Optimizing Packaged Electrification Systems for Mobile Equipment

We will explore examples of packaged system solutions for the electrification of mobile equipment, including ePumps and ePTOs, and explore typical component breakdowns. We will also examine how packaged solutions can help to optimize motor sizing, provide higher efficiencies through the use of variable vs. fixed hydraulic pumps, and reduce system noise. We will also explore smart control solutions, and describe how advanced laboratory testing can be a key component of the design process.

Andy Cailteux, Product Management and Business Development, Parker Hannifin
Andy is responsible for Parker's HPS' business development and product management of emerging electrification technologies, such as ePumps and ePTOs. Andy received his Bachelor's of Science in Mechanical Engineering from Valparaiso University and a Master's of Business Administration (MBA) from Eastern Michigan University, and is a licensed Professional Engineer.

Justin Hernan, Project Engineer, Parker Hannifin
Justin is responsible for the testing of electrification technologies, such as ePumps, ePTOs, permanent magnet motors, pumps, and inverters. Justin received his Bachelor's of Science in Mechanical Engineering from Ohio State University and is in the process of completing his Master's of Business Administration (MBA) from Iowa University.

Off Highway Power Transmission Methods

We will discuss various power transmission designs that may be used for off highway equipment to transmit energy from the prime energy source, such as an ICE engine or a battery, to the vehicle location where work is performed, such as work functions or propulsion, in an off-highway system. We will examine details of each methodology, explore their benefits and challenges and ideal use case examples. Four methodologies will be explored: an ICE Hydraulic system, an ICE Hydraulic/Electric Hybrid system, a Battery Electro-Hydraulic system, and a Battery Electric system.

DJ O'Konek, Engineering Manager, Nott Company

DJ O'Konek is a leading expert in the Fluid Power Industry with over 30 years of experience. His work spans Aerospace, Mobile, and Industrial applications, including contributions to Delta IV rocket production testing and the development of advanced highway maintenance equipment. With multiple patents granted and pending, DJ leads innovative engineering efforts at Nott Company, where he and his team cumulatively bring over a hundred years of experience to developing cutting-edge solutions that help OEMs overcome complex engineering challenges.

Efficiency Improvements in a Mini-Excavator Using a Distributed Independent Metering Valve System

Conventional hydraulic systems impose efficiency penalties on electrified off-highway equipment, increasing battery costs and reducing run-time. This presentation covers the development and testing of a distributed independent metering valve (dIMV) system on a mini-excavator designed to mitigate these losses. Efficiency improvements come from minimizing meter-out losses, leveraging intelligent regeneration and gravity lowering, implementing electronic flow sharing, and eliminating hose burst valves. IMUs enhance load status detection, enabling more efficient control strategies. A comparison to the baseline machine will be presented, with measured efficiency gains of 12–25%, alongside simulation results showing dIMV's synergy with multi-pump architectures and energy recuperation strategies.

Aaron Jagoda, Systems Engineer, Danfoss Power Solutions

Aaron Jagoda is a Systems Engineer in Danfoss' Innovation & Development Solutions team, specializing in hydraulic system innovation, electrification, and digital control strategies for off-highway equipment. With over 15 years of experience, he has led advancements in independent metering valve systems, energy recovery solutions, and electrohydraulic architectures to improve efficiency and control in off-highway machines. Aaron is focused on bridging the gap between traditional hydraulics and emerging electrification trends to drive industry transformation.

Unlocking Efficiency in Electrified Hydraulic Systems

Can batteries replace the combustion engine for hydraulic work functions? The answer is complex and multifaceted, but a direct swap of engine for battery to run the same old hydraulics is not practical. While hydraulics provide a unique and favorable skillset in the rugged world of off-highway machinery, a significant portion of the energy consumed is wasted. But what if current technology could enable a smarter working hydraulic system? Could less battery be used to do the same amount of work? From load-sense systems to active independent metering valves and the help of AI, we'll explore real solutions for efficiency.

Chase Younker, Electronics Product Manager, HAWE Hydraulik

Chase Younker is the Electronics Product Manager for HAWE Hydraulik based in Clackamas, OR. His responsibilities include technical sales of hydraulic components with on-board electronics, battery electric power systems, and integrated control systems for off-highway equipment. His hands-on experience both in hydraulic and electrical applications offers a practical perspective on how the two technologies work together to help the machines we depend on be more capable, robust, and efficient.

Remote Diagnostics & Support Using Connected Devices

The integration of connected devices in hydraulic systems revolutionizes monitoring, diagnostics, and efficiency. By leveraging an IoT device in conjunction with analog sensors and monitored cartridge valves, operators can continuously track system performance, predict failures, and optimize maintenance schedules. This proactive approach enhances uptime, reduces unplanned downtime, and streamlines technical support through remote diagnostics and automated alerts. Additionally, data-driven insights improve energy efficiency and system optimization, reducing operational costs.

Cory Fisher, Director of Engineering Shared Services, Sun Hydraulics

Drawing from over two decades of experience in engineering leadership and product management, Cory is an Engineering Director at Sun Hydraulics. With a background in valve research, design, and development at Caterpillar and Woodward, Cory specializes in electro-hydraulic valves and systems, design, testing, and validation. Holding a Master of Science in Mechanical Engineering from Northern Illinois University, Cory has consistently driven innovation and excellence throughout his career. As a seasoned leader, Cory oversees diverse engineering functions including R&D Laboratory, Simulation, PLM, Distributor Training, and global engineering team coordination, ensuring impactful solutions, and fostering continuous growth in the field of hydraulics.

Hydraulic Data from the Heart of the Circuit: Pump Output Digitization

Recent research and development has produced a new on-board data digitization solution for hydraulic pumps. Currently applied to field-proven, variable displacement piston pumps, the system is equipped with embedded electronics and sensor technology, able to measure, utilize and transmit hydraulic performance information. Principles of operation are described, along with features such as predictive maintenance calculation, detection of eminent failure through anomalous conditions, analysis of duty cycle severity, and data conditioning and transmission capability supporting cloud-based telematics. Additionally, pending technology in contamination sensing and fluid condition monitoring will be previewed.

Mark Preissig, General Manager, Casappa Corporation

With over 25 years of expertise in fluid power technology and mobile equipment applications, Mark brings a deep understanding of hydraulic system innovation and market dynamics. Currently leading Casappa's North American operations, he's focused on aligning technical knowledge with customer needs, and fostering collaboration across engineering, sales, and product development teams. A career of hands-on application work with top global equipment OEMs, spanning the digital evolution of hydraulics, puts Mark in a unique position to share the impact and value of enhanced data acquisition at the pump level.

Fully Digital Electro-Hydraulic Systems: Integrating Real-Time Control, AI-Enabled Safety, and MISRA-C Compliance

This presentation explores the transformative integration of digital electro-hydraulic systems in off-highway applications with real-time operating systems and advanced AI-driven safety features that adhere to rigorous MISRA-C standards while also meeting stringent defense certification requirements. We will illustrate how the convergence of digital sensors, smart actuators, and deterministic control architectures not only enhances efficiency and reliability but also fulfills the high-security standards demanded by defense applications. We will delve into the challenges and innovations involved in aligning cutting-edge fluid power technology with defense-level safety and performance criteria, setting a new benchmark for secure and high-performance solutions in the industry.

Michael B. Terzo, P.E., Founder and CEO, Xirro, LLC; Director and Board Member, HeavyTech, Inc.

Michael Terzo is a visionary engineer and industry disruptor with over 25 years of experience in fluid power, engineering, manufacturing, and entrepreneurship. He is driving a new level of innovation in the off-highway industry by taking a first-principles engineering approach to the heavy-duty vehicle space. He has commercialized hyper-efficient electro-hydraulic technology currently being utilized in commercial vehicles worldwide. Through work funded through the California Energy Commission he has demonstrated hydraulic energy savings of over 96%. Now, through his leadership at HeavyTech, he is developing next-generation, hybrid and electric construction machinery, challenging OEMs with sustainable, high-performance solutions that redefine industry standards.