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## ZBORNIK RADOVA PROCEEDINGS

**45. MEĐUNARODNI  
KONGRES I IZLOŽBA  
O GREJANJU HLAĐENJU I  
KLIMATIZACIJI**

**Beograd, Sava centar, 3–5. XII 2014.**

**45<sup>th</sup> INTERNATIONAL  
CONGRESS & EXHIBITION  
ON HEATING, REFRIGERATION  
AND AIR CONDITIONING**

**Belgrade, Sava Center, 3–5. XII 2014.**

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Društvo za grejanje, hlađenje i  
klimatizaciju (KGH) Srbije pri  
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and Air-Conditioning within  
the Union of Mechanical and Electrical  
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Beograd, 3–5. XII 2014.

Ovogodišnji skup je planiran da bude u duhu tema koje danas obuhvataju aktuelne zadatke svetske energetike i očuvanja životnog prostora i da okupi sve profile učesnika u gradnji zgrada i njihovom energetsom opremanju: energetičare, arhitekte kao i građevince koji ujedinjenim naporima stvaraju objekte, posebno one koji u budućnosti treba da budu nula energije. Rukovodeći se naglašenim potrebama za saradnjom svih učesnika u projektovanju i građenju zgrada, prvi put su u Organizacionom odboru i predstavnici arhitekata.

Spisak tema je širok kako bi se podstakle sve institucije, obrazovne, projektantske, montažerske, kao i one administrativno-pravnog profila, da svojim nastupom, svaka u svojoj specijalnost, upotpune celokupnu problematiku energetike koja se odnosi na građevinske objekte. Predviđen je i poseban program za studente visokoškolskih i univerzitetskih institucija uvođenjem nagrađivanja njihovih najboljih radova.

Kongres i ove godine prati izložba uređaja, sistema, aparata, opreme, koji se ugrađuju i koriste u građevinskim objektima, kao i odgovarajućih instrumenata, materijala i softverskih programa, koji su u vezi sa energetsom potrebama stambenih, javnih i industrijskih zgrada.

**45<sup>th</sup> International Congress and  
Exhibition on HVAC&R**

**INTEGRATED DESIGN AND HEALTHY  
ZERO CO<sub>2</sub> EMISSION BUILDINGS**

Belgrade, 3rd–5th December 2014

This year's congress has been planned to be in the spirit of the topics that include the current objectives of the global energy and environmental science and engineering and to gather all profiles of professional who participate in building construction and building energy supply and fitting: energy engineers, architects and civil/structure engineers who unite their efforts in creating buildings, especially those that should be zero energy buildings in the future. Guided by the increasingly noticeable needs for cooperation between all the participants in building design and construction, for the first time the Organizing Committee includes the representatives of architects.

The list of thematic fields is wide in order to encourage all institutions dealing with education, design, installation as well as those dealing with administrative and legal matters, to help us cover all the aspects of energy relating to buildings by their respective contributions and presentations. The congress will also have a special programme for undergraduate and graduate students by introducing awards for the best student papers.

This year, like previously, the congress is accompanied by an exhibition of devices, systems, apparatus and equipment that are installed in buildings, as well as specific instruments, materials and software programs relating to the energy demands of residential, public and industrial buildings.

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Measured And Estimated Breakdown Of Energy Consumption In A Community Clinic  
*Alessandro Carbonari, Martina Giuliani, Sara Ruffini, Massimo Lemma, Università Politecnica Delle Marche, Dica Department, Via Brece Bianche, Ancona, Italy*

19. **Rehabilitacija riznice manastira Hilandar**  
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*Živojin Perišić*, Independent Consultant
20. **Adaptacija industrijskog objekta u visokoobrazovnu ustanovu u skladu sa poboljšanjem energetske performansi objekta**  
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*Branko Slavković, Komnen Žižić, Danilo Dragović*, Državni univerzitet u Novom Pazaru, Srbija
21. **The Influence Of Thermal Zoning On Thermal Comfort And Energy Consumption In Low Energy Office Buildings**  
*M. D. Moldovan, I. Visa, A. Duta*, Research Centre: Renewable Energy Systems And Recycling, Transilvania Univ.Of Brasov, Romania
22. **Inteligentne zgrade – prednosti, rizici i budućnost**  
Intelligent Buildings – Benefits, Risks And Future  
*Marija Lalošević, Milan Ristanović, Marko Miloš*, Urbanistički Zavod Beograda, Beograd, Srbija
23. **From Conventional to Low Energy Family Building in Serbia. A Life Cycle Perspective**  
*Katarina Slavković, Aleksandra Krstić-Furundžić*, Faculty of Architecture, University of Belgrade, Serbia

Forum: Poboljšanje energetske efikasnosti u novim tehnologijama hlađenja  
pogodnim za očuvanje klimatskih uslova i ozonskog omotača  
Improving Energy Efficiency In Climate And Ozone Friendly  
Latest Refrigeration Technologies

24. **Raspodela rashladnog fluida i ulja u rashladnim sistemima na primeru automobilske klima-uređaja**  
Refrigerant and oil charge distribution in refrigeration systems - MAC unit example  
*Mr. Pega Hrnjak*, University of Illinois, Urbana – USA
25. **Ušteda energije u rashladnim komorama**  
Energy Saving in Cold Storage  
*Mr. Alexander Cohr Pachai*, Technology Manager, Sabroe Factory by Johnson Controls, Denmark, *Ms. Željka Vuković, Mr. Ninoslav Srdić*, Soko inženjering, Belgrade, Serbia
26. **Uvnoteženje toplog i hladnog. Kako naći optimalnu temperaturu tople vode za industrijske visokotemperaturske amonijake i toplotne pumpe**  
Balancing Hot and Cold. How to Find the Optimum Delivery Temperature for an Industrial High Temperature Ammonia Heat Pump  
*Mr. Gert Nielsen*, Multiconsult, Nesttun, Norway
27. **Energetska efikasnost u industrijskim procesima i standardna rešenja sa toplotnom pumpom – “Slon u sobi”**  
Energy Efficiency in Industrial Processes and Standard Solutions with a Heat Pump - The Elephant in the Room  
*Mr. Philippe Nellissen, Mr. Zoran Stajić*, Emerson Climate Technologies
28. **Stvarna štednja energije pomoću “NewTon” NH3/CO2 u komorama za hlađenje i zamrzavanje**  
Actual Energy Conservation by Using NewTon “NH3/CO2” in Cold Storage and Freezer  
*Mr. H. Asano*, MAYEKAWA MFG.CO.LTD., *Mr. Jan Boone*, MAYEKAWA EUROPE

- 29. Analiza rada apsorpcione rashladne mašine pogonjene sunčevom energijom**  
The Thermodynamic Analysis of Absorption Refrigeration Mashine Driven by Solar Energy  
**Ms. Milena Stojković, Mr. Franc Kosi, Mr. Uroš Milovančević, Mr. Milan Gojak,**  
Faculty of Mechanical Engineering, University of Belgrade, Serbia

Mašine i sistemi za hlađenje  
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- 30. Prelaz toplote i vlage sa smrznute površine – inženjerski pristup**  
Heat Transfer and Moisture Loss from a Frozen Surface – an Engineering Approach  
**Mr. Uroš Milovančević, Mr. Franc Kosi, Ms. Milena Stojković,** Faculty of Mechanical Engineering, University of Belgrade, Serbia
- 31. Vazdušne toplotne pumpe kao obnovljiv izvor energije?**  
Air Source Heat Pumps as Renewable Energy Sources  
**Mr. Risto Ciconkov,** Faculty of Mechanical Engineering, University of Skopje, Republic of Macedonia, **Mr. Strahil Panev,** European Comission - Joint Research Centre (JRS), Italy, **Mr. Vasil Ciconkov,** Energija doo, Skopje, Republic of Macedonia
- 32. Teorijska komparativna studija slučaja, ugljovodonici, DME i HFC mešavine kao alternative za zamenu postojećih rashladnih fluida**  
Theoretical Comparative Case Study, Hydrocarbons, DME and HFC Mixture Alternatives Retrofit  
**Ms. Gratiela Tarlea,** Technical University of Civil Engineering, Faculty of Building Services, Bucharest, Romania, **Mr. Vinceriu, M.,** General Association of Refrigeration, Bucharest, Romania
- 33. Visokotemperaturne industrijske toplotne pumpe sa turbokompresorskom termokompresijom**  
High Temperature Industrial Heat Pumps with Turbo Compressors  
**Mr. Milan Sarevski, Mr. Vasko Sarevski,** Faculty of Mechanical Engineering, University of Skopje, Republic of Macedonia
- 34. Uticaj smrzavanja na kvalitet jagodastog voća**  
The Effect of Freezing on the Quality of Berry Fruits  
**Ms. Snežana Stevanović, Mr. Franc Kosi, Mr. Dragan Marković, Mr. Uroš Milovančević, Ms. Milena Stojković, Mr. Vojislav Simonović,**  
University of Belgrade, Serbia
- 35. Energetska efikasnost kombiniranih kompresorsko-ejektorskih rashladnih sistema i toplinskih pumpi**  
Energy Efficiency of Combined Compressor-Ejector Refrigeration/Heat Pump Systems  
**Mr. Milan Sarevski, Mr. Vasko Sarevski,** Faculty of Mechanical Engineering, University of Skopje, Republic of Macedonia

Tehnologije obnovljivih izvora energije i sistemi  
Renewable Energy Technologies & Systems

- 36. Simulacija i projekt solarnog apsorpcijskog sustava hlađenja**  
Simulation And Design of Solar Absorption Cooling System  
**Branimir Pavković, Boris Delač i Vedran Medica,** Viola, Faculty of Engineering, Rijeka, Croatia

- 37. Evaluacija bioklimatskih intervencija urbanog naselja**  
 Bioclimatic Interventions Evaluation of Urban Neighborhoods  
*Efrosini Giama\**, *Elli Kyriaki*, *Panagiota Antoniadou*, *Agis M. Papadopoulos*, Process Equipment Design Laboratory, School Of Mechanical Engineering Aristotle University Of Thessaloniki, Greece
- 38. Energetska optimizacija srpskih kuća sa fotonaponskim panelima i različitim grejnim sistemima**  
 Energy Optimization of Serbian Buildings with PV Panels and Different Heating Systems  
*Danijela Nikolić*, *Milorad Bojić*, *Jasmina Skerlić*, *Jasna Radulović*, *Nenad Miloradović*, Faculty of Engineering, University at Kragujevac, Serbia
- 39. Termička efikasnost dvostruko ozračenog i klasičnog ravnog vodenog prijemnika sunčeve energije - eksperimentalni rezultati**  
 Thermal Efficiency of a Double Exposure and Conventional Flat-Plate Water Solar Collectors - Experimental Results  
*Novak Nikolić*, *Nebojša Lukić*, *Dragan Taranović*, Fakultet Inženjerskih Nauka Univerziteta U Kragujevcu, Srbija
- 40. Solarni destilatori za pitku vodu**  
 Solar Distillers for Drinking Water  
*Nenad B. Miloradović*, Beogradske Elektrane, Beograd, Srbija
- 41. Tankoslojne fotonaponske tehnologije: stanje i izgledi**  
 Thin Film Photovoltaic Technologies: Status and Perspectives  
*J. Radulović*, *M. Bojić*, *D. Nikolić*, *J. Skerlić*, Faculty Of Engineering, University Of Kragujevac, Serbia
- 42. Optička analiza paraboličnog koncentratora sunčevog zračenja sa trapezoidnim reflektujućih segmentima**  
 Optical Analysis of a Parabolic Concentrator of Solar Radiation Based on Trapezoidal Reflective Petals  
*Saša Pavlović*, *Velimir Stefanović*, *Emina Petrović*, *Slavica Cvetković*, Faculty of Mechanical Engineering of Nis, Serbia
- 43. Termičke karakteristike poligenerativnih sistema sa ejektorskom termokompresijom**  
 Thermal Characteristics of Polygeneration Systems with Ejector Thermo Compression  
*Vasko Šarevski*, *Milan Šarevski*, Faculty of Mechanical Engineering, University "Sv. Kiril i Metodij", Skopje, Republic of Macedonia
- 44. Optimizacija performansi solarnih prijemnika korišćenjem softvera Energyplus i algoritma Hooke Jeeves**  
 Maximizing Performances of a Solar Domestic Hot Water System Through Optimum Solar Collector Slope and Azimuth Angles Using the Hooke Jeeves Algorithm  
*Jasmina Skerlić*, *Milorad Bojić*, *Danijela Nikolić*, *Jasna Radulović*, *Dragan Cvetković*, Faculty Of Engineering, Kragujevac, Serbia

Program za studente, mlade inženjere i profesionalni razvoj  
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 – Combined with Main Sponsors Presentations

- 45. Optimizacija geometrijskih parametara radi automatizacije projektovanja solarnih kolektora**  
 Optimization of Geometric Parameters of Solar Collectors  
*Miloš Matejić*, *Nenad Kostić*, *Nenad Marjanović* i *Mirko Blagojević*, mentor Prof. Milorad Bojić, Fakultet Inženjerskih nauka Univerziteta u Kragujevcu, Serbia

- 46. Energetska i ekološka stanovišta prpocesa sagorevanjna stabiljika duvana**  
Energy And Environmental Aspects of Tobacco Stalks Combustion Process  
**Maja Malnar, Vesna Radojičić**, mentor Assos. Prof. Olivera Ećim-Đurić, University of Belgrade, Faculty of Agriculture, Belgrade
- 47. Pogodnosti optimizacije niskih zgrada za stanovanje**  
Benefits of Optimizing Low-Rise Buildings  
**Nenad Kostić, Miloš Matejić, Nenad Petrović, Vesna Marjanović**, mentor Prof. Milorad Bojić, Fakultet Inženjerskih Nauka Univerziteta u Kragujevcu, Srbija

KGH za posebne namene  
HVAC for Special Purposes

- 48. KGH problemi i perspektive novog veka**  
New HVAC Century-Problems and Perspectives  
**Alessandro Sandelewski**, C. Eng, FCIBSE, MASHRAE, LEED GA ASC Engineering Srl, Milan, Italy
- 49. Uticaj brzine vozila na potrebe grijanja**  
Influence of Vehicle Speed on Heating Requirement  
**Svetozar Grahovac**, Mannheim, Germany
- 50. Analiza parametara pi regulatora u sistemu grijanja vode terapijskih bazena**  
Analysys Of Pi Controller Parameters in the Therapy Pool Heating System  
**Milovan Unković**, Institut "Dr Simo Milošević", Igalo, Montenegro
- 51. Simulacija sistema za grejanje i ventilaciju zatvorenih plivačkih bazena**  
Simulation of Heating and Ventilation System of Indoor Swimming Pools  
**Marko Mančić, Dragoljub Živković, Milena Todorović**, University Of Niš, Faculty of Mechanical Engineering, Niš, Serbia
- 52. Karakteristični problemi početnog perioda eksploatacije klimatizacionih postrojenja**  
Typical HVAC systems problems Within the Initial Period of Operation  
**Alojz Tovarović**, Oružane Snage BiH, Centar za obuku za operacije podrške miru
- 53. Određivanje optimalnih parametara graničnog sloja struje vlažnog vazduha merodavnih za inicijalni period kontinualnog procesa formiranja kajmaka**  
Determination of Optimal Parameters of Moist Air Boundary Layer Flow Relevant for the Initial Period of Continual Process of Kajmak Formation  
**Olivera Ećim-Đurić, Mira Radovanović, Aleksandar Nedeljković, Jelena Miočinović, Predrag Puđa**, Univerzitet u Beogradu, Poljoprivredni fakultet, Srbija
- 54. Klimatizacija podzemnih objekata posebne namjene – na primeru objekta „D-0“**  
Air-Conditioning of Underground Instalations for Special Purpose – Case Study „D-0“ Facility  
**Alojz Tovarović**, Oružane Snage BiH, Centar za obuku za operacije podrške miru

Predviđanje potrebe za energijom za ventilaciju i grejanje  
Heating and Ventilation Energy Demand Prediction  
– Legislation and Standardization

- 55. Predviđanje potrošnje toplote u univerzitetskom kampusu korišćenjem neuronske mreže**  
Application of Artificial Neural Networks for the Prediction of Heating Energy Consumption for University Campus  
**Radiša Jovanović, Aleksandra Sretenović, Branislav Živković**, Mašinski fakultet, Univerzitet u Beogradu, Srbija



- 56. Uticaj metodologije proračuna gubitaka toplote prema DIN 4701 iz 1959. i SRPS EN 12831:2012 na potrebnu instalisanu snagu grejnih tela**  
The Heat Losses Calculation Methodology According to DIN 4701 from 1959. i Srps En 12831:2012 Influence on Required Installed Radiators' Power  
**Miloš Milijašević**, MPP Jedinstvo AD, **Tamara S. Bajc, Maja N. Todorović**, Univerzitet u Beogradu, Mašinski fakultet, Srbija
- 57. Uticaj urbanističkih uslova, performansi konstrukcija i regulative na toplotne gubitke zgrada**  
Effects of Town Planning Conditions, Structural Performances and Regulations on Thermal Loss of Buildings  
**Veliborka Bogdanović, Ivana Bogdanović Protić**, Građevinsko-ArHITEKTONSKI Fakultet Univerziteta U Nišu, Srbija
- 58. Eksperimentalno istraživanje karakteristika panelnih sistema grejanja**  
Experimental Investigation of Performance of Panel Heating Systems  
**Dragan Cvetković, Milorad Bojić, Dragan Taranović**, Faculty Of Engineering, University Of Kragujevac, Serbia
- 59. Neuravnoteženosti i prečice u decentralizovanim i centralizovanim jedinicama – terenska merenja u stambenim zgradama**  
Volume Flow Unbalances and Shortcuts in Decentralized and Centralized Ventilation Units – Field Tests In Residential Buildings  
**Alexander Merzkirch, Stefan Maas, Frank Scholzen, Danièle Waldmann**, University Of Luxembourg
- 60. Strategija nacionalne definicije zgrade skoro nula energije**  
Strategy for National Definition of Nearly Zero Energy Buildings  
**Milica Jovanović Popović, Bojana Stanković, Jasna Kavran**, ArHITEKTONSKI Fakultet, Beograd
- 61. Primjena regulativa Srbije, Hrvatske i Bosne i Hercegovine na energetske optimizaciju omotača postojećih stambenih zgrada grada Banja Luka**  
Applying Serbian, Croatian and Bosnia & Herzegovina Regulations on the Energy Optimization of Envelopes of the Existing Residential Buildings in the City of Banja Luka  
**Darija Gajic**, University Of Banjaluka, Faculty Of Architecture and Civil Engineering, and **Aleksandra Krstic-Furundzic**, University Of Belgrade, Faculty of Architecture, Srbija

Forum: Međunarodna saradnja – istraživanje i razvoj  
integrisane strukture zgrade i opreme za KGH  
Forum: International Cooperation on Buildings and Integrated  
Construction/HVAC Equipment R&D  
(REHVA, Danube-ASHRAE, Danube-IBPSA)

- 62. Energetski koncept Slovenije**  
Energy Concept of Slovenia  
**Peter Novak**, Fakulteta za Strojništvo, Ljubljana
- 63. Geo-razmenjivač toplote – studija slučaja**  
Geoheatexchanger - Case Study  
**Galina Prica, Gratiela Tarlea**, Technical University of Civil Engineering, Faculty of Building Services, Bucharest, Romania
- 64. Hibridno hlađenje kontejnera za telekomunikacionu opremu**  
Hybrid Cooling of a Container for Telecommunication Equipment  
**Tea Žakula, Igor Balen, Ivan Šimić**, University of Zagreb – FMENA, Croatia

**65. Postizanje termalnog komfora implementacijom rashladnog sistema zračenjem u uslovima tropske klime: slučaj južnog Tajlanda**

Achieving Thermal Comfort with Radiant Cooling Systems in Tropical Climate: The Case of Southern Part of Thailand

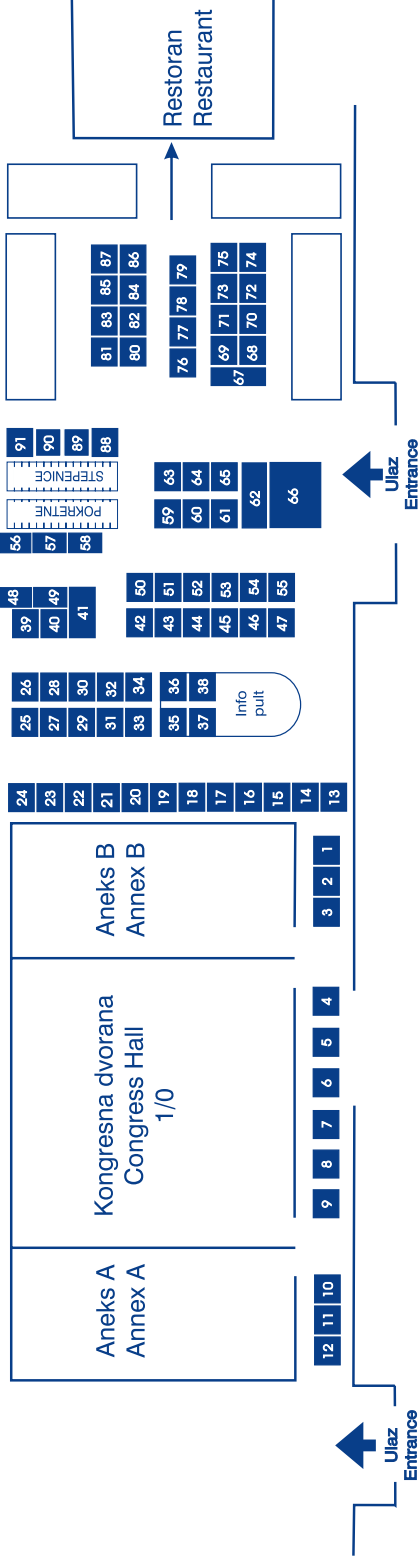
**Juntakan Taweekun**, Department of Mechanical Engineering, Faculty of Engineering, Prince of Songkla University, Hat Yai, Songkhla, Thailand, **Milovan Medojević**, Department of Energy and Process Engineering, Faculty of Technical Sciences, University of Novi Sad, Serbia, **Milana Perić**, Department of Energy and Process Engineering, Faculty of Technical Sciences, University of Novi Sad, Serbia, **Ar-U-Wat Tantiwichien**, Department of Mechanical Engineering, Faculty of Engineering, Prince of Songkla University, Hat Yai, Songkhla, Thailand

**66. Ušteda energije za grejanje i hlađenje zgrada kombinovanom instalacijom toplotne pumpe i sunčeve energije**

Energy Saving for Buildings Heating and Cooling Using Combined Solar-Heat Pump Installations (CSHPI)

**Maken Berdybaeva**, Kyrgyz-Russian Slavic University B.N. Yeltsin, Bishkek, Kyrgyz Republic

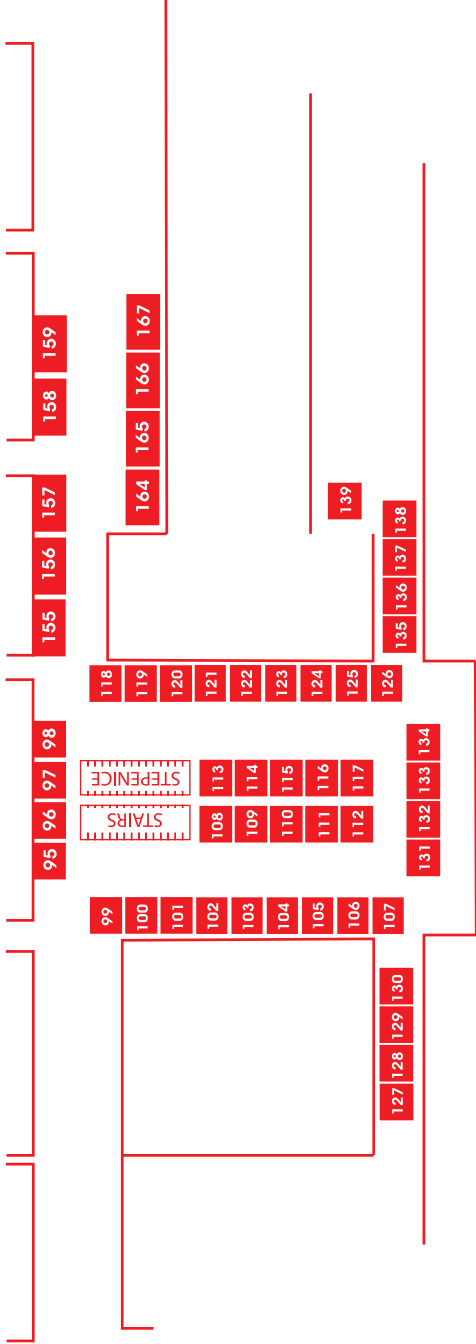
PRIZEMLJE  
GROUND FLOOR



# RASPORED ŠTANDOVA I IZLAGAČA U PRIZEMLJU LAYOUT OF STANDS AND EXHIBITORS ON THE GROUND FLOOR

Broj štanda No of Stand	Izagač – Exhibitor	Broj štanda No of Stand	Izagač – Exhibitor	Broj štanda No of Stand	Izagač – Exhibitor	Broj štanda No of Stand	Izagač – Exhibitor
1	WILO, Beograd	25	INSTALACIJA INŽENJERING doo, Beograd	49	ALFA CLIMA, Knjaževac	73	ETAŽ, Beograd, Vršin
2	ELCOMTRADE, Beograd	26	ESOTEH, Beograd	50	IMI INTERNATIONAL, Beograd	74	VALVE TRADE, Beograd
3	VIS COMPANY, Beograd	27	TOPTHERM, Bečež	51	VISSMANN, Beograd	75	CALEFFI HIDROTERMIKA, Beograd
4	VAILLANT, Beograd	28	TRACO INVEST, Beograd	52	OVENTROP, Beograd	76	THERMOKEY, Italija
5	DAIKIN, Austrija	29	SIPATEC, Beograd	53	MENERGA, Beograd	77	THERMOKEY, Italija
6	TECHNOLOGY INTERNATIONAL SERVICES, Beograd	30	TEHNOSAM, Subotica	54	RACIONALIZACIJA ENERGIJE, Beograd	78	STEELSOFT – LG, Beograd
7	TDM d.o.o., Beograd	31	SIPATEC, Beograd	55	NEVOKAL, Beograd	79	STEELSOFT – LG, Beograd
8	OVEX, Beograd	32	BELIMO AUTOMATION, Beograd	56	EUROFRIGO, Beograd	80	SOKO INŽINJERING, Beograd
9	TERMONET, Beograd	33	SIPATEC, Beograd	57	ELMARK, Beograd	81	SOKO INŽINJERING, Beograd
10	ROBERT BOSCH, Beograd	34	SIDEK INŽENJERING, Beograd	58	UNICOM, Beograd	82	ITN GROUP, Beograd, Zemun
11	IZOLIR, Zrenjanin	35	ZEHNDER, Nemačka	59	TERMOPLUS (CIAT), Beograd	83	ITN GROUP, Beograd, Zemun
12	PEZOS EXPORT IMPORT, Petrovaradin	36	EUROCONS, Vršac	60	EURO HEAT, Kragujevac	84	KLIMA M, Beograd
13	AIRTREND – KOVENT, Beograd	37	UNEP – UNIDO, Francuska	61	AKTING, Beograd	85	KLIMA M, Beograd
14	FENIKS BB, Niš	38	EUROCONS, Beograd	62	HIDRIA d.o.o. Beograd, Beograd	86	TERMO PLUS, Beograd
15	GRUNDFOS SRBIJA, Beograd	39	TERMOMEHANIKA, Beograd	63	INTERFRIGO, Beograd	87	TERMO PLUS, Beograd
16	GRUNDFOS SRBIJA, Beograd	40	KORAJA, Loznica	64	DANFOSS, Beograd	88	SENA, Kragujevac
17	FILTER FRIGO, Beograd	41	TERMOINŽENJERING, Beograd	65	REHAU, Beograd	89	SENA, Kragujevac
18	MPG KGH, Beograd	42	IMI INTERNATIONAL, Beograd	66	ENERGYNET, Kač	90	KLIMA DOP, Beograd
19	TROX, Beograd	43	GROUP PROTEM, Beograd	67	FLUX PRO – SAMSUNG, Beograd	91	IPIROS, Novi Sad
20	TROX, Beograd	44	DRAVIDIS, Beograd	68	FLUX PRO – SAMSUNG, Beograd	92	TERMOISTEM – PANASONIC, Crna Gora
21	CWG Balkan d.o.o., Beograd	45	HERZ ARMATUREN, Nova Pazova	69	UPONOR INFRA FINTHERM, a.s., Češka Republika	93	TERMOISTEM – PANASONIC, Crna Gora
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24	KOMO-YU, Beograd	48	SMART BUILDING TECHNOLOGIES, Beograd	72	ETAŽ, Beograd, Vršin		

GALERIJA  
GALLERY



## RASPORED ŠTANDOVA I IZLAGAČA NA GALERIJII

### LAYOUT OF STANDS AND EXHIBITORS ON THE GALLERY

Boji štanda No of Stand	Izagač – Exhibitor	Boji štanda No of Stand	Izagač – Exhibitor	Boji štanda No of Stand	Izagač – Exhibitor		
<b>95</b>	<b>NOVAKLIMA</b> , Beograd	<b>108</b>	<b>CENTRAL H</b> , Majdanpek	<b>123</b>	<b>CIM GAS</b> , Subotica	<b>137</b>	<b>VELA FILAND</b> , Beograd
<b>96</b>	<b>TERMOPRODUKT RS-1</b> , Sremska Mitrovica	<b>109</b>	<b>EKO TERM</b> , Senta	<b>125</b>	<b>PORTAL</b> , Zaječar	<b>138</b>	<b>LG ELECTRONICS</b> , Beograd
<b>97</b>	<b>EMERSON CLIMATE TECHNOLOGIES</b>	<b>111</b>	<b>SVECOM</b> , Beograd	<b>126</b>	<b>PORTAL</b> , Zaječar	<b>155</b>	<b>GAS LIDER</b> , Beograd
<b>98</b>	<b>EMERSON CLIMATE TECHNOLOGIES</b>	<b>112</b>	<b>PET – PROM</b> , Beograd	<b>127</b>	<b>ECOTIM TEDEX</b> , Beograd	<b>156</b>	<b>TERMOENERGETIKA ARMATURE</b> , Požega
<b>99</b>	<b>ENERGY – PRO</b> , Novi Sad	<b>113</b>	<b>CENTRAL H</b> , Majdanpek	<b>128</b>	<b>TECHNOPARTNER</b> , Beograd	<b>157</b>	<b>ISOPLUS</b> , Beograd
<b>101</b>	<b>GASTEC</b> , Plandište	<b>115</b>	<b>TOPEKO HVAC &amp; FIRESTOP SYSTEMS</b> , Beograd	<b>129</b>	<b>WEISHAUPT</b> , Beograd	<b>164</b>	<b>PEWO</b> , Beograd
<b>102</b>	<b>FEG SREČKO</b> , Beograd	<b>117</b>	<b>TERMO AS</b> , Beograd	<b>130</b>	<b>VOGEL &amp; NOOT</b> , Austrija	<b>165</b>	<b>PEWO</b> , Beograd
<b>103</b>	<b>COOLTECH SOLUTIONS</b> , Beograd	<b>118</b>	<b>MRU GmbH</b> , Nemačka	<b>131</b>	<b>STEPEN</b> , Beograd	<b>166</b>	<b>PEWO</b> , Beograd
<b>104</b>	<b>TEHNIKA KB</b> , Beograd	<b>119</b>	<b>SOBEL</b> , Beograd	<b>132</b>	<b>STEPEN</b> , Beograd	<b>168</b>	<b>IBPSA – DANUBE – Ogranak Međunarodnog udruženja simulacija osobina zgrada Dunavskog regiona</b>
<b>106</b>	<b>OZON DOOEL</b> , Makedonija	<b>120</b>	<b>SMGS</b> , Novi Sad	<b>133</b>	<b>INTER INŽENJERING GRUP</b> , Beograd		
<b>107</b>	<b>HALTON FOODSERVICE GmbH</b> , Nemačka	<b>121</b>	<b>RADING</b> , Kraljevo	<b>134</b>	<b>FANS</b> , Češka Republika		
		<b>122</b>	<b>BM-ART</b> , Sremski Karlovci	<b>135</b>	<b>TOPIZ</b> , Beograd		
				<b>136</b>	<b>LABORATORIJA</b> , Beograd		

**ZBORNİK RADOVA**  
**45. međunarodni kongres o grejanju,**  
**hlađenju i klimatizaciji**  
(Beograd, 3–5.12.2014)

IZDAVAČ

*Savez mašinskih i elektrotehničkih  
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# OPTIMIZACIJA GEOMETRIJSKIH PARAMETARA RADI AUTOMATIZACIJE PROJEKTOVANJA SOLARNIH KOLEKTORA

## OPTIMIZATION OF GEOMETRIC PARAMETERS TO AUTOMATE SOLAR COLLECTOR DESIGN

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*U ovom radu izvršeno je određivanje geometrijskih parametara solarnih kolektora optimizacionim metodama. Razvijen je matematički model za određivanje povoljnih geometrijskih karakteristika solarnih kolektora u cilju maksimizacije njihovog iskorišćenja. Optimalno rešenje kreirano je za geometrijske karakteristike kolektora sa cevima kruznog poprečnog preseka i kolektora sa cevima pravougaonog poprečnog preseka. Izvršena je uporedna analiza iskorišćenja oba tipa kolektora.*

*Rezultatima ovog istraživanja predstavljen je značaj primene optimizacije i parametarskog modeliranja u projektovanju kolektora. Ova rešenja mogu se mogu jednostavno primeniti u praksi.*

*Na kraju rada je izvršena diskusija rezultata i date su smernice daljih istraživanja.*

***Ključne reči:*** solarni kolektori, faktor iskorišćenja, optimizacija, parametarsko modeliranje.

*In this paper the determination of geometric parameters for solar collectors using optimization methods. A mathematical model has been developed for determining beneficial geometric characteristics of solar collectors with a goal to maximize their utilization. An optimal solution was created for geometric characteristics of a collector with circular pipes and a collector with rectangular pipes. A comparative utilization analysis was performed for both types of collectors. Results of this research present the importance of using optimization and parametric modeling in designing collectors. These solutions can be simply be used in practice. The paper concludes with a discussion of results and directions for possible further research.*

***Key words:*** solar collectors, utilization factor, optimization, parametric modeling.

### I. Introduction

Direct sunlight energy can be used in practice for its transformation into heat, electric, or chemical energy. The most widespread use of solar energy is an application of solar collectors for heating water. Solar collectors are devices which by absorbing solar rays turn radiation energy into heat for fluids which flow through the collector. The fluids found in most uses in solar collectors for converting solar into heat energy are air and water. Regarding construction, solar collectors are divided into flat and focusing. Flat collectors absorb global solar radiation and convert it into heat up to  $100^{\circ}\text{C}$ , while focusing collectors using optical systems can achieve temperatures up to  $3000^{\circ}\text{C}$ . Optimization of solar collectors presents very attractive research field. The development of construction and technology of flat solar collectors was done in order to increase their level of efficiency, and decrease their price and other side effects.















