



Autonomy is a system-level problem bringing together various components which can include hydraulics and pneumatics.
DANFOSS POWER SOLUTIONS

3 KEY TECHNOLOGY TRENDS at IFPE 2023

Technology advancements on display at IFPE will focus on sustainability, automation and digitalization.

by Sara Jensen

Once every three years the fluid power industry comes together alongside the construction industry—one of the largest users of fluid power components, particularly hydraulics—for the International Fluid Power Exposition (IFPE) and CONEXPO-CON/AGG.

The 2023 edition of IFPE will once again highlight the latest hydraulic and pneumatic solutions, as well as technology advancements in motion control and power transmission.

Marica Klein, treasurer at Casappa Corp. and chairperson of IFPE 2023, said in an interview with *Power & Motion* the key themes for IFPE 2023 include:

- sustainability,
- automation,
- digitalization.

These themes are driving many of the technology advancements taking place in the fluid power industry as well as the markets they serve like construction, and several manufacturers will highlight their progress in these development areas during IFPE 2023.

Technology Enables Sustainability

Sustainability can be achieved in many ways, such as reducing fuel consumption, utilizing fewer materials and implementation of new power sources to eliminate emissions. And fluid power components can play an important part in reaching sustainability goals.

Improving the efficiency of fluid power components and systems is one of the many ways the industry is going about doing so. By improving efficiency, overall energy and fuel used by a machine can be reduced which leads to lower fuel costs and emissions.

At IFPE 2023, Danfoss Power Solutions plans to display its Dextreme system for excavators which is based on its Digital Displacement technology. Per Danfoss, the Dextreme system provides a pathway to 50% energy savings by tackling losses in the whole excavator hydraulic system. At the heart of the system is a digitally controlled hydraulic pump which enables more efficient and controlled hydraulic flow, leading to improved system efficiency and faster operator response times.

According to Danfoss, the fast response and digital control of the hydraulic pump allows for an excavator's engine loading to be controlled and thus a significant reduction in fuel consumption without negative impacts to productivity.

Additive manufacturing, also commonly referred to as 3D printing, is bringing opportunities to rethink the design of hydraulic components. Doing so can lead to a reduction in component weight and size, which can reduce overall machine weight to improve fuel consumption.



Crowds flooded IFPE 2020, and the 2023 show is expected to be even larger.
ASSOCIATION OF EQUIPMENT MANUFACTURERS

Valeria Tirelli, president & CEO of Aidro Hydraulics & 3D Printing (a Desktop Metal company), explained in an interview with *Power & Motion* that additive manufacturing enables less





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materials and energy to be used than conventional manufacturing methods. It also reduces the amount of tooling necessary for production parts, further benefiting energy reduction.

The ability to create lighter weight parts with additive manufacturing benefits traditional machine designs as well as newer, electric-powered equipment. For electric machines, use of lighter weight components is vital to offsetting the additional weight of batteries.

Electrification Provides Opportunities

The transition to electrification is likely what immediately comes to mind when the term sustainability is mentioned. Although there are examples of hydraulics being replaced in some cases, such as the all-electric compact wheel loader developed by Moog and Komatsu, most of the industry agrees there will remain a need for fluid power components in many applications even as electrification increases.

There is yet to be a technology which can provide the power density of hydraulics, benefiting its ongoing use



Exhibitors at IFPE will showcase a range of fluid power products.
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particularly in larger machines. With the advent of electrification, there are opportunities to improve the efficiency of hydraulic systems.

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When Danfoss' Editron division developed a proof-of-concept fully electric wheel loader, it found efficiency gains could be achieved in the hydraulics system. The company was able to do so by rethinking the system architecture and separating some of the machine functions, leading to reduced power consumption and improved efficiency.

The pairing of fluid power and electric components will become more commonplace as electrification progresses. This will be necessary to achieve the efficiency gains desired for electric-powered machines while also helping to improve the performance of fluid power systems.

In a white paper from IFPE organizers, Poclain Hydraulics discussed how there will be a need for intelligent engineering going forward to bring together electric and hydraulic components which will be necessary to optimize performance of electrified machines.

Poclain is currently working on various electro-hydraulic solutions which it intends to show at IFPE 2023. Among these will be the only opportunity in North America to see its electro-hydraulic smart articulated mini loader which utilizes many of the technologies Poclain is developing which combine electric and hydraulic components.

Bosch Rexroth is also developing components for electric machinery and intends to show its LION electrification platform



at IFPE 2023. Developed specifically for heavy-duty off-highway equipment, the platform includes electric motor-generators, inverters and accessories as well as gearboxes, hydraulics and software components. Components within the platform can be scaled as necessary to help OEMs create hybrid- and full-electric machines.

Like Danfoss and Poclain, Bosch Rexroth is able to bring its hydraulics expertise and knowledge of the heavy equipment industry to the development of products for electric-powered machines. This helps to ensure components and

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At CONEXPO 2020, CASE CE introduced its electric backhoe.
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systems will work well together and machine performance is optimized.

Despite the uptick in recent years in electrified machine launches, the transition to electrification is expected to be a gradual one. Currently there are a few models commercially available but they are mostly compact machines as those are easier to electrify with today's technology. Most OEMs are now working to electrify machines of various sizes, but it will take time to do so.

Automation Brings Technologies Together

With electrification has come the integration of more electronic components in systems and individual components. This is bringing the ability to collect data on performance as well as provide new functionalities such as automation.

Integration of sensors and software is enabling automation of systems and components, including hydraulics and pneumatics. As Peter Bleday, head of autonomy at Danfoss Power Solutions, explained in an interview with *Power & Motion*, many hydraulic components in mobile equipment are now controlled by electronics and software. This enables autonomy to be brought in to control various machine functions—many of which are hydraulically controlled.

Bleday said autonomy is a system-level problem bringing together various components which can include hydraulics and pneumatics. Electrohydraulic, steer-by-wire technology such as Danfoss' EHi steering valves, for instance, will be integral for enabling autonomous driving.

Danfoss understands the impacts autonomy can have on machines and their systems, which is why it is developing components to work with autonomous systems. It has also developed the PLUS+1 Autonomy Solution which brings together hardware and software to help OEMs with their machine automation. It provides manufacturers with software



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blocks containing the necessary information to create autonomous and semi-autonomous systems, helping reduce their development time.

Automation can take many forms, from machines capable of working without an operator in the cab to the automation of certain machine movements, such as digging. The latter is the form currently most common in the construction industry. Automating tasks like digging helps to minimize the input necessary from operators, enabling them to focus on other work and be more comfortable.

By automating certain machine functions, the skills necessary to operate an excavator or other piece of equipment can be reduced. This is becoming an increasingly important aspect due to the lack of skilled labor entering the construction and other heavy equipment markets. The easier a piece of equipment is to use, the faster a new—or even seasoned—operator can get working in a safe, productive and efficient manner.

Improved Data and Maintenance Through Digitalization

In tandem with automation, the increased use of sensors and software is enabling digitalization of fluid power systems. The IFPE white paper describes digitalization as the use of digital technologies to enable or improve a process.

Bosch Rexroth's eLION portfolio includes a range of electronic, hydraulic and other components to enable electrification of heavy machinery.

BOSCH REXROTH



For fluid power applications, this can already be seen through increased data collection and analysis. The white paper also notes digitalization as an important part of achieving the full benefits of electrification.

Collecting and analyzing data on component and system performance makes it easier to monitor when a part is starting to wear or fail so machine owners can be more proactive with their maintenance routines.

HydraForce recently partnered with Tan Delta and Elevat to improve maintenance of hydraulic systems. Tan Delta's oil conditioning sensor will be integrated into manifold assemblies equipped with HydraForce's cartridge valves for continuous monitoring of hydraulic oil conditions. Information will then be analyzed within Elevat's telematics technology and sent to machine owner's so they can take timely action on any potential maintenance needs.

Communication of maintenance needs from physical parts is possible due to the Internet of Things (IoT) which enables automatic alerts to be sent based on information collected by the sensors, software and processing built into a system.

At IFPE 2023, Casappa is planning to show its smart piston pump featuring the pump, electronic control unit (ECU) and sensors integrated into a single unit. As explained in the IFPE white paper, this design is intended to help enhance digital control of the pump as well as improve efficiency by measuring drain pressure and temperature, speed and load sensing. Performance data collected by the pump's sensors will be analyzed to help optimize hydraulic power management and provide condition monitoring. The data can also be used to aid with predictive maintenance.

All of these trends—electrification, automation and digitalization—will work together to help make systems and overall machines more efficient. Efficiency has become increasingly more important to OEMs and their end customers, and further advancements related to these key IFPE themes will only continue due to the benefits which can be provided for both fluid power manufacturers and their customers. **P&M**

Find Them at IFPE

If you'll be attending IFPE 2023, be sure to look for the companies and technologies featured in this article in South Hall 3.

- **Aidro Hydraulics and 3D Printing: S83343**
- **Bosch Rexroth: S80215**
- **Casappa Corp.: S81629**
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