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June 2022



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Top 10 Trends Impacting Construction in North America The Association of Equipment Manufacturers has released a white paper highlighting the key trends impacting construction as well as the industries which serve it. powermotiontech.com/21242356



ACT Expo 2022 Highlights Advancements in Electric Vehicle Technology

New electric vehicle and other alternative energy technologies for the transportation industry were debuted during ACT Expo 2022. powermotiontech.com/21241293



Video: Drivers of Off-Highway Electrification

Antti Väyrynen of Danfoss Editron says there are three key factors driving construction equipment electrification. powermotiontech.com/21241503

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SARA JENSEN Technical Editor sjensen@endeavorb2b.com



Collaboration Brings New Design Opportunities

Industry partnerships are nothing new, but these days it seems like you can't go one week without hearing about a new collaboration between two or more companies—and I think that's great. It's one of the things I've always enjoyed about covering during my B2B career.

When companies bring together their expertise to create new solutions for the market, it demonstrates not only a willingness to share knowledge but also an acceptance that one company does not know everything. Instead they can learn and grow by partnering with others which can help make all involved better at what they do.

In this issue you'll find two articles about recently announced industry collaborations. On pg. 12 you can read about Danfoss' collaboration with RISE Robotics, a developer of electromechanical actuators. The RISE technology looks to bring the best of hydraulics and electronics to heavy-duty equipment manufacturers who are electrifying their systems and machines.

These are areas in which Danfoss is also working. The companies' aim is that their combined knowledge will help advance electrification of heavy-duty equipment such as construction and agricultural machinery, segments where hydraulics still play a vital role but use of electrification will bring efficiency gains and emissions reductions. On pg. 24 you can read about a new collaboration between several OEMs and a software supplier aimed at advancing automation in heavy-duty on- and off-highway vehicles. Known as the Autonomous Operation Cluster (AOC), the companies are hoping to help accelerate the development and implementation of autonomous functions in various machine types.

The participating companies will jointly develop the technologies necessary for autonomous machine functions which will help operators to complete their jobs in an easy and safe manner. They will create the technologies to be used on a range of machinery from firefighting vehicles to construction equipment.

By combining each company's expertise, development time can be sped up by utilizing a larger wealth of industry knowledge. And it can be assured the solutions created will best fit the needs of the various applications to which the autonomous technologies will be utilized.

To learn more about the formation of the AOC, you can also read our exclusive Q&A with TTControl's Leandro Antonio Zaza, Senior Technical Sales Manager & AOC Manager at powermotiontech.com/21241504.



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2022 IDEA AWARDS Celebrate Design Innovation

Entry deadline is June 24; 12 categories of new products to be recognized.

by Staff



THE 2022 INDUSTRIAL DESIGN, Engineering & Automation (IDEA) Awards will celebrate outstanding innovation in product design and function for the manufacturing sector. IDEA Award winners will be chosen by the readers of *Machine Design*, *Electronic Design* and *Power & Motion*, who will vote for entries from 11 different categories. The deadline to enter products for the IDEA Awards is **June 24, 2022 at 5 p.m. CT**. Finalists for the IDEA Awards will be announced on Aug. 15 online at machinedesign.com, electronicdesign.com and powermotiontech.com and in the Mid-Year Report edition of *Machine Design* magazine and the July-August issue of *Power & Motion* magazine.

The Categories for the 2022 IDEA Awards are:

3D Printing

3D printing machines, materials and software, as well as interfaces to CAD and machine tools for post-processing

Automation & Controls

PLC, SCADA and other control devices as well as networks and software used to manage control systems and data

Electric Motors, Drives and Components

Electric motors and drives of all sizes and electrical and electronic components

Design Software

CAD, CAM, CAE, DFM, AI, FEA, modeling and simulation software to assist the design engineer

Robotics

Single-axis and multi-axis robots as well as cobots, AGVs and other robotic transport vehicles

Sensors

Embedded sensors to measure speed, temperature, vibration, positioning and other operational parameters and functions as well as the enabling software

Motion Control

Pneumatic, hydraulic, and electric systems and guides, including cylinders, ball screws, belts, chains and other actuators, as well as fluids, filters and compressed air systems

Cloud and Computing

Edge computing devices, printers, modems, displays, HMIs and interfaces, as well as the cloud systems and software needed to collect and manage operational data

Mechatronics

System management of multi-faceted systems, including hardware and software components and tools

Fastening and Joining

All mechanical and machine tool operations, welding, soldering and adhesives focused on metal or component joining as well as materials used to fasten and secure components

Fluid Power Components

Hydraulic and pneumatic systems and components and compressed air systems as well as all hoses and valves required for efficient fluid power operation

Materials

Metals, alloys, plastics, polymers, ceramics and composites

Each entry is \$500. Companies may submit multiple entries.

For more information, go to the official IDEA Awards page at https://bit.ly/3wIP7I6.

For a review of the 2021 IDEA Award winners, go to www.machinedesign.com/21180745.

Can't find the answers you're looking for? Contact us at bvavra@endeavorb2b.com.



Caterpillar Overhauls Hydraulics for New Next Gen Compact Wheel Loaders

Use of a pressure compensated valve as standard provides new opportunities for precision and efficiency improvements.

by Sara Jensen

eavy equipment manufacturer Caterpillar Inc. has introduced its new Next Generation Cat 906, 907 and 908 compact wheel loaders. Among the many design changes for these machines was an overhaul of their hydraulics systems to help improve efficiency and performance.

A pressure compensated valve is now standard on these wheel loaders. According to the company, this makes it easier for operators to control machine implements as well as hydromechanical attachments. Inclusion of the pressure compensated valve provides improved lift and tilt performance which helps machine operators complete their work more easily.

Updated Hydraulics Platform Improves Efficiency

Historically, Caterpillar has used a parallel valve and a tandem valve on its M series wheel loaders, of which these new machines are a part. Standardizing use of a pressure compensated valve, however, adds new capabilities.

Elie Abi-Karam, product application Sspecialist at Caterpillar, says the pressure compensated valve is effectively the same as the one used on larger Cat machines. It is also software driven like in the company's larger machines.

Bringing the same software and hydraulics platform to its smaller machines provides customers "great ability, controllability and fine motor functions," says Abi-Karam. The system allows very precise movement which can benefit machine owners' productivity by helping to ensure the can do their work accurately and reduce the need for rework.

"At the same time, we can run hydraulic tools efficiently," he says. Operators can lift, lower and tilt attachments which the valve continuously manages to ensure they are moved in the most precise and efficient way possible.

The wheel loaders' hydraulics can be standard or high flow, says Abi-Karam, enabling use of various Caterpillar attachments—adding versatility to the applications in which the machines can be used.

Working auxiliary pressures have been increased from previous wheel loader models which Caterpillar says makes work easier to perform and improves steering to help reduce operator fatigue.

Cylinder snubbing has also been incorporated onto the machines. When the wheel loader's bucket is at its maximum height or full dump there is no longer a bang sensation coming into the cab and felt by the operator says Jas Kundra, sales & marketing manager, Compact Wheel Loaders at Caterpillar. Instead, there is cushioning which keeps the bucket arm's hydraulic cylinder from causing this banging common with other machine designs which can cause discomfort for operators.

Overall, updates to the hydraulics system of these Next Generation compact wheel loaders are expected to help customers perform their work in a more productive, efficient and comfortable manner. **P&M**



John Deere and GUSS Automation Form Joint Venture

The joint venture will enable GUSS to focus on continued advancements of its autonomous sprayer as well as provide the companies opportunity to collaborate on ways to best serve customers in the high-value crop segment.

by Sara Jensen

ohn Deere has announced the formation of a joint venture with GUSS Automation, a Californiabased company which has developed semiautonomous orchard and vineyard sprayers known as GUSS (Global Unmanned Spray System). These machines can be controlled remotely to conduct spraying operations on high-value crops such as almonds, grapes and melons.

Currently, the joint venture will enable GUSS to further collaborate with John Deere's sales channel. The autonomous sprayers are primarily sold through Deere dealers already, and the joint venture will enable a further expansion of these sales efforts.

John Deere told *Power & Motion* via email there are no plans to apply GUSS technology to its products, and GUSS will continue to own and develop its technology. There are also no immediate plans for technology collaboration between the companies. However, John Deere said it is most interested in GUSS for its deep customer understanding of the high-value crop segment and it is Deere's intent to collaborate where it can deliver additional value to customers.

The company said there are similarities

between the two companies, such as their desire to use innovation and technology to help solve customers' problems. "We will look for opportunities to collaborate and best serve customers through our joint efforts," said John Deere.

One of the biggest challenges facing farmers today is labor. Autonomous machines such as GUSS can help overcome labor shortages as a single person can remotely control multiple machines. Automation also helps to ensure more consistent spraying, reducing chemical use which can improve operational costs for farmers as well as reduce impacts to the environment.

Use of automated systems and equipment can help improve the accuracy and efficiency of operations because they eliminate human error. The software and sensors built into an automated system enable tasks to be more precisely controlled. For GUSS, application rates and sprayer speeds can be more tightly controlled and adjusted as necessary through simple software changes.

"As demand for high-value crops grows, we see significant opportunities to help growers be more productive while addressing the challenges of increasing labor costs and finding skilled labor to operate equipment," said Chris Davison, director, Small Tractor & HVC Production Systems at John Deere, in the company's press release announcing the joint venture. "The GUSS team has a deep understanding of the highvalue crop production system, as well as strong relationships with customers and a proven track record of deploying innovative technology."

This is just one of many investments John Deere has made into autonomous agriculture equipment. In 2021, the company acquired Bear Flag Robotics, a developer of autonomous tractor technology. And at the Consumer Electronics Show (CES) 2022, John Deere unveiled its Autonomous 8R tractor which can operate unmanned for tillage operations.

GUSS Sprayers Use Advanced Technology

The autonomous system used to enable unmanned operation of the GUSS sprayer is comprised of GPS, LiDAR, vehicle sensors and proprietary software. All of these work together to give the machine visibility of its environment and keep it on planned paths through the orchard or vineyard.

GUSS developed several additional technologies, as well, to ensure operation under tree canopies. Even the most advanced GPS technology available today can have difficulty picking up signals when a machine is covered by trees or other objects. And because GUSS is intended for high-value crops which are grown in environments with a lot of tree cover, such as almonds, it was important to develop technology that will allow the sprayer to easily maneuver and "see" within these conditions.

GUSS' Select Spray technology ensures precise and efficient spraying of crops. It is able to detect the tree or other crop which needs to be sprayed and applies only the necessary amount of material.

Up to eight machines can be monitored



by a single person via a laptop. The operator receives real-time feedback on how the sprayer is operating, including spray rate and speed, so he or she can ensure all is going as planned or make adjustments as necessary. **P&M**



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Danfoss Collaborating with RISE Robotics on Heavy Machinery Electrification

The companies plan to jointly test and validate the latest version of the RISE Cylinder to aid electrification of heavy-duty equipment.

by Sara Jensen

anfoss Power Solutions has announced the signing of a collaboration agreement with RISE Robotics, a developer of an electromechanical actuator technology aimed at electrifying various applications. The companies will jointly validate and test the latest versions of RISE's electromechanical actuator to aid with electrification efforts in the heavy-duty off-highway equipment industry states Danfoss in its press release announcing the collaboration.

The patented RISE Cylinder is a fluid-free alternative to hydraulic options which can be utilized in a variety of heavy-duty vehicles and equipment. It is designed to help overcome challenges associated with implementing electrification in larger applications. The cylinder is able to do so by delivering the hydraulic-like forces necessary in many heavy vehicle and equipment applications but at a high level of efficiency, precision, speed and weight.

RISE continues to expand its electrification efforts and industry collaborations. Recently, the company announced it was awarded a contract to help modernize the U.S. Air Force's MHU-083 Jammer. At the 2021 edition of The Battery Show it announced a partnership with Anthony Liftgates to demonstrate use of its technology in a liftgate application.

Danfoss has also been working in the electrification space for several years now and has continued growing its product offering in this area. Its Danfoss Editron brand is specifically focused on development of electric powertrain components including electric motors and controls. It has helped power a variety of heavy-duty trucks, marine vessels and construction equipment.

"It's an exciting opportunity to work with RISE Robotics to accelerate the development of solutions that have the potential to create near-term, low-carbon options for our customers," said Danfoss Power Solutions President Eric Alström in the company's press release announcing the partnership. "We're taking bold steps to battle climate change and help customers around the world decarbonize. Electrification is a critical enabler to the Green Transition, and we're thrilled to be on this journey with RISE.

"RISE's unwavering dedication to commercializing scalable solutions enabled by advanced technology is the same pioneering spirit that has fueled Danfoss' journey from startup to industry leader," added Alström. "We look forward to working toward these goals together."

"We are delighted to collaborate with Danfoss," said RISE Robotics CEO Arron Acosta in the press release. "Innovation isn't for everyone, but at Danfoss, innovation is at the core of their DNA. Their speed of decision-making is electric. Their engineering and global manufacturing capabilities lead the way." **P&M**



2022 Fluid Power Vehicle Challenge: Iowa State and Cleveland State Selected Overall Champions

Two competitions were held as part of the 2022 NFPA Fluid Power Vehicle Challenge which drew the largest attendance to date.

by Sara Jensen



The National Fluid Power Association (NFPA) has announced the winners of its 2022 Fluid Power Vehicle Challenge. Iowa State University and Cleveland State University were named Overall Champion of the event.

For the 2022 challenge, two competitions were held to reach more students and industry members. Danfoss Power Solutions and Norgren hosted the events which took place April 20-22 and April 27-29.

Winners at the Danfoss-hosted event were:

Overall Champion: Iowa State University

2nd Place: Murray State University 3rd Place: University of Cincinnati

Winners at the Norgren-hosted

event were:

Overall Champion: Cleveland State University

2nd Place: University of Akron **3rd Place:** Arizona State University

NorgrenAt the Norgren hosted Fluid Power Vehicle Challenge Cleveland State University was named Overall Champion.National Fluid Power Association

NFPA says the 2022 Fluid Power Vehicle Challenge had its largest attendance to date with close to 250 university and industry participants. The association

notes in its press release announcing this year's champions that the event highlighted use of pneumatics and electronics in addition to traditional hydraulic systems in the various teams' designs.

Prizes were given out honoring innovative use of pneumatics and electronics in the students' vehicle designs:

- Best Use of Pneumatics -Sponsored by Norgren: Murray State University and California Polytechnic State University
- Innovative Use of Electronics -Sponsored by IFP Motion Solutions Inc.: University of Cincinnati and Purdue University **P&M**





LIGHTWEIGHT HYDRAULICS Offer New Opportunities

to Manufacturers

Reducing the weight of hydraulic components can benefit an array of industries and bring about new design options.

by Sara Jensen

reation of lighter weight hydraulic components is increasing due to the many benefits which can be achieved. Mobile applications in particular can benefit from use of lightweight components as they can help to reduce the overall weight of the vehicle and thus improve fuel efficiency.

As electrification continues to grow, so too will the need for lightweight components. Not only can their use reduce overall vehicle weight, but they can also compensate for heavier components such as batteries and electric motors. "If you can offset that weight savings with a lightweight aluminum cylinder, especially in the hauling industry, it allows you to haul more product," said Dwayne Skurat, Senior Design Technologist at RAM Industries. "And in the end, it allows you to have a smaller carbon footprint because now you're hauling more pounds for the same weight."

Developing Lighter Weight Components

RAM developed its aluminum cylinder technology due to increasing demand from OEM's for lightweight cylinders which could be used in trailer applications. The company can work with customers to create customized versions for use in trailer and a variety of other applications. It has also created a standard cylinder based on this market need and offers various options from which customers can choose for their own unique versions.

RAM's cylinder features an aluminum body with several internal aluminum components, enabling it to be lighter in weight said Skurat. The cylinder also has a hollow rod, providing additional weight savings.

While there are other aluminum cylinders in the market, he noted many of them do not offer options or customization like the RAM cylinder does. Customization is a large part of what RAM does, which allows it to better meet customers' specific application requirements.

Skurat said the aluminum cylinder

has some unique features, one of which is porting being located at the base of the cylinder. This allows for a cleaner installation and a reduction in line length, as well as more protection for the cylinder lines depending on how it is incorporated.

A built-in check valve is available with the cylinder, as well, which locks the cylinder in place so it cannot move should its line break. And because the check valve is built into the cylinder, additional weight savings can be achieved as it eliminates the need for a separate valve block.

Additive manufacturing—also known as 3D printing—is one of the methods being utilized to create lighter weight hydraulic components. The secret of additive manufacturing is having the ability to change how manufacturers approach the design of their components and adopt the idea of additive manufacturing which essentially means add material only where it is needed, said Valeria Tirelli, President & CEO of Aidro Hydraulics & 3D Printing (a Desktop Metal company) and member of *Power & Motion*'s Editorial Advisory Board.

She explained that most conventional manufacturing for hydraulics starts with a metal block machined to create the desired design. However, with additive manufacturing (AM) the raw material—a metal powder—is continually added to create the product. This enables less material to be used than with conventional methods and thus reduces weight of the component.

"What is really important is to have the correct design for the additive manufacturing approach because we completely change the way we design the parts," said Tirelli. Constraints normally associated with the design of hydraulics due to the limitations of conventional manufacturing methods can be completely removed, allowing more design freedom.

She said what Aidro discovered through the use of AM is that designs can begin with the desired flow of oil through the component. "We create the channel and then we add the material only where it



is needed." Depending on the pressure needed, more or less material can be added as necessary.

"The approach is completely different, we have a lot of freedom to create exactly the shape we need and the shape that will fit in the final hydraulics system," said Tirelli. Parts can now be lighter and more compact, as well as better fit with the shape needed for the hydraulic system, connections, and tooling.

Material Options an Important Factor

Material choice can have a large impact on the creation of lightweight components. RAM said it chose to use aluminum as it is not only lighter in weight but also provides good corrosion protection. In addition, it does not require any painting which provides further weight savings as well.

Skurat said a wide range of aluminum grades are readily available in the market. With the many options available, RAM can machine different components and different strength materials to ensure they will work well within a given application.

Aluminum is also easily machinable, unlike some of the composite materials currently in the market. He noted aluminum is also more cost effective compared to some of the other lightweight materials available such as high-strength steels or composite materials which is beneficial as well.

Jeff Grabowski, Manager of Business Development, QuesTek Innovations, LLC—a provider of Integrated Computational Materials Engineering (ICME) technologies—said during a presentation he gave at the National Fluid Power Association (NFPA) Fluid Power Industrial Consortium's (FPIC) March 2022 event there is a strong desire in the fluid power industry for lighter weight and thinner walled tubes and rods. However, buckling can become an issue.

To overcome this, he said companies could use higher strength steel. Fluid power component manufacturers could also utilize steels modified with ceramic particles which can improve stiffness and modulus of elasticity while maintaining strength. This would help to resist buckling and enable creation of thinner walled tubes or cylinders.

Cost, however, is a factor that would need to be considered. Steel can be expensive, and manufacturers will need to determine if using this higher cost material is worthwhile for their application. "We have found in many industries with certain components it is worth spending more money to get a better material to resolve your problem," said Grabowski. QuesTek has developed steels for applications where the increased cost is worthwhile, such as for aerospace and defense. For these, weight is a factor but so is strength which makes the higher cost worthwhile.

Development of Ferrium C61 and C64 carburizable steels, for instance, enabled the creation of transmission gears for army helicopters which were over 20% lighter in weight compared to the steels used previously. QuesTek was also able to design the steels to have a higher temperature resistance, allowing the gears to perform longer without the use of oil. "This is significant," said Grabowski. "If the oil box is shot and the oil leaks, traditional steels' microstructure breaks down, and you have maybe 10 or 15 minutes until it turns into butter and the helicopter crashes, but this material lasts for almost 90 minutes."

Grabowski said the company is also working on a project with cast iron to see

if it can improve the strength-toughness combination for lightweighting. The project is currently in the early stages but he said there is opportunity for improvements in cast iron development despite the material's use over the last several centuries in many applications.

For some commonly used ductile irons, he said the company believes there is opportunity to modify the chemistries to increase strength or ductility which could allow for lightweighting or increased power density.

Lightweighting on a Growth Trajectory

As a variety of industries and applications—from passenger cars to agricultural machinery to aerospace—can benefit from use of lighter weight components, and particularly as electrification accelerates, their development will continue to grow in the coming years. Skurat said currently lightweighting is a bit of a niche application but expects manufacturers will be looking for more lightweight solutions over the years. He said RAM wants to create alternate sizes and different combinations of rods for its aluminum cylinder design so it can be used in a variety of applications.

In addition, the company may look at creating a lightweight pneumatic cylinder based off the hydraulic design. He anticipates many of the components would be similar but with different sealing and layout. While many pneumatic cylinders in many applications are already made of aluminum, the push toward further lightweighting may increase its use.

"We are going to see growing requirements for [lightweighting]," concludes Darrell Mirva, Engineering Manager at RAM Industries. "We think it is a very promising field, and we see great benefits to the end users." **P&M**





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FAQ

The Importance of Understanding Motor Disconnect Switches

Q: What is the major purpose for using motor disconnect switches?

SI KATKO

A: Motor disconnect switches are an important part of a system's safety protocol for electrical equipment that needs robust protection for both the equipment and personnel. These devices are used to make it easy for manufacturers to disconnect and reconnect power so that operators are able to work safely downstream of the switch—with absolutely no concern about coming in contact with live voltage or power. Besides being used to open and close the motor circuits when repair or maintenance is needed, disconnect switches can be used for lockout/tagout purposes to keep equipment shut down and isolated until proper restart sequences are completed. Disconnect switches also allow operators to access a control panel without being exposed to the line-side voltage. In fact, with today's safety regulations, manufacturers are required to include a local—and visible disconnect switch for motors and equipment.

Q: What components make up a disconnect switch?

A: Disconnect switches are made of wired contacts connected to an actuator of some type, whether a handle or toggle. An enclosure protects the contacts from environmental hazards anywhere from dust and dirt to water and moisture. The handle or toggle allows users to engage and disengage the electrical contacts without opening the distribution enclosure or motor controller. Locking the switch in the disconnect position is often required so that power cannot be turned on accidentally.

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Be sure to work with a company that offers multiple options for mounting your disconnect switch so that you can adapt quickly and easily to any application.

Q: What options are available for mounting in different applications?

A: Mounting is an important part of selecting the right disconnect switch because some applications have limited space to work with. Options to consider include a door interlock installation where the switch is placed on the back panel and the shaft is inserted into the disconnect switch and stays with the switch, with the panel door open and the door interlock handle on the outside of the panel door. For a panel door mount or side mount application, the switch itself is located on the inside of the door or side panel. Then, there is a standard inside panel application with direct handle or toggle operated switch. Note which of

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these mounting methods are ones you might wish to have a locking capability for in order to best protect personnel and equipment.

Q: What specifications can be considered for general use of a disconnect switch?

A: Applications vary quite a bit, but you'll find that 16A to 150A/600V should take care of most of your needs. You will have to consider the size of the manufacturer's solution since many pieces of equipment built today have less real estate available for such devices. This is why companies like Altech have focused on compact designs, such as their UL 508, which is one of the smallest 80A disconnect switches on the market.

Q: What else might I consider when looking for the right disconnect switch?

A: We suggest that you look for a switch mechanism that is digitally controlled—that is, the switch mechanism speed is independent from the operator speed. For example, Altech's UL 98 disconnect switches operate regardless of how slow the handle moves. At a certain point the switch goes from off to on or vice versa. Also, when considering a disconnect switch, look for a manufacturer who uses the same design for either direct or extended handle units. Be sure that the manufacturer you choose also has a comprehensive range of accessories including a variety of door mounting kits and fuse holders. Another consideration, depending on your application would be the materials the disconnect switch is made out of. Look for a company that offers different enclosures such as aluminum, sheet metal, stainless steel and polycarbonate enclosed disconnect switches.

Q: What certifications will I need to consider when selecting a disconnect switch?

A: The National Electrical Code (NEC) says that a disconnect switch must be located in sight from all motors or manufacturing equipment, not more than 50 feet from the equipment it controls. UL listings are also required for the electrical mechanisms of disconnect switches. Altech disconnect switches have been designed and manufactured in accordance with EN 60947-l, EN 60947-3, IEC 60947-1, IEC 60947-3, Low Voltage Directive 2006/95/EY, and UL60947-4-1 (formerly UL508).



Top Market Factors Impacting the Fluid Power Industry

Labor challenges and supply chain disruptions are among the key market factors with the potential to impact hydraulics and pneumatics manufacturers.

by Sara Jensen

ontinued economic growth in 2022 will benefit a variety of industries, including fluid power. While market conditions are expected to remain positive, there are also several aspects such as supply chain disruptions and labor shortages which could influence how hydraulics and pneumatics manufacturers do business going forward.

During the National Fluid Power Association's (NFPA) economic update webinar held March 22, Eric Post, senior economist at ITR Economics, provided his firm's outlook for the coming years and key market factors which have the potential to impact the fluid power industry.

Conflict Between Ukraine and Russia

The ongoing conflict between Ukraine and Russia will have a number of impacts on global markets. Economically, higher commodity prices are likely to be seen particularly in the U.S. for oil and natural gas. Post noted that while there is domestic supply of these, the commodity world is global, and because Russia is a large supplier of oil and natural gas the global market will drive up prices.

Further supply chain issues are also likely to be felt by many businesses as Ukraine and Russia are large suppliers of certain elements. Neon, for example, is sourced from Ukraine; about 50-70% of the world's neon is sourced from the country, said Post. This is an important input for the lasers used to make semiconductor chips, which could result in further manufacturing backlogs for that component and the industries relying on it, such as automotive.

Prolonged inflationary pressures are possible as well due to the current combination of low interest rates and supply chain issues.

In general, there will be global economic impacts from the conflict—of course, in conjunction with the humanitarian impacts—the amount of which will be dependent upon how long it lasts and



what countries are involved should fighting spread beyond Ukraine.

Supply Chains are Untangling

Although supply chain challenges are noted as a possible impact of the conflict between Ukraine and Russia, Post said the supply chain should begin to untangle itself as normal economics take over. The Purchasing Managers Index has begun to show a declining trend, indicating normalization of supply chain pressures.

He again noted this is dependent upon the situation with Ukraine and Russia but as the fog of war—hopefully—dissipates, so too will related supply chain challenges. When things normalize on the political front, it should help normalization of economics and thus supply chains.

The Manufacturing Past Utilization Rate is another indicator whose rate of change has begun moving lower. Post said this is another leading indicator of improvements to the supply chain. Overall, economic indicators show supply chain normalization is expected as 2022 progresses. During the second half of the year more subdued inflation and normal supply chain situations are expected compared to the first half of the year.

Post said during the webinar that manufacturers should avoid panic buying. While the supply chain challenges have been wearing on business, they are expected to normalize. He did note that one aspect that will not normalize is the long-term plan related to ensuring supply chains are secure. It is not likely we will return to a completely globalized world in which everything is sourced all over the globe. Things will need to be imported and processed in the U.S. and other markets. More reshoring and nearshoring will occur, and businesses should think about how they can benefit from these changes.

Manufacturers should also ensure they have redundancies lined up so they will be prepared should other disruptions occur in the market.

Higher Interest Rates and Inflation

The Federal Reserve has begun slowly raising interest rates. Post said for businesses this means now might be a good time to make acquisitions to shore up supply chains or get into new markets because rates are still very low.

If low interest rates are an important factor for a business, he also said it might be a good time to invest in processes to help optimize efficiency. This is also a good time to ensure the right marketing materials and initiatives as well as staff are in place. ITR's outlook macroeconomically is for a rise over the next three years, and businesses will need to be prepared to capitalize upon it.

Higher interest rates are expected going forward, making now the time to act if possible and take advantage of the currently low rates. Significant rate increases are expected in 2022, said Post, which has been indicated by the Federal Reserve itself. One quarter ago he said three rate increases were expected but now seven are more likely. These rate increases are considered necessary to help mitigate current inflation. Rates are not expected to skyrocket, but they are going to be higher than what is seen today and could be a pain point for some businesses.

Inflation rates are expected to come down in the second half of 2022, but rising interest rates will only do so much. Instead, Post said slowing economic growth will cause inflation to go down.

Even lower inflation rates are expected in 2023 before inflation picks up again in 2024, said Post. The U.S. is not likely to see hyperinflation as the Federal Reserve is looking to help mitigate that through interest rate increases. Supply chain normalization will help to prevent that as well. But looking into the future, the 2020s are expected to be a more inflationary decade than the 2010s, he said.

A return to a highly globalized world of very low cost inputs is unlikely, and there will not be a return to loose labor markets. Reshoring and nearshoring will increase, which will aid industrial production in the U.S. and other regions which may have previously outsourced manufacturing. All of this will lead to paying higher prices for goods.

Post emphasized now is the time for businesses to invest in improving their efficiencies. Once costs go up, it may be harder to do so and passing along increased costs to customers may not be possible. So it will be important to focus in on a business' competitive advantages and optimize efficiency.

Labor Shortages will Remain a Challenge

Post said labor shortage is the number one issue ITR is concerned about, which is not expected to end anytime soon. When looking at the 12-month moving average of job openings by industry, he said the U.S. is getting uncomfortably close to 1 million openings on an annual basis in manufacturing. This is well above pre-COVID levels. The same can be seen in warehousing and some other sectors.

The economy has reached a point where there is too much demand and

[Hydraulics]

not enough workers willing to fill that demand, said Post.

There are many factors for this. The COVID-19 pandemic is of course one of them. While there have been improvements, it is still an ongoing pandemic which causing people to become sick as well as fear for many of becoming sick.

Demographics are a large factor as well. Baby Boomers are retiring and fewer people from younger generations are entering the field to take their place. There is a mismatch between what workers want and what employers want—particularly with blue collar jobs—which is leading to high job opening rates. Childcare also continues to be an issue for many.

All of these factors are creating a tight labor market, which Post said ITR does not foresee changing in a meaningful way over the next few years. This again makes it important for businesses to be investing in efficiency improvements now. One positive is quit rates are going to be coming down. The labor market will continue to be tight, but as quit rates decline it should slightly ease pressure on employment costs for businesses. There will not be as dramatic a rise in wages like what was seen in 2021, but wages will keep rising.

Improving efficiencies will remain necessary to compensate for the tight labor market. Post said companies need to learn to do more with fewer workers and will not be able to hire their way out of production or distribution situations anymore.

He noted that while pay is important, so is company culture and retention; businesses need to keep these aspects in mind both to attract and keep employees.

Macroeconomic Trends

Twelve out of 12 leading indicators are declining, but it is a relatively mild decline to date said Post. This means there will decelerating growth in 2022. U.S. gross domestic product (GDP) will see its growth ease, reaching a flat level by mid-2023. The rate of growth is expected to pick up again in the second half of 2023 and into 2024.

Strong consumer spending will be the main economic driver. Retail sales are up 20.9% year-over-year and are forecast to continue at a strong rate. U.S. consumers are in a strong position as they do not have as high a debt load as in years past, enabling them to spend and put money into the economy.

Business to business spending, as measured by Nondefense Capital Goods New Orders, is tracking very well for fluid power manufacturers' sales, said Post. A double-digit growth rate can be seen in new orders and the business confidence index trend is positive as well, though future trajectories show there will be some deceleration.

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ITR does not expect a recession in the near future. Spending is expected to remain positive, and the tight labor market means there will be more investment in capital equipment to produce the goods people want. Inflation will be a factor as well. As noted previously, while it is expected to go down, the market will still be more inflationary than what many are used to, which will impact the businessto-business spending trend.

Industrial Production will continue its growth trend as well, which will be good for the fluid power industry. Capital Goods, New Orders are up 15.1% yearover-year but up 11.6% on a quarterly basis, which Post said indicates a slower growth environment.

If summarizing the U.S. economy, he said businesses are in about as strong a financial position as they've been in the last few decades. Inflation and interest rate pressures will have their impacts,



but consumers and businesses are in strong financial situations which will enable them to weather these impacts. And business opportunities will remain positive for many. Business margins are doing well. Confidence is easing, but overall people are still placing orders, which Post said is good news for today and the future as well. **P&M**





New Autonomous Operation Cluster Advancing Autonomy in Off-Highway Equipment

Ammann, Palfinger, Prinoth, Rosenbauer and TTControl will collaborate to jointly develop technology for autonomous machinery.

by Sara Jensen

new technology collaboration known as the Autonomous Operation Cluster (AOC) is bringing together manufacturers from the off-highway mobile equipment industry to advance development of autonomous systems. It is comprised of five companies

developing technology and machinery utilized in off-highway applications:

• Ammann—a supplier of mixing plants, machines and services to the construction industry with core expertise in road building and transportation infrastructure.

- Palfinger—an international technology and mechanical engineering company as well as producer and provider of crane and lifting solutions.
- Prinoth—an international manufacturer of snow groomers, tracked vehicles and vegetation management.
- Rosenbauer an international company which develops and produces vehicles, fire extinguishing systems, fire and safety equipment and digital solutions for professional, industrial, plant and volunteer fire services and systems for preventive firefighting.
- TTControl—part of HYDAC Group and TTTech Group, a supplier of safety controls, displays and connectivity solutions for mobile machinery.

These companies plan to jointly develop the key technologies necessary to enable autonomous operation of heavy-duty mobile equipment functions. According to a joint press release from the companies announcing the partnership, the aim is to accelerate the development of advanced assistance functions through collaboration to ease operators' jobs and increase productivity, efficiency and safety in a wide range of industries around the globe.

The AOC intends to develop the technology for various types of machines including road construction equipment, cranes, firefighting vehicles and snow groomers. As these are the products each OEM in the AOC currently develops, they will be able to bring their expertise in industry requirements and equipment capabilities to the project.

Use of computer vision and artificial intelligence (AI) will be key as these technologies enable precise detection of objects and processing of information for safe autonomous operation. In addition to helping machines "see" their environment to safely maneuver through it, these technologies can also be used to warn operators of dangerous situations. Corrective actions can then be taken by the operator or the autonomous solution built into the machine.

To start, the AOC plans to define a

technological solution for automating machine functions and develop a proof of concept as well as initial prototypes. Additional application implementation for specific use cases is likely to occur in 2023.

Why Form the AOC?

According to the joint press release, the most important benefit to this new crossindustry collaboration is the reduction in development time that will be possible due to the companies sharing their knowledge in the areas of automation and heavy equipment design. Each of the participating companies will provide experts to be part of a dedicated developer community to address industry-specific technological challenges.

There are three main areas in which the AOC plans to focus its development efforts:

- robust hardware platforms,
- modular software components,
- customized application functions.

The participating companies see many benefits to the formation of the AOC.

"Together, we will lay the foundation for the next generation of automation and autonomy capabilities in the mobile machinery and off-highway industries," says Roberto Ferrari, senior vice president, Service & Operations at TTControl. "TTControl will support this groundbreaking endeavor with its advanced knowledge of electronic architectures and expertise in computer vision and artificial intelligence. With the synergies from this collaboration, we will develop essential building blocks for autonomous vehicles and mobile machinery that will significantly improve the productivity and safety of future off-highway solutions."

"This technology will bring incredible value to the roadbuilding process," says Tomas Kopic, executive vice president of Ammann's Heavy Equipment Division. "There will be improvements in quality, and jobsites will be safer, too. The efficiency gains provided by the technology will improve sustainability—and the profitability of our customers."

"Developing together common technologies and sharing critical computer visioning and AI capabilities within an advanced development environment will allow PALFINGER and all partners of the AOC to increase speed to market and leverage synergies in the development of smart lifting solutions," says Andreas Hille, senior vice president, Product Line Management & Engineering at PALFINGER. "Following our PALFINGER strategy GO DIGITAL we are providing digital assistance and autonomous operating functions which maximize operational effectiveness, increase operational safety and generate additional value by seamlessly integrating our smart lifting solutions into the digital ecosystems of our customers."

"What's great about this development is that it supports the operators in helping them make perfect finishes on the slopes," says Martin Kirchmair, head of R&D at PRINOTH. "Staff turnover in a team of snow groomer operators leads to an imbalance in experience. With the assistance and autonomous functions that we're working on in the cluster, less-experienced operators will be able to prepare ski slopes and courses at the highest level. This saves time and money for ski resorts and helps manage snow sustainably."

"With the development of autonomous firefighting equipment, we improve the safety of emergency forces and meet their increased safety requirements," says Markus Schachner, senior vice president, Product Development. "Additionally, we support our customers to handle different operation scenarios much more efficiently and precisely. As innovation leader of our industry, we want to share our knowledge and with this all collaboration partners will gain economy of scale required to develop Autonomous Functions."

Automation a Solution to Labor Challenges

Like many industries, those in applications utilizing off-highway equipment such as construction and agriculture are finding it difficult to find skilled labor. And this challenge is expected to persist in the coming years. Automation is seen as a means of helping overcome this industry struggle.

Automating certain functions of a machine can make it easier to use. Depending on the system, all an operator may have to do is push a button and the machine takes care of the rest. This can help to reduce training time for new operators as well as improve comfort as they no longer have to exert as much effort to perform tasks.

By automating work functions, there can also be better assurance they are done in a correct and consistent manner every time which helps to improve efficiency and productivity.

Improved safety is another key benefit to automation. Removing human error through use of automated systems ensures machines are operated correctly. And as industries move toward fully autonomous equipment, humans can be removed from the machine completely. Instead, they can be working at a remote location where they monitor the autonomous machines. This is particularly beneficial for equipment used in harsh or dangerous environments, such as mining.

Many industry experts also say implementation of automation could help attract younger generations to work in off-highway equipment industries as they want to work with new, cutting-edge technologies.

Overall, there are many benefits automation can provide to the off-highway equipment industry. While its implementation has already advanced over the past several years, collaborations like AOC will help to bring even more technology advancements to the industry. **P&M**

READ and LEARN MORE!

► Get more insights into the start of the Autonomous Operation Cluster in our Q&A with TTControl's Leandro Antonio Zaza, senior technical sales manager & AOC manager at powermotiontech.com/21241504.

HYBRID ELECTRIC POWERTRAINS

Helping Decarbonize Marine and Offshore Applications

Implementation of hybrid electric systems pairing fuel cells, batteries and other alternative technologies with conventional systems is helping the marine and offshore industry meet emissions reduction targets.

by Sara Jensen

ike many industries, the use of hybrid electric power systems is making its way into marine and offshore applications. Hybrid systems which integrate conventional and new technologies—such as a diesel engine and a fuel cell—offer these applications the opportunity to reduce emissions as well as other benefits like reduced noise and maintenance.

The largest driver for the shift to hybrid electric systems is environmental requirements, i.e. reducing emissions, says Gareth Burton, VP of Technology at the American Bureau of Shipping (ABS)—a marine classification society which develops rules to guide design of marine and offshore vessels.

The International Maritime Organization (IMO) adopted a greenhouse gas (GHG) strategy in 2018 which set a target of reducing total annual GHG emissions by at least 50% by 2050 compared to 2008 levels. IMO is also looking to reduce carbon dioxide (CO₂) emissions per transport work by 40% by 2030 and by 70% by 2050.

Implementation of hybrid electric power systems will help the industry

achieve these targets. Use of such systems can not only help to lower emissions output but also a reliance on fossil fuels. Additional benefits such as those to operational demands are also helping to drive the transition to hybrid power sources. "There's more flexibility when alternative power sources are used," says Burton. "Use of alternative sources allows the engines onboard [vessels] to be used less and increase efficiency and operational flexibility of the vessel."

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HYBRID

Industry Goes Hybrid

By pairing another technology, such as fuel cells, with a vessel's engines, operating range can be extended to make the fuel onboard go further. Depending on the design of the hybrid system, the alternative technology could be used for a period of time before switching to the engine. Or it could supplement power to the engine, reducing its fuel use.

In March 2022, Danfoss Power Solutions' Editron division announced it would provide components including electric motors for use in two new hybrid high-speed passenger ferries which will



operate in central London. The ferries will be able to run on zero-emission electric propulsion and switch to biofuel.

Use of the hybrid powertrain enables the ferries to reduce their environmental impact without sacrificing performance. The ability to switch to use of biofuel will help maintain low emissions while ensuring the ferries can complete their routes. Operating range is often a concern for many when moving to electric powered vehicles, but a hybrid system ensures there is a backup or alternative power capability when needed.

Danfoss notes use of the hybrid system can help to improve comfort for operators and passengers as the ferry is able to run much quieter through use of the electric components. Maintenance is often reduced as well with electrification, as there are fewer moving parts and thus wear and tear is minimized.

On April 28, Danfoss announced the Editron division will also provide the electric drivetrain systems for Aukland, New Zealand's first fully electric passenger ferries.

In addition, the company has recently

expanded its partnership with engine manufacturer Volvo Penta—which has been expanding into hybrid and electric systems in recent years—that will see the companies collaborating on electromobility projects in the marine sector. They have collaborated in the past on hybrid marine vessels and plan to expand their collaborative research and development efforts through the new partnership.

No Single Solution

Various types of hybrid electric systems are under development for marine and offshore applications. In general, Burton says conventional power sources like engines are being paired with newer technologies including

- fuel cells,
- solar panels,
- wind,
- lithium-ion batteries, and
- supercapacitors.

With these technologies, conventional engine power can be supplemented with cleaner power sources. In the case of solar panels and wind, renewable energy can be harnessed to provide power which makes for an especially clean alternative to diesel and other fuels.

Burton says there are many permutations of hybrid electric systems under development for the marine and offshore industry, each of which has its own benefits based on the application requirements. He notes ABS is seeing an increased focus on fuel cells as an alternative energy technology as well as wind propulsion. Battery technology is also gaining ground as a means of energy storage onboard vessels.

Similar to other industries, such as heavy-duty trucking, fuel cells are seen as a potential option for vessels. Hydrogen fuel cells are more energy dense and able to run for longer periods, which benefits their use in larger applications requiring more power and longer run times.

Burton says larger marine vessels have several engines onboard. There is the potential for a fuel cell to supplement and ultimately replace at least one of those engines.

Design an Important Factor

Ensuring the technology being utilized has reached the appropriate level of maturity for the application is a key factor which needs to be taken into account when implementing hybrid electric systems, says Burton. "Along with that are things such as the reliability and durability of the new equipment to make sure it can withstand the rigors of application," he says.

Integration of new alternative energy technologies with conventional power systems is also a key component says Burton. "Quite often there's an energy management system installed on the vessel to manage the energy from the various sources. Making sure that integration is seamless is critical.

"Last, but not least, there's the personnel aspect of the training, as there's new equipment, new technologies and new procedures introduced," he says. "Making sure that the crew on board are fully cognizant of that equipment and are fully trained in the application of it is a key aspect."

As ABS both sets the criteria to which marine and offshore vessels should be designed and evaluates those designs during development, construction and the life of the vessels—it has published guidance on how to integrate and utilize hybrid power systems in this industry.

Recently published guides from ABS (visit https://ww2.eagle.org) include:

- Hybrid Electric Power Systems for Marine and Offshore Applications
- Practical Considerations for Hybrid Electric Power Systems Onboard Vessels

By following the guidelines set out in these documents, engineering teams can be confident the systems and marine vessels are being designed in accordance with well-established and recognized industry criteria.

Integration of hybrid electric power systems will continue to be an area of design focus for years to come in the marine and offshore industry as it looks to reduce its environmental impact, concludes Burton. **P&M** SN: DEMO:

Electric Actuators Becoming Viable Alternative to Pneumatics

Technology advancements and reduced manufacturing costs are making use of electric actuators a potentially more favorable option in certain applications.

by Sara Jensen

neumatic actuators—also referred to as air cylinders—continue to play an important role in many applications. However, electric alternatives are gaining ground due to the many performance benefits they can provide. These include a longer cycle life and programmability.

Low cost and fast actuation speeds have been among the advantages offered by pneumatic actuators. Ed Neff, CEO of SMAC Corp., says a typical pneumatic system comprised of a 25 mm stroke crimped type air cylinder with position switches, solenoid valve, flow controls, etc. costs around \$200-250 in low volumes.

This is about 50% less than the lowest cost

electronic competition he says.

Regarding speed, Neff says pneumatic actuators operate at faster speeds than the most commonly available electric actuators—ball screw types. This typically equates to 800 cycles per minute for a 25 mm stroke. Their force to package size ratio is also better than electric which he says is important in clamping applications or when moving large objects.

But for those applications where performance is more important than cost, electric actuators may be the better option. Advancements in the technology and how it is manufactured are also helping it to become a comparably priced alternative to pneumatic actuators. Linear motor electric actuators can provide faster, more precise movement which gives them an advantage over pneumatic actuators in some applications.

Advantages of Going Electric

Cycle life is one of the areas in which electric actuators can provide an advantage over pneumatic. According to Neff, pneumatic actuators have a short life of about 10 million cycles in slow moving applications and 1 million for high cycle rate applications. Ball screw electric actuators have a similar cycle life.

However, linear motor-based electric actuators which have become more prevalent over the past decade or so have a cycle life which is 10 times greater than both pneumatic and ball screw actuators, says Neff. Cycle rates are also two times higher.

For applications in which rotation of the pneumatic actuator's rod is unwanted, electric could be the better option. If using pneumatics, the solution would be to have a double rod to prevent this rotation but that increases the component's cost to a price similar to that of a conventional electric actuator.

Programmability is another key advantage electric actuators offer. Manual setup and adjustment is required for pneumatic actuators, and it is difficult to get precise feedback on their speed and position, whereas an encoder is embedded into an electric actuator allowing for more precise movement. And with the increased use of computers in industrial environments and need for precision in many applications, the ability to program an actuator can greatly benefit an end-use customer.

Power sources are another area in which electric actuators can be advantageous. Electricity—which is already needed for other aspects of a facility—can be used to power electric actuators. But pneumatic actuators require the installation of air compressors, which can take up space in a facility and add cost. They can also be noisy, and many regions such as Europe have begun to regulate the noise within facilities to help improve the health of workers. Electric actuators, on the other hand, operate quietly.

Linear Motor Actuators

In some applications, the advantages provided by using certain types of electric actuators outweigh the lower cost benefit provided by pneumatic versions. Neff says these include applications in which high speed and long cycle life is desired.

Linear motor electric actuators like the type developed by SMAC are beneficial in these types of applications, he says. SMAC's actuators use moving coil actuator technology in which the coil is used to generate the force necessary to move the actuator, and it is mounted on a linear guide.

Testing of the cylinders has shown a life cycle over 100 million and Neff says the only part that wears is the linear guide. Pneumatic options have a shorter life cycle and often experience failure due to the wear put on components such as the piston seal. Electronic components typically have fewer moving parts which helps to reduce the amount of wear—and therefore maintenance or failure experienced by other components.

Neff says linear motor electric actuators are also 50% faster than their pneumatic counterparts. "Linear motors are very fast. All we are moving is the coil which weighs almost nothing," he explains.

Again, the ability to program the speed and position of the electric actuator and not having to make any manual adjustments is a benefit over pneumatic options. Some electric actuators also allow force to be programmed, further benefiting end-use customers.

Because the linear motor electric actuators are mounted on a linear guide there are no rotating shafts, offering an advantage for use in applications where rotation of the shaft is not wanted.

Overcoming Cost Challenges

Cost remains the number one hurdle to electric actuators overtaking pneumatic actuators in the marketplace. While there are many advantages electric can offer, the fact they are often three times the price of pneumatic actuators can be a difficult proposition.

Overcoming that cost hurdle is where the industry needs to focus. Neff says that is what SMAC has been working on for the past 20 years.

Reducing manufacturing costs of electric actuators was the first step. The company was able to achieve this by using advanced manufacturing methods including.

Use of a high wattage laser cutting machine allows the company to produce about 400 parts per hour, a comparable production speed to that of the machines typically used

Where do electropneumatics come into play?

Electrohydraulics-the combination of electric and hydraulic technology-have become common in many applications. But what about electopneumatics, what benefits could occur if pneumatic and electric are brought together?

Ed Neff, CEO of SMAC Corp., says the company has done something in this area using what he terms as air over electric. SMAC's actuator shaft is attached to the back of a pneumatic piston. The electronics allow fast, precise movement and air is then added to provide force.

He says this type of technology is beneficial for those applications in which speed, precision and force are all required. to produce pneumatic components. "That brings the manufactured cost of mechanical costs [to the same price]," says Neff.

The company has benefitted from the declining costs of encoders and controllers as well. When it first started to develop electric actuators the cost of an encoder was around \$125. Now it is under \$15 because the company makes its own encoders.

SMAC's Derry, N.H.-based division SMAC-EMC has developed, tested and manufactured its own line of optical encoders. This has helped not only to bring production costs for actuators down but also aided with supply chain issues that many companies are facing. This eliminates dependence upon a supplier and enables the company to control the cost.

Controllers used for the actuators are under \$25, says Neff, because the company has sourced controller chips used in drones. Because they are a high-volume consumer electronics component, they are inexpensive while still providing the precision needed for the movement of the actuator.

Printing the coils used in its actuators instead of winding them like other manufacturers do has also helped to reduce manufacturing costs. Neff equates it to circuit board manufacturing technology—they can be printed anywhere and as many as 5,000 per day can be printed on a standard commercial machine. This reduces machine tooling and parts cost without compromising quality which is actually improved. Neff says coil resistance variation is reduced by 90% because it is printed instead of wound.

These reductions in manufacturing costs bring the price of the electric actuators in line with those of non-rotating pneumatic versions, providing an avenue for their use in applications where high speed or precision assembly is required.

Neff says there is still an upfront cost advantage for pneumatic actuators as well as their favorable size to force ratio. And for applications requiring higher forces, pneumatics will still have the advantage. But as costs continue to decline for electric actuators, particularly as volumes increase, within about 10 years it could be possible the price for electric matches that of pneumatic solutions. **P&M**



1. Hydraulic System Handles Higher Flow Rates

Engineered to be durable and reliable in rugged environments, the Joy Compak system features corrosion-resistant materials on valve block assemblies, components and the main body. With a reduced number of components to lessen wear-and-tear, the spool valve in the system is engineered to handle higher flow rates, helping to reduce the risk of part failure and promote extended life. Providing flexibility to suit operational needs, the Joy Compak Next Gen hydraulic system can be conveniently upgraded or retrofit to any PRS system regardless of manufacturer.

The high-performance valve technology of the Compak hydraulic control system helps improve cycle times by up to 12%, compared to the previous model. Designed with operators in mind, this hydraulic system's overall size and weight is reduced, making it easier to position while improving accessibility. Hosing position has also been conveniently located for better access.

Komatsu

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2. New Pump Enables Safer Bulk Dispensing

The FS-EP1 Fluid Supply/Feeding System One-Gallon Pail Pump has been integrated with the ASYMTEK Helios fluid dispensing platform to create a solution for dispensing single-component (1K) thermal interface materials. Such materials, often used as gap fillers in electronics manufacturing, are highly viscous and abrasive, making them difficult to feed from the original packaging to the dispense valve. The FS-EP1 pail pump pushes material to the dispense valve using a closed-hydraulic system. Low shearing of the material ensures that highly conductive thermal gap fillers do not separate, and material properties remain unaffected. There are



no moving parts in contact with the gap filler, and no moving parts outside the pump enclosure-not even in the fluid line. The new FS-EP1 pump is designed to make high-performance bulk dispensing safe and easy to maintain and to minimize downtime. The pump enclosure securely holds a one-gallon pail at the operator's waist level so that it is simple to load and remove. Other features include the durable hydraulic pump, the operator interface and the tool-free seal changeover to improve performance and maintenance.

Nordson Electronics Solutions powermotiontech.com/21242735

3. Counter-Pressure Filler Increases Brewery Throughput

The CB100C rotary counter-pressure filler leverages a 12-head rotary filling turret design, coupled with a dual-station seamer, to allow craft beverage producers to increase their throughput to more than 100 cans per minute. Counter-pressure technology allows craft beverage producers to fill highly carbonated beverages, in excess of 2.7 volumes of CO2. In isobarometric filling, the can being filled and the product going into the can are at equal pressure, maintaining carbonation solubility throughout the filling process. The CB100C employs magnetic flowmeter technology to help brewers get a perfect fill with little waste, and an under-cover gas flush system keeps dissolved oxygen levels low. In addition, industry-leading double-seam technology keeps cans sealed tight, extending critical shelf life. The system is optimized for sleek and standard can bodies, and is designed with guick-change adjustments for easy changeovers accommodating various can heights and body diameters with no valve change required. A compact footprint and an intuitive HMI for individual fill-head volume adjustments simplify operation.

Pneumatic Scale Angelus A Barry-Wehmiller Packaging Systems company

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4. Encoders Provide a Compact Design, Motor Integration

The PressFit Exl 11xx encoder series features a unique compact design that allows fast and simple mounting by press-fitting into a motor housing while still allowing surrounding space for cables and seals. The PressFit encoders are made for integration into motors with a flange size as small as 40 mm [] 40 mm or an axis height of only 20 mm.

The PressFit encoders include a flange that can be secured in a motor housing through a frictional connection, using a specially designed tolerance sleeve. This innovative system promises to support automation efforts by easing mounting requirements, leading to less mounting time being required. The PressFit Exl 11xx encoders provide automatable mounting, faster installation and wide mounting tolerances.

HEIDENHAIN

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5. Pneumatics Products Offers a Variety of Solutions

Allied Electronics & Automation now is offering in-stock pneumatic products from suppliers including Chicago Pneumatic Tools, Duff-Norton, Gefran and Marsh Bellofram Precision Controls. Pneumatic systems use compressed air or gas to generate fluid power and are prevalent in industrial automation applications including food, beverage and medical packaging and automotive. oil and gas and concrete manufacturing. Chicago Pneumatic Tools is a global manufacturer of high-performance pneumatic and cordless tools and workshop equipment designed to deliver lasting customer value in professional and industrial applications including assembly and material removal. Allied currently offers 125 in-stock air tools from Chicago Pneumatic Tools, as well as several Chicago Pneumatic compressors and accessories. Duff-Norton, a Columbus McKinnon



Brand, manufactures motion control technology products designed to deliver reliable performance. Allied currently offers 17 in-stock Duff-Norton rotary unions, which are used to connect rotating equipment to fixed piping used to transmit steam, water, coolant, hydraulic oil, air and other media. Gefran designs and develops a range of sensor, automation and motion control products. Allied currently offers 25 in-stock Gefran rupture discs, which are used to protect industrial equipment and systems from overpressurization and damaging vacuum conditions. Marsh Bellofram Precision Controls is a leading global manufacturer of high-performance products including air and gas pressure regulators, relays,



I/Ps, E/Ps, servo pressure controllers, analog circuit card pressure transducers and regulators, FRL units and related accessories all designed to deliver high accuracy and long service lives. Allied currently offers 54 in-stock pneumatic regulator products from Marsh Bellofram Precision Controls, including pneumatic regulators and air filters and regulator. Allied Electronics & Automation

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6. Pump Units Tackle Large Electrification Projects

Designed to handle the largest electrification applications in the commercial trucking, mining and off-highway markets, the Hydrapulse Frame Size 3 (F3) offers



next-level power density with all the features and options of the Hydrapulse line. The Hydrapulse units are fueling rapid growth in the electrification of the on-highway, off-highway and industrial industries. With power levels up to 100 kW and up to 800 V of direct current, the power-dense F3 is the largest Hydrapulse model to date. The F3 offers versatile drive and mounting options and will be available with both a direct drive or a planetary drive, SAE "B" or "C" mount, a fixed displacement pump and a hydrostatic drive.

Terzo Power

powermotiontech.com/21242739 Video: https://youtu.be/4kDrGHI1nY8

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[One More Thing...]

IoT Enables Better Problem Solving in Fluid Power

Implementing IoT into hydraulic and pneumatic systems can provide real-time data to help manufacturers improve performance and maintenance.

by Sara Jensen

he Internet of Things (IoT) has made its way into just about every industry, including fluid power. IoT essentially enables communication between physical objects through the integration of sensors, software and processing capabilities to allow the exchange of information between devices.

"We are seeing companies who are

putting out tens of thousands and hundreds of thousands of deployable sensor systems when building hydraulic machinery," says Jon Prescott, co-founder and CEO of Scante. These sensors are being integrated into individual hydraulic components as well as systems, bringing IoT capabilities to several parts of a machine.

The cost and capabilities of sensors and other necessary tech-

nologies have come down over the years, making it more feasible to implement IoT in various applications. Prescott says the ability to now use so many sensors has been a game-changer for mobile hydraulic applications. More information can be collected at faster speeds, enabling manufacturers and their customers to get better data on the performance of machines and components.

Improvements in oil quality sensors is an area in which the hydraulics industry is benefiting, as well, says Prescott. Frequent oil sampling is difficult and an issue the industry has been struggling with for years. "The new areas of oil quality sensing using electrochemistry [and other techniques] are absolute game changers for hydraulic system reliability," he says.

The cloud-based calculations, dissemination of data and the analytics possible with these new sensors and other IoTrelated technologies will greatly benefit manufacturers, particularly smaller ones who don't have the expertise required for conducting oil analysis.

"I think one of the leading pieces I find interesting is how IoT can be used to do just-in-time repairs," says Chad Repp, business development manager at HED Inc. This can greatly benefit a manufacturer's end-use customers by reducing their downtime, as repairs can be made



before a critical failure instead of after.

While there has been some implementation of this capability, Repp says it has not yet reached its full market potential. But as IoT adoption grows and users leverage its real-time, day-to-day information capabilities, just-in-time repairs will become more common which will help to improve the efficiency and productivity of many operations.

When looking to implement IoT, it is important to ensure the partners chosen—from the gateway manufacturers to the cloud providers to the solution itself—are the right ones to meet the application requirements. It is important to have the right partners because it is not a single component that is being developed but a solution which evolves and grows over the years to continue serving the customer's needs.

"The way we look at IoT is it is just another feature inside the tech stack," says Adam Livesay, co-founder and CRO of Elevāt. "Five or six years ago, IoT was looked at as being the thing that provided the solution to every problem out there, and you could solve everything."

> However, that mindset has shifted. "Now, the way we look at it is you are really trying to focus on the business case, and the problems or goals that customer [has], and then work your way back to where you are talking about cloud, mobile, machine learning, edge and IoT all combined. And that's how we approach it," he says. "[IoT] is not really that fancy buzzword anymore as much as it is part of the

overall solution."

Repp agrees that IoT and technology in general helps to solve problems. "IoT is more of an enabler of solving problems in the world," he says. "IoT is a way to help with digital transformation and solving the problems that are part of that strategy, and the value proposition behind it all." **P&M**

WATCH AND LEARN MORE!

Get more insights into the use of IoT in fluid power and the benefits it can provide by viewing our webinar "IoT in Fluid Power Management" on demand at *powermotiontech.com/21238955*.

The webinar features a panel discussion with Jon Prescott, co-founder and CEO of Scante; Chad Repp, Business Development Manager at HED Inc.; and Adam Livesay, co-founder and CRO of Elevät. During the webinar they will provide their perspectives on the technologies which enable IoT, best practices for integrating it into fluid power applications and how they see the technology progressing in the coming years.



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