PROGRAM / PROGRAMME

ZBORNIK APSTRAKATA

BOOK OF ABSTRACTS

IX REGIONALNA KONFERENCIJA:
INDUSTRIJSKA ENERGETIKA I ZAŠTITA ŽIVOTNE SREDINE
U ZEMLJAMA JUGOISTOČNE EVROPE

IX REGIONAL CONFERENCE:
INDUSTRIAL ENERGY AND ENVIRONMENTAL PROTECTION
IN THE COUNTRIES OF SOUTHEAST EUROPE

IEEP2024

DRUŠTVO TERMIČARA
SRBIJE
SOCIETY OF THERMAL
ENGINEERS

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POZIV / INVITATION

Poštovane koleginice i kolege,

U periodu od 29. do 31. maja 2024. u Beogradu, u prostorijama Privredne komore Srbije Društvo za procesnu tehniku i Društvo termičara Srbije uz suorganizaciju Privredne komore Srbije u isto vreme i sa zajedničkim delom programa organizuju skupove Procesing '24 i IEEP '24.
IEEP '24 će se održati nakon 30 godina od održavanja prve konferencije pod nazivom "Industrijska energetika" tadašnjeg Društva termičara Jugoslavije koja 2008. godine stiče međunarodni karakter i dobija naziv „Industrijska energetika i zaštita životne sredine u zemljama Jugoistočne Evrope". Od 2008. je uspešno održano osam regionalnih konferencija IEEP. Zato predstojeća IX konferencija ima poseban značaj i odslikava 30 godina uspešnog rada Društva termičara i njegove Sekcije za industrijsku energetiku.

Konferencija će biti povod za poslovne susrete sponzora i izlagača konferencije koji će industrijskim preduzećima predstaviti najnoviju tehnologiju koja doprinosi energetskoj efikasnosti i zaštiti životne sredine.

Pozivamo vas da svojim aktivnim učešćem na IEEP konferenciji doprinesete ostvarenju njenih ciljeva.

Dear Colleagues,

The Society for Process Engineering and the Society of Thermal Engineers of Serbia, with the co-organization of the Serbian Chamber of Commerce, are organizing two conferences Procesing 24 and IEEP 24, which will held at the same time and with a common part of the program in the period from May 29 to 31, 2024. The conferences will be held at the Serbian Chamber of Commerce in Belgrade, Serbia.
IEEP '24 will be held 30 years after the first conference entitled "Industrial Energy" of the then Society of Thermal Engineers of Yugoslavia, which acquired an international character in 2008 and changed name to "Industrial Energy and Environmental Protection in the Countries of Southeast Europe". Since 2008, eight regional IEEP conferences have been successfully held. That is why the upcoming IX conference has a special significance and reflects 30 years of successful work of the Society of Thermal Engineers and its Section for Industrial Energy.

The Conference will provide an opportunity for business meetings of sponsors and exhibitors presenting to the industry the latest technology that enhances energy efficiency and environmental protection.

Therefore, we take this opportunity to invite you to actively take part and contribute to the goals of the IEEP Conference.

Assoc. Prof. Mirjana Stamenić, PhD
Predsednik Organizacionog odbora /
Organizing Committee President

Predrag Stefanović, PhD
Predsednik Društva termičara Srbije /
President of the Society of Thermal Engineers of Serbia

TEMATSKE CELINE / SCOPE AND TOPICS

1. Energetska politika, snabdevanje energijom, zakonodavstvo i podsticajni elementi

- Energetska politika
- Energetska tranzicija
- Podsticajne mere za unapređenje energetske efikasnosti
- Modeli finansiranja energetske efikasnosti
- Zakonska regulativa

2. Energetska efikasnost i sistem energetskog menadžmenta u industriji

- Korišćenje energije u procesnim i drugim industrijskim postrojenjima
- Energetska efikasnost i održivi razvoj procesnih i drugih industrijskih preduzeća
- Energetski efikasne tehnologije
- Unapređenje upravljanja i automatizacije procesa i energetska efikasnost
- Problemi i mogućnosti korišćenja kogeneracije i trigeneracije u industriji
- Korišćenje otpadne toplote
- Revitalizacija tehnoloških energetskih sistema u industrijskim preduzećima
- Programi energetskog menadžmenta
- Analiza stanja i metodi optimizacije u industrijskoj energetici
- Merenje, upravljanje i vizuelizacija procesa

3. Energetska efikasnost i energetski menadžment u zgradarstvu

- Energetska efikasnost u zgradarstvu
- Studije slučaja i najbolja tehnička rešenja za unapređenje energetske efikasnosti u zgradarstvu
- Zeleni objekti
- Novi materijali
- Pametni sistemi za snabdevanje energijom u zgradama
- Kogeneracija i trigeneracija u zgradarstvu
- ESCO koncept u zgradarstvu

4. Inženjerstvo zaštite životne sredine i održivi razvoj

- Zaštita životne i radne sredine i održivi razvoj
- Tretman, korišćenje i upravljanje otpadnim materijalima
- Rešenja za smanjenje emisije gasova staklene bašte
- Koncepti i projekti čistije proizvodnje
- Reciklaža i primena analize životnog veka proizvoda

5. Korišćenje alternativnih goriva i obnovljivih izvora energije

- Korišćenje obnovljivih izvora energije
- Korišćenje otpadnih materija kao goriva
- Zamena goriva i korišćenje alternativnih goriva

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1. Energy Policy, Energy supply, Legislature and Incentives

- Energy Policy
- Energy Transition
- Incentive Measures for Improvement of Energy Efficiency
- Financing Models of Energy Efficiency
- Law Regulations

2. Energy efficiency and energy management in industry

- Utilization of energy in process and other industrial enterprises
- Energy efficiency and sustainable development of process and other industrial enterprises
- Energy-efficient technologies Improving of process management and automation
- Improving of process managemant and automation
- Problems and possibilities of co-generation and tri-generation usage
- The use of waste heat and waste materials
- Revitalization of technological energy systems in industrial companies
- Energy Management Programs
- The situation analysis and optimization methods in industrial energy
- Measurement, control and process visualization

3. Energy efficiency and energy management of residential and commercial buildings

- Energy efficiency of residential and commercial buildings
- Case studies and best technical solutions for improvement of energy efficiency in buildings
- Green buildings
- New materials
- Smart energy supply systems in buildings
- Co-generation and Tri-generation in buildings
- ESCO concept

4. Environmental Engineering and Sustainable Development

- Environment protection and sustainable development
- Treatment, utilization and management of waste materials
- Solutions for reducing greenhouse gas emissions
- Concepts and projects of cleaner production
- Recycling and application of product life cycle analysis

5. Utilization of alternative fuels and renewable energy sources

- Utilization of renewable energy sources
- Utilization of waste materials as fuel
- Fuel substitution and utilization of alternative fuels

6. Special session - Boosting Energy Efficiency Through Improved Control for Reliable Processes in Modern Industry

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PROGRAMSKI POKROVITELJI / PROGRAM PATRONS

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Program rada konferencije sa vremenskim rasporedom

Conference Programme with the timetable

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ROOM 3 • 12.20 – 13.10

PROCESING 2024 SESSION: PROCESSES AND FACILITIES IN PREPARATION OF WATER AND WASTEWATER TREATMENT

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ROOM 1 • 14.00 – 15.50

PROCESING 2024 SESSION: ENVIRONMENTAL PROTECTION ENGINEERING AND SUSTAINABLE DEVELOPMENT IN PROCESS INDUSTRY

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Milan Bulajić, Đorđe Čantrak, Novica Janković (Faculty of Mechanical Engineering, University of Belgrade, Department for Hydraulic Machinery and Energy systems)

TESTING OF THE PUMP UNDER NON-TYPICAL OPERATING REGIMES
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OPTIMAL INTRA-STATION REGIMES OF VLASINSKE HYDROPOWER PLANTS, **Aleksandar V. Petković** (The Academy of Applied Technical Studies Belgrade), **Jovan Ilić** (JSC Electric Power Authority of Serbia), **Ivan Božić** (University of Belgrade, Faculty of Mechanical Engineering)

COMPARISON OF DIFFERENT GAS FLOW MEASUREMENT METHODS AND THEIR APPLICATION IN THE FLUID MECHANICS LABORATORY
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MEHANIZAM ZA KALIBRACIJU SONDE SA VIŠE RUPICA ZA MERENJE PROSTORNOG POLJA BRZINA I PRITISKA U VENTILACIONIM SISTEMIMA

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Apstrakt
Simultana merenja složenih strujnih polja brzine i pritiska, i to sa visokom učestanošću, predstavljaju večiti izazov za istraživače širom sveta. Turbulentno vihorno strujanje na potisu aksijalnog ventilatora je jedan od takvih tipova strujanja. Pojava vihornog strujanja u ventilacionim sistemima, prema brojnim autorima, predstavlja izvor energetskih gubitaka, izmeštanja projektovane radne tačke ventilatora, kao i smanjenja energetske efikasnosti celog sistema. Za istraživanje ovako složenih turbulentnih strujanja, služe sonde sa više rupica, poput takozvanih Konrad ili kobra sondi. U novije vreme se transmiteri pritiska ugrađuju u nosač sonde, pa takve sonde imaju brz odziv, odnosno veliku brzinu uzorkovanja prilikom merenja. Brzina uzorkovanja zavisi od geometrije sonde. Sonda, koja se prikazuje u ovom radu, može da uzorkuje sa nekoliko hiljada odbiraka u sekundi, što je od izuzetnog značaja, s obzirom na postojanje izrazito visokog nivoa turbulencije brzine i pritiska. Nestacionarnost i trokomponentnost strujanja, koja je izražena kod turbomašina, su zahtevi koji dovode do geometrije sonde koja ima veliki broj rupica sa ugrađenim transmiterima visoke učestanosti. Ovo je dovelo do proizvodnje FRAP (eng. Fast Response Aerodynamic Probe) koja ima 5 rupica i zadovoljava ove kriterijume. Za razliku od standardnih sondi (Pito), FRAP sonde je potrebno redovno kalibrisati. Kalibracija zahteva ispitivanje sonde u aerotunelima sa izlaznim mlaznicama dovoljne veličine i jako niskog nivoa turbulencije (do maksimalno 2%), pri različitim uglovima nastrujavanja i brzina na glavu sonde, i to u okviru konusa jedinstvenosti sonde. Ovako složena kalibracija, koja drugo traje, daje, sa druge strane, solidno veliki komfor prilikom merenja sa ovim tipom sondi. Svi očekivani uglovi nastrujavanja sonde u njenim radnim položajima pri merenjima, obuhvataju se tzv. Pitch-Yaw kalibracijom. Direktan prevod znači nagib i skretanje, odnosno menjanje uglova φ i θ. Instalacije na ručni pogon, koje omogućavaju ovo zakretanje i već postoje u laboratoriji Katedre za hidraulične mašine i energetske sisteme, zahtevaju previše vremena, strpljenja i preciznosti od eksperimentatora koji vrši kalibraciju. Ovo dovodi do potrebe za automatizacijom celog kalibracije sonde, što i jeste cilj izlaganja u ovom radu. Osim uštede vremena, automatizacija nudi veći nivo tačnosti pozicija i prikupljanja podataka sa kalibrisanog uređaja. Projektovana instalacija se sastoji od preciznog pozicionera i aerotunela koji ima zadovoljavajući nivo turbulencije. Celo upravljanje je napisano pomoću programskog jezika LabVIEW koji svojim grafičkim prikazom olakšava

istraživaču upravljanje procesom kalibracije. Softver i instalacija su dizajnirani tako da omogućavaju kalibrisanje i drugih uređaja kroz dalju eksploataciju.

Ključne reči: 3D polje brzine, FRAP sonda, turbulencija, mehanizam za kalibraciju