 87 % and 91 %, respectively.

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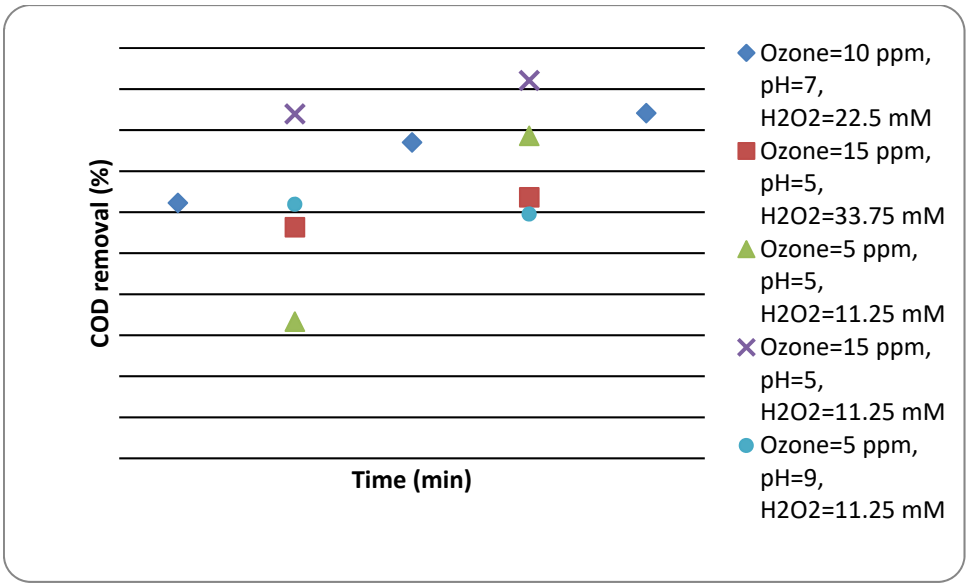

Figure 5. COD removal efficiency versus reaction time

Fig. 5 shows that at 30, 70 and 90 min reaction times efficiencies of the COD removal were highest 84%, 92 % and 84 %, respectively. When reaction time increased, absorbance removal efficency increased first and then decreased.

3.3. Effect of H_2O_2 amount

Experimental studies were performed various amounts of H_2O_2 (0, 11.25, 22.5, 33.75, 45mM). The effects of H_2O_2 amounts for removals of absorbance and COD are shown in Figure 6 and 7.

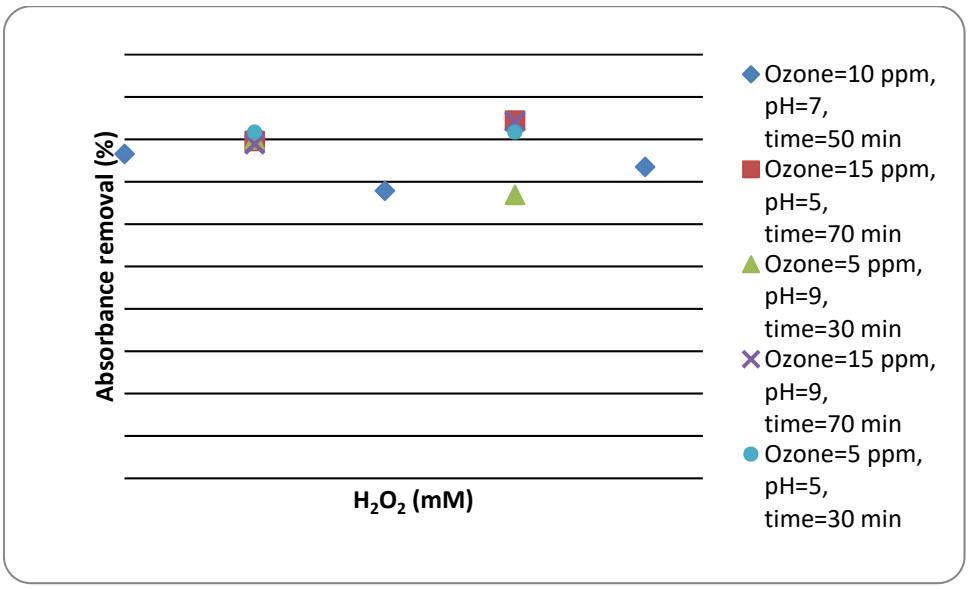

Figure 6. Absorbance removal efficiency versus H_2O_2 amounts

Fig. 6 depicts the performance of hydrogen peroxide treating the industrial wastewater at different dosages. For 11.25 mM and 33.75 mM H_2O_2 amounts,the ratios of percentage change in UV absorbances are at highest as 82% and 84 %, respectively. Removal efficiencies were found close to each other. It can be said that the excess amounts of H_2O_2 was caused scavenger effect on the producing of OH• radicals.

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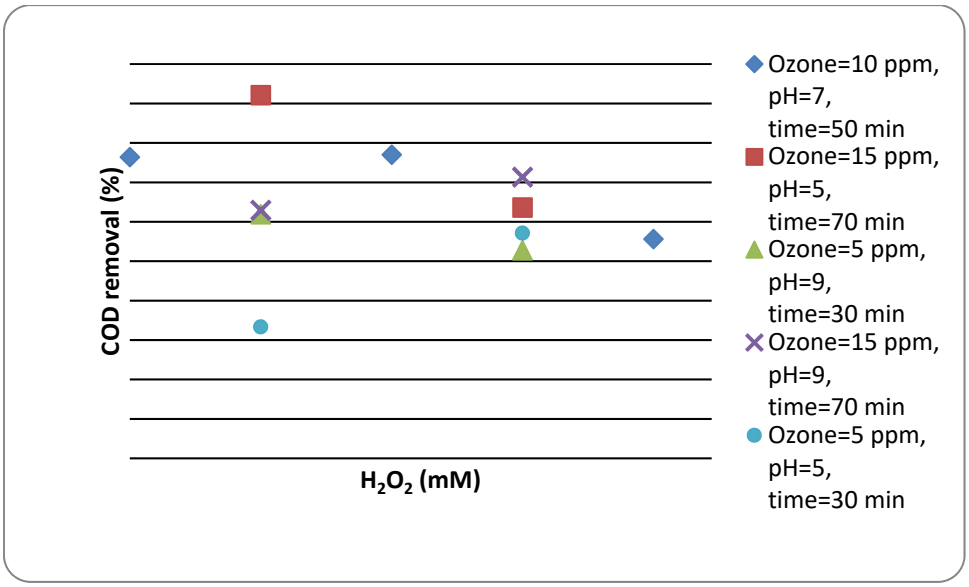

Figure 7. COD removal efficiency versus H_2O_2 amounts

Fig. 7 shows that 11.25mM and 22.5 mM H_2O_2 amounts efficiencies of the COD removal were highest 92 % and 77%, respectively. When H_2O_2 amount increased, COD removal efficency increased but some conditions were observed in decrease depending on ozone concentration and reaction time.

3.4. Effect of Ozone concentration

Experimental studies were performed with different ozone concentrations (0, 5, 10, 15, 20 ppm). The effects of UV absorbance change and COD removal efficiency on the ozone concentrations are shown in Figure 8 and 9.

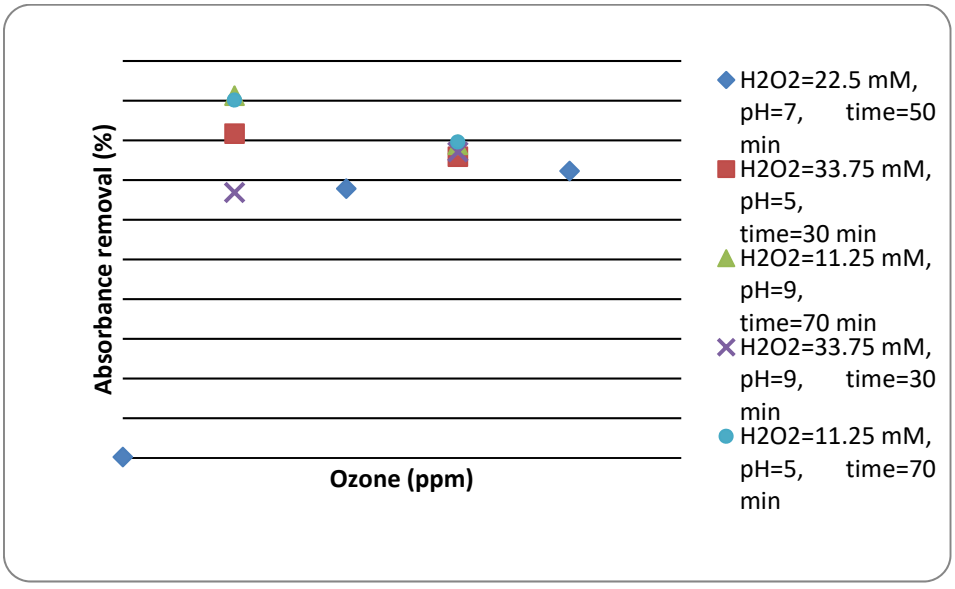

Figure 8. Absorbance removal efficiency versus ozone concentration

Fig. 8 shows that 5 ppm and 15 ppm ozone dosage concentration ratios of the percentage change in UV absorbances were at highest as 91% and 80 %, respectively. Increasing the applied ozone dose had a negative effect on UV absorbance change and was observed the more ozone concentration caused slight turbidity in the water.

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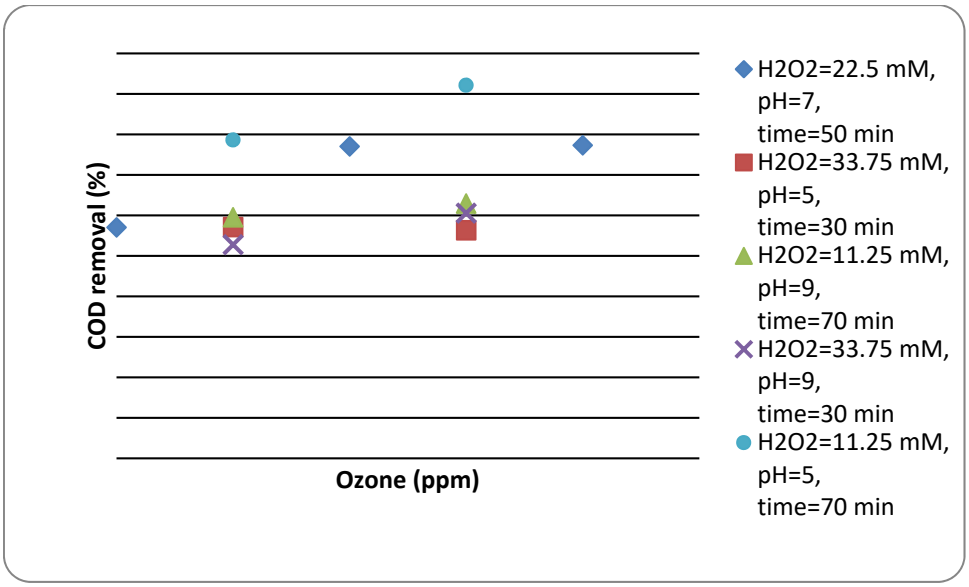

Figure 9. COD removal efficiency versus ozone concentration

Fig. 9 shows that 5 ppm and 15 ppm ozone dosage concentration efficiencies of the COD removal were highest 79 % and 92%, respectively. When the reaction had more than 15 ppm ozone dosage, the absorbance and COD efficiencies were decreased. It was observed that in the ozonation process, the best COD removal efficiency 92% was obtained at asidic pH (5) and high reaction time (70 min).

4. Conclusions

In this study, the treatment which is based on ozonation was applied to the potato chips process wastewater for the removal of COD and the change in UV absorbance. The highest COD removal was observed as 92% under the following conditions; pH 5, 15 ppm O_3 concentration, 11.25 mM H_2O_2 concentration and 70 minutes reaction time. The highest ratio of percentage change in UV absorbance was 91% at the experimental conditions of pH 9, 5 ppm O_3 concentration, 11.25 mM H_2O_2 concentration and 70 minutes.

Also it has been observed that, removal of color and odor clearly at the end of the experiments conducted by $O_3/UV/H_2O_2$ process. Sludge formation of encountered in the classical treatment processes, caused by the sludge disposal problems and additional costs don't occur in this process. This result is an important advantage of the treatability of food industry wastewater using of advanced oxidation processes method.

As a result, the $O_3/UV/H_2O_2$ process is an effective alternative in color removal and also COD removal for potato chips process wastewater.

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TUMOR DETECTION ON CT LUNG IMAGES USING IMAGE ENHANCEMENT

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Abstract: Last three decades, early cancer detection and researches on early detection solutions play vital role for human health. Computed tomography images (CT) are widely used in radiotherapy planning because they provide electronic densities of tissues of interest which are mandatory to a correct dose computation. Furthermore, the good spatial resolution and soft/hard tissues contrast allow precise target delineation. Also, CT techniques are preferred compared to X-Ray and MRI images. Image processing techniques have started to become popular in use of CT images. In this study, image pre-processing, image erosion, median filtering, thresholding and feature extraction of image processing techniques are applied on CT images in detail. The aim of this study is to develop an image processing algorithm for lung cancer detection on CT Images.

Keywords: CT Lung Cancer Images, Thresholding, Feature Extraction

Introduction

As WHO reported (WHO 2012), all around the world 8.2 million people died because of cancer. According to American Cancer Society (ACS 2012) researches showed that lung cancer mortality rates in men has dropped nearly 30 percent whereas, this rate in women has started to regress in last 10 years.

According to ACS (ACS 2012), the second most common cancer in both men and women is lung cancer, where prostate cancer is more common for men and breast cancer is for women. Lung cancer has very low survival rate after late diagnosis, where it is directly proportional with its growth at its detection time. However, if it can be detected at early stages, people have a higher possibility of survival.

Carcinoma, another name given to lung cancer, is growing of abnormal cells. Lung cancers are broadly classified into two types: small cell lung cancers and non-small cell lung cancers which are abbreviated as SCLC and NSCLC respectively (Rath 2001). As for the stages, there are four stages of carcinoma; I, II, III and IV, where staging is relying on tumor size, tumor and lymph node location (Rath 2001).

In today's world there are different techniques such as Chest Radiography (x-ray), Computed Tomography (CT), Magnetic Resonance Imaging (MRI) scan and Sputum Cytology, for diagnosing lung cancer (Al-Tarawneh 2012), (Chaudhary and Singh 2012). As stated earlier, early diagnoses are important for interfering the cancer, so that new technologies are greatly needed. Researches showed that, with early detection, survival rate of lung cancer patients has been increased from 14% to 49% within last five years (Chaudhary and Singh 2012). Image processing techniques are widely used in different medical fields to guide medical staff for detection of cancer in earlier stages (Al-Tarawneh 2012).

Nowadays multi-disciplinary actions are carried out for effective and efficient solutions for human health and survival. One of the most popular multi-disciplinary work is on image processing techniques that have been used in various medical fields (Ada and Kaur 2013), (Dimililer 2012), (Dimililer 2013). The aim of this paper is to perform image processing techniques and their interrelated methods to Health care, especially to the carcinoma patients. Ultimate research relay on quantitative information for instance, the shape, size and the ratio of the

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affected cells (Pathan and Sptalkar 2012).

Proposed Lung Tumor Detection System

In this section, detection of tumors within the lung using Image processing techniques will be proposed. The suggested system will be explained in detail.

Image Acquisition

Computed tomography (CT) scan images are preferred to be used in this research, due to low noise and better clarity compared to X-Ray and MRI images. The lung image database has been chosen from NIH/NCI Lung Image Database Consortium (LIDC) which is an on-line CT image dataset available for the researchers in the field of digital image processing. The images used within this research are in .raw format. Figure 1 shows samples of original CT images.



Figure 1. Original CT lung images.

Image Enhancement on Lung Tumor Detection

Following image acquisition, all the images have gone a few image processing steps; grayscale conversion, thresholding, erosion, median filtering and noise removal, and image subtraction.

Gray Scale Conversion

This step involves conversion of original DICOM images which are in RGB format to grey color. It converts RGB images to grayscale by removing the tint and saturation information while maintaining the luminance.

Normalization

The size of the images has been reduced from `512 x 512` to `256 x 256` pixel values, in order to provide sufficient information while the processing time is low.

Image Thresholding

Threshold value is a specific value that turns a grayscale image into a binary image due to thresholding method. The main idea of this method is when multiple levels are selected, determine the threshold value or values (Dimililer, Kirsal-Ever and Ugur 2016). The easiest method for image segmentation is thresholding method, and it is the most common method used in CT images. The images in the proposed system are divided into five, namely `low brightness, LB (T1)`, `medium-low brightness, MLB (T2)`, `medium brightness, MB (T3)`, `high-medium brightness, HMB (T4)`, and `high brightness, HB (T5)` where ranges are defined as 0-51, 52-103, 104-155, 156-207, 208-255 respectively. These defined threshold values for brightness are classified according to field of applications, as stated in (Khashman and Dimililer 2005).

Figure 2 shows a median filter applied image, whereas figure 2b represents threshold segmentation is applied. This is the area with the consistency values higher than the defined threshold. High consistency areas mostly involve of cancerous tissue. Through the threshold segmentation, the location of cancerous tissue is determined.

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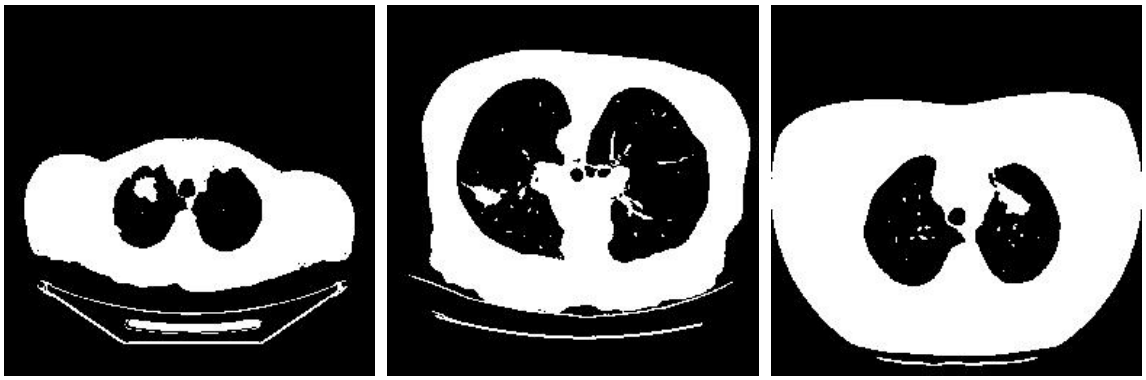

Figure 2. Threshold applied to Median filtered image.

Noise Removal

For removing the noise, erosion and 5 x 5 median filter (Dimililer, Kirsal-Ever and Ugur 2016) are applied to the system respectively. Erosion is one of the basic operators in the morphological image processing. The main effect of the operator on a binary image is to erode away the confines of sites of foreground pixels such as white pixels. Median filtering is applied to reduce the noise within CT images preserving the details and smooth non-impulsive noise. If the aim is to simultaneously minimize noise and conserve edges, a median filter is more impressive (Badrul Alam Miah and Abu Yousuf 2015). Figure 3 represents original CT lung image that erosion applied, where figure 4 shows median filter applied to eroded image.

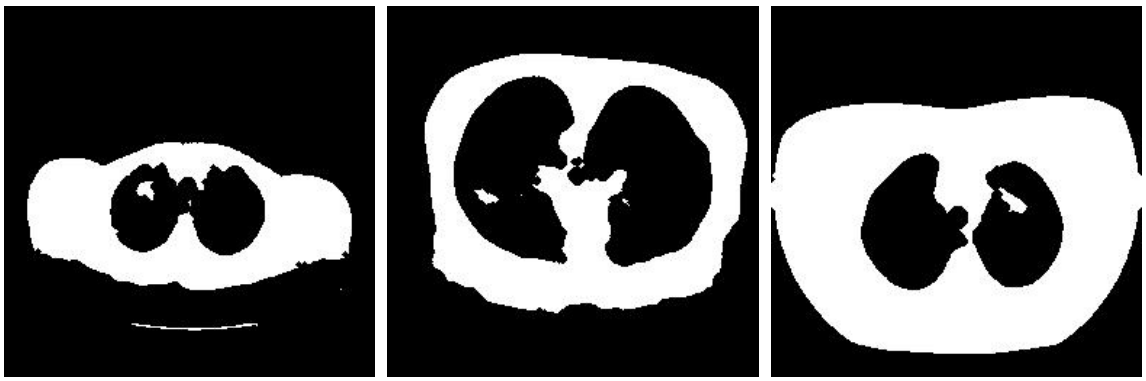

Figure 3. Original CT image with Erosion.

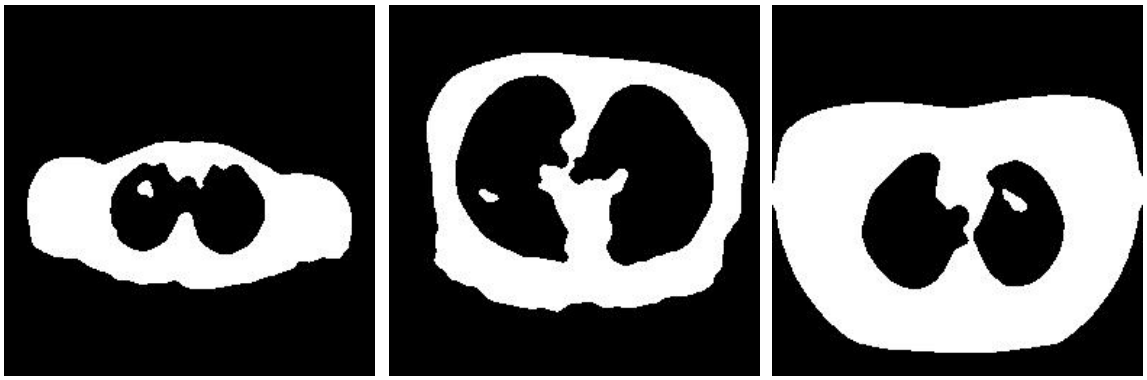

Figure 4. Median filtered applied to eroded image.

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Feature Extraction

Image feature extraction stage plays an important role in this project. Image processing techniques are applied to localize and eliminate various desired portions or shapes (features) of an image.

The objects within the lung images having a total pixel numbers less than 1000, has been considered as 0 (black). The number of pixels has been decided upon several experiments for this type of tumors on lung images.

This whole process has been known as segmentation and after performing segmentation on lung images, the features can be achieved and the diagnosis rule can be designed to detect the cancer nodules in the lungs (Sharma and Jindal 2011). Figure 5 represent this information.

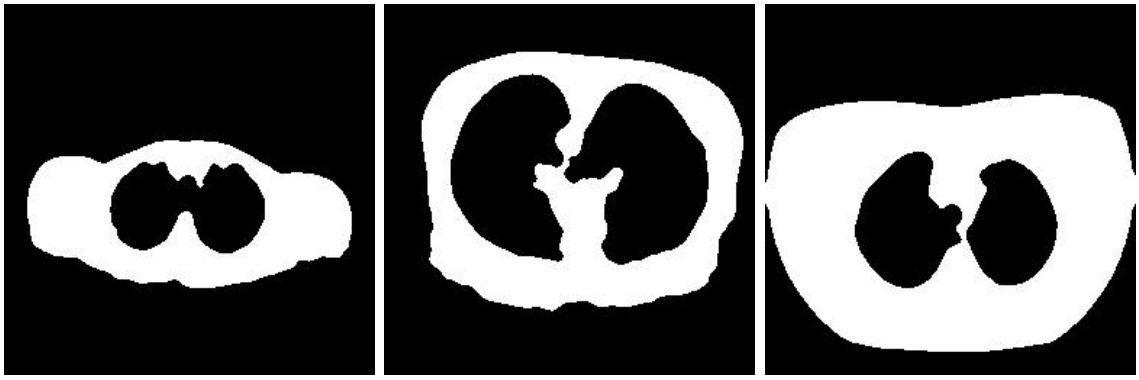

Figure 5. Feature Extraction.

Image Subtraction

In this step, images that have tumor cells are clarified by using filtering and elimination of small objects. Then tumor cells are removed from images. For removing tumor cells from images, objects are eliminated under specific pixel values.

In last step, in order to create tumor cells alone, difference between filtered image and small objects removed from the images are taken into account.

These two approaches are combined and applied successfully. Figure 6 shows the original image with the subtracted image.

Conclusion

In this paper, a tumor detection system using image enhancement is presented. In order to reduce the amount of data with computational and time costs, image processing techniques are used for providing meaningful representations of lung patterns. Relationship between input and output patterns has been created in order to detect the tumors within the images. Input images are obtained in 256x256 raw format, which thresholding are applied in order to clear black and white pixels. Afterwards, erosion and median filtering are used to remove noise. Afterwards, small objects within the image are removed. Last but not the least, small objects removed image is subtracted from median filtered image in order to find the location of the tumor.

Future work will include the modification of the system to recognize images that have scattered tumor on the lung cells.

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Figure 6. Image Subtraction.

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TURIZM ÖN LISANS PROGRAMLARINDA MESLEK AMAÇLI İNGILIZCENIN (EOP) KARŞILAŞTIRMALI İHTIYAÇ DEĞERLENDIRMESI

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Günden güne büyüyen turizm endüstrisi, dengenin arz tarafında sadece doğal kaynaklar, kaliteli ürün, alt yapı ile değil hizmet derecesi ve turistik deneyim memnuniyeti ile sürdürülebilirliğini gerekli kılmaktadır. Hizmet ve ülkeden memnun ayrılan turistler ise onlarla iyi ilişkiler kuran turizm *sahipleri* ve çalışanları sayesinde mümkün olmaktadır. Farklı uyruktan biriyle kurulacak etkili iletişimde mesleğin gereklerini karşılayan yabancı dil öğretimi önemli bir yer teşkil etmektedir. Turizm mesleğine yönelik İngilizce öğretimin öğrenci ve öğretici-uzman görüşlerine dayalı değerlendirilmesi amacıyla yapılan bu çalışma, 498 öğrenci örneklemine uygulanan ihtiyaç analizi anketi vasıtasıyla mevcut dil öğretim durumunu ortaya koymak; 20 öğretici-uzman grubuna uygulanan değerleme anketi vasıtasıyla etkililiğini değerlendirmek üzere tasarlanmıştır. Bu çalışma, turizm eğitiminde yabancı dil öğretiminin önemini ve etkinliğinin araştırdığı için önemli görülmektedir. Bu kapsamda alan yazında konuya ilişkin geçmiş çalışmalar incelenmiş, eğitim, mesleki eğitim, turizm eğitimi gibi kavramsal ifadeler açıklanmış, araştırmanın metodolojisi hakkında bilgi verilmiş, işlenen ve Ki-Kare, tek örneklem K-S, Friedman ve Kendall W gibi parametrik olmayan testlerle analiz edilen verilerin ışığında bulgular ve bulgulara dair tartışmalar ortaya konmuş ve sonuçlara dair önerilerle çalışmaya son verilmiştir. Araştırma sonucunda mevcut öğretim programı, yöntem ve tekniklerinin öğrenci ihtiyaçlarını karşılamakta yetersiz olduğu; turizm mesleğine yönelik dil beceri ve yeteneklerinin iletişime dayalı olmasının umulduğu gibi sonuçlara ulaşılmıştır.

Keywords: ihtiyaç değerleme, meslek amaçlı İngilizce (MAİ), turizm ön lisans programları, turizm yabancı dil öğretimi

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TURİZM PAZARLAMASINDA BİLGİ TEKNOLOJİLERİNİN KULLANIMI: AKILLI OTEL ODASI OTOMASYON SİSTEMİ

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Özet: Turizm sektörü ülke ekonomisinde oldukça önemli bir yere sahiptir. Turizmin ülkelerin kalkınmasında önemli bir araç olarak görülmesi ile birlikte ülkeler ve turizm işletmeleri arasındaki rekabet daha da artmıştır. Yoğun rekabet işletmeleri, sundukları hizmetleri farklılaştırmaya yönlendirmiştir. Turizm hizmetlerinin farklılaştırılmasında özellikle bilgi teknolojisinde yaşanan gelişmelerin katkısı büyüktür. Bilgi teknolojileri turizm pazarlamasını önemli ölçüde etkilemiş, müşteri memnuniyetini arttırmıştır. Bu çalışmada, insanların el hareketlerini tanıyan ve yorumlayan görüntü işleme tabanlı bir sistem geliştirilmiştir. Bu sistem ile tüketicilerin otel odasında yer alan televizyon, stor perde, ışık, klima gibi bazı çevre birimlerini kontrol edebilmesi planlanmıştır. Geliştirilen bu sistemin tüketicilerin konaklama işletmesi tercihleri üzerinde etkili olacağına, düşük maliyetli bir yapıya sahip olması sayesinde de işletme yöneticilerinin sistemden yararlanma taleplerini arttıracağına inanılmaktadır.

Anahtar Kelimeler: Turizm Pazarlaması, Konaklama İşletmesi, Bilgi Teknolojisi, İnsan-Bilgisayar Etkileşimi

Giriş

Turizm, ülkelerin kalkınmasında oldukça önemli bir yere sahip olan sektörlerin başında gelmektedir. Özellikle, bir ülkenin ekonomik açıdan gelişmesinde ayrıcalıklı bir yere sahip olan turizm sektörünün; ulusal ve uluslararası çapta meydana gelen gelişmeleri yakından takip etmesi, turizm işletmelerinin de tüketici isteklerini ve ihtiyaçlarını en iyi şekilde tatmin edebilecek hizmetler sunarak mevcut turist potansiyelini arttırmaları gerekir. Bunu sağlamanın yollarından biri teknolojik gelişmeleri yakından takip etmektir. Yoğun rekabet ortamında rakip işletmeler ile mücadele edebilmenin, değişen tüketici beklentilerine cevap verebilmenin yolu budur. Son yıllarda turizm endüstrisinde de teknolojiden yoğun bir biçimde yararlanıldığı görülmektedir. Merkezi rezervasyon sistemleri, global dağıtım sistemleri, çevrimiçi seyahat portalı vb. turizmde kullanılan bilgi teknolojilerine örnek olarak gösterilebilir. Bu çalışmada, tüketicilerin konaklama işletmesi tercihlerinde etkili olacağı düşünülen, diğer yandan turizm işletmelerinin elde edecekleri gelire olumlu katkılar sağlayacağına inanılan; el hareketlerini tanıma ve yorumlama özelliğine sahip görüntü işleme tabanlı bir sistem geliştirilmiştir. Konaklama işletmelerinde kullanılacak bu sistem sayesinde tüketiciler çeşitli çevre birimlerini kontrol edebilecek ve otel odasında oturdukları yerden birtakım isteklerini yerine getirebileceklerdir. Bu nedenle geliştirilmiş olan sistemin, hem tüketicilere hem de işletmelere olumlu katkılar sağlayacağına inanılmaktadır. Bu kapsamda, çalışmada öncelikle turizm pazarlamasının tanımı ve özellikleri üzerinde durulacaktır. Takip eden kısımda turizm endüstrisi ve teknoloji konusuna kısaca değinilecektir. Üçüncü bölümde ise geliştirilen sistem ve özelliklerinden bahsedilecektir. Çalışmanın son kısmında da sonuçlara yer verilecektir.

Turizm Pazarlamasının Tanımı ve Özellikleri

Turizm sektöründe ulusal ve uluslararası pazarlardan müşteri çekebilmenin yolu etkin bir pazarlama programı hazırlamaktan geçer. Bu kapsamda, turizm pazarlamasında yer alan faaliyetlerin turizm işletmeleri tarafından

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itinalı bir biçimde hazırlanması gerekir. Literatürde turizm pazarlaması kavramına ilişkin çok sayıda tanım yer almaktadır. Turizm pazarlaması kavramı, Kozak ve diğerleri (2002: 281) tarafından "bir turistik destinasyonun ya da turizm işletmesinin en yüksek kazanç elde etme hedefine uygun olarak, turizm ürününün pazarda iyi bir yer almasını sağlamak amacı ile turizm talebinin özelliklerini de dikkate alarak turistik ürün ile ilgili araştırma, tahmin ve seçim yapmayı hedefleyen ve bu konularda alınacak kararlarla ilgili bir yönetim felsefesidir." olarak tanımlanmıştır. Literatürde yer alan bir başka tanımda da turizm pazarlaması, "tanımlanabilir tüketici gruplarının ihtiyaçlarını en iyi biçimde karşılayabilmek amacıyla yöresel, bölgesel, ulusal ya da uluslararası düzeyde özel ya da kamusal turizm elemanlarının yönetilmesi politikalarını sistematik ve eşgüdümlü olarak yürüten en uygun kazancı sağlayan faaliyetlerin tümü." olarak ifade edilmektedir (Hayta, 2008: 33).

Turizm pazarlaması mal pazarlaması ile karşılaştırıldığında bazı farklı niteliklere sahip olduğu görülmektedir. Bu farklılıkların ortaya çıkmasının en temel nedeni hizmetlerin sahip oldukları kendilerine has özellikleridir. Turizm pazarlamasını mal pazarlamasından farklılaştıran başlıca özellikler aşağıdaki gibi sıralanabilmektedir (Kozak, 2006; Hayta, 2008) :

- Turizm pazarlamasının konusunu hem mal hem de hizmetler oluşturmaktadır.
- Turizm pazarlamasında dağıtım kanalı terstir. Bir başka ifade ile, turizm hizmetlerinden yararlanmak isteyen tüketicinin turizm işletmesinin bulunduğu yere gitmesi gerekir.
- Turizm ürünlerine olan talep hem işletmeler hem de ülkeler tarafından yürütülmekte olan tutundurma çabalarından etkilenmektedir.
- Turizm pazarlamasında süreç yönetimi önem taşımaktadır.
- Turizm pazarlamasına yönelik faaliyetlerin temelinde insan unsuru yer almaktadır. Bu durum, turizmin emek yoğun bir sektör olmasından kaynaklanmaktadır.
- Turizm pazarlamasında üretim ve tüketim eş zamanlı olarak gerçekleşmektedir.
- Turizm pazarlamasında alt yapı ve doğal güzellikler hizmet cazibesini arttırmada önemli bir role sahiptir.

Turizm pazarlamasının kendine has özelliklerinden dolayı, mal pazarlamasında dikkate alınan 4P bir başka ifade ile; ürün (product), fiyat (price), tutundurma (promotion) ve dağıtım (place) hizmet pazarlamasında yeterli olmamaktadır. Hizmet pazarlamasına yönelik karma elemanları arasında; fiziksel ortam (physical environment), katılımcılar (participants) ve süreç yönetimi (process management) gibi 4P'nin yanı sıra 3P daha yer almaktadır (Karahan, 2000; Ilgaz Sümer & Eser, 2006).

Hizmet pazarlamasında önemli bir karma elemanı olan fiziksel ortam kapsamında; işletme içinde kullanılan ekipman, mobilya-teçhizat, teknolojik araç-gereç vb. yer almaktadır. Özellikle son yıllarda teknolojide meydana gelen gelişmeler ile birlikte, turizm işletmeleri müşterilerine sundukları pek çok hizmetin merkezine teknolojiyi yerleştirmişlerdir. Turizm işletmeleri tarafından teknoloji, rekabetçi üstünlük elde etmede önemli bir araç olarak yoğun bir biçimde ve farklı şekillerde kullanılmaya başlanmıştır.

Turizm Endüstrisi ve Teknoloji

Günümüzde rakip işletmeler karşısında üstünlük elde edebilmenin ve farklılaşabilmenin yollarından biri teknolojiden yararlanmaktan geçer. Dinamik bir yapıya sahip olan turizm sektörü açısından teknolojiden faydalanmak, bir yandan işletmelerin ve tüketicilerin bilgiye en hızlı biçimde ulaşmalarını sağlar diğer yandan da sunulacak turizm hizmetlerinin kalitesini arttırır.

Turizm endüstrisinde kullanılmakta olan başlıca bilgi teknolojileri aşağıdaki gibi sıralanabilmektedir (Ahipaşaoğlu & Kaya, 2005; Kurgun, Kurgun & Güripek, 2007):

- Merkezi Rezervasyon Sistemleri
- Global Dağıtım Sistemleri
- Online Seyahat Portalları
- Destinasyon Yönetim Sistemleri
- Coğrafi Bilgi Sistemleri

Turizm endüstrisinde sıklıkla kullanılmakta olan bilgi teknolojilerinin yanı sıra tüketici istek, ihtiyaç ve beklentilerindeki farklılaşmalar çerçevesinde turizm işletmelerinin mevcut durumlarını sürekli gözden geçirmeleri gerekmektedir. Hızla değişen tüketici taleplerine yanıt verebilmenin yolu, turizm hizmetlerini farklılaştırmaktan ve sunulan farklı hizmetlerle hedef pazarı şaşırtmaktan geçer. Bu çalışma kapsamında geliştirilmiş olan akıllı otel odası otomasyon sistemi de, tüketicileri otel odasında sunulacak olan kolaylıklar ile şaşırtmak, turizm hizmetlerinden daha rahat bir biçimde yararlanmalarına yardımcı olmak ve işletmelerin çeşitli açılardan tasarruf elde edebilmelerini sağlamak üzere tasarlanmıştır.

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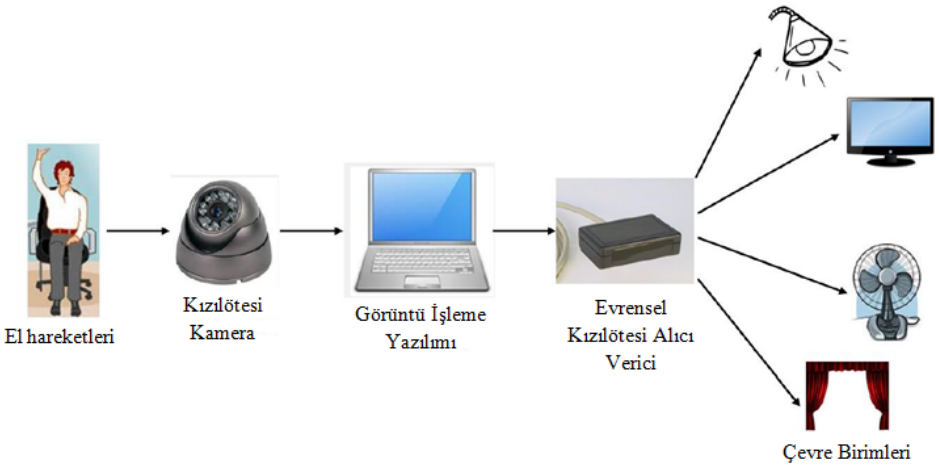
Akıllı Otel Odası Otomasyon Sistemi

Vücut hareketlerinin bilgisayar tarafından tanınması ile doğal ve yenilikçi bir sözsüz iletişim yolu ortaya çıkmıştır. Bu sayede insan bilgisayar etkileşimi (Human-Computer Interaction - HCI) ve işaret dilleri gibi alanlarda birçok uygulama alanı doğmuştur. Bu çalışma kapsamında, otel odasında konaklayan müşterilerin el hareketlerini tanıyan ve yorumlayan görüntü işleme tabanlı bir sistem geliştirilmiştir. Bu sistem ile kişinin bulunduğu ortamda yer alan bazı çevre birimlerini (televizyon, stor perde, ışık, klima) kumanda edebilmesi olanaklı hale gelmektedir. Sistemin genel yapısı Şekil 1'de verilmiştir.



Şekil 1.Önerilen sistemin genel yapısı.

Buna göre; geliştirilen sistemde kızılötesi bir kamera kullanılarak oturma pozisyonundaki kişinin tek elinin konum bilgisi, görüntü işleme algoritmaları ile tespit edilmektedir. Alınan konum bilgisi, ortamda bulunan farklı cihazların belirli kumanda fonksiyonları (cihaz açma-kapama, ses açma-kapama, ışık düzeyi açma-kapama vb.) ile ilişkilendirilmektedir. Bu ilişkilendirme sonucu ortaya çıkacak kumanda komutları Evrensel Kızılötesi Alıcı Verici (Universal Infrared Receiver Transmitter – UIRT) ara birimi ile çeşitli cihazlara iletilerek kumanda işlevi gerçekleştirilmektedir (USB-UIRT, 2016). Bu işlevin gerçekleştirilebilmesi için ilgili cihazların kumanda sinyallerinin UIRT ara birimine daha önceden öğretilmiş olması gerekmektedir.

Kameradan alınan Kırmızı-Yeşil-Mavi formatındaki renkli görüntü gri-seviyeli görüntüye çevrildikten sonra histogram eşitleme (histogram equalization), zıtlık esnetme (contrast stretching) gibi görüntü iyileştirme fonksiyonları uygulanır. Daha sonra, eşik değeri belirleme ve morfolojik görüntü iyileştirme algoritmaları ile kişinin el bölgesi tespit edilir. Örnek bir el görüntüsüne ait tespit adımları Şekil 2'de sunulmaktadır. Gonzalez & Woods (2008)'da uygulanan yöntemlerin detayları ve teknik alt yapılarına yer verilmektedir.



Şekil 2. El bölgesinin tespitine yönelik işlem adımları.

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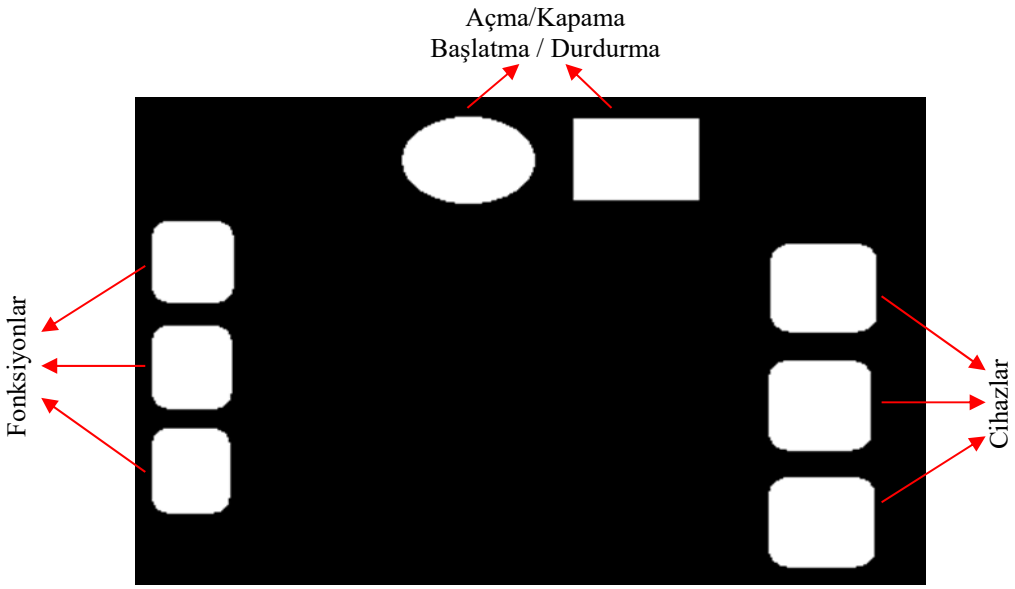
Tespit edilen el bölgesinin işlevsel hale gelebilmesi için bir kullanıcı paneli geliştirilmiştir. Bu panel; veri analizi, görüntü işleme ve karmaşık matematiksel işlemler için kullanılabilecek en uygun programlama ortamlarından biri olarak bilinen Matlab programlama dili ile gerçekleştirilmiştir (Mathworks, 2016). Kumanda edilecek cihazlara ve ilgili fonksiyonlarına erişim sağlanabilmesi için panel üzerinde çeşitli butonların yerleşimi yapılmıştır (Şekil 3). Buna göre; üst sırada yer alan butonlar cihazlar için açma/kapama ve başlatma/durdurma işlevlerini yerine getirmektedir. Sol ve sağ sütunlarda yer alan butonlar ise sırası ile fonksiyonlar ve cihazların erişimi için tasarlanmıştır. Örnek bir ekran çıktısına Şekil 4'de yer verilmektedir. Burada kullanıcı, el hareketleri ile televizyon için ses arttırma fonksiyonunu seçmiştir.



Şekil 3. Cihaz kumanda paneli üzerinde yer alan butonların yerleşimi.



Şekil 4. Televizyonda ses arttırma fonksiyonu için örnek bir ekran çıktısı.

Diğer örneklere Şekil 5'de yer verilmektedir. Buna göre; Şekil 5(a)'da televizyonun çalışmasının durdurulması, Şekil 5(b)'de televizyonun cihazlar panelinden seçimi, Şekil 5(c)'de televizyon kapatma fonksiyonunun gerçekleştirimi ve Şekil 5(d)'de de sistemin başlatılmasına yönelik örnek ekran çıktıları görülmektedir.

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Şekil 5. Sistemin çalışmasını örnekleyen ekran çıktıları.

Sonuç

Bu çalışmada el hareketlerini algılayarak tanıyan görüntü işleme tabanlı bir akıllı otel odası otomasyon sistemi geliştirilmiştir. Böylece otelde konaklayan tüketicilerin oturdukları yerden bulundukları ortamda yer alan bazı çevre birimlerini kontrol edebilmeleri olanaklı hale gelmektedir. Geliştirilen sistemi kullanacak olan konaklama işletmelerinin; maliyet tasarrufları, rekabetçi üstünlük vb. açılardan avantaj elde edebilecekleri düşünülmektedir. Ayrıca, akıllı otel odası otomasyon sisteminin sunmakta olduğu kolaylıkların tüketicilerin otel tercih kararları üzerinde de etkili olacağına inanılmaktadır.

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TURİZM SEKTÖRÜ İÇİNDE AŞÇILIK MESLEĞİNİN KADIN İSTİHDAMINDAKİ ROLÜ

Mutlu DOĞAN

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Özet: Turizm sektörü; dinamik bir sektör olarak ülke ekonomilerine milli gelir açısından önemli bir pay oluşturmaktan, istihdam yaratmaya kadar pek çok katkı yapmaktadır. Turizm sektörü, bu konumu nedeniyle, işsizlik sorunu yaşanan Türkiye gibi gelişmekte olan ülkeler açısından önemli bir sektör haline gelmiştir. Turizm sektöründe üretilen hizmetten memnuniyet ise, bu sektörün başarısının sürdürülebilir hale gelmesinde en önemli şartlardan biridir. Özellikle bu sektörün içinde yer alan konaklama işletmelerinin yiyecek içecek departmanı hem misafir memnuniyeti hem konaklama işletmesine sağlamış olduğu ekonomik katkı açısından kritik bir öneme sahiptir. Yiyecek-içecek departmanının başarısı konaklama işletmesinin başarısını doğrudan etkilemektedir. Bu bölümdeki uzun çalışma süreleri, hafta sonu yoğun çalışma şartları, fiziki bakımdan güç gerektiren işlerin yapılması gibi nedenlerle sektörde erkek istihdamı daha fazla olmuştur. Aynı zamanda bayanlarda evlilik durumu da bu işgücüne katılımı olumsuz yönde etkileyen önemli bir unsurdur. Konaklama işletmelerinde misafir memnuniyetinin oluşmasında, yiyecek-içecek hizmetlerinin ciddi bir etkisinin olduğu göz önüne alındığında, bu alandaki eğitimli personelin önemi bir kat daha artmaktadır. Son yıllarda Üniversitelerin Aşçılık ve Gastronomi bölümlerinin artması ile buralardan mezun olan eğitimli bayan öğrenciler yiyecek içecek departmanlarında görev alarak daha kaliteli hizmet sunumunda katkıda bulunurlar.

Anahtar Kelimeler: Turizm, Yiyecek içecek, Mutfak, Konaklama işletmesi, ,Kadın istihdamı

Abstract: Tourism sector makes many contributions to country economies from creating an important share with regard to national income to providing employment opportunities as a dynamic sector. Thanks to this position, tourism sector has become an important sector for developing countries such as Turkey where unemployment problems are experienced. Satisfaction from the service provided in the tourism sector is among the most important conditions for the sustainability of the success of this sector. The food and beverage departments of the accommodation establishments which are part of this sector have a critical importance for both customer satisfaction as well as the economic contributions provided to the accommodation facility. The success of the food and beverage department has direct effects on the success of the accommodation establishment. Male employment has been more dominant in this sector due to the long working hours, intensive weekend schedules as well as tasks that require physical strength. Marriage is also an important factor that has negative impact on the participation of women in this sector. When it is taken into account that the food and beverage services play an important role in customer satisfaction related with accommodation establishments, the importance of trained personnel in this field becomes even more important. Recently, female students who graduated from the Culinary Arts and Gastronomy departments of universities that have started to increase in number started to take place in the food and beverage departments thus contributing to the presentation of a more quality service.

Keywords: Tourism, Food and beverage, Accommodation establishment, Female employment

GİRİŞ

Günümüzde her yıl milyonlarca insan, sürekli yaşadıkları yerlerden geçici sürelerle ayrılarak başka ülkelere veya bölgelere gitmekte ve buralarda gezip görme, dinlenme, eğlenme ve öğrenme gibi psikolojik sosyal ve kültürel gereksinimlerini karşılamaktadırlar. Ekonomik ve sosyal anlamda geniş etkiler doğuran ve turizm olarak isimlendirilen bu olay, günümüz uygarlığının temel bir özelliğini oluşturmaktadır.

Çağımızda teknolojinin baş döndürücü bir hızla gelişme göstermesi, turizmi de etkilemesi kaçınılmazdır. Teknolojik gelişmelerin sonucu, dünyada oldukça hızlı büyüyen ve gelişen turizm sektörü, Türkiye'de de

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büyümeyi ve gelişmeyi sürdürmekte ve aynı zamanda diğer sektörlerin gelişmesine de katkıda bulunmaktadır. Turizm hareketlerinin tarihsel gelişimine bakıldığında, 1950"li yıllarda uluslararası seyahatlere katılan toplam kişi sayısı yaklaşık olarak 25 milyon kişi iken, 2013 yılında bu rakamın yaklaşık 1.08 milyar kişiye ulaştığı görülmektedir. Bunun yanında dünya genelinde 2020 yılında, uluslararası turizm hareketlerine katılan kişi sayısının 1,6 milyara ulaşması ve uluslararası turizm gelirlerinin de 2 trilyon dolara yükseleceği öngörülmektedir. Küreselleşme olgusu turizm sektörünün ekonomik anlamda dünyanın en hızlı büyüyen sektörlerinden birisi olmasını sağlamıştır.

Ülkemizde ise turizm sektörü, özellikle 2000'li yıllardan itibaren hızlı bir değişim ve gelişim göstermiş ve uluslararası rekabet gücünün en yüksek olduğu sektörlerden biri haline gelmiştir. Türkiye'ye (Türkiye İstatistik Kurumu) [TUİK] verilerine göre 2014 yılı itibariyle gelen turist sayısı, 41 milyon 415 bin 70 kişi, turizm geliri ise 34 milyar 305 milyon 904 bin dolar olarak gerçekleşmiştir. Turizm, ülkelerin ekonomik sıkıntılar yasadığı dönemlerde büyük bir döviz girdisi sağlayarak, dış ticaret açıklarının ve işsizliğin azaltılmasında kilit rol oynamaktadır. Aynı zamanda emek-yoğun özelliği, istihdamı artırıcı bir rol oynayarak, işsizliğin önlenmesinde kurtarıcı durumundadır. Turizm sektörüne giren tüm gelir, turizm sektöründe istihdamı doğrudan, diğer sektörlerdeki istihdamı ise dolaylı olarak etkilemektedir. İnsanların turizm alanında istihdam edilmesi ve bunun için gerekli bilgi ve becerilere sahip olmaları, ülke turizminin gelişimi açısından oldukça önemlidir. Turizm sektörü ve özellikle konaklama işletmeleri ülkemizde ciddi bir istihdam kapasitesine sahiptir. Bu sektörün en belirgin yapısal özelliği hizmet sektörü olması ve çalışanların emeklerinin birincil olduğu işlerin var olmasıdır.

Konaklama işletmeleri; turistlerin geçici konaklama, yeme ve içme, kısmen eğlence ve diğer bazı sosyal ihtiyaçlarını karşılayan işletmelerdir. Başka bir anlatımla; konaklama işletmeleri, turistlerin değişik mekanlarda geceleme ihtiyaçlarını karşılayan tesislerdir. Turistlerin seyahat nedenleri; seyahatten beklentileri, gelir düzeyleri, yaş grupları ve zevklerinin birbirinden farklı olması konaklama işletmelerinin de farklı olmasını gerektirmektedir. Türkiye'de konaklama işletmeleri, otel, motel, tatil köyü, pansiyonlar, sağlık tesisleri gibi değişik kriterlere göre sınıflandırılmaktadır. Konaklama işletmelerinin ekonomik katkısı düşünüldüğünde; bu işletmelerde sunulan yiyecek-içecek hizmetlerinin önemi de kendiliğinden ortaya çıkmaktadır. Çünkü konaklama işletmesinde odalar bölümünden sonra en fazla geliri yiyecek- içecek bölümü sağlamaktadır. işletmeler bu geliri elde edebilmek için yiyecek ve içeceklere önemli tutarlarda harcamalar yapmaktadırlar. Konaklama işletmelerinde yeme içme hizmetlerinin sunulduğu yiyecek içecek bölümünde yemek üretiminin yapıldığı departman olan mutfaklar da büyük bir öneme sahiptir. Bu departman önemli bir istihdam alanı oluşturmaktadır. Burada çalışan personelin profiline bakıldığında erkeklere göre kadın çalışan sayısının az olduğunu, kadınlara biçilen temel alanlardan biri mutfak olmasına rağmen bu durumun sektörde karşılık bulamadığı görülmektedir.

TURİZMDE İSTİHDAM DURUMU

İstihdam kavramını farklı şekillerde tanımlamak mümkündür. Genel anlamıyla istihdam, "çalışmak ve gelir sağlamak istek ve iradesinde olan kişilerin, mal veya hizmet üretiminde çalıştırılmaları" olarak tanımlanabilir.
Turizm sektöründe gösterilen faaliyetlerin büyük bir kısmının hizmet ağırlıklı faaliyetler olması nedeniyle genellikle emek -yoğun bir sektör olması, talep edilen işgücünün de ya kalifiye veya vasıfsız olması, bu tür işgücünün de gelişmekte olan ülkelerin veya ekonomisi bozulmakta olan bölgelerin çoğunda bol miktarda bulunması, turizmin istihdam yaratmada ki katkısını arttırmaktadır. Turizm sektöründen doğrudan etkilenen konaklama, ulaşım, eğlence, seyahat acenteleri, yönetim, finansman ve sağlık gibi pek çok sektör bulunmaktadır. Ayrıca tarım ve imalat gibi diğer sektörleri de dolaylı olarak etkilemektedir. Bu nedenledir ki turizm sektörünün istihdam üzerindeki etkisini net bir şekilde belirlemek oldukça zordur. Turizmin gelişimine paralel olarak artan istihdam etkisi, genel olarak doğrudan, dolaylı ve uyarılmış olarak üç farklı istihdam meydana getirir. Bunlar.

- Doğrudan İstihdam; konaklama, yeme-içme, ulaştırma işletmeleri, seyahat acenteleri ve tur operatörleri gibi turizm işletmeleri doğrudan istihdamı kapsar.
- Dolaylı İstihdam; turizm sektörünün ihtiyaç duyduğu ürünleri ve hizmetleri sağlayan sektörlerdeki ve turistlerin harcamalarından yararlanan faaliyetlerdeki işler dolaylı istihdamın kapsamındadır. Tarım balıkçılık, inşaat, el sanatları, bankalar ve imalat sektörleri gibi sektörler turizmin gelişmesi ile birlikte yeni istihdam olanakları sağlanan sektörlerdir.
- Uyarılmış İstihdam; doğrudan ve dolaylı istihdamla sağlanan gelirlerin harcanmasıyla ekonomide yaratılan ek istihdamı kapsayan istihdamdır.

Turizm sektörünün bu şekilde ortaya çıkarmış olduğu istihdam olanakları, özellikle Türkiye gibi işsizlik problemiyle karşı karşıya olan ülkeler açısından oldukça önemlidir.
Ayrıca, turizm sektöründe makineleşme ve otomasyon imkanlarının sınırlı olması, sektörün meydana getirdiği istihdam yoğunluğunu diğer sektörlere nazaran yükseltmektedir. Sektörde emek-yoğun faaliyetlerin fazla olması

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nedeniyle turistik tüketim harcamaları yüksek oranda doğrudan istihdam etkisi oluşturmaktadır. Bunun yanında turizm sektörüne mal ve hizmet sunan yan sektörlere de yeni iş imkânları sağlayarak dolaylı istihdam etkisi meydana getirmektedir. Turizm sektöründe yapılan yatırım ve harcamaların, diğer sektörlere göre yüksek oranda istihdam sağladığı kabul edilmektedir. İçöz ve Kozak'a göre (1998:225) turizmde istihdam edilen kişilerin sayısını artıran faktörler şunlardır:

- Emek yoğunluğu
- Çok sayıda düsük ücretli iş alanı bulunması
- Çok sayıda yarı zamanlı ve geçici is alanının bulunması
- Sezon yoğunluğu ve dönemsellik olarak belirlenmiştir.

Turizm sektörü elbette tek başına bir ülkenin kalkınmasını sağlayamaz ancak kalkınmanın sağlanmasında olumlu katkılar sağlayacağı da yadsınamaz bir gerçektir. Turizm sektörünün Türkiye ekonomisi içinde yarattığı istihdam ile ilgili olarak tek bir veri bulunmamakla beraber, çeşitli kaynaklardan derlenen bilgilerden bu alanda çalışan toplam kişi sayısının 1 milyonun biraz üzerinde olduğu görülmektedir.

Tablo 1:Konaklama Tesislerinde İstihdam (2000-2010)

Yıllar	Otel+Lokanta (Bin Kişi)	Otel, Eğlence Yerleri (Bin Kişi)
2000	776	211.4
2001	796	243.5
2002	826	255.6
2003	847	280.1
2004	872	297.6
2005	949	309.2
2006	1.001	318.4
2007	1.067	328.7
2008	1.058	341.5
2009	1.131	342.4
2010	1.066	351.4

Kaynak:http://www.tuyed.org.tr (18.05.2011)

Yukarıda verilen tablo incelendiğinde, otel, lokanta ve eğlence yerlerinin istihdam rakamlarının sürekli arttığı, sadece 2008 ve 2010 yıllarında otel lokanta istihdamında bir gerileme olduğu görülmektedir.
Turizm sektöründe kadın-erkek çalışanların durumuna bakıldığında;
Kadınların insani duygulara daha iyi hitap edebilmeleri, sosyal ve aile içerisindeki konumları ve kişisel özellikleri, konaklama işletmelerinde istihdam edilmeleri için bir tercih sebebi olarak ön plana çıkmaktadır. Bu durum, turizm sektöründe her geçen gün kadın çalışanların sayısının artmasından anlaşılmaktadır. EUROSTAT'ın verilerine göre 2013 yılında ülkemizde turizmde istihdam edilen erkeklerin oranı % 70 iken kadınların oranı %30 civarındadır. Ancak turizmde istihdam edilenlerin içerisinde erkeklerin oranı 2006'da %74.3 iken 2013' de %70.1'e düşmüş, kadınların oranı ise %25.7'den %29.9'a yükselmiştir. Bu sektörde kadın çalışanların meslek ve pozisyon durumuna bakıldığında turizm endüstrisinde belirgin yatay ve dikey toplumsal cinsiyet ayrımcılıkları vardır.

- Yatay olarak kadınlar ve erkekler farklı mesleklere yerleştirilirler. Kadınlar garson, temizlikçi, seyahat acentası satış temsilcisi olarak istihdam edilirken; erkekler barmen, bahçıvan, yapı çalışanları, sürücü, teknik personel olarak istihdam edilmektedir.
- Dikey olarak tipik "toplumsal cinsiyet" piramidi turizm sektöründe de yaygındır. Daha düşük pozisyonlar ve kariyer gelişim olanağı çok az olan meslekler kadınlar tarafından doldurulmaktadır. Buna karşın önemli yönetimsel pozisyonlar erkekler tarafından doldurulmaktadır.

Bu durumda, dünya nüfusunun yarısını oluşturan kadınların ekonomik yaşama katılma, ekonomik değer üretme ve dolayısıyla da kalkınmayı sağlamada önemli etkileri olmasına rağmen, ekonomik kalkınmadan yararlanma payları erkeklerin aldıkları payın gerisinde kalmaktadır. Kadınların bu şekilde ekonomik ve toplumsal anlamda ikinci planda kalmalarına neden olan ana etken, kaynağını erkek egemen kültürden alan cinsiyet ayrımcılığıdır. Bu zihniyet, kadının rollerini ev içi alanla sınırlamakta ve ev dışında herhangi bir uğraşı olsa bile bunun kadının ikinci görevi olduğunu söylemektedir. Küreselleşmenin beraberinde getirdiği esnek ve ucuz emek arayışı ile birlikte kadın istihdamı artsa da, dünya genelinde kadın emeği hala büyük oranda, ücretsiz aile işçisi başta olmak üzere, düzenli geliri olmayan işlerde yoğunlaşmış durumdadır.

AŞÇILIK MESLEĞİNDE KADIN İSTİHDAMI

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Türkiye'de kadın, gerçek anlamda 1950'lerden sonra kırdan kente yönelik göçün beraberinde getirdiği kentleşme sonucunda işgücü piyasası içinde yer almaya başlamıştır. Zaman içinde kadınların işgücü piyasasındaki konumları ve çalışma biçimleri de değişime uğramıştır. Bu değişimin sektörel açıdan nasıl olduğu önemli bir konudur. Çünkü bir ülkedeki istihdamın sektörel dağılımı o ülkenin kalkınmışlık düzeyinin önemli bir göstergesidir. Kalkınma ile birlikte istihdam, tarım sektöründe azalırken tarım dışı sektörlerde artmaktadır. Bu durum kadın istihdamı için de aynen geçerli olmaktadır. Gelişmekte olan ülke ve bölgelerde kadın işgücü tarım sektöründe yoğunlaşırken, gelişmiş ülkelerde kadınların yoğun olarak çalıştığı sektör hizmet sektörü olmaktadır. 2000 yılında hizmetler sektöründe çalışan kadın oranı % 27,3 iken, 2005 yılında % 33,3 olmuştur. Hizmet sektörü içerisinde yer alan turizm sektöründe her geçen gün kadın çalışanların sayısı giderek artış göstermektedir. Öte yandan, turizm sektöründe konaklama işletmelerinde işgören devir hızının oldukça yüksek olması bilinen bir sorundur. İşgören devir hızının yüksek olduğu bölümlerin başında, çok sayıda çalışanıyla mutfak departmanı gelmektedir. İşgören devir hızının yüksek lmasına neden olan unsurlardan birinin, çalışma koşulları olduğunu söylemek mümkündür. Çünkü, mutfaklardaki fiziksel çevreye ait unsurlar, işgörenlerin motivasyonunda ve verimli çalışmasında büyük bir etkiye sahiptir. Mutfakta buhar, koku duman olmadan yemek pişirilmesi mümkün değildir ve mutfakta oluşan hava kirliliğinin sağlığı ciddi şekilde olumsuz etkilediği de görülmüştür. Ayrıca, çalışma ortamında uygun olmayan termal stresin rahatsızlığa ve sağlık sorunlarına neden olduğu ve iş performansını olumsuz etkilediği belirlenmiştir. Bununla birlikte mutfaklarda ; kayma, düşme, yaralanma gibi kazalara da çok sık rastlanmaktadır. Dolayısıyla, fiziksel çevrenin çalışanlara hitap edecek şekilde düzenlenmesi gerekmektedir. Sektör itibariyle sıklıkla mevsimlik çalışma, part-time çalışma, uzun çalışma saatleri, kayıt dışı istihdam ve düşük ücret olumsuzlukları ile karşı karşıya kalınmaktadır. Bunun yanısıra çalışanlar genellikle kapalı alan, yüksek sıcaklık, yetersiz ekipman ve teçhizat gibi fiziki çalışma koşullarının olumsuzlukları ile de baş etmeye çalışmaktadırlar. Bu nedenlerden dolayıdır ki mutfaklarda özveri ile çalışan personele ihtiyaç vardır. Bu personelin önemli bir bölümünü aşçılık mesleğini yapanlar oluşturmaktadır. Mesleki Yeterlilik Kurumu (2010) tarafından hazırlanan ulusal meslek standartlarında aşçı; "*işletme ve bölüm istekleri doğrultusunda, standart reçete ve mönü hazırlama, yerel, ulusal ve dünya mutfaklarına ait çorba ve konsomeleri, sıcak ve soğuk sosları, hamur işi yemeklerini, et ve su ürünleri yemeklerini, sebze ve kuru baklagillerden yapılan yemekleri, zeytinyağlıları, pilav ve makarnaları, sıcak-soğuk mezeleri, salataları, garnitürleri ve tatlıları reçete/mönülere ve hijyen kurallarına uygun olarak hazırlama ve servis için sunuma hazır hale getirme bilgi ve becerisine sahip kişi*" olarak tanımlanmaktadır. Aşçılık, üst düzeyde beceri ve planlı çalışmayı gerektiren bir meslektir.

Genelde mutfak departmanın da aşçı olarak çalışan kadın sayısı oldukça azdır. Sektörde daha az eğitim gerektiren işlerde kadınlar çalıştırılmakta ve buna dayalı olarak finansal olarak da az kazanmaktadırlar Toplum içinde kadınlara biçilen temel alanlardan biri mutfak olmasına rağmen bu durumun sektörde karşılık bulmadığını görmekteyiz. Bunun yanı sıra çalışanlar arasında da kadın ve erkek işi ayrımı yapılmaktadır. Burrell vd. (1997) Fransa, İspanya, İtalya ve İngiltere'de konaklama sektöründe çalışan kadınlar üzerinde yapılan bir çalışmada mutfakta kadın ve erkek dağılımında çok fark olmamasına rağmen yapılan iş bakımından farklılıklar tespit edilmiştir. Mutfakta erkekler daha çok yemek yaparken kadınlar temizlik ve bulaşık yıkama işlerinde yer almaktadır. Mok ve Finley(1986), Hong- Kong'da otel yiyecek-hizmet işgörenlerinin iş tatmin düzeylerini demografik değişkenlere göre incelemiş ve iş tatmini ve işgören devri arasındaki ilişkiyi araştırmıştır. Çalışmanın sonuçlarına göre; kadın işgörenlerin erkek işgörenlere, genç işgörenlerin yaşlılara oranla tatmin düzeylerinin daha düşük olduğu sonuçlarına varmışlardır.

Kadınların üzerindeki sorumlulukların yaptıkları işlerin performansını etkileyeceği düşünülmektedir. Özelllikle kesintisiz hizmet esasına dayanan turizm işletmelerinin mesai saatlerinin standart değil de karmaşık olabilmesi ve her an işe çağrılabilme olasılığı, bir düzensizlik olarak ortaya çıkmakta ve bu durum sektördeki özellikle evli kadınlar açısından önemli bir sorun teşkil etmektedir. Hizmetlerin çoğunlukla insan emeğine dayandığı mutfak departmanında iş yüklerinin fazla olması durumu, kadınların fiziki özelliklerinden kaynaklanan bu iş yüküne dayanamama eğilimleri ayrı bir sorun olarak karşımıza çıkmaktadır. Çalışma saatlerinin uzunluğundan dolayı yeterince dinlenememe, çalışanların fiziksel dayanıklılıklarını ve dolayısıyla direnç, güç ve dikkat gibi hususları olumsuz etkileyeceğinden, mutfaklarda kazaların oluşmasına neden olabilmektedir. Ergonomik olarak düzenlenmeyen mutfak donanımı çalışanlarda kas ve iskelet sistemi ile ilgili meslek hastalıklarına neden olmaktadır. Bu mutfaklarda kullanılan ekipmanların ağır ve büyük olması burada çalışan kadınlar için zorluklar yaratmaktadır. Çünkü bu kazanları kaldırmak, büyük tencerelerde büyük kepçelerle çok miktarda hazırlanan yemekleri karıştırmak, belki bin kişi için patatesi tek başına soymak ya da on kiloluk mayonezi taşımak gibi hepsi büyük bir emek ve güç gerektiren işlerdir. Bu işlerden dolayı bel kayması, sırt kaslarının zedelenmesi ve boyun tutulması gibi rahatsızlıklara sık rastlanmaktadır. Bu nedenlerden dolayı turizm işletmeleri mutfaklarında kadın personelin uzun süre istihdam edilmesi zorlaşmaktadır. Ancak Son yıllarda her alanda olduğu gibi mutfak cihazları da teknolojik olarak modern hale gelmiştir. Yeni teknoloji ile donatılmış bu aletler, farklı biçimleri, renkleri, kontrol elemanları, dijital göstergeleri, programlanabilir olmaları nedeniyle mutfakta

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çalışanların işini kolaylaştırmıştır. Günümüz modern mutfakları sayesinde kadınlarda, geçmişte imkansız denilebilecek işleri artık başarabilmektedirler. Böylece teknoloji kadınları tamamen destekliyerek turizm sektöründeki mutfaklarda erkeklerle eşit bir şekilde çalışabilme ortamını sağlamıştır. Teknolojinin bu olumlu etkisiyle birlikte mutfaklarda teknolojik yeniliklere uyum sağlıyacak nitelikli işgücüne ihtiyaç vardır. Bunun için sektörde erkek çalışanların yanı sıra kadın işgücünün eğitim seviyesini yükseltecek örgün ve yaygın eğitim imkânları kullanılarak istihdam edilebilirlik artırılmalıdır. Son yıllarda aşçılık mesleğine olan ilginin arttığı söylenebilir. Bununla birlikte birçok üniversite de önlisans düzeyinde aşçılık programları ile lisans düzeyinde Gastronomi bölümleri açılmıştır. 2011 yılında aşçılık programı sayısı 43 olup , 2014 yılında bu sayı 91' e yükselmiştir. Böylece giderek artış gösteren nitelikli kadın aşçı ihtiyacı bu bölümlerden mezun olan öğrencilerin yiyecek içecek sektörü mutfaklarında istihdam edilmesiyle karşılanacaktır. Bu konuda işletmeler de, mezun öğrencilerin meslekleri konusunda ilerlemelerini sağlamalıdır. Ayrıca, mesleğe karşı olumlu izlenimler sağlayarak, aşçılık eğitimi almış öğrencilerin kendilerini geliştirme de çeşitli fırsatlar sunmalıdırlar.

SONUÇ

Turizm sektörü; dinamik bir sektör olarak ülke ekonomilerine milli gelir açısından önemli bir pay oluşturmaktan, istihdam yaratmaya kadar pek çok katkı yapmaktadır. Turizm sektörü, bu konumu nedeniyle, işsizlik sorunu yaşanan Türkiye gibi gelişmekte olan ülkeler açısından önemli bir sektör haline gelmiştir.

Turizm sektörünün içerisinde yer alan yiyecek- içecek sektörü de aynı hızla gelişmektedir. Ancak istihdam durumuna bakıldığında Turizm sektörünün genelinde kadın çalışan oranının diğer sektörlere göre daha fazla olmakla birlikte yiyecek içecek üretimi yapan işletme mutfaklarında yeterli çoğunluğa ulaşılamadığı görülmektedir. Mutfaklardaki İş yükü ve çalışma sürelerinin fazlalığı özellikle hem erkek hem de bayan çalışanların sorunları arasında büyük bir yer tutmakla birlikte, bu konuyla ilgili olarak iş- görev dağılımı bayanların fiziksel özellikleri ve ailesel boyuttaki sorumlulukları düşünülmelidir. İşletmeler genelde nitelikli işgören istihdam etmeyi sadece gider olarak değerlendirmekte; kaliteli, nitelikli çalışanların sağlayacağı yararlar göz ardı edilmektedir. Bu bakımdan, sektör genelinde mesleki eğitim alan kişilerin istihdam oranı da çok düşük seviyelerdedir. Oysa işletme kalitesinin ve tercih edilme sebeplerinin başında hizmet kalitesinin geldiği yadsınamaz bir gerçektir. Hizmet kalitesi konusunda eğitimli, müşteri ile birebir iletişimde uzman ve başarılı çalışanlar sayesinde başarılabilir. Bu nedenle Turizm işletmeleri, yeni personel politikaları belirlemelidir. İşletmelerin düzenleyecekleri bu politikalar içerisinde işe alım sürecinde eşit değerlendirme, eşit ücret imkanı, sosyal haklar anlamında eşitlik, çalışma saatlerinde eşitlik, kariyer imkanları anlamında ortak imkanlar sağlanması, kariyer değerlendirme sırasında ise önyargılardan uzak eşit şartlarda değerlendirme, yeterli eğitime ve meslek becerisine sahip personel istihdamı gibi konularda düzenlemelere gidilmelidir. Bu düzenlemeler sayesinde yiyecek içecek işletme mutfaklarında aşçılık mesleğini yapmak isteyen kadın istihdamında da önemli bir artış sağlanabilir.

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TÜKETİCİLERİN TEKNOLOJİK YENİLİKLERİ BENİMSEMESİ: BULUT TEKNOLOJİSİNİN BENİMSENMESİNİN UTAUT MODELİYLE ARAŞTIRILMASI

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ÖZET: Bilgi teknolojilerindeki hızlı gelişmeler bireyleri yaşamın her alanında etkilemektedir. Bireyler akıllı telefonlarla çektikleri resimleri, tablette kullanılan metin dosyalarını ve dizüstü bilgisayarlarda izledikleri filmleri birbiriyle bağlantılı olarak bulundukları her yerden ulaşma ve paylaşma imkânına bulut teknolojisiyle kavuşmuşlardır. Bu teknoloji, internet bağlantısı olan tüm cihazlardan sanal ortamdaki kişisel veri depolama alanına ulaşıp kayıtlı öğeleri kullanma imkânı sağlamaktadır. Ancak teknolojinin kullanımında tüketiciler açısından en başta güvenlik endişeleri olmak üzere çeşitli riskler bulunmaktadır. Bu ortamda teknoloji kabulü teknolojinin başarı sağlamasında kritik rol oynayan faktörlerden biridir. Bu çalışmada genç tüketicilerin teknoloji kullanım ve kabulleri UTAUT (Birleşik teknoloji kabul ve kullanım modeli (Unified Theory of Acceptance and Use of Technology) modeli yardımıyla incelenmiştir. Çalışma üniversite öğrenci örneklemi üzerinde gerçekleştirilmiş olup, araştırma sonucunda UTAUT modelini oluşturan faktörler arasındaki ilişkiler ortaya konmuştur.

Anahtar Kelimeler: Teknolojik Yeniliklerin Benimsenmesi, Bulut Teknolojisi, UTAUT Modeli, Teknoloji Kabulü, Teknoloji Kullanımı

CONSUMERS' TECHNOLOGICAL INNOVATIONS ADOPTION: INVESTIGATION OF THE CLOUD TECHNOLOGY ADOPTION USING THE UTAUT MODEL

ABSTRACT: The rapid developments in information technology affect individuals in all areas of life. Today, individuals have the opportunity to use and share the photos taken with smartphones and text files used in tablets and the movies they watch in laptops, which are connected with each other from anywhere with the cloud technology. This technology provides the opportunity to reach a personal data storage of the registered items in a virtual environment from any device with an internet connection. However, there are various risks of the use of technology, including safety concerns for consumers in the first place. In this environment, ensuring the success of the technology acceptance technology is one of the factors that play a critical role. In this study, the use of technology and acceptance of young consumers was analyzed by UTAUT (Unified Theory of Acceptance and Use of Technology) model. The study has been carried out on the sample of undergraduate students and the research results demonstrate the relationships between the factors composing the UTAUT model.

Keywords: Adoption of Technological Innovations, Cloud Technology, UTAUT Model, Technology Acceptance, Use of Technology

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1. Giriş

Kablosuz internet teknolojisindeki gelişmeler, dev boyutlardaki verilerin saklanıp paylaşılabilmesi ve mobil cihazların artan popülaritesi bulut teknolojisine olan ilginin artmasını sağlamıştır (Cao vd., 2013). Teknoloji kabul modelleri arasında en sık kullanılanı Davis vd. (1989) tarafından ortaya konan Teknoloji Kabul Modelidir (Technology Acceptance Model - TAM). Modele yıllar içerisinde yapılan ilave ve değişikliklerle Venkatesh ve arkadaşları (2003) tarafından *Birleşik Teknoloji Kabul ve Kullanım Modeli* (the Unified Theory of Acceptance and Use of Technology - UTAUT) modeli geliştirilmiştir (Wang vd., 2006). Model literatürde geçmişte kullanılan ölçüm araçlarından çok daha iyi bir oranla kullanıcıların teknolojiyi kabul ve kullanımını açıklamayı başarmıştır (El-Gayar ve Moran, 2006).

Bu çalışmanın amacı, UTAUT modeli çerçevesinde genç tüketicilerin bulut teknolojisini kabul ve kullanımlarını etkileyen faktörler arasındaki ilişkileri araştırmaktır. Çalışmanın devamında ilk olarak bulut teknolojisi ve UTAUT modeli çerçevesinde tüketicilerin teknoloji kabulüne yönelik literatür taraması gerçekleştirilmiştir. Sonrasında araştırma modeli ve modele ilişkin hipotezler ortaya konmuştur. Daha sonra ise araştırma metodolojisi ve araştırmada elde edilen sonuçlar analiz edilerek araştırma sonuçları değerlendirilmiştir.

2. Literatür Taraması

2.1.Bulut Teknolojisi

Bulut teknolojisi, internet üzerinden hizmet olarak sunulan uygulamalar ve veri merkezlerinde bu hizmetleri sağlamak amacıyla bulunan donanım ve sistemsel yazılımlardır. Veri merkezlerinin söz konusu donanım ve yazılımları 'Bulut' olarak isimlendirilmektedir (Armbrust vd., 2009). ABD Ulusal Standartlar ve Teknoloji Enstitüsü (National Institution of Standards and Technology - NIST) bulut teknolojisini "*Düşük çaba veya servis sağlayıcısı etkileşimiyle hızlı alınıp iletilebilen, ayarlanabilir bilişim kaynaklarının paylaşıma açık havuzuna istendiğinde uygun bir şekilde ağ erişimi sağlayan model*" olarak tanımlamaktadır (Mell ve Grance, 2011: 3).
Bulut teknolojisi, kullanıcıların hesaplarına ve depolama alanlarına internet üzerinden farklı cihaz ve bölgelerden ulaşabilmelerine olanak sağlamaktadır (Seyrek, 2011). Bulut bilişim teknolojisinin hizmet modelleri temelde *altyapı hizmeti, yazılım hizmeti ve platform hizmetleri* olmak üzere üç grupta toplanmaktadır. Altyapı hizmeti, kullanıcıların çeşitli yazılım ve uygulamaları kurulup çalıştırılabildiği, depolama, işleme ve ağ gibi birçok bilgisayar hizmetini kullanabildiği bir altyapı hizmetinden oluşmaktadır. Kullanıcılar, altyapıyı bizzat kendileri yönetemeseler de depolama alanları, işletim sistemleri ve yüklenen programlar üzerinde kontrol sahibi olabilirler. Yazılım hizmeti, bulut altyapısı üzerinde bulunan uygulamaların kullanıcıların hizmetine sunulmasını içermektedir. Platform hizmetleri ise uygulama geliştirenlerin bulut hizmetinin sağlayıcısı tarafından desteklenen araç, hizmet ve programlama dillerini kullanarak çeşitli uygulamaları oluşturabilmesine yönelik hizmetlerdir (Mell ve Grance, 2011).

Bulut teknolojisi özellikle Dropbox, Apple iCloud ve Google Drive gibi popüler uygulamalar öncülüğünde son yıllarda hızla gelişmektedir (Moryson ve Moeser, 2016). Bulut teknolojisi, farklı cihazlardan kişinin bulunduğu yer ve zaman fark etmeksizin internet bağlantısı olan her yerden tüm dosyalarına ulaşma imkânı verdiği için tüketicilere birçok fonksiyonel fayda sağlamaktadır. Aynı zamanda tüketiciler fiziki depolama aygıtları taşıma zahmetinden de kurtulmaktadırlar. Dolayısıyla tüketiciler arasında bulut hizmetlerinin daha çok depolama amaçlı kullanımı ön plana çıkmaktadır.

2.1 Teknoloji Kabulü ve UTAUT Modeli

Bulut teknolojisinin kabulü hakkında yapılan literatür taraması sonucunda, bu yeni teknolojinin kabulünün önündeki en büyük engellerin güvenlik ve gizliliğe yönelik endişeler olduğu görülmektedir. Seyrek (2011) çalışmasında, firmalar açısından değerli verilerin kaybolması veya çalınmasının kritik zararlara sebebiyet vereceğini belirtmiştir. Moryson ve Moeser (2016) de çalışmalarında UTAUT modelinin değişkenlerine ek olarak algılanan güvenlik riski faktörünü de modele dâhil etmiştir.
UTAUT modeli öncesinde literatürde teknoloji kabulünde kullanılan modeller incelendiğinde en yaygın olarak Davis vd. (1989) tarafından geliştirilen TAM modelinin kullanıldığı görülmektedir. Bu model, bireyin yeni teknoloji kabulünü; bireylerin kullanma niyeti ve davranışları arasındaki ilişkilerle açıklamayı amaçlamaktadır. Model, algılanan kullanışlılık, algılanan kullanım kolaylığı ve bireyin davranışa dönük niyeti olarak belirlenen temel unsurlara dayanmaktadır. Venkatesh ve arkadaşları (2003) çalışmalarında sekiz farklı bilgi teknolojileri kabül modelini incelemişlerdir. Farklı çalışmalarda incelenen bu modeller; nedenli eylem teorisi (the theory of reasoned action - TRA) (Ajzen and Fishbein, 1980); teknoloji kabul modeli (Technology Acceptance Model) (Davis vd. 1989); motivasyonel model (motivational model) (Davis vd., 1992); planlı davranış teorisi (the theory

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of planned behavior) (Ajzen, 1991); birleştirilmiş teknoloji kabul modeli ve planlı davranış modeli (a model combining the technology acceptance model and the theory of planned behavior) (Taylor ve Todd, 1995); PC kullanımı modeli (the model of PC utilization) (Thompson vd., 1991); yenilik yayılma teorisi (the innovation diffusion theory) (Rogers, 1995) ve sosyal biliş teorisi (the social cognitive theory) (Compeau vd., 1995) olarak ele alınmaktadır.

Teknoloji kabul ve kullanımına ilişkin literatür incelendiğinde UTAUT modelinin birçok farklı alanda kullanıldığı görülmektedir. Örneğin Wang vd. (2006) ile Alawadhi ve Morris (2008) e-devlet hizmetleri, Carlsson vd. (2006) mobil cihaz ve hizmetleri, El-Gayar ve Moran (2006) üniversite öğrencilerinin tablet bilgisayar kullanımları, Cheng vd. (2008) ile Foon ve Fah (2011) internet bankacılığı, Yu (2012) ile Zhou vd. (2010) mobil bankacılık, Zhou (2011) mobil internet kullanımı, Oktal (2013) bilgi sistemlerinin kullanımı konularını içeren çalışmalarında UTAUT modelini kullanmışlardır.

Venkatesh ve arkadaşları (2003) çalışmalarında teknoloji kabul ve kullanım davranışının doğrudan belirleyicisi olan *performans beklentisi, çaba miktarı, sosyal etki ve altyapı durumu* olmak üzere dört temel faktörü ele almışlardır.

Performans beklentisi faktörü, bireyin teknoloji kullanımı sonucunda iş performansında sağlayacağı gelişim ve faydalar olarak tanımlanmaktadır. Zhou ve arkadaşları (2010) çalışmalarında performans beklentisinin, kullanıcının teknoloji kullanımı sonucunda elde edeceği performans gelişim beklentisini yansıttığını belirtmiştir. Wang ve arkadaşları (2006) ise çalışmalarında, performans beklentisi faktörünün kullanıcıların mobil cihaz ve hizmetleri kullanma niyetini pozitif olarak etkilediği sonucuna ulaşmışlardır. Cao ve arkadaşları (2013) da çalışmalarında performans beklentisi faktörünün bulut teknolojisinin kabulünde pozitif etkiye sahip olduğunu bulmuşlardır. Carlsson ve arkadaşları (2006) ise çalışmalarında, performans beklentisi faktörünün kullanıcıların mobil cihaz ve hizmetleri kullanıma niyeti üzerinde doğrudan etkileye sahip olduğu sonucuna ulaşmışlardır.

Çaba beklentisi faktörü, teknolojiyi kullanmanın ne kadar çaba gerektirdiğini ve kullanım kolaylığının ne kadar olduğunu ifade etmektedir. Bu faktör, teknolojiyi kullanmanın bireyler açısından ne kadar zor olduğuyla ilişkilendirilmektedir (Zhou vd., 2010). Cheng ve arkadaşları (2008) çaba beklentisi faktörünü, teknolojinin kullanımına ilişkin kolaylık derecesi olarak tanımlamıştır. Bulut teknolojisi geçmişte kullanılan geleneksel depolama yöntemlerinden farklılık gösterdiğinden ve bireylerin kullanımı için internet kullanımı konusunda bilgi sahibi olunmasını gerektirdiğinden özellikle bilişime uzak kişilerin öğrenmek için daha fazla çaba göstermesi gerektirmektedir.

Sosyal etki faktörü, birey için önemli olan kişilerin söz konusu yeni teknolojinin kullanımını ne kadar önemli gördüğünü ifade etmektedir (Cheng vd., 2008). Sosyal medya ve dijital ortamın hızlı gelişimi, bireylerde özellikle medya dosyalarına tüm araçlardan ve her yerden ulaşma isteğini doğurmuştur.

Modelin bir başka faktörü olan altyapı koşulları faktörü ise, organizasyonel ve teknik altyapının bireyin teknolojiyi kabul ve kullanımını destekleme derecesi olarak tanımlanmaktadır (Venkatesh vd., 2003). Bireysel açıdan bakıldığında bu faktör, kullanıcının teknoloji kabulünü hızlandırıp, engelleri ortadan kaldıracak kolaylaştırıcı koşullar olarak görülmektedir. Belirtilen bu etkiler kullanıcıda teknoloji kullanımına yönelik bir niyet oluşturmakta ve bu niyet zaman içerisinde kullanma davranışına dönüşebilmektedir.

3. Araştırma Modeli ve Hipotezler

Cao ve arkadaşları (2013) bulut teknolojilerinin kabulünü UTAUT modeli aracılığıyla inceledikleri çalışmalarında, orijinal UTAUT modeline ek olarak bulut teknolojisinin karakteristiğinden kaynaklanan üç farklı dış faktörü de araştırma modellerinde kullanmışlardır. Bunlar algılanan risk, algılanan maliyet ve bireysel yenilikçilik faktörleridir. Kullanıcıların bulut teknolojisinin kullanımında algılanan riskler; gizliliğin korunması, veri güvenliği ve hizmete ulaşabilme başlıkları altında ele alınmıştır. Bulutta saklanan veriler çoğunlukla fotoğraf, çalışma verileri ve/veya iletişim bilgileri gibi kişisel verileri içerdiğinden tüketicilerin hizmetin güvenlik ve güvenirlilik gibi yönlerine olan talepleri yoğun biçimde ortaya çıkmaktadır. Ayrıca bulut hizmeti tamamen internete bağımlı bir yapı olduğundan, internet ağına bağlanamayan kullanıcılar hizmeti kullanamamakta ve sonuçta verilerine ulaşamamaktadırlar. Algılanan maliyet, bireylerin hizmet kullanımı için katlanacakları algılan maliyet düzeyi olarak ifade edilebilir. Son olarak verilerin bulutta saklama teknolojisi geleneksel saklama metotlarından farklı olduğundan bireyin yenilikçi yapısı da bireylerin teknoloji kabul sürecine etkide bulunacaktır (Cao vd., 2013).

Bu çalışmada bulut teknolojisinin kabulüne etki eden UTAUT modeli faktörleri ve bu faktörlerin birbirlerini nasıl etkilediği incelenmiştir. Bu kapsamda ilgili literatürden yararlanılarak oluşturulan teknoloji kabul ve

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kullanımına pozitif ve/veya negatif etkide bulunması beklenen faktörlere ait hipotezler aşağıdaki tablo 1'de belirtilmiştir.

Tablo 1. Araştırmanın hipotezleri

H1	Kolaylaştırıcı koşullar, performans beklentisi üzerinde olumlu etkiye sahiptir.
H2	Performans beklentisi, özgüven üzerinde olumlu etkiye sahiptir.
H3	Özgüven, sosyal etki üzerinde olumlu etkiye sahiptir.
H4	Kolaylaştırıcı koşullar, çaba beklentisi üzerinde olumlu etkiye sahiptir.
H5	Kolaylaştırıcı koşullar, kaygı üzerinde olumsuz etkiye sahiptir.
H6	Sosyal etki, kaygı üzerinde olumsuz etkiye sahiptir.
H7	Performans beklentisi, niyet üzerinde olumlu etkiye sahiptir.
H8	Kolaylaştırıcı koşullar, niyet üzerinde olumlu etkiye sahiptir.

Çalışmanın sonraki aşamalarında yukarıda tablo 1'de belirtilen hipotezlerin test edilmesi amacıyla gerçekleştirilen araştırma metodolojisi, verilerin analizi, bulgular ve sonuç başlıkları yer almaktadır.

4. Metodoloji

Bu çalışmanın amacı, UTAUT modeli çerçevesinde genç tüketiciler olarak öğrencilerin bulut teknolojisini kabul ve kullanımlarını etkileyen faktörler arasındaki ilişkileri araştırmaktır. Özellikle genç tüketicilerin teknolojiye olan yatkınlığı ve ilgisi, bulut teknolojisi gibi yeni teknolojilerin kabul ve kullanımına etki eden faktörlerin ve bu faktörler arasındaki ilişkilerin belirlenmesini gerektirmektedir. Bu bağlamda bu çalışmadan elde edilecek sonuçlar, teknoloji şirketlerinin pazarlama stratejilerinin belirlenmesine yarar sağlayacaktır

Araştırmanın örneklemi Uludağ Üniversitesi İşletme bölümü lisans öğrencilerinden oluşturmaktadır. Araştırmada pratik ve maliyetsiz olmasından dolayı kolayda örnekleme yöntemi kullanılmıştır. Oldukça yaygın olarak kullanılan bu teknik, en ucuz ve kolay bir şekilde örnek kütleye ulaşıldığı için (Coşkun vd., 2015; Gürsakal, 2009) tercih edilmiştir. Araştırma 1-20 Haziran 2016 tarihleri arasında uygulanmıştır. Anket verileri yüz yüze görüşme yöntemiyle elde edilmiştir.

Anket formu iki bölümden oluşmaktadır. İlk bölümde araştırmanın ana konusunu içeren beşli Likert ölçeğine ait 27 soru, devamında ise anket katılımcılarının demografik verilerini içeren kategorik sorular bulunmaktadır. Likert ölçeğindeki soru ifadeleri Venkatesh tarafından 2003 yılında geliştirilen UTAUT modeline ait ifadelerdir. Ölçek sosyal etki, özgüven, performans beklentisi, niyet, kolaylaştırıcı etkiler, çaba beklentisi ve kaygı olmak üzere 7 faktörden oluşmaktadır. Anket formları lisans öğrencilerine yöneltilmiş ve araştırma sonunda analizde kullanılabilir 150 adet ankete ulaşılmıştır.

5. Analiz ve Bulgular

Araştırmanın analizi IBM SPSS ve AMOS programlarının yardımıyla gerçekleştirilmiştir. Araştırmaya katılan cevaplayıcıların yaş ve cinsiyet gibi demografik verileri incelendiğinde; katılımcıların % 52,7'sinin (79 kişi) bayan, %47,3'ünün (71 kişi) erkeklerden oluştuğu görülmektedir. Araştırma öğrenci örneklemi üzerinde uygulandığından, katılımcıların %95'inin 19-24 yaş aralığında, geri kalan kısmının ise 25-32 yaş aralığında olduğu görülmüştür. Katılımcıların gelir seviyeleri incelendiğinde ise, %36'sının (54 kişi) 500 TL ve daha az, %27,3'ünün (41 kişi) 501-1000 TL, %20'sinin (30 kişi) 1001-1500 TL, %7,3'ünün (11 kişi) 1501-2000 TL, geri kalan %9,3'ünün ise 2001 TL ve üzeri gelire sahip olduğu bulunmuştur.

Araştırma verileri üzerinde yapılan analizler neticesinde verilerin güvenilirlik değeri (cronbach alpha: ,727) uygun değer aralığında gerçekleşmiştir. Ayrıca verilerin basıklık ve çarpıklık değerleri literatürde kabul edilen sınırlar içerisinde bulunmuş olup, elde edilen KMO ve Bartlett Testi Sonuçları aşağıdaki tablo 2'de gösterilmiştir.

Tablo 2. KMO ve Bartlett Testi Sonuçları

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		,742
Bartlett's Test of Sphericity	Yaklaşık ki-kare değeri	1148,020
	Serbestlik Derecesi	190
	Anlamlılık	,000

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Her bir maddenin kendi içerisinde doğru değişkene ait olduğunun saptanması için faktör analizi gerçekleştirilmiş ve kendi grubu içerisinde toplanmayan 5 madde analizden çıkarılmış, tekrarlanan analiz sonuçları geri kalan 20 maddelerin kendi aralarında doğru faktörlerde (7 faktör) toplandığını ortaya koymuştur. Sonraki aşamada AMOS programı yardımıyla kurulan modelde faktörlerin birbirlerini etkileme düzeyleri incelenmiştir. Aşağıdaki tablo 3'de de görüleceği üzere ortaya konan modelin uygunluk değerleri, literatürde kabul gören değer aralıkları içerisinde gerçekleşmiştir.

Tablo 3. Modelin Uygunluk Değerleri

Değer	**Gerçekleşen Değer**	**İyi Derece Uygunluk**	**Literatürde Kabul Gören Değer Aralıkları**
p (olasılık değeri)	,229	$.05 < p \leq 1.00$	$.01 \leq p \leq .05$
CFI	,987	$.97 \leq CFI \leq 1.00$	$.95 \leq CFI < .97$
AGFI	,865	$.90 \leq AGFI \leq 1.00$	$.85 \leq AGFI < .90$
RMSEA	,023	$0 \leq RMSEA \leq .05$	$.05 < RMSEA \leq .08$
$\chi 2$/s.d.	1,081	$0 \leq \chi 2/$ s.d. ≤ 2	$2 < \chi 2/$ s.d. ≤ 3
CFI: Comparative Fit Index – Karşılaştırmalı Uyum Endeksi, AGFI: Adjusted Goodness of Fit Index – Ayarlanmış Uyum İyiliği Endeksi, RMSEA: Root mean square extracted approximation – Ortalama hata karekök yaklaşımı, $\chi 2$: ki kare, s.d. : Serbestlik Derecesi			
Kaynak: Schermelleh-Engel, K., Moosbrugger, H., and MULLER, H. (2003), "Evaluating the Fit of Structural Equation Models: Tests of Significance and Descriptive Goodness-of-Fit Measures", Methods of Psychological Research Online, Vol. 8, No. 2, p. 52.			

Araştırmada faktörlerin birbirlerini etkileme düzeyleri hakkında önerilen hipotezlere ilişkin sonuçlar aşağıdaki tablo 4'te gösterilmiştir.

Tablo 4. Hipotez Testi Sonuçları

	Etkiler	**Gerçekleşen Değer**	**Hipotez Testi Sonucu**
H1	Kolaylaştırıcı Koşullar → Performans Beklentisi (+)	,415	KABUL
H2	Performans Beklentisi → Özgüven (+)	,410	KABUL
H3	Özgüven → Sosyal Etki (+)	,188	KABUL
H4	Kolaylaştırıcı Koşullar →Çaba Beklentisi (+)	,595	KABUL
H5	Kolaylaştırıcı Koşullar → Kaygı (-)	-,387	KABUL
H6	Sosyal Etki → Kaygı (+)	,352	KABUL
H7	Performans Beklentisi → Niyet (+)	,356	KABUL
H8	Kolaylaştırıcı Koşullar → Niyet (+)	,318	KABUL

Yukarıdaki tablo 4 incelendiğinde, bulut teknolojisine ilişkin olarak kolaylaştırıcı koşulların performans beklentisi, çaba beklentisi ve niyet üzerinde olumlu etkisinin, buna karşın kaygı üzerinde negatif etkisinin bulunduğu görülmektedir. Performans beklentisi faktörünün özgüven ve niyet üzerinde pozitif etkisi olduğu, sosyal etkinin de kaygı üzerinde pozitif etkiye sahip olduğu görülmektedir. Ayrıca özgüven faktörünün sosyal etki üzerindeki pozitif etkisinin bulunduğu da araştırmanın önemli sonuçları arasındadır.

Elde edilen sonuçlar değerlendirildiğinde işletmeler bulut teknolojisine ilişkin olarak gerçekleştirecekleri kolaylaştırıcı koşullar aracılığıyla bulut teknolojisinin tüketicileri olan kullanıcıların performans beklentilerini arttırabilirler, kullanıcıların kendilerine özgüven duymalarını sağlayabilir, yeni teknolojiye uyum sağlamak için kabul ettikleri çaba miktarını da olumlu yönde etkileyebilirler. Ayrıca tüketicilerin yeni teknolojiyi benimseme ve kullanmaya yönelik niyetlerini de yönlendirebilirler. Bu anlamda bulut teknolojisinin kabul ve kullanımındaki en önemli faktörlerden birisi olarak kolaylaştırıcı koşullar faktörü ön plana çıkmaktadır.

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6. Sonuç

İnternet kullanımı, kablosuz internet teknolojisinin yaygınlaşmasıyla birlikte hızla artmaya devam etmektedir. Günümüzde bireyler yaşamlarının her alanında internet teknolojisinden faydalanmaktadır. Kişisel verilere her an ve her yerden erişime duyulan ihtiyaç, günümüzde fiziki veri depolama ve taşıma aygıtlarının zaman içerisinde yerini tamamen bulut teknolojisine bırakmasına neden olacaktır. Araştırmacıların özellikle güvenlik ve gizlilik endişeleri göz önüne alındığında hangi faktörlerin bireylerin bulut teknolojisi kullanımlarına etkide bulunacağı önem taşımaktadır.

Bu araştırmadan elde edilen sonuçlar değerlendirildiğinde işletmeler bulut teknolojisine ilişkin olarak gerçekleştirecekleri kolaylaştırıcı koşullar aracılığıyla bulut teknolojisinin tüketicileri olan kullanıcıların performans beklentilerini arttırabilirler, kullanıcıların kendilerine özgüven duymalarını sağlayabilir, yeni teknolojiye uyum sağlamak için kabul ettikleri çaba miktarını da olumlu yönde etkileyebilirler. Ayrıca tüketicilerin yeni teknolojiyi benimseme ve kullanmaya yönelik niyetlerini de yönlendirebilirler. Bu anlamda bulut teknolojisinin kabul ve kullanımındaki en önemli faktörlerden birisi olarak kolaylaştırıcı koşullar faktörü ön plana çıkmaktadır.

Her çalışmada olduğu gibi bu araştırmanın da çeşitli sınırlamaları bulunmaktadır. Zaman, maliyet ve çaba gereksiniminden dolayı araştırmada örnekleme yöntemi olarak kolayda örnekleme yöntemi seçilmiş ve araştırma öğrenci örneklemi üzerinde gerçekleştirilmiştir. Bu sınırlama araştırmanın sonuçlarının genelleştirilmesini kısıtlamaktadır. Gelecekte yapılacak çalışmalarda araştırma örnekleminin farklı gelir seviyesine sahip bireylerin olduğu daha geniş bir örneklem üzerinde gerçekleştirilmesi, araştırma sonuçlarının genelleştirilmesine imkân sağlayacaktır.

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TÜKETİCİLERİN YERLİ VE YABANCI ÜRÜNLERE YÖNELİK TUTUMLARI: KOZMOPOLİT TÜKETİCİ TUTUMUNUN YÜKSEKÖĞRENİM GÖRMÜŞ BİREYLER ÜZERİNDE ARAŞTIRILMASI*

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ÖZET: Bireylerin tüketim davranışları yalnızca ürünlerin fonksiyonel faydalarından değil, sembolik anlamlarından da etkilenmektedir. Tüketicilerin yaptıkları tüketim seçimlerine çeşitli anlamlar yükledikleri bu yapıda kuşkusuz yerli ve yabancı ürünlere yönelik tutumları önemli rol oynamaktadır. Günümüz dünyası mesafelerin giderek kısaldığı bir yapıdadır ve kültürlerin birbirlerini aktif biçimde etkilemeleri kaçınılmaz olmuştur. Çalışmada bu etkileşim düşüncesinden hareketle *Kozmopolit Tüketici Tutumu* incelenmiştir. Kozmopolit tüketici tutumu, bireylerin yerel tüketim kalıplarından sıyrıldıkları, farklı kültürlere ait ürünlerin varlığından ve bu ürünleri tüketmekten hoşnut oldukları açık fikirli bir yapıyı ifade etmektedir. Lisansüstü eğitim görmüş bireyler üzerinde gerçekleştirilen araştırma sonuçları, kozmopolit bireylerin bu tutumlarını tüketim davranışlarına da yansıttığını ve yüksek eğitim düzeyindeki bireylerin etnosentrik bir tutumdan ziyade farklılaşmak amacıyla yabancı ürün tüketimini destekleyen kozmopolit bir tutum sergilediklerini ortaya koymaktadır. Ayrıca araştırma sonucunda yerli ürün tüketimini destekleyen etnosentrik tutum ile kozmopolit tüketici tutumunun birbirleriyle negatif ilişkide olan yapılar olduğu bulunmuştur.

Anahtar Sözcükler: Kozmopolitanizm, Menşe Ülke Etkisi, Yabancı Ürün Tercihi, Tüketici Kozmopolitanizmi, Etnosentrizm

CONSUMER ATTITUDES TOWARDS DOMESTIC AND FOREIGN PRODUCTS: INVESTIGATION OF COSMOPOLITAN CONSUMER ATTITUDE ON POST-GRADUATE INDIVIDUALS

ABSTRACT: Consumers consumption behavior influenced by not only functional beliefs but also symbolic meanings of products. The structure which consumers install various meanings to their consumption choices is undoubtedly affected by attitudes towards domestic and foreign products. Today, cultures actively affecting each other because of closing distances. Driven from this interaction idea this study examines *Cosmopolitan Consumer Behavior*. Cosmopolitan consumer behavior refers to an open-minded nature which individuals stripped of their local consumption patterns and grateful of the presence of the products of different cultures and satisfied from consuming these products. Research was conducted on post-graduate individuals reveals that they exhibit a cosmopolitan attitude rather than an ethnocentric attitudes that supports the foreign product consumption in order to differentiate from others. Moreover, it was found that cosmopolitan consumer attitudes and ethnocentric attitudes that support domestic consumption the product is made have negative correlation with each other.

Keywords: Cosmopolitanism, Country of Origin Effect, Foreign Product Choice, Consumer Cosmopolitanism, Ethnocentrism

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1. GİRİŞ

Uluslararası pazarlarda başarı sağlamak isteyen firmalar açısından faaliyette bulundukları ülkelerdeki tüketici tercihlerini anlamak ve bu tercihleri etkileyen faktörleri doğru analiz edebilmek, yabancı pazar seçimi ve pazar stratejilerinin oluşturulmasında hayati bir rol oynamaktadır (Shankarmahesh, 2006). Bu noktada tüketicilerin yabancı ürünleri yerli muadillerine veya yerli ürünleri yabancı muadillerine neden tercih ettikleri çok önemli bir soru halini almıştır. Özellikle küreselleşme ve liberalizm dönemi bağlamında, ekonomik düşünce sistemlerinde yaşanan değişimlerin değer, inanç ve yaşam tarzlarında yarattığı etkinin farklı tüketim davranışları ortaya çıkarttığı belirtilmektedir. Böylesi bir değişim tüketicilerin ithal ürünleri yerli alternatiflerine tercih etmelerine neden olacak faktörlerin ve tüketicilerin tipik davranışlarının anlaşılması gerekliliğinden ötürü daha özellikli stratejileri gerekli kılmaktadır (Ma, Wang & Hao, 2012).

Artan göç oranları, milletlerarası etkileşimin artması ve dünyadaki bilgi teknolojilerindeki hızlı gelişmeler neticesinde çoğu ülkede yeni bir kültür ortaya çıkmıştır. Söz konusu bu kültür paylaşılan dünya ve insanlığın refahı gibi kavramları ortaya çıkarmış, bireyler farklı toplumlara empati ve anlayış hisleri göstermeye başlamış, bu durum uluslararası ticaret bağlamında tüketici dünya görüşlülüğü olarak tanımlanmıştır (Sunardi, 2009). Seyahat ve uluslar arası sosyal medya aracılığı ile küresel trendlerle doğrudan etkileşim içerisinde olmak, bireyde dünya görüşlü bir tutumun oluşmasını tetikleyebilmektedir. Bu etkileşim farklı kültürlerden alışkanlıklar, adetler ve ürünlere olan alışkanlığı arttırmakta ve tüketicilerde en azından deneme hissi uyandırmaktadır (Nijssen&Douglas, 2008).

2. KOZMOPOLİT TÜKETİCİ TUTUMU

Artan göç oranları, farklı ülkelerden evlat edinmeler, milletlerarası evlilikler ve dünyadaki bilgi ve iletişim teknolojilerindeki hızlı gelişmeler neticesinde çoğu ülkede yeni bir kültür ortaya çıkmıştır. Bu melez kültür paylaşılan dünya ve insanlığın refahı gibi kavramları ortaya çıkarmış, bireyler farklı toplumlara empati ve anlayış hisleri göstermeye başlamış, bu durum uluslararası ticaret bağlamında tüketici dünya görüşlülüğü olarak tanımlanmıştır (Sunardi, 2009). Seyahat ve uluslararası sosyal medya aracılığı ile küresel trendlerle doğrudan etkileşim içerisinde olmak, bireyde dünya görüşlü bir tutumun oluşmasını tetiklemekte, bu etkileşim farklı kültürlerden alışkanlıklar, adetler ve ürünlere olan alışkanlığı arttırmakta ve tüketicilerde en azından deneme hissi uyandırmaktadır (Nijssen & Douglas, 2008).

Kozmopolitanizm, -Yunanca kosmopolitês- kelime olarak dünya vatandaşı anlamına gelmekte olup, antropoloji ve sosyal psikoloji alanlarından pazarlama alanına çekilmiş bir kavramdır. Yönetim ve pazarlama alanlarında daha fazla kullanım alanı bulan kavram, yönetim ve pazarlama alanlarında her geçen gün daha yoğun kullanım alanı bulmuştur. (Cleveland et al., 2011). Söz konusu dünya vatandaşı fikrinin, günümüzün teknoloji ve iletişim olanaklarıyla daha önce olmadığı ölçüde olanaklı olduğu söylenebilir (Skrbis, Kendall & Woodward, 2004). Kozmopolit bakış açısı, her biri kendine özgü özellikleri içeren farklı kültürlerin oluşturduğu ortak bir yapıyla ilişkileri zorunlu kılmakta; çeşitliliğin kendisine, bireysel tecrübelerde kültürlerin bir arada var olabileceğine yönelik bir duruş içerir. Daha derin bir anlamda kozmopolitanizm her şeyden önce 'diğer' ile iletişime geçmeye yönelik isteklilik ve eğilimdir; farklı kültürel deneyimlere açıklığa yönelik estetik ve entelektüel bir duruş, teklikten ziyade zıtlıkları arama yönelimidir (Hannerz, 1990). Kozmopolitanlar keşfetmekten ve yeni tecrübeler edinmekten keyif alırlar. Bu durum onların 'farklı' olana yönelik hoşgörüsünün bir sonucudur (Rössel&Schroeder, 2015). Bu bağlamda, Kozmopolitanlar kendilerini ait oldukları kültürün önyargılarından sıyırmış kişilerdir (Cannon, 2001).

Kozmopolit tüketici olgusu, tüketicilerin dış gruplara yönelik pozitif yönelimlerin bir sonucudur (Parts, 2011). Kozmopolitanizm bireylerin kendi gruplarından başka bir grup hakkında öğrenme ve farklılıkları tüketme isteğini içeren bir yapı olduğundan, kozmopolit tüketiciler farklı ülke ve kültürlerden ürünler tüketmeye yönelmektedirler. İşte bu noktada menşe ülke bilgisinin ürünün kalitesini belirten bilişsel bir ipucu olmasının yanında, aynı zamanda duygular, kimlik ve geçmiş tecrübe/hislerle olan bağlantısı etkide bulunmaktadır (Gec & Perviz, 2012). Ülkelerin tüketicilerde yarattığı çağrışımlar geçmiş tatillerde yabancılarla gerçekleşen iletişim sonucunda doğrudan oluşabileceği gibi, eğitim hayatı ve kitle iletişim araçları aracılığıyla gerçekleşen,

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tüketicilerin ürün veya markalar hakkındaki seçimlerini etkileyen dolaylı çağrışımları da vardır (Verlegh&Steenkamp, 1999).

Kozmopolit tüketici tutumu bireylerin farklı kültür, düşünce ve ürünlere yönelik hoşgörüsünün bir sonucu olarak açık fikirli bir düşünce yapısıyla tüketim davranışlarında kendi kültürlerinin sınırlarının ötesine geçtiği bir yapıyı ifade eder. Bireyin farklı kültürlerle etkileşimi ve farklılıkları tecrübe etmesi, kozmopolit tüketici yapısının gerekliliklerinden olduğundan, bu durum yabancı ürün tüketimini zorunlu kılmaktadır. İşletmeler, geçmişte sadece ulusal pazardaki rakipleriyle rekabet halindeyken günümüzde küreselleşmenin etkisiyle uluslararası pazarlara giren işletmelerle de rekabet halindedirler (Cannon & Yaprak, 2002).

Yukarıdaki açıklamalar ışığında, kozmopolitan tüketicilerin üç özelliğinin olduğu belirtilebilir (Riefler, Diamantopoulos & Siguaw, 2012). Bunlar; farklı ülke ve kültürlere karşı açık fikirli bir bakış açısına sahip olmaları, farklı ulusal ve kültürel ürünlerin çeşitliliğine önem vermeleri ve ithal ürünleri tüketme konusunda istekli olmalarıdır. Açık fikirlilik "Diğer ülke ve kültürlerin özgün öğelerini tecrübe etmeye olan ilgiyi ifade eden önyargılardan uzak bir eğilim'' olarak tanımlanmaktadır. Çeşitlilik arayışı ve çeşitliliği yaşama hissi kozmopolit tüketicilerin genel duruşlarının bir açıklayıcısıdır. Bu duruş, tektipliliğin tercih konusu olduğu bir dünyanın aksine farklılık ve çeşitlilikleri arama istekliliği gündeme getirir (Riefler & Diamantopoulos, 2009) Riefler vd. (2012) kozmopolitan tüketicinin sınırları aşan tüketim boyutunu ''Farklı ülkelerden ürün ve hizmet tüketmeye yönelik bir pozitif eğilim'' olarak tanımlamışlardır. Kozmopolit tüketicileri kültürel sembollere ve etkinliklere olan yakınlıkları, bu kültürlere anlayış gösterme ve bu kapsamda tüketim eğilimlerine sahip olmaları, doğal olarak sanat, müzik ve moda alanlarına yönlenmelerine olanak verir (Cleveland & Papadopoulos, 2009).

Riefler ve Diamantopoulos (2009) yurtdışı seyahatler, kültürlerarası eğitim ve sosyal statü arayışının kozmopolit tüketim eğiliminin öncüllerinden olabileceğini belirtmiştir. Bu durum, kozmopolit tutum bireylerin taşralılıktan kurtulmalarının bir sürükleyicisi olarak algılanabilmektedir. Ülkelerin küresel tüketim sahasına girmeleriyle birlikte rekabet baskısı daha fazla hissedilmekte, hayatta kalabilmek adına daha verimli faaliyetlere ihtiyaç duyulmaktadır. Tüm sektörlerde daha verimli olma sürecinde bir yandan tüketiciler de verimliliğe olan ihtiyaçtaki artışın farkına varmakta, bu ihtiyaç tüketicileri kendilerine avantaj sağlayacak farklı kültürlerden yeni ve daha iyi fikirlere açık hale getirmektedir. Diğer taraftan her geçen yıl iletişim teknolojilerinin günlük yaşama olan etkisi artmasıyla birlikte uluslararası televizyon ağları, uydu bağlantıları, internet ve mobil teknolojiler vasıtasıyla teknolojinin çok hızlı bir biçimde yayılması yabancı ve farklı fikirlerin geçmişe oranla çok daha görünürde ve ulaşılabilir olmasını sağlamıştır.

3. METODOLOJİ

Araştırmanın amacı kozmopolit tüketici kavramının, etnosentrizm ve genel kozmopolitanizm ile olan ilişkisini belirlemektir. Günümüzde milliyetçi hislerin, menşe ülke etkisiyle bağlantılı tüketim tercihlerinin ve ülkelere yönelik tutumların pazarlama alanında giderek daha etkili olduğu göz önüne alındığında, söz konusu kavramlar arasındaki ilişkinin belirlenmesi, tüketici tercihlerinin daha iyi anlaşılabilmesi adına önem taşımaktadır. Bu bağlamda araştırma tüketicilerin kozmopolit bakış açılarının incelenmesi adına; tüketici kozmopolitanizmi, tüketici etnosentrizmi ve genel kozmopolitanizm yapılarını ve bu yapılara ilişkin tutumları kapsamaktadır. Araştırma süresince veriler bu tutumlara ilişkin toplanmıştır.

Araştırmanın soru formunu üç temel yapı oluşturmaktadır. Birinci yapı veya ölçek Shimp ve Sharma (1987) tarafından geliştirilmiş olan 'CETSCALE' adlı tüketici etnosentrizmi ölçeğinin kısa formatıdır. Orijinal hali 17 maddeden oluşan CETSCALE ölçeği, pazarlama yazınında daha önce birçok araştırmada kullanıldığı şekilde 10 maddelik kısa formatında araştırmaya dahil edilmiştir. İkinci yapı veya ölçek Riefler, Diamantopoulos ve Siguaw (2012) tarafından oluşturulmuş olan tüketici kozmopolitanizminin üç boyutlu kavramsallaştırılmasını inceleyen 12 maddelik C-COSMO ölçeğidir. Ölçeğin üç boyutu arasından, tüketimle ilişkisinin daha yüksek olduğundan hareketle 2. boyutu olan 4 maddelik 'Çeşitlilikten hoşnut olma' boyutu araştırmada kullanılmıştır. Son yapı ise Riefler, Laroche ve Papadopoulos'un (2009) çalışmalarında tüketicilerin kozmopolitan eğilimlerinin belirlenmesi amacıyla kullandıkları 6 maddelik genel kozmopolit tutum ölçeğidir. Yapı kozmopolit bireylerin, bu yönelimlerini tüketim davranışlarına da yansıtacağı öngörüsüyle araştırmaya dahil edilmiştir. Anket formunun cevaplanmasında 5 aralıklı likert ölçeğinden faydalanılmıştır. Cevaplayıcılardan '1: Kesinlikle

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katılmıyorum, 2: katılmıyorum, 3: kararsızım, 4: katılıyorum ve 5: kesinlikle katılıyorum' seçeneklerinden kendilerine en yakın geleni cevaplamaları istenmiştir.

4. ARAŞTIRMA MODELİ VE HİPOTEZLER

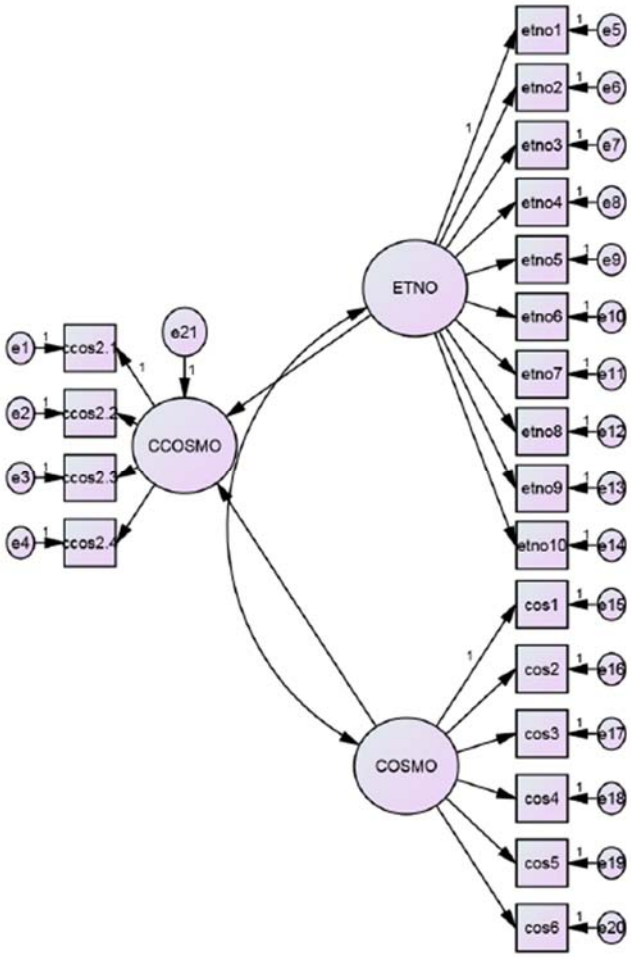
Önceki bölümde belirtildiği gibi çalışmanın amacı kozmopolit tüketici tutumunun, tüketici etnosentrizmi ve kozmopolitanizm yapılarıyla olan ilişkisinin belirlenmesidir. Buradan hareketle araştırmada aşağıdaki hipotezler incelenmiştir.

Hipotez 1: Tüketici etnosentrizmi, Tüketici kozmopolitanizmi üzerinde negatif etkiye sahiptir.

Hipotez 2: Genel kozmopolitanizm, tüketici kozmopolitanizmi üzerinde pozitif etkiye sahiptir.

Hipotez 3: Kozmopolitanizm ve tüketici etnosentrizmi birbirleriyle negatif ilişki içerisinde olan yapılardır.

Hipotezlerin incelendiği model IBM SPSS programının AMOS eklentisi yardımıyla aşağıdaki şekilde oluşturulmuştur.



5. ARAŞTIRMA SONUÇLARI VE BULGULAR

Araştırmanın örneklemi Bursa ilinde öğrenim görmüş ve halen görmekte olan lisansüstü öğrencileri kapsamaktadır. Araştırma, verilerin daha hızlı elde edilmesi ve katılımcıları motive etmesi bakımından web tabanlı anket yardımıyla gerçekleştirilmiştir. Bir aylık süreçte 182 geçerli anket formuna ulaşılmıştır.

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Araştırmada oluşturulan modelin hipotezleri yapısal eşitlik modellemesi ile test edilmeden önce verilerin analizi yapılmıştır. Öncelikle verilerin basıklık ve çarpıklık değerlerinin normalleştirilmesi amacıyla aykırı ve uç veriler tespit edilmiş, normal dağılım etrafında gözlemlenmeyen 50 cevap formu çalışmadan çıkarılmıştır. Geri kalan 132 veri üzerinde devam ettirilen analizlerde yapıların içsel tutarlılıkları ile KMO ve Bartlett testi sonuçları yazında kabul gören değerler çerçevesinde gerçekleşmiştir.

Tablo 1.KMO Testi Sonuçları

KMO (Kaiser-Meyer-Olkin) Değeri		0,831
Bartlett Dağılım Testi	**Yaklaşık x2 değeri**	1463,653
	Serbestlik Derecesi	190
	Anlamsızlık	,000

Sonrasında açıklayıcı faktör analizi kapsamında her bir maddenin kendi yapısı içerisinde yer alıp almadığı incelenmiştir. Sonuç olarak maddelerin kendi faktörleri içinde toplandıkları gözlemlenmiştir. Sonraki aşamada gerçekleştirilen doğrulayıcı faktör analizinde tüketici etnosentrizmini ifade eden ETNO yapısına ait 10 maddeden 2 maddenin analizden çıkartılmasına karar verilmiştir. Gerekli modifikasyonların yapılmasının ardından üç modelin ayrı ayrı ve genel modelin analiz sonuçları aşağıdaki tabloda gösterilmiştir.

Tablo 2. Genel Model Verileri

	Madde	**Ort.**	**Cr. α**	**RMSEA**	**χ^2 / s.d.**	**CFI**	**GFI**
CCOSMO	4	3,46	0,645	0,129	1,04	0,96	0,978
COSMO	6	4,23	0,882	0,018	3,16	1,00	0,985
ETNO	8	2,85	0,881	0,039	1,20	0,99	0,955
Genel Model (Üç yapı)	18	3,52	0,751	0,03		0,984	0,895
Cr. α : Cronbach Alpha, RMSEA: Root mean square extracted approximation – Ortalama hata karekök yaklaşımı, CFI: Comparative Fit Index – Karşılaştırmalı Uyum Endeksi, GFI: Goodness-of-Fit Index – Uyum İyiliği Endeksi, s.d. : Serbestlik Derecesi							

18 madde üzerinde gerçekleştirilen araştırmada ortaya konulan üç hipotez test edilmiştir. Oluşturulan modelde test edilen hipotez sonuçları aşağıda belirtilmiştir.

Tablo3. Çalışmada Önerilen Hipotez Sonuçları

	İfade	**İlişki Gösterimi**	**Beta (β) Katsayı Değerleri**	**Sonuç**
Hipotez 1	Etnosentrizm tüketici kozmopolitanizmini negatif etkiler	CCOSMO <--- ETNO	-,546	Onaylandı
Hipotez 2	Kozmopolitanizm tüketici kozmopolitanizmini pozitif etkiler	CCOSMO <--- COSMO	,204	Onaylandı
Hipotez 3	Kozmopolitanizm ve etnosentrizm arasında negatif bir ilişki vardır	COSMO <--- > ETNO	-,043	Onaylandı

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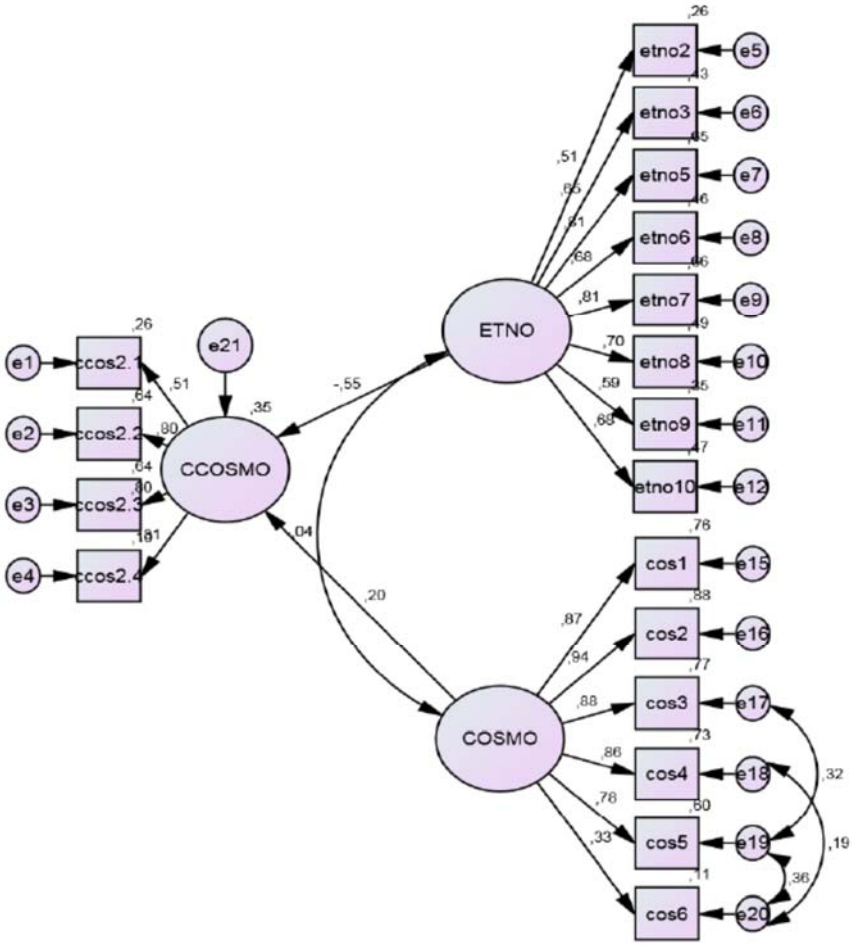
Hipotez sonuçlarının detaylı incelebileceği genel model analizin ardından aşağıdaki gibi şekillenmiştir.



5. SONUÇ

Pazarlama yazınında tüketici kozmopolitanizmi hakkında gerçekleştirilmiş daha önceki çalışmalar, yapının farklılıkları önyargısız ve açık bir şekilde karşılayan ve buradan hareketle çeşitli ülkelerden gelen yabancı ürünlerin tüketimini olumlu yönde etkilediğini ifade etmektedir. Araştırma sonuçları birincil öncülü yerli ürün tüketimi olan etnosentrizm yapısının, tüketici kozmopolitanizmini güçlü biçimde negatif etkilediğini, kozmopolit tüketici tutumunun öncelikli gerekliliklerinden birinin yabancı ürünleri tecrübe etme ve tüketme olduğunu bir kez daha ortaya koymuştur. Buradan hareketle dış pazarlarda başarı sağlamayı veya yabancı ürünlü tüketicilere de hitap etmeyi amaçlayan işletmelerin bu eylemlerinde söz konusu tüketicilerin milliyetçi yönelimlerinin seviyesini ölçümlemeleri söz konusu faaliyetlerindeki verimliliği arttıracaktır.

Pazarlama çabalarının merkezini oluşturan tüketicilerin tutumlarını doğru analiz etmek işletmeler açısından hayati rol oynamaktadır. Kuşkusuz tüketicilerin tüm satın alma davranışları, ürün milliyeti temelli gerçekleşmemektedir. Ancak unutulmamalıdır ki her geçen gün daha küçük bir köy haline gelen gezegenimizde çok uluslu şirketler ve yerli alternatifleri arasındaki rekabet giderek kızışmakta, bu süreçte tüketicilerin yerli ve yabancı ürünlere yönelik geliştirecekleri tutumlar işletmelerin pazarlarda sağlayacakları başarı noktasında kritik bir noktada bulunmaktadır. Çalışma bu bağlamda tüketicilerin yerli ve yabancı ürünlere yönelik tutumlarını incelemek isteyecek işletmelere giriş niteliğinde bilgi sağlamakta, kozmopolit tüketicileri analiz etmelerinde

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kolaylık sağlamaktadır. Ayrıca çalışma, tüketici kozmopolitanizmi yapısı üzerine gerçekleştirilecek sonraki çalışmalarada yol açması açısından önem taşımaktadır.

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TÜRK SİVİL HAVACILIK ALANINDA EĞİTİM VEREN YÜKSEKÖĞRETİM KURUMLARININ MEVCUT DURUM ANALİZİ

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Özet: Türk havacılık sektörünün son yıllardaki büyümesi Dünya genelindeki büyümeye oranla daha hızlı gerçekleşmiştir. Havacılık sektöründeki nitelikli insan kaynağı ihtiyacı da büyümeye paralel olarak gerçekleşmektedir. Bu araştırmanın amacı Türk havacılık alanında eğitim veren yükseköğretim kurumlarının nitelik ve nicelik açısından incelenmesidir. Araştırmanın birinci bölümünde Avrupa Birliği üye ülkelerinin ortaya koymuş olduğu havacılık eğitim standartları literatür taraması ile verilmiştir. Araştırmanın ikinci bölümünde Türkiye de yer alan havacılık alanındaki Yükseköğretim kurumları sayıları, bölüm çeşitliliği ve öğrenci sayıları verilmiştir. Yapılan anket çalışması ile eğitim kurumlarında verilen eğitimin içeriği, yabancı dil seviyesi, toplam ECTS kredisi içerisindeki havacılık derslerinin yeri, öğretim üyesi/elemanı sayısı ortaya konmuştur. Araştırmanın sonucunda Türk sivil havacılık sektörüne insan kaynağı yetiştiren Yükseköğretim kurumlarının mevcut durumu ortaya konarak geleceğe dönük önerilerde bulunulmuştur.
Anahtar Kelimeler: Havacılık, Eğitim, Yükseköğretim Alanında Eğitim

Giriş

Türkiye'de 2003'te başlatılan bölgesel havacılık politikası kapsamında 2013 yılına kadar ticari uçuş sayısı %160, koltuk kapasitesi %176, kargo kapasitesi %346 artmıştır (SHGM, 2015). Gelişen havacılık sektörü Türk sivil havacılık sektörünün dünya sıralamasındaki yerini üst sıralara taşımıştır. AB Avrupa Hava Seyrüsefer Güvenliği Örgütü (EUROCONTROL) verilerine göre Türkiye'nin 2015 yılı itibariyle Avrupa hava ulaşım sektöründe yolcu sıralaması bakımından yeri 3'üncü, dünya havayolu yolcu sıralaması bakımından 9'uncu, RPK (ücretli yolcu kilometre) bakımından ise 10'uncu sıradadır (SHGM, 2016). Türkiye'de 13 havayolu ve hava kargo işletmesindeki toplam uçak sayısı 2015 yılı sonu itibariyle 489'dur (SHGM, 2016). Hava taksi işletme sayısı 50, genel havacılık işletme sayısı 60, balon işletmesi sayısı 25, zirai ilaçlama işletme sayısı ise 39'dur.

Havacılıkta büyümeye paralel olarak insan kaynağı ihtiyacı da artmaktadır. Türkiye'de 2003 yılında havacılık sektöründe istihdam edilen personel sayısı 65.000 kişi iken 2013 yılında bu sayı 180.570 kişiye ulaşmıştır. 10 yıl içerisinde istihdam edilen personel sayısı %200 artarak yıllık ortalama %20 civarında bir artış göstermiştir (DHMİ, 2015).

Türk sivil havacılık sektöründeki insan kaynağı ihtiyacının giderilmesinde 4 farklı yöntem kullanılmaktadır.

- Yükseköğretim kurumlarının havacılık bölümlerinden mezun olanlar,
- Milli Eğitim Bakanlığına bağlı lise dengi okul mezunları,
- Askeri havacılık okullarından mezun olup sivil havacılık sektörüne geçenler,
- Havacılık alanı dışında eğitim alıp hizmet içi eğitimler ile havacılıkta çalışan personel.

Havaaracı Bakım Eğitimi standartları Avrupa Birliği Havacılık Ajansı (European Aviation Safety Agency (EASA)) tarafından belirlenen EASA Part 66/147'de belirtilen standartlara göre verilir (EASA, 2012). Türkiye'de havacılık otoritesi Sivil Havacılık Genel Müdürlüğü (SHGM) tarafından EASA'ya benzer dokümanları içeren SHY66/147'de yayınlanmıştır (SHGM, 2013). Bu standartlara uygun eğitim veren kurumlar Sivil Havacılık otoritesi SHGM tarafından yetkilendirilir. Yetkilendirilen eğitim kurumlarının ders süreleri, içerikleri, derslerin içeriklerinin hangi seviyede anlatılacağı, sınavlarda kaç soru sorulacağı ve devamsızlık bilgileri standardize edilmiştir. Bu çerçevede eğitim alan öğrencilerin havaaracı bakım lisansını alabilmesi için gereklilikler belirlenmiştir.
Havaaracı bakım lisansı için her bir kategori veya alt kategori sorumluluklarını gösteren tablo aşağıda verilmiştir. Bu tabloda söz konusu kategoriler için geçerli konular "X" işareti ile gösterilmiştir (EASA, 2012).

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Tablo 1: Kategorilere Göre Modül Sorumlulukları

Modül No	A veya B1		A veya B1		B2	B3
	Türbin Motorlu Uçaklar	Piston Motorlu Uçaklar	Türbin Motorlu Helikopterler	Piston Motorlu Helikopterler	Aviyonikler	Azami Kalkış Birliği 2.000 kg ve altında olan Kabini Basınçlardırılmayan Piston Motorlu Uçaklar
1	X	X	X	X	X	X
2	X	X	X	X	X	X
3	X	X	X	X	X	X
4	X	X	X	X	X	X
5	X	X	X	X	X	X
6	X	X	X	X	X	X
7A	X	X	X	X	X	
7B						X
8	X	X	X	X	X	X
9A	X	X	X	X	X	
9B						X
10	X	X	X	X	X	X
11A	X					
11B		X				
11C						X
12			X	X		
13					X	
14					X	
15	X		X			
16		X		X		X
17A	X	X				
17B						X

Kaynak: (SHGM, 2016)

İlgili kategorilere göre temel eğitim kurs süresi ve verilmesi gerekli olan temel eğitim oranları belirlenmiştir. Bu eğitimleri alanların girmesi gereken modül sınavları soru sayıları ve süreleri standarttır.

Tablo 2: İlgili Kategorilere Göre Temel Eğitim Kurs Süresi Ve Verilmesi Gerekli Olan Temel Eğitim Oranları

Temel Dersler	Süre (Saat)	Teorik eğitim oranları (%)
Al	800	30 to 35
A2	650	30 to 35
A3	800	30 to 35
A4	800	30 to 35
Bl.l	2400	50 to 60
B1.2	2000	50 to 60
B1.3	2400	50 to 60
B1.4	2400	50 to 60
B2	2400	50 to 60
B3	1 000	50 to 60

Kaynak: (EASA, 2012)

Havaalanı yer hizmetleri alanında çalışmak için gerekli eğitimler IATA (International Air Transport Association, Uluslararası Hava Taşımacılığı Birliği) tarafından belirlenmektedir (IATA, 2016). Bu eğitimler tavsiye niteliğinde olup ulusal havacılık otoritesi tarafından bazıları zorunlu tutulabilmektedir.

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Havayolu işletmelerinde uçuş harekât uzmanı olarak çalışılabilmek için ise ICAO Doc.7192-D3 el kitabına göre aşağıdaki eğitimlerin alınması ve ulusal otorite tarafından yapılacak sınavların başarı ile tamamlanması gerekmektedir (ICAO, 1998):

- Sivil hava hukuku ve kuralları
- Havacılık prensipleri
- Havaaracı yük ve performansı
- Seyrüsefer
- Hava trafik yönetimi
- Meteoroloji
- Yük ve denge kontrolü
- Tehlikeli maddelerin hava aracı ile taşınması
- Uçuş planlama
- Uçuş izleme
- Radyo iletişimi
- İnsan faktörleri
- Güvenlik (Acil ve anormal durumlar)

Türkiye'de ise uçuş harekât uzmanı olarak çalışabilmek için Uçuş Harekât Uzmanı Lisans Yönetmeliğine göre eğitim almak ve sınavdan başarı ile geçmek gerekir (SHGM, 2016).

Araştırma yükseköğretim kurumlarının havacılık bölümleri kapsamında gerçekleştirilmiştir. Türk sivil havacılık sektörüne insan kaynağı yetiştiren Yükseköğretim kurumlarının mevcut durumunun ortaya konulması amacıyla 100'den fazla bölümde anket yöntemiyle veri toplanarak analiz edilmiştir.

Amaç ve Yöntem

Araştırma havacılık eğitimi veren yükseköğretim kurumlarında eğitim veren öğretim elemanları ile yapılmıştır. Araştırmada anket yöntemi ile veriler toplanmıştır. Verilerin toplanmasında Sivil Havacılık Genel Müdürlüğü (SHGM) ve Yükseköğretim Kurumu (YÖK) komisyonu tarafından staj atamalarında kullanılan Havacılık Staj Yazılımı kullanılmıştır. Anket çalışması 43 yükseköğretim kurumunda 91 bölümde gerçekleştirilmiştir. 80 bölüm tarafından anket cevaplanmıştır.

Bulgular ve Analiz

Yükseköğretim kurum sayıları ve bölüm türleri

Yapılan anket çalışması sonucunda Türkiye'de 43 yükseköğretim kurumunun 17'sinde 1 bölüm/program, 13'ünde 2 bölüm/program, 8'inde 3 bölüm/program, 2'sinde 4 bölüm/program, 2'sinde 5 bölüm/program, 1'inde ise 6 bölüm/program bulunmaktadır. Anket sonuçlarından üniversitelerde farklı bölüm ve program adlarında 91 bölümde havacılık eğitimi veren mevcut yükseköğretim kurumlarının 19 farklı bölüm/program adı altında eğitim verdiği anket sonuçlarından ortaya çıkmaktadır. Bölüm/program isimleri farklı olmasına rağmen Türkiye'de havacılık eğitimi genel olarak 6 branşta yapılmaktadır. Bu branşlar teknik bölümler (Uçak veya Havacılık Elektrik Elektroniği, Uçak Gövde Motor Bakım, Uçak Teknolojisi), Pilotaj, Hava Trafik Kontrol, Kabin Hizmetleri, Havacılık İşletmeciliği (Sivil Hava Ulaştırma İşletmeciliği veya Havacılık Yönetimi) olarak genellemek mümkündür. Sonuçlar yükseköğretim kurumlarının büyük çoğunluğunun tüm branşlarda eğitim vermediğini ortaya koymaktadır.

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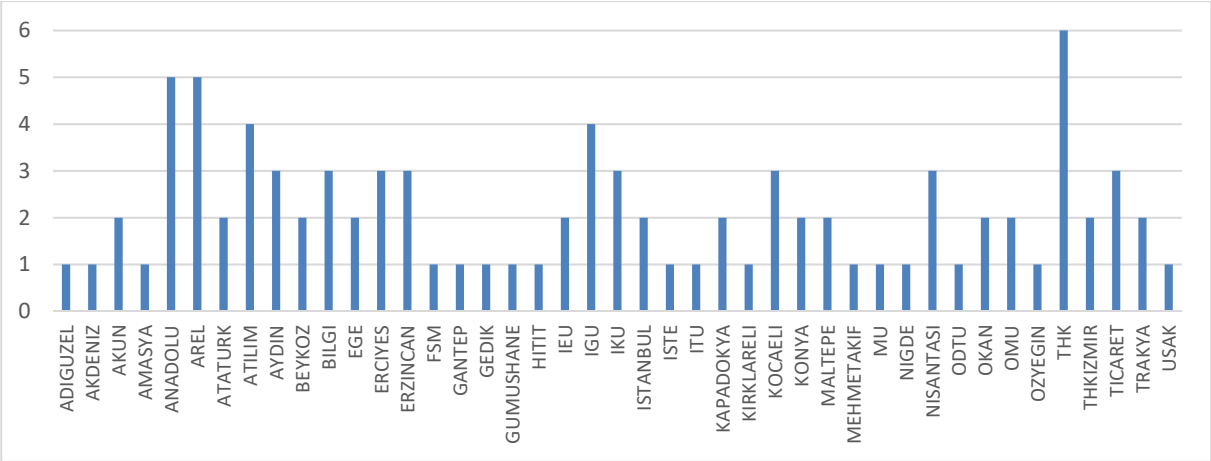
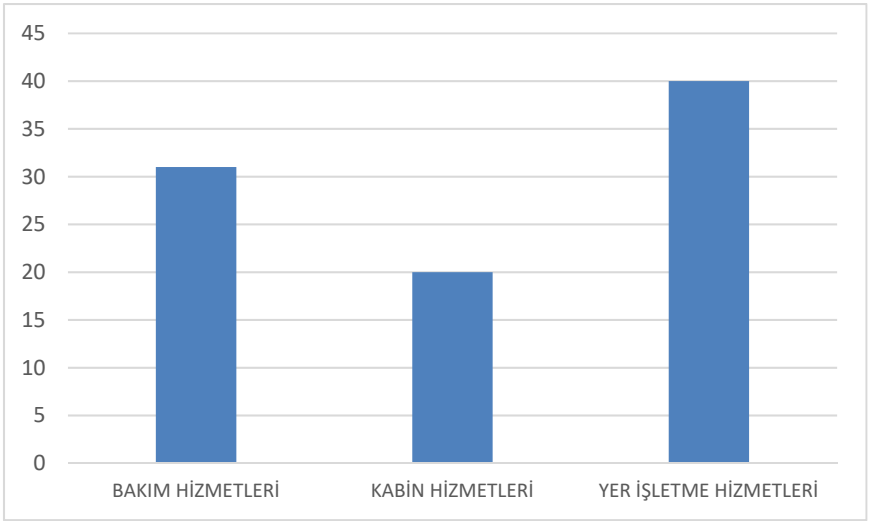


Şekil 1. Havacılık Alanında Eğitim Veren Yükseköğretim Kurumları

Bu anketlerde Bakım Hizmetleri alanında 31, Kabin Hizmetleri alanında 20 ve Yer İşletme Hizmetleri alanında 40 bölüm/program bulunmaktadır. İlave olarak ankette olmayan 2'si devlet, 1'i vakıf, 2'si özel toplam 5 yükseköğretim kurumunda pilotaj bölümü ve sadece 1 yükseköğretim kurumunda Hava Trafik Kontrol bölümü de bulunmaktadır.



Şekil 2. Havacılık Alanında Eğitim Veren Yükseköğretim Kurumları Bölüm/Programları

Bölüm/Programların kuruluş yılları

Yükseköğretim düzeyinde eğitim veren bölümler 1986 yılında kurulmaya başlanmış olup, ankete cevap veren 69 bölüm değerlendirildiğinde 2012 yılından sonra açılan bölüm sayılarında hızlı bir artış olduğu görülmektedir. Bu artışın ana nedeni 2002 yılından sonra havacılık sektöründeki büyüme sonucu kalifiye personel ihtiyacının artmasıdır. 2002 yılı sonrası Türkiye'de havacılık sektöründe büyüme oranı yaklaşık olarak her yıl ortalama %15 civarında ve bundan sonraki büyüme öngörüleri de %10-15 oranında olması beklenirken, yükseköğretim kurumlarının sayısı 2012 ve sonrası için her yıl yaklaşık %100-200 arasında bir artış göstermiştir.

Lisans/Önlisans dağılımı

Bölüm türleri bakımından değerlendirildiğinde anketi dolduranların 22'si lisans ve 58'i önlisans seviyesinde eğitim vermektedir. Bölümlerin eğitim süreleri bölüm türlerine göre değerlendirildiğinde kabin hizmetleri öğrencilerinin tamamının önlisans düzeyinde eğitim aldığı görülmektedir.

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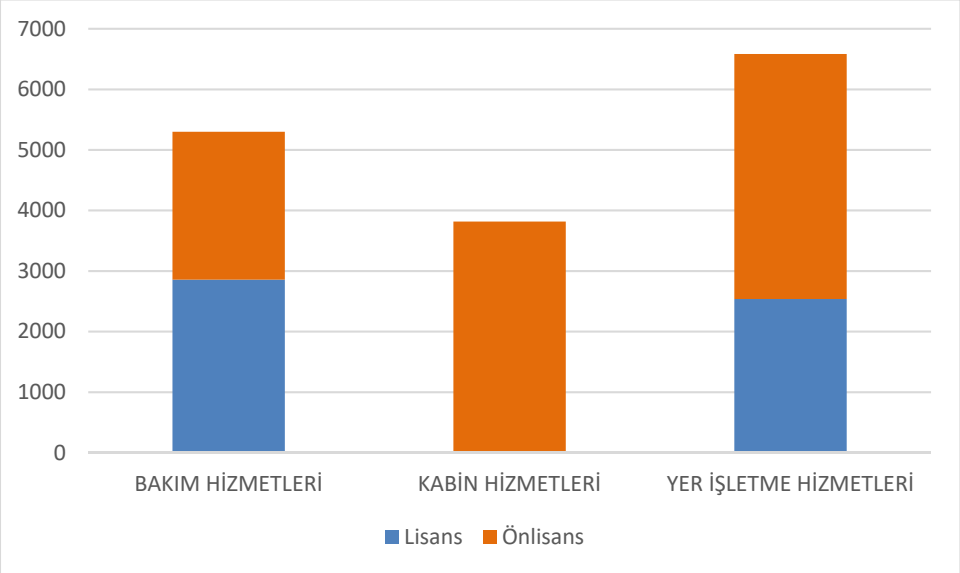
Tablo 4: Bölüm Türlerine Göre Eğitim Süreleri

	Eğitim Süresi		
Bölüm Türü	**Lisans**	**Önlisans**	**Toplam**
Bakım hizmetleri	12	15	27
Kabin hizmetleri	0	19	19
Yer işletme hizmetleri	10	24	34
Toplam	**22**	**58**	**80**

Havacılık alanında yükseköğretim düzeyinde eğitim gören öğrenci sayıları

Anketi cevaplayan 80 yükseköğretim bölüm/programında eğitim alan toplam öğrenci sayısı 15.700'dür. Öğrencilerden 5.393'ü lisans ve 10.307'si ise önlisans bölüm/programında eğitim almaktadır. Ankete cevap vermeyen yükseköğretim kurumlarının da hesaba katılması halinde 16.000'in üzerinde öğrenci olduğu tahmin edilmektedir.



Şekil 3. Öğrenci Sayılarının Eğitim Alanlarına Göre Dağılımı

Yükseköğretim kurumlarında havacılık alanında eğitim gören toplam 15.700 öğrencinin 8.262'si 2015-2016 öğretim yılında bölümlere giriş yapmıştır. Son birkaç yıldır yükseköğretim kurumlarındaki öğrenci kontenjanlarındaki artışın sektörün büyümesi sonucu ihtiyaç duyulan nitelikli eleman ihtiyacının çok üstünde olduğu görülmektedir.

Anketi cevaplayan yükseköğretim kurumlarından 1986'dan bu güne kadar havacılık alanından toplam mezun sayısı 11.017 kişi iken bu kurumlarda okuyan öğrenci sayısı ise 15.700'dür. Mevcut yükseköğretim kurumlarından önümüzdeki 4 yıl içerisinde mezun olacak öğrenci sayısının geçmiş 30 yıllık dönemde mezun öğrenci sayısından fazla olduğu görülmektedir. Bu durum yükseköğretim kontenjanlarındaki artışın sektörün büyüme hedeflerinin çok üstünde olduğunu göstermektedir.

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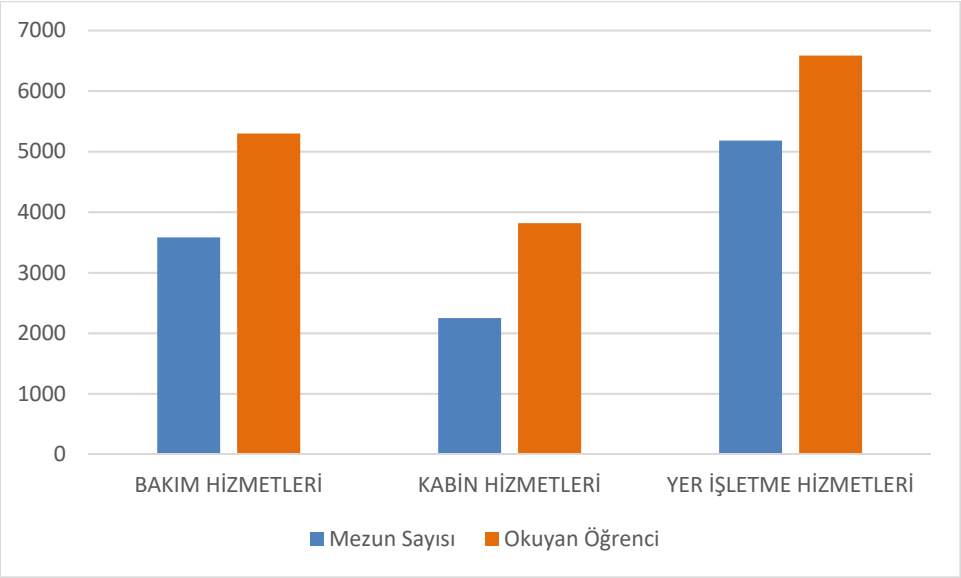
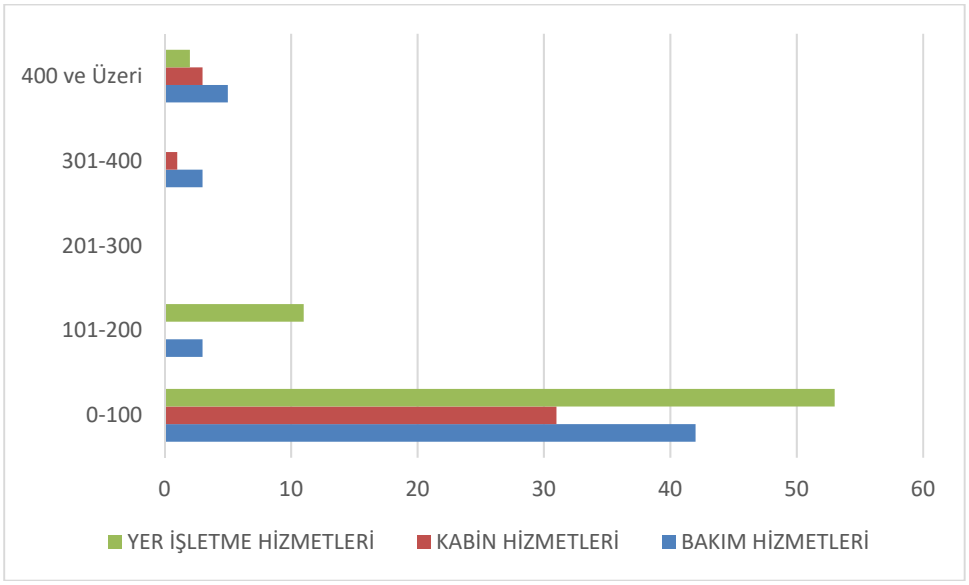


Şekil 4. Mezun Öğrenci Sayısının Okuyan Öğrenci Sayısına Oranı

Eğitim içerikleri

Anketi cevaplayan havacılık eğitimi veren yükseköğretim kurumlarından 50'sinde hazırlık eğitimi verilmektedir. Havacılık eğitiminde İngilizcenin önemi günden güne arttığı halde ve literatürün neredeyse tamamının İngilizce olmasına rağmen yabancı dil hazırlık eğitiminin olmaması veya eğitimin belli bir yüzdesinin İngilizce yapılmaması mezun öğrencilerin kalitesinde göreceli olarak bir düşüşe ve istihdamında sıkıntılara yol açmaktadır. İngilizce hazırlık eğitimi haricinde öğrencilerin toplam aldıkları İngilizce eğitim saati sorulmuştur. Elde edilen yanıtlar gruplandığında yer işletme, kabin ve bakım hizmetlerinden en fazla 0-100 saat aralığında ders alan öğrenci sayısı çıkmıştır. İngilizce eğitim veren kurumların uluslararası dil yeterliliği için gerekli olan eğitim sürelerinin çok altında olduğu anket sonuçlarından ortaya çıkmaktadır. Bu durum mezunların istihdam için gerekli olan dil puanını almalarında zorlanmalarına sebep olmaktadır.



Şekil 5. Hazırlık Hariç İngilizce Ders Saati

Tavsiye edilen İngilizce öğretim saatleri ile karşılaştırıldığında 0-100 saat aralığındaki İngilizce eğitimi A2 elementary seviyesinin altında yer almaktadır.

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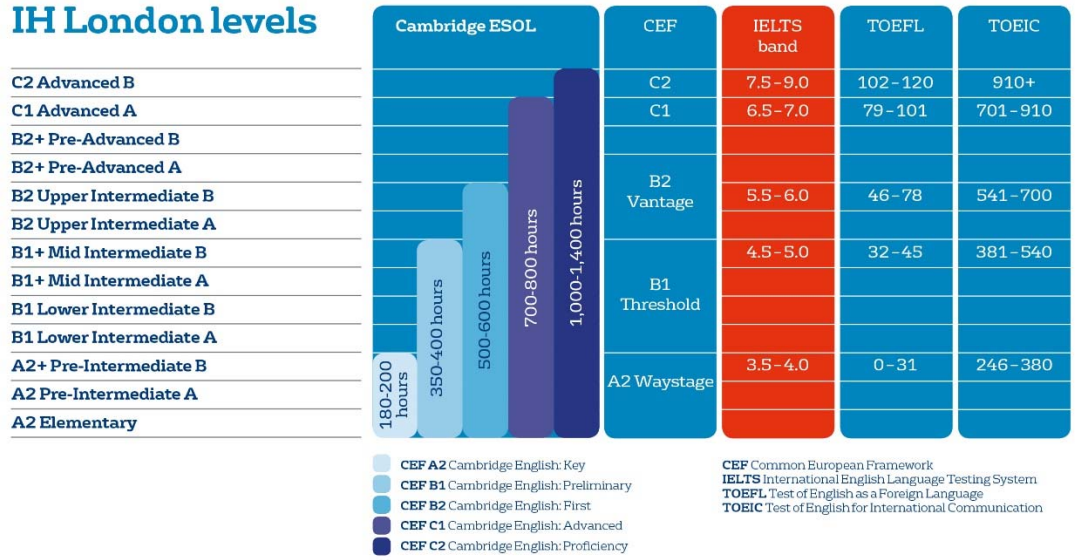
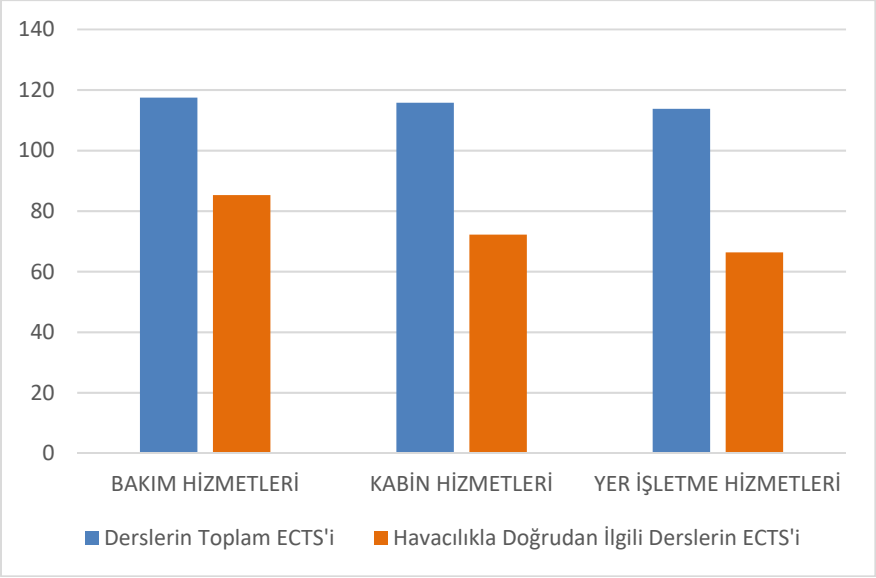


Şekil 6. Uluslararası İngilizce Seviyeleri İçin Tavsiye Edilen Saat Aralığı
Kaynak: (International House London, 2016)

Yükseköğretim kurumlarına öğrencinin mezun olması için gerekli ECTS sayısı ve bu ECTS'in ne kadarının havacılıkla doğrudan ilgili olduğu sorulmuştur. Bu soruya verilen cevaplardan ECTS kredi sayısının doğrudan mesleki eğitim ile ilgili olması bakım eğitimi konusundaki Avrupa Havacılık Emniyet Ajansının (Eurepean Aviation Safety Agency) eğitim standart ve sürelerinden kaynaklanmaktadır.



Şekil 7. Önlisans Düzeyinde Eğitim Veren Bölümlerde Havacılıkla Doğrudan İlgili Derslerin Genel Derslere Oranı

Yükseköğretim kurumlarında ders veren toplam öğretim üyesi/elemanı sayısı, havacılık alanından mezun öğretim üyesi/elemanı sayısı ve doktorasını tamamlamış öğretim üyesi/elemanı sayısı sorulmuştur. Elde edilen veriler ile Şekil 8 hazırlanmıştır. Öğretim üyeleri/elemanları birden fazla ders verdiğinden şeklin oransal olarak değerlendirilmesi daha doğru olacaktır.

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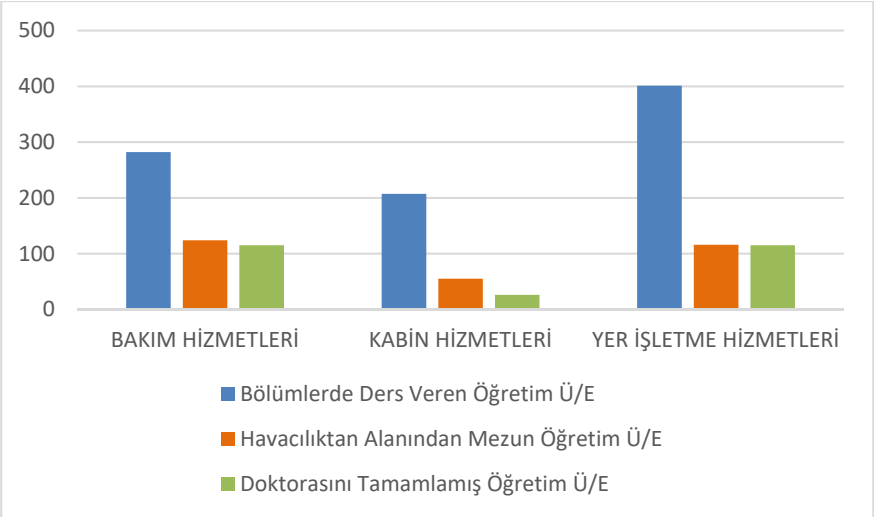

Şekil 8. Öğretim Elemanı Sayısı

Sonuç ve Öneriler

Türkiye'de 2003-2013 yılları arasında havacılık sektöründeki büyüme rakamları dünya ortalamasının çok üzerinde olduğu görülmektedir. Bu büyüme eğiliminin çok üstünde bir büyüme ise havacılık sektörüne insan kaynağı yetiştiren yükseköğretim kurumlarında olmuştur. Son 30 yılda havacılık sektörüne insan kaynağı yetiştiren kurumların verdiği mezun sayısından daha fazlası 2015-2016 öğretim yılında yükseköğretim kurumlarında öğrenimine devam etmektedir. Havacılık sektörünün asıl ihtiyacı olan standartlara uygun yetiştirilen insan kaynağı sayısı toplam mezun sayısına oranlandığında hızlı bir azalmanın olduğu görülmektedir. Mezun sayısında nicelik olarak bir artış olduğu ama nitelik olarak azalma olduğu çıkarımında bulunulabilir.

Türkiye'de Sivil Havacılık Genel Müdürlüğü tarafından belirlenen standartlarda eğitim vermenin (yetki almanın) öğretim kurumlarına ve eğitmenlerine getireceği sınıftaki öğrenci sayısı kısıtlaması, eğitmen özelliklerinden kaynaklı kısıtlamalar, ders içerik kısıtlamaları gibi dezavantajları vardır. Bu nedenle eğitim kurumları yetki almaktan kaçınmaktadır. Fakat mezuniyet sonrası temel eğitim yetkisi olmayan ve standartlara uygun eğitim verilemeyen yükseköğretim kurumlarından mezun olan öğrencilerin havacılık sektöründe istihdam edilmesinin önünde engeller vardır. Örneğin teknisyen olarak çalışmak isteyen ve yetkisi olmayan bir mezun 3 yıl deneyim elde ettikten sonra uçakta yetkili olarak çalışabilmektedir. Bu durum işletmelerin istenen standartta insan kaynağı ihtiyacının karşılanmasını geciktirmektedir.

Mevcut durumun üstesinden gelebilmek için sektörün büyümesi ile orantılı olarak gelecek 10 yılın projeksiyonu çıkartılabilir. Bu doğrultuda öğrenci almış ve eğitimlerine devam eden yükseköğretim kurumları standartlara uygun eğitim verebilmeleri için teşvik edilmelidir. Yeterlilikleri sağlayamayan eğitim kurumlarının Yükseköğretim Kurumu tarafından öğrenci almaları kısıtlanabilir. Buna rağmen verilen mezun sayısı ihtiyaçtan fazla ise öğrenci kontenjanları düşürülebilir. Gelecekte oluşabilecek talep artışlarında ise eğitim yetkisi olan kurumların kapasitelerinde bir artışa gidilerek öğrenci kontenjanları da arttırılabilir. Yükseköğretim Kurulu kendisine bağlı tüm yükseköğretim kurumlarının havacılık ile ilgili bir bölüm açılma talebini Sivil Havacılık Genel Müdürlüğünün izni veya tavsiyesi ile açılması sağlanabilir. Sivil Havacılık Genel Müdürlüğü Türkiye'de havacılık sektöründe hangi bölümlerde nitelikli personel ihtiyacı olduğunu sektör araştırmaları ile tespit edebilmesi önemli bir gerekliliktir. Yükseköğretim kurumlarının uçak üzerinde bakım yapan insan kaynağı eğitmek yerine daha kısa sürede, daha az emek ve maliyetle havacılık sektörünün ihtiyaç duyduğu diğer alanlarda nitelikli insan kaynağı yetiştirilmesi konusunda çalışmalar yapılmalıdır.

SHGM'den alınan rakamlara göre 2016 yaz döneminde sadece uçak bakım alanında toplamda zorunlu staj yapması gereken yaklaşık 1950 öğrenciden 850 öğrenciye staj yapma imkânı bulmuştur. Havacılık sektörü yükseköğretim kurumlarındaki uçak bakım alanında eğitim görenlerin %50'sine staj yeri sağlamıştır. Havacılık sektöründe öğrenci sayısının bu şekilde artmaya devam etmesi durumunda gelecekte mezun öğrencilerin istihdamının sorun haline dönüşeceği tespit edilmiştir. SHGM ve YÖK işbirliği ile havacılık alanında eğitim gören insan kaynağının nitelik ve nicelik olarak havacılık sektörünün ihtiyaçlarını karşılayacak şekilde olması sağlanabilir.

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TÜRKİYE'DE SIĞINMA EVLERİNDE KALAN KADINLARIN İSTİHDAMA KAZANDIRILMA ÇALIŞMALARI VE MARMARA BÖLGESİ ÖRNEĞİ

GAINING THE WORKFORCE OF THE WOMEN WHO ARE RESIDING IN WOMEN'S SHELTERS IN TURKEY AND A SAMPLE CASE FROM MARMARA REGION

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Özet: Bu çalışmada, 2013-2015 yılları arasında Türkiye'nin Marmara bölgesindeki kadın sığınma evlerinde çeşitli sebeplerden dolayı 30 günden fazla yaşamak zorunda kalan kadınların durumları araştırılmıştır. Veriler incelendiğinde, bu kadınlardan meslek eğitimi desteği ve sertifikası alarak kendi ayakları üzerinde durabilecek konuma gelmiş olanların kendi hayatlarını kurma aşamasında başarılı oldukları görülmüştür. Bu çalışma ile meslek eğitimi desteği alan kadınlar ile kadın sığınma evlerinden ayrılma sebepleri arasında anlamlı bir ilişki bulunduğu tespit edilmiştir.

Anahtar Kelimeler: Kadın, Sığınma Evleri, Meslek Eğitimi Sertifikası

Abstract: In this study, women who are forced to temporarily live in women's shelters for more than 30 days for various reasons between the years of 2013-2015 in Marmara region of Turkey were investigated. When the data were analyzed, it was found that the women who gained various vocational training certificates became economically self- sufficient or independent. It was also seen that, these certificates supported them on their journey of getting their life back together. With this study, we observed a meaningful relationship between the training certificates and reasons for leaving the women's shelters.

Keywords: Women, Women's Shelters, Training Certificates

Giriş

Türkiye'de Resmi Gazete'de yayınlanan Kabul Tarihi: 8/3/2012 olan 6284 sayılı "aileninkorunması ve kadına karşı şiddetin önlenmesine dair kanun"nun birinci bölüm'ün deki amaç, kapsam ve temel ilkelere göre;

MADDE 1 – (1) Bu Kanunun amacı; şiddete uğrayan veya şiddete uğrama tehlikesi bulunan kadınların, çocukların, aile bireylerinin ve tek taraflı ısrarlı takip mağduru olan kişilerin korunması ve bu kişilere yönelik şiddetin önlenmesi amacıyla alınacak tedbirlere ilişkin usul ve esasları düzenlemektir.
(2) Bu Kanunun uygulanmasında ve gereken hizmetlerin sunulmasında aşağıdaki temel ilkelere uyulur:
a) Türkiye Cumhuriyeti Anayasası ile Türkiye'nin taraf olduğu uluslararası sözleşmeler, özellikle Kadınlara Yönelik Şiddet ve Aile İçi Şiddetin Önlenmesi ve Bunlarla Mücadeleye İlişkin Avrupa Konseyi Sözleşmesi ve yürürlükteki diğer kanuni düzenlemeler esas alınır.
b) Şiddet mağdurlarına verilecek destek ve hizmetlerin sunulmasında temel insan haklarına dayalı, kadın erkek eşitliğine duyarlı, sosyal devlet ilkesine uygun, adil, etkili ve süratli bir usul izlenir.
c) Şiddet mağduru ve şiddet uygulayan için alınan tedbir kararları insan onuruna yaraşır bir şekilde yerine getirilir.

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ç) Bu kanun kapsamında kadınlara yönelik cinsiyete dayalı şiddeti önleyen ve kadınları cinsiyete dayalı şiddetten koruyan özel tedbirler ayrımcılık olarak yorumlanamaz. Hükümleri yeralmaktadır (Resmi Gazete, 2012).

Yasal Çerçevede Sığınma Evlerinin Kuruluşu

1948'de Birleşmiş Milletler Genel Kurulunda kabul edilen İnsan Hakları Evrensel Bildirgesi, herkesin hiçbir ayrıma uğramadan insan haklarından yararlanacağını belirterek, "Yaşam, özgürlük ve kişi güvenliği her insanın hakkıdır" ve "Hiçkimseye işkence ve zulüm uygulanamaz, insanlıkdışı yada onurkırıcı biçimde davranılamaz, ceza verilemez" denilmektedir.

30 yıl sonra, 1979'da kabul edilen ve Türkiye'nin de taraf olduğu Birleşmiş Milletler Kadınlara Karşı Her Türlü Ayrımcılığın Önlenmesi Sözleşmesi (CEDAW- Kadın Hakları Sözleşmesi), taraf devletlerin kadınlarla erkekler arasında eşitliği sağlama ve kadınlara yönelik ayrımcılığı yasaklama konusundaki yükümlülüklerini ayrıntıyla ortaya koymuştur.

Türkiye CEDAW sözleşmesi uyarınca ilk kez 1990 yılında SHÇEK'e bağlı kadın konukevini açarken aynı zamanda Avrupa Konseyi ülkelerince Mayıs 2011'de imzaya açılan İstanbul Sözleşmesi'ni de imzalayan ilk ülke olmuştur. Kasım 2011'de TBMM'de sözleşme onaylanmıştır.

Aile İçi Şiddetin Önlenmesi ve Bunlarla Mücadeleye İlişkin Avrupa Konseyi Sözleşmesi (İstanbul Sözleşmesi)'ne göre; Kadına Yönelik Şiddet ve Aile İçi Şiddetin Önlenmesi ve Bunlarla Mücadeleye İlişkin Avrupa Konseyi Sözleşmesi, kadına yönelik şiddet, özellikle de ev içi şiddet konusunda, uluslararası alanda bölgesel olarak hazırlanmış ilk Avrupa Konseyi Sözleşmesidir. Kadına yönelik ev içi şiddetle ilgili yaptırım gücü olan ilk uluslararası sözleşme olan bu belge, Mayıs 2011'de Türkiye tarafından İstanbul'da imzalandığı için kısaca İstanbul Sözleşmesi olarak anılmaktadır. İstanbul Sözleşmesi, imzalayıp onaylayan ülkelere, fiziksel, cinsel, ekonomik ve duygusal şiddet türlerini önlemek için gerekli yasal önlemleri alma yükümlülüğü getirmiştir (www.ankara.bel.tr).

İstanbul Sözleşmesi'ndeki Tanımlara Göre

Şiddete uğrayan ya da uğrama riski bulunanlara, özellikle de kadınlara ve çocuklarına ilişkin koruyucu ve önleyici, oldukça kapsamlı 80 madde içeren Sözleşmede yer alan tanımlar şöyle: "Kadınlara yönelik şiddet" bir insan hakları ihlali ve kadınlara yönelik ayrımcılığın bir biçimi olarak anlaşılmaktadır ve ister kamusal ister özel alanda meydana gelsin, kadınlara fiziksel, cinsel, psikolojik ve ekonomik zarar veya ıstırap veren veya verebilecek olan toplumsal cinsiyete dayalı her türlü eylem veya bu eylemlerle tehdit etme, zorlama veya keyfi olarak özgürlükten yoksun bırakma anlamına gelir (http://www.kadinininsanhaklari.org)

"Kadın" sözcüğü 18 yaşın altındaki kız çocuklarını da kapsar.

Sözleşme hazırlanırken aşağıdaki dört temel ilke dikkate alınmıştır:

Önleme (şiddeti önleme),
Koruma (şiddet mağdurunu koruma),
Kovuşturma (şiddet uygulayanı soruşturma),
Politikalar (kadına karşı şiddetin sonlandırılmasına yönelik politikalar).

Sözleşmeye Taraf Devletlerin Yükümlülükleri

İstanbul Sözleşmesi'nin en önemli düzenlemelerin biri, belgeyi imzalayan ve onaylayan devletlere, kadına yönelik şiddetin temelinde yer alan özel dinamikleri saptayıp ortadan kaldırması için belli sorumluluklar yüklemesidir. Mesela Sözleşmeye göre taraf devletlerin, kadınların aşağı bir cins olduğuna ve kadınlarla erkekler için alışılagelmiş rollerin bulunduğu düşüncesine dayanan önyargı, örf ve adet, gelenek ve her türlü farklı uygulamayı ortadan kaldırmak için gerekli önlemleri alma yükümlülükleri vardır. Devletler ayrıca, kadın ve erkeklere ilişkin sosyal ve kültürel davranış modellerinin değişmesini sağlamak için politikalar üretir. Sözleşme özellikle de kültür, örf ve adet, gelenek, din veya sözde "namus" gibi kavramların, şiddet uygulamak için bir mazeret olarak kullanılmasını engeller (http://www.kadinininsanhaklari.org). Ülkemizde 2012 yılında yürürlüğe giren 6284 sayılı Ailenin Korunması ve Kadına Karşı Şiddetin Önlenmesine Dair Kanun ve İstanbul Sözleşmesine bağlı olarak, kadına yönelik şiddetle mücadele edilmektedir. Ayrıca Bakanlığa bağlı sığınma evlerinin dışında belediyelerce ve STK'larca sığınma evleri hizmeti verilmektedir. İstanbul Sözleşmesi'nde yer alan Devlet yükümlülükleri ve gereken özeni gösterme sorumluluğu maddesinde; Taraflar, kadınlara yönelik şiddet eylemlerinde bulunmaktan kaçınır ve devlet adına faaliyet gösteren devlet yetkilileri, görevliler, kurum, kuruluş ve diğer aktörlerin bu yükümlülüğe uygun davranmalarını sağlar. Taraflar devlet dışı aktörlerce işlenen ve işbu Sözleşme kapsamında yer alan şiddet eylemlerinin gereken özeni göstererek önlenmesini,

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soruşturulmasını, cezalandırılmasını ve tazmin edilmesini sağlamak üzere gerekli hukuki veya diğer tedbirleri alır.

Belediye Kanunu

Belediyeler, 5393 sayılı Belediye Kanunundaki koruma evleri maddesi uyarınca bu hizmeti vermektedir. Belediyenin, görev, yetki ve sorumluluklarını düzenleyen bu kanunun 14. Maddesinin a) bendinde "Büyükşehir belediyesi ile nüfusu 50.000'i geçen belediyeler, kadınlar ve çocuklar için koruma evleri açar" ifadesi yer almaktadır (www.ankara.bel.tr).

Kadın Konukevlerinin Amacı

Eşlerden birinin çocuklar ve aynı çatı altında yaşayan diğer aile bireylerinden birine yönelik uyguladığı fiziki, duygusal veya cinsel kötü muameleye aile içi şiddet denir. Sağlıklı bir toplumsal yapının oluşması kadın ve çocukların güçlenmesinden geçmektedir. Çağdaş, demokratik, ileri bir toplum için, kadınların güçlendirilmeleri, etkinlik alanlarının genişletilmesi, eğitim, istihdam, sağlık, siyaset, hukuk ve benzeri alanlarda eşit fırsat ve olanaklardan yararlanmalarının sağlanması büyük önem taşımaktadır. Tüm dünyada olduğu gibi ülkemizde de ciddi bir sorun olan kadına yönelik şiddet; kadının bireysel ve toplumsal işlevlerini, özel yaşamını, işini ve diğer sorumluluklarını yerine getirebilmesinde, kadının güçlenmesi ve ilerlemesinde engel teşkil etmektedir. Bu nedenle şiddet uğrayan kadın ve çocuklar için sığınma evlerinde çok yönlü destek sağlanmaktadır ve sağlanmaya devam edilmektedir. Bu destekler sosyal, ekonomik ve hukuksal sorunların giderilmesine yönelik çalışmalardır(www.ankara.bel.tr).

Dünyada Sığınma Evleri

İlk kadın sığınak/sığınma evleri bazı yazarlara göre 16. yüzyıl İtalya'sında ortaya çıkmıştır. Kocalarından kötü muamele gören ve sokağa atılan ve durumları "mutsuz" olarak tarif edilen kadınlar bu evlere sığınmaktaydı. İtalya Bolonya'daki La Casa del Soccorsodi San Paolobu evlerden biridir (Ferrante, 1990). Günümüz kadın sığınma evinin ilk örneği 1972'de İngiltere'de Erin Pizzey tarafından açılan Batı Londra'daki Chiswick Kadın Sığınağı'dır (Logar, 2008). Kadın sığınma evlerinin şiddetle mücadelede önemli bir yerinin olduğunun anlaşılması ile birlikte kısa bir sürede Avrupa'da, Amerika Birleşik Devletleri ve Kanada'da çok sayıda kadın sığınma evi açılmıştır. 1973'te Amerika Birleşik Devletleri'nde Boston Massachusetts, ve St. Paul Minnesota'da (www.ibiblio.org, 2012), aynı yıl Interval House ve Nellie's isimli sığınma evleri de Kanada'da açılmıştır (http://www.criaw-icref.ca/millenium, 2012.). Almanya'daki ilk modern sığınma evi 1976'da Berlin'de, 1978'de Avusturya Viyana'da, 1979'da İsveç'te, 1989'da İtalya'da kurulmuştur (Logar, 2008).

Viyana'da 1993'te toplanan Dünya İnsan Hakları Konferansı sonuç bildirgesi, toplumsal cinsiyete dayanan şiddeti tanımlamış ve alınacak yasal önlemlerle ve ülkeler arası işbirliği ile toplumsal cinsiyete dayanan şiddetin mutlaka ortadan kaldırılması gerektiğini ortaya koymuştur. Konferansta geliştirilen Kadınlara Yönelik Şiddetin Önlenmesi Bildirgesi Aralık 1993'te Birleşmiş Milletler Genel Kurulu'nda özel olarak kadına karşı şiddeti ele alan ilk insan hakları belgesi olarak kabul edilmiştir. Viyana Konferansında bu gelişmelere ek olarak Avrupa'da kadına yönelik şiddetle mücadele eden kadın örgütleri bir araya gelerek Avrupa Kadına Yönelik Şiddet Ağının (WAVE; WomenAgainstViolence Europe) kurulmasının ilk adımını atmışlardır (Logar, 2008).

WAVE, günümüzde Avrupa bölgesindeki 46 ülkede örgütlenmiştir ve Avrupa'da kadınlara sığınma ve danışmanlık, kadın yardım hattı gibi olanakları sağlayan 4000'den fazla kurumun bilgisini veritabanında bulundurmaktadır (www.wave-network.org). Kadın sığınma evleri günümüzde ülkelerin kadına yönelik şiddete yönelik önlemlerinin önemli bir parçasıdır. Avrupa Konseyi üye ülkelerin kadın sığınma evleri ile ilgili standartlarını belirlemiştir. Bu standarda göre sığınma evlerinin kapasitesinin her 7500-10.000 nüfusa karşılık bir kalacak yer olması gerekmektedir. "Kalacak yer" bir yetişkinin ve ortalama sayıdaki çocuğun kalabileceği yer olarak tarif edilmektedir (Combatingviolenceagainstwomen, 2007).

WAVE verilerine göre Haziran 2011 itibarıyla Avrupa'daki 44 ülkede, sığınma evlerinde her 10 bin kişiye 0,34 kalacak yer sağlanabilmiştir. Avrupa'da kadın sığınma evlerinin kapasitesinin toplam 80.144 kadına hizmet verecek düzeyde olması gerekmekteyken, sağlanan kapasite 27.036'da kalmıştır. WAVE istatistiklerine göre Haziran 2011 itibarıyla Avrupa bölgesinde 44 ülkeden Avrupa Konseyi tarafından tanımlanan kriterleri sağlayan ülkeler İngiltere, İspanya, Hollanda, Norveç, Malta ve Slovenya'dır (Paksoy Erbaydar, 2012).

Türkiye'de Sığınma Evleri

Türkiye'de mağdur kadınlar için açılan ilk sığınma evinin tarihi 18. yüzyıla kadar dayanmaktadır. Osmanlı Devleti'nde ise sığınma evlerinin açılış tarihi ise 300 yıl öncesine dayanmaktadır. İstanbul'daki "Hatuniye Dergâhı" bu evlere örnek bir yapıdır. Burada, şiddet gören ve zor durumda olan kadınlara zanaat öğretilip

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onların kendi ayakları üzerinde durmaları sağlanmış, psikolojik rahatsızlıkları olanlarsa tedavi edilmiştir. Eyüp'teki Hatuniye Dergâhı, Osmanlı Devleti'nde 100 yıla yakın bir süre zor duruma düşmüş, şiddet görmüş kadınlara ev sahipliği yapmıştır. Çeşitli kaynaklara göre kadınlar bu Dergah'a sığınmışlar ve zanaat öğrenmişler, psikolojik rahatsızlıkları olanlarsa tedavi edilip hayata kazandırılmış, yaşlı kadınlar için ise burası bir huzurevi görevi görmüştür. Kapasitesi yüz kişilik olup sadece 18-80 yaşları arasındaki kadınlar kalabilmişlerdir (www.haber7.com).

Dünya'da ilk modern kadın sığınma evi örneklerinin 1970'li yıllarda ortaya çıkmış olmasına karşın, Türkiye'de, ilk sığınma evi 1993 yılında Ankara'da Kadın Dayanışma Vakfı tarafından açılmıştır (www.wave-network.org, www.kadindayanismavakfi.org.tr). İstanbul'un ilk kadın sığınma evi ise 1995 yılında Mor Çatı Kadın Sığınağı Vakfı tarafından kurulmuştur (Altınay, 2008).

Sosyal Hizmetler Çocuk Esirgeme Kurumu'nun 1990 yılında açmaya başladığı Kadın Misafirhanesi/Kadın Konukevi adındaki sığınma evleri ve Bakırköy ve Şişli Belediyeleri'nin aynı yıl açtığı kadın sığınma evleri kamu kurumlarınca açılan ilk sığınma evi örnekleridir (www.morcati.org.tr). Türkiye'de 5393 Sayılı Belediyeler Kanunu nüfusu 50 bini aşan belediyelere kadın sığınma evi açma görevini vermiştir. Bu yasa dışında Aile ve Sosyal Politikalar Bakanlığı Kadının Statüsü Genel Müdürlüğü (KSGM) sığınma evi açabilmektedir. KSGM verilerine göre Mart 2012 itibarıyla Türkiye'de toplam 1859 kalacak yer kapasiteli 83 kadın sığınma evi vardır. Bu sığınma evlerinin 55'i KSGM, 25'i yerel yönetimler 3'ü ise kadın örgütlerince işletilmektedir (Karataş, Şener, Otaran, 2008). İçişleri Bakanlığı Mahalli İdareler Genel Müdürlüğü, Avrupa Birliği'nin mali, Birleşmiş Milletler Nüfus Fonu'nun da teknik desteği ile 2008-2010 döneminde Ankara, Antalya, Bursa, Eskişehir, Gaziantep, İstanbul, İzmir ve Samsun'da sığınma evleri yaptırmış, burada çalışacak kişilerin eğitimi ve kamuoyu duyarlılığının artırılmasına yönelik çalışmalar yürütmüştü (KSGM, 02.03.2012).

Türkiye'de Sığınma Evlerinde Sunulan Hizmetler

- ✓ Şiddete uğrayan kadınların barınma sorununun çözülmesi,
- ✓ Şiddete uğrayan kadınlarda şiddet sonucu ortaya çıkan umutsuzluk, değersizlik, suçluluk, utanç ve korku gibi duyguların aşılması,
- ✓ Özgüven ve özsaygının yeniden yapılanması,
- ✓ Yasal yardımlardan yararlandırılması,
- ✓ Yeni yaşam seçeneklerini sağlıklı bir biçimde belirleyebilmeleri yönünde psikolojik destek, danışmanlık, hukuksal rehberlik sunulması,
- ✓ Kendilerine yeterli olabilecekleri bir iş ve meslek kursuna yönlendirme,
- ✓ Aile veya eşle bir araya gelmeyi tercih etmeleri durumunda ailenin şiddet içermeyen bir ortam haline gelmesi ve çocukların şiddetten uzak, sağlıklı bir ortamda yetişmesi için aile ilişkilerinin sağlıklı sürdürülmesinin sağlanması,
- ✓ İzleme faaliyetlerinin sürdürülmesidir (https://www.ankara.bel.tr)

Bulgular ve Tartışma

Marmara bölgesinde 2013-2015 yılları arasında çeşitli nedenlerle kadın sığınma evlerinde kalan 142 kadın arasında yapılan çalışmaya göre; verileri oluşturan tablo üzerinde yaptığımız "ifcondition" testleri neticesinde kadınların kadın sığınma evlerinde 30-100≥ günün üzerinde kaldığı müddetçe kuaförlük, evde yaşlı ve hasta bakımı, çocuk bakımı, takı tasarımı, okuma yazma gibi eğitimler alaraksertifika veya sertifikalarına sahip olmuşlardır.

Sığınma evinde kalan kadınlardan çocuğu olanların birçoğu iş başvurusu yaparak işe yerleşmiş ve/veya kendi istekleri ile kurumdan ayrılmışlardır.

Bu süre içinde kadın sığınma evine başvuran 142 kadından %12'i (17 kadın) işe yerleşmiştir. İşe yerleşen kadınlardan%65'i (13 kadın) İŞKUR başvurusu yaparak, %52'si (9 kadın) eğitim sertifikalarından en az birine sahip olarak işe yerleşmiştir.

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İSKURbasvurusu * İseYerlesen

Crosstab

			İseYerlesen		
			Evet	Hayır	Total
İSKURbasvurusu	Evet	Count	13	7	20
		% within İSKURbasvurusu	65,0%	35,0%	100,0%
		% within İseYerlesen	76,5%	5,6%	14,1%
		% of Total	9,2%	4,9%	14,1%
	Hayır	Count	4	118	122
		% within İSKURbasvurusu	3,3%	96,7%	100,0%
		% within İseYerlesen	23,5%	94,4%	85,9%
		% of Total	2,8%	83,1%	85,9%
Total		Count	17	125	142
		% within İSKURbasvurusu	12,0%	88,0%	100,0%
		% within İseYerlesen	100,0%	100,0%	100,0%
		% of Total	12,0%	88,0%	100,0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	62,114[a]	1	,000		
Continuity Correction[b]	56,395	1	,000		
Likelihood Ratio	42,940	1	,000		
Fisher's Exact Test				,000	,000
Linear-by-Linear Association	61,677	1	,000		
N of Valid Cases	142				

a. 1 cells (25,0%) have expected count less than 5. The minimum expected count is 2,39.

b. Computed only for a 2x2 table

SERTIFIKA * İseYerlesen

Crosstab

			İseYerlesen		
			Evet	Hayır	Total
SERTIFIKA	Evet	Count	9	37	46
		% within SERTIFIKA	19,6%	80,4%	100,0%
		% within İseYerlesen	52,9%	29,6%	32,4%
		% of Total	6,3%	26,1%	32,4%
	Hayır	Count	8	88	96
		% within SERTIFIKA	8,3%	91,7%	100,0%
		% within İseYerlesen	47,1%	70,4%	67,6%
		% of Total	5,6%	62,0%	67,6%
Total		Count	17	125	142
		% within SERTIFIKA	12,0%	88,0%	100,0%
		% within İseYerlesen	100,0%	100,0%	100,0%
		% of Total	12,0%	88,0%	100,0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3,723[a]	1	,054		
Continuity Correction[b]	2,733	1	,098		
Likelihood Ratio	3,498	1	,061		
Fisher's Exact Test				,094	,052
Linear-by-Linear Association	3,697	1	,055		
N of Valid Cases	142				

a. 0 cells (,0%) have expected count less than 5. The minimum expected count is 5,51.

b. Computed only for a 2x2 table

Sığınma evlerinde bu süre içinde kalan 142 kadından %53'ü (76 kadın) 3 ve 4 çocuk sahibidir. Çocuğu olan kadınlardan %10'u (8 kadın) işe yerleştirilmiştir.

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Geri kalan kadınlardan hiç çocuğu olmayan ve en fazla iki çocuğu olanların istihdama katılmalarını sağlayacak en az bir sertifikaya sahibi olmalarına rağmen işe yerleşmedikleri görülmüştür.

Sığınma evinde bulunan kadınlardan, çocukları bakıma muhtaç olmayanlar çalışma hayatına daha rahat başlamaktadırlar. Çocuğu bakıma muhtaç olanlar ise alacakları ücret bakıcı ücretini karşılayamayacağı için mecburen çalışmamayı ve çocuklarına bakmayı tercih etmişlerdir.

Sonuç

Sığınma evlerinde kalma süresi altı ayla kısıtlanmıştır. Altı ay içinde kadının toplumsal hayata katılabilecek kadar kendini toparlayabileceği, iş bulup, düzenini kurabileceği düşünülmüştür. Öngörülen süre, bazı koşullarda bir altı ay daha uzatılabilmektedir.

Sığınma evleri kadının kalacağı altı aylık dönemden sonrasını da düşünmelidir. Altı ay şiddetten uzak kalan kadın, tekrar şiddet gördüğü yere geri dönmemelidir. Bu sebeple sığınma evleri, kadına iş bulmalı, bir kaç kadını bir araya getirip, onlara ödeyebilecekleri düzeyde bir ev kiralayıp döşeyebilmelidir. Devlet, yerel yönetimler ve gönüllü kuruluşlar bir arada çalışmalıdır. Devlet, kamu veya özel sektör kuruluşları, belli sayıda hükümlü ve özürlü çalıştırma zorunluluğunda olduğu gibi, kadın sığınma evinde yaşayan kadının belli oranda istihdamı ile de sorumlu olabilirler (Alpago, Ceyda, YLT, 2006).
Kadın sığınma evlerinde kalan kadınlara her ne sebeple gelmiş olursa olsun öncelikle psikolog kontrolünde psikolojik destek verilerek özgüvenlerini kazanmaları sağlanmalı, kaldıkları süre içerisinde sivil toplum kuruluşları, üniversiteler, belediyeler, çeşitli özel kuruluşlar aracılığı ile meslek eğitimleri verilerek tümevarımcı yöntemle daha fazla istihdama katılmaları sağlanarak topluma kazandırılmaları ve kendi ayakları üzerinde durmalarını sağlayacak eğitim çalışmalarına ağırlık verilmesi gerektiği neticesine ulaşılmıştır.

Kadın sığınma evleri bünyesinde çalışmak isteyen ancak küçük çocuğu olan kadınlar için çocuk bakım birimi oluşturularak istihdama kazandırılabilecek kadın sayısının artacağı ön görülmektedir. Kurum içinde oluşturulan çocuk bakım evlerinde çalışabilecek kadınlar, kurumda kalan ve kurum içinde çalışmak isteyen ve ayrıca çocuk bakımı eğitimi alıp bu sertifikaya sahip olan kadınlardan oluşabilecektir. Ayrıca bu evlerde de eğitim ve staj imkânı tanınarak çalışma hayatına adım atmaları desteklenmelidir. Böylece kadın istihdamına destek sağlamak kurum içinden de sağlanabilecektir.

Kadınların sosyal ve ekonomik konumlarını iyileştirmek için sorumluluğu bulunan tüm taraflarca çalışmalar yapılması ve olumsuz göstergelerin işaret ettiği alanlarda iyileştirilmelerin yapılması gerekliliği bir gerçektir.

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TÜRKİYE'DEKİ ADLİ HİZMETLERİN DİJİTALLEŞMESİNDE KARŞILAŞILAN SORUNLAR VE ÇÖZÜM ÖNERİLERİ

Özlem OKTAL

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Özet: Adli kurumların üretkenliğini ve verimliliğini arttırmak için Adalet Bakanlığı tarafından geliştirilen; ölçeklenebilir, çok kullanıcılı ve işe yönelik Ulusal Yargı Ağı Projesi (UYAP)'nin uygulamaya geçirilmesi kararının ardından iç kullanıcıların bilişim sisteminde karşılaştığı problemler ile sektördeki yenilik ve gelişmeler doğrultusunda bazı düzenlemeler yapma ihtiyacı ortaya çıkmıştır. Bu ihtiyaç doğrultusunda mevcut kullanılan sistemde ne tür sorunlar olduğu ve çözüm önerileri geliştirilmesi bu çalışmanın temelini oluşturmaktadır. Çalışmanın kapsamını, Türkiye'deki adli hizmetleri yürüten hâkim, başsavcı, savcı, mahkeme başkanı, kâtip, cezaevi personeli olmak üzere toplam 76.592 iç kullanıcı oluşturmaktadır. Çalışmada sistem iç kullanıcılarının bazı değişkenlere göre UYAP bilişim sisteminden memnuniyetini ortaya koyarak, mevcut durumda karşılaşılan sorunların üstesinden gelebilecek öneriler ortaya konulması amaçlanmıştır.

Anahtar kelimeler: Adli hizmetler, bilişim sistemleri, kullanıcı tatmini

Giriş

Son yıllarda bilişim teknolojilerinde meydana gelen hızlı gelişme ve yeniliklerin tüm kurumları etkisi altına aldığı şüphe götürmez bir gerçektir. Bilişim teknolojileri söz konusu olunca, kurumların üretkenliğini ve verimliliğini arttırmak için geliştirilen; ölçeklenebilir, çok kullanıcılı ve işe yönelik sistemler olan yönetim bilişim sistemleri kullanılması ihtiyacının ortaya çıkmasıyla, Adalet Bakanlığı tarafından Ulusal Yargı Ağı Projesi (UYAP)'nin uygulamaya geçirilmesi kararı verilmiştir.

Adli hizmetlerde otomasyona gitme çalışmalarının başladığı 1998 yılından bugüne geçen sürede iç kullanıcıların bilişim sisteminde karşılaştığı problemler ile sektördeki yenilik ve gelişmeler doğrultusunda bazı düzenlemeler yapılmıştır. Teknik uzmanların UYAP Bilişim Sisteminin etkinlik ve verimliliği ile ilgili düşünce ve deneyimlerinin özellikle sistemi kullanan iç kullanıcıların deneyim ve düşünceleri ile bütünleştirilmesi, sistemin etkinlik ve verimliliğinde önemli bir rol oynamaktadır. Sistemin kullanışlılığı, kullanıcıların teknolojiye yatkınlığı, kullanıcıların teknolojiye yönelik kaygıları, sistemden elde edilen bilginin niteliğinin yürütülen görev ve sorumlulukları yerine getirmeye uygun olması, kullanıcıların sistem ile ilgili karşılaştıkları problemlerin üstesinden gelebilme yetkinlikleri, sistemin kullanımına ilişkin verilen teknik hizmetlerin sistem kullanımını kolaylaştırmaya etkisi gibi boyutların analiz edilmesi ihtiyacı belirmiştir. Bu ihtiyaç doğrultusunda çalışmada mevcut kullanılan sistemde ne tür sorunlar olduğunu belirleyerek, sistem iç kullanıcılarının bazı değişkenlere göre UYAP bilişim sisteminden memnuniyetini ortaya koymak, sorunların üstesinden gelebilecek öneriler geliştirmek amaçlanmıştır.

Çalışmanın Amacı ve Kapsamı

Türkiye'nin dört bir yanında faaliyet gösteren adli hizmetlerin etkin bir şekilde yürütülmesini sağlamak üzere kullanılmaya başlanan UYAP Bilişim Sistemi kullanıcılarının bu sistemi kabulüne ilişkin nasıl bir davranış, niyet, tutum ve eğilim içinde olduklarını belirleyerek mevcut sorunların çözümüne ilişkin bazı öneriler geliştirmek amaçlanmıştır. Bu çalışma, Anadolu Üniversitesi Bilimsel Araştırma Projesi [1] kapsamında ve Adalet Bakanlığı'ndan alınan izinle gerçekleştirilmiştir.

Çalışmanın kapsamını Türkiye'deki adli hizmetleri yürüten hâkim, başsavcı, savcı, mahkeme başkanı, kâtip, cezaevi personeli olmak üzere ankete atanan toplam kullanıcı sayısı toplam 76.592'dir. Ankete cevap veren kullanıcı sayısı toplam 8840'dır. Üst düzey iç kullanıcılar, kâtipler ve cezaevi personelinin farklı iş akışları gerçekleştirdikleri ve farklı kararlar verdikleri dikkate alındığında çalışma grubumuzu üst düzey yöneticiler

[1] Bu çalışma Anadolu Üniversitesi Bilimsel Araştırma Projeleri Komisyonu tarafından kabul edilen 1203E045 nolu proje kapsamında desteklenmiştir. Bu projede Doç. Dr. Özlem Oktal (Yürütücü), Prof. Dr. Berna Yazıcı, Doç. Dr. Özlem Alpu ve Doç Dr. Zerrin Sungur görev almıştır.

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(Başsavcı, Savcı, Mahkeme Başkanı ve Hakim), Kâtip ve Cezaevi Personeli olmak üzere üç ana gruba ayırarak ele almanın uygun olacağı düşünülmüştür (Tablo 1).

Bu çalışmada UYAP Bilişim Sistemi iç kullanıcılarının sistemi kullanmaya yönelik davranışlarının çeşitli faktörler çerçevesinde analizi hedeflenmiştir. Başlıca faktörler performans beklentisi, çaba beklentisi, kolaylaştırıcı şartlar, kaygı, teknoloji kullanımına yönelik tutum, teknik etkililik, risk, sistem kalitesi, hizmet kalitesi, içerik kalitesi, sosyal etki, motivasyonel etki, özyeterlilik ve kullanıcı tatminidir.

Araştırma Yöntemi

106 sorudan oluşan anket formunun ilk bölümünde; çalışmanın konusu, önemi, sonuçların nasıl kullanılacağı ve katılımcıdan yapması istenenleri kapsayacak şekilde bir ön tanıtım yazısı yer almaktadır. İkinci bölüm, boyutları ölçmek üzere hazırlanan ölçek maddelerinden oluşmaktadır. Son bölümde ise, katılımcıların bilişim sistemlerini kullanım oranları ve demografik bilgilerine yönelik sorular ve UYAP Bilişim Sistemi ile ilgili önerilerin yapılmasına imkân veren bölüm yer almaktadır. Ankette toplam 83 adet ölçek maddesi bulunmaktadır. Ölçek maddeleri, literatürde yer alan ölçek maddeleri temel alınarak, 5'li Likert ölçeğinde hazırlanmıştır. Bu çalışmada toplanan veriler, IBM Statistics SPSS versiyon 21 istatistik programı ile analiz edilmiş, lojistik regresyon ve log lineer modeller oluşturulmuştur.

Öncelikle sistem iç kullanıcılarının sistem kabulüne ilişkin davranış, tutum, niyet ve eğilimlerinin hangi göstergelerle (değişkenlerle) saptanabileceği araştırılmış, daha sonra çok sayıdaki değişkenlerin arkasında yatan gizli boyutlar(faktörler) ortaya çıkarılmaya çalışılmıştır. Araştırmada değişken kümelerinin güvenirliliği Cronbach alfa istatistiğiyle değerlendirilmiştir. Çalışmada yer alan değişkenlerin (83 değişken için) standart Cronbach alfa istatistiğinin değeri 0.96'dır. Bu istatistik, çalışmada ele alınan anketin güvenilir olduğunu göstermektedir.

Table 1: Genel Demografik Özellikler

Değişken		**Toplam (n=8840)**	**%**
Cinsiyet	Kadın	2628	29.7
	Erkek	6212	70.3
Yaş	18-24	1000	11.3
	25-34	4608	52.1
	35-44	2142	24.2
	45 yaş ve üzeri	1090	12.3
Kullanıcı grubu	Hâkim	274	3.1
	Başsavcı	72	0.8
	Savcı	219	2.5
	Mahkeme Başkanı	28	0.3
	Kâtip	4898	55.4
	Cezaevi personeli	1629	18.4
	Diğer	1720	19.5
Eğitim	İlköğretim	27	0.3
	Lise	1824	20.6
	Üniversite	6479	73.3
	Yüksek lisans	497	5.6
	Doktora	13	0.1
İş deneyimi (yıl)	1 yıldan az	984	11.1
	1-5	2866	32.4
	6-10	2351	26.6
	11-15	1066	12.1
	16 yıl ve üzeri	1573	17.8
Bilişim sistemi kullanma deneyimi (yıl)	1-3	3614	40.9
	4-6	3934	44.5
	7 yıl ve üzeri	1292	14.6

Analiz ve Bulgular Işığında Saptanan Sorunlar ve Çözüm Önerileri

Analiz sonuçları incelendiğinde genel olarak aşağıdaki bulgular ortaya çıkmaktadır:

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- ***Katipler***in UYAP bilişim sistemi ile ilgili kullanıcı tatminini en fazla etkileyen yaş değişkenidir. Buna göre sırasıyla 18-24, 25-34 ve 35-44 yaş aralığı iç kullanıcılar diğerlerine (45 yaş ve üzeri) göre bilişim sisteminden daha fazla tatmin olmaktadır. Ardından sırasıyla 11-15 yıl arası iş deneyimi olanlar, sırasıyla 1-3 ve 4-6 yıl bilişim sistemi kullanma deneyimi olanlar ve erkek kâtipler gelmektedir. Bunun dışında, sırasıyla içerik kalitesi, teknolojiye karşı tutum, sistem kalitesi, teknik etkililik, özyeterlilik, performans beklentisi, hizmet kalitesi, çaba beklentisi ve risk bilişim sistemi kullanımından duyulan tatmini etkileyen değişkenler olarak diğerlerini takip etmektedir.

- ***Cezaevi personeli***nin sistem kullanımı tatminini en fazla etkileyen faktörün teknolojiye karşı tutum faktörü olduğu, onu cinsiyet değişkeninin izlediği görülmektedir. Bunun dışında, sırasıyla sistem kalitesi, performans beklentisi, içerik kalitesi, hizmet kalitesi, kaygı ve son olarak da risk, bilişim sistemi kullanımından duyulan tatmini etkileyen faktörler olarak diğerlerini takip etmektedir.

- Üst düzey iç kullanıcılar, kâtipler ve cezaevi personelinin farklı iş akışları gerçekleştirdikleri ve farklı kararlar verdikleri dikkate alındığında, ***mahkeme başkanı, başsavcı, savcı ve hakim***den oluşan üst düzey yönetici grubunun ise UYAP bilişim sistemine uyum sağlamasını etkileyen temel faktörler; güven, kaygı, teknoloji okur-yazarlığı ve algılanan kullanım kolaylığı olarak belirlenmiştir. Değişkenler ise cinsiyet, yaş, meslek grubu, iş deneyimi, bilişim sistemi kullanma deneyimi olarak tanımlanmıştır. Buna göre;
  - Meslek, yaş ve cinsiyet değişkenleri ile kullanıcının kendini güvende hissedecek bir ortam yaratacak yapı ve düzenlemeleri kapsayan kurumsal bir ortam ile ilgili algılaması açısından; 35-44 yaş aralığındaki üst düzey kullanıcıların daha yaşlı üst düzey yönetici meslek grubundakilere göre bilişim sistemine daha fazla uyum gösterdiği söylenebilir. Savcıların bilişim sistemini kullanmaya gösterdiği uyumun mahkeme başkanlarına ve hakimlere göre daha fazla olduğu ifade edilebilir.
  - Meslek, yaş ve cinsiyet değişkenleri ile kullanıcıların bilgiye etkin olarak erişme ve bu bilgiyi iletmede internet gibi ortamları kullanma becerisi; bilgiye erişirken ve ürettiği bilgiyi paylaşırken teknolojiden yararlanma becerisi açısından; mahkeme başkanı ve hakimlerin UYAP bilişim sistemine daha fazla uyum sağladığı söylenebilir. 25-44 yaş aralığındaki üst yönetim düzeyindeki iç kullanıcıların 45 yaş ve üzeri üst yönetim düzeyi iç kullanıcılarına göre sisteme uyumunun daha fazla olduğu söylenebilir.
  - Bilişim sistemi kullanma deneyimi, yaş ve meslek değişkenleri ile kullanıcının sistemi çok fazla çaba sarf etmeden kullanabileceğine inanma derecesi açısından; hakim ve başsavcıların bilişim sistemine daha fazla uyum sağladığı söylenebilir. 25-44 yaş aralığındaki üst düzey yönetici grubunu oluşturan iç kullanıcıların sisteme uyumunun daha fazla olduğu ifade edilebilir. 4-6 yıl bilişim sistemi kullanma deneyimine sahip iç kullanıcıların sisteme uyumunun daha fazla olduğu söylenebilir. UYAP bilişim sisteminin kullanımının kolay olmadığını düşünenlerin sisteme daha fazla uyum gösterdiği belirtilebilir. 45 yaş ve üzeri mahkeme başkanlarının ve başsavcıların, 25-34 yaş aralığındaki mahkeme başkanlarına ve başsavcılara göre bilişim sistemine daha fazla uyum gösterdiği ifade edilebilir.
  - Cinsiyet, yaş ve meslek değişkenleri ile kullanıcının bilişim sistemini kullanırken bireyde kaygı yaratan duygusal reaksiyonlar açısından; 25-34 yaş aralığındaki UYAP üst düzey yönetici grubu iç kullanıcılarının bilişim sistemine uyumu daha fazla olduğu gibi hakimlerin sisteme daha çok uyum gösterdiği ifade edilebilir. Bilişim sistemi kullanımı ile ilgili kaygıları olmayan üst düzey yönetici grubunun daha fazla uyum gösterdiği söylenebilir. Bunun yanında erkek iç kullanıcıların sisteme uyumu çok daha fazladır. Diğer taraftan UYAP bilişim sistemi kullanımı ile ilgili kaygı taşımayan 45 yaş ve üzeri iç kullanıcılar bilişim sistemine daha fazla uyum göstermektedir. Yaşça büyük olan üst düzey yönetici grubu iç kullanıcıların sisteme uyumu çok daha fazladır. Kadın hakimlerin kadın savcılara göre bilişim sistemine uyumunun çok daha fazla olmasının yanı sıra yaşça büyük olan kadın iç kullanıcıların bilişim sistemine daha çok uyum gösterdiği söylenebilir.

Kâtipler, cezaevi personeli ve mahkeme başkanları, hakimler, başsavcılar ve savcılardan oluşan üst yönetim düzeyi olmak üzere belirlenen üç farklı iç kullanıcı grubuna uygulanan anket sonucunda elde edilen bulgular, bu kullanıcı gruplarının sistem ile ilgili karşılaştıkları problemler saptanmış ve bazı öneriler geliştirilmiştir. Aşağıda genel olarak bu sorun ve çözüm önerilerine ilişkin başlıklar yer almaktadır:

- Kullanıcılar sistemin kesintisiz çalıştığı sürece iyi işlediğini, bir sorun olmadığını, zaman ve kırtasiyeden tasarruf edilerek işlerinin kolaylaştığını ifade etmektedirler. Sistemde hızı olumsuz etkileyen süreçlerin iyileştirilmesi ve geliştirilmesine gereksinim duyulmaktadır.
- UYAP bilişim sistemi ile ilgili değerlendirmeler arasında yer alan önemli bir başka başlık da eğitim konusudur. Adliyelerde çalışan uzman kullanıcıların sistem sorunları hakkında yeterli bilgiye sahip olmamaları eğitim gereksinimi üzerinde durulması gerektiğini göz önüne sermektedir. Personele yüz yüze eğitim verilmelidir.

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- Eğitimlerin sürekli olarak devam etmesi verilen eğitimlerin hangi düzeye geldiğinin incelenmesi ve verilecek eğitimlerde eksiklerin giderilmesi gerekmektedir.
- UYAP bilişim sistemi ile ilgili sorunlardan bir diğeri genel olarak ekranların ve menülerin sadeleştirilmesi ve daha az modül, işlem adımı ile daha çok iş yapılabileceği yönündedir. Onaylanacak işlem sayısının azaltılması gerekmektedir. Ancak esas sorun, hukuki adımların kısaltılmasının, basitleştirilmesi ya da birleştirilmesinin zorluğudur.
- Bir diğer sorun, UYAP bilişim sistemine yerinden bağlanabilme ile ilgilidir (mobil cihazlar, farklı mekânlar, vs.).
- UYAP yardım masasının daha hızlı ve etkili bir şekilde hizmet vermesi sorunların çözümünde etkili olacaktır.
- Birtakım güvenlik politikaları ve kurallarının oluşturulması, teknik donanım ile ilgili sorunların azalmasında etkili olabilir.
- UYAP'ın kişisel kullanımının Hakim ve Savcı boyutunda artırılması gerekmektedir.
- Diğer kurumlarla entegre olacak alt yapı oluşturulmalıdır. Danıştay'ın UYAP'a tam olarak entegre olması ile birlikte aynı şekilde onaylanmış Danıştay kararlarına da yerel idari yargı yerlerinin ulaşabilmeleri sağlandığı takdirde Mahkemeler arası bilgi belge teminine yönelik ara kararlar yapılmasına gerek kalmayacağı ve yargılamaların bu nedenle uzamasının da önüne geçileceği düşünülmektedir.
- Bilgisayarların ve yardımcı donanımın yenilenmesi gerekmektedir.
- Kâğıtsız ortama geçme gerekliliği, ıslak imzanın yerine e- imza kullanımının yaygınlaştırılması gerekmektedir.

Sonuç

Genel olarak araştırma sonucunda üç iç kullanıcı grubunun UYAP ile ilgili daha etkili ve verimli bir çalışma ortamı içinde yer alabilmesi için düzeltilmesi gereken ortak noktaları şu şekilde sıralayabiliriz: UYAP'ın işlem hızının yükseltilmesi, teknik personelin nitelik ve nicelik açısından yetersizliğinin giderilmesi, iç kullanıcılara UYAP'ın kullanımına ilişkin hizmet-içi eğitim verilmesinin önemle üzerinde durulması, UYAP ile ilgili yapılacak yeniden düzenleme çalışmalarında bu sistemi bizzat kullanan en alttan en üste kadar tüm personelin istek, şikâyet ve önerilerinin öğrenilebileceği bir çalışma grubu oluşturularak bunların hayata geçirilebilecek hale getirilmesi, UYAP'ın kullanımına ilişkin yeni politika ve kurallar oluşturularak bu kural ve politikaların yerine getirilip getirilmediğinin adil bir biçimde denetlenmesi sağlanmalıdır.

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TÜRKİYE VE İTALYA ARASINDAKİ TİCARETİN DURUMU VE GELİŞTİRİLMESİNE YÖNELİK ÖNERİLER

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ÖZ:Türkiye ve İtalya, Akdeniz Havzası'nda ortak çıkarları bulunan, ortak tarih ve değerleri paylaşan iki bölgesel güçtür. İki ülke ilişkilerini stratejik ticari ortaklık olarak tanımlamak mümkündür. İki ülkenin bölgesel ve küresel meselelere çözüm bulunması hususunda işbirliği içinde çalışma iradesi mevcuttur. Nitekim Türkiye ve İtalya, Afganistan'dan Libya'ya geniş bir coğrafyada barış ve istikrarın sağlanması amacıyla çaba göstermekte ve işbirliği yapmaktadırlar. İtalya ile ilişkilerimiz, Akdeniz Havzası'nda ortak çıkarlar ve değerleri paylaşan iki bölgesel güç sıfatıyla stratejik ortaklık boyutu taşımaktadır. AB'nin kurucu üyeleri arasında bulunan İtalya, ülkemizin AB üyelik sürecini güçlü ve görünür şekilde destekleyen ülkelerin başında gelmektedir. İtalya ülkemizin en önemli ticaret ortaklarından biridir. İtalya'da yaklaşık 35 bin vatandaşımız yaşamaktadır. Ülkelerin ekonomik faaliyet farklılıkları ülkeler arası ticaretin artmasında en önemli etkenlerin başında gelir. İtalya ve Türkiye arsındaki bu ekonomik faaliyet farklılık iki ülke ekonomisinin birbirini tamamlayıcı nitelikte farklı ekonomik yapıların ortaya çıkmasına neden olmuştur. Bu durum ihracat ve ithalat açısından Türkiye ve İtalya arsında büyük bir ticari potansiyel yaratmaktadır. Bu çalışmada Türkiye ve İtalya arasındaki ticaretin gelişimi 2000 yılından 2015 yılına kadar incelenerek Türkiye açısından oldukça büyük ve önemli bir pazar olan İtalya ile ithalat ve ihracat durumu ortaya konulmuştur. Yöntem olarak belli başlı ticari kalemlerde Türkiye ve İtalya arsındaki ticaret durumu incelenecektir. Ele alınan ürünler şunlardır: Teknolojik ürünler, Ham madde, Gıda, Tekstil, Makine, Hayvancılık, vb. ürünlerdir. Bu ürünlere ilişkin Türkiye'nin de dış ticaret verileri toplanmıştır. İthalat ve ihracat verileri her bir üründe İtalya ile net ticaret (ihracat-ithalat) hesaplanmış ve Tablo ve grafik olarak verilmiştir. İthalat ve ihracat verileri 2000-2015 dönemini kapsamakta olup TÜİK dış ticaret istatistiklerinden derlenmiştir. Türkiye ve İtalya arasında bu ürünler açısından rekabet gücünün daha iyi anlaşılabilmesi için, her ülkenin her bir üründeki *net ticaretleri* hesaplanmıştır. Bir ülkenin bir üründeki *net ticaret konumu* ihracatı ile ithalatı arasındaki fark olarak tanımlanmıştır. Bu çalışmanın önemi Türkiye'nin İtalya için zaman serisi olarak bu kalemler bazında net ticaretini gösterecek ve potansiyel ticaret için Türkiye ve İtalya arsında bazı seçilmiş kalemlerde dış ticaret ilişkileri ve ticaretinin geleceği hakkında bir fikir verecektir. Dolayısıyla böyle bir bilgi bazı karar alıcı birimlerin uzun dönemli plan ve strateji düzenlemelerine yardım edecektir. Sonuç olarak yaklaşık 60 milyonluk nüfusu ve ticaretinin büyük bölümünü Avrupa Birliği ülkeleri dışına yapan İtalya dış ticaret yapısı gereği Türkiye için önemli bir ticari ortak haline gelmektedir. Ama İki ülke arasında dış ticaret dengesinde Türkiye aleyhine bir durum söz konusudur.İhracatımızın %4,4'ünü İtalya'ya yaparken ithalatımızın %5,2'sini İtalya'dan gerçekleştirmekteyiz. AB üyesi ülkelere gerçekleştirdiğimiz ihracatta İtalya'nın payı %10,7 iken, AB ülkelerinden yapılan ithalatta İtalya'nın payı %14,1'dir. İkili ticaret hacmimiz 2014 yılı itibariyle 19,19 milyar Dolardır (ihracatımız 7,14 milyar Dolar, ithalatımız 12,05 milyar Dolar). Ülkemizde yaklaşık 1.200 İtalyan firması faaliyet göstermektedir. 2002 yılından bu yana İtalya'dan ülkemize gelen toplam yatırım miktarı 2 milyar 699 milyon Dolar olmuştur. 2014 yılında ülkemizi 697.360 İtalyan turist ziyaret etmiştir. 1997 yılında Türkiye ile İtalya arasındaki ticaret hacminin 10 milyar dolar iken 1998 yılında Türkiye ile İtalya arasında yaşanan Öcalan krizi ve dünyadaki global krizin de etkisi ile bu rakamın 1998 yılında 5.8 milyar dolara 1999 yılında da daha düşük seviyelere gerilemiştir. "İtalya, Almanya'dan sonra en büyük ticari partnerimizdir. İki ülke arasındaki ticari potansiyelin tam kullanılmadığı da tespitler arasındadır. Büyük düşüş gösteren ticari ilişkiler daha sonra tekrar yükselme trendine girmiş olmakla birlikte hala Türkiye'nin İtalya'ya olan ihracatı İtalya'nın Türkiye'ye ihracatı arasında büyük fark bulunmaktadır.

Anahtar Kelimeler: Ticaret Coğrafyası, İthalat ve İhracat, İtalya, Ekonomik Coğrafya

Abstract: Turkey and Italy, found common interests in the Mediterranean Basin are two regional powers that share a common history and values. Bilateral relations can be defined as strategic business partners. Finding solutions to regional and global issues of the two countries will work and in cooperation are available in the matter. In fact Turkey and Italy, in a wide region from Afghanistan to Libya in an effort to ensure peace and stability and are cooperating. Our relations with Italy, who share common interests and values in the Mediterranean Basin capacity of the two regional powers, the strategic partnership dimension. Located among the founding members of the EU, Italy has come to our country's EU accession process among the countries that support strong and visible. Italy is one of our country's most important trade partners. about 35 thousand citizens living in Italy. Countries differ in economic activity increased trade between countries is among the most important factors. The economic activities of the differences between the two economies, Italy and Turkey have caused to the emergence of different economic structure complement each other. In this case, in terms of exports and

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imports is creating a huge trade potential between Turkey and Italy. This study examined the development of trade between Turkey and Italy from 2000 until 2015, which is a fairly large and important market in terms of import and export situation in Turkey were found with Italy. Method as in certain commercial items trade situation between Turkey and Italy will be examined. The products be addressed are: Technological products, raw materials, food, textile, machinery, livestock, and so on. They are the product. Turkey's foreign trade data is collected on these products. Import and export data, net trade with Italy in each product (export-import) are given as calculated and tables and graphs. Import and export data are compiled from TSI covers the 2000-2015 period, foreign trade statistics. For a better understanding of these products in terms of competitiveness between Turkey and Italy, each country's net trade in each product is calculated. A country's net trade position in exports of a product is defined as the difference between imports. The importance of this study, these items as time series for Turkey to Italy will give you an idea about the future of trade relations and trade in some selected items in Turkey and Italy hypercalcemia will show the net trade basis and potential trade. Therefore, such information will help the long-term plans and strategies of certain decision-makers regulation unit. Therefore, such information will help the long-term plans and strategies of certain decision-makers regulation unit. As a result, about 60 million people and a large part of that trade outside the European Union countries, Italy foreign trade structure should become an important trade partner for Turkey. But it is a case against Turkey in the balance of trade between the two countries. Our 4.4% of our exports while imports are realizing from Italy to 5.2% in Italy. Italy's share of EU exports to the country have realized 10,7%, while the share of imports from EU countries, Italy is 14.1%. Our bilateral trade turnover in 2014 was 19.19 billion dollars (7.14 billion US dollars our exports and imports 12.05 billion US dollars). In our country, it operates about 1,200 Italian company. Since 2002 the total amount of investment has been coming to our country from Italy 2 billion 699 million dollars. We visited our country in 2014, 697 360 Italian tourists. While the $ 10 billion trade volume between 1997 Turkey and Italy in 1998 occurred between Turkey and Italy Ocalan crisis and the world global crisis than this figure with effect in 1998. In 1999, 5.8 billion dollars, also declined to lower levels. "Italy, the biggest trade partner after Germany Dan sturdy. Are among the findings that the use of full trade potential between the two countries. "Italy, the biggest trade partner after Germany Dan sturdy. Are among the findings that the use of full trade potential between the two countries. indicates largest decline in trade relations, but then again it has entered into an upward trend with exports to Italy to Turkey is still a big difference between Italy's exports to Turkey.

Keywords: Geography of Trade, Import and Export, Italy, Economic Geography

1-Giriş

Türkiye ve İtalya, Akdeniz Havzası'nda ortak çıkarları bulunan, ortak tarih ve değerleri paylaşan iki bölgesel güçtür. İki ülke ilişkilerini stratejik ticari ortaklık olarak tanımlamak mümkündür. İki ülkenin bölgesel ve küresel meselelere çözüm bulunması hususunda işbirliği içinde çalışma iradesi mevcuttur. AB'nin kurucu üyeleri arasında bulunan İtalya, ülkemizin AB üyelik sürecini güçlü ve görünür şekilde destekleyen ülkelerin başında gelmektedir. İtalya ülkemizin en önemli ticaret ortaklarından biridir. İtalya'da yaklaşık 35 bin vatandaşımız yaşamaktadır.

Ülkelerin ekonomik faaliyet farklılıkları ülkeler arası ticaretin artmasında en önemli etkenlerin başında gelir. İtalya ve Türkiye arsındaki bu ekonomik faaliyet farklılık iki ülke ekonomisinin birbirini tamamlayıcı nitelikte farklı ekonomik yapıların ortaya çıkmasına neden olmuştur. Bu durum ihracat ve ithalat açısından Türkiye ve İtalya arsında büyük bir ticari potansiyel yaratmaktadır.

Bu çalışmada Türkiye ve İtalya arasındaki ticaretin gelişimi 2000 yılından 2015 yılına kadar incelenerek Türkiye açısından oldukça büyük ve önemli bir pazar olan İtalya ile ithalat ve ihracat durumu ortaya konulmuştur. Yöntem olarak belli başlı ticari kalemlerde Türkiye ve İtalya arsındaki ticaret durumu incelenecektir. Ele alınan ürünler şunlardır: Teknolojik ürünler, Ham made, Gıda, Tekstil, Makine, Hayvancılık, vb. ürünlerdir. Bu ürünlere ilişkin Türkiye'nin de dış ticaret verileri toplanmıştır. İthalat ve ihracat verileri her bir üründe İtalya ile net ticaret (ihracat-ithalat) hesaplanmış ve Tablo ve grafik olarak verilmiştir. İthalat ve ihracat verileri 2000-2015 dönemini kapsamakta olup TÜİK dış ticaret istatistiklerinden derlenmiştir.

Bu çalışmanın önemi Türkiye'nin İtalya için zaman serisi olarak bu kalemler bazında net ticaretini gösterecek ve potansiyel ticaret için Türkiye ve İtalya arsında bazı seçilmiş kalemlerde dış ticaret ilişkileri ve ticaretinin geleceği hakkında bir fikir verecektir. Dolayısıyla böyle bir bilgi bazı karar alıcı birimlerin uzun dönemli plan ve strateji düzenlemelerine yardım edecektir. Sonuç olarak yaklaşık 60 milyonluk nüfusu ve

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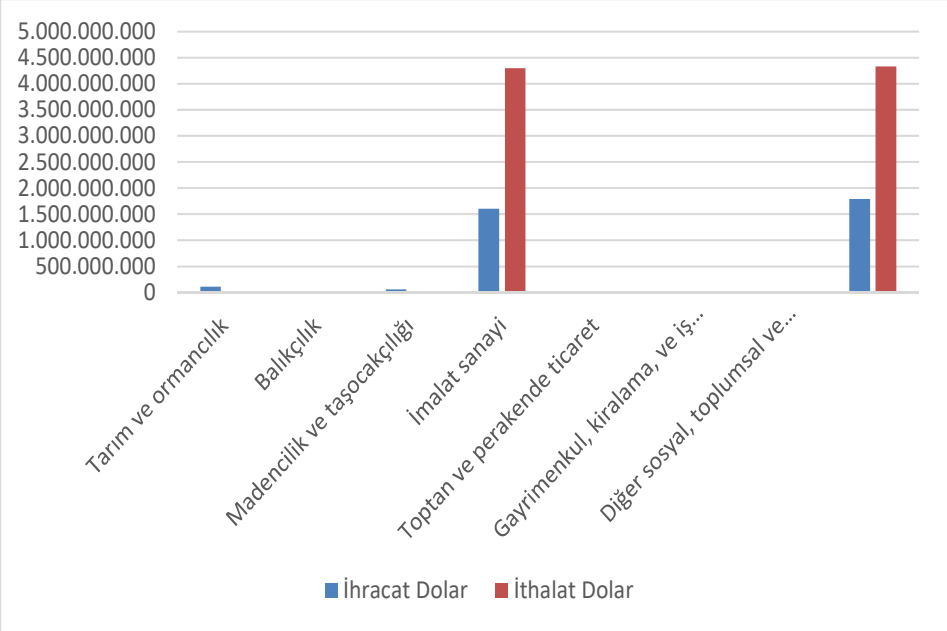
ticaretinin büyük bölümünü Avrupa Birliği ülkeleri dışına yapan İtalya dış ticaret yapısı gereği Türkiye için önemli bir ticari ortak haline gelmektedir.

2.1 2000 Yılında İtalya İle Türkiye Arasındaki Ticari İlişkiler

Ürün adı	İhracat Dolar	İthalat Dolar	İhracat ve İthalat Farkı
Tarım ve ormancılık	109.572.846	17.573.908	91.998.938
Balıkçılık	8.194.066	3.767	8.190.299
Madencilik ve taşocakçılığı	59.967.389	15.449.606	44.517.783
İmalat sanayi	1.602.000.262	4.295.889.358	-2.693.889.096
Toptan ve perakende ticaret	9.374.488	3.305.452	6.069.036
Gayrimenkul, kiralama, ve iş faaliyetleri		43.419	-43.419
Diğer sosyal, toplumsal ve kişisel hizmetler	198.386	522.757	-324.371
Toplam	1.789.307.437	4.332.788.267	-2.543.480.830



Grafik 4: 2000 yılı Türkiye ve İtalya (ihracat ve ithalat)

Yukarıdaki tabloda 2000 yılı İtalya ve Türkiye arasındaki ithalat ve ihracat payları verilmiştir. Bu verilere göre ulaşabileceğimiz sonuçlar şunlardır; tablodan anlaşılacağı gibi Türkiye'nin 2000 senesinde İtalya'dan en çok ithal ettiği ürün (4.295.889.358 dolar) İmalat sanayi olarak görülmektedir. İtalya'ya ikinci en çok ithal edilen başka bir değişle ürkiye'nin kasasından para çıktığı ürün ise Tarım ve Ormancılık (17.573.908 dolar) yer almaktadır. Bunu 15.449.606 dolarla Maden ve taşocakçılığı takip etmektedir. Türkiye'nin İtalya ile 2000 senesinde yaptığı ihracat paylarına bakılacak olursa Türkiye'nin kasasına en fazla girdiyi 1.602.000.262 dolarla en çok ithal edilen imalat sanayi busefer de ençok ihraç edilen ürün olarak yer almaktadır. İkinci kar edilen dışa satımı yüksek olan ürün ise bakıldığında 109.572.846 dolarla tarım ve ormancılık ikinci kar elde edilen üründür. Türkiye'nin en fazla ithal ettiği ve en çok ihraç ettiği ürün olan imalat sanayi ürünleri ithalat ve ihracat farkına bakıldığında kasadan en çok paranın çıktığı ve Türkiye'nin bundan kar etmediği görülmektedir (-2.693.889.096).

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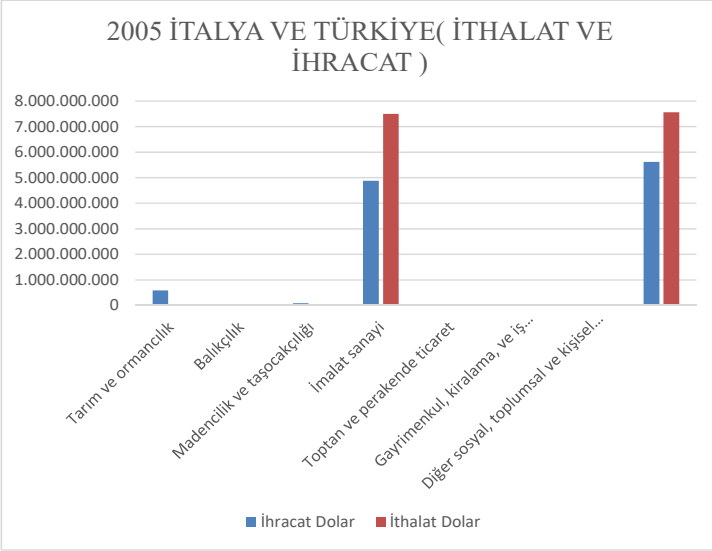
2000 senesi İtalya ile yapılan ihracat ve ithalat farklarına bakıldığında Türkiye'nin İtalya'dan aldığı ve dışa bağımlılığının olduğu gözlenen ürünler ise şöyle sıralanabilir; imalat sanayi ve Gayrimenkul, kiralama ve iş faaliyetleri ürünleri yer almaktadır. Bunun yanı sıra Gayrimenkul, kiralama ve iş faaliyetlerinde ihracatta veri bulunmayıp ithal edildiği görülmektedir.

2.2 2005 Yılında İtalya İle Türkiye Ticari İlişkiler

Ürün Adı	İhracat Dolar	İthalat Dolar	İhracat ve İthalat Farkı
Tarım ve ormancılık	591.839.552	29.081.420	562.758.132
Balıkçılık	41.005.297	45.215	40.960.082
Madencilik ve taşocakçılığı	87.796.760	20.588.148	67.208.612
İmalat sanayi	4.880.007.921	7.506.080.537	-2.626.072.616
Toptan ve perakende ticaret	16.066.489	4.347.173	11.719.316
Gayrimenkul, kiralama ve iş faaliyetleri		3.876.406	-3.876.406
Diğer sosyal, toplumsal ve kişisel hizmetler	39	2.243.171	-2.243.132
Toplam	5.616.754.657	7.566.262.070	-1.949.507.413



Grafik 3: 2005 italya ve Türkiye Ticareti(ithalat ve ihracat)

Yukarıdaki tabloda 2005 yılı İtalya ve Türkiye arasındaki ithalat ve ihracat payları verilmiştir. Bu verilere göre ulaşabileceğimiz sonuçlar şunlardır; tablodan anlaşılacağı gibi Türkiye'nin 2005 senesinde İtalya'dan en çok ithal ettiği ürün (7.506.080.537 dolar) İmalat sanayi olarak görülmektedir. İtalya'ya ikinci en çok ithal edilen başka bir değişle Türkiye'nin kasasından para çıktığı ürün ise Tarım ve Ormancılık (29.081.420 dolar) yer almaktadır. Bunu 20.588.148 dolarla Maden ve taşocakçılığı takip etmektedir. Türkiye'nin İtalya ile 2005 senesinde yaptığı ihracat paylarına bakılacak olursa Türkiye'nin kasasına en fazla girdiyi 4.880.007.921 dolarla en çok ithal edilen imalat sanayi busefer de ençok ihraç edilen ürün olarak yer almaktadır. İkinci kar edilen dışa satımı yüksek olan ürün ise bakıldığında 591.839.552 dolarla tarım ve ormancılık ikinci kar elde edilen üründür. Tabloya bakıldığında en çok ihraç edilen dolar bazında payda imalat sanayi yer alması gerekirken 4.880.007.921 dolarlık bir payla ithalatına bakıldığında girdinin çıktıdan daha fazla olduğu (7.506.080.537 dolar) ve bu yüzden kar edilmediğini aksine kasadan para çıktığını görmekteyiz.

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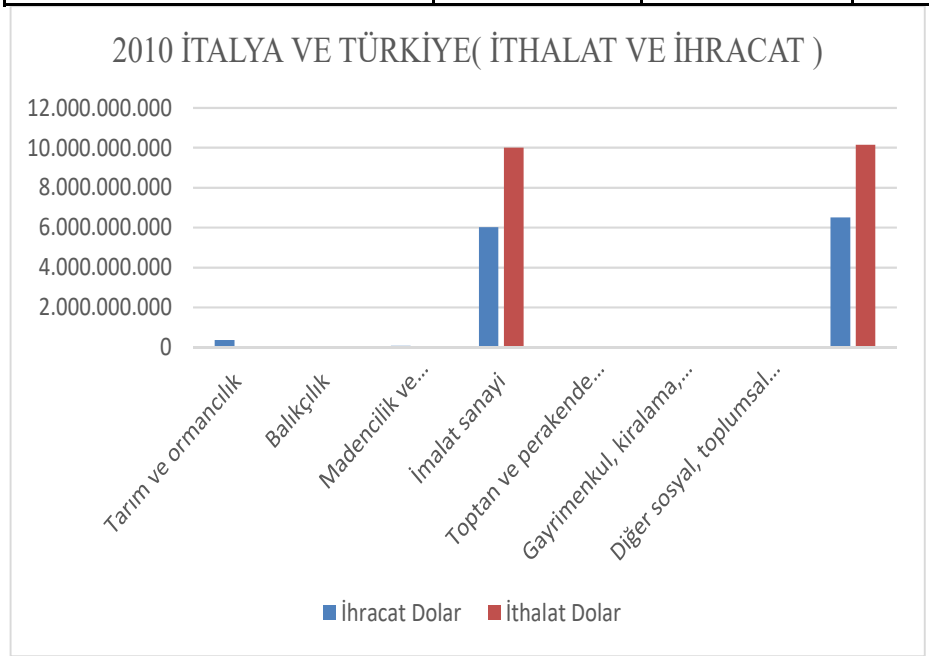
2005 senesi İtalya ile yapılan ihracat ve ithalat farklarına bakıldığında Türkiye'nin İtalya'dan aldığı ve dışa bağımlılığının olduğu gözlenen ürünler ise şöyle sıralanabilir; imalat sanayi ve Gayrimenkul, kiralama ve iş faaliyetleri ürünleri yer almaktadır. Bunun yanı sıra Gayrimenkul, kiralama ve iş faaliyetlerinde ihracatta veri bulunmayıp ithal edildiği görülmektedir.

2.3 2010 Yılında İtalya İle Türkiye Arasındaki Ticari İlişkiler

Ürün Adı	İhracat Dolar	İthalat Dolar	İhracat ve İthalat Farkı
Tarım ve ormancılık	370.248.969	41.559.500	328.689.469
Balıkçılık	20.962.372	350.461	20.611.911
Madencilik ve taşocakçılığı	78.079.032	16.808.188	61.270.844
İmalat sanayi	6.024.478.371	10.011.293.327	-3.986.814.956
Toptan ve perakende ticaret	11.453.612	66.800.759	-55.347.147
Gayrimenkul, kiralama ve iş faaliyetleri		38.052	-38.052
Diğer sosyal, toplumsal ve kişisel hizmetler	54.501	3.037.587	-2.983.086
Toplam	6.505.276.857	10.139.887.874	-3.634.611.017



Grafik 2: 2010 Türkiye ve İtalya arasında yapılan ithalat ve ihracat

Yukarıdaki tabloda 2010 yılı İtalya ve Türkiye arasındaki ithalat ve ihracat payları verilmiştir. Bu verilere göre ulaşabileceğimiz sonuçlar şunlardır; tablodan anlaşılacağı gibi Türkiye'nin 2010 senesinde İtalya'dan en çok ithal ettiği ürün (10.011.293.327 dolar) İmalat sanayi olarak görülmektedir. İtalya'ya ikinci en çok ithal edilen başka bir değişle Türkiye'nin kasasından para çıktığı ürün ise Toptan ve perakende ticaret (66.800.759 dolar) yer almaktadır. Bunu 41.559.500 dolarla tarım ve ormancılık takip etmektedir. Türkiye'nin İtalya ile 2010 senesinde yaptığı ihracat paylarına bakılacak olursa Türkiye'nin kasasına en fazla girdiyi İtalya'ya yapılan ihracatlardan İtalya'ya 3. En çok ithal edilen ürün olan Tarım ve ormancılık 370.248.969 dolarla bu sefer ihracatta başta gelmektedir. İkinci kar edilen dışa satımı yüksek olan ürün ise bakıldığında 78.079.032 dolarla madencilik ve taş

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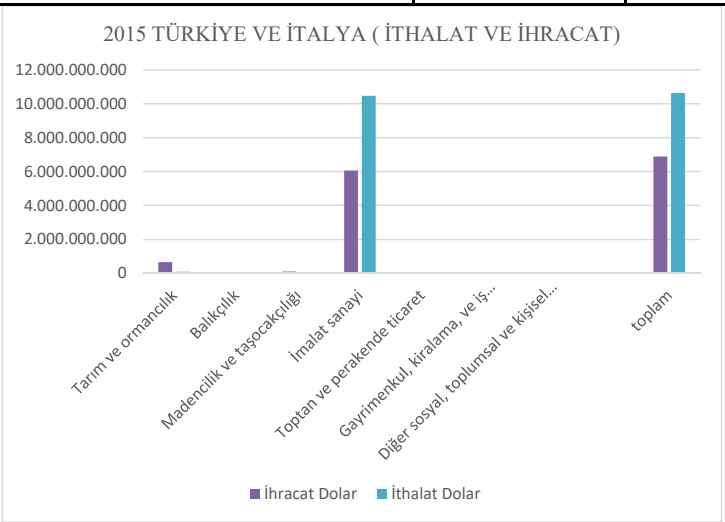
ocakçılığı ikinci kar elde edilen üründür. Tabloya bakıldığında en çok ihraç edilen dolar bazında payda imalat sanayi yer alması gerekirken 6.024.478.371 dolarlık bir payla ithalatına bakıldığında girdinin çıktıdan daha fazla olduğu (10.011.293.327 dolar) ve bu yüzden kar edilmediğini aksine kasadan para çıktığını görmekteyiz.

2010 senesi İtalya ile yapılan ihracat ve ithalat farklarına bakıldığında Türkiye'nin İtalya'dan aldığı ve dışa bağımlılığının olduğu gözlenen ürünler ise şöyle sıralanabilir; imalat sanayi ve Toptan ve perakende ticaret ürünleri yer almaktadır. Türkiye'nin en az ithal ve ihraç ettiği ürün ise Gayrimenkul, kiralama ve iş faaliyetleri yer almaktadır ithalatta payı bulunmayıp ihraç edildiği görülmektedir.

2.4 2015 Yılında İtalya İle Türkiye Arasındaki Ticari İlişkiler

Ürün adı	İthalat Dolar	İhracat Dolar	İhracat ve İthalat Farkı
Tarım ve ormancılık	657.945.013	94.412.105	-563.532.908
Balıkçılık	53.063.094	56.334	-53.006.760
Madencilik ve taşocakçılığı	102.689.255	16.663.708	-86.025.547
İmalat sanayi	6.056.893.130	10.473.059.888	4.416.166.758
Toptan ve perakende ticaret	20.255.514	53.924.781	33.669.267
Gayrimenkul, kiralama, ve iş faaliyetleri		258.133	258.133
Diğer sosyal, toplumsal ve kişisel hizmetler	44.124	1.954.232	1.910.108
Toplam	10.640.329.181	6.890.946.464	-3.749.382.717



Grafik 1: 2015 Yılı Türkiye ve İtalya ihracat ve ithalat

Yukarıdaki tabloda 2015 yılı İtalya ve Türkiye arasındaki ithalat ve ihracat payları verilmiştir. Bu verilere göre ulaşabileceğimiz sonuçlar şunlardır; tablodan anlaşılacağı gibi Türkiye'nin 2015 senesinde İtalya'dan en çok ithal ettiği ürünler 6.056.893.130 dolarla İmalat sanayi ürünleri yer almaktadır. İkinci en fazla ithal edilen ürün ise 657.945.013 dolarla Tarım ve Ormancılık ürünleri mevcuttur. 2015 senesinde İtalya'dan ithal edilen en az ürün ise Gayrimenkul Kiralama ve İş faaliyetleri yer almaktadır. Tabloya göre ihracat ürünlerine bakılacak olursa en çok İtalya'ya ihraç edilen ürün İtalya'dan en çok ithal edilen imalat sanayi ürünleri 10.473.059.888 dolarla yer almaktadır. İkinci en çok ihraç edilen ürün ise tabloda görüldüğü gibi 94.412.105 dolarla Tarım ve Ormancılık

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ürünleri yer almaktadır. Türkiye'nin 2015 senesinde İtalya'ya en az ihraç ettiği ürün ise görüldüğü üzere 56.334 dolarla Balıkçılık gelmektedir.

Türkiye'nin İtalya'ya ihraç ettiği ürünlere bakılacak olursa ihracat ve ithalat farkından anlaşılacağı gibi kar ettiği ve Türkiye'ye ekonomik girdi olarak 4 ürün göze çarpmaktadır. Bunlar başta İmalat Sanayi (4.416.166.758 dolar) olmak üzere takiben Toptan ve Perakende Ticaret (33.669.267 dolar). Diğer Sosyal, Toplumsal ve Kişisel Hizmetler (1.910.108 dolar) le devam etmekte ve 4. Ürün ise payı azda olsa kar ettiği ürün Gayrimenkul, kiralama ve iş faaliyetleri (258.133 dolar) yer almaktadır. Türkiye'nin kar ettiği gibi ithalatta kasasından para çıktığını da görmekteyiz bunun için ihracat ve ithalat farklarına baktığımızda Türkiye'nin 3 üründe kasasından para çıktığını ve ihracatın ithalattan az olup dışa bağımlılığı olduğu ürünleri görebilmekteyiz. Bu ürünler şöyle sıralanabilir en çok fark ve en çok para akışı olan ürün Tarım ve Ormancılık (-563.532.908 dolar) dır. İkinci olarak ise Madencilik ve taşocakçılığı (-86.025.547) yer almaktadır son olarakta Balıkçılık (-53.006.760 dolar) Türkiye'nin kasasından para çıkmasına neden olmuş üründür.

3. Sonuç ve Öneriler

İtalya ekonomik ve ticari ilişkileri bakımından Türkiye için olan önemini korumaktadır. Türkiye'nin ithalatında Almanya'dan sonra İtalya ikinci sırada kendini göstermektedir. İtalya ile Türkiye arasında 5 yıllık periyotlarla incelediğimiz ticari ilişkilerde Türkiye ve İtalya ithalat ve ihracatta birbirlerine bağlı olduklarını görmekteyiz. Türkiye'nin ihracatında geleneksel olarak son yıllarda otomotiv sanayi ürünleri (imalat) ve parçaları makineli cihazlar ve beyaz eşya elektrikli cihazlar önemli ölçüde ihracatımızda yer almaktadır. Türkiye'nin kasasına İtalya'ya ihracattan doğan girdiye bakıldığında 2000-2005-2010-2015 senelerinde ençok girdiyi sağlayan ve karı yüksek olan ürünler imalat sanayi olarak görülmekte.

Türkiye'nin üç tarafı denizlerle çevrili olmasına rağmen İtalya'dan balık ithalatı yapması tuhaf ama gerekçesine bakılacak olursa Türkiye'nin tüketimde balıkçılığın İtalya'dan fazla olması ve bunun yetersiz olmasından dolayı İtalya'dan balık ithalatı yapıldığı aşinadır. Tarım ve ormancılığa dayalı sanayi faaliyetlerinde Türkiye'nin İtalya'ya bazen ihraç ettiğini bazen de ithal etmek zorunda kaldığını görmekteyiz. Gayrimenkul, kiralama ve iş faaliyetlerinde verilere bakıldığında 2000-2005-2010-2015 senelerinde Türkiye'nin ihracat verilerinin bulunmayıp bu ürünleri İtalya'dan ithal ettiği görülmektedir. Buda bize İtalya'nın hizmetler sektörüne bağlı olan Gayrimenkul, kiralama ve iş faaliyetlerinde geliştiğini ve rağbet gördüğünü göstermektedir.

İtalya ülkemizin geleneksel tarımsal ürünlerinin ihracatında önemli Pazar konumunu muhafaza etmektedir tarımsal ürünler ihracatımızda başlıca ürünler olan zeytinyağı, fındık, kuru incir ve Antep fıstığı ihracatında İtalya ilk sırada yer almaktadır. Son yıllarda İtalya'ya yönelik ihracatımızın ürün bileşiminde önemli bir gelişme göstermektedir. Türkiye'nin İtalya'yla yaptığı ticari ilişkilerde incelediğimiz 5 yıllık periyotlarda Diğer sosyal, toplumsal ve kişisel hizmetler sektöründe İtalya'nın az farkla da olsa önde olduğunu ve Türkiye'nin İtalya için Pazar konumunda olduğu görülmektedir. İtalya ve Türkiye'nin ticari ilişkilerinin gelişmiş olmasının iki ülkenin de Akdeniz'e kıyısı olup deniz yolu ulaşımında gelişmiş olmasının büyük etkisi bulunmaktadır. Bunun yanı sıra Türkiye ve İtalya arasında imzalanan ticari protokollerde bu ilişkiyi güçlendirmekte ve Türkiye'nin ekonomisinin gelişmesinde etkisi aşikârdır.

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TÜRKİYE' DE KÜRESELLEŞMENİN ÇEVRESEL KALİTE ÜZERİNDEKİ ETKİSİ: EKONOMETRİK BİR ANALİZ[1]

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Özet

Bu çalışmanın amacı Türkiye' de küreselleşme, ekonomik büyüme ve doğrudan yabancı sermaye yatırımlarının CO2 salınımı üzerindeki potansiyel etkisini eşbütünleşme ve vektör hata düzeltme modeline dayalı nedensellik testi ile araştırmaktır. Bu çalışmada örneklem 1974-2011 dönemini kapsamaktadır. Ampirik sonuçlar değişkenlerin eşbütünleşik olduğunu ve küreselleşme, ekonomik büyüme ve doğrudan yabancı sermaye yatırımlarının CO2 salınımı üzerinde pozitif bir etkisi olduğunu göstermektedir. Nedensellik test sonuçları ise, uzun dönemde küreselleşme, ekonomik büyüme ve doğrudan yabancı sermaye yatırımlarından CO2 salınımına doğru tek yönlü bir nedensellik ilişkisi ortaya koymaktadır.

Anahtar Kelimeler: Küreselleşme, CO_2 salınımı, Türkiye, eşbütünleşme, nedensellik

THE EFFECT OF GLOBALİZATİON ON ENVİRONMENTAL QUALİTY İN TURKEY: AN ECONOMETRİC ANALYSİS

Abstract

The aim of this study to investigate the potential impact of globalization, economic growth and foreign direct investment on CO2 emissions in Turkey using cointegration and causality test within the Vector Error-Correction Model (VECM). This paper covers the sample period from 1974 to 2011. The empirical results show that the variables are cointegrated and globalization, economic growth and foreign direct investment have positive impact on CO2 emissions. The causality test results reveal a unidirectional causality from globalization, economic growth and foreign direct investment to CO2 emissions in the long run.

Key words: Globalization, CO_2 emission, Turkey, cointegration, causality

Giriş

Küreselleşme, dünya genelinde sosyal, kültürel ekonomik ve politik yönden insan hayatının her yönünü etkilemektedir. Küreselleşme ile beraber, ekonomiler arasındaki karşılıklı bağımlılık ve toplumlar arasında bilgi, fikir, teknoloji, sermaye, emek, mal ve hizmet akımları giderek artmış; piyasaları düzenleyen ve kontrol eden ulusal hükümetlerin geleneksel rollerine karşı bir tavır ortaya çıkmıştır (Esty ve Ivanova, 2004). Bu süreç içinde, ekonomilerde finansal gelişme, yabancı sermaye yatırımları ve serbest ticaret hacmi artmış ve tüm piyasalarda artan dış rekabet yüksek büyüme oranları ile sonuçlanmıştır (Shahbaz vd., 2015). Diğer taraftan ekonomik büyümenin ve bütünleşmenin bu hızlı temposu dünya genelinde bir takım sorunlara da yol açmıştır. Bu kapsamda ekonomistler özellikle küreselleşmenin çevre üzerindeki etkisini şiddetle tartışmaya başlamıştır (Baek vd., 2009). Bu tartışmalarda küreselleşme sıklıkla uluslararası serbest ticaret ile eşanlamlı kabul edilmiş (Huwart ve Verdier, 2013) ve bir ülkenin küreselleşme düzeyi o ülkenin serbest ticaret düzeyi/dışa açıklık oranı ile ölçülmüştür (Shahbaz vd., 2015).

Teorik literatürde küreselleşmenin çevre üzerindeki etkisine yönelik iki farklı görüş bulunmaktadır. Bu görüşlerden birincisine göre küreselleşme çevre kalitesini azaltmaktadır. Çünkü küreselleşmenin bir sonucu olarak artan ekonomik faaliyetler- sanayileşme, kentleşme, ticaret, yatırım gibi- büyük miktarlarda doğal kaynak kullanımına neden olmakta ve dünya genelinde biyolojik çeşitlilik, hava, toprak, su ve ormanlar üzerindeki baskıyı giderek arttırmaktadır (Esty ve Ivanova, 2004; Jobert vd., 2015). Buna ilaveten küreselleşme hükümetlerin çevresel koruma kapsamındaki düzenleme güçlerini baltalamakta ve bu durum kirli endüstrilerde faaliyette bulunan çok uluslu şirketler için dünya genelinde önemli yatırım alanları ve imkânları sağlamaktadır (Christmann ve Taylor, 2001).

İkinci görüşe göre ise, küreselleşme çevre kalitesini iyileştirmektedir. Bu görüşe göre, artan ticaretle beraber sanayileşme, sermaye hareketleri, araştırma ve yenilik faaliyetlerinin küreselleşmesi dünya genelinde enerji verimliliği ve daha temiz teknolojilerin gelişimine katkıda bulunarak yeşil büyüme sürecini teşvik etmektedir. Dahası küreselleşen bilgi, dünya genelinde çevresel sorunlar karşısında hassasiyetleri arttırmakta ve çevre

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politikalarının gelişimi için büyük bir seferberlik sağlamaktadır (Shahbaz vd., 2016). Ayrıca çokuluslu şirketler gelişmiş ülkelerdeki yeşil teknolojileri, çevresel standartları ve uygulamaları gelişmekte olan ülkelere aktararak gelişmekte olan ülkelerde çevresel sorunların azalmasına çok önemli katkılarda bulunabilmektedir (Christmann ve Taylor, 2001).

Bu iki farklı görüş literatürde ampirik çalışmalar ile araştırılmaktadır. Bu kapsamda birinci grup çalışmalar küreselleşmenin çevre üzerinde olumsuz etkisi olduğu yönündeki görüşü destekler sonuçlara ulaşmıştır. Bu kapsamda Dinda (2006), küreselleşmenin göstergesi olarak dışa açıklığın CO2 salınımı üzerindeki etkisini 1965-1990 dönemi 54 ülke için panel veri yöntemi ile araştırmıştır. Ülkeler OECD, OECD üyesi olmayan ülkeler ve toplam ülkeler (her iki grubun toplamı) olmak üzere üç gruba ayrılmıştır. Her üç ülke grubu için bulgular küreselleşmenin CO2 salınımını üzerinde arttırıcı bir etkisi olduğunu göstermektedir. Leitao (2013), 1980-2010 dönemi İrlanda, İspanya, Portekiz ve Yunanistan' da küreselleşmenin CO2 salınımı üzerindeki etkisini sabit etkiler modeli ile tahmin etmiştir. Küreselleşmenin göstergesi olarak sadece dışa açıklığı değil; sosyal, ekonomik ve politik küreselleşmeyi de kapsayan ve Dreher (2006) tarafından hesaplanan küreselleşme endeksini kullanmıştır. Çalışmanın sonucunda küreselleşmenin CO2 salınımını arttırdığı bulgusuna ulaşmıştır. Shahbaz vd. (2015), 1970-2012 dönemi Hindistan' da Dreher (2006) tarafından hesaplanan küreselleşme endeksinin CO2 salınımı üzerindeki etkisini Gecikmesi Dağıtılmış Otoregresif Model (ARDL) yöntemi ile araştırmıştır. Çalışmada küreselleşmenin CO2 salınımı üzerinde artırıcı bir etkisi olduğu bulgusu elde edilmiştir. Mehrara (2016), 1970-2011 dönemi İran' da dışa açıklığın CO2 salınımı üzerindeki etkisini ARDL yöntemi ile araştırmıştır. Çalışmada dışa açıklık oranındaki artışın CO2 salınımını arttırarak çevresel kaliteyi bozduğu sonucuna ulaşılmıştır.

İkinci grup çalışmalar ise küreselleşmenin çevresel kaliteyi iyileştirdiği görüşünü destekler bulgulara ulaşmıştır. Bu yönde Ling vd. (2015), 1970-2011 çeyrek dönemlik veri seti ile dışa açıklığın CO2 salınımı üzerindeki etkisini ARDL yöntemi ile Malezya için tahmin etmiştir. Çalışmada dışa açıklığın CO2 salınımını azaltarak çevre üzerinde olumlu bir etkisi olduğu sonucuna ulaşılmıştır. Shahbaz vd. (2016), 1971-2012 dönemi Afrika ülkelerinde küreselleşme endeksinin CO2 salınımı üzerindeki etkisini ARDL yöntemi ile araştırmıştır. Çalışmada küreselleşmenin Angola, Kamerun, Kenya, Kongo, Libya, Mısır, Tunus ve Zambiya' da CO2 salınımını azalttığı; Fas, Gana, Güney Afrika, Sudan ve Tanzanya'da ise arttırdığı sonucuna ulaşmıştır.

Bu çalışma ise küreselleşmenin çevresel kalite üzerindeki etkisini 1974-2011 Türkiye için eşbütünleşme ve nedensellik yöntemleri ile sınamayı amaçlamaktadır. Çalışmada küreselleşme, Dreher (2006) tarafından hesaplanan küreselleşme endeksi (sosyal, ekonomik ve politik küreselleşmeyi kapsayan) ile temsil edilmektedir. Bildiğimiz kadarıyla bu çalışma, küreselleşme ve CO2 salınımı arasındaki ilişkiyi Türkiye için araştıran ilk çalışmadır. Bu çalışma ile literatüre katkı yapılması hedeflenmiştir. Bu hedef çerçevesinde çalışmanın geri kalanı şöyle düzenlenmiştir: Girişten sonraki birinci bölümde materyal ve yöntem açıklanacaktır. İkinci bölümde ekonometrik bulgulara yer verilecek ve sonuç bölümünde bulgular değerlendirilecektir.

Materyal ve Yöntem

Çalışmada 1974-2011 dönemi Türkiye' de yıllık verilerle küreselleşmenin çevre kalitesi üzerindeki etkisini ekonometrik yöntemler ile sınamak için aşağıdaki gibi bir denklem tanımlanmıştır:

$$CO_{2t} = \beta_0 + \beta_1 Y_t + \beta_2 FDI_t + \beta 3i\ GLOB_{it} + \varepsilon_t \quad (1)$$

(1) numaralı denklemde CO2, çevresel kalite düzeyini temsilen kişi başına düşen CO2 salınımını (metrik ton) ve GLOB, küreselleşme endeksini göstermektedir. Modele kontrol değişken olarak dâhil edilen Y ve FDI sırasıyla kişi başına düşen gayrisafi yurtiçi hasılayı (2010 yılı sabit fiyatlarla $ cinsinden) ve doğrudan yabancı sermaye yatırımlarını (Gayrisafi milli hasıla içindeki % payı) ifade emektedir. Küreselleşme endeksi Dreher (2006) ve Dreher vd., (2008) hesaplamalarından, diğer göstergeler Dünya Bankası Kalkınma göstergelerinden elde edilmiştir. Değişkenlerin tamamının doğal logaritması alınmıştır. (1) numaralı denklemde t indisi dönem aralığını, ε hata terimini, β_0 sabit terimi ve β_1, β_2 ve β_3 ise sırasıyla gelir, doğrudan yabancı sermaye yatırımları ve küreselleşme değişkenlerinin tahmin edilecek esneklik katsayılarını göstermektedir.

Çalışmada ekonometrik analiz için öncelikle değişkenlere ait serilerin durağanlıkları sınanacaktır. Çünkü durağan olmayan seriler ile yapılan tahminlerde sahte regresyon sorunu ortaya çıkmaktadır (Granger ve Newbold, 1974). Bunun için Dickey ve Fuller (1981) ve Phillips ve Perron (1988) tarafından geliştirilen geleneksel birim kök testleri sıklıkla kullanılmaktadır. Birim kök testleri sonucunda genellikle serilerin düzey değerlerinde durağan olmadığını ancak ilk farklarında durağan olduğunu gözlemlenmektedir. Bu durumda değişkenler arasındaki ilişkilerin tespit edilebilmesi için eşbütünleşme analizleri gerekmektedir. Eşbütünleşme

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analizi, değişkenlere ait seriler durağan olmasa bile, bu serilerin durağan bir doğrusal kombinasyonunun var olabileceğini ve eğer varsa, bunun ekonometrik olarak belirlenebileceğini işaret etmektedir. Böyle bir ilişki durumda değişkenlere ait katsayı tahmininde sahte regresyon sorunu ortadan kalkacaktır. Literatürde Engle ve Granger (1987), Johansen (1988) ve Johansen ve Juselius (1990) tarafından geliştirilen eşbütünleşme yöntemleri sıklıkla kullanılmaktadır. Bu kapsamda çalışmada Johansen ve Juselius (kısaca JJ, 1990) tarafından geliştirilen eşbütünleşme yöntemi tercih edilmiştir. JJ sınaması, modeldeki tüm değişkenleri endojen (içsel) kabul ettiğinden VAR modeli tahmin edilmekte ve Akaike Information Criterion (AIC), Schwarz (SC), Final Prediction Error (FPE) ve Likelihood Ratio (LR) ve HQ (Hannan-Quinn Bilgi Kriteri) gibi bilgi kriterleri kullanılarak optimal gecikme uzunluğu belirlenmektedir. Ayrıca belirlenen gecikme uzunluğunda otokorelasyon ve değişen varyans probleminin olmaması gerekmektedir. Sonraki aşamada JJ tarafından geliştirilmiş olan maksimum özdeğer istatistiği ve İz (trace) istatistiği testleri kullanılacaktır. İz testi sıfır (null) hipotezini "en çok r kadar koentegre vektör vardır" şeklinde ifade etmektedir. Maksimum özdeğer testi ise, "r kadar koentegre vektör vardır" sıfır hipotezine karşılık r+1 kadar vardır alternatif hipotezini test etmektedir. Testler sonucunda elde edilen λtrace ve λmax istatistik değerlerinin karşılaştırılacağı kritik değerler JJ tarafından oluşturulmuştur. Test sonucu eşbütünleşme ilişkisinin varlığını işaret ediyorsa, normalleştirme işlemi yapılarak (-1 ile çarpma) uzun dönem katsayıları tahmin edilmektedir.

Ekonometrik analizin son aşamasında değişkenler arasındaki ilişkinin yönünü belirlemek için vektör hata düzeltme modeline dayalı Granger (VEC) nedensellik test yöntemi kullanılacaktır. Bu yöntemde serilerin gecikmeli değerleri hata düzeltme terimine eklenerek standart Granger nedensellik testi kullanılabilmektedir. Bu kapsamda X ile Y değişkenleri arasındaki nedensellik ilişkisinin araştırılmasında kullanılan bir hata düzeltme modeli şu şekilde tanımlanmaktadır:

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^{m} \alpha_{1i} \Delta Y_{t-i} + \sum_{i=1}^{m} \alpha_{2i} \Delta X_{t-i} + \psi EC_{t-1} + e_{1t} \quad (2)$$

$$\Delta X_t = \beta_0 + \sum_{i=1}^{m} \beta_{1i} \Delta X_{t-i} + \sum_{i=1}^{m} \beta_{2i} \Delta Y_{t-i} + \Phi EC_{t-1} + \varepsilon_{1t} \quad (3)$$

2-3 numaralı denklemler hem kısa hem de uzun dönem nedensellik ilişkisinin araştırılmasında kullanılmaktadır. Kısa dönem nedensellik araştırması Wald tetsi ile ($\alpha_{2i} = 0$) yapılmaktadır. Uzun dönem nedensellik ilişkisi ise hata düzeltme katsayısının (ψ ve Φ) istatistiki olarak anlamlı olması durumunda geçerli kabul edilmektedir.

Ekonometrik Bulgular

Tablo 1' de birim kök test sonuçları raporlanmıştır. Test sonuçlarına göre değişkenlerin düzey değerlerinin birim kök içerdiği ve bu nedenle durağan olmadığı görülmektedir. Bu nedenle değişkenlerin ilk farkları alınarak tekrar birim kök testine tabi tutulmuş ve tüm değişkenlerin ilk farklarında durağan olduğu görülmüştür.

Tablo 1: Birim Kök Test Sonuçları

Değişkenler*		ADF test istatistiği		PP test istatistiği	
		Sabitli	Sabitli ve Trendli	Sabitli	Sabitli ve Trendli
CO2		-0,63	-2,65	-0,55	-2,77
Y		-0,28	-2,52	-0,15	-2,63
FDI		-1,58	-4,67a	-1,20	-4,63a
GLOB		-1,78	-2,33	-5,02a	-7,47a
ΔCO2		-5,82a	-5,73a	-6,06a	-5,93a
ΔY		-4,20a	-5,83a	-5,84a	-5,92a
ΔFDI		-8,49a	-8,45a	-9,51a	-9,24a
ΔGLOB		-6,02a	-6,68a	-7,47a	-16,61a
Kritik Değerler	%1	-3,62	-4,22	-3,62	-4,22
	%5	-2,94	-3,53	-2,94	-3,53
	%10	-2,61	-3,20	-2,61	-3,20

Not:
* Δ, ilk fark işlemcisini temsil etmektedir.
a, %1 önem düzeyinde istatistiki anlamlılığı göstermektedir.

Birim kök testinden sonra, değişkenler arasında uzun dönemli bir ilişkinin varlığını sınamak için JJ eşbütünleşme testi uygulanmış, test sonuçları Tablo 2' de raporlanmıştır. Test için uygun gecikme uzunluğu 1 olarak seçilmiş ve bu gecikmede değişen varyans ve otokorelasyon sorunları gözlemlenmemiştir. Test sonuçlarına göre, maksimum özdeğer istatistiği değişkenler arasında bir eşbütünleşme ilişkisini % 5 anlamlılık

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düzeyinde desteklemektedir. Buna göre CO2, gelir, doğrudan yabancı sermaye yatırımları ve küreselleşme arasında uzun dönemli bir denge ilişkisi geçerlidir.

Tablo 2: Eşbütünleşme Test Sonuçları

Sıfır Hipotez (Ho)	Alternatif Hipotez (H1)	Iz (Trace) istatistiği	Kritik değer (%5)	Sıfır Hipotez (Ho)	Alternatif Hipotez (H1)	Maks. Özdeğer istatistiği	Critical value (%5)
r=0	r>0	45,04	47,85	r=0	r=1	28,83*	27,58
r≤1	r>1	16,21	29,79	r=1	r=2	12,75	21,13
r≤2	r>2	3,45	15,49	r=2	r=3	3,41	14,26
r≤3	r>3	0,04	3,84	r=3	r=4	0,04	3,84

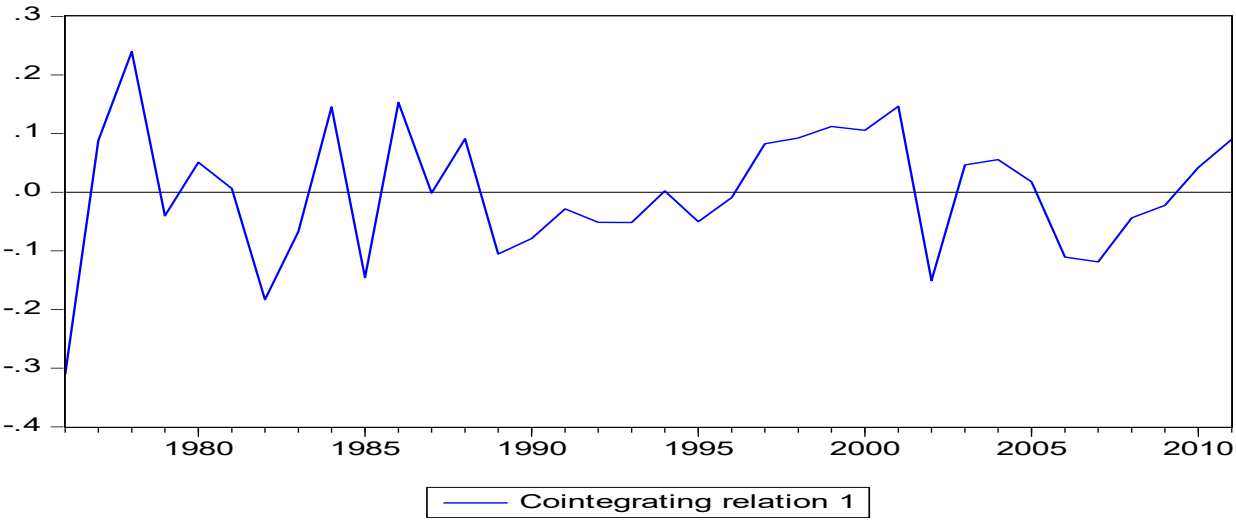
Eşbütünleşme ilişkisinin elde edilmesinden sonra gelir, doğrudan yabancı sermaye yatırımları ve küreselleşmenin CO2 salınımı üzerindeki etkisini ortaya koyan uzun dönem katsayıları tahmin edilmiştir. Tablo 3' de tahmin sonuçları gösterilmektedir. Tahmin sonuçlarına göre küreselleşmenin (GLOB) CO2 salınımı üzerindeki etkisi %5 anlamlılık düzeyinde pozitif yöndedir. Buna göre Türkiye' de küreselleşme süreci çevresel kaliteyi azaltıcı yönde bir etkiye neden olmaktadır. Modele kontrol değişken olarak dâhil edilen gelir ve doğrudan yabancı sermaye yatırımların CO2 salınımı üzerindeki etkisi de pozitif yöndedir. Diğer bir ifadeyle gelirde ve doğrudan yabancı sermaye yatırımlarındaki artışın çevresel kalite üzerindeki etkisi olumsuz yöndedir.

Tablo 3: Uzun Dönem Katsayılarının Tahmini

Değişkenler	Katsayı*	Standart Hata	t istatistiği
Y	0,31[b]	0,15	-2,07
FDI	0,12[a]	0,03	-4,19
GLOB	0,08[b]	0,03	-2,23
C (Sabit)	-1,86		

Not:
*, Normalleştirme işlemi içsel değişkenin ters işareti (-1) ile çarpılması sonucu gerçekleştirilmektedir.
[a], %1 ve [b], %5 önem düzeyinde istatistiki anlamlılığı göstermektedir.

Grafik 1'de tahmin edilen model için AR karakteristik polinomunun ters kökleri ve eşbütünleşme grafiği gösterilmektedir. Köklerin tamamının çember içinde olması ve simetrik izdüşümlere sahip olması ekonometrik modelin durağanlık açısından herhangi bir sorun taşımadığını ortaya koyup, eşbütünleşme ilişkisinin normal bir dağılım taşıdığını ve uygun bir matematik formu ile çalıştığını doğrulamaktadır. Sistemin eşbütünleşme grafiği değerlendirildiğinde ise, eşbütünleşme ilişkisine ait grafiksel eğilimin 0 etrafında dalgalanması modelde yer alan ve tek tek durağan olmayan değişkenlerin doğrusal bileşiminin durağan olduğunu ortaya koymaktadır.



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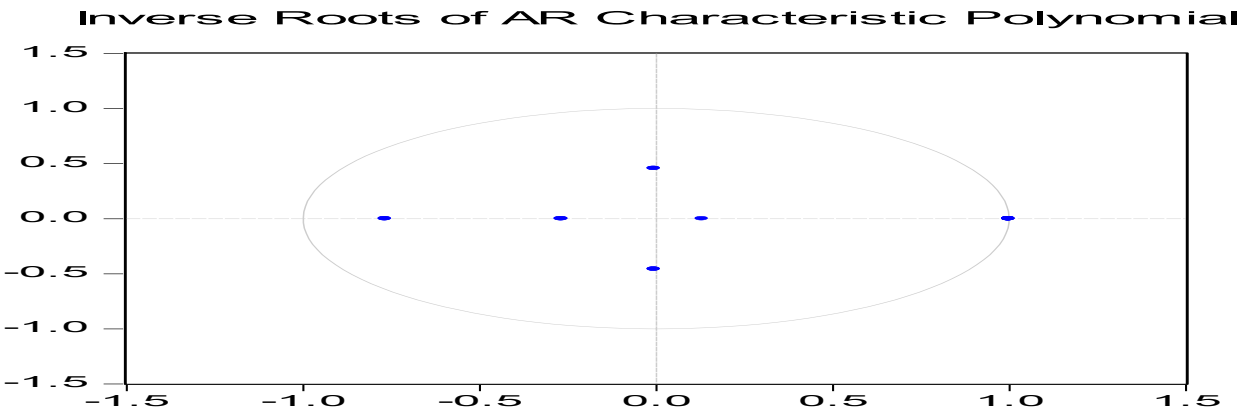

Şekil 1: AR Karakteristik Polinomunun Ters Köklerinin Birim Çember İçindeki Konumu ve Eşbütünleşme Grafiği

Ekonometrik analizin son aşamasında değişkenler arasındaki ilişkinin yönünü belirlemek için uygulanan nedensellik test sonuçlarına Tablo 4' de yer verilmiştir. Buna göre kısa dönemde küreselleşme ve doğrudan yabancı sermaye yatırımları arasında çift yönlü bir nedensellik ilişkisi görülmektedir. Uzun dönemde ise; gelir, doğrudan yabancı sermaye yatırımları ve küreselleşmeden CO2 salınımına ve doğrudan yabancı sermaye yatırımları, küreselleşme ve CO2' den gelire doğru tek yönlü bir nedensellik ilişkisi bulunmaktadır. Bu bulgular eşbütünleşme test sonuçlarını desteklemektedir.

Tablo 4: Nedensellik Test Sonuçları

	Kısa Dönem Nedensellik*				Uzun Dönem Nedensellik*
	ΔCO_2	ΔY	ΔFDI	$\Delta GLOB$	ECT
ΔCO_2	-	0,14	0,98	0,07	-0,27[a]
		(0,70)	(0,32)	(0,78)	[-2,85]
ΔY	2,61	-	0,09	0,01	-0,10[c]
	(0,10)		(0,79)	(0,88)	[-1,83]
ΔFDI	0,15	1,18	-	7,73[a]	1,06
	(0,69)	(0,27)		(0, 00)	[1,36]
$\Delta GLOB$	0,04	0,57	5,05[b]	-	1,81
	(0,82)	(0,44)	(0,02)		[1,04]

Not:
*, Parantez içindeki değerler olasılık değerini ve köşeli parantez içindeki değerler t istatistiğini göstermektedir.
[a], %1 ve [b], %5 ve [c], %10 önem düzeyinde istatistiki anlamlılığı göstermektedir.

Sonuç

Ekonomik, sosyal ve politik yönden insan hayatını her aşamasını etkileyen küreselleşme sürecinin çevresel kalite üzerindeki etkisi olumlu ve olumsuz olmak üzere iki yöndedir. Bu kapsamda ilgili çalışmada 1974-2011 dönemi Türkiye' de küreselleşme, ekonomik büyüme ve doğrudan yabancı sermaye yatırımlarının CO2 salınımı üzerindeki potansiyel etkisi araştırılmıştır. Araştırma için yapılan birim kök testleri sonucunda serilerin ilk farklarında durağan olduğu bulgusuna ulaşılmıştır. Birim kök test sonrasında Johansen ve Juselius (1990) eşbütünleşme testi ve VEC' e dayalı Granger nedensellik testleri uygulanmıştır. Test bulguları; CO2, gelir, doğrudan yabancı sermaye yatırımları ve küreselleşme arasında uzun dönemli bir eşbütünleşme ilişkisinin varlığını işaret etmiştir. Bu ilişkiye göre küreselleşmenin CO2 salınımı üzerindeki etkisi pozitif yönde olup; küreselleşmenin çevresel kaliteyi azalttığı sonucuna ulaşılmıştır. Nedensellik test sonucuna göre ise, uzun dönemde gelir, doğrudan yabancı sermaye yatırımları ve küreselleşmeden CO2 salınımına doğru tek yönlü bir nedensellik ilişkisi olduğu görülmüştür.

Bu sonuçlar literatürde Dinda (2006), Leitao (2013), Shahbaz vd., (2015) ve Mehrara (2016) bulgularını desteklemektedir. Son olarak Türkiye' de gelir ve doğrudan yabancı sermaye yatırımların CO2 salınımı üzerindeki etkisi pozitif yönde olup, gelirdeki artış (ekonomik büyüme) ve doğrudan yabancı sermaye yatırımlarının çevresel kaliteyi olumsuz yönde etkilediği görülmüştür. Bu bulgular değerlendirildiğinde Türkiye' de küreselleşme sürecinin CO2 salınımını arttırarak çevresel kaliteyi olumsuz yönde etkilediği sonucuna

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ulaşılmıştır. Bu nedenle çalışmanın temel önerisi küreselleşme sürecinin çevre üzerindeki olumsuz etkilerini minimize edecek politikaların desteklenmesi yönündedir.

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TÜRKİYE'DE NÜFUSUN DOĞDUĞU İLE GÖRE ANALİZİ: ORANSAL DEĞİŞİMLER (1950-2015)

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ÖZET

Bu çalışmada Türkiye nüfusunun doğduğu ile göre dağılımı ele alınmıştır. Buna göre payın dağılımında iller ve yıllar arasında önemli farklılıklar görülmektedir. 1950 yılında Konya (%3.7), İstanbul (%3.5), Ankara (%3.1), İzmir (%2.9) ve Sivas (%2.8) şeklinde olan ilk beş il sıralaması 2015 yılında İstanbul (%9.7), Ankara (%4.4), İzmir (%3.3), Konya (%2.8) ve Adana (%2.6) şekline dönüşmüştür. Genellikle doğum oranlarının fazla olduğu ve yoğun göç almasından dolayı nüfusun artış hızının yüksek olduğu illerin payı yüksek olmaktadır. Söz konusu dönemde payın gelişiminde illeri çeşitli gruplara ayırmak mümkündür. Buna göre payı sürekli artan en önemli iller İstanbul, Şanlıurfa ve Diyarbakır olmuştur. Nitekim İstanbul'un payı %3,5'ten %9.7'ye, Şanlıurfa'nın %1.5'ten %2.8'e, Diyarbakır'ın ise %1.4'ten %2.5'e ulaşmıştır. Daha düşük oranlarda da olsa, Ankara, Hatay, Mersin, Van, Ağrı, Bitlis, Hakkâri, K.Maraş, Muş gibi illerin de payı artış göstermiştir. Payı artan illere karşın, Türkiye'deki illerin büyük bir kısmı, pay düşüşünün olduğu illerden oluşturmaktadır. Payı düşen illerden en fazla kayıp yaşayan illere Kastamonu, Balıkesir, Çanakkale, Kayseri, Manisa, Denizli, Giresun, Çankırı, Kütahya, Sinop, Sivas, Artvin, Aydın ve Bilecik örnek olarak verilebilir. Üçüncü grubu ise payı çok değişmeyen iller oluşturmaktadır. Buna İzmir, Antalya, Erzurum, Samsun, Tokat, Tunceli, Yozgat, Bingöl, Elazığ, Eskişehir, Amasya, Hakkâri, Ordu, Sakarya, Trabzon gibi iller örnek verilebilir.

Anahtar kelimeler: Nüfus, Türkiye nüfusu, doğum yeri, nüfus coğrafyası

THE ANALYSIS OF TURKEY'S POPULATION ACCORDING TO BIRTH PROVINCE : PROPORTIONATE CHANGES (1950-2015)

ABSTRACT

In this study, it is discussed the distribution of Turkey population according the birthplace and changes in the share of provinces (1950-2015). According to the results, it has been change proportionally in the ranking of provinces between 1950-2015. In 1950, While the first five province was Konya (3.7%), İstanbul (3.5%), Ankara (3.1%), İzmir (2.9%) and Sivas (%2.8), it has changed as İstanbul (9.7%), Ankara (4.4%), İzmir (3.3%), Konya (2.8%) ve Adana (2.6%) in 2015. Generally, the share of the provinces, which birth rates and growth rate of the population are high is more than other provinces. In this period (1950-2015), the provinces can be divided into various groups in the change

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of the share. According to this, the provinces that the share increase constantly are İstanbul, Şanlıurfa and Diyarbakır. Really, İstanbul's share from 3.5% to 9.7%, Şanlıurfa's share 1.5% to 2.8%, Diyarbakır's share 1.4% to 2.5% has reached. The share of some provinces has increased at lower rates. These provinces are Ankara, Hatay, Mersin, Van, Ağrı, Bitlis, Hakkâri, K.Maraş, Muş. On the other hand, in the most provinces of Turkey, the share has decreased. The provinces that the share decrease the most are Kastamonu, Balıkesir, Çanakkale, Kayseri, Manisa, Denizli, Giresun, Çankırı, Kütahya, Sinop, Sivas, Artvin, Aydın and Bilecik. The third group consists of low-changing provinces in share. These are İzmir, Antalya, Erzurum, Samsun, Tokat, Tunceli, Yozgat, Bingöl, Elazığ, Eskişehir, Amasya, Hakkâri, Ordu, Sakarya and Trabzon.

Keywords: Population, Turkey's population, birthplace, geography of population

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TÜRKİYE'DE ŞEHİRLEŞME HAREKETLERİ-TERÖR OLAYLARI İLİŞKİSİ

Relation Between Urbanization Movement and Terrorist Incidents in Turkey

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Özet: Şehirleşme, herhangi bir alandaki şehirli nüfus miktar, oran ve yoğunluğunun artışı, şehir olarak kabul edilen yerleşmelerin sayıca artışını, büyük veya metropol şehirlerin sayıca artışını, şehirsel alanın yatay ve dikeyde gelişmesi, şehirlere özgü yaşam sosyal ve ekonomik ilişkilerin gelişmesi şeklinde tanımlanmaktadır. Şehirleşme hareketleri üzerinde rol oynayan önemli faktörlerden biri de terör olaylarıdır. Terör olaylarının şehirlerde veya kırsal alanlarda meydana gelmesi şehirleşme üzerinde de farklı etkiler oluşturmaktadır. Şehirlerde meydana gelen terör olayları şehirleşme hareketlerini olumsuz etkilerken, kırsal alanda meydana gelen terör olayları da şehirleşme hareketlerini olumlu etkilemektedir.

Türkiye'de meydana gelen terör olayları da ülke genelinde veya lokal olarak şehirleşme hareketlerini etkilemiştir. Bu araştırmada 1975-1980 yılları arasında meydana gelen terör olayları ile 1985-2000 yılları arasında meydana gelen terör olaylarının şehirleşme hareketleri üzerinde nasıl bir etki oluşturduğu ortaya konulmuştur. Bu amaçla ilgili dönemlerde sıkıyönetim ve olağanüstü hal ilan edilen iller belirlenmiş ve bu illerin şehirsel nüfuslarında meydana gelen değişiklikler istatistiksel yöntemlerle analiz edilmiştir. Şehirsel nüfusta meydana gelen değişiklikler ayrıca, idari yapıda meydana gelen değişiklikler ve hükûmet politikalarıyla ilişkilendirilmiştir.

1975-1980 yılları arasında Türkiye'de yaşanan siyasi ve ekonomik krizlerin bir sonucu olarak şehirlerde pek çok terör olayları meydana gelmiştir. Şehirlerde meydana terör olayları şehirlerde can güvenliği ve istihdam sorunlarını ortaya çıkarmış ve şehirler cazibesini kaybetmiştir. Artan terör olayları nedeniyle bu dönemde 22 ilde sıkıyönetim ilan edilmiş olup, bu illerin yıllık şehirsel nüfus artış hızlarında önceki ve sonraki dönemlere göre düşüşler görülmüştür. 1985-2000 yılları arasında ise terör olayları Türkiye'nin Doğu ve Güneydoğu illerinin kırsal kesimlerinde meydana gelmiştir. Bu nedenle 11 ilde olağanüstü hal ilan edilmiştir. Kırsal alanda yaşanan terör olayları nedeniyle bazı köyler devlet eliyle boşaltılırken, birçok köy can güvenliğinin sağlanamaması nedeniyle köylülerce boşaltılmıştır. Boşalan ve boşaltılan köylerde yaşayanların, en yakında bulunan ilçe ve il merkezlerine göç etmeleri nedeniyle bu illerin şehirli nüfus miktarı, oranı ve şehirli nüfus yıllık artış hızı oranlarında önemli artışlar yaşanmıştır.

Anahtar Kelimeler: Terör, Şehir, Şehir Coğrafyası, Şehirleşme, Zorunlu Göç.

Abstract: Urbanization is determined as increasing in urban population, urban population rate, urban population growth rate, number of urban areas and metropolitan areas, vertical and horizontal development of urban areas, and improvement of social end economic features that unique urban areas. One of the factors playing role on urbanization is the terrorist incidents. Terrorist incidents have different effects on urbanization when it occured in rural or urban areas. While terrorist incidents occured in urban areas has a negative effect on urbanization, terrorist incidents occured in rural areas has a positive effect on urbanization.

Terrorist incident carried out in Turkey have effected urbanization movements accros to country or locally. This study aims to find out how to terrorist incidents was carried out in

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1975-1980 period and in 1985-2000 period effected urbanization movement inTurkey. For this purpose, provinces that martial law and state of emergency declared in were determined and changes occured in urban population of these provinces were analyzed by some statistical methods. Changes in urban populations were also associated with the changes in the administrative structure of some provinces and goverment policies.

As a result of economical and social crisis occured in 1975-1980 period in Turkey, many terrorist incidents were carried out in Turkish cities. Those terrorist incidents were carried out in the urban areas revealed some security and employment problems. That's why many cities lost it's urban attractivenes. Because of the increases in the terrorist attacks in this period, Turkish government declared martial law in 22 provinces located in different regions. The annual urban population growth rate of those provinces decreased in this period compared to previous and next population censuses. In 1985-2000 period, terrorist attacks were intensified in the rural areas of Eastern and Southeastern provinces of Turkey. Following the increase of terrorist attacks Turkish government declared state of emergency in 11 Eastern and Southeastern provinces. Because of security problems in rural areas, some villages were evacuated by governmet while some villages were evacuated by local people and their own initiatives. Those people who had left avacuted villages migrated to the nearest towns and cities. This forced migration caused to significant increases in urban population and urban population growth rate of these provinces.

Keywords: Terror, Urban, Urban Geography, Urbanization, Forced Migration.

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TÜRKİYE' DE YAŞAYAN İNSANLARIN YAŞAM DÜZEYİ MEMNUNİYETİ ÜZERİNE BİR ÇALIŞMA

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Özet: Bu çalışmada Türkiye'de yaşayan insanların yaşam düzeyi memnuniyetleri üzerine bir çalışma yapılmıştır. Çalışmada Türkiye İstatistik Kurumu (TÜİK) Yaşam Düzeyi verilerinden yararlanılmıştır. Türkiye İstatistik Kurumu verileri 2003-2015 yılları arasında toplam temel alınarak, kadın ve erkek temel alınarak, umutlu ve umutlu değil kategorilerinde oluşturulmuştur. Bu bağlamda Türkiye'de yaşayan insanların yaşam düzeyleri memnuniyetleri analizi tüm verilere göre, cinsiyetlere göre ve cinsiyetler arasında fark olup olmadığına göre yapılmıştır. Verilerin analizinde orana dayalı t testi kullanılmıştır.

Anahtar Kelimeler: Yaşam Düzeyi, Memnuniyet, t-testi

LEVEL OF SATISFACTION PEOPLE LIVING IN TURKEY A STUDY ON LIFE

Abstract: In this study, the level of satisfaction of the people living in Turkey a study on life. Study Turkey Statistical Institute (TÜİK) is taken from Life Level data . Turkey Statistical Institute data for 2003-2015, based on the total, based on women's and men's not hopeful and hopeful, based on categories. In this context the level of satisfaction of life of people living in Turkey are made according to all data. This analysis was conducted by gender.and based on whether the difference between the sexes.. The analysis examines two independent sample t-test is applied.
Key Words: Level Life, Satisfaction, t-test.

GİRİŞ

Çalışmanın amacı, Türkiye' de yaşayan insanların 2003-2015 yılları arasında yaşam memnuniyetlerinin incelenmesidir. Bu bağlamda, ilk olarak Türkiye nüfusunun toplamı için, kadın ve erkek nüfusunun 2003-2015 yılları arasında yaşam memnuniyeti düzeylerinde fark olup olmadığı incelenmiştir. Daha sonra kadın nüfusu için yaşam memnuniyetinin 2003-2015 yılları arasında farkının olup olmadığı incelenmiştir. Son olarak da erkek nüfusu için yaşam memnuniyetinin 2003-2015 yılları arasında farkının olup olmadığı incelenmiştir.

YÖNTEM VE ANALİZ

Türkiye İstatistik Kurumunun (TÜİK) 2003-2015 yılları arasında nüfusun tamamı için yaşam memnuniyeti yüzdelik değerleri tablo 1' de, Kadın nüfusu için yüzdelik değerleri tablo 2' de, Erkek nüfus için yüzdelik değerleri ise tablo 3' de verilmiştir.

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Tablo 1: Yıllara göre Türkiye nüfusunun toplam yaşam memnuniyeti oranları

	Yıllar												
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Umutlu	66,9	66,7	66,8	64,4	70,1	64,9	65,5	72,8	75,2	76,6	77,0	73,8	25,6
Umutsuz	33,1	33,3	33,2	35,6	29,9	35,1	34,5	27,2	24,8	23,4	23,0	26,2	25,6

TÜİK Yaşam Memnuniyeti Araştırması, 2003-2015

Tablo 2: Yıllara göre Kadın nüfusunun yaşam memnuniyeti oranları

	Yıllar												
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Umutlu	66,6	68,3	68,1	64,9	69,5	64,9	67,9	72,9	74,9	76,9	77,5	74,7	74,0
Umutsuz	33,4	31,7	31,9	35,1	30,5	35,1	32,1	27,1	25,1	23,1	22,5	25,3	26,0

TÜİK Yaşam Memnuniyeti Araştırması, 2003-2015

Tablo 3: Yıllara göre Erkek nüfusunun yaşam memnuniyeti oranları

	Yıllar												
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Umutlu	67,1	65,2	65,3	63,8	70,7	64,9	62,8	72,7	75,5	76,3	76,5	72,9	74,7
Umutsuz	32,9	34,8	34,7	36,2	29,3	35,1	37,2	27,3	24,5	23,7	23,5	27,1	25,3

TÜİK Yaşam Memnuniyeti Araştırması, 2003-2015

HİPOTEZLER

H_1: Türkiye'de yaşayan erkek ve kadın nüfusun 2003-2015 yıllarındaki yaşam memnuniyetleri arasında fark vardır.

H_2 : Türkiye'de toplam nüfusun 2003-2015 yılları arasında ki yaşam memnuniyetleri arasında fark vardır.

H_3 : Türkiye'de yaşayan Kadınların 2003-2015 yılları arasında ki yaşam memnuniyetleri arasında fark vardır.

H_4 : Türkiye'de yaşayan Erkeklerin 2003-2015 yılları arasında yaşam memnuniyeti arasında fark vardır.

TÜİK veri tabanından alınan 2003-2015 yılları arasındaki yaşam memnuniyeti verilerinin cinsiyete göre bar grafiği Şekil 1 de, ilgili yıllara ait yaşam memnuniyeti verileri için kullanılan parametrik testlerden "iki yüzde arasındaki farkın önemlilik testi" sonuçları Tablo 4 de verilmiştir.

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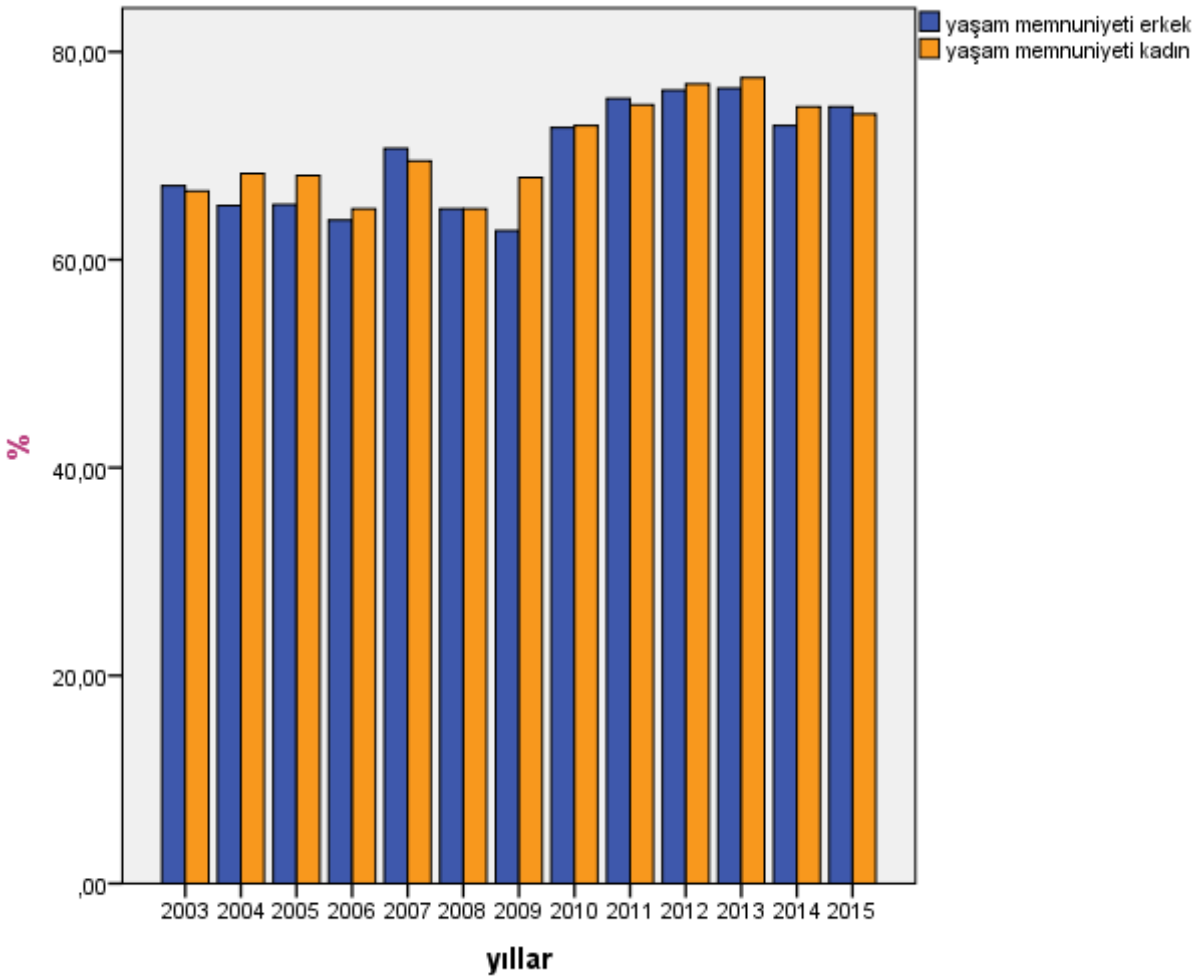
Şekil 1:



Tablo 4: Cinsiyete göre yaşam memnuniyet test sonuçları

Cinsiyet	Ortalama yüzde	T	P
Erkek	69,87	-0,516	0,611
Kadın	70,85		

Yapılan test sonucunda kadın ve erkeklerin yaşam memnuniyetleri arasında % 95 güvenle istatistiksel olarak farkın olmadığı söylenebilir.

2003-2015 yılları erkek yaşam memnuniyetleri arasında ki farka ait test sonucu tablo 5 de gösterilmiştir.

Tablo 5: Erkek nüfus için yaşam memnuniyet test sonuçları

Cinsiyet	Ortalama yüzde	s.d	T	P
Erkek	69,87	12	48,78	0,00

Yapılan test sonucunda erkeklerin yaşam memnuniyeti 2013-2015 yılları arasında %95 güvenle istatistiksel olarak anlamlı bir fark göstermektedir.

2003-2015 yılları kadın yaşam memnuniyetleri arasında ki farka ait test sonucu ise tablo 6 da gösterilmiştir.

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Tablo 6: Kadın nüfus için yaşam memnuniyet test sonuçları

Cinsiyet	Ortalama yüzde	s.d	t	p
Kadın	70,85	12	57,16	0,00

Yapılan test sonucunda kadınların yaşam memnuniyeti 2013-2015 yılları arasında %95 güvenle istatistiksel olarak anlamlı bir fark göstermektedir.

Herhangi bir cinsiyet ayrımı yapmadan 203-2015 yılları arasında genel nüfusun yaşam memnuniyetine bakıldığında Tablo 7 deki sonuçların ortaya çıktığı görülmektedir.

Tablo 7: Tüm nüfus için yaşam memnuniyet test sonuçları

Cinsiyet	Ortalama yüzde	s.d	t	p
Kadın-Erkek	70,39	12	53,74	0,00

Yapılan test sonucunda tüm nüfusun yaşam memnuniyeti 2013-2015 yılları arasında %95 güvenle istatistiksel olarak anlamlı bir fark göstermektedir

SONUÇ

Türkiye'de 2003-2015 yılları arasında kadın ve erkek yaşam memnuniyeti düzeyleri %95 güvenle istatistiksel olarak farklı değildir.

Türkiye'de toplam nüfusun 2003-2015 yılları arasındaki yaşam memnuniyetleri %95 güvenle anlamlı bir fark göstermektedir.

Türkiye'de 2003-2015 yılları arasında kadınların yaşam memnuniyetleri %95 güvenle istatistiksel olarak anlamlı bir fark göstermektedir.

Türkiye'de 2003-2015 yılları arasında erkeklerin yaşam memnuniyetleri %95 güvenle istatistiksel olarak anlamlı bir fark göstermektedir.

KAYNAKÇA

Türkiye İstatistik Kurumu, 2003-2015 Yılları Kadın Yaşam Memnuniyeti Verileri

Türkiye İstatistik Kurumu, 2003-2015 Yılları Erkek Yaşam Memnuniyeti Verileri

Türkiye İstatistik Kurumu, 2003-2015 Yılları Genel Yaşam Memnuniyeti Verileri

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TÜRKİYE'DEKİ YAZILIM MÜHENDİSLİĞİ LİSANS MÜFREDAT PROGRAMLARININ KARŞILAŞTIRILMALI OLARAK İNCELENMESİ

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Özet. Dünyada Bilişim Teknolojileri alanında eğitim veren başta üniversiteler ve diğer kurumlar için müfredat geliştiren organizasyonlardan The Associationfor Computing Machinery (ACM) ve The ComputerSociety of the Institutefor Electrical and Electronic Engineers (IEEE), birlikte Computing Curricula 2001 (CC2001)'i, daha sonra da Software Engineering 2004 (SE2004)'ü yayınlayarak Yazılım Mühendisliğinin de aralarında olduğu farklı disiplinler ile ilgili müfredat programı raporu hazırlamışlardır. Bu müfredat serisi CS2013 ile güncellenmiştir. Bu çalışmada, ülkemizdeki mevcut Yazılım Mühendisliği bölümlerinin müfredat programlarındaki derslerin SE2004 raporundaki öneriler ile ne ölçüde örtüştüğünün tespit edilmesi amaçlanmıştır. Çalışma ile ayrıca ülkemizde bulunan Bilişim Teknolojileri alanlarında lisans eğitimi veren bölümlerin sayı, kontenjan, yerleştirme puanları gibi bilgileri de karşılaştırılarak bir değerlendirme yapılmıştır. Çalışma sonunda, çekirdek dersleri müfredat programlarında veren bölümlerin oranı %78, matematik bilimi derslerinde %93 ve giriş seviyesi derslerinde %92 olarak görülmüştür. Çalışmanın mevcut ve yeni kurulacak olan Yazılım Mühendisliği bölümlerine müfredat planlaması açısından faydalı olacağı düşünülmektedir.

Anahtar Kelimeler: Yazılım Mühendisliği Müfredatı, Yazılım Mühendisliği Eğitimi, SE2004

1 Giriş

Dünyada olduğu gibi ülkemizde de Bilişim Teknolojileri (BT) mühendislik alanları günümüzde gençlerin en çok tercih ettikleri alanların başında gelmektedir. Bunun en önemli nedenlerinden birisi BT mühendislerine duyulan ihtiyaç ve gelir seviyeleridir. İŞKUR (Türkiye İş Kurumu)'nun yayınladığı 2013- 1. Dönem Türkiye işgücü piyasası raporu'na göre açık işlerde sayısal büyüklük olarak ilk yirmiye giremeyen Mimar, Makine Mühendisi, Elektrik Mühendisi, Fizyoterapist, Yazılım Mühendisi gibi mesleklerde açık iş oranı Türkiye ortalamasının üzerindedir. Açık iş oranı genellikle mesleki beceri ve nitelik gerektiren mesleklerde daha yüksektir. Ayrıca bu işlerden 50% ila 94% arasında değişen oranlarda bilgisayar kullanma, fiziki ve bedensel yeterlilik, hesap yapabilme (analitik beceri), iletişim ve ifade yeteneği mesleğe ilişkin yeterli bilgi, sorun çözme ve bağımsız karar verme becerileri, proje tabanlı çalışma, takım çalışması ve yabancı dil becerileri ile % 30 oranında satış ve pazarlama becerisi talep edilmektedir (İşkur, 2014).

Bu ilgi, eğilim ve beklentiler beraberinde BT eğitimlerini de ayrı bir yere taşımaktadır. Ülkemizde BT alanlarında ortaöğretim, ön lisans, lisans ve lisansüstü seviyelerinde farklı müfredatlar da eğitim veren birçok kurumsal yapı bulunmaktadır. BT mühendislikleri bunların en önemlilerindendir. BT mühendisliklerinin gelişimi ve müfredatları 1960'lardan itibaren doğan ihtiyaçlar ve geliştirilen teknolojiler bağlamında şekillenerek günümüzdeki yapısına kavuşmuştur.

BT mühendislikleri günümüzde yaygın olarak Bilgisayar, Bilgisayar Bilimleri, Bilgi Sistemleri, Bilgi Teknolojisi ve Yazılım olarak beş mühendislik programında kendilerine tanımlanan görev ve sorumluluk alanlarında faaliyet göstermektedir (Acm, 2014). Bu alanlar arasındaki ortak özelliklerin çok olmasından dolayı müfredatları da birbirine benzemektedir. Nitelikli BT mühendisi yetiştirmek için gösterilen çabalar geçmişten günümüze devam etmektedir.

Bu amaçla The Association for Computing Machinery (ACM), The Association for Information Systems (AIS), The Association for Information Technology Professionals (AITP) ve The Computer Society of the Institute for

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Electrical and Electronic Engineers (IEEE) gibi bazı uluslararası kuruluşlar müfredat önerileri geliştirerek, Accreditation Board for Engineering and Technology (ABET), Computing Sciences Accreditation Board (CSAB), The UK Engineering Council (ECUK), British Computer Society (BCS), European Network for Accreditation of Engineering Education (ENAEE) ve Information Systems Engineering (ISE) gibi bazı kuruluşlarda akreditasyon ve standartlar belirleyerek BT eğitimine katkı vermektedirler. Ülkemizde de Mühendislik Eğitim Programları Değerlendirme ve Akreditasyon Derneği (MÜDEK) bu görevi yerine getirmektedir.

Daha iyi müfredatlar tasarlamaya yönelik akademik çalışmaların çok öncelerden beri yapıldığını görmekteyiz. Thomas vd.(1995) çalışmalarında 1986-1995 yıllarındaki müfredatları inceleyerek yazılım mühendisliği temel konularını belirlemeye ve değerlendirmeye çalışmışlardır. Pullan ve Oliver (1995) üç yıllık bir yazılım mühendisliği müfredatı önerisinde bulunmuşlardır. Bagert (1998) çalışmasında, bilgisayar bilimi, bilgisayar mühendisliği ve yazılım mühendisliği alanlarının müfredat farklılıklarını ve akreditasyonlarını inceleyerek yeni hazırlanacak müfredatlar hakkında öngörülerde bulunmuştur. Xing (2012) ise son zamanlarda artış eğilimi gösteren eğitimde küreselleşmenin Çin'deki yazılım mühendisliği eğitimi üzerine etkilerini incelemiştir. Karakaş (2005) araştırmasında ACM & IEEE-CS Curriculum Comittee on Software Engineering 2004 içeriğine uyumlu bir Yazılım Mühendisliği programı önermektedir. Önerilen program ile öğrenci üniversiteye girdikten dört yıl sonra ekonomik bağımsızlık kazanmak yerine, üç yıl sonra ekonomik bağımsızlık kazanmakta ve Yazılım Mühendisi diplomasını alırken iki yıllık bilgisayar programcılığı iş deneyimi oluşmaktadır (Karakaş, 2005).

Bunlar ve benzer birçok araştırmada BT mühendisliklerini birbirinden daha belirgin özelliklerle ayırabilecek müfredat çalışmalarına rastlamaktayız. Ülkemizde de son yıllarda BT eğitiminde önemi gelişmeler hatta arayışlar olduğu söylenebilir. Özellikle geleneksel Bilgisayar Mühendisliği bölümleri yanında önceleri sadece lisansüstü birkaç program olarak başlayan, daha sonra birkaç vakıf üniversitesinde açılarak başlayan ve günümüzde sayıları gittikçe artan Yazılım Mühendisliği bölümleri dikkat çekmektedir.

Bu çalışmada, ülkemizdeki Yazılım Mühendisliği bölümlerinin müfredatları dersler, ulusal ve uluslararası kredileri ve yıllık planları incelenerek kabul gören uluslararası müfredatlar ile olan benzerlik ve farklılıkları ortaya konulmaya çalışılmıştır. Bu sayede ülkemiz Yazılım Mühendisliklerinin uluslararası ölçekte yerini değerlendirme olanağı bulunmuştur.

Araştırmanın devamında, BT disiplinlerinin 1960'lardan günümüze değişimine kısa bir bakış, BT mühendisliklerinin iş, görev tanımları, müfredat geliştirme çalışmaları, ülkemiz müfredatlarının analiz ve değerlendirmeleri irdelenecektir.

1.1 Yazılım Mühendisliğinin Ortaya Çıkma Süreci

Dünyada bilgisayara dayalı disiplinler 1960'larda oluşmaya başladı. O zamanlarda Kuzey Amerika'da Bilgisayar Bilimleri, Elektrik Mühendisliği ve Bilgi Sistemleri olmak üzere 3 farklı program mevcuttu. Her bir program kendi alanını net bir şekilde belirlemişti. Bilgisayar alanına yönelmek isteyen bir öğrenci, yazılım geliştirmek ve bilgisayar alanında teorik bilgiye sahip olmak istiyorsa Bilgisayar Bilimleri bölümünü seçiyor, eğer donanım konusunda uzmanlaşmak istiyorsa Elektrik Mühendisliği programını seçiyor, eğer bir problemi çözmek üzere donanım ve yazılım kullanmak istiyorsa Bilgi Sistemleri programını seçiyordu. 1990 öncesi Amerika'daki tek büyük değişiklik Bilgisayar Mühendisliğinin oluşmasıydı. 1970'li yılların ortalarında çip tabanlı mikro işlemcilerin yapılmaya başlanmasıyla Bilgisayar Mühendisliği Elektrik Mühendisliğinin altında bir disiplin olarak doğdu (Acm, 2014).

1968'de Almanya Garmisch'de NATO sponsorluğunda düzenlenen konferansta Yazılım Mühendisliği kavramı kullanıldı. 1980'lerde Bilgisayar Bilimleri programlarında ders olarak verilmeye başlandı. Amerika'da 1990'larda Yazılım Mühendisliğinin, Bilgisayar Bilimlerinin önemli bir bileşeni olduğu anlaşıldı.

1990'lardan sonra ABD'de, Bilgisayar Mühendisliği, Elektrik Mühendisliğinden ayrı bir disiplin olarak statüsünü pekiştirdi ve bilgisayar donanım ve ilgili yazılım açısından birincil bir rol üstlenmişti. Daha ucuz ve güvenilebilir bir yazılım geliştirirken ortaya çıkan problemlere çözüm bulabilmek için Yazılım Mühendisliği ortaya çıktı.

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BT mühendislikleri günümüzde Bilgisayar, Bilgisayar Bilimleri, Bilgi Sistemleri, Bilgi Teknolojisi ve Yazılım olarak beş mühendislik programına ayrılmıştır. Bu programlar arasında eski alışkanlık ve algılardan dolayı zaman zaman kavram yanılgıları meydana gelebilmektedir.

Bilgisayar Mühendisliği, bilgisayar ve bilgisayara dayalı sistemlerin tasarım ve yapımıyla ilgilenir. Donanım, yazılım, haberleşme ve bunların etkileşimini de içerir. Müfredatı; teoriler, ilkeler, elektrik mühendisliği ve matematikçilerin uygulamaları üzerine yoğunlaşmıştır ve bilgisayar ve bilgisayar tabanlı cihazların tasarımında bunları kullanır. Bilgisayar mühendisliği öğrencileri, haberleşme sistemleri de dahil olmak üzere donanım sistemleri, bilgisayarlar ve bilgisayar içeren cihazlar üzerinde çalışırlar. Bilgisayar mühendisliği çalışmaları yazılımdan çok donanımla ilgilenir veya yazılım ve donanım aynı öneme sahiptir. Gömülü sistemler, günümüzde bilgisayar mühendisliğinin baskın alanlarından biridir (Acm, 2014).

Bilgisayar Bilimleri Mühendisliği, teorik ve algoritmik temellerden robotik alanındaki teknolojik gelişmelere, bilgisayar görme, akıllı sistemler, biyoinformatik, ve diğer heyecan verici alanlarda, çok geniş bir yelpazeye sahiptir. Bilgisayar bilimleri çalışmaları "yazılım tasarlama ve uygulama", "bilgisayar kullanım alanını genişletmeye çalışma" ve "bilgisayar alanındaki problemlere etkili çözüm üretme" olarak 3 kategoride toplanabilir. Diğer disiplinlinler işe yönelik kişi yetiştirirken, bilgisayar bilimleri yeni teknolojilere ve fikirlere kolay adapte olabilmelerini sağlayan geniş temel bilgiler vermektedir.

Bilgi Sistemleri Mühendisliği, işletmelerin bilgi ihtiyaçlarını karşılamak için, bilgi teknolojisi çözümleri ve iş süreçlerine odaklanır. Bilgi sistemleri uzmanı, teknik ve organizasyonel etkenleri anlayarak bir kuruluşun bilgi sistemlerine yönelik gereksinimleri belirlemede önemli bir rol oynar ve aynı zamanda bunların özellikleri, tasarımı ve uygulanmasında etkindirler. Organizasyonel ilkeleri ve uygulamaları anlamalı böylelikle teknik ve idari topluluklar arasında köprü kurabilmelidirler. Bilgi Sistemleri Mühendisliği iki isim altında karşımıza çıkabilmektedir. Bilgisayar Bilgi Sistemleri daha çok teknoloji konusunda odaklanırken, Yönetim Bilgi Sistemleri daha çok organizasyonel ve davranışsal bakış açısına odaklanır.

Bilgi Teknolojisi Mühendisliği, iki farklı şekilde tanımlanabilir. En genel anlamıyla bilgisayara dair her şeyin yerine kullanılabilmektedir. Akademik anlamda ise özel sektör, kamu, sağlık hizmetleri, okullar ve diğer birçok kurumun ihtiyaç duyduğu bilgisayar teknolojisini sağlayabilecek öğrenciler yetiştiren bir lisans derecesidir. İşletmeler düzgün çalışabilen, güvenli, geliştirilebilir, yönetimi kolay ve yenilenebilir bir sisteme ihtiyaç duyar. Bilgi teknolojisi uzmanları gerçek, günlük ihtiyaçları karşılamak aynı zamanda yazılım ve donanım seçiminden de sorumludur.

Yazılım Mühendisliği, kullanıcıların bütün gereksinimlerini karşılayabilen, geliştirilmesi ve bakımı pahalı olmayan, güvenli ve verimli yazılım sistemleri tasarlayan ve sürdüren disiplindir. Yüksek maliyetli, büyük yazılımların artması, yazılım güvenliğinin önem kazanmasıyla yazılım mühendisliği gelişmiştir. Somut, fiziksel eserler için geliştirilen mühendislik uygulamaları ile matematik ve bilgisayar bilimleri ilkelerini birleştirmeye çalışmaktadır.

Yazılım mühendisliği, bilgisayar bilimleri müfredatında bir veya daha fazla ders şeklinde verilebildiği gibi enstitüler tarafından lisans programı olarak sunulabilmektedir. Bilgisayar bilimleri ve yazılım mühendisliğinin birçok ortak dersi vardır. Yazılım mühendisliği öğrencileri, doğru yazılım üretme teknikleri, güvenilir yazılım tasarımı, uygulanması ve sürdürülmesi üzerine yoğunlaşırken, bilgisayar bilimleri öğrencileri de, yazılım mühendisliği programlarında elde edilen mühendislik bilgi, tecrübe ve teknikleri hakkında bilgi sahibi olurlar. Yazılım mühendisliği öğrencileri yazılım oluşturulma işlemine bizzat katılır. Yazılım mühendisliği öğrencileri kullanıcıların isteğine cevap verebilecek, güvenli, kullanışlı yazılım geliştirme konusunda eğitim alır. Şekil 1'de Organizasyonel Konular ve Bilgi Sistemleri, Uygulama Teknolojileri, Yazılım Metot ve Teknikleri, Sistem Altyapısı, Bilgisayar Donanımı ve Mimarisi genel müfredat alanlarının Yazılım Mühendislikleri müfredatlarındaki oranı görülmektedir. Şekil 1 incelendiğinde sağ yönde uygulama geliştirmede artış sol yönde ise teoride artış olduğu görülmektedir. Aynı şekilde organizasyonel çalışma alanı ve insan ilişkileri yukarı yönde artmakta, teknik detaylar ve cihazlarla çalışma alanı ise aşağı yönde artmaktadır. Şekilden de anlaşıldığı gibi yazılım mühendisliği, bilgisayar donanımı ve bilgisayar mimarisi ile alakalı çalışma yapmamaktadır. Sağa ve sola olan dengeli dağılım da yazılım mühendisliğinin hem teorik hem de uygulama alanında çalışma yaptığını göstermektedir (Acm, 2014).

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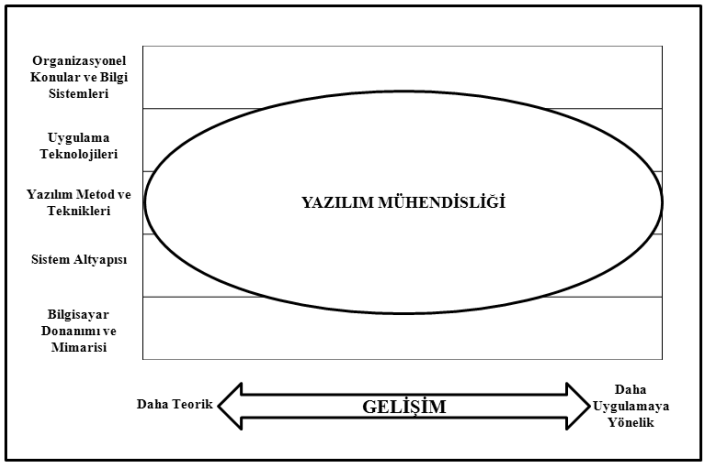

Şekil 1. Yazılım Mühendisliğinin Müfredat Alanları (Acm, 2014).

1.2 Türkiye'de Bilişim Alanındaki Mühendislik Lisans Programlarının İstatistiki Bilgileri

2012 ÖSYM verilerine göre, Türkiye'de yükseköğretim veren üniversitelerde 1274 mühendislik programı bulunmaktadır (Ösym, 2014). Bu programlardan bilişim alanında eğitim veren mühendislik programları incelendiğinde, 124 adet Bilgisayar Mühendisliği, 18 adet Yazılım Mühendisliği ve 5 adet Bilişim Sistemleri Mühendisliği olduğu görülmektedir. Tablo 1'de ise bu bölümlerin kontenjan ve doluluk oranları açısından istatistiki verileri bulunmaktadır. 2012 yılında 8872 BT kontenjanının 7683'ü dolarak %13.4'ü boş kalmıştır.

Tablo1. Bölümlerin kontenjan istatistikleri (Ösym, 2014).

Program	Toplam Kontenjan	Doldurulan Kontenjan	Doluluk Oranı
Bilgisayar Mühendisliği	7761	6878	%88.62
Yazılım Mühendisliği	967	699	%80.62
Bilişim Sistemleri Mühendisliği	144	106	%73.61

Türkçe Bilgisayar Mühendislik programlarının puanları ortalama 501–326 arasında, İngilizce Bilgisayar Mühendislik programlarının puanları ortalama 544–267 arasında değişmiştir. Bilişim Sistemleri Mühendisliği programı 379 puan, Yazılım Mühendisliği programı ise 440–279 puanları arasında değişim göstermiştir.

Bu veriler, üzerinde değişik tartışmalara yol açacak, farklı yorumlara açık bir tablo ortaya koymaktadır. Bunun yanı sıra Bilgisayar Mühendisliği ve Yazılım Mühendisliği arasındaki kabul edilebilir sınırların ve algıların ders müfredatlarını nasıl etkilediğini görmek, ihtiyaçlarımız doğrultusunda yapılması gerekenleri planlamak açısından önemlidir.

2 BT'de Müfredat Geliştirme

Günümüzde Bilgisayar, Bilgisayar Bilimleri, Bilgi Sistemleri, Bilgi Teknolojisi ve Yazılım olarak beş mühendislik alanına ayrılan BT'nde müfredat geliştirmek de bir o kadar zor olmaktadır. Bunun başlıca nedenleri;

- Mühendisliklerin birbirlerine çok yakın kavramsal alanlara sahip olmaları
- Hedeflenen iş ve görev tanımlarının çoğunun birbirine yakın/geçişli olması
- İşverenlerin bir mühendislik alanından birden çok alan uzmanlığını beklemesi
- Öğrencilerin iş ve beceri kaygılarıyla birden çok mühendislik alanı uzmanlığına sahip olmak istemeleri
- Eğitim kurumlarının öğrencilerine birden fazla mühendislik alanı uzmanlığını vermek istemesi
- Akademik değerlendirme ve akreditasyon kurumlarının müfredatlar da ki ders türlerini, sayılarını ve kredilerine sınırlamalar getirmesi olarak sıralanabilir.

ACM, AIS, AITP ve IEEE orta ve yükseköğretim kurumları için müfredat geliştiren dört önemli organizasyondur. 1990'lardan önce her bir organizasyon kendi müfredat önerisini sunarken, daha sonraları birlikte hareket ederek tek bir standart oluşturma çalışmaları yaptılar. ACM ve IEEE-ComputerSociety, Curriculum-68 ile başlayarak hemen hemen 40 yıldır ve yaklaşık on yıllık aralıklarla bilişim alanında eğitim

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veren yükseköğretim kurumları için uluslararası kılavuz müfredatlar hazırlamaktadır. Son olarak CS2013 yayınlanmıştır. CS2013 BT müfredatını Tablo 2'de görülen 18 temel alana ayırarak planlamıştır. Burada SE (Software Engineering) BT temel alanlarından birisidir.

Tablo 2. CS2013 temel 18 alanı (Software Engineering, 2004).

CS2013 Temel Alanları	
AL(Algorithms and Complexity)	AR(Architecture and Organization)
CN(Computational Science)	DS(Discrete Structures)
GV(Graphics and Visualization)	HCI(Human-Computer Interaction)
IAS (Inf.Assurance and Security)	IM(Information Management)
IS(Intelligent Systems)	NC(Networking and Communications)
OS (Operating Systems)	PBD (Platform-based Development)
PD (Parallel and Distributed Comp.)	PL (Programming Languages)
SDF (Soft. Development Fundamentals)	SE (Software Engineering)
AL (Algorithms and Complexity)	AR (Architecture and Organization)

2.1 SE2004 Yazılım Mühendisliği Müfredat Önerilerinin İncelenmesi

ACM ve IEEE-CS tarafından Yazılım Mühendisliği için geliştirilen SE2004 çalışmasının temel amacı üniversitelere ve akreditasyon kurumlarına Yazılım Mühendisliği lisans eğitimi müfredatı hakkında öneriler sunmaktır. Yazılım mühendislerinin mezun olduklarında bilmesi gereken bilgiler ve kazanmaları gereken temel yetenekler bu çalışmada ifade edilmektedir.

SE2004'de Yazılım Mühendisliği Tablo 3'de ki 10 bilgi alanına ayrılmıştır. Her bir bilgi alanı ünite ve konular şeklinde de açıklanarak ayrılması gereken saatler belirlenmiştir. Çekirdek konuların bulunduğu üniteler Zorunlu(E-Essential), çekirdek konular içinde olmayan ama müfredata dahil edilmesi halinde bütünlüğü bozmayacak üniteler İstenilir (D-Desirable) ve diğer üniteler de Seçmeli (O-Optional) şeklinde kodlarla ifade edilmiştir. Ayrıca bu kodların dışında ünitelerin özellikleri; yeni ve somut durumlarda öğrenilen materyalleri kullanma becerisi: Uygulama (a-Application), bilgi ve materyalin içeriğini anlamak: Kavrama (c-Comprehension) ve geçmiş bilgilerin hatırlanması: Bilgi (k-Knowledge) kodlarıyla belirlenmiştir.

Tablo3. Bilgi alanları tablosu (Software Engineering, 2004).

Kod	Bilgi Alanı	Saat
CMP	Computing Essentials	172
FND	Math & Engineering Fundamentals	89
PRF	Professional Practice	35
MMA	Software Modeling & Analysis	53
DES	Software Design	45
VAV	Software Verification & Validation	42
EVL	Software Evolution	10
PRO	Software Process	13
QUA	Software Quality	16
MGT	Software Management	19

Yazılım Mühendisliği ve Bilgisayar Mühendisliği lisan programları iki farklı program olarak nitelense de özellikle giriş düzeyinde birçok konuda ortaktırlar. Bu yüzden SE2004 çalışmasında müfredat programı önerilirken CC2001'deki (Acm, 2014) (Computer Science volume) derslere de yer verilmiştir. SE2004'de önerilen dersler bir kod sistemi kullanılarak ifade edilmiştir. Bu kod sistemi **XXabc** şeklinde formüle edilmiş ve XX için Tablo 4'teki kodlar kullanılmıştır. Örneğin "Introduction to Software Engineering and Computing" dersi SE101 olarak kodlanmış yani 1. Sınıf yazılım mühendisliği temel ders grubu üyesi bir ders anlamına gelmektedir.

Tablo4. SE2004 ders kodları (Software Engineering, 2004).

XX	Açıklama
CS	CCCS'den gelen dersler için
SE	SE2004'de tanımlanmış yazılım mühendisliği dersleri için
NT	SE2004'de tanımlanmış teknik olmayan dersler için
MA	SE2004'de tanımlanmış matematik dersleri için

abc	Açıklama
a	Kaçıncı yıl olduğunu gösterir.
b	0: Yazılım mühendisliği temel dersleri 1: Tasarım ve hesaplamada önemli ağırlığa sahip dersler 2: Ağılık olarak sonuç odaklı konulara sahip dersler
c	a ve b rakamları aynı ise bu dersleri ayırma için

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SE2004'de ilk yıl ve lisans programının yarısında verilebilecek giriş seviyesindeki derslere bir müfredat örneği Tablo 5'te görülmektedir.

Tablo5. SE2004 Giriş seviyesi ders önerileri (Software Engineering, 2004).

YIL 1 SE101 → SE102 → CS103 / SE200	**SE101** Introductionto Software Engineering and Computing **SE102** Software Engineering and Computing II **SE200** Software Engineering and Computing III **CS103** Data Structures and Algorithms
YIL 2 CS101 → CS102 → CS103 / SE201	**CS101** Programming Fundamentals **CS102** The Object-Oriented Paradigm **SE201** Introductionto Software Engineering
MATEMATİK DERSLERİ CS105 → CS106 / MA271	**CS105** Discrete Structures I **CS106** Discrete Structures II **MA271** Statistics and Empirical Methods

Çekirdek derslerin müfredatta yer alması ve derslerin sıralaması ile ilgili SE2004'de verilen öneriler Tablo 6'da yer almaktadır.

Tablo6. SE2004 Yazılım Mühendisliği Çekirdek Ders Önerileri (Software Engineering, 2004).

SE211 (A) → SE311 (D) SE212 (B) SE321 (C) / SE322 (E) → SE323 (F)	**SE211** Software Construction **SE212** Software Eng. Approach to Human Comp. **SE311** Software Design and Architecture **SE321**Software Quality Assurance and Testing **SE322** Software Requirements Analysis **SE323** Software Project Management

SE2004 çalışmasında derslerin detaylı tanım ve amaçlarına ekler kısmında yer verilmesinin yanı sıra Tablo 7'degörüldüğü gibi çeşitli dört yıllık örnek müfredat önerileri de sunulmuştur.

Tablo7. SE2004 Yazılım Mühendisliği Örnek Müfredat Planı (Software Engineering, 2004).

Yıl 1		**Yıl 2**		**Yıl 3**		**Yıl 4**	
Söm 1A	Söm 1B	Söm 2A	Söm 2B	Söm 3A	Söm 3B	Söm 4A	Söm 4B
Giriş seviyesi dersleri			CS	CS	CS	SE400	SE400
CS105	CS106	CALC1	CALC2	MA271	SE	SE	Seçim
NT		SE200/201	SE	SE	SE	Seçim	Seçim
		NT	SE	NT	Seçim		

2.2 Türkiye'deki Yazılım Mühendisliği Bölümlerinin SE2004 ile Müfredat Uyumları

Bu çalışmada SE2004'de belirtilen çekirdek derslerden 4, matematik derslerinden 2 ve giriş seviye derslerinden 4 tanesi ele alınmış ve ülkemizdeki 16 Yazılım Mühendisliği bölümünün ders müfredatları incelenerek bu derslerin programlarda yer alma istatistikleri çıkartılmıştır. Çalışmada SE2004'de belirtilen ders isimlerinin ülkemizde aynı içerikte, farklı isimler altında verildiği görülmüş ve bunların birer örnekleri Tablo 8'de verilmiştir. Çalışmada hatalı sayım yapmamak için hazırlanan bu tablodan faydalanılmıştır. Ders içeriği kadar isim bütünlüğünün de müfredat hazırlık aşamasında üniversitelerin belirli bir standardı yakalamaları için dikkat etmeleri gereken hususlardan biri olduğu düşünülmektedir.

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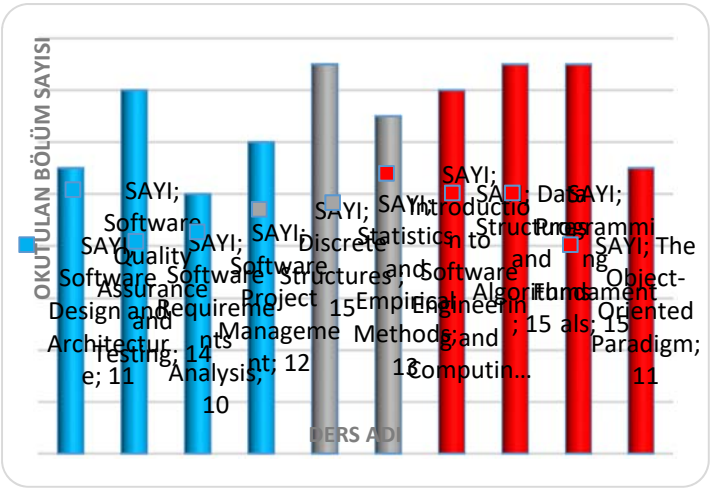
Tablo8. SE321, CS105, CS106, CS101 Dersine Karşılık Gelen Türkiye'deki Dersler

Türkiye'deki Benzer ders isimleri	**SE2004'deki Ders Karşılığı**
Yazılım Kalite Güvencesi ve Sınama	**SE321** Software Quality Assurance and Testing (Çekirdek Ders Grubu Dersi)
Yazılım Kalite Güvencesi ve Test etme	
Yazılım Test Temelleri	
Yazılım Test Teknikleri	
Yazılım Sınama ve Doğrulama	
Yazılım Kalite Güvencesi	
Ayrık Matematik	**CS105** Discrete Structures I **CS106**Discrete Structures II (Matematik Ders Grubu Dersi)
Ayrık Yapılar	
Ayrık Hesaplama Yapıları	
Bilgisayar Bilimlerinde Ayrık Yapılar	
Algoritma	**CS101** Programming Fundamentals (Giriş Seviyesi Ders Grubu Dersi)
Algoritma Analizi	
Algoritmaların Analiz ve Tasarımı	
Algoritma Çözümleme ve Tasarımı	
Algoritma Tasarımı	
Dağıtık Sistemler Ve Algoritmalar	
Algoritma ve Programlama 1	
Programlamaya Giriş	
Programlama ve Problem Çözme I	
Bilgisayar Programlama 1	

Türkiye'deki 16 Yazılım Mühendisliği bölümünün müfredat programlarının SE2004 çalışmasında önerilen dersler ile uygunluk düzeyleri Şekil 2 ve Şekil 3'te Çekirdek, Matematik ve Giriş Seviyesi Ders Gruplarında verilmiştir.

Şekil 2'deki grafikte çekirdek dersler mavi, matematik bilimi dersleri gri ve giriş düzeyi dersleri kırmızı renkler ile ifade edilmiştir. Çekirdek dersler grubunda "Software Requirements Analysis (Yazılım Gereksinim Analizi)" dersinin müfredatlar da 10 bölümde bulunarak en az yer alan ders olduğu ve "Software Quality Assurance and Testing (Yazılımda Kalite Güvenilirlik ve Test)" dersinin de 14 bölümde bulunaraken fazla yer alan ders olduğu görülmektedir. Matematik dersler grubunda "Statistics and Empirical Methods (İstatistiksel ve Deneysel Metodlar)" dersinin müfredatlar da 13 bölümde bulunarak en az yer alan ders olduğu ve "Discrete Structures (Ayrık Yapılar)" dersinin de 15 bölümde bulunarak en fazla yer alan ders olduğu görülmektedir. Giriş Seviyesi dersler grubunda "The Object-Oriented Paradigm (Nesne Yönelimli Programlama)" dersinin müfredatlar da 11 bölümde bulunarak en az yer alan ders olduğu ve "Data Structure and Algorithm (Veri Yapıları ve Algoritmalar)" ve "Programming Fundamentals (Programlamanın Temelleri)" dersinin de 15 bölümde bulunarak en fazla yer alan ders olduğu görülmektedir.



Şekil 2. SE2004 Derslerinin Türkiye'deki Bölümlerde Okutulma Sayıları

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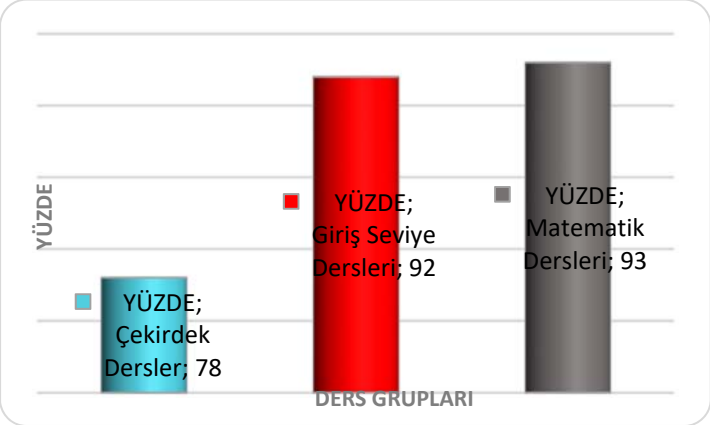
Şekil 3'deki grafikte bölümlerin üç gruptaki tüm derslerinin ortalama uygunlukları görülmektedir. Ülkemizdeki bölümlerin müfredatlarında Çekirdek derslerin 78%, Giriş Seviye derslerin 92% ve Matematik Bilimi derslerinin 93% oranlarında verildiğini görmektedir.



Şekil 3. SE2004 Ders Gruplarının Türkiye'deki Bölümlerde Uygulanma Oranları

3 Sonuç ve Öneriler

Gerçekleştirilen çalışma ile dünyada BT mühendislikleri alanlarındaki şekillenmeye bölümlerin tanım ve genel yapılarına değinilmiştir. Özellikle ülkemizde BT alanında eğitim veren farklı lisans programlarının bu tanımlar çerçevesinde eğitim ve öğretimlerini şekillendirmeleri, müfredatlarını hazırlamaları büyük önem taşımaktadır. Çünkü ülkemizdeki bölümler ile dünyadaki bölümlerin küreselleşmenin zirvede olduğu yüzyılımızda özellikle akreditasyon konusunda uyumlarının önemi yadsınamaz bir gerçektir. Bugün ülkemizde çok az sayıda bilgisayar mühendisliği bölümünün ABET, MÜDEK vb. kuruluşlara akredite olduğu görülmektedir. Bu sayıların hem bilgisayar hem de yazılım mühendisliği alanlarında artması bölümlerin hedefleri açısından önem taşımaktadır.

Yazılım mühendisliği bölümlerinin ülkemizde sayısının az olduğu ve özellikle özel üniversiteler bünyesinde açılmış olduğu görülmektedir. Bu sayının artması ve bölümün ülkemizde de tanınırlık düzeyinin gelişmesi için bölümün çizgilerinin iyi bilinmesi ve müfredat çalışmalarının titiz yapılması büyük önem arz etmektedir. Özellikle bu bölümleri tercih edecek öğrencilerin bilgisayar mühendislerinden ya da diğer BT mühendisliklerinden ne tür farklarının olacağını bilmeleri önemlidir fakat ülkemizde bu ayrımın net olarak farkına varılmadığını görmekteyiz.

Yazılım mühendisliklerinin özel sektörce kabul görmeleri ve iş hayatında daha çok tanınmalarına katkıda bulunacak her türlü çalışmanın bir birliktelik içerisinde uygulanması gerektiği düşünülmektedir. Özellikle teknoloji fakülteleri bünyesinde son yıllarda Yazılım Mühendisliği bölümlerinin açıldığı ve bu fakültelerdeki İş Yeri Eğitimi uygulamaları ile öğrencilerin özel sektörle bütünleşmesi ve bölümün tanınırlığının artmasının gerçekleştirileceği düşünülmektedir.

Çalışmamızda yüksek bir oranda bölümlerin müfredatlarının SE2004 ile uyumlu olduğu görülmüştür. Fakat çalışmada özellikle seçmeli derslerin hangilerinin okutulduğunun net olarak bölümler tarafından açıklanmaması tam bir müfredat analizi yapılmasını engellemiştir. Çünkü seçmeli derslerin oranı programlarda önemli bir yer tutmaktadır.

Çalışmanın mevcut bilişim alanındaki mühendislik bölümlerinin ve yeni kurulma aşamasında olan yazılım mühendisliği bölümlerinin müfredat çalışmalarında aydınlatıcı bir yol gösterici olacağı düşünülmektedir.

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ULTRASOUND ASSISTED SYNTHESIS OF ZINC BORATE

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Zinc borate has many applications including the polymer additive which serves as the flame retardant, the preservative in wood composites, the smoke and afterglow suppressant due to its ability to undergo endothermic dehydration in fire conditions, and optical properties, and the additive for lubrication. Zinc borate in general is produced with the reaction between zinc oxide, boric acid and water.

The chemical effects of ultrasound derive primarily from acoustic cavitation and the sonochemical method has been extensively used to generate novel materialswith unusual properties. The chemical and mechanical effects of ultrasound are dueto the cavitation phenomena which produces bubbles during the rarefaction (negativepressure) period of sound waves. The eventual collapse of bubbles generates intenselocal temperatures (hot spots), extreme pressures and rapidheating and cooling rates. These high heating and cooling rates hinderthe organization and crystallization of the products. Furthermore the fast kinetics doesnot permit the growth of the nuclei. Due to these extreme conditions, in almost all thesonochemical reactions leading to inorganic products, nanomaterials have been obtained. In this perspective, ultrasonic irradiation has been successfully applied toprepare various nanosized metals and metal oxides.

In this study, will be investigated the results of a systematic study of the effects of ultrasound power, ultrasound pulse ratio and probe type on zinc borate synthesis with the reaction of zinc oxide and boric acid.

Keywords: Zinc borate, Ultrasound, Synthesis, Flame retardancy

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UNICEF ÜLKELER RAPORU IŞIĞINDA TÜRKİYE'NİN ÇOCUK GÜVENLİĞİ BAKIMINDAN DÜNYADAKİ YERİ

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Özet: Hayata dair yeterli tecrübesi bulunmayan ve hayata dair meseleleri öğrenme aşamasında olan çocukların himayesi birçok ebeveyn için ileri mertebede öneme haizdir. Onların iyi bir hayat sürmesi ve yetişkin bireyler oluncaya dek mümkün mertebe koruma altında olmaları sadece ailelerin değil bütün bir dünyanın meselesi haline gelmiştir. Çocukların gelecekte yaşadıkları ülkenin sahipleri olacakları bilinciyle hareket eden Birleşmiş Milletler Çocuk Acil Durum Fonu (UNICEF) çeşitli faaliyetlerle bu amaca hizmet etmeye çalışmaktadır. Özellikle son zamanlarda dünya gündemini daha fazla işgal etmeye başlayan çocukların her türlü şiddetten korunması meselesi, taciz ve ilgisizlik gibi başlıca problemleri içermektedir. Dünyada olduğu gibi Türkiye'de de çocuklara yönelik üzücü vakaların yaşanması Türkiye'nin çocukların korunması hususunda dünyadaki yerinin nerede olduğu hususunda merak uyandırmıştır. Bu sebeple UNICEF'in 2015 Ülkeler Raporu çerçevesinde kümeleme analizi tekniğiyle bu husus tespit edilmeye çalışılmıştır. Ayrıca bu çalışmada Türkiye'nin yıllara göre çocukların korunması hususunda ne tür bir değişim kaydettiği tespit edilmeye çalışılmıştır.

Anahtar Kelimeler: UNICEF, Çocuk, Çocuk korunumu, Kümeleme Analizi

Giriş

Çocuklar hayata gözlerini açtıkları an ile yetişkinlik dönemleri arasında kalan süre zarfında mensubu oldukları toplumlara göre zihinsel ve fiziksel değişimlere maruz kalmaktadırlar. Bu süre zarfında en çok ihtiyaç duyacakları şey ise içerisinde yaşadıkları toplumun bir başka mensup olan yetişkin bireylerin onlara rehberlik etmeleri ve onları muhtemel tehlikelere karşı koruma altına almalarıdır.

Yetişkin bireylerin yardımının elzem olduğu bilinmesine rağmen maalesef çocuklar dünyada ve Türkiye'de şiddete maruz kalabilmektedir ve çocuklara reva görülen bu şiddet yıllara göre artış göstermektedir (Unicef Report, 2014). Çocukların her türlü şiddetten korunmasını amaçlayan çalışmalar ve faaliyetler Dünya Bankası, Birleşmiş Milletler vb. uluslararası örgütler tarafından mercek altına alınarak desteklenmektedir (Bissell, 2015).

Çocuklara karşı artan trenddeki şiddet eğilimi mevzu bahis uluslararası örgütleri harekete geçirdiği gibi UNICEF'i de konu hakkında tedbir almaya sevk etmiştir. UNICEF çocukların korunması üzerinde özellikle durarak 2006 yılında Birleşmiş Milletler Genel Sekreterliğinin sunduğu raporda bu meseleye özel yer ayırmış ve konu ile alakalı çalışmaları desteklediğini belirtmiştir (Hart et al., 2011).

Literatür

Girişte belirttiğimiz gibi çocuklara uygulanan şiddetin özellikle son yıllarda Türkiye'de olduğu gibi dünyada da yankı bulması ile bu yönde yapılan çalışmaları tetiklemiştir. Tanzanya çocuk güvenliği açısından ciddi zafiyetlerin oluşması sebebiyle mercek altına alınarak çocuklara uygulanan şiddetin nasıl azaltılabileceğinin belirlenebilmesi için 2010-2013 yılları arasında çocuk güvenliği ile alakalı ölçümler yapılmıştır. Çocuğa olan şiddetin daha belirgin olduğu cinsel, fiziksel ve duygusal hasarların ölçümü yapıldığında şiddet mağdurlarının büyük bir kısmının kız çocuğu olduğu ve her yılda elde edilen verilerin bir önceki yılın verilerin 3 katı olacak şekilde arttığı belirlenmiştir. Ayrıca şiddet uygulanan çocuklarının anne ve babasından her ikisinin de hayatta olanlarının oranının 2011-2012 döneminde %48 iken bu oranın 2012-2013 döneminde %91'e çıktığı ve ebeveynlerin çocuklarına şiddet uygulamalarının ailenin içinde bulunduğu maddi sıkıntılar ile bağlantılı olduğu tespit edilmiştir (Ng'ondi, 2015).

Tanzanya'da için yapılan çalışmaya benzer Uganda için de düzenlenerek ülkenin merkez bölgesinde 42 ilkokuldan 3706 öğrenci ile birlikte çocuk güvenliği hizmetleri hakkında bir anket çalışması yapılmıştır. Denek çocuklar üzerinde belirgin seviyede olan darplar türüne, şiddetine ve kaç kere tekrar edildiğine göre sınıflandırılmıştır ve anket çalışması yapıldıktan sonra denek öğrenciler 4 ay boyunca takip edilmişlerdir. İlk bulgulara göre 529 çocuğun darp edilmeye maruz kaldığı ve bu deneklerin yaklaşık 2/3'ünün kız çocuğu olduğu tespit edilmiştir. Bu sonuçlara göre birlikte çalışılan deneklerin %14'lük bir kısmının şiddete maruz kaldığı ve bunun kabul edilebilir seviyenin çok üstünde olduğu belirtilmiştir (Child et al., 2014).

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Çocuk güvenliği meselesinin Estonya özelinde başka yönden bir incelemesinin yapıldığı bir çalışmada çocuk merkezli yaklaşımın Estonya'da nasıl uygulanabileceğine cevap aranmaktadır. Bu maksatla çocuk güvenliğinden sorumlu Estonya'nın farklı bölgelerinden 20 kişiye anket uygulaması yapılmıştır. Çalışmalar sonucunda varılan sonuç ise çocuk güvenliğinden sorumlu çalışanların çocuk merkezli yaklaşımlar için daha fazla teşvik edilmesi ve daha fazla bilinçlendirilmeleri gerektiği şeklinde olmuştur (Toros et al., 2013).
Kanada'da yapılan başka bir çalışmada ise çocuk istismarına maruz kalanların ve istismar riski altında olanların tespit edilmesi maksadıyla hazırlanarak elde edilen 2012 Kanada Halk Sağlığı anketi sonuçlarından faydalanılmıştır. Kanada için yapılan işbu çalışmada ise Kanada'da yaygın olarak görülen istismar türlerinden olan fiziksel ve cinsel istismarın yanı sıra yakın akraba kaynaklı şiddete ait verilerle mevzu bahis olan anket sonuçlarının birbiriyle ne kadar örtüştüğü belirlenmeye çalışılmıştır. Ülkenin 10 farklı bölgesinden gelen verilerle yapılan karşılaştırmaya göre her üç istismar türünün de hemen hemen aynı oranda çocuk güvenliğinden sorumlu organizasyonlara anket yoluyla rapor edildiği ve bunların arasından en öne çıkan fiziksel istismar hususu üzerinde eğilmenin gerektiğini belirtmişlerdir (Afifi et al., 2015).
Çocuk istismarı ve çocuk güvenliği hakkında yakın zamanda yapılan çalışmalardan elde edilen sonuçlar vaziyetin ne derecede vahim olduğunu ortaya koymaktadır. İstatistikî verilerden elde edilen sonuçların rakamsal olarak tek başına irdelenmeleri ve yorumlanmalarının yanı sıra bu verileri temsil eden göstergelerin belli düsturlar muvacehesinde kendi aralarında kıyas edilerek daha çok veya az öneme haiz olanlarını tespit etmek nev'inden birtakım çalışmalar da mevcuttur. Lakin kıyas aşamasına geçmeden evvel göstergelerin temsil hususunda güvenilir olması yapılacak çalışmaların sıhhati bakımından önem arz etmektedir.
Elde edilen verilerin daha iyi yorumlanabilmesi için kullanılan göstergeleri geliştirmek ve belli bir kalıp içerisine sokmak maksadıyla yapılan bir çalışmada ise çocuk güvenliği hususunda önerilen göstergelerin iyi tanımlanmasının meseleyi daha iyi kavramamıza imkan sağlayacağı iddia edilmektedir. Bu maksatla Uganda'da yapılan bir çalışmada çeşitli göstergeler kullanılarak çocuk güveliği hususunun güvenilir bir şekilde ölçülebileceği bir mekanizma geliştirilmiştir ve bu mekanizmanın tamsayılı ölçüme uyarlanması çalışması devam etmektedir (Ager et al., 2011).
İngiltere'nin 152 farklı bölgesinden 13 yaş üstü çocuklar üzerinde ihtiyaç sahibi çocuklar ve buna mukabil çocuk güvenliği servislerinin performans ölçümleri ile alakalı ve eğilimler ile kalite göstergeleri arasındaki korelasyonu belirlemeye matuf yapılan bir çalışmada yapılan ölçümler ile Eğitim Standartları Ofisinin derecelendirmelerinin birbirine benzer şekilde olduğu, sonuç olarak ise yapılan ölçümlerin çalışmanın yapıldığı dönemin ilk dönemlerine nazaran son dönemlerine ait derecelendirmelerle daha tutarlı olduğu tespit edilmiştir (Hood et al., 2016).

Metodoloji

Yukarıda bahsedilen İngiltere konulu (Hood et al., 2016) yerel bölgeler arasında yapılan kıyaslama çalışması bize daha geniş kapsamda Türkiye ile alakalı bir çalışmanın yapılabileceği fikrini aşılamıştır. Lakin yerel bazda değil küresel bazda yapılacak bir çalışmanın Türkiye'nin karşılaştırmalı olarak nerede olduğunu kavramamıza yardımcı olacağı fikrini taşımaktayız. Yaptığımız bu çalışmadaki temel maksatlar;

- Çocukları korumaya yönelik alınan tavır ve onlara yönelik şiddet hususunda ülkelerin mevcut durumlarını rakamlarla belirtmek
- Türkiye'nin mevzu bahis veriler çerçevesinde diğer ülkelere nazaran nerede durduğunu belirlemek ve
- Çocukların maruz kaldığı istenmeyen durumlarda cinsiyet ayrımcılığının olup olmadığını tespit etmektir.

Çalışmada UNICEF'in 2015 ülkeler raporu dikkate alınmakta ve raporun "Çocuk Güvenliği" alt başlığında aşağıda belirtilen indikatörler değerlendirmeye alınmaktadır:

- Çalışan çocuk işçi oranı
- Doğum kaydı oranı
- Terbiyede şiddete başvurma oranı
- Kadına şiddetin mazur görülmesi oranı

Raporda yer alan verilerin değerlendirilmesi aşamasında kadın sünneti meselesi dar bir coğrafyada gözlemlenmesi cihetiyle göz ardı edilmektedir. Genel olarak çocuk güvenliği hakkında AB ülkelerinden veri elde edilemediği için ülkeler değerlendirmesinde AB ülkeleri değerlendirme dışı kalmıştır.
Cinsiyet ayrımı için kullanılan indikatörler ele alındığında genel olarak verilerin normal dağılıma uymadıkları gözlemlenmektedir. Erkek-Kız karşılaştırması yapabilmek için ise Mann-Whitney testi uygulanarak; çocuk çalışan işçi, kadınlara yönelik şiddetin mazur görülmesi ve terbiyede şiddete başvurulması indikatörleri bakımından cinsiyet ayrımının yapılıp yapılmadığı tespit edilmiştir.

Sonuçlar ve Değerlendirme

Aşağıdaki dendogram sonuçlarından da görülebileceği üzere kümeleme analizi sonuçlarına göre Türkiye; 4 ana gruptan en iyi derecede olan Arnavutluk, Svaziland, Azerbaycan, Lao, Guyana ve Moldova'nın içerisinde

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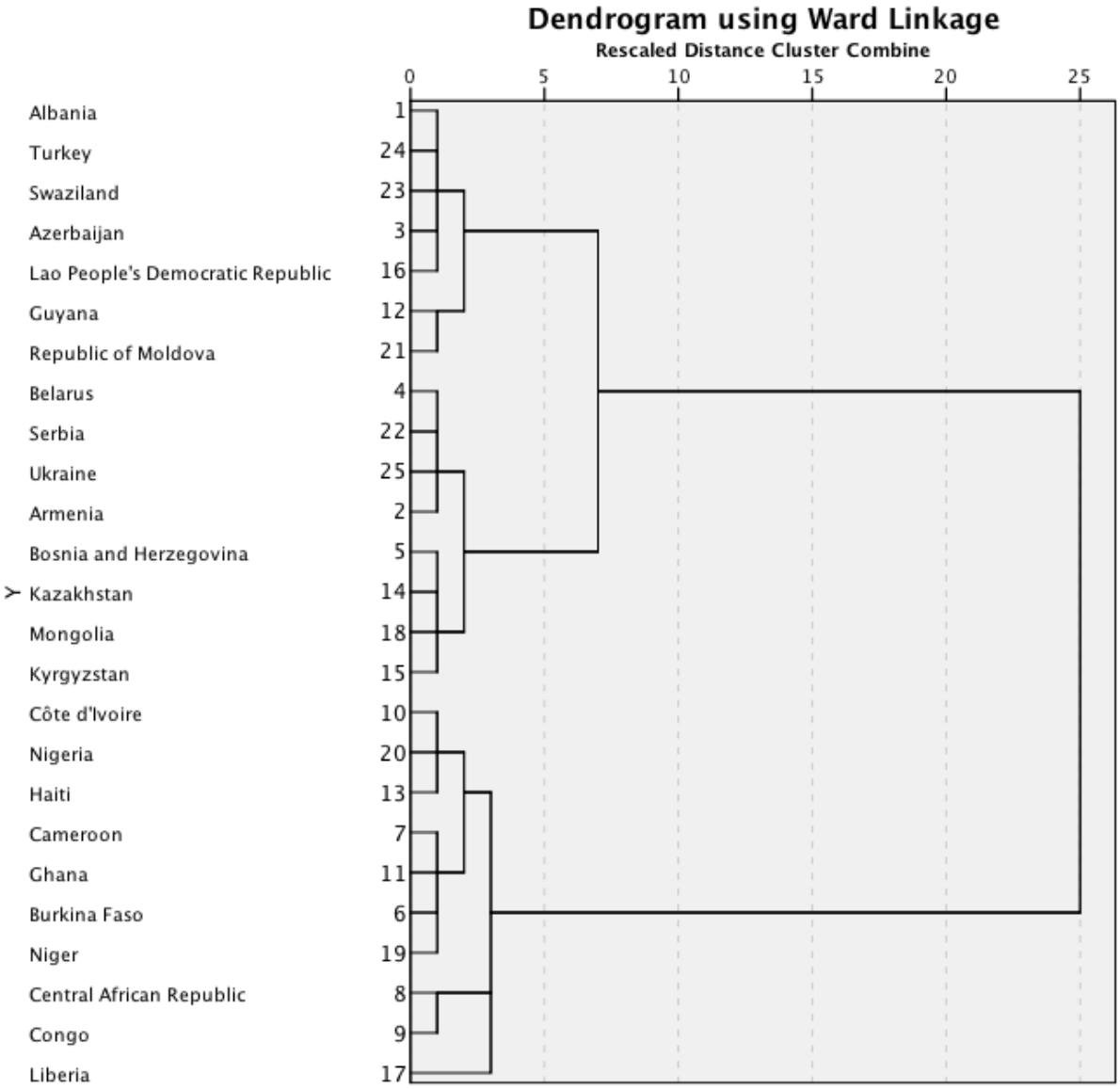
bulunduğu grupta yer almaktadır. Bu sonuçlara göre Türkiye'nin çocuk güvenliği konusunda ne kadar hassas davrandığı açıkça görülmektedir.



Şekil-1: Çocuk Güvenliği Hususunda Ülkelerin Kümeleme Analizine Göre Dendrogramdaki Yerleri

Tablo-1: Belirtilen Göstergelere Göre Erkek-Kız Ayrımının Olup Olmadığına Dair Sonuçlar

İndikatör	Ortalama		Standart Hata		P Değeri
	Erkek	Kız	Erkek	Kız	
Çocuk Çalışan Oranı (%)	15,9761	14,3685	1,1439	1,2169	0,165
Kadına Şiddetin Makul Karşılanması (%)	33,0228	39,1875	2,4570	2,5614	0,226
Terbiyede Şiddete Başvurulması (%)	79,8053	76,5789	1,5201	1,8626	0,288

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Çocuk çalışma oranı, kadına şiddetin makul görülmesi ve terbiyede şiddete başvurulmasında cinsiyet ayrımının yapılıp yapılmadığı hususunda yapılan analizlerin yukarıdaki tabloda elde edilen sonuçlarına göre hiçbir hususta cinsiyet ayrımının yapılmadığı tespit edilmiştir.
AB ülkelerinden yeterli verilerin elde edilememesinden dolayı analiz sonuçları her ne kadar net bir tablo ortaya koyamasa da yaklaşık bir değerlendirmeye imkan tanımaktadır. Analiz sonuçlarına göre Türkiye övünülebilecek bir konumdadır lakin %8'lik çocuk işçi oranı bunu gölgelemektedir. Çocuk haklarının ihlali hususunda ise cinsiyet farkı gözetilmeksizin her çocuk tehlike altındadır.

Teşekkür

Karabük Üniversitesi'ne konferansa iştirak edebilmemiz için sağlamış olduğu imkanlardan dolayı teşekkür ederiz.

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URLA-ÇEŞME YARIMADASININ MORFOTEKTONİK ÖZELLİKLERİ

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Çalışma alanı Batı Anadolu'da, İzmir körfezi ile Kuşadası körfezleri arasında Ege Denizi'ne doğru uzanan yarımadalar kompleksinin güney ve güneybatı kesimlerini oluşturur.

Çalışma alanının en eski arazileri Devonien'e ait kırıntılı birimler ile bunların üzerine konkordant olarak gelen Alt Karbonifer kireçtaşlarıdır. Sahada geniş alanlar kaplayan ve komprehansif seri niteliğinde Mesozoyik birimler, Paleozoyik üzerinde taban konglomeraları ile başlar. Çoğunluğu karbonatlardan oluşan ve Alt Triyas'tan Alt Kretase sonlarına kadar devamlı denizel ortamda çökelmiş tortullardır (Karaburun istifi, Karaburun platformu, Karaburun kuşağı). Mesozoyik yaşlı komprehansif seri üzerine yine taban konglomeraları ile başlayan En Üst Kretase (Maestrihtiyen) yaşlı, fliş karakterli kırıntılı çökeller gelir (İzmir-Ankara zonunun güneybatı kesimini oluşturan Bornova flişi veya Bornova karmaşığı). Sahada Tersiyer Neojen göl ortamında çökelen göl tortulları, volkano-sedimanter formasyonlar ve volkanitlerle temsil edilir (Tersiyer'in ilk yarısı, Orta Miyosen'e kadar süren uzun bir karasal aşınım dönemi ile karakterize edilir). Özellikle kıyı ovalarında ve tektonik, tektono-karstik depresyonlarda bulunan alüvyonlar ise en genç birimlerdir.

Çalışma alanı iki tektonik kuşağın (İzmir-Ankara zonunun bir bölümünü oluşturan Bornova karmaşığı ve Karaburun kuşağı) temas sahasında bulunur. Maestrihtiyen'de fliş çökeliminin meydana geldiği havza kapanmaya başlamıştır. Bu sırada sıkışma tektoniği ile ilgili deformasyonlara bağlı olarak Karaburun karbonat istifi K-G doğrultulu, doğuya eğimli bindirme fayları ile dilimlenerek, Bornova karmaşığı üzerinde naplaşmıştır. Alp orojezine bağlı kompresyonel hareketler, çalışma sahasının dışında kalan doğu kesimlerde, Bornova karmaşığının Batı Anadolu'nun en büyük tektonik birliği olan Menderes masifi üzerine bindirmesine de neden olmuştur. Çalışma alanında genellikle K-G doğrultulu olan neotektonik döneme ait morfotektonik yapılar Batı Anadolu'nun genelinden farklıdır; ancak yarımadadaki K-G doğrultulu paleotektonik yapılarla uyumludur.

Yarımadanın merkezi kesimleri, genel olarak Mesozoyik kireçtaşlarından oluşan ve K-G doğrultusunda uzanan yüksek alanlar durumundadır. Merkezi sırt şeklindeki bu kütle, Pliyosen ve Kuvaterner'deki neotektonik hareketlerle yükselmiş ve yer yer eğim atımlı faylarla parçalanarak, üzerinde kabaca kuzey-güney doğrultulu bazı depresyonlar oluşmuştur. Daha sonra bu çöküntü alanlarında karstik süreçler etkili olduğundan, Barbaros, Kadıovacık ve Nohutalan depresyonları gibi tektono-karstik depresyonlar meydana gelmiştir. Pliyosen ve Kuvaterner'deki tektonik hareketler, yarımada kıyılarındaki kuzey-güney doğrultulu koy ve körfezlerin oluşumunda da rol oynamıştır.

Genel olarak 250-650 metreler arasında yükseltiye sahip merkezi sırtın doğu ve batısında, geniş çapta neojen göl tortullarının bulunduğu alçalım alanları mevcuttur. Kuvaterner'deki tektonik hareketlerle bu alçalım alanları içinde yer yer tali çöküntü alanları oluşmuştur. Denize doğru açılan bu tali çöküntü alanlarının gerisinde önce kıyı setleri ve lagünler, bilehare lagünlerin alüvyonlarla doldurulması bazı kıyı ovaları meydana gelmiştir. Batıda Alaçatı ovası, Gülbahçe Körfezinin güneyinde Malkaça ovası bu şekilde meydana gelmiş, denizel transgresyonlar ve akarsu faaliyetleri sonucu alüvyonlarla doldurulan tektonik kökenli kıyı ovalarıdır.

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USE OF MOLTEN SALT METHOD IN THE SYNTHESIS OF METAL HYDRIDE ELECTRODE MATERIALS

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Abstract: La-Ni based alloys are being used in the commercial secondary nickel metal hydride batteries. Economical synthesis of these alloys may cause large scale utilization of them especially in the electrical vehicles. The electro-deoxidation, which is accepted as the revolutionary technique in the extractive metallurgy, is very promising in the metal hydride alloy synthesis since it provides direct synthesis of the alloys from their oxide raw materials. In this study $La(Ni_{0.8}Co_{0.2})_5$ (AB_5 type) and $La_2(Ni_{0.8}Co_{0.2})_7$ (A_2B_7 type) alloys were synthesized in the molten $CaCl_2$ electrolyte at 850°C and the charge/discharge characteristics of the synthesized alloys were observed. Sintering caused the hygroscopic La_2O_3 to disappear and the non-hygroscopic $LaNiO_3$ to form. LaOCl was observed to form chemically upon contact of the sintered pellet with the melt. The X-ray diffraction peaks indicated that the sinter products reduced to $LaNi_5$ and La_2Ni_7 phases within 2 h and 6 h electro-deoxidation process, respectively. The sluggish reduction kinetics of LaOCl phase was observed to retard the appearance of La_2Ni_7 phase. The discharge capacities of $La(Ni_{0.8}Co_{0.2})_5$ and $La_2(Ni_{0.8}Co_{0.2})_7$ alloys were determined as 325 mA h g^{-1} and 332 mA h g^{-1}, respectively. The results obtained in this study showed that the electro-deoxidation technique is very promising in the synthesizing of the high performance hydrogen storage alloys.

Keywords: La-Ni Alloys, Electro-deoxidation, Hydrogen Storage

Introduction

A novel technique called electro-deoxidation, which is also known as Fray-Farthing-Chen (FFC) Cambridge process (Chen, 2000, Mohandas, 2004), is reported as very promising for the economical synthesis of the alloys directly from their oxide mixtures (Zhu, 2007, Tan, 2010, Anik, 2014). Lanthanum-Nickel based alloys are generally synthesized by the melting and casting under the protective atmosphere (Srivastava, 1999, Hayakawa, 2005, An, 2013). Of course the individual elements (La and Ni) must be already extracted and refined for the melting and casting processes. The cast products need annealing for several hours to get the structural homogeneity (Huang, 2002). Obviously this production pathway for the La-Ni based hydrogen storage alloys is not very encouraging especially for the large scale applications like battery systems of the electrical vehicles. The electro-deoxidation method looks more cost-effective since it provides direct synthesis of the alloy with final stoichiometry from the raw materials (oxides). In this work AB_5 and A_2B_7 type intermetallic alloys were synthesized by the molten salt electro-deoxidation method and the electrochemical hydrogen storage was applied to the final alloy structures.

Materials and Methods

Commercially available La_2O_3, NiO and CoO powders were obtained from Alfa Aesar. Required amounts of the oxide powders were mixed homogeneously in anhydrous ethanol includes 3% (by weight) polyethylene glycol (PEG) with a planetary ball mill. The powder was then dried overnight at room temperature. Dried powder was cold pressed into pellets of 10 mm in diameter, under a pressure of 1.5 tonne cm^{-2}. The oxide pellets were then sintered at 1200°C for 3 h.

The electrochemical experiments were performed in a quartz cell which was located inside a homemade programmable electrical furnace. The upper end of the quartz cell was closed tightly with a quartz cover which has holes for the electrode leads, thermocouple, gas inlet and outlet. The quartz cell was continuously purged with Ar gas during the electro-deoxidation process.

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100 gr $CaCl_2$ was mixed with 1 gr CaO and placed into graphite crucible. Before electro-deoxidation process $CaCl_2$-CaO powder mixture was dried under Ar gas. Drying was carried out by slow heating (about 1°C min^{-1}) to 150°C and holding at 150°C for 15 h and then slow heating to 300°C and holding at 300°C for 15 h and then finally slow heating to the target temperature of 850°C for the electro-deoxidation experiments.

In order to fully remove the water and the possible redox-active impurities, pre-electrolysis were carried out at 2.5 V and 850°C for 4 h. During the pre-electrolysis graphite crucible was used as anode and another graphite rod was used as cathode. For the electro-deoxidation experiments the graphite rod was removed from the cell and the prepared oxide pellet electrode was inserted into the quartz cell as a cathode. The electro-deoxidation was conducted at 3.2 V for various times at 850°C. The potential control was carried out by the programmable direct current source.

After the electro-deoxidation experiments the pellet electrodes were removed from the molten melt and they were located in the upper part of the quartz cell which was cooled down by keeping the Ar gas purging. The solidified salt on the pellet was washed out by tap water. After slight surface grinding the pellets were kept in 1 M HCl for few minutes. Finally the deoxidized pellet samples were dried at 100°C for 24 h under vacuum.

Working electrodes were prepared by mixing 0.1 g alloy powder with 0.3 g nickel powder and then cold pressing into pellets of 10 mm in diameter, under a pressure of 10 tonne cm^{-2}. Hg/HgO reference electrode was used in 6 M KOH solution. Tests were performed with GAMRY Model Reference 3000 potentiostat/galvanostat unit. The charge current density was 100 mA g^{-1} and the charging was carried out down to the severe gassing potential. The discharge current density was 25 mA g^{-1} and the discharge cut-off potential was -0.5 $V_{Hg/HgO}$.

The phase structure of the alloy powders was examined by the X–ray diffractometer (Bruker axs D8) using Cu Kα radiation. The powder morphologies were observed by ZEISS SUPRATM 50 VP Scanning Electron Microscope (SEM).

Results and Discussion

The alloy development stages of $La(Ni_{0.8}Co_{0.2})_5$ alloy during electro-deoxidation are shown in XRD patterns in Figure 1. Sintering of La_2O_3 + NiO + CoO mixture at 1200°C for 3 h yields formation $LaNiO_3$ phase in the expense of La_2O_3 as in the following reaction:

$$La_2O_3 + 2NiO + 1/2O_2 = 2LaNiO_3 \quad [1]$$

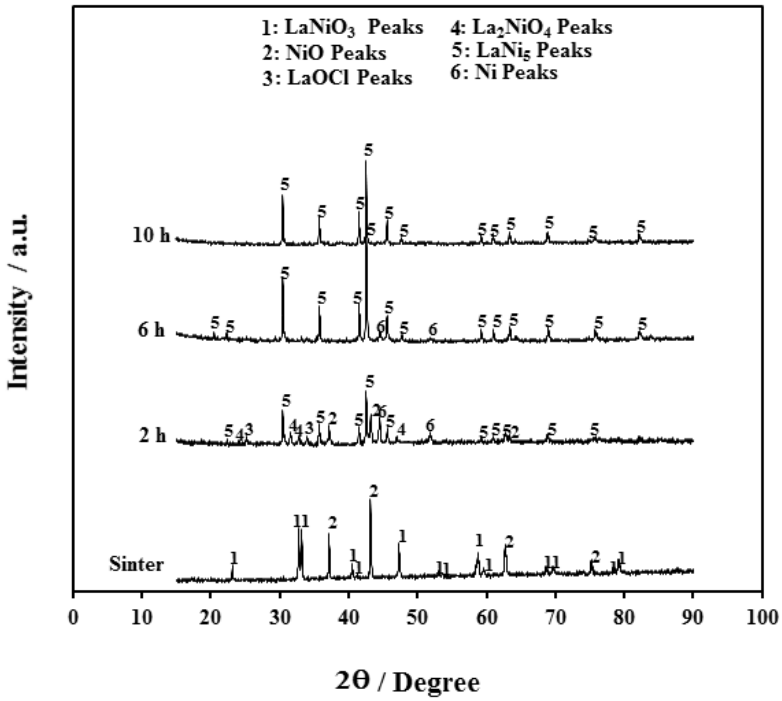

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Figure 1. XRD patterns show the alloy development stages at various electro-deoxidation times for $La(Ni_{0.8}Co_{0.2})_5$ alloy.

After 2 h electro-deoxidation the sinter product $LaNiO_3$ phase disappears and La_2NiO_4 phase forms probably as a result of the following reduction reaction:

$$2LaNiO_3 + 2e^- = La_2NiO_4 + NiO + O^{2-} \quad [2]$$

The remaining reactions can be expected as in the followings:

$$La_2NiO_4 + 2Cl^- = 2LaOCl + NiO + O^{2-} \quad [3]$$

$$NiO + 2e^- = Ni + O^{2-} \quad [4]$$

$$La_2NiO_4 + 9Ni + 8e^- = 2LaNi_5 + 4O^{2-} \quad [5]$$

After 6 h electro-deoxidation La_2NiO_4 phase disappears due to the completion of Reactions 3 and 5, and the following reactions couple to the above reactions:

$$LaOCl + 3e^- = La + Cl^- + O^{2-} \quad [6]$$

$$La + 5Ni = LaNi_5 \quad [7]$$

10 h electro-deoxidation looks to enough to get stable alloy structure with 100% $LaNi_5$ phase. There is no any Co phase in Figure 1 since Co makes Co-La and Co-La-O phases with the exactly same stoichiometry of Ni-La and Ni-La-O phases. Therefore peak positions of Co phases are exactly same with those of Ni phases and it impossible to differentiate them in the XRD patterns.

Alloy development stages of $La_2(Ni_{0.8}Co_{0.2})_7$ alloy are depicted with the XRD patterns in Figure 2. Reactions 1-7 look also valid for the $La_2(Ni_{0.8}Co_{0.2})_7$ alloy development. In the final stage there is following extra reaction:

$$LaNi_5 + La + 2Ni = La_2Ni_7 \quad [8]$$

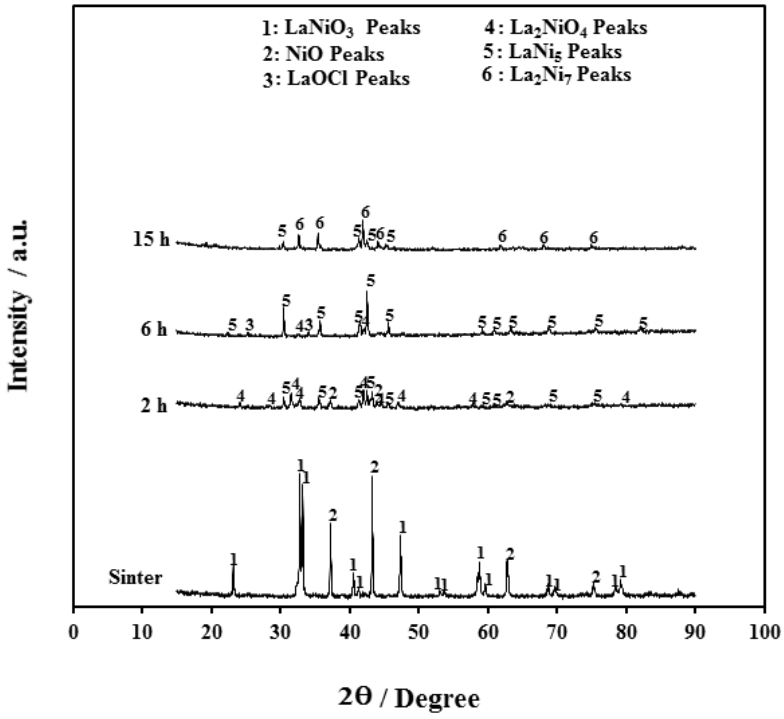

Figure 2. XRD patterns show the alloy development stages at various electro-deoxidation times for $La_2(Ni_{0.8}Co_{0.2})_7$ alloy.

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The presence of Reaction 8 retards the gaining of the stable structure for $La_2(Ni_{0.8}Co_{0.2})_7$ alloy and it takes 15 h to complete electro-deoxidation process. There is also retained $LaNi_5$ phase in the alloy structure probably due to the inefficiency of Reaction 8 since it requires elemental diffusion of La and Ni. Segregation of these elements to the pellet surface may destroy the homogeneity of the pellet and Reaction 8 cannot take place completely.

Scanning electron micrographs of the as-sintered oxide powders and fully deoxidized powders of both $La(Ni_{0.8}Co_{0.2})_5$ and $La_2(Ni_{0.8}Co_{0.2})_7$ alloys are provided in Figure 3. As-sintered powders have typical fine oxide powder appearance. At the end of the electro-deoxidation process, however, the large crystalline metallic powder morphology develops. The porous structure of the developed alloys are also apparent in Figure 3.

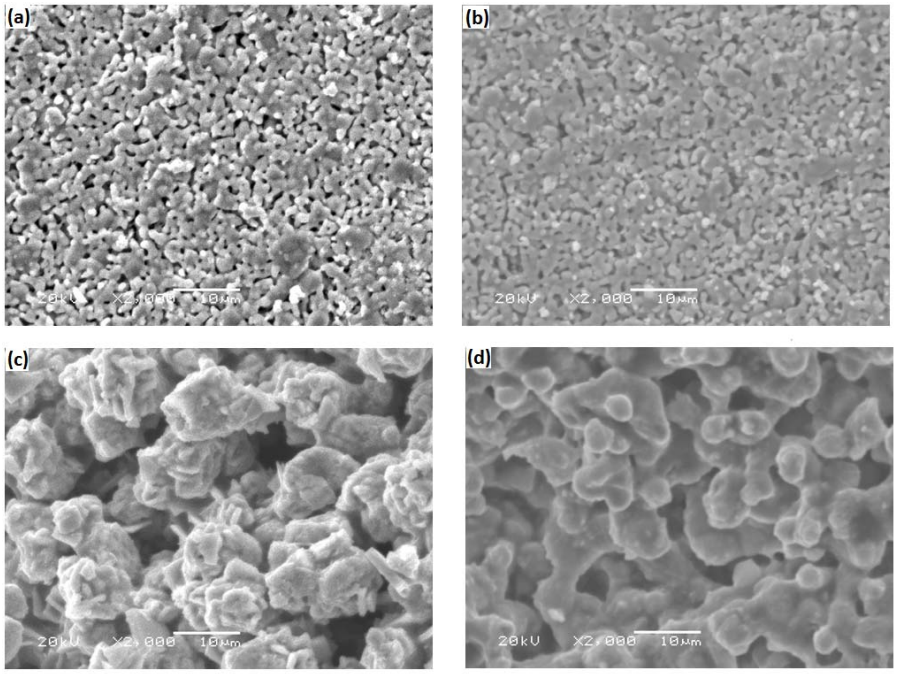

Figure 3. Powder morphology of sintered (a) $La(Ni_{0.8}Co_{0.2})_5$ and (b) $La_2(Ni_{0.8}Co_{0.2})_7$ alloys, and the fully deoxidized powder morphology of (c) $La(Ni_{0.8}Co_{0.2})_5$ and (d) $La_2(Ni_{0.8}Co_{0.2})_7$ alloys.

After synthesizing alloys with a final structure the discharge capacities as a function charge/discharge cycles are obtained as in Figure 4. The synthesized alloys need few cycles for activation to reach their maximum discharge capacities. The maximum discharge capacities of $La(Ni_{0.8}Co_{0.2})_5$ and $La_2(Ni_{0.8}Co_{0.2})_7$ alloys are 325 mA h g^{-1} and 332 mA h g^{-1}, respectively.

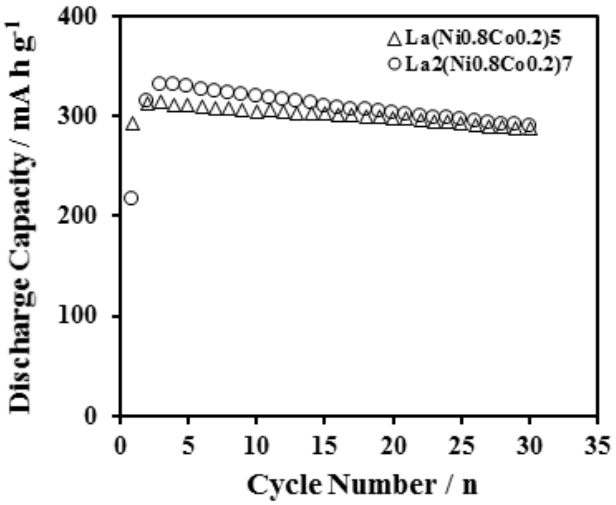

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Figure 4. Discharge capacities of $La(Ni_{0.8}Co_{0.2})_5$ and $La_2(Ni_{0.8}Co_{0.2})_7$ alloys as a function of charge/discharge cycles.

This work clearly shows that electro-deoxidation may become very effective and probably more economical method in the synthesis of the energy storage materials.

Conclusion

$La(Ni_{0.8}Co_{0.2})_5$ (AB_5 type) and $La_2(Ni_{0.8}Co_{0.2})_7$ (A_2B_7 type) alloys were synthesized in the molten $CaCl_2$ salt at 850°C. Sintering caused the hygroscopic La_2O_3 to disappear and the non-hygroscopic $LaNiO_3$ to form. LaOCl was observed to form chemically upon contact of the sintered pellet with the melt. The X-ray diffraction peaks indicated that the sinter products reduced to $LaNi_5$ and La_2Ni_7 phases within 2 h and 6 h electro-deoxidation process, respectively. The sluggish reduction kinetics of LaOCl phase was observed to retard the appearance of La_2Ni_7 phase. The discharge capacities of $La(Ni_{0.8}Co_{0.2})_5$ and $La_2(Ni_{0.8}Co_{0.2})_7$ alloys were determined as 325 mA h g^{-1} and 332 mA h g^{-1}, respectively. The results indicated that the electro-deoxidation technique is very promising in the synthesizing of the high performance hydrogen storage alloys

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ÜÇGEN VEYA SINÜZOİDAL DİNAMİK YÜK İLE YÜKLENMİŞ DİK TABAKALI VİSKOELASTİK SIĞ KÜRESEL KALIN KABUKLARIN DİNAMİK DAVRANIŞLARI

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Özet: Bu çalışmada Üçgen veya sinüzoidal dinamik yük ile yüklenmiş olan viskoelastik malzemeye sahip dik tabakalanmış sığ küresel viskoelastik kalın kabukların dinamik davranışları birinci mertebe kayma deformasyon teorisi dikkate alınarak Laplace uzayında nümerik olarak incelenmiştir. Bu çalışma ile ayrıca sığ küresel kalın kabukların dinamik analizleri için çok etkin ve aynı zamanda çok basit bir çözüm yaklaşımı önerilmiştir. Önerilen yöntemde, sistemi idare eden hareket denklemi Navier yaklaşımı kullanılarak zaman uzayında elde edilmiştir. Ardından sistem hareket denklemine Laplace dönüşümü uygulanmış ve böylece dönüşmüş uzayda zaman terimlerinden bağımsız hale dönüşen lineer cebrik denklem takımı sayısal olarak çözülmüştür. Dönüşmüş uzayda elde edilen sayısal sonuçları zaman uzayına dönüştürmek için Durbin'in modifiye edilmiş ters Laplace dönüşüm metodu kullanılmıştır. Elde edilen çözümlerin doğrulanması önerilen yöntem ile elde edilen değerlerin farklı yaklaşımlar ile elde edilen değerler ile karşılaştırılması yapılarak sağlanmıştır. Karşılaştırma için Navier yaklaşımı ve Newmark metodunun birlikte kullanılması ile elde edilen değerler ayrıca ANSYS sonlu elemanlar yazılımı ile elde edilen değerler kullanılmıştır. Bu çalışmada elde edilen sayısal değerler, önerilen yöntemin son derece doğru ve basit bir çözüm yöntemi olduğunu ve dik tabakalı viskoelastik sığ küresel kabuk problemlerine kolayca uygulanabildiğini kanıtlamıştır.

Anahtar Kelimeler: Viskoelastik Malzeme; Dinamik Analiz; Ters Laplace Dönüşüm; Dik Tabakalı Sığ Küresel Kabuk

Giriş

Tabakalı kompozit kabuklar sahip oldukları eğrilik ve değişik tabakalanma kombinasyonları nedeniyle yüksek yük taşıma kabiliyeti gibi çok önemli bir avantaja sahiptirler. Tabakalı kompozit kabuklar bu avantajlarından dolayı inşaat sektöründen gemicilik sektörüne, uzay ve havacılık teknolojisinden mobilya sektörüne kadar neredeyse tüm mühendislik alanlarında yüzyıllardır çok yaygın olarak kullanılmaktadır.

Tabakalı kompozit kabukların her alanda kullanılması nedeniyle bu alanda pek çok araştırma yapılmış ve yapılmaya devam etmektedir (Chen ve Huang, 2001; Dey ve Karmakar, 2014; Jung ve Han, 2014; Prusty, ve Satsangi, 2001; Şahan, 2015). Tabakalı kompozit kabuklar taşıdıkları yükler dikkate alındığında çok değişik yük tiplerine maruz kalabilirler. Bu nedenle ani dinamik yük etkisindeki tabakalı kompozit kabukların davranışlarını belirlemek çok önemlidir. Bir başka durum da tabakalı kompozit kabuğun malzeme davranışının problemlerde dikkate alınmasıdır.

Bu çalışmada dik olarak tabakalanmış viskoelastik sığ küresel kabukların ani üçgen veya sinüzoidal dinamik yük etkisi altındaki davranışları incelenecektir.

Bu çalışmada, üçgen veya sinüzoidal dinamik yük ile yüklenmiş olan viskoelastik malzemeli sığ küresel kabukların hareket denklemlerine Laplace dönüşümü uygulanması ve ardından dönüşmüş uzayda elde edilen lineer cebrik denklem takımının sayısal olarak çözülmesi ve son olarak elde edilen çözümlerin Durbin'in modifiye edilmiş ters dönüşüm yöntemi yardımıyla zaman uzayına dönüştürülmesi prosedürünün oldukça etkin bir yöntem olduğu ayrıca gösterilmiştir.

Elde edilen sistem hareket denklemi Laplace dönüşümü yardımıyla lineer cebrik takımına dönüştürülmüş ve Gauss eliminasyon metodu ile Laplace uzayında çözülmüştür..Elde edilen çözümlerin Laplace uzayından zaman uzayına dönüşümü için Durbin'in modifiye edilmiş ters Laplace metodu kullanılmıştır. Kabuk malzemesinin viskoelastik olduğu kabul edilmiştir. Viskoelastik malzeme durumunda Kelvin sönüm modeli kullanılmaktadır.

Bu çalışmada, navier yaklaşımı ile kalın kabuk için elde edilen hareket denklemlerine Laplace dönüşümü uygulanması ve ardından Durbin'in modifiye edilmiş ters dönüşüm yöntemi uygulanması ile oldukça etkin ve doğru sonuçlar bulunabildiği karşılaştırmalı olarak gösterilmiştir.

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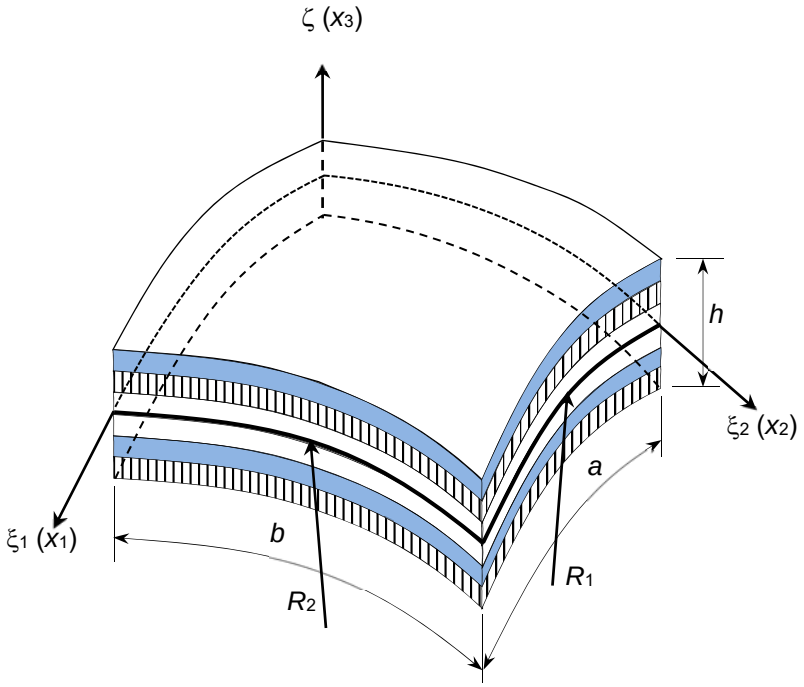
Teorik Formülasyon

Eşit kalınlıklara sahip *N* adet tabakadan oluşan bir sığ kalın küresel kabuk düşünelim.böyle bir tabakalı kompozit kabuğa ait eksen takımı ve geometrisi Şekil 1'de gösterilmiştir..



Şekil 1. Tabakalı kompozit kabuğun geometrisi ve eksenler takımı

Birinci Mertebe Kayma Deformasyon Teorisi (BKDT) için kabuğun herhangi bir noktasındaki deplasman ifadeleri aşağıdaki şekilde yaılabilir. (Reddy 2004)

$$\begin{Bmatrix} u_1(\xi_1,\xi_2,\zeta,t) \\ u_2(\xi_1,\xi_2,\zeta,t) \\ u_3(\xi_1,\xi_2,\zeta,t) \end{Bmatrix} = \begin{Bmatrix} u_0(\xi_1,\xi_2,t) \\ v_0(\xi_1,\xi_2,t) \\ w_0(\xi_1,\xi_2,t) \end{Bmatrix} + \zeta \begin{Bmatrix} \emptyset_1(\xi_1,\xi_2,t) \\ \emptyset_2(\xi_1,\xi_2,t) \\ 0 \end{Bmatrix} \quad (1)$$

burada (u_1, u_2, u_3) tabakalı kompozit kabuğun herhangi bir noktasının deplasmanlarını, (u_0, v_0, w_0) kabuğun orta düzleminin deplasmanlarını, ($\emptyset_1$, $\emptyset_2$) ise orta düzlemin dönmelerini ifade eder (Reddy 1984).
Kabuğun herhangi bir koktasındaki şekil değiştirmeler aşağıdaki gibi yazılablir.

$$\{\varepsilon\} = \{\varepsilon^0\} + \zeta \{\kappa\}, \qquad \{\gamma\} = \{\gamma_{23}, \gamma_{13}\}^T$$

$$\{\varepsilon\} = \{\varepsilon_1, \varepsilon_2, \gamma_{12}\}^T, \qquad \{\varepsilon^0\} = \{\varepsilon_1^0, \varepsilon_2^0, \gamma_{12}^0\}^T, \qquad \{\kappa\} = \{\kappa_1, \kappa_2, \kappa_3\}^T \quad (2)$$

burada

$$\varepsilon_1^0 = \frac{1}{\alpha_1}\frac{\partial u_0}{\partial \xi_1} + \frac{w_0}{R_1}, \qquad \varepsilon_2^0 = \frac{1}{\alpha_2}\frac{\partial v_0}{\partial \xi_2} + \frac{w_0}{R_2}, \qquad \gamma_{12}^0 = \frac{1}{\alpha_1}\frac{\partial v_0}{\partial \xi_1} + \frac{1}{\alpha_2}\frac{\partial u_0}{\partial \xi_2}$$

$$\gamma_{23} = \frac{1}{\alpha_2}\frac{\partial w_0}{\partial \xi_2} + \emptyset_2 - \frac{v_0}{R_2}, \qquad \gamma_{13} = \frac{1}{\alpha_1}\frac{\partial w_0}{\partial \xi_1} + \emptyset_1 - \frac{u_0}{R_1}$$

$$\kappa_1 = \frac{1}{\alpha_1}\frac{\partial \emptyset_1}{\partial \xi_1}, \qquad \kappa_2 = \frac{1}{\alpha_2}\frac{\partial \emptyset_2}{\partial \xi_2},$$

$$\kappa_3 = \frac{1}{\alpha_1}\frac{\partial \emptyset_2}{\partial \xi_1} + \frac{1}{\alpha_2}\frac{\partial \emptyset_1}{\partial \xi_2} + \frac{1}{2}\left(\frac{1}{R_2} - \frac{1}{R_1}\right)\left(\frac{1}{\alpha_1}\frac{\partial v_0}{\partial \xi_1} - \frac{1}{\alpha_2}\frac{\partial u_0}{\partial \xi_2}\right) \quad (3)$$

olarak tanımlanır.
Tabakalı kompozit kalın kabuklar için *k*-nıncı tabakanın gerilme-şekil değiştirme ilişkisi aşağıdaki gibidir.

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$$\begin{Bmatrix}\sigma_{11}\\ \sigma_{22}\\ \tau_{12}\\ \tau_{23}\\ \tau_{13}\end{Bmatrix}^{(k)} = \begin{bmatrix}\overline{Q}_{11} & \overline{Q}_{12} & \overline{Q}_{16} & 0 & 0\\ \overline{Q}_{12} & \overline{Q}_{22} & \overline{Q}_{26} & 0 & 0\\ \overline{Q}_{16} & \overline{Q}_{26} & \overline{Q}_{66} & 0 & 0\\ 0 & 0 & 0 & \overline{Q}_{44} & \overline{Q}_{45}\\ 0 & 0 & 0 & \overline{Q}_{45} & \overline{Q}_{55}\end{bmatrix}^{(k)} \begin{Bmatrix}\varepsilon_{11}\\ \varepsilon_{22}\\ \gamma_{12}\\ \gamma_{23}\\ \gamma_{13}\end{Bmatrix} \quad (4)$$

BKDT için tabakalı kabukların normal kuvvetler, momentler ile şekil değiştirme arasındaki ilişkisi aşağıdaki gibi yazılabilir.

$$\begin{Bmatrix}N_{11}\\ N_{22}\\ N_{12}\\ M_{11}\\ M_{22}\\ M_{12}\end{Bmatrix} = \begin{bmatrix}[A] & [B]\\ [B] & [D]\end{bmatrix} \begin{Bmatrix}\varepsilon_1{}^0\\ \varepsilon_2{}^0\\ \gamma_{12}{}^0\\ \kappa_1\\ \kappa_2\\ \kappa_3\end{Bmatrix} \quad (5)$$

burada

$$(A_{ij}, B_{ij}, D_{ij}) = \sum_{k=1}^{N}\int_{\zeta_k}^{\zeta_{k+1}} \bar{Q}_{ij}^{(k)}(1, \zeta, \zeta^2)d\zeta \quad (i, j = 1,2,6) \quad (6)$$

olarak yazılır. Burada ζ_k ve ζ_{k+1} k.*ncı* tabakanın sırasıyla üst ve alt tabakanın koordinatlarıdır.
Kesme kuvvetleri ise.

$$\begin{Bmatrix}Q_2\\ Q_1\end{Bmatrix} = K_s[A_s]\{\gamma\}$$

şeklinde elde edilir. Burada K_s kayma şekil değiştirme faktörüdür. Bu çalışmada, K_s 5/6 olarak dikkate alınmıştır. (7) denklemindeki $[A_s]$ aşağıdaki şekilde elde edilir.

$$(A_{s_{ij}}) = \sum_{k=1}^{N}\int_{\zeta_k}^{\zeta_{k+1}} \bar{Q}_{ij}^{(k)}d\zeta \quad (i, j = 4,5) \quad (8)$$

Dinamik Analiz

Kenarlarından basit mesnetlenmiş tabakalı kabuk için BKDT'ye göre SS-1 sınır şartları aşağıda verilmiştir.

$$\begin{array}{llll} u_1(x_1,0,t)=0, & u_1(x_1,b,t)=0, & u_2(0,x_2,t)=0, & u_2(a,x_2,t)=0,\\ N_1(0,x_2,t)=0, & N_1(a,x_2,t)=0, & N_2(x_1,0,t)=0, & N_2(x_1,b,t)=0,\\ \phi_1(x_1,0,t)=0, & \phi_1(x_1,b,t)=0, & \phi_2(0,x_2,t)=0, & \phi_2(a,x_2,t)=0,\\ u_3(x_1,0,t)=0, & u_3(x_1,b,t)=0, & u_3(0,x_2,t)=0, & u_3(a,x_2,t)=0,\\ M_1(0,x_2,t)=0, & M_1(a,x_2,t)=0, & M_2(x_1,0,t)=0, & M_2(x_1,b,t)=0, \end{array} \quad (9)$$

Tabakalı kompozit kabuğa ait deplasmanlar (9) denkleminde verilen sınır şartlarını sağlayacak şekilde çift Forurier serisi yardımıyla aşağıdaki şekilde ifade edilmektedir.

$$\begin{Bmatrix}u_0(x_1,x_2,t)\\ v_0(x_1,x_2,t)\\ w_0(x_1,x_2,t)\\ \emptyset_1(x_1,x_2,t)\\ \emptyset_2(x_1,x_2,t)\end{Bmatrix} = \sum_{n=1}^{\infty}\sum_{m=1}^{\infty} \begin{Bmatrix}U_{mn}(t)\cos\alpha x_1 & \sin\beta x_2\\ V_{mn}(t)\sin\alpha x_1 & \cos\beta x_2\\ W_{mn}(t)\sin\alpha x_1 & \sin\beta x_2\\ X_{mn}(t)\cos\alpha x_1 & \sin\beta x_2\\ Y_{mn}(t)\sin\alpha x_1 & \cos\beta x_2\end{Bmatrix} \quad (10)$$

burada $\alpha = m\pi/a$, $\beta = n\pi/b$ olarak verilmektedir.
Kabuk üzerine etki eden yayılı yük, q, çift Fourier serisi yardımıyla aşağıdaki şekilde ifade edilebilir

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$$q(x_1, x_2, t) = \sum_{n=1}^{\infty} \sum_{m=1}^{\infty} Q_{mn}(t) \sin \alpha x_1 \quad \sin \beta x_2 \tag{11}$$

burada Q_{mn} aşağıdaki şekilde elde edilir

$$Q_{mn}(t) = \frac{4}{ab} \int_0^a \int_0^b q(x_1, x_2, t) \sin \alpha x_1 \quad \sin \beta y \, dx_1 dx_2 \tag{12}$$

Dik açılı olarak tabakalanmış kabukların Navier çözümü aşağıdaki denklem takımı ile elde edilir

$$[M_{mn}]_{5\times5}\{\ddot{\Delta}_{mn}\}_{5\times1} + [K_{mn}]_{5\times5}\{\Delta_{mn}\}_{5\times1} = \{F_{mn}\}_{5\times1} \tag{13}$$

burada $(\Delta_{mn}) = (U_{mn}, V_{mn}, W_{mn}, X_{mn}, Y_{mn})$ deplasman vektörüdür.
Zaman bağlı olan (13) denklemine Laplace dönüşümü uygulanırsa Laplace uzayında aşağıdaki cebrik denklem takımı elde edilir.

$$[[K] + z^2[M]]\{\bar{\Delta}\} = \{\bar{F}\} + \{\bar{F}_0\} \tag{14}$$

burada, $\{\bar{\Delta}\}$ dönüşmüş deplasman vektörü, $\{\bar{F}\}$ dönüşmüş uzaydaki yük vektörü, $\{\bar{F}_0\}$ başlangıç koşulları nedeniyle yük vektörüne gelen katkı olup $\{\bar{F}_0\}$ aşağıda verilmiştir.,

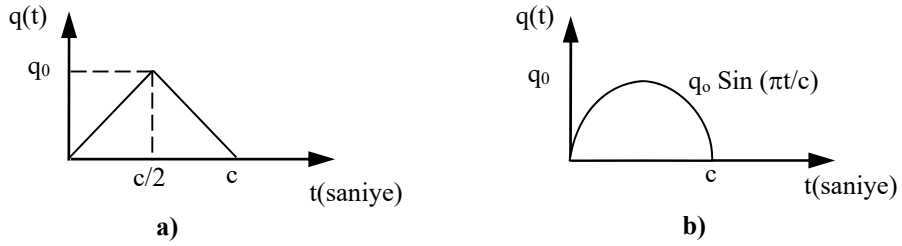
$$\{\bar{F}_0\} = z[M]\ \{\Delta(0)\} + [M]\{\dot{\Delta}(0)\} \tag{15}$$

burada, $\{\Delta(0)\}$ ve $\{\dot{\Delta}(0)\}$ sırasıyla başlangıç deplasman ve hız vektörleri olup bu çalışmada sıfır alınmıştır.
Kelvin tipi sönüm modeli için viskoelastik çözüm, elastik-viskoelastik analojisi yardımıyla, Laplace dönüşüm uzayında elastik sabitlerin kompleks karşıtları ile yer değiştirmesinden elde edilmektedir (Boley ve Weiner 1960)

$$E_v = E(1 + g\ z) \quad , \quad G_v = G(1 + g\ z) \tag{16}$$

Sayısal Uygulamalar

Bu çalışmada önerilen yöntem kullanılarak elde edilen sayısal değerler için basit mesnetlenmiş (0/90) şeklinde tabakalanmış kompozit kabuk (a/b=1, a/h=10, R/a=10) için gösterilecektir. Bu çalışmada önerilen yöntem ile elde edilen sayısal değerler Newmark metodu ile elde edilen değereler ve ANSYS yazılımı ile elde edilen değerler ile karşılaştırılmalı olarak gösterilmiştir. Sayısal örneklerde kabuk geometrisi ve malzeme özellikleri olarak aşağıdaki değerler kullanılmıştır.
a=b=1 m., h=0.1 m., R_1=R_2=R=10 m. (a/h=10, a/b=1, R/a=10).
E_1=25x10^9 N/m^2, E_2=1x10^9 N/m^2, G_{12}=G_{13}=0.5x10^9 N/m^2, G_{23}=0.2x10^9 N/m^2, ν=0.25, ρ=2000 kg/m^3.
Bu çalışmada iki farklı ani dinamik yük dikkate alınmıştır (Şekil 2). Ani dinamik yükler düzgün yayılı olup q_0 = 1000 N/m^2 olarak c ise 0.02048 saniye olarakdikkate alınmıştır.



Şekil 2. Dinamik Yükler **a)** Üçgen Ani Yük, **b)** Yarım Sinüs Ani Yük

Üçgen ani yük dikkate alındığında elde edilen deplasman değerleri Şekil 3 ve 4'te verilmiştir. Önerilen yöntem ile farklı sönüm oranları (g=0.0003, 0.002, 0.006, 0.01, 0.02) için elde edilen değerlerin Newmark değerleri ile karşılaştırması Şekil 3'te ANSYS değerleri ile karşılaştırılması ise Şekil 4'te verilmiştir.

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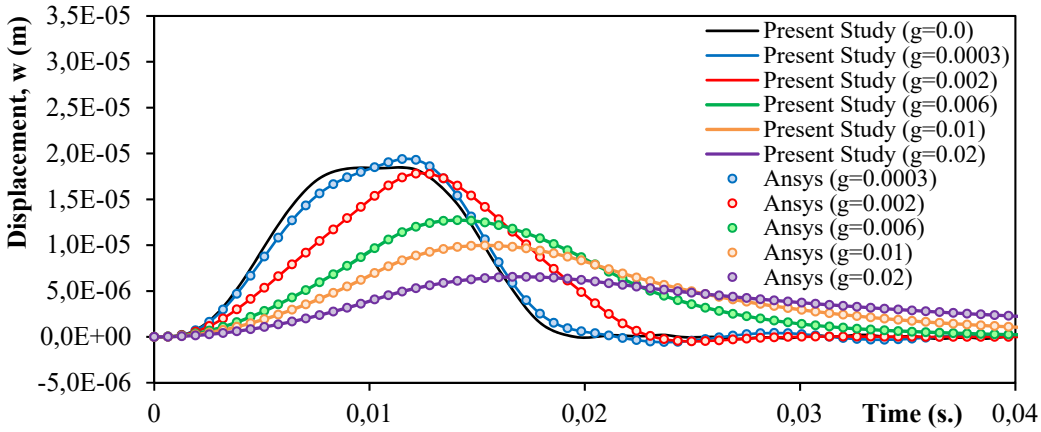
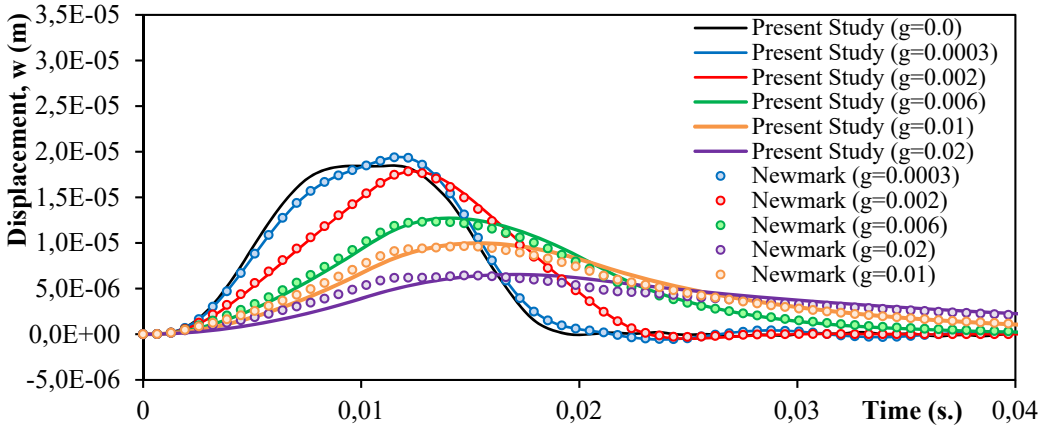
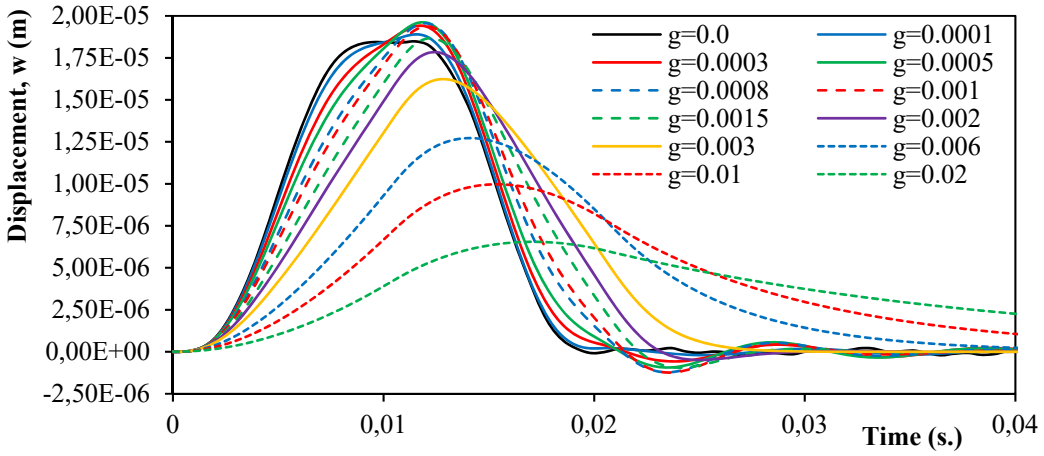


Şekil 3. Üçgen ani yük için kompozit kabuk merkezinde önerilen yöntem ile elde edilen deplasmanların ANSYS değerleri ile karşılaştırılması.



Şekil 4. Üçgen ani yük için kompozit kabuk merkezinde önerilen yöntem ile elde edilen deplasmanların Newmark değerleri ile karşılaştırılması.

Şekil 3 incelendiğinde farklı sönüm oranları (g=0.0003, 0.002, 0.006, 0.01, 0.02) için önerilen yöntem ile elde edilen değerlerin ANSYS değerleri ile çakıştığı görülmektedir. Şekil 4 incelendiğinde ise farklı sönüm oranları için önerilen yöntem ile elde edilen değerlerin küçük sönüm oranları için çakıştığı fakat sönüm oranı büyüdükçe değerlerin birbirinden uzaklaştığı görülmektedir. Şekil 3 ve 4'ten anlaşıldığı üzere küçük sönüm oranları için pik değerleri elastik duruma göre daha büyüyerek sağa doğru kaymakta büyük sönüm değerleri içinse pik değeri elastik duruma göre küçülerek sağa doğru kaymaktadır. Bu durumun daha iyi incelenmesi için daha çok sayıda sönüm oranı dikkate alınarak çözümler elde edilmiş ve Şekil 5'te gösterilmiştir. Şekil 5'te verilen değerler incelendiğinde küçük sönüm oranları için pik değerlerin elastik değerlere göre artış gösterdiği ve sağa doğru kaydığı büyük sönüm oranları için pik değerlerin elastik değerlere göre azaldığı ve sağa doğru kaydığı görülmektedir.



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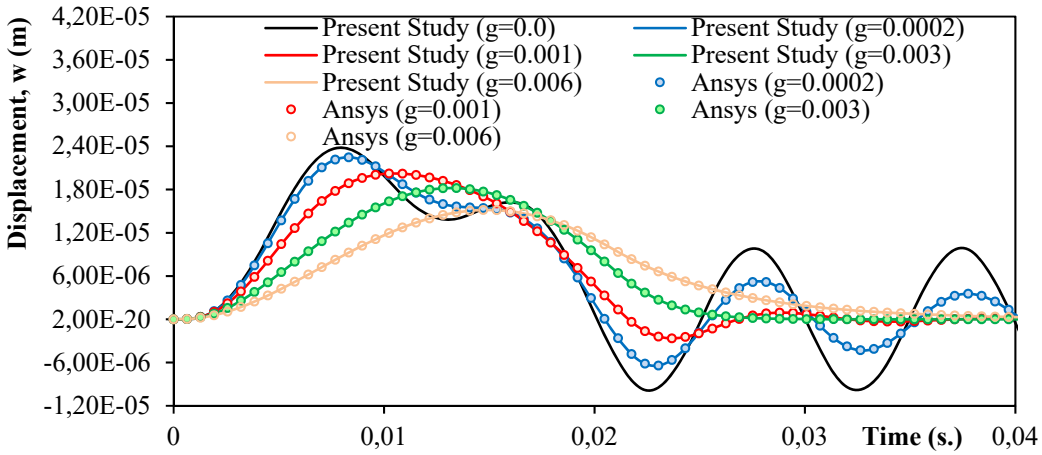
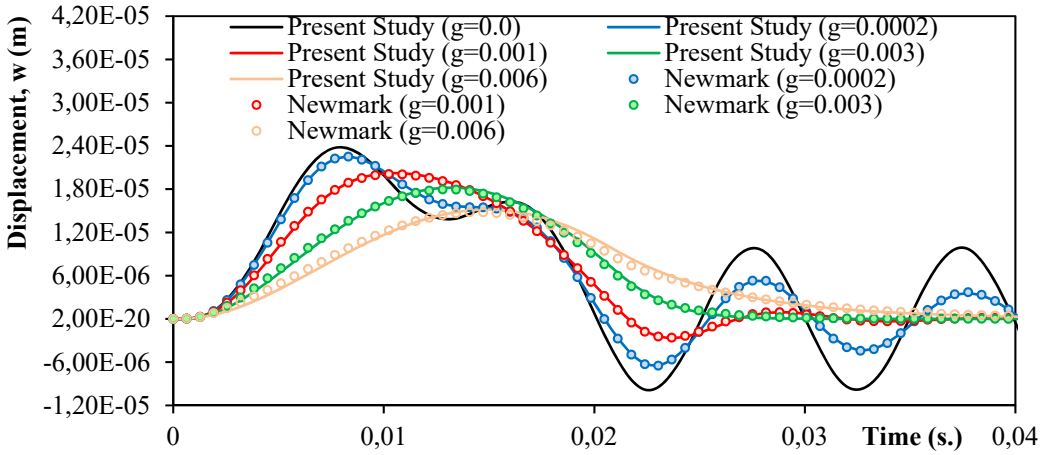
Şekil 5. Üçgen ani yük için kompozit kabuk merkezinde farklı sönüm oranları için elde edilen deplasmanların karşılaştırılması.

Yarın Sinüs ani yük dikkate alındığında elde edilen deplasman değerlerinin zamanla değişimleri Şekil 6 ve 7'de verilmiştir. Önerilen yöntem ile farklı sönüm oranları (g=0.0002, 0.001, 0.003, 0.006) için elde edilen değerlerin Newmark değerleri ile karşılaştırması Şekil 6'da ANSYS değerleri ile karşılaştırılması ise Şekil 7'de verilmiştir.



Şekil 6. Yarım Sinüs ani yük için kompozit kabuk merkezinde önerilen yöntem ile elde edilen deplasmanların ANSYS değerleri ile karşılaştırılması.



Şekil 7. Yarım Sinüs ani yük için kompozit kabuk merkezinde önerilen yöntem ile elde edilen deplasmanların Newmark değerleri ile karşılaştırılması.

Şekil 6 ve Şekil 7 incelendiğinde farklı sönüm oranları (g=0.0002, 0.001, 0.003, 0.006) için önerilen yöntem ile elde edilen değerlerin ANSYS ve Newmark değerleri ile çakıştığı görülmektedir. Şekil 6 ve 7'ten anlaşıldığı üzere sönüm ile pik değerler sağa doğru kaymakta ve değerler zamanla olmektedir.

Sonuçlar

Önerilen yöntemin temelinde şu sonuçlar çıkarılabilir.

Üçgen ani yük durumunda küçük sönüm oranları için pik değerlerin elastik değerlere göre artış gösterdiği ve sağa doğru kaydığı büyük sönüm oranları için pik değerlerin elastik değerlere göre azaldığı ve sağa doğru kaydığı görülmektedir. Önerilen yöntem ile elde edilen değerlerin ANSYS değerleri ile çakıştığı fakat Newmark değerlerinin yakınsak olduğu görülmektedir.

Yarım Sinüs Ani yük durumunda önerilen yöntem ile elde edilen değerlerin ANSYS ve Newmark değerleri ile çakıştığı görülmektedir.

Bu çalışma ile, navier yaklaşımı ile kalın kabuk için elde edilen hareket denklemlerine Laplace dönüşümü uygulanması ve ardından Durbin'in modifiye edilmiş ters dönüşüm yöntemi ile zaman uzayında sonuçlar elde edilmesi ile oldukça etkin ve doğru sonuçlar bulunabildiği kanıtlanmıştır.

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Teşekkür

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ÜLKEMİZDE ÜNİVERSİTE SANAYİ İŞBİRLİĞİNİN ÖNEMİ

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Bu çalışmada Üniversite-Sanayi işbirliği geliştirilerek hem sanayide hem de eğitimde verimliliğin arttırılması, üniversitelerde, sanayinin ihtiyaç duyduğu nitelikte ara eleman yetiştirilmesi, üniversite hocalarının ve öğrencilerin sanayi ile irtibatının sağlanması, mezun öğrencilerin iş bulmalarında kolaylık sağlanması ve sanayinin AR-GE çalışmalarının geliştirilmesinde üniversite tarafından destek sağlanması amaçlanmaktadır.

Çalışmada Manisa bölgesindeki 80 adet firmadaki üst düzey yetkililerle mesleki eğitimden beklentileri ve çözüm önerileri konuşulmuş, yetkili kişilerin üniversite akademik personeli ile ilgili alanlarda görüş alışverişi yapmaları sağlanmıştır. Ayrıca hazırlamış olduğumuz anket formları firma çalışanları ve personeline doldurularak mevcut durumlar analiz edilmiştir.

Çalışma sonucunda işletmelerin talepleri doğrultusunda eğitim ve öğretim planlarının güncellenmesi, teknolojiye adaptasyonu ve işletmelerin eğitim ortamına daha aktif olarak katılmalarının sağlanmasının yararlı olacağı sonucuna varılmıştır. Bu bağlamda belirlenen sorunların tespiti ve çözüm önerileri doğrultusunda sanayi ve üniversite adaptasyonun şekillenmesi, nitelikli işgücü ve bunun getireceği verimli bir ekonominin sağlanmasının ülkemiz için oldukça fayda sağlayacağı kanaatına varılmıştır.

Anahtar Kelimeler: Üniversite Sanayi İşbirliği, Üniversite AR-GE Çalışmaları, Mesleki Eğitim.

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VACATIONING AT A DESTINATION UNDER TERORISM RISK: TOURISTS' DESTINATION IMAGE PERCEPTIONS ABOUT ISTANBUL

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Abstract: The main purpose of this study is to analyze the consequences of terror related risks on destination image perceptions of tourists who are vacationing at a destination under terrorism risks. The survey was conducted with tourists, who were visiting Istanbul during a risky period. Before surveying with tourists, several terrorism attacks had took place in Istanbul. This study investigates the impact of terrorism activities on tourists' destination image perceptions of Istanbul as a travel destination, and also its impact on destination satisfaction, which in turn influence tourists revisit intentions and word of mouth behavior. The survey was conducted with 156 respondents at the Sultan Ahmet Square. Destination image of Istanbul is assessed with the destination atmosphere, travel environment, attraction & events, shopping, accommodation, and dining dimensions. Although tourists are vacationing at a destination under terrorism risk, results of this study indicate that the destination image of Istanbul is positive in the mind of tourists. Visiting Istanbul is quite valuable in terms of emotional, functional and overall values. Overall, respondents are highly satisfied with their decision to travel to Istanbul and strongly agree that it is right choice to visiting Istanbul. Majority of the respondents indicated that they are satisfied or extremely satisfied with their visit to Istanbul. Lastly, the findings showed that tourists, who visited Istanbul under terrorism risks, are highly satisfied with their travel experience and expressed that they will recommend Istanbul to others, say positive things about Istanbul, and they stated that they are willing to revisit Istanbul.

Keywords: Destination Image, Perceived Value, Destination Loyalty, Terrorism

Introduction

There has been substantial growth in the tourism industry and it has become one of the most rapid growing economic sectors in the world for last decades. According to World Tourism Organization 2015 Annual Report international tourist arrivals grew by 4.4% in 2015 with an additional 49 million more than in 2014, to reach a total of 1,184 million in 2015 (World Tourism Organization, 2015). Kim, Holland, and Han (2013) state that since tourism has been playing important role for regional development, there are strong competition among destinations to attract more tourists and make them become loyal to destination. Therefore, tourism professionals and destination marketers should re-consider their tourism marketing strategies to increase customer loyalty and build long-term relationships with their customers.

It is commonly recognized that destination image, that is "the sum of beliefs, ideas, and impressions that a person has of a destination", is a key factor in destination marketing (Taşcı & Gertner, 2007). Liu (2014) argues that in order to survive at the global competitive marketplace, it is crucial to create a unique destination image that differentiates a destination from the other destinations to get a positive positioning in the minds of customers. Baloglu and McCleary (1999) state that brand image is mainly shaped by two major forces: stimulus factors (e.g. information sources and previous experiences), and personal factors (e.g. psychological and social factors).

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It is argued that favorable destination image leads to higher perceived value. Perceived value is one of the most important key determinant of customer satisfaction and loyalty (Kim, Holland, & Han, 2013) as well as repurchase intentions (Demirgüneş, 2015). Favorable destination image positively influence tourists' satisfaction (Prayag et al., 2015). In other words, it is stated that perceived value has positive effect on future behavioral intentions (e.g. intention to revisit) (Kim, Holland, & Han, 2013). Demirgüneş (2015) argued that customer's perceived value can be determined by money, quality, benefit, and social psychology; while Peng and Liang (2013) identified perceived values as functional, emotional and price values. Lee, Yoon, and Lee (2007) argued that perceived value is identified in the form of emotional, functional and overall value, which can be used to measure tourists' perceived value for a destination.

Buyong and Rajani (2011) state that destination loyalty can be expressed as: behavioral loyalty, attitudinal loyalty, and composite loyalty. While behavioral loyalty can be defined as repeat visits, attitudinal loyalty refers to tourists' psychological expression such as intention to revisit a destination or recommend it to others, and finally composite loyalty is an integration of both attitude and behavior loyalty (Buyong & Rajani, 2011). Kim, Holland, and Han (2013) argue that repeat visits have often been regarded as desirable behaviors in terms of destination loyalty. In the literature it is argued that satisfied the customers are more likely to revisit the same destination, and are more willing to share their positive travel experience with their friends and relatives (Yoon & Uysal, 2005; Chia & Qub, 2008).

The main purpose of this study is to analyze the consequences of terror related risks on destination image perceptions of tourists who are vacationing at a destination under terrorism risks. The survey was conducted with tourists, who were visiting Istanbul during a risky period. Before surveying with tourists, several terrorism attacks had took place in Istanbul. This study investigates the impact of terrorism activities on tourists' destination image perceptions of Istanbul as a travel destination, and also its impact on destination satisfaction, which in turn influence tourists revisit intentions and word of mouth behavior

Research Methodology

The survey was conducted with tourists at the Sultan Ahmet Square. The data for this research were collected by using a self-administrated questionnaire. Destination image scale of this study includes 33 items that is adapted from several studies (Baloglu & McCleary, 1999; Qu, Kim, & Im, 2011; Kim, Holland, & Han, 2013). Perceived value scale embraces 8 items and it is adapted from the study of Kim, Holland, and Han (2013). Lastly, 3- item scale which is also adapted from the study of Kim, Holland, and Han (2013) is used to assess tourist destination loyalty. Destination image, perceived value, and destination loyalty scales are measured with seven-point Likert-type scale (1= "strongly disagree" to 7= "strongly agree"). To measure overall satisfaction, a single-item scale was used and respondents were asked to rate satisfaction level with the visiting experience of Istanbul on a 7-point Likert scale, ranging from 1= "extremely unsatisfied" to 7= "extremely satisfied".

Cronbach's Alpha value for the destination image, perceived value, and destination loyalty scale are 0.95, 0.92, and 0.84, respectively. Since Cronbach's Alpha of 0.70 or above is considered acceptable as a good indication of reliability, it is clear that scales of this study is reliable.

Table 1 Reliability of the scales

	Cronbach's Alpha	**Mean**	**N of Items**
Destination Image (DI)	.945	5.41	33
Perceived Value (PV)	.916	5.85	8
Destination Loyalty (DL)	.837	6.07	3

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Findings of the study

The survey was conducted with tourists at the Sultan Ahmet Square and the survey was conducted throughout May 2016. A total of 156 usable responses was gathered and demographic characteristics of the respondents are presented as frequencies and percentages in Table 2. The distribution of gender groups are quite fairly distributed. Among the 156 respondents, 84 were female; while 72 were male. Approximately 60% of the respondents were between the ages of 26-40, 24.4% of them between the ages of 18-24, 11.5% of them between the ages of 41-65, and finally 4.5% of them were above the age of 65. Most of the respondents were the first time visitors (69.9%), 22.8% of them visited Istanbul 2-4 times, and 8.3% of them visited Istanbul 5 and more times. Regarding their country of origin, 12.9% of them were from United Kingdom, while 12.2% of them were from Germany and 7% of them from United States. The majority of the respondents (49%) had come from European countries.

Approximately 65% of tourists visited Istanbul for holiday purpose; while 20% of them had come Istanbul in order to visit their friends or relatives, and 6% of them visited Istanbul for business purposes. While surveying with tourists, 31.4% of tourists had been in Istanbul since 3 or 4 days, and 32.7% of them had been in Istanbul since 5 or 6 days. Since approximately 90% of tourists stayed in Istanbul at least 3 days, it is clear that respondents spent enough time to experience about the city and gain some ideas about Istanbul.

Table 2 Demographic profile of tourists

		N	%			N	%
Gender	Male	72	46.2		1-2 days	16	10.3
	Female	84	53.8		3-4 days	49	31.4
Age	18-25	38	24.4	**Duration of Stay**	5-6 days	51	32.7
	26-40	93	59.6		7-9 days	14	9.0
	41-65	18	11.5		10 and over days	26	16.6
	65 above	7	4.5				
Number of Visit	First time visitors	109	69.9	**Country of Origin**	United Kingdom	20	12.9
	2-4	34	21.8		Germany	19	12.2
	5 and more	13	8.3		U.S.	11	7.0

Table 3 indicates the descriptive analysis of the 33-item destination image scale. Since the mean value of the scale of destination image is (μ: 5.41); it can be said that the destination image of Istanbul are positive in the mind of tourists. Destination image of Istanbul is assessed with the destination atmosphere, travel environment, attraction & events, shopping, accommodation, and dining dimensions. Tourists have favorable perceptions about the destination atmosphere (μ: 5.78), attractions & events (μ: 5.69), and dining (μ: 5.49) in Istanbul. The mean value of these three dimensions are higher than the average mean value of the destination image scale (μ: 5.41). The perceptions of tourists with the other destination image dimensions of Istanbul are also mildly positive.

Tourists strongly agree that Istanbul has distinctive (μ: 6.47), interesting (μ: 6.43), and variety of (μ: 6.38) historic and cultural attractions. Tourists also considered Istanbul as an exciting (μ: 6.19), enjoyable (μ: 6.11), and pleasant destination (μ: 5.94). Moreover, tourists have favorable perceptions about local cuisine (μ: 5.84). Tourists also agree that Istanbul has a wide variety of shop facilities (μ: 5.55) and is a good place for shopping (μ: 5.43). With regard to accommodation, tourists agree that Istanbul has a wide variety of accommodation alternatives (μ: 5.56), accommodation facilities in Istanbul provide satisfactory customer service (μ: 5.33), and they are reasonable priced (μ: 5.32).

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Table 3 Descriptive statistics for destination image

	N	Min	Max	Std. Deviation	Mean	Cronbach Alpha
Destination Atmosphere					**5.78**	**.809**
Istanbul is an exciting destination	156	1.00	7.00	.97792	6.1923	
Istanbul is an enjoyable destination	156	1.00	7.00	.94331	6.1154	
Istanbul is a pleasant destination	156	1.00	7.00	1.10012	5.9487	
Istanbul is relaxing and restful destination	156	1.00	7.00	1.49986	4.8782	
Travel Environment					**5.01**	**.799**
It is easy to access Istanbul	155	1.00	7.00	1.32084	5.5226	
Native people in Istanbul is friendly and helpful	156	1.00	7.00	1.46459	5.4423	
Using local transportation in Istanbul is easy and convenient	154	1.00	7.00	1.42957	5.0455	
Istanbul is clean and tidy environment	156	1.00	7.00	1.60070	4.7756	
Istanbul has secure and safe environment	154	1.00	7.00	1.40862	4.7662	
Information about local transportation is easily accessible in Istanbul	154	1.00	7.00	1.58066	4.5390	
Attraction and Events					**5.69**	**.864**
Istanbul has distinctive history and heritage	155	1.00	7.00	.88501	6.4710	
Istanbul has interesting historic and cultural attractions	156	1.00	7.00	.99144	6.4359	
Istanbul has variety of historic and cultural attractions	156	1.00	7.00	1.09816	6.3846	
Istanbul has variety of breathtaking scenery and natural attractions	155	1.00	7.00	1.20058	5.7871	
Istanbul has a colorful night life	148	1.00	7.00	1.20006	5.3108	
Istanbul has variety of cultural events and festivals	144	1.00	7.00	1.21918	5.1944	
Istanbul has tempting cultural events and festivals	147	1.00	7.00	1.31315	5.0408	
Istanbul has a wide variety of outdoor activities	148	1.00	7.00	1.43101	4.9189	
Shopping					**5.13**	**.871**
Istanbul has a wide variety of shop facilities	156	2.00	7.00	1.23519	5.5577	
Istanbul is a good place for shopping	155	1.00	7.00	1.27930	5.4323	

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Shopping in Istanbul is convenient	156	1.00	7.00	1.31208	5.1987	
Prices are reasonable for shopping in Istanbul	156	2.00	7.00	1.29724	4.9679	
Shops in Istanbul provide satisfactory customer service	154	1.00	7.00	1.41733	4.9351	
Shops in Istanbul sell high quality of merchandise	154	2.00	7.00	1.31216	4.7143	
Accommodation					**5.33**	**.848**
Istanbul has a wide variety of accommodations	156	1.00	7.00	1.17633	5.5577	
Accommodation facilities in Istanbul provide satisfactory customer service	155	1.00	7.00	1.24895	5.3290	
Accommodation in Istanbul is reasonable priced	156	1.00	7.00	1.23386	5.3205	
Accommodations facilities in Istanbul are clean and of good quality	155	1.00	7.00	1.31148	5.1419	
Dining					**5.49**	**.771**
Istanbul has tempting local cuisine	156	3.00	7.00	1.10222	5.8462	
Istanbul has a wide variety of restaurants	156	1.00	7.00	1.26922	5.7692	
Restaurants in Istanbul provide satisfactory customer service	156	2.00	7.00	1.21017	5.5000	
Restaurants in Istanbul has standard hygiene and cleanliness	156	1.00	7.00	1.32187	5.1987	
Restaurants in Istanbul are reasonable priced	156	1.00	7.00	1.18780	5.1218	

Table 4 illustrates the descriptive analysis of the 8-item perceived value scale. Since the mean value of the scale of perceived value is (μ: 5.85); it can be said that perceived value of visiting Istanbul is considered as positive by tourists. Perceived value of visiting Istanbul is assessed with the functional (μ: 5.79), emotional (μ: 5.92), and overall value (μ: 5.85) dimensions. Although, perceived emotional value is higher than perceived functional value of visiting Istanbul, tourists strongly agree that visiting Istanbul is valuable and worth it (μ: 6.07) and good value for the given money (μ: 5.73). They also considered visiting Istanbul is reasonably priced (μ: 5.58). With regard to emotional value, tourists strongly agree that they got pleasant experiences during their visit Istanbul (μ: 6.05) and visiting Istanbul made them feel better (μ: 5.80). Overall, respondents are highly satisfied with their decision to travel to Istanbul and strongly agree that it is right choice to visiting Istanbul (μ: 6.36). Besides, they emphasize that Istanbul is a place where they want to travel always (μ: 5.95).

Table 4 Descriptive statistics for perceived value

	N	**Min**	**Max**	**Std. Deviation**	**Mean**	**Cronbach Alpha**
Functional Value					**5.79**	**.809**
Visiting Istanbul is valuable and worth it	155	1.00	7.00	1.12302	6.0710	
Compared to other tourism destination. Istanbul is a good value for the money	156	1.00	7.00	1.26668	5.7308	

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Visiting Istanbul is reasonably priced	156	1.00	7.00	1.19655	5.5833	
Emotional Value					**5.92**	**.893**
I got pleasant experiences during my visit to Istanbul	155	1.00	7.00	1.06504	6.0452	
Visiting Istanbul made me feel better	156	1.00	7.00	1.18278	5.8013	
Overall Value					**5.85**	**.741**
The choice to visit Istanbul was the right decision	155	1.00	7.00	.98045	6.3677	
Istanbul is a place where I want to travel always	156	1.00	7.00	1.22523	5.9551	
After visiting Istanbul. my image of Istanbul was improved	156	1.00	7.00	1.51709	5.2436	

To measure overall satisfaction, a single-item scale was used and respondents were asked to rate their satisfaction level with their visiting experience of Istanbul on a 7-point Likert scale, ranging from 1= "extremely unsatisfied" to 7= "extremely satisfied". 25% of the tourists are extremely satisfied, 51% of them are satisfied, and 19% of them are somewhat satisfied with their visit to Istanbul. Therefore, it can be stated that respondents perceived a positive value and had good travel experiences.

Loyalty to Istanbul was measured with 3-item destination loyalty scale. The value for the scale of destination loyalty is high with a mean of μ: 6.07. As it can be seen from the Table 5, tourists are strongly willing to make positive word of mouth (μ: 6.28), encourage their friends to visit Istanbul (μ: 6.23), and revisit Istanbul (μ: 5.71). Therefore, the results shows that tourists, who visited Istanbul under terrorism risks, are highly satisfied with their travel experience and expressed that they will recommend Istanbul to others, say positive things about Istanbul and they stated that they are willing to revisit Istanbul.

Table 5 Descriptive statistics for destination loyalty

	N	**Min**	**Max**	**Mean**	**Std. Deviation**	**Cronbach Alpha**
Destination Loyalty				**6.07**		**.837**
I will say positive things about Istanbul to other people	155	1.00	7.00	6.2839	.99188	
I will encourage friends and relatives to visit Istanbul	156	1.00	7.00	6.2308	1.06466	
I will definitely revisit Istanbul	154	1.00	7.00	5.7143	1.3658	

Conclusion

Although several terrorism attacks had took place before and during the visit of tourists, it can be said that the destination image of Istanbul in the mind of tourists are positive. Tourists have highly favorable perceptions about the destination atmosphere as well as attractions & events of Istanbul. Tourists strongly agree that Istanbul has distinctive, interesting, and variety of historic and cultural attractions. They also considered Istanbul as an exciting, enjoyable, and pleasant destination. Moreover, tourists have favorable perceptions about local cuisine, as well as shopping and accommodation facilities. Overall, respondents are highly satisfied with their decision to travel to Istanbul and strongly agree that it is right decision to visiting Istanbul. They emphasized that visiting Istanbul is valuable and worth it. The majority of respondents' are highly satisfied with their overall travel experience, and they expressed that they will recommend their visits to others, say positive things about Istanbul, and they are willing to revisit Istanbul.

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VARDİYALAR ARASI ALGILANAN İŞ YÜKÜNÜN NASA-TLX METOTU İLE ARAŞTIRILMASI

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Özet: Çalışanlar bir yandan kendilerine ait sosyal yaşamlarını sürdürürken bir yandan da çalışma hayatındaki fizyolojik ve psikolojik gerilimlerle mücadele etmek durumdadır. Sanayileşme sürecinin doğal bir sonucu olarak ortaya çıkan ve işletmeler açısından vazgeçilmez olan vardiyalı çalışma düzeni ise bu mücadeleye farklı boyutlar kazandırmaktadır. Ayrıca teknolojik ve bilimsel gelişmelerin çalışma ortamlarında meydana getirdiği değişimler çalışanları özellikle zihinsel anlamda oldukça zorlamaktadır. Bu kapsamda gerek iş güvenliği ve işçi sağlığı açısından gerekse ergonomik açıdan çalışanların iş yüklerinin ölçülmesi ve belirli limitlerde sınırlandırılması önem kazanmaktadır. Bu çalışmanın amacı, farklı vardiya tiplerine göre algılanan zihinsel iş yüklerinin ölçülmesi ve karşılaştırılmasıdır. Çalışma kapsamında metal sektöründe faaliyet gösteren bir firmada çalışan 33 işçi üzerinde, sübjektif iş yükü ölçüm yöntemlerinden olan National Aeronautics and Space Administration's Task Load Index (NASA-TLX) yöntemi uygulanmıştır. Elde edilen sonuçlar SPSS paket programı kullanılarak analiz edilmiştir. Çalışanların vardiyalar arası algıladıkları iş yüklerinde anlamlı farklılıkların olduğu sonucu ortaya çıkmıştır. Bunun yanı sıra görev alanı, yaş ve tecrübe gibi faktörler kapsamında da iş yükü değerlendirmesi yapılmış ve çeşitli önerilerde bulunulmuştur.

Anahtar Kelimeler: İş yükü, vardiyalı çalışma, NASA-TLX

Giriş

Küreselleşen dünyada bilim ve teknoloji alanında gerçekleşen hızlı değişimler firmaların içerisinde bulunduğu çalışma ortamını rekabetçi kılmaktadır. Rekabet yoğun bir ortamda firmalar açısından ayakta kalabilmenin ana koşulu ise bu değişimlere ayak uydurmakla mümkündür. Bu değişimlerle iş hayatına yeni yöntem ve yaklaşımlar girmektedir. Söz konusu yöntem ve yaklaşımlar çalışanların yeteneklerini fiziksel ve zihinsel açıdan çeşitlendirmekte, hatta zorlamaktadır.

Evet, yeni yöntemler ve yaklaşımlardan işletmeler doğru bir şekilde yararlanmalıdır. Ancak ergonomik yaklaşımlardan asla taviz verilmemelidir. Çalışanların fiziksel ve zihinsel yeteneklerinin daha etkin ve verimli olarak kullanılması göz ardı edilmemelidir. Aksi durumda çalışanların özellik ve yeteneklerinin dikkate alınmadan geliştirilmiş her türlü donanım ve yazılım iş verimini azaltacak, iş güvenliği ve işçi sağlığı açısından çeşitli problemlere neden olacaktır.

Bir çalışma ortamında bireylerin performansını ve sağlığını etkileyen çeşitli olumsuz faktörler vardır (Ozkan ve ark., 2015).Bu kapsamda insan-makine etkileşiminin başladığından beri tartışılan bir konu olan iş yükü kavramı ön plana çıkmaktadır. İş yükü genel manada bir çalışanın performansına ve tepkilerine etki eden çeşitli baskılar olarak ifade edilebilir (Weiner,1982). Diğer bir tanımda iş yükü, bir işin yapılması esnasında harcanan işlem kapasitesinin derecesi olarak ifade edilmektedir (Young ve ark. 2008).

İş yükünün ölçülmesi ve belirli seviyeleri aşmasının engellenmesi çalışanların sağlığı, iş tatmini ve dolayısıyla iş verimi açısından oldukça önemlidir. Önceleri fiziksel iş yükünün ölçülmesine yoğunlaşılmasına karşın günümüzde otomasyon sistemlerinin artışına bağlı olarak artan makine kullanım oranı ile iş yükü ölçümü daha çok zihinsel kapsamda değerlendirilmektedir. Zira görevlerin çalışanlar tarafından yapılmasından ziyade denetim ve kontrol ağırlıklı bir düzene geçilmektedir. Zihinsel iş yükünün ölçülmesinin, sayısal olarak ifade edilmesinin fiziksel iş yüküne göre çok daha zor olduğunu da vurgulamak gerekir (Güreşçi ve Fığlalı, 2004).

Zihinsel iş yükü için literatürde genel geçer kabul görmüş tek bir tanım yoktur. Zihinsel iş yükü, bireyin görevlerini gerçekleştirmek için kullandığı zihinsel çaba miktarı olarak tanımlanabildiği gibi (Gao ve ark., 2011) kişilerdeki kullanılabilir kaynakların miktarı ile işin gerektirdiği arasındaki fark olarak ta tanımlanmaktadır (Güreşçi ve Fığlalı, 2004).

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Vardiyalı çalışma tüm gün sürenin, aynı günün farklı zaman dilimlerinde farklı işçi gruplarının çalıştırılması şeklinde tanımlanabilir (Odabaşı, 1997). Vardiyalı çalışma düzeni bazı ekonomik, sosyal ve sosyo-politik sebepler gereğince firmalar için artık bir zorunluluktur. Ancak bu düzene göre alışılmış iş saatleri dışında çalışmak, çalışanları fizyolojik ve psikolojik açıdan etkilemektedir. Bu kapsamda etkinin boyutunun araştırılması ve çeşitli önlemlerin alınması önem kazanmaktadır. Fizyolojik etkilerin çeşitli donanım ve ekipmanlarla ölçülebilmesi mümkünken psikolojik etkilenmenin boyutu zihinsel iş yükü ölçümü ile mümkün olabilmektedir.

Zihinsel iş yükü doğrudan ölçülen veya mutlak bir değer atanabilen bir kavram değildir (Ozkan ve ark., 2015). Zihinsel iş yükü ölçümü üç sınıfta incelenebilir: performansa dayalı ölçümler, fizyolojik ölçümler ve öznel ölçümler (Vidulich ve Tsang,2012). Yaygın ve en sık kullanılan öznel ölçüm yöntemleri National Aeronautics and Space Administration-Task Load Index (NASA- Görev Yük Endeksi, NASA-TLX), Cooper-Harper Ölçeği ve Subjective Workload Assessment Technique (Öznel İş Yükü Değerlendirme Tekniği, SWAT)'dir (Kurata ve ark., 2015).Sübjektif yöntemler arasında da NASA-TLX'in kullanım oranı oldukça yüksektir (Zheng ve ark., 2011).

Bu çalışma çalışanların algıladıkları iş yüklerinin üzerine vardiyalı sistemde çalışmanın etkisini araştırmak üzere planlanmıştır. Çalışma kapsamında halen faaliyette olan bir firmadaki çalışanlardan elde edilen veriler ile NASA-TLX yöntemi kullanılarak çalışanların iş yükleri hesaplanmıştır. İlgili iş yükü hesaplamaları aynı çalışanların her bir ayrı vardiyada çalışmaları durumunda hesaplanarak vardiyalar arasında iş yükü algılama farklılığı olup olmadığı araştırılmıştır.

Literatür Araştırması

Bu bölümde çalışmada kullanılan metot ile literatürde yapılan çalışmalara bazı örnekler verilecektir.

Zheng vd. (2011) pilotların hissettikleri zihinsel iş yükünü henüz uçak tasarım aşamasında dikkate alarak en uygun tasarım parametrelerini bulmaya çalışmışlardır. Çalışmada NASA-TLX yöntemini kullanmışlardır.

Akyeampong vd. (2014) hidrolik ekskavatörlerin ergonomisini geliştirmek için bir İnsan-Makine Ara yüzü (HMI) tasarım parametreleri önermişlerdir. Çalışmada operatörlerin zihinsel iş yükü skorlarının hesaplanmasında NASA-TLX metodunu kullanmışlardır.

Şeker (2014) çalışmasında Ar-Ge projeleri değerlendirme faaliyetlerinin temel aşamalarında çalışan uzmanların zihinsel iş yüküne yaş, cinsiyet, medeni durum ve eğitim düzeyi gibi demografik faktörlerin etkisini NASA-TLX metodu ile değerlendirmiştir.

Darvishi ve Meimanatabadi (2015) İran'da faaliyet gösteren bir bankada banka personellerinin zihinsel iş yükünü değerlendirmişlerdir. Çalışma kapsamında NASA-TLX ve Nordic Genel Anketi yöntemleri 200 banka personeline uygulanmış ve çıkan sonuçlar değerlendirilmiştir.

Fallahi vd. (2016) bir şehir trafik kontrol merkezinde çalışan 16 adet operatörün trafik yoğunluğunu izleme sırasındaki zihinsel iş yükünü incelemişlerdir. Zihinsel iş yükü belirlemek için, çalışanlara ait fizyolojik sinyalleri (EKG, EMG) kaydetmişler ve NASA-TLX yöntemini uygulamışlardır. Sonuç olarak operatörlerin yüksek trafik yoğunluğu sırasında düşük trafik yoğunluğuna göre daha büyük bir zihinsel iş yükü altında oldukları ortaya çıkmıştır.

Literatürde bu çalışmalar dışında ayrıca hemşirelerin (Young ve ark. 2008), fiziksel terapistlerin (Liang ve ark. 2014), muhasebe çalışanlarının (Ozkan ve Ozdevecioglu, 2015) ve öğrencilerin (Kurata ve ark., 2015) zihinsel iş yüklerinin değerlendirilmesinde, uçak kokpit ekran ara yüzü tasarım parametrelerinin belirlenmesinde (Wei ve ark., 2014) NASA-TLX yönteminin kullanıldığı görülmektedir.

Nasa-Tlx Yöntemi

NASA-TLX genel iş yükünü 6 alt farklı ölçekle değerlendiren çok boyutlu oranlamalara sahip öznel bir yöntemdir Bu altı ölçek Zihinsel Talep, Fiziksel Talep, Zamansal Talep, Performans, Efor ve Rahatsızlık Seviyesidir. Bu ölçeklere ait tanımlayıcı bilgiler Tablo 1'deki gibidir.

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Tablo 1:NASA-TLX ölçütleri ve tanımları

Ölçek	Değerlendirme Aralığı	Tanım
Zihinsel Talep	Düşük/Yüksek	Ne kadar zihinsel ve algılama aktivitesine ihtiyaç duyulduğu (Düşünme, karar verme, hesaplama, hatırlama, bakma, arama, araştırma vb.). Görevin icrası hatasız ve kesin mi olmalı yoksa hata kabul edilebilir mi? Görev kolay mı zor mu? Sade mi karmaşık mı?
Fiziksel Talep	Düşük/Yüksek	Ne kadar fiziksel aktiviteye ihtiyaç duyulduğu (ittirme, çekme, çevirme, kontrol etme, çalıştırma vb.)? Görev basit mi yoksa yorucu mu, yavaş mı hızlı mı, gelişi güzel yapılabiliyor mu özel bir özen mi istiyor? Sonucunda bedeni olarak yorgunluk oluyor mu? Oluyorsa ne kadar oluyor?
Zamansal Talep	Düşük/Yüksek	Belirli görevin bir aşamasını yerine getirirken ne kadarlık bir zaman baskısı, kısıdı üzerinizde hissetmektesiniz? Görevi yerine getirmek için atılan adımların hızlı ya da yavaş olması? Üzerinizde kısa bir süre içerisinde sıkıştırılmış işler yapma hissi uyanıyor mu?
Performans	İyi/Zayıf (yetersiz)	Verilen görevin hedeflerine ulaşmada size göre veya denetçilere göre ne derece başarılı olduğunuzu düşünüyorsunuz? Görevinizi yerine getirirken ne derece tatmin edilmiş oluyorsunuz? Sizce görevi yerine getirme oranınız nedir?
Efor	Düşük/Yüksek	Görevinizi yerine getirmek için ne kadar ağır çalışma gereklidir (Zihinsel ve fiziksel)? Görevin gerektirdiği performans seviyesini yerine getirmek ne kadar zor?
Rahatsızlık Seviyesi	Düşük/Yüksek	Görevinizi yerine getirirken kendinizi ne kadar güvensiz, gayri memnun, zarar görmüş, gerilmiş, sinirlenmiş, karışık, gevşek ya da karmaşık hissediyorsunuz?

NASA-TLX yöntemi oran, ağırlıklar ve birleştirmeden oluşan üç parçalı değerlendirme işlemlerine sahiptir. İlki "ORANLAMA" olarak adlandırılır ve bu aşamada Tablo 1'de gösterilen tüm ölçekler için 1 ile 100 aralığında olan gösterge çizelgesi üzerinden deneklerden kendi durumlarına göre ilgili boşlukları işaretlemeleri istenir. İkinci aşama ise "AĞIRLIKLAR" olarak adlandırılır ve bu aşamada Tablo 1'de gösterilen 6 ölçeğin 15 tane iki taraflı karşılaştırması yapılır. Bu aşamada çalışanlara görevlerini icra ederken hangi ölçütü daha yoğun olarak yaşadıkları sorulur ve iki seçenekten birinin seçilmesi istenir. Son aşama olan "BİRLEŞTİRME" olarak adlandırılır ve bu aşamada artık oluşan ağırlıklar ve oranların birleştirilmesi ile toplam ağırlıklı iş yükü skoru belirlenmiş olur. Bu yöntemin tüm süreçlerini içinde barındıran NASA-TLX adlı bir bilgisayar programı mevcuttur. Bu program ticari olmayan kullanımlar için ücretsiz olup NASA tarafından kullanıcıların hizmetine sunulmuştur.

Uygulama Çalışması

Çalışma kapsamında kullanılan veriler metal sektöründe faaliyet gösteren bir firmadaki çalışanlardan hazırlanan anketler yoluyla temin edilmiştir. Çalışmaya birer hafta aralıklarla farklı vardiyalarda çalışan 33 mavi yakalı personel katılmıştır (Her bir vardiyada 33/3=11 personel çalışmaktadır). Çalışanlara Şekil 1'de gösterilen anket uygulanmıştır.

Aynı denek için farklı vardiyalarda çalışmaları esnasında anket doldurmalarının birbirinden bağımsız olmasına özen gösterilmiştir. Doldurulan tüm anketlerden elde edilen veriler yukarıda programın kullanılması kısmında anlatıldığı gibi NASA-TLX programına girilerek her bir işçinin her bir vardiyada algıladığı iş yükü hesaplanmaya çalışılmıştır. Tablo 2'de, örnek olarak, bir işçiye ait iş yükü hesabını gösterir program çıktısı 3 vardiyadaki durumunu göstermektedir.

Tablo 2'de oran sütununda gösterilen değerler deneklerin anketin 1.kısmındaki ORANLAMA kısmına vermiş oldukları değerlerdir. Ağırlık sütununda belirtilen değerler ise anketin 2. bölümünde sorulan 15 adet ikili karşılaştırmalardan elde edilen ağırlıklardır. Toplam iş yükü de her bir faktöre karşılık gelen değer ile ağırlıkların çarpımlarının ayrı ayrı toplanması ile elde edilmiştir.

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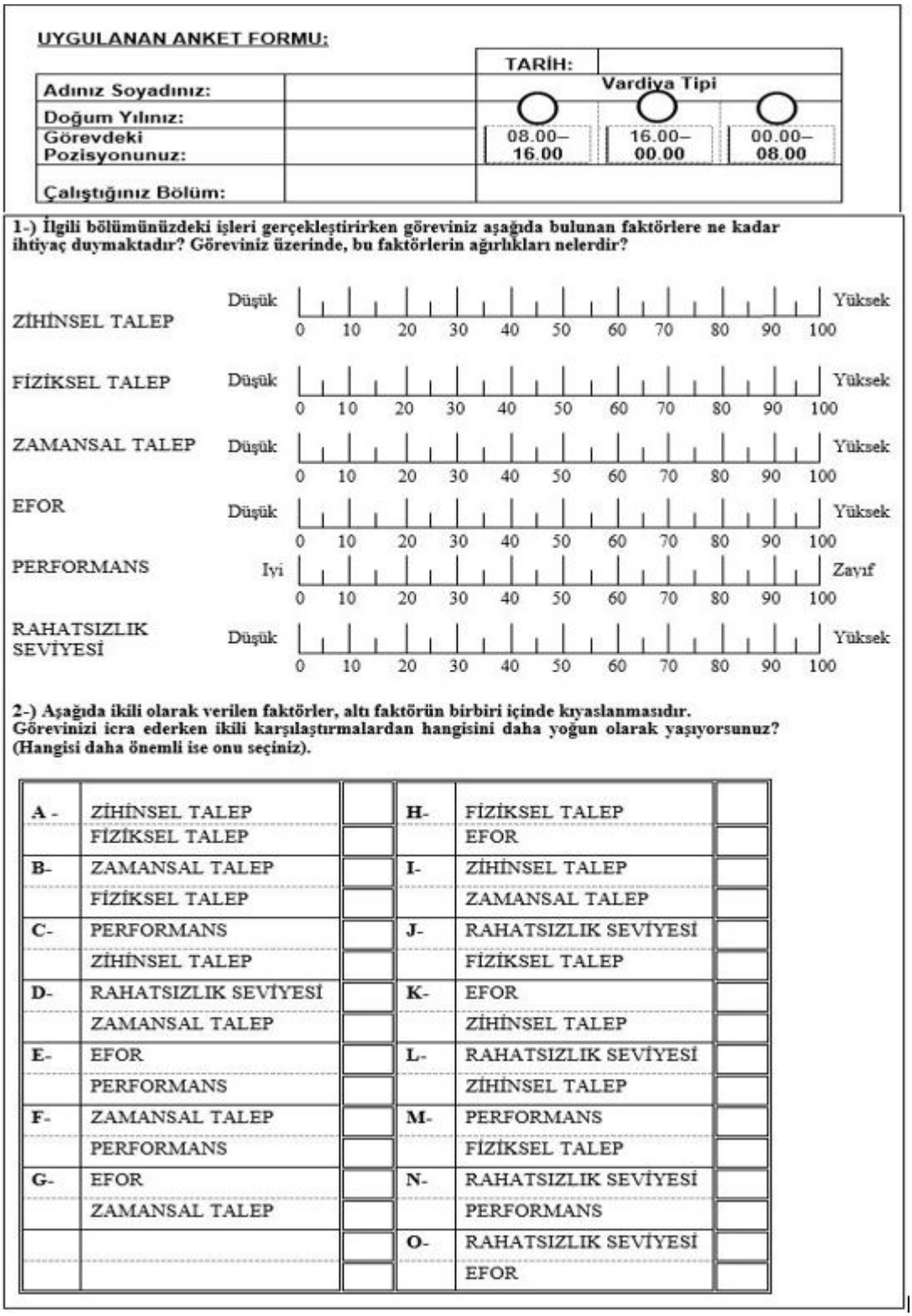

UYGULANAN ANKET FORMU:

		TARİH:	
Adınız Soyadınız:		Vardiya Tipi	
Doğum Yılınız:		○ 08.00–16.00	○ 16.00–00.00	○ 00.00–08.00
Görevdeki Pozisyonunuz:			
Çalıştığınız Bölüm:			

1-) İlgili bölümünüzdeki işleri gerçekleştirirken göreviniz aşağıda bulunan faktörlere ne kadar ihtiyaç duymaktadır? Göreviniz üzerinde, bu faktörlerin ağırlıkları nelerdir?

ZİHİNSEL TALEP	Düşük	0 10 20 30 40 50 60 70 80 90 100	Yüksek
FİZİKSEL TALEP	Düşük	0 10 20 30 40 50 60 70 80 90 100	Yüksek
ZAMANSAL TALEP	Düşük	0 10 20 30 40 50 60 70 80 90 100	Yüksek
EFOR	Düşük	0 10 20 30 40 50 60 70 80 90 100	Yüksek
PERFORMANS	Iyi	0 10 20 30 40 50 60 70 80 90 100	Zayıf
RAHATSIZLIK SEVİYESİ	Düşük	0 10 20 30 40 50 60 70 80 90 100	Yüksek

2-) Aşağıda ikili olarak verilen faktörler, altı faktörün birbiri içinde kıyaslanmasıdır. Görevinizi icra ederken ikili karşılaştırmalardan hangisini daha yoğun olarak yaşıyorsunuz? (Hangisi daha önemli ise onu seçiniz).

A -	ZİHİNSEL TALEP		H-	FİZİKSEL TALEP	
	FİZİKSEL TALEP			EFOR	
B-	ZAMANSAL TALEP		I-	ZİHİNSEL TALEP	
	FİZİKSEL TALEP			ZAMANSAL TALEP	
C-	PERFORMANS		J-	RAHATSIZLIK SEVİYESİ	
	ZİHİNSEL TALEP			FİZİKSEL TALEP	
D-	RAHATSIZLIK SEVİYESİ		K-	EFOR	
	ZAMANSAL TALEP			ZİHİNSEL TALEP	
E-	EFOR		L-	RAHATSIZLIK SEVİYESİ	
	PERFORMANS			ZİHİNSEL TALEP	
F-	ZAMANSAL TALEP		M-	PERFORMANS	
	PERFORMANS			FİZİKSEL TALEP	
G-	EFOR		N-	RAHATSIZLIK SEVİYESİ	
	ZAMANSAL TALEP			PERFORMANS	
			O-	RAHATSIZLIK SEVİYESİ	
				EFOR	

Şekil 1. Çalışanlara uygulanan anket

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Tablo 2:NASA-TLX program çıktısı birleştirilmiş örneği

NASA Task Data	1.Vardiya		2.Vardiya		3.Vardiya	
Ölçek	**Oran**	**Ağırlık**	**Oran**	**Ağırlık**	**Oran**	**Ağırlık**
Zihinsel Talep	85	0.267	90	0.267	90	0.267
Fiziksel Talep	75	0.000	75	0.000	75	0.000
Zamansal Talep	85	0.267	85	0.267	85	0.267
Performans	25	0.200	25	0.200	20	0.200
Efor	85	0.067	85	0.067	80	0.067
Rahatsızlık Seviyesi	80	0.200	80	0.200	75	0.200
İşçi Numarası (8)						
Toplam İş yükü	**72.00**		**73.33**		**71.00**	

Tablo 3'de her bir deneğin her bir vardiya tipindeki iş yüküne ait tanımlayıcı istatistik bilgileri gösterilmektedir. Tabloya genel olarak bakıldığında vardiyalar arasında toplam iş yükleri arasında 1.vardiyadaki iş yükünün 2. vardiyadan, onunda 3. vardiyadakinden düşük çıktığı gözlenmiştir.

Tablo 3:Farklı vardiya tiplerinde deneklerin algıladıkları iş yüklerine ait genel bilgiler

Tanımlayıcı	**Toplam İş Yükü**				**Yaş**	**Tecrübe**
	1.Vardiya	**2.Vardiya**	**3.Vardiya**	**Ortalama**		**(Yıl)**
Ortalama	69.08±8.70	72.05±10.02	76.14±9.14	72.42±9.66	30.36±4.20	5.67±3.02

İş yükleri 1. vardiyada ortalama 69.08, 2. vardiyada ortalama 72.05 ve 3. vardiyada ortalama 76.14 olarak çıkmıştır. Çalışanların yaş ortalaması 30.36 iken, ortalama tecrübe 5.67 yıldır. Tablo 3'de gözlemlenen vardiyalar arasında algılanan iş yükü farklılığının istatistiki olarak anlamlı olup olmadığı incelenmiştir. Bu kapsamda 2'den fazla grubun varlığı nedeniyle Varyans Analizi (ANOVA) uygulanmıştır. Tüm analizler SPSS paket programı kullanılarak %95 güven aralığında yapılmıştır.

ANOVA (Analysis Of Variance) parametrik bir testtir. Bu testin sağlıklı sonuç vermesi için her grubun normal dağılıma sahip olması gerekmektedir. Yani ANOVA testine başlamadan önce her bir grup için normallik testi yapılmalıdır. Yapılan normallik testine ait hipotezler aşağıdaki gibi olup, analiz sonucu çıkan değerler Tablo 4'de gösterilmiştir.

H_0= Veriler %95 güvenle normal dağılmıştır.
H_1= Veriler %95 güvenle normal dağılmamıştır.

Tablo 4: Normallik testi SPSS çıktıları

Vardiyalar	**Kolmogorov-Smirnov**			**Shapiro-Wilk**		
	Statistic	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
Vardiya1	.102	33	.200	.962	33	.290
Vardiya2	.091	33	.200	.975	33	.632
Vardiya3	.084	33	.200	.970	33	.493

Tablo 4'deki Sig. değerlerine göre Sig>0.05 olduğundan dolayı H_0 hipotezleri her bir grup için ayrı ayrı kabul edilebilir. Yani her bir vardiya türüne ait iş yükü verileri %95 güvenle normal dağılımlıdır. Bu durumda verilerimizin normal dağıldığı sonucuna vardığımıza göre ANOVA testi uygulayabiliriz. Yapılan ANOVA testine ait hipotezler aşağıdaki gibi olup, analiz sonucu çıkan değerler Tablo 5'de gösterilmiştir.

H_0= %95 güvenle, grupların ortalamaları arasında istatistiksel olarak anlamlı bir farklılık yoktur.
H_1= %95 güvenle, grupların ortalamaları arasında istatistiksel olarak anlamlı bir farklılık vardır.

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Tablo 5: Varyans analizi SPSS çıktıları

ANOVA					
	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	829.549	2	414.775	4.792	.010
Within Groups	8,309.188	96	86.554		
Total	9,138.737	98			

Tablo 5'deki Sig. değerine göre Sig<0.05 olduğundan dolayı H_1 hipotezi kabul edilmektedir. Bu sonuç göstermektedir ki; vardiyalar arası algılanan ortalama iş yükleri arasında %95 güven aralığında istatistiksel olarak anlamlı bir farklılık vardır.

Gruplar arası farkın olduğu durumlarda, farklılığın hangi gruptan kaynaklı olduğunu tespit eden istatistik post-hoc olarak bilinmektedir. Kullanılacak test, varyansın homojen olup olmamasına göre farklılık arz etmektedir. Varyansların homojenliği testine ait hipotezler aşağıdaki gibi olup, analiz sonucu çıkan değerler Tablo 6'da gösterilmiştir.

H_0= %95 güvenle, grup varyansları homojendir.
H_1= %95 güvenle, grup varyansları homojen değildir.

Tablo 6: Varyansların homojenliği testi SPSS çıktıları

Levene Statistic	**df1**	**df2**	**Sig.**
.411	2	96	.664

Tablo 6'daki Sig. değerine göre Sig>0.05 olduğundan dolayı H_0 hipotezi kabul edilmektedir. Bu sonuç grup varyanslarının %95 güvenle homojen olduğunu göstermektedir. O halde post hoc testlerinden varyansın homojen olması durumunda kullanılanlar ele alınabilir. Bu kapsamda Tukey testi tercih edilmiştir. Teste ait hipotezler aşağıda sunulmuş olup, SPSS çıktısı Tablo 7'de gösterilmiştir.

H_0= %95 güvenle, iki grup arasında istatistiksel olarak anlamlı bir farklılık yoktur.
H_1= %95 güvenle, iki grup arasında istatistiksel olarak anlamlı bir farklılık vardır.

Tablo 7:Tukey testi SPSS çıktıları

Test	**(I) Vardiya**	**(J) Vardiya**	**Mean Difference (I-J)**	**Std. Error**	**Sig.**
Tukey HSD	1	2	-2.970	2.290	0.401
		3	-7.061	2.290	*0.007**
	2	1	2.970	2.290	0.401
		3	-4.091	2.290	0.180
	3	1	7.061	2.290	*0.007**
		2	4.091	2.290	0.180

Tablo 7 incelendiğinde Sig. değerinin 0.05'ten küçük olduğu karşılaştırma 1. ile 3. vardiya arasında olmaktadır. Bu durumda ANOVA testinde ortaya çıkan gruplar arasındaki anlamlı farklılığın bu iki vardiyadan kaynaklandığını söyleyebiliriz.

Çalışanlara uygulanan anketlerde her bir çalışana ait yaş ve tecrübe bilgisi de toplanmıştır. İş yükü, yaş ve tecrübe arasında anlamlı bir ilişki olup olmadığını anlamak için Korelasyon analizi yapılmıştır. Analize ait hipotezler aşağıdaki gibi kurulmuş olup, SPSS çıktısı Tablo 8'de gösterilmiştir.

H_0= İki değişken arasında %99 güvenle istatistiksel olarak anlamlı bir ilişki yoktur.
H_1= İki değişken arasında %99 güvenle istatistiksel olarak anlamlı bir ilişki vardır.

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Tablo 8:Korelasyon analizine ait SPSS çıktıları

		İş yükü	Yaş	Tecrübe
İş yükü	Pearson Correlation	1	.076	.012
	Sig. (2-tailed)		.457	.909
Yaş	Pearson Correlation	.076	1	.609*
	Sig. (2-tailed)	.457		.000
Tecrübe	Pearson Correlation	.012	.609*	1
	Sig. (2-tailed)	.909	.000	

Tablo 8'e göre iş yükü-yaş ve iş yükü-tecrübe arasındaki ilişkiyi gösteren korelasyon katsayıları sırası ile 0.076 ve 0.012 olduğu gözlemlenmiştir. Sig.>0.01 olması nedeniyle H_0 hipotezi kabul edilebilmektedir. Tablo 8'deki verilerle iş yükünün yaş ve tecrübe ile bir ilişkisinin olduğu istatistiki manada söylenemezken, yaş ile tecrübe arasında doğru yönlü ve orta seviyede bir korelasyon olduğu söylenebilir.

İlgili firmada 6 farklı görev alanı bulunmaktadır. Görev alanlarına ait farklı vardiyalarda ortalama iş yükleri Tablo 9'da gösterilmiştir.

Tablo 9. Görev alanları-vardiyalara göre ortalama iş yükleri

Görev Alanı	İşçi Sayısı	1.Vardiya	2.Vardiya	3.Vardiya
1	4	67.75	72.75	72.25
2	8	63.96	65.92	73.17
3	9	66.22	68.70	74.59
4	4	76.00	81.08	82.00
5	2	70.50	68.84	68.17
6	6	76.00	79.83	83.78

Tablo 9'daki verilerden hareketle deneklerin görevlerinin algıladıkları iş yüklerinde bir değişim yarattığı gözlenmektedir. 6 farklı görev alanının 4'ünde 1.vardiyadan 3. vardiyaya doğru 3 vardiyada giderek artan bir iş yükü, 1'inde giderek azalan bir iş yükü, 1'inde ise 1.vardiyada 2.ve 3.vardiyalara göre düşük, 2. vardiyada 3. vardiyaya göre yüksek bir iş yükü karşımıza çıkmaktadır. Bu da bize görev alanlarının çoğunda gündüz vardiyasından gece vardiyasına doğru 3 vardiyada iş yüklerinde giderek artış olduğunu göstermektedir.

Sonuç Ve Öneriler

Sanayileşme sürecine paralel olarak ekonomik, sosyal ve sosyo-politik sebeplerle çalışma koşullarında çeşitli değişimler gözlenmektedir. Bu değişimler çalışanların algıladıkları iş yüklerini doğrudan veya dolaylı olarak etkileyen faktörlerin ortaya çıkmasına neden olmaktadır. Vardiyalı çalışma düzeni de bu kapsamda ele alındığında bir yandan firmalar açısından elzem olması, bir yandan da ortaya çıkan gece çalışması ile güçleşen çalışma koşullarının oluşması açısından incelemeye değerdir.

Bu çalışmada, gün içindeki farklı vardiya tiplerinde çalışanların algıladıkları zihinsel iş yükleri ölçülmüş ve çeşitli karşılaştırmalarda bulunulmuştur. Uygulama çalışması metal sektöründe faaliyet gösteren bir firmada çalışan işçilere NASA-TLX yönteminin uygulanması şeklinde icra edilmiştir. Yöntemin ortaya çıkardığı sonuçlar SPSS paket programı kullanılarak çeşitli açılardan analiz edilmiştir.

Algılanan iş yüklerinin çalışma saatlerinin başlangıcı olarak düşünülebilen sabah saatlerinden gece saatlerine doğru gittikçe artış gösterdiği ortaya çıkmıştır. Ayrıca 1.vardiyadaki deneklerin %87.88'nin, 3.vardiyada çalışmaları durumunda algıladıkları iş yüklerinde artış olmuştur. Aynı şekilde 1.vardiyadaki deneklerin %75.76'sının iş yükleri, 2.vardiyada çalışmaları esnasındakine göre, 2.vardiyadaki deneklerin de %69.70'inin iş yükleri, 3.vardiyada çalışmalarındakine göre düşük çıkmıştır. Çalışanların vardiyalar arası algıladıkları iş yüklerinde anlamlı farklılıkların olduğu yapılan istatistiki testlerle ortaya konulmuştur. Bunların yanı sıra görev alanı, yaş ve tecrübe gibi faktörler kapsamında da iş yükü değerlendirmesi yapılmıştır.

Algılanan iş yükünün gece vardiyasında yüksek olması doğal olarak karşılanabilir. Fakat yüksek olan bu iş yükünün optimum bir noktaya çekilmesine yönelik önlemler alınmalıdır. Bunu gerçekleştirmek için; gece çalışma ortamı koşullarını gündüz çalışma ortamı koşullarına yakınlaştırmak için çeşitli ergonomik düzenlemeler yapılabilir (aydınlatma, sıcaklık, nem, havalandırma vb.). Gece zammının yeniden düzenlenmesi gibi

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çalışanların motivasyonunu yükseltecek, iş doyumu ve tatminini artıracak çalışmalar yapılabilir. Gece vardiyasında dinlenme aralıkları yeniden belirlenebilir (Örneğin gündüz vardiyasına nazaran gece vardiyasında dinlenme zaman aralıklarına -maliyetlere aşırı ek külfetler yüklenmeden- ilave süreler eklenebilir). Çalışanların vardiya tiplerinin değişiminin haftalık olması onların uyku ritimlerinin bozulmasına neden olduğu tartışılmaz bir gerçektir. Bir hafta gece vardiyasında çalışmaları diğer hafta gündüz vardiyasında çalışmaları çalışanların uyku düzenlerini bozmaktadır. Bu sebeple vardiya değişimlerinin mümkün mertebe daha uzun bir sürece oturtulması bu sorunu bir nebze giderecektir (Örneğin 2 haftada bir değişim yapılması).

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VARIATION OF DRIVING CONCENTRATION WITH DRIVER PERCEPTION THROUGH IN-CAR VIEW ROAD SCENE AS VISUAL STIMULANT

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Abstract: To make driver generate a right decision as evaluating scenes perceiving by his brain, several factors (objects with different shapes, movements, and illuminations) that effects on driving concentration are existed. In this study, continuously changing scenes that are seen by driver eyes through windshield are statistically investigated. Here I have initially extracted a set of features. Then I have found optimal feature subset using Linear discriminant analysis. And then I get a measure to indicate driver concentration using Jensen Shannon Inequality and Hellinger distance. It has been validated the measures via relationships between them. Consequently, a model is proposed for seeking how the scene influencing on driver concentration as an effective factor for comfortable driving. It suggests concentration risk rate of *fr* is less than all the other road models. However, concentration risk rate of *rsfs* is more than all the other road models.

Keywords: Vehicle environment perception, Jensen Shannon Divergence and Hellinger measure, feature selection, Linear discriminant analysis

Introduction

Motivation

There are many factors that influence on driver performance such as car interior design, suspension, technical specifications, road conditions, traffic density, changing climatic conditions, behavior of other vehicles, vehicle accessories in the placement. A very important factor that influences on driving comfort is also the scene through the windshield. In many studies conducted so far, one or a few factors have been taken into account. However, scene through windshield plays an important role in driver psychology, which has not been intensively investigated. As a matter of this fact in many trading areas I prefer background decoration with different colors considering customer mood. For instance, blue colors are used in a fishery shop; dresses with white, green or blue colors are preferred in hospital; relaxing wall paintings are chosen in resorts, and different decorations are used to increase working efficiency. Hence, depending on landscape in our environment I can sense specified perceptions in our brain. Therefore, I can come up with different ideas via this hypothesis for vehicle drivers who face with many visual landscapes on steering wheel. Different lights, colors, patterns and geometries of the landscape have positive or negative effect on driving performance. Drivers can be aggressive when they look through specified landscapes although some of scenes can improve his driving performance.

Problem Statement

There are limited studies on driving comfort of psychological impact of landscapes. Therefore, constantly changing landscapes under different light conditions should be classified to estimate impacts of resulting classification on driver visual performance. In order to identify impact of the scenes through windshield on driver concentration, different types of landscapes should also be examined. These visual conditions can be exemplified as light of the sun on the road, watching vehicles in crowded traffic, and driving on dark road.

Proposed Approach

In this study, 40 pictures taken within a car have been examined, which are specified as 10 fr, 10 mrht, 10 drht, and 10 rsfs. The pictures taken through the windshield include some inner part of the car that is not related to whole

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the scene. Therefore, this portion of the image is removed using a filter. Then Linear discriminant analysis algorithm is utilized to select some of effective features (C. Ding and H.C. Peng. 2003). I have developed pie charts to sketch minimum and maximum values of selected features. Analyzing the pie charts I have found that probabilistic distribution of features fits an exponential kernel. By substituting correspondent probabilistic values in to an object function, scenes are classified. Using the resulting values of this classification, the concentration of driver on road is probabilistically investigated. In this way, a state of the art model is proposed to estimate driver concentration using respective scenes that driver look through windshield.

Related Work

In one study using spatial vibrotactile clues of landscapes, visual attention of drivers was investigated to get potential emergency response rate (Shankar, Venkataraman, Fred Mannering, and Woodrow Barfield, 1995). In another paper, authors worked on risk factors for traffic accidents with single vehicle in Hong Kong (Treat, John R, 1979). In this article, the effect of district, human, vehicle, safety, and environmental factors are examined (Ho, Cristy, Hong Z. Tan, and Charles Spence, 2005). As to another study, risk of injury of child bruises was strongly associated with traffic volume risk (Yau, Kelvin KW, 2004).. Injuries at region with highest traffic volumes were 14 times greater than less intensity region (Teran-Santos, J., A, 1999). In some of articles, reasons that cause accidents by diverting the attention of the drivers were investigated (Violanti, John M., and James R. Marshall, 1996). In these works, some of the reasons such as Sleep Apnea, Alzheimer disease, and using a cell phone increase the rate of traffic accidents by distracting drivers (Dubinsky, Richard M., Anthony C. Stein, and Kelly Lyons, 2000). In another paper, nearly half of truck drivers expressed a negative view about technological precautions for driver drowsiness (Ansari, S, 2000).

Contribution

The factors effecting on traffic accidents have been investigated in most of the recent studies. However there are a few researches that are focusing effects of environmental landscape on driver. In this way, performing a risk analysis I are seeking how to affect windshield landscape on performance of driver. In this study Linear discriminant analysis based feature reduction method is exploited. Then Jensen Shannon and Hellinger Distance with exponential kernel are utilized to get object function. Additionally, classifications are probabilistically visualized on a pie chart.

Outline of the Paper

Theories and infrastructure information of the study are given in Section II. Experimental results are explained in Section III. Finally the results obtained are discussed in Section IV.

Materials and Methods

There are many visual factors that influence on driver concentration such as monotonous free road (fr), road scene under frontal full sunlight (rsfs), dark road with heavy traffic (drht), and monotonous road with heavy traffic (mrht). For example, sunlight bothering driver's eyes can impair driving comfort and safety. In this study, under stochastic driving conditions, driver concentration effect for changing landscape has been modeled, and introduced a state of the art approach. Hence, investigating pictures with 10 fr, 10 mrht, 10 drht, and 10 rsfs are taken inside a vehicle.

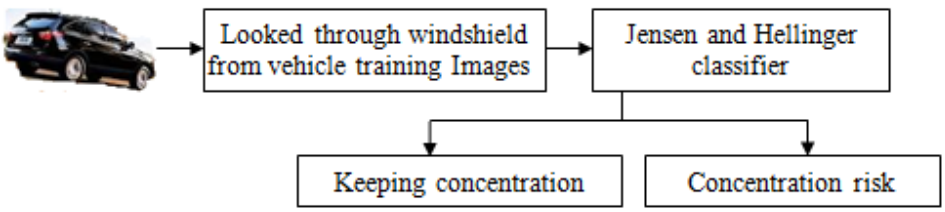

Figure 1. Proposed system

These 40 pictures are preferred as training pictures. The proposed system is shown in Figure 1.

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Steps to be followed for the proposed system are

Step 1: 40 pictures are acquired through the windshield. In the pictures, some inner part of the car that is not related to whole the scene is removed using a filter.
Step 2: 10 of them are selected using Linear discriminant analysis.
Step 3: Pie charts are obtained considering minimum and maximum ranges of selected features for pictures with 10fr, 10mrht, 10drht, and 10rsfs as seen in Figure 2. These pie chart limit values are subjected to 3 stages for each feature separately as depicted in Figure 2.

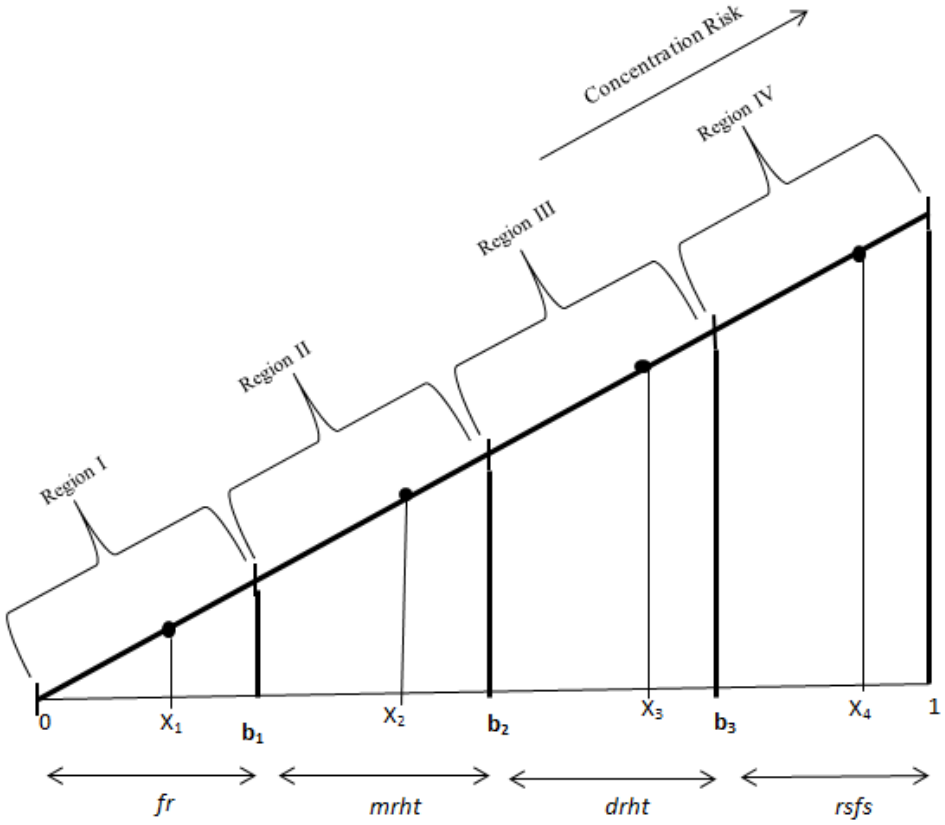

Figure 2. Dial limit values of features in the fr, mrht, drht and rsfs pictures

In Fig. 2, $ffr_i = \{ffr_1, ffr_2, \ldots., ffr_{10}\}$ is feature *i* values of image for *fr*. $frsfs_i = \{frsfs_1, frsfs_2., frsfs_{10}\}$ is feature i values of image for *rsfs*. $fmrht_i = \{fmrht_1, fmrht_2, \ldots., fmrht_{10}\}$ is feature *i* values of image for *mrht*. $fdrht_i = \{fdrht_1, fdrht_2, , fdrht_{10}\}$ is feature *i* values of image for *drht*. ffr_{min} is the smallest feature values of 10 *frv*. ffr_{max} is the biggest feature values of 10 *frv*. $frsfs_{max}$ is the biggest feature values of 10 *rsfs*. $fmrht_{max}$ is the biggest feature values of 10 *mrht*. $fdrht_{max}$ is the biggest feature values of 10 *drht*. Road (R_j) is 10 *fr*, 10 *mrht*, 10 *drht*, and 10 *rsfs*. In Fig. 2, region I is *fr*, Region II is *mrht*, Region III is *drht*, Region IV is *rsfs* . As Stage II is normalized to Stage III, ranges of features can be expressed as

$$x_i = (fR_j - a).1/frsfs_{max} \qquad b_i = (fR_{jmax} - a).1/frsfs_{max} \tag{1}$$

where b_i is the status of maximum feature value normalized to 1, which is obtained from 40 training pictures *fr*, *mrht*, *drht*, and *rsfs*; x_i refers to feature values obtained from pictures. As pie chart values are examined, it is seen that x_i and b_i values are in compliance with exponential distribution. Accordingly, exponential kernel is obtained by

$$P(c|a_{ij}) = 100b_i^{x_i} \tag{2}$$

where $P(c|a_{ij})$ is probabilistic value of the images, *fr*, *mrht*, *drht* and *rsfs*.
Step 4: In Stage II, minimum value of *fr* images is subtracted from each of limit rates so that initial value of these values shall be 0. They are normalized in Stage III by means of Eq. (1), and probabilistic ranges are estimated.
Step 5: After training image is normalized to 1, these values indicate exponential distribution rather linear one. This situation can be seen from b_i and x_i rates on the pie chart.

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Step 6: Probabilistic values of *fr, mrht, drht* or *rsfs* are found by means of Eq. (2) for exponential kernel.
Step 7: These probabilistic values are used by Eqs. (2) and (3) for each feature associated with concentration rate.
Step 8: The values obtained by Step 7 are substituted by Eqs. (4) and (5) which are weights according to Jensen divergence and Hellinger measure. Therefore weight values for each feature can be found.
Step 9: These weight values are added and multiplied with the value of each feature separately by means of Eq. (6). As a result of this calculation, a probabilistic measure is obtained. The range of this measure is in between 0 and 1 since the rates obtained by Eq. (9) are estimated in a probabilistic way. Thus, closing to 1 means the increase of "Concentration Risk" as seen in Fig. 2, Stage III.

Jensen-Shannon Divergence and Hellinger

Jensen Divergence (Js) and Hellinger (He) measure are given in Eqs. (3) and (4) for 10 *fr*, 10 *mrht*, 10 *drht* and 10 *rsfs* images taken through windshield of vehicle. $P(c|a_{ij})$, in Eq. (2), can be calculated by Bayesian Network probabilistic approach. However, probabilistic distributions of features show conformity with the Exponential Kernel. Initial values of $P(c|a_{ij})$ are obtained from this kernel. $KL(C|a_{ij})$ is the average mutual information between the events c and a_{ij} with the expectation taken with respect to a posteriori probability distribution of (C Lee, Chang-Hwan, Fernando Gutierrez, and Dejing Dou 2011). I can define Kullback- Leibler divergence with naïve Bayesian as

$$KL(C|a_{ij}) = \sum_c P(c|a_{ij}) \log\left(\frac{P(c|a_{ij})}{P(c)}\right) \tag{3}$$

Progressing Eq. (3) I can find the new measures, which are Jensen Shannon and Hellinger. When Jensen divergence and Hellinger measure in Eq. (4), (5) are put in their place, average weights with respect to Js and He are estimated namely by Eq. (6). Weights calculation Js and He are shown in Eq. (7) as

$$Js(C|a_{ij}) = \sum_c P(c|a_{ij}) \log\left(\frac{P(c|a_{ij})}{P(c)}\right) + (1 - P(c|a_{ij})) \log\left(\frac{(1-P(c|a_{ij}))}{(1-P(c))}\right) \tag{4}$$

$$He(C|a_{ij}) = \sum_c \left(\sqrt{P(c|a_{ij})} - \sqrt{(P(c)}\ \right)^2 \tag{5}$$

$$W_{Jsavg,Heavg}(i) = \sum_{j/i} \frac{(a_{ij})}{N} Js(C|a_{ij}), He(C|a_{ij}) \tag{6}$$

$$W_{Js,He}(i) = \frac{W_{Jsavg,Heavg}(i)}{z \sum_{j/i} P(a_{ij}) \log P(a_{ij})} \tag{7}$$

where $W_{jsavg,Heavg}(i)$ is average weight calculation of the feature i for Js and He. $W_{Js,He}(i)$ is weight of the feature i for Js and He.

On the other hand, Topsøe (F. Topsøe 2000). mentioned about a close relationship between Hellinger distance and Jensen divergence. Therefore the relationship between Jensen-Shannon and Hellinger can be expressed by

$$\frac{1}{2} He\left(P(c|a_{ij}), (P(c)\right) \leq Js\left(P(c|a_{ij}), (P(c)\right) \leq 2 \ln(2)\, He\left(P(c|a_{ij}), (P(c)\right) \tag{8}$$

Decision Making

After calculating weights for each selected feature of images, these weights are put in their places as

$$d_{Jsavg,Heavg} = \frac{argmax\ P(c) \prod_{a_{ij} \in d} P(a_{ij}|c)^{W_{Js,He}(i)}}{Si} \tag{9}$$

where a_{ij} is the *j*-th value in *i*-th feature, N is the total number of records, c is the target feature, d_{Js} is test data for Jensen, d_{He} is test data for Hellinger, z is normalization constant, and *Si* is number of sample images for each scene type, that is, *Si*=10 for 10 *fr*, 10 *mrht*, 10 *drht*, and 10 *rsfs*.

$$Concentration\ \ Risk = \frac{d_{Jsavg} + d_{Heavg}}{2} \tag{10}$$

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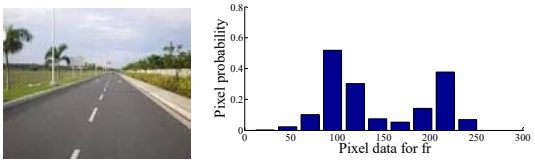
The concentration risk can be estimated using the average of d_{Jsavg} and d_{Heavg} as seen in Eq. (9).

Results and Discussion

Some of samples out of 40 pictures are given in Figure 3.



Figure 3. Sample images through windshield for *fr, mrht, drht, rsfs*



(a) (b)

Figure 4. (a) Image (fr1)(b) Probabilistic distribution of image in (a)

Probabilistic density distributions of the image fr2, in and Figure 4 are shown at right side of same images. All the Equations between (9-10) the values of d_{Js} and d_{He} are obtained in Figure 5.

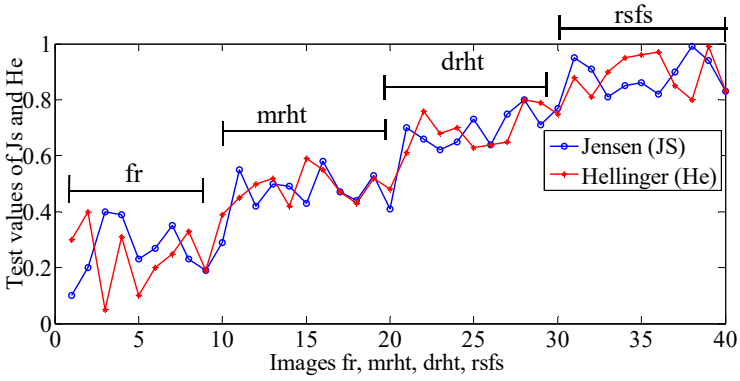


Figure 5. d_{js} , d_{He} values for images fr, mrht, drht and rsfs

Reviewing Figure 5, the $d_{js,he}$ values of fr images are in the range between 0-0.4; the $d_{js,he}$ values of mrht images are in the range between 0.4-0.6; the $d_{js,he}$ values of drht images are in the range between 0.6-0.8, and the $d_{js,he}$ values of rsfs images are in the range between 0.8-1 are found. Table 1 is obtained by Figure 5.

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Table 1: D_{Jsort}, D_{Heort} and Concentrarion Risk (*Conr)* Rates of *fr, mrht, drht and rsfs for* 40 İmages

	fr	**mrht**	**drht**	**rsfs**
d_{Jsort}	0.251	0.534	0.701	0.894
d_{Heort}	0.265	0.482	0.703	0.886
$Concentration\ \ Risk\ \ (Conr)$	0.258	0.508	0.702	0.89

According to *Conr* row in Table 1, I can conclude that

$$Conr_{fr} < Conr_{mrht} < Conr_{drht} < Conr_{rsfs}$$

It suggests concentration risk rate of *fr* is less than all the other road models. However, concentration risk rate of *rsfs* is more than all the other road models.

Conclusion

In this work, 40 training images taken through windshield of the vehicle are examined. Object function for the images *fr, mrht, drht*, and *rsfs* is obtained by Jensen Shannon Divergence and Bhattacharya Distance. The results are found as concentration risk via proposed decision-making algorithm. Consequently, I estimate the impact of landscape through the windshield on driver concentration. It suggests concentration risk rate of *fr* is less than all the other road models. However, concentration risk rate of *rsfs* is more than all the other road models. As a next step of this study all the frames along the road could be combined. Hence, this information would be a complementary clue for the studies on driver behavior.

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WEAR BEHAVIOR OPTIMIZATION OF MULTI DIRECTIONAL CUTTING TOOLS IN THE ROUGH TURNING OF AISI 4140

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Abstract: Multi directional tools (MDT) that can perform grooving, profiling and cutting processes minimize tool changing and tool setup times on their own, and are an alternative to the classical right/left-hand cutting tool. In the presented paper, wear behavior is investigated in the rough turning of AISI 4140 steel with PVD coated cemented carbide MDT. At the high feed rate and depth of cut conditions, experiments are conducted based on Taguchi's L8 orthogonal array (OA) in different levels of process parameters (cutting speed, chip breaker type and nose radius). Experimental results are assessed through signal to noise (S/N) ratio and analysis of variance at the confidence level of 95%, and optimization of the system is realized sufficiently.

Keywords: Chip Breaker Forms, Taguchi Method, Turning, Wear, Optimization

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WOLLASTONİT, ALÜMİNA VE SİLİKA TUĞLA HARCINDAN ÜRETİLEN CAS SERAMİKLER

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Özet: Bu çalışmada hammadde olarak alümina ve silika esaslı tuğla harcı ve wollastonit kullanılarak CaO-Al_2O_3-SiO_2 (CAS) üçlü denge diyagramına göre düşük ergime sıcaklığına sahip ağ. % 27.5 CaO, 15Al_2O_3 ve 57.5 SiO_2 içeren CAS bileşimi hazırlanmıştır. Aşınma ve korozyon dayanımının gerekli olduğu uygulama alanlarına yönelik CAS seramik sistemini üretmek için belirlenen hammaddeler tartılarak bilyalı değirmende yaş olarak 3 saat 250 devir/dk hızla homojen karıştırma işlemine tabi tutulmuştur. Etüvde kurutulan numuneler hidrolik pres yardımı ile tabletler halinde şekillendirilip 10°C/dk ısıtma hızında 1000°C-1200°C sıcaklık aralıklarında 1, 3 ve 5 saat sürelerde sinterlenmiştir. Kullanılan başlangıç tozlarının ve farklı sıcaklık ve sürelerde sinterlenen CAS seramiklerin mikroyapıları taramalı elektron mikroskobu ile incelenmiş ve XRD ile faz analizleri belirlenmiştir.

Anahtar kelimeler: CAS seramikler, alümina ve silika tuğla harcı, wollastonit

Abstract: In this study, using alümina-silica brick mortar and wollastonite were prepared CaO-Al_2O_3-SiO_2 (CAS) ternary equilibrium diagram has a low melting point composition wt.% 27.5 CaO, 15Al_2O_3 ve 57.5 SiO_2. To produce the CAS ceramic system for applications that require wear and corrosion resistance, homogenization process applied at 3 hour as a dry milled with 250 rpm. Samples are oven-dried and shaped into tablets by a hydraulic press than was sintered at 10 °C/min. heating rate at temperature in the range 1000°C-1200 °C between the range time 1 hour up to 5 hour. The starting powder is used and sintered CAS ceramics at different temperatures and times examined by scanning electron microscopy of the microstructure and phase analysis by XRD was determined.

Keywords: CAS ceramics, alumina and silica brick mortar, wollastonite

Giriş

Cam-seramikler camın kontrollü kristallendirilmesi ve çekirdeklendirilmesi yolu ile üretilen seramik malzemelerdir. Cam, kontrollü kristallenme yolu ile seramiğe dönüştürülür (Höland,2012). Kontrollü kristalleşme genellikle çekirdeklenme ve kristalleşme evresi olmak üzere 2 aşamayı içerir [Khater ve arkadaşları, 2012]. Cama ilave edilen metal veya oksitler çekirdekleşme oluşumunu sağlayarak camın kristalizasyonunda etkin rol oynamaktadır. En önemli çekirdekleyiciler TiO_2, Cr_2O_3, ZrO_2, ve P_2O_5 oksitleri ile platin grubu metalleri, diğer soy metaller ve floridlerdir. Oluşan bu çekirdekler etrafında kristal fazlar büyür; ince taneli, düzensiz dağılımlı kristallerle birlikte bir miktar kalıntı faz da içerebilen cam seramiklerin yapısı boşluk, gözenek ve mikro çatlak içermeyen bir karaktere sahip olur. Cam-seramiklerin içerdikleri kristallerin tane boyutlarının küçük olması (1mikron veya 1 mikrondan daha küçük) tokluk, darbe dayanımı, aşınma gibi mekanik özelliklerinin iyi olmasındaki önemli bir etkendir (Yıldız, 1995).

CaO-Al_2O_3-SiO_2 (CAS) seramik sistemleri temel silikat sistemlerinden birisidir ve bu sistemler endüstrinin birçok alanında yaygın olarak kullanılırlar (Duan ve arkadaşları, 1998). CAS sistemli seramikler doğal hammaddelerden üretilebildiği gibi atık hammaddelerden de üretilebilmektedir. Kömür yakma külü, çelik üretim cürufu, atık yakma tesisinden gelen uçucu kül ve filtre tozları ve farklı tipte cürufların yanısıra cam kırıkları veya bunların karışımı gibi çeşitli silikat bazlı atıklar kimyasal bileşim olarak SiO_2, Al_2O_3 ve CaO içermelerinden dolayı CAS esaslı cam-seramikler; başlangıç bileşimi ve ısıl işlem şartlarının kontrolü ile istenilen özelliklere sahip malzemeler olarak üretilebilmektedir (Raupp-Pereira ve arkadaşları, 2006). Bu düşük maliyetli, koyu renkli malzemeler (çünkü atıklar yüksek düzeyde geçiş elementleri içerir), genellikle, mukavemetli, sert ve kimyasal dayanıklıdır. Bunların kullanım amacı aşınma ve kimyasal maddelere dayanıklı

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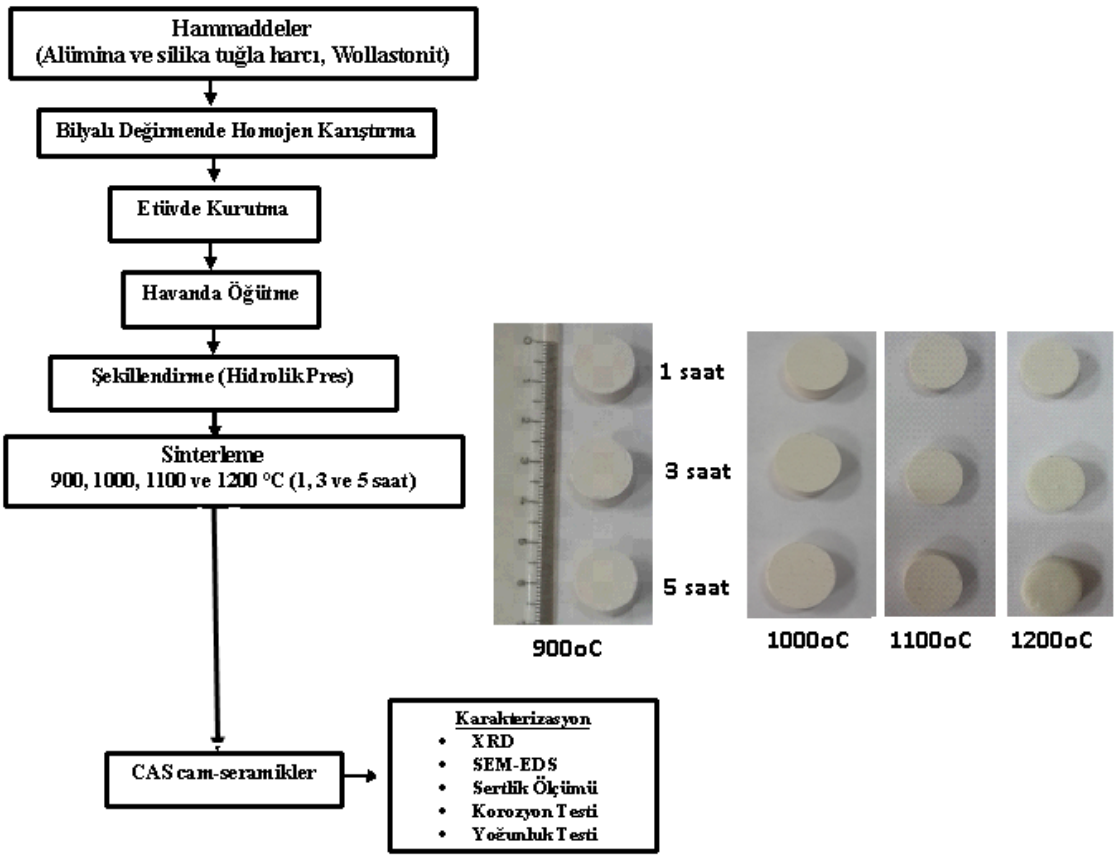
parçalar olarak ya da kimyasal, mekanik ve diğer ağır sanayi veya inşaat alanında yer ve duvar karosu olarak kullanılmasıdır (Zanotto, 2010).

CAS esaslı malzemeler; mükemmel aşınma direnci, kimyasal kararlılık, endüstriyel anlamda aşınma ve korozyon dayanımının gerekli olduğu alanlarda bulk ve kaplama malzemesi olarak kullanılabilirlik ve atık ve doğal hammadde kaynaklarından ekonomik olarak üretilebildiğinden talep edilen malzeme gruplarından birisidir. Optik ve mekanik özellikleri bakımından da tercih edilmektedirler. CAS cam seramikleri içerdikleri iğnemsi veya ağacımsı yapıda β-wollastonit fazı içerdiklerinden ilgi çekici malzeme olmuşlardır. Normal camların aksine içerdikleri bu düşük termal genleşme katsayısına sahip β-wollastonit fazı ile beraber camsı faz içermelerinden dolayı kompozit bir malzemedirler ve β-wollastonit fazının camsı faz ile termal uyumsuzluğu nedeni ile termal mukavemeti düşük olabilir (Xie ve arkadaşları, 2010). CAS sistemi cam-seramikleri yüksek sertlik, çizilme dayanımı ve kimyasal dayanıklılığının yanında düşük hammadde maliyetleri nedeni ile inşaat alanında yer ve duvar kaplama malzemesi olarak iyi bir adaydır (Banijamali ve arkadaşları, 2007). CAS cam-seramikler yüksek mukavemet ve iyi bir tokluğa sahip olduğu için ısıl işlem prosesinin kontrolü cam seramiklerin yapısını ve fonksiyonunu önemli ölçüde etkiler (Fanderlik, 1991).

Mevcut çalışmada; silika, alümina ve CaO kaynağı olarak alümina ve silika esaslı tuğla harcı ve wollastonit kullanılarak CaO-Al_2O_3-SiO_2 (CAS) üçlü denge diyagramına göre düşük ergime sıcaklığına sahip ağ. % 27.5 CaO, %15 Al_2O_3 ve %57.5 SiO_2 içeren CAS bileşimi hazırlanmıştır. Farklı sıcaklık ve sürelerde sinterlenmiş numunelerin faz analizleri, mikroyapısal incelemeleri gerçekleştirilmiştir.

Deneysel Çalışmalar



Şekil 1. CAS üretim akım şeması ve ısıl işlem sonrası elde edilen makro görüntüler

Tablo 1. Kullanılan Hammaddelerin Kimyasal analizleri

Hammaddeler (ağ.%)	SiO_2	Al_2O_3	Fe_2O_3	CaO	TiO_2
Silika Tuğla Harcı	94-96	1-1.5	0.8-1.5	-	-
Şamot Tuğla Harcı	38-42	30-55	2-2.5	1-1.5	2.9-3.5
Wollastonit	52	-	-	48	-

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Mevcut çalışmada; başlangıç hammaddeleri olarak silika, alümina ve CaO kaynağı olarak alümina ve silika esaslı tuğla harcı ve wollastonit tozları kullanılarak CAS üçlü denge diyagramına göre düşük ergime sıcaklığına sahip ağ. % 27.5 CaO, 15Al_2O_3 ve 57.5 SiO_2 içeren CAS bileşimi hazırlanmıştır. Tablo 1 de kullanılan hammaddelerin kimyasal analizleri verilmiştir. Başlangıç malzemeleri belirlenen CAS bileşimini sağlamak üzere tartılmış, yaş olarak saf su ile bilyalı değirmende homojen karışımı sağlanmış, sonrasında presleme yöntemi ile paslanmaz çelik kalıp yardımı ile şekillendirilmiştir. Presle şekillendirilen numuneler 900°C-1200°C sıcaklık aralıklarında 1, 3 ve 5 saat sürelerde sinterlenmiştir. Şekil 1'de Üretim akım şeması üretilen ve üretilen CAS tabletlerin makro görüntüleri verilmiştir. Sinterleme sonrası numunelerin mikroyapısal incelemeleri JEOL 6060 LV marka taramalı elektron mikroskobu ile faz analizleri ise Rigaku DMAX /2200 marka X-ray difraktometresinde CuKα ışınımı kullanılarak gerçekleştirilmiştir

CAS kodlu bileşimlerden hazırlanan numunelerin yoğunluk değerleri Arşimet yöntemi kullanılarak ASTM (c693-93) standardına göre eşitlik 1 yardımıyla hesaplanmıştır. Korozyon dayanımı için başlangıç ağırlıkları tartıldıktan sonra hacimce %10'luk NaOH çözeltisinde 100˚C'de 2 saat süre ile bekletilen numuneler 2 saat süre sonunda oda sıcaklığına kadar soğutulduktan sonra saf su içerisinde yıkanıp ardından etüvde 80˚C'de kurutulduktan sonra ağırlıkları tartılmıştır. Korozyon dayanımı, ağırlıktaki toplam değişim hesaplanarak belirlenmiş olup; bunun için ağırlık kaybı başlangıç ağırlığına oranlanarak ağırlıktaki toplam değişim % cinsinden eşitlik 2 yardımı ile hesaplanmıştır.

$$\rho = \frac{W_a}{W_c - W_b} d_S \qquad (1)$$

$$L = \frac{W_0 - W_S}{W_0} \times 100 \qquad (2)$$

ρ= numunenin yoğunluğu (g/cm^3),
w_a= numunenin kuru ağırlığı (g),
w_b= sıvı içinde numunenin asılı haldeki ağırlığı (g),
w_c= sıvı emdirilmiş numune ağırlığı (g) ve
d_s= sıvı yoğunluğu (g/cm^3)

L= ağırlıktaki toplam değişim (%)
W_0= numunenin başlangıç ağırlığı (g),
W_s= numunenin korozyon sonrası ağırlığı

CAS kodlu 1200˚C sıcaklıkta 5 saat sinterlenen numunelerin mikrosertlik değerleri; Leica marka mikrosertlik cihazı ile 100 gr yük altında 30 sn. bekleme süresi ile alınan 5 ölçümün ortalaması hesaplanarak Vickers (HV) sertlik değerleri tespit edilmiştir. Mikrosertlik testi öncesi numuneler metalografik yüzey hazırlama işlem kademelerine tabi tutulmuştur. 60-1200'lük SiC zımpara kağıdı kullanılarak yüzeyler düzgün hale getirildikten sonra alümina pasta yardımıyla parlatılıp HF ile dağlanmıştır.

Deneysel Sonuçlar

Mikroyapı Analizi

Şekil 2.'te CAS kodlu tozların 1000˚C, 1100°C ve 1200 ˚C'lerde 1 ve 5 saat sinterlenmesi sonrası kırık yüzey mikroyapı görüntüleri verilmiştir. Mikroyapı görüntülerinden 1000˚C ve 1100˚C'lerde CAS kodlu tozlar arasında yeterli bağlanmanın olmadığı dolayısı ile sinterlenme sıcaklık ve süresinin yeterli olmadığı, 1200˚C'lerde ise sinterleme sıcaklığının yeterli olduğu ve 5 saatlik sinterleme süresinde (Şekil 2.(f)) camsı yapının hemen hemen tüm yapıya hakim olduğu gözlenmiştir.

Presle şekillendirilmiş CAS tabletlerin 1200 ˚C'de 3 saat ve 5 saat sinterlenmesi sonucu elde edilen numunelerin SEM görüntüsü ve EDS analizi Şekil 3.'de görülmektedir. 1200 ˚C'de 3 saat sinterlenmiş numunelerin EDS tablosu incelendiğinde, Al_2O_3 bakımından en zengin bölgenin 1 kodlu bölge, SiO_2 bakımından en zengin bölgenin 5 kodlu bölge ve CaO bakımından en zengin bölgenin 2 kodlu bölge olduğu EDS tablosundan görülmektedir. Ayrıca CAS bileşimini oluşturan ana bileşenlerin tamamının tüm bölgelerde mevcut olduğu belirtilebilir. Özellikle 2 nolu bölge wollastonit fazını, 5 nolu CAS bileşenlerini içeren camsı matriks görünümündeki bölgenin anortit faz bileşenlerine sahip olduğu, 1 kodlu bölgedeki yüksek Al_2O_3 miktarı ise ısıl işlem işlemi esnasında CAS kodlu numunenin alümina altlık üzerine serpilen alümina tozu ile reaksiyonundan kaynaklandığı düşünülmektedir. 1200 ˚C'de 5 saat sinterlenen numunenin SEM görüntüsü Şekil 3.(b)'de, EDS analizi Şekil 3.(d)'de görülmektedir. EDS tablosu incelendiğinde, 1 kodlu bölgenin CaO ve SiO_2 açısından en zengin olduğu, 4 kodlu bölgenin Al_2O_3 miktarı en zengin bölge olduğu görülmektedir. 1 kodlu bölgenin wollastonit faz bölgesi ve 4 kodlu bölgenin anortit faz bölgesi olduğu belirtilebilir.

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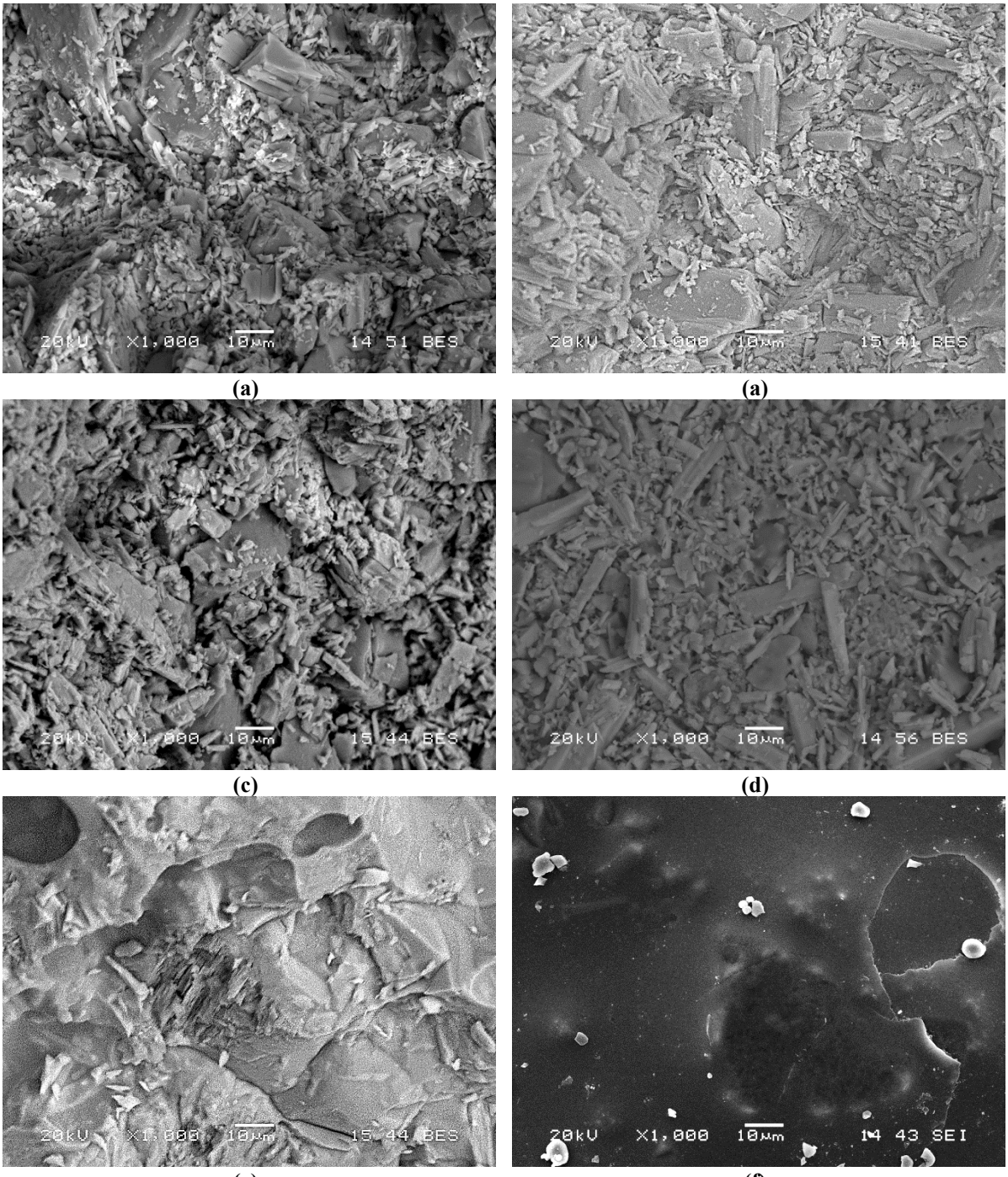

Şekil 3. (a),(b) 1000°C, (c),(d) 1100°C ve (e),(f) 1200°C'de 1 ve 5 h süre ile sinterlenen CAS seramiklerin mikroyapıları

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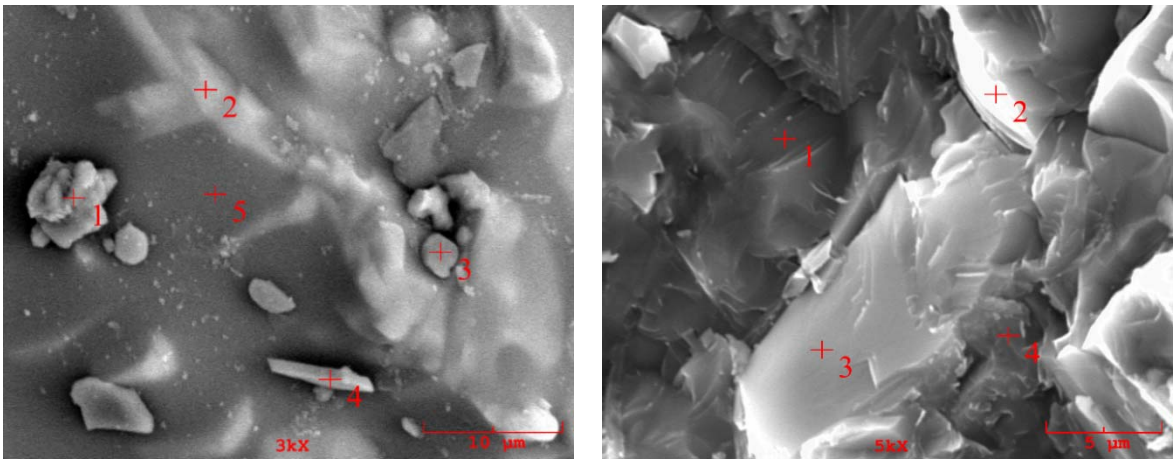


(a) **(b)**

Elementler	Miktar (%)				
	1	2	3	4	5
O	41.260	44.180	44.648	38.758	31.976
Al	56.409	0.894	29.199	41.829	10.292
Si	1.591	28.530	14.642	13.840	42.458
Ca	0.740	26.395	11.510	5.572	15.274

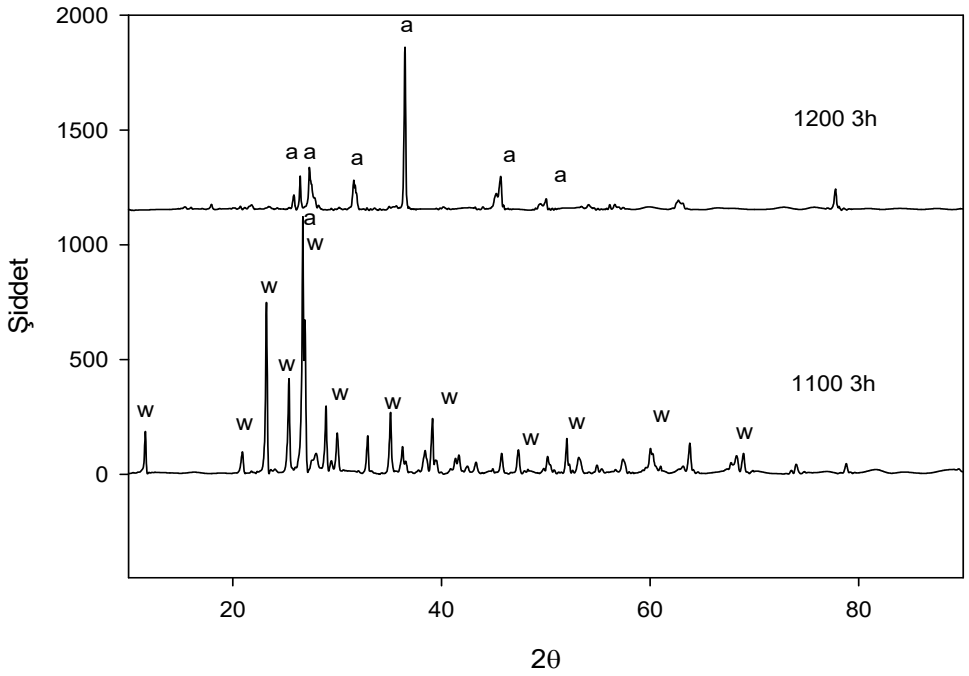
(c)

Elementler	Miktar (%)			
	1	2	3	4
O	19.171	33.750	39.519	31.918
Al	0.468	0.021	1.535	6.442
Si	12.275	0.690	7.947	4.478
Ca	40.909	29.866	32.964	35.219

(d)

Şekil 3. (a),(c) 1200°C'de 3 saat ve (b),(d). 1200°C'de 5 saat sinterlenen CAS numunelerin SEM-EDS analizi

Faz Analizi



Şekil 4. 1100°C ve 1200°C'lerde 3 saat sinterlenen CAS numunelerin XRD analizi (a: anortit, w: Wollastonit)

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Şekil 4'te 1100°C ve 1200°C'lerde 3 saat sinterlenmiş CAS bileşimine sahip numunenin XRD analizleri verilmiştir. Yapılan faz analizinde anortit ve wollastonit ($CaSiO_3$) fazları tespit edilmiş olup; sıcaklık 1200°C'lere yükseldiğinde yapıda anortit ($CaAl_2Si_2O_8$) faz yapısının hakim olduğu görülmektedir. CAS esaslı camlar [SiO_4] ve [AlO_4]Ca[AlO_4] yapısından oluşur. CAS camları çekirdeklenme sıcaklığına ısıtıldığında serbest Ca^{+2} iyonları [SiO_4] birimi ile ilk cam-seramik oluşumunu wollastonit fazını olarak gerçekleştirmek için birleşme eğilimi gösterir. Kristalizasyon sırasında [AlO_4]Ca[AlO_4] birimleri yeniden düzenlenip [SiO_4] yapısı ile birleşerek CAS sisteminde anortit fazını oluşturur (Luan ve arkadaşları, 2010).

Korozyon, yoğunluk ve sertlik

CAS kodlu 1100˚C ve 1200˚C'lerde 1, 3 ve 5 saat sürelerde sinterlenen numunelerin hacimce %10 NaOH çözeltisi içerisinde 100˚C'de 2 saat süre ile gerçekleştirilen korozyon testi sonrası ağırlık değişimi değerleri ve yoğunluk testi sonuçları Tablo 2'de verilmiştir. Tablodan görüldüğü üzere CAS kodlu 1100°C 1 saat sinterlenen numunelerde en yüksek ağırlık kaybı % 6.80 iken, aynı sıcaklıkta süre arttıkça numunede ağırlık artışı tespit edilmiş olup; bu durum bazik çözelti ile numunelerin reaksiyon ürünü oluşturmasından kaynaklanabileceği ile açıklanabilir. Sıcaklık değeri 1200°C'lere çıkarıldığında ağırlık kaybının çok düşük olduğu tespit edilmiştir.

Tablo 2. CAS kodlu numunelerin korozyon, yoğunluk ve sertlik testi sonuçları (NaOH çözeltisi)

Isıl İşlem Şartları		Ağırlık Kaybı (%)	Yoğunluk (gr/cm^3)	Sertlik (Hv)
1100 ˚C	1 saat	6.80	1.96	-
	3 saat	-1.30	1.97	-
	5 saat	-2.40	2.17	-
1200˚C	1 saat	-1.16	2.21	-
	3 saat	0.16	2.22	-
	5 saat	0.15	2.33	815

Zafer Yavuz Merkit (2016), yaptığı yüksek lisans tez çalışmasında hammadde olarak pomza, mermer tozu ve Al_2O_3 tozlarını kullanarak hazırlamış olduğu CAS kodlu numunelere hacimce %10 luk NaOH çözeltisinde korozyon testini uygulamış ve 100°C'de 2 saat süre sonunda numunelerde ağırlık kayıplarının olmadığını tespit etmiştir.

Ren ve arkadaşları CAS esaslı seramikleri CaO Al_2O_3 ve SiO_2 başlangıç hammaddelerinden üretmişlerdir. CAS esaslı bileşimler alümina pota içerisinde 1550°C'de 5 saat ergitildikten sonra ön ısıtılmış 500°C'deki paslanmaz çelik kalıba dökülmüş ardından ön ısıtılmış 650°C deki fırında tavlanmıştır. Isıl işlem şartları 5°C/dk ısıtma hızı ile 700°C'de 2 saat çekirdeklenme ve 910°C'de 3 saat çekirdeklerin büyümesi için olarak belirlemişlerdir. Hazırlamış oldukları CAS esaslı numunelerde sertlik değeri 790 Hv olarak bulunmuştur. Araştırmacılar CAS bileşimine Fe_2O_3'in ağ. % 0-10 katkısını inceledikleri çalışmalarında Fe_2O_3 miktarı %6 oranına kadar sertlik değerini arttırdığını bu değerin üstüne çıkıldığında ise sertlik değerinin 700 Hv'nin altına düştüğünü tespit etmişlerdir (Ren ve arkadaşları, 2015). Mevcut çalışmada ise sertlik değeri en yüksek sinterleme sıcaklık ve süresinde ortalama 815 Hv olarak tespit edilmiştir (Tablo 2). Guo ve ark. kömür gangı (silika ve alümina kaynağı) ve CaO hammaddelerini kullanarak CAS cam-seramikleri üretmek için alümina pota içerisinde 1400°C'de 2 saat ergitme işlemi ardından suya döküm kurutma ve kırma-eleme işlem kademelerini izlemişlerdir. CAS cam-seramiklerin ağ. % 1 HCl ve NaOH çözeltilerinde oda sıcaklığında 28 gün süren ağırlık kaybı değerleri sırasıyla 1.36 ve 0.88 olarak tespit edilmiştir (Yang ve arkadaşları, 2012). S. Banijamali ve ark. ticari saflıkta $CaCO_3$, korundum, SiO_2, TiO_2, CaF_2 ve ZrO_2 hammaddelerini kullanarak homojen karışımlarını sağladıktan sonra zirkon pota içerisinde 1450°C'de 1 saat ergitmişler ve suya döküm yapmışlardır. 850-1200°C'lerde sinterlemiş oldukları CAS numunelerini H_2SO_4 asidik çözeltisinde 1 saat kaynatarak kimyasal dayanımlarını tespit etmişlerdir. Ağırlık kaybını % 1.8-2.28 aralığında bulmuşlardır. Sertlik ölçümünde 100 g yük 30 s bekleme süresi kullanılmış olup, 10 ölçümüm ortalaması alınarak bileşime göre değişen 540-613 Hv sertlik değerlerine ulaşmışlardır (Banijamali ve arkadaşları, 2009).

Genel Sonuçlar

CAS esaslı seramik malzemeler üstün aşınma ve korozyon dayanımı özellikleri yanında radyoaktif kalkanlama malzemesi olarak da önem arz eden malzeme gruplarından birisidir. Mevcut çalışmada wollastonit, alümina ve

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silika tuğla harcı başlangıç malzemeleri kullanılarak düşük üretim sıcaklıklarına sahip CAS bileşimi hazırlanmış olup; üretilen CAS seramiklerin mikroyapısal özellikleri, faz yapısı, NaOH çözeltisi içerisindeki korozyon dayanımı, farklı sıcaklık ve sürelerdeki sinterleme şartlarındaki yoğunluk değişimi değerleri hesaplanmıştır. Ayrıca 1200˚C'de 5 saatte en yüksek sinterleme sıcaklık ve süresinde sertlik ölçümü yapılarak ortalama 815 Hv sertlik değerine ulaşılmıştır.

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YAPAY SİNİR AĞLARI İLE KISA DÖNEM YÜK TAHMİNİ

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Özet: Günümüzde tüketicilere ekonomik, güvenilir ve kaliteli güç dağıtımı önemli bir konu haline gelmiştir. Bunu gerçekleştirmek için iyi planlama gereklidir. Planlamanın iyi olması da yük tahminine bağlıdır. Yük tahmini piyasa fiyatlarının oluşmasında da oldukça önem arz eder. Bu çalışmada Batı Karadeniz bölgesinin kısa dönemli yük tahmini Yapay Sinir Ağları (YSA) yöntemi ile gerçekleştirilmiştir. Çalışmada uzaktan okuma ile elde edilen saatlik veriler ve sıcaklık değerleri girdi olarak alınarak saatlik yük tahmini yapılmıştır.

Anahtar Kelimeler: Kısa Dönem Yük Tahmini, YSA, Güç Sistemleri

Giriş

Güç sisteminin planlanması ve işletilmesindeki en önemli sorunlardan biride yük tahmini yapmaktır. Yük tahmini; planlama, güç sistemlerinin güvenirliği ile yakından ilgilidir. Ayrıca doğru tahmin edilen yükler elektrik piyasasında fiyat tahmini içinde gereklidir. Sorun sadece sistem işletmecileri için değil aynı zamanda piyasa işletmecileri için ve iletim şebeke sahipleri veya piyasa işletmecisi için de önem arz etmektedir(Song et. Al, 2005; Chen & Singh2001). İlaveten yük tahminini etkileyen çeşitli sosyo politik ve çevresel faktörler de vardır. İlaveten sistemde yüklerin lineer olmayan ve rastlantısal davranışları vardır. Bu faktörlerden dolayı konu anlaşılması ve uğraşılması zor konu haline gelmektedir(Song et. al, 2005; IEEE Power System Eng. Com., 1980).

Kısa dönem yük tahmini ile saatlik veya günlük yük tahmini yapılmaya çalışılır. Bu tahminlerle santraller arasında yük paylaşımı ve santrallerin devreye girip çıkma zamanları belirlenmiş olur(Azadeh et. al, 2009, March). Yük tahminleri kısa dönemli olduğu gibi uzun dönemli tahminler de olabilir(Campbell & Adamson 2006, September). Literatür araştırıldığında çeşitli yük tahmin metotları geliştirilmiştir. Benzer gün yaklaşımı ile iki veya üç yıl içerisindeki tarihsel verilerin kullanılarak benzer günlerin, tarihsel ve çevre şartları da göz önüne alınarak elde edilen tahminlerdir(Feinberg & Genethliou, 2005). Yaygın kullanılan yöntemlerden birisi de uydurma yöntemleridir. Bu yöntemler hava, gün tipi, tüketici profili gibi faktörleri de modelleyerek tahmin yapar. Bir çok alanda kullanıldığı gibi zaman serileri ile de yük tahmini çok sık kullanılan yöntem olarak karşımıza çıkmaktadır. Sosyal alandan ekonomiye, istatistikten teknik alana kadar bir çok alanda kullanıldığı gibi zaman serileri ile de yük tahmininde çok sık kullanılan yöntem olarak karşımıza çıkmaktadır. Yapay sinir ağlarının yanında bulanık mantık yöntemi de yük tahminlerinde kullanılan yöntemlerden bir olarak görülmektedir. Bilgisayar teknolojisinin gelişimine bağlı olarak son yıllarda çok sık kullanılan uzman sistemlerde yük tahmin modellemesinde kullanılmaya başlanmıştır(Feinberg & Genethliou 2005; Engle et. al, 1992; Yang et. al, 1995, May; Bakirtzis et. al, 1996).

Yük profilleri ve yük tahminleri konusunda dünyanın gelişmiş ülkelerinde çeşitli çalışmalar yapılmıştır. İngiltere'de yapılan çalışmada Runming Yao ve arkadaşı bir evin günlük elektrik tüketim profilini çıkarmıştır(Yao & Steemers, 2005). Yük profilleri üzerine yapılan bir çalışmada ise Norveçde toplam elektriğin %40 ını tüketen konutlar için müşteriler sınıflandırılmıştır ve profilleri elde edilmiştir(Andrei et. al, 2015). Yapılan bir başka çalışma ile de iç enerji tüketimi YSA yöntemiyle yük tahmini yapılmaya çalışılmıştır(Songpu et.al., 2015, May). Diğer önemli ve ilk çalışmalardan bir tanesi uzman sistemler kullanılarak kısa dönem olarak yirmi dört saatlik yük tahmini yapılmıştır(Rahman & Bhatnagar, 1988). Diğer bir çalışmanın konusu ise yük tahmini yanında müşterilerin profilleri belirlenerek yük tahmini yapılmıştır(Felea et. al, 2012). Farklı bir çalışmada ise ticari binaların elektrik tüketim tahminleri yapılmıştır(Frank & Sen 2011, August).

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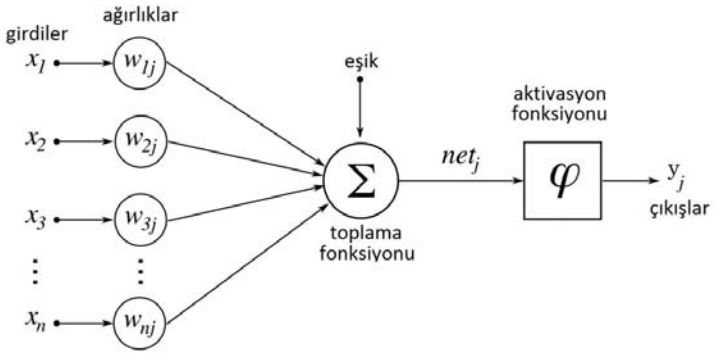
Yapay Sinir Ağları

YSA insanın biyolojik sinir ağlarından ilham alarak ortaya çıkarılan ve sinir ağlarına benzer bazı özellikleri içeren bilgi işleme sistemidir(Fausett, 1994). Basit şekilde insan beyninin taklit yapan YSA ile; öğrenme, optimizasyon, analiz, sınıflandırma, genelleme gibi konulara başarılı bir şekilde uygulanabilmektedir(Öztemel, 2003). YSA'nın kullanıldığı önemli alanlardan biri de ileri yönelik tahminlerdir. YSA'nın çalışmasına teşkil eden en küçük birimler yapay sinir hücresi olarak isimlendirilirler. Şekil 1'de görüleceğe üzere bir yapay sinir hücresi beş katmandan oluşmaktadır.



Şekil 1. Yapay Sinir Hücresi

Bu katmanlar incelenirse, girdiler; dış ortamdan veya diğer hücrelerden yapay sinir hücresine giren bilgilerdir. Ağırlıklar; yapay sinir hücresine gelen bilgiler çekirdeğe ulaşmadan önce bir ağırlık katsayısı ile çarpılarak çekirdeğe iletilir. Böylece girdinin etkisi arttırılıp azaltılabilir. Ağırlıklarla çarpılarak gelen girdiler toplama fonksiyonu vasıtasıyla toplanır. Toplam fonksiyonu eşitlik 1'de verildiği gibidir.

$$Net = \sum_{j=1}^{n} x_j * w_j + b \quad (1)$$

Burada, Net YSA'ya giren değişkenlerin ağırlıklar ile çarpılması sonucu oluşan toplamı, x algoritmaya giren değişkenleri, w değişkenler üzerine etki eden ağırlıkları, b ise eşik değerini ifade etmektedir. Aktivasyon fonksiyonunda hücreye gelen net bilgi işlenerek, bu girdiye karşılık hesaplanıp üretilen çıktıdır. Aktivasyon fonksiyonu olarak genellikle doğrusal olmayan fonksiyon seçilir. Bunun nedeni YSA'nın doğrusal olmayan özelliğinden gelmektedir ve bu durum kolayca türevinin alınması için gereklidir(KAYNAR & TAŞTAN, 2009). Aktivasyon fonksiyonu ile toplamadan gelen bilgiler çıktıya dönüştürülür. Aktivasyon fonksiyonu ile girdi ve çıktı bilgileri arasındaki eşleşme sağlanır. Aktivasyon fonksiyonunun doğru seçilmesi ağın performansını etkileyecek niteliktedir(Hwang & Ding, 1997). Çeşitli aktivasyon fonksiyonları vardır, ancak bu çalışmada aktivasyon fonksiyonu olarak eşitlik 2'de verilen sigmoid fonksiyon seçilmiştir. İfadede geçen y ise çıkışı ifade etmektedir.

$$y = \frac{1}{1-e^{-Net}} \quad (2)$$

YSA'nın önemli bir parçası da ağ yapılarıdır. Ağ yapıları çeşitli özellikte olabilmekte ve giriş çıkış katmanları arasında birden fazla katman olabilir. Ara katmanlar gizli katmanlar olarak da ifade edilmektedir. Bu katmalar ile karmaşık işlemleri hesaplamak daha da kolaylaşır(ELMAS, 2003). YSA temel olarak eğitim ve test şeklinde iki aşamada çalışmaktadır. Eğitim aşaması ile ağırlıklara göre çıktılar hesaplanır. Test aşaması ile de YSA'nın bilgi sahibi olmadığı veriler ile sistem test edilir. Yapılan çalışma için tasarlanan YSA yapısı ve elemanları Şekil 2'de verilmektedir.

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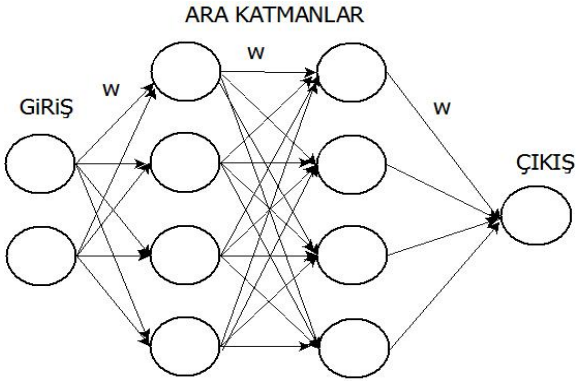

Şekil 2. Tasarlanan 2-4-4-1 YSA ağ yapısı

Bu ağ yapısında dışarıdan gelen bilgiler girdi katmanı üzerinden algoritmaya girerler. Ara katman veya gizli katmanlar üzerinden ağırlıklarında etkisi ile çıkış katmanına iletilirler. Bu girdi ve çıktı arasındaki ilişki ile ağın öğrenmesi sağlanır. Yapılan bu çalışmada İleri Beslemeli Geri Yayılım (Feed Forward Back Propagation Neural Network Architecture) YSA algoritmasıyla öğrenme sağlanmıştır. İleri doğru hesaplama işleminde ağa giren bilgiler ağırlık matrisleriyle işleme girerek çıktı değeri hesaplanır. Sonra ağın ürettiği çıktı değeri ile gerçek değer arasındaki hata minimize edilerek geriye doğru ağırlık katsayıları yeniden düzenlenir. Bu işlem ağın istenen çıktı değerini üretmesine kadar devam eder(KALENDER & HAMZAÇEBİ, 2014). Geriye yayılma algoritması, gerçek çıktı t ile istenen çıktı y arasındaki karesel hatayı minimum yapmak için gradyen azalma algoritmasını (gradyen descent algorithm) kullanır ve hata hesaplanır(Kalogirou, 2001; Kalogirou, 1999). Yapılan çalışmada hata fonksiyonun minimize edildiği fonksiyon eşitlik 3'te verilmiştir.

$$E = \frac{1}{2}\sum_{k=1}^{n}(y_k - t_k)^2 \quad (3)$$

Eşitlikte E hata fonksiyonunu, y_k ağın ürettiği çıktıyı, t_k ise gerçek değeri göstermektedir. YSA giren verilerin girdi olmadan önce belli işlemlere tabi tutulması gerekmektedir. Bu işlem normalizasyon olarak ifade edilir ve veriler 0 ile 1 arasında bir değere taşınır. Bu şekilde işlemlerin hızlandırılması sağlanmış olur. Bu çalışmada eşitlik 4'de verilen min-max normalizasyonu kullanılmaktadır(Jayalakshmi & Santhakumaran, 2011).

$$x' = \frac{x_i - x_{min}}{x_{max} - x_{min}} \quad (4)$$

Bu eşitlikte; x' normalleşmiş veriyi, x_i normalleşecek olan girdi değerini, x_{min} girdi değerleri içindeki en küçük değeri, x_{max} girdi verileri içindeki en büyük sayıyı temsil etmektedir.

Yapılan bu çalışmada tahmin sonuçlarını karşılaştırmak amacıyla peformans ölçümü olarak eşitlik 5'de verilen ortalama mutlak yüzde hata (Mean Absulate Percentage Error, MAPE) eşitliği kullanılmıştır. Eşitlikte verilen n sayısı veri sayısını ifade etmektedir.

$$MAPE = \left(\frac{1}{n}\sum\frac{gerçek - tahmin}{gerçek}\right) * 100 \quad (5)$$

Uygulama

Bu çalışmada Batı Karadeniz Bölgesinde (SEDAŞ bölgesi) Otomatik Sayaç Okuma Sistemi (OSOS) ile konut ve ticarethanelerde okunan sayaçlar baz alınarak yapılmıştır. Şekil 3'de verildiği şekilde Sedaş dağıtım bölgesi olan İzmit, Sakarya, Düzce ve Bolu illerinde elektrik enerjisi tüketimi uzaktan sayaç okuması gerçekleştirilmiştir. Bu sistemle, elektrik sayaçları kablosuz (GPRS) erişimle uzaktan okunarak ve verilerin bir merkezde toplanması sağlanmıştır.

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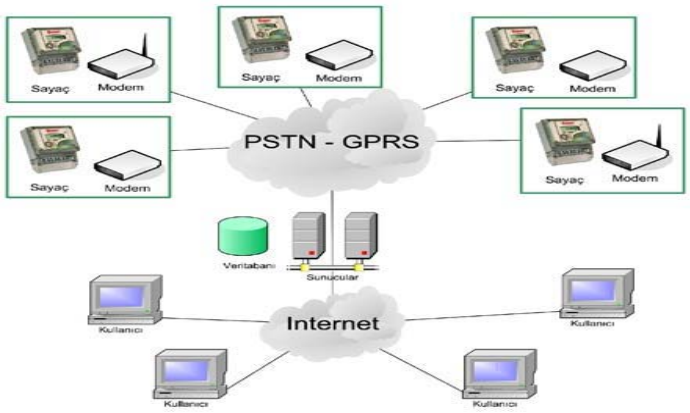

Şekil 3. Otomatik Sayaç Okuma Sistemi(http://www.beyaz.net /otomasyon)

Yapılan çalışma ile Tablo 1'deki kıstaslara göre örnek konut ve ticarethane aboneleri belirlenerek buralara saatlik okunabilen sayaçlar bağlanmıştır. Sayaç sayıları tabloda verildiği şekilde, şehir nüfusu, yerleşim yeri, kullanılan sayaç türü ve aylık enerji tüketim miktarları gibi kısıtlar alınarak belirlenmiştir. Tablo 1'de görüldüğü gibi tüketim miktarı üç grupta toplanmıştır. Aylık Tüketim miktarı 150 kWh'a kadar olan tüketiciler düşük gruptakiler olarak alınmıştır ve 150 sayısı ile kodlanmışlardır. Aylık Tüketim miktarı 151-250 kWh arasında olan tüketiciler normal gruptakiler olarak tanımlanmıştır ve 250 sayısı ile kodlanmışlardır. Aylık Tüketim miktarı 250 kWh'ten fazla olan tüketiciler ise yüksek gruptakiler olarak tanımlanmıştır ve 251 sayısı ile kodlanmışlardır.

Tablo 1. Aylık tüketim miktarına göre grupların oluşturulması

Tüketim Grubu	Gündüz Tük.	Puant Tük.	Gece Tük.
0-150	Düşük	Düşük	Düşük
151-250	Normal	Normal	Normal
251 ve üstü	Yüksek	Yüksek	Yüksek

Bu çalışmada OSOS kapsamında okunmuş verileri olan Ekim ayı incelemeye tabi tutulmuştur. İlk üç hafta saatlik okunan değerler eğitilmişlerdir. Bu değerler normalleştirme işlemine tabi tutulduktan sonra YSA'ya veri olarak girilmişlerdir. Veriler eğitilme işleminden sonra test aşamasına geçilmiştir. Eğitme işlemi Ekim ayı için haftanın her günü için ayrı ayrı gerçekleştirilmiştir. Tablo 2'de sadece Ekim ayı Salı günlerine ait veriler ve eğitime tabi tutulduktan sonra elde edilen tahminler verilmiştir. Ortalama hata değerini ifade eden MAPE (mean absolute percentage error) değeri %4,31 olarak görülmektedir. Bu değer ağın başarı ile eğitildiğini ifade etmektedir.

Tablo 2. 2015 Ekim ayı Salı günlerine ait eğitime tabi tutulan veri seti (kWh)

Tarih	Saat	Sıcaklık	Ölçülen enerji tük.	YSA eğitilen	%MAPE
6 Ekim	00	14,4	124,6630	129,1397	3,591016
	01	15,2	95,4070	105,45	10,52646
	02	16,2	83,0600	83,68703	0,754909
	03	15,8	73,5490	73,58599	0,050298
	04	16,6	70,5540	66,7189	5,435695
	05	17,4	67,5040	65,161	3,470905
	06	17,6	70,6230	67,02853	5,089655
	07	18,6	84,7140	82,64882	3,591016
-	-	-	-	-	-
13 Ekim	08	19,2	115,5870	112,6596	2,532678
	09	20	132,4360	129,5167	2,204325
	10	20,2	163,2940	159,51	2,31728
	11	20,2	174,2290	163,9177	5,91824
	12	19,6	174,1280	187,9649	7,946415
	13	19	172,4990	184,1147	6,733786

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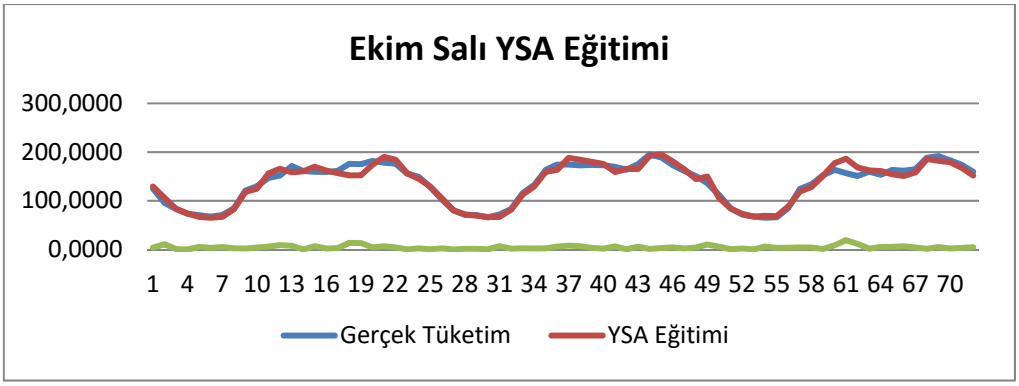
	14	18,6	173,6750	179,7122	3,476159
	15	18,8	172,9100	175,7294	1,630587
-	-	-	-	-	-
20 Ekim	16	18,6	163,4290	154,4188	5,513218
	17	18	161,6860	150,9221	6,657288
	18	16,4	164,5860	158,1305	3,922266
	19	15,4	188,5120	185,8284	1,423568
	20	14,8	191,8540	182,1758	5,044577
	21	14,2	183,0960	179,0437	2,213183
	22	14	173,8280	167,7568	3,492669
	23	15	159,5380	152,0845	4,671896
Toplam MAPE					4,316987

YSA algoritmasının eğitimi sonucunda elde edilen eğitim değerleri ile gerçek değerlerin grafiği şekil 4'de verilmiştir. Burada elde edilen eğri sadece Ekim ayına ait Salı günlerinin eğitimi sonucunda elde edilmiştir. Aynı zamanda ortalama hata değerlerini ifade eden MAPE değerleri de grafik üzerinde gösterilmiştir.



Şekil 4. 2015 Ekim ayı Salı günlerine ait eğitime tabi tutulan değerler ve MAPE değerleri

Bu eğitilme işlemi Ekim ayına yönelik her gün için ayrı ayrı gerçekleştirilmiştir. YSA'da eğitilen üç haftalık değerler belirlendikten sonra son haftaya ait günler teste tabi tutulmuştur. Test işlemi sonucunda gerçek tüketilen değerler ve YSA ile tahmin edilen değerler karşılaştırmalı olarak Tablo 3'de verilmiştir.

Tablo 3. 2015 Ekim ayı üçüncü haftaya yönelik gerçek ve YSA ile tahmin edilen enerji tüketim değerleri

	Pazartesi		Salı		Çarşamba		Perşembe		Cuma		Cumartesi		Pazar	
Saat	Tük.	YSA	Tük.	YSA	Tük.	YSA	Tük.	YSA	Tük.	YSA	Tük.	YSA	Tük.	YSA
00	145,16	166,37	143,62	153,66	148,74	149,15	126,94	128,24	144,98	150,53	142,60	144,71	159,77	145,82
01	111,43	123,85	102,63	123,20	111,39	123,64	105,84	101,90	103,57	118,16	122,03	120,74	123,27	128,36
02	89,99	92,11	88,92	99,54	84,83	101,24	82,09	83,35	85,97	87,44	91,97	95,74	99,22	101,20
03	75,83	77,83	79,59	83,72	76,97	92,57	77,24	74,40	79,34	79,86	76,60	79,86	79,25	78,96
04	68,32	71,20	76,62	77,25	71,60	78,13	71,46	71,50	73,40	77,52	72,37	73,49	69,62	70,66
05	69,55	71,68	74,63	76,39	70,19	71,82	71,06	71,01	72,94	77,27	73,73	71,59	67,54	69,86
06	67,90	75,43	80,63	78,60	70,44	73,12	71,39	73,88	72,82	78,89	70,26	72,26	65,48	71,70
07	84,68	92,11	94,70	96,99	89,10	87,73	82,86	89,37	88,55	85,61	78,66	82,44	72,10	76,43
08	124,58	120,16	132,34	137,39	125,76	118,79	120,60	115,76	129,81	102,73	93,68	104,28	85,21	85,28
09	144,38	149,22	144,75	161,90	151,39	151,79	137,92	124,22	134,42	144,72	129,37	131,59	105,57	104,60
10	186,15	173,80	168,97	173,39	164,84	169,06	158,67	132,98	162,05	166,87	165,43	157,24	138,14	124,52
11	193,33	197,66	184,38	185,87	175,28	182,44	164,63	151,67	168,68	164,44	180,49	180,34	150,95	141,65
12	199,87	189,61	202,56	196,38	191,28	180,00	170,27	163,65	178,68	198,66	193,20	195,54	176,48	154,74

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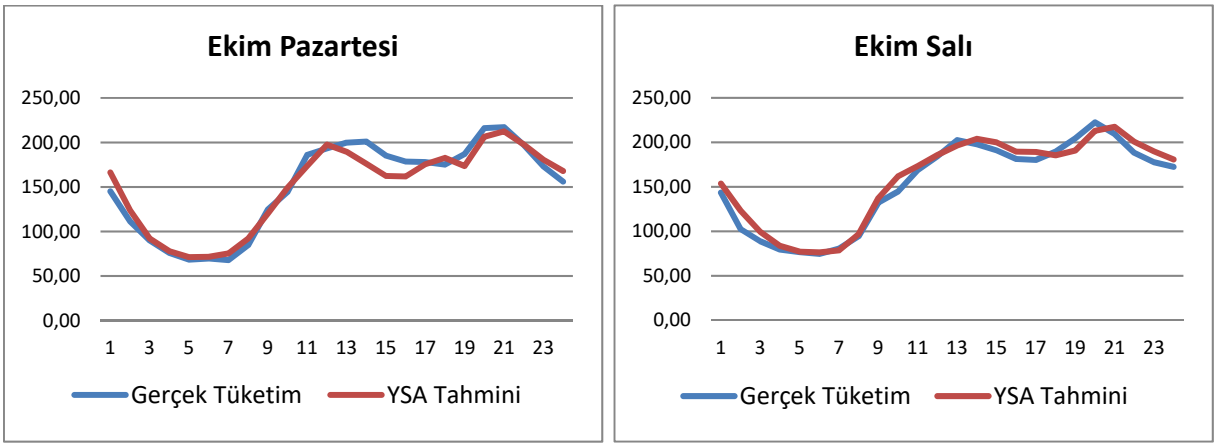
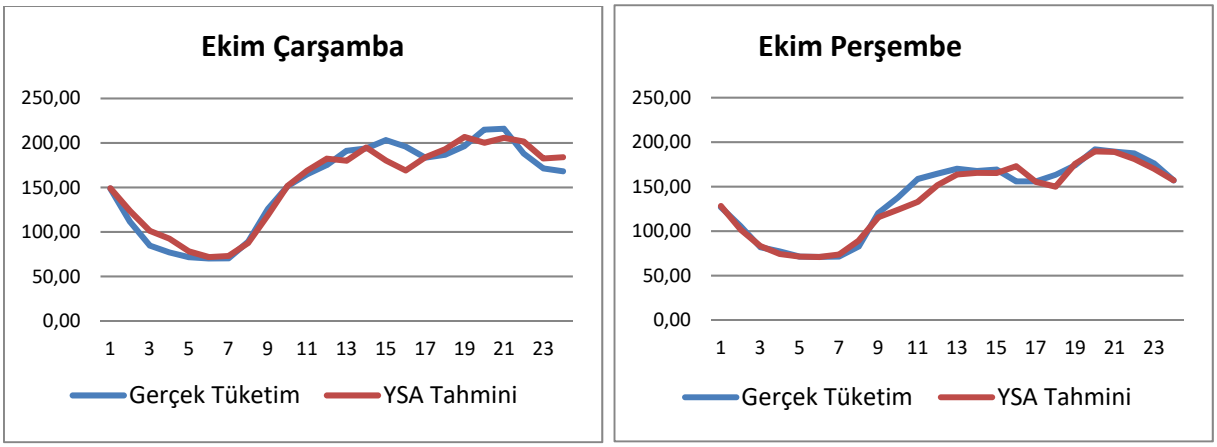
13	200,98	176,03	197,89	203,98	194,00	194,94	167,67	165,42	181,33	194,12	193,03	209,43	178,48	167,63
14	185,19	162,41	191,00	200,04	203,24	180,24	169,31	165,24	165,81	183,37	199,45	206,91	188,80	168,74
15	178,52	161,92	181,23	189,49	195,90	169,12	155,90	173,05	159,99	175,61	185,04	194,29	187,04	157,17
16	178,00	175,47	180,16	189,16	183,44	183,90	155,99	155,43	167,87	165,76	191,90	184,35	165,42	154,55
17	175,08	182,79	189,59	185,37	186,72	192,75	163,28	150,01	172,28	176,34	187,86	171,43	161,79	158,47
18	186,98	173,63	204,50	190,77	196,68	206,73	174,06	176,00	196,03	193,37	208,22	164,32	163,52	156,27
19	216,08	206,48	222,48	212,96	215,01	200,30	191,97	189,72	214,81	211,19	202,28	180,56	198,28	167,60
20	217,26	212,50	209,51	217,46	216,05	205,83	189,47	189,07	206,10	198,54	198,75	189,46	200,65	188,87
21	197,37	197,77	188,32	200,64	188,09	201,57	187,46	181,10	201,10	200,37	186,40	179,27	195,76	162,98
22	173,27	180,70	177,73	190,01	171,39	182,57	176,34	170,14	185,41	186,18	172,49	164,44	181,19	149,59
23	156,19	167,98	172,52	180,71	168,25	184,07	157,07	157,23	173,27	170,63	163,44	162,05	177,60	149,31
MAPE	% 6,019875		% 5,292062		% 6,447205		% 4,003305		% 5,364536		% 4,918232		% 7,590693	

Tablo 3'deki veriler sonucunda her güne ait MAPE değerleri elde edilmiştir. MAPE değerlerinin değişimi %4 ile %7,5 arasında değişmektedir. Bu sonuçlara göre YSA ile tahmin edilen değerler gerçek değerlere yaklaşmıştır. Bu hata değerleri bu yöntem için oldukça başarılı sayılmaktadır[26]. YSA ile tahmin değerler ve gerçek değerlerin günlük profil eğrileri Şekil 5, 6, 7 ve 8'de sırasıyla verilmiştir.



Şekil 5. Pazartesi ve Salı gününe ait gerçek ve YSA ile tahmin edilen enerji tüketim eğrileri



Şekil 6. Çarşamba ve Perşembe gününe ait gerçek ve YSA ile tahmin edilen enerji tüketim eğrileri

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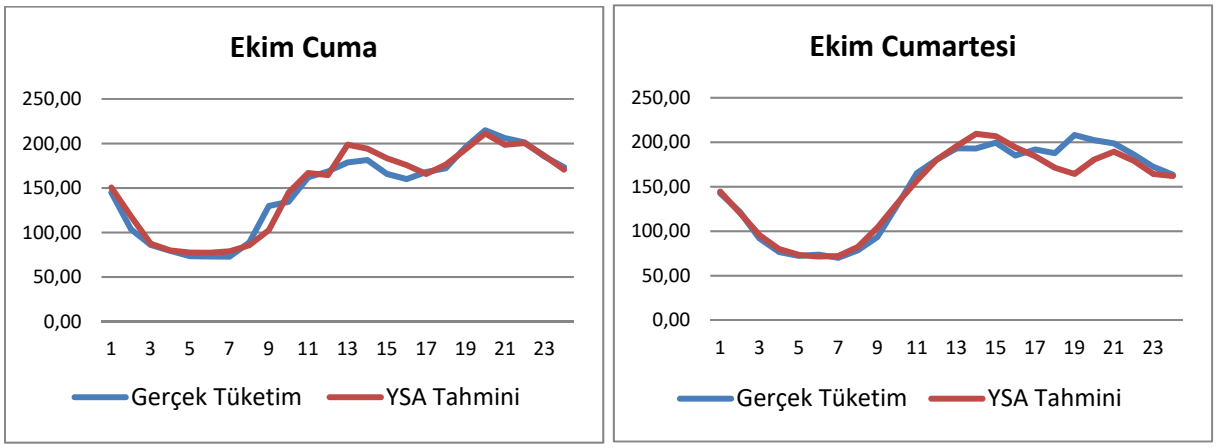
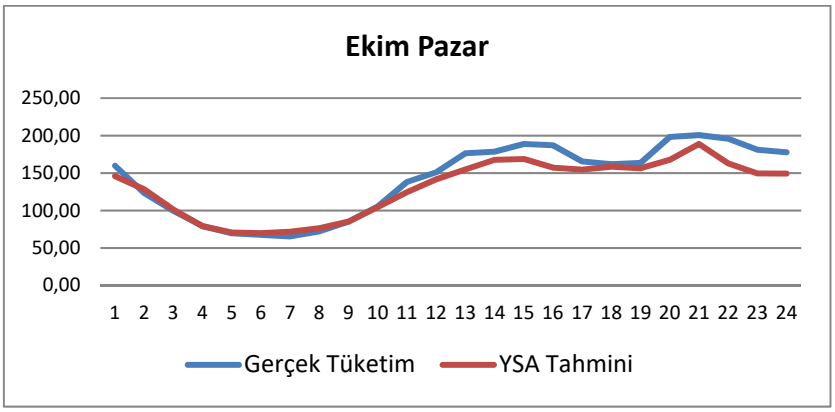


Şekil 7. Cuma ve Cumartesi gününe ait gerçek ve YSA ile tahmin edilen enerji tüketim eğrileri



Şekil 8. Pazar gününe ait gerçek ve YSA ile tahmin edilen enerji tüketim eğrileri

Günlük tüketim profilleri incelendiğinde YSA sonucu elde edilen değerler ile başarılı bir şekilde tahmin yaptığı görülmektedir. Oluşan hataların ise özellikle değişimin ani olduğu saatlerde gerçekleştiği görülmektedir.

Sonuçlar ve Tartışma

Bu çalışmada Batı Karadeniz bölgesinde faaliyet gösteren SEDAŞ dağıtım şirketinin kısa dönemli yük tahmini YSA ile gerçekleştirilmiştir. Kullanılan veri seti gerçek değerler olup OSOS kapsamında örnekleme seçilen müşterilere takılan sayaçlardan okunan değerlerdir. Bu değerler, YSA ile elde edilen değerlerle karşılaştırılmış olup metodun geçerliliği incelenmiştir. Elde edilen değerler MAPE performans kıstaslarıyla karşılaştırılmışlardır. Elde edilen değerler hata olarak incelendiğinde Tablo 5'deki sonuçlar elde edilir.

Tablo 5. Ekim ayın ait son haftaya ait hata değerleri

	26 Ekim Pazartesi	27 Ekim Salı	28 Ekim Çarşamba	22 Ekim Perşembe	23 Ekim Cuma	24 Ekim Cumartesi	25 Ekim Pazar	Ortalama
MAPE	% 6,0198	% 5,2920	% 6,4472	% 4,0033	% 5,3645	% 4,9182	% 7,5906	%5,6623

MAPE değerleri incelendiğinde %10'nun altındaki değerler çok iyi, %10-%20 arasındaki değerler iyi, %20-%50 arasındaki değerler kabul edilebilir ve %50'nin üzerindeki değerler yanlış ve hatalı olarak kabul edilmiştir(Var & Türkay, 2014). Ayrıca tablolardan tahmin karakteristiklerine bakıldığında gerçek değerlere benzeştiği görülmektedir. Bu çalışma ile aynı zamanda lineer olmayan verilere sahip modellerin YSA ile başarılı bir şekilde modellendiği gösterilmiştir. İleriki çalışmalarda Enerji tüketimini etkileyen diğer faktörler de göz önüne alınarak çalışma daha da geliştirilebilir. Yeni senaryolar üretilerek yeni

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tahminler de gerçekleştirilebilir.

Açıklamalar

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YAZILIM MÜHENDİSLİĞİ LİSANS PROGRAMLARINDA ONTOLOJİNİN ÖNEMİ

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Tim Berners Lee 2009 yılındaki TED konferansında "Bağlı Data -Linked Data" kavramının önemini şöyle açıklar: "Günümüzde bu kadar yüklü miktarda bilgi, açık data, bir teknoloji olarak farklı ilişkilerle birbirine bağlanmalıdır. İstenilen Web sonucunu elde etmek için her şeyi anlamlandırmak gerekecektir. Bu, anlamsal web hareketidir ve Wikipedia projesi bu hareketin başlangıcıdır". Modele Dayalı Yazılım Mühendisliğinde bilgi tabanlı uygulamalar bilginin paylaşımı için ontolojileri kullanır. Başlangıçta yapay us uzmanlarının çalışma alanı olduğu kabul edilen ontoloji, günümüz yazılım problemlerinin çözümünde endüstriyel yazılım mühendisliği uygulamalarının bir parçası olmaktadır.

Yazılım Mühendisliği eğitim programının SWEBOK taksonomisindeki bilgi alanlarından biri olan Matematiksel Temeller karmaşık gerçek dünya problemlerine açıklaştırılmış bir mantık ile iyi anlaşılmış çözümler sunulmasını sağlar. Tamlık, diğer bir ifade ile doğrulukla ilişkilendirilen biçimsel sistemlerin incelenmesi ayrık matematiğin temel yapı taşıdır. Yazılım mühendisliği lisans programlarında bu disiplinin bir bilgi alanı olmasının nedeni, yazılım problemlerinin farklı uygulamaları için kesin bir soyutlamaya gereksinim olmasıdır.

SWEBOK taksonomisindeki bir diğer bilgi alanı Yazılım Mühendisliği Modelleri ve Yöntemleri, modellemeyi herhangi bir yazılım bileşenin soyutlaması olarak tanımlar; bu bileşenin tek bir soyutlaması yoktur. Yazılım modeli de bu soyutlamaların birleştirilmesinden oluşur; model yeniden kullanıldığında yeni içerik ile uygunluğunu basitleştirmelerin oluşturduğu varsayımlar sağlayacaktır. Ontoloji, makine tarafından okunabilir bir formatta varlıklar, öznitelikler, ilişkiler ve herkesin anlayabileceği kurallardan, diğer bir ifade ile belitlerden oluşan, herhangi bir alana ait kavramsallaştırmadır. Faklı alanlara ait ontolojiler kavramların modellenmesini amaçlayarak bağımsız olarak geliştirilmiş bu ontolojilerin yeniden kullanılabilmelerini ve genişletilebilmelerini destekler. Yazılım Mühendisliği Modelleri ve Yöntemleri bilgi alanının üç model tipinden biri olan bilgi modelleme, anlamsal ya da diğer bir ifade ile kavramsal bilgi modeli olarak bir soyutlamadır ve bilginin gerçek dünya görünümünü kavramsallaştıran kavramları, özellikleri, ilişkileri ve kısıtları içerir. Sonuç olarak insan-bilgisayarın Web üzerinde daha iyi bir etkileşimi ile heterojen ve dağıtık bilgiye akıllı erişimi sağlayan Semantik Web için standart bilgi simgelenişi gerçekleşir. Bunu aynı bilgi alanının yapısal modelleme tiplerinden biri olan UML diyagramları ile gerçekleştirmek mümkün değildir. Ontoloji dillerinde yaygın kullanılan mantık odaklı olarak bilginin simgelenişi, betimleme mantığı ile gerçekleştirilir ve bu SWEBOK taksonomisinin aynı bilgi alanına aittir. Birinci dereceden önermeler mantığı tüm nesneler arasındaki ilişkilerin küme elemanları şeklinde modellenmesini sağlar. Örneğin W3C, OWL 2 (Web Ontology Language) dilinin sınıf/ kavram yapıcılarını betimleme mantığı sözdizimi ile tanımlamıştır. Ontoloji çalışmalarının açıklaştırılması için bilinen akıl yürütme algoritmaları ile teorik olarak iyi tanımlanmış, biçimsel özelliklerin iyi ifade edilerek karmaşıklığın azaltıldığı semantik tanımlamalar kullanılmalıdır. eBilim, coğrafi incelemeler, mühendislik, tıp, biyoloji, savunma sanayi projeleri ontolojilerin kullanıldığı uygulama alanlarındandır.

Sonuç olarak, yazılım mühendisliği disiplininde iyi tanımlanmış, anlaşılır kavramsal betimlemelerle ilgili alana özel ontolojiler tasarlayabilen, bu alanda günümüz gereksinimlerine cevap verebilecek nitelikte mühendislerin yetiştirilmesi hedeflenmelidir.

Keywords: Ontoloji, Anlamsal Web, SWEBOK, Bilgi Alanları

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YENI SÜBSTITÜE 2-AMINO-1,3,4-TIYADIAZOL TÜREVLERININ SCHIFF BAZLARINI İÇEREN BILEŞIKLERIN SENTEZI VE KARAKTERIZASYONU

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Heterosiklik bileşiklerin önemli bir sınıfı olan 1,3,4-tiyadiazol ve türevlerinin antioksidan, antibakteriyel, antideprasan, antidiyabetik, antifungal, antikonvülzan ve antienflamatuar etkiler de dahil olmak üzere çok çeşitli biyolojik özelliklere sahip olduğu bilinmektedir. Özellikle, Schiff bazları içeren sübstitüe1,3,4-tiyadiazol türevlerinin antikanser aktiviteye sahip olmalarından ötürü, çok daha fazla önem arz etmektedirler. 1,3,4-Tiyadiazol halkasının modifikasyonuna bağlı olarak, bu türevler farklı mekanizma üzerinden farklı etki göstermektedirler. Ayrıca, kükürt atomu içeren 1,3,4-tiyadiazol türevleri çözünürlüğü arttırarak iyi doku geçirgenliği sağlamaktadır. Yine 1,3,4-Tiyadiazol halkasına bağlı amin halkasındaki Schiff bazlarının sentezleri çeşitli farmakolojik özelliklerinden dolayı yaygın şekilde yapılmaktadır.
Bu çalışmada, çeşitli biyolojik aktiviteye sahip olabileceğini düşündüğümüz 1,3,4-tiyadiazol türevlerinin schiff bazlarının sentezi gerçekleştirildi. Bu amaçla, ilk olarak çeşitli nitril türevlerinin TFA eşliğinde tiyosemikarbazit ile olan reaksiyonundan başlangıç bileşiği olan sübstitüe 2-amimo-1,3,4-tiyadiazol türevlerini sentezlendi.
Çalışmanın ikinci aşamasında ise elde edilen çeşitli sübstitüe 2-amimo-1,3,4-tiyadiazol türevlerinin, aromatik aldehit türevleri ile olan kondenzasyon reaksiyonu sonucunda ise sonuç bileşiği olan schiff bazlarının sentezigerçekleştirildi.

Son olarak da sentezi gerçekleştirilen tüm bileşiklerin yapıları; IR, ^{13}C NMR, ^{1}H NMR, MS ve elementel analiz kullanılarak aydınlatıldı.
Keywords: Tiyadiazol, Nitril, Schiff Bazı, Biyolojik Aktivite

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YEREL SİYASET ve SİYASAL KÜLTÜR: ŞANLIURFA BÜYÜKŞEHİR BELEDİYE MECLİS ÜYELERİ ÖRNEK OLAY İNCELEMESİ

(LOCAL POLITICS AND POLITICAL CULTURE: A CASE STUDY ON MEMBERS OF THE MUNICIPAL COUNCIL OF THE SANLIURFAMETROPOLITAN MUNICIPALITY)

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Özet: Yerel siyaset, kentte faaliyet gösteren siyasal aktörlerin kentin sorunlarını konu edindikleri ve çözümler ürettikleri, yerel toplumu idare etmek yöntemidir. Bu anlamda yerel siyaset, siyasetin yerelde faaliyet gösteren yerel yönetimler ayağını oluşturmaktadır. Yerel yönetimler ise demokratik sistemlerin temel kurumlarından bir tanesidir. Yerel yönetimlerin varoluşunun siyasal gerekçesi demokrasi düşüncesine dayanmaktadır. Yerel yönetimler denildiğinde, demokrasinin işlevselliği açısından, ilk akla gelen kurumlardan bir tanesi yerel düzeyde karar alma süreçlerini etkileyen belediye meclis üyeleridir. Yerel halkın alt yapı, sosyal ve kültürel sorunları ile ilgili kararlar alan belediye meclis üyelerinin siyasal kültürü - söz konusu yerine getirdiği faaliyetler nedeniyle - toplum yaşamı açısından önemli bir siyasal konu olmaktadır. Bu bağlamda, belediye meclis üyelerinin sahip oldukları siyasal kültür, üzerinde araştırma yapmaya değer bir konu olarak karşımıza çıkmaktadır. Bu çerçevede, bu çalışmada, Şanlıurfa Büyükşehir Belediye Meclis Üyeleri'nin - bireyin tüm siyasal pratiklerini şekillendiren, siyasal alana ilişkin sahip oldukları değerler, ritüeller, semboller ve inançlarını ifade eden - siyasal kültürü anket tekniğine dayanan bir saha çalışması ile ortaya konmaya çalışılacaktır.

Anahtar Kelimeler: Yerel siyaset, siyasal kültür, belediye meclisi, Şanlıurfa

Abstract: Local politics is the method to govern the local people where the political actors address the issues of the city and generate solutions for these issues. In this regard, local politics forms the local government component of the politics that performs political activities on a local level. The local government on the other hand is one of the fundamental institutions of the democratic systems. The political ground for the existence of local governments is based on the democratic edifice. One of the first institutions that come to mind when local governments are concerned in terms of the functionality of democracy is the members of the municipal council that influence the decision making processes at the local level. The political culture of the members of the municipal council has great importance for the politicsbecause of the political activities they perform for the society since these members are the ones who make decisions on infrastructural, social and cultural issues of the local people. For these reasons, the political culture of the members of the council is a political subject worth studying thoroughly. In this framework, we conducted a field study based on survey questionnaire technique to find out the political culture of the members of the municipal council of the Metropolitan Municipality of Şanlıurfa,i.e. the political values, rites, symbols and beliefs that form the political practices of the individuals.

Keywords: Local politics, political culture, municipal council, Şanlıurfa

Giriş

Siyaset, küresel, bölgesel, ulusal ve yerel düzeylerde karar alma ve uygulama mekanizmalarına etki etme sürecidir. Bu süreci aracısız yapan ve karar alıp uygulamaya koyan kişilere siyasetçi denir. Yerel düzeyde siyasetçiler, siyasal partilerin il, ilçe ve belde örgütlerinde, belediye meclislerinde, il genel meclislerinde ve belediyenin yürütme organında yer alırlar. Yerel siyasetçiler yerel halkın beklentileri, talep ve şikâyetlerini karar verme süreçlerine taşıma görevini üstlenirler. Karar ve uygulamalarla ilgili olarak halkı bilgilendirir ve yeni durumun tespit edilmesiyle bu görevi tekrar ederler (Gül vd., 2014: 75).

Yerel siyaset kurumunun başında belediye yönetimi faaliyetini yürüten siyasetçiler gelir. Belediye, "belde sakinlerinin mahallî müşterek nitelikteki ihtiyaçlarını karşılamak üzere kurulan ve karar organı seçmenler

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tarafından seçilerek oluşturulan, idarî ve malî özerkliğe sahip kamu tüzel kişisi"dir. Belediyenin özerkliği, kanunlarda belirlenen sınırlar içinde kalmak koşuluyla, kendi görev ve yetki alanında kural koyabilmesi, farklı toplumsal kesimleri dikkate alarak kamu hizmetini sunabilmesi, merkezi yönetimin belediye işlerine müdahale etmesini önleyebilmesi, mahalli müşterek nitelikteki kaynakları oluşturabilmesi, halkın refah düzeyini arttırmada katkıda bulunması ve karar organlarının seçimle göreve gelmesinden oluşmaktadır. Belediyenin karar organı belediye meclisi olup nisbi temsil seçim sistemine göre doğrudan halk tarafından seçilir. Belediye meclisleri yerel topluluğun sahip olduğu siyasal ve kültürel değerleri temsil ederler.

Bu çalışmada ilk önce kuramsal çerçevede yerel siyaset ve siyasal kültür açıklanacaktır. Daha sonra Şanlıurfa Büyükşehir Meclis Üyeleri'nin siyasal ilgi, siyasal bilgi ve siyasal değerleri uygulanan anket çalışmasından elde edilen veriler doğrultusunda analiz edilecektir.

Yerel Siyaset Kavramı ve Belediye Meclis Üyeleri

Siyaset kavramı sözlükte, "devlet işlerini düzenleme" ve "yürütme sanatı" anlamına gelir. Siyaset, Arapça'da, "at talimi", "at öğrenimi" ve "at bakıcılığı" anlamına gelen seyis kelimesinden türetilmiştir. Siyaset biliminde siyaset, "ülke", "devlet" ve "insan" yönetimi biçiminde tanımlanabilir (Daver, 1993: 3-5). Siyaset, ülkeyi yönetme, halkın yönetilmesi, kamusal ve siyasal alanın tasnif edilmesi, uzlaşıyla siyasi kararların alınması, siyasi mücadeleyle iktidara gelinmesi, siyasi iktidar aracılığıyla kaynakların, değer ve sembollerin dağıtılması anlamlarına da gelir (Akdoğan, 2008: 9). Fakat siyaset bilimi literatüründe, siyaset tanımı üzerine ortak bir fikir birliği sağlanamamıştır. Bunun nedeni, siyaset terimiyle ilgili karşılaşılan sorunlar ve bu sorunlara koşut olarak ortak bir tanımın yapılamamasıdır (Kalaycıoğlu, 1984: 3).

Siyaset ile özdeş olan "politika", "polis" ve "polisiye" eski Yunan'da "kent-devlet" anlamına gelen "polis" kelimesine kadar uzanır (Ranciére, 2007: 71). Siyasetin temeli kent yönetiminden meydana geldiği görüşü, yerel siyasetin tanımlanması açısından da anlam taşır. Yerel siyasetin kent yönetimi bağlamında taşıdığı anlam ile siyasetin ilk oluştuğu kent yönetiminden ortaya çıkması önem arz eder. Dolayısıyla yerel siyaset, kentte faaliyet gösteren kişi, kurum ve kuruluşların, kent ve kent halkına ait sorun ve konuları ele alarak sürdürdükleri bir yerel iktidar mücadelesidir. Bu mücadelenin ana aktörleri, valilik, kaymakamlık, il özel idaresi, kamu kurum ve kuruluşlarının taşra örgütleri, belediye başkanları ve belediye meclis üyeleridir (Akdoğan, 2008: 10).

Yerel siyaset aynı zamanda kentsel siyaset kavramıyla eş anlamlı olarak kullanılır. Dar anlamdaki yerel siyaset, yerel düzeyde karar verme süreçlerini etkileyen bütün faktörlerin incelenmesidir. Geniş anlamdaki yerel siyaset ise, kentleşme sürecini ve yerel birimleri ilgilendiren kırsal ve kentsel alanlarla ilgili konular, yerel yönetimlerle merkezi yönetim arasındaki ilişkiler ve yerel seçimleri kapsar. Fakat yerel siyaset kavramını geniş ve dar anlamlarını birbirlerinden ayırmak zordur. Yerel düzeyde karar verme süreçleri ve bu kararları etkileyen faktörler ne yerel yönetim birimi olan belediye yönetimi sınırlarıyla sınırlandırılabilir ne de kendi başlarına bir amaç gibi ele alınabilir. Dar anlamdaki yerel siyaset, merkezi yönetim tarafından benimsenen siyasalardan ve ulusal siyasetten büyük ölçüde etkilenir (Keleş, 2000:102).

Yerel siyasete mekân ve bağlam açısından bakıldığında temel olgu kent ve kent yönetimidir. Kentle ilgili her türlü yönetim birimi, kent üzerinde çalışan her türlü sivil toplum örgütleri ve özel kuruluşlar, kent düzeyinde faaliyet gösteren medya ve diğer yerel düzeyli vakıf ve dernek sıralanabilir (Akdoğan, 2008: 10).

Yerel siyasetin en önemli aktörleri belediye meclis üyeleridir. Belediye meclis üyeleri, belediyenin karar organı olup doğrudan halk tarafından nisbi temsil seçim sistemiyle seçilir. Bu nedenle kentte faaliyet gösteren siyasi partilerin aldığı oy oranı doğrudan belediye meclisine yansır. Meclis üyeleri seçimle göreve gelmelerine karşın, kamuoyunun baskısını pek hissetmezler. Daha çok ildeki siyasi parti yönetiminin baskısını hissederler (Tekeli, 1992: 61).

Öte yandan büyükşehir belediye meclis üyelerinin seçimi, "2972 sayılı Mahallî İdareler ile Mahalle Muhtarlıkları ve İhtiyar Heyetleri Seçimi Hakkında Kanun" hükümlerine göre yapılır. Bu meclis üyeleri doğrudan halk tarafından seçilmezler. Halk doğrudan büyükşehir ilçe belediye meclis üyelerini seçer. Büyükşehir belediye meclisi ise, büyükşehir belediyesine bağlı ilçe belediyeleri için belirlenen belediye meclisi üye sayısının, her ilçe için beşte biri alınmak suretiyle bulunan toplam sayı kadar üyelerden oluşur. Bunlara ilaveten büyükşehir belediye meclis üyeleri için kontenjan (1-6 kişi) üyelikte bulunur. Büyükşehir belediye meclis üyelerinin aynı anda iki meclis üyesi olmaları, onları, tüm kente (il mülki idare sınırı) ilişkin karar almada daha çok bilgi ve tecrübe sahibi olmalarını gerektirir. Büyükşehir belediye meclis üyelerinden hem ilçeye hem de büyükşehir yönetimine önemli katkılar sağlanmaları beklenir. Bu konuda büyükşehir belediye meclis üyeleri üzerine yapılan bir saha çalışmasında, meclis üyeleri, her iki belediyeye aynı düzeyde katkı sunduklarını beyan etmişlerdir (Şengül, 2010: 118).

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Büyükşehir belediye meclislerinin görev ve yetkileri konusunda büyükşehir belediye yönetimlerini düzenleyen 5216 sayılı Kanunda ayrı bir başlık halinde düzenleme yapılmamıştır. Fakat kanunun çeşitli maddelerinde meclise çok sayıda görev ve yetkiler verilmiştir. 5393 sayılı Belediye Kanunu hükümleri esas itibariyle büyükşehir belediye meclis üyeleri için de geçerlidir (Dönmez, 2010: 84). Buna göre 5216 sayılı Büyükşehir Belediye Kanunu ile 5393 sayılı Belediye Kanunu birlikte ele alındığında büyükşehir belediye meclisinin görev ve yetkileri arasında şunlar bulunur: Stratejik plân ile yatırım ve çalışma programlarını kabul etmek; bütçe ve kesin hesabı kabul etmek; belediyenin imar plânlarını görüşmek ve onaylamak; büyükşehir ve il belediyelerinde il çevre düzeni plânını kabul etmek; borçlanmaya karar vermek; kanunlarda vergi, resim, harç ve katılma payı konusu yapılmayan ve ilgililerin isteğine bağlı hizmetler için uygulanacak ücret tarifesini belirlemek; şartlı bağışları kabul etmek; belediye adına imtiyaz verilmesine ve belediye yatırımlarının yap-işlet ya da yap-işlet-devret modeli ile yapılmasına karar vermek; meclis başkanlık divanını ve encümen üyeleri ile ihtisas komisyonları üyelerini seçmek; norm kadro çerçevesinde belediyenin ve bağlı kuruluşlarının kadrolarının ihdas, iptal ve değiştirilmesine karar vermek; belediye tarafından çıkarılacak yönetmelikleri kabul etmek; meydan, cadde, sokak, park ve tesislere ad vermek; mahalle kurulması, kaldırılması, birleştirilmesi, adlarıyla sınırlarının tespiti ve değiştirilmesine karar vermek; diğer yerel yönetimlerle birlik kurulmasına, kurulmuş birliklere katılmaya ya da ayrılmaya karar vermek; yurt içindeki ve İçişleri Bakanlığı'nın izniyle yurt dışındaki belediyeler ve yerel yönetim birlikleriyle karşılıklı iş birliği yapma konusunda karar vermek.

Belediyenin görev ve sorumlulukları ise, imar, su ve kanalizasyon, ulaşım gibi kentsel alt yapı; coğrafî ve kent bilgi sistemleri; çevre ve çevre sağlığı, temizlik ve katı atık; zabıta, itfaiye, acil yardım, kurtarma ve ambulans; şehir içi trafik; defin ve mezarlıklar; ağaçlandırma, park ve yeşil alanlar; konut; sosyal hizmet ve yardım; meslek ve beceri kazandırma; kadınlar ve çocuklar için konukevleri açma; sağlıkla ilgili her türlü tesisi açma; mabetlerin yapımı, bakımı, onarımını yapma; kültür ve tabiat varlıkları ile tarihî dokunun ve kent tarihi bakımından önem taşıyan mekânların ve işlevlerinin korunmasını sağlama; sporu teşvik etmek amacıyla gençlere spor malzemesi verme ve gıda bankacılığı yapma.

Siyasal Kültür Kavramı

Siyasal kültür kavramı, 1960'lı yılların başlarında siyaset bilimi literatürüne girmiştir. Siyaset bilimi çalışmalarına yeni bir yaklaşım getiren siyasal kültür kavramı, kamu hukukunun etkisindeki kurumsal yaklaşımın, siyasetin toplumsal boyutunu ihmal eden, formel ilişkilere ve yapılara odaklanmasına bir itirazı ifade etmektedir.

Siyasal kültür kavramı etrafında kümelenmiş bilim çevreleri, kurumları ve yapıları inceleyerek gerçekte siyasetin nasıl işlediğini anlayabilmenin zor olduğunu, siyasetin gerçek mahiyetini ve işleyişini anlayabilmek için kurum ve yapıların içinde var olduğu toplumsal yapıya bakmak gerektiği konusuna yoğunlaşmaktadırlar. Çünkü siyaseti işleten bu kurumlar, toplumsal zeminde yer alan dinamikler tarafından biçimlendirilmektedir (Türköne, 2010: 222). Olgulardan herhangi birine öncelik vermektense, iki olgu (siyasi kültür ve siyasal kurumlar) arasında karşılıklı bir etkileşim olduğunu varsaymak daha uygun bir tespit olacaktır. Yani siyasi kültür, sadece belirleyen bir değişken değildir, aynı zamanda belirlenen bir değişkendir. Bağımsız ya da bağımlı bir değişken olma durumu siyasal kurumlar için de geçerlidir.

Siyasal kültür, içinde barındırdığı farklı unsurlarla bir bütün oluşturan genel kültürün siyasete tekabül eden parçasını oluşturmaktadır. "Bir insan grubu ya da toplumda kişiden kişiye ya da kuşaktan kuşağa geçen bilgi, değerler, görenekler ve maddi değerler" genel kültürün tanımı ise, siyasal kültür de bu genel tanım içinde geçen siyasete ilişkin bilgi, değerler, semboller, ritüeller ve inançlar bütünüdür (Ozankaya, 1971: 1). Buna göre, bir insan grubunda, toplum ya da siyasi kurumda içkin yönetim anlayışı, hoşgörü düzeyi, din algısı, birey ve topluma atfedilen değer, cinsiyet özellikleri, siyasal duygu ve inançlar ve siyasal üslup siyasal kültüre ait unsurlardır.

Siyasal kültürün, ne tür içeriğe sahip olursa olsun hâkim olduğu toplumda bireylerin siyasete ilişkin algılarını, siyasal katılma biçim ve düzeylerini belirlemekte olduğu düşünülmekte ve siyasi olana ilgi duyma, ilgiyi bilgiye dönüştürme, bilgiyi bir değer haline getirme ve bunun sonunda davranış gösterme, ayrıca kamu kurumlarına yönelik beklentilere kadar her insani hal ve tavrı biçimlendirdiği kabul edilmektedir (Oktay, 2005: 214-215). Siyasal kültüre biçilen bu tek taraflı rol abartılı da olsa, siyasal kültürün söz konusu durumları biçimlendirmede önemli bir misyonu yerine getirdiği gerçeğini değiştirmez.

Kültür kavramını, bağımsız değişken olarak ele alan ilk önemli çalışma Almond ve Verba'ya ait *The Civic Culture* başlıklı saha çalışmasıdır. Demokrasi ile siyasi tavırlar arasındaki ilişkiyi esas alan bu çalışma, beş ülkeyi (ABD, Batı Almanya, İngiltere, İtalya ve Meksika) karşılaştırma tekniğine dayanmaktadır. Çalışmada

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kültürün oluşum süreci üç boyutta ele alınmaktadır (Almond & Verba, 1963: 15): Siyasi sisteme ilişkin bilgiyi içeren tanıma boyutu, lidere ve siyasi kurumlara bağlılığı içeren duygu boyutu ve siyasi olaylara ilişkin değer yargılarını içeren yargı boyutu.

Almond ve Verba, kültüre ait bu boyutların birlikte oluşturduğu bütüne bağlı olarak üç tür siyasal kültür kalıbından söz etmektedirler (Almond & Verba, 1963: 17-19): Yerel siyasal kültür, uyrukluk (tabiyet) kültürü ve katılımcı siyasal kültür.

Yerel siyasal kültür, milli kültür niteliği kazanmamış, köy, bölge ve etnik kimliklerin yaygın olduğu (daha ulus aşamasına gelmemiş) yerlere ait kültürdür. Bu kültür biçiminde birey, daha çok içinde yaşadığı çevrenin değerleriyle kendisini özdeşleştirmektedir, yerel bir aidiyete sahiptir. Ulusal çaptaki kurumlardan ne haberi, ne de beklentisi vardır. Bundan dolayı, siyasi sisteme yönelik tanıma, duygu ve değer yargıları yerel sınırları aşamamakta, ulusal bir ölçeğe ulaşamamaktadır.

Uyrukluk kültürü, ulus kimliğini kazanmış, belli ölçülerde modernleşmiş ve bireyin sistemin kurumlarının ne şekilde işlediğinin farkında olduğu bir kültürdür. Ancak sistem bireyin siyasete katılımına izin vermediği için, birey, sistemin işleyişi karşısında pasiftir. Siyasal sistemin karar ve eylemlerine karşı etkili olamayacağını düşünen bireyin siyasal etkinlik duygusu zayıftır. Birey, kendi köşesine çekilmiş, sistemden çekinen bir pozisyondadır. Siyaset karşısındaki tavrında ürkeklik ve tevekkül hâkimdir.

Katılımcı kültürün hüküm sürdüğü toplumda birey, siyasi sisteme karşı yeterli bilgiye sahip olduğu gibi sistemi etkileyebileceği ve onu değiştirebileceği inancındadır, yani siyasi etkinlik duygusu güçlüdür. Sistem de açık bir sistem olduğundan katılıma izin vermekte ve birey aktif bir şekilde siyasete katılmakta, siyasi sisteme etki edebilecek – siyasal partiye ve sivil toplum örgütüne üye olma, oy kullanma, gösteri ve yürüyüşe katılma gibi - bütün katılım yollarına başvurmaktadır.

Almond ve Verba'nın yaptığı bu sınıflandırma bir idealize etme halidir. Her toplumda bu üç kültür saf hali ile bulunmazlar. Genelde bir toplumda bu üç kültür biçimi birlikte bulunmaktadır. Ağırlık durumlarına göre biri diğerinin önünde bulunabilmektedir. Bundan dolayı, bir toplumun bu kültür biçimlerinden hangisine sahip olduğu ağırlık durumlarına göre tespit edilmektedir.

Çalışmanın Amacı, Kapsamı ve Araştırmanın Yöntemi

Araştırmanın Amacı ve Kapsamı

Belediyeler, yerel alanda yürütülen siyasetin en önemli unsurunu oluşturmaktadır. Dolayısıyla yerel siyaset denildiğinde ilk akla gelen kuruluş belediyeler olmaktadır. Günümüz demokrasisi yetkilerin olabildiğince yerele aktarıldığı bir siyasi anlayışı ifade etmektedir. Bir bakıma günümüz çoğulcu demokratik sistemleri, yetkileri genişletilmiş belediye yönetimleriyle adeta özdeşleşmiştir. Türkiye'de 2004 yılından bu yana büyükşehir belediyesi kanununda yapılan değişikliklerle belediyelerin görev ve yetkileri arttırılmış, hizmet alanları genişletilmiştir. Buna göre, "5216 sayılı Büyükşehir Belediyesi Kanunu" ve "6360 sayılı On Üç İlde Büyükşehir Belediyesi ve 26 İlçe Kurulması ile Bazı Kanun ve Kanun Hükmünde Kararnamelerde Değişiklik Yapılmasına Dair Kanun" büyükşehir belediyelerinin görev ve yetkilerini arttırdığı gibi hizmet alanlarını da genişletmiştir*. Büyükşehir belediyelerinin sınırlarının il mülki idare sınırı olarak belirlenmesi büyükşehir belediye meclis üyelerinin hizmet alanlarını ilçe ve mahalleri de kapsayacak şekilde genişletmiştir. Bu durum, büyükşehir belediye meclislerinin karar organı hükmündeki meclis üyelerinin önemini daha da arttırmıştır.

Belediye meclis üyelerinin siyasal kültürü, bu çalışma özelinde, üç açıdan önemlidir: Birincisi; belediye meclis üyeleri, belediyenin karar organı olup, aldıkları kararlar ile toplumun sosyal, ekonomik, siyasal ve kültürel yaşamını etkileyebilecek bir konumu işgal etmektedirler. Büyükşehir belediye meclis üyelerinin bu konumu, onların siyasal kültürlerini önemli kılmaktadır. İkincisi; belediye meclis üyeleri, halk tarafından seçildiği için halkın siyasal kültürünü belli ölçüde yansıtma özelliği taşımaktadır. Üçüncüsü; belediye meclis üyeleri, sahip oldukları siyasal değer ve kültür ile mensup oldukları siyasal partinin siyasal kültürünü, kısmi de olsa, yansıtmaktadırlar. Bu çerçeve çalışmanın amacı, belediye meclis üyelerinin siyasal kültürlerini incelemektir. Bu çalışma Şanlıurfa Büyükşehir Belediye Meclis Üyeleriyle sınırlı tutulmuştur.

Araştırmanın Yöntemi

Bu çalışma, betimsel tarama yöntemine dayanmaktadır. Çalışmada, anket tekniği kullanılmıştır. Çalışma grubu, 83 üyeden oluşan Şanlıurfa Büyükşehir Belediyesi Meclis Üyeleri'nin tümünü oluşturmaktadır.

Belediye meclis üyeleri, önceden meclis tarafından belirlenen günde, alışılmış toplantı yerinde toplanmaktadır. Bu çalışmanın 29 sorudan oluşan anket soruları, çalışmanın yürütücüleri tarafından meclis üyelerinin toplandığı

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13 Nisan 2016 tarihinde uygulanmıştır. Meclis toplantısına 43 belediye meclis üyesi katılmıştır. Toplantı öncesinde anketin içeriği ve amacı hakkında bilgiler verilmiş ve meclis başkanının yardımı ile anket soruları tek tek toplantıya katılmış 43 meclis üyesine dağıtılmıştır. Geri dönüşümü gerçekleşen anket sorularından beş tanesinin hiç cevaplandırılmadığı ya da değerlendirmede dikkate alınmaması gereken düzeyde eksik cevaplandırıldığı tespit edilmiştir. Sonuç olarak, 39 meclis üyesinin ankete verdikleri cevaplar değerlendirme kapsamına alınmıştır. Geçerliliği kabul edilen 39 anket sayısı Şanlıurfa Büyükşehir Belediye Meclis Üyeleri'nin toplamının % 47'sine denk gelmektedir. Bu oran, Şanlıurfa Büyükşehir Belediye Meclis Üyeleri'ni % 10 yanılma payı ile temsil etme gücüne sahiptir (Baş, 2003: 46). Anket sonuçları SPSS programında analiz edilirken, kayıp değer göz önünde tutulmamıştır. Analizde sadece cevap verilen sorular dikkate alınmıştır.

Bu çalışmada, Şanlıurfa Büyükşehir Belediye Meclis Üyeleri'nin siyasal kültürüne ait iki sorunun cevabı aranacaktır:

- Genel olarak Şanlıurfa Büyükşehir Belediye Meclis Üyeleri'nin siyasal kültürü ne kadar gelişmiştir?
- Demografik özellikler, belediye meclis üyelerinin siyasal kültür anlayışlarını ne ölçüde etkilemektedir?

Araştırma Verilerinin Değerlendirilmesi

Bu çalışmada, ankete katılanların "yaş", "cinsiyet", "öğrenim durumu", "ikamet yeri", "meslek", "gelir", "aşiret mensubiyeti" ve "siyasal parti mensubiyeti" özellikleri siyasal kültür durumları ile değerlendirilmiştir. Ankete katılan meclis üyelerinin % 85'inden fazlası şehirde oturduğundan ve aşiret üyesi olduklarından dolayı, ikamet yeri ve aşiret mensubiyeti değişkenleri analiz dışında tutulmuştur. İkamet yeri ve aşiret üyeliği değişkenleri ankete katılanların kahir ekseriyetinin kentte oturuyor (% 84.6) olmaları ve aşiret mensubu Adalet ve Kalkınma Partisi (AK Parti) % 92.6, Halkların Demokratik Partisi/Demokratik Bölgeler Partisi (HDP/DBP) % 70 ve Milliyetçi Hareket Partisi (MHP) % 100) olmaları dolayısıyla iki değişken analiz dışında tutulmuştur. Geri kalan değişkenler içinde üç değişken ile siyasal kültür sorularına verilen cevaplar (bağımlı değişkenler) arasında anlamlılık ilişkisi tespit edilmiştir. Bu değişkenler cinsiyet, öğrenim durumu ve siyasal parti mensubiyetidir. Bunların dışında yer alan yaş, meslek ve gelir değişkenleri ile belediye meclis üyelerinin siyasal kültür nitelikleri arasında anlamlı bir ilişki tespit edilmemiştir.

Saha çalışması iki alt başlık altında değerlendirilmiştir. Birinci alt başlıkta, ankete katılan büyükşehir belediye meclis üyelerinin demografik özellikleri ele alınmıştır. İkinci alt başlıkta, belediye meclis üyelerinin siyasal kültür bağlamında siyasal ilgi, siyasal bilgi ve siyasal değerleri frekans tabloları biçiminde analiz edilmiştir. Ayrıca, bağımsız değişken durumundaki büyükşehir belediye meclis üyelerinin cinsiyet özellikleri, öğrenim durumları ve siyasal parti mensubiyeti özellikleri, bağımlı değişken durumundaki belediye meclis üyelerinin siyasal ilgi, siyasal bilgi ve siyasal değere ilişkin anket sorularına verdikleri cevaplarla çaprazlama (crosstab) şekilde değerlendirilmiştir.

Demografik Özellikler

Yaş özelliklerine göre, ankete katılan katılımcılar içinden "26-29" yaş kategorisinde yer alan kimse çıkmamıştır. En yüksek oran orta yaş kategorisi olan "30-45" yaş (% 61.5) aralığında bulunanlara ait iken, en düşük oran "56 ve yukarısı" yaş (% 15.4) aralığında bulunanlara aittir. "46-55" yaş aralığına mensup katılımcı oranı ise % 23.1'dir. Bu oranlardan Şanlıurfa Büyükşehir Belediye Meclis Üyeleri'nin büyük çoğunluğunun orta yaş ve üstü kategorisinde yer aldıkları anlaşılmaktadır. Şanlıurfa Büyükşehir Belediye Meclisi Üyeleri'nden ankete katılanların % 84.6'sı erkek, % 15.4'ü kadındır. Dolayısıyla, Şanlıurfa Büyükşehir Belediye Meclisi erkek ağırlıklı bir meclistir. Öğrenim durumuna göre, en yüksek oran lisans (% 46.2) düzeyinde eğitim almış katılımcılara, en düşük oran ise lisansüstü (% 5.1) düzeyinde eğitim almış katılımcılara aittir. Lise mezunlarının oranı % 41, ortaöğretim mezunlarının oranı % 7.7'dir. Katılımcıların % 61.5'i Şanlıurfa kent merkezinde oturuyor iken, % 23.1'i "ilçe"de, % 15.4'ü de "köy"de oturmaktadır. Meslek grupları içinde en yüksek oran profesyonel meslek (% 30.8) grubuna ait iken, en düşük oran emekli meslek (% 10.3) grubuna aittir. Esnaf meslek grubuna ait olanların oranı ise % 20.5'tir. Gelir gruplarına göre, "1500-2500" TL, "2501-3500" TL ve "3501-5000" TL grubuna mensup katılımcıların oranı eşit düzeyde % 28.2'dir. Geri kalan % 15.4'lük oran "5001 ve yukarısı" TL gelir grubuna aittir. Katılımcıların demografik özellikleri açısından en çarpıcı noktalardan bir tanesi aşiret mensubiyetidir. Katılımcıların % 87.2'si gibi çok yüksek bir oranı bir aşirete mensup olduğunu ifade etmiştir. Katılımcıların % 69.2'si AK Parti üyesi, % 25.6'si HDP/DBP üyesidir. Üyelerin % 5.1'i ise MHP'ye mensuptur. Ankete katılan toplam altı kadın üyeden beş tanesi HDP/DBP, sadece bir tanesi AK Parti üyesidir.

Siyasal Kültür

Bu çalışmada, siyasal kültür üç alt başlık altında incelenmiştir: Siyasal ilgi, siyasal bilgi ve siyasal değer. Siyasal ilgi, bireylerin siyasete ne düzeyde alaka gösterdiklerini; siyasal bilgi, siyasete ilişkin sahip oldukları malumatı ve siyasal değer de siyasete dair algılarını, beklentilerini ve moral değerlerini oluşturmaktadır.

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Siyasal İlgi

Tablo 1: Siyasi gelişmeleri hangi sıklıkla takip etmektesiniz?

ŞBŞBMÜ	Sayı	Yüzdelik
Düzenli olarak	35	89.7
Ara sıra	3	7.7
Pek takip etmem	1	2.6
Toplam	39	100

Ankete katılanlar, çok yüksek düzeyde gazete, internet gibi sosyal medya iletişim kanalları yoluyla "düzenli olarak" siyasal gelişmeleri takip ettiklerini ifade etmişlerdir (Tablo 1). Cinsiyet özelliklerine göre en yüksek oran kadınlara aittir. Ankete katılan kadınlar % 100 oranında siyasi gelişmeleri düzenli takip ettiklerini ifade etmişlerdir. Öğrenim durumuna göre, daha düşük eğitimli olanlardan (ortaöğretim % 66.7) daha yüksek eğitimli olanlara (lisansüstü % 100) doğru siyasi gelişmeleri düzenli takip etme oranı, düzenli bir şekilde artmaktadır. Siyasal parti mensubiyetine göre HDP/DBP üyeleri çok az bir farkla AK Parti üyelerine göre daha yüksek düzeyde siyasal gelişmeleri düzenli takip ettiklerini ifade etmişlerdir.

Tablo 2: Televizyon programlarındaki siyasi tartışma programlarını hangi sıklıkla takip etmektesiniz?

ŞBŞBMÜ	Sayı	Yüzdelik
Düzenli olarak	15	39.5
Ara sıra	23	60.5
Pek takip etmem	-	-
Toplam	38	100

Televizyon programları üzerinden "düzenli olarak" siyasi tartışma programlarını takip eden üyeler, toplam üyelerin yarısından azdır. Belediye meclis üyeleri daha çok "ara sıra" tartışma programlarını takip ettiklerini ifade etmişlerdir. Bununla birlikte, hiçbir üye "pek takip etmem" cevabını vermemiştir (Tablo 2). Hem kadın hem erkeklerde oran genel oranlara yakındır. Erkekler kadınlara göre az bir farkla daha yüksek oranda düzenli olarak tartışma programlarını takip etmektedirler. Öğrenim durumuna göre, "ortaöğretim" düzeyinde tartışma programlarını düzenli takip ettiğini söyleyen hiçbir üye çıkmamışken, "lise"den (% 33.3) "lisansüstü" (% 100) düzeyine doğru oran düzenli olarak artmaktadır. Siyasal parti özelliklerine göre AK Parti üyeleri HDP/DBP üyelerine göre daha yüksek düzeyde tartışma programlarını takip etmektedirler. HDP/DBP'li üyeler belli bir etnik grubun kimlik hakları üzerinde yürüttüğü siyasi pozisyonu itibariyle daha yüksek düzeyde siyasi tartışmaları takip etmeleri beklenirdi.

Siyasal Bilgi

Tablo 3: Avrupa Birliği ülkelerinde hakim demokratik uygulama biçimi hangisidir?

ŞBŞBMÜ	Sayı	Yüzdelik
Çoğunluk demokrasisi	10	25.6
Çoğulcu demokrasi	20	51.3
Vesayetçi demokrasi	-	-
Bilmiyorum	9	23.1
Toplam	39	100

Ankete katılan belediye meclis üyelerine, Avrupa Birliği ülkelerinde hâkim demokratik uygulamanın ne olduğu sorulmuştur. Belediye meclis üyelerinin verdiği cevaplardan hareketle soruya ilişkin siyasal bilgilerinin yeterli olmadığını söylemek mümkündür. Çünkü üyelerin ancak 1/2'si "çoğulcu demokrasi" cevabını vererek doğru cevabı bilmiştir (Tablo 3). Cinsiyete göre verilen doğru cevaplar hem kadın hem erkeklerde genel ortalama ile aynı orandadır. Öğrenim durumuna göre "ortaöğretim" düzeyinde hiç kimse doğru cevap vermemiştir. "Lise"den (% 50) "lisansüstü"ne (% 100) doğru ise oran düzenli olarak artmaktadır. Siyasal parti mensubiyeti değişkeninde HDP/DBP üyeleri (% 70) AK Parti üyelerine (% 57.7) oranla belirgin bir bilgi üstünlüğüne sahiptirler. MHP'li olan iki üyeden sadece biri doğru cevap vermiştir.

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Tablo 4: Avrupa Yerel Yönetimler Özerklik Şartı neyi içermektedir?

ŞBŞBMÜ	Sayı	Yüzdelik
Güçlü bir merkezi yönetim	7	17.9
Yerindelik denetiminin getirilmesi	-	-
Yetkinin yerel yönetimlere aktarılması	24	61.5
Bilmiyorum	8	20.5
Toplam	39	100

"Avrupa Yerel Yönetimler Özerklik Şartı" sadece bilim insanları ve ilgili siyasi çevrelerin bilgisi dâhilinde olan bir konu değildir. Türkiye'deki siyasi konjonktür gereği bir çok kişi yüzeysel de olsa, bu şartın en azından yerel yönetimlerin yetkilerinin arttırılmasını öngören bir belge olduğunu tahmin eder. Ancak belediye meclis üyelerinin sadece yaklaşık 2/3'ü doğru cevap verebilmiştir (Tablo 4). Bu soruya "kadın"ların % 83.3'ü" erkek"lerin % 57.6'sı doğru cevap vermiştir. "Ortaöğretim" düzeyinde eğitime sahip olanların hiç birisi bu soruya doğru cevap vermemiş iken, "lisansüstü" düzeyinde eğitim sahibi olan kişilerin tümü doğru cevap vermiştir. "Lise" ve "lisans" düzeyinde oranlar sırasıyla % 75 ve % 55.6'dır. Siyasal parti özelliklerine göre, MHP'li üyeler (% 100) ve HDP/DBP'li üyeler (% 90) çok yüksek oranda soruya doğru cevap vermişken, AK Parti'li üyelerin (% 48.1) ancak yarıya yakını doğru cevap vermiştir.

Tablo 5: Türkiye Avrupa Yerel Yönetimler Özerklik Şartı'na hangi konularda çekince koymuştur?

ŞBŞBMÜ	Sayı	Yüzdelik
Yetkinin yerel yönetimlere aktarılması	7	17.9
Diğer	7	17.9
Bilmiyorum	25	64.1
Toplam	39	100

Türkiye "Avrupa Yerel Yönetimler Özerklik Şartı"nı imzalamış olmakla birlikte bazı maddelerine (mali kaynaklar, iç örgütlenme, idari vesayet ve yargı yoluna başvurma vb.) çekinceler koymuştur. Geniş anlamda Türkiye'nin çekince koyduğu maddeler "yetkinin yerel yönetimlere aktarılması" konularıdır (Keleş, 2000: 55). Bu soru açık uçlu olarak sorulmuş olup, sorunun cevabı katılımcılar tarafından yazılmıştır. Bu soruya üyelerin sadece % 17.9'u doğru cevap verebilmiştir. "Diğer"i değişkeninde yer alan % 17.9'luk kesim "Kürtler'in hak elde etmesi konuları", "siyasi özerklik", "anadilde eğitim" gibi doğru olmayan cevaplar vermiştir. "Diğer"i değişkeni ile birlikte Avrupa Yerel Yönetimler Özerklik Şartı'na Türkiye'nin çekince koyduğu konuları bilmeyenlerin oranı % 82 gibi çok yüksek bir orandır (Tablo 5). Cinsiyet özelliklerine göre, kadın ve erkeklerde soruya doğru cevap verme oranı genel toplamdaki doğru oran ile hemen hemen aynıdır. Ortaöğretim düzeyinde eğitimlilerde soruya doğru cevap veren kimse olmamıştır. Lise ve lisansüstü eğitimlilerde oran sırasıyla % 25 ve % 50'dir. Siyasal parti mensubiyetine göre MHP üyelerinde oran % 50, HDP/DBP üyelerinde oran % 30 ve AK Parti üyelerinde oran % 11.1'dir.

Tablo 6: Laiklik nedir?

ŞBŞBMÜ	Sayı	Yüzdelik
Din ve devlet işlerinin birbirinden ayrı olması	24	63.2
Bilmiyorum	14	36.8
Toplam	38	100

Laiklik nedir? sorusu da açık uçlu olarak sorulmuştur. Laiklik kavramı, popüler bir kavramdır. Birincisi, Türkiye'de mevcut demokratik sistem laik bir sistemdir ve sistemin bu yönüne sürekli vurgu yapılmaktadır. İkincisi, Laiklik kavramı, Türkiye'de siyasal kültür alanında üzerinde en çok tartışılan kavramlardan bir tanesidir. Bununla birlikte, belediye meclis üyeleri, kendilerinden beklenen oranda söz konusu soruya doğru cevap vermemiştir. Ankete katılan Şanlıurfa Büyükşehir Belediye Meclis Üyeleri'nin ancak 2/3 kadarı laiklik kavramının tanımını bilmiştir (Tablo 6). Ankete katılanların hem öğrenim düzeyleri hem yürüttükleri siyasi faaliyet düşünüldüğünde daha yüksek oranda laikliğin tanımını bilmeleri beklenirdi. Daha önceki sorularda olduğu gibi bu soruda da "kadın"lar (% 50) "erkek"lere (% 34.4) oranla daha yüksek bir doğru cevap verme oranına sahiptir. Öğrenim durumuna göre, laiklik kavramını bilme oranı "ortaöğretim"den (% 33.3) "lisans" (% 76.5) düzeyine doğru düzenli bir şekilde artmaktadır. "Lisansüstü" düzeyinde eğitime sahip üyelerin biri doğru cevap vermişken biri "bilmiyorum" cevabını vermiştir. HDP/DBP'li üyeler ile AK Parti'li üyeler, sırasıyla % 60

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ve % 61.5 oranında doğru cevap vermiş iken, MHP'li üyelerin ikisi de laiklik tanımı sorusuna doğru cevap vermiştir.

Siyasal Değer

Tablo 7: Nasıl bir yönetimden yanasınız?

ŞBŞBMÜ	Sayı	Yüzdelik
Demokratik bir yönetimden yanayım	25	64.1
Dine dayanan bir yönetimden yanayım	1	2.6
Demokrasi ve dinin iç içe olduğu bir yönetimden yanayım	12	30.8
Tek kişinin hüküm sürdüğü bir yönetimden yanayım	-	-
Kararsızım	1	2.6
Toplam	39	100

Şanlıurfa Büyükşehir Belediye Meclis Üyeleri'nin demokratik bir sisteme verdikleri desteğin çok güçlü olmadığı görülmektedir. Ankete katılanların % 30.8'i demokrasi ile dinin iç içe olduğu bir sistemi savunmuşken, % 2.6'sı da dini bir yönetimi benimsemiştir. Bu oranlardan da ankete katılan belediye meclis üyelerinin % 33.4'ünün batılı anlamda demokratik bir sisteme sıcak bakmadıkları anlaşılmaktadır. Cinsiyet özelliklerine göre, kadınlar (% 83.3) erkeklere (% 60.6) göre daha yüksek oranda demokratik bir sistemden yana görülmektedirler. Öğrenim durumu ile değişkenler arasında anlamlı bir ilişki tespit edilmemişken, siyasal parti mensubiyeti ile sahip çıkılan yönetim biçimi arasında çok güçlü bir ilişki tespit edilmiştir. Buna göre, AK Parti üyelerinin sadece % 50.6'sı demokratik bir yönetimden yana tutum belirlemişken, HDP/DBP üyelerinin tamamı bu yönde beyanda bulunmuşlardır. MHP'nin iki üyesi ise demokrasi ve dinin iç içe olduğu bir yönetim anlayışını benimsediklerini ifade etmişlerdir.

Tablo 8: Yerel Yönetimlerin yetkileri ile ilgili ne düşünüyorsunuz?

ŞBŞBMÜ	Sayı	Yüzdelik
Yerel yönetimler olabildiğince özerk olmalı	20	51.3
Yerel yönetimler üzerinde merkezi yönetimin sıkı bir denetimi olmalıdır	13	33.3
Kararsızım	6	15.4
Toplam	39	100

Belediye meclis üyelerinin gelişmiş çoğulcu sistemlerin mütemmim cüzü hükmündeki yerel yönetimlerin merkezi yönetim karşısında daha özerk bir konuma sahip olmaları gerektiği yönündeki anlayışa da çok sıcak bakmadıkları anlaşılmaktadır. Ankete katılan üyelerin sadece 1/2'si yerel yönetimlerin özerk olması gerektiğini ifade etmiştir. Geri kalan üyelerin 1/2'sinin bir kısmı bu konuda sıkı merkezi yönetim denetimini benimsediklerini bir kısmı da kararsız olduklarını ifade etmişlerdir (Tablo 8). Demografik özellikler açısından, kadınlar (% 66.7) erkeklere (% 48.5) göre, HDP/DBP üyeleri (% 90) AK Parti üyelerine (% 37) göre daha güçlü bir şekilde yerel yönetimlerin özerkliğine vurgu yapmışlardır. AK Parti'li üyeler en yüksek oranda (% 44.4) yerel yönetimler üzerinde merkezi yönetimin sıkı denetimini savunmaktadırlar. Ayrıca öğrenim düzeyi yükseldikçe daha özerk yönetim anlayışına olan destek de artmaktadır.

Tablo 9: Laik bir yönetimi benimsiyor musunuz?

ŞBŞBMÜ	Sayı	Yüzdelik
Evet	18	46.2
Kararsızım	9	23.1
Hayır	12	30.8
Toplam	39	100

Din ve devlet işlerinin bir birinden ayrılması ilkesi olarak basitçe ifade edilen laiklik, demokratik sistemin ayrılmaz bir parçasını oluşturmaktadır. Bir sistemde egemenliğin halka ait olması için sistemin kaçınılmaz bir şekilde laik olması gerekmektedir. "Laik bir yönetimi benimsiyor musunuz?" sorusuna verilen cevaplar, belediye meclis üyelerinin demokratik bir sisteme sundukları desteğin çok zayıf olduğunu göstermektedir. Belediye meclis üyelerinin sadece % 46.2'si laik bir yönetimden yana olduğunu beyan etmiştir (Tablo 9). Cinsiyet özelliklerine göre, erkekler (% 48.5) kadınlara (% 33.3) göre, HDP/DBP üyeleri (% 60) AK Parti üyelerine (% 40.7) göre daha yüksek oranda laik yönetimi benimsemektedirler. Öğrenim durumu ile söz konusu soruya verilen cevaplar arasında ise anlamlı bir ilişki tespit edilmemiştir. HDP/DBP, ideolojik olarak sosyalist

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bir kimliğe sahiptir. HDP/DBP'li üyelerin laiklik düzenine verdikleri desteğin oransal düzeyi, partinin sosyalist ideolojisi ile büyük bir çelişki arz etmektedir (www.hdp.org.tr). HDP/DBP'li belediye meclis üyelerinin büyük çoğunluğunun (% 70) herhangi bir aşirete mensubiyetleri, geleneksel siyasal kültürde içkin değer yargılarını, söz konusu belediye meclis üyeleri için önemli kıldığı düşünülebilir.

Tablo 10: Gösteri ve yürüyüş yapmanın (yasal yollardan) sorunların çözümüne katkıda bulunacağına inanıyor musunuz?

ŞBŞBMÜ	Sayı	Yüzdelik
Evet İnanıyorum	26	66.7
Kararsızım	4	10.3
Hayır inanmıyorum	9	23.1
Toplam	39	100

Gösteri ve yürüyüş yapmak temel demokratik haklardan bir tanesidir. Gösteri ve yürüyüş, sivil toplum örgütlerini mevcut iktidar karşısında bir güç dengesi haline getirmekte ve siyasal iktidarın daha sivil bir kimlik kazanmasında önemli bir işlevi yerine getirmektedir. Ankete katılan belediye meclis üyelerinin şimdiye kadar sorulara verdikleri cevaplar - demografik özelliklerinden bağımsız olarak - güçlü bir demokratik kültüre sahip olmadıklarını ortaya koymaktadır. Ancak gösteri ve yürüyüş konusunda belediye meclis üyelerinin, katılımcı demokratik kültürde görülen güçlü siyasal etkinlik duygusuna yakın bir etkinlik duygusu taşıdıkları görülmektedir (Tablo 10). Siyasal kültür çalışmalarında, kadınların erkeklere göre daha muhafazakâr bir siyasal tutum içinde oldukları tespit edilmektedir (Lipset, 1986: 250, Abadan, 1965: 508). Ancak siyasal iktidardan hesap sormayı ifade eden bu soruda, kadınlar (% 100) erkeklere (% 60.6) göre daha yüksek oranda siyasal iktidardan hesap sorulması gerektiği yönünde beyanda bulunmuşlardır. Öğrenim düzeyi arttıkça gösteri ve yürüyüşün sorunların çözümüne katkı sunacağı yönündeki inanç artmaktadır. Buna göre ortaöğretim düzeyinde oran % 33.3 iken lisan düzeyine gelindiğinde oran % 77.8'e çıkmaktadır. Siyasal parti üyeliğine göre, HDP/DBP üyelerinin % 100'ü gösteri ve yürüyüşün sorunların çözümüne katkı sağlayacağını beyan etmişken, bu oran AK Parti üyelerinde % 59.3'te kalmaktadır. MHP'nin üyelerinden bir tanesi "kararsızım", diğeri de "hayır, inanmıyorum" cevabını vermiştir.

Tablo 11: Sivil Toplum Örgütleri'nin yerel karar alma süreçlerine katılması konusunda ne düşünüyorsunuz?

ŞBŞBMÜ	Sayı	Yüzdelik
Sivil toplum örgütleri yerel karar alma süreçlerine aktif bir şekilde katılmalı	23	59.0
Sivil toplum örgütlerinin yerel karar alma süreçlerine katılması kargaşaya neden olur	9	23.1
Kararsızım	7	17.9
Toplam	39	100

Sivil toplum örgütleri, demokrasinin en gerekli koşullarından bir tanesidir. Demokrasi eğer güçler arasında kurulan bir dengenin sonucu ise ki öyledir, bu anlamda sivil toplum örgütleri devletin devasa gücüne karşı sivil toplumu koruyan bir denge unsuru olmaktadır. Bundan dolayı, gelişmiş katılımcı demokratik sistemde sivil toplum örgütlendiği gibi, devlet de bu örgütlenmeye olanak tanımaktadır. Ankete katılan belediye meclis üyelerinin sivil toplum örgütlerinin karar alma süreçlerinde yer almaları gerektiği konusunda gerekli düzeyde demokratik ve sivil bir tutum içinde olmadıkları, devletçi bir tutum içinde oldukları görülmektedir. Ankete katılanların sadece % 59'u sivil toplum örgütlerinin aktif bir şekilde siyasetin içinde yer almalarına sıcak bakmıştır (Tablo 11). Bu konuda da kadınlar (% 100) erkeklere (% 51.5) göre, HDP/DBP üyeleri (% 90) AK Parti üyelerine (% 48.1) göre daha katılımcı bir sistemden yana tutum sergilemektedirler. AK Parti'li üyelerin 1/3'e yakını sivil toplum örgütlerinin karar alma süreçleri içinde yer almalarının kargaşaya neden olacağını ifade etmişlerdir. Sivil toplum örgütlerinin karar alma süreçleri içinde yer almaları konusunda ortaöğretim düzeyinde eğitime sahip olanlarda oran % 33 iken, diğer öğrenim kategorilerinde oran yaklaşık % 60'tır.

Tablo 12: Kadınların da erkekler gibi aktif bir şekilde siyasete katılmaları konusunda ne düşünüyorsunuz?

ŞBŞBMÜ	Sayı	Yüzdelik
Kadının asıl yeri evidir	6	15.4
Kadınlar da erkekler gibi aktif bir şekilde siyasete katılmalıdır	22	56.4
Kadınların siyasete katılıp-katılmaması çok önemli bir mesele değildir	8	20.5
Kararsızım	3	7.7
Toplam	39	100

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Ankete katılan belediye meclis üyelerinin kadınların siyaset içindeki konumları konusundaki görüşleri de demokratik değerleri içerecek özellikleri taşımaktan uzaktır. Katılımcılar, daha geleneksel ve erkek egemen bir anlayışa sahiptirler. Belediye meclis üyelerinin sadece % 56.4'ü kadınların da erkekler gibi faal bir şekilde siyasetin içinde bulunmalarını doğru bulmaktadır. Geri kalan üyeler kadınların siyasetin içinde yer almalarını ya doğru bulmamakta ya da önemli görmemektedir (Tablo 12). Bu soruya verilen cevaplarda da kadınlar erkeklere göre daha çağdaş ve demokratik-katılımcı bir tutum içindedirler. Kadınların % 83.3'ü gibi yüksek bir oran kadınların kamusal alanda siyaset yapmalarını olumlu görmektedirler. Erkeklerde bu oran % 51.5'tir. Öğrenim durumuna göre de, daha eğitimli olanlar (lisansüstü % 100) daha az eğitimli olanlara (ortaöğretim % 33.3) göre daha yüksek oranda kadınların siyaset yapmalarını olumlu bulmaktadırlar. Siyasal parti mensubiyeti açısından HDP/DBP üyeleri (% 80) AK Parti üyelerine (% 48.1) göre daha yüksek oranda kadınların siyaset içinde yer almalarına daha sıcak bakmaktadırlar.

Tablo 13: Bazı ülkelerde uygulanan *"recall"* uygulamasının Türkiye'de de uygulanmasını istiyor musunuz?

ŞBŞBMÜ	Sayı	Yüzdelik
Evet	22	57.9
Kararsızım	6	15.8
Hayır	10	26.3
Toplam	38	100

Recall ya da "geri çağırma", seçilen siyasetçilerden memnun olmayan belli bir orandaki (% 15 ile % 55 arasında değişir) seçmenin seçilen kişileri görevden almasına olanak sağlar. Bu tür görevden alma yöntemine, her seçim döneminde bir defa, basit ya da mutlak çoğunluk seçim sistemlerinde başvurulabilir. Çünkü her seçilmişin ne kadar oyla seçildiği belli olması gerekir. Bu özel seçim sistemi, Türkiye'de, belediye meclis üyelerine uygulanamazken, basit çoğunluk seçim sistemiyle seçilen belediye başkanlarına uygulanabilir.

Şanlıurfa Büyükşehir Belediye Meclis Üyeleri'nin % 57.9'u *recall* uygulamasına sıcak bakmaktadırlar (Tablo 13). Demografik özelliklerine göre, kadınların sadece % 16.7'si *recall*'a olumlu bakarken % 66.7'si kararsız bir tutum içinde olduğunu beyan etmiştir. Erkeklerde ise *recall*'u olumlu görme oranı (% 65.6) kadınların oranından çok daha yüksektir. Öğrenim durumuna göre, ortaöğretim (% 33.3) düzeyinde eğitimli olanlar dışında oranlar bir birine yakın olup % 60 civarındadır. Diğer sorulara verilen cevaplara göre, HDP/DBP belediye meclis üyeleri AK Parti'li üyelere göre daha demokratik ve katılımcı bir kültüre sahip görülüyor iken, bu soruya verilen cevaplarda AK Parti'li üyelerin daha demokratik bir tutum içinde oldukları görülmektedir. AK Parti'li üyelerin % 63'ü *recall*'a olumlu bakarken, HDP/DBP üyelerinde bu yöndeki eğilim % 33.3'tür. Ancak *recall*'a "hayır" diyenlerde AK Parti'li üyelerin (% 29.6) oranı HDP'li üyelerin (% 22.2) oranından daha yüksektir.

Sonuç

Çalışmanın genel sonuçlarına göre, ankete katılan Şanlıurfa Büyükşehir Belediye Meclis Üyeleri'nin siyasete ilişkin ilgileri az, bilgileri - % 37'si laikliğin tanımını bilmeyecek kadar - olabildiğince zayıftır. Aynı zamanda, siyasal değerleri de gelişmiş, modern ve katılımcı demokratik nitelikteki toplumların sahip olduğu değerlerden uzaktır. Ankete katılan belediye meclis üyelerinin önemli bir kısmı, demokratik bir yönetime gereken desteği vermemekte, yerel yönetimler üzerinde merkezi yönetimin sıkı denetimini benimsemekte, demokrasinin vazgeçilmez koşulu olan laikliğe olumlu bir anlam yüklememekte, sivil toplumun yerel alanda siyasal karar alma süreçlerinde yer almalarına gereken önemi vermemekte, kadınların siyasal yaşamda yer almasına çok sıcak bakmamaktadır. Belediye meclis üyelerinin siyasal kültür açısından olumlu görülebilecek tutumları, siyasal etkinlik konusundadır. Buradan hareketle, Şanlıurfa Belediye Meclis Üyeleri'nin katılımcı siyasal kültürlerinin zayıf olduğunu; yerel siyasal kültür, uyrukluk kültürü ve katılımcı siyasal kültürün iç içe geçtiği bir siyasal kültüre sahip olduklarını söylemek mümkündür. Ankete katılan belediye meclis üyeleri, zayıf siyasal ilgileri, az siyasal bilgileri, önemsenecek oranda laik devlet düzenine sıcak bakmamaları ve dine dayanan bir yönetim biçimine yönelik sahip oldukları değer yargıları ile yerel siyasal kültüre; yerel yönetimler üzerinde devlet denetimine atfettikleri önem açısından uyrukluk kültürüne ve belli oranda demokratik yönetimin değerlerini önemsemeleri bakımından da katılımcı siyasal kültüre yaklaşmaktadırlar.

Demografik özelliklerine göre, kadınlar erkeklere oranla, daha eğitimli olanlar daha az eğitimli olanlara oranla ve HDP/DBP'li üyeler, AK Parti'li üyelere oranla siyasete daha ilgili oldukları gibi; siyasal bilgileri de daha yüksektir. Dolayısıyla, katılımcı siyasal kültüre daha yakın durmaktadırlar. Siyasal değerler konusunda da, kadınlar erkeklere oranla, daha eğitimli olanlar daha az eğitimli olanlara oranla, HDP/DBP'li üyeler, AK Parti'li üyelere oranla katılımcı demokratik kültüre daha yakın tutum içindedirler.

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Ankete katılan altı kadın üyeden bir tanesi dışında geri kalan üyeler HDP/DBP parti üyesidir. Dolayısıyla, kadın belediye meclis üyelerinin siyasete ilişkin siyasal kültür anlayışlarının cinsiyet özelliklerinden mi kaynaklandığı ya da mensup oldukları siyasal partinin siyasi duruşu yoksa ideolojisinden mi kaynaklandığı tartışmalıdır. Tartışmalı bir diğer konu da HDP/DBP parti üyelerinin AK Parti'li üyelerden daha güçlü bir şekilde katılımcı siyasal kültüre yakın durmalarıdır. Burada da, HDP/DBP'li üyelerin bu tutumunun katılımcı siyasal kültürde içkin siyasal değerler ile onların temsil iddiasında oldukları etnik gruba ilişkin talep ettikleri haklarla örtüşmesinden mi kaynaklandığı, yoksa ideolojik-ilkesel bir duruş mu olduğu tartışmaya açıktır.

* 6360 sayılı Kanunla getirilen yenilikler çerçevesinde büyükşehir belediye sınırı il mülki idare sınırı olarak belirlenmiş; büyükşehir ilçelerinin mülki idare sınırları içerisinde yer alan köy ve belde belediyelerinin tüzel kişiliği ile il özel idarelerinin tüzel kişiliği ve bucak teşkilatı kaldırılmıştır (Resmi Gazete, 6.12.2012).

Kaynakça

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YEREL ZEMİN KOŞULLARININ EN BÜYÜK İVME DEĞERİNE ETKİSİ

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Özet: Yerel jeolojik zemin koşullarının sismik hareketlerin karakterlerini doğrudan etkilediği ve değiştirdiği, bu zeminler üzerindeki mevcut yapılar üzerinde hasara sebep olabileceği bilinen bir gerçektir. Bu çalışmada, farklı azalım ilişkileri için farklı yerel zemin koşulları ve değişik fay çeşitleri kullanılarak tahmini en büyük ivme değerleri hesaplanmıştır. Çalışmadaki amaç değişik büyüklükteki depremler için farklı zemin koşullarının, farklı fayların ivme değerleri üzerindeki etkisinin incelenmesidir. Bu amaçla araştırmacılar tarafından önerilen azalım ilişkileri kullanılmıştır. Yerel zemin çeşitleri olarak TDY 2007'de verilen zemin sınıfları olan A, B, C ve D sınıfı zeminler veri olarak alınmıştır. Yerel zemin koşullarının yanı sıra fay cinsi de dikkate alınan parametrelerden biri olmuştur. Fay cinsi olarak normal, ters ve doğrultu atımlı faylar olmak üzere üç farklı fay cinsi dikkate alınmıştır. Deprem magnitüdü değerleri olarak 7.4, 7.2, 7.0, 6.5, 6.0, 5.5 ve 5.0 değerleri alınmıştır. Deprem üssüne 50km uzaklık dikkate alınmıştır. Sonuçlar karşılaştırılmış ve öneriler yapılmıştır.

Anahtar Kelimeler: Yer ivmesi, deprem, fay, yerel zemin koşulları

EFFECT OF LOCAL SOIL CONDITION TO PEAK GROUND ACCELERATION VALUE

Abstract: The local soil conditions affects and changes the characteristics of seismic motions directly. These conditions have also caused damage on the structure which is on these grounds. In this study, variable parameters have been selected such as attention relationship, local soil condition and fault type. The peak acceleration values have been calculated through using these variables. For this purpose attention relationships offered by researchers have been used to calculate peak acceleration values. The soil condition such as A, B, C, D soil type that were given in TEC 2007 have been selected in this study. Normal, reverse and strike-slip fault types have been considered as variable fault parameters. Earthquake magnitude values 7.4, 7.2, 7.0, 6.5, 6.0, 5.5 and 5.0 have been taken into account. The distance to earthquake epicentre, a 50km distance has been used. Results were compared and recommendations made.

Keywords: Ground acceleration, earthquake, fault, local soil condition

Giriş

Dünyanın pek çok yerinde depremlerin beşeri faaliyetler üzerinde oluşturduğu tehdit, yapı ve tesislerin tasarımında depremlerin dikkatli bir şekilde göz önüne alınması için yeterli bir sebeptir. Depreme dayanıklı tasarımın amacı, belirli bir düzeydeki sarsıntıyı, aşırı hasar meydana gelmeden atlatabilecek yapı ve tesisi inşa etmektir. Hasar ve can kaybı yaratabilecek bir depremden kaynaklanan yer hareketinin belirli bir yerde ve belli zaman periyodunda meydana gelme ihtimali deprem tehlikesi olarak tanımlanmaktadır (Kayabalı, 1995; Türkeli,2008; Eyidoğan2003)

Depremsellik, jeolojik ve tektonik verilere ve istatistiksel verilere dayanmaktadır. Depremin zamanı, merkez ve merkez üstü konumu, kaynak parametreleri ve yarattığı etkilerle ilgili makrosismik veriler, bir bölgenin deprem tehlikesinin belirlenmesindeki en önemli parametrelerdir. Bir bölgenin depremselliği o bölgede gelecekte olabilecek bir depremin göstergesidir (Işık, 2010).

Sismik tehlike analizi, belirli bir sahadaki yer sarsıntısı tehlikesinin nicel olarak hesaplanmasıdır. Sismik tehlike analizinin amacı zeminin ve mühendislik yapılarının gelecekte maruz kalacağı depremsel yükleme şartlarının

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hesaplanmasında gerekli olan depremsel yer hareketi ile ilgili parametrelerin (ivme, hız, deplasman) hesaplanmasıdır (Giardini,1999).

Yerel zemin koşulları tasarım spektrumunu değiştirecek ve değişen tasarım spektrumu ile bina performansı daha gerçekçi olarak hesaplanacaktır. Bu durumun yer değiştirme istemlerini önemli oranda değiştireceği açıktır. Daha yüksek değerlerde yer değiştirme talepleri karşılanmayan yapılarda hasar tahminlerinin ve bina performansının gerçek değerlerden uzaklaşacağı açıktır (Işık, 2015).

Yerleşim biriminin olasılığa dayalı (probabilistik) sismik tehlike analizi; gelecek depremlerin konumu, oluş zamanı, büyüklüğü ve diğer özellikler, olasılık hesaplarına dayalı olarak tahmin edilmektedir. Bunun devamında, tasarım spektrumlarının veya benzeştirilmiş kuvvetli yer hareketlerinin elde edilmesi; öngörülen deprem parametreleri ile uyumlu "anakaya" yer hareketinin belirlenmesi ve bunun, seçilen çalışma alanında yer alan zemin profiline uygulanarak zemin yüzeyinde tasarım yer hareketinin elde edilmesinde kullanılmaktadır (Işık,2010).

Depreme dayanıklı yapı tasarımında, tasarıma esas deprem hareketinin gerçeğe en yakın şekilde simüle edilmesi konusu giderek önem kazanmaktadır. Tasarım deprem hareketini yer hareketi karakteristikleri cinsinden tanımlandığından, yer hareketi parametrelerini hesaplama yöntemlerine gerek duyulur. Yer hareketi parametrelerini hesaplamada, belirli bir yer hareketi parametresini o parametreyi en kuvvetli şekilde etkileyen büyüklükler cinsinden ifade eden azalım ilişkileri kullanılmaktadır. Azalım ilişkileri, sismik tasarımda kullanılan sismik tehlike analizinde önemli rol oynamaktadır (Erdik, 2003).

Bu çalışmada Türkiye ve dünyada geçerli olan 5 amprik azalım ilişkisi kullanılarak değerlendirilmiştir. Bu çalışmada Ulusay vd. (2004), Çeken vd. (2008), Kalkan – Gülkan (2004), Boore vd. (1997) ve Akkar - Bommer (2010) azalım ilişkileri kullanılmıştır. Bu azalım ilişkileri kullanılarak, farklı yerel zemin koşulları dikkate alınarak tahmini en büyük ivme değerleri hesaplanmıştır. Çalışmadaki amaç farklı zemin koşullarının ivme değerleri üzerindeki etkisinin incelenmesidir.

Materyal ve Metot

Depremler, iç dinamik süreçlerle yerkabuğu içerisinde meydana gelen deformasyonların yarattığı ve jeolojide fay olarak tanımlanan kırılmalar sonucu oluşan yer sarsıntılarıdır. Depremin büyüklüğü (magnitüd), kırılma (faylanma) esnasında açığa çıkan enerjinin miktarına bağlı olarak değişir. Genelde, boşalan enerji kırılma merkezinden uzaklaştıkça giderek azalır. Fakat, bazen lokal jeolojik yapı özelliklerinden kaynaklanan olumsuz zemin koşulları bu durumu değiştirebilir ve kaynaktan uzak olmasına rağmen depremin yıkıcı etkisinin beklenilenden fazla olmasına yol açabilir. Bu nedenle herhangi bir bölgenin deprem potansiyeli değerlendirilirken depreme yol açan fayların (aktif fay) ve yerel zemin özelliklerinin iyi bilinmesi gerekmektedir (Akdeniz, 2003).

Bir deprem sırasında oluşan zemin titreşimleri, deprem odağından çevreye yayılacak ve etkileri zemin koşullarına bağlı olarak odaktan uzaklaştıkça değişecek ve genellikle azalacaktır.

Depreme dayanıklı yapı tasarımında performansa dayalı tasarım yaklaşımının benimsenmesi ile birlikte, kuvvetli yer hareketinin gerçeğe en yakın şekilde benzeştirilmesi konusu önem kazanmıştır. Zaman tanım alanında gerçekleştirilen doğrusal olmayan dinamik analizde kullanılan bilgisayar yazılımları ve yapısal modelleme tekniklerindeki son gelişmeler, bu tip analizlerde girdi olarak kullanılan yapay ivme benzeşimleri konusunu ön plana çıkarmaktadır. Tasarım depremi olarak, benzer özellikler taşıyan mevcut deprem kayıtlarının kullanılması uygun gözükse dahi, tektonik yapı, deprem büyüklüğü, yerel jeoloji ve yakın fay bölgesi koşullarını sağlayan uygun bir veri dizisinin bulunması çok olası değildir (Erdik, 2003).

Depremin ivmesi, deprem anında zeminin ne kadar miktarda ve ne hızla sarsıldığının bir ölçüsüdür. Deprem sırasında yerin sarsılması aynı zamanda ivme olayıdır. Maksimum (Pik) ivme, deprem sırasında kaydedilen en büyük ivme değeridir. Kuvvetli yer hareketi ölçümlerindeki amaç, deprem sırasında oluşan yer ivmesini ölçmektir. İvme kayıtları mühendislik uygulamaların ve bilimsel çalışmalar için önemli veri tabanı oluşturmaktadır. Önemli mühendislik bilgileri içeren bu ivme değerleri, depreme dayanıklı yapı tasarımı konusunda, depremin uzaklıkla olan azalım ilişkileri geliştirilmesinde kullanılmaktadır. Herhangi bir istasyonda kaydedilmiş bir depremin, istasyondan değişik uzaklıklardaki yerleşim birimlerinde beklenen hasar tahmini ve şiddet dağılımı belirlenebilmektedir. Deprem tehlikesi belirlemesinde, en önemli dinamik parametreyi depremin ivmesi teşkil etmektedir. Ancak bazı durumlarda deprem ivmesini kaydetmek mümkün değildir. Bu gibi durumlarda farklı kaynak ve zemin koşullarında daha önce elde edilmiş deprem verileri kullanılarak elde edilen azalım ilişkileri kullanılarak elde edilen azalım ilişkileri kullanılarak bir bölge için en büyük yer hareketinin değeri tahmin edilebilmektedir. Bu azalım ilişkilerinde genel olarak yer hareketinin değişimi; yerel zemin koşulları, deprem

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büyüklüğü ile kaynak ve çalışılan bölge arasındaki mesafe ilişkileri kullanılmaktadır. Günümüzde dünyanın çeşitli bölgeleri için ivme azalım ilişkileri mevcut olup, yaygın olarak kullanılmaktadır. Günümüzde kullanılan azalım ilişkilerinin çoğu farklı periyotlara karşılık gelen spektral ivme genliklerinin hesaplanmasına dayanmaktadır. Bunun başlıca nedeni, deprem ile ilgili mühendislik hesaplarında yer ivmesinin çok önemli rol oynamasıdır (Afad, 2016).
Depremler sırasında kuvvetli yer hareketinin ölçülmesi; depremin fiziksel boyutunun, deprem dalgasının yayılım karakteristiğinin, etkin süresinin, frekans içeriğinin, deprem-yer-yapı etkileşiminin, deprem yüklerinin doğru tespitinin ve yıkıcı etkilerinin kestirilmesi gibi çeşitli mühendislik çalışmalarında kullanılmaktadır. Kuvvetli yer hareketi kayıtlarının incelenmesi, mühendislik yapılarının deprem sırasındaki davranışlarının ve hasar görebilirliğinin tahmininde kullanılan temel girdilerden birisidir. Şüphesiz, yıkıcı bir deprem sırasında en önemli dinamik parametrelerden birisi, depremin ivmesidir. Bu sebeple, depremin dinamik etkilerini yerinde ölçmek ve depremi daha doğru değerlendirmek amacıyla deprem potansiyeli yüksek birçok ülkede, çok sayıda ulusal ve yerel ölçekte ivme-ölçer ağları kurularak kuvvetli yer hareketi (ivme) gözlemleri yapılmaktadır (Afad, 2016a).

Azalım ilişkileri kullanılarak yer hareketlerinin tahmin edilmesinde en fazla gereksinim duyulan parametreler; deprem büyüklüğü (M), fay türü, incelenen alan ile deprem kaynağı arasındaki uzaklık (R) ve zemin sınıfı, ya da zeminin kaya, yumuşak ya da sıkı zemin olması gibi yerel zemin koşullarıdır.

Yerel jeolojik zemin koşullarının sismik hareketlerin karakterlerini doğrudan etkilediği ve değiştirdiği, bu zeminler üzerindeki mevcut yapılar üzerinde hasara sebep olabileceği bilinen bir gerçektir. Çalışmada TDY 2007' de verilen zemin sınıfları dikkate alınmıştır (Tablo 1).

Tablo 1. Zemin sınıfları (TDY, 2007)

Zemin Grubu	*Zemin Grubu Tanımı*	*Stand. Penet.*	*Relatif Sıkılık*	*Serbest Basınç Direnci*	*Kayma Dalgası Hızı*
	1. Masif volkanik kayaçlar ve ayrışmamış sağlam metamorfik kayaçlar, sert çimentolu tortul kayaçlar....	(N/30)	(%)	(kPa)	(m/s)
A	2. Çok sıkı kum, çakıl.....	—	—	> 1000	> 1000
	3. Sert kil ve siltli kil.....	> 50	85–100	—	> 700
		> 32	—	> 400	> 700
	1. Tüf ve aglomera gibi gevşek volkanik kayaçlar, süreksizlik düzlemleri bulunan ayrışmış çimentolu tortul kayaçlar.....				
B	2. Sıkı kum, çakıl.....	—	—	500–1000	700-1000
	3. Çok katı kil ve siltli kil...	30–50	65–85	—	400–700
		16–32	—	200–400	300–700
	1.Yumuşak süreksizlik düzlemleri bulunan çok ayrışmış metamorfik kayaçlar ve çimentolu tortul kayaçlar.....				
C	2. Orta sıkı kum, çakıl.....	—	—	< 500	400–700
	3. Katı kil ve siltli kil.....	10–30	35–65	—	200–400
		8–16	—	100–200	200–300
	1.Yeraltı su seviyesinin yüksek olduğu yumuşak, kalın alüvyon tabakaları.....				
D	2. Gevşek kum.....	—	—	—	< 200
	3. Yumuşak kil, siltli kil....	< 10	< 35	—	< 200
		< 8	—	< 100	< 200

Bu çalışmada Türkiye ve dünyada geçerli olan 5 amprik azalım ilişkisi kullanılarak değerlendirilmiştir. Bu çalışmada Ulusay vd. (2004) , Çeken Vd. (2008) , Kalkan – Gülkan (2004), Boore vd. (1997) ve Akkar - Bommer (2010) azalım ilişkileri kullanılmıştır. Bu azalım ilişkileri kullanılarak, farklı yerel zemin koşulları dikkate alınarak tahmini en büyük ivme değerleri hesaplanmıştır. Çalışmadaki amaç farklı zemin koşullarının ivme değerleri üzerindeki etkisinin incelenmesidir. Yerel zemin koşullarının yanı sıra fay cinsi de dikkate alınan parametrelerden biri olmuştur. Fay cinsi olarak normal, ters ve doğrultu atımlı faylar dikkate alınmıştır. Deprem magnitüdü değerleri olarak 7.4, 7.2, 7.0, 6.5, 6.0, 5.5 ve 5.0 değerleri alınmıştır. Mesafe olarak deprem üssüne 50km uzaklık dikkate alınmıştır (Tablo 2).

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Tablo 2a. Magnitüdü7.4 olan depremin farklı zemin ve fay çeşidine göre elde edilen en büyük ivme değerleri

Magnitude	7,4			Distance	50km				(cm/s^2)			
Soil Type	A			B			C			D		
Fault Type / Attenuation Relations	N	T	D	N	T	D	N	T	D	N	T	D
Ulusay et all (2004)	157.79	157.79	157.79	157.79	157.79	157.79	187.21	187.21	187.21	238.39	238.39	238.39
Çeken et all (2008)	84.47	84.47	84.47	84.47	84.47	84.47	105.60	105.60	105.60	131.73	131.73	131.73
Kalkan and Gülkan (2004)	85.23	85.23	85.23	85.23	85.23	85.23	95.33	95.33	95.33	109.50	109.50	109.50
Boore et all (1997)	78.55	78.55	78.55	78.55	78.55	78.55	102.66	102.66	102.66	137.71	137.71	137.71
Akkar and Bommer (2010)	95.59	95.59	79.48	95.59	95.59	79.48	74.76	99.01	82.33	88.29	116.94	97.23
Average	100.33	100.33	97.10	100.33	100.33	97.10	113,11	117,96	114,63	141,12	146,85	142,91
N: Normal R: Reverse S:Strike-slip												

Tablo 2b. Magnitüdü7.2 olan depremin farklı zemin ve fay çeşidine göre elde edilen en büyük ivme değerleri

Magnitude	7,2			Distance	50km				(cm/s^2)			
Soil Type	A			B			C			D		
Fault Type / Attenuation Relations	N	R	S	N	R	S	N	R	S	N	R	S
Ulusay et all (2004)	136.47	136.47	136.47	136.47	136.47	136.47	161.91	161.91	161.91	206.18	206.18	206.18
Çeken et all (2008)	79.71	79.71	79.71	79.71	79.71	79.71	99.66	99.66	99.66	124.32	124.32	124.32
Kalkan and Gülkan (2004)	80.31	80.31	80.31	80.31	80.31	80.31	89.32	89.32	89.32	103.17	103.17	103.17
Boore et all (1997)	70.69	70.69	70.69	70.69	70.69	70.69	92.39	92.39	92.39	121.33	121.33	121.33
Akkar and Bommer (2010)	87.01	87.01	72.35	87.01	87.01	72.35	68.05	90.13	74.94	80.37	106.44	88.51
Average	90,84	90,84	87,91	90,84	90,84	87,91	102,27	106,68	103,64	127,07	132,29	128,70
N: Normal R: Reverse S:Strike-slip												

Tablo 2c. Magnitüdü7.0 olan depremin farklı zemin ve fay çeşidine göre elde edilen en büyük ivme değerleri

Magnitude	7,0			Distance	50km				(cm/s^2)			
Soil Type	A			B			C			D		
Fault Type / Attenuation Relations	N	R	S	N	R	S	N	R	S	N	R	S
Ulusay et all (2004)	118.03	118.03	118.03	118.03	118.03	118.03	140.03	140.03	140.03	178.31	178.31	178.31
Çeken et all (2008)	73.83	73.83	73.83	73.83	73.83	73.83	92.30	92.30	92.30	115.13	115.13	115.13
Kalkan and Gülkan (2004)	75.02	75.02	75.02	75.02	75.02	75.02	83.90	83.90	83.90	96.38	96.38	96.38
Boore et all (1997)	63.62	63.62	63.62	63.62	63.62	63.62	83.15	83.15	83.15	109.10	109.10	109.10
Akkar and Bommer (2010)	78.03	78.03	64.88	78.03	78.03	64.88	61.02	80.82	67.20	72.07	95.45	79.37
Average	81,71	81,71	79,08	81,71	81,71	79,08	92,08	96,04	93,32	114,20	118,87	115,66
N: Normal R: Reverse S:Strike-slip												

Tablo 2d. Magnitüdü6.5 olan depremin farklı zemin ve fay çeşidine göre elde edilen en büyük ivme değerleri

Magnitude	6,5			Distance	50km				(cm/s^2)			
Soil Type	A			B			C			D		
Fault Type / Attenuation Relations	N	R	S	N	R	S	N	R	S	N	R	S
Ulusay et all (2004)	82.10	82.10	82.10	82.10	82.10	82.10	97.41	97.41	97.41	124.04	124.04	124.04
Çeken et all (2008)	56.13	56.13	56.13	56.13	56.13	56.13	70.18	70.18	70.18	87.54	87.54	87.54
Kalkan and Gülkan (2004)	60.95	60.95	60.95	60.95	60.95	60.95	68.16	68.16	68.16	78.30	78.30	78.30
Boore et all (1997)	48.88	48.88	48.88	48.88	48.88	48.88	63.89	63.89	63.89	83.83	83.83	83.83
Akkar and Bommer (2010)	55.64	55.64	46.27	55.64	55.64	46.27	43.52	57.63	47.92	51.39	68.07	56.60
Average	60,74	60,74	58,87	60,74	60,74	58,87	68,63	71,45	69,51	85,02	88,36	86,06
N: Normal R: Reverse S:Strike-slip												

Tablo 2d. Magnitüdü6.0 olan depremin farklı zemin ve fay çeşidine göre elde edilen en büyük ivme değerleri

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Magnitude	6,0			Distance	50km				(cm/s^2)			
Soil Type	A			B			C			D		
Fault Type / Attenuation Relations	N	R	S	N	R	S	N	R	S	N	R	S
Ulusay et all (2004)	57.11	57.11	57.11	57.11	57.11	57.11	67.76	67.76	67.76	86.28	86.28	86.28
Çeken et all (2008)	37.95	37.95	37.95	37.95	37.95	37.95	47.45	47.45	47.45	59.18	59.18	59.18
Kalkan and Gülkan (2004)	46.93	46.93	46.93	46.93	46.93	46.93	52.49	52.49	52.49	60.30	60.30	60.30
Boore et all (1997)	37.56	37.56	37.56	37.56	37.56	37.56	49.09	49.09	49.09	64.41	64.41	64.41
Akkar and Bommer (2010)	36.13	36.13	30,04	36.13	36.13	30,04	28.26	37.42	31,12	33.37	44.20	36.75
Average	43,14	43,14	41,92	43,14	43,14	41,92	49,01	50,84	49,58	60,71	62,87	61,38
N: Normal R: Reverse S:Strike-slip												

Tablo 2e. Magnitüdü5.5 olan depremin farklı zemin ve fay çeşidine göre elde edilen en büyük ivme değerleri

Magnitude	5,5			Distance	50km				(cm/s^2)			
Soil Type	A			B			C			D		
Fault Type / Attenuation Relations	N	R	S	N	R	S	N	R	S	N	R	S
Ulusay et all (2004)	39.73	39.73	39.73	39.73	39.73	39.73	47.13	47.13	47.13	60.02	60.02	60.02
Çeken et all (2008)	22.81	22.81	22.81	22.81	22.81	22.81	28.52	28.52	28.52	35.58	35.58	35.58
Kalkan and Gülkan (2004)	34.26	34.26	34.26	34.26	34.26	34.26	38.32	38.32	38.32	44.01	44.01	44.01
Boore et all (1997)	28.86	28.86	28.86	28.86	28.86	28.86	37.72	37.72	37.72	49.49	49.49	49.49
Akkar and Bommer (2010)	21.36	21.36	17.76	21.36	21.36	17.76	16.71	22.13	18.40	19.73	26.13	21.73
Average	29,40	29,40	28,68	29,40	29,40	28,68	33,68	34,76	34,02	41,77	43,05	42,17
N: Normal R: Reverse S:Strike-slip												

Tablo 2f. Magnitüdü5.0 olan depremin farklı zemin ve fay çeşidine göre elde edilen en büyük ivme değerleri

Magnitude	5,0			Distance	50km				(cm/s^2)			
Soil Type	A			B			C			D		
Fault Type / Attenuation Relations	N	R	S	N	R	S	N	R	S	N	R	S
Ulusay et all (2004)	27.63	27.63	27.63	27.63	27.63	27.63	32.79	32.79	32.79	41.75	41.75	41.75
Çeken et all (2008)	12,20	12,20	12,20	12,20	12,20	12,20	19,02	19,02	19,02	19,02	19,02	19,02
Kalkan and Gülkan (2004)	23.71	23.71	23.71	23.71	23.71	23.71	26.51	26.51	26.51	30.46	30.46	30.46
Boore et all (1997)	22.17	22.17	22.17	22.17	22.17	22.17	28.98	28.98	28.98	38.03	38.03	38.03
Akkar and Bommer (2010)	11,50	11,50	9,56	11,50	11,50	9,56	8,99	11,91	9,90	10,62	14,07	11,7
Average	19,44	19,44	19,05	19,44	19,44	19,05	23,26	23,84	23,44	27,98	28,67	28,19
N: Normal T: Ters D.:Doğrultu atımlı												

Sonuçlar ve Tartışma

Bu çalışmada Türkiye ve dünyada geçerli olan 5 amprik azalım ilişkisi kullanılarak hesaplamalar yapılmıştır. Bu azalım ilişkileri kullanılarak, farklı yerel zemin koşulları dikkate alınarak tahmini en büyük ivme değerleri hesaplanmıştır. Hesaplamalar yapılırken fay tipleri olarak normal, ters ve doğrultu atımlı faylar seçilmiştir. Deprem magnitüdü değerleri olarak 7.4, 7.2, 7.0, 6.5, 6.0, 5.5 ve 5.0 değerleri alınmıştır. Deprem üssüne 50km uzaklık dikkate alınmıştır.

Zemin koşullarının deprem etkisindeki yapıların davranışını değiştirmektedir. Yöreye özgü zemin hesaplamaları hassasiyetle yapılmalıdır. Özel zemin koşullarına sahip yerleşim bölgelerindeki yapıların maruz kalacakları deprem etkilerinin farklı olabileceği açıkça görülmektedir.

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ZİHİNSEL VE RUHSAL ENGELLİLERE YÖNELİK TERAPİ BAHÇELERİ: ÖZEL BAKIM MERKEZLERİ ÖRNEĞİ

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Özet:
Sürdürülebilir kentlerde insanların ruh sağlığının iyileştirilmesinde bir araç olarak karşımıza çıkan terapi bahçeleri, peyzaj mimarlarının ilgi alanlarından biridir. Terapi bahçelerinin planlama ve tasarım aşamaları, ilgili tıp alanında çalışan uzmanların da sürece dâhil olmasını gerektirmektedir. Dünyada hastane ve özel bakım merkezlerinde uygulanan birçok terapi bahçesinin bulunması, bu konuya verilen önemi ortaya koymaktadır. Türkiye'de ise son yıllarda gündeme gelmesine karşın, terapi bahçelerinin uygulanması konusuna yeterince önem verilmediği görülmektedir. Bu çalışmada Zonguldak-Bartın-Karabük (ZBK) Planlama Bölgesi'nde yer alan ve Aile ve Sosyal Politikalar Bakanlığı'na (ASPB) bağlı özel bakım merkezleri incelenmiştir. Çalışma kapsamında araştırılan özel bakım merkezlerinde terapi bahçesi bulunmadığı saptanmış, engelli bireylerin fiziksel ve ruhsal ihtiyaçlarının karşılanabilmesi için gerekli olan terapi bahçelerine ilişkin planlama ve tasarım ölçütleri geliştirilmiştir. Dört aşamada tamamlanan çalışmanın birinci aşamasında konuyla ilgili temel kavramlar, ilgili yasa ve yönetmelikler, teknik raporlar ve istatistiklere ilişkin literatür ve veri taraması yapılmıştır. Çalışma kapsamında terapi bahçeleri konusuna ilişkin yapılmış çalışmalar ile dünyada ve Türkiye'de uygulanmış olan terapi bahçesi örnekleri incelenmiştir. Çalışma alanının seçildiği ikinci aşama arazi çalışmalarını kapsamaktadır. Üçüncü aşamada, elde edilen tüm veriler terapi bahçelerinde göz önünde bulundurulması gereken tasarım ölçütlerinin belirlenebilmesi için analiz edilmiştir. Dördüncü aşamada "sürdürülebilirlik, yönlendirme, ulaşılabilirlik, sosyalleşme, anlamlı aktivite, hatırlatma, duyusal uyarım, güvenlik" başlıkları altında kabul edilen tasarım prensipleri doğrultusunda çalışma alanına ilişkin öneriler geliştirilmiştir.

Anahtar Kelimeler: Terapi Bahçeleri, Özel Bakım Merkezleri, Peyzaj Tasarımı.

Giriş

Gelişen teknoloji ve nüfus artışının getirdiği yoğun kentleşme, insan psikolojisi üzerinde olumlu etkileri olduğu bilinen doğal alanların azalmasına ve insanların doğadan giderek uzaklaşmasına neden olmaktadır. Bu durum, insanlarda depresyon ve bunalım gibi psikolojik ve zihinsel rahatsızlıkların görülme olasılığını artırmaktadır. Bu rahatsızlıklardan kurtulmak, fizyolojik ve psikolojik yönden kendini iyi hissetmek isteyen insanlarda, doğaya yönelme eğiliminin başladığı görülmektedir. Geçmişten günümüze kadar doğanın tedavi amacıyla kullanıldığı bilinmektedir.

Doğa temelli terapi; bahçe etkinlikleri, doğa ile ilişkili algısal deneyimler ve sembolleri içeren farkındalığa dayalı bilişsel tedavi yaklaşımı olarak ifade edilebilir. Özellikle strese dayalı psikolojik hastalıkların tedavisinde doğa temelli terapi yaklaşımının uygulandığı görülmektedir (Sola Corazon vd., 2010; Sahlin vd., 2012).

Doğal peyzajın insan sağlığı üzerine olan etkisinin şehirleşmenin başladığı dönemde kendini göstermeye başladığı söylenebilir (Özgüner, 2004). Doğal peyzajın insan psikolojisi ve fizyolojisi üzerine etkilerini inceleyen araştırmalar ülkemizde yaygın olmamakla birlikte, uygulamaların eskiye dayandığı söylenebilir. Selçuklu ve Osmanlı dönemlerindeki darüşşifaların şifa bahçeleri kapsamında ele alınması, müziğin bir terapi yöntemi olarak kullanılması ve bitkilerin tedavi amaçlı kullanılması bu açıdan önemlidir. Gelişmiş ülkelerde bu konuda yapılan araştırma ve uygulamalar bulunmaktadır (Erer ve Atıcı, 2010). Terapi Peyzajları Ağı'na (*Therapeutic Landscapes Network*) (2013) göre; ABD'de Amerikan Peyzaj Mimarları Topluluğu (*American Society of Landscape Architects*-ASLA) tarafından denetlenen birçok rehabilitasyon bahçesi örneği mevcuttur. Ayrıca 1999'dan beri terapi bahçelerinin çevrimiçi bir veritabanı bulunmaktadır (Balode, 2013).

İyileştirme bahçeleri, psikiyatrik hastaların rekreasyonel gereksinimlerinin karşılanacağı tedavi amaçlı kentsel mekânlar yaratmaktadır. Sağlık kurum ve kuruluşlarında, kurumla koordineli olarak yapılan, bitkisel ve yapısal tasarım elemanlarını içeren bir peyzaj düzenlemesinin tedavinin bir parçası olduğu kabulü giderek yaygınlaşmaktadır (Keçecioğlu, 2014). Özellikle ruh ve sinir hastalıkları hastanelerindeki bahçelerin terapiye yönelik dış mekân planlama ve tasarımına ilişkin çalışmalar (Sakıcı, 2009; Sakıcı vd., 2013; Sakıcı & Var 2013)

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bu kapsamda önem taşımaktadır. Hastane bahçeleri ile özel bakım merkezlerine ait bahçelerin de açık-yeşil alanlar içinde yer alan dış mekânlar olduğu unutulmamalıdır. Bu bahçeler; terapi bahçelerinin planlama ve tasarım ölçütlerine uygun olarak kullanıcıların istek ve ihtiyaçlarına göre farklı etkinliklerin gerçekleştirileceği, konforlu ve kullanımı rahat mekânlar olarak düzenlenmelidir. Bu süreçte peyzaj mimarlarına önemli görevler düşmektedir (Sakıcı vd., 2013). Peyzaj mimarlığı alanında, iyileştirme bahçeleri teması henüz yeni ele alınmakla birlikte, uygulama açısından değerlendirildiğinde, peyzaj mimarlarının hastaneler ve yakın çevrelerinin tasarım sürecine olumlu etkileri olduğu saptanmıştır (Akın, 2006).

Terapi bahçelerinin tasarlanması, belirli bir hasta veya hasta grubunun iyileşmesine etki eden ya da tedavide ölçülebilir çıktılar sunan bir süreç olarak ifade edilebilir (Mitrione & Larson, 2007). Terapi bahçelerinin dönüştürücü (*transformative*) mekânlar olarak tasarlanması sürecinde tüm hedef kitlenin -hastalar, aile üyeleri, bakıcılar, gönüllüler, hasta yakınları ve kurum çalışanları- dikkate alınması tasarımın anlamlı olmasını sağlayacaktır (Burt, 2014). Terapi bahçeleri (*therapeutic gardens*) ile literatürde benzerlik gösteren kavramlar olarak; şifa/iyileştirme bahçeleri (*healing gardens*), hortikültürel bahçeler (*horticultural gardens*), rehabilitasyon bahçeleri (*rehabilitation gardens*) ve restoratif bahçeler (*restorative gardens*) sayılabilir. Bu bahçelerin; hastaneler, cezaevleri, ıslahevleri, huzurevleri, toplum ruh sağlığı merkezleri, psikiyatri merkezleri, rehabilitasyon merkezleri ve özel bakım merkezleri gibi kurumlarda uygulanması önerilmektedir. Dünyada birçok özel bakım merkezinde terapi bahçelerinin bulunması, bu konuya verilen önemi ortaya koymaktadır. Türkiye'de ise son yıllarda bu konu sık sık gündeme gelse de gereken önemin yeterince verilmediği görülmektedir.

Türkiye'de özel bakım merkezleri 16.08.2013 tarih ve 28737 sayılı Resmi Gazete'de yayınlanan "Bakıma Muhtaç Özürlü Bireylere Yönelik Özel Bakım Merkezleri Yönetmeliği"ne (ASPB, 2013) bağlı olarak çalışmaktadır. Yönetmelikte "Özel Bakım Merkezleri"; bakıma muhtaç özürlülerin bakımı için yatılı ve/veya gündüzlü hizmet veren, gerçek veya tüzel kişiler tarafından açılan ve sosyal hizmet kuruluşu statüsünde olan merkezler olarak tanımlanmaktadır. Yönetmelikte yer alan 30. ve 31. maddelerde, peyzaj tasarım sürecini etkileyecek olan ifadeler bulunmaktadır. 30. maddenin 1. bendinde yer alan "Merkez, gürültü ve hava kirliliğine maruz olmayan, insan sağlığını olumsuz yönde etkileyecek endüstriyel kuruluşlar ile her türlü gayrisıhhî müesseselerden uzak, ulaşıma elverişli, toplu yaşam alanlarının içinde ve çevre düzenlemesi yapılmış bir yerde açılır. Merkez binasının bulunduğu yerin, bakıma muhtaç engelli bireylerin geliş gidişlerinde trafik yönünden uygun ve emniyetli olması şartı aranır" ifadesi, merkezin konumu ve çevresel şartlarını tanımlamaktadır. Merkez binasının kullanımı ve fiziksel şartlarını tanımlayan 31. maddeye göre ise; bina ahşap olmamalı, engelli grupların özellikleri dikkate alınarak belirlenen erişilebilirlik standartlarına uygun olmalı, merkez binasına ait bahçenin büyüklüğü yatak odası olarak kullanılacak zorunlu alanların toplam büyüklüğünden az olmamalıdır.

Bu çalışmada ZBK Planlama Bölgesi'nde yer alan ve ASPB'ye bağlı özel bakım merkezlerinin incelenmesi ve terapi bahçelerinin tasarımına ilişkin öneriler geliştirilmesi amaçlanmıştır.

Materyal ve Yöntem

Çalışma alanı olarak belirlenen ZBK Planlama Bölgesi, Karadeniz Bölgesi'nin Batı Karadeniz bölümünde yer almakta olup (Şekil 1), Türkiye'nin 3. derecede gelişmiş bölgeleri arasında 11. sıradadır. Bölgenin en önemli özelliği yeraltı kaynakları açısından zengin olmasıdır. Buna bağlı olarak madencilik ve demir-çelik sanayi gelişmiştir. Bölge içindeki en gelişmiş il Zonguldak'tır. Bartın 1991, Karabük ise 1995 yılında Zonguldak'tan ayrılarak il statüsüne kavuşmuştur (BAKKA, 2011).

Türkiye'de en az bir engeli olanların il nüfuslarına oranlarına bakıldığında Zonguldak, Bartın ve Karabük illerinin Türkiye ortalamasının (% 6,9) üzerinde olduğu görülmektedir (TÜİK, 2011). Bu durum, ZBK Planlama Bölgesi'nin çalışma alanı olarak seçilmesinde önemli bir etkendir. Çalışma sonucunda bu bölgede, zihinsel ve ruhsal engellilere hizmet veren, Zonguldak ve Bartın illerinde yer alan 2 adet özel bakım merkezi olduğu saptanmıştır.

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Şekil 1. ZBK Planlama Bölgesi'nin ülke ve bölge içindeki konumu (TÜİK, 2011).

Çalışma 4 aşamada tamamlanmıştır. Birinci aşamada konuyla ilgili temel kavramlar, ilgili yasa ve yönetmelikler, teknik raporlar ve istatistiklere ilişkin literatür ve veri taraması yapılmıştır. Çalışma kapsamında terapi bahçeleri konusuna ilişkin yapılmış çalışmalar ile Türkiye'de ve dünyada uygulanmış olan terapi bahçesi örnekleri incelenmiştir. Çalışma alanının da seçildiği ikinci aşama arazi çalışmalarını kapsamaktadır. Bu aşamada, derin mülakat yöntemi kullanılarak kurum yetkilileri ve çalışanları ile yüz yüze görüşmeler yapılmıştır. Mekânsal olanakların analiz edilmesi ve değerlendirilmesi amacıyla, kurumlardan 1/50 ölçekli mimari projeler elde edilmiş ve arazi çalışmaları sürecinde yapılan alan analizi aşamasında alandan fotoğraflar çekilmiştir. Üçüncü aşamada, elde edilen tüm veriler terapi bahçelerinde göz önünde bulundurulması gereken tasarım ölçütlerinin belirlenebilmesi için analiz edilmiştir. Bergeman'ın (2012) çalışmasında belirlenen ölçütler (dikkat dağıtma, duygu kontrolü, stres düzenleme, fiziksel hareket olanağı sağlama, sosyal destek fırsatları sunma ve bireysel iletişim kurma) terapi bahçelerinin tedaviye ilişkin tasarım ölçütleri olarak kabul edilmiş ve alanla ilişkilendirilmiştir. Çalışmanın dördüncü ve son aşamasında belirlenen tasarım ölçütleri ve Shamanth (2014) tarafından belirlenen tasarım prensipleri "sürdürülebilirlik (*sustainability*), yönlendirme (*orientation*), ulaşılabilirlik (*accessibility*), sosyalleşme (*socialisation*), anlamlı aktivite (*meaningful activity*), hatırlatma (*reminiscence*), duyusal uyarım (*sensory stimulation*), güvenlik (*safety*) başlıkları altında toplanmış ve çalışma alanına ilişkin öneriler geliştirilmiştir.

Bulgular ve Tartışma

Türkiye'de ASPB'ye bağlı olup, zihinsel ve ruhsal engelli bireylere hizmet veren 156 adet özel bakım merkezi bulunmaktadır. Bu merkezlerin % 61'inin bir bahçeye sahip olduğu, ancak terapi bahçesi niteliğinde bir çalışmanın yapılmadığı saptanmıştır. ZBK Planlama Bölgesi'ndeki zihinsel ve ruhsal engellilere yönelik Özel Çaycuma Bakım Merkezi ve Özel Bartın Bakım Merkezi adlarında 2 adet özel bakım merkezine ilişkin bilgiler Tablo 1'de verilmiştir.

Tablo 1. Çalışma alanlarına ilişkin genel bilgiler.

Adı	**Özel Çaycuma Bakım Merkezi**	**Özel Bartın Bakım Merkezi**
İli	Zonguldak	Bartın
Engel Grubu	Zihinsel/Ruhsal	Zihinsel
Yaş Grubu	18+	18+
Cinsiyet	Karma	Karma
Kapasite	60	57
Terapi Bahçesi Varlığı	Yok	Yok

Özel Çaycuma Bakım Merkezi, 2012 yılının Aralık ayında kurulmuştur. Merkez toplam 60 kişilik yatak kapasitesine sahip olup, şu anda 40 kişiyi barındırmaktadır. Bakıma Muhtaç Özürlülere Yönelik Özel Bakım Merkezleri Yönetmeliği'ne göre 2013 yılı ve öncesinde açılan bakım merkezleri karma (zihinsel/ruhsal/bedensel) olarak açılabiliyorken, 2013 yılı sonrasında güncellenen yönetmelik gereği tek engel grubuna yönelik olarak düzenlenmesi gerekmektedir (ASPB 2006; ASPB, 2013). 2013 yılı öncesi Bakıma Muhtaç Özürlülere Yönelik Özel Bakım Merkezleri Yönetmeliği'ne tabi olan Özel Çaycuma Bakım Merkezi zihinsel ve ruhsal engellilere yönelik olarak açılmıştır. Bu Merkez'de sorumlu müdür, sosyal hizmetler uzmanı, sağlık personeli, bakıcı ve hizmetliler görev yapmaktadır. Hasta bakımından sorumlu olan personel sayısı 16'dır. Binanın oturum alanı yaklaşık 250 m² olup zemin kat dâhil olmak üzere 3 katlıdır. Zemin haricindeki her katta 2

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adet yatakhane, banyo ve tuvaletten oluşan 2 daire ve her daireye özel 2 adet de etkinlik odası bulunmaktadır. Etkinlik odaları dinlenme ve serbest etkinlik amaçlı kullanılmaktadır. Zemin katta 2 tane yönetici odası, ortak kullanım alanı (televizyon odası), sağlık odası, özel bakım odası, ibadethane, bireysel görüşme odası, sosyal servis, yemekhane, mutfak, WC ve personel odası bulunmaktadır. Binaya sonradan eklenen bölüm ise çamaşırhane olarak kullanılmaktadır. Bahçenin tamamı kilitli parke taş döşemeli sert zeminden oluşmaktadır ve dört bir kenarı güvenlik gerekçesi ile 2 m yüksekliğinde demir ve plastik içerikli sınır elemanı ile sınırlandırılmıştır. Güvenlik gerekçesi ile bahçe kapısı her zaman kilitli olup, ziyaretçiler kontrollü olarak içeri alınmaktadır. Bahçenin içe bakan kısmında sınır elemanlarının önünde genişliği 1 m olan yeşil bant bulunmaktadır. Bahçede 2 adet kameriye bulunmaktadır. Uygun hava koşullarında taşınabilir oturma birimleri ile bahçe imkânları değerlendirilebilmektedir (Şekil 2).



Şekil 2. Özel Çaycuma Bakım Merkezi'nin konumu, iç ve dış mekânlarına ilişkin görüntüler

Özel Bartın Bakım Merkezi, 2016 yılının Şubat ayında kurulmuştur. Toplam 57 kişilik yatak kapasitesine sahip olan merkezde sadece ağır zihinsel engelli olan toplam 15 kişi barınmaktadır. Bartın Özel Bakım Merkezi de bu yönetmelik gereği (ASPB, 2013) zihinsel engellilere yönelik olarak açılmıştır. Bakım merkezine sadece ağır zihinsel engelli raporu bulunan hastalar, ailelerinin izni ile yerleştirilmektedir. Özel teşebbüsler tarafından açılan ve yönetilen bakım merkezine ASPB her hastanın bakım giderleri için maddi destek sağlamaktadır. Denetleme işlemleri belirli periyotlarda ASPB tarafından yapılmaktadır (ASPB, 2013). Bartın Özel Bakım Merkezi'nde görev yapan 12 personelden 2'si sağlık personeli, 2'si sosyal hizmetler uzmanı, 7'si bakıcı ve 1'i hizmetli olarak çalışmaktadır. Yönetimden sorumlu kişiler 4 yıllık lisans düzeyinde eğitim veren ilgili bölümlerden; hasta bakımından sorumlu çalışanlar ise 2 yıllık ön lisans düzeyinde eğitim veren yüksekokulların ilgili programlarından mezun olmuş kişilerdir. Oturum alanı 1280 m² olan ve zemin kat dâhil olmak üzere toplam 4 kattan oluşan binada; zemin haricindeki her katta 2 adet yatakhane, banyo ve tuvaletten oluşan 2 daire ve her daireye özel 2 adet de etkinlik odası bulunmaktadır. Etkinlik odaları dinlenme ve serbest etkinlik amaçlı kullanılmaktadır. Zemin katta 2 tane yönetici odası, ortak kullanım alanı (televizyon odası), sağlık odası, özel bakım odası, ibadethane, bireysel görüşme odası, sosyal servis, yemekhane, mutfak, WC ve personel odası bulunmaktadır. Bina girişinden itibaren başlayan kılavuz iz ve görme engelliler alfabesinin (Braille) de kullanıldığı yönlendirme levhaları görme engelli bireyler tarafından da mekânın kullanımını kolaylaştırmaktadır. Bakıma Muhtaç Özürlülere Yönelik Özel Bakım Merkezleri Yönetmeliği'nde geçen "Bahçenin büyüklüğü, yatak odası olarak kullanılacak zorunlu alanların toplam büyüklüğünden az olamaz" ibaresine göre (ASPB, 2013); toplam bahçe alanı, 1800 m² olup, yönetmeliğe uygundur. Bahçenin tamamı kilitli parke taş döşemeli sert zeminden oluşmaktadır. Bahçe güvenlik gerekçesi ile 60 cm yüksekliğinde taş duvar üzerine, 2 m yüksekliğinde tel çit ile sınırlandırılmıştır. Bahçe kapısı her zaman kilitli olup, gelen ziyaretçiler kontrollü olarak içeri alınmaktadır. Bahçenin kuzeye bakan bölümünde biri engelli parkı olmak üzere 2 araçlık otopark mevcuttur. Kuzeydoğusu ise çiçek parteri oluşturmak amacıyla planlanmış, ancak uygulamaya aktarılamamış 1 m genişliğinde yeşil bantla çevrilidir. Bahçede herhangi bir oturma alanı, gölgelenmiş mekân ya da bitkisel

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düzenleme bulunmamaktadır. Ancak, taşınabilir oturma birimleri ile uygun hava koşullarında bahçe olanaklarından yararlanılabilmektedir (Şekil 3).



Şekil 3. Özel Bartın Bakım Merkezi'nin konumu, iç ve dış mekânlarına ilişkin görüntüler

Terapi bahçelerinde tasarım ilkeleri oluşturulurken dikkate alınması gereken ölçütler, Bergeman (2012) tarafından yapılan çalışmada önerilen terapi bahçeleri hedeflerinden geliştirilmiştir. Bu hedefler oluşturulurken, hastalar, kurum çalışanları ve hasta yakınlarından oluşan farklı kullanıcı grupları göz önünde bulundurulmuştur. Tablo 2'de bu kullanıcı grupları ile ölçütler arasındaki ilişki verilmiştir.

Tablo 2. Terapi bahçelerinde tasarım ilkeleri oluşturulurken dikkate alınması gereken ölçütler ve kullanıcı grupları ilişkisi (Bergeman, 2012)

Ölçütler	Hasta	Kurum Çalışanı	Hasta Yakını
Dikkat Dağıtma	x	x	x
Duygu Kontrolü	x		
Stres Düzenleme	x	x	x
Fiziksel Hareket İmkânı Sağlama	x		
Sosyal Destek Fırsatları Sunma	x	x	x
Bireysel İletişim Kurma	x		x

Terapi bahçelerinin psikolojik, sosyal ve fiziksel yararları bulunmaktadır. Bu bahçelerin özellikleri olarak; zamanlanmış ve programlanmış aktiviteler içermesi, ulaşılabilir olması, sınırlarının iyi tanımlanmış olması, insan-bitki etkileşimini güçlendirmesi, tedaviyi destekleyici koşulların varlığı, çok amaçlı tasarımları içermesi, fark edilebilir mekânların varlığı sıralanabilir (Hazen, 201.).

Bunun yanı sıra; sınırlı zihinsel ve fiziksel beceriye sahip olan engelli bireylerin, kendi içinde farklı potansiyellere sahip olabileceği de hesaba katılmalıdır. Bu potansiyeller doğrultusunda terapi bahçeleri oluşturulurken; hastaları sosyal, psikolojik, fiziksel yönlerden destekleyecek, özgüven duygularını geliştirecek ve bireysel becerilerini artıracak yönde uygulamalar yapılmalıdır (Uslu & Shakouri, 2012).

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Tartışma ve Sonuç

Sağlık kuruluşlarına ait bahçelerin de tedavinin bir parçası olarak değerlendirilmeleri gerekmektedir. Bahçelerin tedaviye destek olacak şekilde fonksiyonel ve estetik olarak tasarlanması hastaların tedavi süreçlerini daha huzurlu, stresten uzak, mutlu geçirmesini ve tedaviye daha hızlı yanıt vermesini sağlayacaktır. Özel bakım merkezleri gibi kurum ve kuruluşlarda yalnız iç mekânlar önemsenmiş; dış mekânların kullanıcılara olumlu katkıları göz ardı edilmiştir.

Özel bakım merkezinde uygulanacak bir terapi bahçesinin planlama ve tasarım sürecinde peyzaj mimarı ve terapi bahçeleri konusunda bir klinik uzmandan profesyonel yardım alınması önerilmektedir. Terapi bahçesinin etkin kullanımının sağlanabilmesi amacıyla, mimarlar ve peyzaj mimarlarının tasarım sürecinde iç ve dış mekân arasındaki ilişkiyi kurgulayacak şekilde ortak çalışmaları gerekmektedir. Balode (2013) hedefe ulaşabilmek için küresel deneyimleri ve en iyi uygulamaları özümsemek, yenilikçi çözümler üretmek, bireysel gereksinimleri rehabilitasyon merkezlerine ve peyzajlara uyarlamak gerektiğini ifade etmektedir.

Terapi bahçelerinde; tasarım sürecine başlamadan önce kullanıcı grubunu bilmek önemlidir. İlgi grubunun özellikleri, hastalık tipi ve beklentilerine yönelik tasarımlar yapılmalıdır. Kullanıcı gruplarına bağlı olarak fiziksel aktiviteleri ve bahçeyi pasif biçimde deneyimleme olanakları dengeli olmalıdır. Bu bağlamda; AHTA'ya (2012) göre oluşturulacak terapi bahçelerinde göz önünde bulundurulması gereken tasarım prensipleri aşağıda sıralanmıştır (Shamanth, 2014):

- Sürdürülebilirlik: Bahçenin kullanımının sürdürülebilir olması için, düzenli bir aktivite programı olması ve düzenli bahçe bakımı yapılması gerekmektedir. Tasarım sürecinde peyzaj mimarının varlığı ile uygulama ve bakım sürecinde peyzaj teknikeri, sertifikalı bahçıvan gibi uzmanların ekibe katılması, kurum çalışanlarının bahçeyi iyi tanıması gibi etmenler terapi bahçelerinin başarısına etki edecektir.
- Yönlendirme: Bahçenin, bina içinden de rahatlıkla görünebilecek bir yerde konumlandırılması gerekmektedir. Basit bir yol sistemiyle, bahçe giriş ve çıkışının belirgin olması gerekmektedir.
- Ulaşılabilirlik: Bahçenin fiziksel, zihinsel ve ruhsal engelli tüm bireyler için ulaşılabilir olduğundan emin olunmalıdır. Ulaşılabilir olması için farklı yüksekliklerde bitki yataklarının olması gerekmektedir.
- Sosyalleşme: Yaşam kalitesini geliştirmeli; çalışanlar, hastalar ve aynı zamanda hasta yakınları arasındaki etkileşimi destekleyici ögeler içermelidir.
- Anlamlı aktivite: Terapi bahçelerinde yapılan aktiviteler hastaların iyileşme sürecinin bir parçası olup; hastalara yeni beceriler kazandırabilmelidir. Ruhsal durumu bozulma eğilimi olan hastalardaki gerilemeyi yavaşlatmaya yardımcı olmalıdır.
- Hatırlatma: Aktiviteler ve içerdiği ögelerle hastalar üzerinde hatırlatıcı özelliği olmalıdır.
- Duyusal uyarım: Beş duyuya da hitap etmelidir. Tedavilerine bağlı olarak bazı hastaların güneşe karşı duyarlılığı oluşabilmektedir. Bu nedenle güneşli ve gölge alanların dengeli bir şekilde oluşturulması gerekmektedir.
- Güvenlik: Hastaların, hasta yakınlarının ve kurum çalışanlarının güvenliğinin sağlanması önemlidir.

Özel Bakım Merkezleri gibi tedaviye dayalı kurum ve kuruluşlarda Peyzaj Mimarları ve Mimarların iç ve dış mekân tasarımına ilişkin plan kararlarına terapi peyzajlarını katmaları hem çalışanlar ve hasta yakınları hem de hastalar için önemli fırsatlar doğuracaktır. Sağlıkla ilgili etmenleri inceleyen bir tasarım perspektifi (*salutogenic design*) peyzaj mimarlığı ve tasarım sürecini insan sağlığını destekleyen ve sürekliliğini sağlayan, aynı zamanda masraflı olan sosyal, eğitsel, sağlık ve ekonomik müdahaleleri azaltan değerli bir araç haline getirmektedir (Souter-Brown, 2015). İnsanların doğa ile etkileşim içinde bulunacakları sağlıklı açık-yeşil alanlar yaratmak doğal yollarla, az masraflı ve sağlıklı (kimyasal ilaçlardan arınmış) olarak tedavi edilmelerine önemli katkılar sağlayacaktır.

Terapi bahçelerinin planlama ve tasarım sürecinde değerlendirilmesi gereken konular aşağıda özetlenmiştir: İç mekândan dış mekânın izlenebilir olması, erişilebilir olması, oturma mekânlarına/ kentsel donatılara yer verilmesi, yürüyüş yollarının basit patikalar halinde düzenlenmesi ve sabit döşeme malzemelerinin kullanılması, gölgeleme elemanı, su ögeleri, simgeler (*landmark/lar*) ve yön işaretleri kullanılması, dış mekândan tuvaletlere kolay anlaşılır yönlendirme levhalarının yerleştirilmesi, akşam aydınlatmasının sağlanması, dış mekânda acil durumlarda yardım isteyebilecekleri alarm sisteminin oluşturulması, dış mekân etkinliklerinin mevsimsel olarak süresinin artırılması amacıyla sera/kış bahçesi tasarlanması, çokduyulu (*multisensory*) deneyime yönelik mekânların oluşturulması, bitkisel tasarımda doğal peyzaj özelliklerinin yanı sıra beş duyuya hitap edecek çok yıllık, kokulu, kelebek ve kuşları çeken zehirli/batıcı olmayan süs bitkilerine yer verilmesi, yenilebilir (*edible*) peyzajı içeren tasarım yapılması (Shamanth, 2014; Thorsen Gonzalez & Kirkevold, 2016). Terapi bahçesinin

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tüm odalardan görülmesi etkinliklere katılımı sağlamak ve katılamayacak durumda olanlara uzaktan da olsa etkinlikleri izleyebilme olanağı sunulması açısından yararlı olacaktır.

Peyzajın doğallığı ile orantılı olarak sağlık ve memnuniyet de artmaktadır. Yeşil alanların varlığı, kırsal alanların sakinliği, kuş sesleri, çiçek ve toprak kokusu gibi peyzaja ait özelliklerin hastalar üzerinde olumlu etkisi bulunmaktadır. Buna bağlı olarak sağlık ile ilgili kurum ve kuruluşlarının yakınında duyu ya da terapi bahçelerinin gelişme eğiliminde olduğu görülmektedir (Balode, 2013). Terapi bahçelerinde farklı renk, doku ve formlarla duyuların uyarılacağı duyu bahçesi niteliğindeki bitkisel tasarım önem taşımaktadır (Erbino vd., 2015). Terapi bahçeleri hem estetik hem de fonksiyonel ölçütlere uyularak uygulanmak zorundadır. Çoğu bahçe insanları estetik açıdan memnun ederken, duyu ve terapi bahçeleri, insanın beş duyusuna da hitap edecek fonksiyonellikte oluşturulmuştur (Balode, 2013). Zihinsel engelli bireylerin (özellikle çocukların) rehabilitasyon amaçlı bulundukları kurumların bahçe düzenlemeleri yapılırken fiziksel güvenilirlik ve terapi açısından faydaları için fonksiyonellik ön planda tutulmalıdır (Bulut & Göktuğ 2006). Terapi bahçelerinin hedefi insanların iyileşmesi, sağlıklı olması ve doğayla etkileşim içinde bulunmasıdır.

Hastalıklara bağlı bazı etkilere yönelik oluşturulan terapi bahçelerinde planlama yapılırken aşağıdaki etmenlerin göz önünde bulundurulması önerilmektedir: Yön bulamamaya neden olan hastalıklar sebebiyle basit yapılar oluşturulması, kolay algılanabilir yollar ve girişlerin tasarlanması gerekmektedir; düşey peyzaj elemanlarının hastaların fiziksel ve ruhsal yönden emniyette olmalarını sağlaması ve bahçeden kaybolma risklerini azaltması nedeniyle terapi bahçelerinde çit veya ayırıcı duvarlar tasarlanmalıdır; yazın serin ve nemli bir ortam yaratması, sesiyle duyguları etkilemesi, havuz/çeşme/fıskiye olarak bir simge (*landmark*) özelliği ile kaybolma riskini azaltması nedenleri ile terapi bahçesinde su ögesi kullanılması önemlidir; bazı ilaçların kas yorgunluğuna sebep olması nedeniyle kolay erişilebilir dinlenme mekânları oluşturulmalıdır; güneşe karşı duyarlılığı artıran hastalıklar nedeniyle gölgeliklerin tasarlanması gerekmektedir; duyuların uyarılmasının tedavi sürecine katkı sağlayacağı bazı hastalıklar için farklı renklere, dokulara ve kokulara sahip bitkiler kullanılmalıdır; bitkilendirme tasarımı yapılırken hastaların alışık olduğu türden ve kelebek ve kuşları çeken bitkilendirme yapılmalı, toksik ve zararlı olmayan bitkilerin yanı sıra bahçede süreklilik için çok yıllık bitkiler kullanılmalıdır; yalnız çalışanlar için erişilebilir bir alan yaratılması, hastalardan uzak sakin bir dinlenme olanağı sunacağından önem taşımaktadır; dinlenme, okuma, fiziksel aktivite, rehabilitasyon aktivitesi (el işi, sanat terapisi, kutu oyunları vb), hortikültürel terapi, açık havada yemek, yakınlarla buluşma gibi etkinliklere olanak sağlayacak şekilde güneşli ve gölge alanlar, özel ya da sosyalleşme alanları, yürüme ya da dinlenme alanları gibi alternatiflerin sağlanması bahçenin etkin kullanımını sağlamak açısından önemlidir; açık mekân aktivitelerinin tüm yıl boyunca devam etmesi gerektiğinden kış bahçeleri ve seralar gibi korunaklı alanlar tasarlanmalıdır (Balode, 2013; Shamanth, 2014; Erbino vd., 2015).

Sonuç olarak, ilgili meslek disiplinlerinden uzmanları içeren ekiplerle oluşturulan terapi bahçeleri, özellikle toplumdan kendini soyutlamış ve ilaç tedavisinden yeterince verim alamayan zihinsel ve ruhsal engelli bireylerin topluma sağlıklı olarak kazandırılmaları, eksilen özgüven duygularını onarmaları, insanlarla karşılıklı ilişki kurabilmeleri ve kendilerini bir grubun parçası olarak görmeleri için önem taşımaktadır. Tüm odak gruplar için terapi bahçelerinin tedavi sürecine katkı sunacak şekilde doğayı hissedebilecekleri, flora ve faunayı inceleyebilecekleri nitelik taşıması önerilmektedir. Terapi bahçelerinin planlama, tasarım, uygulama ve bakım sürecine ilişkin verilen temel önerilerin yalnız ZBK Planlama Bölgesi'nde yer alan ve çalışma alanı olarak seçilen Özel Çaycuma Bakım Merkezi ve Özel Bartın Bakım Merkezi için değil; bundan sonra yapılması planlanan özel bakım merkezlerinin bahçeleri için de yönlendirici olacaktır.

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ZONGULDAK İLİ EMNİYET KEMERİ KULLANIM DURUMUNUN DEĞERLENDİRİLMESİ

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Dünyada, trafik kazaları ve buna bağlı oluşan ölümler, çözüm aranan en büyük sorunların başında gelmektedir. Kazalara bağlı oluşan ölümleri en aza indirebilmek için yapılan çalışmalar ve düzenlemeler devam etmektedir. Bunun yanı sıra kullanımı zorunlu olmasına ve kazalarda oluşacak ölüm riskini ciddi oranda azalttığı bilinmesine rağmen, özellikle ülkemizde emniyet kemeri kullanım oranı oldukça düşüktür.

Zonguldak'ta topoğrafik yapı ve mevcut yollar, trafik güvenliği açısından olumsuzluklar oluşturmaktadır. Sürücülerin, bu farkındalıkla emniyet kemeri kullanımlarının doğru orantılı olup olmadığının anlamlandırılması amacıyla bu çalışma yapılmıştır. Çalışmada, Zonguldak ilinde emniyet kemeri kullanım durumu gözlemlenmiştir. Gözlemler, D010 numaralı devlet karayolu üzerinde yapılmıştır. Hafta içi ve hafta sonu, sabah ve akşam olmak üzere yapılan gözlemlerde sürücüler ve ön koltuktaki yolcuların emniyet kemeri kullanıp kullanmadıkları belirlenmiştir. Buna ek olarak, cinsiyet ve yaş değişkenleri de gözlemlenmiştir. Elde edilen veriler yorumlanarak, emniyet kemeri kullanım oranlarının kadın ve erkeklere göre dağılımları yaşları ile ilişkilendirilmiştir. Elde edilen sonuçlarla ilgili konudaki literatür çalışmaları karşılaştırılarak, Zonguldak ili emniyet kemeri kullanım değerlendirmeleri yapılmıştır.

Keywords: Emniyet kemeri, trafik kazası, trafik güvenliği, Zonguldak.

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EXPOSURE ASSESSMENT OF HALOGENATED POPS IN STREET DUST IN AN INDUSTRIALIZED CITY

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Abstract: In past few decades, human health and quality of environment are deteriorated due to unrestrained use of Persistent Organic Pollutants (POPs).These chemical substances could remain unweathered (stable) in nature, be transported through different environmental pathways and bio-accumulate easily via lipid storage in adipose tissues. POPs may cause serious health problems like cancer, congenital disorders, immune system disorders or endocrine system disorders, etc. Within this context, in the year of 2001, an international environmental treaty, which is named as Stockholm Convention on POPs, was signed in Stockholm, Sweden. The main purpose of Stockholm Agreement is to eliminate or restrict the production, use, import and export of POPs. One of distribution pathways of POPs is via atmospheric transportation and this happens with street dust mostly. Street dust exposure is one of common and important dust exposures and it has become important to understand its constituents of POPs. In this study, street dust samples were gathered from 20 different points of highly industrialized precincts in Kocaeli Province. Collected dust samples were dedected simultaneously for 14 polybrominated diphenyl ethers (PBDEs) and 15 Poly Chlorinated Biphenyl (PCBs) isomers. For the analysis of PBDEs, Agilent 7890 N GC coupled with an Agilent 5977A mass spectrometer system was employed while PCBs were performed with Agilent 7890 N GC coupled with ECD dedector. Total centrations for Σ_{14}PBDE and Σ_{15}PCBs were measured as 76.52 and 16.87 ng g^{-1} respectively. The average daily intakes of $\sum_{14}$PBDEs were 1.96×10^{-1} ng/kg-day, 8.70×10^{-3} ng/kg-day and 2.99×10^{-5} ng/kg-day for dermal contact, ingestion and inhalation exposure, respectively. The contributions to $\sum_{14}$PBDEs exposure were approximately 95% and 5% for the dermal contact of street dust, whereas the exposure via inhalation of indoor dust was negligible. Exposure to $\sum_{15}$PCBs through dermal contact was the dominant route for human (4.52×10^{-1} ng/kg-day), while exposure by way of and ingestion (1.34×10^{-3}ng/kg-day) and inhalation ($5.94\times10^{-7)}$ ng/kg-day)of dust was negligibleAs a consequence, exposure to both PBDEs and PCBs contaminated street dust through dermal contact was the dominant route.

Keywords: street dust, risk assessment, Polybrominated Diphenyl Ethers (PBDEs), Polychlorinated Biphenyls (PCBs).

Introduction

Street dust as a complex environmental matrix refers to the load of deposited dust on an imperviously paved surface (Klees et al,2015). Furthermore, the term street dust refers not only to dust that exists on surfaces next to a road, but also to dust that accumulates on paved surfaces at industrial sites originating from processes taking place at those premises (Klees et al,2013). Health risks associated with uptake of contaminated dust may need to be evaluated, in particular at industrial sites (Klees et al.,2015).

Persistent organic pollutants (POPs) represent a diverse group of toxic substances that are semi-volatile, mobile in the environment, and prone to long-rang transport, and bioaccumulation. Soil acts as a natural sink for these toxic chemicals (Čupr et al., 2010; Hassanin et al., 2005; Meijer et al., 2002, 2003). Under the framework of the Stockholm Convention on POPs signed in 2001, a list of chemicals whose production, use and storage must be eliminated or severely restricted was produced (Yuan,2014). Polybrominated diphenyl ethers (PBDEs) are a class of additive flame retardants widely used in a variety of commercial and household products, such as polyurethane foam, plastics, textiles and electronics. They are similar in their physicochemical properties such as hydrophobicity, lipophilicity, thermal stability, and toxicity to polychlorinated biphenyls (PCBs), another well-studied group of contaminants (Chen et al., 2008).

Polychlorinated biphenyls (PCBs) are among the most persistent and toxic of the group of chemicals classified as persistent organic pollutants (POPs) (Salihoglu et al., 2011). Polychlorinated biphenyls (PCBs) are xenobiotic compounds of anthropogenic origin that are ubiquitous, toxic and persistent in the environment (Erickson, 1997).

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Owing to their properties of industrial interest, PCBs were extensively used in various applications as dielectric fluids, plasticizers, additives, among others, in many countries starting from the 1930s (Gedik,2010). Although their production was banned worldwide by the Stockholm Convention on POPs, they are still in use especially in closed applications, and hence, pose a threat to the environment and human health if handled improperly (Gedik,2010). Wei et al (2009) reported that 80% of polybrominated flame retardants were found in fine particles of indoor dust. However, the information regarding PCB fractionation in different size particles is limited. Besides, bioaccessibility, measured in vitro experiments simulating the digestion process in the human gastrointestinal tract, is often used as a substitute of bioavailability (Xing, 2008; Guney et al., 2010). The human health risk associated with bioaccessible fraction of dust should be used as an indicator to better estimate the absorbed dose after ingestion (Oomen et al., 2002). However, the bioavailability or bioaccessibility of PCBs is seldom reported in risk assessments, especially exposure to PCBs via in and outdoor dust (Wang et al.,2013).

Polybrominated diphenyl ethers (PBDEs) inhibit fires and slow fire burn rates to reduce the loss of property and lives to fire, including a variety of consumer goods such as building materials, textiles furniture, TV sets, computers circuit boards and casings, foams and upholstery (Tan et al., 2007; Lagalante et al., 2009). In 2001, global consumption of the technical PBDE mixtures Penta-, Octa-, and Deca-BDE was 7500, 3800, 56000 tons, respectively (Eguchi et al., 2013). PBDEs also have endocrine disrupting properties and some have been shown to affect the neurotoxic health (Main et al., 2007; Meeker et al., 2009). Due to their toxicological effect, the production and use of PBDE formulations have been banned in Europe, and Pentaand Octa-BDE have now been banned in North America and China (Wu et al.,2015). In 2009, PBDEs were added to the list of banned chemicals included in the Stockholm Convention on Persistent Organic Pollutants (Besis and Samara, 2012).

The aims of the study were to estimate the exposure and cancer risks associated with the ingestion, inhalation and dermal contact of PBDEs and PCBs in outdoor dustand to compare the risks due to exposure to PBDEs and PCBs in the outdoor dust.

Materials & Methods

Sampling

A composit dust samples were gathered from 20 homes floors of the volunteers utilizing a Nilfisk Elit Plus 1600W vacuum cleaner (determined to catch 99.5% of all particles 0.3 µm and bigger). The volunteers were contracted through the individual correspondence. Testing was directed in the winter season from December 2015 to January 2016 to dispense with however much as could reasonably be expected indoor to outside ventilation. To maintain a strategic distance from cross sullying, the vacuum cleaner sack was changed after every example accumulation. In the wake of testing, the pack were put into the golden glass bottles prewashed with isooctane and put away in a cooler at −20 °C until sieving. Field spaces comprising of anhydrous sodium sulfate "tested" utilizing the same hardware and methodology portrayed above for the genuine examples were likewise broke down to figure out whether there was any defilement amid test taking care of and planning (Abdallah et al., 2013).

Extraction and Clean up

Samples were homogenized by sieving through a 100 µm a stainless steel strainer. 1 g of dust sample were weighted and spiked with labaled PBDE 203 and labaled PCB 181 as recuperation standard. Dusts were investigated taking after the strategy prompted by Cetin et al. (2016). 10 ml of acetone:hexane (1:1 v/v) arrangement was included and ultrasonically separated. The blending and extraction was rehashed for a brief moment time. The volume of supernatants was decreased around 2 ml with turning evaporator. A 30 cm× 1 cm glass section was pressed with 3 g silicic corrosive (deactivated with 4.5% deionized water) and 2 g alumina (deactivated with 6% deionized water) and finished with 0.8 g of anhydrous sodium sulfate. The section was pre-washed with 20mL DCM took after by 20 mL petroleum ether (PE). At that point, the concentrated example was added to the segment and PBDEs and PCBs were eluted with 60 mL PE.

For the examination of PBDEs, Agilent 7890 N GC combined with an Agilent 5977A mass spectrometer framework EI mode outfitted with a DB-5HT narrow section (15 m × 0.25mm i.d., 0.10 µm film thickness,J&W Scientific) was utilized, while the investigation of PCB was performed on an Agilent 7890 N GC combined with µECD and furnished with a HP5-MS slender segment (30 m × 0.25mm i.d., 0.25 µm film thickness, J&W Scientific. For the investigation of PCB, the underlying stove temperature was held at 80 ◦C for 2min, raised to 200 ◦C at 30◦C min−1, and raised to 320 ◦C at 10◦C min−1 held for 10 min. The injector temperatures were 300

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◦C. PBDE were identified in the framework with the temperature program: 100 °C for 1 min, 8 °C/min to 320 °C, and held for 6 min. The temperatures were 80, 230, 150, and 320 ◦C for the injector quadrupole, particle source, and interface, separately. The recuperation of the PBDE 206 and PCB surrogates in all examples was in the scope of 72–106% and 84–112%for the majority of the specimens. The surrugate standard The PBDE and PCB - spiked dust was utilized to look at the recuperation of the logical strategies for the estimations of PBDE and PCBs focuses, and the recuperations were in the scope of 70–115% and 85-110% for PBDEs and PCBs relying upon individual congeners.

Exposure Scenarios and Risk Assessment

Human introduction to clean by means of three pathways (ingestion, inward breath and dermal contact) was evaluated with the accompanying conditions (US EPA, 1989; US EPA 2009; Kurt-Karakus, 2012).

$$D_{ing} = C_{dust} \times \frac{R_{ing} \times ET \times EF \times ED}{BW \times T_{avg}} \times CF \quad (1)$$

$$D_{inh} = C_{dust} \times \frac{R_{inh} \times ET \times EF \times ED}{PEF \times BW \times T_{avg}} \times CF \quad (2)$$

$$D_{dermal} = C_{dust} \times \frac{SAF \times A_{skin} \times DAF \times ET \times EF \times ED}{BW \times T_{avg}} \times CF \quad (3)$$

Where

D_{ing}, D_{inh}, D_{dermal} is t he chemical daily intake via ingestion; inhalation or dermal contact routes (mg kg^{-1} day^{-1}). C_{dust} is the measured dust concentration (mg kg^{-1}), R_{ing}, R_{inh} is daily ingestion and rate (mg dust day^{-1}) and daily inhalation rate (m^3 day^{-1}). Et, EF and ED are exposure time per day in homes (hours/day), exposure frequency (day $year^{-1}$) and exposure duration (years), respectively, BW is the body weight (kg). T_{avrg} is the averaging lifespan in Turkey (days). A_{skin} is the exposure skin area (cm^2), PEF is the particle emission factor (m^3 kg^{-1}). SAF is the skin adherence factor (mg cm^{-2} h^{-1}), DAF is the dermal absorption factor (unitless),

The values of the exposure parameters for children and adults with reference are provided in Table 1.

Table 1: Exposure parameters for children and adults with references

Exposure Factors	Abbreviations	Adults	Reference
the measured dust concentration (mg kg^{-1})	C_{dust}		this study
Ingestion rate of dust (mg dust day^{-1})	R_{ing}	30	USEPA,2011
Inhalation rate (m^3 day^{-1})	$R_{inhalation}$	20	USEPA, 2016
Exposure time per day in homes (hours/day)	ET	11/24 (0.46)	this study
Exposure frequncy (day $year^{-1}$)[c] (site specific)	EF	350	this study
Exposure duration (years)	ED	24	USEPA, 2001
Body weight (kg)	BW	70	USEPA, 2016
the averaging life time (days) for non-carcinogen	T_{avg}	T_{exp} *365	USEPA 2009
the averaging life time (years) forcarcinogen	T_{avg}	70years× 365days/years	
the particle emission factor (m^3 kg^{-1})	PEF	$1.36*10^9$	USEPA 2009,
the skin adherence factor (mg $cm^{-2}h^{-1}$)	SAF	0.7	USEPA 2002a,2002b

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Exposure Skin area (cm^2)	A_{skin}	5700	USEPA, 2001
The dermal absorption factor (unitless)	DAF	0.001(PBDE) 0.14 (PCB)	USEPA 2001 USEPA 2016b Wang et al.,2016
unit conversion factor	CF		

A hazard quotient(HQ) for no-cancer risk was computed for the PBDEs and PCBs having RfD values (eqn 4), though the extra life-time cancer risk because of presentation to the poison by means of the inward breath, ingestion and dermal contact pathways of the dust were assessed with conditions 5, 6 and 7 (US EPA, 2009).

$HQ_i = Di/RfD_i$ and $HI=\sum_{i=1}^{n} HQ_i$ (4)

$Carcinogenic\ Risk_{inhalation}=D_{inhalation}\times SF_{inh}$ (5)

$Cancer\ Risk_{ingestion}=D_{ingestion}\times SF_{ing}$ (6)

$Cancer\ Risk_{dermal}=D_{dermal}\times SF_{dermal}\times GIABS$ (7)

where RfD_i is reference dose via ingestion, dermal contact and inhalation pathways; D is the average daily exposure dose of individual PBDEs or PAHs in dust through ingestion, dermal contact and inhalation pathways (mg/kg/day); SF is the slope factor $(mg/kg/day)^{-1}$ via ingestion, dermal contact and inhalation pathways; and GIABS is the gastrointestinal absorption factor. he reference dose (RF) and slope factor (SF) used in the health risk estimations are provided in Table 2 in the supporting information.

Table 2: Reference dose (mg/kg/day) and slope factor (SF) used in calculations of health risk estimation

	RfD (mg kg^{-1} day^{-1})			SF (mg kg^{-1} $day^{-1})^{-1}$		
Pollutants	RfD_{inh}	RfD_{ing}[a]	RfD_{dermal}	SF_{inh}	SF_{ing}	SF_{dermal}
BDE209	0.007[1]			0.0007[2]	0.0007[2]	0.0007[2]
BDE47	0.0001[1]					
BDE99	0.0001[1]					
BDE 153	0.0002[1]					
PCB 105	3.9[3]			1.1[3]		

[1]Li et al. (2015);[2]USEPA 2008;[3] Yuan et al., 2014

Results & Discussion

The aggregate centralizations of PBDEs (Σ_{14}PBDEs) extended from 15,22 to 327,61 ng g^{-1}, with a middle of 76,52 ng g^{-1}. BDE-209 (middle: 24,07 ng g^{-1}) was the most overwhelm congener. The aggregate groupings of PCBs (Σ_{15}PCBs) went from 0,01 to 60,96 ng g^{-1}, with a middle of 7,39 ng g^{-1}. PCB-180 (middle: 2,46 ng g^{-1}) was the most rule congener, trailed by PCB-147 (middle: 1,00 ng g^{-1}).

The average daily exposure dosages of PBDEs and PCBs through ingestion, dermal contact and inward breath exposure were depicted in Table 2. The average daily intakes of $\sum_{14}$PBDEs were 1.96×10^{-1} ng/kg-day, 8.70×10^{-3} ng/kg-day and 2.99×10^{-5} ng/kg-day for dermal contact, ingestion and inward breath exposure, individually. The commitments to $\sum_{14}$PBDEs exposure were roughly 95% and 5% for the dermal contact of road dust, though the exposure by means of inward breath of indoor dust was insignificant. Exposure to $\sum_{15}$PCBs through dermal contact was the overwhelming course for human (4.52×10^{-1} ng/kg-day), while exposure by method for and ingestion (1.34×10^{-3} ng/kg-day) and inward breath (5.94×10^{-7}) ng/kg-day) of dust was irrelevant.

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As an outcome, exposure to both PBDEs and PCBs polluted road dust through dermal contact was the prevailing course.

Table 3: Averaging daily dose (D) (ng/kg/day) via dust exposure

	D_{inh} ng/kg-day	D_{ing} ng/kg-day	D_{dermal} ng/kg-day		D_{inh} ng/kg-day	D_{ing} ng/kg-day	D_{dermal} ng/kg-day
BDE17	1,26954E-06	0,000408	0,008494	PCB_18	4,93323E-08	9,89E-05	0,032108
BDE28	1,031E-06	0,000407	0,00671	PCB_31+28	5,31602E-08	0,000124	0,043441
BDE47	1,49321E-06	0,000428	0,01057	PCB_20	5,42514E-08	0,000127	0,040669
BDE66	1,23129E-06	0,000397	0,007135	PCB_52	3,97075E-08	9,56E-05	0,030887
BDE71	1,45253E-06	0,000541	0,009217	PCB_44	3,6627E-08	8,18E-05	0,025528
BDE85	1,91753E-06	0,000521	0,011999	PCB_101	6,11254E-08	0,000142	0,053144
BDE99	1,08814E-06	0,000433	0,008337	PCB_149+118	5,21777E-08	0,000114	0,040072
BDE100	1,29326E-06	0,000556	0,008643	PCB_105	3,59765E-08	8,37E-05	0,026486
BDE138	1,34407E-06	0,000439	0,008933	PCB_153	4,15795E-08	8,75E-05	0,03264
BDE153	1,45401E-06	0,00053	0,009229	PCB_138	3,45811E-08	9,48E-05	0,029396
BDE154	1,68806E-06	0,00053	0,009804	PCB_180	1,19333E-07	0,000257	0,083172
BDE183	2,35078E-06	0,00063	0,016007	PCB_170	3,78861E-08	8,39E-05	0,026406
BDE190	1,60295E-06	0,000522	0,011326	PCB_ 194	8,11538E-08	1,67E-04	6,39E-02
BDE209	1,070E-05	0,002361	0,069759				
Σ_{14}PBDEs	2,991E-05	8,70E-03	1,96E-01	**$\sum_{15}$PCBs**	5,94399E-07	1,34E-03	4,52E-01

The hazard index(HI) values for BDE-47, - 99,- 153 and - 209 demonstrated in Table 3 were lower than safety limit of 1, and this outcome recommended that none of the populace gatherings would be prone to experience potential health risk because of exposure to PBDEs from open air dust in the study range. As exhibited in Table 3, the HQ for BDE-153 was the most noteworthy among the 4 PBDE congeners. The cancer risk of PBDEs was figured just for the congener PBDE 209 whose SF are worked by USEPA and delineated in Table 3. The mean cancer-causing levels were $7{,}49\times10^{-15}$, $1{,}6\times10^{-11}$ and $4{,}9\times10^{-11}$ for inward breath, ingestion and dermal introduction of BDE 209. The ingestion and dermal exposure to PBDE 209 levels represented the most elevated danger, while the dangers connected with inward breath pathways were insignificant among the three pathways.

Table 3: Hazard quotients (HQ) and cancer estimation (R) of PBDEs via dust exposure collected from 20 homes

	HQ_{inh}	R_{inh}	R_{ing}	R_{dermal}
BDE47	3,45E-05			
BDE99	2,59E-05			
BDE153	1,79E-05			
BDE209	3,33E-06	7,49E-15	1,6E-11	4,9E-11
Σ_{14}PBDEs	8,16E-05			

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Conclusion

The hazard index (HI) values for BDE-47, - 99, - 153,- 209 through inward breath pathways were lower than safety limit of 1, recommending that none of the populace gatherings would be prone to encounter a potential health risk because of exposure to PBDEs from outdoor dust in the study zone.

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EXPOSURE ASSESSMENT OF URBAN SURFACE DUST CONTAMINATED WITH PAH IN A HEAVILY INDUSTRIALIZED PROVINCE

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Abstract: Twenty surface dust samples were collected in different areas of Kocaeli proviance such as industrialized area, urban area and street dust between 26-27 December in 2015. After extraction and column clean up, elute was analyzed for 16 PAHs with Agilent 7890 N GC coupled with an Agilent 5977A mass spectrometer system EI mode. ΣPAHs concentrations in the urban surface dust ranged from 46.32 ng/g to 6313 ng/g with median value of 46.32 ng/g. The exposure were assessed in living population via three pathways, namely, ingestion of soil, dermal contact and inhalation of dust particles. The average daily intakes of $\sum_{14}$PAHs were 12.48 ng/kg-day, 0.0092 ng/kg-day and 1.46×10^{-5} ng/kg-day for dermal contact, ingestion and inhalation exposure, respectively. The contributions to $\sum_{14}$PAHs exposure were approximately 99% for the dermal contact of the dust, whereas the exposure via inhalation and ingestion of urban surface dust was negligible. The mean B2-PAH group carcinogenic levels via dermal contact, ingestion and inhalation pathways were 5.5×10^{-4}, 1.2×10^{-10} and $1.9\times10^{-6,}$ indicating dermal pathway was the major route to cause health concern. The total carcinogenic risk level of both B2 PAHs (5.5×10^{-4}) were higher than EPA safe limit range (1×10^{-6}).

Keywords: Urban Surface Dust, Polycyclic Aromatic Hydrocarbons (PAHs), Exosure Assessment

Introduction

The industrialized proviances have faced serious environmental problems due to high population density, hosting huge industrial complex and high traffic loadings. Hence the assessment of expsoure to population living in urban center have drawn much attention in recent years. In the urban areas, the sources such as industrial plants, vehicules and coal combustion process have emitted several pollutants which cause health problems on the population. Polycyclic aromatic hydrocarbons (PAHs) are one of the most ubiquitous group of pollutants found in urban environment such as atmosphere, precipitation, urban surface dust. PAHs are produced as a result of by-products of incomplete burning of petroleum products, and other incomplete combustions such as vehicle exhaust, coal-fired heating, and straw, fuel wood combustion and tobacco smoke (Yu et al., 2014; Finlayso-Pitts and Pitts 1997; Zhou et al. 2004; Li et al. 2006).Several PAHs are known carcinogens and identified by EPA as “priority pollutant” .

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Urban surface dust (street dust) referred to the load of deposited dust on an imperviously paved surface next to road or at the industrial sites is major reservoir for organic pollutants because of its sorption quality and holding capacity (Wu_outdoor_2015; Klees et al., 2013). Hence urban surface dust have been a useful indicator of environmental quality of an urban area.

The objectives of the present work were: (i) to investigate PAHs levels in urban surface dust from a Heaviliy Industrialized Proviance; (ii) to estimate the exposure and cancer risks associated with the ingestion, inhalation and dermal contact of PAHs in urban dust;

Materials and Methods

Study Site and Sampling

Geographical coordinates of Kocaeli city hosted one of the most important industrial zones in Turkey are 9°22′–30°21′E, 40°31′–41°13′ N The dust sampling was performed at 20 within the Kocaeli region (29°22′–30°21′E, 40°31′–41°13′ N) hosted one of the most important industrial zones in Turkey. The industrial zone includes petrochemical plant, hazardous and clinical waste incineration and storage facility, textile (185 industrial enterprises) and other (above 1000) industrial plants. Today Kocaeli hosts 1900 industrial investments of which 247 have been established with international capital. In addition, due to D-100 (74 312 vehicles/day), TEM (61 854 vehicles/day) and D-130 (49, 451 vehicles/day) state highways passing through the city, an extensive flow of traffic arises. General layout of the study area is shown in Figure 1. Kocaeli is also home to more than 1,600,000 people and is one of Turkey's most densely populated cities (TUIK,2016).

The dust was collected with the brush prewashed with isooctane from rural,urban, industrial and industrially influenced urban areas during January 2016. The sample dust were put into the amber glass bottles prewashed with isooctane. Field blanks consisting of anhydrous sodium sulfate "sampled" using the same equipment and procedures described above for the real samples were also analysed to determine if there was any contamination during sample handling and preparation (Abdallah et al., 2013). In the laboratory, the samples were nitrogen-dried in hood and cleaned from stones, hairs etc., sieved(<100 μm) and finaly stored in a freezer at −20 °C until extraction.

Sample Extraction and Clean up

The 5 gr sample was spkied with surrogate standards (Acetanapthalene-d10, Chyresene-d10, Perylene-d10, Phenantherene-d10) and extracted by ultrasonicagitation in 10-ml mixture of 1:1 acetone: hexane. The mixing and extraction were repeated a second time with the addition of 10 ml of fresh solvent The extract volumes were reduced and transferred into hexane (2 mL) using a rotary evaporator and a high purity N_2 stream. A 30 cm× 1 cm glass column was packed with 3 g silicic acid (deactivated with 4.5% deionized water) and 2 g alumina (deactivated with 6% deionized water). The column was pre-washed with 20mL DCM followed by 20 mL petroleum ether (PE). Then, the sample in 2mL hexane was added to the column. The column was eluted with 40 ml of DCM. All elute volumes were reduced to approximately 200 μl in a rotary evaporator and under a gentle stream of nitrogen.

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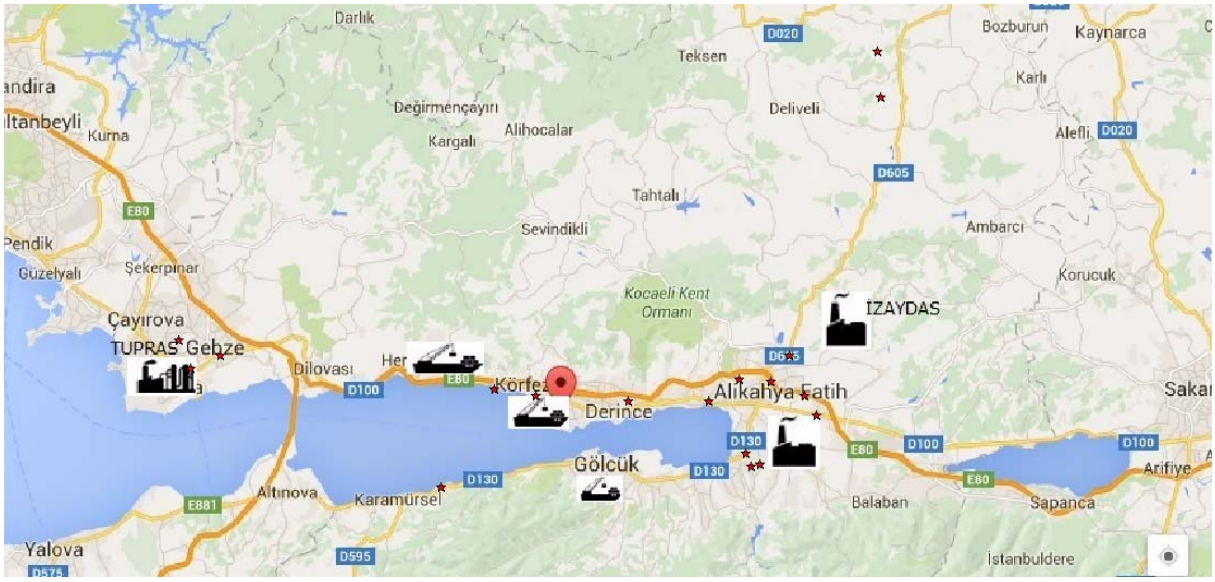

Figure 1: Location of sample point

Elute was analyzed for USEPA's priority 16 PAHs including Naphthalene (Nap), Acenaphthylene (Acy), Acenapthene (Ace), Flourene (Flu), Phenanthrene (Phe), Anthracene (Ant), Fluoranthene (Flt), Pyrene (Pyr), Benzo(a)anthracene (BaA), Chrysene (Chr), Benzo(b)fluoranthene (BbF), Benzo(k)fluoranthene (BkF), Benzo(a)pyrene (BaP), Dibenzo(a,h)anthracene (DahA), Benzo(g,h,i)perylene (BgP) with Agilent 7890 N GC coupled with an Agilent 5977A mass spectrometer system EI mode equipped with a DB-5HT capillary column (15 m × 0.25mm i.d., 0.10 µm film thickness,J&W Scientific) was employed. For the analyzed PAH, the initial oven temperature was held at 50 °C for 1 min, raised to 200 °C at 25 °C min^{-1}, and raised to 300 °C at 8 °C min^{-1}, and held for 8 min.

Health Risk Calculation

The exposure assessment and risk calculation were mentioned in detail in previous work (Civan and Kara, unpublished). Below are the formulas to calculate dose received through ingestion, inhalation and dermal contact pathways (US EPA, 1989, 1996; Shin et al., 2011;Kurt-Karakus, 2012)

$$D_{ing} = C_{dust} \times \frac{R_{ing} \times F_{exp} \times T_{exp}}{BW \times T_{avg}} \times CF \qquad (1)$$

$$D_{inh} = C_{dust} \times \frac{R_{inh} \times F_{exp} \times T_{exp}}{PEF \times BW \times T_{avg}} \times CF \qquad (2)$$

$$D_{dermal} = C_{dust} \times \frac{SAF \times A_{skin} \times DAF \times F_{exp} \times T_{exp}}{BW \times T_{avg}} \times CF \qquad (3)$$

where

D_{ingi}, D_{inhi}, $D_{dermali}$ The chemical daily intake for the age-group i via ingestion; inhalation or dermal contact routes (mg kg^{-1} day^{-1});

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C_{dust}	The measured dust concentration (mg kg^{-1}) (human expsosed these pollutants in their homes)
R_{ingi}	Daily ingestion rate for the age-group i (mg dust day^{-1})
R_{inhi}	Daily inhalation rate or the age-group i (m^3 day^{-1})
Et_i	Exposure time per day in homes for the age-group i (hours/day).
EF	Exposure frequency (day $year^{-1}$)
ED	Exposure duration (years) for the age-group i
BW_i	The mean body weigh for the age-group i (kg)
T_{avrg}	The averaging lifespan in Turkey for the age-group i (days)
CF	Unit conversion factor,
A_{skini}	The exposure skin area for the age-group i (cm^2)
PEF	the particle emission factor (m^3 kg^{-1})
SAF	The skin adherence factor (mg cm^{-2} h^{-1}),
DAF	The dermal absorption factor (unitless),

Slope factor of benzo(a)pyrene (Bap) via inhalation, ingestion and dermal pathways are 3.83, 7.3 and 25 mg kg^{-1} day^{-1}, respectively (Peng et al., 2011; USEPA, 1994). Seven carcinogenic PAHs concentrations and their respective toxic equivalency factors (TEFs) including BaP (1), BaA (0.1), BbF (0.1), BkF (0.01), Chr (0.001), DahA (1) and Ind (0.1) were used in the cancer risk assessment applying BaP toxicity equivalence (Man et al., 2013; US EPA 1993).

Result and Discussion

Levels of PAH in urban surface dust

Different levels of 16 PAH homologues were dedected in Kocaeli collected from road rural industrial and industrially influenced urban areas. Table 1 represents the statistical summary of PAHs in urban surface dust. Total PAHs concentration in Kocaeli urban dust display a very wide range with maximum concentration being 9 times greater than the minimum concentration. Σ_{16}PAHs concentrations in the urban surface dust ranged from 358.9 ng/g (at rural site far from the industrial areas) to 3380 ng/g (at located in the vicinity of petroleum refinery)with median value of 1098 ng/g.

Concentrations of Phe, Flt+Pyr, Chry, Bkf, Bbf and Naph were comparatively higher among the 16 individual PAHs at all the locations, accounting for 15.7%, 10.4%, 9.8%, 8.7%, 7.5% and 7.3%, respectively.The HMW-PAH/LMW-PAHs averaged 1.71 (ranged from 0.14 to 4.16) indicating some location affected from noun-exhaust source and most of the locations's Total concentrations of B2 group seven PAHs were comparable to those of the other nine PAHs, accounting for 12% and 61% of the total PAHs. The concentration of BaP, the most potent carcinogenic, ranged between 1.9 (at rural site) and 199.8 ng/g (vicinity of highway) with median of 41.6 ng/g. Fluoranthene+Pyrene (median: 116.5 ng g^{-1}) was the most dominate congener, followed by chrysene (median: 112.6 ng g^{-1}), flourene (median: 109.3 ng g^{-1}), phenanthrene (median: 105.6 ng g^{-1}), benzo(k)fluoranthene (median: 98.04 ng g^{-1}) and Benzo(b)fluoranthene (median: 76.57 ng g^{-1}), while acenapthene (median: 17.4 ng g^{-1}), Dibenzo(a,h)anthracene (median: 21.72 ng g^{-1}) and acenaphthylene (median: 26.9 ng g^{-1})were the least abundant

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congener for all the samples. These Flt+Pyr, BkF, BbF, Chr, Flue and Phe varied in quantities, from 48% to 82% of all congeners. The seven most dominate PAHs species are indicative of combustion (Soltani et al., 2015; Hwang et al., 2003) therefore the common source of PAHs in the urban dust in Kocaeli was vehicular emission.

Table 1: The mean, median, minimum and maximum range of PAHs homologues

	Abbr.	**mean**	**median**	**min**	**max**
Naphthalene	Nap	74.86	49.3	31.58	232.45
Acenapthene	Ace	23.69	17.4	1.25	80.01
Flourene	Flue	162.3	109.3	15.54	770
Acenaphthylene	Acy	50.26	26.87	5.12	242.2
Phenanthrene	Phe	112.8	105.58	6.82	251.2
Anthracene	Ant	57.47	43.27	11.06	242.1
Fluoranthene+Pyrene	Flt+Pyr	149.1	116.53	5.09	354.2
Benzo(a)anthracene	BaA	57.48	39.23	10.95	211.3
Chrysene	Chr	129.9	112.64	5.16	379.9
Benzo(b)fluoranthene	BbF	94.69	76.57	12.62	264.4
Benzo(k)fluoranthene	BkF	118.5	98.04	5.92	421.2
Benzo(a)pyrene	BaP	58.55	41.57	1.86	199.8
Indeno(1,2,3-c,d)pyrene	Ind	82.75	64.57	2.99	301.5
Dibenzo(a,h)anthracene	DahA	40.87	21.72	8.98	187.1
Benzo(g,h,i)perylene	BgP	60.78	33.31	3.68	191.6
$\sum_{16}$PAHs		1273	1098	358.9	3380

In this work, three-ring PAHs including contributed between 19 % to 87 % of ΣPAHs, and four to six-ring PAHs including contributed varied from 13% to 81% of ΣPAHs. The lower molecular weights (LMW) of PAHs was the most dominant in the sampling point closed to pethrochemical plants while the higher molecular weights (HMW) of PAHs reached 87%of total PAHs in the proximitey of high ways. The LMW PAHs are emitted from various natural sources and incomplete burning petroleumproducts, while the HMW PAHs sources include various types of complete combustions (Yu et al.,2014;Chen et al. 2005; Wilcke 2007; Yu et al. 2006). In overall data these higher molecular weights of PAH (4-6 ring) makes larger fraction of total PAH concentration, suggesting a common source of vehicle emissions in Kocaeli urban dust.

Risk Assessment

Expsoure of PAHs through inhalation, ingestion and dermal contact were r reported in Tables . The average daily intakes of $\sum_{14}$PAHs were 39.7 ng/kg-day, 0.01 ng/kg-day and 4.6×10^{-5} ng/kg-day for dermal contact, ingestion and inhalation exposure, respectively. The contributions to $\sum_{14}$PAHs exposure were approximately 99% for the dermal contact of the dust, whereas the exposure via inhalation and ingestion of urban surface dust was negligible.

The mean B2-PAH group carcinogenic levels via dermal contact, ingestion and inhalation pathways were 4.3×10^{-4}, 3.4×10^{-7} and $7.9\times10^{-11,}$ indicating dermal pathway was the major route to cause health concern. The total carcinogenic risk level of both B2 PAHs (5.5×10^{-4}) were higher than EPA safe limit range (1×10^{-6} and 1×10^{-4}).

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Our estimated results suggested that drivers in both sites are exposed to moderate/high carcinogenic risk via both dust ingestion and dermal contact pathways.

Table2: The population with occupational exposure to PAHs via urban surface dust ingestion, averaging daily dose (D) (ng/kg/day)n via dust exposure

	D_{inh} ng/kg-day	D_{ing} ng/kg-day	D_{dermal} ng/kg-day
Nap	2.93E-06	5.88E-03	2.44E+00
Acy	8.20E-07	1.91E-03	6.54E-01
Flue	5.85E-06	1.37E-02	5.47E+00
Acy	1.60E-06	3.85E-03	1.33E+00
Phe	4.00E-06	8.93E-03	3.64E+00
Ant	2.04E-06	4.74E-03	1.62E+00
Flt+Pyr	5.84E-06	1.28E-02	5.35E+00
BaA	1.99E-06	4.63E-03	1.59E+00
Chr	4.68E-06	9.85E-03	3.98E+00
BbF	3.01E-06	8.25E-03	2.77E+00
BkF	4.20E-06	9.07E-03	3.17E+00
Bap	2.08E-06	4.44E-03	1.57E+00
ınd	3.24E-06	7.21E-03	2.76E+00
DBA	1.41E-06	3.13E-03	1.33E+00
BgP	2.19E-06	4.65E-03	1.98E+00
B_2 group	2.06E-05	0.0465723	1.72E+01
$\sum_{16}$PAHs	4.59E-05	1.03E-01	3.97E+01

Table3: Cancer estimation (R) of PBDEs and PAHs based upon the BaP toxicity equivalence concentration via dust exposure

	R_{inh}	R_{ing}	R_{dermal}
Bap	7.99E-12	3.24E-08	3.92E-05
B2 group	7.94E-11	3.40E-07	4.29E-04

Conclusion

ΣPAHs concentrations in the urban surface dust ranged from 46.32 ng/g to 6313 ng/g with median value of 46.32 ng/g. The exposure were assessed in living population via three pathways, namely, ingestion of soil, dermal contact and inhalation of dust particles. The average daily intakes of $\sum_{14}$PAHs were 39.7 ng/kg-day, 0.1 ng/kg-day and 4.6×10^{-5} ng/kg-day for dermal contact, ingestion and inhalation exposure, respectively. The contributions to $\sum_{14}$PAHs exposure were approximately 99% for the dermal contact of the dust, whereas the exposure via inhalation and ingestion of urban surface dust was negligible. The mean B2-PAH group carcinogenic levels via dermal contact, ingestion and inhalation pathways were 4.3×10^{-4}, 3.4×10^{-7} and $7.9\times10^{-11,}$ indicating dermal

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pathway was the major route to cause health concern. The total carcinogenic risk level of both B2 PAHs (5.5×10^{-4}) were higher than EPA safe limit range (1×10^{-6} and 1×10^{-4}).

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ADSORPTION OF METHYLENE BLUE FROM AQUEOUS SOLUTION BY USING SURFACTANT MODIFIED POMELO PEEL

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Abstract: This work, the potential of using surfactant modified pomelo peel for adsorbing methylene blue was studied. Experiments were carried out as function of contact time, initial adsorbate concentration, initial solution pH and temperature. The dynamic data fit well with the pseudo-second-order kinetic model (R^2> 0.9999) with the apparent activation energy of +45.67 kJ/mol. The Langmuir model agrees very well with the experimental data (R^2>0.9900). On the basis of the Langmuir analysis, the maximum adsorption capacities were determined to be 294.20 mg/g at 25°C, 304.31 mg/g at 35 °C and 306.56 mg/g at 45°C and 308.42 mg/g at 55°C. The negative values of gibbs free energy indicate the spontaneous nature of the adsorption. It is suggested that the adsorption is likely to be chemical adsorption.

Keywords: surfactant modified pomelo peel, methylene blue, adsorption, kinetics, isotherm

INTRODUCTION

Water pollution from dye contamination in natural stream in Ubon Ratchathani province, Thailand is one of significant problems. The problem gains more serious due to the rapid growth of household scale textile industries to meet increasing population and exporting demands. Two types of dye which are natural and synthetic dyes are usually used in dyeing process. The synthetic dyes are preferred because of their bright and lasting colors, resistance to heat and light and ease applications. After dyeing process, approximately 40% dye amount is left in water body and usually find their way into nearby rivers and/or spaces under houses. The synthetic dyes are high water solubility, heat and light resistance and low biodegradability (Chuah et al., 2005). High amount of accumulated synthetic dyes in water support can cause unsightly scenery, obstruction of light transmission into water body and being harmful to humans, animal, and aquatic life. Therefore, it is very important to remove the synthetic dyes from wastewater before discharge. In order to persuade the villagers in household scale industries concern water pollution and pay attention to wastewater treatment, the treatment methods should be simple, fast and low cost. Adsorption technology is one of treatment methods which can achieve those suggestions. Adsorption process is the adhesion of dye molecules, adsorbate, from wastewater to a solid surface, adsorbent.

The activated carbon is a well known adsorbent and widely used in dye removal from wastewater; however, the commercial activated carbon is expensive due to high energy consumption during its preparation. Recently, alternative ways to develop biosorbent from natural materials as biosorbent also exist to decrease the cost. The materials that have received considerable attention to use biosorbent for dye removal are fruit peel, corncob, sugarcane bagasses, rice hull, bacteria, fungi and algae (Jayarajan et al., 2011; Umpuch and Jutarat, 2013). Pomelo is a fruit which is widely grown in Thailand so that it is plentiful and cheap. Pomelo peel (PP) is composed of insoluble monomers such as pectin, cellulose and hemicelluloses which have important functional groups such as carboxyl and hydroxyl groups. These functional groups can interact with cations in aqueous solution.

In addition, the adsorption capacity of biosorbent can enhance by various modifications (Wibulswas, 2004; Charuwong and Kiattikomol, 2004). Adsolubilization technology is a process to form admicelle of cationic surfactant on the external surface of adsorbent. The adsolublization causes the surface properties of adsorbent altering from hydrophilic to hydrophobic. It has been proven that the surfactant modified biosorbent is effective for organic compound adsorption. However, the adsorption of cationic dyes by surfactant modified biosorbent is seldom studied.

This study focused on preparation of surfactant modified pomelo peel (SMPP) which is a novel material for cationic dye, methylene blue, removal from aqueous solution. Experiments were carried out as function of contact time, initial dye concentration, initial solution pH and temperature. Also, the dye removal efficiency of SMPP was determined by single-stage batch adsorption tests including kinetic model, adsorption isotherms and thermodynamic study.

MATERIALS AND METHODS

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Methylene blue (MB) supplied by Aldrich, Ireland was used as an adsorbate. Distilled water was employed for preparing all the solutions and reagents. MB has a molecular weight of 373.9 g/mol which corresponds to methylene blue hydrochloride with three group of water ($C_{16}H_{18}ClN_3S.3H_2O$). A stock solution of MB was prepared by dissolving 1.0 g in 1 L of distilled water, and the solutions for adsorption tests were prepared from the stock solution to the desired concentration by successive dilutions.

The natural pomelo peel was purchased from a local market at Warin Chamrap, Ubon Ratchathani province, Thailand as a solid waste. The yellow-green peel (flavedo) was removed from the pomelo peel with a knife. The residue, white spongy peel (albedo), was then washed with distilled water several times to remove all impurities. Then, the clean material was dried at a temperature of 40°C in an air-circulating oven until weight being constant. The dried pomelo peel was crushed and shredded in a blender for about 15 min and sieved to obtain a particle size below 300 µm, designated as precursor. An amount of 1.0 g of the precursor was treated with 100 mL of 1000 mg/L tetradecyltrimethylammonium bromide ($C_{17}H_{38}NBr$) surfactant. Agitation at 200 rpm was allowed for 15 min at room temperature using an orbital shaker. Afterwards, the surfactant modified pomelo peel (SMPP) particles were filtered with a microfilter (Whatman, UK), washed with distilled water several times to remove superficially retained surfactant, and dried in an oven at 40 °C until weight being constant. To have uniform modification and reproducible results, the SMPP particles were sieved (50 mesh) before use for adsorption studies. All adsorbents were packed in plastic bags and stored in desiccators for further use.

The batch sorption experiments were carried out in a set of Erlenmeyer flasks (250 mL) by agitating desired amounts of SMPP particles with 100 mL of dye solutions of desired concentration and pH, in an isothermal shaker. A series of adsorption experiments were investigated in different operating conditions related to the contact time, initial MB concentration, initial solution pH and temperature. First, the effect of contact time was investigated. A series of 250 mL Erlenmeyer flasks containing 100 mL of the 300 mg/L MB solutions were mixed with 0.1 g of SMPP. These flasks were closed with paraffin to avoid evaporation and then horizontally shaken at 200 rpm. The samples were measured at 2, 5, 15, 30 and 60 min. Second, the effect of initial MB concentrations was carried out in the same fashion with that in the first experiment, but the initial concentrations were varied in a range of 50 to 300 mg/L of MB solution (pH_0 = 5.0) and the contact time was assigned at 24 hours. The effect of the initial solution pH was carried out in the same manner with the second experiments but varying the pH_0 of 300 mg/L MB solution from 2.0 to 10.0. Finally, the effect of temperature was investigated by repeating the first and second experiments but investigating at other temperatures such as 35, 45 and 55°C (Umpuch and Jutarat, 2012).

The collecting samples were filtered by micro-filter to remove adsorbent particles and the MB concentration in the filtrate was analyzed by UV-Vis Spectrophotometer at wavelength corresponding to the maximum absorbance for MB of 663 nm. The absorbance values were converted to MB concentration by calibration curve. The MB adsorbed quantity and the removal MB percentage (%MB Removal) were calculated using the following equations:

$$q_t = \frac{V(C_0 - C_t)}{m} \quad (1)$$

$$\%\ MB\ \text{Removal} = \frac{C_0 - C_t}{C_0} \times 100\ \% \quad (2)$$

where q_t (mg/g) is the quantity of MB biosorbed per unit mass of biosorbent, C_0 (mg/L) is the initial MB concentration, C_t (mg/L) is the MB concentration after biosorption, m (g) is the mass of biosorbent, and V (L) is the volume of aqueous solution. In addition, the %MB removal of pomelo peel and SMPP determined by using second experiment but fixed initial MB concentration as 300 mg/L were 46.30% and 65.74%, respectively.

RESULTS AND DISCUSSION

The effect of contact time on the instantaneous adsorption capacities of MB by SMPP, q_t, is shown in Fig.1. The dye uptakes increased in the first 2 min and then gradually increased with time until reaching a constant. The rapid rate in the initial stage was probably due to the abundant availability of active sites on the external surface of the SMPP particles. The adsorption rate gradually increased in the later stages because of the reduction in available active sites. The saturation of MB molecules on the SMPP was addressed at the final stage. The equilibrium time required for the adsorption of the MB was approximately 30 min.

To find the mechanism controlling the adsorption process, pseudo-first-order, pseudo-second order, and intraparticle diffusion models were used to check the experimental data. The q_t (mg/g) is the amount of MB adsorbed at time t. The pseudo-first order kinetic model is normally applicable for only the initial 30 min of adsorption process. If the diffusion rate of adsorbate across the boundary layer to adsorbent surface is at a rate of limiting step, the kinetic data are well fitted to the pseudo-first order model (Lagergren and Svenska, 1898). It is

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generally expressed as follows:

$$\ln(q_e - q_t) = \ln q_e - k_1 t \quad (3)$$

where k_1 (min^{-1}) is the rate constant of first-order adsorption.

The pseudo-second order kinetic model was proposed by Ho in 1995 (Ho and McKay, 1998). If the chemical sorption is the rate-limiting step, the experimental data follow the pseudo-second order expression according to Eq.(4). It is expressed as:

$$\frac{t}{q_t} = \frac{1}{k_2 q_e^2} + \frac{1}{q_e} t \quad (4)$$

where k_2 ($g/(mg.min)^{-1}$) is the rate constant of second-order adsorption.

If the diffusion of cadmium ions into the pores and capillaries of the adsorbent is the rate of limiting step, the adsorption data can be presented by the following Eq.(5):

$$q_t = k_p t^{1/2} + C \quad (5)$$

where k_p represents intraparticle diffusion rate constant ($mg/(g.min^{1/2})$) and C is a constant (mg/g) which gives information on the thickness of the boundary layer.

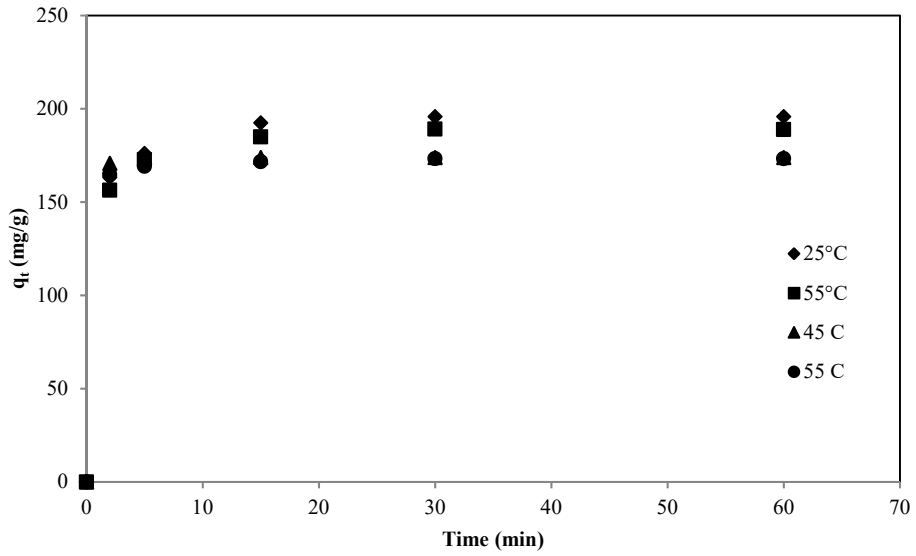

Figure 1. Effect of temperature on the adsorption of MB onto SMPP for a solution initially containing 300 mg/L of MB as a function of time.

Table 1 Constants from three kinetic models for MB adsorption on SMPP

Model	**Parameters**	**T(°C)**			
		25	**35**	**45**	**55**
	$q_{e,exp}$(mg/g)	195.83	189.17	173.89	173.33
Pseudo-first order	k_1 (min^{-1})	1.68	1.62	1.24	1.29
	$q_{e,cal}$ (mg/g)	6.75×10^{31}	3.61×10^{30}	6.98×10^{22}	1.17×10^{24}
	R^2	0.2573	0.2547	0.1631	0.1834
Pseudo-second order	k_2 (g/(mg*min))	0.0163	0.0176	0.567	0.0639
	$q_{e,cal}$ (mg/g)	196.97	189.97	173.93	173.58
	R^2	0.9999	0.9999	0.9999	0.9999
Intraparticle diffusion	k_p ($mg/(g.min^{1/2})$)	19.03	18.33	15.09	15.43
	C (mg/g)	88.13	85.31	92.23	88.68
	R^2	0.4981	0.4953	0.3662	0.3952

The calculated values of $q_{e,cal}$ (Table 1) from the pseudo-first-order kinetics model and intraparticle diffusion model

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were dramatically lower than the experimental value (q_{exp}). The linear plot of t/q_t against t according to Eq. (4) was observed. The constant k_2 and the corresponding linear regression correlation coefficient values, R^2, are given in Table 1. As the values of R^2 were limited to unity (R^2>0.9986), the adsorption data conform to the pseudo-second order model. This indicated that the rate of limiting step was the formation of chemical bonding between the MB and the dissociated functional groups on the surface of the SMPP.

The activation parameter can be determined by the Arrhenius equation. The slope of the plot of log k_2 vs. 1/T can then be used to evaluated the activation energy, E_a, according to equation (6). The Arrhenius equation is expressed as:

$$\log k_2 = \log A - \frac{E_a}{RT} \tag{6}$$

where E_a is the activation energy (J/mol) and A is the Arrhenius factor (g/(mol.s))

The experimental results obtained gave E_a = +45.67 kJ/mol for the adsorption of MB onto SMPP. Low E_a values (<42 kJ/mol) indicate diffusion control processes, and the higher E_a values (>42 kJ/mol) indicate chemically controlled process. In this study, low value of the E_a indicates that the adsorption process of MB adsorption on SMPP might be a chemical adsorption.

The study of adsorption isotherm is fundamental, and plays an important role in the determination of the maximal capacity of adsorbent. Adsorption isotherm of MB on SMPP which is the plot of MB concentration in solid vs. MB concentration in liquid at equilibrium stage was illustrated in Fig.2.

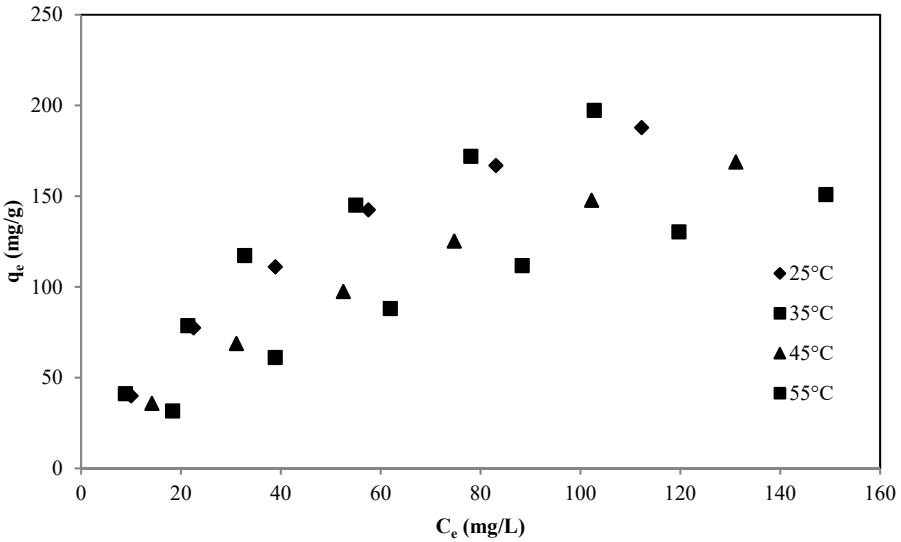

Figure 2. Effect of temperature on the adsorption of MB onto SMPP for a solution initially containing 300 mg/L of SMPP as a function of equilibrium MB concentration.

The equilibrium data usually were correlated by well established isotherm models such as Langmuir and Freudlich isotherms. For the adsorption on a totally homogeneous surface, generally the Langmuir equation applies because here interactions between adsorbed molecules are negligible. The Langmuir equation is most often used to describe equilibrium sorption isotherm (Anwar et al., 2010) which is valid for monolayer sorption with a finite number of identical sites. The linear form of Langmuir isotherm is given below.

$$\frac{C_e}{q_e} = \frac{C_e}{q_m} + \frac{1}{K_L q_m} \tag{7}$$

where q_m (mg/g) is the maximum sorption of monolayer, C_e (mg/L) is a final equilibrium concentration of cadmium, q_e (mg/g) is the MB adsorbed per unit weight of the SMPP at final equilibrium concentration, and K_L (ml/g) is the Langmuir constant related to the affinity of binding sites.

The essential characteristics of the Langmuir isotherm can be expressed by means of "R_L" which is a dimensionless constant referred to as a separation factor of equilibrium parameter. The R_L is defined by

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$$R_L = \frac{1}{1 + K_L C_0} \quad (8)$$

This parameter suggests the type of isotherm is irreversible ($R_L=0$), favorable ($0<R_L<1$), linear ($R_L=1$), or unfavorable ($R_L>1$). As can be seen from Table 2, the R_L values are between 0 and 1.0, indicating that the adsorption of MB onto SMPP is favorable.

The widely used empirical Freundlich equation based on sorption on a heterogeneous surface is given by

$$\log(q_e) = \log(K_F) + \frac{1}{n}\log(C_e) \quad (9)$$

where K_F ($mg^{1-1/n}.L^{1/n}.g^{-1}$) and n are the physical constants of the Freundlich isotherm. The K_F and n are the indicators of adsorption capacity and adsorption intensity respectively (Salleh et al., 2011).

The results showed the Langmuir isotherm was best fitted to the experimental data for MB indicating that the monolayer of MB molecules covers along the SMPP surface. Table 2 shows the monolayer capacity of absorbed MB onto SMPP was 294.20 mg/g at 25°C, 304.31 mg/g at 35 °C and 306.56 mg/g at 45°C and 308.42 mg/g at 55°C.

Table 2: Isotherm constants and correlation coefficients for the adsorption of MB on SMPP at different temperatures

Model	Parameters	T(°C)			
		25	35	45	55
Langmuir isotherm	q_m (mg/g)	294.11	304.31	306.56	308.42
	K_L (L/mg)	0.0159	0.0174	9.31×10^{-3}	6.47×10^{-3}
	R_L	0.173	0.161	0.264	0.340
	R^2	0.9993	0.9907	0.9975	0.9952
Freundlich isotherm	K_F (l/g)	9.89	11.00	5.97	3.90
	n	1.56	1.57	1.44	1.35
	R^2	0.9839	0.9814	0.9962	0.9915

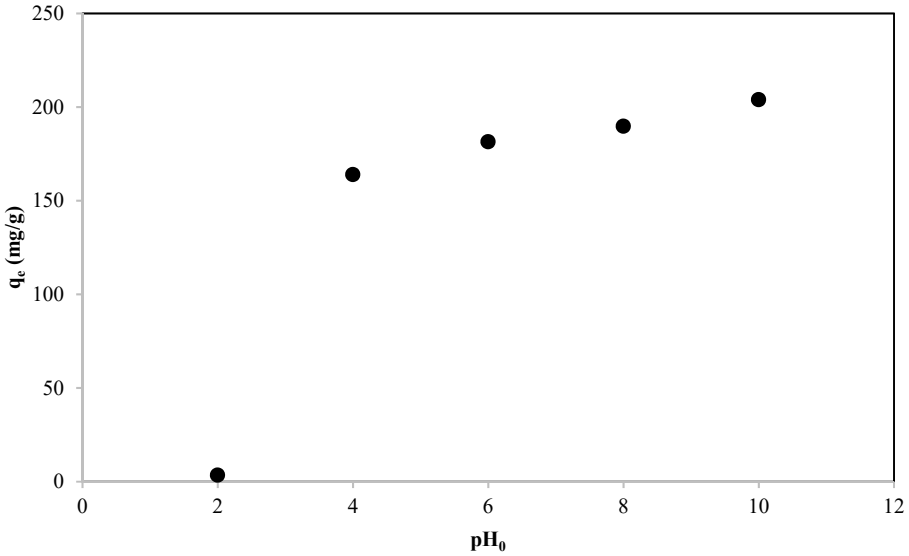

Figure 2. Effect of initial solution pH on the adsorption of MB onto SMPP for a solution initially containing 300 mg/L of SMPP.

The effect of initial solution pH on the equilibrium adsorption capacities of MB by SMPP, q_e, is shown in Fig.2. The uptakes of the MB dye increased with increase in the initial solution pH. The sorption capacity increased greatly when the pH increased from 2.0 to 4.0 and gradually increased further when the pH increased from 4.0 to 10.0. The interaction between MB and admicelle coating on the PP surface is suggested as hydrophobic-hydrophobic interactions since the MB is co-ions with positive charge on the adsorbent surface. At acidic medium, there is a small quantity of hydroxide ions so that the MB is in cationic form. The adsorption capacity is very small in this condition because electrostatic repulsion between the MB and active site. On the other hand, the increase

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of pH levels provides higher amount of hydroxide ion which compensate with MB cations to form neutral molecules. In addition, the positive charge on the adsorbent surface also compensate with hydroxide ions become neutral surface. Consequently, the electrostatic repulsion is weaker and the MB and admicelle forms hydrophobic-hydrophobic interactions. This results in higher adsorption capacity of MB in the alkali medium.

The effect of operating temperature on the instantaneous and equilibrium adsorption capacities of MB by SMPP is shown in Fig.1 and 2. The increase of temperature in the system caused a decrease of the adsorption capacity. This indicated that the reaction was exothermic process. This result was in accordance with those observed in the previous literature (Yan et al., 2007). Thermodynamic parameters can be determined from the variation of the thermodynamic equilibrium constant K_L with temperature.

$$\Delta G^0 = -RT \ln K_L \quad (9)$$

where R is the universal gas constant (8.314 J/mol.K) and T is temperature in Kelvin. The average standard enthalpy change (ΔH^0) and the standard entropy change (ΔS^0) are determined from the Van't Hoff equation (Umpuch and Sakaew, 2013).

$$\ln K_L = -\frac{\Delta H^0}{RT} + \frac{\Delta S^0}{R} \quad (10)$$

As seen in Table 3, all ΔG^0 shifted to a less negative value when the temperature increased suggesting the adsorption occurred less spontaneously at higher temperature. The negative value of the enthalpy change (ΔH°) indicated that the sorption was an exothermic process. This also suggested that the adsorption process takes place without energy consumption. The negative value of entropy change (ΔS°) corresponded to an decrease in the degree of freedom of the adsorbed species. However, a little change of entropy can be observed showing that SMPP did not change significantly as a result of adsorption.

Table 3: Thermodynamic parameters for the adsorption of MB on SMPP

T(°C)	K_L (L/mol)	ΔG° (kJ/mol)	ΔH° (kJ/mol)	ΔS° (kJ/(mol.K))
25	5.95	-4.42	-26.75	-0.080
35	6.51	-4.64		
45	3.48	-3.09		
55	2.42	-2.19		

CONCLUSION

The cationic surfactant adsolubilized on pomelo peel caused a presence of admicelle which is organophilic on the external surface of the precursor enhancing adsorption capacity to MB blue dyes. The MB uptakes rapidly increased in the first 2 min and achieved equilibrium at 30 min. The SMPP sorbs MB effectively in alkali solution and sorption of MB is strongly pH dependent. The sorption process is well described by Langmuir and Freundlich equations. The kinetic study demonstrated that the adsorption kinetics followed pseudo-second order kinetic model. The activation energy of +45.67 kJ/mol was determined. The calculated ΔH^0, ΔS^0 and ΔG^0 suggested that the adsorption was exothermic and spontaneous. From the above results, the SMPP was an effective adsorbent for the removal of the organic dyes from synthetic effluents.

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ÇAĞDAŞ ARAP ŞİİRİNDE SEMBOLİZM AKIMI ÜZERİNE BİR İNCELEME

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Özet: Sembolizm 19. yüzyılın ikinci yarısında parnasizme tepki olarak Fransa'da ortaya çıkmış bir sanat akımıdır. Fransa'da gelişerek diğer Avrupa ülkelerine yayılmıştır. Dönemin Kant, Henri Bergson, Richard Wagner gibi filozof ve sanatkârlar bu akımın düşünce alt yapısının oluşmasını sağlamıştır. Daha sonra C. Baudelaire (1821-1867), P. Verlaine (1844-1896), A. Rimbaud (1854-1891) ve S. Mallarme (1842-1898) gibi Fransız şairler bu akımın prensiplerini, yaratıcı gücünü ortaya koyarak geliştirmişlerdir. Özellikle Baudelaire "Correspondances" adlı şiiriyle dünyanın "semboller ormanı " olduğunu ifade etmiş ve ilişkiler teorisi düşüncesini ortaya koymuştur. Dünya edebiyatını etkileyen sembolizm şüphesiz ki Arap edebiyatını da derinden etkilemiştir. Özellikle Arap şiirinin klasik gelenekten kurtulup, çağın değişimine ayak uydurması gerektiğini savunan genç Arap şairlerinin bu isteğini karşılayan sembolizm akımı olmuştur. Bu çalışmamızda sembolizmin Çağdaş Arap şiiri üzerinde etkisi ve yansıması üzerinde durularak, bu bağlamda çeşitli örnekler verilmiştir.

Anahtar Kelimeler: Modern Arap Şiiri, Sembol, Sembolizm, Simge, Parnasizm

A STUDY ON SYMBOLISM IN MODERN ARABIC POETRY ABSTRACT

Abstract: Symbolism is an art movement emerged in France in the second half of the 19th century as a response to Parnassianism. It developed in France and has spread to other European countries. The philosophers and artists of this period such as Kant, Henri Bergson and Richard Wagner has provided the background of this movement. Then, French poets such as C. Baudelaire (1821-1867), P. Verlaine's (1844-1896), A. Rimbaud (1854-1891) and S. Mallarmé (1842-1898) have developed the principles of this movement by putting forward its creative powers. Especially Baudelaire has expressed the World as a "forest of symbols" with his poem, "Correspondences" and has asserted the idea of the theory of relations. Undoubtedly, symbolism affecting world literature has deeply influenced Arabic Literature as well. It is symbolism which meets especially the request of young Arab poets who claim the necessity of getting rid of the classical traditions of Arabic poetry and adapting to changes in the current era. This study examines the impact of the symbolism on the contemporary Arabic poetry and its reflections and several examples are given in this context.

Keywords: Modern Arabic Poetry, Symbol, Symbolism, Symbolic, Parnassianism

Giriş

Sembolizm, ilk olarak İngiliz ve Alman romantizminde görülmüşse de, bir akım olarak XIX. yüzyılın son çeyreğinde parnasizme (şiirde gerçekçiliğe) tepki olarak Fransa'da ortaya çıkmıştır. Bilhassa Fransa, Almanya gibi batılı ülkelerinde başlayan Rönesans ve reform hareketleri bu akımın doğuşuna zemin hazırlamıştır. Batı toplumlarında başlayan bu aydınlanma hareketleri ardından insan ve hayatın tek gerçeği sadece materyalizm olmuştur. Hayatı ve insan zihnini sadece madde ve ilimle sınırlandırmaya çalışmıştır. Batı toplumunda egemen olmaya başlayan materyalist düşünce, belli bir süre sonra insanı bunalıma sevk etmiş ve kendi ruh dünyasını tatmin edecek yeni arayışlara girmiştir. Bu arayışın içinde olanların başında Alman filozof Kant olmuştur. Kant'a göre her türlü bilgi ve düşünce sübjektif ve görecelidir. Bilginin elde edilmesinde sezgi gücü çok önemli ve kaçınılmazdır. Buna ilaveten bilginin elde edilmesinde dış dünyanın gerçekleri ve tabiatı göz ardı edilmemelidir.
Kant insanın yaratıcı hayal gücüne inanır. Ona göre insanın duyularla kazandığı izlenimleri, duyular ötesi bir seviyede sezgiye dayanan akıl sayesinde "fikir öbekleri" olarak adlandırılan kavramlara dönüştürme melekesi olmalıdır. Yani yaratıcı hayal gücü, insanın zihninde doğuştan getirdiği ve sezgiyle özdeşleştirdiği sentetik bir meleke ve bir yaratma gücü kendinde olmalıdır. Dolayısıyla Kant, bilginin sübjektifliğine ve sezginin bu konudaki önemine dikkat çeker. Çünkü her gerçek bilginin özü bir sezgidir. Her yeni gerçek de bir sezgiden ortaya çıkar(Çetişli, 2001:93-94).
Aynı şekilde Fransız filozofu Henri Bergson (1859-1941) pozitivist felsefeye karşı çıkarak bilimin sonsuz olanaklarının bulunduğunu inancı, ruhun imkânlarını reddetmek anlamına geldiğini ifade eder. Ona göre akıl her türlü bilgiye götüren tek kaynak değildir. Aklın karşısında bilincin doğrudan doğruya bilgilerine, bilincin yeteneklerine önem verilmesi gerekmektedir. Gerçeğe varmak, bilinç olaylarını kavramak, muhakeme yoluyla

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bilinenden bilinmeyene doğru metotlu bir biçimde giden akılla değil, ancak sezgiyle mümkündür. (Çetişli, 2001:95).
Yine materyalist dünya görüşüne karşı çıkan bir başka düşünür de Alman müzisyen Richard Wagner (1813-1883)'dır. Mistik bir dünya görüşünü benimseyen Wagner, sanatın önemine işaret ederek müzikal öğenin sembolizmin üzerinde tartışılmaz bir etkisinin olduğunu vurgulamıştır. Ona göre sanatın işlevi insanın ruhunda var olan gizli gerçeği gün ışığına çıkarmaktır. Bu da ancak duygusallık, canlılık ve sezgiyle mümkündür. He ne kadar müzik duyular bakımından ruhun içeriğini ifade etmekte ise de bu içeriği anlaşılır biçimde yansıtmaktan oldukça uzaktır. Bu açıklığı getirecek kişi de ozandır. İnsan ruhunun derinliklerinde var olan gerçekleri ifade etmek ancak duyguyla düşüncenin bir araya gelmesiyle mümkün olacaktır(Çetişli, 2001:95).
"Sembolizm" adı ilk defa 1886 yılında akımın bildirisini hazırlayan Jean Moreas tarafından kullanılmıştır. Maurice du Plessys (1864-1924), Jean Moreas (1856-1910), Laurent Tailhed (1854-1919), Georges Rodenbach (1855-1898) gibi dekadanlar diye bilinen bir grup şair sembolizmin bir akım olarak ortaya çıkmasına zemin hazırlamıştır. (Çetişli, 2001:93)
Sembolizm ilkeleri Charles Baudelaire (1821-1867), Stephane Mallarme (1842-1898), Paul Verlaine (1844-1896), Arthur Rimbaud (1854-1891), Jean Moreas, Henri de Regnier (1864-1936) gibi Fransız şairler tarafından ortaya konulmuş ve tüm dünya edebiyatçılarını etkilemiştir. Özellikle Charles Baudelaire yazdığı "*Correspondances"* adlı şiirle sembolizm akımının birçok prensiplerini ortaya koymuştur. Dünyanın "semboller ormanı " olduğunu ifade ederek sözcüklere yeni ve farklı anlamlar yüklemiştir. Örneğin "*La Beauté*" (Güzellik) adlı şiirinde şair, bir rüyasını katı bir nesne olan taşa şöyle benzeterek nitelemiştir(Baudelaire, 2001:40):
Je suis belle, ô mortels! comme un rêve de pierre,
Et mon sein, où chacun s'est meurtri tour à tour,
Est fait pour inspirer au poète un amour
Eternel et muet ainsi que la matière

Taştan bir rüyâ kadar güzelim;
Her birinin sırayla ölümünü bulduğu göğsüm
Şaire ilham verir bir aşkla ölümsüz
Çamur kadar yalnız ve sessiz.

Yukarıdaki mısralarda görüldüğü gibi Baudelaire, aralarında ortak bir özellik bulunmayan "rüya" ile "taşı" birbirine benzetmeye çalışmıştır.
Fransız sembolist şairler, yukarıda ifade ettiğimiz gibi sanatta gerçekçilik anlayışına karşı çıkarak insanın iç dünyasına yönelmesi gerektiği görüşünü dile getirirler. Onlara göre somut varlıklar, dış dünya ile insanın duyuları arasında köprü kurmaya yarayan birer simgeden ibarettir. Çünkü dış gerçek ancak insanın algılayış biçimiyle var olmaktadır. Bir başka ifadeyle dış dünyanın görüntülerini somut nesnel gerçeklikleriyle değil, bu görüntülerin sezgilerinden, izlenimlerden yansıyan niteliklerini şiire aktarılmalıdır. Bir insan onu nasıl algılıyorsa öyle değerlendirilmelidir.
Sembolistler şiirde müzikal öğeye çok önem vermişlerdir. Şiiri de sesiz bir şarkı olarak tarif etmişlerdir. Onlara göre şiir düşüncelere değil duygulara seslenmelidir. Bir şey anlatmak için yazılmaz. Ayrıca sözcükler insanın duygularını ifade etmek için yetersizdir. Bu nedenle insanların duygularını harekete geçirmek için müziğe önem verilmelidir. Çünkü şiirde sözcüğün anlam değerinden çok, müzikal değeri önemlidir. Nitekim Baudelaire "*La Musique*" (Müzik) adlı şiirinde müzikal öğenin şiirde ne kadar önemli olduğunu şöyle dile getirmiştir(Baudelaire, 2001:113):
La musique souvent me prend comme une mer!
Vers ma pâle étoile,
Sous un plafond de brume ou dans un vaste éther,
Je mets à la voile;

Müzik çok zaman beni deniz gibi taşıyor
Taşıyor beni solgun yıldızıma
Bir sis tavan altında veya sonsuza dek
Böyle açarım yelkeni.
Sembolistler, şiirlerinde alışılmışın dışında ve farklı çağrışımlar elde etmek için çeşitli istiare, teşbih, kinaye ve mecaz gibi söz sanatları kullanmışlardır. Bu da manayı derinleştirmiş, herkesin anladığı şekilde yorum getirme olanağını yaratmıştır.
Yine gerçeklerden kaçarak hayale sığınılması, hayatta mevcut olan çirkinlikleri hayal gücüyle güzel gösterilmesi sembolistlerin temel özelliklerindir.
Sembolizm, tüm dünya edebiyatını etkilemiş bir akımdır. Amerika Birleşik Devletleri'nde Edgar Allan Poe (1809-1849), İngiltere'de Oscar Wilde (1854-1900), Almanya'da Stefan George (1868-1933), Rusya'da Konstantin Dimitriyevic Balmont (1867-1942), Turkiye'de Ahmet Haşim (1883-1933) gibi bu akımın etkisinde kalan

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şairlerdir. Arap dünyasında ise başta Lübnanlı şairleri olmak üzere birçok Arap dünyasının genç şair ve edebiyatçılarını etkilemiş bir akımdır.

Çağdaş Arap Şiirinde Sembolizm

Çağdaş Arap şiirinde sembolizm akımını incelemeye geçmeden önce, klasik Arap edebiyatı geleneğinde sembolizmin bilinip bilinmediği veya kullanılıp kullanılmadığı hususuna değinmekte konunun daha kapsamlı anlaşılması bakımından yarar vardır.

Arapçada sembol kavramının sözcük karşılığı "*remz*"dir. Arapların bu sözcüğü bildiklerini ve edebî ürünlerinde kullandıklarını görmekteyiz. Bazı Arap dilciler, *remz* sözcüğünü, "dudak, göz, kaş ve elle yapılan bir tür işaret" şeklinde açıklar. Bazıları da *remz*in anlaşılmayacak derecede "kısık bir sesle konuşmak veya işaret etmek" anlamına geldiğini belirtir. Nitekim Kuran'ı Kerim'de *remz* sözcüğü"bir alamet, bir işaret" anlamına gelecek şekilde şöyle kullanılmıştır (Ali İmrân/14):

"قَالَ رَبِّ اجْعَل لِّيَ آيَةً قَالَ آيَتُكَ أَلاَّ تُكَلِّمَ النَّاسَ ثَلاَثَةَ أَيَّامٍ إِلاَّ رَمْزًا"

"Zekeriya, "Rabbim! (çocuğum olacağına dair) bana bir alâmet ver" dedi. Allah da şöyle dedi: "Senin için alâmet, insanlarla üç gün konuşmaman, ancak işaretleşebilmendir."

İbn Manzûr, *remz* sözcüğünün anlamını"iki dudağın hareketiyle mırıldamak gibi dille çıkarılan kısık bir ses veyahut dudakla yapılmış bir işaret" olduğu şeklinde açıklar (İbn Manzûr, 1994: "remz" mad.).

el-Câhız söz sanatlarından bahsederken "işaret" kavramıyla ilgili daha geniş bir bilgi vererek mananın sadece sözle değil, aynı zamanda yazı veya işaretler kullanılarak ifade edildiğini söyler. (el-Câhız, 1998:69).

Araplar, *remz* sözcüğünü ıstılahı bir kavram olarak ilk defa Abbasî Dönemi'nde kullanmaya başlamıştır. Bilindiği üzere Abbasî Dönemi edebiyat, ilim, fikir ve sanat alanında gelişmelerin yaşandığı bir dönemdir. *Remz* sözcüğünü ıstılahî anlamda ilk defa kullanan eleştirmen Kudâme b. Ca'fer(ö. 337/948) olmuştur (Kudâme, tsz:90). Kudame b. Cafer'den sonra İbn Reşîk el-Keyravânî (ö. 456/1064) bu sözcüğü kavramsal anlamda kullanmış ve işaretin taşıdığı anlamları ortaya koyarak açıklamaya çalışmıştır. İbn Reşîk işaret kavramını"*tüm söz çeşitlerinde bulunan ve sözün genelinden anlamı anlaşılan, zahiri manasından uzak bir mana ima eden veciz bir söz"* olarak açıklar (İbn Reşîk, 1981:305).

Klasik Arap şairlerinin, Arapçada karşılığı *remz* olarak bilinen sembolü bir kavram olarak şiirlerinde kullanıp kullanmadıkları hususunda edebiyat eleştirmenlerinin iki farklı görüşü bulunmaktadır. Bunlardan biri Arap şairlerin sembolü bir kavram olarak bilmedikleri ifade etmektedir. Bu görüşü dile getiren eleştirmenlerin başında da İlyâ Havî (1929-2000) gelmektedir. Cahiliye şairlerinin sembolü bir edebî sanat olarak bilmediklerini ifade eden İlyâ Havî, bu dönemin şairlerinin düşünce ve kültürel yapısında bir derinlik olmadığını ifade eder. Ona göre cahiliye şairi, çevresinde gördüklerini şiirine konu edinirdi ve bununla yetinirdi. Kâinatın karmaşık ve derin yapısını düşünecek bir kabiliyet veya bilimsel bir altyapıya sahip değildi. Bu yüzden şiirlerindeki manalar basit ve yüzeyseldi. Kapalılıktan uzaktı. Okuyucunun zihninde farklı çağrışımlar yaratacak bir mana yoktu. Hatta dinî inançlarında dahi bu yüzeysellik ve basitliği görmek mümkündür. Taş, odun parçası veya yediği gıdalardan kendine bir tanrı edinirdi. İhtiyaç duyduğunda da kutsallık atfettiği bu nesneleri günlük hayatta kullanmaktan sakınmazdı. Ayrıca cahiliye edebiyatında dolaylı anlatım üslubu pek yoktur. Daha çok icaz üslubu egemendir.

Yine İlyâ Havî'ye göre metafizik âlem hakkında cahiliye Araplarının bilgilerinin olmayışı onları şiirlerinde tabiatın görünen gerçekleri ele almalarına ve konu edinmelerine sevk etmiştir. Şayet kâinatın sır dolu gizemleriyle ve onu harekete geçiren güç hakkında yeterli bir bilgiye sahip olsaydılar, bugün cahiliye şiiri Yunan şiiri gibi mitolojik unsurlarla dolup taşmıştı. Eski Yunanlılarda mitolojik inançlar, insanların düşünce dünyalarının ayrılmaz bir parçasıydı. Oysa cahiliye Arap şiirinde insan hayatını ve onun hayal ve düşünce dünyasını etkileyen mitolojik bir tanrısal güç yoktu. Cahiliye insanı yaşamında tanrı gücünden çok sahip olduğu maddî güce güvenirdi. Bu nedenle cahiliye şairi şiirlerinde bineğini betimlerken onun korku dolu ıssız çölü nasıl kat tetiği üzerinde dururdu. Şair Antara b.Şeddâd (ö.21/642) ve 'Amr b. Kelsûm(ö.540. civarı)'un şiirlerinde olduğu gibi.

Diğer bir görüş ise yukarıdaki görüşün tam aksini iddia ederek Arapların sembolü bildiklerini dile getirir. Bu görüşe göre cahiliye döneminde kâhinlik düşüncesi yaygındı. Kâhinler, günlük hayatta kullanılan dilden farklı bir dil kullanırdı. Kendilerine özgü bir dilleri vardı. Bu dil oldukça müphem ve kapalıydı. Sembolik anlatımlarla doluydu. Kâhinler, dinleyicinin üzerinde etki yaratmak için dildeki müzikaliteye de önem verirdi. Kapalılık, ima ve sezgi bakımından bu dil daha çok batılı sembolistlerin kullandıkları dile yakındı. Bu dönemde yazılmış olan gazel şiirlerinin tümü sembolik anlatımlarla doluydu. Çünkü bu şiirlerde ismi anılan sevgili gerçek sevgili değildi. Bu isimlerin çoğu sembolik anlamlar taşıyordu.(el-Cundî, tsz:160). Buna ilaveten cahiliye şairleri şiirlerinde sembolik anlatımlara çokça yer vermişlerdir. Örneğin cahiliye şairlerinden İmru'l-Kays bir şiirinde geceyi tasvir ederken gece sözcüğüne pek çok anlam yüklemiştir (Ceviz, 2004:34):

وَلَيْلٍ كَمَوْجِ البَحْرِ أَرْخَى سُدُوْلَهُ عَلَيَّ بِأَنْوَاعِ الهُمُوْمِ لِيَبْتَلِي
فَقُلْتُ لَهُ لَمَّا تَمَطَّى بِصُلْبِهِ وَأَرْدَفَ أَعْجَازاً وَنَاءَ بِكَلْكَلِ
لاَ أَيُّهَا اللَّيْلُ الطَّوِيْلُ أَلاَ انْجَلِي بِصُبْحٍ، وَمَا الإِصْبَاحُ مِنكَ بِأَمْثَلِ

Beni sınamak için, türlü türlü kederlerle deniz dalgaları misali perdelerini üzerime salan nice geceler var.
Gece yoğunluğu ile boynuzunu uzatıp, arkasına süre ekleyip, göğsünü şişirdiğinde ona dedim ki:
Ey uzun gece! Açıl da sabah olsun; sabah da senden daha iyi değil ya!

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Yukarıdaki mısralarda görüldüğü üzere şair geceyi yere çöken cüsseli bir deveye benzetir. Ancak şair, mısralarda deve sözcüğünü zikretmez. Onun levazımlarından olan deve için kullanılan yere çöküş fiili olan "*kelkele*"yi zikreder. Bir başka ifadeyle geceyi azgın, cüsseli ve efsanevi bir devenin yere çöküşüne benzetir. Görüldüğü gibi burada zımni bir istiare bulunmaktadır Bu da sembolün bir çeşidi olarak kabul edilmektedir.

Dolayısıyla şair, karamsarlığını, üzüntüsünü ve hayal kırıklığını ifade etmek için gece sözcüğünü kullanarak içinde bulunduğu durumu veya ruh halini ifade etmeye çalışmıştır.

Cahiliye Araplarının sembolü şiirlerinde kullandıkları bir gerçektir. Örneğin Temimoğulları kabilesine esir düşen bir şairin sembolik anlatımlarla kabilesini şöyle uyardığı görülmektedir (İbn Reşîk, 1981:308):

خَلُّوا عن الناقة الحمراء أرْحُلَكُمْ والبازلَ الأصْهَبَ المعقولَ فاصْطَنِعُوا
إن الذِّئابَ قدْ اخْضَرّتْ بَرَاثِنُهَا والنَّاسُ كُلّهُـــمُ بَكْـرٌ إذا شَبِعُـــــوا

Sert ve kumsal bir dağın üzerinde yürüyen kırmızı bir dişi deve görüyorum. Kumral devenin üzerinden eşyalarınızı indirin.

Kurtların ayağı yeşil oldu(otların üzerinde) yürümekten, insanların tümü Bekr b.Vâi'il'dir (düşmanınızdır) doyduklarında.

Şair yukarıdaki mısralarında "kurt" sözcüğüyle düşmanı, "kırmızı dişi deve"yle çölü, "kumral deve"yle bir dağı sembolize etmiştir.

Yukarıda verdiğimiz örneklerde görüldüğü gibi cahiliye şairlerinin şiirlerinde çeşitli sembolik ifadeler kullandıkları görülmektedir. Ancak kavramsal olarak sembol, ilk defa Abbasî döneminde kullanılmaya başlanmıştır. Abbasî şairlerinden Beşşâr b. Burd (**ö**. 167/783-84) alışıla gelmiş şiir kalıplarının dışına çıkarak, batılı sembolistlerin önemli kuramlarından olan "ilişkiler teorisi"ne benzer bir şiir söylemiştir (http://www.adab.com/):

فرمت بي خلف الستور لأفواهِ الْمَنَايَـا مَنْ بَيْنِ حمْرٍ وَسـودِ
أيُّها السَّاقِيانِ صُبَّا شرابِـيواسقِياني من ريق صفـراء رود
ولها مضحكٌ كغر الأقاحـيوَحَدِيثٌ كَالْوَشْـي وَشْـيِ الْبرودِ

Beni gizemler arkasında ölümün siyah ve kırmızı pençelerine attı
Ey iki saki! Şarabımı doldur ve bana sarı rüzgârların salyasından içir
Onun bir gülüşü var papatya ağzı gibi ve yeleğin süslemesi gibi nakışlı sözleri var.

Yukarıdaki mısralarda görüldüğü üzere şair, sevgilisinin sözlerini nakışla süslenmiş bir yeleğe benzetir. Dolayısıyla söz duyulur; görülmez. Ancak şair dinleme duyusunun yerine görme duyusunu kullanır. Yine ölüme pençeler ve pençelere de renkler, canlılara has olan salya sözcüğünü de rüzgâra izafet etmesi oldukça dikkat çekicidir. Bilindiği üzere klasik Arap şairleri, genelde teşbih yaparken iki kavramın yani müşebbeh/benzeyen ve müşebbehbih'in/benzetilen vech-i şebehte/benzeyen açısından ortak yanı bulunması gerekmektedir. Ortak yanı yoksa benzetme sanatı yapılmazdı. Örneğin Baudelaire'in yukarıdaki mısralarda hayalini taşa benzetmesi gibi bir benzetme yapılmazdı. Bu tür benzetmeler de şairler tarafından bilinmezdi.

Aynı şekilde Abbasî şairlerinde Ebû Temmâm(ö. 231/846)'ın şiirlerini incelediğimizde pek çok sembolik ifadelere rastlamak mümkündür. Bilindiği üzere dolaylı anlatım ve kapalılık Ebû Temmâm'ın şiir özelliklerindendir(el-Kazvinî, 1994).

Yine el-Müttennebî (905-965)'nin şiirlerini incelediğimizde şiirlerinde oldukça derin anlamları olan ve orijinal sembolleri kullandığını görmekteyiz. Özellikle onun gazellerinde sembolik anlatımlara sık rastlamaktayız. Örneğin bir şiirinde şöyle der (el-Mutenebbî, tsz:429):

وَزِدْنَا من حسْنِ وَجْهِكمـا دامَ فَحسْنُ الوجُوهِ حَالٌ تَحَـــولُ
وَصِلْنَا نَصِلْكِ فِـي هَذِهِ الدُّنيَـا فإن المُقـــامَ فيها قليـــــــلُ

Yüz güzelliğinden bize de ver var olduğu sürece, zira yüz güzelliği değişkendir
Sen bize, biz sana kavuşalım, zira bu dünyada ikamet geçicidir.

Şair, bu beyitlerinde klasik gazel şairlerindeki alışılmışın dışına çıkarak âşık ve maşukun geleceği, akıbeti hakkında bilgi vermeye çalışmaktadır. Kullandığı semboller vasıtasıyla insanı düşünmeye sevk etmektedir. Son beyitte yer alan"ikamet" sözcüğü oldukça derin ve geniş anlamlar taşımaktadır. Bu sözcüğü kullanırken aslında ölümü kastetmektedir; bilindiği üzere "ikamet" sözcüğü "göç" sözcüğünün zıddıdır. Şair "göç etmek" sözcüğüne metafizik bir anlam yüklemeye çalışmıştır. Âdeta şunu ifade etmek istemektedir; bir yerde her ne kadar uzun bir süre ikamet edilirse edilsin sonunda bir göç, bir yolculuk vardır. Bir başka ifadeyle, göçten sonra bir göçün daha olduğunu ifade etmeye çalışmaktadır ki o da ölümdür.

Yine şair Ebû Firâs el-Hemedânî (932-968)'nin, Rumların elinde tutsakken yazdığı bir kısım gazelleri sembolik anlatımlarla doludur.

Endülüs şairlerinin şiirlerinde de sembolik anlatımların yoğun olduğu görülmektedir. Örneğin İbn Hafâce (1058-1139) bir dağı nitelerken hiçbir zaman dağın adını zikretmeden çeşitli semboller kullanarak onu betimlemeye çalışmıştır (el-Muleycî, 1989:204):

وَقورٌ على ظَهرِ الفلاةِ كأنَّــه طِـوالَ اللَّيالي مُفكرُ في العَواقبِ

Sahranın üzerinde vakur (bir insan) gibi duruyor, geceler boyu zamanın sorunlarını düşünüyor.

Dolayısıyla klasik Arap şairlerinin Arapçada *remz* olarak bilinen sembolü kullandıkları bir gerçektir. Ancak klasik şairlerin *er-remziye* olarak bilinen sembolizmi bir akım olarak bilmedikleri de bir vakadır. Sembolizm, batı şair ve

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edebiyatçılarının genç Arap şairleri üzerindeki etkisinin bir sonucu olarak 1936'dan sonra Arap edebiyatında ortaya çıkmaya başlamıştır.

Bilindiği üzere ilk önce Lübnanlı edebiyatçıların ürünlerinde görülmeye başlamıştır. Lübnan, nüfusunun bir kısmının Katolik Araplardan oluşması ve misyoner okullarının burada açılması sebebiyle, diğer Arap ülkelerine göre Batıyla, bilhassa Fransa ile çok erken dönemlerde temasa geçmiş ve tarih boyunca hep yakın ilişkiler içinde olmuştur.

Ayrıca Birinci Dünya Savaşı'ndan sonra gerek Lübnan, gerekse Suriye uzun bir dönem Fransız işgalinin altında kalmıştır. Her iki ülkenin entelektüelleri arasında Fransızca, Arapçadan sonra kullanılan ikinci bir dil olmuştur. Bu da onlara Fransız edebiyatında yaşanan gelişmeleri yakından takip etme olanağı sağlamıştır(el-Cundî, tsz:416). Böylece Baudelaire, Rimbaud, Mallarmé, Valéry, Paul Verlaine gibi Fransız sembolist şairlerin şiirlerinin yanı sıra eleştiri türünde ve edebiyat kuramları gibi pek çok eser Arapçaya çevrilmiştir. Çevrilen bu eserler, Ebû Şebeke, Sa'îd 'Akl, Yûsuf Gassûb, Salâh Lebkî, Bişr Fâris, Emîn Nahle, Nakûlâ Feyyâd gibi dönemin genç şairleri tarafından büyük ilgi görmüştür(el-Hamdânî, 1989:279).

Çağdaş Arap şiirinde sembolizm akımına zemin hazırlayan pek çok faktör bulunmaktadır. Bunların başında da neo-klasik (el-Klâsîkiyye'l-Cedîde)şairleri gelmektedir. Arap şiirinde ilk değişim belirtileri neo-klasik şairlerin şiirlerinde görülmeye başlamıştır. Bu akımın ilk temsilcisi Mahmûd Sâmî el-Barûdî (1837-1904) olduğu için *Medresetu'l-Barûdî* (Barudî ekolu) olarak da bilinmiştir (Brugman,1948:926). Ayrıca Mısır'da Sâmî el-Barûdî'nin yanı sıra Ahmed Şevkî (1869-1932), Hâfız İbrâhîm (1871-1932), Halîl Mutrân (1872-1949), Irak'ta Cemîl Sıdkî ez-Zehâvî (1863-1936), Ma'rûf er-Rusâfî (1875-1945), Lübnan'da Şekîb Arslân, Halîl el-Yâzıcî, Suriye'de Muhammed el-Bezm, Tunus'ta Muhammed eş-Şâzlî, bu ekole mensup ünlü şairlerdir(el-Fâhûrî, 1987:926). Bu ekolün şairleri, edebiyatın "altın çağı" diye nitelendirilen Abbâsî döneminin, Ebû Temmâm (796-843), el-Buhturî (821-897), Ebû Nuvâs (762-813), Beşşâr b. Burd (714-784), el-Mutenebbî (915-965) gibi ünlü şairleri taklit etmişse de Arap şiirinde muhteva bakımından yenilik getirme çabasında olmuşlardır. (Brugman,1948:26). Örneğin Avrupa kültürünü yakından tanıma olanağını bulan Ahmed Şevkî,1897yılında Cenevre'de Uluslararası Oryantalizm Konferansı'nda okuduğu *Kibâru'l- Havâdis fî Vâdî'n-Nîl* (Nil Vadisinde Meydanâ Gelen Önemli Olaylar) adlı ünlü kasidesinin Victor Hugo'nun *La Legende de Siecles* (Asırların Efsaneleri) adlı kasidesinden esinlenerek Mısır tanrıçalarından olan İsis, Ramsis, Amun, Kıloptra, Anka kuşu, Hz. Mesih kuşu gibi mitolojik semboller kullanmaya başlamıştır (Şevkî,1988:17-33; Dayf; 1997:47).

Neo-Klasik şairlerinden sonra sembolizmin belirtileri Avrupa'da olduğu gibi romantik şairlerin şiirlerinde görülmeye başlamıştır. Arap romantik şiirine geçişi sağlayan Halil Mutrân, Arap kasidesinde gerek içerik gerekse biçim yönünden değişikliğe gidilmesi ve kasidenin organik bütünlüğünün sağlanması, yeni kural ve kavramlar geliştirmesi gerektiğini vurgulamıştır. Ayrıca şiirde bireysel özgürlük, duygu, hayal gibi konuların üzerinde durmuştur. Mutrân, Fransız romantiklerin, özellikle Hugo'nun şiirsel anlatımlarının, Musset'nin liriklerinin ve Baudelaire'in etkisinde kalarak Arap şiirinin gelişimine büyük katkı sağlayarak sembolizm akımının Arap şiirinde yerleşmesine bir basamak hazırlamıştır(Tur, 2005:7). Özellikle onun "*İlâ Gurûbi'ş-Şems"*(Güneşin Batışına) ve *el-Mesâ'* (Akşam) adlı şiirlerinde hayatın son baharını ima eden pek çok sembol kullanmıştır.

Aynı şekilde sembolizmin ilk belirtilerini, Mehcer edebiyatçılarının romantik ürünlerinde görmek mümkündür. Bilindiği üzere Arap şiirinin modernleşme sürecinde en büyük katkı sağlayan, gerek romantizm gerekse sembolizm akımlarının Arap edebiyatında ekolleşmesine zemin hazırlayan, Suriye ve Lübnan'dan dinî, siyasî ve iktisadî nedenlerden dolayı Kuzey ve Güney Amerika'ya göç etmiş şair ve yazarlardır ki bunlar "Mehcer Ekolü" diye anılırlar. Bu ekolün önde gelen şair ve yazarları Cubrân Halîl Cubrân (1883-1931), Mihâ'îl Nu'ayme (1889-1988), Emîn er-Reyhânî (1876-1940), İliyyâ Ebû Mâdî (1889-1957), Nesîb 'Arîda (1887-1946)'dır. Bu şahsiyetlerin tümü, Amerika'ya göç etmeden önce Lübnan ve Suriye'deki misyonerlik okullarında iyi eğitim almış Hıristiyan Araplardı. Kendi anavatanlarındayken dahi Arap şiirinin daha köklü bir değişime ihtiyacı olduğu inancını taşıyorlardı.

Mehcer şairleri, Arap şiirinin gerek şekil gerekse muhteva bakımından klâsik anlayışından kurtulması gerektiğini vurgulamışlardır. Bu grubun başını çektiği yenilikçi isimlerinden Cubrân Hâlîl Cubrân, 1908 yılında resim bilgisini artırmak amacıyla Paris'e gitmiş ve orada Rodin'den resim dersi almıştır. Bu sırada Rodin, Cubrân'a İngiliz romantik akımının öncüsü ve şiirlerinde mistisizm sembollerini öne çıkaran şair ve ressâm William Blake (1757-1827)'in eserlerini okumasını önermiştir. William Blake'in eserlerini büyük bir beğeniyle okuyan Cubrân, onun etkisinde kalarak, Batı'daki teknik anlamıyla sembolizmi Arap edebiyatında ilk kullanan kişi olarak kabul edilmiştir(el-Cundî, tsz: 405). Arap şiir anlayışının değişiminin öncülüğünü yapan Cubrân, şiir ile nesir arasındaki ayrımları kaldırmıştır. Yazdığı serbest nazım şiirleriyle de Arap şiirindeki biçim sorununun çözümüne yönelik girişimlerde bulunmuş, Arap şiirinde serbest kasidenin ortaya çıkmasına zemin hazırlamıştır(bkz.el-'Azma, 1988: 108 v.d.). Nitekim eleştirmen Mârûn 'Abbûd, Arap edebiyatında romantizm ve sembolizmin ilk kurucusunun Cubrân Halîl Cubrân olduğunu belirtirken, (el-Cundî, tsz:185). İlyâs Ebû Şebeke de, Cubrân, Mîhâ'il Nu'ayme ve İliyyâ Ebû Mâdî'nin eserlerinde sembolü ustaca kullandıklarını ve sembolizmin Arap edebiyatında müstakil bir akım olarak gelişmesine zemin hazırladıklarını ifade etmiştir(el-Hamdânî, 1989:410).

Batı edebiyatının etkisinde kalan Mehcer şairlerinin şiirleri, gerek içerik gerekse biçim yönünden klâsik Arap şiir anlayışından farklı olduğu için Mısır'da "Apollo Grubu" olarak bilinen şairler tarafından benimsenmiştir. 1932

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Yılında Kahire'de, Ahmed Zekî Ebû Şâdî tarafından oluşturulan ve Batı edebiyatından daha çok yararlanarak şiirde modernleşmeyi teşvik eden bu grubun yaşlı şairleri, farklı fikir eğilimlerinden oluşmuşsa da 'Alî Mahmûd Tâhâ, Zekî Mubârak (1892-1952), Ebu'l-Kâsım eş-Şâbbî, İlyâs Ebû Şebeke, İbrâhim Nacî gibi ikinci kuşağın hepsi romantik şairlerden oluşuyordu. Bu grup, çalışmalarını kendi kuruluş amacına uygun olarak, adını Yunan mitolojisindeki sanat ve ilham tanrısından alan *Apollo* dergisinde yayımlamışlardır. Şiirlerinde manalara derinlik katmak için çeşitli semboller kullanmışlardır. Özellikle Yunan mitlerinin birer sembol olarak kullanılması hususunda çokça yararlanmışlardır. Örneğin Alî Mahmûd Tâhâ, bir şiirinde manayı güzelleştiren ve anlama derinlik katan ve bir de musiki ahengi sağlayan sembolik anlam taşıyan bir ifadeyi şöyle kullanır (Taha, 2012:25):

فِـي يَدِه زَهـرةُ تَقطـرُ مـاءً عَرَفتُ عيْنـي بِهـا أدمُع قَلْبِـي

Elimde su damlatan bir çiçek var, gözüm onunla kalbimin gözyaşlarını tanıdı.

Yukarıdaki mısrada görüldüğü gibi şair, kalbi gözyaşı akıtan bir çiçek misaliyle simgelemektedir.

Mehcer edebiyatçılarının Lübnanlı genç şairler üzerindeki etkisinin göz ardı edilmemesi gerekmektedir. Özellikle şiirde yenilik arayışı içinde olan Lübnanlı genç şairler, aradıkları yeniliği sembolizm akımında bulmuşlardır. Zira sembolist akım, sembolistlerin şiirdeki klâsik kalıpları zorlaması sonucu ortaya çıkmıştır. Sembolistler, klâsik kalıpların musikiyi, ahengi, sezginin serbest çağrışımını, sembolün gizemini ve sanatkârın bunları elde etme hürriyetini engellediği düşüncesini taşıyorlardı. Onlara göre şiirin yapısı, önceden ve başkaları tarafından belirlenmiş olan değil, bilakis şairin dehası ve yeteneği ve bir ölçüde de şiirin muhtevası tarafından belirlenmelidir. Sembolistlerin bu yaklaşımı, serbest şiirin esas olmasını da beraberinde getirmiştir (Fettûh, 1984:304; el-Cundî, tsz: 399 v.d.).

Modern Arap şiirinde sembolizmi bir akım olarak ilk defa kullanan Lübnanlı şairlerden, edebî hayatına romantik bir şair olarak başlayan Edîb Mazhar (1898-1929)dır. Mazhar'ın, sembolizmi ilk defa *en-Nesîmu'l-Esved* (Siyah Meltem), *Neşîdu's-Sukûn* (Sesizliğin Şarkısı), *el-Veteru'd-Dâmî* (Kanlı Tel) adlı şiirlerinde kullandığı kabul edilmektedir. Edîb Mazhar, Fransız sembolist şairi Albert Samain(1858-1900)'ın şiirlerinden etkilenerek bu akımın özelliklerinden olan "ilişkiler teorisi"ni şiirlerinde kullanmıştır. Mazhar'dan sonra Sa'îd 'Akl (1911-2/2014), *Bint Yiftâh*, *el-Mecdeliyye*, *Kadmûs* ve *Randelli* adlı müzikal çalışmalarıyla, çağdaş Arap şiirinde sembolizme bir ivme daha kazandırmıştır. Sa'îd 'Akl, *Muftaraku't-Turuk* (Yol Ayrımı) adlı sembolik nesir türünde yazdığı tiyatro eserinin ön sözünde musiki, ilişkiler teorisi, görme, sezme, muğlaklık ve dil gibi sembolizmin özellikleri hakkında görüşlerini ortaya koyarak sembolizmin Arap edebiyatında müstakil bir akım oluşturmasına ve kökleşmesine vesile olmuştur (bkz. el-Hamdânî, 1989:278 v.d;).

Çağdaş Arap şiirinde ikinci büyük sembolist şair, Nizâr Kabbânî (1923-1998)'dir. Ayrıca Salâh Lebkî (1906-1955), Bişr Fâris (1906-1963), Bedr Şâkir es-Seyyâb (1926-1964), Ahmed 'Abdulmu'tî Hicâzî (1935-?), Adonis('Ali Ahmed Sa'îd (d.1930), İlyâs Ebû Şebeke (1903-1947), Emîn Nahle, Abdulvahhâb el-Beyyâtî (1926-1996) gibi şairler de bu akımın önde gelen temsilcilerindendir(Fettûh, 1984 305).

Şunu da hatırlatmak gerekir ki serbest kasideye yönelmeyi tercih eden sembolist Arap şairler, vezin ve kafiyenin kullanılmamasından doğan müzikal boşluğu gidermek için, şiirde tekrar sanatına başvurmuş, iç ve dış kafiyeyi kullanmış ve kelimenin taşıdığı fonetik değere önem vererek mısralarda yeni taksimlere gitmiştir. Ali Ahmed Bâkesîr, Nâzik el-Melâ'ike, Sa'îd 'Akl, Adonis, Nizâr Kabbânî'nin şiirlerinde olduğu gibi.

Arap dünyasında sembolizm akımının genç edebiyatçılar arasında büyük bir ilgi görmesi ve geniş bir zemin bulmasının sebeplerinden biri de siyasi nedendir. Bilindiği üzere Arap dünyası diktatörlük ve baskıcı rejimlerle yönetilmektedir. Şair ve yazarlar siyasilerin hışmından çekindikleri için onları açık ve doğrudan eleştirmekten çekiniyorlardı. Bu nedenle siyasal eleştiride bulunurken hep sembolik anlatımlar kullanarak sembolleri bir nevi maske şeklinde kullanıp kendilerini gizliyorlardı. Nitekim Bedr Şakir es-Seyyâb bu bağlamda şöyle der: " *Sembolizmin Irak'ta ortaya çıkış nedenlerinden biri de tamamen siyasiydi. Irak'ın baskıcı yönetiminin başında bulunan Nurî Said Paşa (1888-1958)'nın hükümetini açık bir şekilde eleştirmekten çekiniyorduk. Ona karşı ayaklanmamızı ifade etmek için sembolik ifadelere başvuruyorduk. Daha sonra edebî çevrelerde siyasi sebepler olmaksızın sembolizm daha geniş bir şekilde yayıldı. Çünkü siyasî sebepler geçiciydi."*(el-Ğarfî,1986:118).

Örneğin Nizâr Kabbânî,Arap dünyasının baskıcı diktatörlerini eleştirirken kendini siyasilerin hışmından korumak için şu şekilde sembolik ifadeler kullanır (Kabbânî, 1999:491-492):

لو أحدٌ يمنحني الأمانْ..
لو كنتُ أستطيعُ أن أقابلَ السلطانْ
قلتُ لهُ: يا سيّدي السلطانْ
كلابكَ المفترساتُ مزّقت ردائي
لو أحدٌ يمنحُني الأمانْ
من عسكرِ السلطانْ..
قُلتُ لهُ: لقد خسرتَ الحربَ مرتينْ..

Birisi bana güven verirse
Sultanla görüşebilirsem
Ona derim ki: Sultan hazretleri!
Yırtıcı köpeklerin elbisemin kolunu parçaladılar
Birisi bana güven verirse

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Sultanın askerlerinden
Ona "savaşı iki defa kaybettin" derdim..

Çağdaş Arap şairleri, Arap şiirine yeni bir soluk katmak amacıyla, sembolizm akımının birçok özelliğini taşıyan ve sembolistlerin bir manifestosu ve "semboller ormanı" olarak kabul edilen Baudelaire'in (Correspondances) ilişkiler teorisine şiirlerinde geniş yer vermeye başlamışlardır. Batı sembolizm akımının çağdaş Arap şairlerinin üzerindeki etkisinin daha iyi anlaşılabilmesi için Baudelair'in, *Correspondances* (İlişkiler) adlı manzumesi üzerinde durmakta yarar vardır. Bu manzume şöyledir (Kolcu, 2002:91-92; Göker, 1982:72):

La Nature est un temple ou de vivants piliers
Laissent parfois sortir de confuses paroles:
L'homme y passe a trvers des foréts de symboles
Qui l'observent avec des reğards familiers.

Comme de longs échos qui de loin se confondent
Dans une ténébreuse et profonde unité
Vaste comme la nuit et comme la clarté
Les parfums, les couleurs et les sons serépondent.

Il est des parfums frais comme des chairs d'enfants,
Doux comme les hautbois, verts comme les prairies,
Et d'autres, corrompus, riches et triomphants,

Ayant l'expansion des choses infinies,
Comme l'ambre,le musc, le benjoin et l'encens,
Qui chantent les transports de l'esprit et des sens.

Bir tapınaktır doğa, orada canlı sütunlar
Anlaşılmayan sözler fısıldar zaman zaman;
Tanıdık bakışlarla kendisini gözleyen
Sembol ormanları arasından geçer insan.
Uzaktan birbirine karışan uzun yankılar gibi

Karanlık ve derin bir birlik içinde ki,
Gece gibi, aydınlık gibi geniştir
Kokular, renkler, sesler arasında ilişki vardır.

Kokular vardır çocuk tenleri gibi taze,
Fülütler gibi tatlı, çayırlar gibi yeşil,
Başka kokular da vardır, bozulmamış, zengin, kuvvetli

Sonsuz şeyler gibi yayılan
Misk ve amber, aselbent, buhur gibi kokular,
Ruhun ve duyumların heyecanlarını söyler.

Baudelaire, bu manzumesinde madde ile ruh ilişkisini, büyük bir birliğin ahengiyle açıklar. Ona göre doğa, madde ile ruhun bir arada bulunduğu bir tapınak olup, ilâhî bir yönü bulunmaktadır. Tapınak taştan, kireçten, ağaçtan yapılan maddî bir mekândır. Fakat içinde bir ruhaniyet taşımaktadır. İnsan da tıpkı tapınak gibi madde ve ruhtan inşa edilmiştir. O, bu tapınakta (doğada) manevî dünya ile iletişim kurmaktadır. Bir başka ifadeyle doğada bulunan her şey canlıdır ve konuşmaktadır. Ancak söylediği şeyler açık değildir, karışık ve gizlidir. Dolayısıyla doğa, gizli, esrarlı şeylerle doludur. O "karışık sözlerle" konuşur. Çünkü insan doğanın içinde objelerin kendilerini değil, onların belirtileri, işaret ve kanıtları olan sembolleri görür. Baudelaire'deki bu düşünce, Eflatun felsefesinin, "*Gerçek olan şey, yaşanan, gözle görülen olaylarda değil, olayların arkasında, saf, sonu olmayan, önceden var olan fikirlerdir*" diyen "fikirler teorisi"ne dayanmaktadır.

Yaratılan şeylerin hem maddî hem manevî yönleri vardır. Yaratılan şeyler bir bütündür. Bu nedenle maddî dünya ile manevî dünya birbirine yabancı değildir. İnsan diğer yaratılan şeylerden farklı değildir. Çünkü Baudelaire'e göre insan, doğada semboller arasından geçerken bu semboller kendisini "aşina bakışlarla süzmektedirler", onu tanımaktadırlar. Dolayısıyla doğa ile insan arasında bir ilişki vardır ve doğadaki her şeyin bir bütün olarak meydana gelmesine de "evrensel benzerlik" denilmektedir.

Doğanın söylediği gizli sözleri bize açıklayabilmek için değişik türdeki duyumlar birbirleriyle uyum ve ilişki kurmaktadırlar. Değişik duyumlar arasında kendiliğinden bir çağrışım olup, birbirlerini anımsatmaktadırlar. Bir başka ifadeyle kokular, renkler ve sesler arasında ilişki vardır. Öyle ki, "kokular tazelik kazanabilmekte", "çocuk tenleri gibi" ses olup kulağa hitap edebilmekte "fülütler gibi tatlı" ya da "çayırlar gibi yeşil" renk olabilmektedir.

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Bu ilişki sadece duyumlar arasında değil, duyumlarla insan ve ruh halleri arasında da vardır. “Kokular vardır, ruhun ve duyumların heyecanlarını söyler.”
Yine sembolistler, dış dünya veya tabiatta görülen ve duyularla algılanan her nesnenin, bir varlık özünün (idea) dış görüntüsünden; “göz alıcı giysileri”nden başka bir şey olmadığı kanaatindedirler. Yani onlar hiçbir zaman asıl gerçek değildir. Asıl gerçek, söz konusu görüntünün arkasında gizlidir. Akılla elde edilen bilgi gerçeğin sadece küçük bir bölümüdür.
Dolayısıyla ilişkiler teorisine göre kâinatta var olan her şey bir bütündür; bu bütünlük içindeki varlıklar veya madde-ruh arasında bir ilişki ağı bulunmaktadır. Bir başka ifadeyle; madde-ruh, beden-ruh, evren-insan, kırmızı-sıcak, ses-renk, görme işitme gibi farklı renkler ve duyular arasında ilişkiler ağı vardır. Şayet dikkatle bakar ve görenin ötesine geçebilirsek, bunu yakalamak mümkün olabilecektir (Nevfel,1995:164 v.d.; Kolcu, 2002:188-190). Sembolist bir sanatkârın görevi de dış gerçeği değil, görünenin arkasında saklı bulunan hakikî gerçeği, gizli manayı, ilâhî gerçeği eserlerinde verebilmesi veya en azında sezdirebilmesidir(Çetişli, 2001:96).
Çağdaş Arap sembolist şairler, Baudelaire’in (Correspondances) ilişkiler teorisinden hareketle şiirlerinde yeni istiare ve teşbihler getirmiştir. Kendi renkleri olmayan nesnelere farklı renkleri izafet etmiştir. Gerçekte aralarında herhangi bir bağ bulunmayan nesneler arasında da bir ilişki kurmuştur. Farklı duyuları birbirinin yerine kullanmıştır. Örneğin Nizâr Kabbânî bir şiirinde bu bağlamda şöyle der(Kabbânî,1986:857):

صَنَعْتُ الأَصْوَاتَ التي لَهَا رَائِحَةٌ ..
والرَّائِحَةَ التي لَهَا صَوتٌ ..

Yarattım kokulu sesleri …
Ve sesli kokuyu ..
İşitme duyusunun yerine koku alma duyusunu kullanır(Kabbânî,1983:476):

فَفِي الظِّلِّ يَغْدُو لِعطركِ صَوْتٌ وتُصبِحُ أَبْعَادُ عَينيكِ أَكبَرْ

Gölgede senin kokunun bir sesi var ve gözlerinin boyutları daha büyük olur.
Algılama duyusunun yerine koku alma duyusunu kullanır(Kabbânî,1983:121):

قَبْلَ المَجِيءِ أَشُمُّ فِكْرَتَهَا …وأَحِسُّ خطوتَهَا عَلَى عِرْقِي

Gelmeden önce düşüncesini koklarım... ve adımını da damarımda hissederim.
Görme duyusunun yerine de işitme duyusunu kullanır(Kabbânî,1983:477):

فِـي مَرفَـأ عَيْنَـيكِ الأزْرَق أَمْطَـارٌ مِنْ ضَـوءٍ مَسْمُوعْ

Gözlerinin mavi limanında duyulan ışık yağmurları var.
Çağdaş Arap şairleri, ilişkiler teorisini pek çok şiirlerinde kullanarak kelimelerin görünür anlamını değil, görünenin arkasında saklı bulunan hakikî gerçeği, gizli manayı ortaya koymaya çalışmışlardır.
Şairin şiirlerinde bazen soyut kavramları somut kavramlarla nitelediği de görülür. Örneğin bir şiirinde seslere mavi parmaklar izafet eder(Kabbânî,1983:223):

أَنَامِـلُ صَوتُـكِ الزَّرقَاءُ تُمْعِنُ فِـيَّ تَمْزِيقـاً

Sesinin mavi parmakları parçalarcasına bana dik dik bakıyor.
Şair, başka şiirinde de şehvetinin bir sesi ve açlığının bir eli olduğunu vurgular(Kabbânî,1983:55):

وأَبْحِرِي فِي جَرْحِ جَرْحِي أَنَا لِشَهْوَتِي صَوْتٌ … لِجُوعِي يَدَانِ

Benim yaramın yarasında yol al, benim şehvetimin bir sesi ve açlığımın iki eli var.

Yenilikçi bazı Fransız sembolist şairler, duyguları renklerle teşbih ederek açıklamaya çalışırlar. Sevinci, üzüntüyü, sıkıntıyı, lezzeti, tokluğu birer renkle sembolize ederler.(el-Cundî, tsz:404). Aynı durumu sembolist Arap şairlerinde de görüyoruz. Örneğin Nizâr Kabbânî bir şiirinde sevgilisinin yaşadığı sıkıntıyı şu renkle imgeler(Kabbânî,1983:485):

هِيَ الأُخْرَى
تُعَانِي مَا أُعَانِيه
تَعِيشُ السَّاعةَ الصَّفْراء
تُعَانِي عُقْدَةَ سَوْدَاء

O da
Benim çektiğim sıkıntıyı çekiyor
Sarı anı yaşıyor
Siyah bir kompleks yaşıyor.
Bir başka şiirinde de üzüntüsünü şu renkle ifade eder(Kabbânî,1983:615):

أَنَا حُزْنِي رَمَادِيٌّ
كَهَذا الشَّارِعِ المُقْفَرْ

Benim hüznüm gri
Tıpkı bu ıssız cadde gibi.
Tunuslu şair Ebu’l-Kâsım eş-Şâbbî’nin bu bağlamda şu şiirlerini örnek verebiliriz. Bu şiirinde şair, tatma duyusunu, işitme duyusu yerine şöyle kullanmıştır(eş-Şâbbî, 1993:200-201):

أيها الطائـــر الكئـــب تَغـــرَّدْ إن شَدْوَ الطيـــوُر حلوُ رَخِيمُـهْ

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وارتشفْ مِنْ فَمِي الأناشيدَ سَكرَ فالهوى ساحـــرُ الدلالِ، وَسيمُـهْ

Ey üzgün kuş öt, zira kuşların nameli ötüşü tatlıdır.
Ağzımdan sarhoş olmuş şarkıları yudumla, aşk güzel ve şımarık bir sihirdir.
Aynı şekilde "kuşların ötüşü" kulakla duyulur, fakat bir "tatlı" gibi ağızla tadılmaz.
Yine bir başka şiirinde şair, işitme duyusunu görme duyusu yerine şu şekilde kullanmıştır(eş-Şâbbî, 1993:207):

سَيُسـمَعُ صوتٌ كلحنٍ شجيٍ تَطايَرَ مـن خَفَقاتِ الوتـــرْ
يُرَدِده حُزنُنـا فـي سكـــونٍ على قَبْرِنا الصَّامتِ المطمئنْ

Çalgı tellerinin titreyişinden bir ses duyulacak hüzünlü bir beste gibi.
Hüznümüz eşsiz ve huzur dolu olan mezarımızın üzerine tekrarlayıp duracaktır bu şarkıyı.
Çalgı tellerinden uçuşanlar gözle görülür, kulakla işitilmez.
Sembolist Çağdaş Arap şairlerinin şiirlerinde dikkat çeken bir başka husus da mitolojik, dinî, tarihî ve folklorik unsurları birer sembol olarak geliştirip kullanmasıdır. Çağdaş Arap şiirinde mitolojik, dinî ve tarihî figürlerin sembol olarak kullanımı *Temmuzî Şairler* grubuyla başlamıştır. Bu grup adını, Sümer mitolojisinde geçen, baharı ve yeniden dirilişi simgeleyen "Tammuz veya Domuzi ile İştâr (İnanna)" efsanesinden alır(bkz. Hooke, 2002: 25v.d).
Temmûzî Şairler terimini ilk defa Cebrâ İbrâhîm Cebrâ, Yûsuf el-Hâl'ın *el-Bi'r el-Mehcûr* (Terkedilmiş Kuyu) adlı şiir koleksiyonu için yazdığı mukaddimede kullanır. Cebrâ, bu terimle şiirlerinde daha çok dirilme, canlanma, verimlilik ifade eden mitolojik sembollere yer veren çağdaş Arap şairlerini kasteder(Ebû Gâlî, 1998:74; İsma'il 1978:232). Bu hareketin öncüleri Bedr Şâkir es-Seyyâb, Cebrâ İbrâhîm Cebrâ, Yûsuf el-Hâl, Halîl Hâvî olarak kabul edilirken, daha sonra yazar ve eleştirmen Es'ad Rezzûk bu öncü gruba Adonis ('Ali Ahmed Sa'îd)'i de dâhil eder(Sâ'î, 1978:360).
Çağdaş Arap şiirinde Temmûzî Şiir Hareketi'nin ortaya çıkışı, Ezra Pound ve T. S. Eliot'ın bu hareketin öncü şairlerinin üzerindeki etkisinin bir sonucudur. Özellikle Eliot'ın Yunan, Sümer, Roma gibi değişik uluslara ait mitleri kullandığı *The Waste Land* adlı şiiri, çağdaş Arap şairlerinin büyük ilgisini çekmiştir. Bu ilginin bir sonucu olarak çağdaş Arap şairleri dikkatlerini, Eliot'ın diğer çalışmaları üzerine yoğunlaştırmışlardır. Başta es-Seyyâb olmak üzere Halîl el-Hâvî, Yûsuf el-Hâl,'Ali Ahmed Sa'îd, Nâzik el-Melâ'ike, el-Beyâtî, Salâh Lebkî gibi şairler Eliot'ın etkisinde kalan şairler arasındadır (el-'Abdulhammûd, 1996:157-158). Nizâr Kabbânî T. S. Eliot'ın çağdaş Arap şairleri ve özellikle de Irak ve Mısır şairleri üzerinde olumlu etkiler bıraktığını, Eliot ve Ezra Pound sayesinde serbest şiir yazımını ve şiirde mitolojik, dinî ve tarihî sembollerin kullanımını öğrendiklerini ifade etmiştir.(Kabbânî, 1963:56-57).
Temmûzî Şairler, Arapların Haziran 1967 yenilgisinden sonra yeniden dirilişi simgelemek için Temmûz, Anka, Lazarus, Sezif, İsis, Osiris gibi mitleri şiirlerinde genişçe işlemeye başlamışlardır. Ayrıca Arap dünyasında yaşanan sosyo-politik sorunları dile getirmek ve eleştirilere derin bir mana kazandırmak için Arap tarihinden ve folklorundan alınmış Sinbâd, Şehrazâd, Şehriyâr, Hârûn er-Reşîd gibi pek çok sembolü de ustaca kullanmışlardır. *Temmûzî Şairler*, tarihî ve folklorik figürleri bir sembol olarak kullanmalarının yanı sıra kutsal kitaplarda geçen Hâbîl ve Kâbîl, İbrâhîm, Nuh, Hızır, Mehdî, Deccâl, Burâk, Hira mağarası, Ashabu'l-Kehf, Mesih, Meryem, 'Âd ve Semûd gibi dinî kaynaklı hikâyelerde geçen figürleri yeni bir üslûpla şiirlerinde işlemişlerdir. Ayrıca bu şairler, bazı şahsiyetleri efsaneleştirerek yeni semboller geliştirmişlerdir. Örneğin, pek çok çağdaş Arap şairi, Fransız işgaline karşı direniş gösteren Cezayirli halk kahramanı Cemîle Buhayrad'ın adını efsaneleştirmişlerdir. Artık bu isim, Cezayir devriminin tanınmış bir halk kahramanı olmaktan çok özgürlük uğruna mücadele eden bir insanı sembolize etmektedir (el-'Abdulhammûd, 1996:159; İsmâ'il, 1979: 218). Aynı şekilde el-Beyâtî, büyük tasavvuf şairlerinden olan ve idam edilen Hallâc Mansûr'u işkence ve eziyet çeken günümüz Arap insanını simgeleyen bir figür olarak geliştirmiştir(İsmâ'il, 1978). es-Seyyâb da, 1959 yılında komünist göstericiler tarafından Musul'un şehir meydanında idam edilen Hafsa'yı, mitolojide yer alan İştâr değil, çağın İştâr'ı olarak sembolleştirip şiirlerinde işlemiştir(el-'Azma, 1988:272). Örneğin Bedr Şâkir es-Seyyâb, *"el-Mesih bade es-Salb"* (Çarmıha Gerildikten Sonra Hz. Mesih) adlı şiirinde Hz. Mesih'i yeniden dirilişi imgeleyen bir figür olarak şöyle kullanır(es-Seyyâb, 2000:242):

و الصليب الذي سمروني عليه طوال الأصيل
لمتمتني . و أنصت : كان العويل
يعبر السهل بيني و بين المدينه
موته البعث ،يحيا بمن يأكل
في العجين الذي يستدير

Gurup vaktinde üzerine beni astıkları çarmıh
Beni öldürmedi. Dinle!: Çığlık sesi
Benim ile şehir arasındaki düzlüğe kadar gidiyordu
Onun ölümü diriliş,
Kendisine sunulan hamurdan yediği şeyle canlanır.
Aynı şekilde es-Seyyâb, Hz. Eyyûb karakterini sabır ve şükrün imgesi olarak "*Sifru Eyyûb"* (Eyyub'un Kitabı) adlı şiirinde şu şekilde ele alır (es-Seyyâb, 2000:149-150):

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لكَ الحمدُ مَهمَا استطالَ البلاءومَهمَــا اسْتبدَّ الألـــــمُ
لك الحمدُ، إن الرزايا عَطاءوانْ المصيباتِ بعضُ الكرَم

Musibetler ne kadar artarsa artsın ve her ne kadar acı şiddetli olursa olsun, sana şükürler olsun ya Rabb! .
Sana şükürler olsun, belalar bir nimettir, musibetler de keremin bir parçasıdır.

Çağdaş Arap şairleri, tarihi, dinî gibi pek çok şahsiyetleri şiirlerinde sembolleştirerek yeni imgeler geliştirerek bu imgelere yeni anlam ve kavramlar yüklemişlerdir. Şair Nazım Hikmet'i direniş ve başkaldırıyı, Sultan Abdülhamit ve Harun er-Reşîd doğu erkeğini, cahiliye şairi Antara b. Şeddâd günümüzün cahil, şiddet yanlısı Arap insanını, cahiliye şairlerinden el-Hanse Arap gözyaşını, Sinbad yeniliği, azim ve kararlığı sembolize eden karakterler olarak kullanmıştır.

Sonuç

Sembolizm XIX. yüzyılın son çeyreğinde Batı edebiyatında realizme tepki olarak ortaya çıkmış bir sanat akımdır. Bu akım, dış dünya ile gerçek ilkesinden hareket etmiştir. Dünyada var olan benzerlikleri ve bunların arasındaki ilişkileri bulmaya çalışmıştır. Mana ve anlamda kapalılık ilkesini benimsemiş ve şiirde musikiye önem vermiştir. Serbest şiir ilkesini benimsemiş, ferdiyetçi bir düşünceyi tercih etmiştir.

Klasik Arap şairlerinin şiirlerinde çeşitli sembolleri kullandıkları görülmüştür. Şiirlerindeki teşbih, istiare, kinaye gibi edebî sanatlar bilinen teşbihlerdir. Bir başka ifadeyle okuyucunun anlamı algılama konusunda pek fazla düşünmeye sevk etmezdi. Şiirleri gerçeğe daha yakındı, içindeki hayal pek derin değildi.

Ancak Abbâsî döneminde ilmî, siyasî, dinî ve kültürel gelişmeler sayesinde Arap şiirinde yeni gelişmeler yaşanmıştır. Şairler alışılmışın dışına çıkarak yeni teşbih ve istiareler getirmişlerdir. Bu da şiirin anlamına derinlik katmıştır. Ebû Temmâm, el-Mutenebî gibi bazı şairlerin dilinin kapalı olmasına neden olmuştur.

Her ne kadar klasik Arap şiirinde sembol kullanılmışsa da sembolizm, ilkeleri olan bir akım olarak Arap şiirinde 1940'lı yıllardan sonra kullanılmaya başlanmıştır. Sembolizmin ilk belirtileri batı edebiyatında olduğu gibi Birinci Dünya savaşından sonra gerek Divan Ekolü, gerek Mehcer şairleri gerekse Halîl Mutrân'ın romantik eserlerinde görülmeye başlanmıştır. Özellikle Arap edebiyatının gerek içerik ve gerekse şekil bakımından değişime ihtiyacı olduğunu düşünen Mehcer edebiyatçılarının ve başında da Cubrân Halîl Cubrân'ın romantik ve tasavvufi eserlerinde sembolizmin ilk belirtileri görülmeye başlanmıştır. Daha sonra batıyla ve özellikle Fransa'yla yakın temas içinde olan Sa'id 'Akl, Edîb Mazhar, Yûsuf Gassûb gibi Lübnanlı şairler Fransız sembolistlerin etkisinde kalmışlardır. Sembolizm bir akım olarak bu genç şairlerin şiirlerinde görülmeye başlanmıştır. Arap şiirinin taklitten kurtulması ve yeniliğe gidilmesi gerektiğini savunan dönemin genç Arap şairlerinin bu isteklerini karşılayan, sembolizm akımı olmuştur. Bu yüzden Çağdaş Arap şairleri tarafından bu akım büyük bir ilgi görmüş Arap şairleri sembolizmin batı edebiyatındaki temsilcilerinin eserlerini yakından takip etmişlerdir.

Dahasonra sembolizm, Mısırlı Ahmed Zekî Ebû Şâdî (1892-1955), 'Ali Mahmûd Tâhâ, (1902-1949), İbrâhim Nacî (1898-1953), Muhammed 'Abdulmu'tî el-Hemşerî, Suriyeli Ömer Ebû Rîşe (1910-1990), Nizâr Kabbânî, Lübnanlı İlyâs Ebû Şebeke (1903-1947), Tunuslu Ebu'l-Kâsım eş-Şâbbî (1909-1934), Sudanlı Beşîr et-Ticânî (1912-1937), Iraklı Muhammed Mehdî el-Cevâhirî(1899-1997)', Abdulvahhâb el-Beyyâtî, Nâzik el-Melâ'ike Flistinli Mahmud Dervîş gibi şairlerin şiirlerinde olgunlaşarak Arap şiirinin modernleşmesine ivme kazandırmıştır. Çağdaş Arap şairleri, Sembolizmin manifestosu olarak kabul edilen "ilişkiler teorisi"nden hareket ederek şiirlerinde yeni istiare ve teşbihler getirmiştir. Şiirlerinde mitolojik, dinî ve tarihî karakterleri kullanarak yeni semboller geliştirmişlerdir.

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FARKLI KOŞULLARDA DÖKÜLEN KOLONLARIN DÜŞEY YÖNDE ULTRASES DEĞİŞİMİNİN İNCELENMESİ

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Özet: Çalışmada farklı kür ve vibrasyon koşullarda dökülen dört adet 40x40x250 cm3 ebatlarındaki kolonun derinlik değişimine bağlı olarak ultrases boyuna dalga hız ölçümleri yapılmıştır. Ultrasonik yöntem beton içerisinden geçirilen ultrasonik boyuna dalga hızının betona hasar vermeden ölçülmesi esasına dayanmaktadır. Bu amaçla dökülen kolonlarda üç seviyede (alt-orta-üst) düşey yönde, karot örnekler alınarak ultrases hız ölçümleri yapılmış ve dayanımları tahmin edilmiştir. Sonuçlarda vibratör ve kür uygulaması ile ultrases hızının arttığı, ancak aşırı vibrasyona maruz kalan bölgede ayrışmaya sonucu bölgesel olarak ultrases hızının düştüğü görülmüştür. Tüm kolonlarda en yüksek ultrases hızının alt bölgede, en düşük ultrases hızının ise üst bölgede olduğu belirlenmiştir. Buna bağlı olarak en yüksek dayanım alt bölgede, en düşük dayanımlarda üst bölgelerde çıkmıştır.

Anahtar kelimeler: Kolon beton, ultrases, dayanım.

Giriş

Beton uzun yıllardan beri kullanılan en önemli yapı malzemelerinden biridir. Yapılarda kullanılan betonun kalitesi, o yapının depreme karşı dayanımını etkileyen en önemli etkenlerden biridir. Gerek taze beton üzerinde, gerekse sertleşmiş beton üzerinde dayanım belirlemek amacıyla kullanılan birçok yöntem vardır. Betonun kalitesi standart olarak, taze betondan alınan silindirik ya da kübik numunelerin 28 gün laboratuvar ortamında bakımı yapılarak kırılması sonucu belirlenmektedir. Fakat döküm aşamasında alınan bu numune en ideal şartlar altında kalıplanarak, standartlara uygun laboratuvar şartlarında kür edildiğinden, dayanımının şantiye şartlarına oranla yüksek çıkması olağan bir durumdur. Yoğunluğu yüksek olan betonların basınç dayanımlarıda genellikle yüksek olur. Su/çimento oranı yüksek olan betonlar daha çok kapiler boşluk içerdiğinden, bu betonların yoğunluğu ve basınçlarıda yüksek değildir (Erdoğan, 2003).

Beton kalitesi tasarım, üretim, taşıma, yerleştirme, sıkıştırma ve bakım aşamaları sonucunda oluşmaktadır. Bu aşamaların her birinde aynı ve yeterli özen gösterildiğinde istenen sonuç alınabilir (Yılmaz ve Canpolat, 2002). Şantiye şartlarında dökülen betonun kalitesini etkileyen başlıca faktörler arasında sıkıştırma (vibrasyon) ve bakım (kür) gelmektedir. Sıkıştırma işlemi kaba ve ince agreganın kümeleşmemesi, beton içerisinde hava boşlukları kalmaması, her beton döküm tabakasının bir alt tabaka ile karışarak bağlantısının sağlanması, çelik donatı ile çevresinin beton ile tam olarak sarılması ve kalıpla temas halinde olan beton yüzeylerinde yeterince ince malzeme birikerek düzgün bir beton yüzey elde edilmesi amacı ile yapılır (Arslan, 2001). Vibrasyon ile beton kuvvetli bir titreşime tabi tutulmaktadır. Sıkıştırma sonucu içerisindeki hava boşlukları azalan beton daha dayanıklı ve geçirimsiz olmaktadır.

Sertleşmiş betonun mukavemetini etkileyen önemli faktörlerden biri ise betonun bakımıdır. Betonun santralden çıkış ve yerine yerleştirme aşamalarında herhangi bir problem olmasa bile uygun şekilde bakımı yapılmazsa mukavemetinde önemli oranlarda azalma olmaktadır. Çimentonun hidratasyonu betona mukavemet kazandıran etkenlerin başında gelmektedir. Çimento hidratasyonu haftalarca, hatta aylarca devam edebilmektedir. Beton içerisinde çimentonun suyla tepkimeye girerek oluşturduğu bu etki sonucu beton yeterli dayanımı kazanmaktadır. Beton içerisindeki bu hidratosyon tepkimesinin devam etmesi için yeterli su ve sıcaklığın betonda muhafaza edilmesi gerekmektedir. Teorik olarak bu şartlar sağlandığı takdirde betonun mukavemet kazanmaya devam edeceği kabul edilmektedir. Betonun hidratasyon için gerekli olan suyu kaybetmesini engelleyerek yeterli dayanımı kazanmasını sağlamak amacıyla çeşitli kür yöntemleri vardır. Bunların başında, betonun yüzeyini sulayarak sürekli nemli kalmasını sağlamak, kimyasal kür katkılarıyla beton yüzeyini kaplamak ve su geçirmeyen bir örtü ile beton yüzeyini kaplamak gelmektedir.

Sertleşmiş betonun mukavemeti tahribatlı ve tahribatsız yöntemler olarak iki şekilde yapılmaktadır. Tahribatsız deneyler, bir malzemenin gelecekte faydalılığını etkilemeyecek teknolojilerle inceleyerek, betonun yerinde değerlendirilmesi, zararın mertebesinin belirlenmesi, nitelik güvencesi, fiziksel özellikler olan yoğunluk, elastisite

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modülü, dayanım ve sıklığın belirlenmesinde kullanılır (Tikalsky, 2004). Literatürde ultrasonik ses hızı ve beton dayanımları konusunda yapılmış pek çok çalışma mevcut olup bunlardan bazıları özetlenecek olursa; Bungey (1989), betonarme yapıların farklı seviyelerinde ölçümler yaparak dayanım değişimlerini beton seviyeleri ile ilişkilendirerek kontur haritaları yapmış. Kheder [1998] yaptığı çalışmada, ıslak ve havada kurumuş betonların basınç dayanımını tahmin etmek için ultrasonik ses hızı ve beton test çekici yöntemlerini kullanmıştır. Qasrawi (2000), hasarsız deney yöntemleri ile beton dayanımı tahminlerini özetlemiş ve yaptığı çalışmada beton numunelere, hem test çekici hem de ultrasonik ses hızı testleri uygulamış ve beton dayanımının belirlenmesinde ultrasonik ses hızı yönteminin daha etkili olduğu sonucuna varmıştır. Demirboğa ve ark. (2004), yaptıkları çalışmada; ultrasesi, mineral katkılı betonun basınç dayanımını ölçmede kullanmışlar, Ultrases hızı ve basınç dayanımı arasındaki ilişkinin, mineral katkı ile üstel ilişkili olduğunu, ancak, her mineral katkı için katsayıların değiştiği belirtmişler. Abo-Qudais (2004), yaptığı çalışmada betondaki agrega granülometrisinin, s/ç oranının ve kür süresinin ultrasonik ses hızı üzerindeki etkilerini incelemiştir. del Rio ve ark. (2006), yaptıkları çalışmada beton basınç dayanımı ile ultrasonik ses hızı arasında üstel bir matematiksel ilişki olduğunu ortaya koymuşlardır. Khan ve ark. (2007), yaptıkları çalışmada ultrasonik ses hızı ile yüksek performanslı betonların dayanımları arasında bir gerilme modeli kurmuşlardır. Turgut ve Küçük (2007), yaptıkları çalışmada beton döküm yönünde ve yatay yönde doğrudan, dolaylı ve yarı dolaylı ultrasonik ses hızı ölçümleri yapmışlar ve doğrudan yapılan ultrasonik ses hızlarının dolaylı olarak döküm yönündeki ultrasonik ses hızı oranlarını ortaya çıkarmışlardır. Hobbs ve Kebir (2007), tarafından yapılan çalışmada ultrasonik ses hızı yönteminin beton dayanımının belirlenmesinde daha etkili olduğu gözlenmiş, fakat bu yöntemin tek başına kullanımı yerine ultrasonik ses hızı ve test çekici yöntemlerinin birlikte kullanılarak elde edilen sonuçların daha güvenilir olduğu fikrine ulaşılmıştır. Turan ve Tanrıkulu (2013), betoton test çekici ile ultrasonik ses hız deneyler sonuçları ile beton basınçları arasındaki ilişkiyi incelemişlerdir.

Tahribatsız yöntemler arasında en yaygım olarak bilinen ve kullanılan yöntemlerin başında Schmidt çekici ile betonda sertlik ölçümü ve ultrases dalga hız ölçümü gelmektedir. Tahribatlı yöntemlerden en yaygın kullanılanı ise karot alma yöntemidir. Tahribatlı yöntemlerle beton mukavemeti tayininde kesin sonuçlar vermesine rağmen zaman açısından, maliyet açısından ve yapıya verdiği zarar açısından bazı durumlarda tahribatsız yöntemler tercih edilebilmektedir.

Bu çalışmada farklı kür ve vibrasyon koşullarda dökülen dört adet 40x40x250 cm^3 ebatlarındaki kolonun derinlik değişimine bağlı olarak ultrases boyuna dalga hız ölçümleri yapılmıştır. Kolonlarda üç seviyede (alt-orta-üst) düşey yönde, karot örnekler alınarak ultrases hız ölçümleri yapılmış ve dayanımları tahribatsız olarak ultrases ile tahmin edilmiştir. Çalışma, Adıyaman Üniversitesi Fen Bilimleri Enstitüsünde hazırlanmış olan "*Farklı koşullarda dökülen kolonlarda Vibrasyon ve Kür Koşullarının Değişiminin Beton Dayanımına Etkisi*" isimli tez çalışmasının ön bulgularını içermektedir.

Materyal ve Metod

Çalışmada beton santralinde üretilen C 30/37 basınç dayanım sınıfında hazır beton kullanılmıştır. Tasarlanan betonda CEM I 42.5 R çimento ve agrega olarak doğal dere malzemesi kullanılmıştır. 1 m^3 beton için; 320 kg çimento, 160 kg su, 800 kg ince agrega, 1200 kg kaba agrega kullanılarak 2480 kg/m^3 birim kütleye sahip taze beton bileşimi tasarlanmıştır. Çalışmada 4 adet 40x40x250 cm boyutlarında film kaplı (playwood) düz yüzeyli çıplak beton kalıbı kurulmuştur (Şekil 1).



Şekil. 1. Çalışma için kurulan kalıp

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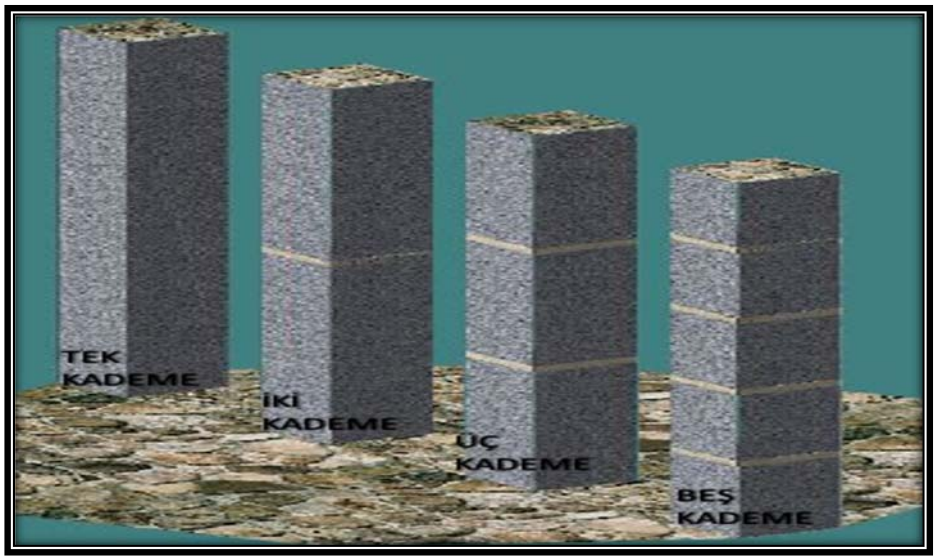
Hazır beton santralinden mikserlerle getirilen taze beton, hazırlanan 40x40x250 cm ebatlarındaki kalıplara farklı aşamalarda vibrasyon uygulanarak dökülmüştür. Dört kolon için beton döküm aşamaları ve vibrasyonlar faklı seçilmiştir. Birinci kolonda (K1) beton tek kademede dökülerek vibrasyon uygulanmamıştır. İkinci kolonda (K2) beton iki eşit kademede dökülerek her kademeye şantiye koşullarında eşit miktarda vibrasyon uygulanmıştır. Üçüncü kolonda (K3) beton dökümü üç eşit kademede ve vibratör uygulanarak yapılmıştır. Dördüncü ve son kolonda (K4) beton 5 eşit kademede ve her aşamaya vibratör yapılarak standartlara uygun döküm yapılmıştır (Şekil 2).



Şekil. 2. Kolonlara uygulanan beton döküm planı

Üretimi yapılan kolonlar kalıpların sökülmesinden sonra farklı kür uygulamalarına tabi tutulmuştur. 1. kolona kür uygulaması yapılmamış, 2. kolona 7 gün, 3. kolona 7 gün, 4. kolona 28 gün şantiye ortamında su ile kür uygulanmıştır. 1., 2. ve 3. kolonlar beton dökümünden 7 gün sonra üzerlerine naylon örtü serilerek ortam koşullarınadan etkilenmemesi için korunmuştur. 4. kolon ise beton dökümünden 28 gün sonra üzerlerine naylon örtü serilerek korunmuştur (Şekil 3).



Şekil. 3. Kolon numunelerin şantiyede kür edilmesi ve korunması

Kolon betonları şantiye ortamında 5 ay muhafaza edilmiş, bu süre sonunda kolonlar kesilmek üzere mermer fabrikasına götürülmüş ve kolonların her biri alt, orta ve üst bölgelerinden este ile kesilerek 40x40x25 cm ölçülerinde 4x3=12 adet dikdörtgen prizmalı beton numuneleri çıkarılmıştır (Şekil 4).

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Şekil. 4. 40x40x25 cm boyutlarına kesilen beton numuneleri

Daha sonra kesilen kolon numunelerinden her numuneden 4 adet olmak üzere (12x4) toplam 48 adet, 10x25 cm boyutlarında beton döküm doğrultusunda düşey yönde karot alınmıştır (Şekil 5). Prizmatik numunelerden alınan 10 cm çapındaki karotlar narinlikleri 2 olacak şekilde (1/2) ölçülerek alt ve üst yüzey birbirine paralel olacak şekilde boyutlandırılmıştır. Elde edilen karotlar 15 gün laboratuvar şartlarında korunduktan sonra tartılarak ultrases deneyi ile karot boyunu kat etme süresinden gidilerek ulrases hızları 1 nolu eşitlik ile hesaplanmıştır.

$$V = \frac{X}{t} \quad (1)$$

Burada; V hız (km/sn), X kat edilen mesafe (km) ve t süre (sn) dir.

Bulunan bu hız değerleri Bal ve ark., (2010) önerdikleri eşitlik 2'den gidilerek beton dayanımları tahmin edilmiştir.

$$fck = 2.6\ Vp\ 1.8 \quad (2)$$

Burada; fck beton basınç dayanımı (MPa), Vp ulrasonik hız (km/sn) dır.



Şekil. 5. Karot alma işlemi

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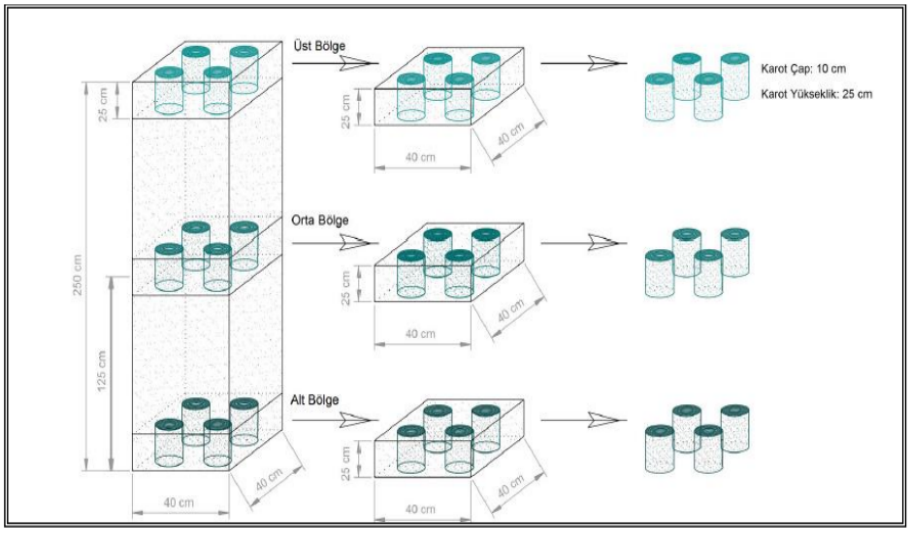


Şekil. 6. Karot alma planı

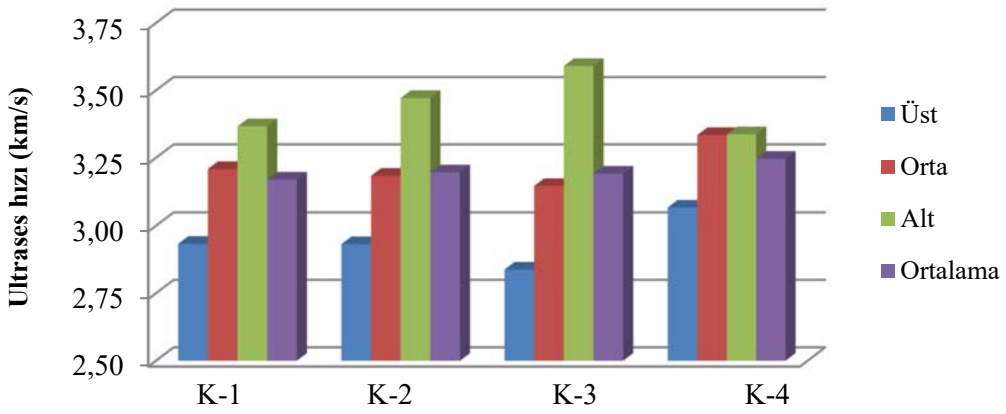
Araştırma Bulguları

Hazır beton firmasından alınan C 30/37 basınç dayanım sınıfındaki betona ait 1 m³ de betonda kullanılan malzeme miktarları Tablo 1'de verilmiştir. Çalışmada farklı kür ve vibrasyon koşullarda dökülen K1, K2, K3 ve K4 kolonlarından düşey yönde, üç seviyede (alt-orta-üst) alınan karot örneklerinden yapılan ölçümler sonucunda Ultrases hızları ile yoğunluk değerleri hesaplanmış ve ultrases hızlarından tahmini beton dayanım değerleri belirlenmiştir (Tablo 2).

Tablo 1. 1 m³ betonda kullanılan malzeme miktarları

Kullanılan Malzeme Cinsi	**Miktarı (kg)**
Çimento CEM I 42.5 R	320
Su	160
İnce agrega	850
Kaba agrega	1150
TOPLAM	**2480 kg/m3**

Kolonların ultrases hızı değerleri ile ortalamaları incelendiğinde, her kolonda en düşük üst bölgede, en yüksek alt bölgede olduğu, kendi aralarında genel ortalama ultrases hızların da en düşük ultrases hızının K1 (tek kademe vibratörsüz kürsüz) kolonunda, en yüksek ultrases hızının K4 (beş kademe vibratörlü kürlü standartlara uygun dökülen ve bakılan numune) kolonunda olduğu belirlenmiştir (Şekil 6-7)).



Şekil. 7. Kolon seviyelerinde ultrases hız değişimi

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Tablo 2 kolonlardan ölçülen ve hesaplanan değerler

Kolon No	Kolon Bölgesi	Karot	Vhız (km/s)	Ort. (km/s)	Std. sapma	Tahmini Dayanım (MPa)	Ort	Yoğunluk (kg/dm³) ɣ	Ortlm (kg/dm³)
K1	Üst	Ü-1	3,099	2,933	±0,341	19,91	18,17	2,373	2,376
		Ü-2	2,428			12,84		2,358	
		Ü-3	3,167			20,71		2,406	
		Ü-4	3,039			19,23		2,369	
	Orta	O-1	3,123	3,208	±0,108	20,19	21,21	2,395	2,388
		O-2	3,333			22,70		2,388	
		O-3	3,113			20,08		2,385	
		O-4	3,264			21,86		2,385	
	Alt	A-1	4,109	3,367	±0,960	33,09	24,13	2,409	2,411
		A-2	2,544			13,96		2,418	
		A-3	4,283			35,65		2,419	
		A-4	2,531			13,83		2,400	
K2	Üst	Ü-1	2,422	2,932	±0,365	12,78	18,18	2,396	2,423
		Ü-2	3,162			20,65		2,422	
		Ü-3	2,917			17,86		2,425	
		Ü-4	3,227			21,42		2,448	
	Orta	O-1	3,142	3,183	±0,078	20,41	20,90	2,386	2,382
		O-2	3,274			21,98		2,388	
		O-3	3,099			19,91		2,396	
		O-4	3,217			21,30		2,359	
	Alt	A-1	3,264	3,472	±0,256	21,86	24,50	2,418	2,434
		A-2	3,383			23,32		2,436	
		A-3	3,395			23,47		2,440	
		A-4	3,845			29,36		2,443	
Kolon No	Kolon Bölgesi	Karot	Vhız (km/s)	Ort. (km/s)	Std. sapma	Tahmini Dayanım (MPa)	Ort	Yoğunluk (kg/dm³) ɣ	Ortlm (kg/dm³)
K3	Üst	Ü-1	2,446	2,838	±0,472	13,01	17,25	2,446	2,428
		Ü-2	3,212			21,24		2,399	
		Ü-3	2,414			12,70		2,409	
		Ü-4	3,279			22,04		2,459	
	Orta	O-1	4,004	3,145	±0,643	31,58	20,91	2,377	2,384
		O-2	3,025			19,07		2,383	
		O-3	3,104			19,97		2,385	
		O-4	2,449			13,04		2,391	
	Alt	A-1	3,29	3,59	±0,375	22,18	26,11	2,444	2,451
		A-2	3,378			23,26		2,458	
		A-3	3,568			25,66		2,476	
		A-4	4,126			33,34		2,427	
K4	Üst	Ü-1	3,599	3,068	±0,459	26,07	19,79	2,475	2,432
		Ü-2	2,482			13,35		2,459	
		Ü-3	3,138			20,37		2,404	
		Ü-4	3,053			19,39		2,391	
	Orta	O-1	3,207	3,334	±0,422	21,18	22,91	2,407	2,405
		O-2	3,025			19,07		2,401	
		O-3	3,957			30,92		2,399	
		O-4	3,147			20,47		2,413	
	Alt	A-1	2,921	3,337	±0,333	17,90	22,87	2,435	2,430
		A-2	3,264			21,86		2,421	
		A-3	3,711			27,55		2,426	
		A-4	3,452			24,18		2,437	

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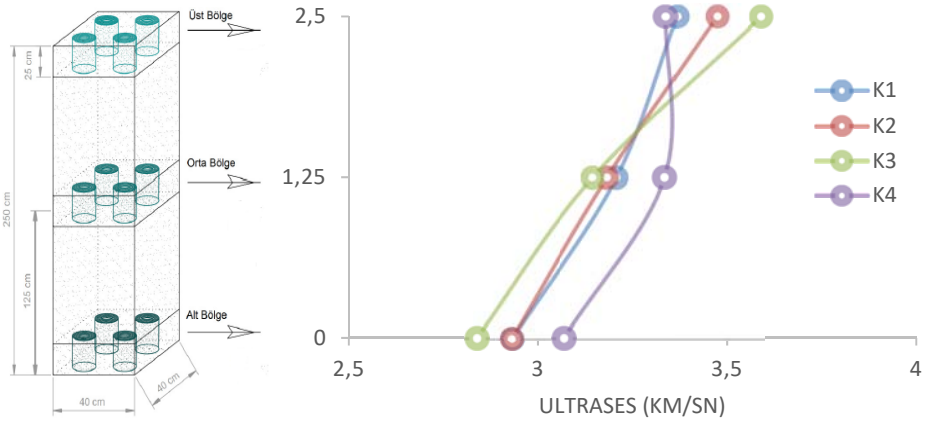
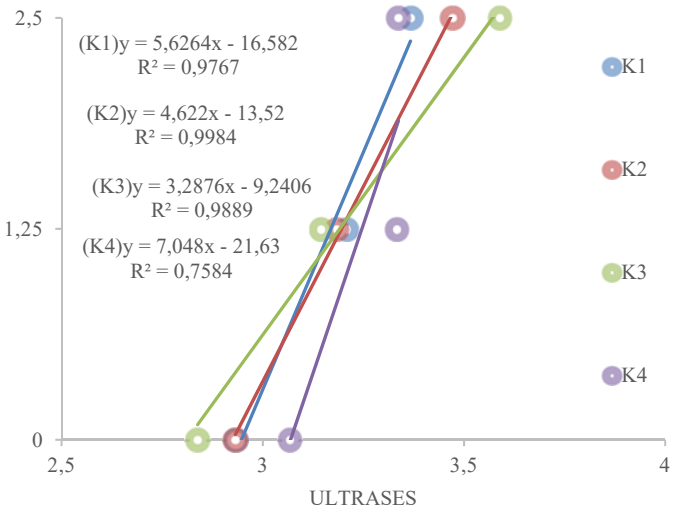


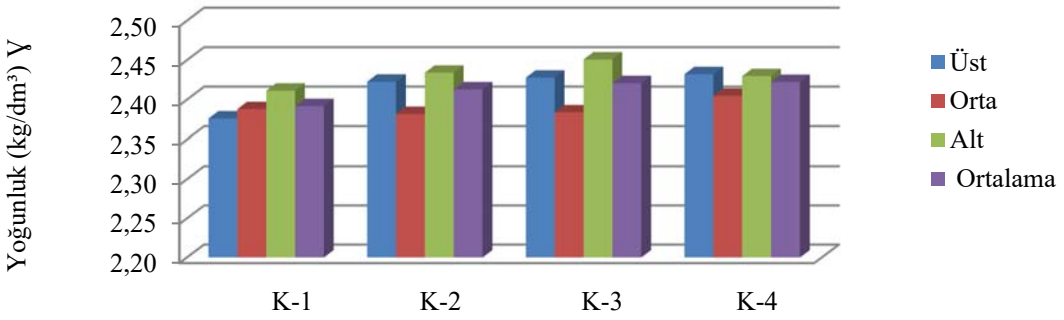
Şekil. 8. Kolon seviyelerinde ultrases hız değişimi

Kolonların ultrases hızı ortalama değerlerinin alt, orta ve üst seviye değerlerinin korelasyonlarında yüksek regresyon (R^2= 0.75- R^2= 0.99) katsayıları elde edilmiştir (Şekil 9).



Şekil. 9. Kolon seviyelerinde ultrases hız korelasyonları

Kolonların kendi içerisindeki ortalama yoğunlukları incelendiğinde, K1 kolonunda üst bölgede düşük alt bölgede yüksek olmak üzere doğrusal bir artış gözlenmiş, K2, K3 ve K4 kolonlarında üst bölge yüksek orta bölge düşük alt bölge yüksek olacak şekilde dağılım gözlemlenmiştir (Şekil 10).



Şekil. 10. Kolon seviyelerinde yoğunluk değişimi

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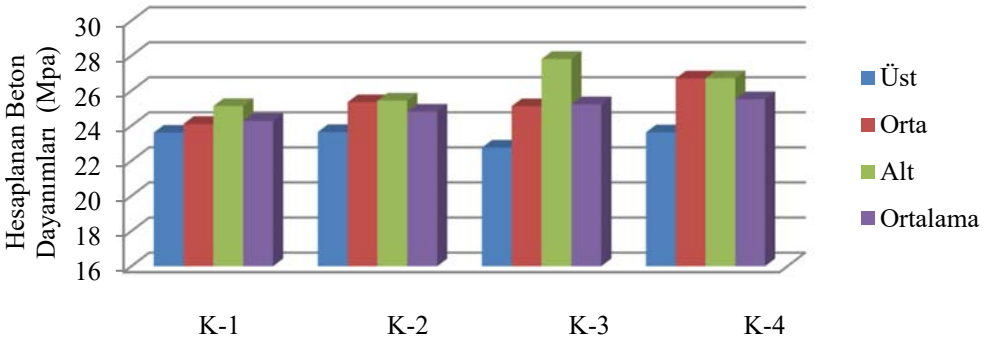
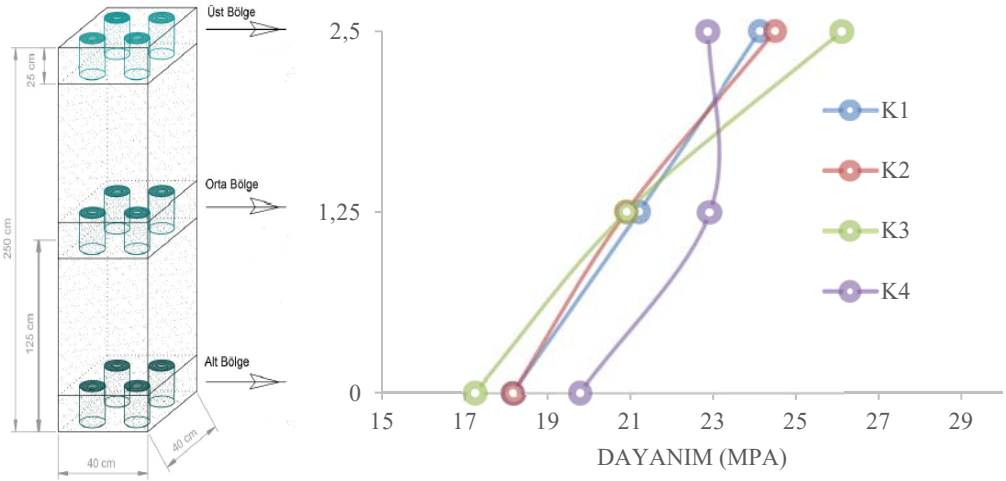
K1, K2, K3 ve K4 kolonlarının kendi içerisindeki hesaplanan tahmini dayanımlar beklenildiği gibi ultrason hız değerleri ile paralellik göstermiş ve her kolonda en düşük dayanım üst bölgede, en yüksek dayanım alt bölgede çıkmıştır. Kolonların kendi aralarında genel ortalama dayanımları incelendiğinde; en düşük dayanım tek kademe vibratörsüz kürsüz numunede, en yüksek dayanım beş kademe vibratörlü kürlü standartlara uygun dökülen ve bakılan numunede çıkmıştır (Şekil 11-12).

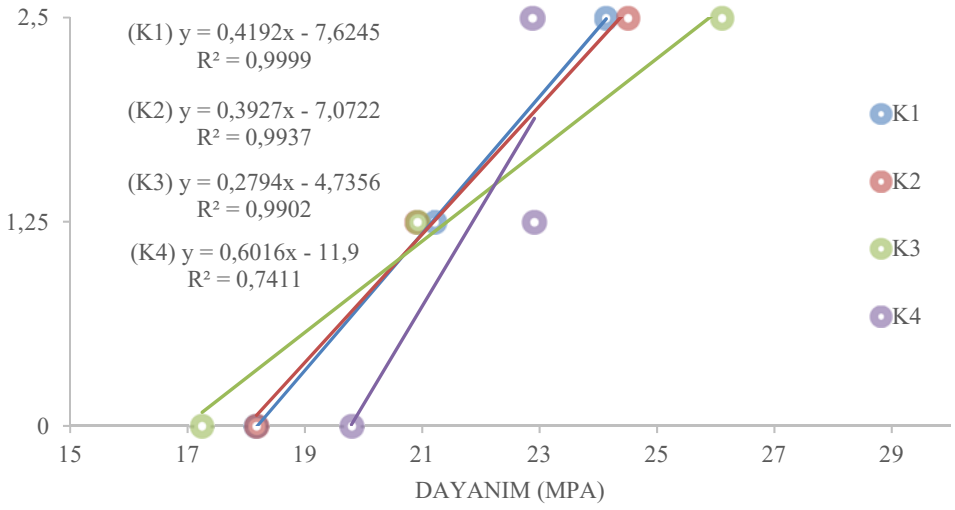


Şekil. 11. Kolon seviyelerinde tahmin edilen dayanımlar



Şekil. 12. Kolon seviyelerinde tahmin edilen dayanımlar

Kolonların hesaplanan dayanım değerlerin için alt, orta ve üst seviye için yapılan korelasyonlarında yüksek regresyon (R^2= 0.74- R^2= 0.99) katsayıları elde edilmiştir (Şekil 13).



Şekil. 13. Kolon seviyelerinde dayanım korelasyonları

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Sonuçlar ve Öneri

Tahribatsız yöntemlerden biri olan ultrases hızı ile beton dayanımının güvenilir bir şekilde öngörülmesi mümkündür. Bu da inşaatı bitmiş beton elemanların zarar görmeden dayanımlarının yerinde tespit edilmesinde ekonomiklik ve hız sağlar. Çalışmada kolonlardan alınan karotlardan ultrases hızlarının değerlendirilmesinde;

Ultrases hızlarının her kolonda en düşük üst bölgede, en yüksek alt bölgede çıktığı,

Genel olarak vibratör ve kür uygulaması ile ultrases hızının arttığı,

Kolonların kendi aralarında genel ortalama ultrases hızı ortalamalarında, en düşük ultrases hızının K-1 (tek kademe vibratörsüz kürsüz) numunesinde, en yüksek ultrases hızının K-4 (beş kademe vibratörlü kürlü) numunesinde çıktığı,K-1, K-2 ve K-3 kolonlarında alt, orta ve üst bölümlerde ölçülen ultrases hız değerleri arasında ki farkın K-4 kolonunda farklı seviyelerden ölçülen ultrases hız değerlerinden fazla olduğu ve buradan K-4 kolonun daha homojen bir yapıya sahip olduğunu,

Ultrases hızlarından gidilerek hesaplanan dayanım değerleri kolonlarda en düşük üst bölgede, en yüksek alt bölgede olduğu,

K-2, K-3 ve K-4 (vibratörlü ve kürlü) kolonlarının yoğunluk değerleri K-1 (vibratörsüz ve kürsüz) kolonundan yüksek yoğunlukta olduğu,

Çalışmada şantiye koşullarında beton dökümünde geleneksel yapılan beton dökümü ile standartlarda önerilen beton döküm koşullarının beton özeliklerindeki etkisi deneysel veriler ile araştırılmış ve beton dökümünde standartlara uymanın daha homojen bir yapı elamanın elde edileceği görülmüştür. Şantiye koşullarında standartlara uygun dökümlerin yapılması ve yapı denetim firmalarının da bunun kontrolunu ciddi yapmaları önemlidir.

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HEAVY METAL REMOVAL BY POLYMER – ZEOLITE BASED ADSORBENT

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Abstract: Water resources are threatened by a lot of pollutants such as heavy metals. Copper, a heavy metal, is quite toxic at high concentrations similar to the other heavy metals. These metals can also accumulate fatty tissues of livings. Due to these reasons heavy metals should be removed from wastewaters before being discharged. There are many methods to remove heavy metals such as chemical precipitation, ion exchange, membrane technologies, etc. Adsorption is an alternative method which is cheap, easy to apply and effective. Various adsorbents including biopolymers are used efficiently for heavy metal removal. Alginate is one of them composed of mannuronic and guluronic acid monomers. Alginate can form beads by adding mostly calcium which were used for heavy metal removal. Recent studies were particularly focused on improvement of these beads by adding some materials capable of capturing heavy metals such as clay, bentonite, activated carbon, etc. In this study, a natural zeolite, clinoptilolite was used to increase copper removal capacity of alginate beads. For copper removal, series of adsorption experiments were performed under constant temperature and mixing rate. Alginate-clinoptilolite beads were found to be more effective (almost 20 % of higher copper removal) compared to alginate beads alone. Adsorption of copper was equilibrated after about 8 hours of incubation and the highest copper reduction was observed as 87 mg Cu^{2+}/g alginate-clinoptilolite beads at initial Cu^{2+} concentration of 100 mg/L.

Keywords: Alginate, Clinoptilolite, Copper, Toxicity

Introduction

Environmental pollution is particularly get worse by industrial evolution. A lot pollutants become wide spread in the biosphere, such as heavy metals. Heavy metals are generally toxic even at considerably low concentrations. Also, they can accumulate in fatty tissues which resulted increase in heavy metal levels in the food web. Therefore, heavy metals are required to be treated before discharge into the environment (Papageorgiou et al, 2008). There are many methods used for the treatment of heavy metals such as chemical precipitation, filtration, ion exchange, membrane technologies and adsorption. One of the alternatives is adsorption by natural polymers. For instance, alginates are found to be effective in heavy metal uptake (Vieira and Volesky, 2000).

Alginates are polysaccharides composed of mannuronic (M) and guluronic (G) acid monomers. These monomers can be arranged as MM-, MG- and GG-blocks (Hay et al, 2010). Carboxylic acid groups linked to these monomers are claimed to be the main functional groups in heavy metal removal. Also, complexation reactions together with divalent cations might have a role in heavy metal uptake. Alginates with high GG-blocks content can form strong gels with divalent ions particularly calcium ions (Davis et al, 2003). Generally alginate beads formed by gelation investigated in related studies. However, in recent years, studies especially focused on improving heavy metal removal capacity of alginate beads by forming composite structures. For example, heavy metals like Pb^{2+}, Mn^{2+}, Cd^{2+}, Cu^{2+}, Zn^{2+}, Fe^{2+}, Al^{3+} and Hg^{2+} were removed by magnetic alginate beads (Bee et al, 2011; Idris et al, 2010; Idris et al, 2012; Ngomsik et al, 2009; Park et al, 2007), alginate montmorillonite beads (Shawky, 2011), pectin alginate beads (Harel et al, 1998) and ceramic membrane alginate beads (Athanasekou et al, 2009). Similarly, this study aimed to improve heavy metal uptake capacity of alginate beads by combining alginate and clinoptilolite.

Clinoptilolite is a natural zeolite having ability to remove metals from wastewaters by ion exchange. Cd^{2+}, Cu^{2+}, Ni^{2+}, Cr^{3+}, Pb^{2+}, Fe^{3+} could be removed by using clinoptilolite effectively (Kocaoba et al, 2007; Inglezakis et al, 2002; Inglezakis et al, 2003; Iznaga et al, 2007; Petrus et al, 2005; Sprynskyy et al, 2006). Also, it is a cheaper source and very abundant in Turkey (DPT, 1996). As a result, the main purpose of this study is determination of optimal conditions for composite alginate-clinoptilolite beads formation and then testing these beads for their ability to take copper from a synthetic wastewater. It is thought that this study might be useful in order to have a new designed and effective adsorbent for heavy metal removal by using cheaper and natural materials, one of which has major sources in our country.

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Materials and Methods

Alginate was purchased and used directly. Clinoptilolite was first ground and then sieved into different sizes. The lowest size clinoptilolite (<100 µm) was selected due its possible higher surface area. It was washed with 2M NaCl solution for 1 day at 150 rpm in order to increase heavy metal uptake capacity. After that, it was washed with distilled water, then dried at 100 ºC for 1 day and stored in a desiccator.

Essentially, alginate beads are produced by pouring alginate solution drop by drop into $CaCl_2$ solution. However, there is no standard procedure for the production these beads. For this reason, 1, 2 and 4% alginate solutions were prepared and added dropwise into 50, 100, 250 mM $CaCl_2$ solutions by using a peristaltic pump under constant stirring at 50 rpm. After that these beads were incubated overnight for hardening and separated by filtration through 0.45 µm filter under vacuum by washing with distilled water. At the end, optimal concentrations for alginate and calcium ion were selected for bead preparations. This procedure was used for both alginate and alginate-clinoptilolite (1g / 1g) beads formation.

For the removal of copper, first, the efficiencies of alginate and alginate-clinoptilolite beads were compared by using 100 mg (i) alginate beads and (ii) alginate-clinoptilolite beads. These beads were added into 100 mg/L Cu^{2+} solution (100 mL in 250 mL erlenmeyer flasks) at pH 4, 25 °C and 200 rpm for 72 hours. Two samples, collected at time zero and 72 hours, were filtered through 0.45 µm filter and acidified by HNO_3. Finally, copper analyses were performed by Inductive Coupled Plasma-Mass Spectroscopy (ICP-MS).

In the second experimental set, the kinetics of copper adsorption by alginate-clinoptilolite beads were followed by using 100 mg alginate-clinoptilolite beads. These beads were added into 100 mg/L Cu^{2+} solution (100 mL in 250 mL erlenmeyer flasks) at pH 4, 25 °C and 200 rpm for 72 hours. Samples, collected at 1, 4, 8, 12, 24 and 72 hours, were filtered through 0.45 µm filter and acidified by HNO_3. Finally, copper analyses were performed by ICP-MS.

Results and Discussion

Optimization of the Procedure Used for Alginate Beads Production

Essentially, alginate beads are formed by combining two solutions under constant and gentle stirring: alginate and calcium salts. However, there is no standard procedure for the bead production. For this reason, first different concentrations of alginate and $CaCl_2$ solutions were prepared and alginate beads were formed. Second, the results were evaluated in terms of homogeneity of the beads' size, shape and hardness of the beads. For this purpose, three different alginate solutions, 1, 2 and 4 %, dropped into 50, 100 and 250 mM calcium ion containing solutions.

Alginate solution at 4 % concentration showed considerably high viscosity, probably because of its polymeric nature. In general, solution of a polymer has high viscosity particularly when the polymer has high polymerization degree. If this kind of a polymer is used at high concentration, the solution would have high viscosity. Thus, the beads formed by alginate solution at 4 % concentration had irregular shapes independent of calcium concentration. When the beads produced by 1 and 2 % of alginate solutions were compared, the ones formed by 2 % of alginate solutions were found hard enough to use in the experiments although beads formed by 1 % of alginate solutions were a bit softer.

On the other hand, there were no obvious variations between the beads formed at different calcium ion concentrations. Only the beads formed at 50 mM of $CaCl_2$ solutions seemed to have smaller and more homogenous size distribution when they were observed visually. This could also reduce the chemical usage compared to other calcium doses tested (100 and 250 mM) in the study. As a result, alginate beads were determined to produce by dropping 2 % of alginate solution into 50 mM of $CaCl_2$ solutions (Figure 1). This procedure was also utilized for the production of alginate-clinoptilolite beads.

Copper Removal by Alginate-Clinoptilolite Beads

The main goal of this study is to form a new composite alginate bead by cheaper and possibly local sources which is more effective in heavy metal uptake. Clinoptilolite is selected for this purpose since it is a low cost material with abundant sources in Turkey. Then, in order to determine the effectiveness of zeolite addition into alginate beads, first, copper removal capacities of alginate beads and alginate-clinoptilolite beads were investigated for 72 hours at constant temperature and mixing rate. Results showed that both alginate and alginate-clinoptilolite beads could remove copper efficiently from the synthetic wastewater having about 100 mg/L of Cu^{2+}. Alginate-clinoptilolite beads had higher heavy metal uptake capacity. About 20 % more copper removal could be achieved by new composite beads after 72 hours (Table 1). Therefore, there should be no diffusional limitations for copper migration due to clinoptilolite addition and functional groups of clinoptilolite appeared to be used for the exchange of copper.

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Figure 1. Alginate beads produced by 2% alginate and 50 mM Ca^{2+}

Table 1. Copper removal by alginate and alginate-clinoptilolite beads

Bead type	Initial copper concentration (mg/L)	Final copper concentration (mg/L)	Removal (%)
Alginate	103.3	37.5	64
Alginate-clinoptilolite	107.5	18.4	83

Since alginate-clinoptilolite beads were found to be more efficient compared to alginate beads alone, this combination was subjected to further experiments. For these experiments, first, kinetics of copper removal by alginate-clinoptilolite beads were investigated during 72 hours. The main purpose was to determine the equilibrium time for adsorption process at which there should be no drastic change of copper concentration in the solution.

Samples were collected at previously determined time intervals and variation of copper concentration in solution is presented in Figure 2. When the results were evaluated, adsorption of copper seemed to be considerably fast onto alginate-clinoptilolite beads. For example, only after 1 hour, copper removal efficiency was reached up to 60 %. In addition, copper concentration decreased from 100 to 30 mg/L after 4 hours of incubation period while it was measured around 18 mg/L after 8 hours. Then, until 72 hours, there were no significant changes in copper concentrations. As a result, the maximum copper removal was observed around 83 % and the equilibrium time for the adsorption phenomena was about 8 hours.

Amount of adsorbed copper per mass adsorbent is an important indication for adsorption capacity. In literature, it is generally noted as q_e (mg/g), which is defined as the amount of metal adsorbed per unit mass of adsorbent. The changes of q_e are also illustrated in Figure 2. As it is shown in the figure, at the beginning, the trend is opposite to copper concentration in the solution as expected. Thus, q_e values were first increased and then it was somehow fixed through the end of the experiment. The maximum q_e value was reached around 8 hours that is corresponded to 87 mg Cu^{2+}/g alginate-clinoptilolite beads.

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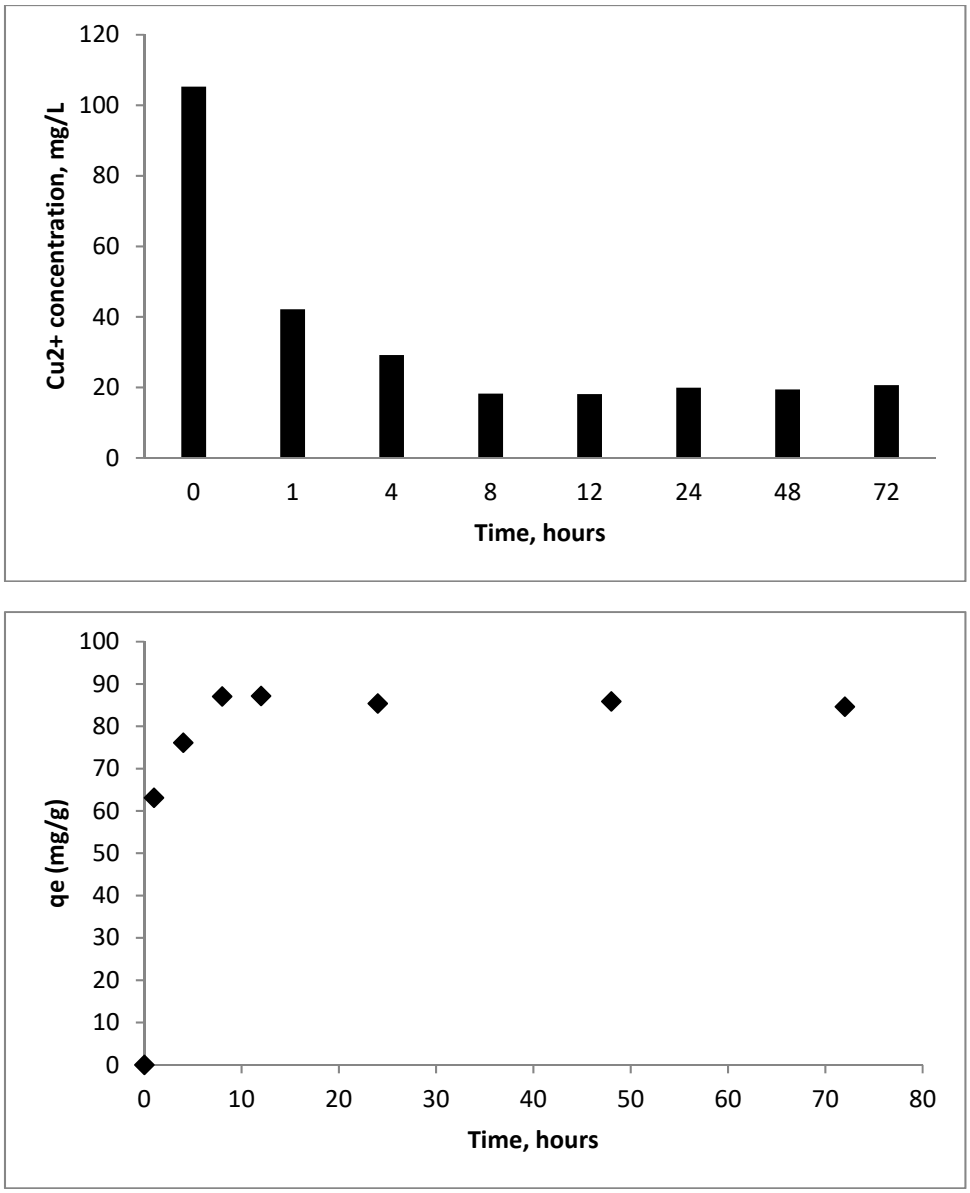

Figure 2. Changes in copper concentration and adsorption with time by alginate-clinoptilolite beads

Conclusion

Heavy metals are one of the major pollutants in industrial wastewater streams. They are required to be treated so that these metals are not harmful for the livings. Alginate – clinoptilolite beads are found to be effective combinations for heavy metal removal according to the results of the current study. These composite alginate beads can be suggested to use as alternative adsorbents since clinoptilolite is one of the local and cheaper sources in Turkey. Also, the results of the study might be helpful for further investigations particularly for column adsorption systems operated in continuous mode.

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SAMAN VE KURU OT BALYALARI İÇİN SICAKLIK VE NEM ÖLÇÜM CİHAZI TASARIMI VE GERÇEKLEŞTİRİMİ

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ÖZET

Bu çalışmada, mikrodenetleyici ile Saman ve benzeri kuru ot balyalarının sıcaklık ve bağıl nem ölçümünü için cihaz tasarımı yapılmıştır. Gerçekleştirilen çalışmada bağıl nem ve sıcaklık sensöründen gelen bilgi Arduino Uno mikrodenetleyicisi aracılığıyla işlendikten sonra Grafik LCD de ortam bağıl neminin ve sıcaklığının ölçülmesi sağlanmaktadır.

Cihazın gövde kısmı saman balyalarına girişinin kolay olması için tasarlanmıştır. Böylelikle ölçülen bölgedeki sıcaklık ve bağıl nem oranları saman ve benzeri kuru ot balyasının iç kısmından alınan sıcaklık ve bağıl nem oranları ile kıyaslanabilmektedir. Saman ve benzeri kuru ot balyasının balyalama süreci sonrası satış vb. işlemlerde standartlarda bir nem oranına sahip olup olmadığı görülebilmektedir.

Anahtar Kelimeler: Sıcaklık, Bağıl Nem, Mikrodenetleyici, Kuru ot balyası, Arduino

DESIGN AND IMPLEMENTATION TEMPERATURE AND HUMIDITY METER FOR STRAW AND HAYSTACK

ABSTRACT

In this work, a device has been designed for measuring temperature and relative humidity of straw and this kind of haystack by the way of microcontroller. In the work after processing the information coming from relative humidity and heating censor via Arduino uno microcontroller, it is being provided that measuring the heat and the humidity on graphic LCD.

Body of the device has been designed for accessing easily to haystack. With the help of this designing, we can compare the heat and humidity rates inside the haystack and in the measuring zone. After baling process of straw and hay, it can be seen if there's any humidity rate or not up to standard in the process like trading

Keywords: Temperature, Relative humidity, Microcontroller, Haystack, Arduino

1.Giriş

Ülkemizde de saman yıllık olarak yenilenebilen, belli zamanlarda bol ve kolay bulunabilen bir malzemedir. Tahıl üretiminde buğday, yulaf, pirinç, arpa gibi ürünlerin sap kısımları hayvanlara yem olarak saklanır (Irklı Eryıldız,2000)

Yeşil yem bitkilerinin çiçeklenme döneminde hayvana yararlı besin maddeleri miktarı yönünden, bitkilerin biçme işleminin gecikmesi nedeniyle % 30-35 oranında kayıp olabilmektir. Üreticinin, yoncanın çiçek açma döneminden 10- 12 gün sonra biçme işlemini uygulaması ve bu devre içinde yonca tarlada serili iken üzerine yağmur düşmesi, yoncadaki yem değerinin % 30'una yakını kaybolmakta ve bu üreticinin yılda 30 ton kaba yem zararı olmaktadır. Halbuki üretici yoncanın çiçek açma döneminde biçme işlemi ve yonca tarla koşullarında % 25-30 nem oranına geldiğinde yuvarlak balyalama makinası ile balyalama veya sıkıştırmalı yığın yapma makinası ile yığın haline getirme işlemini yaptığında bu kayıplar % 3- 5'e kadar düşmektedir. Böylece üreticinin yıllık yem kaybı 3~5 tona kadar azalma görülmektedir (Ülger, 1978). Ürün nem oranı en iyi balyalama nem oranı olan % 20 dir. Uygulama sürelerinde bölgede mevsim gereğince yağış olmadığında, ürünün geceleyin almış olduğu nem miktarının kuruma süresine etkilemediği ortaya çıkmıştır. Bölgede yoncanın biçme işleminden sonra tırmıkta karıştırma, alt üst etme ve namlu haline getirme işlemleri uygulandığında, biçme işleminden bir gün sonra yoncanın nem oranı balyalama sınırına erişebilmekte ve dolayısıyla balyalanabilmektedir (Ülger, 1979)

Yonca hasatında kayıpların hepsi tırmıklama sırasında yaprakların dökülmesi şeklinde olduğu kabul edilmektedir. Yaprak kayıpları, kullanılan tırmığın teknik özelliklerine ve buna bağlı olarak yoncanın biçildiği yerden sıra yığınına kadar kat ettiği uzaklığa, tırmığın çalışma hızına, ortalama ot hızına, hareket halindeki ota tırmık parmaklarının çarpmasıyla hızın yükselmesi veya azalması durumuna, ürünün çeşidine, nem oranına, ürünün tarla verimine ve tarla koşullarına bağlı olarak değişmektedir. Yonca % 20 nem oranında tırmıklandığı

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zaman yaprak kaybı % 21, %30 nemde namlu yapıldığında yaprak kaybı % 13 ve % 40 nemde yapılan namlularda ise, yaprak kayıpları % 8 olmaktadır. Yeşil yem bitkilerinin biçilme işleminden sonra balyalanması için % 25-30 ürün nem oranına sahip olması gerekmektedir. Balyalama sırasındaki kayıpları etkileyen faktörler; balya makinasının teknik özellikleri, ürünün nem oranı, ürün çeşidi, ürün verimi, namlu yoğunluğu, balya yoğunluğu ve namlunun düzgünlüğüdür (Baştaban, 1983). Birim kuru maddede bulunan besin madde içeriği yüksek olan hayvan beslemede kullanılan yemlere kesif yem, düşük olanlara ise kaba yem denilmektedir. Ülkemizde bir yıllık kaba yem ihtiyacı, yaklaşık 50 milyon ton kuru ota eşittir. Yem bitkileri üretim alanlarından ve çayır meralardan elde edilen kaliteli kaba yem üretim miktarı ise 17 milyon ton civarındadır (Yıldız, 2008).

Hayvansal üretimin artırılması için beslenme, bakım, ıslah ve hayvan barınaklarının verimi ile mümkündür. Bitkisel ürünlerin nitelik ve niceliklerini bozulmadan korunmaları uygun çevre koşullarını (sıcaklık, nem vb.) sağlayacak şekilde projelenmiş depolar ile mümkün olmaktadır (Yağanoğlu 1994). Tarım sektöründe saman yonca vb. hayvan gıdalarının biçme işlemi, balyalama işlemi, saklama işlemi ve balya halinde satılma işlemi gibi işlemlerde sıcaklık, nem gibi çevre koşulları önem arz etmektedir.

Uygun sıcaklık ve nem oranlarında saman ve kuru otlarda, hem hayvan gıdalarının besin değerleri yüksek olmakta hem saklanma koşulları uzamakta hem de satın alma işlemlerinde saman ve kuru ot ağırlık değerleri doğru hesaplanarak yıl boyu yetecek miktar doğru olarak hesaplanabilmektedir.

Bu çalışmada saman ve kuru ot gibi hayvan gıdalarının balyalama işlemi yapıldıktan sonra balya neminin kontrolünün yapılması için gerekli cihazın tasarımı ve gerçekleştirilmesi yapılmıştır.

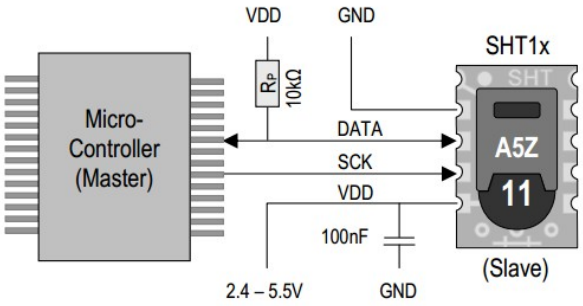
2. Materyal ve Metod

Bu çalışmada, Arduino Uno mikrodenetleyici kartı, SHT10 sıcaklık ve nem sensörü ve Grafik LCD kullanılarak ortam sıcaklığı ve bağıl nem miktarının ölçümü yapılıp, grafik LCD ' ye aktarımı yapılmıştır.



Şekil 1: Devre Bileşenleri

Kullanılan Sıcaklık sensörü SHT10 Metal koruyuculu tipinde seçilmiş olup, nem ölçüm aralığı 0~100% RH, sıcaklık ölçüm aralığı -40 ~ +123.8 °C dir.



Şekil 2. SHT10 bağlantı şeması (Datasheet SHT1x,2011)

Kullanılan Arduino UNO Rev.3 kartında ATmega328 mikrodenetleyici kullanılmış olup kartın 14 Dijital I/O Pini (6 PWM pini) 6 ADC giriş pini bulunmaktadır. 16 MHz çalışma frekansına, 32 KB Flash hafızasına sahiptir. (arduino.cc,2016)

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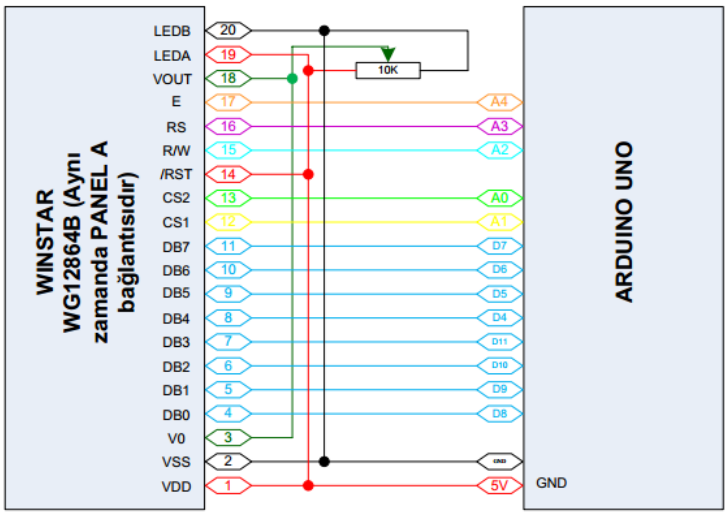
Şekil 3. Arduino Uno Rev.3 kartı

Kullanılan Grafik LCD, Winstar WG12864B-Mavi olup, 20 pinli Mavi ekran ışığına sahiptir. Ekranda sıcaklık ve nem oranının kolay görülebilmesi. Saman tozlarından etkilenmemesi için tercih edilmiştir.



Şekil 4. Grafik LCD'nin Mikrodenetleyici bağlantısı

Cihazın tasarımı yapılırken daha stabil ölçüm yapılabilmesi için algoritma şekil 5'de detaylandırılmıştır.

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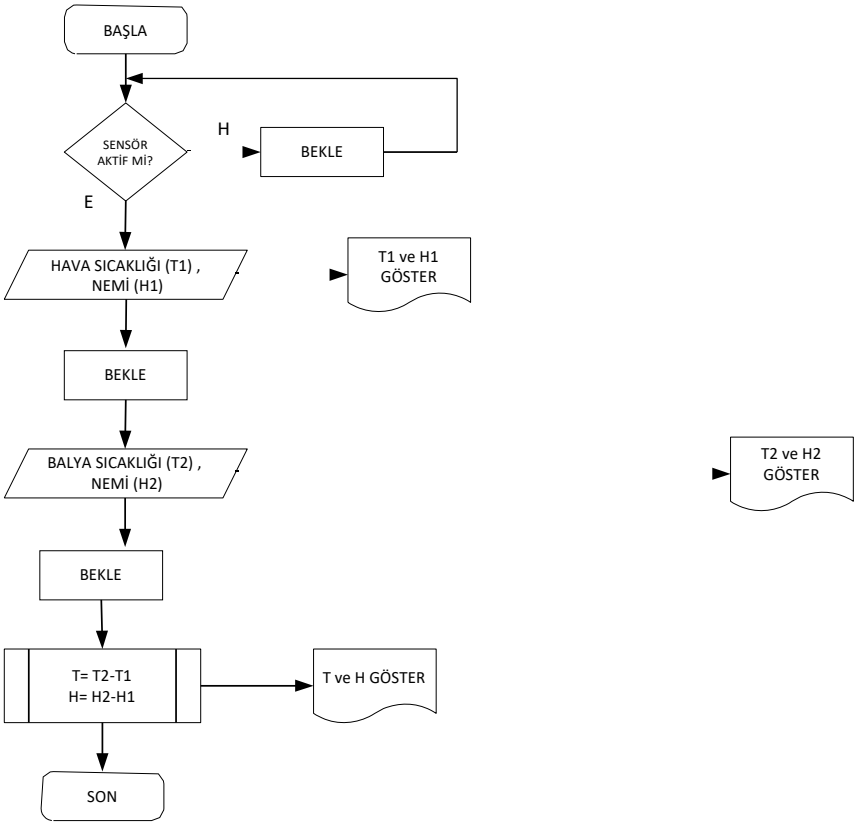
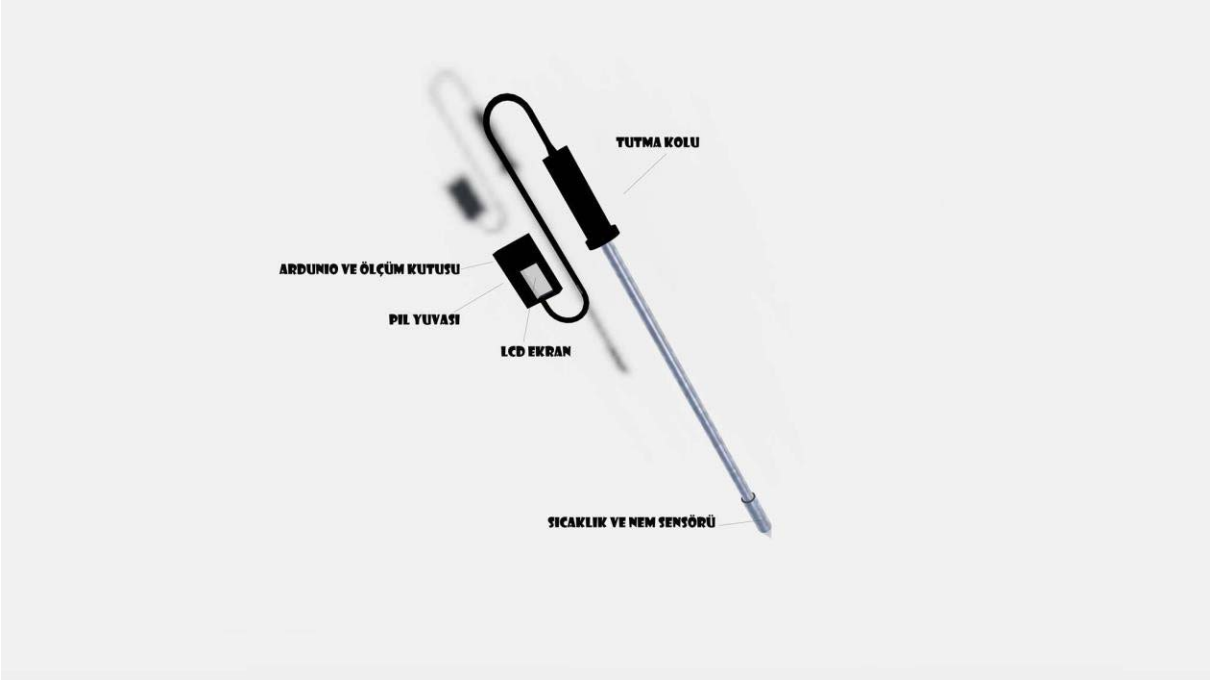


Şekil 5. Cihazın algoritması

Cihazın tasarımı yapılırken, saman balyasına kolay girebilmesi için ucu sivri metal bir parça tasarlanmış ve sıcaklık/nem sensörü içerisine yerleştirilmesi planlanmıştır. Şekil 6' da cihaz yapımına başlanmadan üç boyutlu tasarımı yapılmıştır.



Şekil 6. Cihazın 3 boyutlu tasarımı

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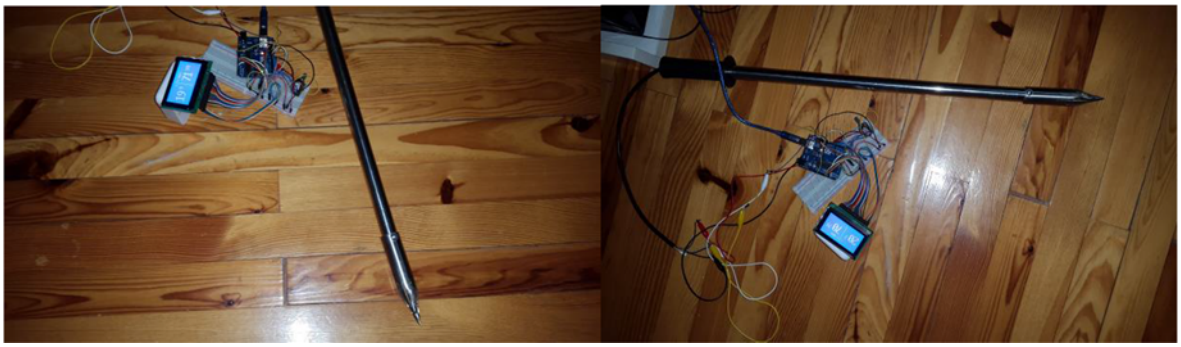
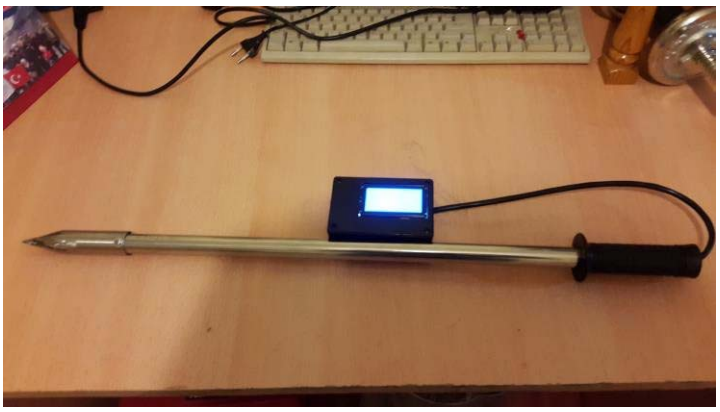
Metal kısımda ölçümün sağlıklı yapılabilmesi için sivri kısmında oyuklar açılmıştır. Cihazın kullanımını kolaylaştırmak için elin kolay kavrayabilmesi için tutma kısmı yerleştirilmiştir.



Şekil 7. Cihazın tasarım aşamaları

Cihazın mikrodenetleyicisi, Grafik LCD, batarya, açma anahtarı bir kutu içerisine yerleştirilmiş olup, saman ve/veya kuru otun sıcaklık ve nem miktarının kolay okunabilmesi için el tutma kısmından uzak tutulmuştur.



Şekil 8. Cihazın tüm montajının tamamlanmış hali

Cihaz balyaların sıcaklık ve nem miktarını en az hata ile ölçebilmesi için, önce balyaya saplanmadan önce havanın sıcaklık ve bağıl nemi ölçülmekte daha sonra balya içerisine batırıldıktan sonra balya sıcaklık ve nemini ölçmektedir. Bütün ölçümler Grafik LCD'de gösterildikten sonra, iki sıcaklık ve nem arasındaki farkta en son olarak ekranda gözükmektedir.



Şekil 9. Cihaz ile sıcaklık ve nem ölçüm işlemi

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3. Sonuç ve Öneriler

Bu çalışmada tasarımı yapılan cihaz, tarım ve hayvancılık sektörüne özellikle saman ve kuru ot satın alma işlemlerinde kullanılması ve yardımcı olması için gerçekleştirilmiştir. Balya neminin ölçülme işlemi, saman ve kuru otun toplanmasından kullanımına kadar çoğu aşamasında ihtiyaç olarak görülmüştür. Hayvancılık ile uğraşan kişiler genelde yıllık ihtiyaçlarını balya ağırlığına göre karşılamaktadır. Balyaların olması gereken ideal nem oranından fazla nemli olması durumunda ise balyalar fazla kilo gösterecek bu olay da satan kişinin maddi olarak lehine bir durum olarak ortaya çıkarken satın alan kişinin maddi zararına ve yıl boyunca yetmesi gereken hayvan yiyeceğinin erken bitmesine yol açacaktır. Böylelikle balya halindeki saman ve/veya kuru otun fazla nemli olması durumunda, ağırlığının artmış olması ihtimali göz önüne alındığında alım satım işleminde yanlışlıkların önüne geçilmiş olacaktır.

4. Tartışma

Günümüz teknolojisinde, elektrik-elektronik teknolojisi bir çok disiplin ile birlikte çalışmakta ve teknolojinin imkanları kullanılmaktadır (Aydın, 2013). Bu çalışmanın ortaya çıkması hayvancılık sektöründen gelen talep üzerine olmuş, elektronik malzemelere ve balyaya kolay girip doğru ölçüm yapabilmesi için ilk tasarım aşamasında 3 boyutlu olarak cihazın tasarımı yapılmış olup, ardından 3 boyutlu tasarımına göre mekanik kısmı gerçekleştirilerek cihaz tamamlanmıştır.

Bu ve benzeri cihaz tasarımları farklı disiplinlerin bir araya gelmesi sayesinde ortaya çıkacak ve ihtiyaca göre cihazın geliştirilmesine devam edilebilecektir.

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A STUDY ON MICROSTRUCTURE AND FABRICATION OF TI-NB ALLOY BY CONVENTIONAL SINTERING

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ABSTRACT:
The binary titanium alloys show attractive properties for biomedical applications. The most important factors for an implant material are biocompatibility, osseointegration, corrosion and mechanical resistances and also porous structure to nutrition exchange within human bodies. The purpose of this study is to investigate the effect of sintering temperature on microstructure and fabrication of porous Ti-10Nb alloys via conventional sintering for use as hard-tissue implants. The porous Ti-10Nb alloy was fabricated using conventional sintering method at different temperatures (1200 ºC, 1300 ºC and 1400 ºC). Later, the microstructures of synthesized specimens were examined by optical microscopy, scanning electron microscopy (SEM) and X-ray diffraction (XRD). The results indicated that the Ti-10Nb alloys were mainly composed of α and β phases and also are seen needle-like morphology of martensites in the microstructure.

Keywords: Fabrication

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HIGH RISE BUILDINGS IN HISTORIC CITIES

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ABSTRACT
High rise building was the most remarkable new building type to emerge in the late 19th century which has entirely changed the scale, appearance, concept and image of cities with its great visual impact. With advanced technologies the skylines of the cities dominated by high rise buildings all over the world in 20th century. In the 21st century it can be expected that more and more innovative high rise buildings will be built, utilizing the cutting-edge techniques also in historic cities with World Heritage Sites. High rise buildings' relationship with their context is more problematic than any other structure, the subject of what they add and what they take away to the city is quite controversial. Introducing a new building in a historic city has a dramatic impact on traditional urbanistic structure. In this study high rise buildings in historic cities with World Heritage Sites, their development, and impact on the city and the urban image are examined by selected examples from different historic cities. The current approaches for designing high rise buildings in a historical setting will be also examined.
Keywords: High rise building, historic city, architecture

INTRODUCTION

High rise buildings which are an indispensable part of our cities, will continue to exist in the future due to certain reasons such as evolving and changing social needs, rapid urbanization and population growth. There are different terms that define this building type; such as tall buildings, high rise buildings, skyscrapers depending on various contexts. In this study the term high-rise building is used which is substantially taller than their neighbours and/or which significantly changes the skyline.

High rise buildings have the potential to create a powerful image in the context of urban memory, even the potential to change the climate of the region. Technically, architecturally, socially and spatially their impact on the environment is quite strong. High rise buildings' relationship with their context is more problematic than any other structure, the subject of what they add and what they take away to the city is quite controversial. The most intense debates take place in historic cities while the separation or harmony between traditional and contemporary is more sharp and decisive here. High rise building was the most remarkable new building type to emerge in the late 19th century which has entirely changed the scale, appearance, concept and image of cities with its great visual impact. A high-rise building, can be a residential block an office tower or has a mixed use function. With advanced technologies the skylines of the cities dominated by high rise buildings all over the world in 20th century. In the 21st century it can be expected that more and more innovative high rise buildings will be built, utilizing the cutting-edge techniques also in historic cities with World Heritage Sites (WHS).

The global urban population has increased from 0.7 billion in 1950 to 3.9 billion in 2014. UN forecasts another 60 percent by 2050, as 6.3 billion people are projected to live in urban settlements (UN, 2014). A majority of people will be living in urban areas and vertical development is inevitable for the urban growth in the future cities. Cities, which can only be analyzed and understood by interdisciplinary study, are growing and developing constantly day by day. Christine Boyer, the author of 'The City of Collective Memory', suggests in her book that the city consists of three major layers; the city as a work of art (one common to the traditional city), the city as panorama(one characteristic of the modern city) and the city as spectacle (one appropriate to the contemporary city) (Boyer, 1994). These different architectural layers touch each other heterogeneously and form the diversity.

Every new proposed high rise building in a historic city should have a good architectural quality and bring a sustainable approach (Abel, 2006). By the architectural quality of the building is meant; scale, form and massing proportion and silhouette, facing materials, relationship to other structures, effect on the skyline, effect on

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streetscape and near views (CABE 2007). These type of buildings should be more urban and as well as respectful to a historic city as its impact on public space and the skyline is distinctive due to its scale and density. In this study high rise buildings in historic cities with World Heritage Sites, their development, and impact on the city and the urban image are examined by selected examples from different historic cities. The current approaches for designing high rise buildings in a historical setting will be also examined.

Historic City – High Rise Building

Historic cities with World Heritage Sites have more exclusive place among world cities while they have common value for all humanity with Outstanding Universal Value. The urban conservation for these cities is important for the human history. Introducing a new building in a historic city has a dramatic impact on traditional urbanistic structure. High rise building and a historic city is perceived as two contrasting concepts while high rise building concept is fundamentally different from other contemporary building due to their scale and visual impact on the surrounding. Building a high rise building in a historical setting the protection of the authenticity and integrity is essential as it is an instantly recognizable addition to the city's skyline.

Historic area or city is defined in 1976 UNESCO Recommendation as: *"Historic and architectural (including vernacular) areas" shall be taken to mean any groups of buildings, structures and open spaces including archaeological and palaeontological sites, constituting human settlements in an urban or rural environment, the cohesion and value of which, from the archaeological, architectural, prehistoric, historic, aesthetic or sociocultural point of view are recognized. (URL1)*

Cities are changing and developing rapidly and uncontrolled development can deteriorate the urban heritage with its tangible and intangible values that has shaped through the history. UNESCO defines its approach for the management of historic urban landscape as holistic; the goal is to integrate the conservation and social and economic development. It is crucial[1] to manage the urban development around a World Heritage site and there are two important factors that should be considered; buffer zone regulation, maintenance. Buffer zone is intended to protect World Heritage sites from negative influences. It defines a neighboring zone that may influence a World Heritage site. Although it is not a must the majority of World Heritage sites have a buffer zone which guarantees the protection of the sites. They are not formal components but they contribute to the attributes of the Outstanding Universal Value and to the setting.

High-rise buildings in historical settings are added as new layers into the city and may become the elements which enrich the urban texture without destroying the local environment. CABE (Commission for Architecture and the Built Environment) and English Heritage published Guidance on Tall Buildings in 2007. The main principle is defined as: *to secure high quality design and ways to enhance and improve places in which people live their lives and conserve heritage assets for this and future generations*. Well-designed tall buildings in the right place can be a force for good, but that they also have the potential to cause a destruction of the historical fabric. The destruction can occur in two ways; *Visual character, Urban life quality.*

City can have various silhouettes depending on the viewing direction and the viewpoint. Silhouettes of cities possess their personal individuality, gives the first emotion, first perception for that city thus the first image is created in our minds. Key elements, historic -cultural landmarks and its historic characters of the setting can be observed by a viewer and tall buildings have the potential to determine and create a silhouette or to break the existing. Besides forming the built heritage some buildings in historic cities become the symbol of the city they characterized the urban policies, new developments or new decisions about tall buildings which will be analyzed in the case cities. Preserving the free sky and vistas around these specific buildings is directly related to the perception of the image of the city.

Lynch specifies three separate components of the city's image as follows: "identity, structure & meaning" and verifies that "in reality they always appear together" and determines the image. (Lynch, 2010). The Urban identity is created by urban images in long time process through the history and composed of various

[1] New development which can affect the World heritage site has the risk for the site to be admitted to the list of endangered World Heritage.

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components. In the historical process cities have been shaped by various factors such as wars, religion and economy. Initially they were designed for defensive purposes then in medieval times religion shaped the city and religious structures became the focal point and identified the silhouette and image of the city. It is an indisputable fact that the image or identity of a city is not merely identified by the silhouette. The Urban identity of a city is determined by its own idiosyncratic features that are its geography, socio-cultural values of the community and the architectural production. In this respect the urban identity is dependent on meeting the needs of the present with the preservation of the past.

The Case of İSTANBUL

The city of İstanbul is a harmonised combination of the works of nature and man and one of the most significant centers for Civilization and Culture of the world. During Marmaray excavations it has been observed that the history of the city starts in BC 8500. The city protected its status as a capital from Constantine the Great until the 20th century. Great empires like the Eastern Roman, Byzantine and Ottoman made this city their capital for 16 centuries long (Batur, 2011). Among its history the unique geography makes the city special, which is located on three pieces of land separated by the sea. The city was founded on a peninsula and surrounded by the Golden Horn (Halic) on the north, the Bosphorus on the east and the Marmara Sea on the south. Its relationship with the sea and its topography formed the original character of the city. Throughout the history peninsula has radically changed in the context of social-culturally and spatially and also through the fire and the impact of earthquakes. The four regions of Istanbul Historic Peninsula were declared as World Heritage Site on 06.12.1985 by UNESCO.



Figure 1. The Location of Historic Peninsula in the City

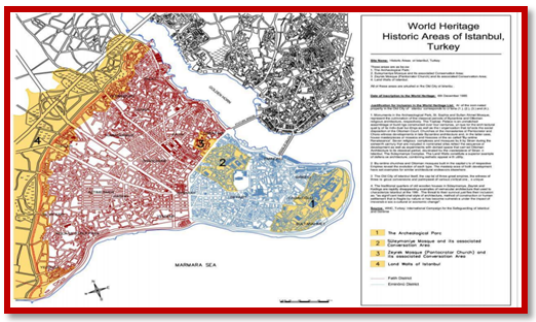

Figure 2.WHS of İstanbul

1. **Sultanahmet Archeological Park** (First Degree Archeological Site and Urban Archeological Site)

2 The Süleymaniye Mosque and Environs Protected Area

3 Zeyrek Mosque (Pantokrator Church) and Environs Protected Area

4 İstanbul Land Walls

The four sites of the property are first Degree Conservation Sites, the masterpieces are the ancient Hippodrome of Constantine, the 6th-century Hagia Sophia and the 16th-century Süleymaniye Mosque. The Historic Peninsula was surrounded by ancient walls which were built by Theodosius in the early fifth century.



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Figure 3.View of Istanbul's historic peninsula, looking from Galata. Abdullah Fréres, ca. 1880-93 and a collage of WHS.

The total area is 2,110 hectares; 1,562 hectares of which is covered by the Historic Peninsula and 548 hectares by the Buffer Zone. The "Buffer Zone" is determined in the Management Plan lying parallel to the Land Walls is within the boundaries of Eyup, Bayrampasa and Zeytinburnu Districts. The skylines of the Historic Peninsula express the Outstanding Universal Value of the property. In the Prost's İstanbul Master Plan (1936-58)[2] the first principles and regulations were determined to protect the silhouette of the Historic Peninsula. He put 40 m height limit: that allows max. 3-storey buildings with heights not exceeding 9.50 meters in locations those are above sea level by 40 meters or more, with the purpose of protecting the silhouette of the Historic Peninsula. (Bilsel,C,Pinon, P.,2010)

After the proclamation of the Republic, Ankara became the capital city and contrariwise to other metropolises the population of Istanbul has reduced in 1930s. In 1950s the city started witnessing demographic expansion due to migration which still continues increasingly. High rise buildings appeared first in 1950s and until to the mid 1970s averaging 25 stories office and hotel buildings were built. 1980s were megapolization period (Akdağ, et.al 2010), after 1980s the new urban regeneration process is started (Tekeli, 2014). The remarkable high-rise buildings were built in 1990s in new commercial districts (Zincirlikuyu, Maslak and Beşiktaş) in European side. In the 20th and 21th century the number of high rise buildings is increased rapidly in the city. There are 43 high rise buildings taller than 150 m and 33 of them are completed. The tallest completed building is the Sapphire Tower (2010) with 261 m height. 56 percent of these buildings have residential functions, 21 percent have mixed-use and the rest have hotel and office function. The Cluster of tall buildings are established around Levent-Maslak district and forming a highly visible and attractive symbol of the modern metropolis which change the symbolic perception. The number of tall buildings increasing in both sides of the city and from different locations of the city various characteristics of skylines can be observed. (CTBUH)



Figure 4: Cluster of tall buildings in İstanbul (CTBUH)

The startling development is occured with the construction of 16/9 residential tower complex with 3 buildings of 27, 32 and 37 storeys in the western district of Zeytinburnu which began in 2010 and damaged the silhouette of the highly valued Historic Peninsula when viewed from Bosphorus. Many objections were raised by public before and during the construction of the buildings regarding the negative impacts that they could cause, but somehow the legal procedures have been fitted or changed in order to complete the construction. Despite all these objections and the on-going court processes the buildings were completed. The 3 blocks obstructed the view and caused an adverse impact by changing the background setting of the Blue Mosque, Topkapi Palace and Hagia Sophia. The court ruled that those buildings were illegally built as they "negatively affected the world heritage site that the Turkish government was obliged to protect" (URL 2). According to the expert report[3] these 3 buildings located in the buffer zone area and they harm the appreciation of the Outstanding Universal Value of the World heritage Site from different viewpoints. Even though Turkish top administrative court affirmed a decision which imposes the demolition of the buildings it has not been implemented yet.

[2] Prof. Henri Prost, Head City Planner of Paris Region was invited to Istanbul in 1936 to make a Master Plan for Istanbul. Although he is criticized for not having evaluated Istanbul within a general development perspective and for transforming the fabric of the city's historic core to rationalize the traffic circulation, his role was significant in the protection of the unique silhouette of the historic peninsula . He mentioned that the Marmara shore of the old city was endowed with "one of the most beautiful views of the world" (Bilsel,C,Pinon, P.,2010)

[3] According to the İstanbul 4th Administrative Court expert report. The impact of the skyscrapers on the silhouette of the city has been documented after it has been observed from several points such as the ferry passing the Bosphorus, Bosphorus Bridge, Salacak, Harem, Maiden's Tower, Kadıköy and Çamlıca. (URL 3)

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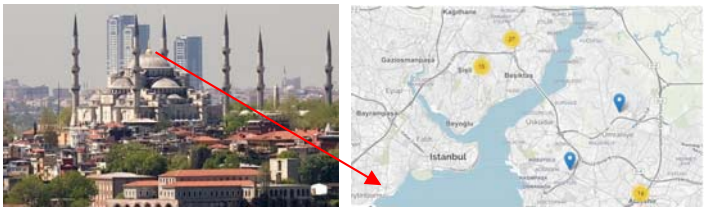

Figure 5: 16/9 Buildings and Historic Peninsula

The 1/100.000 scale Istanbul Master Plan is a reference document that shapes Istanbul's future silhouette concerning the spaces and guiding plans which emphasize a holistic silhouette main plan for the districts including the Historic Peninsula, the Golden Horn and the Bosphorus. Those districts have a direct influence on the silhouette of Istanbul and therefore it is very important to consider them while preparing a study regarding Istanbul's silhouette. Several significant viewpoints like the Bosporus Bridge, the Üsküdar coastline, Harem, Haydarpaşa, Kadıköy Center coastline, Moda, Kabataş coast, the Unkapanı Bridge, the Galata Bridge etc. were identified in order to observe the effects of high buildings on the silhouette. While doing this the natural surface differences and average eye level observation were taken into the consideration. By digital analysis the ultimate height of the buildings that would not affect the silhouette of the Historic Peninsula was defined. (İstanbul Hist.Penin. Site M.P. 2011)

The Case of LONDON

Another historic city that changed its silhouette in time due to the high rise development is London, which is one of the world cultural capital with its 2000 years history. St Paul's Cathedral (1711) has been the tallest building in London until the early twentieth century. After the construction of Faraday Building and Unilever House in the 1930s, the views of St. Paul's Cathedral from the River Thames were obstructed. Consequently 'St Paul's Heights Policy' (a local view protection policy) was implemented in 1937 to protect and enhance important local views from different directions. Until 1970 during post war reconstruction period some high rise building were built in city as the number increased in 1980s the sensitivity to conservation and heritage considerations and also view protection agenda revived.(part 2) . Through history the dynamics of building high-rise buildings in the city has been shaped by different policies and in the 2000s, a cluster of tall buildings were built in the east of the City. They are set in the background of The Tower of London4 which is a palace-fortress and the best-preserved example of a royal Norman castle. The Tower of London(3) (Insc. 1988) is one of the four (The Royal Botanic Gardens at Kew(1), The Palace of Westminster (2), Maritime Greenwich) inscribed prominent UNESCO World Heritage Sites in London. The relationship between the Tower of London and the city in the background is a very sensitive point that should not harm the appreciation of the Outstanding Universal Value of the World heritage Site. In order to conserve the cultural heritage and to protect the skyline of the four towers of the White Tower some visual separation should be obtained between the upper parts of the White Tower and the tall buildings in the background.



Figure 6:WHS in London

The free sky space around the White Tower enhances the value of its visual dominance and where this space has been compromised then the visual appearance has been depreciated. Some prominent tall buildings of the late20th and early 21st centuries and earlier periods such as spires of city churches are rising behind the tower(Konuk, G. 2008).

[4] The centrepiece is the 11th century White Tower - "white" because of its massive whitewashed walls.

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Figure 7. Tower of London

In 1991 to protect the strategic views the Secretary of State for the Environment determined Protected Vistas and directions with planning guidance. However, in 2007, the Government's Strategic Views protection was devolved on the Mayor of London and in this year narrow-scoped Mayor's London View Management Framework (LVMF) was published which has been revised and significantly widened in 2010. Although new regulations implemented to protect the perspectives and views of historic monuments in 2007, it failed to ease tensions between different actors (Appert 2015). The London Plan 2011 and the City of London Local Plan are the planning policies that manage the construction of high rise buildings in the city. Conservation areas and also the areas where would adversely affect the protected views are considered as inappropriate areas for the construction of high rise buildings. These determined protected views are 'protected views of St Paul's Cathedral', 'the Tower of London' and 'Views from the Monument'

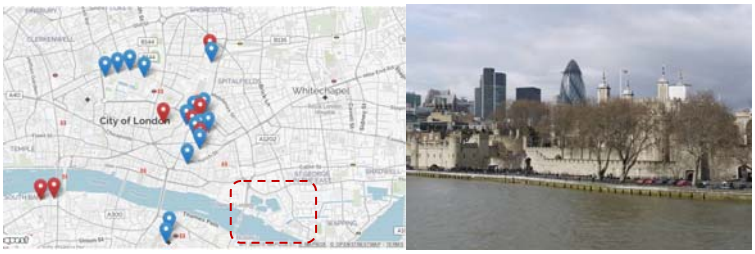

Figure 8: Buildings 100 m+ completed/under construction around Tower Of London

64 percent of tall buildings in London have office functions, 20 percent have residential and the rest have mixed-use function. There are 49 high rise buildings taller than 100 m and 16 of them are taller than 150 m. The tallest completed building in London is the Shard (2013) with 306 m height. (CTBUH)
Tall buildings are permitted to be proposed on suitable sites only if they have potential effect on (city of London):

- *the City skyline*
- *character and amenity of their surroundings including their relationship with existing tall buildings*
- *significance of heritage assets and their setting*
- *effect on historic skyline features*



Figure 9: The LVMF protected vistas map

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CONCLUSION

Each city has its own unique dynamics of urbanization and those dynamics differ depending on the cultural, political, economical and geographical position of the country that the city belongs to. Cities, which can only be analyzed and understood by interdisciplinary study, are growing and developing constantly day by day and this is also valid for historic cities. Building a high rise building in a historical setting has a direct effect on the surrounding heritage and unfortunately there are many examples of unsightly designed, improperly settled buildings which have visually adverse impact over a wide neighborhood. High rise buildings which are an indispensable part of our cities will continue to exist in the future due to certain reasons such as evolving and changing social needs, rapid urbanization and population growth. These building types have the potential to create a powerful image in the context of urban memory, even the potential to change the climate of the region. Technically, architecturally, socially and spatially their impact on the environment is quite strong. Where should they fit in a city and their relation to existing heritage and their height should be clearly determined by needed planning guidance with the participation of different stakeholders. Every new proposed high rise building in a historic city should have a good architectural quality and bring a sustainable approach and not destruct the Visual character and Urban life quality of the city. These type of buildings should be more urban and as well as respectful to a historic city as its impact on public space and the skyline[5] is distinctive due to its scale and density. In the historical process different urban policies, political decisions, global actors and economic systems influenced decision-making mechanism. Regarding urban interventions which are produced by legal policies change the urban image and shaped the historic cities as analyzed in case cities above. The Urban identity of a city is determined by its own idiosyncratic features that are its geography, socio-cultural values of the community and the architectural production therefore each city has its own story.

Historic cities with World Heritage Sites have more exclusive place among world cities while they have common value for all humanity with Outstanding Universal Value. Any proposed building in a historic city has to consider the existing skyline and should not harm the views and the major landmarks of the city. These assessments have to be done by digital analysis methods to understand the effects of those buildings on the context and the silhouette. Not only conservation of the cultural and historical heritage of the city has to be considered but also the fulfillment of the needs of a living and dynamic city has to be taken into the consideration. A sensitive balance has to be obtained between both phenomenon as high rise buildings have the potential to create a powerful and positive image in the context of collective urban memory, and may become the elements which enrich the urban texture. Urban identity is dependent on meeting the needs of the present with the preservation of the past.

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[5] Skylines are "the outline or silhouette of a building or number of buildings or other objects seen against the sky," (Oxford English Dictionary)

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