

CONFERENCE ROOM 1

CONFERENCE ROOM 2

CONFERENCE ROOM 3

9:00  
a.m.

WELCOME & OPENING ADDRESS

9:10  
a.m.

Materials



Chair: Gordon Mohn

A-1 Challenges for novel lead free alloys in hydraulics  
Björn Reetz, Otto Fuchs KG, Germany

A-2 Researches on waterhydraulic motor  
Franc Majdič, University of Ljubljana, Faculty  
of mechanical engineering, Slovenia

A-3 Orifices flow saturation in oil hydraulic  
applications  
Pietro Marani, CNR IMAMOTER, Italy

System design & integration



Chair: Oliver Koch

B-1 Frequency based efficiency evaluation – From  
pattern recognition via backwards simulation to  
purposeful drive design  
Martin Starke, TU Dresden, IMD, Germany

B-2 Optimization of operation strategy for primary  
torque based hydrostatic drivetrain using  
artificial intelligence  
Yusheng Xiang, Karlsruhe Institute of  
Technology, Germany

B-3 Hardware-in-the-loop simulation of hybrid  
hydromechanical transmissions  
Viktor Larsson, Linköping University, Sweden

Novel system solutions



Chair: Dr.-Ing. Mark Krieg

C-1 A closed circuit electro-hydraulic actuator with  
energy recuperation capability  
Shaoyang Qu, Purdue University, USA

C-2 Energy analysis of novel zonal two-cylinder  
actuation system for heavy loads  
Tatiana Minav, Tampere University, Finland

C-3 Experimental evaluation of an electro-  
hydrostatic actuator for subsea applications  
in a hyperbaric chamber  
Amadeu Placido Neto, Bosch Rexroth AG,  
Germany

10:30  
a.m.

BREAK

11:00  
a.m.

## Additive manufacturing



Chair: Dr.-Ing. Alexander Leonhard

- D-1 Tribological investigations on additively manufactured surfaces using Extreme High-Speed Laser Material Deposition (EHLA) and Laser Powder Bed Fusion (LPBF)  
Achill Holzer, RWTH Aachen, IFAS, Germany
- D-2 Assessment of frictional losses to horizontally oriented fluid passages fabricated using additive manufacturing  
Yi Zhu, Zhejiang University, China
- D-3 Design and experimental investigation of an additive manufactured compact drive  
Gunnar Matthiesen, RWTH Aachen, IFAS, Germany
- D-4 Additive manufacturing of hydraulic manifolds- An holistic approach across the entire value chain  
Bastian Beckmann, Bosch Rexroth AG, Germany

## Components



Chair: Dr.-Ing. Axel Müller

- E-1 Functional proof of a flat slide valve as a 4/3-way proportional valve  
Stefan Aengenheister, RWTH Aachen, IFAS, Germany
- E-2 Control concept for a grease lubricated hydrostatic bearing  
Igor Mass, Hochschule Niederrhein, Germany
- E-3 Foam accumulators: packaging and weight reduction for mobile applications  
Manuel Rexer, TU Darmstadt, Germany
- E-4 One dimensional unsteady model of a hydro-pneumatic piston accumulator based on Finite Volume Method  
Filipp Kratschun, RWTH Aachen, IFAS, Germany

## Intelligent control



Chair: Prof. Dr.-Ing. Welf-Guntram Drossel

- F-1 Simulation of an interlocking hydraulic direct-drive system for a biped walking robot  
Juri Shimizu, Waseda University and Hitachi Ltd., Japan
- F-2 Nonlinear force tracking control of electrohydrostatic actuators submitted to motion disturbances  
Tahereh Vaezi, Université de Lyon, INSA de Lyon, France
- F-3 Multidimensional flow mapping in proportional seat valves  
André Sitte, TU Dresden, LFD, Germany
- F-4 Multi-objective control of a self-locking compact electro-hydraulic cylinder drive  
Nikolaj Grønkrær, Aalborg University, Denmark

12:45  
a.m.

LUNCH

CONFERENCE ROOM 1

CONFERENCE ROOM 2

CONFERENCE ROOM 3

1:45  
p.m.

Fluids



Chair: Prof. Dr.-Ing. Katharina Schmitz

- G-1 Numerical prediction and experimental investigation of cavitation erosion of hydraulic components using HFC  
Atena Moosavi, TU Dresden, LFD, Germany
- G-2 Practical aspects when using ionic liquids as hydraulic fluid  
Darko Lovrec, University of Maribor, Slovenia
- G-3 Method for the experimental determination of the diffusion coefficient of air in hydraulic fluids  
Andris Rambaks, RWTH Aachen, IFAS, Germany
- G-4 Optimizing hydraulic reservoirs using Euler-Euler-Lagrange multiphase CFD simulation  
Lukas Muttenthaler, Johannes Kepler University and Engel Austria GmbH, Austria

Pumps



Chair: Michael Fabianek

- H-1 The influence of the swash plate oscillation on pressure ripple in variable displacement axial piston pump  
Xiaochen Huang, Zhejiang University, China
- H-2 Investigation of the wear behavior of the slipper in an axial piston pump by means of simulation and measurement  
Roman Ivantysyn, TU Dresden, LFD, Germany
- H-3 A fast approach for a coupled fluid-thermal modelling of the lubricating interfaces of axial piston machines  
Swarnava Mukherjee, Purdue University, USA
- H-4 A CFD design of engineered surface for tribological performance improvements in hydraulic pumps  
Fabio Scolari, Università di Parma, Italy

Mobile applications



Chair: Prof. Dr.-Ing. Frank Will

- I-1 Optimization of hydrostatic-mechanical transmission control strategy by means of torque control  
Yusheng Xiang, Karlsruhe Institute of Technology, Germany
- I-2 Reinforcement learning: A control approach for reducing component damage in mobile machines  
Lars Brinkschulte, Karlsruhe Institute of Technology, Germany
- I-3 Intelligent Twin Steering System  
Biagio Borretti, Dana Motion Systems Italia S.r.l., Italy
- I-4 Autonomous control of hydraulic mobile applications – a 21-ton excavator case study  
Timothy John Opperwall, Husco International Inc., USA

3:30  
p.m.

**BREAK**

4:00  
p.m.

## Fundamentals



Chair: Prof. Dr.-Ing. Peter Pelz

- J-1 Impedance measurement in a hydrostatic drive  
Benedikt Müller, FLUIDON GmbH, Germany
- J-2 On the thermodynamic consistency of  
experimentally determined fluid properties  
Enrico Gaspare Pasquini, FLUIDON GmbH,  
Germany
- J-3 Fluid-thermal co-simulation for a machine  
tool frame  
Christoph Steiert, TU Dresden, LFD, Germany
- J-4 The applicability of the mass-flow-model  
according to ISO 6358 with the parameter critical  
conductance  $C$  and critical pressure ratio  $b$  for  
gases in high pressure range up to 300 bar  
Lucian Pasiaka, Eugen Seitz AG, Switzerland

5:45  
p.m.

## Pumps



Chair: Dr.-Ing. Robert Rahmfeld

- K-1 Damping strategies for energy efficient pressure  
controllers of variable displacement pumps  
Florian Schoemacker, RWTH Aachen, IFAS,  
Germany
- K-2 Optimization of the tribological contact of  
valve plate and cylinder block within axial  
piston machines  
Stefan Geffroy, RWTH Aachen, IFAS, Germany
- K-3 Numerical and experimental study on novel  
hydraulic pump concept  
Seong-Ryeol Lee, RWTH Aachen, IFAS, Germany
- K-4 A numerical model for evaluation of gerotor  
torque considering multiple contact points and  
fluid-structure  
Zubin Mistry, Purdue University, USA

## Mobile applications



Chair: Prof. Dr.-Ing. Marcus Geimer

- L-1 Challenges and possibilities of the integration  
of electric drives in mobile machinery  
Andreas Opgenoorth, RWTH Aachen, IFAS,  
Germany
- L-2 Research on efficient driving method of heavy  
hydraulic excavator boom  
Lianpeng Xia, Taiyuan University of Technology,  
China
- L-3 Optimal control of the hydraulic actuated boom  
system based on Port-Hamiltonian formulation  
Lingchong Gao, TU München, Germany
- L-4 The use of a holistic machine simulation for the  
development of hydraulic hybrid modules to  
reduce transient raw emissions  
Felix Pult, Karlsruhe Institute of Technology,  
Germany

7:00  
p.m.

GET TOGETHER & EXHIBITION OPENING

**TUESDAY, MARCH 10, 2020**

LARGE HALL

HALL 4

9:00  
a.m.

## WELCOME & OPENING ADDRESS

**Prof. Dr.-Ing. habil. DEng/Auckland Dr. h.c. mult.  
Hans Müller-Steinhagen**

Rector of Technische Universität Dresden

**Prof. Dr.-Ing. Peter Post**

Chairman of the Fluid Power Research Fund of the VDMA

**Dr. Ralph Wiechers**

Member of the Executive Board and Chief Economist of the VDMA

9:45  
a.m.

## Digital systems



Chair: Peter-Michael Synek

**1-0 General Lecture:**  
**Digital mobile machines – From cloud down to earth**  
Jürgen Weber, TU Dresden, LFD, Germany

**1-1 General Lecture:**  
**Industrial hydraulics: Now – Next – Beyond**  
Steffen Haack and Mark Krieg, Bosch Rexroth AG, Germany

10:45  
a.m.

**BREAK**

11:15  
a.m.

## Digital systems



Chair: Dr.-Ing. Steffen Haack

**2-0 General Lecture: Digitization of the hydraulics – uniform semantics only allows interoperability**

Martin Hankel, Bosch Rexroth AG, Germany

**2-1 Interoperable information model of a pneumatic handling system for plug-and-produce**

Raphael Alt, RWTH Aachen, IFAS, Germany

**2-2 B2MML as an exchange format for asset administration shells as part of a Plug-and-Produce process for a fluid power engineering application**

Hartmut Schweizer, TU Dresden, IAI, Germany

**2-3 A reference architecture for cyber-physical fluid power systems: Towards a smart ecosystem**

Dominik Martin, Karlsruhe Institute of Technology and Trelleborg Sealing Solutions Germany GmbH, Germany

## Novel displacement machines



Chair: Prof. Dr. Rudolf Scheidl

**3-0 General Lecture: Displacement machines – key elements of future technology**

Robert Rahmfeld, Danfoss Power Solutions GmbH & Co. OHG, Germany

**3-1 Applying a multi-service Digital Displacement® pump to an excavator to reduce valve loss**

Matteo Pellegrini, Artemis Intelligent Power Ltd., UK

**3-2 Digital pumps in speed-controlled systems – an energy study for a loader crane application**

Samuel Kärnell, Linköping University, Sweden

**3-3 Design and testing of pistons and cups for large hydrostatic pumps and motors**

Peter Achten, INNAS, Netherlands

12:45  
p.m.

LUNCH

1:45  
p.m.

Industrial applications



Chair: Dr.-Ing. Frank Bauer

**4-0 General Lecture: User-oriented systematic of control concepts for fluid-mechatronic servo drives**

Peter Anders, HS Furtwangen, Germany

**4-1 CytroConnect – A cloud-based IoT-service as connectivity solution for electrohydraulic systems**

Martin Laube, Bosch Rexroth AG, Germany

**4-2 “DuoCast” – A novelty on the world market of die casting**

Thomas Neubert, Hydrive Engineering GmbH, Germany

**4-3 Energy management systems for electro hydrostatic propulsion based forming presses**

Tim Reidl, Moog GmbH, Germany

Components



Chair: Dr.-Ing. Marcus Fischer

**5-1 State of the art digital on-board-electronics vs. potentially disruptive control architectures for hydraulic valves**

Achim Richartz, Bosch Rexroth AG, Germany

**5-2 Optimization of directional control valves through downstream compensation approach**

Davide Mesturini, Walvoil SpA, Italy

**5-3 Evolution mikro – Micro-dosing in the high-pressure range thanks to innovative drive technology**

Bernd Freissler, ProMinent GmbH, Germany

**5-4 CFD aided optimization of customer specific tank systems using an innovative labyrinth de-aerator**

Karl Wartlick, ARGO-HYTOS GmbH, Germany

3:15  
p.m.

BREAK

3:45  
p.m.

## Predictive maintenance



Chair: Prof. Dr.-Ing. Peter Post

- 6-1 Validation of a soft sensor network for condition monitoring in hydraulic systems  
Jakob Hartig, TU Darmstadt, Germany
- 6-2 Predictive maintenance with a minimum of sensors using pneumatic clamps as an example  
Wolfgang Gauchel, Festo AG & Co. KG, Germany
- 6-3 Development of a lumped parameter model of an aerospace pump for Condition Monitoring purposes  
Geneviève Mkadara, Institut Clément Ader, France
- 6-4 Condition monitoring systems for hydraulic accumulators - Improvements in efficiency, productivity and quality  
Christian Nisters, HYDAC Technology GmbH, Germany

5:20  
p.m.

## KEYNOTE SPEECH

Thomas Schmidt, Saxonian State Minister for Regional Development  
Christian Ludwig, Kamax Tools & Equipment GmbH, Germany

7:00  
p.m.

## Electro-hydraulic actuators



Chair: Prof. Dr.-Ing. Peter Anders

- 7-0 **General Lecture: Electrohydrostatic actuation system – an (almost) complete system view**  
Dirk Becher, Moog GmbH, Germany
- 7-1 Flexible and easy to engineer servo-hydraulic actuators using 3D printing manufacturing process  
Stefan Thienen, Bosch Rexroth AG, Germany
- 7-2 Electro-hydrostatic compact drives with variable transmission ratio  
Giacomo Kolks, TU Dresden, LFD, Germany
- 7-3 Robustness of the Liebherr-Aerospace EHA technology for future flight control application  
Tobias Röben, Liebherr-Aerospace Lindenberg GmbH, Germany

---

CONFERENCE BANQUET

---



WEDNESDAY, MARCH 11, 2020

LARGE HALL

HALL 4

9:00  
a.m.

## Pneumatics



Chair: Prof. Victor Juliano De Negri

- 8-0 **General Lecture: Pneumatics and Industrie 4.0 – opportunity or contradiction?**  
Peter Post, Festo AG & Co. KG, Germany
- 8-1 Increase of energy efficiency in vacuum handling systems based on biomimetic principles  
Harald Kuolt, J. Schmalz GmbH, Germany
- 8-2 Behaviour and impact of leakage in vacuum gripping systems  
David Straub, J. Schmalz GmbH, Germany
- 8-3 Much does not help much: 3D pareto front of safety, comfort and energy consumption for an active pneumatic suspension strut  
Manuel Rexer, TU Darmstadt, Germany
- 8-4 Combinations of energy saving measures in pneumatics  
Vladimir Boyko, TU Dresden, LFD, Germany

11:00  
a.m.

## Mobile applications



Chair: Dr.-Ing. Oliver Martens

- 9-0 **General Lecture: ZF view on future drivetrains for compact and medium size wheel loaders**  
Jürgen Legner, ZF Friedrichshafen AG, Germany
- 9-1 Agrothermie – Design and testing of a novel hydraulically-actuated, locally vibrating plough  
Jianbin Liu, TU Dresden, LFD, Germany
- 9-2 Assistance system for an automated log-quality and assortment estimation based on data-driven approaches using hydraulic signals of forestry machines  
Chris Geiger, Karlsruhe Institute of Technology, Germany
- 9-3 Emission reduction by hydraulic hybrids  
Kalevi Huhtala, Tampere University, Finland
- 9-4 Design and performance evaluation of next generation clutch control valve  
Michael Erhard, Thomas Magnete GmbH, Germany

BREAK

11:30  
a.m.

## Special domains



Chair: Prof. Andrew Plummer

- 10-0 General Lecture: The roof wing opening system of the UAE pavilion at Expo 2020**  
Paolo Leutenegger and Carlo Vergano, Duplomatic Motion Solutions SpA, Italy
- 10-1 Preliminary design and testing of a servo-hydraulic actuation system for an autonomous ankle exoskeleton  
Emmanuel Viennet, School of Engineering and Architecture of Fribourg, Switzerland
- 10-2 Miniature hydraulics for a mechatronic lower limb prosthesis  
Christian Stentzel, TU Dresden, IMD, Germany
- 10-3 Fully variable, simple, and efficient - electrohydraulic - valve train for reciprocating engines  
Wolfgang Schneider, W. Schneider Ingenieurbüro, Switzerland

## Mobile applications



Chair: Dr.-Ing. Thomas Fedde

- 11-1 Active automatic chassis actuation for an excavator  
Christoph Boes, Moog GmbH, Germany
- 11-2 Integrated smart hydraulic displacement machine for closed systems  
Rocco Kemnitz, RAPA Automotive GmbH & Co. KG, Germany
- 11-3 Hydropneumatic all-wheel suspensions: Applications, challenges and special solutions  
Wolfgang Bauer, ARGO-HYTOS GMBH, Germany
- 11-4 Fluid dynamic vibration absorber for cabin suspension  
Nicolas Brötz, TU Darmstadt, Germany

1:00  
p.m.

LUNCH

# WEDNESDAY, MARCH 11, 2020

LARGE HALL

HALL 4

2:00  
p.m.

## Novel system architectures



Chair: Dr.-Ing. Christoph Boes

- 12-0 **General Lecture: Model based engineering for electro-hydraulic solutions**  
Matthias Wahler, Bosch Rexroth AG, Germany
- 12-1 Bootstrap reservoir concepts for electro-hydraulic compact cylinder drives  
Søren Ketelsen, Aalborg University, Denmark
- 12-2 Efficiency that borders on the impossible  
Walter List, Weber Hydraulik GmbH, Germany
- 12-3 SWOT-analysis on electro-hydraulic drives in construction machinery  
Martin Inderelst, XCMG European Research Center GmbH, Germany
- 12-4 Modular independent metering system for mobile applications providing smooth mode transition  
Jan Lübbert, TU Dresden, LFD, Germany

## Actuators & sensors



Chair: Dr.-Ing. Albert W. Schultz

- 13-0 **General Lecture: MEMS sensors in hydraulics, an opportunity to create smart components**  
Massimiliano Ruggeri, CNR-IMAMOTER, Italy
- 13-1 Self-sensing position determination of a sensor-designed proportional solenoid  
Thomas Kramer, TU Dresden, LFD, Germany
- 13-2 On/off solenoid with sensorless position detection  
Peter Tappe, Magnet-Schultz GmbH, Germany
- 13-3 Rotor swivel motor as actuator on an innovative control valve  
Ingo Dietrich, TU Darmstadt, Germany
- 13-4 Experimental and numerical study of a novel piezo-electric pilot stage for servovalves  
Andrew Plummer, University of Bath, UK

3:50  
p.m.

**BREAK**

4:20  
p.m.

## Safety & reliability



Chair: Dr.-Ing. Martin Petzold

- 14-1 Lifetime impact prediction of component modifications in axial piston units by the failure likelihood assessment  
Ivan Baus, Danfoss Power Solutions GmbH & Co. OHG, Germany
- 14-2 Simulation-based system reliability analysis of electro-hydraulic actuator with dual modular redundancy  
Maxim Andreev, ESI ITI GmbH, Germany
- 14-3 Enabling SIL2 safety certified applications for mobile machine OEMs  
Peter Lauer, Eaton Corp., USA

5:30  
p.m.

## FAREWELL ADDRESS + BEST PAPER AWARD

Jürgen Weber, TU Dresden, LFD, Germany

7:00  
p.m.

LABORATORY PARTY

## Actuators & sensors



Chair: Dr.-Ing. Markus Laufenberg

- 15-1 Development and control of smart pneumatic McKibben muscles for soft robots  
Min Pan, University of Bath, UK
- 15-2 Multistable valve technology with magnetic shape memory alloy as passive element activated by a bidirectional solenoid actuator  
Julius Happel, ETO Magnetic GmbH, Germany
- 15-3 Evaluation of a fast measuring ultrasonic flow meter  
Lutz Müller, TU Dresden, LFD, Germany