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“Growth at this level is a win for the employees of Digi-Key, it’s a win for the Thief River Falls community and it’s a win for the state of Minnesota.”



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From the Editor

By Bob Vavra, Senior Content Director

A Marathon and a Sprint



IMTS showcased a clear direction for manufacturing. Now it's up to us to take advantage of the opportunities presented.

AS I RACED between the four halls at Chicago's McCormick Place

to take in all that manufacturing had to offer at IMTS 2022 in September, I literally walked a marathon. Over four days, I covered the 26.2 miles (and a little more) to see what manufacturing suppliers wanted to showcase in the largest post-pandemic trade event in North America.

There always is a lot to see at IMTS, but this year's event was more than devices, machines and technology. If the ability to gather 90,000 attendees safely is considered an achievement, it appears the show satisfied that goal admirably. That leads to the next question—what's next?

That was the primary question that attendees needed to ask at this show. IMTS showcased a clear direction for manufacturing. The future is digitization—a smart, scalable, connected and managed enterprise. The digital future offers better product design in a collaborative environment; smarter use of materials and energy to meet the changing environmental expectations of end-users; and an automated plant that employs the scarce human resource more intelligently while leaving the heavy lifting and bending to their new robotic co-workers.

This no longer is a panacea. This is real-life manufacturing. The technol-

ogy works. What's left is a thorough examination of what your operation can implement now to derive the greatest success.

This is an opportunity to take a long, hard look at design and operations. Identifying places to improve product creation and throughput starts with the design and operations teams now using digital twins, efficient 3D product prototyping and increasing use of artificial intelligence, all to streamline the process before the first part rolls off the line.



If the goal is not to waste time in the production process, then this fresh look at what we do now and how we can do it better in the future also must not waste time. The looks for improvement have been laid out in clear ways before the attendees at IMTS, and there is no return to the past. The digital future has arrived. If learning about the enabling technology at IMTS felt like a marathon, this next effort must feel more like a sprint, because those who do not start fast will inevitably be left behind. ■

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A Tour of Digi-Key Electronics' Product Distribution Center Expansion

Scalability was prioritized in the design of a nearly fully automated pick, pack and ship conveyor system. The new Digi-Key Electronics facility is a study in high-service distribution of electronic components.

AT A GLANCE:

- Digi-Key Electronics has added a 2.2 million square foot facility at its headquarters in Thief River Falls, Minn. to pick, pack and ship electronic components.
- Digi-Key President Dave Doherty and Chris Lauer, vice president, order fulfillment, discuss the milestones of the Product Distribution Center Expansion (PDCe).
- There are 27 miles of automated conveyor inside the building, and an average order will travel more than 3,200 feet inside the building.

by Rehana Begg, Senior Editor

For *Machine Design* editors, every opportunity to tour a facility is carefully evaluated for its ability to deliver on at least three factors: an opportunity to learn, the ability to assess a process and the independence to share information collected. The event marking the opening of Digi-Key Electronics' Product Distribution Center Expansion (PDCe) in Thief River Falls, Minn. would meet the criteria.

To Learn: Why This Location Matters

With distribution operations in two distribution locations—Fargo, N.D. and Thief River Falls—the global distributor of electronic components and automation products offers more than 13.4 million products and processes more than 6.4 million orders annually. Its website notes that 99.9% of orders are shipped same day. The large majority of orders is shipped from Thief River Falls.

The new facility located at Digi-Key's headquarters in Thief River Falls adds 2.2 million square feet to the existing premises. That's a footprint of more than 22 football fields, or 1,045,600 square feet.

The PDCE building was designed by Minnesota-based Widseth, and McShane Construction served as general contractor on the project. Digi-Key has partnered with KNAPP, a warehouse logistics and automation specialist, to design and implement the internal automation and operational equipment.

Improving productivity, efficiency and time spent on collecting and packing orders and eliminating waste are among the key reasons for selecting this state-of-the-art electronic picking, packing and shipping solution, according to Digi-Key President Dave Doherty.

But why would an enterprise that already sells and ships more than six million orders a year to 180 countries invest in a \$400 million warehouse expansion at a remote location in northwestern Minnesota?

The rationale deftly unfolds at a press briefing following the invitation-only ribbon-cutting event. “Productivity is all about continuing to allow us to scale,” said Doherty at a press briefing following the invitation-only ribbon-cutting event. “And it’s a mixed blessing. We make no apologies for being in a remote area



The PDCE building was designed by Minnesota-based Widseth, and McShane Construction served as general contractor on the project.

because it’s pushing us into that automation for the right reasons.”

The roots of that mixed blessing can be traced back to 1972, when Digi-Key was founded by Ronald Stordahl, an electrical engineer. The company became a pioneer in the mail-order catalog business and a key resource for design engineers. Today, Digi-Key ranks as the fourth largest electronic component distributor in North America and the fifth largest electronic component distributor in the world.

Three River Falls has remained the hub where most of the activity takes place. With more than 3,600 of Digi-Key’s 5,200 employees based in there, the reputation of the city and the enterprise have become intertwined.

“Growth at this level is a win for the employees of Digi-Key, it’s a win for the Thief River Falls community and it’s a win for the state of Minnesota,” touted Steve Grove, commissioner of Minnesota DEED, in a press release. “The opening



Digi-Key opened its 2.2 million square foot Product Distribution Center expansion (PDCE) with a Digi-Reel cutting. Pictured: Chris Lauer, vice president, order fulfillment, Digi-Key; Thief River Falls Mayor Brian Holmer; Dr. Ron Stordahl, owner, Digi-Key; Dave Doherty, president, Digi-Key; Minnesota Department of Employment and Economic Development Commissioner Steve Grove; and Ramesh Babu, CIO, Digi-Key. All photo credits: Digi-Key Electronics

of this facility is made possible by local and state economic support, which will contribute an additional \$500 million in economic output, as well as the addition of more than 1,000 new jobs.”

Doherty said Digi-Key closed 2021 with a 65% growth rate and that bookings in 2022 were up 25% year-over-year as of the grand opening. Digi-Key has added 680 new employees since work began on the PDCe project in 2018.

To Assess: Developing New Methods for Order Picking

The most impressive feature housed in the PDCe is a conveyor system made up of 27 miles of automated conveyor and spanning four floors. Scalability was clearly prioritized in the design of nearly fully automated conveyor system, which in fact is made up of two primary conveyors that provide redundancy in the event of breakdown. An average order might travel more than 3,200 feet inside the building, according to Digi-Key.

That picking parts are the only task done by hand is a conspicuous change from Digi-Key’s former picking process. “The old building was really remarkable in its day,” explained Doherty. “One of

the coolest things about it was you didn’t require chokes. We had a crossbelt that was only about half the speed [of the new conveyor system] and it meandered through about half of the second floor. You could put picks, typically small plastic packs, and just drop it right on the belt. Some of the drawbacks were the walk time—people had to go up and down the aisles to get to the part—and inaccuracies.”

In addition, it took up to 300 people to “turn on the lights because parts were stored all over the two floors,” added Doherty.

Not only does the new system reconfigure the way work is organized, but it also eliminates ineffective work processes and provides an “upfront edge,” said Chris Lauer, vice president, order fulfillment at Digi-Key Corporation. “In our old pick base, you were looking at 100 parts. In the new picking system, it’s an average of about 2.3 parts that are in front of you. The new system points pickers to the bin they should pick. Ultimately, we’re looking to pick up our accuracy as well as better performance.”

Staff now manage the flow of orders from a control room. The new warehouse management system and OSR (order

retrieval system) provides the advantage of streamlining paper trails and documentation.

“We bought the best of the best because we felt we had to do that,” said Lauer, who spent about six months working on system requirements. “Our old system is like a Ferrari, but you need a Ferrari mechanic to support it. The [new system] becomes a lot more scalable.”

To Share: Potential Value of Modeling for Future Growth

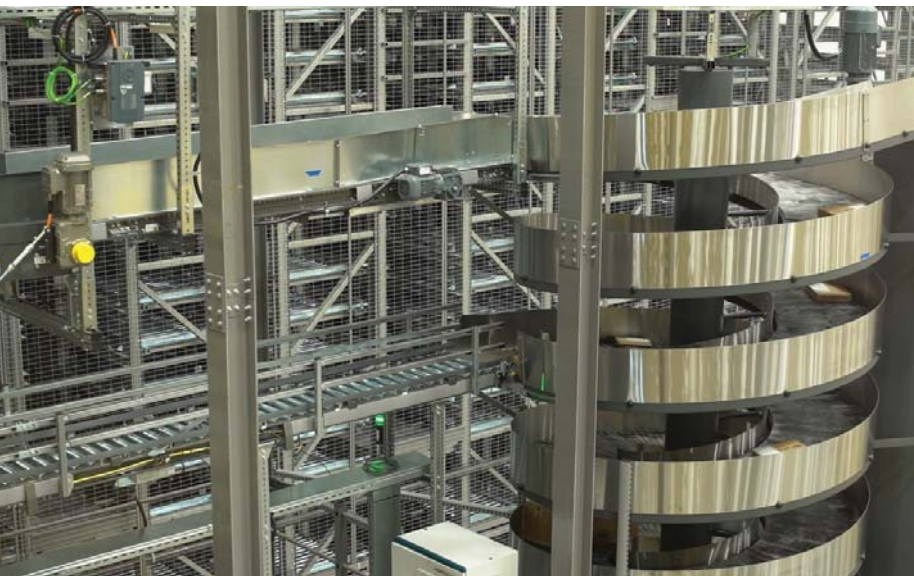
Aside from the customized conveyor system, the facility itself showcases value-added engineering features. The construction incorporated 17,000 tons of steel, 1,860 pieces of precast concrete and a 328-ft steel bridge connects the expansion to the current headquarters.

The building features six backup diesel engines and pumps along with a water tank built for fire suppression. Sustainability features include the roof’s white membrane, which reflects the sun’s heat, and sensor-activated LED lights to minimize electricity usage. The facility also has its own storm sewer and run-off ponds to mitigate any flooding or storage concerns in the community.

When asked how long the new warehouse will meet Digi-Key’s needs before another upgrade would be warranted, Doherty quipped: “You tell me what you see in the industry and I’ll tell you the next time.”

Industry insiders who understand the ebb and flow of supply chain cycles would be familiar with longer-term trends as well as short-term factors. The past few years of serving demand for products such as connectors, capacitors and microcontrollers provide a quick study in dealing with inventory shortages.

For Doherty, having cornered a niche that allows Digi-Key to aggregate inventory in one location and serve global demand gives the company a leg up in spite of the pandemic’s emotional constraints. “We are serving some of today’s demand, but we’re really trying to serve tomorrow’s demand,” he said. ■



KNAPP, a leader in warehouse logistics and automation, partnered with Digi-Key on the internal automation and operational equipment. Two primary conveyor systems provide redundancy in the case of a breakdown and provide opportunities for future growth.

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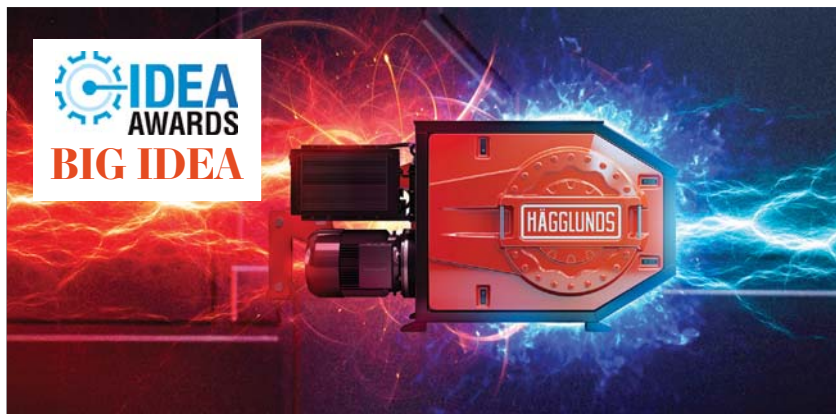
IDEA AWARDS WINNERS

Hägglands Fusion Drive System from Bosch Rexroth voted as Big IDEA winner by readers.

The votes are in, and readers of *Electronic Design*, *Machine Design* and *Power & Motion* have selected the 2022 IDEA Award winners. Readers chose the top products in eight categories

and the single product with the highest number of votes overall received the Big IDEA Award. This year's recipient is the **Hägglands Fusion Drive System from Bosch Rexroth.**

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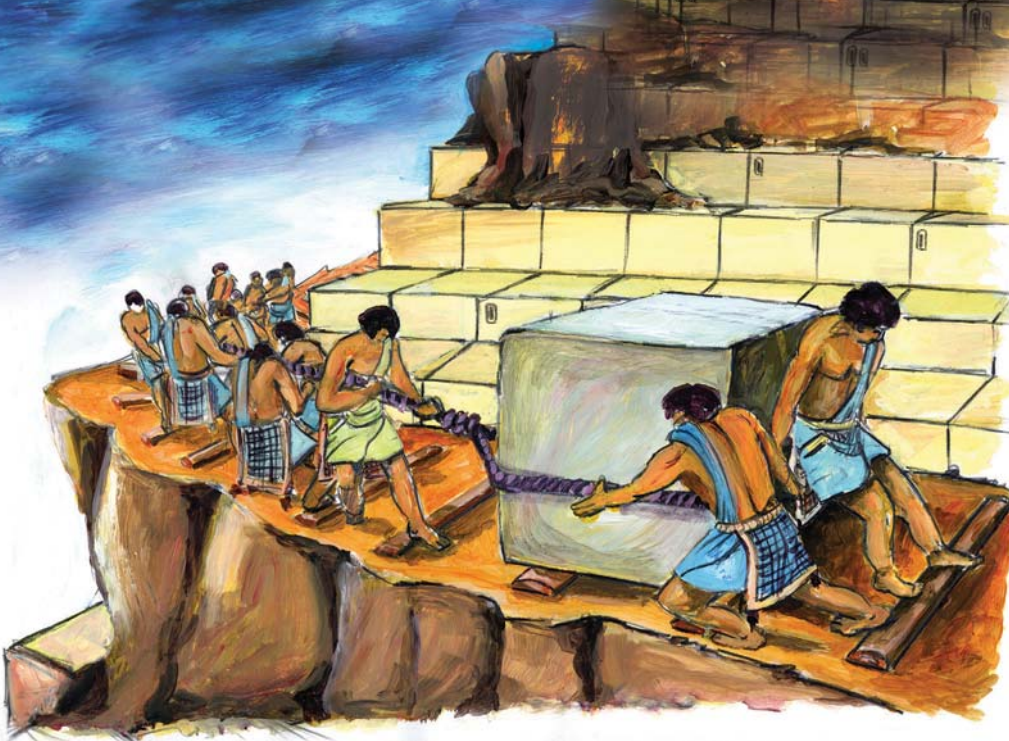
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“An Interactive Discussion With Members”

MxD’s Berardino Baratta discusses how his organization reaches out to bring all manufacturing stakeholders together.

by **Bob Vavra**, Senior Content Editor

Berardino Baratta, the new CEO of advanced manufacturing consortium MxD, talked with Machine Design senior content director Bob Vavra to discuss the mission of MxD in a wide-ranging interview. They talked about MxD’s success to date, how more manufacturers could use MxD on their own projects, and the future of digital technology. The interview has been edited for length and clarity.

For the full video of Bob Vavra’s interview with Berardino Baratta, go to <https://machinedesign.com/21249188>.



MXD’s Growth

Bob Vavra: First of all, congratulations on being named the new CEO of MxD.

Berardino Baratta: Thank you so much. It’s pretty exciting to be in this role. You know, it’s an amazing team. We’re doing some really good work and the opportunity to lead this organization is really something...I’m humbled by the opportunity, but also really excited by it at the same time.

BV: You’ve been associated with MxD for many years. Talk about where the organization is now and how you’ve seen it grow and change over the last few years.

BB: I joined MxD three years ago this month. Initially, I came in to run the tech strategy team underneath. Two years ago, when the VP of engineering projects and engineering role opened up, I made the transition into that team and I’ve been

running that group up until this most recent posting. But when you think about it, it’s roughly three-and-a-half, four years ago that Chandra [Brown], our previous CEO, came on board and the organization dramatically changed. We changed names, but that was just one message of it.

We joked that we became more efficient: We went from a five-letter acronym to three. But really, when you think about it, we’ve expanded what we do and our mission hasn’t dramatically changed. We’re here to help manufacturers, so we want to strengthen their operations. We want to make them more secure. We are the Digital Institute and the Cybersecurity Institute, so really that’s where you’re going to see our focus. But the amount of impact into manufacturing has shifted, and I’ll give you some numbers, right?

We were named as a national center for cybersecurity in manufacturing. That happened in the last three-and-a-half years. We received congressional fund-

ing to implement some of those programs. You know, right now I’ll leave it at that. But later, hopefully we can dive into some of the cybersecurity elements.

In the last three years, we’ve tripled the number of active projects to 66 today, across our whole portfolio, digital supply chain, factory floor, cybersecurity and workforce. What’s really interesting is in the first eight years of the institute, we completed 74 projects. So today we have almost as many active projects as we completed in eight years.

These projects are across that whole portfolio of activities. It’s all there to try to help strengthen manufacturing. We’ve started doing some work in the last two years with the Department of Defense at their facilities to help them modernize. We’re working with Rock Island Arsenal here in Illinois. We’re helping them lead some of their modernization efforts to really start bringing advanced manufacturing to their floor. If you ever get a

chance to visit this facility, it's an amazing facility with over 100 years of history. They have some things that you could think are out of World War II/Korea timeframe. Some of those elements, though, are cutting edge, and we're trying to make sure that we bring forward all of their legacy equipment and legacy technology to make them the most effective.

If you visited MxD before the pandemic, and you visited today, it is 70% different—80% almost—almost every element of that floor is changed. One example of that is AT&T and Datacom, as members, we have a fully functional 5G network here, not just one but two. We actually can cover all of the 5G technologies that manufacturers are looking to use. And working with the government and industry, we have funding to go build out a series of testbeds that we'll start looking at the use cases that both industry and the DoD need and so that we can start testing 5G use cases here in our factory environment.

Workforce Development

BB: [Workforce Development is] probably the most important thing that we do, because this is really making sure that not only do we have the factories of tomorrow with the technologies of tomorrow, but also the people to run them and to produce the parts that we want. So, working with industry and academia. We launched, just before I joined, a digital taxonomy that looked at the roles of the future for digital engineering and digital manufacturing.

In 2020, we issued a Cybersecurity for Manufacturing Hiring guide that identified over 180 roles that [reflect] how cybersecurity affects manufacturing. In total, we have over 427 roles identified and we built out success profiles and career pathways.

What does someone look like early-, mid- and late-stage in their career? The pathway is the way to get there. How do you take someone that's never considered a manufacturing role and find them an entry-level career in this space?



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To me, this is the most interesting thing we do because it's impacting human lives. If we can create an opportunity for someone to have a career in manufacturing that they didn't have access to before, these are fulfilling careers that can really help take care of people and change their lives.

“ If we can create an opportunity for someone to have a career in manufacturing that they didn't have access to before, these are fulfilling careers that can really help take care of people and change their lives.

You know, there's predicted to be a 3-million-person shortfall in jobs by the end of the decade. We really want to do our part to help fill those gaps.

That's just a glimpse in the stuff we've been doing, but if you think as an as an institute, we're fulfilling our mission. The fact that we're the second oldest mission is allowing us to have some time meet underneath that we can build on. And that's how you'll see it with all these different activities that where maybe the seeds were planted three or four years ago, but now we're really starting to reap the benefit of it.

Importance of Partnerships

BV: MxD has evolved also from the very beginning. This initiative started as a public/private and government cooperation on this front. But it's really evolved. It's not solely government funded anymore. Your partners are very heavily involved in this, both from the supply side and from the academic side. Can you talk about how that process has evolved?

BB: You mentioned public/private partnership, right? This is not about just

government funding. It's really about a co-investment. We're a partner organization with 300-plus members today. Like manufacturing, a small handful of the big manufacturers—the Lockheed, the Boeing, the Dow. And a lot of solution providers at the top, as well—Siemens, Microsoft, AT&T and others.

But the bulk of our members are small manufacturers. There are start-ups and small solution providers. There are 40-plus academic institutions. We really try to bring together the best of everyone's abilities to try to target those problems that are too big for any one manufacturer.

So as much as I would love to go to Boeing and fix Boeing's problems and make Boeing make a better airplane, I'd rather figure out what are the problems that affect Boeing and Dow and Datacom for their partnership programs.

Now we're looking at a supply chain problem and we then target technology from the government side and money

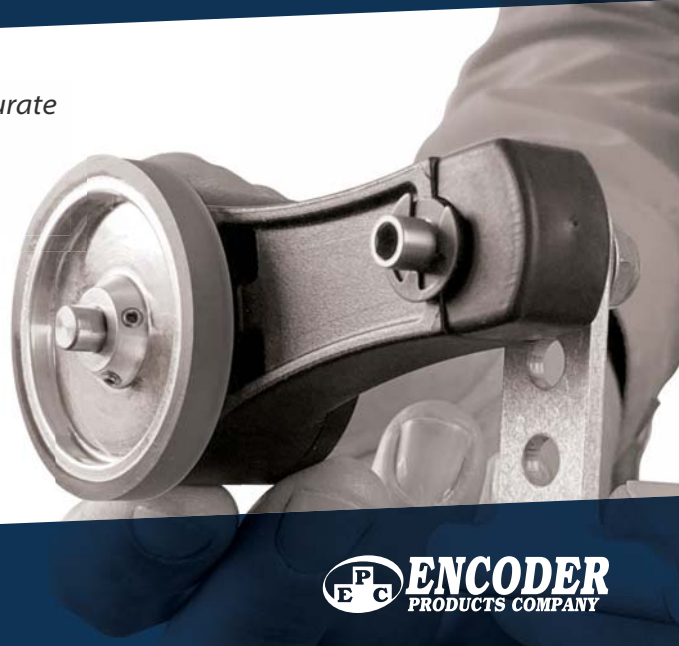
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from the government side into those problems. But we match it to the private investment of both capital and people so that together they're trying to solve these problems. As a membership consortium, everybody benefits. We make sure that everyone within the consortium gets something out of a project.

I'll give a couple of examples: We'll do a project related to supply chain resiliency. So we had a first-generation project that was with Dow and Microsoft and Purdue University. They worked together showing how you can use artificial intelligence to identify risks within the supply chain. When we had the opportunity with CARES Act funding to build on that, we expanded that program out and started looking at a much broader form of risk, but also much broader tools in place to try to mitigate that risk.


So it's all about not just building a project and saying, "Here's some technology, we're done." It's about that interactive discussion with the members. How do you start taking the solution out of one project, understanding the impact, move to the next one? But it doesn't just end the projects. We talk about projects a lot because it throws up the good numbers—140 projects to date, \$150 million total investment. These are big numbers, but things like workshops and seminars, we put on a lot of these things.

When we went into the pandemic, we shifted everything to virtual. So now we call them all webinars, but it's the same thing. How do you bring together experts? How do you bring together the people that are trying to solve these problems to enable a conversation? So we did a 5G workshop in 2019 that really started looking at the art of the possible for 5G. In 2021, we followed up with a workshop that started making it more grounded in reality. We're now in discussions where people share their real examples of how they've implemented it.

The people that are implementing, they get some value out of sharing it. But what's really interesting is [asking] who are that next tier of manufacturers that can take

that outcome and really start benefiting [from] it?

We did one for Future Factory that looked at what the future of manufacturing would look like. Out of that, we found out that data was the key piece, so we had a follow-up session that really started looking at how do you generate the data within a factory and then share it both within your operations [and] among the supply chain.

 *If we can create an opportunity for someone to have a career in manufacturing that they didn't have access to before, these are fulfilling careers that can really help take care of people and change their lives.*

Factory of the Future

BB: The last piece I want to hit is the Future Factory. Our space here in Chicago, 22,000-sq-ft space, right, where MxD and our members, we put into practice Industry 4.1 cybersecurity. It's not just the PowerPoint, it's not just a concept. You can come in and see these things. Some of them, you can actually... go touch them and play with them. Our assembly test bed is a fan favorite because they get to actually play with the tech up front. But each of those 10,000 visitors that come through our doors initially in person, now it's a combination of virtual and in-person.

A high school student come through it and understands what manufacturing looks like. It's not what they see in the movies. Here's the reality of how advanced the technologies are in that space. You can have a CEO that comes through and they start realizing, oh, that \$100 million request or that million-dollar request for equipment, that's what they need.

So it's not a concept. It's actually they can see it and touch it. But the piece that's also important is you get a small business owner [who] not only sees the benefit of digital, but they can also learn the effects of cybersecurity attacks and

that they are at risk. So now they can start taking mitigations to deal with that risk and close that risk within their operations.

We highly encourage people to come to our facility. This is just the tip of the iceberg on the offerings that we can provide, but it's really about that partnership between government, industry, academia, all working together. And we're the facilitator that makes that happen.

A Focus on Small- to Mid-sized Manufacturing

BV: **Your neighborhood is starting to attract more and more like-minded companies. I know one of your partners is Fast Radius. They've also set up shop not too far away.**

BB: Fast Radius is a great example. They started here. There is some urban legend that they never paid rent—they just kind of showed up. I don't know, can't prove or deny that fact. What's amazing is we've watched them grow from a small startup into a public entity now they've done an IPO.

As you notice, they've built a facility and over that period of time they were smart about leveraging MxD. They had rented space here when they needed extra space. They use our technology, they use the ecosystem to build partnerships. It's really on a membership side. I always tell people, the more you invest into the membership, the more you'll reap as a reward, and that applies to a small business just as much as it does to a large one.

BV: **And Fast Radius is a good example of something else that we really talk about. You mentioned the Dows and Boeings of the world, but they've got**

staff built in who research these things and can do the kind of onsite R&D for their own company on some of these issues. But these are very scalable solutions, and small- and mid-size manufacturers can and should be taking advantage of some of this R&D. So talk about how they can get access, first of all, and then also take better advantage of the work that you're doing.

BB: You hit the nail on the head when you said that most manufacturers are small and they can take advantage of this technology. A lot of times we have to get them to realize that it is something that they can achieve because they think "I'm too small, I can't afford to do this."

“You hit the nail on the head when you said that most manufacturers are small and they can take advantage of this technology. A lot of times we have to get them to realize that it is something that they can achieve because they think "I'm too small, I can't afford to do this."**”**

The piece that's really interesting is small manufacturers can't afford to do risky investments. They want to know, "if I spend a dollar, when am I going to see my dollar back and what's the benefit my operation is going to receive from it?"

We do things where every project has to have a piece of outcome, some tangible value that's provided to all members, no matter what size. For a lot of them, it's playbooks, it's outcomes where they can actually understand, okay, here's what it took to build this technology. Here's the benefit that we saw. Here's the problems that we faced so they can go into these efforts, eyes wide open, but it gets even more. We actually launched a project

[that] specifically built a tool to help small businesses look at the ROI behind digital adoption.

Now you have a tool that's just in the process of completing that every member will have access to, that they can go in there, they can look at some categories of digital technology. It'll explain the benefits they receive from it. It'll explain how you have to actually implement it and then tell you, here's what the ROI looks like, and it's based on actually working with SMMs, not just the theoretical that, oh, Boeing did it, and here's what we think it'll be for you.

But out of that is also playbooks. You know, next step that comes out of it is some manufacturers, you give them that information on the ROI, they're ready to go. You have everything they need; they can just take off. Some need more information. And so in those cases, we have things around like [asking] how do you implement a technology piece? ■

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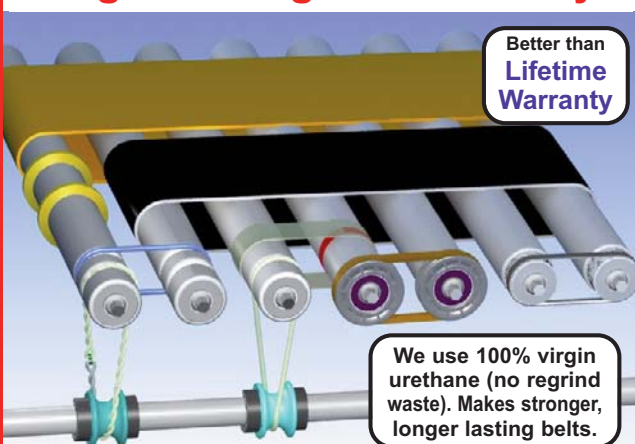
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Q&A:

An Energy Efficiency Tool Can Futureproof a Full-Stack, Automated Assembly Line



Bright Machines discusses how an ECO tool is used to quantify its manufacturing footprint and how the company intelligently automates assembly lines.

by **Rehana Begg**, Senior Editor

With physical industries accounting for 75% of U.S. greenhouse gas (GHG) emissions, net-zero goals are contingent upon investments in the decarbonization of these industries.

This statement, made by venture capital firm Eclipse Ventures in a press release, was intended to draw attention to a novel instrument that shows promise at assessing the potential environmental and economic value for emerging industrial technologies.

The Eclipse Carbon Optimization (ECO) framework is a methodology designed to quantify a technology's future sustainability and carbon reduc-

tion potential. Eclipse Ventures touts the effectiveness of the due-diligence instrument for weighing opportunities in carbon-intensive physical industries.

The ECO framework is based on the open platform tool CRANE, which was developed by the climate non-profit Prime Coalition. Users are able to analyze the future potential environmental value proposition of new technologies in the same way they are used to assessing the economic value proposition. The ECO framework was applied to 11 venture companies and the results were published to highlight the combined carbon reduction potential.

According to the ECO framework, three primary components are considered:

AT A GLANCE:

- The Eclipse Carbon Optimization (ECO) framework is a methodology designed to quantify a technology's future sustainability and carbon reduction potential.
- Bright Machines was one of 11 companies identified as addressing carbon intensity within the manufacturing sector.
- Lior Susan, co-founder and CEO of Bright Machines, explains how microfactories enable manufacturers to localize supply chains and reduce global shipping.



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- The estimated total GHG emissions in the market addressed by portfolio technology.
- The estimated GHG emissions reduction potential of the portfolio technology.
- The estimated market penetration rate of the portfolio technology.

The ECO Report also outlines how participating companies' technological advancements are transforming the physical world. Combined, participants have the potential to reduce annual emissions by more than 200 million metric tons of carbon dioxide equivalent (MMtCO₂), or 4% of total U.S. emissions, by 2040. That's the equivalent of removing about ~44 million internal combustion engine passenger vehicles from the road, stated the report.

Jay Knafel, partner at Eclipse Ventures, noted in a press release that quantifying sustainability is "mission-critical for investors" if they intend to reduce

the carbon intensity of physical infrastructure.

"What the report confirms is that Bright Machines Microfactories, when delivered as a flexible and scalable full-stack automation solution, can help modernize one of the world's biggest industries by enabling manufacturers to localize supply chains, which is both economically and environmentally advantageous over the long run," noted Lior Susan, co-founder and CEO of Bright Machines, a participant in the study.

In the following Q&A with *Machine Design*, Susan discusses the measurements made available through the ECO framework, and shares insights into the ways Bright Machines leverages computer vision, machine learning, 3D simulation and robotics to fundamentally change the flexibility scalability and economics of production.

Machine Design: Tell us a bit about Bright Machines. Please give us your

elevator pitch on the Bright Machines Microfactory. What problem does this technology solve?

Lior Susan: Bright Machines is pioneering an innovative approach to intelligent, full-stack manufacturing. Our core offering is the Bright Machines Microfactory—a complete, programmable assembly line that is powered by the Brightware Platform and offers a full-stack solution. Microfactories solve the problem of manufacturers needing many workers to do repetitive tasks, which is expensive and leads to slowdowns and mistakes. Our solution intelligently automates tedious assembly and inspection tasks, making it possible to build more units at a lower cost and with higher quality, and make changes to production as needed. Furthermore, workers are freed up to pursue more interesting, high-value roles in the production process.

MD: What does your vision of the factory of the future look like?



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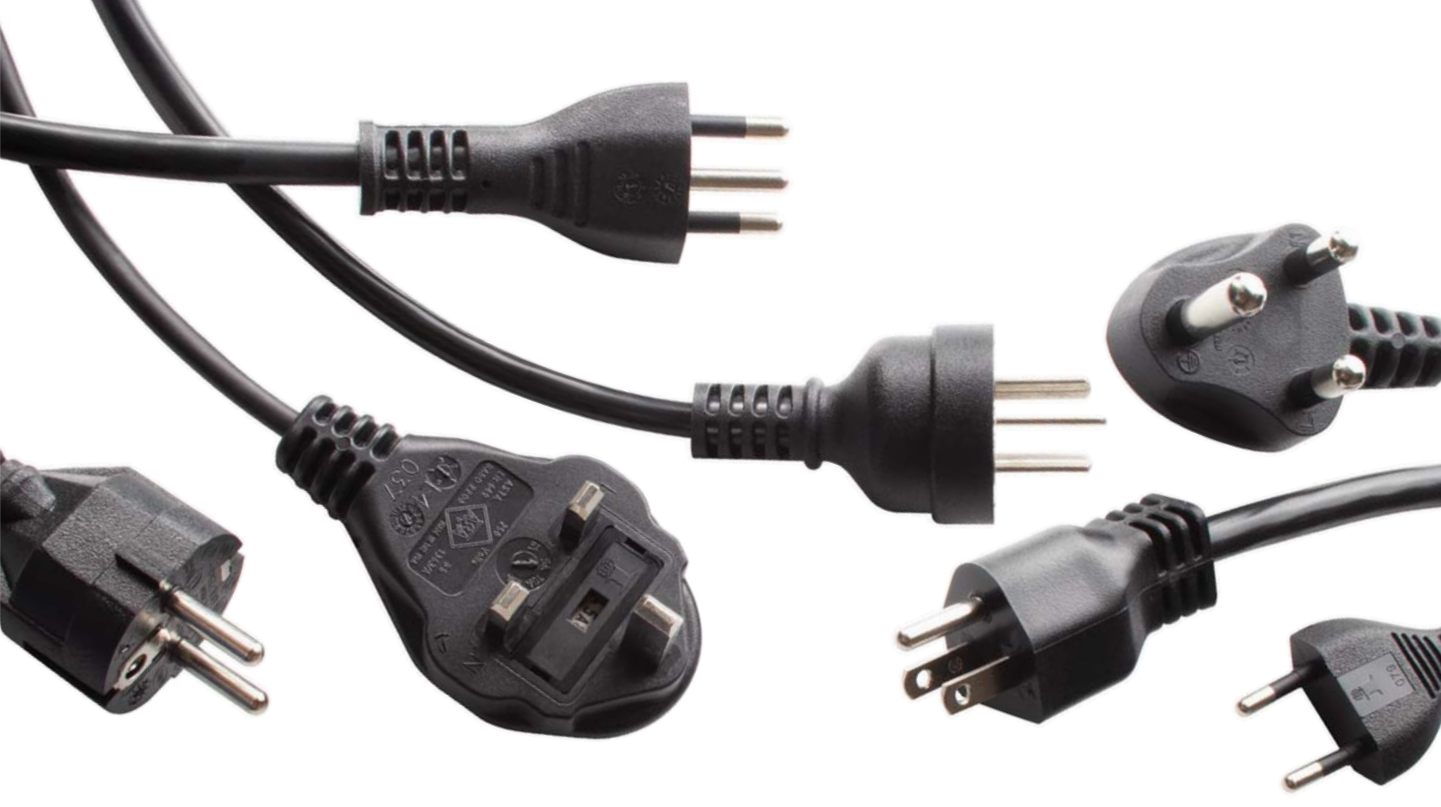
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LS: Our vision for the industry is what we call Software-Defined Manufacturing. This involves advancing automation and software solutions that apply data and algorithms to a wide range of manufacturing operations, making them more efficient and effective over time. In the factory of the future, production will mainly be handled by machines, while humans direct the machines and do other high-level tasks. These machines will continue to get smarter to do better work and will deliver valuable data that employees can use to further improve how products are made.

MD: Is your automation framework intended to eliminate manual labor?

LS: It's a misconception that manufacturing automation will eliminate the need for manual factory work and reduce jobs. Most researchers and academics agree that there will in fact be a net increase of jobs as a result of automation technology. Jobs on the factory floor don't go away, they

evolve. Instead of doing a task like inserting a screw, a worker might now be able to direct the machine's work and evaluate its output and quality.

“It's a misconception that manufacturing automation will eliminate the need for manual factory work and reduce jobs. Most researchers and academics agree that there will in fact be a net increase of jobs as a result of automation technology. Jobs on the factory floor don't go away, they evolve.”

As machines continue to get smarter and capable of assembling more products, reskilling the workforce is key. Bright Machines offers low code/no

code software so employers can re-skill employees in running production recipes without having a background in software engineering.

MD: Please explain how Bright Machines' flexible, software-defined automation supports companies in their efforts to localize their supply chains. What are the associated advantages?

LS: Today manufacturers are increasingly looking at options to bring their production closer to home to mitigate risks and increase flexibility. They can also save money and be more sustainable by reducing reliance on global shipping. Bright Machines Microfactories are flexible and modular and can be set up in a variety of settings, taking up minimal space.

The cost of implementing automation varies little across geographies, which makes it valuable to manufacturers moving production to regions with higher labor costs. One notable example is Stanley Black & Decker, which has

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publicly announced their desire to reduce manufacturing in China by 60%. Over the next several years, they have committed to relocate product lines back to the U.S. and other countries as a core pillar of their “Make Where We Sell” strategy.

MD: Explain how the Eclipse Carbon Optimization (ECO) Framework is used to assess the potential of various emerging industrial technologies to reduce annual carbon emissions. How can product manufacturers incorporate the ECO Framework methodology into their assembly?

LS: As companies and communities look to reverse climate change, improve economic resiliency and accelerate digital transformation, the Eclipse Carbon Optimization (ECO) Framework is a new tool that assesses the potential of various emerging industrial technologies to reduce annual carbon emissions. An industry first, pioneered by Eclipse Ventures, ECO helps investors identify the full promise and impact of technologies by quantifying sustainability and carbon reduction potential alongside economic ROI.

There are existing tools that measure the resiliency and efficiency of new technologies, but ECO gives investors and manufacturers a comparable methodology to assess sustainability and future economic potential of such technologies. The ECO Framework is based on CRANE, an open platform, soon-to-be open source tool developed by leading climate nonprofit Prime Coalition. Manufacturers and their investors have access to the CRANE tool to replicate what Eclipse Ventures has done.

Furthermore, it is also important for the industry to continue the sustainability conversation and be aware of the many ways that manufacturing contributes to emissions and can help reduce the damage.

MD: According to the press release, “Bright Machines was one of the companies identified as addressing carbon intensity within the manufacturing sec-

tor, showcasing that automation allows for far higher yields, reduced transportation requirements due to local production, and less waste.”

LS: In the ECO Framework, Bright Machines is identified as addressing carbon intensity within the manufacturing sector, since automation allows for far higher yields, reduced transportation

requirements due to local production and less waste. The framework confirms that our microfactories enable manufacturers to localize supply chains and reduce global shipping, which is both economically and environmentally advantageous.

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“Our team works with 30 global manufacturing companies, including original equipment manufacturers (OEMs), original design manufacturers (ODMs) and contract manufacturers. We serve customers across industry segments including networking infrastructure, automotive components, industrial controls, general-purpose machinery, data centers and consumer goods.”

typically require less floor space and can be located closer to end-customer markets and can be designed to be more energy efficient and transportation light—reducing pollution and minimizing excess production and waste. Today’s automation can also increase quality and lower defect rates, reducing scrap and harmful waste produced by factories.

The ECO Framework found that Bright Machines has the potential to reduce intensity by 51% per unit carbon or 5.5 MMtCO₂ annually—the equivalent of planting 6.5 million trees annually.

MD: Which manufacturing verticals are most likely to adopt the Bright Machines Microfactory?

LS: Our team works with 30 global manufacturing companies, including original equipment manufacturers (OEMs), original design manufacturers (ODMs) and contract manufacturers. We serve customers across industry segments including networking infrastructure, automotive components, industrial controls, general-purpose machinery, data centers and consumer goods. In the four years since Bright Machines was founded, we have achieved strong momentum, deploying over 100 microfactories to factories worldwide.

MD: What are the limitations of the Bright Machines Microfactory?

LS: The only limitation is the size of the product that can be assembled. We focus

on smaller units with heights up to 220 mm and weight up to 30 kg. As demand for enabling technology like intelligent automation continues to grow, we continue to build out our technology stack to give customers new opportunities to build efficiencies and understanding into their factory operations.

A key focus is continuing to expand the microfactories’ capacity to produce products for new verticals and to build in even more flexibility capabilities so that customers can get more use out of the same hardware and software. Finally, the microfactory’s built in feedback loop allows it to gather data on accuracy and efficiency, making continuous improvements possible. ■



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Can automated welding solutions stack up to fixed automation solutions? Brian Knopp, founder of Cobot Systems, explains why they do.

by Rehana Begg, Senior Editor

Manufacturers looking for ways to rearchitect their welding solutions may find their needs can be met with a pre-engineered solution. At the very least, readymade options take the guesswork out of what to automate first or how to integrate the robot with the machine. They also have built-in safety features and efficiency, often require less space than industrial robots, are four to five times faster than manual welding, and eliminate rework and scrap parts.

“Automation by definition delivers a controlled and repeatable process, and [cobot welding systems] are four to five times faster than manual welding,” explained Brian Knopp, founder of Cobot Systems, which focuses on automated manufacturing, including laser welding, CNC machine tending, screw driving, dispensing and assembly.

Hardly a newcomer to laser welding, Knopp and his partner, Brian Miller, started their first automation company, ProCobots, in 2018, which had an exclusive focus on CNC machine tending. The pair sold the company to Indianapolis-based Hurco in 2019, and moved on to develop the first commercially available IPG LightWELD laser welder to be guided and controlled by a cobot.

Knopp and Miller hitched their integration expertise to the cobot capabilities offered by Universal Robots when they launched Cobot Systems in 2021. A 90-min. online training course is all it takes to bring the operator online, Knopp said.

“Laser welding enables dramatically faster welding, is easier to learn and operate, and provides higher-quality and consistent results across a wider range of materials and thicknesses with minimal distortion, deformation, undercut or burn-through,” he said in a recent Universal Robots press release.

In the following Q&A with *Machine Design*, Knopp shares a few basic considerations for pre-engineered welding solutions and discusses how his company’s collaborative laser welding cell stacks up.



A 90-min. online training course will prepare an operator for duty.
Photo credits: Cobot Systems



The work cell enclosure comes with the UR10e cobot, IPG LightWeld laser welder URcaps software and utilities.

Machine Design: Please walk us through the components and features of your welding cell.

Brian Knopp: Our pre-engineered welding package is a laser welding system built around the Universal Robots UR10e collaborative robot and the IPG LightWELD handheld laser. We have a standardized welding table designed with integral robot mounting brackets, storage for the UR controller and, most importantly, mechanical and pneumatic fixturing. We have designed an EOAT (end-of-arm tooling) system to mount the welder to the cobot and developed a URCaps software application that enables the robot program to dynamically set and adjust welding parameters and select between spot welds and path welds. The system also includes an enclosure with safety interlocks.

MD: Each type of automation has its own best applications. How do cobot welding systems stack up to fixed automation?

BK: Our robotic laser welding system utilizes the IPG handheld laser welder. The IPG LightWELD is four times faster than traditional TIG welding, which makes it difficult for a human operator to control. By integrating the handheld laser with the cobot, companies can take advantage of the higher speeds and maximize quality through the precision positioning capabilities of the cobot.

MD: What are the best applications for this robotic welding system? Can you give examples of tasks that this welding system can handle better than traditional welding methods?

BK: Best applications are stainless and carbon steel sheet metal welding. Traditional TIG welding can burn through thin sheet metal and cause significant distortion and discoloration. Cobot laser welding does not introduce as much heat to the material, allowing welding of very thin materials without burn through or distortion. This is a game-changer.

MD: What floor footprint is needed to set up this welding cell?

BK: The smallest cell we offer requires a 6 ft. x 8 ft. footprint.

MD: What kind of payback or productivity gains can be expected from a cobot welding system?

BK: ROI can be achieved in as little as six months. We have customers that have reduced a 90-min. TIG welding application down to six minutes using our laser welding cobot cell.

MD: Why should one consider laser welding over traditional arc welding?

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BK: Laser welding is recommended as a replacement to TIG welding because it is four to five times faster than TIG, eliminates distortion and it works great on materials up to 1/4-in. thick. Traditional arc welding works on much thicker materials and are better suited for welding structural steel such as angle iron, channel and thick-walled pipe.

MD: Is it important to be able to track weld quality while the part is still in production? What happens if a gap or imperfection is detected?

BK: Absolutely. For the most part, laser welding does not use filler metal. It is a fusion weld and requires tight seams and accurate joints. Sheet metal parts processed on CNC laser cutting machines

and CNC press brakes produce joints that are well suited for laser welding. If there is a gap or imperfection on the joint, a wire feed attachment can be added to the laser welder.

MD: How should one start to select a welding robot for the application?

BK: If you want to automate a TIG welding process, contact us at www.cobot.com. For automation of MIG and Arc welding, I suggest contacting your local Universal Robots distributor and/or local welding equipment dealer.



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MD: How does automation impact welding safety?

BK: All automation projects require a risk assessment, which results in proper safety requirements being built into the system.

MD: How is the job of the traditional welder in a job shop impacted by automated welding systems?

BK: Traditional welders can focus on projects requiring their skills versus running production.

MD: When you speak to customers in the field, where are they on their automation journey? Are they ready for a welding cobot or does it take convincing to make the transition?

BK: With today's labor challenges it does not take much convincing. Customers know automation is a solution and know they want it. The difficulty for them is finding the right partner. ■



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Near Field Communications (NFC) technology allows users to download configuration settings and retrieve logger data by tapping the transmitter with a smart device such as a phone or tablet. *Courtesy ABB*

High-Accuracy Flowmeters Can Transform Water Sustainability

Electromagnetics and communication protocols lead to app-based data management.

by Krishna Prashanth, Electromagnetic Flow Meters, ABB Measurement & Analytics

Water lost from distribution networks is a serious, perennial problem for water companies around the globe. It is particularly critical as the world's water supply is being put under increasing strain from factors such as rising urbanization, industrialization and the increasing need for irrigation for agriculture. Faced with these issues, governments are expecting water utilities to ensure that every possible drop of water is delivered to where it is needed.

Achieving this is a huge undertaking—it is no easy task to account for every liter of water in pipelines that may stretch for thousands of kilometers across country that may be remote, difficult to operate in or hard to access. Although some countries have made progress in tackling and fixing water losses in their networks, others still have a lot of work to do and

are still experiencing water losses that can run into high double figures.

A report by the International Water Association in 2019 highlighted the scale of the problem, estimating that pipelines around the globe lose around 346 billion liters of treated water every day. These losses have to be replaced, requiring more energy and resources that add to the environmental burdens already caused by an energy-hungry industry. The resulting costs also reduce revenue that could be invested in upgrading networks. With these pressures and expectations, the water industry needs to both find the location of leaks and explain why they are happening.

Improvement Starts with Measurement

Detecting lost water starts with choosing a flow measurement method. A variety of flow measurement techniques can be

used depending on the application. These can range from constrictive methods, such as flumes and weirs for open channel systems, to orifice, mechanical, ultrasonic or electromagnetic flowmeters in closed pipe systems. Each of these methods have their own benefits and drawbacks.

The second major factor is the location of the measurements. Many water companies simply don't measure in enough places to be able to get a full picture of their network, resulting in gaps in their understanding. Performing measurements as widely as possible gives utilities the maximum amount of data on the location and severity of water losses, data which can be used to develop methods and strategies to resolve them. It follows that any device used to measure flows must be as easy as possible to install, access and maintain, as water pipelines pass through both towns and cities as well as through remote areas that may not be as easy to access.

One of the most capable methods is electromagnetic flowmeters, which offer several advantages including consistent accuracy and high reliability. They are also very stable and can be used in a range of installations.

A major attraction of electromagnetic flowmeters is that they offer greatly enhanced accuracy with uncertainty as low as $\pm 0.4\%$ or better compared to other methods, as well as exhibiting a high level of repeatability throughout their operational life. Accuracies of this level are important when measuring for lost water to discriminate between legitimate consumption and leaks or other sources of loss.

Reliability is another important benefit of electromagnetic flowmeters. They have no moving parts, and so do not suffer from the wear and tear that affects mechanical designs. In turn, this reduces the maintenance burden and saves costs by avoiding the need for upstream strainers to filter sediment.

Electromagnetic flowmeters also have the potential to handle distorted velocity profiles without affecting accuracy, eliminating the need for defined lengths of pipeline upstream or downstream of the point of measurement as required by other technologies. As such, electromagnetic flowmeters can be fitted in locations with limited space, such as sites in towns and cities.

The Benefits of Digital

Several technological developments are making electromagnetic flowmeters even more attractive and cost-effective.

One of these developments is the ability to use alternatives to conventional mains power, allowing flowmeters to be fitted anywhere. ABB launched the world's first battery-powered device in the early 1990s, and its latest generation of AquaMaster electromagnetic flowmeters can be used in remote locations without the need for a mains supply.

With the small size of electromagnetic flowmeters, these options open the possibility of achieving enhanced flow measurement in many more locations. As they have a significantly lower power consumption than conventional mains-powered devices, they can also offer reductions in energy cost that can help further reduce the cost of ownership of electromagnetic flowmeters.

Getting measurement data from the devices is another important aspect and manufacturers are looking at using Low Power Wide Area Network (LPWAN) band and Narrow Band Internet of Things (NB-IoT) technologies. These allow rapid exchange of measurement, configuration and maintenance data while using greatly reduced levels of power. As these technologies mature, they offer the prospect of controlling and monitoring water supplies in near real-time.

Further benefits are possible using Power over Ethernet (PoE), which uses

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the same cable for both power and communications. This improves flexibility by allowing for flowmeters to be installed wherever needed, making it ideal for industrial water measurement and control applications. Another development is ABB's 4-wire Ethernet, which combines classic outputs with future communication protocols, ensuring devices are future-proof and increasing their longevity.

Flowmeters with Ethernet connectivity increase simplicity, flexibility and reliability, while offering access to previously hidden data, such as measurement of density, conductivity or concentration of the medium.

The time needed to commission, operate and maintain electromagnetic flowmeters and the skills and training of technicians and operators is another factor in their total cost of ownership. Near Field Communications (NFC) technology allows users to download configuration settings and retrieve logger data by tapping the transmitter with a smart device such as a phone or tablet loaded with ABB's Velox app. This allows a variety of operational, logging and diagnostic data to be downloaded, interrogated and shared.

Pressure Completes the Puzzle

Pressure is a major cause of pipe bursts and water leaks, so effective pressure management is critical to getting the best performance from a water distribution network. While reducing pressure to reduce leakage can be a solution, it is not suitable for all areas, such as those with lower pressure, as it could cause them to suffer from weak or interrupted water supplies. Getting more data on pressure is key to making the right choice on pressure levels in the network.

Utilities are increasingly attracted by the prospect of combining flow and pressure measurement into one device. This offers numerous benefits, one of which is simplifying the gathering, sharing and analysis of data. By integrating the two readings into one device, users can download logged data and investigate flow and pressure activity for a specific period. Combin-

ing these possibilities with the ability to download and share this data through a smart device greatly improves the ability to assess and enhance network performance.

Water Sustainability Transformed

Optimizing water network management is based on achieving the highest levels of flow and pressure measurement

accuracy. This allows true consumption to be understood, ensuring the utility can account for every drop of water supplied.

Highly accurate flowmeters help ensure that major investments in water supply infrastructures are wisely spent and that water, one of the world's most precious resources, is well managed for the benefit of all. ■

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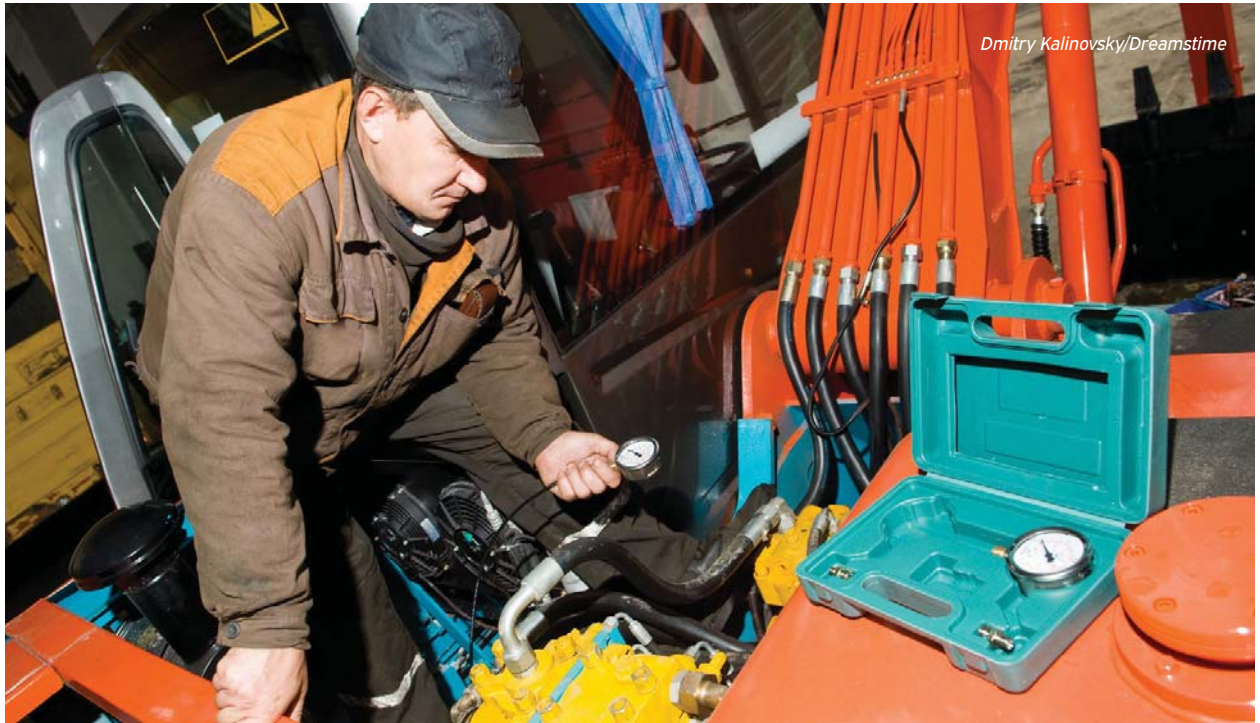
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Why Maintenance of Water Glycol Hydraulic Fluids Makes All the Difference

Keeping equipment working at optimal performance with less downtime and supporting a longer lifespan are among significant factors that make fire-resistant hydraulic fluids a safe choice.

by **Ronald Knecht**, Global OEM Manager – Hydraulics & Lubricants, Quaker Houghton

Standing at 50-55% market adoption, HFC is a water-based fluid that can be used in all industries where there is a major risk of fire. HFC hydraulic fluids remain the most widely used fire resistant hydraulic fluids today because of their price ratio and their combination of excellent fire-resistant properties with good lubrication performance.

AT A GLANCE:

- HFC technology have major benefits, including reliable performance with less downtime. But a strong maintenance strategy remains vital to reduce issues of corrosion in components within any hydraulic system.
- Ronald Knecht explains how a disciplined maintenance regime for water glycol (HFC) hydraulic fluids can help keep systems operating more effectively and efficiently—and for longer.
- Four maintenance variables—viscosity, pH, alkaline reserve and particle count—are considered.

OPTIMIZE YOUR DESIGN

Hydraulic fluids with hydrofluorocarbon or HFC technology have low flammability and can be used in all industries where there is a major risk of fire (presence of a heat source at high temperature), such as high-pressure die casting (HPDC) foundries or steel-making shops. In addition to offering uncompromising fire resistance, other factors for choosing HFC include its OEM endorsements.

However, a strong maintenance strategy is vital to reduce issues of corrosion in components within any hydraulic system—thereby avoiding the potentially significant costs involved in replacing parts and unplanned repair downtime.

Ongoing maintenance requires regular sampling and analysis to protect against costly component damage. A properly maintained HFC operated system can behave very reliably. The impact of neglected maintenance will often result in a period of unplanned downtime, which needs to be meticulously scheduled to minimize the associated inconvenience and revenue losses. However, the long-term cost efficiencies and safety benefits of HFC are beyond question with an effective maintenance plan in place.

The Four Key Maintenance Parameters

1. Viscosity

The viscosity of a water glycol fluid is directly related to the water content. The glycol and PAG (polyalkylene glycol) thickener contained in an HFC fluid are not volatile and will remain in the hydraulic reservoir regardless of fluid temperature. One can therefore expect to see the viscosity of the fluid increase over time as water can evaporate.

The rate of viscosity increase will depend on such factors as ambient temperature, reservoir temperature, airflow across the reservoir breather and the amount of make-up fluid added. A knowledgeable hydraulic fluid supplier can provide their HFC users with a graph that directly relates the viscosity to the water content. A graph eliminates the need to run actual water contents and allows for easy maintenance. Please note that it is important to do any water suppletion gradually.

Also bear in mind that a falling viscosity can be related to excess water in the water glycol fluid. This excess water can only come from a leaking heat exchanger or over-addition of water in a water adjustment. Should a water alteration ever be necessary, it will need to be made using soft, distilled or deionized water. Divalent metal ions such as calcium and magnesium, which are found in tap and spring water, will cause the lubrication additive to separate from the fluid, resulting in performance issues.

2. pH

In the water-based HFC, the pH of the fluid must be above 8.0 to inhibit rust. Additionally, alkanolamine chemistry must be used to raise the pH; caustic materials such as sodium hydroxide will not inhibit rust. The pH of the fluid in use will drop due to the loss of the vapor phase corrosion inhibitor.

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This is to be expected, as the vapor phase corrosion inhibitor is volatile; it must leave the body of the fluid to inhibit rust in the vapor space above the fluid in the reservoir. Quaker Houghton, for example, uses a dual amine additive system that ensures that the pH of the fluid in use will remain above 8.0. A pH of less than 8.0 indicates that the system has been contaminated or diluted.

3. Alkaline Reserve (AR)

AR will drop with use because the vapor phase inhibitor is slowly being removed from the fluid. As indicated, the rate of evaporation will depend on reservoir temperature, ambient temperature and airflow across the reservoir's breather. An AR of 90 or above is needed to inhibit vapor phase rust in an HFC fluid. Small additions of make-up fluid can have a significant positive impact on the alkaline reserve of a water glycol fluid. Depending on the amine used as the vapor phase corrosion inhibitor, there may never be a need to adjust the AR of fluid in service.

4. Particle Count

To maximize component life, particle counts need to be managed. Pump and valve OEMs have recommended particle counts for fluid depending on pump type, operating pressure and whether or not servo or proportional valves are used. Identifying the critical hardware in your hydraulic system will allow you to set particle count targets for a given piece of equipment. Typically, water glycol fluid will have particle counts in the area of 19/17/14 as determined using the ISO 4406:1999 standard. This applies to fluid supplied in drums and intermediate bulk containers.

Obtaining accurate counts using ISO 4406 requires crystal clear fluid. Hazy fluid will introduce errors in the particle counts. Other methods such as particle re-suspension can provide better results but are not completely accurate. This method is good for trending analysis; however, a review of OEM fluid cleanliness guidelines as well as dialogue with your fluid supplier will help in establishing cleanliness limits for fluid in service.

Quaker Houghton's expertise can provide clarity and guidance. The company offers the world's leading brands of fire-resistant hydraulic fluids, including HOUGHTO-SAFE for HFC, which has excellent corrosion inhibition, excellent lubrication and low heat release. ■

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Inductive Proximity Sensors Detect Actuating Parts

The new IRC40 Inductive Proximity Sensors were designed as a durable solution for daily indoor and outdoor applications. They ensure accurate detection of actuating parts, such as skid conveyor positioning, step detection on escalators and material positioning on conveyor systems. The IRC40 Series sensors are resistant to extreme operating conditions such

as exposure to a wide range of temperatures, frequent high pressure and washdown cycles. They offer flexible adjustment and adaptability for any application due to the 5-position sensing face. The sensors can be installed quickly without any tools, thanks to their push-lock system of the mounting bracket. Main technical features include a rotatable sensing face in five different positions without the need of additional tools; four corner visible LEDs with diagnostic functions; an extended sensing distance of 22 to 40 mm; and IP68 and IP69K protection against high pressure and high temperature washing cycles. The IRC40 Series Inductive Proximity Sensors are ideal for conveyor systems, production lines and escalators.

CARLO GAVAZZI

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Transport System Now Provides Contactless Power, Data

No Cable Technology (NCT) is an extension of the eXtended Transport System (XTS) product line. NCT provides contactless power supply and synchronous real-time data communication directly to XTS movers. This solution enables individual movers to serve as mobile handling and processing stations, essentially turning the intelligent transport system into a powerful, highly flexible multi-robot system. The modular XTS solution has been expanded with NCT to include a special motor module as well as electronics that mount on the movers. The hardware required for the transmission technology is fully integrated into the motor module, so the system does not sacrifice any existing functionality or expand equipment footprint. No additional connections or supply lines are needed.

BECKHOFF

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Safety Switches Provide Hazardous Equipment Protection

When used in conjunction with a properly designed safety system, SSP safety enabling switches provide the operator with a special control mode for tasks such as maintenance or debugging of hazardous equipment. These switches consist of a spring-return three-position (N.O.-N.C.-N.O.) grip button that must be maintained by the operator in the middle position for the machinery to continue operating. In addition to the grip button, models are available that include a built-in E-stop button, LED indicators, additional pushbuttons for auxiliary functions or an activity sensor to detect when the switch is in its home position.

AUTOMATIONDIRECT

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Touchless Linear Position Sensors

Ideal for applications ranging from packaging and healthcare to construction and forestry, the TFD-4000 Series of touchless linear position sensors provide wear-free operation in tight spaces. Maximum sensor dimensions are 40 × 27 × 7 mm thin. Sensing direction can be either parallel or perpendicular to mounting holes. The TFD-4000 Series utilizes a magnetic position marker to provide a touchless measurement range of 0 to 14, 24 or 50 mm, depending on model.

NOVOTECHNIK, U.S.

www.machinedesign.com/21250595

Wide Array of Plastic Cap Sizes, Uses Available

The expanded offerings of the S Series Straight Plastic Caps now are available in nearly 200 total metric and imperial sizes to fit .078 in. (2 mm) to 5.250 in. (133.35 mm) outside diameters. These caps are ideal for use as shipping caps, end caps, pipe caps, product protection, paint protection and thread protection. These S Series caps are available with a plain top, and many of the sizes are also available with a knurled top-collar, which makes them easy to grip and remove. The caps also are available in LDPE plastic and flexible TPE.

MOCAP

www.machinedesign.com/21251320



3-Phase Filters Have EV, Battery Uses

The FMAC NEO and FMAD NEO 3-phase filter families now meet IEC 60204-1 specifications. Downsized for smaller footprint, without any compromise to performance, the two new filter series are suitable for use in energy applications such as EV fast charging and battery storage, as well as industrial applications in general. Designed for 3-phase or 3-phase with neutral applications, the FMAC NEO and FMAD NEO series are ENEC and UL approved for rated currents 16 to 230 A at 300/520 VAC 50/60 Hz at an ambient temperature of 50°C. Standard versions are designed for industrial applications with leakage currents of <13 mA.

SCHURTER

www.machinedesign.com/21251315



Get Smarter to Capture Leaking Current Data



Design new devices into systems to measure and analyze electrical waste.

by Adam Justice & Cristian Codreanu, Grid Connect

Leakage current is energy that flows from a machine's circuit to its frame or the ground. The current typically leaks from the insulation around conductors and/or the filters protecting a piece of equipment. It's not a safety hazard if the machine is properly grounded, but it is wasting energy.

Leakage current doesn't have to be a waste, though. Instead, design engineers and machine owners could analyze data from current to detect how a machine is performing, when to turn a device on or off, or a pending failure. Capturing the data can be as easy as plugging legacy devices into any one of an array of smart power cords, smart outlets and internet rebooters.

Gauging Performance

A smart power cord could supply energy to legacy commercial and industrial machines like ovens, espresso machines, motors and EKG equipment while analyzing voltage. Such cords include a microchip, a processor integrated with Wi-Fi and Bluetooth, and a cloud-based machine-monitoring application. By linking the smart AC power cord and to Wi-Fi, machine makers and operators could receive emails or texts about operating conditions. With the correct set of APIs, a machine builder could also securely link data from a smart cord to software systems of interest to machine operators.

A smart power cord also can turn non-networked machines like commercial kitchen appliances, industrial pumps and health-care equipment into IoT devices that stream operational data to machine makers, owners and operators, so they can predict maintenance and track usage. For example, a beverage-machine maker or owner could connect to the internet with a smart power cord and learn how many drinks, and of what size, employees are making; owners could even see which sizes are filled the most or learn when the unit was last cleaned.

Equipment manufacturers and product marketing managers who want insights from the field about their products could sell machine owners a smart power cord and begin streaming data to perform predictive maintenance or even build a better product based on how the owner's employees operated the machine.

Smartly Monitoring Energy Use

A machine owner could also plug their legacy device into a smart outlet, which typically includes a power board, logic board and chips for monitoring energy and memory. With data from a smart outlet, machine operators can benefit from monitoring power consumption and, whenever possible, cutting the power to a machine that needn't run all the time.

In a facility where machines continuously draw power, plant managers may want to power up when they know there will be the greatest demand and power down during slower periods outside normal business hours. Managers can monitor and measure loads for specific outlets along with the outlet's history. And if a device is behaving abnormally, that data would show up on the associated mobile application for the facility owner or manager to view.

Detecting Failure

If a machine included a motor, a smart outlet could also detect the power factor. If the power factor was less than optimal, the mobile application could indicate that by showing a user the motor was degrading. An example where a smart outlet would provide beneficial information in this way would be a pump. Knowing the pump was going to fail would prevent damage from, say, water flooding a below-grade space.

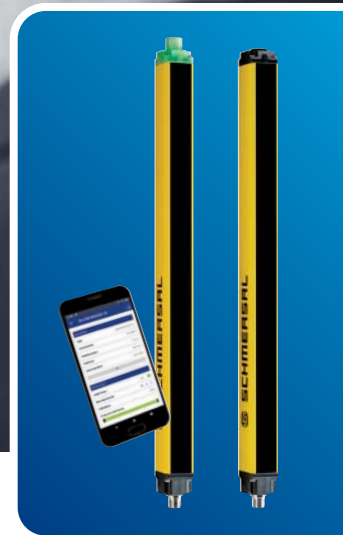
Smart devices can also detect and stave off failure of another kind: broken internet connections. The typical wireless router has approximately one gigabyte of memory, so the proliferation of laptops, smartphones, smart TVs and tablets connected to a small business Wi-Fi network will quickly tax routers. The operating system, processor and memory used by a router can get hung up when there's a change in the temporary IP address the internet service provider assigns to smartphones or tablets linked to a business Wi-Fi network.

The laptop, router and connection to the internet get out of sync. But a smart device for automatically rebooting the router would provide the router with a clean slate to run efficiently each day. With a smart internet rebooter automatically detecting and immediately fixing the situation with a reboot, there would be little downtime for smart devices such as wireless security cameras and fire alarms.

While engineers are busy working on their latest machine designs, there is data in legacy machines they can unlock. The smart devices mentioned herein can be a key to how previous designs are working in the field now. Gathering that research could be as simple as replacing the power cord or outlet to which a machine is designed. ■



SCHMERSAL
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Schmersal Safety Light Curtains with Bluetooth interface

Schmersal SLC440 safety light curtains are now available with an integrated Bluetooth interface for data sharing with smartphones & tablets.

The SLC440 BLE uses the Bluetooth Low Energy system for secure data transmission, up to 5 meters. The data transmitted from the safety light curtains is accessible by the Schmersal **SLC Assist App**, available for Android and iOS smartphones and tablets.

The SLC440 offers many integrated functions including fixed blanking, floating blanking, fixed blanking with movable edge region, double reset, contactor control (EDM), automatic mode, re-start mode, and beam coding.

This unprecedented access to the operational data of the Safety Light Curtain has many advantages:

- The app serves as an installation alignment aid as it displays the signal strength of each beam.
- Real time monitoring of the active operation mode, the status of the OSSD outputs and the status of the protective field provides the information necessary to quickly resolve faults.
- The app can provide documentation on the light curtain, either emailed or saved to the smartphone or tablet.
- Additionally, you can see which functions have been enabled and their parameterized settings.

Contact us to learn more about this innovation in safety light curtains
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