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ISSN 2831-4883 Print. ISSN 2831-4891 Online.

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Blending the New and Traditional

Electrification may be the “hot” topic at the moment in many industries, particularly those related to mobility, but it’s important to remember so-called traditional technologies will continue to have their place.

As our story on page 14 shows, there will still be a need for hydraulic components and systems. Yes, there are many efficiency gains which can be achieved through the use of electrohydraulic components, and the trend toward more incorporation of electronics into hydraulics is likely to continue. But as Mitch Eicher of Parker Hannifin points out in the piece, traditional hydraulic components will remain critical to systems where the flow rate, pressure or actuators need to be controlled.

He goes on to say that the speed and force necessary, as well as energy consumed, would be both size- and cost-prohibitive using electromechanical solutions to drive all components. Therefore, components such as hydraulic valves will remain necessary in many applications.

The key going forward for design teams will be understanding how best to bring new and traditional technologies together. This will lead to more of a systems design approach, one which Eicher says Parker Hannifin—and many other companies—is employing.

As he states in the article, it is no longer about questioning whether to go the hydraulics, pneumatics or electromechanical route but instead looking at system solutions. “Our focus in our manufacturing division is hydraulic valves but, as electrification comes, those valves are getting smarter. In some applications, they may be going more electromechanical for their control or for certain components.”

Bringing new and traditional technologies together can help to better optimize performance of a system or machine. It can also offer opportunities for improvements to traditional systems and components such as simplified designs.

This pairing of the “new and old” can be seen as a bit of a metaphor for the direction of *Power & Motion*, as well. While continuing to cover traditional hydraulics and pneumatics technologies, it would be remiss not to also be covering what technologies are coming and being utilized alongside hydraulic and pneumatic components.

As many in the industry continue to say, it’s an exciting time due to the new technologies entering the market and how they’re being blended with what already exists. Technology and how it’s designed will continue to evolve, and we look forward to seeing—and covering—that evolution.



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Fluid Power Industry Comes Together Again at **NFPA Annual Conference**

Electrification, supply chains and workforce were key topics of discussion at this year's conference.

by Sara Jensen

The National Fluid Power Association's (NFPA) Annual Conference once again brought members of the fluid power industry. It was clear throughout the event people were glad to be seeing one another again in person after almost 2 years of virtual and hybrid events.

NFPA reports over 250 members from 140 companies attended the 2022 conference. This allowed for plenty of networking

between industry members as well as time to catch up with acquaintances new and old.

Overall, attendees were feeling positive about the hydraulics and pneumatics markets. This came through in many discussions the *Power & Motion* team had while at the conference. Many people our team spoke with reported business has been strong, but noted the challenges of supply chains which for some has lead to the need to engineer things differently to help overcome the supply shortages.

Supply chains were a key topic discussed during some of the conference presentations; other areas of focus included electrification and how the current conflict between Ukraine and Russia could impact global markets.

On the subject of electrification, Theodore Krause from Argonne National Laboratory discussed the increasing developments in this area as well as fuel cell cells in recent years. As part of his discussion he provided a look at recent test results from a study in which electric drivetrains were integrated into three types of off-highway equipment—an agricultural tractor, a wheel loader and an excavator. The study compared efficiency of the electric machines compared to diesel, and potential return on investment for end use customers.

Electrification is of course an important area for fluid power manufacturers to monitor as it will likely bring about changes to the industry, while also offering new opportunities.

David Burkus provided a humorous and insightful presentation on how to lead teams from anywhere. Remote and hybrid work have become the norm for many and is likely to remain so going forward. Therefore, it is important for leaders in any business to learn how to effectively lead their teams no matter where they may be located.

His four key criteria for leading high performing teams included shared understanding which entails sharing calendars and work agreements as well as thinking about what tasks work best when everyone is together in person instead of how many

SUPPLY CHAINS were a key topic discussed during some of the conference presentations; other areas of focus included **electrification** and how the current conflict between Ukraine and Russia could impact global markets.

days people are in the office together. Psychological safety was another criteria; ensuring people feel safe to express their thoughts is vital, especially now in hybrid and remote work situations.

The conference was capped off by returning presenter Peter Zeihan who spoke on navigating a disruptive world. Specifically, he focused on changes which are occurring in the labor market, such as the retirement of baby boomers, and supply chains. On the latter he discussed the need for companies to move past just in time production as that model will no longer benefit most businesses.

Zeihan also touched on his thoughts on the Ukraine and Russia conflict, which had begun that day. In general, there will be impacts on the global market—some of which are already being felt and others yet to come. **P&M**

Visit powermotiontech.com/21235916 to learn more about how manufacturers are helping those in Ukraine and the various industry impacts to date.

Sara Jensen to Lead Power & Motion

by From Staff

Power & Motion

announces Sara Jensen has been hired as the brand's technical editor, directing expanded coverage into the modern fluid power space, mechatronic and smart technologies.

"Sara joins us with more than a decade of experience covering the advancing fluid power industry. She specializes in onboard vehicle applications, which brings excellent balance to our existing competencies," says Bob Vavra, senior content director.

"Her active presence in the fluid power industry brings with it a strong network of established contacts and relationships that will help us further integrate ourselves into the fluid power and motion control markets," continues Vavra.

Jensen joins *Power & Motion* and the Design & Engineering Group at Endeavor Business Media after a successful career leading OEM Off-Highway, covering fluid power technology extensively as it has progressed from components to an integrated system, to a smarter and connected part of an optimized vehicle.

"Sara has a long history of creating exceptional industry coverage in a multitude of delivery platforms, from print magazine to digital content, including video and podcast formats. Her



“My interest in the fluid power industry has only grown as the technologies have advanced over the years, and I can’t wait to dive even deeper into the industry.”

experience is exactly what *Power & Motion* needs to bring the next level of industry coverage to its audience,” says Michelle Kopier, group content director for the Design & Engineering Group.

“I’m thrilled to be given a chance to lead the new *Power & Motion* brand at Endeavor Business Media,” said Jensen of her appointment. “My interest in the fluid power industry has only grown as the technologies have advanced over the years, and I can’t wait to dive even deeper into the industry.” **P&M**

Breaux: Automation, Fluid Power Technologies Will Blend

by Sara Jensen

Motion's president discusses his company's acquisition of KDG and its customers' future with Power & Motion.

On Jan. 3, Motion Industries Inc. completed its \$1.3 billion acquisition of Kaman Distribution Group (KDG). The deal merged Motion, the fifth-largest distribution company according to Source Today's Top 50 Industrial Distributors listing, with KDG, which is ranked 20th on that list.

Power & Motion recently discussed the deal—and its implications for customers—with Randy Breaux, president of Motion.

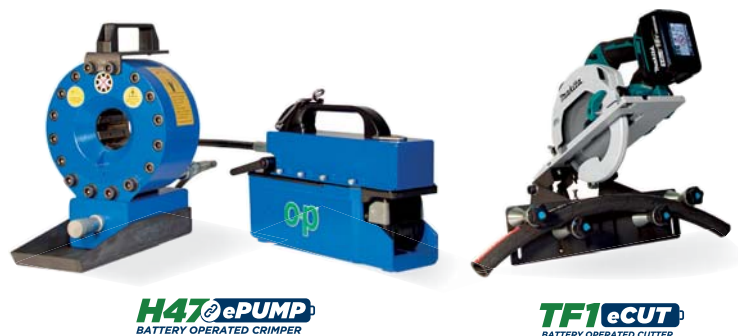
POWER & MOTION: Talk about the value of the Kaman Distribution Group (KDG) acquisition, both in terms of what it means to your customers and Motion as a company.

RANDY BREAU: Obviously, we believe that bringing together the two companies will greatly benefit our customers and our business. As a single provider, Motion can now bring our customers solutions and services that each business may have had

separately, many of which complement the other. Motion tended to concentrate on national customers, while KDG focused on smaller, regional customers. Combined, we now serve all customers with greater technical resources, more products and more services/solutions than before.

P&M: The supply chain challenges of the last year continue. How does this addition of KDG to the Motion portfolio address these issues? Are there economies of scale that help Motion address some of these supply chain issues for its customers?

RB: Yes, they do continue. We have been



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fortunate, however, as both Motion and KDG have done an excellent job since late 2020 to manage the supply chain issues we saw in 2021 that are carrying over into 2022. Most of our products do not come from overseas; therefore, we may not be as vulnerable as others who import many of the products they sell. However, we expect to see continued supply chain challenges through the balance of the year.

“As a single provider, Motion can now bring our customers solutions and services that each business may have had separately, many of which complement the other.”

Motion has always been the largest customer for most of our suppliers, and adding KDG only makes us that much more important to our strategic suppliers. We have a great group of strategic suppliers who support Motion and our customers very well. That will only strengthen as we continue to grow.

P&M: What do you see as some of the causes of—and some of the opportunities from—the supply chain challenges we face today?

RB: The supply chain issues we face today result from many different issues over many months and years. I couldn't even imagine starting to discuss the causes with our limited time. However, I think it is a bit easier to address from an opportunity standpoint. First, those with inventory are in the best position; of course, it has to be the right inventory.

So inventory management leading up to the present crisis was key. Fortunately, both Motion and KDG did a very good job securing inventory to help manage the supply chain situation we are in. The result

is that the customer grants the business to us versus a competitor that didn't address the supply chain issues as well as we did. It's the old adage, “You can't sell out of an empty wagon”—which is true!

Second, having solid relationships with your strategic suppliers is also critical during these times. Providing our supplier partners with accurate demand needs, consistent orders and bills paid on time

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certainly helps strengthen relationships with our key suppliers and eases tensions over supply chain issues. This makes them want to do business with Motion rather than one of our competitors.

P&M: Distributors have a changing role for their customers. It's not just about parts delivery, but you're also helping customers craft solutions to their issues. Talk about this evolution and how the KDG acquisition helps in that effort.

RB: This is correct. Most of our customers do not look to us only to provide a product; they want us to provide technical and engineering support and solutions for their



Randy Breaux, president of Motion



applications. While some of our business is just replacing a part number that is called in with the same part, in most cases we help a customer

identify a better solution than the one that just failed.

We are fortunate to add many very technically savvy KDG teammates in the business' fluid power, automation and general power transmission areas. People with this type of experience are hard to find today, so the addition of the KDG team is a real benefit.

P&M: The fluid power industry, in particular, continues to change with the expansion into electrification and hybrid systems. How does Motion see the fluid power market, and what do you think the future holds for the fluid power market?

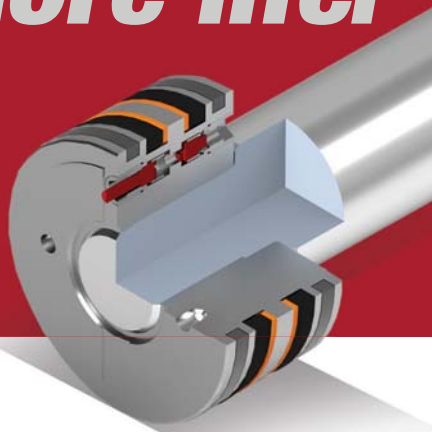
RB: We are very excited about the additional fluid power opportunities that the KDG acquisition brings to Motion and our customers. As we look at all industry sectors, they have to identify ways to automate processes due to necessity—not necessarily desire. Automation comes in the form of fluid power, pneumatics and electronic motion control.

As we look ahead, we believe that these technologies will continue to blend, and solution providers like Motion will need to be experts in all three areas. We are now well positioned with people and skillsets to bring all the solutions our customers require in the years to come. **P&M**

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Are Hydraulic Components on a Steady Path to **BEING DISPLACED?**

Engineers weigh hydraulic systems options before bringing them to market in custom and general applications.

by **Rehana Begg**

The current surge and expected growth in the integration of electronics with hydraulics reveals a shift in focus. It compels industrial manufacturers to review their competitive stance so they can identify the simplest, safest, most economical systems that are both scalable and easy to maintain. But does it also mean that traditional hydraulics are on a steady path to being permanently displaced?

With the investments shifting toward renewable energy and as time goes on, newer technologies related to high-pressure hydraulic systems become more applicable. Electrohydraulic pumps, for instance, are touted for being up to 80% more efficient than their traditional counterparts.

Mitch Eichler, a business development manager at Parker Hannifin, contends that traditional hydraulic components

At a Glance:

- Mitch Eichler, business development manager at Parker Hannifin, is a mechanical engineer with a passion for commercializing hydraulic valve applications designs. He shares insights from his field.
- With the advantages of a high power density, large force output and easiness to actualize linear motions, hydraulic transmission systems are widely used in industrial hydraulics and for mobile hydraulic machinery.
- Along with the trade up from purely mechanical to electrohydraulic components comes the expectation of higher levels of performance, accuracy and scalability.

will remain critical to systems where the flow rate, pressure or actuators need to be controlled. Based solely on the force, speed required and the energy consumed, he argued, it would be size- and cost-burdensome to drive all components directly using electromechanical solutions.

“Those really high-force, high-demand applications still are largely done by

hydraulic valves,” said Eichler.

Across the board, hydraulic experts tend to agree that the combination of high power density, large force output and the ease with which one can actualize motion makes hydraulic transmission stand head above shoulders in industrial and mobile hydraulic machinery.

“The way that fluid power works, you can get a lot of bang for your buck—it’s a very dense solution in a small space,” emphasized Eichler, a mechanical engineer who specializes in hydraulic valve applications.

Building Interdependencies

An either/or debate about hydraulics supports a way of thinking that’s more academic than it is practical, said Eichler. At Parker Hannifin’s motion systems group, various divisions work together. “It’s not as much that you either go hydraulics, pneumatic or electromechanical anymore,” he explained. “We look at them as a system solution. Our focus in our manufacturing division is hydraulic valves but, as electrification comes, those valves are getting smarter. In some applications, they may be going more electromechanical for their control or for certain components.”

Parker’s upcoming generation of DFplus control valves is a fitting example of future design. As Parker’s highest dynamic valve, it has been around for 20 years and is designed for the most demanding applications such as general presses, machine tools and blow molding. The next generation FP valve will have several communication protocols, especially IO-Link. The range of functions include actual value (spool position),

temperature, operating hours and various error messages.

In this example, the focus is less about developing brand new hydraulic valve technology and more about bringing new communication possibilities into existing hydraulic systems, including programming valves by NFC (near field communication) with your phone, with your table or with your computer, and doing



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Parker’s Drive Controlled Pump system solutions are variable-speed hydraulic pump systems which provide high energy efficiency.

so wirelessly or through different bus protocols. “That’s really what we’re seeing as the future,” Eichler said.

Managing Complexity

Does the introduction of new technologies simplify or complicate the design characteristics? To some extent, the industry is witnessing a bit of both. “In the late 1980s through the early 2000s, when electrohydraulics started becoming much more prevalent, the control in the valve was largely mechanical,” Eichler explained.

“I usually compare it to a Swiss watch,” he added. “All the sensing and logic was done by spools and different springs and orifices and lots of mechanical contrivances that got the job done. And that was the only way it could be done. But now that we’re seeing systems becoming more advanced, they’re also becoming simpler. Instead of having all these different orifices and spools and mechanical sensing elements, you can reduce part count and complexity in the valve by closing the loop around the spool.”

Instead of having compensators that will always give you a fixed pressure drop (“to give a certain flow out of the valve and thus a certain speed of the system”), you can achieve this more simply with a valve that has advanced electronics on board and that can make sure that you’re hitting that flow rate. “And, if you need to open the valve further, it will do that, instead of relying on the internal mechanical parts to get there through traditional hydraulic control,” Eichler said.

Oriented to Industry 4.0

As valve design evolves with the onboarding of electronics, so does the understanding of how machines perform. Industries want to get smarter, more efficient and cut costs, and they want to be able to do more predictive maintenance, pointed out Eichler.

The synergistic integration of digital and mechatronic technologies means that industrial valves are better equipped to monitor and perform online diagnostics and to provide more efficient control. This applies to off-highway/on-highway types of equipment, too.

Consider the efficiency of an automated side-load garbage disposal truck, where a driver controls a mechanical arm from the side of the truck. Older trucks depend on

As valve design evolves with the onboarding of electronics, so does the understanding of how machines perform.

lever-operated directional control valve actuation. Newer machines, by contrast, use sequence valves or may have onboard electronics and advanced sensing integrated in the hydraulic system that complete the action with one push of a button or lever. "You're getting away from lots of hoses and mechanical linkages, and you're running wires, and you're pushing a button," Eichler said.

Along with new compact design and productivity gains come health and safety benefits, too. Automation diminishes the physical strain in manual labor routines, as well as moves operators out of harm's way, Eichler said.

If "smart" is the end goal, technologies that support hydraulic functions are anything but lagging. "If manufacturers try to do everything and make every valve capable of sensing anything we can imagine, then it's probably never going to be a cost-competitive solution for the end user," he said.

Instead, the preference is to work with

OEMs and their end users on a case-by-case basis and to understand what their process of collecting data is. Eichler suggests asking troubleshooting questions: "What will they use it for? How will they use it? And at what level is it valuable? Is this something they need to be checking minute-by-minute, hour-by-hour, day-by-day?" Depending on the application, all of these types of changes can be built into different valves.

"We want to make sure we're not just putting together toys for engineers," quipped Eichler. "The more whistles and bells that a valve has can be great. Sometimes you need that built into the valve because it alerts you to track something that you didn't think was important and teaches you something about your machine. But it comes down to size and cost and that total value proposition." **P&M**

Video: Mitch Eichler on Why Electrohydraulic Valves Control the Flow

Along with the trade-up from purely mechanical to electrohydraulic components comes the expectation of higher levels of performance, accuracy and scalability.



Mitch Eichler, business development manager at Parker Hannifin, is a mechanical engineer with a passion for commercializing hydraulic valve applications designs. In this video he discusses why the combination of high power density, large force output and the ease with which one can actualize motion make hydraulic transmission stand out in industrial and mobile hydraulic machinery.

At Parker Hannifin's motion systems group, technologies are considered to be complementary. "It's not as much that you either go hydraulics, pneumatic or electromechanical anymore," Eichler explained. "We look at them as a system solution. Our focus in our manufacturing division is hydraulic valves but, as electrification comes, those valves are getting smarter. In some applications, they may be going more electromechanical for their control or for certain components."

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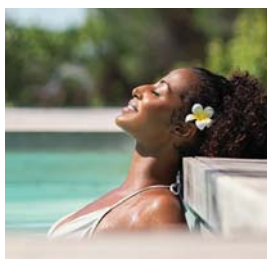
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The Future of CONSTRUCTION EQUIPMENT

Learn how Moog and Doosan Bobcat came together to create an all-electric compact track loader.

by Bob Vavra

Doosan Bobcat won two awards at the 2022 CES Show in Las Vegas for its Bobcat T7X, billed as “the world’s first all-electric compact track loader.” Helping to power the T7X is a machine electrification system from Moog Inc. that delivers an integrated software framework, electric machine controller, lift and tilt electric cylinders, electric traction motors and power electronics. “With the help of Moog’s system, the T7X is a major step forward for the productivity, safety and sustainability of construction machinery,” Moog officials said in a press release.

In the accompanying video interview, *Power & Motion* discussed the partnership with Doosan Bobcat. Participating in that that video discussion were:

- Joe Alfieri, vice president and general manager of Moog Construction
- Joe Baldi, director of strategy & partnerships for Moog

In a separate interview, Alfieri talked about the project and its innovative approach to developing the force and motion needed for the application from



an electric system. Alfieri, a member of the *Power & Motion* Editorial Advisory Board, also discussed the future implications of electric actuation and motion control for the construction industry as a whole and in particular for hydraulics application.

Power & Motion: Talk about the first discussions with Doosan regarding the Bobcat T7X. What were their goals, and why was Moog selected as their partner on the project?

Alfieri: Doosan Bobcat had a vision for an all-electric machine. But they realized getting there would require partners

to overcome challenges. One difficult challenge they—as well as any OEM—faced was finding electric cylinders of the size and force necessary to power the T7X's lift and tilt. Through its research, Doosan Bobcat learned about Moog and its work for the agricultural and construction industry.

During a visit to Moog, Doosan Bobcat realized Moog was a not only a provider of technology but also a systems integrator that could speed up the journey to reach Doosan Bobcat's vision in much the same way Moog did in converting hydraulic full flight simulators to all-electric versions.

P&M: Talk about the engineering involved with transitioning from a traditional hydraulic system to an electric one. What are some of the engineering challenges your team faced in the process?

Alfieri: Transitioning from hydraulic to electric is about understanding an entire system, not just providing components, especially when an OEM wants to achieve all the performance required for a comparable or even better machine. It's not a one-to-one (or pin-to-pin) replacement because there's a lot of modification to do. We took a systemwide view, which is what enabled us to engineer a purely electric solution, including battery, and sized appropriately to get right run time for four hours of heavy-duty work and eight hours of normal-duty work.

To achieve the power wanted and prepare for a path toward next-gen autonomous features, we designed an electric system above 400 V. But that high voltage requires safety in terms of the electrical system (e.g., remove shock hazards) as well as the function of the machine to ensure the vehicle won't make unintended moves. One way we achieved that is with a safe torque off feature.

P&M: The move toward electrification in construction and off-highway equipment is accelerating. Is this strictly an environmental issue, or are there practical advantages to moving to an all-electric fleet?

Alfieri: Some practical advantages

would be the fact that all-electric machines like the T7X require almost no maintenance. When we replace the hydraulic system with an electric one, we're also removing pumps, hoses, tanks and valves that can break or require service. For example, the Bobcat T7X has electric actuators and motors, so it uses only one quart of eco-friendly coolant compared to 57 gallons of fluid in its diesel/hydraulic equivalent model.

Another advantage for electric systems is that they become much more controllable, and as things become more automated, the vehicle owner or operator has more precise control. Regarding data, electric systems allow machine owners to collect data to make smarter decisions at the machine level and the construction site.

An all-electric machine is a software-enabled like a smartphone; the vehicle owner can achieve faster, more precise updates and features. And environmentally speaking, there's less noise and less vibration, which helps operators work longer and reduce noise pollution in neighborhoods and communities near construction.

P&M: Given all of this, where do hydraulic systems continue to be valuable? What are the advantages of hydraulics in the off-highway environment?

Alfieri: Hydraulic systems continue to be appropriate for large machines, like heavy-duty excavators. That said, there are hybrid solutions, too, so a vehicle maker doesn't have to choose an all-hydraulic or all-electric system. Moog has technology that covers hydraulic, electric and electro-hydraulic; we're technologically neutral. These high-powered continuous duty machines can be designed for zero emission, too.

Not long ago, Moog partnered with CASE to develop a zero-emission, electrically controlled hydraulic backhoe loader that weighed more than 15,800 lb. There will always be niche applications for hydraulic systems, and it's important to have solutions to support those.

The construction industry will increasingly see electrified solutions for multi-axes machines, but for packaging and

power-density reasons, hydraulic solutions will still be valuable. For example, the aircraft industry went to electric solutions, but the dimensions of the interior space of jet airliners' wings still require hydraulic transmission to achieve the required power density to move the wings flaps, spoilers and slats.

P&M: How will Moog apply the lessons of the Bobcat project to other aspects of your business? What other applications will we see in the future?

Alfieri: We took a huge step with Doosan Bobcat, and there will be many more to follow, including converting different product types from hydraulic to electric and differently sized products from hydraulic to electric. This could include skid steers, tractor backhoe loaders, wheel loaders, mini-excavators and outside the

construction industry to areas like airport handling equipment and even garbage trucks. This work starts to open opportunities for more electric systems, which are more controllable and offer additional productivity solutions through connectivity and automation in future machines.

P&M: What should the industry do to start preparing for a hybrid approach to off-highway equipment? Are we going to need changes in maintenance, supply and engineering for existing fleets?

Alfieri: Anyone in the industry should start asking themselves, and their business partners and suppliers how they're preparing for an increasingly electrified future, so they can chart a course forward. The skills maintenance crews will have in the future will be more about electrification

and software versus mechanical hydraulic. As machines increasingly become all-electric, maintenance will be more predictive because a vehicle owner can stream data from the machine and apply analytics to be smarter about maintaining a fleet and scheduling maintenance.

Troubleshooting and diagnostics will be possible via the web, and maintenance workers can, potentially, understand what needs to get fixed before they leave their office. In fact, repairs may not require a technician, and if they do, technicians can tell what parts they need before they even leave their office. It's an opportunity for maintenance workers, and others, to develop a new set of skills to take on different types of jobs.

Other changes will include building of new electrical charging stations. And inevitably new suppliers and players will emerge. **P&M**

Video: Building the Bobcat T7X

Learn how Moog and Doosan Bobcat came together to create an all-electric compact track loader.

In a video interview with *Power & Motion*, Moog's Joe Alfieri and Joe Baldi discuss the company's collaboration with Doosan Bobcat—a partnership that led to the Bobcat T7X, billed as “the world's first all-electric compact track loader.”

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Spotlight on Sealing Solutions for Fluid Power and Off-Highway

Ensuring performance in extreme conditions, industrial seals meet unique application needs.

by Rehana Begg

The coronavirus negatively impacted supply chains and manufacturing industries across the globe. One effect was a decline in demand from end-use industries, such as aerospace, automotive, construction, mining, and oil & gas.

That effect will likely be short-lived as manufacturers build back to serve their customers and as infrastructure funds are unlocked, according to Michael Cook, global segment director, off-highway, and marketing Americas segment manager, fluid power, Trelleborg Sealing Solutions.

Fluid power components and industrial seals support almost every industrial sector where extreme operating conditions set the bar for fluid handling and fluid power applications. Its most important function is to optimize the performance of the machine.

Not surprisingly, enhancements to overall equipment effectiveness (OEE) and turnkey solutions are among top

trends in a global fluid power equipment market that was valued at \$48.9 billion in 2020, according to recent data.

At Trelleborg, fluid power consists of hydraulic and pneumatic components manufacturing along with the machine tool, material processing and material handling industries. Off-highway consists of the agriculture, construction, mining and forestry industries. Based on the significant supply chain ties between these industries, the trends in the sector are consistent across the relevant customer base, explained Cook, whose role requires him to evaluate target customers and identify product and service gaps.

Given the specialized credentials Cook has amassed since joining Trelleborg in 2013, it seemed only fitting to ask him to provide readers with a finger-on-the pulse overview of the industry he serves.

Michael Cook: I joined Trelleborg in 2013 as an application engineer focused on our oil & gas segment. I worked with our product management team to propose the best solutions for the extreme applications in that industry. I moved to our fluid power and off-highway segments in 2018 as a technical specialist where I focused on the product strategy for these markets and played a key role in the launch of our AS568 standard O-Rings and the Inch Polyurethane (PU) Product Line for the Americas.

My experience in these segments has provided me with a vision and strategy in my new role as global segment director to ensure we grow our global customer base and continue creating value for our customers. I have also participated in the Trelleborg Graduate Program and the Trelleborg Sealing Solutions Talent Program, both of which helped further my leadership and intrapersonal skills.

Rehana Begg: Can you comment on notable recent trends in the fluid power and off-highway segments?

MC: After major growth in 2021, the fluid




power and off-highway market is set for further growth in 2022 as infrastructure spending is allocated. We continue to see the shift to electrification and integrated use of the Internet of Things (IoT) for next-generation equipment. From a seal supplier standpoint, electrification can change the product mix

we recommend for given applications, while the use of IoT provides the impetus to further understand how we can provide real-time feedback on seal performance.

Developing integrated supply partners is another industry focus as the ability to receive kitted or pre-assembled solutions at the C-Part level can ease labor constraints and reduce SKUs and potential installation issues.

RB: What types of seals are most commonly used in the function of hydraulic components in fluid power applications?

MC: Hydraulic systems contain a configuration of seals, each with its own job to perform. In linear hydraulics applications, there are typically rod and piston seals, along with wear rings and wipers. These components can be made from Polytetrafluoroethylene



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(PTFE) or PU materials.

In rotary hydraulics, common seal types are radial oil seals, cassette seals, mechanical face seals and V-Rings. Many of these seals incorporate rubber or metal components, but PTFE and PU can also be used based on the application.

All hydraulic applications have static seals, with O-Rings being the most common example, and materials being selected based on the temperature and media requirements.

RB: Can you provide a checklist of the considerations needed to select the right seal for an application?

MC: Typically, we need to know the application's pressure, temperature, speed and media requirements to begin the seal selection process. Another important factor is whether we have existing hardware constraints, or whether we are working with

a blank slate and can recommend groove dimensions and surface finish requirements. From there, we can select the seal profile and material that will best handle the given operating conditions and achieve the customer's targeted lifespan.

RB: What role does the seal supplier play in the design process of customizing components?

MC: A knowledgeable supplier will typically be as hands-on as the customer allows. At Trelleborg, we collaborate with customers in all phases of the design process. We have a wide portfolio of both standard and custom products, as well as hardware and surface finish recommendations, that ensure our products work efficiently while reducing potential customer concerns such as friction or heat generation. Understanding the customer's primary

goal for a given application enables us to use our internal resources and experience to recommend the best solution.

RB: Which quality assurance measures should be employed? Which steps or testing procedures should be followed to control and ensure compliance?

MC: The fluid power and off-highway segments do not have overarching quality assurance standards like one would see in the aerospace and automotive sectors. Many customers have their own standards that we review with our quality team to ensure they can be incorporated into our process if they are not already a standard procedure.

Trelleborg Sealing Solutions is ISO 9001 certified. We have a robust quality management system, which ensures we consistently provide products that meet specified requirements. These requirements can range from 100% inspection to Product Part Approval Processes (PPAPs) or other custom certification packages. Additionally, we make recommendations to our customers regarding safe handling and storage of our products along with best practices for installation to limit the potential for damage.

RB: Consider the term "cognitive sealing." I understand that this is the term Trelleborg uses to describe predictive maintenance. How is Trelleborg using digitization and IoT strategies—such as sensing, data capturing and AI methods—to interpret the environment around a sealing system?

MC: Cognitive sealing helps companies increase the safety of their machines and applications, while at the same time reducing maintenance and the cost of unexpected downtime.

IoT allows for the remote monitoring of devices and the collection of data. As seals are often critical components within processing systems, cognitive sealing can offer real benefits to manufacturers.

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team of highly skilled data scientists, electronic engineers and sealing experts who are able to assist in developing condition monitoring solutions. From sensor selection to data analytics and artificial intelligence, we collaborate with customers to develop predictive failure models, build system health dashboards and improve system operation beyond the seals.

RB: What exactly is the “seal health score” and what is involved in analyzing a sealing system?

MC: Several factors influence the health of a seal. By collecting data from the sensors within the application, we can fine-tune our algorithms to account for friction, temperature, pressure and so on. In fact, we take into account external data such as wave height for applications at sea. By deriving the impact on the seal, we can simulate a “health score,” which

helps us predict when the seal will fail.

This is only one part of the analysis. We also look at the behavior of the environment to see if there are other signs of degradation in the sealing system. By examining the unique combination of data from various sensors and the complex relationship between them, we can identify patterns or “failure fingerprints.” These enable us to predict not only when a seal will fail but also what type of failure to expect.

Lastly, these systems are not only about failure but also about continuous improvement. Analyzing the data provides actionable insights for future improvements in design and seal selection.

RB: Does Trelleborg incorporate sustainable methods for manufacturing seals? If so, please describe how.

MC: Trelleborg incorporates sustainable

methods of manufacturing wherever possible. In addition to optimizing our tooling and machining programs to limit production waste, we “re-grind” material for non-critical components such as wipers and wear rings. Some of our manufacturing plants are also working on eco-packaging initiatives to reduce our plastic usage.

Outside of manufacturing, we use our finite element analysis (FEA) and simulation expertise to predict seal performance and modify our designs prior to any testing, which helps limit prototype loops. Finally, our products provide sustainable options for our customers.

For example, our Lubrication Management program not only extends seal life and reduces scrap—it significantly reduces friction, lowering the energy required to power hydraulic systems and potentially enabling the downsizing of drive components. **P&M**

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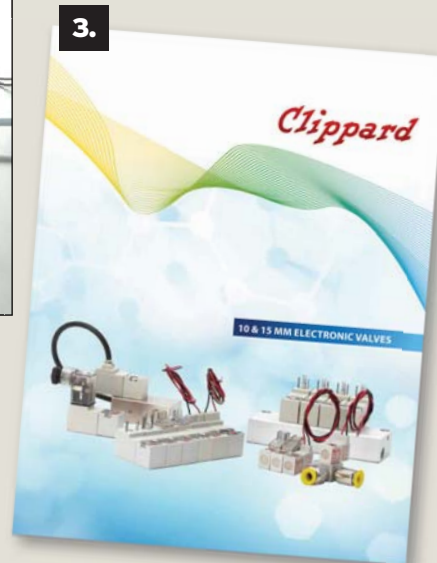
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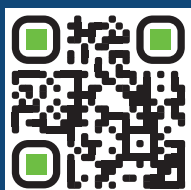
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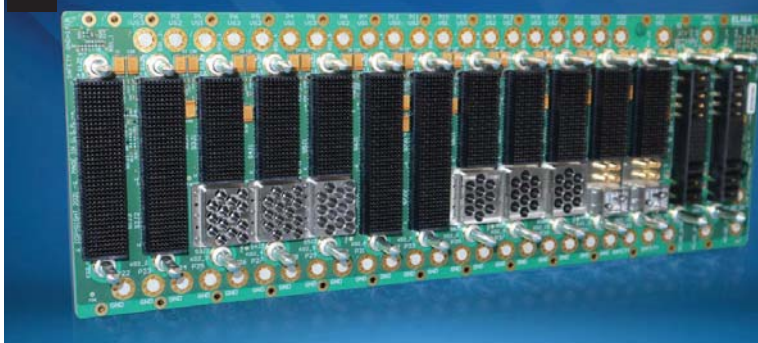
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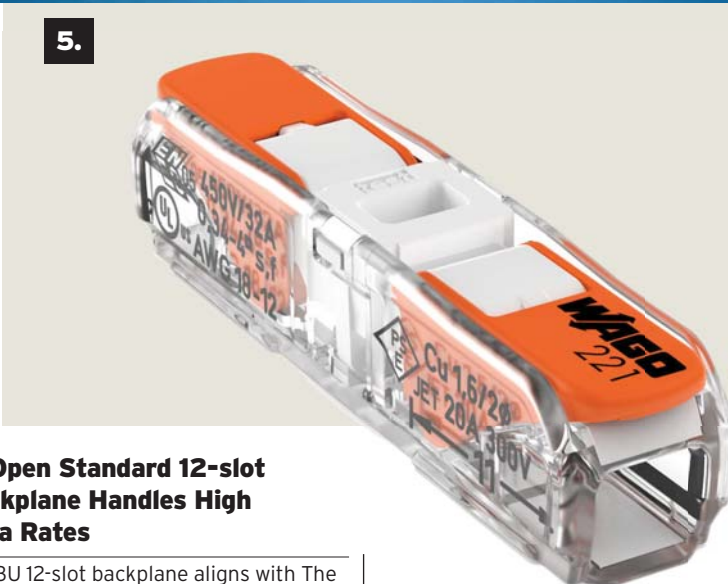
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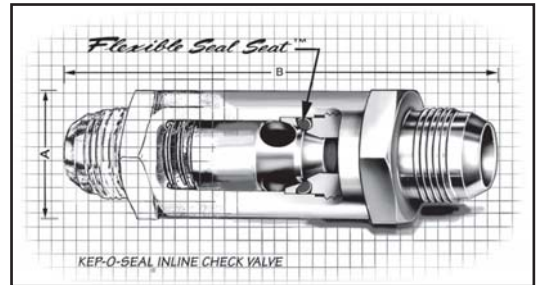
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Q&A: **Jacob Paso** Highlights the Benefits of Hydraulic Motion Controllers

Jacob Paso, an expert in servo-hydraulic motion control, explains why hydraulic motion control remains critical to the industry.

by **Rehana Begg**

If you guessed the biggest and most universal return from applying digitalization to machines is predictive maintenance or having a way to analyze swaths of data, you're not even close.

The true benefit is in customer support, according to Jacob Paso, motion product development manager, Delta Computer Systems, Battle Ground, Wash.

It's not only Delta's support engineers who have ramped up remote support. Delta's OEM customers report improved support results and "better and less expensive transfer of expertise from the manufacturer to the end customer," said Paso, an electrical engineer who specializes in industrial, high-performance hydraulic motion control.

Greater visibility leads to an agile approach, with improved product quality and less downtime, said Paso.

If Paso's explanation seems uncomplicated, keep in mind it's a skill he regularly exercises. "I enjoy solving thorny motion problems, and thrive on the challenge of conveying technical information in a clear, simple manner, providing an intuitive understanding of complex topics," he said.

In this Q&A, *Power & Motion* challenged Paso to simply explain a few complex trends, including what design characteristics to keep in mind when selecting

an electronic motion controller, why hydraulic motion control remains critical and how to optimize legacy hydraulic technologies.

Power & Motion: I'll go directly to the question I'm trying to explore right now. What do you consider to be the single most impactful trend that you've seen in fluid power and the evolution of fluid power in the past five years?

Jacob Paso: Probably the single most impactful trend is the improvement in all of the equipment involved. We've seen that in sensors, in actuators, the valves, the motion controllers, the knowledge that's packaged into the algorithms. Put together, that has all created great improvement. I can't separate that out into a single one part of it.

If I narrow a little bit to our specific niche, which is high-performance motion control and hydraulics, one of the trends is the increase in use of position together with force control to provide greater quality in the product. And of course, this comes because of greater algorithms and better sensors and actuators and so on. So, we're kind of seeing an increase in that across the board.

P&M: At a more granular level, can you give me an example of how that works in its execution?

JP: Sensors, some years ago, could go down to maybe 10 or 5 μm of resolution. Now we're seeing down to 0.1 μm of resolution. Hydraulic proportional valve frequency response of 100 Hz used to be really, really good. Now we're seeing 300, 400, 500 Hz valves. And not just the speed, but the quality of these valves being manufactured makes position control and force control just a lot easier to do, assuming we have the algorithms to take advantage of that.

P&M: What has been your company's most recent achievement in innovation?

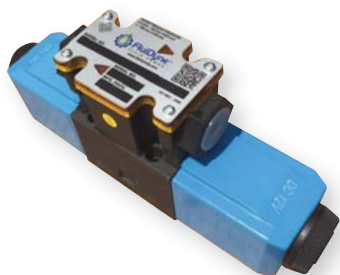
JP: Our biggest recent achievement is increasing the number of axes our controllers support from 8 to 50 axes. And this is done while not only maintaining the same update rate of one kilohertz but also improving that update rate. Customers benefit from reduced costs of not having to buy multiple motion controllers for large machines—especially in wood products where they have large sawmill lines—and better synchronization between more axes and easier troubleshooting of large systems because you can see all the axes at once. So that's Delta's recent great achievement. **P&M**

For an expanded version of this interview, visit <https://powermotiontech.com/21235423>.





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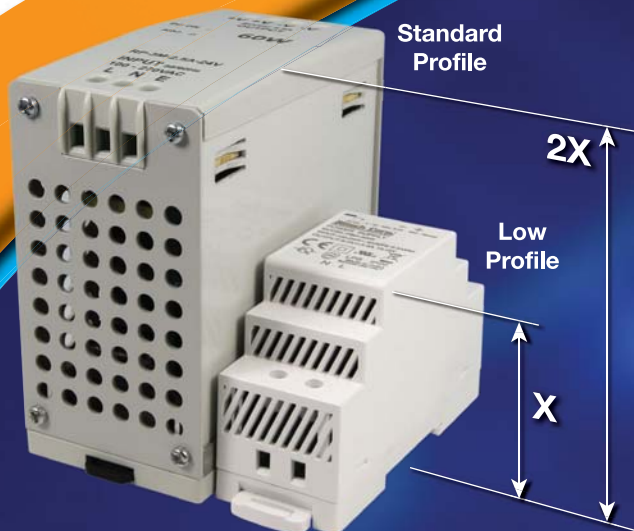
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