

# Day 1

Wednesday, August 21

## Improved design & control of hydraulics on electrified off-highway vehicles

**11am - Advanced modeling techniques and performance comparisons of electrohydraulic systems**

*Bruno Dupuis, corporate account manager, Famic Technologies, Canada*

Fluid power systems have significantly advanced with the progress and innovations in electrification and automation technologies. This presentation compares system performances obtained by using various advanced modeling techniques to improve overall vehicle efficiency and reduce energy consumption. The comparisons will be on typical hydraulic functions commonly used on off-highway vehicles and their electrohydraulic counterparts. The demonstration will shed light on the critical role of simulation in pinpointing areas for improvement through results obtained. We will showcase practical examples of these modeling techniques, providing an insightful illustration of the discussed concepts.

**11.20am - Digital proportional control technology – advancing hydraulic system design**

*Russ Schneidewind, director of business development, HydraForce, USA*

*Dave Ruxton, R&D engineer, HydraForce, USA*

In support of government mandates for off-highway vehicles, hydraulic systems must integrate electronic controls and sensors to enhance performance and productivity. These systems will also need to provide performance data to operators and owners via telematics. Digital proportional control technology optimally integrates electronics, sensors and hydraulic proportional valves, reducing hydraulic hysteresis, response time and performance variability. It offers precise control of speed and force in advanced electrohydraulic systems. We'll present the latest digital proportional control technology for off-highway equipment, showcasing innovations that improve efficiency, data collection and design simplicity for customized applications, accelerating time-to-market.

**11.40am - Innovative control systems: beyond a commodity – unlocking the hidden potential of hydraulics**

*Ben Holter, product director digital systems, Husco, USA*

For decades, hydraulics has been relegated to the status of a commodity, overshadowed by other aspects of machine design such as emissions and comfort. However, by prioritizing advanced hydraulic control, you can unlock unprecedented gains in efficiency and performance while simultaneously reducing overall system costs and achieving your functional safety goals. Join Husco for an enlightening session where we delve into the benefits of upgrading hydraulics systems. From productivity and reducing emissions to achieving automation goals, learn how innovative control systems for work functions, end effectors, steering, braking and others areas can revolutionize your machine system(s) with unparalleled efficiency and effectiveness.

**12pm - Silent efficiency: hydraulics for electrified machines**

*David Stevenson, vice president of marketing and product management, Bucher Hydraulics, USA*

We will address powering working hydraulics in electrified machinery, focusing on low noise and high efficiency. Key points include: (1) Criteria for selecting actuators suitable for direct electrification for efficient power conversion; (2) Strategies to maximize regeneration potential in hydraulic actuators for sustainable energy use; (3) Techniques to prevent hydraulic power losses, optimizing performance; (4) Using advanced technologies, such as smart controls and sustainable fluids, to enhance hydraulic power systems. The presentation aims to provide engineers, designers and professionals with insights and solutions for optimizing the performance and sustainability of electrified machinery with hydraulic systems.

**12.20pm - Lunch**

## 2pm - 3.40pm Improved hydraulic performance through data utilization

**2pm - Enhancing performance through hydraulic data: collection and utilization strategies for system and machine optimization**

*Adam Livesay, founder, Elevat, USA*

This presentation explores advanced methodologies for collecting and using hydraulic data to enhance system and machine performance. With sophisticated sensors and advanced data analytics, hydraulic systems in various industries are now leading in innovation and efficiency. We will focus on the latest data acquisition techniques, such as IoT-enabled devices and real-time monitoring, providing unprecedented system visibility. The presentation will demonstrate how analyzing this data can identify inefficiencies, predict failures and support proactive maintenance, extending machinery lifespan and reducing downtime. Case studies will showcase significant improvements in energy efficiency, reliability and productivity, addressing data management challenges and solutions for successful integration.

**2.20pm - Optimizing and maintaining hydraulic efficiency on mobile machinery**

*Martin Cuthbert, managing director, Webtec, UK*

With changing business models and the rise of leased mobile machine fleets with service agreements, hydraulic maintenance must be planned from the design stage. As machines progress from design to production, optimizing hydraulic efficiency and system maintenance becomes crucial. The presentation will cover four hydraulic maintenance approaches, the available sensors and tools, their benefits for engineers in design, manufacturing and service, and the business case for data collection with field application examples.

#### **2.40pm - Hydraulic cartridge flow meters for data acquisition**

*Dale Dietel, president/CEO, DGD Fluid Power, USA*

The ongoing development of smart machines (IoT, Industry 4.0, J1939) necessitates data acquisition of all critical operating conditions in hydraulic systems, including pressures, temperatures and rates of flow. Monitoring overall system as well as component performance enhances machine efficiencies and adds to the dataset needed to minimize downtimes, warranty costs and the costs of troubleshooting remote equipment. Although solutions to monitor pressures and temperatures are readily available, flow measurement has historically been a challenge. This presentation will review recent developments regarding data acquisition and the reasons you may want to know the flow rates on your equipment's hydraulic systems.

### **3pm - 3.40pm Functional safety requirements for hydraulic systems**

#### **3pm - Demystifying functional safety in mobile hydraulics**

*Marcus Herrera, systems application engineer, HYDAC, USA*

Functional safety: what does this mean and how does it affect hydraulics? Marcus Herrera, a UL-certified functional safety professional, will walk through the basics of functional safety, with a focus on the difference between ISO 13849 and IEC 62061. Attendees will gain an understanding of what goes into certifying a system in functional safety, and how functional safety might affect the mobile hydraulic system architecture, software requirements and component capabilities.

#### **3.20pm - ISO 13849 safety methodology and what it means for off-road equipment OEMs**

*Rich Nagel, program manager - motion systems group electrification growth team, Parker Hannifin, USA*

Electrifying off-highway equipment poses unique safety challenges, especially for electromechanical systems. Key to overcoming these is adherence to ISO 13849, which sets the standard for designing safety-related control system parts. Essential for ensuring the safety and reliability of such vehicles, ISO 13849 outlines best practices and compliance steps, from risk assessment to safety function validation. This session highlights the significance of ISO 13849 and provides insights into its application, aiming to bolster vehicle safety with comprehensive safety requirement specifications and advanced technologies.

## **Day 2**

**Thursday, August 22**

### **11.30am - 12.50pm Increased hydraulic efficiency for longer duty cycles**

#### **11.30am - The importance of efficient hydraulics and the impact on e-motor and battery selection and life**

*Andrew Krajnik, system integration manager, Hydac, USA*

Diesel engines mask inefficiencies in hydraulic systems. Losses show up as higher fuel consumption, which is an operational cost that is easily addressed by refueling. However, electric machines expose these losses. Electric drivetrains are highly efficient, making hydraulic losses a significant drain on battery life. Unlike refueling, battery charging takes much longer. To maintain operating times with a lossy hydraulic system, larger batteries are needed, increasing upfront costs. Therefore, optimizing hydraulic efficiency in electric machines is critical. While there may be an initial investment in improving hydraulics, lower battery requirements ultimately lead to lower overall machine costs.

#### **11.50am - High-performance hydraulic components extend battery life in mobile hydraulic equipment**

*Jim Kaas, president, IFP Motion Solutions, USA*

The electrification of machines prompts designers to balance machine runtime and battery costs. Enhancing hydraulic system efficiency can prolong operating time on existing battery capacity or reduce battery size for cost savings. An investigation into advanced counterbalance valve energy-saving potential was conducted using a battery-driven power unit. Various load levels were tested to examine duty cycle impacts. Factors such as cylinder load, position, pressure and fluid temperature were monitored. Results showed a 10% increase in cycle counts and operating times with high-efficiency valves, enabling the elimination of an entire battery, with a cost/benefit analysis provided.

#### **12.10pm - Innovations in hydraulic valves improve energy efficiency**

*Cory Fisher, director of engineering shared services, Sun Hydraulics, USA*

A new approach to independent metering delivers 80% of the performance of traditional independent metering at roughly 20% of traditional solutions' cost. The approach involves replacing the high-ratio counterbalance valve and proportional pressure-reducing/relieving valve with prototype electrohydraulic counterbalance valves, revealing significant energy savings without compromising stability, and with increased electrohydraulic flexibility. Sun Hydraulics also introduces an innovation whereby users benefit from power generation capabilities for sensors and solenoid valves and from the ability to recover and recycle energy that would otherwise be lost

during operation. Eliminating the need for wires and harnesses, this approach streamlines operations, improving reliability and safety standards.

#### **12.30pm - A dive into adaptive load sensing and energy recovery solutions**

***Austin Karst, application engineering manager, Walvoil, USA***

In response to the need for higher productivity and lower emissions in modern mobile machinery, a new hydraulic system significantly reduces energy inefficiencies, which can reach up to 40%. This is especially vital for electrified applications, to extend range and reduce battery use. Hydraulic digital solutions like adaptive load sensing and meter out compensation enhance efficiency and energy recovery. Tested implementations show significant energy savings while maintaining the same work cycle and operator experience. This innovation promotes sustainability and efficiency in the next generation of hydraulic systems.

**12.50pm - Lunch**

## **2pm - 2.20pm Improved thermal management of electrified vehicle systems**

### **2pm - Active heat pump-based thermal management for off-highway vehicles and how the Tesla Octovalve changed the game**

***Michael Terzo, founder and CEO, Xirro, LLC, USA***

The use of hydraulics, wide-ranging duty cycles and diverse applications in off-highway vehicles require a unique approach to thermal management when electrifying systems. While the automotive industry may not have the same requirements, understanding how it has addressed thermal challenges is critical to doing the same for off-highway vehicles. This presentation will take a deep technical dive into the Tesla thermal management system from its architecture, design, efficiency gains, manufacturing approach and functionality. It will then show how lessons learned from automotive can be successfully applied to construction, agriculture, mining and other heavy-duty, off-highway battery-electric and hybrid machines.

## **2.20pm - 3pm Improved design and control of hydraulics on electrified off-highway vehicles**

### **2.20pm - Emerging valve technologies: integrated CAN, safety circuits, multifunction spools**

***Daniel Fernandes, business development manager, Hawe Hydraulik, USA***

Modern hydraulic equipment demands electrified control, redundant safety, optimized costs, automation and smaller space claims. Join this presentation to learn more about the valve technologies that support these demands and provide substantial value to machine manufacturers around the world. You will hear about a specific example where a harness with 60 wires is reduced to seven wires using onboard CANbus integration. You will also learn how auxiliary functions can have upgraded controls and performance while reducing cost. Join us to see a continuation of technological advancements and new patents in the electromechanical hydraulic valve space.

### **2.40pm - Compact customized control solutions**

***DJ O'Konek, engineering manager, Nott Company, USA***

The mobile machinery market is witnessing a rise in electric and hybrid hydraulic/electric systems, necessitating adaptive control systems. These systems must be designed to ensure a user-friendly experience and enable effective management for optimal machine performance. Simplifying integration and setup for manufacturers and design teams is crucial. Recent advancements have allowed the ability to focus on customizing control systems and the system housings to create systems that are more compact than previously achievable. These innovations aim to enhance efficiency while addressing evolving market demands for streamlined, high-performance machinery solutions.

## **3pm - 3.40pm Increased hydraulic efficiency for longer duty cycles (continued)**

### **3pm - Electrification revolution: enhancing the efficiency of hydraulic systems through electrification**

***Anant Jain, senior electrification system engineer, Danfoss Power Solutions, USA***

This presentation will cover the current electrification technology and megatrends driving the shift. We will dissect the total cost of ownership for machines, emphasizing the role of efficiency in electrification. We will delve into the different approaches, ranging from engine swaps to system-wide optimization for improving system efficiency, empowering machine builders in their electrification journeys. Using an electric wheel loader as a case study, the presentation will showcase current architectures and avenues for improvement based on duty-cycle data. The presentation will conclude with a business outlook and expected electric adoption rates, serving as a comprehensive guide to navigate the electrified future.

### **3.20pm - Improving battery life in electrified off-highway vehicles by using high-performance, energy-efficient hydraulic oils**

***Mark Petit, manager OEM Americas, Evonik Industries, USA***

The fluid power industry is seeing an increasing need for energy-efficient solutions. The efficiency of hydraulic fluids can be quantitatively compared according to ASTM D7721, in which test procedures for mobile and stationary equipment are described in detail. The efficiency improvements from shear-stable, high-VI hydraulic

oils directly extend the operating battery life in these off-road applications, with the most pronounced effects in mobile construction equipment. This presentation shares and confirms that shear-stable polyalkylmethacrylates are the most suitable VI improvers to formulate energy-efficient hydraulic fluids.

*\*This program may be subject to change*