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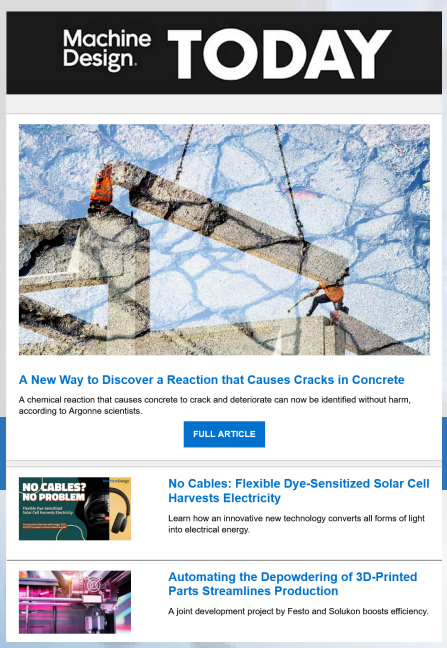

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HIGHLIGHTS FROM

MD&M West 2025

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AI Can Reason, and the Medical Devices Industry has a Reason for AI

THE SURGE IN ARTIFICIAL INTELLIGENCE (AI) demos at MD&M West 2025 demonstrated the transformative potential across the medical devices industry.

The number of AI references in conference presentations may have been surpassed by the sheer presence of exhibitors ready to answer questions and demonstrate their inventive solutions. This strong industry focus only reinforced AI's growing role in the medical device sector.

Rehana Begg,
Editor-in-Chief
Machine Design

The Future of Manufacturing in the Era of AI

Machine Design's technical editor, Sharon Spielman highlights top moments of the keynotes and provides a glimpse into the future of manufacturing in the era of AI. In "The Shift from Digitization to Datafication in Manufacturing," she reports on Dr. Shawn DuBravac's central message: The manufacturing sector is in transition from "digitization to datafication," and this shift will shape the coming decades.

Digitalization is a means to use digital technologies to transform business models and provide value-producing opportunities. Datafication signals the unprecedented ways in which our lives and businesses are becoming interwoven with data points to be tracked and analyzed—and predicting what decision we will make.

Manufacturers have a long history of storing data, thanks to PLC, SCADA and CMMS systems. As an industry it has been sluggish about figuring out how to exploit big data capabilities. (The "black box" nature of AI technologies carries some blame, as do privacy and security concerns.) However, if DuBravac's forecasts are accurate, advanced analytics, machine learning and data integration will become an inextricable part of our decision-making. Period.

AI on the Trade Show Floor

Dubravac's keynote inspired my curiosity to inquire from exhibitors on the trade show floor how they leveraged "datafication," or algorithmic decision-making. Naturally, responses varied depending on how they gauged their organization's level

of digital maturity and experience with emergent technologies. Moreover, conversations revolved around how businesses were exploiting new opportunities.

Anupam Girdhar, divisional CEO of Ascential Medical & Life Sciences, offered a considered response. "One part that sometimes gets missed is that while a lot of companies focus on devices, on instruments, on consumables, there's an underlying platform that's needed to automate things," he said. "It's one thing to develop a device—it's another thing to develop it at mass production level, in a cost-efficient way. That's something that we are talking to our customers about quite a bit this time."

It wasn't long ago that the idea of pulling signals from instruments would not have been possible. Setting aside the ethical, security and privacy tensions, companies did not have the right means to develop a pipeline for their data, store the data and, more importantly, do something with it.

To this end, Girdhar contends Ascential has made "good progress" in making its instruments data ready. "In the old days you had Design for Manufacturing and so on. Now it is Design for Data and Design for AI, so that your instruments are capable of at least spitting out that data," he said.

With foundational data as a baseline, meaningful use cases can now follow. "For example, if you see failure rates very high in a certain instrument, you now know exactly how to pull that data out," Girdhar explained. "In fact, that's being collected in real time. Then, [consider] how to analyze it and how to pinpoint the issue... And now AI can read what's going on based on the recurring usage."

A New Competitive Landscape

Medical device companies of all sizes are looking to expand their role in the value chain. At the macro level, the industry as a whole is on track for steady growth. Global annual sales are expected to climb by more than 5% a year, reaching nearly $800 billion by 2030, according to KPMG.

But that growth isn't guaranteed—analysts point to key shifts in underlying dynamics, from price pressures to the way new players are using data to shake up the sector. To stay ahead, companies will need to lean into insight-generating technologies that integrate data intelligence with their products and services. This could fundamentally change how healthcare is delivered.

AI Has Landed

At MD&M West 2025, attendees came away with a clear sense that MedTech companies that adopt AI modalities are gaining productivity benefits. To keep up with its evolving role, continuous learning and repositioning for the future competitive landscape will be essential to unlocking even greater possibilities.

We appreciate hearing from you. Email me directly at rbegg@endeavorb2b.com.

Sharon Spielman/Machine Design

CHAPTER 1:

A Showcase of Innovations Turns Heads at MD&M West

SHARON SPIELMAN, Technical Editor, *Machine Design*

From next-generation barcode readers to custom integration solutions, the sheer scope of medtech advancements on display was formidable.

Attendees at MD&M West experienced a showcase of innovations that aim to redefine the industry landscape. Trade shows are essential for fostering connections and providing insights into emerging trends and technologies that shape the future of manufacturing, but *Machine Design* recognizes that not everyone can get to these valuable events. So allow us to bring a few of these technologies to you.

Exhibitors presented a wide array of advancements, including next-generation barcode readers that simplify setup processes through intuitive web-based interfaces, as well as enhanced product catalogs that offer a broader selection of configurations for ready-to-use solutions.

The focus on precision engineering was evident with highlights such as silent, compact pumps designed for medical applications and cutting-edge solenoid valves that emphasize reliability and performance. The commitment to manufacturing integration was highlighted by seamless connections that boost quality assurance, reflecting a growing trend toward

The DataMan 290, introduced by Cognex at the beginning of 2025, marks a significant advancement in their next-generation barcode reader technology. The device aids in the setup process by utilizing a web-based user interface (UI).
Sharon Spielman/Machine Design

custom automation solutions.

Attendees also witnessed advancements in robotic technologies aimed at improving operational efficiency, alongside innovative approaches to procurement that streamline sourcing processes and decision-making. Here is a closer look.

Barcode Reader Technology

Cognex recently introduced the DataMan 290, marking a significant advancement in their next-generation barcode reader technology. Launched at the beginning of the year, Eric Hershberger demonstrated how this new device aids in the setup process by utilizing a web-based user interface (UI). Users no longer need to install any software to set up the DataMan 290; instead, they can easily configure the reader through a series of web pages, Hershberger explained. This highly configurable setup process significantly simplifies the user experience, allowing quick plug-and-play functionality.

While the traditional setup tool remains available for use with other Cognex barcode readers, the web UI is the standout feature of the DataMan 290, enabling a seamless, user-friendly experience from the get-go. Ultimately, the focus is on efficiency and ease of use, allowing users to start reading barcodes with minimal hassle.

Expanding Gear Catalog

Brian Dengel from KHK revealed plans for a 2025 expanded catalog with 27,000 configurations, up from 26,000 this past year. This expansion primarily enhances existing prod-

KHK plans to launch its expanded catalog in 2025 with 27,000 configurations, primarily enhancing existing products that are now available with heat treating options for customers seeking ready-to-use solutions. Sharon Spielman/Machine Design

ucts which are now available with heat treating options for customers seeking ready-to-use solutions. The new catalog will include several innovative sub-series, each designed to address specific customer needs:

J Series. Allows customers to purchase stock items off the shelf, with options for bore opening, keyway insertion and tap tooling.

H Series. Newly introduced, this series provides heat-treated teeth on stock items, enhancing durability and performance for a variety of applications.

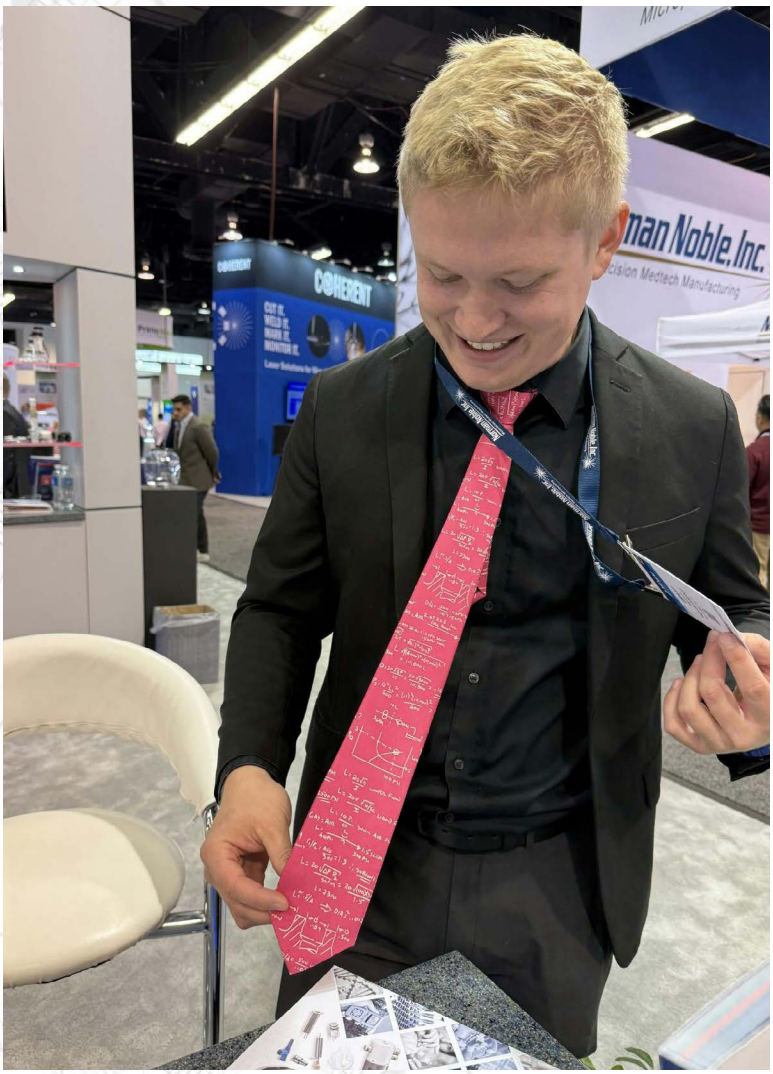
HJ Series. A combination of the J and H series, this option allows customers to obtain stock items with optimized bore openings, keyways, tap tooling and heat treatment.

E Series. Featuring eccentric bushings, this series modifies stock items by boring them out and integrating a specialized bushing to meet custom requirements.

F Series. Similar to the E Series, the F Series provides concentric bushings, enabling adjustments to stock gears through strategic bore openings and bushing enhancements.

S Series. This semi-standard series caters to larger products that may not be practical for advance production, allowing customers to order on a major basis.

With a base of 6,000 parts coupled with these diverse sub-series, KHK now boasts 27,000 SKUs in their catalog. While the full line comprises around 32,000 SKUs, it's noteworthy that 5,000 items had previously been discontinued due to slow movement. Dengel noted, however, approximately 3,800 of those can still be produced if needed.



Sharon Spielman/Machine Design

Valves and Pumps for Precision

The Lee Company showcased an array of products from the company's Health and Science division. The exhibition focused on cutting-edge solenoid valves and pumps, showcasing its commitment to precision and performance in medical applications. Chris Marchant highlighted the newly acquired piezoelectric disc pump from Leventis. This pump distinguishes itself by being incredibly silent, pulsatile-free and compact, making it an ideal choice for a variety of medical uses.

Marchant pointed out its miniaturization capabilities and high performance, which are critical in today's healthcare landscape. In addition to the disc pump, the Lee Company showcased a range of other pumps, including solenoid-driven dispense pumps and stepper motor-driven variable volume pumps. These products are used for diagnostic instruments requiring high precision and accuracy, with options for customizations to meet specific application needs.

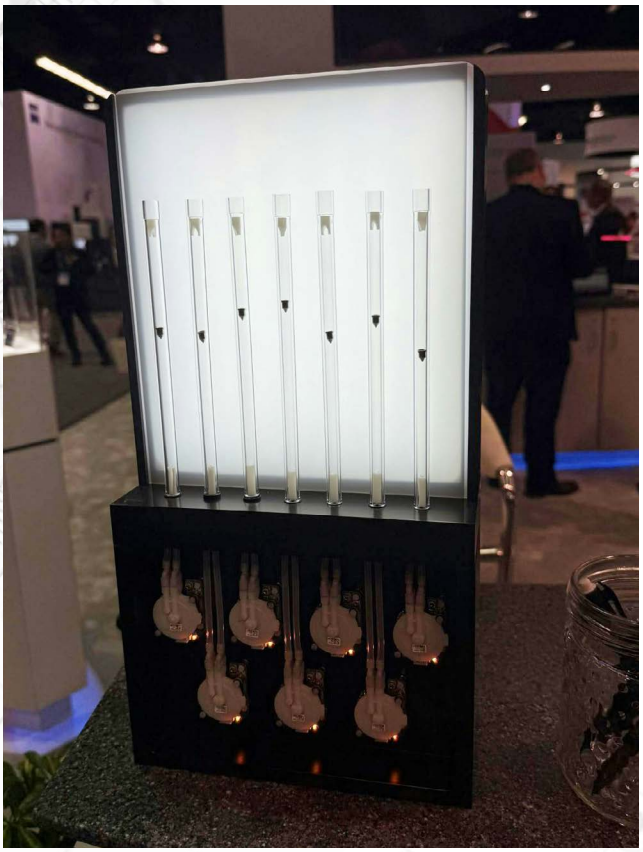
From a valve perspective, the company presented various types, including isolation solenoid valves designed for handling aggressive chemicals. Marchant said these valves are necessary for controlling fluid flow in a reliable manner, whether through two-way or three-way configurations. He also noted the company's dispensing valves, which are capable of delivering droplets in the nanometer range.

Fun Fact: There's a story behind the tie that Grant Midkiff donned at Tuesday's show. When the company's founder, Leighton Lee II, was coming up with how to calculate a restriction for fluids in a unique way to have more of a set standard, he came up with the Lohm rate, which stands for liquid ohms and is unique to The Lee Company. The tie has Lee's handwriting from the calculations on it. "We call it the Lee Company tie," Midkiff told *Machine Design*. It's a conversation-starter among employees and clients alike, he said, noting he sometimes gets asked if he is a math teacher when he wears it.

Manufacturing Integration

Pico MES showcased an innovative approach to manufacturing integration, emphasizing seamless connections and robust quality assurance. Their booth showcased and array of integrating devices, from simple input/output device connections like foot switches and badge readers to advanced data-driven tools.

Bryan Bauw told *Machine Design* that one of the key highlights is the company's commitment to ease of use. By focusing on plug-and-play integrations, Pico MES eliminates the need for extensive coding, making it accessible for users to incorporate essential devices into their systems effortlessly. He said this foundational layer paves the way for more sophisticat-



The Lee Company's newly acquired piezoelectric disc pump from Leventis is incredibly silent, pulsatile-free and compact, making it a suitable choice for a range of medical uses.

Sharon Spielman/Machine Design

ed capabilities, such as partnerships with notable entities like IR and their distributor, Zemarc, which enhance torque management for assembly processes. For instance, when assembling complex products like genomic sequencing machines, Bauw said Pico MES facilitates detailed feedback on the assembly process, allowing manufacturers to monitor and optimize operations in real-time.

When asked about feedback from design engineers, Bauw said that many have expressed interest in how Pico MES can bridge their CAD designs with shop floor data. The integration possibilities are vast, whether through middleware developed by Pico or direct API communication, depending on the existing systems' compatibility. This interconnectedness allows for real-time feedback from operators. For example, if an issue arises—such as a part being too tight—operators can document their observations directly linked to the part's serial number, Bauw said. This feedback can be escalated to both manufacturing and design engineers, driving continuous improvement in parts design and manufacturing processes.

By focusing on plug-and-play integrations, Pico MES eliminates the need for extensive coding, making it accessible for users to incorporate essential devices into their systems effortlessly, according to Bryan Bauw (pictured).

Sharon Spielman/Machine Design

Custom Integration

Camozzi Automation presented its latest capabilities in custom integration solutions aimed at enhancing equipment performance for medical applications. Doug Lenihan showed *Machine Design* a display that featured a highly specialized piezo pump, originally manufactured by Bartles, which had been modified by Camozzi's engineering team. The team's expertise culminated in the development of an advanced aspiration and dispense section, precisely crafted with the integration of solenoid valves, a manifold block and a custom-designed printed circuit board (PCB).

Advancements in Robotics

HIWIN displayed their advancements in harmonic drive systems and strain wave bearings. These components are integral to the performance of articulated and humanoid robots. Joe Jou showed *Machine Design* the company's harmonic drives, commonly

A specialized piezo pump, originally manufactured by Bartles, was modified by Camozzi's engineering team, culminating in the development of an advanced aspiration and dispense section, precisely crafted with the integration of solenoid valves, a manifold block and a custom-designed printed circuit board (PCB). Sharon Spielman/Machine Design

Integral to the performance of articulated and humanoid robots, HIWIN displayed their advancements in harmonic drive systems and strain wave bearings as well as its E2 drive, featuring embedded Ethernet IP protocol.

Sharon Spielman/Machine Design

known as strain wave bearings, and said they offer significant advantages in various applications, including medical robotics and aerospace. He noted their application in robotic joints, which require high precision and load-bearing capabilities.

One of their standout features is their vertical integration in manufacturing. When needed, they pour their own steel to meet strict quality control standards. This approach not only ensures the desired hardness and heat treatment but also allows for competitive pricing without compromising on quality, Jou said, adding that their process involves working closely with design teams to select the right products, materials and technologies, ensuring a tailored solution that meets the exact requirements of the application.

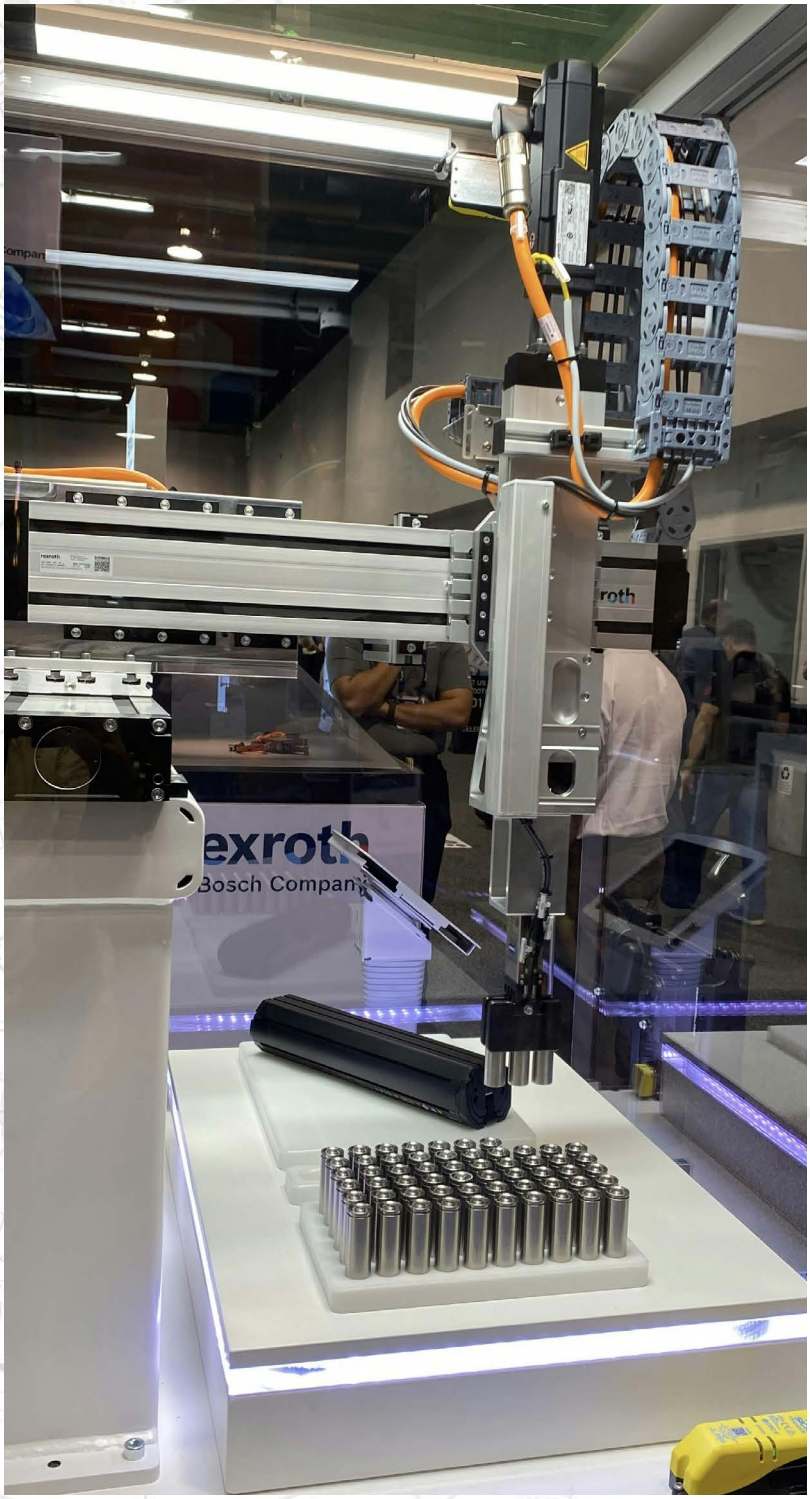
While HIWIN has had strain wave gears in their product lineup for some time, they are continually expanding their offerings. At the show, they introduced new variations of their strain wave gears and cross roller bearings. Jou said a notable mention was the introduction of the E2 drive, featuring embedded Ethernet IP protocol, which improves the connectivity and functionality of their robotic systems.

An ERP solution from Dassault Systemes, DELMIAWorks provides integrated manufacturing execution systems (MES) and comprehensive warehouse management capabilities. The company showcased its solutions for the medical manufacturing sector. Sharon Spielman/Machine Design

Integrated MES

DELMIAWorks, formerly known as IQMS, showcased its solutions for the medical manufacturing sector. An ERP (Enterprise Resource Planning) solution, DELMIAWorks provides integrated manufacturing execution systems (MES) and comprehensive warehouse management capabilities tailored for the unique needs of medical device manufacturers.

One of the standout announcements was the integration of Dassault Systemes' DELMIAWorks with its SOLIDWORKS, a CAD engineering solution known to many in the industry. DELMIAWorks enables users to begin their workflow with a 3D model, seamlessly transitioning that model into the DELMIAWorks environment through a new feature called Data Bridge. This integration not only streamlines processes but also enhances efficiency and collaboration among engineering teams.



Linear Guides, Automation Integration

At the Bosch Rexroth booth, Clint Hayes showed *Machine Design* their latest linear technologies, highlighting the company's evolution from profile rail products to integrated solutions like the Integrated Measuring System (IMS). Hayes said that the company initially focused on linear guide products designed for rigidity and high load capacity. The current offerings combine linear guidance with ball screw and roller screw technologies to achieve precise load handling across various industries, ranging from nanometer-level production to aerospace tooling.

Hayes said that Rexroth's collaboration with their automation electrification division enhances their offerings by pairing mechanical components with advanced servo motors, drives and PLCs, creating comprehensive solutions for customers.

The exhibit showcased standard XYZ solutions that incorporate drive and guidance mechanisms housed in precise aluminum extrusions. Hayes noted these systems cater to a diverse range of applications, including battery pick-and-place tasks, as pictured.

Bosch Rexroth's exhibit showcased standard XYZ solutions that incorporate drive and guidance mechanisms housed in precise aluminum extrusions. These systems cater to a diverse range of applications, including battery pick-and-place tasks. Sharon Spielman/Machine Design

Measuring Technology for Patient Treatment

Gisbet Ledvon from Heidenhain showed *Machine Design* the impact their measuring technology can have on the medical industry. The ability to accurately position patients on treatment tables is a game-changer, he said, adding that with their advanced systems, once a patient is placed correctly for treatment, they can return for subsequent sessions with absolute precision.

"This means that a patient can come back after a week or even two, and the treatment will be delivered exactly to the same spot, ensuring that the tumor is targeted without damaging the surrounding healthy tissue," Ledvon said. He noted that measurement technology typically associated with robotics and machine tools is finding vital applications in the medical field to help save lives.

The ability to accurately position patients on treatment tables is a game-changer, Gisbet Ledvon from Heidenhain, said. He added that with their advanced systems, once a patient is placed correctly for treatment, they can return for subsequent sessions with absolute precision. Sharon Spielman/Machine Design

Smalley is preparing to launch a high-force spring. Called a nested crest to crest, it is designed for aerospace and oil and gas industries. The compact spring offers high force and is made from various materials, including carbon steel, stainless steel and more than 40 different alloys, tailored to customer needs. Sharon Spielman/Machine Design

Compact Spring

Smalley's Lauren Nagys told *Machine Design* that they are preparing to launch a new high-force spring, called a nested crest to crest, designed for aerospace and oil and gas industries. This compact spring offers high force and is made from various materials, including carbon steel, stainless steel and over 40 different alloys, tailored to customer needs. Additionally, the springs can be heat-treated as required. While this nested spring is their latest offering, the company also showcased a range of established products for customers across various industries.

Streamlining the Sourcing Process

Chris Brown from CADDi told *Machine Design* about how CADDiQuote is developing procurement with its AI-powered solutions designed specifically for managing sourcing events. When a new sourcing event is initiated, he said, the tool automatically searches for all similar parts, analyzing supplier data, historical costs and quality metrics. It then recommends the top three suppliers from the existing procurement database and facilitates

CADDiQuote is developing procurement with its AI-powered solutions designed for managing sourcing events. Its speed and efficiency are advantageous for engineers in R&D, because typically they lack direct access to approved vendor lists or historical quality data, but this solution allows engineers to focus on their core tasks without having to navigate the procurement complexities. Sharon Spielman/Machine Design

the sending of quotes.

What makes this process efficient, he noted, is the ability for suppliers to enter a dedicated portal, where they provide pricing information. This data is processed by AI-based business intelligence (BI) tools that extract essential information, such as costs, lead times and quality assessments. Ultimately, the system recommends the most suitable supplier for each component. Brown added that what's particularly beneficial is the integration with ERP systems through APIs, allowing for seamless data transfer. Purchase orders can be automatically generated and sent to the best supplier based on comprehensive analysis, significantly reducing the sourcing time from several hours to just about 35-40 sec., he said.

This speed and efficiency are especially advantageous for engineers in R&D, Brown explained, because typically engineers lack direct access to approved vendor lists or historical quality data, but this solution can alleviate this issue. "It allows engineers to focus on their core tasks without having to navigate the procurement complexities, thereby streamlining the overall sourcing process," Brown said.

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Sharon Spielman/Machine Design

CHAPTER 2:

Lean into the Blur of Chaotic Change

SHARON SPIELMAN, Technical Editor, *Machine Design*

In his keynote address on Tues., Feb. 4, at MD&M West, Nick Webb, a healthcare futurist, medical device technologist and author, explored the shifts in healthcare, emphasizing the importance of consumerism, emerging technologies and fostering a positive organizational culture.

In his keynote on the morning opening of the MD&M West conference and exposition, medical device technologist, author and healthcare futurist Nick Webb shared insights gathered from five years of in-depth exploration into the future of healthcare. He pressed upon the audience not only to think about the overarching future of healthcare but to consider their own futures within this dynamic and ever-evolving sector. "What is the future for you?" he asked.

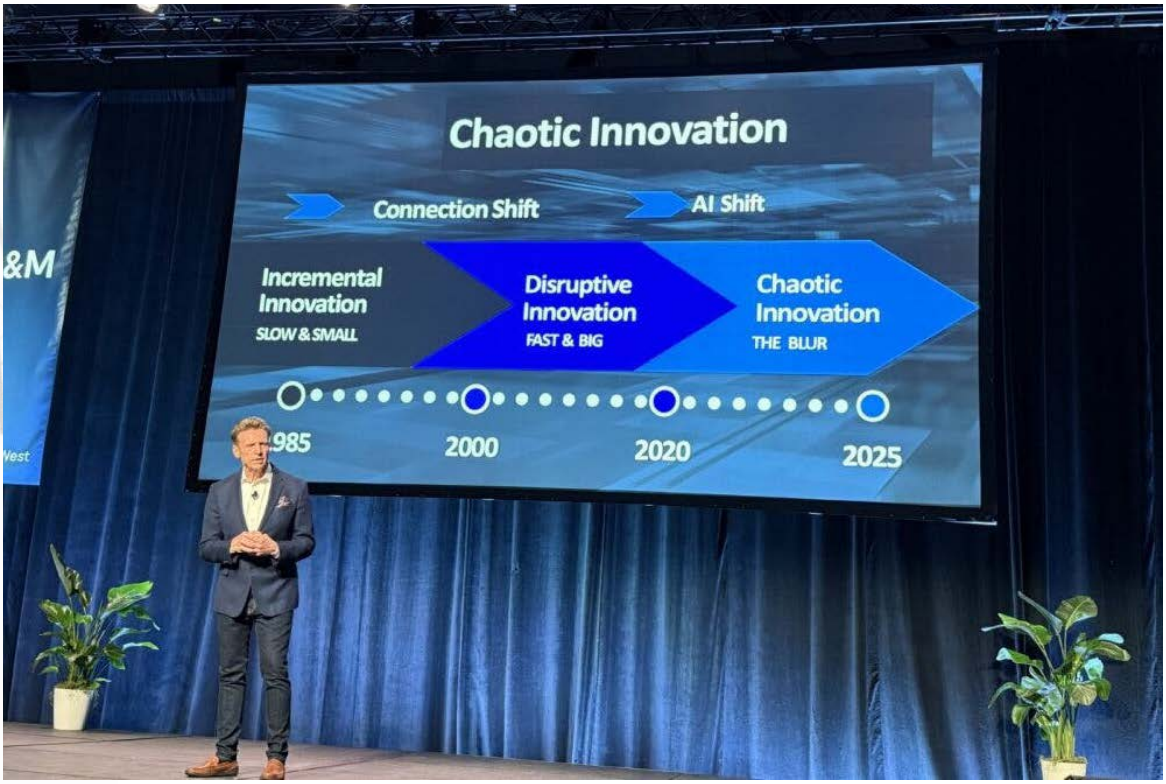
Webb articulated an understanding of the duality present in the healthcare trajectory—one filled with opportunities for organizations willing to adapt and fraught with challenges for those that resist change.

Understanding the Future of Healthcare

Webb initiated his keynote by posing a critical question: "Is the future of healthcare good or bad?" The answer: "Yes." He reframed this inquiry, directing attention to personal implications for those working within healthcare, particularly within the medical device industry. His optimistic outlook underscored that organizations prepared to embrace transformative changes could find themselves positioned for extraordinary growth.

He centered on several trends that are reshaping healthcare:

- **Anticipatory genomics.** The ability to foresee potential health outcomes and personalize treatment plans.
- **Decentralization.** Shifting away from traditional healthcare models toward more patient-centered, accessible care.
- **Artificial intelligence.** AI's potential to streamline processes, amplify patient engagement and improve outcomes by providing actionable insights from vast data sets.



After talking about incremental, disruptive and chaotic innovation, Nick Webb explored the shifts in healthcare, emphasizing the importance of consumerism, emerging technologies and fostering a positive organizational culture.
Sharon Spielman/ Machine Design

Pillars for Success in a Chaotic Environment

"How do we grow during this chaotic change?" he asked. To successfully navigate the complexities of modern healthcare, Webb highlighted three essential pillars:

1. **Consumerism**. Recognizing the shift toward a consumer-centric healthcare landscape, Webb said that organizations must move beyond traditional transactional models. It is no longer sufficient to provide medical devices based solely on technical specifications; companies must now offer holistic, experiential value that resonates with diverse stakeholders across the healthcare ecosystem. He cited real-world examples, illustrating how organizations that prioritize exceptional user experiences can significantly outperform competitors.
2. **Emerging technologies.** Webb encouraged attendees to harness emerging technologies beyond AI, including advanced analytics, robotic process automation and connected medical devices. He encouraged taking a proactive approach to technology adoption, reminding the audience that failure to integrate these innovations can lead to obsolescence. He also talked about the opportunity for organizations to reduce operational costs and improve efficiency by effectively leveraging these technological advancements.
3. **Staffing and Human Experience Innovation (HXI).** Webb said a key component for success lies in cultivating a workplace culture that prioritizes employee well-being and innovation. He introduced the concept of HXI, asserting that organizations that nurture a positive work environment not only enhance employee satisfaction but also drive creativity and productivity. He noted that fostering a culture of happiness among staff is crucial for achieving outstanding organizational performance.

Engaging Real-World Examples

Throughout his presentation, Webb used relatable anecdotes and examples from various sectors to underscore the importance of understanding evolving consumer expectations and illustrate how patient experiences are being reshaped through technology and innovation.

He also drew attention to the rise of wearables and implantables as tools for empowering patients, focusing on how these devices facilitate better health management, preventative care and informed decision-making. He projected that the integration of these technologies would significantly change patient-provider interactions, emphasizing the need for organizations to adapt to these new paradigms.

A Vision for the Future

While wrapping up his keynote, Webb delivered a call to action for industry professionals, urging leaders in the medical device sector to adopt a mindset centered on empathy, innovation and resilience. By prioritizing the delivery of both economic and experiential value, organizations can craft strategies that resonate with an increasingly discerning consumer base, he said.

Webb also noted the importance of layered and dynamic value—advocating for a reframed perspective in which healthcare organizations view themselves as integral parts of a broader human experience ecosystem. He said that success in this new landscape hinges on collaborative approaches, innovative thinking and a dedicated focus on enriching human experiences throughout the healthcare continuum.

Webb left the audience with a clear understanding that the future of healthcare is not only bright for those willing to change, but also critical for the well-being of individuals and communities alike. By embracing the ongoing transformations, healthcare professionals have the opportunity to play a pivotal role in advancing care and improving patient outcomes, ultimately ensuring a thriving and sustainable healthcare environment. “Lean into the blur of chaotic change,” he urged.

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igus GmbH

CHAPTER 3:

As Seen at MD&M West 2025: Product Showcases, Solutions and More

REHANA BEGG, Editor-in-Chief, *Machine Design*

MD&M West 2025 offers cutting-edge automation solutions for medical device innovation.

The trade show floor offers a firsthand look at how market trends shape current design and manufacturing innovations. Attendees at MD&M West 2025 could navigate emerging trendlines, shifting industry demands and competitive strategies.

This year's forward-looking agenda—packed with topics ranging from integration of AI, machine learning, IoT in smart factories and autonomous manufacturing systems to the application of simulation and optimization of digital twins, advanced materials applications and sustainability—provided both the ways and means to stay ahead in an evolving industrial landscape.

Precision Dispensing and Fluid Packaging

Nordson EFD has been honing its expertise in precision industrial dispensing syringes and valve systems since it was founded in 1963. The Electron Fusion Devices company is based in East Providence, R.I., and was acquired by Nordson Corporation in 2000, complementing the Nordson EFD (Engineered Fluid Dispensing) suite of offerings.

In tune with the medical devices development trendline toward smaller and lighter designs, Nordson EFD brought its PICO Nexμs jetting system, a small form factor, 24V, DIN-rail mounted jetting controller that monitors and coordinates jet dispensing through human machine interface at the point of dispense. The system can be mounted to a DIN rail inside the machine cabinet.

PICO Nexμs uses industrial Ethernet protocols such as PROFITNET and EtherNet/IP to establish communication with programmable logic controllers (PLCs). The precision dispensing system consistently applies accurate amounts of adhesives, sealants, lubricants

and other fluids used in assembly applications. The product has been certified for PROFINET devices and controllers, and ODVA (Open Device Vendor Association) has confirmed successful conformance testing for the Ethernet I/P protocol.

PICO Nexµs was the winner of Machine Design's 2024 Edge Award in the Automation & Controls category. An informational product video can be found here.

More highlights:

- Nordson highlighted its G4VPlus enclosure with two PICO Nexµs jetting systems angled to perform a needle-bonding application.
- Nordson showed off its reagent dispensing capabilities on blood glucose test strips via a PROX5 Series automated dispensing system.
- EFD's 4-axis PROPlus robotic solution illustrated precision fluid dispensing for hearing aid assembly.

Demonstrating Assembly Line Precision and Flexibility

Supporting its expansion into the U.S. market, PIA Automation's

Nordson's PICO Nexµs Jetting System updates precision fluid dispensing applications by providing real-time insights for data-driven process control and production. PICO Nexµs was the winner of Machine Design's 2024 Edge Award in the Automation & Controls category. Nordson EFD

Two PICO Nexµs jetting systems perform a needle-bonding application using a G4VPlus robot. The application is just one representation of Nordson EFD's smart factory and IIOT solutions.

Nordson EFD

live precision technology demonstrations showcased the company's modular assembly lines and process automation. For example, PIA exhibited the development behind "V-RAC," an assembly module capable of re-adjusting to handle various drug delivery devices efficiently.

The demonstration provided a glimpse into the potential for flexible assembly lines of small- to mid-volume lots. The V-RAC covers assembly of a various range of insulin pens or auto injectors. The module is scalable and reusable, and is cleanroom ISO 7 compatible.

A robotic arm simulates real-world processes, handling devices like an insulin pen. The robot seamlessly picks a device from a tray and maneuvers it through multiple axes, moving up, down and around, simulating a vision control module.

"PIA's expansion into the U.S. market is a significant step in our global growth strategy and we are proud to bring our proven expertise in automation to U.S. manufacturers to streamline operations, and embrace innovative solutions tailored to their needs," said Falc Borchard, VP Sales & Applications, PIA Automation North America. "With our modular approach and advanced automation capabilities, we're setting new standards for efficiency, adaptability and precision in assembly lines."

Find Hygienic, Self-lubricating Bearings Faster

Among the many causes of bearing failure, lubrication issues are an often-cited reason. Igus—a leading German manufacturer of high-performance polymers and motion plastics, including bearings, energy chains and linear guides—points to a study conducted by a

PIA Automation's "V-RAC" is a flexible assembly module capable of re-adjusting to handle various drug delivery devices efficiently.
PIA Automation

The igus online shop for plain bearings integrates a catalog, webshop and calculation program into a single platform. igus GmbH

major ball-bearing manufacturer where 54% of all bearings failed due to lubrication issues.

Igus designs and manufactures dry-running, cleanroom-compatible, media-resistant and corrosion-resistant plastic plain bearings and linear bearings as part of an extensive line of components used in medical equipment. These solutions are designed to not only resist dirt, dust and exposure to extreme environments but also eliminate maintenance and extend service life.

Medical device OEMs can find the right precision or plain bearings for a variety of medical devices via the igus iglide online shop. The shop integrates a catalog, webshop and calculation program into a single platform, allowing users to find what they need in a matter of seconds. The more requirements the plain bearing has to fulfill, such as FDA conformity, operating temperatures or loads, the more selective the choice becomes. The system can calculate the dimensions and price on custom-made products in real-time, too.

Lars Butenschön, product marketing manager iglide at igus GmbH, characterized the new igus webshop for iglide plain bearings as a milestone in the company's service digitalization.

Click here to try out the webshop facility's competency on iglide plain bearings.

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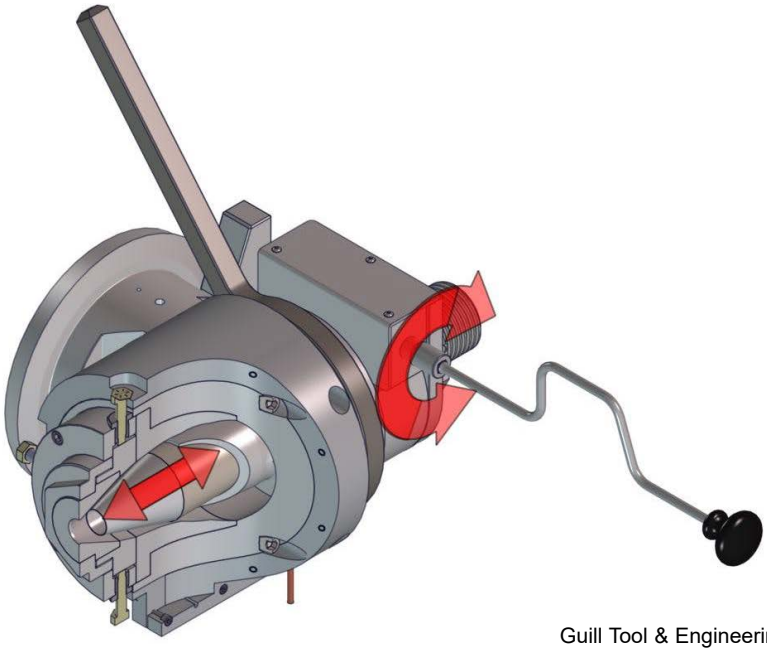


Guill Tool & Engineering

CHAPTER 4:

Designing a Better Rubber/ Silicone Extrusion Crosshead

REHANA BEGG, Editor-in-Chief, *Machine Design*

Extrusion tool designers introduce a new extrusion head design featuring MAGS adjustment.

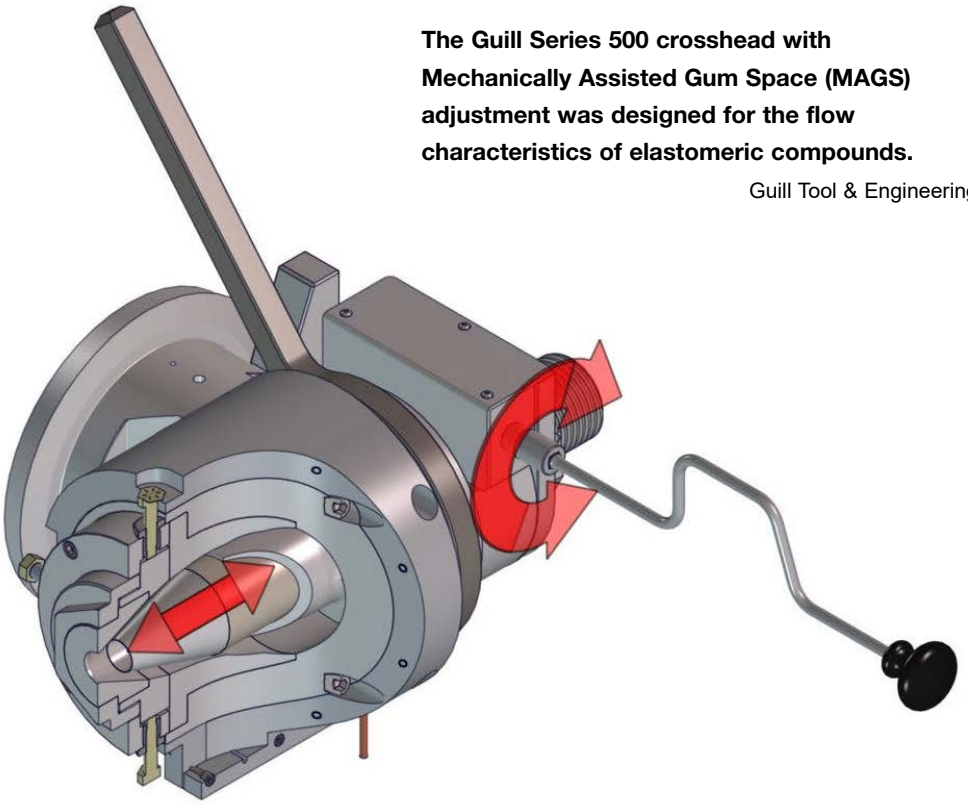
Exhibiting at MD&M West 2025, three members of Guill Tool & Engineering's skilled team of machinists and engineers demonstrated new design features they're bringing to extrusion tooling.

One example is the 500 Series crosshead. The engineers designed the series specifically for the flow characteristics and unique processing challenges of elastomeric compounds. It is a drop-in replacement on most existing NRM lines, noted the company. The crosshead design can also be adapted to fit any extruder design or line layout.

Representatives from Guill Tool & Engineering demonstrated new design features they're bringing to extrusion tooling. Machine Design

Mechanically Assisted Gum Space

A key feature of the new crosshead design is the mechanically assisted gum space (MAGS) adjustment system. This method of gum space adjustment allows the operator to make an effortless adjustment from a single point using a common socket wrench. The visual indicator on the core tube allows the operator to see how far the gum space has been moved, making the adjustments much more accurate and repeatable than before.



The Guill Series 500 crosshead with Mechanically Assisted Gum Space (MAGS) adjustment was designed for the flow characteristics of elastomeric compounds.

Guill Tool & Engineering

View a video of the Guill 500 Series crosshead with MAGS gum space adjustment below:

Features and Benefits:

- The hardware-free and patented cam lock design means no time is wasted unbolting and re-securing fasteners for disassembly and re-assembly;
- Only half of a rotation of the cam nut is required to loosen and automatically extract the deflector from the head body; and
- With no undercuts on the deflector, there are no material hang-ups when extracting the deflector, allowing for faster and easier cleaning and changeover.
- The re-designed flow inlet channel reduces the shear and heat that is generated as the materials are being processed. This leads to lower head pressures, allowing the material to move through the head in a much more balanced and even flow.

Guill Tool & Engineering provides tooling for the medical, aerospace, defense, extrusion, consumer and commercial, wind, oil and energy industries.

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Baumer

CHAPTER 5:

IO-Link Masters: Enabling Sensors and Devices to Communicate Through Software

REHANA BEGG, Editor-in-Chief, *Machine Design*

Presenters at MD&M West highlight the advantages of IO-Link, a manufacturer-independent digital communication protocol/interface, while introducing a software solution.

The Design Alley educational program at MD&M West 2025 was organized around prototypes, software and testing and measurement equipment. For their part, presenters Mauricio Lugo and Steffen Schneider elected to focus on "Harnessing the Power of IO-Link."

Sponsored by Baumer, a manufacturer of sensors, encoders, measurement instruments and automated imaging components, their presentation was curated for designers and engineers.

What Tangible Benefits Does IO-Link Offer?

Focusing on the tangible benefits plants can expect from implementing IO-Link, Lugo and Schneider emphasized that the advantages—standardized wiring, enhanced data availability and advanced diagnostics—have an impact across different production stages, from the engineering process through operations. IO-Link is a manufacturer-independent digital communication protocol/interface and manufacturers can benefit through cost and time savings, they said.

The pair highlighted a use case from Swiss machine manufacturer Aerne Engineering. They explained how the automation specialist relies on smart sensors to accelerate design and commissioning, and how they use IO-Link and software to tie their systems together. A

Lugo and Schneider also introduced attendees to Baumer's Sensor Suite of software, which allows plants to parametrize, monitor and evaluate IO-Link devices.

Insights from Sensor Technology Experts

Leading up to their presentation, Machine Design reached out to Lugo and Schneider to glean further insight into their sensor technology. They responded jointly via email to our queries (answers edited for clarity).

The Experts Behind the Insights:

- **Mauricio Lugo**, director of sales – Western Region, Baumer, has more than 20 years of experience in the industrial automation industry. He joined Baumer seven years ago, where he specializes in solving sensor applications for customers, particularly focusing on medical and lab automation.
- **Steffen Schneider**, a business development manager at Baumer's headquarters in Switzerland, is a technical sensor expert with more than 10 years of experience in industrial automation and has worked as a product manager for sensors and measurement electronics with digital interface for five years. He has a special emphasis on laboratory automation and material handling.

Machine Design: **At a high level (consider this your elevator pitch on IO-Link), what is the relationship between this connection technology and sensors and actuators?**

Mauricio Lugo & Steffen Schneider: Baumer sensors offer the best and most reliable sensor functions. With the IO-Link technology, the functions integrated directly in the sensor can be easily parameterized. Sensors are immediately ready to use and optimally adjusted to the respective application.

Baumer Sensor Suite (BSS) is a PC freeware for evaluation, selection and parameterization of both IO-Link devices and Baumer CANopen devices. Baumer

IO-Link also makes it possible to transmit a wide range of additional information directly from the sensor to the OT world or IT world, making for more effective systems—your gateway to the digital factory.

MD: **What are the biggest advantages?**

ML & SS:

- Easy commissioning & fast sensor exchange
- Diagnostic data for condition monitoring for optimized processes
- Loss-free transmission of measured values thanks to digital communication
- More sensor information for reliable control of systems & machines
- Precise parameterization of sensor functions
- Efficient engineering thanks to PC-based sensor tools

MD: **Standardization is a big topic when it comes to IO-Link. Are there any updates or specifics we should communicate to our audiences?**

ML & SS: On the IO-Link device front, we saw only minor spec updates with the latest standard V1.1.3. However, we are seeing a giant leap forward in the performance of IO-Link Masters. The new generation masters deliver way more energy and can now power modules with up to 4 Amps via Class A and B combined.

Their cycle time is also tenfold from the last generation, removing one of the biggest bottlenecks IO-Link had in the past: speed. With this new master generation IO-Link applications are just as fast as reading switched signals from a DIO card right in the PLC.

In addition, newer masters support all state-of-the-art IIoT protocols, such as OPC-UA, MQTT and JSON, allowing valuable sensor data to be used by higher level systems. This allows maintenance to switch from fixed-service cycles to demand-based servicing for example or makes fully automatic AI assisted leak detection in the air pressure system possible.

MD: **Which specific products is Baumer showcasing at the booth?**

ML & SS: We are showing different sensors with IO-link, including our awarded Baumer Sensor Suite software, together with the Baumer USB-C IO-link master for easy parametrization and the UF200 Sensor, our newest ultrasonic product.

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Machine Design

CHAPTER 6:

Clippard's Long Stroke Smart Pinch Valves Make Music

REHANA BEGG, Editor-in-Chief, *Machine Design*

A pneumatic music machine gets *Machine Design's* "Pick of the Day" at MD&M West 2025.

Passersby couldn't help but be mesmerized by a curious contraption on display at Clippard's booth at MD&M West 2025.

The pneumatic music machine was intended to showcase the specialty valve company's different pressure and flow control capabilities. It featured different types of valves, as well as pressure controllers that rapidly changed the pressure and flow of air across beakers filled with brightly colored liquid. The resulting sound created music. "Flight of the Bumblebee" was the orchestral interlude playing as I stepped up to inspect the display.

The Trappings Behind the Music

Housed at the bottom of the display were four Cordis CHV high-volume boosters. These high-flow pressure controllers produce a high flow of air and enable accurate pressure control. In addition, it housed the electronics, including a music interface (MIDI) for converting the air flow (pitch) to a signal that the pressure controllers and valves can understand.

"Now, we don't make beakers, or we don't make music machines," pointed out Andrew Aurand, director of sales, Clippard Instrument Laboratory, a manufacturer of miniature

Clippard's pneumatic music machine was a showstopper. The contraption is constructed with different types of valves, as well as pressure controllers. Machine Design

pneumatic valves, and a specialist in ultra-low leak, precision pressure control and high-resolution flow control. "We make fast responding valves using our proprietary spider technology, as well as our flow and pressure controllers that have integrated PID loops to give you control in your application."

A New Line of Smart Pinch Valves

New on the trade show circuit this year is Clippard's line of smart pinch valves. Aurand said Clippard offers five different sizes of pinch valves with integrated intelligence.

He demonstrated two options: "We have both a hit and hold circuit, which allows reduced power consumption, as well as heat buildup," Aurand said. In critical applications, where media can be strongly impacted by temperature changes, this can really make a difference, he said.

The second option is an integrated mechanical position sensor. "For those in the medical device space, this redundancy is very important when engaging with some of the regulatory bodies," said Aurand.

During Aurand's demo, he held up an NPV7 series valve, which provides the added benefit of a longer stroke compared to the standard NPV series and makes it great for applications that need greater flow, or where viscous or particulate-laden media are a factor.

The valves come pre-installed with 12 in. (30 cm) of either standard medical/laboratory grade or sanitary food grade silicone tubing.

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Sigma-Netics

CHAPTER 7:

The Shift from Digitization to Datafication in Manufacturing

SHARON SPIELMAN, Technical Editor, *Machine Design*

In his keynote at MD&M West on Wed., Feb. 5, Dr. Shawn DuBravac discussed the shift in manufacturing and emphasized the role of AI in reshaping the industry and the importance of adapting workforce strategies for the future.

Shawn DuBravac, Ph.D., CFA, delivered a keynote at MD&M West that addressed shifts in the manufacturing sector. He highlighted the transition from digitization—a focus that he noted has dominated the last two decades—to datafication, which he predicts will shape the coming decades.

From Ice Harvesting to Data-Driven Manufacturing

DuBravac took the audience on a historical journey, back to the late 1800s, when ice harvesting was a significant industry in colder states like Michigan and New York. At its peak, this industry involved more than 100,000 workers and 25,000 horses. Ice was harvested from frozen rivers and lakes, and it played a critical role in food preservation. However, technological advancements soon shifted the industry toward ice manufacturing in urban centers, revolutionizing how ice was produced and consumed.

He illustrated that each technological shift often leaves behind established players, much like how the ice harvesting industry transformed. The traditional ice harvesters could not adapt to the newly manufactured ice market dominated by companies like GE and Frigidaire.

Investment and Transformation in Manufacturing

Moving to contemporary times, DuBravac pointed out that U.S. manufacturers are currently investing in new facilities at an unprecedented pace—200% more than prior to the pandemic. This investment reflects a shift towards highly digitized, efficient manufacturing systems. While electronics, particularly semiconductors and the electric vehicle (EV) ecosystem, are leading this transformation, he noted that the food and beverage industry also witnesses similar investment growth.

He urged industry leaders to navigate these changes by considering both imme-

U.S. manufacturers are investing in new facilities at a rapid pace—200% more than before the pandemic, which DuBravac says reflects a shift toward digitized, efficient manufacturing systems.
Sharon Spielman/Machine Design

diate operational needs and future market demands. The future of manufacturing requires balancing current customer satisfaction with forward-thinking strategies to meet emergent needs 5-10 years down the line.

The Role of AI, Datafication

DuBravac talked about the role of artificial intelligence (AI) and the transition to datafication, focusing particularly on how AI can improve operational efficiencies. He cited examples such as JetBlue's integration of generative AI into its customer service operations, which significantly reduced call handling times.

He also discussed the concept of AI-driven knowledge management in companies like Georgia Pacific, where generative AI systems integrated operational knowledge, helping with training and operational efficiency.

In discussing the workforce's evolution alongside AI, DuBravac mentioned younger generations' comfort with technology, suggesting that workers are already adapting to automated systems. Addressing concerns about job displacement, he said that AI would likely not replace jobs outright but rather change the nature of work, stressing the importance of upskilling and preparing the workforce for future roles.

He also referred to innovative applications in various industries, like John Deere's AI-equipped tractors that have changed farming practices by using fewer inputs while still achieving desired outcomes.

DuBravac wrapped up his keynote by stressing that businesses must be open to experimenting with AI technologies, understanding that its integration would reshape business models and relationships with customers. He highlighted the significant shifts occurring in manufacturing, driven by technological advancements and the necessity for industries to rethink their operations amidst an ever-evolving landscape.

The takeaway is clear: the combined strength of human intelligence and machine capabilities will define the future of manufacturing.

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Sharon Spielman/Machine Design

CHAPTER 8:

SWE Roundtable: Empowering Women in Engineering

SHARON SPIELMAN, Technical Editor, *Machine Design*

At this MD&M West-held event, four accomplished women from disparate backgrounds and engineering fields shared their stories.

On Wed. Feb. 6, the Society of Women Engineers (SWE) hosted a roundtable session about lessons in leadership and empowering women in STEM. The event, which took place at MD&M West in Anaheim, Calif., brought together four distinguished women from various engineering fields to share their experiences, insight and advice on fostering a more inclusive environment for women in STEM.

Meet the Panelists

Mariel Cisneros. A senior program manager at Northrop Grumman, Cisneros described her journey into aerospace engineering, emphasizing her immigrant background and a childhood book about space that inspired her. She leads a team focused on research and advanced design, helping to pave the way for innovative, software-defined aircraft.

Ondine Beaufils. Currently serving as a senior engineering manager at Safran Electronics and Defense, Beaufils shared her lifelong passion for aviation. She leads projects that design pilot controls for commercial airplanes and has extensive experience collaborating with major aircraft manufacturers globally.

Kshitija Garde. A senior engineering program manager at Medtronic, Garde is committed to mentoring young girls in STEM through outreach initiatives. She discussed her role in developing life-saving medical devices and highlighted the need for early exposure to engineering for children.

Dr. Tracy Nguyen. An optometrist and the executive vice president of SWE San Diego, Nguyen's involvement in engineering is heavily influenced by her daughter's interest in robotics. She advocates for increasing representation and visibility of female role models in STEM.

The session was moderated by Sophia Leung, food science lab manager at Enzyme Innovation and president of SWE Orange County.

A group of Gen Z engineers pose for *Machine Design* after the presentation. Best wishes to Walaa Shawakha, Yogitha Shastri, Celina Ibelaidene and Emily Tsaturian as they step into their careers! Sharon Spielman/Machine Design

The panelists emphasized the importance of encouraging girls to pursue engineering before they hit middle school, where interest typically declines. They noted that studies indicate girls exposed to female role models are 2.5 times more likely to pursue STEM fields and recommended early outreach programs and initiatives to change the narrative around who can be successful in engineering, stating that representation can significantly impact a girl's confidence in her abilities.

Cisneros said the decline might start even earlier. Recounting how she goes to local elementary schools to talk with girls as early as kindergarten age about STEM, she noticed that when she asks them to draw an engineer, 90% of the time it's a man with glasses and a coat. "It's your…typical scientist kind of thing," she said, noting that "it's because of the cartoons that they're watching, right …So even as [young] as five years old, they always draw the man."

To help introduce women in STEM at that young age, Cisneros said she brings guests from her women in engineering network to talk about the amazing things they are doing. "We build rockets and we build heart valves and we build airplanes, and we do these amazing things, and we're women. But as early as, you know, the kindergarteners, they're drawing all men. So I think that that's interesting."

Networking, Mentorship, Career Progression and Retention

Networking was a central theme, with the panelists urging young women to seek mentorship from their networks. They highlighted the value of organizations like SWE as vital support systems. In addition, they discussed structured mentorship programs at their respective companies, including Northrop Grumman, which pairs early-career engineers

with senior leaders.

"We're a group of Gen Z engineers looking to transition from academia into industry," one audience member offered. "We were wondering what advice you have for us." Garde said to remember it takes practice and time to master the art, adding that it takes teamwork and diligence. Beaufils urged them to do an internship, even if they have already graduated, stating, "I personally will only hire someone who's done an internship because I want to make sure that they know how the corporate world works."

When discussing retention of women in STEM careers, the panelists shared strategies for personal and professional development. Garde emphasized the importance of having a strong peer network, while Cisneros advised on the critical skill of effective communication, particularly in showcasing one's accomplishments to management. Nguyen said the SWE chapters across the country are always willing to help.

As the session concluded, the panelists shared actionable advice for women entering the engineering field:

- Establish connections and engage actively in organizations like SWE.
- Seek out mentors within close proximity to your work for deeper insights.
- Be flexible in career beginnings and embrace opportunities that may not align perfectly with your initial aspirations.
- Focus on ongoing learning and development to evolve in your career.

This roundtable session served not only as an empowering platform for women in engineering but also reinforced the shared commitment to supporting one another in breaking barriers and achieving success in STEM fields. These insights can help foster a stronger community and inspire future generations of women engineers.

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Sharon Spielman/Machine Design

CHAPTER 9:

More Highlights from MD&M West's Show Floor

SHARON SPIELMAN, Technical Editor, *Machine Design*

Machine Design puts the spotlight on six more standout solutions from the Anaheim expo.

Around every corner at MD&M West was another innovative product, service or solution. There was so much to see at this year's event to help medical device manufacturers get and stay ahead of this rapidly evolving industry. *Machine Design* brings you six more standouts.

Specialty Metal Processing

Ulbrich Specialty Wire Products showcased its role as a re-processor of metals, focusing on the production of specialty strips from stainless steel, nickel and titanium-based alloys. Patrick Meinert told *Machine Design* about the company's capability to roll strip materials to tighter tolerances, providing mechanical properties that are not widely available in high volumes.

They focus on producing complex shapes, offering near-net shapes instead of traditional rectangles that require further machining. This includes ultra-fine, round and flat wires catering to medical applications, such as stranded products suitable for advanced catheter systems.

The company also produces straight and cut-to-length flat wire for niche applications. The products are manufactured at Ulbrich's South Carolina facility, ensuring adherence to medical-grade requirements using biocompatible materials, including 304L and 316L stainless steel, and maintaining a contaminant-free processing environment.

Ulbrich Specialty Wire Products showcased its expertise through the production of ultra-fine, round and flat wires catering to medical applications, including stranded products suitable for advanced catheter systems. Sharon Spielman/Machine Design

A Miniature Automation Solution

Schneeberger Inc. introduced a new addition to its product lineup, focusing on automation with its latest miniature slide. The company, known for serving original equipment manufacturers across a range of industries—including machine tool, solar technology, semiconductor technology, electrical engineering and medical engineering—highlighted this compact version of its existing products.

The miniature NDN slide is designed for high-speed operation and high acceleration, making it especially suitable for applications in medical engineering. Its small size and versatility allow for use in various fields, including optics and photonics. The product can be manufactured from stainless steel and offered with different types of coatings, enhancing its adaptability to specific applications.

While the miniature slide is particularly useful in medical contexts due to its size, it can also be utilized across various industries depending on the machinery size and precision requirements, a company representative told *Machine Design*.

Schneeberger introduced a miniature slide designed for high-speed medical engineering applications.

Sharon Spielman/Machine Design

THK America Inc. displayed how they integrate components to aid in efficiency for manufacturing systems. Sharon Spielman/Machine Design

Streamlined Linear Motion Technology

THK America Inc. displayed its approach to linear motion technology. Their exhibit highlighted the integration of multiple components into a single, streamlined unit, particularly focusing on actuators that simplify both the design and construction of various systems, Bryan Alarcon told *Machine Design*.

THK's actuators combine essential elements like linear motion guides, drive systems (such as ball screws or belts), and base frames into one cohesive part, for efficiency and reducing complexity for manufacturers.

Contamination Prevention for Medical Device Manufacturing

Porex highlighted their solutions in the diagnostics, medtech and bio-processing markets, emphasizing the importance of contamination prevention for engineers involved in medical device manufacturing. Subho Goswami told *Machine Design* that their collaboration with Cirrus demonstrates how Porex filters effectively remove unused active pharmaceutical ingredients (APIs) from donor blood, ensuring safety and efficacy.

Additionally, Porex filters prevent clumping in inhalers and possess antibacterial properties— crucial for delivering uncontaminated medication. In dialysis applications, Goswami said their filtration solutions eliminate contaminants during bicarbonate reconstitution, maintaining the purity of fluids.

Porex is also advancing technologies that convert whole blood into universal donor blood by removing antigens, thereby enhancing transfusion compatibility. In medical

imaging, their vents play a key role in ensuring the uniform delivery of contrast agents during mammograms, preventing air and contaminants from affecting diagnostic outcomes.

Advanced Integrated CAM Capabilties

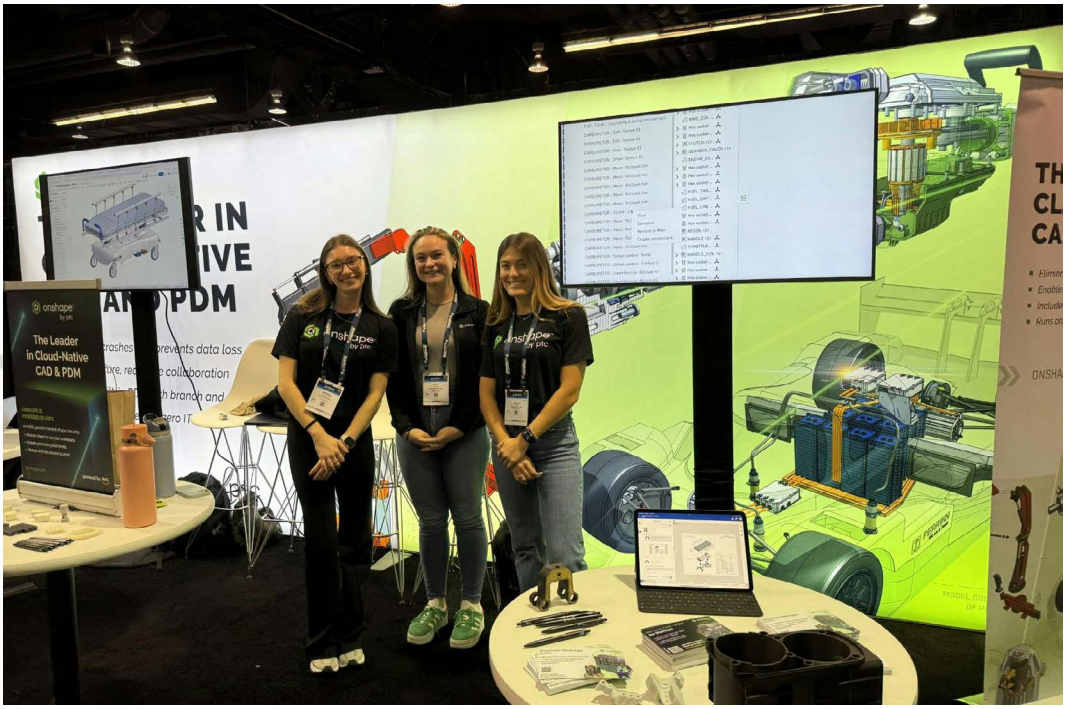
PTC's Onshape unveiled its latest innovation at MD&M West: CAM Studio, an embedded computer-aided manufacturing (CAM) offering that is now native to the Onshape platform. Brenna Robillard told *Machine Design* this development aims to enhance the capabilities of users by integrating CAM functionalities directly within the design environment.

Additionally, the company is gearing up for the launch of its Onshape Government, which will provide teams with an ITAR (International Traffic in Arms Regulations)-compliant environment, ensuring secure and regulated operations for government-related projects. The cloud-native CAD and PDM package aims to enable secure, real-time collaboration and supports work from nearly any device anywhere.

Closed-loop Dosing System

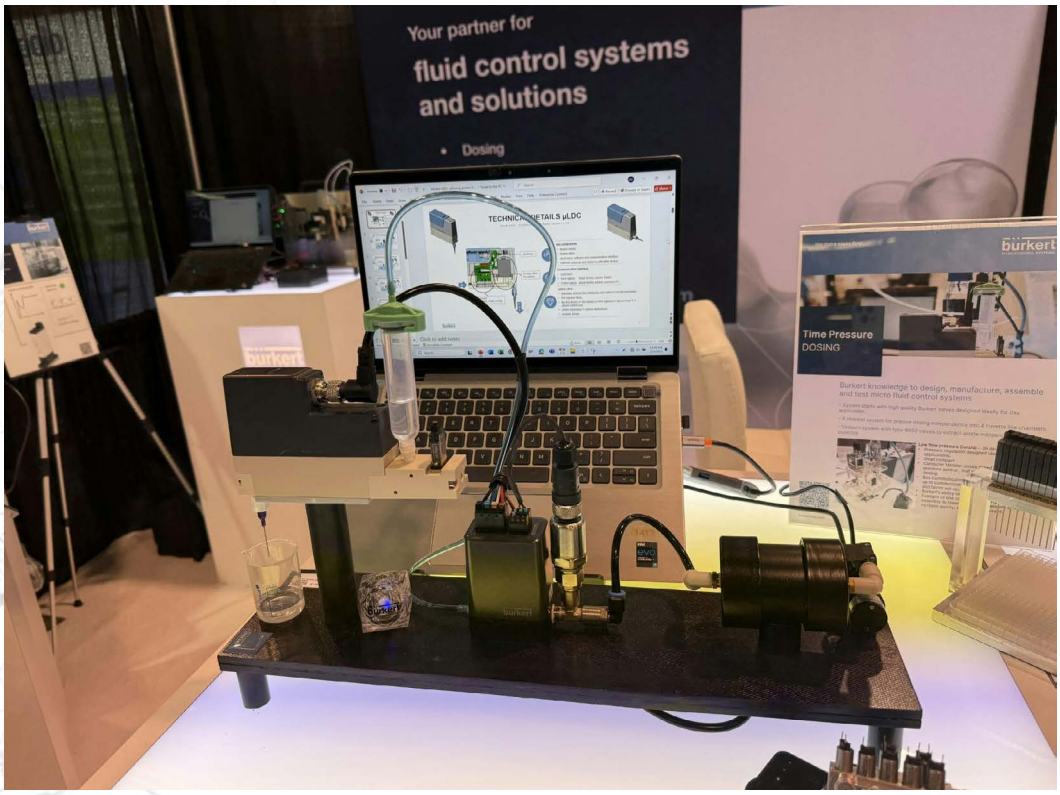
Burkert's Craig Occhiato gave *Machine Design* a demo of the company's closed-loop dosing system that achieves remarkable precision, capable of dispensing half a microliter per

Porex highlighted contamination prevention in diagnostics and med tech, showcasing filtration solutions necessary for patient safety. Sharon Spielman/Machine Design



At the show, Onshape launched CAM Studio, an embedded solution for design efficiency.

Sharon Spielman/Machine Design



Burkert's liquid dosing system offers engineers in the medical device sector a solution for non-contact dosing with real-time feedback as well as accuracy.

Sharon Spielman/Machine Design

stroke. This cutting-edge system is reported to be the smallest of its kind on the market and utilizes electronic controls along with a CAN bus to precisely manage air pressure over liquid.

By finely adjusting this air pressure and using a fast-responding valve, the system delivers doses accurately. The system is made to be compatible with various aggressive media found in medical devices, protecting both the fluid and the internal components. The integration of a pressure sensor provides real-time feedback, allowing for continuous adjustments that allow dosing precision compared to traditional open-loop systems, which require manual recalibration.

Burkert offers a demo kit that enables engineers to easily set up the system using components with CAN bus communication, all connected through a USB to a PC for straightforward testing and configuration. Overall, Occhiato explained this advanced dosing system has attracted attention from medical device engineers due to its non-contact dosing capabilities, real-time volume verification and operational efficiency.

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