| —— CONFERENCE ROOM 1 —— | —— CONFERENCE ROOM 2 —— | —— CONFERENCE ROOM 3 —— |

9:00 WELCOME & OPENING ADDRESS

9:10

Materials

System design & integration

Novel system solutions

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 Study of cavitation resistance of materials for surface recovery and protection from cavitation erosion
Vladimir Lomakin, Bauman Moscow State Technical University, Russian Federation

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

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

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

C-3 Experimental evaluation of an electro-hydrostatic actuator for subsea applications in a hyperbaric chamber
Amadeu Placido Neto, Federal University of Santa Catarina, Brazil

10:30 ————————— BREAK —————————

11:00

Additive manufacturing

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

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 hydro-static 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

F-1 Simulation of an interlocking hydraulic direct-drive system for a biped walking robot
Juri Shimizu, Waseda University, Japan

F-2 Non-linear force control of hydraulic 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 Grønkjær, Aalborg University, Denmark

12:45 ——————————————— **LUNCH** ———————————————

—— CONFERENCE ROOM 1 —— —— CONFERENCE ROOM 2 —— —— CONFERENCE ROOM 3 ——

13:45

Fluids

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, Gemany

G-4 Optimizing hydraulic reservoirs using Euler-Euler-Lagrange multiphase CFD simulation
Lukas Muttenthaler, Engel Austria GmbH, Austria

Pumps

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

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

15:30   **BREAK**

16:00	Fundamentals	Pumps	Mobile applications

Fundamentals

J-1 Pump and motor 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

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

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 Science and 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

17:45

19:00 ——— **GET TOGETHER & EXHIBITION OPENING** ———

LARGE HALL   HALL 4

9:00 WELCOME & OPENING ADDRESS

9:45 Digital systems

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   BREAK

Digital systems

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
Johannes Kunze von Bischhoffshausen, Trelleborg Sealing Solutions Germany GmbH, Germany

Novel displacement machines

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

──────── LARGE HALL ──────── ──────── HALL 4 ────────

13:45

Industrial applications	Components

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

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

15:15 ──────────────── BREAK ────────────────

15:45	## Predictive maintenance

Predictive maintenance

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

Electro-hydraulic actuators

7-0 General Lecture: Electrohydrostatic actuation system – an (almost) complete system view
Dirk Becher, Moog GmbH

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

17:20 KEYNOTE SPEECH

19:00 CONFERENCE BANQUET

WEDNESDAY, MARCH 11, 2020

LARGE HALL

HALL 4

09:00

Pneumatics

Mobile applications

8-0 **General Lecture: Pneumatics and Industry 4.0 – opportunity or contradiction**
Peter Post, Festo AG & Co. KG, Germany

9-0 **General Lecture: ZF view on future drivetrains for compact and medium size wheel loaders**
Jürgen Legner, ZF Friedrichshafen AG, Germany

8-1 Increase of energy efficiency in vacuum handling systems based on bionic principles
Harald Kuolt, J. Schmalz GmbH, Germany

9-1 Agrothermie – Design and testing of a novel hydraulically-actuated, locally vibrating plough
Jianbin Liu, TU Dresden, LFD, Germany

8-2 Behaviour and impact of leakage in vacuum gripping systems
David Straub, J. Schmalz GmbH, 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

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

9-3 Emission reduction by hydraulic fluids
Seppo Tikkanen/Kalevi Huhtala, Tampere University, Finland

8-4 Combinations of energy saving measures in pneumatics
Vladimir Boyko, TU Dresden, LFD, Germany

9-4 Design and performance evaluation of next generation clutch control valve
Michael Erhard, Thomas Magnete GmbH, Germany

11:00

BREAK

| 11:30 | Special domains | Mobile applications |

Special domains

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 an electro-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

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 GmbH, 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

13:00 ——— LUNCH ———

WEDNESDAY, MARCH 11, 2020

LARGE HALL

14:00 Novel system architectures

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 border 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

HALL 4

Actuators & sensors

13-0 General Lecture: MEMS sensors in hydraulics, an opportunity to create smart components
Massimiliano Ruggerie, 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 integrated sensorless position detection
Peter Tappe, Magnet-Schultz GmbH, Germany

13-3 Evaluation of a fast measuring ultrasonic flow meter
Lutz Müller, TU Dresden, LFD, Germany

13-4 Numerical optimisation of a novel servovalve architecture actuated by piezo-electric ring benders
Andrew Plummer, University of Bath, UK

15:50 BREAK

16:20 | ## Safety & reliability

14-1 Lifetime analysis of axial piston units based on quantitative assessment in relation to fatigue effects
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

Actuators & sensors

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 superelastic element activated by a bidirectional solenoid actuator
Julius Happel, ETO Magnetic GmbH, Germany

15-3 Rotor swivel motor as actuator of an innovative control valve
Ingo Dietrich, TU Darmstadt, Germany

17:30 | ## FAREWELL ADDRESS + BEST PAPER AWARD

Jürgen Weber, TU Dresden, LFD, Germany

19:00 — **LABORATORY PARTY** —