



University of Banja Luka  
Faculty of Mechanical Engineering  
26<sup>th</sup> - 28<sup>th</sup> May 2011

# DEMI 2011

*10<sup>th</sup> Anniversary International Conference  
on Accomplishments in  
Electrical and Mechanical Engineering and  
Information Technology*

## PROCEEDINGS

ZBORNIK RADOVA

BANJA LUKA, May 2011.



University of Banja Luka  
Faculty of Mechanical Engineering  
26-28 May 2011

**DEMI 2011**

*10<sup>th</sup> Anniversary International  
conference on accomplishments in  
Electrical and Mechanical Engineering  
and Information Technology*

# **PROCEEDINGS**

## **ZBORNIK RADOVA**

University of Banja Luka  
Faculty of Mechanical Engineering

BANJA LUKA, May 2011.

**PROCEEDINGS OF THE 10<sup>th</sup> ANNIVERSARY INTERNATIONAL CONFERENCE ON  
ACCOMPLISHMENTS IN ELECTRICAL AND MECHANICAL ENGINEERING AND  
INFORMATION TECHNOLOGY**

Under patronage of:  
Ministry of Science and Technology of the Republic of Srpska,  
Ministry of Industry, Energy and Mining of the Republic of Srpska  
and  
City of Banjaluka

Publisher:  
Faculty of Mechanical Engineering Banja Luka

For publisher:  
PhD. Miroslav Rogić, Full Professor

Editor in Chief:  
PhD. Gordana Globočki-Lakić, Associate Professor

Organizational board:  
**Gordana Globočki-Lakić**, PhD. Associate Professor, Chairman  
**Miroslav Rogić**, PhD. Professor  
**Snežana Petković**, PhD. Associate Professor  
**Zdravko Milovanović**, PhD. Associate Professor  
**Petar Gvero**, PhD. Associate Professor  
**Strain Posavljak**, PhD. Assistant Professor  
**Darko Knežević**, PhD. Assistant Professor  
**Tihomir Latinović**, PhD. Assistant Professor  
**Valentina Golubović-Bugarski**, PhD. Assistant Professor  
**Milan Tica**, MSc. Mechanical Engineering  
**Stevo Borojević**, MSc. Mechanical Engineering  
**Bojan Knežević**, MSc. Electrical Engineering  
**Branislav Sredanović**, BSc. Mechanical Engineering  
**Branislav Jovković**, BSc. Mechanical Engineering  
**Milivoj Stipanović**  
and  
**Ljubo Glamočić**, PhD. Ministry of Industry, Energy and Mining of the Republic of  
Srpska

Technical processing:  
Milivoj Stipanović

Circulation:  
190

## SCIENTIFIC BOARD

**Blagojević Aleksa**, Faculty of Mechanical Engineering Banjaluka, B&H  
**Blagojević Drago**, Faculty of Mechanical Engineering Banjaluka, B&H  
**Bobrek Miroslav**, Faculty of Mechanical Engineering Banjaluka, B&H  
**Bojanić Pavao**, Faculty of Mechanical Engineering Beograd, Serbia  
**Bulatović Miodrag**, Faculty of Mechanical Engineering Podgorica, Montenegro  
**Čosić Ilija**, FTN Novi Sad, Serbia  
**Dakić Pantelija**, Faculty of Mechanical Engineering Banjaluka, B&H  
**Določek Vlatko**, University of Sarajevo, B&H  
**Đuričković Veljko**, Faculty of Mechanical Engineering Banjaluka, B&H  
**Filipović Ivan**, Faculty of Mechanical Engineering Sarajevo, B&H  
**Gerasimčuk G. Vasilj**, "KPI", Ukraine  
**Gruden Dušan**, TU Wien, Austria  
**Ivković Branko**, Faculty of Mechanical Engineering Kragujevac, Serbia  
**Jokanović Simo**, Faculty of Mechanical Engineering Banjaluka, B&H  
**Jovišević Vid**, Faculty of Mechanical Engineering Banjaluka, B&H  
**Kojić Miloš**, Harvard University, USA  
**Kostolansky Eduard**, University of Cyril and Methodius Trnava, Slovakia  
**Kozić Đorđe**, Faculty of Mechanical Engineering Beograd, Serbia  
**Lukač Duško**, University of Applied Science, Germany  
**Maksimović Stevan**, Aeronautical Institute, Serbia  
**Miletić Ostoja**, Faculty of Mechanical Engineering Banjaluka, B&H  
**Miličić Dragomir**, Faculty of Mechanical Engineering Banjaluka, B&H  
**Milutinović Dragan**, Faculty of Mechanical Engineering Beograd, Serbia  
**Nedić Bogdan**, Faculty of Mechanical Engineering Kragujevac, Serbia  
**Ninković Dobrovoje**, ABB Turbo-Systems AG, Switzerland  
**Ognjanović Milosav**, Faculty of Mechanical Engineering Beograd, Serbia  
**Pešić Radivoje**, Faculty of Mechanical Engineering Kragujevac, Serbia  
**Plančak Miroslav**, FTN Novi Sad, Serbia  
**Pop Nicolae**, North University of Baia Mare, Romania  
**Radvanović Milan**, Faculty of Mechanical Engineering Beograd, Serbia  
**Ravano Giambattista**, University SUPSI, Switzerland  
**Savić Vladimir**, FTN Novi Sad, Serbia  
**Schmied Joachim**, Delta JS, Switzerland  
**Seok Park Hong**, University of Ulsan, Korea  
**Šljivić Milan**, Faculty of Mechanical Engineering Banjaluka, B&H  
**Soković Mirko**, Faculty of Mechanical Engineering Ljubljana, Slovenia  
**Stefanović Milentije**, Faculty of Mechanical Engineering Kragujevac, Serbia  
**Stegić Milenko**, FSB Zagreb, Croatia  
**Thomeensen Trygve**, Norwegian University of Science and Technology, Norway  
**Todić Velimir**, FTN Novi Sad, Serbia  
**Tufekčić Demo**, Faculty of Mechanical Engineering Tuzla, B&H  
**Veinović Stevan**, Faculty of Mechanical Engineering Kragujevac, Serbia  
**Vereš Miroslav**, Faculty of Mechanical Engineering, Bratislava, Slovakia  
**Zeljковић Milan**, FTN Novi Sad, Serbia  
**Zrilić Ranko**, Faculty of Mechanical Engineering Banjaluka, B&H  
**Zrnić Nenad**, Faculty of Mechanical Engineering Beograd, Serbia

# CONTENT

<b>KEYNOTE LECTURES.....</b>	<b>1</b>
1. Claudio R. Boër SUSTAINABLE INNOVATION AND INNOVATION FOR SUSTAINABILITY: THE EVOLUTION AND INVOLUTION OF PRODUCTION PARADIGMS .....	3
2. Giambattista Ravano COOPERATION MODELS BETWEEN UNIVERSITIES AND INDUSTRY IN APPLIED RESEARCH, SWITZERLAND CASE STUDY AND SOME PRACTICAL EXAMPLES .....	5
3. Radivoje Pešić, Stevan Veinović TRANSPORT ECOLOGY AND GLOBAL CLIMATE CHANGE .....	7
4. Milosav Ognjanović DESIGN CONSTRAINTS AND ROBUST DESIGN AS THE MODERN APPROACH TO MECHANICAL STRUCTURE DEVELOPMENT DESIGN CONSTRAINTS AND ROBUST DESIGN AS THE MODERN APPROACH TO MECHANICAL STRUCTURE DEVELOPMENT .....	21
5. Neven Duić RENEWABLE ENERGY AS A DRIVER OF ECONOMIC GROWTH .....	35
6. Stojan Petrović, Božidar Nikolić, Emil Hnatko, Jovo Mrđa, Stevan Veinović MALICIOUS ECOLOGY ON VEHICLES AND TRAFFIC EXAMPLE .....	55
<b>A. MECHANICS AND DESIGN .....</b>	<b>57</b>
7. Michail Leparov, Georgi Dinev, Marieta Jancheva ABOUT RECEIPTS OF VARIANTS OF TECHNICAL OBJECTS .....	59
8. Leparov M., Yancheva M. ABOUT THE INTEGRATION OF ASSEMBLY UNITS .....	65
9. Darko Knežević, Aleksandar Milašinović, Zdravko Milovanović ANALYSIS OF INFLUENCE OF LENGTH OF DEVELOPMENT OF BOUNDARY LAYER ON FLOW RATE THROUGH RADIAL CLEARANCE WITHIN HYDRAULIC CONTROL COMPONENTS .....	71
10. Nebojša Radić, Goran Sekulić, Dejan Jeremić ANALYTICAL-NUMERICAL STRESS ANALYSIS OF SPUR GEARS WITH STRAIGHT TEETH .....	77
11. Georgy Dinev, Marieta Yancheva CAD DESIGN OF FLEXIBLE FRICTION COUPLING .....	83
12. Dragan Lišanin, Marinko Petrović, Nenad Grujović, Jelena Borota COMPARATIVE ANALYSIS OF THE FORMATION OF SMALL GRAIN GUIDANCE .....	87
13. Pavle Stepanić, Željko Đurović, Aleksa Krošnjar, Aleksandra Pavasović COMPARISON OF TECHNIQUES FOR DETECTION OF FAILURE ROLLING ELEMENT BEARINGS .....	93
14. Strain Posavljak, Miodrag Jankovic, Katarina Maksimovic CRACK INITIATION LIFE OF NOTCHED METALLIC PARTS EXPOSED TO LOW CYCLE FATIGUE .....	99

15	Srđan Bošnjak, Zoran Petković, Miloš Đorđević, Nebojša Gnjatović, Nenad Zrnić DESIGN IMPROVEMENTS OF THE BUCKET WHEEL WITH DRIVE .....	111
16.	Aleksandar Marinković, Aleksandar Čočić, Bratislav Stojiljković, Milan Vulićević DESIGN OF TESLA-TIFFANY CASCADE FOUNTAIN AS A SAMPLE OF TESLA'S RESEARCH CREATIVITY IN FIELD OF MECHANICAL ENGINEERING .....	117
17.	Svetislav Lj. Marković DESIGN SEALS FOR REAL CONNECTIONS .....	123
18.	Valentina Golubović-Bugarski, Drago Blagojević, Đorđe Čiča, Branislav Sredanović DETECTION OF STRUCTURAL DAMAGE LOCATION USING FREQUENCY RESPONSE FUNCTION DATA .....	129
19.	Dragi Stamenković, Mato Perić DETERMINATION OF RESIDUAL STRESSES IN TUBULAR WELDED STRUCTURAL COMPONENTS .....	135
20.	Živko Pejašinić, Zorana Tanasić, Goran Janjić EFFECT OF MATERIAL PROPERTIES OF MEASURING FORCE TRANSDUCER ELASTIC ELEMENTS TO METROLOGIY CHARACTERISTICS .....	145
21.	Siniša Kuzmanović, Milan Rackov EVALUATION OF CONCEPTUAL SOLUTIONS OF UNIVERSAL HELICAL TWO STAGE GEAR UNITS .....	151
22.	Ivica Čamagić, Nemanja Vasić, Zijah Burzić FATIGUE ANALYSIS FROM FRACTURE MECHANICS ANGLE .....	159
23.	Slobodanka Boljanović, Stevan Maksimović, Strain Posavljak FATIGUE LIFE ESTIMATION OF CRACKED STRUCTURAL COMPONENTS .....	165
24.	Ibrahim Badžak, Remzo Dedic, Mersida Manjgo HYDRAULIC INSTALLATION OF EKO CONTAINER .....	173
25.	Vesna Ranković, Nenad Grujović, Goran Milovanović, Dejan Divac, Nikola Milivojević PREDICTION OF DAM BEHAVIOUR USING MULTIPLE LINEAR REGRESSION AND RADIAL BASIS FUNCTION NEURAL NETWORK .....	179
26.	Nenad Zrnić, Srđan Bošnjak, Vlada Gašić, Miodrag Arsić SOME ASPECTS IN FAILURE ANALYSIS OF CRANES .....	185
27.	Stevan Maksimović, Ivana Vasović, Mirko Maksimović SOME ASPECTS TO DESIGN OF AIRCRAFT STRUCTURES WITH RESPECTS TO FATIGUE AND FRACTURE MECHANICS .....	191
28.	Andrija Vujičić, Nenad Zrnić STATE-OF-THE-ART IN LIFE CYCLE ASSESSEMENT AS A CORE OF LIFE CYCLE DESIGN .....	203
29.	Mersida Manjgo, Ljubica Milović, Zijah Burzić STRESS INTENSITY FACTOR AND ITS EFFECT OF STRUCTURAL INTEGRITY .....	209
30.	Vukojević Nedeljko, Hadžikadunić Fuad, Pavić Mate VIBRATORY STRESS RELIEVING OF TANK FLANGS .....	215

31.	Ranko Antunovic VIBRODIAGNOSTICS OF ROTATION MACHINES .....	221
<b>B. PRODUCTION TECHNOLOGIES AND ENGINEERING .....</b>		<b>229</b>
32.	Kramar D., Soković M., Kopač J. ADVANCED CUTTING TECHNOLOGY – HIGH-PRESSURE JET ASSISTED MACHINING .....	231
33.	Milan Milovanović, Milentije Stefanović ANALYSIS OF THE EFFECTS OF APPLYING NEW MATERIALS .....	241
34.	Tomasz Kudasik, Tadeusz Markowski, Olimpia Markowska, Sławomir Miechowicz APPLICATION OF RAPID PROTOTYPING RESINS FOR PHOTOELASTIC TESTING .....	247
35.	Slavica Cvetković AUDITING PROCESS DESIGN COMPANY LOGISTICS SYSTEM .....	253
36.	Andonovic Vladan, Vrtanoski Gligorce CAD/CAM TECHNOLOGY IN DENTAL MEDICINE .....	259
37.	Zoran Janjuš, Aleksandar Petrović, Aleksandar Jovović, Radica Prokić-Cvetković, Predrag Ilić CHANGES VOLTAGE COMPACTION POLYPROPYLENE FILLED WITH GLASS POWDER .....	265
38.	Miletic Ostoja, Todić Mladen CHANGING THE WALL THICKNESS PROFILE IN THE PROCESS OF PROFILING .....	271
39.	Plavka Skakun, Miroslav Plančak, Dragiša Vilotić, Mladomir Milutinović, Dejan Movrin, Ognjan Lužanin COMPARATIVE INVESTIGATION OF DIFFERENT LUBRICANTS FOR BULK METAL FORMING OPERATIONS .....	275
40.	Borislav Kovljenić COMPLEXITY ANALYSIS OF CAD/CAM SYSTEMS INTEGRATION IN ERP BUSINESS ENVIRONMENT .....	281
41.	S. Aleksandrović, T. Vujinović, M. Stefanović, V. Lazić, D. Adamović COMPUTER CONTROLLED EXPERIMENTAL DEVICE FOR INVESTIGATIONS OF TRIBOLOGICAL INFLUENCES IN SHEET METAL FORMING .....	285
42.	Radu Alexandru Roșu, Viorel Aurel Șerban, Mihaela Popescu, Uțu Dragoș Cosmin Locovei DEPOSITION OF TITANIUM NITRIDE LAYERS BY REACTIVE PLASMA SPRAYING .....	291
43.	Sławomir Miechowicz, Tadeusz Markowski, Tomasz Kudasik, Olimpia Markowska DESIGN AND FABRICATION OF MEDICAL MODELS WITH RAPID PROTOTYPING TECHNIQUES AND VACUUM CASTING .....	297
44.	Djordje Vukelic, Branko Tadic, Janko Hodolic, Igor Budak, Milovan Lazarevic DEVELOPMENT AN EXPERT SYSTEM FOR MACHINING FIXTURE DESIGN .....	303
45.	Bogdan Nedić, Gordana Globočki-Lakić DEVELOPMENT MODEL FOR CONTROL METAL CUTTING PROCESS .....	309



46.	Aurel Prstić, Zagorka Acimović-Pavlović, Zvonko Gulišija, Mirjana Stojanović DEVELOPMENT OF EPC PROCESS FOR MANUFACTURING PARTS IN AUTOMOTIVE INDUSTRY .....	315
47.	Obućina Murčo, Škaljić Nedim, Smajić Selver EFFECT OF SURFACE ROUGHNESS ON WOOD ADHESION .....	321
48.	M. Stefanović, D. Vilović, M. Plančak, S. Aleksandrović, Z.Gulisija, D. Adamović FORMING LIMIT INDICATORS IN METAL FORMING .....	327
49.	Runčev Dobre, Gligorče Vrtanoski, Ljupčo Trpkovski HEATED TOOL BUTT WELDING OF POLYETHYLEN PIPES .....	337
50.	Marija Mihailović, Aleksandra Patarić, Zvonko Gulišija, Miroslav Sokić INCREASING PRODUCTION EFFICIENCY THROUGH CASTING QUALITY IMPROVING BY ELECTROMAGNETIC FIELD APPLYING .....	343
51.	Zorana Tanasić, Goran Janjić, Bobrek Miroslav, Živko Pejašinić INFLUENCE OF ORGANIZATIONAL CULTURE ON BUSINESS PERFORMANCE .....	349
52.	Robert Molnar, Drago Soldat INNOVATION-THE KEY FACTOR IN ENTREPRENEURIAL CYCLES .....	355
53.	Vid Jovišević, Stevo Borojević, Gordana Globočki-Lakić, Branislav Sredanović LABORATORIES UNDER REQUIREMENTS OF DIRECTIVES AND STANDARDS OF EUROPEAN UNION .....	361
54.	Sanja Petronic, Andjelka Milosavljevic, Biljana Grujic, Radovan Radovanovic Radmila Pljakic LASER SHOCK PEENING OF N-155 SUPERALLOY EXPOSED TO AGGRESSIVE MEDIUM .....	367
55.	Bogdan Marić, Ranko Božičković LEAN CONCEPT TOOLS IN PROCESS OF TECHNICAL SYSTEMS OVERHAUL .....	373
56.	Ranko Radonjić, Milan Šljivić, Živko Babić, Milentije Stefanović NUMERICAL SIMULATION OF HOLE FLANGING OF CIRCULAR SHEETS ..	379
57.	Dejan Lukić, Velimir Todić, Mijodrag Milošević, Goran Jovičić ONE APPROACH TO THE DEVELOPMENT AND IMPLEMENTATION OF FLEXIBLE MANUFACTURING SYSTEMS .....	385
58.	Milentije Stefanović, Srbslav Aleksandrović, Dragan Adamović PAPER ABOUT PAPERS IN THE AREA OF METAL FORMING PRESENTED AT <i>DEMI</i> CONFERENCES HELD SO FAR .....	391
59.	Todic Mladen, Miletic Ostoja POSITION OF THE NEUTRAL SURFACE DEFORMATION AT BENDING TWO LAYER COMPOSITES .....	399
60.	Milena Cosić, Zagorka Acimović-Pavlović, Zvonko Gulišija, Mirjana Stojanović, Zoran Janjušević POSSIBILITY TO USE RHEOCASTING PROCESS FOR MANUFACTURING PARTS IN AUTOMOTIVE INDUSTRY .....	405
61.	Zvonko Gulišija, Marija Mihailović, Aleksandra Patarić, Zoran Janjušević PROPERTIES OF THE WROUGHT AI ALLOY 7075 OBTAINED BY ELECTROMAGNETIC CASTING PROCESS .....	409
62.	Vrtanoski Gligorce, Andonovic Vladan RAPID TECHNOLOGY IN DENTAL BIOMECHANICS .....	413



63.	Stevo Borojević, Vid Jovišević, Gordana Globočki-Lakić, Đorđe Čiča, Branislav Sredanović, Marko Radisavljević SELECTION OF VARIANT FOR MATERIAL FLOW TYPE IN CONDITIONS OF GROUP APPROACH USING THE SOFTWARE SYSTEM TECNOMATIX PLANT SIMULATION .....	419
64.	Velimir Todić, Dejan Lukić, Mijodrag Milošević, Jovan Vukman TECHNOLOGICAL BASIS FOR THE DEVELOPMENT AND IMPLEMENTATION OF FLEXIBLE MANUFACTURING SYSTEMS .....	427
65.	Goran Janjić, Predrag Nagraisalović, Zorana Tanasić, Miroslav Bobrek, Živko Pejašinović THE PROCESS OF MEASURING EQUIPMENT MANAGEMENT AND ITS AUTOMATIZATION .....	433
66.	S. Mazzola, P. Pedrazzoli, G. Dal Maso, C. R. Boër VIRTUAL ENVIRONMENT PLATFORM FOR INDUSTRIAL OPERATION AND MAINTENANCE .....	441
<b>C. THERMOTECHNIQUE AND ENERGETICS .....</b>		<b>447</b>
67.	Nataša Soldat, Mirjana Radišić BASIC ASPECTS OF DEFINING MECHANICAL-TECHNOLOGICAL SOLUTIONS FOR THE PRODUCTION OF BIOGAS FROM LIQUID MANURE .....	449
68.	Crnojević C., Lečić M. DETERMINATION OF PRESSURE DROP TWO-PHASE FLOW OIL AND GAS FOR ISOTHERMAL FLOW IN HORIZONTAL PIPELINE .....	453
69.	Igor Andreevski, Gligor Kanevče, Ljubica Kanevče, Aleksandar Markoski, Sevde Stavreva DEVELOPMENT AND APPLICATION OF REGULATORY DISPERSION MODEL FOR AIR POLLUTION ASSESSMENT .....	459
70.	Gordana Tica, Veljko Đuričković, Petar Gvero DIMENSIONING OBJECT'S COOLING SYSTEM FOR PREDETERMINED KNOWN RELIABILITY .....	465
71.	Mića Vukić, Velimir Stefanović, Predrag Živković, Mirko Dobrnjac EXPERIMENTAL INVESTIGATION OF THERMAL AND FLOW PROCESSES IN SHELL AND TUBE HEAT EXCHANGERS .....	475
72.	Popov G., Klimentov Kl., Kostov B. INVESTIGATION OF THE ENERGY CONSUMPTION IN REGULATING THE FLOW RATE OF PUMP SYSTEMS .....	481
73.	Đorđe S. Čantrak, Slavica S. Ristić, Novica Z. Janković LDA, CLASSICAL PROBES AND FLOW VISUALIZATION IN EXPERIMENTAL INVESTIGATION OF TURBULENT SWIRL FLOW .....	489
74.	Popov G., Klimentov Kl., Kostov B. METHODS TO ESTIMATE THE ENERGY CONSUMPTION IN REGULATING THE FLOW RATE OF PUMP SYSTEMS .....	495
75.	Majid Soleimaninia NUMERICAL INVESTIGATION OF HEAT TRANSFER ENHANCEMENT IN NATURAL CONVECTION AND FORCED CONVECTION IN A FLUID SATURATED VARIABLE POROSITY MEDIUM .....	501

76.	Milica Grahovac OBJECTIVE FUNCTION DEFINITION FOR PRIMARY HVAC SYSTEM TOTAL COSTS MINIMIZATION .....	515
77.	Diana Alina Bistran, Manuela Pănoiu, Tihomir Latinović, Marcel Topor PARALLEL SOLUTIONS TO ACCELERATE MATHEMATICAL ALGORITHMS IN HYDRODYNAMIC STABILITY PROBLEMS .....	523
78.	Sevde Stavreva, Marko Serafimov, Igor Andreevski REDUCING CONSUMPTION OF ENERGY OF DATA CENTERS .....	533
79.	N. Manić, V. Jovanović, D. Stojiljković RESULTS OF EXPERIMENTAL INVESTIGATION OF PELLET STOVE ACCORDING TO EN 14875 .....	539
80.	Mirjana Radišić, Nataša Soldat SOME EXPERIENCES IN THE PRODUCTION OF BIOGAS FROM LIQUID MANURE .....	549
81.	Aleksandar Stjepanović, Slađana Stjepanović, Ferid Softić, Zlatko Bundalo TEMPERATURE CHARACTERISTICS OF PHOTOVOLTAIC MODULE .....	555
82.	Predrag Živković, Gradimir Ilić, Mirko Dobrnjac, Mladen Tomić, Žana Stevanović, WIND POTENTIALS ASSESMENT IN COMPLEX TERRAIN .....	561
83.	Ljubo Glamočić WIND POWER RESOURCES IN THE REPUBLIC OF SRPSKA .....	567
84.	Milovan Kotur, Gostimir Radić COVENANT OF MAYORS FORESEEN ACTIVITIES AT DISTRICT HEATING COMPANY – TOPLANA A.D. BANJA LUKA .....	575
85.	Milovan Kotur, Branko Usorac, Petar Gvero, Gordana Tica PARTIAL REPLACING HEAVY FUEL OIL WITH BIOMASS IN THE DISTRICT HEATING COMPANY IN GRADIŠKA .....	581
86.	Milovan Kotur, Zoran Knežević, Petar Gvero, Gordana Tica BIOMASS PROJECT IN DISTRICT HEATING COMPANY (DHC) IN PRIJEDOR, BIH .....	587
<b>D. TRAFFIC MEANS .....</b>		<b>593</b>
87.	Stojan Petrović, Božidar Nikolić, Emil Hnatko, Jovo Mrđa, Stevan Veinović MALICIOUS ECOLOGY ON VEHICLES AND TRAFFIC EXAMPLE .....	595
88.	Zlatomir Živanović, Zoran Jovanović, Željko Šakota A COMPARATIVE ANALYSIS OF CNG AND HYBRID BUSES VS DIESEL BUSES .....	607
89.	Milan Milovanović, Dragoljub Radonjić, Saša Jovanović ADJUSTMENTS OF VEHICLES WITH GAS DRIVE .....	613
90.	Dalibor Jajcevic, Raimund Almbauer APPLICATION OF A CYCLIC BOUNDARY CONDITION FOR CFD SIMULATIONS OF A 2-CYLINDER IC-ENGINE .....	619
91.	Melisa Velic, Semir Mulalic, Adnan Pecar CALCULATING THERMODYNAMIC PROPERTIES BY CREATING AND USING MODEL OF A DIESEL ENGINE WITH SIX CYLINDERS .....	627

92.	Mile Raičević, Miroslav Demić, Nebojša Rako, Predrag Milenković DETERMINING THE DURATION OF VIBRATION MEASUREMENTS OF HUMAN BODY IN LABORATORY CONDITIONS BY SUBJECTIVE METHODS .....	633
93.	Miroљjub Tomić, Stojan Petrović, Slobodan Popović, Nenad Miljić DUAL PORT INDUCTION SYSTEM FOR DMB 1.4 MPI ENGINE .....	651
94.	Blažević A., Bibić DŽ., Filipović I. FUNCTION AND ADOPTION OF IC ENGINES DUAL MASS FLYWHEEL .....	661
95.	Jelena Eric Obucina, Jovanka Lukic HYDRAULIC PUMP IN THE OF VEHICLE STEERING SYSTEM .....	667
96.	Aleksandar Davinić, Radivoje Pešić, Dragan Taranović, Miroslav Ravlić IGNITION SYSTEM OF MULTIPROCESSING OTTO/DIESEL ENGINE .....	673
97.	Filipović I., Milašinović A., Blažević A., Pecar A. IMPACT OF THE SPECIFIC ABSORBERS ON THE DYNAMIC LOAD OF THE IC ENGINE'S CRANKSHAFT .....	681
98.	Jasna Glišović, Jovanka Lukić, Danijela Miloradović IMPROVEMENTS OF GROUND VEHICLES FUEL ECONOMY USING REGENERATIVE BRAKING .....	687
99.	Predrag Živković, Mladen Tomić, Gradimir Ilić, Mirko Dobrnjac, Vladimir Lazović, INFLUENCE OF TRAFFIC ON AIR QUALITY IN NIŠ .....	693
100.	Boran Pikula, Ivan Filipović, Mirsad Trobradović INVESTIGATION OF DYNAMICS CHARACTERISTICS OF HYBRID VEHICLES .....	699
101.	Vladan Ivanovic, Decan Ivanovic, Vladimir Pajkovic LANDFILL GAS AS A FUEL FOR A VEHICLE FLEET FOR THE CITY LANDFILL .....	705
102.	Jovanka Lukić, Radivoje Pešić, Dragan Taranović NVH INVESTIGATION OF POWER STEERING SYSTEM HYDRAULIC PUMP .....	711
103.	Vojislav B. Krstić, Božidar V. Krstić, Vukić N. Lazić POSSIBILITY OF DETERMINATION THE ROUTES FOR TRANSPORTATION OF HAZARDOUS GOODS ON THE BASIS OF THE RISK LEVEL .....	717
104.	Božidar V. Krstić, Vojislav B. Krstić, Ivan B. Krstić POSSIBILITIES DETERMINATION OF THE OPTIMAL STRATEGY FOR PREVENTIVE MAINTENANCE OF THE CARDAN SHIFT VEHICLE USING POLYCRITERION OPTIMIZATION .....	723
105.	Pikula Boran, Filipovic Ivan, Kepnik Goran RESEARCH OF THE EXTERNAL AERODYNAMICS OF THE VEHICLE MODEL .....	731
106.	Vladimir R. Pajković ROAD TRAFFIC SAFETY PERFORMANCE IN MONTENEGRO .....	739
107.	Dobrivoje Ninkovic SURVEY OF METHODS FOR CALCULATING THE WAVE ACTION IN THE MANIFOLDS OF INTERNAL COMBUSTION ENGINES .....	745
108.	Dragan Taranovic, Radivoje Pesic, Jovanka Lukic, Aleksandar Davinic TEST BENCH FOR NON-STANDARD MEASUREMENT CHARACTERISTICS OF RECIPROCATING COMPRESSOR .....	759

109.	Branislav Aleksandrović, Rajko Radonjić, Marko Đapan, Aleksandra Janković THE RESEARCH OF CORRELATIONS BETWEEN MOTORCYCLE OSCILLATORY PROCESSES DURING THE NONSTEADY MODES OF MOTION .....	765
110.	Izudin Delić, Izet Alić TRENDS IN DEVELOPMENT OF CATALYTIC CONVERTER OF INTERNAL COMBUSTION ENGINES (ICE) .....	771
111.	Pantelija Dakić, Sreten Perić MONITORING OIL FOR LUBRICATION OF TRIBOMECHANICAL ENGINE ASSEMBLIES .....	777
<b>E. MECHATRONICS .....</b>		<b>793</b>
112.	Milan Paripović ANALYSES THE DAMAGE CAUSED BY ATMOSPHERIC DISCHARGE AND OVERVOLTAGE PROTECTION .....	795
113.	Slaviša Todorović, Miroslav Rogić AUTOMATION AND OPTIMIZATION OF PROJECT OPERATIONS IN THE BRIDGE CRANE DESIGN PROCESS .....	801
114.	Corina Daniela Cunțan, Ioan Baci, Loredana Ghiorghioni DC STABILIZER WITH DIGITAL CONTROL .....	807
115.	Marija Milićević, Vladimir Kaplarevic, Zoran Dimić, Vojkan Cvijanović, Mirko Bućan DEVELOPMENT OF DISTRIBUTED CONTROL SYSTEM FOR ROBOTS CONTROL BASED ON REAL-TIME LINUX PLATFORM .....	813
116.	Miroslav Rogić, Bojan Knežević, Branislav Ristić DEVELOPMENT OF THE CONCEPT OF INTERACTIVE EDUCATION IN MECHATRONICS .....	819
117.	Ivan B. Krstić, Božidar V. Krstić, Dragan I. Milosavljević EFFECTIVENESS DETERMINATION OF ELECTRONIC DEVICES PREVENTIVE MAINTENANCE .....	825
118.	Mihailo P. Lazarević, Vasilije Vasić, Aleš Hace, Karel Jezernik FURTHER RESULTS ON MODELING, INTEGRATED DESIGN AND SIMULATION OF A MECHATRONIC SYSTEM WITH FPGA .....	831
119.	Miroslav Grubišić, Snježana Rezić IMPACT OF SENSOR FAILURE ON WORK OF ELECTRONICALLY CONTROLLED DIESEL ENGINES .....	837
120.	Miroslav Kostadinović, Zlatko Bundalo, Dušanka Bundalo IMPLEMENTATION OF PLANTWEB ALERTS IN A DELTAV SYSTEM .....	843
121.	Vahid Bagher Poor, Majid Hashemipour IMPLEMENTATION OF RFID TECHNOLOGY AND SMART PARTS IN WIRELESS MANUFACTURING SYSTEMS .....	849
122.	Tihomir Latinovic, Sorin I Deaconu, Remiquez Labudski, Marcel Topor INTELLIGENT APPROACH FOR MOBILE ROBOT SIMULATOR WITH ROBOSIM SOFTWARE .....	857

123. Milutinovic D., Glavonjic M., Slavkovic N., Kokotovic B., Milutinovic M., Zivanovic S., Dimic Z. MACHINING ROBOT CONTROLLED AND PROGRAMMED AS A MACHINE TOOL .....	863
124. Vladimir Kaplarević, Marija Milićević, Jelena Vidaković, Vladimir Kvirgić NEW APPROACH FOR DESIGNING ROBOT PROGRAMING SYSTEM BASED ON L-IRL PROGRAMING LANGUAGE .....	873
125. Kostic Aleksandra, Velic Melisa, Bektesevic Jasmin PRACTICAL STRATEGIES FOR STABILISATION OF ALGORITHMS BASED ON SECULAR EQUATIONS OF RSPDTM .....	877
126. Platon Sovilj, Nenad Čabrilo, Vladimir Vujičić, Ivan Župunski REMOTE MEASUREMENTS BY ZIGBIT WIRELESS MODULE .....	885
127. K. Abhary, D. Djukic, H-Y. Hsu, Z. Kovacic, D. Mulcahy, S. Spuzic, F. Uzunovic SOME ASPECTS OF KNOWLEDGE ENGINEERING .....	893
128. Nenad Miloradović, Rodoljub Vujanac, Blaža Stojanović STACKING AISLE WIDTH FOR FORKLIFT TRUCKS IN PALLETIZED STORAGE AND HANDLING SYSTEMS .....	899
129. Mihajlo J. Stojčić, Bojan Knežević THE CONTROLLER DESIGN FOR TRACKING TRAJECTORY WITH CONTROLLED JERK .....	905
130. Deaconu, S. I., Oprea N, Popa, G. N., Latinovic T. ULTRASONIC WELDING SYSTEM FOR AUTOMOTIVE WIRINGS INDUSTRY .....	911
131. Dražen Pašalić, Zlatko Bundalo, Dušanka Bundalo, Miroslav Kostadinović WIRELESS SENSOR NETWORKS IN HOME AUTOMATION .....	917
132. Mihailo Lazarević, Petar Mandić, Vasilije Vasić SOME APPLICATIONS OF NEUROARM INTERACTIVE ROBOT AND WEBOTS ROBOT SIMULATION TOOL .....	923
<b>F. MAINTENANCE OF TECHNICAL SYSTEMS .....</b>	<b>929</b>
133. Rusmir Bajrić, Enver Omazić, Fehmo Mrkaljević AVAILABILITY ANALYSIS OF IRREDUNDANT TECHNICAL SYSTEMS .....	931
134. Aleksandar Živković, Milan Zeljković, Milorad Rodić, Milivoje Mijušković COMPUTER AND EXPERIMENTAL DETERMINATION OF THE HUB UNIT LIFE .....	937
135. Danijela Nikolic, Vanja Sustersic, Jasmina Skerlic DECENTRALIZED WASTEWATER TREATMENT SYSTEMS IN LARGE SETTLEMENTS .....	943
136. Ivan B. Krstić, Dragan I. Milosavljević, Božidar V. Krstić DETERMINATION THE PERIODICITY OF MANAGING OF PREVENTIVE MAINTENANCE OF TECHNICAL SYSTEMS .....	949
137. Mihaela Popescu, Radu Alexandru Roșu, Carmen Oprea, Ibolyka Bran ENVIRONMENT PROTECTION FOR WELDING AND ALLIED TECHNIQUES .....	955
138. Milomir Čupović, Desimir Jovanović, Bogdan Nedić FTA AND FMEA IN PREDICTING INCIDENTAL CONDITIONS IN CABLE CARS AND SKI LIFTS .....	961

139. Milorad Pantelić, Srđan Bošnjak	
MAINTENANCE AND LIFECYCLE OF THE EXCAVATION UNITS .....	967
140. Dusan Jovanic, Drago Soldat	
MODELING MAINTENANCE ACTIVITIES ON A WELDED CONSTRUCTION	
USING IDEF0 METHODOLOGY .....	973
141. Jasmina Skerlic, Vanja Sustersic, Danijela Nikolic	
NATURAL SYSTEMS OF WASTEWATER TREATMENT IN SMALL	
SETTLEMENTS .....	979
142. Miodrag Milutinović, Vladimir Popović	
PROCEDURES FOR RISK BASED MANAGEMENT AND MAINTENANCE	
RIMAP PRINCIPLE .....	985
143. Dragoslav Dobraš, Sead Avdić	
PURPOSE AND METHOD EDUCATION OF INTERNATIONAL	
RECOGNIZED PERSONNEL FOR WELDING .....	997
144. Aleksandar Majstorović	
SAFETY PARTS OF BODY TO RESPIRATION WITH BREATHING	
APPARATUS IN DANGEROUS ZONE .....	1003
145. Stojan Simić	
STATUS OF MAINTENANCE SERVICE IN COMPANIES IN REGION IN	
TIMES OF RECESSION .....	1009
146. Remigiusz LABUDZKI	
IDENTIFY CHARACTERISTICS OF OBJECTS IN MACHINE VISION.....	1015

## PREFACE

This year, the 10<sup>th</sup> Anniversary International Conference on Accomplishments in Electrical, Mechanical Engineering and Information Technology DEMI is going to be held. The number of countries taking part in DEMI is increasing so this year scientists and researchers from 17 countries are going to take part. This modest jubilee, but with a considerable number of participants, points to the fact that that DEMI Conference is becoming an internationally recognized conference with respectable participants from technologically developed countries.

The first DEMI Conference was held in 1998 and was organized by the Faculty of Mechanical Engineering in Banja Luka having aimed to draw together university and institute scientists and professionals as well as experts from a very weakened, post-war economy. Such mission and role of the DEMI Conference has remained one of its priorities to this day. From 1998-2003, the DEMI Conference was being held every year, and after that time, it started to be held every two years. The DEMI became a traditional conference and it took over a significant but demanding role of gathering researchers and scientists as well as economy experts with the aim to foster faster implementation of contemporary research and new technologies in production processes in order to ensure better competitiveness of our industry. Definitely, this task has not been an easy one to achieve.

This 10<sup>th</sup> anniversary DEMI Conference has seen a significant progress. For the first time, the official language of the Conference is English. The number of papers to be presented at the Conference is 145 from 17 countries (former Yugoslav countries, Austria, Germany, Switzerland, Italy, Norway, Poland, Romania, Bulgaria, Turkey, Australia, New Zealand). The previous DEMI 2009 Conference brought together researchers and scientists from 11 countries which indicates a greater interest in this conference. The Conference activities will be realized in six sections which encompass the following thematic fields: Production Technologies and Engineering, Mechanics and Design, Traffic Means, Thermotechnique and Energetics, Maintenance of Technical Systems and Mechatronics. Key note lectures will be delivered by scientists from universities from Switzerland, Norway, Serbia and Croatia who are involved in researches of the highest scientific level in the fields of: mechatronics, energetics, modern approaches to machine structure and product design, the ecology of transportation and global warming, paradigms of contemporary production and a company's adjustment to the current market requirements, etc.

Therefore, we hope that the papers to be presented will contribute in considering and reflection on the present situation of research in mechanical and electrical engineering as well as information and communications technologies in the regional conditions, enable comparison with developed European countries and offer new models for faster implementation of contemporary research as to encourage production in the country. As it is the most important scientific and professional conference in the fields of mechanical engineering, information and communications technologies in our country, this is expected from the DEMI Conference with good reason.





## IGNITION SYSTEM OF MULTIPROCESSING OTTO/DIESEL ENGINE

Aleksandar Davinić<sup>1</sup>, Radivoje Pešić<sup>2</sup>, Dragan Taranović<sup>3</sup>, Miroslav Ravlić<sup>4</sup>

**Summary:** *Essence of multiprocessing operation principle of an engine is to achieve Otto and Diesel working process in the same cylinder, depending on operating regime and using two different types of bio-fuels. Thus, this engine has two fuel supply systems and an ignition system. The main problem of the ignition system is reliability of a spark plug during longer operation of the engine in Diesel mode. Due to potential forming of electrically conductive deposit on a ceramic spark plug isolator, instead of using classical ignition system (one spark per cycle), multi-sparks producer type of the ignition system is used that is able to obtain continuous, arbitrary long electric discharge between the spark plug electrodes. Possible occurrence of electrically conductive deposit leads to establishing of surface electric arc and momentary burning, which enables self-cleaning of the spark plug. Description of proposed ignition system and comparison of its electric characteristics with standard BOSCH MP 3.1 ignition system in laboratory conditions are presented in the paper. Comparative results of engine tests of these two ignition systems also are given in the paper.*

**Key words:** *ignition system, multiprocessing engine, spark plug, self-cleaning*

### 1. INTRODUCTION

One possibility to increase the economy of the IC engine and to influence row emissions is to introduce the multiprocessing operating principle. The essence of this principle is the ability to lead the operating process by OTTO, DIESEL, HCCI... cycle during engine operation, whereat the most favorable cycle is selected depending on the operating regime.

At the Faculty of Mechanical Engineering from Kragujevac, there is an ongoing effort to develop a multiprocessing Otto-Diesel engine that operates by Diesel cycle (mode) at lower loads and by Otto cycle during start and at larger loads [1,2,3]. The basic engine (DMB 3DA450) is an air cooled diesel engine with single cylinder and direct injection. In order to achieve multiprocessing features, the following was done:

---

<sup>1</sup> MSc Aleksandar Davinić, assistant, Kragujevac, Faculty of Mechanical Engineering in Kragujevac, Serbia, E-mail: davinic@kg.ac.rs

<sup>2</sup> PhD Radivoje Pešić, professor, Kragujevac, Faculty of Mechanical Engineering in Kragujevac, Serbia, E-mail: pesicr@kg.ac.rs

<sup>3</sup> MSc Dragan Taranović, assistant, Kragujevac, Faculty of Mechanical Engineering in Kragujevac, Serbia, E-mail: tara@kg.ac.rs

<sup>4</sup> MSc Miroslav Ravlić, Kragujevac, PRIZMA, Serbia, E-mail: miroslav.ravlic@prizma.co.rs















