



IAHR 2024 PROGRAMME



32nd Symposium on Hydraulic Machinery and Systems

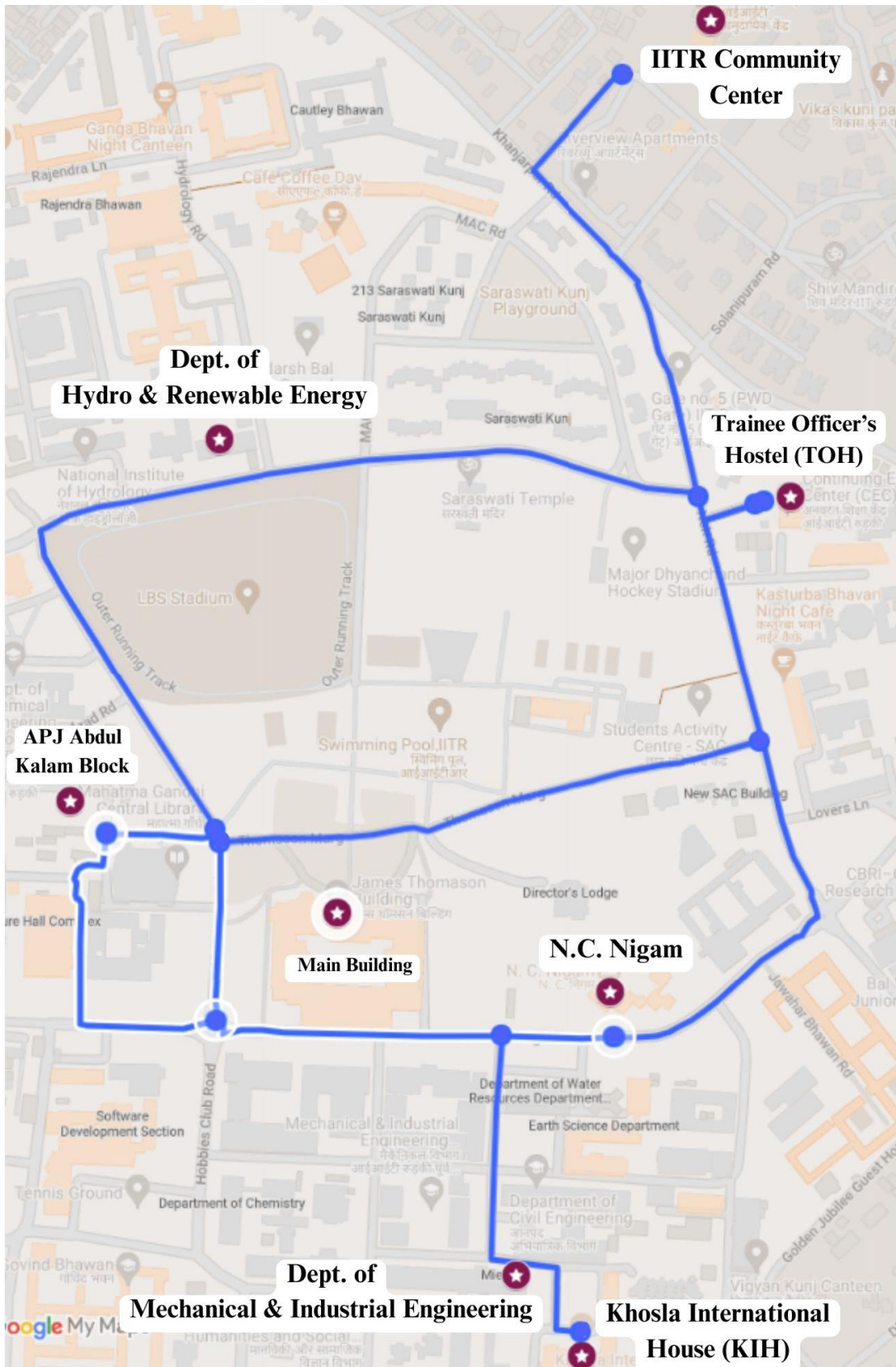
September 11-14, 2024



**Department of Hydro and
Renewable Energy**

**Department of Mechanical and
Industrial Engineering**

Indian Institute of Technology Roorkee



IITR Community Center

Dept. of Hydro & Renewable Energy

Traineer Officer's Hostel (TOH)

APJ Abdul Kalam Block

Main Building

N.C. Nigam

Dept. of Mechanical & Industrial Engineering

Khosla International House (KIH)

Programme at a Glance



Hosted by
Spain Water
and IWHR, China

32nd IAHR Symposium on Hydraulic Machinery and Systems

Indian Institute of Technology Roorkee, India

September 11 – 14, 2024

जल एवं नवीकरणीय ऊर्जा विभाग

DEPARTMENT OF HYDRO AND RENEWABLE ENERGY

यांत्रिक और औद्योगिक इंजीनियरिंग विभाग

DEPARTMENT OF MECHANICAL AND INDUSTRIAL ENGINEERING



(As on Sept 03, 2024)

10.09.2024							1830 onwards	
							Welcome Reception followed by Dinner	
	9000- 1030 hrs	1030-1100 hrs	1100-1300 hrs	1300-1430 hrs	1430-1630 hrs	1630-1700 hrs	1700-1830 hrs	1830 onwards
11.09.2024 (Day 1)	0900- 0945 hrs Registration 0945-1030 hrs Inaugural Session	Tea Break	Plenary Session-1 (PS 1) (Keynote)	Lunch Break and Networking	Technical Session-1 (TS-1) • Hydraulic Turbines [5] • Pump-Turbines [6] • Fluid-structure interaction and fatigue loading [6]	Tea Break	Technical Session-2 (TS-2) • Hydraulic Turbines [5] • Pump-Turbines [5] • Hydropower [4]	IAHR Executive Committee Meeting 1900 onwards Cultural Event MAC
	Plenary Session-2 (PS 2) (Keynote)		Technical Session-3 (TS-3) • Hydraulic Turbines [5] • Pump-Turbines [4] • Energy Storage and Flexibility [4]		Technical Session-4 (TS-4) • Hydraulic Turbines [5] • Computational Fluid Dynamics [7] • Multiphase Flow [6]		Technical Session-5 (TS-5) • Hydraulic Turbines [4] • Pump-Turbines [3] • Vortex Breakdown [3]	1930 onwards
	Plenary Session-3 (PS 3) (Keynote)		Technical Session-6 (TS-6) • Hydraulic Turbines [3] • Recent Measurement Techniques [3] • Multiphase flow [3]		Technical Session-7 (TS-7) • Hydraulic Turbines [4] • Energy Storage and Flexibility [3] • General Topics [5]		Valedictory Session	
14.09.2024 (Day 4)	Technical Tour to Pathri (1955) and Chilla (1982) hydropower stations, Pashulok barrage, Ganga Aarti 0830 hrs Departure from IIT Roorkee and return by 2000 hrs. Lunch and Snacks shall be by host during the tour.							

PREFACE

Hydropower is a reliable, versatile, and low-cost source of clean electricity generation and responsible water management. Hydropower plants are helping to accelerate the clean energy transition, providing essential power, storage, flexibility, and climate mitigation services. Hydropower is also a key asset for building secure, clean electricity systems and reaching global net-zero targets. Hydraulic machinery is an essential component of a hydropower plant to generate electricity. It is always vital to share current knowledge on research and development, including numerical analysis, design, operation, and monitoring of hydraulic machinery and systems. Research and development from academia and industry have constantly been improving the hydraulic turbine and components design.

The 32nd IAHR symposium on Hydraulic Machinery and Systems offers an opportunity for academic researchers and industrial experts from all over the world to share recent advances in theoretical, experimental, and computational research as well as the challenges faced by the industry.

This biennial Symposium is jointly organized by the Department of Hydro and Renewable Energy and Department of Mechanical and Industrial Engineering and is being held at the Indian Institute of Technology Roorkee, India during September 11-14, 2024. The symposium brings together national and international experts on a common platform to share knowledge on various hydraulic machinery related topics. The symposium includes original research articles within the scope of the below-mentioned technical tracks.

- *Intake systems*
- *Hydraulic turbines*
- *Pump turbines*
- *Hydropower*
- *Multiphase flow*
- *Vortex breakdown*
- *Recent measurement techniques*
- *Computational fluid dynamics (CFD)*
- *Fluid-structure interaction and fatigue loading*
- *Ocean hydro machinery*
- *Energy storage and flexibility*
- *General topics*

INSTITUTE AND ORGANIZERS

Indian Institute of Technology Roorkee

Indian Institute of Technology Roorkee (IIT Roorkee) is among the foremost institutes of national importance in higher technological education and engineering, basic and applied research. Since its establishment, the Institute has played a vital role in providing the technical workforce and know-how to the country and pursuing research. The Institute ranks amongst the best technological institutions globally and has contributed to all sectors of technological development. It has also been considered a trend-setter in the area of education and research in the field of science, technology, and engineering. The Institute has celebrated its demisemiseptcentennial (175 years) of establishment during 2021-22.



James Thomson Building, Indian Institute of Technology Roorkee

Department of Hydro and Renewable Energy

Department of Hydro and Renewable Energy (HRED) formerly Alternate Hydro Energy Centre, an academic department of Indian Institute of Technology, Roorkee was established in the year 1982. HRED has been providing professional supports in the field of Small Hydropower Development covering planning, Detailed Project Reports, Detailed Engineering Designs and Construction drawings, Technical Specifications of Turn-Key execution/equipment Supply, Refurbishment, Renovation and Modernisation of SHP Stations, Techno-Economic Appraisal, R&D/Monitoring of Projects, Remote Sensing and GIS Based Applications. Technical support to over 25 different state and central government organizations for SHP development has been provided. IPPs and financial institutions are utilizing its expertise and support for their SHP development. HRED also worked on several projects related to the conservation and management of water bodies.



Department of Hydro and Renewable Energy, IIT Roorkee

Department of Mechanical and Industrial Engineering

The Department of Mechanical Engineering (MIED) came into being in the year 1946 and the first batch of Mechanical Engineers graduated in the year 1949. The department was renamed as Department of Mechanical & Industrial Engineering on its silver jubilee in 1974 when an undergraduate programme in Industrial Engineering was started. At present it offers both undergraduate and postgraduate courses in various facets of Mechanical and Industrial Engineering. The department offers Master of Technology courses in Machine Design Engineering, Production and Industrial Systems Engineering, Thermal System Engineering, Welding Engineering and CAD, CAM, and Robotics. The department has laboratory and workshop facilities with modern sophisticated equipment to conduct research in all areas related to Mechanical and Production & Industrial Engineering. The faculty actively participates in sponsored research and consultancy work.



Department of Mechanical and Industrial Engineering, IIT Roorkee

Organizing Committee



Prof. K. K. Pant
Director IITR, Patron



Prof. Arun Kumar
Symposium Chair



Prof. Bhupendra K. Gandhi
Symposium Co-Chair

MEMBERS



Prof. Sunil Kumar Singal



Prof. Krishna Mohan Singh



Prof. Chandra Shekhar Pant



Prof. Nikhil Kumar Singh



Prof. Hemant Jibhau Sagar



Prof. Himanshu Jain

SCHOLAR MEMBERS



Dr. Naman Arora



Dr. Firoz Khan



Mr. Bhushan R. Rode



Mr. Udit Batra

Committees for Different Activities

S. No.	Committee	Member
1.	Media & Publicity	1. Prof. Krishna Mohan Singh 2. Dr. Naman Arora 3. Shri Rohit Sahu
2.	Session Management	1. Prof. Chandra Shekhar Pant 2. Prof. Krishna Mohan Singh 3. Shri Manish Pipal
3.	Inaugural and Valedictory function	1. Prof. Nikhil Singh 2. Shri Rohit Rana
4.	Exhibition	1. Prof. Pratham Arora 2. Prof. Sunil Kumar Singal 3. Shri Upendra Bajpai
5.	Catering	1. Prof. Sunil Kumar Singal 2. Prof. Himanshu Jain 3. Shri Ravinder Singh 4. Shri Prashant Kumar
6.	Accommodation & Transportation	1. Dr. Naman Arora 2. Dr. Nitin Kumar Jhankal 3. Shri Ankit Kumar Gupta
7.	Cultural Programme	1. Prof. Himanshu Joshi
8.	Conference proceedings	1. Dr. Naman Arora 2. Shri Bhushan Ravindra Rode
9.	Banners/poster/signage	1. Dr. Arnab Mukherjee 2. Dr. Subodh Khullar 3. Dr. Sandeep Kumar
10.	Handling of VIPs	1. Prof. Rhythm Singh
11.	Hall management	1. Prof Hemant Jibhau Sagar 2. Shri Shubham Mallik
12.	Registration	1. Shri Udit Batra 2. Shri Rahul Vishwakarma 3. Shri Nitish Prasad
13.	Guest and key speakers handling	1. Prof. Ravita Lamba 2. Shri Omprakash Yadav
14.	Overall Coordination	1. Prof. Arun Kumar 2. Prof. Bhupendra Kumar Gandhi

Symposium Themes

1. Intake systems

This section covers the research topics related to the intake systems of a hydropower plant, including diversion structure, intake gate, trash rack, desilting structure, water conductor system, main inlet valve, surge tank, fatigue loading in penstock, hydraulic transient, etc.

2. Hydraulic turbines

This section covers all the components of hydraulic turbines, such as spiral casing, stay vane, guide vane, runner, labyrinth seals, and draft tube. The potential areas of interest are design and optimization, multidisciplinary design optimization, unsteady flow phenomena, performance prediction and enhancement, erosion and cavitation flow, etc.

3. Pump turbines

This section covers all topics related to a centrifugal pump, pump as turbines, reversible pump turbines, including its design, optimization, performance, cavitation, vibration, phenomena in pumping and turbine mode, etc.

4. Hydropower

This section covers topics related to sustainable development and challenges in the hydropower projects, including small hydropower, mini and micro-hydro, decentralized development, load flexibility, environmentally friendly turbine design, innovations in sustainable hydro, and energy-efficient application, etc.

5. Multiphase flow

This section covers topics related to two or more phases of flow study in the hydraulic machinery, including cavitation, erosion, aeration, synergic effect, etc.

6. Vortex breakdown

This section covers topics related to vortex breakdown in hydraulic machinery, including trailing edge vortex, leading-edge vortex, inter blade vortex, draft tube, etc.

7. Recent measurement techniques

This section covers topics related to recent measurement techniques used in hydropower plants, including efficiency, pressure, velocity, strain, and vibration. It also focuses on the measurement techniques of suspended sediment and hydro abrasive erosion in the hydraulic machinery.

8. Computational fluid dynamics (CFD)

This section covers topics related to numerical techniques used in hydraulic machinery. The potential area of interest is high-quality CFD simulations, development of numerical models, turbulence modeling, detached eddy simulations, large-eddy simulations, direct numerical simulations, etc.

9. Fluid-structure interaction and fatigue loading

This section covers experimental or numerical analysis topics, including fluid-solid interaction, vibration, resonance, damping, stress-strain measurement, crack development, estimating fatigue lifetime, finite element method, etc.

10. Ocean hydro machinery

This section covers wave energy, tidal energy, and marine current energy topics. It focuses on the ocean hydro types of machinery mainly used to convert the ocean hydropower into mechanical energy to generate electricity finally.

11. Energy storage and flexibility

This section covers topics related to hydropower energy storage, market, scheduling, energy management, transient operations such as load variation, start-stop, load rejection, no-load, runaway. Energy generation and management with multiple turbines, load sharing, ancillary services, load ramping are potential areas of interest.

12. General topics

This section invites the topics which are not covered in the above sections and are explicitly in the context of hydropower and hydraulic machinery e.g., recent manufacturing techniques for hydraulic turbines, refurbishment, life assessment, turbine testing, calibration method, prototyping, scaling, turbine blade material and metallurgy, data acquisition and data processing.

Keynote Speakers



Prof. Stefan Riedelbauch

Director

Institute of Fluid Mechanics and Hydraulic Machinery

University of Stuttgart, Germany

Prof. Stefan graduated in Mechanical Engineering at the Technical University of Munich, Germany in 1986. He then worked at the German Aerospace Center (DLR) in Goettingen on Hypersonic Aerodynamics and obtained his PhD at the Technical University of Munich in 1991. Between 1992 and 2010 he worked with Voith Hydro in Heidenheim, Germany and York, PA, USA and had been involved in different technical activities and positions with a focus on Hydro Power. Among those were numerical flow field simulation, turbine design for new plants and modernization including model testing, head of turbine product development and Chief Engineer of turbine and generator engineering. In 2010, he became full Professor and is currently Director of the Institute of Fluid Mechanics and Hydraulic Machinery at the University of Stuttgart, Germany.



Prof. Ole Gunnar Dahlhaug

Professor

Department of Energy and Process Engineering

Faculty of Engineering

Norwegian University of Science and Technology, Norway

Prof. Ole received his MSc in Mechanical Engineering in 1992, finished PhD from Norwegian University of Science and Technology in 1997, and received a Professorship in hydro turbine technology in 2005. He has been working with hydropower technology since 1992, and in addition to the work on Norwegian hydropower plants, he has worked on sediment erosion in hydropower plants in Nepal, Peru, and Chile. His expertise and competence are mainly in the fields of mechanical equipment in hydropower stations, efficiency measurements of prototype pumps and turbines, laboratory tests of pumps and turbines, centrifugal pump and reversible pump turbines, Francis and Pelton turbine design, sediment erosion in hydro turbines, fatigue loads in hydro turbines, maintenance of hydro turbines.



Prof. Chisachi Kato

Senior Researcher, Research Institute of Science and Technology
College of Science and Technology
Nihon University
Professor Emeritus, The University of Tokyo, Japan

Prof. Chisachi Kato is a senior researcher at the Research Institute of Science and Technology, College of Science and Technology, Nihon University. He specializes in fluid mechanics/engineering, computational and experimental fluid dynamics/aeroacoustics, turbomachinery, automobile engineering, and ship hydrodynamics. Upon graduation from the University of Tokyo in 1984, he joined and worked as a research engineer for about 15 years at the Mechanical Engineering Research Laboratory of Hitachi, Ltd. In 1995, he was conferred his doctoral degree in engineering from the University of Tokyo. In January 1999, he moved to the Institute of Industrial Science (IIS) at the University of Tokyo and was appointed as a professor in January 2003. He retired from the University of Tokyo in March 2024 and moved to the present position in April 2024. Prof. Kato has consecutively led many government-funded projects aimed at the development and diffusion of large-scale application software for use in related industries, which has resulted in more than 110,000 downloads of the developed software.

Prof. Kato has also served as the vice chair, the chair, and the president of many domestic as well as overseas academic societies. Recently, Prof. Kato served as the President of the High-Performance Computing Infrastructure Consortium from May 2018 to April 2020, the President of the Turbomachinery Society of Japan from May 2019 to April 2021, the President of the Japan Society of Mechanical Engineers from April 2022 to March 2023, the Chair of Asian Fluids Machinery Committee (AFMC) from September 2017 to December 2023, and the Vice Chair of the IHAR Hydraulic Machinery and Systems committee from September 2018 to present.



Prof. Pavel Rudolf

Head
Victor Kaplan Department of Fluid Engineering
Energy Institute
Faculty of Mechanical Engineering
Brno University of Technology, Czech

Prof. Pavel joined the Faculty of Mechanical Engineering, Kaplan Department of Fluid Engineering, Brno University of Technology as an assistant lecturer in the year 1999 and currently serving as an associate professor and head of Victor Kaplan Department of Fluid Engineering. He had been associated with the

Universität of Stuttgart, Institut für Hydraulische Maschinen und Strömungslehre, Technische Universität München, Politehnica Timisoara, and the University of Warwick. He is serving as a member of IAHR Hydraulic Machinery and Systems Committee, Czech pilot center ERCOFTAC (representative for FME BUT), and European society for mechanics EUROMECH.

Prof. Zhengwei Wang

Professor, Doctoral tutor

Department of Thermal Engineering, Tsinghua University,
China



Prof. Wang completed his masters in Hydraulic machinery at Department of Electric Powering Engineering, Huazhong University of Science & Technology in 1992 and finished his PhD in 1996 at Department of Hydropower Engineering, Tsinghua University. He started his career as a lecturer at Institute of Fluid Machinery and Fluid Engineering, Tsinghua University in 1996. Since 2007, he has been serving as a Professor, Doctoral tutor, Research team leader, and Director of Institute of Fluid Machinery and Fluid Engineering, Tsinghua University. His research areas include Multiphase transient flow theory and flow control of hydraulic machinery, Multi field coupling theory and basic research on engineering application of hydraulic machinery, and Research on intelligent and green informatization of hydraulic equipment and system. Prof. Wang's research team has developed a tidal generator set which has been successfully applied to Jiangxia tidal test power station with bidirectional turbines, pumps and discharge operation and also, they have developed and designed more than 80 sets of runners which operated efficiently and safely in many hydropower stations and pumping units.

Speakers From Hydropower Industry

1. Andritz Hydro Pvt. Ltd.



2. Voith Hydro Pvt. Ltd.



3. Jyoti Ltd.



4. Kirloskar Brothers Ltd.



Enriching Lives

KIRLOS KAR BROTHERS LIMITED

5. Flovel Energy Pvt. Ltd.



Symposium Program

Day 1: Sept. 11, 2024 (Wednesday)

Time (hrs)	Session	Particulars	Venue
0945 – 1030	Inaugural Session	Mr. Pankaj Agarwal, Secretary, Ministry of Power, Government of India – Chief Guest Prof. Kamal Kishore Pant, Director IIT Roorkee	APJA Kalam Block Room No. 103
1030 – 1100	High Tea		APJA Kalam Block Lawn
1100 – 1300	Plenary Session (PS1) Session Chair: Prof. Krishna Mohan Singh	Keynote Speaker: Prof. Stefan Riedelbauch, University of Stuttgart, Germany	APJA Kalam Block Room No. 103
		Keynote Speaker: Prof. Ole Gunnar Dahlhaug, NTNU, Norway	
		Address by Andritz Hydro	
		Address by Voith Hydro	
1300 – 1430	Lunch Break		Community Centre
Technical Session (TS1)			
1430 – 1630	Parallel Session Hydraulic Turbines Session Chair: Prof. Rahul Goyal	Paper ID: 128 Paper Title: Flow analysis and optimization study of main components of flow-type small hydro turbine system Presenting Author: Seong-Han Bae	APJA Kalam Block Room No. 102
		Paper ID: 20 Paper Title: Effects of load reduction on forces and moments on the runner blades of a Kaplan turbine model Presenting Author: Martina Nobilo	
		Paper ID: 21 Paper Title: Analysis of the flow discharge and losses from an eroded bucket on the Pelton turbine Presenting Author: Jim Abregu	
		Paper ID: 24 Paper Title: Numerical study of nozzle erosion and its cascading impact on jet quality Presenting Author: Arun Pandey	
		Paper ID: 25 Paper Title: Practical evaluation method for oil level height in turbine self-lubricated guide bearing Presenting Author: Gaku Nara	
	Parallel Session Pump Turbines Session Chair: Dr. Ali Abbas	Paper ID: 2 Paper Title: Behaviour of cavitation characteristics for different vane leading edge profiles of radial flow pump impeller Presenting Author: Christopher Stephen	APJA Kalam Block Room No. 103
		Paper ID: 144 Paper Title: Investigating the Impact of Stagger Angle on Double Suction Pump Performance through Computational Fluid Dynamics Presenting Author: Arihant Sonawat	
		Paper ID: 11 Paper Title: Pump start instability on a low head pump turbine and testing with partial deaeration Presenting Author: Bernd Nennemann	
		Paper ID: 23 Paper Title: Experimental investigation of a FSFC variable speed pump-turbine prototype - Part1: penstock fatigue reduction and fast active power regulation Presenting Author: Christophe Nicolet	
		Paper ID: 29 Paper Title: Influence of pump turbine impeller blade angles on the unsteady flow phenomena and “S-Curve” characteristics region Presenting Author: Shrestha Ujjwal	
	Parallel Session	Paper ID: 113 Paper Title: Preliminary design of adjustable Guide Vanes for PaTs in Pumped storage applications Presenting Author: Domenico Filannino	APJA Kalam Block
	Parallel Session	Paper ID: 63 Paper Title: Experimental facility dedicated to detection and prediction of penstock fatigue induced by pressure oscillations Presenting Author: Vlad Hasmatuchi	

Time (hrs)	Session	Particulars		Venue	
	Fluid Structure Interaction & Fatigue Loading	84	Evaluation of the fatigue-related influence of start-ups on Pelton turbines based on reduced scale model stress measurements	Aldo Leonardo Alerci	Room No. 104
	Session Chair: Prof. Ole Gunnar Dahlhaug	86	Numerical prediction of the fluid damping of a standing disc with a variable axial distance from a rigid wall	Karim Khalfaoui	
		117	Advancing the Reliability of Residual Life Assessment for Turbines through Strain Gauge Measurements: Key Aspects and Latest Developments	Florian von Locquenghien	
		136	On the modelling of the fatigue-induced damage in Francis turbines start-up sequences	Elena Vagnoni	
		102	Mechanism Analysis of the Abnormal Tailrace Emergency Gate Vibration of a High-Head Pumped Storage Power Station Operating in Pump Mode	Song Xue	
1630 – 1700	Tea Break			APJA Kalam Block Lawn	
Technical Session (TS2)					
1700 – 1830	Parallel Session Hydraulic Turbines Session Chair: Prof. Nikhil Kumar Singh	26	Chain-reaction collapse of cavitation clouds in Francis turbine runner during start-up	Takero Mukai	APJA Kalam Block Room No. 102
		36	Assessment of Wear-Resistance in Hydro Turbine Steel: The Impact of Sediment Erosion on a Metal-Ceramic Coating	Ashwin Pandey	
		51	Mitigation of vibrations caused by inter-blade vortices using a pumping cap for natural aeration	Samer Afara	
		116	Influence of labyrinth clearance on the hydrodynamic performance of a high head Francis turbine	Md. Mustafa Kamal	
		150	Empirical relationship with experimental model test results on change of blade number of Kaplan turbine on flow and efficiency characteristics	Mukesh Mangla	
	Parallel Session Pump Turbines Session Chair: Prof. Chisachi Kato	80	Increasing grid flexibility – Implementation and testing of improved start and mode change procedures in a PSPP with double-fed induction machines and reversible pump-turbine	Alexander Jung	APJA Kalam Block Room No. 103
		89	Numerical analysis and runner shape optimization of a high head pump-turbine	Denis Chirkov	
		138	Numerical study of pressure fluctuation in vaneless space of variable speed reversible pump-turbine in turbine mode at maximal head	Bhushan Ravindra Rode	
		64	Experimental investigation of a FSFC variable speed pump-turbine prototype – Part2: runner fatigue reduction	Daniel Biner	
		97	Estimate of the radial unsteady forces acting on a cavitating inducers from casing pressure measurements	Eddy Terrasse	
	Parallel Session Hydropower Session Chair: Prof. Alexander Presas	154	Effect of wrap angle on performance of Pump as Turbine (PAT) in both pump and turbine modes	Anant Rai	APJA Kalam Block Room No. 104
		46	A machine learning based analysis of bearing vibrations for predictive maintenance in a hydropower plant	Hakan Nilsson	
		140	Transient analysis of water conductor systems in a hydropower plant	Firoz Khan	
		3	Transient vibration characteristics and vibration control of coupled unit-plant structure for pumped storage station	Jinjian Zhang	
	1830 onwards	IAHR Executive Committee Meeting			

Day 2: Sept. 12, 2024 (Thursday)

Time (hrs)	Session	Particulars			Venue
0900 – 1030	Plenary Session (PS2) Session Chair: Martin Rentschler	Keynote Speaker: Prof. Chisachi Kato, The University of Tokyo, Japan Topic: Industrial applications of wall-resolving Large Eddy Simulation to turbomachinery- present status and future perspectives			APJA Kalam Block Room No. 103
		Keynote Speaker: Prof. Pavel Rudolf, Brno University of Technology, Czech Republic Topic: Exploring cavitation in swirling flows: insights from experiments and simulations			
		Address by Jyoti Ltd.			
1030 – 1100	High Tea				APJA Kalam Block Lawn
Technical Session (TS3)					
1100 – 1300	Parallel Session Hydraulic Turbines Session Chair: Prof. Elena Vagnoni	Paper ID	Paper Title	Presenting Author	APJA Kalam Block Room No. 103
		61	Investigations on various hardcoating technologies	Reiner Mack	
		69	Signature investigation of misaligned jet in Pelton turbines due to flow obstruction in nozzle	Sailesh Chitrakar	
		75	On the effect of flow rate on pressure fluctuations and cavitation characteristics in a novel bulb turbine	Sonal Shandilya	
		153	A Comparative Analysis of CFD Methodologies to Predict the Performance of Francis Turbine	Arnab Mukherjee	
		77	Numerical study of flow phenomena and erosion in three guide vane cascade rig	Kushal Shrestha	
	Parallel Session Pump Turbines Session Chair: Dr. Christophe Nicolet	41	Numerical study of hydraulic excitation modes caused by rotor-stator interaction of a runner with splitters	ZiWu Guan	APJA Kalam Block Room No. 104
		101	Analysis of pump model pressure fluctuation characteristics under different rotation speeds of a Francis pump-turbine	Xiao Yexiang	
		71	The effects of flow rate on the performance of centrifugal pump as turbine based on entropy production theory	Yunqi Liu	
		72	Study on optimization design of pump turbine with high head based on CFD technique	Yang Zheng	
	Parallel Session Energy Storage & Flexibility Session Chair: Prof. Sunil Kumar Singal	33	Analysis of mode-switching of a contra-rotating pump-turbine based on load gradient limiting shutdown and startup sequences	Jonathan Fahlbeck	APJA Kalam Block Room No. 102
		79	Increasing grid flexibility through ancillary services – Results of Virtual Inertia and Fast Frequency Response tests in a PSPP with double-fed induction machines	Alexander Jung	
		82	An innovative approach to PID governor upgrade for reaching SFC regulation stability	Damir Dolenc	
		83	Transfer and Measurement of Power Plant Transients on a High-Performance Closed-Loop Test Rig	Christoph Geiger	
1300 – 1430	Lunch Break				Community Centre
Technical Session (TS4)					
1430 – 1630	Parallel Session	Paper ID	Paper Title	Presenting Author	APJA Kalam Block
		81	Numerical investigation for intake and discharge conditions of horizontal multi-jet Pelton turbines	Peter Mössinger	

Time (hrs)	Session	Particulars		Author	Venue
1700 – 1830	Hydraulic Turbines Session Chair: Prof. Hemant Jibhau Sagar	93	Innovative Approaches to Hydraulic Turbine Advanced Condition Monitoring	David Valentin	Room No. 103
		96	Multidisciplinary optimization of an axial turbine	Stefan Fraas	
		98	Comparison of discharge characteristics of Pelton injector estimated by empirical relation, numerical simulation and experiment	Sajan Shrestha	
		143	Broad spectrum quality assessment of flow numerical simulations in Pelton turbine runners	Martin Rentschler	
	Parallel Session CFD Session Chair: Prof. Ilie-Alin Bosioc	15	CFD Simulation of the startup of a pump-turbine with investigation of the usage of a porous domain for modelling very small guide vane angles	Marco Zorn	APJA Kalam Block Room No. 104
		16	Parallel performance evaluation of the island model for optimizing a diffuser augmented kinetic turbine	Alexander Tismer	
		32	1D-3D co-simulation pipe resonance induced by cavitating vortex shedding	Sébastien Alligne	
		104	Large Eddy Simulation Analysis of Francis Turbine: A Comparison with Experimental Data and Investigation of Vortex Rope Dynamics in the Draft Tube	Soufiane Ramdani	
		126	Mitigation of High Load Flow Instabilities using Axial Water Jet Injection in Francis Turbines	Subodh Khullar	
		129	Numerical study on the optimal design of straight-through labyrinth seals for minimum leakage loss of Francis turbine	Mamata Rijal	
		141	Computational Fluid Dynamics Based Transient Investigation of The Penstock in A Hydropower Plant	Firoz Khan	
	Parallel Session Multiphase Flow Session Chair: Prof. Hari Prasad Neopane	37	A Computational Study Using a Hybrid RANS-LES Turbulence Model for Cavitation Analysis in a High-Pressure Francis Turbine Guide Vane	Pallav Sahu	APJA Kalam Block Room No. 102
		146	Investigating the effect of operating time duration on the erosion in Pelton turbine	Naman Arora	
		67	Streamline rotodynamic pump model for two-phases flow simulations	Simon Martel	
		78	Pelton turbine needle eccentricity leading to asymmetric hydro-abrasive erosion	Navam Shrivastava	
		119	Numerical Study of Sediment Erosion of a Francis Turbine with change in guide vane design	Rohit Kumar Sahu	
		149	Numerical Analysis of Cavitation Characteristics of Francis Turbine at Different Runner Blade Numbers	Prashant Kumar	
	1630 – 1700	Tea Break			APJA Kalam Block Lawn
	Technical Session (TS5)				
1700 – 1830	Parallel Session Hydraulic Turbines Session Chair: Prof. Dhiman Chatterjee	Paper ID	Paper Title	Presenting Author	APJA Kalam Block Room No. 103
		120	Combined Water and Air Injection in Francis Turbine Draft Tube	Sandeep Kumar	
		123	Design of Guide Vane Cascade Test Rig and Numerical Analysis of Flow Field	Rohit Kumar Sahu	
		142	Experimental Investigations of Sediment Erosion in Guide Vanes of Francis Turbine	Ravi Poudel	
	147	Diagnosis of the unstable behaviour of a Kaplan turbine before synchronizing to the grid	Greco Alonso Moraga González		
	Parallel Session Pump Turbines	38	Influence of superhydrophobic surface on the performance of a pump-turbine in pump mode	Zhiyi Yuan	APJA Kalam Block Room No. 104
		94	Analysis the pump model cavitation with small guide vane	Xiao Yexiang	

Time (hrs)	Session	Particulars		Venue
	Session Chair: Prof. Vlad Hasmatuchi		opening of pump-turbine	Pengcheng Zhang
		106	Flow patterns and fatigue damage during the turbine start-up process of a DFIM variable-speed pump-turbine	
	Parallel Session Vortex Breakdown	30	A parametric study of axial flow jets for mitigation of vortex rope instabilities	Saeed Salehi
		35	CFD simulation and validation of a load rejection procedure in a high head Francis turbine using OpenFOAM software	Faiz Azhar Masoodi
	Session Chair: Prof. C S Pant	135	The influence of the free runners on the decelerated swirling flow from the draft tube cone of hydraulic turbines.	Alin Bosioc
				APJA Kalam Block Room No. 102

Day 3: Sept. 13, 2024 (Friday)

Time (hrs)	Session	Particulars		Venue	
0900 – 1030	Plenary Session (PS3)	Keynote Speaker: Prof. Zhengwei Wang, Tsinghua University, China Topic:		APJA Kalam Block Room No. 103	
	Session Chair: Prof. Hakan Nilsson	Address by Kirloskar Brothers Ltd.			
		Address by FLOVEL Energy Pvt. Ltd.			
1030 – 1100		High Tea		APJA Kalam Block Lawn	
Technical Session (TS6)					
1100 – 1300	Parallel Session Hydraulic Turbines Session Chair: Mr. Bernd Nennemann	Paper ID	Paper Title	Presenting Author	APJA Kalam Block Room No. 103
		110	Exploring the Optimal Design of Hydraulic Characteristics of Pelton Turbine Nozzle	Yunfa Lin	
		127	Experimental and Numerical Investigation of Hydraulic Axial Thrust Fluctuation due to Draft Tube Vortex at partial load on Francis turbine	Yuta Tamura	
		130	Measurement of runner vibrations in a Francis turbine model from the casing with different sensors	Monica Egusquiza	
	Parallel Session Recent Measurement Techniques Session Chair: Prof. Anant K. Rai	60	Developing a customized laboratory setup to assess sensors for real-time suspended sediment monitoring	Carolin Friz	APJA Kalam Block Room No. 102
		148	Measuring mode shapes of Kaplan runners using optical sensors placed on the stationary frame	Greco Alonso Moraga González	
		10	CFD - Tool for choosing a suitable flow measurement methods	Jiri Soucek	
	Parallel Session Multiphase Flows Session Chair: Mr. Florian von Locquenghien	151	Simulation of Unsteady Cavitation Around a Circular Leading-Edge Hydrofoil by Using MSST PANS	Diana Puga	APJA Kalam Block Room No. 104
		56	Numerical Analysis of Cavitation Effects in Low-Head, Medium-Specific Francis Turbines for Small Hydroelectric Power Plants	Pankaj Kumar Gohil	
		112	Cavitation induced gate vibration and elimination in a sediment flushing deep tunnel of dam	Haolin Tian	
1300 – 1430		Lunch Break		Community Centre	
Technical Session (TS7)					

Time (hrs)	Session	Particulars		Venue	
		Paper ID	Paper Title	Presenting Author	
1430 – 1630	Parallel Session Hydraulic Turbines Session Chair: Prof. Alexander Tismer	54	Influence of cavitation simulation on Pelton turbine bucket performance	Xiao Yexiang	APJA Kalam Block Room No. 103
		53	Stay vane cracks induced by von Karman vortices for a Francis turbine	Qinghua Shi	
		99	Analysis of the flow interference on a Pelton turbine at different operating heads	Xiao Yexiang	
		4	Vibration control of hydraulic generating set with rub-impact based on MRD optimized arrangement	Liang Nie	
	Parallel Session Energy Storage & Flexibility Session Chair: Prof. David Stefan	14	Water hammer control of pumped-storage power plant with two units under hydraulic short circuit operation	Zilong Cui	APJA Kalam Block Room No. 104
		17	Multi-scale oscillation of pumped storage - wind power coupling system with surge tanks	Jiening Li	
		92	Experimental Investigations of Overpressure Values during Load Rejection in several Hydraulic Passages of Hydropower Plants Equipped with Kaplan Turbines	Sorin-Ioan Lupa	
	Parallel Session General Topics Session Chair: Prof. Sailesh Chitrakar	59	Assessment of the distributor layout influence on the vortical flow within the hydraulic turbine	David Stefan	APJA Kalam Block Room No. 102
		76	Assessment of Synergistic Cavitation and Silt Erosion Performance of Hydroturbine Steel	Durga Pechetti	
		87	Onsite performance testing of Archimedes hydropower screw for low head and ultra-low head hydro power project– A case study	Deepak S Pillai	
		121	Impact of Aerofoil Shapes on the Performance of Darrieus Vertical Axis Turbines: A Computational Study for Offshore Wind and Hydro Applications	Shubham Sharma	
		6	On the Generation of Vortical Flow Structures in Pipes with Multifurcations	Bernhard Semlitsch	
1630 – 1700	Tea Break			APJA Kalam Block Lawn	
1700 – 1830	Valedictory Session			APJA Kalam Block Room No. 103	

For any assistance:

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KIH : Intra 4100 and from Mobile +91 1332 284100
TOH : Intra 4014 and from Mobile +91 1332 284014
Community Centre : Intra 6740 and from Mobile +91 1332 286740

IIT Roorkee Important Services Telephone Numbers			
	Institute Services	Dialling from :	
		Campus Network	* Other Networks
1	Security Control Room	200, 201	1311, 1181
2	Hospital Emergency	202	4260
3	Fire & Safety	203	4026
4	Centralised Complaint Management	222	4789
5	Telephone Assistance & Complaints	205	5555
* Other Networks: DIRECT INWARD DIALLING: +91-1332-28XXXX (FOR IITR EXTN. NO. XXXX)			

NOTES

Nearby Restaurants and Cafes

[Aroma Restaurant and Catering](#)

3rd Floor Multi Activity Centre (MAC), IIT Roorkee



[Tamarind Multi Cuisine Restaurant](#)

Prem Mandir Road



[Café Coffee Day \(CCD\)](#)

Ground Floor Multi Activity Centre (MAC), IIT Roorkee



[Desi Tadka Restaurant](#)

Haridwar Road



[Rustic House \(with Bar\)](#)

Near Gate No. 5



[Hotel Center Point and Restaurant](#)

Near Centenary Gate (Gate No. 2),
(Towards Boat Club – IIT Roorkee)



[Olive Multi Cuisine Restaurant](#)

Near Gate No. 5



[The White Rabbit \(with Bar\)](#)

Boat Club Road



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