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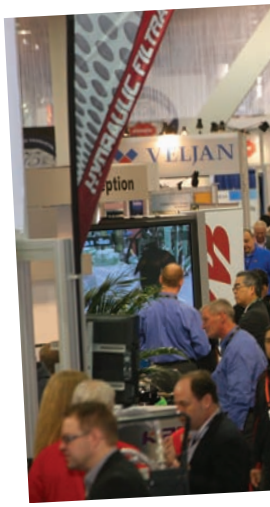

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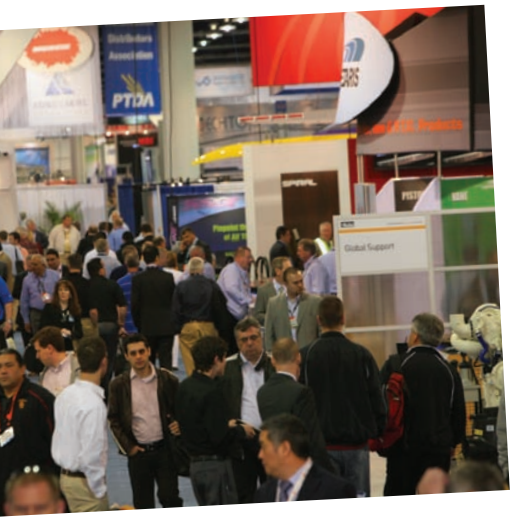


NEW! Fluid Power Seminar Series

Presented by *Hydraulics & Pneumatics,* these seminars will present practical information so attendees can better understand the operation of hydraulic and pneumatic components, circuits, and systems.

This series is free for all show registrants. For more details on the Fluid Power Seminar Series, please visit www.ifpe.com.

hydraulics & pneumatics

College-Level Courses

Monday, March 3 - Tuesday, March 4, 2014

These half-day courses will benefit practicing engineers and others involved in design and manufacturing processes. Certificates for PDH or CEU's are available upon completion of each course.

Each course is $300. If you take more than one course, you'll receive discounted pricing of just $225 per course!

MONDAY, MARCH 3

8:00 am - 12:00 pm

Overview of Fluid Power Systems

Medhat Khalil, Director of Professional Education, Milwaukee School of Engineering

Gain a thorough understanding of the fundamentals of a hydraulic system's construction and a comparison to other drive and control systems in the Overview of Fluid Power Systems course. Dr. Medhat Khalil will demonstrate a satellite view of the main components that consists a hydraulic system and how to read a schematics. This presentation will be concluded by discussing hydraulic circuits for basic applications.

1:00 – 4:00 pm

Sizing a Hydrostatic Transmission Using Calculations

Tom Blansett, Manager, Training Services, Eaton

Learn two methods of calculations used to properly size and select the pump and motor for a closed circuit transmission application. The first method is to calculate the "Power Range" of your vehicle or machine; this method is used when the final gear reduction between the motor and load is unknown or the customer wants assistance to select the final drive ratio. The second method is used when the final drive ratio is specified by the customer.

The following is a list of the commonly encountered vehicle and machine performance requirements that will be calculated:
1) Tractive effort and vehicle speed in the normal working range.
2) Drawbar pull and vehicle speed in the normal working range.
3) Gradeability and vehicle speed in the normal working range.

For full session descriptions, visit www.ifpe.com

TUESDAY, MARCH 4

8:00 am – 12:00 pm

Condition Monitoring for Hydraulic Fluids

James Hannon, ExxonMobil and Dr. Robert M. Gresham, Society of Tribologists and Lubrication Engineeers

Learn the basic concepts related to operating and maintaining real-world hydraulic systems through proper fluid selection and Condition Monitoring techniques. This course is divided in three parts:

1. STLE Overview
2. Oil Analysis (Overview & Business case)
   – Business Justification for an Oil Analysis Program
   – Basic Oil Analysis
3. Hydraulic Fluid Selection
   – Application / Environment
      • Industrial
      • Hydraulic Fluid Performance
      • Consolidation
   – Condition Monitoring
      • Oil Analysis
      • Thermal Studies
      • Leakage Studies

1:00 – 4:00 pm

Design, Modeling and Control of Hybrid Powertrain

Zongxuan Sun, Department of Mechanical Engineering, University of Minnesota

With the rising oil demand and concerns on climate change, improving fuel efficiency and reducing emissions has become the main target of powertrain research for both on-road vehicles and off-road machineries. Powertrain hybridization has been widely accepted as one of the most promising solutions for addressing this issue. In a hybrid powertrain, an alternative power source (electric power or fluid power, for example) complements the internal combustion engine, to improve fuel efficiency by engine downsizing, load leveling, and regenerative braking. This short course will cover the background information, the various types of hybrid powertrain systems, different hybrid architectures, and the modeling and control of the hybrid powertrain.

Technical Sessions

Wednesday, March 5 - Friday, March 7, 2014

IFPE's Technical Conference is the #1 resource for information on the latest research for the design engineering community. The technical conference will emphasize new technologies and methods related to improved analysis, design, manufacture, and performance of fluid power components and systems for mobile and industrial markets. Wednesday and Thursday presentations will include keynote addresses from leading industry experts.

Tickets for the Technical Conference are $85 and include:

- Admission to all technical presentations and two keynote presentations
- A flash drive with the Proceedings of the IFPE Technical Conference
- Certificate for PDH or CEUs

Schedule subject to change. Please check www.ifpe.com/Education for the latest information.

WEDNESDAY, MARCH 5 · 8:45 am - 10:15 am

W1 Modeling: Hybrid (Green), PCB Stability, Controls

8:45 am **PCB System Dynamic Stability Utilizing Digital Protyping**
Michael Beyer, Senior Technical Specialist, Eaton Corporation

9:15 am **Innovative Hybrid Modeling Approach to Enhance Green Design Based on Fully Integrated Mechatronic System**
Vincent Remillard, Application Engineer/Technical Manager, Famic Technologies Inc.

9:45 am **Optimizing Hydraulic Control Systems with Modeling and Simulation**
David Ruxton, Applications Engineer, HydraForce and Nick Stabile, Design Engineer Group Leader, HydraForce

W2 Wireless Technology: Applications, Performance, Safety

8:45 am **High Speed Real-Time Industrial Ethernet Technology Revolutionizes Off-Highway Vehicle Automation Architectures**
Sari Germanos, Technology Marketing Manager, Ethernet POWERLINK Standardization Group

9:15 am **Global Navigation Satellite Systems (GNSS) Technologies for Off-Highway Agricultural Vehicles: The Benefits of Using State-of-the-Art Mobile Hydraulics Technology**
Leroy Garciano, Systems and Application Engineer, Danfoss

9:45 am **Machine Control with Only Two Hoses**
Douglas Anderson, Systems and Application Engineer, Danfoss

W3 Controls: Analysis, Performance, Systems

8:45 am **Servo Motion Control with Custom Feedback Increases Operation Uptime, Reduces Maintenance, and Improves Monitoring of Machine Parameters**
Peter Nachtwey, President, Delta Computer Systems Inc.

9:15 am **Practical Solutions for Open Circuit System Instability**
Chad Daniel, Manager, BA Sales Americas, Danfoss

9:45 am **Hydraulic Steering "Jerk" on Articulated Vehicles**
Jared Cave, Systems and Applications Engineer, Danfoss

WEDNESDAY, MARCH 5 · 10:30 am – 12:00 pm

W4 Modeling Pumps for Design and Performance

10:30 am **Comparison of Steady State Flow Loss Models for Axial Piston Pumps**
Samuel Hall, System and Application Engineer, Danfoss

11:00 am **On the Hydraulic Pumps Modeling for Applications Engineers**
Medhat Khalil, Director of Professional Education, Milwaukee School of Engineering

11:30 am **Mathematical Modeling and Experimental Research on Influence of Improved Stator Curve on the Characteristic of Vane Pump**
Radovan Petrovic, Professor, College of Applied Engineering, Center for Power Control Hydraulics (CPCH)

W5 Noise Control: Modeling and In-Line Suppression

10:30 am **Prediction of the Acoustic Radiation from a Hydraulic Piston Pump Using Flexible Multibody Dynamics**
Michael Beyer, Senior Technical Specialist, Eaton Corporation

11:00 am **Optimization of Dissimilarly-Sized Dual In-Line Suppressors**
Elliott Gruber, Graduate Student, Georgia Tech

W6 Hydraulic Energy Storage Methods

10:30 am **Fluid Power in Transportation**
Charles Juhasz, Director of Engineering, Scientific Services Inc

11:00 am **Experimental Studies of Viscous Loss in a Hydraulic Flywheel Accumulator**
Kyle Strohmaier, Master's Student, University of Minnesota

11:30 am **Industrial Application of an Intelligent and Efficient Fluid Power Storage System**
Leonid Sheshin, Head of Fluid Power Department, Lumex-Marketing Ltd

For full session descriptions, visit www.ifpe.com

WEDNESDAY, MARCH 5 · 1:00 – 2:00 pm

KEYNOTE PRESENTATION

Energy Consumption in Fluid Power—The Impact and Potential Savings in Mobile Machine Applications

Lonnie Love, PhD, Group leader of Oak Ridge National Laboratory's (ORNL) Automation, Robotics and Manufacturing Group

Fluid Power is a foundational technology for both the manufacture and operation of mobile machines. However, there are many areas where fluid power can improve. A recent ORNL/NFPA study suggests that between 2% and 3% of U.S. energy consumption is derived from fluid power components and systems. Furthermore, the average efficiency of fluid power systems is approximately 21%–although typically higher in mobile machines. Therefore, moderate improvements in efficiency can yield tremendous energy savings. Emerging trends in advanced manufacturing (additive processes, light weight metals, low cost carbon fiber) can simultaneously increase efficiency as well as improve competitiveness. Another challenge is workforce development. How can we inspire youth to not only consider careers in science and engineering, but become knowledgeable about the benefits and efficiency potential in fluid power?

WEDNESDAY, MARCH 5 · 2:15 – 3:45 pm

W7 New Pump Designs (Digital/Discrete) and Applications

2:15 pm **Midsize Wind Turbines with Hydraulic Transmissions**
Feng Wang, PhD, University of Minnesota

2:45 pm **Applications for Discrete Flow Pumps**
Matt Kronlage, Product Applications Engineer, Turolla OpenCircuitGear

3:15 pm **Digital Hydraulic Transformer – DHTM475**
Elton Bishop, Manager, DigitalHydraulic LLC

W8 Using Hydraulics for Tier 4 Off Highway Compliance

2:15 pm **Engine Overspeed Protection for Tier 4 Machines with Hydrostatic Transmissions**
Simon Nielsen, Systems Engineer, Danfoss

2:45 pm **Modern Hydrostatic Propel Drives Change Wheeled Off-Road Vehicles**
Jörn Petersen, Sales Director Construction Machinery Sector, Bosch Rexroth

For full session descriptions, visit www.ifpe.com

W9 Controls: Analysis, Performance, Systems

2:15 pm **Coordinating Subsystem to Maximize Efficiency**
Timothy Post, Application Engineering Manager, HED

2:45 pm **Hydraulic Generator Drive Robust Control**
Christian Daley, Engineer, Danfoss

3:15 pm **Pressure Control in Pulsed Electrohydraulic Forming of Sheet Metal**
Celestine Okoye, University Lecturer,
Federal Ministry of Education Headquarters

WEDNESDAY, MARCH 5 · 4:00 – 5:00 pm

W10 Novel Methodology for Analysis of Pumps and Motors

4:00 pm **Equations for New Approach to Fluid Power Components**
Nahum Goldenberg, CEO, HydroCAD-Nahum Goldenberg, Ltd

4:30 pm **A Novel Methodology of Displacement Calculation for the Swash Plate Axial Piston Pump with Conical Cylinder Block**
Will Guo, Engineering Team Leader, Danfoss

W11 Pneumatics: Reusable Energy, Robotics, Orthotics

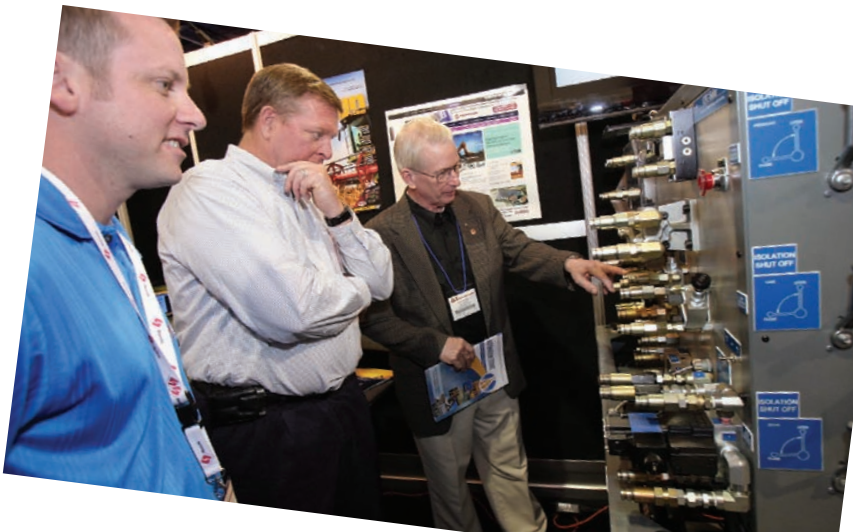
4:00 pm **Heat and Efficiency Considerations in Fluid-Powered Co-Robotics Applications**
Douglas Cook, Staff Researcher, Milwaukee School of Engineering

4:30 pm **Walking Energy Hydraulic Regeneration Potential to Extend Range of Active Orthotic Exoskeletons**
Keith Fisher, Associate Professor, Montana State University

W12 Work/Duty Cycles: Determination and Optimization

4:00 pm **Establishing an Optimal Work Cycle for an Alternative Wheel Loader Concept**
Bobbie Frank, Alternative Drivetrain Research Engineer,
Volvo Construction Equipment and Lund University

4:30 pm **Drive Cycle Formation Procedures for Off-Highway Vehicles**
QingHui Yuan, Manager, Eaton Corporation



THURSDAY, MARCH 6 · 8:45 – 10:15 am

T1 Fluid Performance: Temperature, Film Thickness, Base Stock

8:45 am **Study of Temperature and Lubricant Effects on the Efficiency of a Complete Hydrostatic Drive System**
Shubhamita Basu, Technology Manager, The Lubrizol Corporation and Edward Akucewich, Technical Fellow, The Lubrizol Corporation

9:15 am **Effect of Base Stock Type on Film Thickness and Performance in Hydraulic Pumps**
Edward Akucewich, Technical Fellow, The Lubrizol Corporation

9:45 am **Hydraulic Fluid Efficiency Effects in External Gear Pumps**
Paul Michael, Research Chemist, Milwaukee School of Engineering

T2 Modeling: Vane Pumps and Valves

8:45 am **A Numerical Model for the Simulation of Flow in Radial Piston Machines**
Pulkit Agarwal, Graduate Student, Maha Fluid Power Research Center, Purdue University

9:15 am **New Non-Linear Model for a 4-Way Directional Control Servo or Proportional Valve**
Jack Johnson, Electrohydraulic Engineer, IDAS Engineering Inc

9:45 am **A Non-Linear Valve Model is Applied to a Highly Overlapped Proportional Valve**
Jack Johnson, Electrohydraulic Engineer, IDAS Engineering Inc

T3 Wireless Technology: Application, Performance, and Safety

8:45 am **Connecting Your Vehicle to the World**
Christopher Kolbe, Vice President of Sales & Marketing, HED

9:15 am **Applying Wireless Technology to Electro-Hydraulics: Architecture, Compliance, and Safety Considerations**
Anthony M. Di Tommaso, Manager, Product Development, Cervis Inc.

9:45 am **CAN Be Safe**
Mark Byrnes, Senior Software Engineer, Danfoss

THURSDAY, MARCH 6 · 10:30 am – 12:00 pm

T4 Hydraulic Hybrids: Simulation, Design, Performance

10:30 am **Control System Development for a Hydraulic Hybrid Lift Truck**
Michael Olson, Lead Engineer - Controls and Modeling, Eaton Corporation

11:00 am **Comparison of Two Different Electronic Feedback Methods to Increase the Damping in the Simulation Model of Electro-Hydraulic Hybrid Actuator System for Off-Highway Working Vehicles**
Rafael Aman, Post-Doctoral Researcher, Lappeenranta University of Technology

T5 Valves: Modeling, Performance, Contamination

10:30 am **Control and Stability Analysis of a Practical Load-Sense Systems**
Abhijit Das, Advanced Systems Engineer, Danfoss

11:00 am **Improvements in Controllability and Efficiency of Electronically Controlled Valve Systems**
Gary LaFayette, Sr Engineer, Danfoss

11:30 am **Servo Valve Design for Faster Response in Motion Systems and Also Low Contamination Susceptibility**
K. Osaka, Design Engineer, R&D Department, Yuken Kogyo Co

T6 Fluids: Environment, Performance (Including Hybrids)

10:30 am **Environmental Lubricants in the Fluid Power Industry**
Mark Miller, Executive Vice President, Terresolve Technologies/ RSC Biosolutions

11:00 am **The Effects of Fluid Properties on the Efficiency of Hydraulic Hybrid Vehicles**
Steven Herzog, OEM Liaison Manager, Evonik Oil Additives USA, Inc.

11:30 am **Improving Fuel Efficiency, Productivity and GHG Emissions of Off-Highway Equipment Through the Use of Energy Efficient Hydraulic Fluids**
Thomas Schimmel, Business Segment Manager, Hydraulic Fluids, Evonik Oil Additives USA, Inc.

For full session descriptions, visit www.ifpe.com

THURSDAY, MARCH 6 · 1:00 – 2:00 pm

KEYNOTE PRESENTATION

Hydraulic Hybrid Excavator—Customers, Diversity Drives Innovation

Ken Gray, Global Product Manager, Large Hydraulic Excavators, Caterpillar Inc.

The fuel-saving Cat® 336E H Hybrid was launched in 2013 as the industry's first hydraulic hybrid excavator. With over 300 patents filed, the innovative hydraulic hybrid technology is a significant departure from the typical hybrid approach. To accomplish such a feat required an acute, intense focus on the customer and a diverse, global team empowered to drive an innovative solution. Learn the story behind the development of this game-changing product from Caterpillar.

THURSDAY, MARCH 6 · 2:15 -3:45 pm

T7 Hydraulic Hybrids: Energy Recovery and Reuse

2:15 pm **Towards a New Kind of Energy Recovery for Electric Vehicles**
Jose Garcia, Assistant Professor, Purdue University

2:45 pm **Hydraulic Hydrostatic System for Swing Energy Recovery and Reuse**
Jiao Zhang, Engineering Technical Steward, Caterpillar, Inc.

3:15 pm **Series Hybrid Hydrostatic System**
James O'Brien II, President, NRG Dynamix

T8 Fluids: Filter Testing, Water Monitoring and Control

2:15 pm **Got Water?**
Jawad Khan, Data Analyst, POLARIS Laboratories

2:45 pm **Laboratory and Field Investigations of Water-Adsorbing Oil Filters and Relative Humidity Sensors**
Paul Michael, Research Chemist, Milwaukee School of Engineering

3:15 pm **Impact of the Use of Secondary Particle Counter Calibration Samples on Particle Count and Filter Test Results**
Bryan Steffan, CV Test Engineer, Cummins Filtration Inc.

T9 Hydraulic Fan Drive Systems: Design and Performance

2:15 pm **Improvements in Reversing Fan Drives**
Stephen Frantz, Staff Engineer, Danfoss

2:45 pm **Dedicated Closed Circuit Hydrostatic Fan Drive Control**
Josh Cronbaugh, Product Engineer, Danfoss and Mark Peterson, Staff Engineer, Danfoss

3:15 pm **Open Circuit Fan System Stability Analysis**
Robert Harris, Systems and Application Engineer, Danfoss

THURSDAY, MARCH 6 · 4:00 – 5:00 pm

T10 Valves: Adjustment, Modeling, Empirical Evaluation

4:00 pm **Methods to Adjust the Characteristic Curves of Electro-Hydraulic Proportional Valves in Mobile Applications**
Mark Jankowski, Engineering Manager, Thomas Magnete USA, LLC

4:30 pm **Empirical Method Produces Improved Consistency In Variable Discharge Coefficient Effects**
Jack Johnson, Electrohydraulic Engineer, IDAS Engineering Inc

T11 Test Stands and Procedures: Air-Borne Noise and Pneumatics

4:00 pm **Meeting ISO3744 - Determination of Airborne Noise Generated by Hydrostatic Unit**
Jaromir Tvaruzek, NVH Senior Engineer, Danfoss

4:30 pm **Development of a Portable Pneumatic Educational Tool for STEM Education**
Farid Breidi, Student, Purdue University

T12 Sensors: Thermal Properties and Pressure Ripple Energy for Sensing

4:00 pm **Applications of Thermal Actuation Technologies within the Fluid Power Environment**
Gary Swanson, President, Thermotion, LLC

4:30 pm **Pressure Ripple Energy Harvester Enabling Autonomous Sensing**
Ellen Skow, Research Graduate Assistant, Georgia Institute of Technology

FRIDAY, MARCH 7 · 8:45 – 10:15 am

F1 Connectors, Manifolds, Cylinders

8:45 am **Corrosion Protection Methods for Fluid Connectors**
Josef Pfister, Division Engineering Manager, Parker Hannifin Corporation

9:15 am **New Process for Improved Seamless Forged Pipes for Hydraulic Cylinders**
Pierre Sutter, Product Manager, Vallourec

9:45 am **Pressure Ratings and Design Guidelines for Manifold Applications**
Robert O'Rourke, Product Engineering Manager, Dura-Bar

F2 Pneumatics: Performance, Reusable Energy, Seal Friction

8:45 am **Two-Phase Heat Regeneration in Hydraulic Accumulators: Efficiency Improvement at Low Cost**
Alexander Stroganov, President, Lumex Instruments Canada

9:15 am **Characteristics of Air Flow Control Components for the Emergency Breathing System**
So-Nam Yun, Valve Developer, Korea Institute of Machinery & Materials

9:45 am **Pneumatic Lipseal Friction**
John Berninger, Consultant, Parker Hannifin Corporation

F3 Air in Fluids: Effect and Elimination

8:45 am **Air Bubble Separation and Elimination from Working Fluids for Performance Improvement of Hydraulic Systems**
Yutaka Tanaka Sayako Sakama, Professor, Hosei University

9:15 am **Impact of Gas Cavitation in the Instantaneous Flow Provided by External Gear Pumps**
Andrea Vacca, Assistant Professor, Maha Fluid Power Research Center, Purdue University

FRIDAY, MARCH 7 · 10:30 am – 12:00 pm

F4 Charge Pump, Reservoir Design, Seal Friction

10:30 am **Mobile Equipment Reservoir Baffle Innovation**
Robert Post, Contributing IFPS Member, on behalf of IFPS

11:00 am **Charge Pump and Loop Flush Sizing for Closed Loop, One Pump, Multi-Motor Systems**
Brent Sinclair, Systems and Application Engineer, Danfoss

F5 Modeling: Valves, Analysis, Performance

10:30 am **Modeling, Simulation and Analysis of a Simple Load-Sense System**
Leroy Garciano, Systems and Application Engineer, Danfoss

11:00 am **Improving the Position Control Performance of a Proportional Spool Valve, Using 3D CFD Modeling**
Emma Frosina, PhD Student, University of Naples Federico II

F6 New Pump Designs

10:30 am **Design of a Variable Displacement Triplex Pump**
Shawn Wilhelm, PhD Student, University of Minnesota

11:00 am **Experimental Characterization of External Gear Machines with Asymmetric Teeth Profile**
Ram Sudarsan Devendran, PhD Student, Maha Fluid Power Research Center, Purdue University

11:30 am **Using Helical Gear Form to Reduce Ripple and Noise in External Gear Pumps**
Agostino Martini, Manager, Settima Meccanica Co.

FRIDAY, MARCH 7 · 1:00 – 2:00 pm

F7 Improved Quality and Safety, Using FMEA and Component Coding

1:00 pm **Using System FMEAs to Improve Safety, Quality and Performance in Off-Highway Hydraulic Systems**
D. Dean Houdeshell, Manager, Systems & Application Engineering – Americas, Danfoss

1:30 pm **Using 3D-Color Coding to Communicate Fluid Power Designs**
Vito Gervasi, Director R&D, RPR, Milwaukee School of Engineering

F8 Test Stand Design: Hi-Bandwith and Impulse Fatigue

1:00 pm **Design of a High-Bandwidth, Hydrostatic Absorption Chassis Dynamometer with Electronic Load Control**
Daniel Skelton, Graduate Research Assistant, Purdue University

1:30 pm **Energy Efficient Impulse/Fatigue Testing**
Timothy Kerrigan, Fluid Power Consulting Engineer, MSOE - Fluid Power Institute

F9 Innovative Applications of Hydro-statics for Small Machines

1:00 pm **Novel Use of a U-style Hydrostatic Transmission to Develop a Low-Power Dual-Mode Transmission**
Wyatt Hall, Engineering Intern, Danfoss

1:30 pm **Hydrostatic Baja Vehicle**
David Johnson, Student/Applications Engineer, Milwaukee School of Engineering/Hengli America Corporation

For full session descriptions, visit www.ifpe.com

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