

# Bath Symposium on Fluid Power and Motion Control FPMC 2026

16<sup>th</sup> – 18<sup>th</sup> September 2026

## Programme in brief

### Wednesday 16<sup>th</sup> September

- 09:10 – 10:45 **Session 1: AI, Digital Twins and Smart Technology**
- 11:10 – 12:45 **Session 2: Condition Monitoring and Fault Diagnosis**
- 13:55 – 15:15 **Session 3: Digital Hydraulics**
- 15:40 – 17:15 **Session 4: Electrohydraulic Control**

### Thursday 17<sup>th</sup> September

- 08:55 – 10:30 **Session 5: Modelling and Simulation**
- 10:55 – 12:30 **Session 6: Noise, Vibration and Sensors**
- 12:45 – 13:45 **ASME FPST Executive Committee meeting**
- 14:00 – 15:15 **Koski Lecture**
- 15:40 – 17:15 **Session 7: Sealing and Tribology**
- 19:00 – 22:30 **Dinner and Awards Ceremony at Roman Baths and Pump Room, Bath**

### Friday 18<sup>th</sup> September

- 08:55 – 10:15 **Session 8: Novel Valves and Actuators**
- 10:40 – 12:15 **Session 9: Pumps and Motors**
- 13:25 – 14:45 **Session 10: Pneumatics, Hydrogen and Alternative Fluids**
- 15:10 – 16:45 **Session 11: Novel and Efficient Systems**



**Technical Sessions (Details may be subject to change)**  
**Wednesday 16<sup>th</sup> September**

**09:10 – 10:45 Session 1: AI, Digital Twins and Smart Technology**

- 09:15 Johannes Sprink, Bernhard Sender, Till Waldermann and Katharina Schmitz, *Evaluating Training Method Transferability for Sensor-Based Work Cycle Classification in Hydraulic Excavators*
- 09:30 Junyi Cao and Xin Li, *Theoretical and Experimental Study of a Novel Suction Unit in a Wall-Climbing Robot*
- 09:45 Xuan Wang, Junhui Zhang, Xiaolong Zhang, Xuguang Li, Fei Lyu and Bing Xu, *A Physics-Informed Neural Network–Based Soft Measurement Method for Flow Rate Estimation of an Electric Fuel Pump* Xu, B.
- 10:00 Tobias Schulze, Vladimir Boyko and Jürgen Weber, *Energy Monitoring for Fluid Power Systems using the Asset Administration Shell*
- 10:15 Guohua Sun, Jinyuan Liu, Huaizhi Zong and Ruqi Ding, *Precision Motion Control of Hydraulic Manipulator Via Hybrid Attention TDNN Framework*
- 10:30 Discussion

**10:40 – 12:15 Session 2: Condition Monitoring and Fault Diagnosis**

- 10:45 Terkil Bak-Jensen, Lasse Schmidt and Henrik Pedersen, *Decomposition of Pressure Measurement Signals in Variable-Speed Electro-Hydraulic Drives*
- 11:00 Lukas Boden, Fabian Blatter, Marcus Geimer and Katharina Schmitz, *Quantitative Assessment of Fatigue Crack Growth under Cyclic Internal Pressure Loading by Combined Strain Analysis and Numerical Simulation*
- 11:15 Yanbin Zhao, Yijie Lu, Jian Hu, Hao Liu, Bo Yang and Xiaoping Ouyang, *Health Diagnostic Method for Piston Pumps Based on Best Two-Point Features*
- 11:30 Mohit Bhola, Gyan Wrata, Diego Chamorro and Henrik Pedersen, *Structural Analysis for Fault Diagnosis of Hydraulic Accumulator Circuitry for Wind Turbine Pitch System*
- 11:45 Gyan Wrata, Mohit Bhola, Benedikte Petersen, Diego Chamorro and Henrik Pedersen, *From SCADA Signals to Fault Diagnosis: Comparing Classification Algorithms for Cylinder Leakage Detection*
- 12:00 Discussion

**13:55 – 15:15 Session 3: Digital Hydraulics**

- 14:00 Shinobu Nagura, Yuta Yanagida and Kazushi Sanada, *A Study on the Application of Digital-Hydraulic Pressure Reducing Circuit to Pilot-Pressure Supply Circuit for Construction Machinery*
- 14:15 Lucas Thura, Eric Bideaux, Sylvie Sesmat and Jean-François Tréguouët, *Multivariable control of a switched inertance HBBC*
- 14:30 Travis Wiens, *Model Based Pressure Control of Digital Displacement Pumps*
- 14:45 Daniil Dumnov, Jonathan Melling, Nigel Johnston, Andrew Plummer and Nathan Sell, *Control of Digital Displacement Pumps with Part-Stroke Modulation*
- 15:00 Discussion

**15:40 – 17:15 Session 4: Electrohydraulic Control**

- 15:45 YiXiang Zhang, Yanbin Zhao, Xinling Chen, Bo Yang, Fengqi Zhou, Hao Liu and Xiaoping Ouyang, *Position Control of Bandwidth-Constrained Electro-hydrostatic Actuators via Exact Discretization and Model Predictive Controllers*
- 16:00 Zhongpeng Cao, Yonggang Lin, Danyang Li and Bowen Chen, *Neural network adaptive sliding mode pose tracking control strategy for wind turbine drivetrain test bench*
- 16:15 Ruiheng Jia, Weidi Huang, Junhui Zhang and Bing Xu, *Three-time-scale Composite Motion Controller of Large-scale Flexible Hydraulic Manipulator*
- 16:30 Grégory Tardy, Eric Bideaux, Christophe Gostomski and Olivier Tartavel, *Optimal individual-metering control applied to a compact-excavator*
- 16:45 Cao Chen, Xingbang Zhao and Yanyan Zhan, *Coupled Modeling and Multi-Channel Velocity-Feedforward Decoupling Control for Normal-Force Tracking of Divergent Flaps in a Two-Dimensional Thrust-Vectoring Nozzle*
- 17:00 Discussion

## Thursday 17<sup>th</sup> September

### **08:55 – 10:30 Session 5: Modelling and Simulation**

- 09:00 Ziquan Guo, Yuxi Chen and Hua Zhou, *Design and Reliability Study of the Crankshaft for a 280MPa Ultra-High Pressure Reciprocating Water Pump: A Transient FEA Method Using the Rigid-Soft Coupling Dynamics Model*
- 09:15 Bernhard Sender, Victor Isenberg, Johannes Sprink and Katharina Schmitz, *Operator effect on the efficiency of a wheeled excavator*
- 09:30 Bernhard Manhartgruber, *A holistic finite difference approach for elasto-hydrodynamics of piston-bore interfaces*
- 09:45 Hauke Lerche, Tobias Radermacher and Jürgen Weber, *Online Identification of Effective Bulk Modulus in Electrohydraulic Actuators*
- 10:00 Hui Yang, Jing Yao, Ya Jin, Yujia Zhang, Yuanzhi Xu and Xiaofei Wan, *Research on Digital Twin Model Construction for the Aircraft Hydraulic Pipelines*
- 10:15 Discussion

### **10:55 – 12:30 Session 6: Noise, Vibration and Sensors**

- 11:00 Oriol Gomez, Pedro Javier Gamez-Montero, Miquel Torrent and Juanjo Perez, *Experimental study of noise source and flow ripple interrelation in external gear pumps*
- 11:15 Gudrun Mikota, Bernhard Manhartgruber and David Holzer, *The hydraulic damping effect of torsional damping in the pump drivetrain*
- 11:30 Jonathan Melling, Daniil Dumnov, Nigel Johnston and Nathan Sell, *Flow Ripple Characteristics of a Digital Displacement® Pump*
- 11:45 Kevin Bauer, Simon Knoll, Svenja Horn and Jürgen Weber, *A low-cost vibration measurement device for condition monitoring of axial piston pumps: design trade-offs, validation, and cost potential*
- 12:00 Michael Lenz, Luqi Xiang, Jürgen Weber and Mathias Rauschenberger, *Pump flow pulsation measurement applying the virtual flow soft sensor*
- 12:15 Discussion

### **14:00 – 15:15 Koski Lecture**

Presenter and Koski Medal winner: Katharina Schmitz

### **15:40 – 17:15 Session 7: Sealing and Tribology**

- 15:45 Senlei Wu, Chenhao Guo, Hao Liu and Xiaoping Ouyang, *Coupled Creep and Wear Effects on Sealing Performance of Novel PLUS Seals*
- 16:00 Yuhan Song, Julian Angerhausen and Katharina Schmitz, *Load-dependent formation of grain microstructures and influence on wear resistance in hydraulic friction pair*
- 16:15 Jianxiong Wu, Junhui Zhang, Bing Xu and Chao Zhang, *High-temperature tribological behavior and wear mechanism of copper-based friction disc for wet brake in hydraulic motor*
- 16:30 Yangtao Xing, Fugang Zhai, Zhiqiang He, Xiaonan Wang and Runyuan Zhao, *A Transient Lubrication Model and Oil Film Flow Characteristics of Radial Lip Seals under Coupled Dynamic Eccentricity and High Rotational Speed*
- 16:45 Roman Ivantysyn, Tobias Radermacher and Jürgen Weber, *High-Speed Hydraulics for Electrified Machines: Tribological Limit Testing and Component Optimization of Axial Piston Pumps*
- 17:00 Discussion

## Friday 18<sup>th</sup> September

### **08:55 – 10:15 Session 8: Novel Valves and Actuators**

- 09:00 Timo Rothhardt and Katharina Schmitz, *Holistic Analysis of Geometric Parameters in 2/2 Directional Poppet Valves Using Design of Experiments: Effects on Pressure Drop and Flow Force*
- 09:15 James Gallentine and Eric Barth, *High-Pressure, Variable Stiffness, Fluid-Agnostic, Fabric Reinforced Inverse Artificial Muscles (FRIAMs)*
- 09:30 Marco Del Giudice, Andrea De Martin, Roberto Guida, Massimo Sorli and Giovanni Jacazio, *A machine learning approach to improve the cutting process of spools for proportional control valves*
- 09:45 Kresten Atkins and Jim Van de Ven, *Use of McKibben Actuators as Pumping Elements for Wave Energy Converters*
- 10:00 Discussion

### **10:40 – 12:15 Session 9: Pumps and Motors**

- 10:45 Quan Zhang, Le Xu and Hua Zhou, *Effects of Gear Ring-Housing Clearance on Oil Film Deformation and Leakage in Straight Conjugate Internal Gear Pumps: A Coupled Fluid-Thermal-Structural Simulation*
- 11:00 Shengnan, Li., Zhao Chunxiao, Bin Zhang, Hong Haocen, Nan Xu, Haoran Wan and Yang Huayong, *Dynamic Characteristics and Performance Optimization of a Constant-Pressure Variable-Displacement Axial Piston Pump*
- 11:15 Peter Achten, Robin Mommers, Sef Achten, Jeroen Potma and Jasper Achten, *The design and performance of the FCT45 hydraulic transformer*
- 11:30 Xianhui Zhou, Kun Wang, Huijuan Su, Changhong Feng and Yujiang Qiu, *Behavior of Fluid-Induced Excitations on the External Rotor of a Small-Scale Electronic Liquid-Cooled Pump*
- 11:45 Kailash Choudhary, Ajinkya Pawar, Andrea Vacca, Di Domenico Sabrina and Manuel Rigosi, *Numerical and Experimental Investigation of Micromotions in Helical External Gear Machines*
- 12:00 Discussion

### **13:25 – 14:45 Session 10: Pneumatics, Hydrogen and Alternative Fluids**

- 13:30 Lassi Puolakka and Matti Linjama, *Derivative-Free Coolant Flow Distribution Solver for Thermal Management Systems*
- 13:45 Michal Kaliszuk, *Modeling and experimental validation of transient pressure characteristics in vehicle pneumatic brake systems during release*
- 14:00 Francesco Sciatti, Vincenzo Di Domenico, Paolo Tamburrano, Elia Distaso and Riccardo Amirante, *CFD Investigation of a Convergent–Divergent Nozzle Metering Valve for Hydrogen-Powered Aircraft Fuel Systems*
- 14:15 Dami Adeyemi, Andrew Plummer, Nathan Sell and Alireza Ebrahimi, *Fuel System Modelling and Flow Control for Hydrogen-Powered Aircraft*
- 14:30 Discussion

### **15:10 – 16:45 Session 11: Novel and Efficient Systems**

- 15:15 Alice Betti, Andrea Fornaciari, Barbara Zardin and Massimo Borghi, *Application of Linear System Analysis to Support Design Optimization of an Electro-Hydraulic Compensator for a Variable Displacement Axial Piston Pump*
- 15:30 Zhuang Xiong, Haoyi Jiang, Zhenfei Ling, Hao Liu and Xiaoping Ouyang, *Simulation and Experimental Study of a Novel Accumulator-Driven High-Speed Hydraulic Impact System*
- 15:45 Jikun Ai, Huaizhi Zong, Yuanchun Luo, Junhui Zhang and Bing Xu, *Optimization and Design of a High-Torque-Density Electro-Hydrostatic Rotary Actuator(EHRA) for Robotic Joints*
- 16:00 Ravi Sah, Mahmud Ibrahim and Perry Li, *Implementing the Hybrid Hydraulic Electric Architecture (HHEA) on an Electrified Compact Track Loader*
- 16:15 Zhixin Yan, Lianpeng Xia, Weinan Huang, Jinyuan Cui and Long Quan, *Research on the Configuration and Characteristics of High Energy Efficiency Operation System for Medium and Large sized Hydraulic Excavators*
- 16:30 Discussion

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**FPMC 2026, 16<sup>th</sup> – 18<sup>th</sup> September 2026**  
**University of Bath**

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## **FPMC 2026 Organisers**

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Andrew Plummer, *University of Bath*

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Nigel Johnston, *University of Bath*

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Will Harrison, *University of Bath*

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