MONDAY, MARCH 9, 2020

CONFERENCE ROOM 1

9:00 a.m. WELCOME & OPENING ADDRESS

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

CONFERENCE ROOM 2

9:10 a.m. MATERIALS

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

CONFERENCE ROOM 3

9:10 a.m. SYSTEM DESIGN & INTEGRATION

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

CONFERENCE ROOM 3

9:30 a.m. 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

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Amadeu Placido Neto, Bosch Rexroth AG, Germany

10:30 a.m. BREAK
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 Grønkær, Aalborg University, Denmark
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<td><strong>Fluids</strong></td>
<td><strong>Pumps</strong></td>
<td><strong>Mobile applications</strong></td>
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<tr>
<td>Chair: Prof. Dr.-Ing. Katharina Schmitz</td>
<td>Chair: Michael Fabianek</td>
<td>Chair: Prof. Dr.-Ing. Frank Will</td>
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| G-1 Numerical prediction and experimental investigation of cavitation erosion of hydraulic components using HFC  
Athena Moosavi, TU Dresden, LFD, Germany | H-1 The influence of the swash plate oscillation on pressure ripple in variable displacement axial piston pump  
Xiaochen Huang, Zhejiang University, China | I-1 Optimization of hydrostatic-mechanical transmission control strategy by means of torque control  
Yusheng Xiang, Karlsruhe Institute of Technology, Germany |
| G-2 Practical aspects when using ionic liquids as hydraulic fluid  
Darko Lovrec, University of Maribor, Slovenia | 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 | I-2 Reinforcement learning: A control approach for reducing component damage in mobile machines  
Lars Brinkschulte, Karlsruhe Institute of Technology, Germany |
| G-3 Method for the experimental determination of the diffusion coefficient of air in hydraulic fluids  
Andris Rambaks, RWTH Aachen, IFAS, 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 | I-3 Intelligent Twin Steering System  
Biagio Borretti, Dana Motion Systems Italia S.r.l., Italy |
| G-4 Optimizing hydraulic reservoirs using Euler-Euler-Lagrange multiphase CFD simulation  
Lukas Muttenthaler, Johannes Kepler University and Engel Austria GmbH, Austria | H-4 A CFD design of engineered surface for tribological performance improvements in hydraulic pumps  
Fabio Scolari, Università di Parma, Italy | I-4 Autonomous control of hydraulic mobile applications – a 21-ton excavator case study  
Timothy John Opperwall, Husco International Inc., USA |

**CONFERENCE ROOM 1**

**CONFERENCE ROOM 2**

**CONFERENCE ROOM 3**

**MONDAY, MARCH 9, 2020**

**BREAK**
GET TOGETHER & EXHIBITION OPENING

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 Pasieka, Eugen Seitz AG, Switzerland

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

5:45 p.m.

7:00 p.m.
TUESDAY, MARCH 10, 2020

LARGE HALL

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
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 Pellegri, 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
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<td>1:45</td>
<td><strong>Industrial applications</strong></td>
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<td>LARGE HALL</td>
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<td>Chair: Dr.-Ing. Frank Bauer</td>
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<td>4-0</td>
<td><strong>General Lecture: User-oriented systematic of control concepts for fluid-mechatronic servo drives</strong></td>
<td>Peter Anders, HS Furtwangen, Germany</td>
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<td>4-1</td>
<td><strong>CytroConnect – A cloud-based IoT-service as connectivity solution for electrohydraulic systems</strong></td>
<td>Martin Laube, Bosch Rexroth AG, Germany</td>
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<td>4-2</td>
<td><strong>“DuoCast“ – A novelty on the world market of die casting</strong></td>
<td>Thomas Neubert, Hydrive Engineering GmbH, Germany</td>
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<td>4-3</td>
<td><strong>Energy management systems for electro hydrostatic propulsion based forming presses</strong></td>
<td>Tim Reidl, Moog GmbH, Germany</td>
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<td>3:15</td>
<td><strong>BREAK</strong></td>
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<tr>
<td>5-1</td>
<td><strong>State of the art digital on-board-electronics vs. potentially disruptive control architectures for hydraulic valves</strong></td>
<td>Achim Richartz, Bosch Rexroth AG, Germany</td>
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<td>5-2</td>
<td><strong>Optimization of directional control valves through downstream compensation approach</strong></td>
<td>Davide Mesturini, Walvoil SpA, Italy</td>
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<td>5-3</td>
<td><strong>Evolution mikro - Micro-dosing in the high-pressure range thanks to innovative drive technology</strong></td>
<td>Bernd Freissler, ProMinent GmbH, Germany</td>
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<td>5-4</td>
<td><strong>CFD aided optimization of customer specific tank systems using an innovative labyrinth de-aerator</strong></td>
<td>Karl Wartlick, ARGO-HYTOS GmbH, Germany</td>
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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. CONFERENCE BANQUET

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
WEDNESDAY, MARCH 11, 2020

LARGE HALL

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

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

11:00 a.m. BREAK
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

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
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
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

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

7:00 p.m. LABORATORY PARTY