

## Monday Morning (September 17)

10:20 - 11:10

Hardy Hall

### Plenary Lecture 1

**“Monitoring, load extension and detection of damage in hydraulic turbines. New challenges.”**

Prof. Eduard Egusquiza (CDIF-UPC Barcelona, Spain)

## Monday Afternoon (September 17)

13:00 - 15:00

RY202

### Hydraulic Turbines 1

Paper No. 6

**“Very Large Eddy Simulation of the Swirling Flow in Draft Tube of Francis Turbine”**

HUAN CHENG(Dongfang Electrical Machinery Co., Ltd., China), LING\_JIU ZHOU(China Agricultural University, China), YONG\_ZHI ZHAO(Dongfang Electrical Machinery Co., Ltd., China)

Paper No. 18

**“Pressure oscillation suppression by air admission in a Francis turbine draft tube”**

Xianwu Luo(Tsinghua University, China), An Yu(Hohai University, China), Weiping Yu(Taizhou University, China), Lin Wang(Tsinghua University, China), Hongyuan Xu(Tsinghua University, China)

Paper No. 49

**“Numerical Study on the Flow in Balancing Hole”**

Jun Matsui(Yokohama National University, Japan), Atsushi Okubo(Yokohama National University, Japan), Yousuke Yamashita(Yokohama National University, Japan)

Paper No. 20

**“Investigating the influence of the jet from three nozzle and spear design configurations on Pelton runner performance by numerical simulation”**

Sean Petley(Lancaster University, United Kingdom), Alexandros Panagiotopoulos(NTUA, Greece), Shaun Benzon(Mott MacDonald, United Kingdom), Audrius Zidonis(Lancaster University, United Kingdom), George Aggidis(Lancaster University, United Kingdom), John Anagnostopoulos(NTUA, Greece), Dimitris Papantonis(NTUA, Greece)

Paper No. 21

### “Transient CFD and experimental analysis for improved Pelton turbine casing designs”

Sean Petley(Lancaster University, United Kingdom), George Aggidis(Lancaster University, United Kingdom)

Paper No. 23

### “Dynamic measurements on a Kaplan turbine: model - prototype comparison”

Mauricio Angulo(Faculty of Engineering - National University of La Plata, Argentina), Cecilia Lucino(Faculty of Engineering - National University of La Plata, Argentina), Francisco Botero(School of Engineering - EAFIT University, Colombia), Arturo Rivetti(Faculty of Engineering - National University of La Plata, Argentina), Sergio O. Liscia(Faculty of Engineering - National University of La Plata, Argentina)

[RY203](#)

## [Hydraulic Turbines 2](#)

Paper No. 382

### “Influence of Guide Vane Clearance on Internal Flow of Medium Specific Speed Francis Turbine”

KISHORKUMAR GNANASEKARAN(EAML ENGINEERING CO., LTD., Japan), TADACHIKA TANAKA(EAML ENGINEERING CO., LTD., Japan), NAOKI YAMAGUCHI(EAML ENGINEERING CO., LTD., Japan), KAZUYOSHI MIYAGAWA(WASEDA UNIVERSITY, Japan), TOUI TANIWAKI(EAML ENGINEERING CO., LTD., Japan), WATARU TAKAHASHI(WASEDA UNIVERSITY, Japan)

Paper No. 384

### “Performance variation study on bulb turbines with different water head under considering free surface and water gravity”

Yaping Zhao(Xi'an University of Technology, China), Weili Liao(Xi'an University of Technology, China), Xiaobo Zheng(Xi'an University of Technology, China), Xingqi Luo(Xi'an University of Technology, China), Zhihua Li(Xi'an University of Technology, China)

Paper No. 385

### “Unusual Pressure Rise during the Load Rejection at a Deriaz Turbine”

Hiroaki Kikuta(Voith Fuji Hydro K.K., Japan), Kai Shimokawa(Voith Fuji Hydro K.K., Japan), Kengo Izutsu(Voith Fuji Hydro K.K., Japan), Tadashi Tsukamoto(Voith Fuji Hydro K.K., Japan), Shogo Nakamura(Voith Fuji Hydro K.K., Japan)

Paper No. 388

### “A Runner Modernization in a Deriaz Turbine Hydropower Station”

Hiroaki Kikuta(Voith Fuji Hydro K.K., Japan), Ryoji Suzuki(Voith Fuji Hydro K.K., Japan), Shogo Nakamura(Voith Fuji Hydro K.K., Japan), Danijel Anciger(Voith Hydro Holding GmbH & Co. KG, Germany)

Paper No. 390

**“Design optimization of medium specific speed Francis turbines with unshrouded runners”**

Wataru Takahashi(WASEDA University, Japan), Masafumi Shinji(WASEDA University, Japan), Zhihao Liu(WASEDA University, Japan), Kazuyoshi Miyagawa(WASEDA University, Japan), Yoshiichirou Hayashi(Chigasaki Research Institute, Japan)

Paper No. 394

**“Fluid Exiting Force due to Flutter and Rotor, Stator Interactions of Axial Flow Turbines”**

Kazushi Ajiro(WASEDA University, Japan), Kunimasa Matsuda(WASEDA University, Japan), Kaoruko Onishi(WASEDA University, Japan), Kazuyoshi Miyagawa(WASEDA University, Japan)

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[Pumps 1](#)

Paper No. 47

**“Three-Objective Optimization of a Single-Channel Pump for Wastewater Treatment”**

Jin-Hyuk Kim(Korea Institute of Industrial Technology , Korea), Wang-Gi Song(University of Science & Technology , Korea), Young-Seok Choi(Korea Institute of Industrial Technology, Korea), Kyoung-Yong Lee(Korea Institute of Industrial Technology, Korea), Sang-Bum Ma(Inha University, Korea), Kwang-Yong Kim(Inha University, Korea)

Paper No. 54

**“Influence of Impeller and Guide Vane Hub Size on Hydraulic Performance of Mixed-flow Pump”**

Wenpeng Zhang(Yangzhou University, China), Fangping Tang(Yangzhou University, China), Shengying Zhou(Tengzhou urban and rural water supply center, China), Ye Xia(Yangzhou University, China), Chenhui Wu(Yangzhou University, China), Haiyu Liu(Yangzhou University, China)

Paper No. 95

**“The effect of balancing holes on performance of a centrifugal pump: Numerical and Experimental Investigations”**

Mehrdad Raisee(University of Tehran, Iran), Mohammad Fathi(University of Tehran, Iran), Seyed Ahmad Nourbakhsh(University of Tehran, Iran)

Paper No. 115

**“Wall Roughness Influence on the NPSH Characteristics of Centrifugal Pumps”**

Andrej Lipej(University of Novo mesto, Slovenia), Simon Muhic(University of Novo mesto, Slovenia), Dusko Mitrasevski(SM Pumps, Slovenia)

Paper No. 170

**“Artificial neural network for the performance improvement of a centrifugal pump”**

WENJIE WANG(Jiangsu University, China), JI PEI(Jiangsu University, China), SHOUQI YUAN(Jiangsu University, China), Xingcheng Gan(Jiangsu University, China), Tingyun Yin(Jiangsu University, China)

Paper No. 216

**“Effect of Lean Mode of Blade Trailing Edge on Hydraulic Performance for Double-suction Centrifugal Pump”**

Chaoyue Wang(College of water resources and civil engineering , China), Fujun Wang(Beijing Engineering Research Center of Safety and Energy Saving Technology for Water Supply Network System, China), Zhichao Zou(College of water resources and civil engineering, China), Ruofu Xiao(College of water resources and civil engineering, China), Wei Yang(College of water resources and civil engineering, China)

**R303**

**Hydraulic Systems 1**

Paper No. 3

**“Transient Characteristics of a Centrifugal Pump at Rapid Startup”**

Teiichi TANAKA(National Institute of Technology, Kumamoto College, Japan), Naoto Takatsu(National Institute of Technology, Kumamoto College, Japan)

Paper No. 8

**“Modification of the shell type trifurcation shape for penstock design in A hydraulic plant by numerical simulations”**

Young-Joon Kim(K-water, Korea), Jung-Jae Hyun(K-water, Korea), Jong-Woong Choi(K-water, Korea), Won-Guk Jang(K-water, Korea), Yong Cho(K-water, Korea), In-Jun Cho(K-water, Korea), Young-Il Kim(K-water, Korea), Tai-Young Cho(K-water, Korea)

Paper No. 14

**“Effect of Throttling Orifice Head Loss on Dynamic Behavior of Hydro-turbine Governing System with Air Cushion Surge Chamber”**

Wencheng Guo(Huazhong University of Science and Technology, China), James Yang(Royal Institute of Technology, Sweden), Jiebin Yang(Wuhan University, China)

Paper No. 30

**“Detection of Extended Blockages in Pressurised Pipelines using Hydraulic Transients with a Layer-Peeling Method”**

Wei Zeng(University of Adelaide, Australia), Jinzhe Gong(University of Adelaide, Australia), Martin Lambert(University of Adelaide, Australia), Angus Simpson(University of Adelaide, Australia), Benjamin Cazzolato(University of Adelaide, Australia), Aaron Zecchin(University of Adelaide, Australia)

Paper No. 34

**“A New Method to Calculate Hydraulic Transients in HDPE Pipes Using the Standard Solid Model to Represent the HDPE Viscoelastic Behaviour”**

RAFAEL B. CARMONA-PAREDES(UNIVERSIDAD NACIONAL AUTONOMA DE MEXICO, Mexico), RENE AUTRIQUE(POLICONDUCTOS, Mexico), EDUARDO RODAL-CANALES(UNIVERSIDAD NACIONAL AUTONOMA DE MEXICO, Mexico), DAVID PANIAGUA-LOVERA(UNIVERSIDAD NACIONAL AUTONOMA DE MEXICO, Mexico)

Paper No. 42

**“Numerical Analysis for Transient Process of Hydropower and Water-supply System Sharing a Headrace Tunnel”**

Jiebin Yang(Wuhan University, China), Jiandong Yang(Wuhan University, China), Wencheng Guo(Huazhong University of Science and Technology, China), Anting Ma(Wuhan University, China)

[RY305](#)

[Cavitation and Multiphase Flow 1](#)

Paper No. 109

**“Numerical simulation of the cavitation micro-jet velocity and erosion on a plane-convex hydrofoil with semicylindrical obstacle”**

Victor Hidalgo(Escuela Polit?cnica Nacional, Ecuador), Xianwu Luo(Tsinghua University, China), Xavier Escaler(Polytechnic University of Catalonia, Spain), Esteban Valencia(Escuela Polit?cnica Nacional, Ecuador), Patricio Cruz(Escuela Polit?cnica Nacional, Ecuador)

Paper No. 226

**“Cavitation Erosion - Corrosion Behavior of Some Hydraulic Turbine Runner Steels”**

Laurent Ton-That(Hydro-Quebec, Canada), Robert Lacasse(Hydro-Quebec, Canada)

Paper No. 280

**“Statistical analysis of cavitation erosion impacts in a vibratory apparatus with copulas”**

Gabriel Taillon(Waseda university, Japan), Kaoruko Onishi(Waseda university, Japan), Taisei Mineshima(Waseda university, Japan), Kazuyoshi Miyagawa(Waseda University, Japan)

Paper No. 423

**“Cavitation erosion resistance of high-strength fiber reinforced composite material”**

Gabriel Taillon(Waseda University, Japan), Sumio Saito(Waseda University, Japan), Kazuyoshi Miyagawa(Waseda University, Japan), Chiharu Kawakita(National Maritime Research Institute, Japan)

Paper No. 432

“Cavitation erosion testing of different cavitation-resistant materials and coatings using the cavitating jet method”

Pavel Rudolf(Brno University of Technology, Czech), Martin Julis(Brno University of Technology, Czech), Pavel Gejdos(Brno University of Technology, Czech), Lenka Klakurkova(Brno University of Technology, Czech), Martin Hudec(Brno University of Technology, Czech)

[RY306](#)

[WS:Energy Storage 1](#)

Keynote Speech

WSES-1 Prof. Avellan	TBD
WSES-2 Prof. Gajic	Hydro storage reduces electricity costs and keep wind and solar unpolluted (Paper No. 461)
WSES-3 Prof. Lee	Recent Technologies on Energy Storage and Prospects
WSES-4 Prof. Nourbakhsh	TBD

Monday Evening (September 17)

15:20 - 17:40

R202

Hydraulic Turbines 3

Paper No. 50

**“Preliminary Design and Performance Analysis of a Positive Displacement Hydraulic Turbine”**

Arihant Sonawat(University of Science and Technology, Korea), Seung-Jun Kim(University of Science and Technology, Korea), Young-Seok Choi(Korea Institute of Industrial Technology, Korea), Kyoung-Yong Lee(Korea Institute of Industrial Technology, Korea), Kyungmin Kim(Korea District Heating Corporation, Korea), Yong-Kab Lee(Anflux Co., Ltd., Korea), Jin-Hyuk Kim(Korea Institute of Industrial Technology, Korea)

Paper No. 31

**“Unsteady Simulation of Cavitating Turbulent Flow for Low Head Francis Turbine.”**

Pankajkumar\_Paragbhai Gohil(Sarvajanic College of Engineering and Technology, Surat, India), R\_P Saini(Indian Institute of Technology, Roorkee, India)

Paper No. 7

**“Development of the pressure-time method as a relative method”**

Pontus P. Jonsson(Vattenfall AB, Sweden), Georgiana Dunca(University POLITEHNICA of Bucharest, Romania), Michel J. Cervantes(Luleå University of Technology, Sweden)

Paper No. 222

**“PARAMETRIC OPTIMIZATION TO REDUCE EROSION IN A FRANCIS TURBINE RUNNER”**

Esteban Valencia(Escuela Politecnica Nacional, Ecuador), Edwin Bone(Escuela Politecnica Nacional, Ecuador), Jair Yanez(Escuela Politecnica Nacional, Ecuador), Sergio Galv?n(Universidad Michoacana de S?n Nicol?s de Hidalgo, Mexico), Victor Hidalgo(Escuela Politecnica Nacional, Ecuador), Edgar Cando(Escuela Politecnica Nacional, Ecuador)

Paper No. 429

**“Construction of the Reduced Order Dynamic Model for Swirling Flow Control in Hydraulic Turbine Draft Tube”**

Pavel Rudolf(Brno University of Technology, Czech), Ondrej Urban(Brno University of Technology, Czech), David Stefan(Brno University of Technology, Czech)

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## Hydraulic Turbines 4

Paper No. 395

### “Experimental Investigation on the Dynamic Response of Pelton Runners”

Monica Egusquiza(UPC, Spain), Carme Valero(UPC, Spain), Alexandre Presas(UPC, Spain), David Valentin(UPC, Spain), Eduard Egusquiza(UPC, Spain)

Paper No. 410

### “Characterization of the Effects of Ingested Bodies on the RSI of Hydraulic Turbines”

Alfredo Guardo Zabaleta(Universitat Politècnica de Catalunya, Spain), Alfred Fontanals(Universitat Politècnica de Catalunya, Spain), Carme Valero(Universitat Politècnica de Catalunya, Spain), Eduard Egusquiza(Universitat Politècnica de Catalunya, Spain)

Paper No. 61

### “Numerical and Experimental Assessment of the Pulsating Water Jet in Conical Diffusers”

Constantin Tanasa(Politehnica University Timisoara, Romania), Raul Szakal(Politehnica University Timisoara, Romania), Daniel-Calin Mos(Politehnica University Timisoara, Romania), Sebastian Muntean(Romanian Academy-Timisoara Branch, Romania), Tiberiu Ciocan(Politehnica University Timisoara, Romania)

Paper No. 421

### “Proposal of a New Hydraulic Turbine Capable of High Efficiency Operation over a Wide Range of Flow Rate and Effective Head”

Kazuyoshi MIYAGAWA(WASEDA University, Japan), Masafumi SHINJI(WASEDA University, Japan), Wataru TAKAHASHI(WASEDA University, Japan), Takayuki SUGIMOTO(TOHOKU SMALL HYDROPOWER CO.,LTD., Japan), Tsubasa NAGANUMA(TOHOKU SMALL HYDROPOWER CO.,LTD., Japan), Reijiro WAKU(TOHOKU SMALL HYDROPOWER CO.,LTD., Japan), Tatsuya IRIE(WASEDA University, Japan)

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## Pumps 2

Paper No. 250

### “Experimental Study on the Optimal Range on Nozzle-to-throat Clearance of Jet Centrifugal Pump”

Qun Wang(Jiangsu University, China), Yang Wang(Jiangsu University, China)



Paper No. 317

**“Influence of posterior cavity structure on axial force and pressure distribution of stamping pump”**

Wenqi Zhang(Zhejiang University of Technology, China), Zicheng Zhang(Zhejiang University of Technology, China), Chengqi Mou(Zhejiang University of Technology, China)

Paper No. 407

**“Flow losses analysis in a mixed flow pump with annular volute by entropy production evaluation”**

JIAN CAO(Jiangsu University, China), Ji Pei(Jiangsu University, China), Yandong Gu(Jiangsu University, China), Wenjie Wang(Jiangsu University, China), shouqi Yuan(Jiangsu University, China)

Paper No. 458

**“Hydraulic optimization of impeller blade in reactor coolant pump base with Kriging model”**

Daoxing Ye(Xihua University, China), Xide Lai(Xihua University, China), Xiang Zhang(Xihua University, China), Qianglei Wang(Xihua University, China)

Paper No. 274

**“Effect of a Blade Thickness on the Hydraulic Performance of a Mixed-flow Pump Impeller”**

Yong-In Kim(University of Science & Technology , Korea), Sung Kim(Korea Institute of Industrial Technology , Korea), Hyeon-Mo Yang(Korea Institute of Industrial Technology , Korea), Kyoung-Yong Lee(Korea Institute of Industrial Technology , Korea), Jin-Hyuk Kim(Korea Institute of Industrial Technology , Korea), Young-Seok Choi(Korea Institute of Industrial Technology , Korea)

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[Hydraulic Systems 2](#)

Paper No. 44

**“Analysis of the Francis turbine upper-part-load pulsation Part I - Experimental results vs. hydro-acoustic model”**

Peter Doerfler(Hydro adviser LLC, Switzerland)

Paper No. 43

**“Analysis of the Francis turbine upper-part-load pulsation Part II - Mechanism of self-excitation”**

Peter Doerfler(Hydro adviser LLC, Switzerland)

Paper No. 136

**“Influence of Impeller’s Elastic Deformation on the Stability of Balance Piston Mechanism of Rocket Engine Turbopump”**

Hiromichi Hiraki(Nagoya University, Japan), Tsuyoshi Inoue(Nagoya University, Japan), Shota Yabui(Nagoya University, Japan)

Paper No. 89

**“GPU Parallel Acceleration of Transient Simulations of Open Channel and Pipeline Coupled System”**

Wan\_wan Meng(Wuhan University, China), Yong\_guang Cheng(Wuhan University, China), Jia\_yang Wu(Wuhan University, China), Zhi\_yan Yang(Wuhan University, China), shuai Shang(Zhangfeng Water Conservancy Management Company Ltd, China), feng Yang(Construction Management Company for Chushandian Reservoir Project of Henan Province, 0)

Paper No. 104

**“Hydraulic transient challenges for the upgrade of FMHL+ pumped storage power plant from 240MW to 420MW”**

Christophe Nicolet(Power Vision Engineering S?rl, Switzerland), Antoine B?guin(Power Vision Engineering S?rl, Switzerland), Jean-Daniel Dayer(ALPIQ Suisse SA, Switzerland), Ga?l Micoulet(ALPIQ Suisse SA, Switzerland)

Paper No. 124

**“The Elastic Property of Water and Penstock's Effect on Governor Stability”**

Torbj?rn K. Nielsen(NTNU, Norway), Bj?rnar Svingen(Hymatec and NTNU, Norway), Ingrid K Vilberg(NTNU and FDB, Norway)

Paper No. 68

**“Transient Hydraulic Calculations with a Linear Turbine Model derived from a Nonlinear Synthetic Model”**

Bjornar Lona Svingen(NTNU / Hymatek Controls, Norway), Torbjorn K Nielsen(NTNU, Norway)

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**[Cavitation and Multiphase Flow 2](#)**

Paper No. 11

**“Numerical simulation using the bubble size distribution model of cryogenic cavitation around an axial helical inducer”**

Yu Ito(Tokyo Institute of Technology, Japan), Xiao Zheng(Tokyo Institute of Technology, Japan), Takao Nagasaki(Tokyo Institute of Technology, Japan)

Paper No. 116

### **“The Simulation of Asymmetric Micro-Textures on the Lubrication Characteristics of Sliding Friction Pairs”**

Dongni Liu(Dalian?Maritime?University, China), Zhijun Yan(Dalian?Maritime?University, China), Xueliang Yan(Dalian?Maritime?University, China), Xinhe Zhu(Dalian Maritime University, China), Dong Cheng(Dalian?Maritime?University, China), Xun Fang(Dalian?Maritime?University, China), Cheng Xue(Tsinghua University, China)

Paper No. 127

### **“Cavitation Aggressiveness on a Hydrofoil”**

Jean-Bastien Carrat(LEGI, Univ. Grenoble Alpes, CNRS, France), Timo Bouvard(LEGI, Univ. Grenoble Alpes, CNRS, France), Regiane Fortes Patella(LEGI, Univ. Grenoble Alpes, CNRS, France), Jean-Pierre Franc(LEGI, Univ. Grenoble Alpes, CNRS, France)

Paper No. 284

### **“From nucleation to cloud cavitation”**

Peter F. Pelz(TU Darmstadt, Germany), Johannes Bittenbender(TU Darmstadt, Germany), Thomas Keil(TU Darmstadt, Germany), Tim F. Gross(TU Darmstadt, Germany), Alexander Terwort(TU Darmstadt, Germany)

Paper No. 351

### **“Numerical investigation on flow field characteristics of Helmholtz Oscillator”**

Zhenlong Fang(Wuhan University of Technology, China), Qiang Wu(Wuhan University of Technology, China), Pan Jiang(Wuhan University of Technology, China), Wei Wei(Wuhan University of Technology, China)

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[WS:Energy Storage 2](#)

Paper No. 140

### **“Pressure Pulsations During a Fast Transition from Pump to Turbine Mode of Operation in Laboratory and Field experiment”**

Magni F. Svarstad(Norwegian University of Science and Technology (NTNU), Norway), Torbjørn K. Nielsen(Norwegian University of Science and Technology (NTNU), Norway)

Paper No. 209

### **“CFD simulation of transient startup for a low specific-speed pump-turbine”**

Ernesto Casartelli(Hochschule Luzern, Technik & Architektur, Switzerland), Oliver Ryan(Hochschule Luzern, Technik & Architektur, Switzerland), Angelika Schmid(Hochschule Luzern, Technik & Architektur, Switzerland), Luca Mangani(Hochschule Luzern, Technik & Architektur, Switzerland)

Paper No. 29

**“Transient Simulation of Model Pumped Storage Hydropower Plant during Load-Rejection Scenarios by using 1D?3D Simulation”**

Chengcheng Yin(Wuhan University, China), Jiandong Yang(Wuhan University, China), Wei Zeng(University of Adelaide, Australia), Yongguang Cheng(Wuhan University, China)

Paper No. 292

**“Transfer of transient conditions from prototype to closed-loop model test rig”**

Johannes Junginger(University of Stuttgart, Germany), Stefan Riedelbauch(University of Stuttgart, Germany), Oliver Kirschner(University of Stuttgart, Germany)

Paper No. 72

**“Effect of Cavitation Flow on the Transitions in a Pumped Storage Power Station”**

Xiaolong Fu(Harbin Institute of Technology, China), Guodong Li(Harbin Institute of Technology, China), Deyou Li(Harbin Institute of Technology, China), Hongjie Wang(Harbin Institute of Technology, China), Guanghui Zhang(Harbin Institute of Technology, China), Wei Li(Harbin Institute of Technology, China), Xianzhu Wei(Harbin Institute of Technology, China)

Paper No. 342

**“Hydraulic transient Simulation and Characteristic Investigation on Kaplan Type Hydroelectric Power Plant with Open Channel”**

Sheng Chen(Hohai University, China), Jian Zhang(Hohai University, China), Xiaodong Yu(Hohai University, China)

Tuesday Morning (September 18)

9:00 - 9:50

R Y203

Plenary Lecture 2

“Understanding and progress on the unsteady problems due to rotor-stator interactions in hydraulic machines”

Prof. Kazuyoshi Miyagawa (Waseda University, Japan)

10:10 - 12:10

R Y202

Hydraulic Turbines 5

Paper No. 98

“Physical mechanisms of inter-blade vortex development inside blade channels at deep part load operation of Francis turbines”

Keita Yamamoto(EPFL , Switzerland), Andres M?ller(Nippon Koei Co., Ltd., Japan), Arthur Favrel(EPFL , Switzerland), Christian Landry(Power Vision Engineering S?rl, Switzerland), Fran?ois Avellan(EPFL, Switzerland)

Paper No. 74

“Radial Dampers Impact on Shaft Vibrations at Resonance”

Rolf Gustavsson(Vattenfall AB, Sweden), Mattias N?sselqvist(Vattenfall AB, Sweden), Jens ?sterud(Vattenfall AB, Sweden)

Paper No. 82

“Francis turbine with tandem runners: a proof of concept”

Romeo F. Susan-Resiga(Politehnica University Timisoara, Romania), Adrian Stuparu(Politehnica University Timisoara, Romania), Sebastian Muntean(Romanian Academy - Timisoara Branch, Romania)

Paper No. 88

“Numerical Investigation of the Behavior of the Cavitation Rope in a Francis Turbine with Vortex-Control Grooves”

An YU(Hohai University, China), Daqing ZHOU(Hohai University, China), Huixiang CHEN(Hohai University, China)

Paper No. 90

“Development of Wide Operating Range Runner for Francis Turbine Upgrading”

Jiri Obrovsky(Litostroj Power - CKD Blansko Engineering, a.s. , Czech), Josef Zouhar(Litostroj Power - CKD Blansko Engineering, a.s., Czech), Martin Abraham(Litostroj Power - CKD Blansko Engineering, a.s., Czech), Ales Skotak(Litostroj Power - CKD Blansko Engineering, a.s., Czech)

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## Hydraulic Turbines 6

Paper No. 451

### “An Experimental Investigation of Cavitation Surge in Draft tube of Francis Turbine”

Koichi Yonezawa(Central Research Institute of Electric Power Industry, Japan)

Paper No. 457

### “Oscillation investigation of hydraulic generating unit induced by pressure fluctuation of draft tube vortex during load-up transient process”

Leike Zhang(Taiyuan University of Technology, China), Yi Xu(Shenyang Academy of Environmental Science, China), Qianqian wu(Sanjiang University, China), Zhenyue Ma(Dalian University of Technology, China), Xueni Wang(Taiyuan University of Technology, China)

Paper No. 99

### “Influence of Draft Tube Water Injection System on Cavitation Behaviour in a Full-Scale Francis Turbine with Visual Access”

Ingrid\_K. Vilberg(Norwegian University of Science and Technology, Norway), Morten Kjeldsen(Flow Design Bureau AS, Norway), Xavier Escaler(Universitat Politècnica de Catalunya, Spain), Jarle\_V. Ekanger(Flow Design Bureau AS, Norway), Torbjørn\_K. Nielsen(Norwegian University of Science and Technology, Norway)

Paper No. 435

### “Design and numerical development of an axial rotor to be prototyped and applied in experimental test bench”

Tiago Martins de Azevedo(Federal University of Itajuba, Brazil), Geraldo Lucio Tiago Filho(Federal University of Itajuba, Brazil), Ramiro Gustavo Ramirez Camacho(Federal University of Itajuba, Brazil)

Paper No. 440

### “Towards the simplified design of a multistage hydrokinetic turbine”

Geraldo Lúcio Tiago Filho(Federal University of Itajuba, Brazil), Germán Alejandro Ibarra Bolaños(Universidad Antonio Nariño, Colombia)

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## Pumps 3

Paper No. 19

### “Unsteady Flow Characteristic Analysis of a Centrifugal Pump under Over-load Operating Conditions”

Xiaoran Zhao(Tsinghua University, China), Yexiang Xiao(Tsinghua University, China), Zhengwei Wang(Tsinghua University, China), Jin Zhang(Tsinghua University, China)

Paper No. 150

**“A Theoretical, Numerical and Experimental Analysis of S-Shape Instabilities in Reversible Pump-Turbines: Resultant Strategies for Improving Operational Stability”**

Markus Lenarcic(ANDRITZ AG, Austria), Arno Gehrer(ANDRITZ AG, Austria)

Paper No. 362

**“Suppression of the unstable head curve in mixed flow pump with adjustable vane by use of shallow grooves”**

Shusaku KAGAWA(EBARA CORPORATION, Japan), Takaki SAKURAI(EBARA CORPORATION, Japan)

Paper No. 315

**“Analysis of blade-passage flow of a mixed-flow pump at performance-curve instability”**

Isao Hagiya(Hitachi, Ltd., Research and Development Group, Japan), Chisachi Kato(Institute of Industrial Science, The University of Tokyo, Japan), Yoshinobu Yamade(Mizuho Information and Research Institute, Inc., Japan), Masashi Fukaya(Hitachi, Ltd., Research and Development Group, Japan), Takahide Nagahara(Hitachi, Ltd., Industrial Products Company, Japan)

Paper No. 391

**“Influence of forward rake and skew blade angle on positive slope characteristics of mixed flow pumps”**

Naruki Nitta(WASEDA University, Japan), Hitoshi Kanno(WASEDA University, Japan), Satoshi Maeda(WASEDA University, Japan), Kazuyoshi Miyagawa(WASEDA University, Japan), Yasushi Shinozuka(DMW Corporation, Japan), Kotaro Kado(DMW Corporation, Japan), Shigeyuki Tomimatsu(DMW Corporation, Japan)

Paper No. 22

**“Development and Validation of a One-Dimensional Transient Rotodynamic Pump Model at Component Scale.”**

Laura Matteo(CEA, Universit? Paris-Saclay, France), Antoine Dazin(LMFL, France), Nicolas Tauveron(CEA Grenoble, France)

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[Hydraulic Systems 3](#)

Paper No. 183

**“Behavior of Francis turbines at part load. Field assessment in prototype: Effects on the hydraulic system”**

Carme Valero(Polytechnic University of Catalonia, Spain), M?nica Egusquiza(Polytechnic University of Catalonia, Spain), David Valentin(Polytechnic University of Catalonia, Spain), Alexandre Presas(Polytechnic University of Catalonia, Spain), Eduard Egusquiza(Polytechnic University of Catalonia, Spain)

Paper No. 223

“Modeling and reducing fuel flow pulsation of a fuel-metering system during pump mode switching in a turbo fan engine”

Seiei MASUDA(IHI Corporation, Japan), Fumio SHIMIZU(Kyushu Institute of Technology, Japan), Kazuhiro TANAKA(Kyushu Institute of Technology, Japan), Masaki FUCHIWAKI(Kyushu Institute of Technology, Japan)

Paper No. 262

“The unitary aqueduct method: a new tool for the preliminary design of air chambers”

Ren? Autrique(Policonductos, M?xico, Mexico), Eduardo Rodal(Instituto de Ingenier?a, UNAM, M?xico, Mexico)

Paper No. 373

“Empirical findings on the transmission of draft tube instabilities along the penstocks of hydraulic plants”

Jean HERAUD(EDF, France), Bruno LECOMTE(EDF, France), Mathieu COMELLI(GE RENEWABLE HYDRO, France), Pierre Yves LOWYS(GE RENEWABLE HYDRO, France), Goran PAVIC(INSA Lyon, France)

Paper No. 318

“Practical experiences with water hammer control in Slovenian hydropower plants”

Jernej Mazij(Litostroj Power d.o.o., Slovenia), Anton Bergant(Litostroj Power d.o.o., Slovenia)

Paper No. 288

“Effect of combination vacuum relief and air release valve on hydraulic transients during pipeline filling process”

Ling Wang(Tsinghua University, China), Zhengwei Wang(Tsinghua University, China)

[RY305](#)

[Cavitation and Multiphase Flow 3](#)

Paper No. 307

“Experimental Study of Interactions between a Laser Induced Cavitation Bubble and a Particle”

Feipeng Chen(North China Electric Power University, China), Yuning Zhang(North China Electric Power University, China), Yongxue Zhang(China University of Petroleum-Beijing, China), Yuning Zhang(China University of Petroleum-Beijing, China)



Paper No. 360

**“The role of added mass in the dispersion of bubble clouds”**

stephane etienne(Polytechnique Montr?al, Canada), Sarra Zoghiami(Polytechnique Montr?al, Canada), C?dric B?guin(Polytechnique Montr?al, Canada), David Scott(GE Renewable Energy, Canada), Laurent Bornard(GE Renewable Energy, Canada)

Paper No. 386

**“Numerical Analysis of Liquid Droplet Impingement on Rough Material Surface with Water Pool”**

Hirotohi SASAKI(Institute of Fluid Science, Tohoku University, Japan), Yuka IGA(Institute of Fluid Science, Tohoku University, Japan)

Paper No. 261

**“Flow characteristics of water delivery piping system and its effective flow area at discharge branches”**

Fumio SHIMIZU(Kyushu Institute of Technology, Japan), Masatoshi AKINAGA(Kyushu Institute of Technology, Japan), Yuya MATSUYOSHI(Kyushu Institute of Technology, Japan), Kazuhiro TANAKA(Kyushu Institute of Technology, Japan)

Paper No. 328

**“The Effect of Turbulence on the Dynamics of Two Bubbles in Hydrodynamic Cavitation”**

Liang Lv(China University of Petroleum-Beijing, China), Yongxue Zhang(China University of Petroleum-Beijing, China), Yuning Zhang(China University of Petroleum-Beijing, China)

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[WS:Energy Storage 3](#)

Paper No. 269

**“Development trends in the field of reversible pump-turbines ? Study of pumping and generating mode off-design conditions”**

Uro? Je?e(Litostroj Power, Slovenia), Vojtech Novotny(Litostoj Power, Czech), Ale? Skotak(Litostroj Power, Czech)

Paper No. 308

**“Experimental Study of a Prototype Reversible Pump Turbine during Low Partial Load Condition in Generating Mode”**

Yuning Zhang(North China Electric Power University, China), Xianghao Zheng(North China Electric Power University, China), Tao Liu(North China Electric Power University, China), Jinwei Li(China Institute of Water Resources and Hydropower Research, China), Yuning Zhang(China University of Petroleum-Beijing, China), Xiaoze Du(North China Electric Power University, China)

Paper No. 132

**“Experimental and Numerical Investigation of the Speed-no-Load Instability of a Low Specific Speed Pump-Turbine with focus on the Influence of Turbulence Models”**

SABRI DENIZ(Lucerne University of Applied Sciences, Switzerland), ERNESTO CASARTELLI(Lucerne University of Applied Sciences, Switzerland), ARMANDO DEL RIO(Lucerne University of Applied Sciences, Switzerland)

Paper No. 321

**“Model experiments and study on regulating stability of isolated hydropower plants”**

Weijia Yang(Wuhan University, China), Jiandong Yang(Wuhan University, China), Renbo Tang(Wuhan University, China), Anting Ma(Wuhan University, China), Liangyu Hou(Wuhan University, China)

Paper No. 438

**“Experimental and Numerical Investigations of a High-Head Pumped-Storage Power Plant at Speed No Load”**

Jean Decaix(University of Applied Sciences and Arts Western Switzerland Valais, Switzerland), Vlad Hasmatuchi(University of Applied Sciences and Arts Western Switzerland Valais, Switzerland), Maximilian Titzschkau(Kraftwerke Oberhasli AG, Switzerland), Pedro A. Manso(Ecole Polytechnique Fédérale de Lausanne, Switzerland), François Avellan(Ecole Polytechnique Fédérale de Lausanne, Switzerland), Cécile Ménéch(University of Applied Sciences and Arts Western Switzerland Valais, Switzerland), Laurent Rapillard(University of Applied Sciences and Arts Western Switzerland Valais, Switzerland)

Paper No. 103

**“Rotor-stator interaction in a pump-turbine operating in synchronous condenser mode”**

Elena Vagnoni(EPFL, Switzerland), Lóca Andolfatto(EPFL, Switzerland), Renaud Guillaume(GE, France), Pierre Leroy(GE, France), François Avellan(EPFL, Switzerland)

Tuesday Afternoon (September 18)

13:30 - 15:30

R202

Hydraulic Turbines 7

Paper No. 106

**“Vibration fault diagnosis based on Multi-scale EMD time-series similarity mining for hydroturbine”**

yangang xue(0, 0)

Paper No. 134

**“Solution of a kind of negative flow in Pelton turbine”**

Ruzhi Gong(Harbin Institute of Technology, China), Chao Ying Shang(Harbin Institute of Technology, China), Hongjie Wang(Harbin Institute of Technology, China), Deyou Li(Harbin Institute of Technology, China), Yikui Zhou(Harbin Institute of Technology, China), Xianzhu Wei(State Key Laboratory of Hydro-Power Equipment, Harbin Institute of Large Electrical Machinery, 0)

Paper No. 114

**“Formation of Rotating Vortex Rope in the Francis-99 Draft Tube”**

Nahaleh Sotoudeh(Tarbiat Modares University, Iran), Reza Maddahian(Tarbiat Modares University, Iran), Michel J. Cervantes(Lulea University of Technology, Sweden)

Paper No. 118

**“Physic of Bad-behaved Flow in Pelton Turbine through Dynamic Simulation”**

Lei HAN(Harbin Institute of Technology, China), Gaofu Zhang(Harbin Institute of Technology, China), Ruzhi Gong(Harbin Institute of Technology, China), Hongda Wei(Harbin Institute of Technology, China), Wei Li(Harbin Institute of large electrical machinery, China)

Paper No. 130

**“Numerical methodology to predict and analyze cavitating flows in a Kaplan turbine”**

Flavia Turi(Univ. Grenoble Alpes, Grenoble INP, France), Regiane Fortes-Patella(Univ. Grenoble Alpes, Grenoble INP, France)

Paper No. 108

**“On the runner cone perforation in Francis hydro-turbine”**

Younging Xu(Shenyang Institute of Engineering, China), Wentao Su(Harbin Institute of Technology, China)

RY203

## Pumps Working as Turbines 1

Paper No. 449

### “Characteristics and Internal Flow of a Low Specific Speed Pump used as a Turbine”

Zhihao LIU(WASEDA University , Japan), Kazuyoshi MIYAGAWA(WASEDA University, Japan), Tatsuto YUKAWA(WASEDA University , Japan), Roshanak FAHIMI(University of Tehran, Iran), Mojtaba TAHANI(University of Tehran, Iran)

Paper No. 414

### “Numerical Analysis on the Impeller Blade Load of Hydraulic Turbine under Gas-Liquid Two Phase Condition”

Fengxia Shi(lanzhou university of technology, China), Senchun Miao(lanzhou university of technology, China), Renhui Zhang(0, 0), Yanlei Guo(0, 0), Sushi Yue(0, 0)

Paper No. 357

### “Optimisation of a pump-as-turbine runner using a 3D inverse design methodology”

Peng Wang(Advanced Design Technology, United Kingdom), Maira Vera-Morales(Advanced Design Technology, United Kingdom), Marc Vollmer(Advanced Design Technology, United Kingdom), Mehrdad Zangeneh(University College London, United Kingdom), Baoshan Zhu(Tsinghua University, China), Zhe Ma(Tsinghua University, China)

Paper No. 403

### “Numerical Simulation of Two-phase Flow in an Energy Recovery Micro-Hydraulic Turbine Based on Francis Hydraulic Model”

Shuaihui SUN(Xi'an University of Technology, China), Ye PANG(Xi'an University of Technology, China), Pengcheng GUO(Xi'an University of Technology, China), Xiaobo ZHENG(Xi'an University of Technology, China), Jianguo YAN(Xi'an University of Technology, China), Denghui HE(Xi'an University of Technology, China), Xingqi LUO(Xi'an University of Technology, China)

Paper No. 341

### “Investigating the effect of the type and diameter of volute on the efficiency of centrifugal reverse pump at different operating conditions”

Mojtaba Tahani(University of Tehran, Iran), Roshanak Fahimi(University of Tehran, Iran), Hossein Yousefi(University of Tehran, Iran), Younes Noorollahi(University of Tehran, Iran), Kazuyoshi Miyagawa(Waseda University, Japan), Majid Najafpour(Iran University of Science and Technology, Iran), Majid Mehrnia(University of Tehran, Iran), Salman Saremian(Islamic Azad University, Iran)

Paper No. 346

### “Experimental investigation on renewable energy extraction in water distribution

## network for power injection to the national electricity grid in Tehran”

Mojtaba Tahani(University of Tehran, Iran), Fatemeh Razi Astaraei(University of Tehran, Iran), Saharnaz Refaei(University of Tehran, Iran), Kazuyoshi Miyagawa(Waseda University, Japan), Roshanak Fahimi(University of Tehran, Iran), Mehdi Malekzadeh(University of Tehran, Iran), Majid Najafpour(Iran University of Science and Technology, Tehran, Iran, Iran)

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[Pumps 4](#)

Paper No. 38

### “Response of Backflow to Flow Rate and Pressure Fluctuations in Centrifugal Pump”

Wenzhe Kang(China Agricultural University, China), Lingjiu Zhou(China Agricultural University, China), Zhengwei Wang(Tsinghua University, China), Wei Wang(China Agricultural University, China)

Paper No. 53

### “Study on pressure pulsation characteristics of Two-way pumping system with super low head and large flow”

Weixuan Jiao(Yangzhou University, China), Li Cheng(Yangzhou University, China), Can Luo(Yangzhou University, China), Di Zhang(Yangzhou University, China)

Paper No. 87

### “Influence of impeller vane arrangement on energy performance and pressure fluctuation of a double-suction centrifugal pump”

Yu SONG(0, 0), Yongyao LUO(0, 0)

Paper No. 208

### “Experimental study on radiation noise characteristics of multistage centrifugal pump under variable speed conditions”

J P Yuan( National Research Center of Pumps in Jiangsu University. China, China), K L Huang( National Research Center of Pumps in Jiangsu University. China, China), Q R Si( National Research Center of Pumps in Jiangsu University. China, China), B L Zhou( National Research Center of Pumps in Jiangsu University. China, China), G C Sheng( National Research Center of Pumps in Jiangsu University. China, China), Y F Tang( National Research Center of Pumps in Jiangsu University. China, China)

Paper No. 240

### “Pressure pulsation characteristics of the cascade and its impact on flow-induced noise”

Hui Quan(LanZhou University of Technology, China), RenNian Li(LanZhou University of Technology, China), Jin Li(LanZhou University of Technology, China), BaiHeng Fu(LanZhou University of Technology, China), ShiFang Yuan(LanZhou University of Technology, China), Yi Chai(LanZhou University of Technology, China), XiaoYu Chai(LanZhou University of Technology, China)

Paper No. 289

## “Linear and Nonlinear Stability Analysis of Rotating Stall in a Wide Vaneless Diffuser”

Yaguang HENG(Xihua University, China), Antoine DAZIN(?cole nationale sup?rieure d'arts et m?tiers, France), Najib OUARAZI(Universit? Lille 1, France), G?rard BOIS(?cole nationale sup?rieure d'arts et m?tiers, France)

[RY303](#)

[General Topics 1](#)

Paper No. 408

## “Numerical Investigating Flow Characteristic of Swirling Turbulent Round Jet”

Bo Yuan(Chongqing University, China), Shuai Jia(Chongqing University, China), Liangming Pan(Chongqing University, China), Quanling Wang(Chongqing University, China), Jiakuan Li(Chongqing University, China), Jiarui Li(Chongqing University, China)

Paper No. 300

## “Simulation Research on the Damping Direct Injection Method of Hydro Turbine Generating Unit Under Multi-machine Condition”

Jing Qian(Kunming University of Science and Technology, China), Yun Zeng(Kunming University of Science and Technology, China), Jiamin Gen(Kunming University of Science and Technology, China), Zhiming Ma(Kunming University of Science and Technology, China)

Paper No. 301

## “Parameters Design and Simulation Research of Water Pressure Phase Compensation Link in Governor Side of HydroTurbine Generating Unit”

Yun Zeng(Kunming university of science and technology, China), Jing Qian(Kunming University of Science and Technology, China), Shige Yu(Kunming University of Science and Technology, China), Guangbo Yang(Kunming University of Science and Technology, China), Zhengkai Zhang(Kunming University of Science and Technology, China), Fangfang Wang(Kunming University of Science and Technology, China), jikun Zhang(Kunming University of Science and Technology, China)

Paper No. 258

## “Investigation of Flattened Torque Converter Performance at Low Speed Ratio”

Yuki Ohta(Shinshu University, Japan)

R305

## Cavitation and Multiphase Flow 4

Paper No. 355

“Experimental study on the effect of bubble cluster shape on cavitation in water hydraulic valve”

Haihang Wang(Harbin Engineering University, China), He Xu(Harbin Engineering University, China), Vishwanath Pooneeth(Harbin Engineering University, Mauritius), Liye Jiao(Harbin Engineering University, China), Mingyu Hu(Harbin Engineering University, China)

Paper No. 361

“Characterization of bubble cloud quality and evolution using optical probes”

Julien Bouvard(Polytechnique Montr?al, Canada), C?dric B?guin(Polytechnique Montr?al, Canada), St?phane Etienne(Polytechnique Montr?al, Canada), David Scott(GE Renewable Energy, Canada), Laurent Bornard(GE Renewable Energy, Canada)

Paper No. 16

“Experimental and Computational Capture of High Frequency Oscillation Induced by Inception Cavitation in Submerged Shear Layer”

Yuchuan Wang(Northwest A &F University, China), Lei Tan(Tsinghua University, China), Xinyang Liu(North China University of Water Resources and Electric Power, China), Diyi Chen(Northwest A &F University, China)

Paper No. 331

“Numerical simulation of unsteady cloud cavitation: a comparative study of compressible mixture models”

Guoyi Peng(College of Engineering, Nihon University, Japan), Macoto Mori(Graduate school of Engineering, Nihon Univ., Japan), Tatsumi Tazaki(Graduate school of Engineering, Nihon Univ., Japan), Yausuyuki Oguma(College of Engineering, Nihon Univ., Japan)

Paper No. 173

“Cavitation CFD Analyses Considering the Pressure Wave Propagation within the Piping Systems”

Motohiko Nohmi(EBARA Corporation, Japan), Shusaku Kagawa(EBARA Corporation, Japan), Byungjin An(EBARA Corporation, Japan), Tomoki Tsuneda(EBARA Corporation, Japan), Donghyuk Kang(Saitama University, Japan), Kazuhiko Yokota(Aoyama Gakuin University, Japan)

Paper No. 225

“ASSESSMENT OF CAVITATION REGIME IN DIVERGENT ROTATING FLOWS”

Florentina Bunea(National Institute for Research and Development in Electrical Engineering ICPE-CA, Romania), Gabriel Ciocan(Laval University, Canada), Adrian Nedelcu(National Institute for Research and Development in Electrical Engineering ICPE-CA, Romania)

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## WS:Energy Storage 4

Paper No. 110

### “Renovation of the Pumped-Storage System from Fixed Speed to Adjustable Speed at Okutataragi Power Station”

Hiroyuki Tanaka(Kansai Electric Power Company, Incorporated, Japan)

Paper No. 70

### “Short-term Hydro Scheduling of a Variable Speed Pumped Storage Hydropower Plant Considering Head Loss in a Shared Tunnel”

Jiehong Kong(SINTEF Energy Research, Norway), Hans Ivar Skjelbred(SINTEF Energy Research, Norway), Hubert Abgottspon(Axpo Trading AG, Switzerland)

Paper No. 322

### “Modelling and simulation of flexible power control of variable-speed pumped storage plants using MATLAB/Simulink”

Weijia Yang(Wuhan University, China), Jiandong Yang(Wuhan University, China)

Paper No. 259

### “Study on Intense Vibration of Local Structures of Some Pumped-storage Powerhouse”

Jin\_wei Li(China Institute of Water Resources and Hydropower Research, China), Zhen\_fu Gu(Hebei Zhanghewan Pumped Storage Power Generation Co. Ltd., China), Hai\_feng Zhu(Hebei Zhanghewan Pumped Storage Power Generation Co. Ltd., China), Ji\_xing Yu(China Institute of Water Resources and Hydropower Research, China), Jin\_hui Ouyang(China Institute of Water Resources and Hydropower Research, China)

Paper No. 312

### “Super Grid Prospects in North-East Asia”

Young Ho LEE(Korea Maritime & Ocean University(KMOU), Korea)



## Tuesday Evening (September 18)

15:50 - 17:30

**R202**

### **Hydraulic Turbines 8**

Paper No. 139

**“Investigations of rotating stall inception in a propeller turbine runner operating in low-load conditions”**

Sebastien Houde(Laval University, Canada), Claire Deschenes(Laval University, Canada), Guy Dumas(Laval University, Canada), Yvan Maciel(Laval University, Canada)

Paper No. 146

**“Reduced scale model testing for prediction of natural frequencies and hydro-acoustic resonances in hydropower plants operating in off-design conditions”**

Arthur Favrel(Ecole Polytechnique F?d?rale de Lausanne, Switzerland), Joao Gomes Pereira Junior(Ecole Polytechnique F?d?rale de Lausanne, Switzerland), Christian Landry(Power Vision Engineering S?rl, Switzerland), S?bastien Allign?(Power Vision Engineering S?rl, Switzerland), Christophe Nicolet(Power Vision Engineering S?rl, Switzerland), Fran?ois Avellan(Ecole Polytechnique F?d?rale de Lausanne, Switzerland)

Paper No. 149

**“Numerical study of the flow dynamics at no load operation for a high head Francis turbine at model scale.”**

M?lissa Fortin(Laval University, Canada), Bernd Nennemann(Andritz Hydro Canada Inc., Canada), S?bastien Houde(Laval University, Canada), Claire Desch?nes(Laval University, Canada)

Paper No. 151

**“Hydraulic turbine start-up: a fluid-structure simulation methodology”**

Matthieu Melot(Universit? Laval, Canada), Bernd Nennemann(Andritz Hydro Canada Inc., Canada), Jo?l Chamberland-Lauzon(Andritz Hydro Canada Inc., Canada), Claire Desch?nes(Universit? Laval, Canada), Maxime Coulaud(Universit? Laval, Canada)

Paper No. 152

**“Financial analysis for optimization of hydropower plants regarding hydro-abrasive erosion: A study from Indian Himalayas”**

Anant Kumar Rai(Indian Institute of Technology Roorkee, India), Arun Kumar(Indian Institute of Technology Roorkee, India), Thomas Staubli(Lucerne University of Applied Science and Arts, Hochschule Luzern, Switzerland)

**R****Y**203

## **Pumps Working as Turbines 2**

Paper No. 324

### **“Numerical Investigation of Tongue Effects on Pump Performance in Direct and Reverse Modes”**

Hamed Alemi(Hydraulic Machinery Research Institute, Iran), Mohammad Fathi(Hydraulic Machinery Research Institute, Iran), Mehrdad Raisee(Hydraulic Machinery Research Institute, Iran), Seyed Ahmad Nourbakhsh(Hydraulic Machinery Research Institute, Iran)

Paper No. 325

### **“A Novel Volute Design for Reducing Radial Force in Pump and PAT Modes”**

Hamed Alemi(Hydraulic Machinery Research Institute, Iran), Mohammad Fathi(Hydraulic Machinery Research Institute, Iran), Mehrdad Raisee(Hydraulic Machinery Research Institute, Iran), Seyed Ahmad Nourbakhsh(Hydraulic Machinery Research Institute, Iran)

Paper No. 224

### **“Radial Hydraulic Machinery Four-Quadrant Performance Curves Dependent on Specific Speed and Applied in Transient Calculations”**

Zdravko P Giljen(PhD student, Senior engineer for mechanical works, Montenegro Electric Company, Vuka Karadzića Street no 2, Nikšić, Montenegro), Milos S Nedeljkovic(University of Belgrade, Faculty of Mechanical Engineering, Kraljice Marije 16, 11120 Beograd, Serbia)

Paper No. 165

### **“Optimum Design of Low Head Francis Runner to Enhance Performance against Sediment Erosion”**

Ujjwal Shrestha(Mokpo National University, Korea), Zhenmu Chen(Mokpo National University, Korea), Young\_D. Choi(Mokpo National University, Korea)

**R****Y**204

## **Pumps 5**

Paper No. 26

### **“Multistage Canned Motor Pump - Getting Deep Insights with CFD ? Simulation, Optimisation and Validation”**

Markus Mosshammer(Graz University of Technology, Austria), Helmut Benigni(Graz University of Technology, Austria), Helmut Jaberg(Graz University of Technology, Austria), Stefan Kraemer(HERMETIC-Pumpen GmbH, Germany), Christian Dahlke(HERMETIC-Pumpen GmbH, Germany)

Paper No. 39

### “Numerical simulation of suction and discharge valves’ motion in reciprocating waterflooding pump”

Yi Ma(Zhejiang University of Technology, China), He Zhang(Ningbo Tongli Pump Industry Co., Ltd, China), Huashuai Luo(Zhejiang University of Technology, China), Yingfeng Chen(Ningbo Heli Mechanical Pump Co., Ltd, China), Qiang Wang(Zhejiang University of Technology, China)

Paper No. 85

### “Investigation of tip leakage vortex characteristics around tip clearance in a mixed-flow pump”

Yabin LIU(0, 0), Lei TAN(0, 0)

Paper No. 368

### “Fully-Resolved Large Eddy Simulation of Transitional Flow in Inter-Stage Bush of a Centrifugal Pump”

Romain Prunier(Hitachi, Ltd., Japan), Chisachi Kato(The University of Tokyo, Japan), Yoshinobu Yamade(Mizuho Information & Research Institute Inc., Japan), Takahide Nagahara(Hitachi, Ltd., Japan)

Paper No. 369

### “Influence of Clearance Flow on Disk Friction Loss in Low Specific Speed Hydraulic Machines”

Ryutaro Ujiie(Waseda University, Japan), Asuma Ichinose(Waseda University, Japan), Yohei Nakamura(Waseda University, Japan), Kazuyoshi Miyagawa(Waseda University, Japan), Takeshi Sano(Mitsubishi Heavy Industries, LTD, Japan)

[RY303](#)

[General Topics 2](#)

Paper No. 133

### “Study of flow structure in erosion prone complex geometries”

Eirik Volent(Norwegian University of Science and Technology, Norway), Ole Gunnar Dahlhaug(Norwegian University of Science and Technology, Norway), Erik Tengs(Norwegian University of Science and Technology, Norway)

Paper No. 327

### “On the Extension of Acoustic Flow Metering Devices to Monitoring of Transient Phenomena”

Ion CANDEL(Universit? Grenoble Alpes, France), Cornel IOANA(Universit? Grenoble Alpes, France), Angela DIGULESCU(Military Technical Academy, Romania), Carmen BADINA(Electricite de France, Division Technique Generale, France)

Paper No. 200

## “Effect of Groove Configurations on the Swirling Intensity of Supersonic Separator”

JaeSung Lee(Sungkyunkwan University, Korea), HyeonJae Noh(Sungkyunkwan University, Korea), YounJea Kim( Sungkyunkwan University , Korea)

[RY305](#)

## [Cavitation and Multiphase Flow 5](#)

Paper No. 171

## “A Simplified Thermodynamic Effect Model for Cavitating Flow in Hot Water”

Anh Dinh Le(0, Japan), Yuka Iga(Institute of Fluid Science, Japan)

Paper No. 297

## “Numerical investigation of thermal cavitating flows in fluoroketone over a NACA 0015 hydrofoil”

Shaofeng Zhang(Zhejiang Sci-Tech University, China), Xiaojun Li(Zhejiang Sci-Tech University, China), Zuchao Zhu(Zhejiang Sci-Tech University, China), Zhe Lin(Zhejiang Sci-Tech University, China)

Paper No. 383

## “Performance of V-Cone Flowmeter Applied to Cryogenic Fluid Measurement Considering Cavitation”

Denghui He(Xi'an University of Technology, China), Bofeng Bai(Xi'an Jiaotong University, China), Senlin Chen(Xi'an University of Technology, China), Jie Zhang(Xi'an University of Technology, China), Xingqi Luo(Xi'an University of Technology, China)

Paper No. 314

## “Development of gaseous cavitation model in hydraulic oil flow considering the effect of dynamic stimulation.”

Yosuke Ibata(Tohoku University, Japan), Yudai Matsuura(Tohoku University, Japan), Shunpei Takahashi(Tohoku University, Japan), Yuka Iga(Tohoku University, Japan)

Paper No. 283

## “Modelling of a converging/diverging tube using CATHARE-3 two-phase flow system code for sodium cavitation studies.”

Laura Matteo(CEA, Universit? Paris-Saclay, France), G?d?on Mauger(CEA, Universit? Paris-Saclay, France), Nicolas Tauveron(CEA Grenoble, France)

Paper No. 168

## “Effect of Suction Pipe Inlet Condition on the Occurrence of Vortex in Pump Sump”

Ming Guo(Mokpo National University, Korea), Zhenmu Chen(Mokpo National University, Korea), Young-Do Choi(Institute of New and Renewable Energy Technology Research, Korea)

R306

WS:Energy Storage 5

Seminar

”Rules to Hydraulic Transient Design Analysis”

Prof. Gajic

## Wednesday Morning (September 19)

9:00 - 9:50

R203

### Plenary Lecture 3

“Changes in hydro turbine design - The last 40 years, and into the future.”

Mr. Stuart Coulson (Voith Hydro, USA)

10:10 - 12:10

R202

### Hydraulic Turbines 9

Paper No. 153

“Fluid-structure simulations of the stochastic behavior of a medium head Francis turbine during startup”

Jean-François Morissette(Hydro-Québec, Canada), Jonathan Nicolle(Hydro-Québec, Canada)

Paper No. 156

“Evaluation on Sediment Erosion of Pelton Turbine Flow passage component”

Juan LIU(China institute of water resources and hydropower research, China), Jiangcheng YU(China institute of water resources and hydropower research, China), Cuiwei Jiang(China institute of water resources and hydropower research, China)

Paper No. 162

“Experimental Investigation of a High Head Francis Turbine Model During Shutdown Operation”

Rahul Goyal (Grenoble-INP, France), Bhupendra K Gandhi (Indian Institute of Technology Roorkee, India), Michel J Cervantes(Lulea University of Technology Sweden, Sweden)

Paper No. 58

“Hardware in the Loop Testing of Electronic Hydro Governor for Francis Turbine”

Rama Gopal Potturi Potturi(BHEL R&D, India), Sarma SVR(BHEL R&D, India), Jayateerth Agarkhed(BHEL, Electronics Division, India), Krishna Prasad BR(BHEL, Electronics Division, India)

Paper No. 166

“Optimum design of J-Groove for a bulb turbine model to suppress swirl flow in the draft tube”

Viet Luyen Vu(Mokpo National University, Korea), Zhenmu Chen(Mokpo National University, Korea), Young-Do Choi(Institute of New and Renewable Energy Technology Research, Mokpo National University, Korea)

Paper No. 164

## “Pressure Fluctuation Test and Vortex Observation in Francis Turbines Draft Tube”

Lei Zhu(China Institute of Water Resources and Hydropower Research, China), Xiaochao Meng(China Institute of Water Resources and Hydropower Research, China), Jianguang Zhang(China Institute of Water Resources and Hydropower Research, China), Ying Chen(China Institute of Water Resources and Hydropower Research, China), Haiping Zhang(China Institute of Water Resources and Hydropower Research, China), Wanpeng Wang(China Institute of Water Resources and Hydropower Research, China), Li Lu(China Institute of Water Resources and Hydropower Research, China)

[RY203](#)

## [Sustainable Hydropower 1](#)

Paper No. 15

## “Experimental assessing the effect of decompression on Crucian Carps injury during turbine passage and the optimization methods”

Long Meng(China Institute of Water Resources and Hydropower Research, China), Wanpeng Wang(China Institute of Water Resources and Hydropower Research, China), Cuilin Liao(China Institute of Water Resources and Hydropower Research, China), Lice Zhao(China Institute of Water Resources and Hydropower Research, China), Tiejou Li(China Institute of Water Resources and Hydropower Research, China), Haiping Zhang(China Institute of Water Resources and Hydropower Research, China), Bingquan Ma(China Institute of Water Resources and Hydropower Research, China)

Paper No. 126

## “Study on High Pressure Design of Contra-Rotating Small Hydroturbine”

Takuji Hosotani(Tokushima University, Japan), Toru Shigemitsu(Tokushima University, Japan), Yuki Kawaguchi(Tokushima University, Japan), Tomofumi Ikebuchi(Tokushima University, Japan)

Paper No. 66

## “Numerical Investigation of Performance and Flow Patterns of a Modified Savonius Hydraulic Rotor”

Yongchao Zhang(Jiangsu University, China), Can Kang(Jiangsu University, China), Chen Pan(Jiangsu University, China), Wisdom Opare(Takoradi Technical University, Ghana)

Paper No. 69

## “Experimental Analysis of the Operation of a Small Francis Turbine Equipped with an Innovative Aeration Device”

Diana\_M Bucur(University POLITEHNICA of Bucharest, Romania), Georgiana Dunca(University POLITEHNICA of Bucharest, Romania), Florentina Bunea(National Institute for R&D in Electrical Engineering ICPE-CA, Romania), Gabriel\_D Ciocan(University of Laval, Canada)

Paper No. 71

## **“A Comparison of Linear Interpolation and Spline Interpolation for Turbine Efficiency Curves in Short-term Hydropower Scheduling Problems”**

Hans Ivar Skjelbred(SINTEF Energy Research, Norway), Jiehong Kong(SINTEF Energy Research, Norway)

Paper No. 77

## **“Role of Turbine Testing Lab for overcoming the challenges related to hydropower development in Nepal”**

Hari Prasad Neopane(Kathmandu University, Nepal), Sailesh Chitrakar(Kathmandu University, Nepal), Ole Gunnar Dahlhaug(Norwegian University of Science and Technology, Norway)

[RY204](#)

[Pumps 6](#)

Paper No. 393

## **“Design Optimization of a Low specific speed Centrifugal Pump with an Unshrouded Impeller for Cryogenic Liquid Flow”**

Tomoyuki Hayashi(Waseda University, Japan), Yohei Nakamura(Waseda University, Japan), Kazuyoshi Miyagawa(Waseda University, Japan)

Paper No. 131

## **“Experimental Analysis of a Pump Equipped with an Axial Rotor with Variable Speed”**

Alin Bosioc(Politehnica University Timisoara, Romania), Daniel Mos(Politehnica University Timisoara, Romania), Ionel Draghici(AQUATIM SA, Romania), Sebastian Muntean(Romanian Academy - Timisoara Branch, Romania), Liviu Anton(Politehnica University Timisoara, Romania)

Paper No. 147

## **“Failure analysis of the rainwater axial pumps installed in a wastewater pumping station”**

Sebastian Muntean(Romanian Academy - Timisoara Branch, Romania), Alin Bosioc(Politehnica University of Timisoara, Romania), Liviu Marsavina(Politehnica University of Timisoara, Romania), Sergiu Galatanu(Politehnica University of Timisoara, Romania), Ionel Aurel Draghici(AQUATIM S.A. Timisoara, Romania), Liviu Eugen Anton(Politehnica University of Timisoara, Romania)

Paper No. 286

## **“Research on Hydraulic Characteristics of Twin Screw Pump”**

Di Zhang(Yangzhou University, China), Li Cheng(Yangzhou University, China), Yingyuan Li(Yangzhou University, China), Weixuan Jiao(Yangzhou University, China)



Paper No. 202

### “PIV Measurement of Internal Flow in Mini Centrifugal Pump”

Toru Shigemitsu(Tokushima University, Japan), Yuya Ogawa(Tokushima University, 0), Eito Nakaishi(Tokushima University, 0)

Paper No. 238

### “Flow Control of Low Specific Speed Constant Head Pump with Based on Splitter Blade Technology”

Weijun Wang(Jiangsu University-Zhenjiang Research Institute of Fluid Engineering Equipment Technology, Zhenjiang, Jiangsu, China, China), Yang Wang(Jiangsu University, China), Chengsi Yang (Jiangsu University-Zhenjiang Research Institute of Fluid Engineering Equipment Technology, China), Bin Sun (Jiangsu University-Zhenjiang Research Institute of Fluid Engineering Equipment Technology, Zhenjiang, Jiangsu, China), Rong Lu (Jiangsu University-Zhenjiang Research Institute of Fluid Engineering Equipment Technology, Zhenjiang, Jiangsu, China), Min Liu (Jiangsu University-Zhenjiang Research Institute of Fluid Engineering Equipment Technology, Zhenjiang, Jiangsu, China)

[RY303](#)

### [Computational and Experimental Technique 1](#)

Paper No. 41

### “Numerical and Experimental Investigation of Erosion Induced Leakage Flow through Guide Vanes of Francis Turbine”

Sailesh Chitrakar(Kathmandu University, Nepal), Hari Prasad Neopane(Kathmandu University, Nepal), Ole Gunnar Dahlhaug(Norwegian University of Science and Technology, Norway)

Paper No. 17

### “Reducing Computational Effort Of High Head Francis Turbines”

Ken-Robert G. Jakobsen(EDRMedeso AS, Norway), Erik Tengs(EDRMedeso AS/Norwegian University of Science and Technology, Norway), Martin Aa. Holst(EDRMedeso AS, Norway)

Paper No. 46

### “Numerical Investigation of Tip Leakage Vortex Cavitation in Blade of Axial Turbines”

Mehrdad Raisee(University of Tehran, Iran), Seyed Ahmad Nourbakhsh(University of Tehran, Iran), Ali Maghooli(University of Tehran, Iran)

Paper No. 93

### “A benchmark test case for swirling flows: design of the swirl apparatus, experimental data, and numerical challenges”

Romeo F. Susan-Resiga(Politehnica University Timisoara, Romania), Constantin Popescu(Politehnica University Timisoara, Romania),

Raul Szakal(Politehnica University Timisoara, Romania), Sebastian Muntean(Romanian Academy - Timisoara Branch, Romania), Adrian Stuparu(Politehnica University Timisoara, Romania)

Paper No. 100

### “Correlation Between Numerical Simulations and Measurements to Assess Uncertainties: A Case Study on a Hydroelectric Runner”

Martin Gagnon(Institut de recherche d'Hydro-Québec (IREQ), Canada), Ariane Immarigeon(Hydro-Québec, Canada), Jonathan Nicolle(Institut de recherche d'Hydro-Québec (IREQ), Canada), Jean-François Morissette(Institut de recherche d'Hydro-Québec (IREQ), Canada)

[RY305](#)

### [Cavitation and Multiphase Flow 6](#)

Paper No. 313

### “The gap size effect on leakage flow and cavitation in the clearance of a 2D hydrofoil: high-speed visualization and velocity measurements”

Konstantin\_S. Pervunin(Kutateladze Institute of Thermophysics SB RAS, Russia), Mikhail\_V. Timoshevskiy(Kutateladze Institute of Thermophysics SB RAS, Russia), Ivan\_I. Zapryagaev(Kutateladze Institute of Thermophysics SB RAS, Russia), Dmitriy\_M. Markovich(Kutateladze Institute of Thermophysics SB RAS, Russia), Georgy\_A. Semenov(PJSC "Power Machines" (LMZ), Russia), Aleksandr\_V. Zakharov(PJSC "Power Machines" (LMZ), Russia)

Paper No. 396

### “Unsteady forces and moments acting on a cantilevered rectangular hydrofoil with tip clearance in cavitating conditions”

Yushin Ehara(Kyushu University, Japan), Soichiro Kitamura(Kyushu University, Japan), Wakana Tsuru(Kyushu University, Japan), Satoshi Watanabe(Kyushu University, Japan), Shin-ichi Tsuda(Kyushu University, Japan)

Paper No. 452

### “On the hysteresis of incipience and desinence of tip vortex cavitation”

Ali Amini(EPFL, Switzerland), Martino Reclari(MHI, Japan), Takeshi Sano(MHI, Japan), Mohamed Farhat(EPFL, Switzerland)

Paper No. 117

### “Numerical investigation into cavitating flow around a NACA66 hydrofoil with advanced turbulence models”

Longgang Sun(Xi'an University of Technology, China), Pengcheng Guo(Xi'an University of Technology, China), Xingqi Luo(Xi'an University of Technology, China), Xiaobo Zheng(Xi'an University of Technology, China), Jianguo Yan(Xi'an University of Technology, China), Jianjun Feng(Xi'an University of Technology, China)

Paper No. 400

**“Flow Field and Cavitation Characteristics of Hydrofoils Coated with Hydrophilic and Hydrophobic Polymers”**

Taisei Mineshima(Waseda University, Japan), Kaoruko Onishi(Waseda University, Japan), Kazuyoshi Miyagawa(Waseda University, Japan)

Paper No. 453

**“Boundary layer instability control around a hydrofoil in the unsteady cloud cavitating ow”**

Bettar O. el Moctar(University of Duisburg-Essen, Germany), Ebrahim Kadivar(University of Duisburg-Essen, Germany)

[RY306](#)

[Ocean Hydro 1](#)

Paper No. 160

**“A Study of Counter-rotating Impulse Turbine for Wave Energy Conversion - Effect of Middle Vane on the Performance - ”**

Manabu Takao(National Institute of Technology, Matsue College, Japan), Kohei Yamada(Shinko Techno Engineering Co., Ltd., Japan), Rintaro Sasaki(National Institute of Technology, Matsue College, Japan), Ashraful Alam(National Institute of Technology, Matsue College, Japan), Shinya Okuhara(National Institute of Technology, Matsue College, Japan), Yoichi Kinoue(Saga University, Japan)

Paper No. 161

**“Performance Comparison of Turbines for Bi-directional Flow”**

Manabu Takao(National Institute of Technology, Matsue College, Japan), Seisuke Fukuma(National Institute of Technology, Matsue College, Japan), Shinya Okuhara(National Institute of Technology, Matsue College, Japan), Ashraful Alam(National Institute of Technology, Matsue College, Japan), Yoichi Kinoue(Saga University, Japan), Toshiaki Setoguchi(Saga University, Japan)

Paper No. 167

**“A Study on the Design and Performance Analysis on a Small Pump-turbine System for Ocean Renewable Energy Storage System”**

Ujjwal Shrestha(Mokpo National University, Korea), Patrick\_Mark Singh(Fiji National University, Fiji), Young\_Do Choi(Mokpo National University, Korea)

Paper No. 251

**“Performance of Counter-Rotating Tandem Propellers at Oblique Flow Conditions”**

Nak-Joong Lee(Kyushu Institute of Technology, Japan), Morihito Inagaki(JSE Co., LTD, Japan), Toshiaki Kanemoto(Saga University, Japan)

Paper No. 217

## “Counter-Rotating Type Tidal Stream Power Unit: Excellent Performance Verified at Offshore Test”

Isao Samura(Kyowa Engineering Consultants Co., Ltd., Japan), Kazuo Kuwano (Kyowa Engineering Consultants Co., Ltd., Japan), Ryunosuke Kawashima(EIM Electric Co., Ltd., Japan), Taizo Oda(EIM Electric Co., Ltd., Japan), Takumi Imakyurei(EIM Electric Co., Ltd., Japan), Hideyuki Inoue(Eagle Industry Co., Ltd, Japan), Yuuichiro Tokunaga(Eagle Industry Co., Ltd, Japan), Toshiaki Kanemoto(Saga University, Kyushu Institute of Technology, Japan), Kazuyoshi Miyagawa(Waseda University, Japan), Toshihiko Miwa(Maeda Corporation, Japan), Hiroshi Yamanokuchi(Maeda Corporation, Japan)

Paper No. 245

## “Optimization of Marine Current Turbines, Using Meta Heuristic Algorithms”

Mojtaba Tahani(University of Tehran, Iran), Narek Babayan(University of Tehran, Iran), Roshanak Fahimi(University of Tehran, Iran), Kazuyoshi Miyagawa(Waseda University, Japan), Mohammad Hossein Khozaei(University of Tehran, Iran), Sima Adimi(University of Tehran, Iran)

Wednesday Afternoon (September 19)

13:10 - 15:10

**RY202**

**Hydraulic Turbines 10**

Paper No. 176

**“Optimisation of Pelton Turbine Jet Deflector Using CDF Analysis”**

Boro Popovski(University Ss Cyril and Methodius, Macedonia), Andrej Lipej(Faculty of Technologies and Systems, Slovenia), Predrag Popovski(University Ss Cyril and Methodius, Macedonia), Zoran Markov(University Ss Cyril and Methodius, Macedonia)

Paper No. 179

**“Experimental and Numerical Analysis of Turbulent Velocity Fluctuations in a Francis Turbine Draft Tube in Part Load Operation”**

Axel Frey(Institute of Fluid Mechanics and Hydraulic Machinery, University of Stuttgart, Germany), Oliver Kirschner(Institute of Fluid Mechanics and Hydraulic Machinery, University of Stuttgart, Germany), Stefan Riedelbauch(Institute of Fluid Mechanics and Hydraulic Machinery, University of Stuttgart, Germany), Roland Jester-Zuerker(Voith Hydro Holding GmbH & Co. KG, Germany), Alexander Jung(Voith Hydro Holding GmbH & Co. KG, Germany)

Paper No. 190

**“CFD-based Casing and Distributor Hydraulic Design Optimization”**

Christophe Devals(?cole Polytechnique de Montr?al, Canada), Nigel Murry(Andritz Hydro Canada Inc, Canada), Brian Mullins(Andritz Hydro Canada Inc, Canada), Julien Dompierre(?cole Polytechnique de Montr?al, Canada), Luca Mangani(Lucerne University of Applied Sciences and Arts, Switzerland), Francois Guibault(?cole Polytechnique de Montr?al, Canada)

Paper No. 193

**“MICRO-ENERGY HARVESTING BASED ON VORTEX INDUCED VIBRATION OF CROSS-FLOW TURBINE WITH VARIOUS CANTILEVER BEAM CONFIGURATIONS”**

HyeonJae Noh(Sungkyunkwan University, Korea), JaeSung Lee(Sungkyunkwan University, Korea), YounJea Kim( Sungkyunkwan University , Korea)

Paper No. 194

**“Multilevel Design Optimization of Hydraulic Turbines based on Hierarchical Metamodel?Assisted Evolutionary Algorithms”**

Evgenia Kontoleonos(ANDRITZ HYDRO GmbH, Austria), Markella Zormpa(National Technical University of Athens, Greece), Sigrun Nichtawitz(ANDRITZ HYDRO GmbH, Austria), David Mack-Sahl(ANDRITZ HYDRO GmbH, Austria), Simon Weissenberger(ANDRITZ HYDRO GmbH, Austria)

Paper No. 196

### **“Refurbishment of twin Francis Turbines ? Maximising the annual Production”**

Helmut Benigni(University of Technology, Graz, Austria), J?rgen Schiffer(University of Technology, Graz, Austria), Helmut Jaberg(University of Technology, Graz, Austria)

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## [Sustainable Hydropower 2](#)

Paper No. 159

### **“Performance of a Submerged Impulse Hydro Turbine”**

Takuto Azegami(Graduate School of Shinshu University, Japan), Yusuke Katayama(Kyushu University, Japan), Yoshiaki Haneda(National Institute of Technology, Nagano College, Japan), Shouichiro Iio(Shinshu University, Japan)

Paper No. 174

### **“Design of a New Kaplan Pico-Turbine Runner Blades”**

Ludovic Favre(University of Applied Sciences of Western Switzerland, Switzerland), Nicolas El Hayek(University of Applied Sciences of Western Switzerland, Switzerland), Maxime Chiarelli(University of Applied Sciences of Western Switzerland, Switzerland), Elena-Lavinia Niederh?user(University of Applied Sciences of Western Switzerland, Switzerland), Laurent Donato(University of Applied Sciences of Western Switzerland, Switzerland)

Paper No. 205

### **“Particle-based Evaluations of Fish-friendliness in Kaplan Turbine Operations”**

Pedro Romero-Gomez(Andritz HYDRO GmbH, Austria), Monika Lang(Andritz HYDRO GmbH, Austria), Josef Michelcic (Andritz HYDRO GmbH, Austria), Simon Weissenberger(Andritz HYDRO GmbH, Austria)

Paper No. 215

### **“Torque Loss Occurring on a Submerged Impulse Hydro Turbine”**

Saki Usami(Graduate School of Shinshu University, Japan), Hiroki Koyama(Graduate School of Shinshu University, Japan), Takuto Azegami(Graduate School of Shinshu University, Japan), Yusuke Katayama(Kyushu university, Japan), Yoshiaki Haneda(National Institute of Technology, Nagano College, Japan), shouichiro Iio(Shinshu university, Japan)

Paper No. 268

### **“Design and Performance Evaluation of a Substitution Solution for Spiral Casing of Pico-Hydroelectric Plants”**

Ludovic Favre(University of Applied Sciences of Western Switzerland, Switzerland), Nicolas El Hayek(University of Applied Sciences of Western Switzerland, Switzerland), Maxime Chiarelli(University of Applied Sciences of Western Switzerland, Switzerland), Elena-Lavinia Niederh?user(University of Applied Sciences of Western Switzerland, Switzerland), Laurent Donato(University of Applied Sciences of Western Switzerland, Switzerland)

Paper No. 277

**“Effect of Guidevane on the Characteristics of a Propeller-Type Hollow Micro-Hydraulic Turbine with Excellent Performance in Passing Foreign Matter”**

Tomomi Uchiyama(Nagoya University, Japan), Tomohiro Degawa(Nagoya University, Japan), Satoshi Honda(Hokuriku Electric Power Company, Japan), Takuji Kawai(Ricoh Company, Ltd., Japan), Kenichi Uehara(Ricoh Company, Ltd., Japan), Yoichi Maekawa(Ricoh Company, Ltd., Japan)

[RY204](#)

[Pumps 7](#)

Paper No. 1

**“Numerical study of air-entraining and submerged vortices in pump sump”**

Shinichiro Yanase(Okayama University, Japan), Ryo Yamasaki(Tsurumi Manufacturing Co., Japan), Toshinori Kouchi(Okayama University, Japan), Yasunori Nagata(Okayama University, Japan), Shunji Higuchi(Tsurumi Manufacturing Co., Japan), Toshihiko Kawabe(Tsurumi Manufacturing Co., Japan), Toshihiro Takami(Okayama University of Science, Japan)

Paper No. 28

**“Influence of the inlet vortex on axial flow pump unit”**

Jie-Xi Song(Yangzhou University, China), Chao Liu(Yangzhou University, China), Fan Yang(Yangzhou University, China)

Paper No. 36

**“The Numerical Optimization and Model Test of Axial Flow Pump Device with Elbow Inlet Flow Channel”**

Chuanliu Xie(Yangzhou University, China), Fangping Tang(Yangzhou University, China), Fan Yang(Yangzhou University, China), Wenpeng zhang(Yangzhou University, China), Jiren Zhou(Yangzhou University, China), Haiyu Liu(Yangzhou University, China)

Paper No. 40

**“An Experimental Study on Air Entrainment in a Suction Sump in Over-Critical-Submergence Condition”**

Akira Morita(Doshisha University, Japan), Katsuya Hirata(Doshisha University, Japan), Masakatsu Hattori(Doshisha University, Japan), Tsuyoshi Maeda(Doshisha University, Japan), Takashi Noguchi(Kyoto University, Japan)

Paper No. 102

**“Experimental Investigation of a Pumping Station from CET Powerplant Timisoara”**

Adrian Stuparu(Politehnica University Timisoara, Romania), Alexandru Baya(Politehnica University Timisoara, Romania), Alin Bosioc(Politehnica University Timisoara, Romania), Liviu Anton(Politehnica University Timisoara, Romania), Daniel Mos(Politehnica University Timisoara, Romania)

Paper No. 122

### “Numerical Simulation of Vortices Behavior in a Pump Sump”

Young Ho Lee(Korea Maritime and Ocean University, Korea), Ayham Amin Al habashna(Korea Maritime and Ocean University, Korea),  
Chang Gu Kim(Korea Maritime and Ocean University, Korea), Byung Ha Kim(Korea Maritime and Ocean University, Korea)

**R****Y****3****0****3**

## Computational and Experimental Technique 2

Paper No. 107

### “Numerical investigation of the jet velocity profile and its influence on the Pelton turbine performance”

Takashi Kumashiro(Hitachi Mitsubishi Hydro Corporation, Japan), Siamak Alimirzazadeh(Ecole polytechnique f?d?rale de Lausanne, Switzerland), Audrey Maertens(Ecole polytechnique f?d?rale de Lausanne, Switzerland), Ebrahim Jahanbakhsh(Ecole polytechnique f?d?rale de Lausanne, Switzerland), Sebastian Leguizam?n(Ecole polytechnique f?d?rale de Lausanne, Switzerland), Fran?ois Avellan(Ecole polytechnique f?d?rale de Lausanne, Switzerland), Kiyohito Tani(Hitachi Mitsubishi Hydro Corporation, Japan)

Paper No. 111

### “Field Test for Hydraulic Turbine Discharge and Efficiency Based on Current-meter Method”

Dengfeng Cao(China Institute of Water Resources and Hydropower Research, China), Luoping Pan(China Institute of Water Resources and Hydropower Research, China), Ye Zhou(China Institute of Water Resources and Hydropower Research, China)

Paper No. 113

### “Signature analysis of characteristic frequencies in a high head Francis turbine”

Chirag Trivedi(Norwegian University of Science and Technology, Norway), Einar Agnalt(Norwegian University of Science and Technology, Norway), Ole\_Gunnar Dahlhaug(Norwegian University of Science and Technology, Norway), Bard\_Aslak Brandastro(Norwegian University of Science and Technology, Norway)

Paper No. 145

### “Experimental investigation and numerical simulation of flow in the draft tube elbow of a Francis turbine over its entire operating range”

Masashi Sakamoto(Nippon Koei Co., Ltd., Japan), Andres M?ller(Nippon Koei Co., Ltd., Japan), Lo?c Andolfatto(Ecole polytechnique f?d?rale de Lausanne, Switzerland), Takashi Hashii(Nippon Koei Co., Ltd., Japan), Kazuhiko Yamaishi(Nippon Koei Co., Ltd., Japan), Fran?ois Avellan(Ecole polytechnique f?d?rale de Lausanne, Switzerland)



Paper No. 154

**“Numerical simulation of a bulb turbine with an eddy-preserving limiter scheme”**

Liu Yang(McGill University, Canada), Yao Jiang(McGill University, Canada), Siva Nadarajah(McGill University, Canada)

Paper No. 155

**“Numerical investigation of draft tube flows using SAS turbulence model and a low-dissipation scheme.”**

Yao Jiang(McGill University, Canada), Liu Yang(McGill University, Canada), Siva Nadarajah(McGill University, Canada)

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[Cavitation and Multiphase Flow 7](#)

Paper No. 129

**“Interphase Characteristic Analysis in the whole flow passage of a Multiphase Rotodynamic Pump”**

Wenwu Zhang(Beijing Institute of Technology, China), Zhiyi Yu(Beijing Institute of Technology, China), Yongjiang Li(Beijing Institute of Technology, China)

Paper No. 177

**“Analysis of Bubble Distribution Characteristics in a Multiphase Rotodynamic Pump”**

Yong\_Jiang Li(Beijing Institute of Technology, China), Zhi\_Yi Yu(Beijing Institute of Technology, China), Wen\_Wu Zhang(Beijing Institute of Technology, China)

Paper No. 246

**“Numerical research of the particles erosion within the double suction centrifugal pump”**

Haifeng Li(KSB Shanghai Pump Co., LTD., China), zaibing Pan(KSB Shanghai Pump Co., LTD., China)

Paper No. 445

**“Investigation of internal flow pattern of a multiphase axial pump”**

Takeshi Sano(Mitsubishi Heavy Industries, Ltd., Japan), Yun Xu(Tsinghua university, China), Tokiya Wakai(Mitsubishi Heavy Industries, Ltd., Japan), Martino Reclari(Mitsubishi Heavy Industries, Ltd., Japan), Shu-liang Cao(Tsinghua university, China)

Paper No. 447

**“CFD Simulation of the Inlet Gas Void Fraction Effect on Multistage Electrical Submersible Pump.”**

Sina YAN(Xi'an University of Technology, China), Xingqi LUO(Xi'an University of Technology, China), Lefu ZHANG(Xi'an University of

Technology, China), Jianjun Feng(Xi'an University of Technology, China), Guojun ZHU(Xi'an University of Technology, China), Senlin CHEN(Xi'an University of Technology, China), Denghui HE(Xi'an University of Technology, China), Chenhao LI(Xi'an University of Technology, China)

Paper No. 235

**“Study on the influence of cavitation on the performance of nuclear main pump”**

Shuyan Zhang(Lanzhou University of Technology, China), Xiaorui Cheng(Lanzhou University of Technology, China)

[RY306](#)

[Ocean Hydro 2](#)

Paper No. 275

**“Reduction of Aerodynamic Noise radiated from Wells Turbine”**

Yuji Tujimoto(Oita University, Japan), Masato Shibata(Oita University, Japan), Shintaro Kouno(Oita University, Japan), Hiromitsu Hamakawa(Oita University, Japan), Hidechito Hayashi(Nagasaki University, Japan), Eru Kurihara(Oita University, Japan)

Paper No. 310

**“Performance of Fluidic Diode for a Twin Unidirectional Impulse Turbine”**

Shinya Okuhara(National Institute of Technology, Matsue College, Japan), Masato Itoga(The Chugoku Electric Power Co., Inc., Japan), Ashrafal Alam(National Institute of Technology, Matsue College, Japan), Manabu Takao(National Institute of Technology, Matsue College, Japan), Yoichi Kinoue(Saga University, Japan)

Paper No. 285

**“Numerical Study of a Sinusoidal Transverse Propeller”**

guillaume fasse(Arts et Metiers PARISTECH, France), annie-claude bayeul-lain?(Arts et Metiers PARISTECH, France), olivier COUTIER-DELGOSHA(Virginia Tech, United States), arnaud curutchet(ADV TECH, France), benoit paillard(ADV TECH, France), Fr?d?ric Hauville(Ecole Navale, France)

Paper No. 439

**“STUDY OF A ROTOR WELLS TYPE WITH DISTRIBUTOR APPLIED TO ULTRA-LOW FALL HYDROELECTRIC POWER PLANTS”**

Almir Luiz Rodrigues(Federal University of Itajuba, Brazil), Geraldo Lucio Tiago Filho(Federal University of Itajuba, Brazil), Antonio Carlos Barkett Botan(Federal University of Itajuba, Brazil)

Paper No. 303

**“A Pump System with Wave Powered Impulse Turbine”**

Yoichi Kinoue(Saga University, Japan), Norimasa Shiomi(Saga University, Japan), Masaki Sakaguchi(Saga University, Japan), Hideaki Maeda(Torishima Pump Mfg. Co., Ltd., Japan), M. M. A. Alam(National Institute of Technology, Japan), Shinya Okuhara(National Institute of Technology, Japan), Manabu Takao(National Institute of Technology, Japan)

Paper No. 304

**“Effect of Hub-to-Tip Ratio on the Performance of Bi-Directional Impulse Turbine with Flow Collector for Tidal Energy Conversion”**

Yoichi Kinoue(Saga University, Japan), Norimasa Shiomi(Saga University, Japan), Manabu Takao(National Institute of Technology, Japan), Tengen Murakami(Saga University, Japan), Yasutaka Imai(Saga University, Japan), Shuichi Nagata(Saga University, Japan)

Paper No. 439

**“STUDY OF A ROTOR WELLS TYPE WITH DISTRIBUTOR APPLIED TO ULTRA-LOW FALL HYDROELECTRIC POWER PLANTS”**

Almir Luiz Rodrigues(Federal University of Itajuba, Brazil), Geraldo Lucio Tiago Filho(Federal University of Itajuba, Brazil), Antonio Carlos Barkett Botan(Federal University of Itajuba, Brazil)

## Wednesday Evening (September 19)

15:30 - 17:10

**R202**

### **Hydraulic Turbines 11**

Paper No. 198

**“Investigation of the BulbT conical diffuser flow dynamics with TR-PIV and pressure measurements”**

Jean-David Buron(University of Laval, Canada), S?bastien Houde(University of Laval, Canada), Claire Desch?nes(University of Laval, Canada)

Paper No. 199

**“Sensitivity of the Winter-Kennedy method to inlet and runner blade angle change on a Kaplan turbine”**

Binaya Baidar(Lule? University of Technology, Sweden), Jonathan Nicolle(Institut de recherche d'Hydro-Qu?bec, Canada), Bhupendra K. Gandhi(Indian Institute of Technology Roorkee, India), Michel J. Cervantes(Lule? University of Technology; Norwegian University of Science and Technology, Sweden)

Paper No. 218

**“Pressure Pulsations and Fatigue Loads in High Head Francis Turbines”**

Bj?rn Winther Solemslie(Norwegian University of Science and Technology, Norway), Einar Agnalt(Norwegian University of Science and Technology, Norway), Chirag Trivedi(Norwegian University of Science and Technology, Norway), Ole Gunnar Dahlhaug(Norwegian University of Science and Technology, Norway)

Paper No. 220

**“Onboard measurements of pressure pulsations in a high head Francis model runner**

”

Einar Agnalt(NTNU, Norway), Bj?rn W Solemslie(NTNU, Norway), Ole-Gunnar Dahlhaug(NTNU, Norway)

**R203**

### **Sustainable Hydropower 3**

Paper No. 405

**“A Study on Performance Prediction of Darrieus-type Hydroturbine Operated in Open Channels Using CFD with Actuator Disk Method”**

Yoshitaka Suzuki(Kyushu University, Japan), Yusuke Katayama(Kyushu University, Japan), Satoshi Watanabe(Kyushu University, Japan), Shin-ichi Tsuda(Kyushu University, Japan), Akinori Furukawa(Oita National College of Technology, Japan)

Paper No. 298

### “Experiment on Basic Performance of a Simple Waterwheel/Windmill with a Cross-Stream Axis”

Hironobu Sato(Doshisha University, Japan), Tomohiro Tokiwa(Doshisha University, Japan), Hiroaki Mihara(General Building Research of Corporation of Japan, Japan), Takashi Noguchi(Kyoto University, Japan), Katsuya Hirata(Doshisha University, Japan)

Paper No. 460

### “Design Considerations for a Ultra-low-head Kaplan Turbine”

Jinbo Chen(Michigan State University, United States), Abraham Engeda(Michigan State University, United States)

[RY204](#)

[Pumps 8](#)

Paper No. 210

### “Origin and formation process of a submerged vortex in a pump sump”

Yoshinobu Yamade(Mizuho Information & Research Institute, Inc., Japan), Chisachi Kato(the University of Tokyo, Japan), Takahide Nagahara(Hitachi, Ltd., Japan), Jun Matsui(Yokohama National University, Japan)

Paper No. 249

### “Experimental study of subsurface vortices at pump intake with an improved diversion-cone”

Zilong Zhao(0, China), Zhongdong Qian(0, China), Zhiwei Guo(0, China), Pengfei Wu(0, China)

Paper No. 273

### “Evaluation Strategy of Particle Swarm Optimization and It's Application in Pumping Station System Optimal Operation”

Fangling Zhao(Yangzhou University, China), Xiaoli Feng(Yangzhou University, China)

Paper No. 291

### “LES Simulation of Air-Core Vortex in Intake Flow Field of Pumping Station”

Dan Zi(China Agricultural University, China), Lian Shen(University of Minnesota, United States), Fujun Wang(China Agricultural University, China)

Paper No. 84

### “Influence of prewhirl angle on a centrifugal pump with inlet guide vane running in turbine mode”

Ming LIU (0, 0), Lei TAN(0, 0), Shuliang CAO(0, 0)

RY303

## Computational and Experimental Technique 3

Paper No. 172

### “PIV Measurements of the Flow in the Guide Vane Channels of a High Head Pump-turbine”

Peng Xue(China Institute of Water Resources and Hydropower Research, China), ZhiPing Liu(China Institute of Water Resources and Hydropower Research, China), Li Lu(China Institute of Water Resources and Hydropower Research, China), YaJuan Tian(China Institute of Water Resources and Hydropower Research, 0), Xin Wang(0, 0), Rui Chen(0, 0)

Paper No. 178

### “The design of 25kw class hydraulic turbine generator by using CAE.”

Won Hyuk Jung(DNDE, Korea), Su Do Lee(DNDE, Korea), Gil Sun Choi(DNDE, Korea), Seok Heum Baek(DNDE, Korea)

Paper No. 182

### “Simulation of the Hydroabrasive Erosion of a Bucket: A Multiscale Model with Projective Integration to Circumvent the Spatio-Temporal Scale Separation”

Sebasti?n Leguizam?n(?cole Polytechnique F?d?rale de Lausanne (EPFL), Switzerland), Ebrahim Jahanbakhsh(?cole Polytechnique F?d?rale de Lausanne (EPFL), Switzerland), Audrey Maertens(?cole Polytechnique F?d?rale de Lausanne (EPFL), Switzerland), Siamak Alimirzazadeh(?cole Polytechnique F?d?rale de Lausanne (EPFL), Switzerland), Fran?ois Avellan(?cole Polytechnique F?d?rale de Lausanne (EPFL), Switzerland)

Paper No. 207

### “Research of key technology for turbine efficiency measurement based on thermodynamics method”

ye zhou(China Institute of Water Resources and Hydropower Research, China), luoping pan(China Institute of Water Resources and Hydropower Research, China), dengfeng cao(China Institute of Water Resources and Hydropower Research, China), yongqiang liu(China Institute of Water Resources and Hydropower Research, China)

RY305

## Cavitation and Multiphase Flow 8

Paper No. 75

### “Stochastic modelling of cavitation erosion in Francis runner”

Quentin Chatenet(?cole de Technologie Sup?rieure (?TS), Canada), Laurent T?n-Th?t(Institut de Recherche d'Hydro-Qu?bec (IREQ), Canada), Martin Gagnon(Institut de Recherche d'Hydro-Qu?bec (IREQ), Canada), Mitra Fouladirad(Universit? de Technologie de Troyes (UTT), France), Antoine Tahan(?cole de Technologie Sup?rieure (?TS), Canada), Emmanuel Remy(EDF R&D, France)

Paper No. 229

### “Cavitation in a Spool Valve for Water Hydraulics”

Hitomi OKABE(Graduate School of Science and Technology, Shinshu University, Japan), Yukiko TANAKA(Faculty of Engineering, Shinshu University, Japan), Akari WATANABE(Faculty of Engineering, Shinshu University, Japan), Futoshi YOSHIDA(KYB Corporation, Japan), Shouichiro IIO(Faculty of Engineering, Shinshu University, Japan), Yoshiaki HANEDA(National institute of technology, Nagano College, Japan)

Paper No. 230

### “Influence of gas desorption in a safety relief valve undergoing cavitation”

Marcos Lema(University of A Coruña, Spain), Anne Gosset(University of A Coruña, Spain), Fernando López Peña(University of A Coruña, Spain)

Paper No. 299

### “Comparative research on various turbulence closure models for unsteady cavitation flows in the ultra-low specific speed centrifugal pump”

Cong Wang(China University of Petroleum, Beijing, China), Yongxue Zhang(China University of Petroleum, Beijing, China), Jinya Zhang(China University of Petroleum, Beijing, China), Zhiwei Li(China University of Petroleum, Beijing, China), Ao Xu(China University of Petroleum, Beijing, China)

Paper No. 353

### “Detection of erosive cavitation on hydraulic turbines. Field Assessment”

Alexandre Presas(Tsinghua University, China), David Valentin(UPC, Spain), Mónica Egusquiza(UPC, Spain), Came Valero(UPC, Spain), Eduard Egusquiza(UPC, Spain), Yongyao Luo(Tsinghua University, China), Zhengwei Wang(Tsinghua University, China)

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[Ocean Hydro 3](#)

Paper No. 276

### “A Straight-bladed Vertical Axis Turbine for Wave Energy Conversion: Effect of Guide Vane Position on the Performance”

Masaki SAKAGUCHI(Saga University, Japan), Yasutaka HAYAMIZU(National Institute of Technology, Yonago College, Japan), Takeshi GONDA(National Institute of Technology, Yonago College, Japan), Shinichi MORITA(National Institute of Technology, Yonago College, Japan), Shigeru OHTSUKA(National Institute of Technology, Yonago College, Japan), Manabu TAKAO(National Institute of Technology, Matsue College, Japan), Yoichi KINOUE(Saga University, Japan), Toshiaki SETOGUCHI(Saga University, Japan)

Paper No. 375

### **“Development of Ocean Current Marine Turbine”**

Shinkichi Tanigaki(Mitsubishi Heavy Industries, Ltd., Japan), Hiroyuki Ishida(Mitsubishi Heavy Industries, Ltd., Japan), Sadato Sugiyama(Mitsubishi Heavy Industries, Ltd., Japan), Shin Asano(Mitsubishi Heavy Industries, Ltd., Japan), Nobuyasu Sakata(Mitsubishi Heavy Industries, Ltd., Japan)

Paper No. 397

### **“A Numerical Study on Performance Improvement of Counter-Rotating Type Tidal Stream Power Unit”**

Hoyun Jung(Institute of Ocean Energy, Saga University, Japan), Toshiaki Kanemoto(Institute of Ocean Energy, Saga University, Japan), Pin Liu(Institute of Ocean Energy, Saga University, Japan), Tengen Murakami(Institute of Ocean Energy, Saga University, Japan)

Paper No. 415

### **“Development and performance evaluation of stall delay bi-directional air turbine with additional blades”**

Mitsumasa Iino(Ashikaga Institute of Technology, Japan), Jun Nakamura(FUJI ELECTRIC CO., LTD., Japan), Masamichi Iwasaki(FUJI ELECTRIC CO., LTD., 0), Takeaki Miyazaki(The University of Tokyo, Japan), Makoto Iida(The University of Tokyo, Japan)

Paper No. 287

### **“Multipole Optimization of Turbine Arrays in Tidal Flows”**

Christian Schmitz(TU Darmstadt, Germany), David Kr?mer(TU Darmstadt, Germany), Peter F. Pelz(TU Darmstadt, Germany)



## Thursday Morning (September 20)

9:00 - 9:50

R203

### Plenary Lecture 4

“Cavitation and sand wear in a water injection pump: CFD and field experience.”

Dr. Paul Cooper (Consultant, USA)

10:10 - 12:10

R202

### Hydraulic Turbines 12

Paper No. 231

“Francis design and prediction technology for flexible operation”

Joel Chamberland-Lauzon(Andritz Hydro, Canada), Christine Monette(Andritz Hydro, Canada), Bernd Nennemann(Andritz Hydro, Canada),  
Matthieu Melot(Andritz Hydro, Canada), Stefan Birk(Andritz Hydro, Germany), Nicolas Ruchonnet(Andritz Hydro, Switzerland)

Paper No. 248

“Numerical analysis of a Kaplan turbine model transient operation”

Raluca\_G. Iovanel(University POLITEHNICA of Bucharest, Romania), Diana\_M. Bucur(University POLITEHNICA of Bucharest, Romania),  
Georgiana Dunca(University POLITEHNICA of Bucharest, Romania), Michel\_J. Cervantes(Luleå University of Technology, Sweden)

Paper No. 232

“Numerical simulation of air injection in Francis turbine”

Denis Chirkov(Institute of Computational Technologies SB RAS, Russia), Pavel Shcherbakov(Institute of Computational Technologies SB  
RAS, Russia), Vladimir Skorospelov(Sobolev Institute of Mathematics SB RAS, Russia), Sergey Cherny(Institute of Computational  
Technologies SB RAS, Russia), Alexander Zakharov(PJSC "Power Machines" LMZ, Russia)

Paper No. 234

“Numerical and experimental investigation of the runner channel vortex in Francis turbines regarding its dynamic flow characteristics and its influence on pressure oscillations”

Marcelo V. Magnoli(Voith Hydro Holding GmbH & Co. KG, Germany), Danijel Anciger(Voith Hydro Holding GmbH & Co. KG, Germany),  
Marco Maiwald(Voith Hydro Holding GmbH & Co. KG, Germany)

Paper No. 241

“Numerical simulation and analysis at partial load in Francis turbines: Three-

## dimensional topology and frequency signature of inter-blade vortices”

François Doussot(Grenoble Institute of Technology, France), Guillaume Balarac(Grenoble Institute of Technology, France), James Brammer(GE Renewable Energy, France), Olivier Métais(Grenoble Institute of Technology, France), Claire Ségoufin(GE Renewable Energy, France)

Paper No. 228

## “Numerical and Experimental Analysis of Micro-class hydro Francis turbine”

Enkhtaivan Batmunkh(Korea Maritime and Ocean University, Korea)

[RY203](#)

[Hydraulic / Mechanical and Fluid / Solid Interaction 1](#)

Paper No. 37

## “Dynamic response of a NACA0009 hydrofoil under cavitation conditions”

Wei Wang(China Agricultural University, China), Lingjiu Zhou(China Agricultural University, China), Zhengwei Wang(Tsinghua University, China), Xavier Escaler(Universitat Politècnica de Catalunya-Barcelona Tech, Spain), Oscar De La Torre(University of Bristol, United Kingdom), Wenzhe Kang(China Agricultural University, China)

Paper No. 221

## “An Experimental Investigation of the Hydrodynamic Damping of Vibrating Hydrofoils”

Carl W Bergan(Norwegian University of Science and Technology, Norway), Erik O Tengs(EDR&Medeso AS, Norway), Bjørn W Solemslie(Norwegian University of Science and Technology, Norway), Ole Gunnar Dahlhaug(Norwegian University of Science and Technology, Norway)

Paper No. 33

## “Numerical Simulation of the Hydrodynamic Damping of a Vibrating Hydrofoil”

Erik Tengs(Norwegian University of Science and Technology, Norway), Carl Bergan(Norwegian University of Science and Technology, Norway), Pål-Tore Storli(Norwegian University of Science and Technology, Norway), Martin Holst(EDR Medeso, Norway), Ken-Robert Jakobsen(EDR Medeso, Norway)

Paper No. 78

## “Prediction of vibration amplitudes on hydraulic profiles under von Karman vortex excitation”

Bernd Nennemann(Andritz Hydro Canada Inc., Canada), Christine Monette(Andritz Hydro Canada Inc., Canada)

Paper No. 148

## “PIV measurements and CFD simulations of a hydrofoil at lock-in”

Kristian F Sagmo(Norwegian University of Science and Technology, Norway), Erik O Tengs(EDR&Medeso As , Norway), Carl W Bergan(Norwegian University Of Science and Technology , Norway), Pål-Tore Storli(Norwegian University of Science and Technology, Norway)

[RY204](#)

[Panel Discussion](#)

## The Future of Pumping Machinery

[RY303](#)

[Computational and Experimental Technique 4](#)

Paper No. 253

## “Cost-effective CFD for vortex shedding from a trailing edge of hydraulic turbine blade”

Sadao Kurosawa(Toshiba, Japan), Masahiko Nakazono(Toshiba, Japan)

Paper No. 272

## “GPU-Accelerated Pelton Turbine Simulation Using Finite Volume Particle Method with Linear Eddy Viscosity Models”

Siamak Alimirzazadeh(École polytechnique fédérale de Lausanne, Switzerland), Takashi Kumashiro(Hitachi Mitsubishi Hydro Corporation, Japan), Sebastian Leguizamón(École polytechnique fédérale de Lausanne, Switzerland), Audrey Maertens(École polytechnique fédérale de Lausanne, Switzerland), Ebrahim Jahanbakhsh(École polytechnique fédérale de Lausanne, Switzerland), Kiyohito Tani(Hitachi Mitsubishi Hydro Corporation, Japan), François Avellan(École polytechnique fédérale de Lausanne, Switzerland)

Paper No. 290

## “Pump to Turbine Transient for a Pump-Turbine in a Model Test Circuit and a Real Size Power Plant”

Stefan Riedelbauch(University of Stuttgart, Germany), Christine Stens(University of Stuttgart, Germany)

Paper No. 255

## “Scale adaptive simulation of draft tube flow for application in the hydraulic design process”

Roland Jester-Zürker(Voith Hydro Holding GmbH & Co. KG, Germany), Paul Weber(Voith Hydro Holding GmbH & Co. KG, Germany)

Paper No. 254

### “Transposition of efficiencies between prototype and model of an axial turbine for ultra-low heads using Computational Fluid Dynamics tool”

Antonio Carlos Barkett Botan(Universidade Federal de Itajubá, Brazil), Ramiro Gustavo Ramirez Camacho(Universidade Federal de Itajubá, Brazil), Geraldo Lucio Tiago Filho(Universidade Federal de Itajubá, Brazil), Tiago Martins de Azevedo(Universidade Federal de Itajubá, Brazil), Jacek Swiderski(Swidorski Engineering Inc, Canada), Tony Tung(Tung Hydraulic Energy Technologies, Canada), Joe Martin(Norcan Hydraulic Turbine Inc., Canada)

[RY305](#)

### [Cavitation and Multiphase Flow 9](#)

Paper No. 236

### “Vibration and Flow Characteristics near Cavitation Occurrence in Mixed-Flow Pump”

Hyeonmo Yang(Korea Institute of Industrial Technology, Korea), Kyoung-Yong Lee(Korea Institute of Industrial Technology, Korea), Jin-Hyuk Kim(Korea Institute of Industrial Technology, Korea), Young-Seok Choi(Korea Institute of Industrial Technology, Korea)

Paper No. 243

### “Numerical Prediction of Efficiency and Cavitation for a Pelton Turbine”

Dragica Jost(Kolektor Turboinstitut, Slovenia), Aljaž Kerlavaj(Kolektor Turboinstitut, Slovenia), Mitja Morgut(University of Trieste, Italy), Valentin Pirnat(Kolektor Turboinstitut, Slovenia), Enrico Nobile(University of Trieste, Italy)

Paper No. 338

### “Water Column Separation at Turbine Start Up Loading”

Aleksandar Gajic(University of Belgrade, Serbia), Stanislav Pejovic(Toronto University, Canada)

Paper No. 344

### “Numerical Study on Cavitating Flow-induced Vibration of Liquid Rocket Engine Inducer”

Qin Wu(Tsinghua University, China), Biao Huang(Beijing Institute of Technology, China), Hanzhe Zhang(Beijing Institute of Technology, China), Guoyu Wang(Beijing Institute of Technology, China), Shuliang Cao(Tsinghua University, China)

Paper No. 345

### “Effect of Different Start-up Characteristics on the Cavitation Performance in Rotary Lobe Pump”

Yibin Li(Lanzhou University of Technology, China), Dongsheng Guo(Lanzhou University of Technology, China)

RY306

## WS:PumpedStorage 1

Paper No. 211

### “Transient approach for identification of the S-shape region of pump turbines”

Wilhelm Weber(Voith Hydro Holding GmbH & Co. KG, Heidenheim, Germany, Germany), Jens Kahler(Voith Hydro Holding GmbH & Co. KG, Heidenheim, Germany, Germany), Marcelo Magnoli(Voith Hydro Holding GmbH & Co. KG, Heidenheim, Germany, Germany), Armin Schuh(Voith Hydro Holding GmbH & Co. KG, Heidenheim, Germany, Germany), Jiri Koutnik(Voith Hydro Holding GmbH & Co. KG, Heidenheim, Germany, Germany)

Paper No. 247

### “Hump Characteristic of Pump-Turbine with Splitter Blades under Different Guide Vane Openings”

JING JIA(Jiangsu University, China)

Paper No. 67

### “Influence of Cavitation on Hump Characteristics in a Pump-Turbine Model”

Deyou Li(Harbin Institute of Technology, China), Song Lin(Harbin Institute of Technology, China), Hongjie Wang(Harbin Institute of Technology, China), Wenwen Fu(Harbin Institute of Technology, China), Jinxia Chen(Harbin Institute of Large Electrical Machinery, China), Xianzhu Wei(Harbin Institute of Large Electrical Machinery, China), Daqing Qin(Harbin Institute of Large Electrical Machinery, China)

Paper No. 101

### “Studies on the evolutions of the axial force and moment of the runner and guide vanes during runaway transient process in pump mode”

Zhiyan Yang(Wuhan University, China), Yongguang Cheng(Wuhan University, China), Linsheng Xia(Wuhan University, China)

Paper No. 412

### “Non-axisymmetric flow characteristic in a pump turbine runner at pump mode”

Like Wang(Xi'an University of Technology, China), Weili Liao(Xi'an University of Technology, China), Jinling Lu(Xi'an University of Technology, China)

Paper No. 418

### “Experiments and numerical simulations of a flow instability in a low-specific-speed Pump-Turbine”

Koichiro Matsumura(Aoyama Gakuin University, Japan), Kazuhiko Yokota(Aoyama Gakuin University, Japan), Donghyuk Kang(Saitama University Graduate school, Japan), Wakana Tsuru(Aoyama Gakuin University, Japan), Hayate Sugiyama(Aoyama Gakuin University, Japan)

Thursday Afternoon (September 20)

13:30 - 15:10

RY202

Hydraulic Turbines 13

Paper No. 381

**“Motion Prediction of Foreign Matters using CFD-DEM Method in Francis Turbines for Small and Medium Power Stations”**

Yamato Imasaka(Waseda University, Japan), Hitoshi Kanno(Waseda University, Japan), Kazuyoshi Miyagawa(Waseda University, Japan),  
Motohiko Nohmi(Ebara Corporation, Japan)

Paper No. 260

**“On Modeling Runner Included into a Hydroacoustic System”**

Vladimir\_Yu. Borodulin(Kutateladze Institute of Thermophysics SB RAS, Russia), Aleksandr\_A. Dekterev(Kutateladze Institute of  
Thermophysics SB RAS, Russia), Pavel\_A. Kuibin(Kutateladze Institute of Thermophysics SB RAS, Russia), Andrey\_V.  
Minakov(Kutateladze Institute of Thermophysics SB RAS, Russia), Georgy\_A. Semenov(PJSC "Power Machines" LMZ, Russia),  
Aleksandr\_V. Zakharov(PJSC "Power Machines" LMZ, Russia)

Paper No. 265

**“CFD Analysis of Flow Pattern in S-Shape Region for Low Specific Speed Francis Turbine”**

Katsutoshi Kobayashi(Hitachi, Ltd., Japan), Yuta Tamura(Hitachi Mitsubishi Hydro Corporation, Japan)

Paper No. 271

**“Kaplan turbine working as a propeller: CFD investigation and experimental validation of generated power fluctuation.”**

Mauricio A Angulo(Universidad Nacional de La Plata, Argentina), Arturo Rivetti(Universidad Nacional de La Plata, Argentina), Cecilia V  
Lucino(Universidad Nacional de La Plata, Argentina), Sergio O Liscia(Universidad Nacional de La Plata, Argentina)

Paper No. 293

**“Numerical Investigation of Blade Tip Cavitation on Large Discharge Condition of Diagonal Turbine”**

Yuta Tamura(Hitachi Mitsubishi Hydro Corporation, Japan), Tomoaki Ishihara(Hitachi Mitsubishi Hydro Corporation, Japan), Kiyohito  
Tani(Hitachi Mitsubishi Hydro Corporation, Japan), Kenji Shingai(Hitachi Mitsubishi Hydro Corporation, Japan)

**R****Y**203

## Hydraulic / Mechanical and Fluid / Solid Interaction 2

Paper No. 316

### “Excitation of torsional modes in guide vanes due to rotor stator interaction”

Eivind Myrvold(Rainpower, Norway), Jan Tore Billdal(Rainpower, Norway), Petter T. K. ?stby(Rainpower, Norway), Bj?rn Haugen(NTNU, Norway)

Paper No. 339

### “Validation of CFD Analysis of Acoustic Effects in PumpTurbine Runners”

Olivier Braun(Andritz AG, Austria), Nicolas Ruchonnet(ANDRITZ HYDRO AG, Switzerland), Beat Horisberger(ANDRITZ HYDRO AG, Switzerland), Adrien Taruffi(ANDRITZ HYDRO AG, Switzerland), Arno Gehrler(ANDRITZ AG, Austria)

Paper No. 188

### “Fluid added polar inertia and damping for the torsional vibration of a Kaplan turbine model runner considering multiple perturbations”

Arash Soltani Dehkharghani(Lulea University of Technology, Sweden), Jan-Olov Aidanp??(Lulea University of Technology, Sweden), Fredrik Engstr?m(Lulea University of Technology, Sweden), Michel J. Cervantes(Lulea University of Technology, Sweden)

Paper No. 13

### “Energy Flow Transmission Analysis on the Powerhouse Vibration under Turbine Hydraulic Loads”

Zhenyue MA(School of Hydraulic Engineering, China), Wei XU(School of Hydraulic Engineering, China), Baoping ZHI(School of Hydraulic Engineering, China)

Paper No. 352

### “Behavior of Francis turbines at part load. Field assessment in prototype: Effects on power swing”

David Valentin(UPC, Spain), Alexandre Presas(UPC, Spain), M?nica Egusquiza(UPC, Spain), Carme Valero(UPC, Spain), Eduard Egusquiza(UPC, Spain)

**R****Y**204

## Pumps 9

Paper No. 444

### “Influence of the Tip Clearance on the Auto-Oscillation Frequency of a Cavitating Pump”

Peter F. Pelz(TU Darmstadt, Germany), Paul Taubert(TU Darmstadt, Germany)

Paper No. 51

### “Cavitation Performance of a Vertical Condensate Pump Featured by the Impeller with Long and Short Blades”

Can Kang(Jiangsu University, China), Shuang Teng(Jiangsu University, China), Wenbin Zhang(Shanghai Marine Equipment Research Institute, China), Kejin Ding(Shanghai Marine Equipment Research Institute, China), Ning Mao(Jiangsu University, China), Yongchao Zhang(Jiangsu University, China)

Paper No. 181

### “Implementation of a passive control system for limiting cavitation around hydrofoils”

Tommaso Capurso(Polytechnic University of Bari, Italy), Michele Lorusso(Polytechnic University of Bari, Italy), Bernardo Fortunato(Polytechnic University of Bari, Italy), Sergio M. Camporeale(Polytechnic University of Bari, Italy), Marco Torresi(Polytechnic University of Bari, Italy)

Paper No. 371

### “Three dimensional numerical analysis of inducer about suppression of cavitation instabilities by asymmetric slits on blades”

Yoshito Kamikura(Tohoku University, Japan), Hiroki Kobayashi(Tohoku University, Japan), Yuka Iga(Tohoku University, Japan), Satoshi Kawasaki(Japan Aerospace Exploration Agency, Japan)

Paper No. 430

### “The suppression of cavitation surge in a double-suction centrifugal pump by using branch-type and slit-type accumulations installed at a pump outlet pipe”

Tomoshige Maeda(Aoyama Gakuin University, Japan), Wakana Tsuru(Aoyama Gakuin University, Japan), Donghyuk Kang(Saitama University Graduate School, Japan), Tomoki Tsuneda(EBARA Corporation, Japan), Byungjin An(EBARA Corporation, Japan), Shusaku Kagawa(EBARA Corporation, Japan), Motohiko Nohmi(EBARA Corporation, Japan), Kazuhiko Yokota(Aoyama Gakuin University, Japan)

[RY303](#)

## [Computational and Experimental Technique 5](#)

Paper No. 320

### “CFD analysis of the hydrodynamic characteristics of an eccentric shaft in a canned motor”

Zhen Jia(Tsinghua University, China), Zhigang Zuo(Tsinghua University, China), Shuhong Liu(Tsinghua University, China)

Paper No. 340

### “Stereo PIV measurement of vortices in a model pump intake”

Miao Guo(College of Water Resources and Civil Engineering, China), Xuelin Tang(College of Water Resources and Civil Engineering,



China), Xiaoqin Li(College of Water Resources and Civil Engineering, China), Fujun Wang(College of Water Resources and Civil Engineering, China)

Paper No. 348

**“Numerical Modeling of a Laser Generated Cavitation Bubble with a Coupled Level Set and Volume of Fluid Method”**

Jiayong Yin( China University of Petroleum-Beijing, China), Yongxue Zhang( China University of Petroleum-Beijing, China), Yuning Zhang( China University of Petroleum-Beijing, China)

Paper No. 350

**“Numerical study on various vortices in pump sump based on LBM-LES”**

Jun Lei Lei(China Agricultural University, China), Xuelin Tang(China Agricultural University, China), Xiaoqin Li Li(China Agricultural University, China), Miao Guo Guo(China Agricultural University, China)

Paper No. 374

**“Experimental and Numerical Investigation of Flow Field in Flexible Tube”**

Dominik Fiedler(Faculty of Mechanical Engineering, Brno University of Technology, Czech), Simona Fialová(Faculty of Mechanical Engineering, Brno University of Technology, Czech), Jiří Burda(Faculty of Mechanical Engineering, Brno University of Technology, Czech)

[RY305](#)

[WS:Single- & Multi-Stage 1](#)

Paper No. 65

**“Investigation on Inner Flow Quality Assessment of Centrifugal Pump Based on Euler Head and Entropy Production Analysis”**

Bo Qian(Zhejiang University, China), Jinping Chen(Jiangsu Zhenhua Pump Ltd., China), Peng Wu(Zhejiang University, China), Dazhuan Wu(Zhejiang University, China), Peng Yan(Science and Technology on Water Jet Propulsion Laboratory, Marine Design & Research Institute of China(Maric), China), Shiyang Li(Zhejiang University, China)

Paper No. 332

**“Prediction of flow phenomena, performance and thrust forces of three-stage pump by using URANS”**

Hiroyoshi Watanabe(Ebara Corporation, Japan)

Paper No. 365

**“Detailed Flow Characteristic Analyses of a Three-Stage Centrifugal Pump at**

## Design and Off-Design Conditions”

Jin-Hyuk Kim(Korea Institute of Industrial Technology , Korea), Bo-Min Cho(ANFLUX Inc., Korea), Sung Kim(Korea Institute of Industrial Technology , Korea), Yong-Kab Lee(ANFLUX Inc., Korea), Young-Seok Choi(Korea Institute of Industrial Technology, Korea)

Paper No. 305

## “Unsteady RANS Simulation of Three-stage Centrifugal Pumps with Different Impeller-Diffuser Gaps”

Taiki Takamine(Kyushu University, Japan), Satoshi Watanabe(Kyushu University, Japan), Kazuyoshi Miyagawa(Waseda University, Japan)

[RY306](#)

[WS:Pumped Storage 2](#)

Paper No. 32

## “Optimized design the pump turbine based on LDV and PIV”

Demin Liu(Dongfang Electric Machinery CO., LTD, China), yongzhi Zhao(0, China)

Paper No. 431

## “Design of a pump-turbine using a quasi-potential flow approach, mathematical optimization and CFD”

Frantisek Pochyly(Brno University of Technology, Czech), Pavel Rudolf(Brno University of Technology, Czech), David Stefan(Brno University of Technology, Czech), Prokop Moravec(Brno University of Technology, Czech), Jiri Stejskal(Brno University of Technology, Czech), Ales Skotak(CKD Blansko Engineering, Czech)

Paper No. 203

## “Multiobjective optimization design of ultrahigh-head pump turbine runners with splitter blades”

zan ao hu(xihua university, China), baoshan zhu(tsinghua university, China), xiaobin liu(xihua university, China), zhe ma(tsinghua university, China), cheng xue(xi hua university, China)

Paper No. 97

## “A study on the evolution of the instability in two model pump-turbine runners with large blade leans”

Zhe Ma(Tsinghua University, China), Baoshan Zhu(Tsinghua University, China), Lei Tan(Tsinghua University, China)

Paper No. 456

## “Experimental and numerical investigation of flows inside draft tube of a pump-turbine”

Xide Lai(Xihua University, China), Quanwei Liang(Dongfang Electric Machinery Co. Ltd, China), Daoxing Ye(Xihua University, China), Xiaoming Chen(Xihua University, China), Qiuqin Gou(Xihua University, China), Qinghua Zhang(Xihua University, China)

Thursday Evening (September 20)

15:30 - 17:10

[RY202](#)

[Hydraulic Turbines 14](#)

Paper No. 302

**“A Step Forward: IEC 62097-Edition 2 ‘HYDRAULIC MACHINES, RADIAL AND AXIAL ? METHODOLOGY FOR PERFORMANCE TRANSPOSITION FROM MODEL TO PROTOTYPE’”**

Kotaro Tezuka(Toshiba Energy Systems & Solutions Corporation, Japan), Nadine Pajean-Wassong(EDF, France), Wolfgang Artner(ANDRITZ HYDRO GmbH, Austria), Jacob Iosfin(BC Hydro, Canada)

Paper No. 311

**“Effect of spiral vortices on the stability of vortex structures in turbine draft tube”**

Frantisek Pochyly(Brno University of Technology, Faculty of Mechanical Engineering, Czech), Simona Fialova(Brno University of Technology, Faculty of Mechanical Engineering, Czech), David Stefan(Brno University of Technology, Faculty of Mechanical Engineering, Czech)

Paper No. 319

**“Francis turbine high load instabilities - Model Test and CFD simulation”**

Daniel\_Amancio Rodriguez(Universidad Nacional de La Plata, Argentina), Arturo Rivetti(Universidad Nacional de La Plata, Argentina), Mauricio\_Abel Angulo(Universidad Nacional de La Plata, Argentina), Cecilia\_Veronica Lucino(Universidad Nacional de La Plata, Argentina), Sergio\_Oscar Liscia(Universidad Nacional de La Plata, Argentina)

Paper No. 363

**“CFD-based rehabilitation for the high specific speed Francis turbine”**

Koichi Kubo(Toshiba Corporation , Japan), Takahiro Nakashima(Toshiba Corporation , Japan), Ryosuke Shima(Toshiba Energy Systems & Solutions Corporation , Japan), Yasuyuki Enomoto(Toshiba Corporation , Japan)

Paper No. 376

**“Development of high-efficiency and low-cost unshrouded turbine runner for small scale hydropower plant”**

Takamitsu Aida(Tanaka Hydropower Co., Ltd., Japan), Kazuyoshi Miyagawa(Waseda University, Japan), Yohei Nakamura(Waseda University, Japan)

**R Y203**

## **Hydraulic / Mechanical and Fluid / Solid Interaction 3**

**Paper No. 141**

### **“Random Vibration Characteristics of Perforated Plates in Parallel Flow”**

Cheng Xue(Xihua University , China), Baoshan Zhu(Tsinghua University, China), Xiaobing Liu(Xihua University, China), Yoshitsugu NEKOMOTO(Mitsubishi Heavy Industries, Ltd., Japan), Jinsheng Liu(Tsinghua University, China), Dongni Liu(Dalian Maritime University, China)

**Paper No. 436**

### **“Journal bearing with non-Newtonian fluid in the area of Taylor vortices”**

Simona Fialova(Brno University of Technology, Faculty of Mechanical Engineering, Czech), Milada Kozubkova(Technical University Ostrava, Czech), Jana Jablonska(Technical University Ostrava, Czech), Michal Havlasek(Brno University of Technology, Faculty of Mechanical Engineering, Czech), Frantisek Pochyly(Brno University of Technology, Faculty of Mechanical Engineering, Czech), Dominik Sedivy(Brno University of Technology, Faculty of Mechanical Engineering, Czech)

**Paper No. 441**

### **“Computational analysis of flow-driven string dynamics in a pump and residence time calculation”**

Kenji Komiya(Waseda University, Japan), Taro Kanai(Waseda University, Japan), Yuto Ootoguro(Waseda University, Japan), Masayuki Kaneko(Waseda University, Japan), Kyohei Hirota(Waseda University, Japan), Kenji Takizawa(Waseda University, Japan), Yutong Zhang(Rice University, United States), Tayfun E Tezduyar(Rice University, United States), Motohiko Nohmi(EBARA corporation, Japan)

**Paper No. 244**

### **“Advanced Simulation of Coupled Physics in Thrust Bearings”**

Bjoern Huebner(Voith Hydro Holding GmbH & Co. KG, Germany), Daniel R.B. Silva(Voith Hydro Holding GmbH & Co. KG, Germany)

**R Y203**

## **Pumps 10**

**Paper No. 2**

### **“Experimental and numerical study on flow induced characteristics of centrifugal pump under air-water bubble inflow”**

Q R Si(National Research Center of Pumps, China), W T He(National Research Center of Pumps, China), Q L Cui(National Research Center of Pumps, China), S Q Yuan(National Research Center of Pumps, China), G Bois(LMFL, FRE CNRS 3723, France), K Y Zhang(National Research Center of Pumps, China)

Paper No. 92

### “Investigation on internal flow of gas - liquid two - phase flow in centrifugal pumps based on dimensionless method”

qianglei Cui( Research Center of Fluid Machinery Engineering and Technology, Jiangsu University, Zhenjiang 212013, China, China), qiaorui Si( Research Center of Fluid Machinery Engineering and Technology, Jiangsu University, Zhenjiang 212013, China, China), Gerard Bois(LMFL, FRE CNRS 3723, ENSAM, 8 boulevard Louis XIV, 59046 Lille Cedex, France), shouqi Yuan(Research Center of Fluid Machinery Engineering and Technology, Jiangsu University, Zhenjiang 212013, China, China), jianping Yuan(Research Center of Fluid Machinery Engineering and Technology, Jiangsu University, Zhenjiang 212013, China, China), Wenting He(Research Center of Fluid Machinery Engineering and Technology, Jiangsu University, Zhenjiang 212013, China, China)

Paper No. 213

### “Multiphase Performance and Internal Flow Pattern of Helico-axial Pumps”

Yun XU(Institute of fluid machinery & engineering, China), Shu-liang CAO(Institute of fluid machinery & engineering, China), Martino RECLARI(Fluid Dynamics No.2 Laboratory, Japan), Tokiya WAKAI(Fluid Dynamics No.2 Laboratory, Japan), Takeshi SANO(Fluid Dynamics No.2 Laboratory, Japan)

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### “Computational Analysis of Flow Field Characteristics of a Liquid Rocket Unshrouded Impeller”

Hideyo Negishi(JAXA, Japan), Shinji Ohno(Ryoyu System Co., Ltd., Japan), Taro Fukuda(Daiichi System Engineering, Co., Ltd., Japan), Yohei Ogawa(JAXA, Japan)

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### “Experimental Investigation on Suction Performance and Cavitation Instabilities of Turbopumps with Two Different Inducers”

Tatsuya Morii(Kyushu University, Japan), Yohei Tanaka(Kyushu University, Japan), Satoshi Watanabe(Kyushu University, Japan), Satoru Ohashi(IHI Corporation, Japan), Yasushi Matsunaga(IHI Corporation, Japan)

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Koichi Tsubogo(the Open University of Japan, Japan), Masayuki Hyodo(Yamaguchi University, Japan)

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## Centrifugal Pump Vaned Diffuser”

Annie-Claude Bayeul-Lain?(Arts et Metiers PARISTECH, France), Patrick Dupont(Ecole Centrale de LILLE, France), Antoine Dazin(Arts et Metiers PARISTECH, France), G?rard bois(Arts et Metiers PARISTECH, France)

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#### “Reduction of the mathematical model of liquid flow withing an instability”

Frantisek Pochyly(Brno University of Technology, Faculty of Mechanical Engineering, Czech), Ondrej Urban(Brno University of Technology, Faculty of Mechanical Engineering, Czech), Simona Fialova(Brno University of Technology, Faculty of Mechanical Engineering, Czech)

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#### “Influence of Hydraulic Characteristics on Transient Behavior of Ultra High Head Pump Turbine”

Quanwei LIANG(Dongfang Electric Machinery Co., Ltd, China), Jiayi FAN(Dongfang Electric Machinery Co., Ltd, China), Qinghua SHI(Dongfang Electric Machinery Co., Ltd, China)

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#### “Steady and transient performance of a model pump-turbine at off-design conditions: turbine mode”

Jinhong Hu(Wuhan University, China), Jiandong Yang(Wuhan University, China), Wei Zeng(University of Adelaide, Australia)

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#### “Load Rejection Process of a Pumped Storage Power Station Analyzed by 3D CFD Method”

Feifei Wen(Wuhan University, China), Yongguang Cheng(Wuhan University, China)

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#### “Three-dimensional transient simulation of a model pump-turbine during the load rejection processes”

Linsheng Xia(Wuhan University, China), Yongguang Cheng(Wuhan University, China), Zhiyan Yang(Wuhan University, China)

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Igor Iliev(Norwegian University of Science and Technology, Norway), Chirag Trivedi(Norwegian University of Science and Technology, Norway), Einar Agnalt(Norwegian University of Science and Technology, Norway), Ole Gunnar Dahlhaug(Norwegian University of Science and Technology, Norway)