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November/December 2026
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This year's group of Emerging Leaders honorees not only lead by example but also share what they've learned along the way with others.
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Identify the Emerging Leaders in Your Shop

Here are five traits to look for in your young employees — possibly your future shop managers and mentors — as exemplified by this year's group of *Production Machining*'s Emerging Leaders.

Creating the annual Emerging Leaders articles (this year's piece starts on page 24) is always a fun experience. After identifying the honorees, I have conversations with them about how they got involved in manufacturing, ways they've positively impacted their companies and what it means to be a leader. It's not the same as creating a technology deep-dive article. It's more about getting to know someone.

From those chats, I create profiles of each which I roll into that one long article. (Note that I had help this year. I'm thankful for *Modern Machine Shop*'s Executive Editor Julia Hider and Senior Associate Editor Evan Doran who each created an Emerging Leaders profile. Much appreciated.)

After I looked over all the individual profiles for this year's honorees, a distinct theme emerged from each. In fact, they're actually action items for manufacturing managers. Keep a keen eye out for young employees in your shop who:

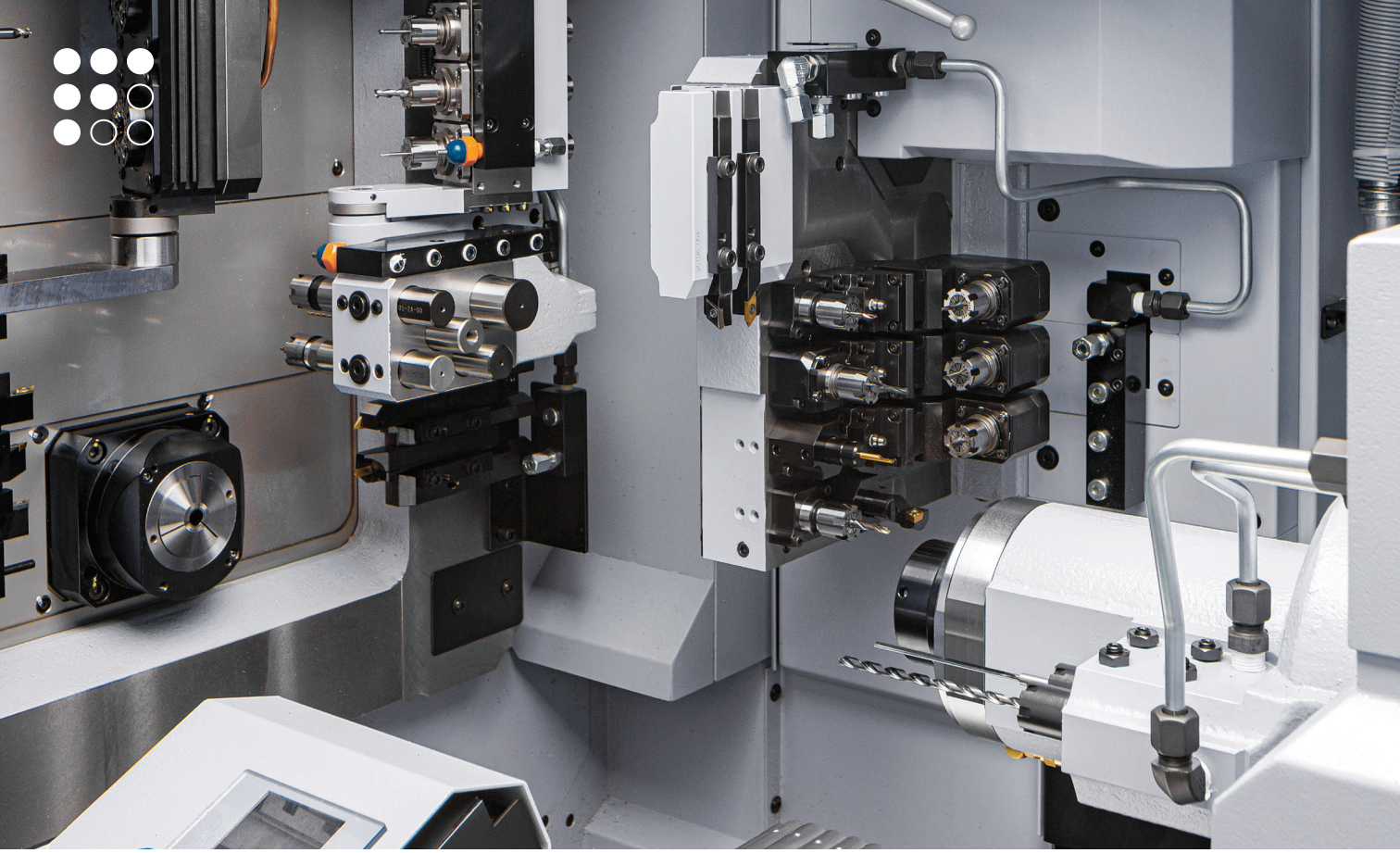
SHARE INFORMATION AND FOCUS ON TRANSPARENCY. For Tyler Beal, general manager of Midway Swiss Turn in Wooster, Ohio, information sharing and transparency is at the heart of what he wants out of a company culture. Beal says that he is purposely open so his teammates can understand why the shop operates the way it does and so that they can offer feedback as a result. He notes that the shop implements many ideas from employees, so it's vital to make sure staff members are on the same page and ask the right questions.

SEEK OUT SHOPFLOOR PROBLEMS. Owen Larson is planning manager of Benchmark Precision Technologies in Tempe, Arizona. Larson admits that while he is very supply-chain focused, he takes time to walk the shop floor and suggests his team does so as well. "I preach to my team to get out on the shop floor and talk to the machinists to learn about the problems that they encounter on a daily basis," Larson explains. "My goal is for everything to run as smoothly as possible. So, if I don't understand the daily problems that a machinist goes through, then I'm not going to be able to properly plan for success."

DON'T WAIT TO BE ASKED. Dillon Lewis, floor lead at Canton, Michigan's Lyon Manufacturing, is known for not limiting himself to the responsibilities of his own position. When an operator needs help, a machine has a problem, quality identifies an issue or engineering needs assistance implementing a process, Lewis gets involved. Examples range from gutting and rewiring a faulty Acme Gridley screw machine that was retrofitted in the '80s with a PLC to taking on the lead for robotic machining cells. But then, ultimately, he shares what he knows and learned with others.

FOSTER EMPLOYEE GROWTH. Savannah Smucker is vice president of operations at SpiTrex MDI in Lancaster, Pennsylvania. Her nominee, Director of Programming Ted Force, says her greatest accomplishment thus far has been the culture she has built within the organization. He says Smucker has fostered an environment in which employees are encouraged to learn, grow and succeed while strengthening collaboration and creating a workplace where people feel valued and empowered.

EMBRACE BEING INTERRUPTIBLE. Paramount Machine's Area Lead Eric Van Orden performs a part of the company's machine programming, manages the shop's in-house tool management system/database, works with vendors and suppliers relative to tooling issues and much more. But he considers it funny when others at the shop come to him with a problem and start by saying, "Hey, sorry, I know you're busy and I hate to interrupt you…" He likes to tell them, though, that one of the biggest parts of his job is to be interruptible. Although Van Orden's official title at Paramount Machine is "area lead," it also very well could be "problem solver." And, actually, that could apply to all of this year's Emerging Leaders. PM

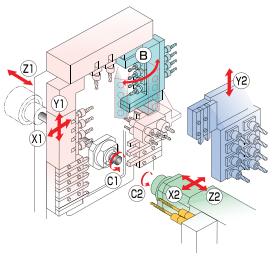


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One More Call: The Compounding Value of Going the Extra Quarter Mile

My friend Charles (not his real name, but close) is a bazillionaire who parlayed a career in sales into a huge real estate empire. How'd he do it?

From humble beginnings, as the story goes, he drove an old bus west from Iowa to Stockton, California, and when the bus broke down, he set up camp and started a career in sales. It wasn't easy at first, but as time went on success came. He kept his overhead low, lived below his means and as the money flowed he banked the difference between his growing income and his low overhead and invested it in real estate. Residential at first, then commercial, then large developments.

Charles understood the compounding nature of investing. The rule of 72s reminds us that money doubles every 10 years at 7.2%. My sense is that Charles did quite a bit better than 7.2%.

A quick aside on compounding returns — it's amazing how they build wealth. Consider a frugal and forward-thinking young woman who has managed to save $100,000 by her 30th birthday. Even if she doesn't save another penny, if she invests that amount and earns, on average, 7.2% per year, that sum will become $200,000 by age 40, $400,000 by 50, $800,000 by 60 and $1.6 million by 70. Compounding works!

Back to Charles. He was able to "retire" years before his 60th birthday. I put retire in quotes because he continues to manage his considerable real estate holdings, but he no longer makes sales calls. At the event at which his retirement was announced and celebrated, he was asked to share the secret of his success. His answer?

"I always made one more call."

This answer necessitated an explanation, so he went on. He shared that at the end of every day, after a series of customer visits and sales calls, the time came to return home or to whatever hotel at which he was to lay his head on a pillow that evening. On his way there, he kept his eyes open for an opportunity to make one more stop. And he always did.

Charles could have driven by. Could have gone home or to the hotel. Might have given into the temptation of a warm dinner or a cold beer at the end of an already long day. But he didn't.

He always made one more call. That last visit, he noted, was the key to his success.

He knew he could have mailed it in. It turns out his customers recognized this, too. They appreciated his tenacity, his work ethic and his genuine interest in learning how he could help them. And help them he did.

Over time, this practice of making one more call paid dividends. That one last call — every workday — meant one more customer conversation, one more opportunity to ask the right questions, one more quote, (in time) one more purchase order, one more commission check. This practice, day upon day, week upon week, month upon month, and year upon year, produced results beyond measure.

It occurs to me that Charles understood the value of compounding returns not just in real estate but also in sales. His discipline to make one more call over all those years compounded just like his real estate investments did. His extra efforts stacked up not just into one more order but to many more satisfied customers, many more success stories to share with his new prospects, many more referrals, and eventually into many, many more orders.

This lesson should resonate not just with those in the profession of selling but to all in manufacturing. A general manager makes one last trip through the plant at day's end, noting and correcting anything that's out of place or process. An accounting manager makes one more phone call on a past due receivable. The quality tech checks one more order before calling it quits for the day. The shipping and receiver supervisor preps one more order for shipment as the sun goes down. The marketing coordinator preps one more social media post as the lights dim about the office.

Over time, the headstarts these provide to the next days' work compound in ways that generate exponential returns.

How do we compound results in sales, in manufacturing, in life? Make one more call. PM



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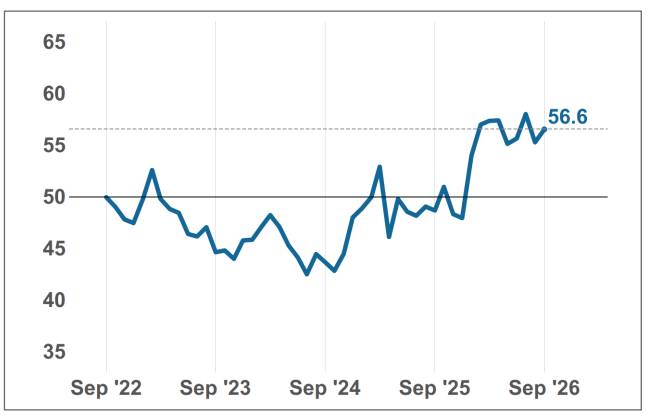
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Precision Machining Index Climbs in September Despite Production Slip



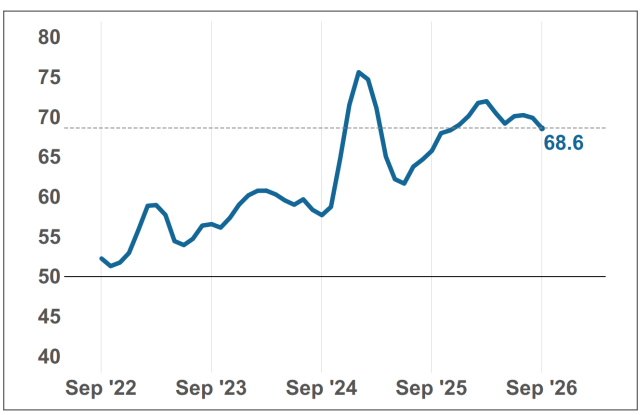
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PRECISION MACHINING BUSINESS INDEX



The Gardner Business Index (GBI): Precision Machining is an indicator of the current state of precision machining activity based on survey responses regarding new orders, production, backlog, employment, exports and supplier deliveries. Over 50 is expansion, and under 50 is contraction.

FUTURE BUSINESS INDEX



The GBI Future Business Index is an indicator of the future state of the precision machining market from industry respondents regarding their opinion of future business conditions for the next 12 months. Over 50 is expansion, and under 50 is contraction.

GBI COMPONENTS SCORECARD

	Change vs Month Ago	Change vs Year Ago
Supplier Deliveries	▲	▲
Production	▲	▲
New Orders	▲	▲
Backlog	▲	▲
Employment	▼	▲
Exports	▼	▲

The GBI Components Scorecard reports the monthly change rate of primary composites market factors contributing to the overall monthly index reading.

READING THE SCORECARD:

Color indicates where a component value falls relative to 50 for the current month. Green indicates expansion; red indicates contraction.

Shade indicates a value's distance from 50; the darker the shade, the further from 50.

Direction indicates a value's change versus the previous time period. Pointing up is always better.

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STEPHANIE HENDRIXSON
EDITOR-IN-CHIEF
Additive Manufacturing Media

Additive Manufacturing Adds to Vertically Integrated Knowledge

The employee-owned manufacturer's deep knowledge and experience in traditional manufacturing prepared it to adopt additive. Now, the investment is paying off.

For long-established manufacturers, adopting additive manufacturing is a balancing act: New technology must find a niche within established capabilities. Employees must buy-in to its value, and learn how and where to use it. And care must be taken to direct only the right business cases toward additive, and to protect relationships with customers.

Penn United Technologies has perhaps struck that balance better than most, adapting to meet customer demand with an AM program built on a strong manufacturing foundation.

The Cabot, Pennsylvania-based business first brought additive in-house at the prompting of a key customer, and much of its AM expansion has also been client-driven. The specific machines, materials and postprocessing equipment have been added to meet the needs of these clients, and in some cases the machines are even owned by the companies whose parts they make.

But the reason these metal 3D printers are operated at Penn United is the result of all the company had built leading up to the adoption of additive. The company has decades of experience in manufacturing processes ranging from stamping and precision grinding to carbide production and coating. Across its various processes, Penn United manufactures parts for challenging markets including nuclear reactor fuel assemblies, surgical devices and aircraft components — all of which have unique regulatory nuances that the company has become adept in navigating.

Market demand may have directly driven the addition of laser powder bed fusion (LPBF) equipment to the production floor, but Penn United's robust quality system, deep manufacturing knowledge and employee ownership model have been instrumental in its success with this technology.

I visited the Penn United campus in Cabot this January to learn more about how the company implements additive manufacturing both as a distinguishing feature, and a capability like any other.



↑ Penn United works with a fleet of nine laser powder bed fusion 3D printers. Some machines the company owns outright; others it operates on behalf of customers.
Source: Penn United Technologies

A Legacy of Growth in Manufacturing

Penn United Technologies was founded in a Pennsylvania pole barn in 1971 as a manufacturer of progressive stamping dies. Before long, customers began to ask if the company could also manufacture the stampings. Penn United acquired stamping presses to run the tools it made, and expansion hasn't stopped since.

A defining feature of the business almost since the beginning has been its ownership: The company has been fully owned by employees since 1974, making it one of the oldest employee-owned businesses in Pennsylvania. That distinction means that the adoption of additive manufacturing, or any new capacity, is a decision owned by the entire company.

Equipment additions over the years have included reel-to-reel plating (supporting the stamped connectors

that make up a larger proportion of its business), precision machining and more through equipment purchases. The business has also grown through acquisition. In recent years, the company acquired a carbide manufacturing company originally located in Tennessee (carbide being a key material used in stamping dies) and a manufacturer of metal compaction tooling for powder metallurgy in St. Mary's, Pennsylvania.

Another, unusual acquisition has made Penn United a machine manufacturer as well as a user. When company leaders learned that Parker Majestic, the supplier of dozens of Penn United's precision grinding machines, was going out of business around 2000, they made the decision to acquire the company. As a power user of these machines, Penn United already had deep embedded knowledge on the platform, as well as experience with modifying them, adding NC and then CNC controls for example.

Today Penn United still uses more than 100 of these grinders in its production operations, plus develops and manufactures machines to sell into the market. The move to acquire this key supplier has ensured continued access to Parker Majestic grinding equipment, and has also given Penn United a direct, internal line of communication to experts in this technology.

Additive manufacturing came into the mix with Penn United taking delivery of its first metal 3D printer in 2018. More recently, the company is now making a foray into plastics, with the addition of plastic injection molding capability, supported by its tooling expertise.

The company today employs nearly 600 across its locations in Cabot, Saxonburg, Sarver, St. Mary's and Warminster, Pennsylvania. Its vertically integrated operations enable the company to take customer designs from tooling through finished part, whether that end product is a stamped, plated connector; an injection-molded plastic component; or a 3D printed nuclear fuel assembly component.

Adding Additive: Laser Powder Bed Fusion

Each move made by Penn United, whether equipment or business acquisition, has been driven by application demand and intentionally chosen by the company's employee-owners.

The addition of additive manufacturing followed this trend, growing out of an existing relationship with a customer in the nuclear space for which Penn United has long manufactured fuel straps, stamped pieces of metal that are assembled together into a grid used to hold fuel and control rods inside a nuclear reactor. The customer was interested in additive, and had a good use case for a different structural component used in the lower region of the fuel rod assembly.

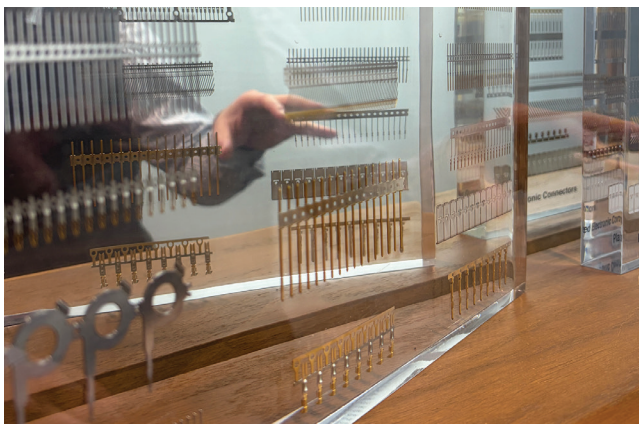
"They could get the AM parts out in the market, but they were struggling with the qualification side," says Charlie Phillips, vice president, "which we were very familiar with because they were long-term customers. They purchased the asset — the first EOS M290 that we have — and we signed an operational agreement to run the piece of equipment for them and support all the postprocessing activities."

Although Penn United had not performed metal additive manufacturing prior to this operating agreement, the company was primed to succeed because of its experience with nuclear standards as well as its legacy in conventional manufacturing. Having postprocessing capability including wire EDM, machining and grinding plus vast manufacturing experience already in house meant that mastering laser powder bed fusion was the primary challenge, and one that the company was well-positioned to surmount.

"From a nuclear regulatory standpoint, we were able to jump right into printing parts because we've been



↓ **Following its founding as a manufacturer of dies, it wasn't long before Penn United began offering stamping services with that same tooling. Metal stamping continues to be a key capability for the company.** Source: *AM Media*



↑ **Examples of stamped parts manufactured at Penn United.**
Source: *AM Media*

stamping and machining parts for the nuclear world for years," says Jake Jones, business development manager (and grandson of company cofounder Carl Jones). "We hardly had to make any changes to the quality system because it already had to umbrella so many different technologies. It was robust enough to support additive."

That first application proved an early win for both Penn United and its customer: 3D printing allowed the complex component to be manufactured more quickly and in fewer pieces, and supported additional functionality not possible with traditional manufacturing.

The success soon called for Penn United's addition of two more EOS M290 machines to support the work. Today this customer still makes up a significant portion of the additive production happening at Penn United, and continues to drive experimentation with using the technology for other nuclear fuel assembly components — including perhaps the possibility to 3D print entire fuel "spacer grids" instead of manufacturing them strip by strip.

"That's been a great partnership," Phillips says. "It allowed us to get into AM, and allowed them to have a competent supplier where they can get good parts that are functional and usable and production scale."

Expanding with AM

Since 2017, additive manufacturing has grown significantly at Penn United, from that first machine and customer to a fleet of nine metal 3D printers all from EOS, the most recent of which was just being installed when I visited the facility in January. The machines are a mix of M290s, an M4K from EOS sister company AMCM which can handle builds up to 1,000 mm tall, and the company's newest, an M400-4 equipped with automated Volkmann powder handling system and a Grenzeback dual-setup station for faster build change-overs. Penn United runs a selection of materials including stainless steel, nickel alloys, aluminum and C18150 copper as well as proprietary alloys.

The company's postprocessing capability has grown along with its additive capacity. Penn United now has a dedicated AM postprocessing cell consisting of a United Machining wire EDM for part cut off, Chevalier surface grinder and Hurco three-axis machining center.

Other support equipment includes a machine for testing mini tensile bars — a more cost-effective means of performing material characterization, with ASTM standards now available — and a Solukon SFM-AT 1000-S system for automated depowdering that can handle parts ranging to 1,000 mm tall (the Z-height of the MK4 machine) and up to 800 kg.

While most parts that Penn United 3D prints today are quite a bit smaller than this, the company anticipates growth in part size as well as additive opportunity with the addition of its larger machines; having capability to depowder larger parts is a significant step toward winning work to manufacture them.

Roughly 50% of the additive business the company sees is related to energy, spanning oil and gas, nuclear and renewables. Another 30% or more is connected to defense work, right now largely material characterization as military branches and others seek to move into using additive as an alternative to castings, among other things. Other production work includes a medical device used in the treatment of amputees, consumer firearm components and aerospace parts, as well as some prototyping work.

There are not necessarily commonalities among the parts made at Penn United, but there are trends the company notices. "Right now, we definitely see a growth in thermal management-type components," Phillips notes. "That's related to data center energy consumption, and some aerospace opportunities we're starting to see as well.

"It's high-precision, high-value parts," that Phillips says define the company's sweet spot for both additive and Penn United's more conventional production methods.

"We're able to leverage our current customer base with the other technology, then acquire new customers through the additive process as well," Phillips says. "Some of the customers that we started with AM, we're doing other things for them now, too. It's a great marriage of a new technology that allows us to be in the right place at the right time for a lot of customers."

Where AM Fits in a Vertically Integrated Shop

Part of the reason additive manufacturing "works" at Penn United is because it is part of that larger network of manufacturing operations and expertise. Its other existing processes and systems prepared the company to adopt additive manufacturing, and these factors continue to influence its success — including when deciding when not to pursue AM.

"Sometimes people just want to print to get exposure," Phillips says. "And a lot of those we've said, 'This is not a good part' for that exposure. You'll kill additive in your organization if you print this part. Let's find one that's better."

"If the only critical feature of your part is the surface finish on one face, then yeah, I don't know if you should be printing that part," says Jones by way of example. On the other hand, "We're looking at an energy part right now that's nothing more complex than a simple bracket. But it's not critical, doesn't need a lot of precise machining, and fits in our larger-scale additive machines. Additive could actually make sense for this. It could be more cost effective than machining it out of a block of steel that's twice as large as the part."

"We have to look at it in the context of all of our capabilities considering the volumes and the materials that are being used," Jones says. "We don't necessarily care what the preform is that gets to the spindle. Additive provides a ton of advantages for certain features, but sometimes a billet or a casting or a forging is a better answer."

Penn United's breadth provides the experience and options to reroute jobs that may not fit with AM's strengths. Parts that do move forward with additive are still informed by the other specialties at the company.

"Engineers are cross-trained on almost everything, so they have a very good understanding of what the shop needs us to print in order to make it machinable or grindable," Jones says. "It's a marriage of all these capabilities. We wouldn't be able to have additive if it wasn't for this."

Penn United consults with customers to establish the best orientation and support strategy for each part, informed by its knowledge of downstream processing needs. The objective is to limit how long it takes to print and then finish each job.

"Material is only 10 to 20% of the cost of an additive part," Jones says, "so we want to optimize to minimize machine time."

Once the design and build strategy are established, they become part of a "control plan" for the part to ensure consistency every time it is manufactured.

Employee Ownership Ethos Drives Success

Perhaps the most important key for Penn United's AM adoption has been its people and their ownership over the business. The employee stock ownership plan (ESOP) structure established in 1974 feeds through the ethos of the entire operation.

When every employee has a real stake in the business, incorporating something as expensive and radically different as laser powder bed fusion can be a hard sell.

"These are not cheap pieces of equipment. We're essentially investing our employees' money, so we've got to be very conscious of that," Phillips says. "But I think that creates a level of dedication, hard work, grit, whatever you want to call it to see it through."

The customer's commitment to Penn United's first additive parts helped ease the adoption transition, and that early success helped show the company's employee-owners what is possible and overcome skepticism. Now, additive has become an accepted and well-supported part of the business.

"One of my early fears was you put additive in front of the 35-year-tenured tool-and-die guy, and he'd be like, 'What's this stuff?'," Phillips says. "I can't say how proud we are of them to lean into it. I give a lot of credit to the people out in the shop who did that. I think it speaks deep to the culture we have."

That culture has enabled additive manufacturing to not only become established, but to flourish. Where some manufacturers appoint or identify a singular additive "champion," at Penn United, employee-owners as a whole have become this technology's champions.

"[The manufacturing team] is very motivated to help us figure out how to make a project work, or how to make it more cost-effective by tweaking their processes. Our sales team is constantly motivated to go out there and try to keep these machines filled," Jones says. Additive manufacturing has been able to advance because of this embedded understanding of the impact a new technology can have.

"We give a lot of credit to many of the AM service providers across the industry. I can't imagine doing this with private equity money or venture capitalist money," Phillips says. "You have to have a level of persistence to incubate all these opportunities. It's not for the faint of heart to go be an additive expert." PM

Penn United Technologies Inc. • pennunited.com

AI Built into Your Shop's Live Data

For ITAR-registered shops handling Controlled Unclassified Information (CUI), the AI boom has largely been off-limits. Using public-access LLMs with shop data can be a compliance violation because these models might train on inputs and can then re-share private information to inform other users. Meanwhile, if a shop were to independently decide to build a self-hosted, government-cloud AI stack capable of handling CUI, this could cost north of $1M per year to run.

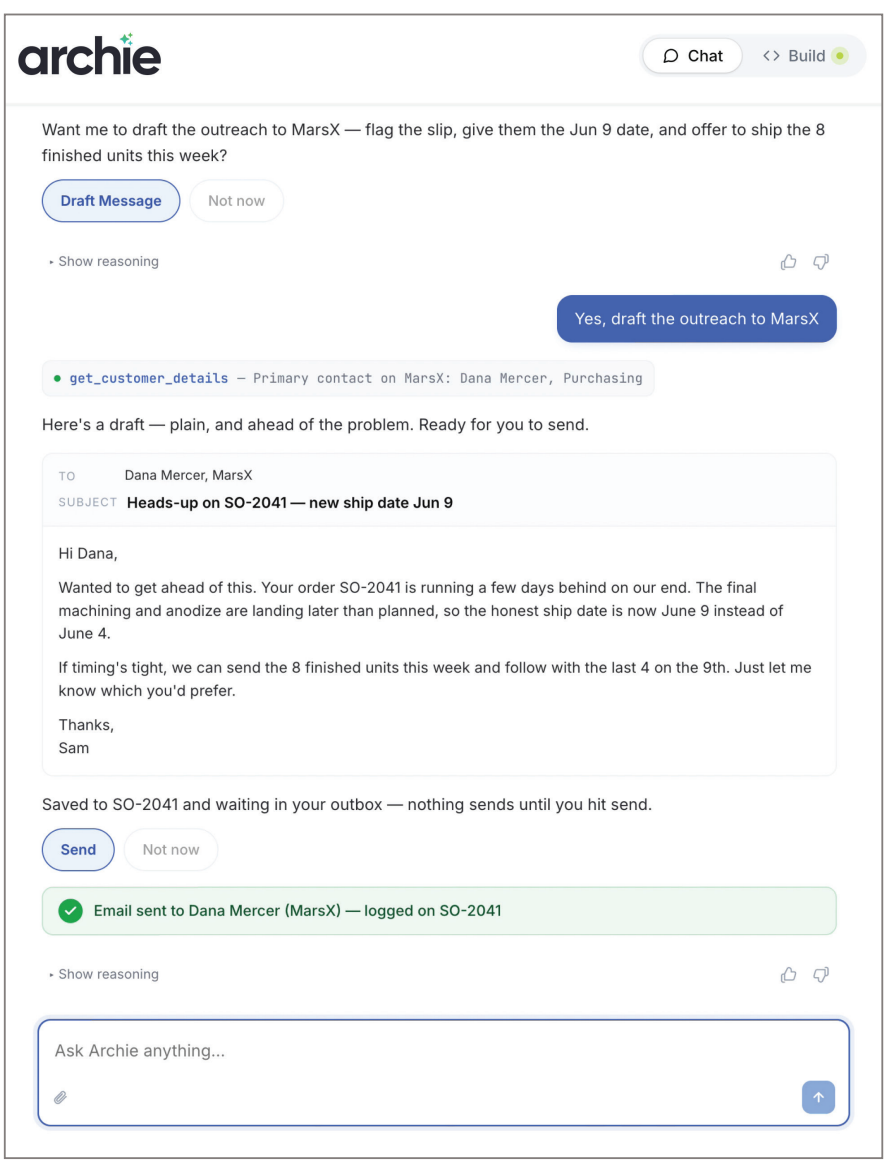
Fulcrum, a manufacturing software platform used by more than 700 job shops and fabricators, has launched its native AI platform, Archie. The company says Archie is designed to enable shop owners and production managers to ask questions, build custom apps and deploy autonomous agents all from inside Fulcrum.

Archie is a solution for the entire network of manufacturers. Shops running Fulcrum get enterprise-grade AI at a fraction of the cost it would take for them to host it themselves, the company says.

One Connectivity Platform

With Archie, the following features will be available to Fulcrum users:

- **ARCHIE CHAT.** Ask Archie which jobs are at risk this week, what a customer's true cost history looks like, which vendors keep missing dates and so on. Archie reads live Fulcrum data and answers directly. You can even prompt it to help you take actions such as changing a due date, leaving a note on a job or updating a record.
- **ARCHIE BUILD.** Currently in beta testing, Archie builds a real, functional app on your live Fulcrum data in minutes. Custom apps publish to a dedicated space where anyone on your team can open and run them. If you decide to, you can share what you've built with the Fulcrum manufacturing network (and other shops can share their tools with you, too).
- **ARCHIE AGENTS.** Releasing soon, this capability enables users to deploy custom agents to handle



→ Public AI tools are often off-limits for ITAR-registered shops handling CUI, and building a compliant, self-hosted AI stack is costly. Archie runs inside Fulcrum on Microsoft Azure Government Cloud, so shops get AI without the compliance risk or the price tag, according to Fulcrum.

Source (all images): Fulcrum

recurring work on their own. These agents can autonomously schedule and complete tasks. Examples include reorder check-ins, status alerts and follow-up drafts. You set the rules for how these agents work; Archie doesn't act without your explicit authorization.

Securely Build the Tools Your Shop Needs

The difference between Archie and using a public AI tool, or an add-on AI offered by a legacy manufacturing software, is secure access to clean, comprehensive data in Fulcrum.

Fulcrum shops run all operations digitally. Every job, routing, cost, vendor record and customer interaction lives in a single live system. Shops that use Fulcrum are said to average 3.4 times more operational data than shops on other platforms. When Archie answers a question or builds an app, it is drawing on the full picture of how a shop operates. The reports and the information are reliable, thorough and actionable.

"Archie isn't a chatbot we've stapled onto Fulcrum," says Sunny Han, Fulcrum founder and CEO. "It's the AI layer of a platform built from the ground up to capture live shop data. The reason Archie can take action is because Fulcrum already owns the record. No other manufacturing AI can say that."

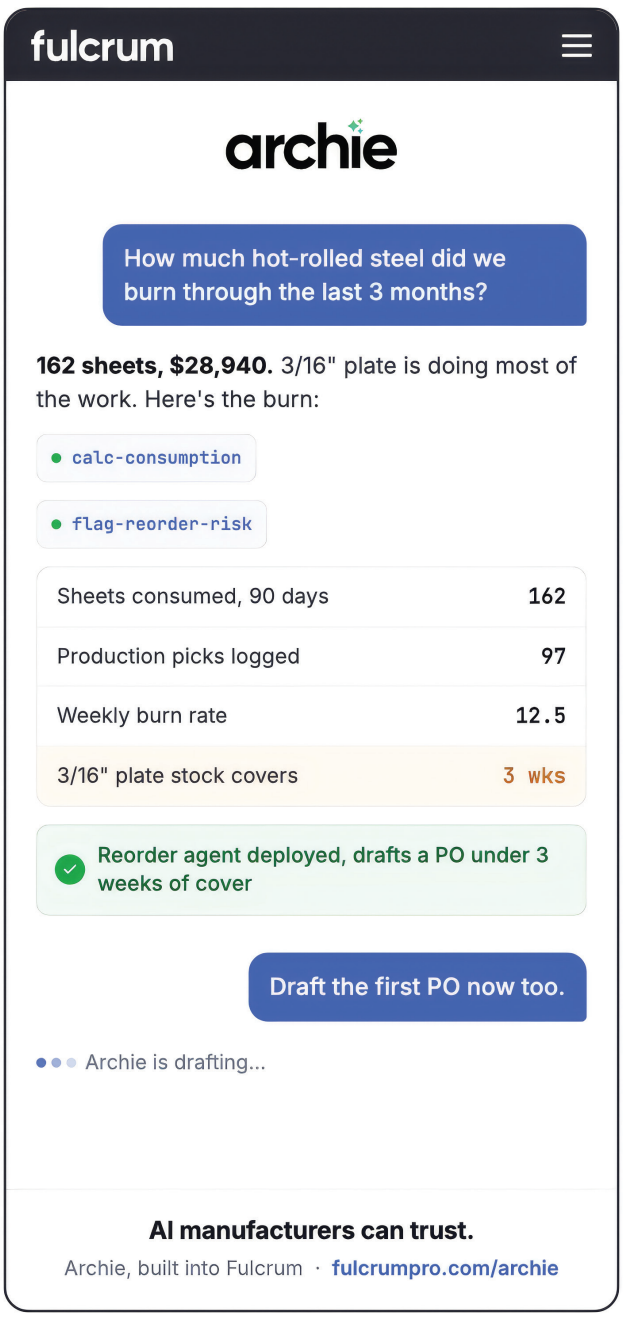
For users which are ITAR-registered, all of Archie's processing, storage and data handling happens inside Fulcrum's Microsoft Azure Government Cloud environment, not in a general-purpose cloud environment. Azure Government Cloud is a separate, walled-off version of Microsoft's cloud that is restricted to U.S. persons and meets the data-handling requirements ITAR imposes on controlled technical data.

A standard commercial cloud environment (even a secure one) doesn't meet that bar on its own. That means no part of an ITAR customer's Archie usage touches Fulcrum's regular commercial infrastructure or any non-Gov-Cloud service.

High-Growth Shops are Early Adopters

Fulcrum says it's goal is to give shops the tools to run better as the industry changes around them, and Archie is the next piece of that. This especially important because more shops are asking for AI they can actually use inside their compliance requirements. Users today span sheet metal fabrication, precision CNC machining and aerospace-grade manufacturing, a cross-section of the job shop market where AI has historically been unavailable or non-compliant.

The company envisions this spreading fastest among



↑ Current users include companies performing sheet metal fabrication, precision CNC machining and aerospace-grade manufacturing.

CNC machining and fabrication shops looking to compete and produce quality components on par with the demands of the major contractors that hire them. PM

| Fulcrum • fulcrumpro.com

DEREK KORN EDITOR-IN-CHIEF

R&D Investments Speed Creation of Naturally Bacteria-Resistant Coolant

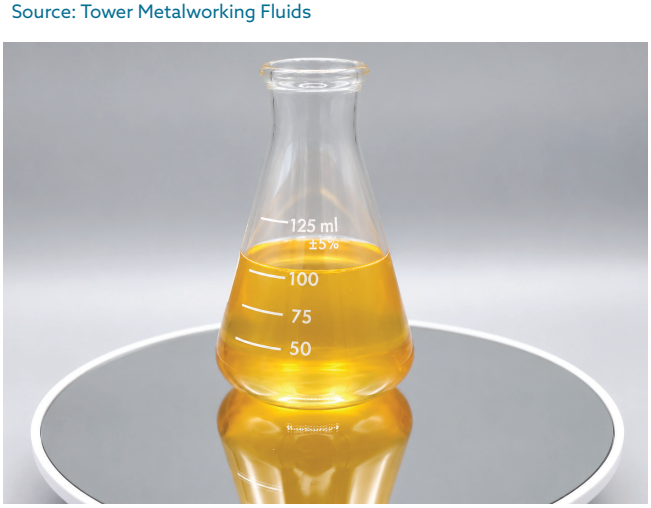
Since 1933, Tower Metalworking Fluids (Tower MWF) has been a leading developer and manufacturer of metalworking fluids for applications including machining, grinding, stamping, roll forming and tube and pipe manufacturing. It also offers rust preventatives, hydraulic oils and cleaners. The company has recently completed two major capital investments by way of a new research and development center and an expanded quality control laboratory.

New equipment includes a four-ball wear and extreme-pressure tester, twist compression tester, tap torque tester, Turbiscan stability analyzer and X-ray fluorescence spectroscopy instrumentation, providing comprehensive evaluation of fluid performance, stability, lubricity and elemental chemistry.

Scott Prince, president and CEO of Chicago-based Tower MWF, says the facility advancements represent a strategic investment in the future of the company's metalworking fluid technology, enabling Tower MWF to enhance quality assurance, improve responsiveness to customer needs and support continued growth. But it also has already shown to accelerate new product development.

Tower Metalworking Fluids' SAF-T-COOL Enviro 485 is made primarily from naturally based materials even down to the emulsifiers without the need for large amounts of biocides. It is said to offer lubricity to extend tool life as well as bio-resistance to prevent bacteria formation.

Source: Tower Metalworking Fluids



That comes in the form of the company's new SAF-T-COOL Enviro 485 petroleum-free, renewable-resource coolant which continues to demonstrate positive results in actual shop conditions and has proven to offer lubricity to significantly improve tool life for machining Inconel while remaining bacteria-free for more than a year.

Lloyd Hundley, company vice president and laboratory director, says SAF-T-COOL Enviro 485 is the latest example of the company's efforts to replace dangerous manufacturing fluids products. "Our goal is to offer alternates to our customers that not only meet their machining requirements but are much safer for the environment as well as shopfloor personnel who would otherwise be exposed to dangerous chemicals," he notes. "We want their lives to be better and healthier."

Chemist Clayton Cooper led this project, which launched a little more than two years ago. He says that SAF-T-COOL Enviro 485 is made primarily from naturally based materials even down to the emulsifiers without the need for large amounts of biocides. The coolant also contains no chlorinated paraffin or sulfur extreme pressure additives, and is boron-free for global acceptance. And while other bio-based alternatives similarly offer good lubricity, SAF-T-COOL Enviro 485 does not promote bacteria growth and maintains emulsion stability even in challenging water conditions.

As mentioned above, Tower MWF has been working with a machine shop specializing in aerospace components which has become as an extended trial site for testing, starting with parts machined from Inconel. Hundley says one reason it chose this shop was that it closely tracks tool life.

The shop is said to have faced a significant challenge with a new high-volume job involving forged Inconel brake components. These parts, hardened to 45 to 50 HRC, are difficult and expensive to machine. The facility was using a petroleum-oil-based, semi-synthetic coolant at 15% concentration, but was achieving only two parts



↑ A new research and development center and an expanded quality control lab enable Tower Metalworking Fluids to enhance quality assurance for customers while speeding new products to market. Source: *PM*



↑ The advanced equipment in the company's new formulating area helped speed the development of SAF-T-COOL Enviro 485. Commercial production quantities are said to be available in early 2027. Source: *PM*





↑ LEFT: A shop previously was getting only two parts per tool for an Inconel job with the former coolant it was using (note the tool wear). RIGHT: Note the sharp edge here after the shop converted to SAF-T-COOL Enviro 485. Source: Tower Metalworking Fluids

per tool, leading to high tooling costs and frequent tool changes. In addition, makeup fluid usage was typically 10 gallons per day.

When changing to SAF-T-COOL Enviro 485, the product was mixed with tap water at 12% concentration. The coolant was said to be low foaming, easy to mix and had stable refractometer readings. After the change, the shop realized improved tool life and reduced coolant-related costs without compromising part quality.

For the Inconel job, annual tool usage (achieving only two parts per tool) was 8,000 tools costing $97.32 each resulting in a $778,560 tool spend. After the coolant change, tool life increased to seven parts per tool, saving $556,114 annually. Additionally, tool change outs were reduced by 71% and makeup fluid usage was cut in half to 5 gallons per day. Plus, the shop has seen no bacteria or malodors in more than a year of operation.

In terms of developing this new Tower MWF product, Prince points to the value of the company being a 100% employee-owned ESOP since 2014. He says this ownership structure is more likely to offer a chemist such as Cooper the leeway and time to dedicate himself to completing such a challenging project that he might not be afforded with corporate ownership business models. Cooper also notes that while he initially spent a good bit of time working on the SAF-T-COOL Enviro 485 project in the previous lab, the new advanced lab enabled him to make multiple improvements to the formula in a much shorter amount of time.

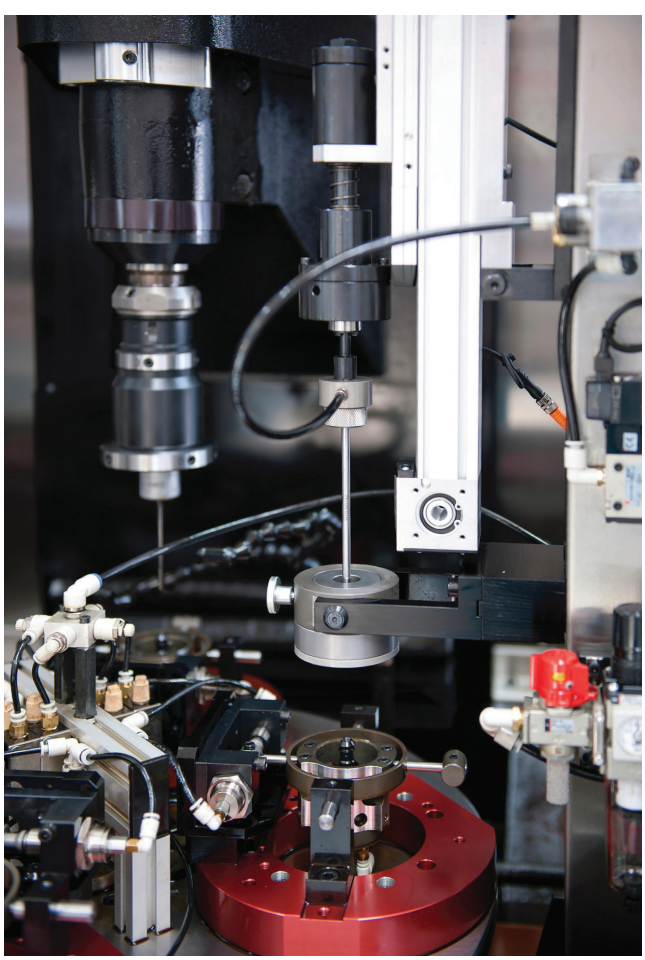
Prince notes that to ensure a successful market introduction and long-term product support, final development and commercialization activities are still underway. He says commercial production quantities are anticipated to be available in early 2027. **PM**

| Tower Metalworking Fluids • towermwf.com

Building Process Intelligence Into Honing Operations

Honing is a highly precise sizing and finishing operation in which a revolving tool (mandrel), fitted with abrasives, strokes in and out of a bore. During the process, the abrasives are expanded, removing minute amounts of material to bring the hole to its proper size and finish. The resulting finish consists of microscopic peaks and valleys arranged in a crisscross or "crosshatch" pattern. The valleys enable oil retention between mating components during operation, such as pistons within an engine cylinder.

However, Gunter Peersman, global distributor and sales manager for Sunnen Products Co. in Europe, says honing rarely commands the same attention as milling, turning, grinding and robotics. Yet in many precision applications, it might be one of the most consequential processes in the production chain, affecting part performance, throughput, quality and cost in ways that are often disproportionate to its relatively narrow place in the machine tool world.



Peersman expands on this in a recent article he wrote in which he explained how that disconnect exists partly because honing is specialized. It remains a niche process, rarely emphasized in formal engineering education, yet is increasingly essential as industries demand tighter tolerances, better bore geometry and more engineered surface finishes. In many applications, the bore is not just another feature — it is central to how the part performs in the field.

For instance, in hydraulic cylinders, it affects sealing and leakage. In engine cylinders, it affects lubrication retention and wear. And in aerospace and medical applications, it can directly affect reliability, friction and service life, making the bore a functional performance surface rather than just a machined dimension.

Honing also carries unusual operational weight because it often occurs late in the manufacturing process after significant value has already been added through material, machining, labor and scheduling, he notes. By that stage of manufacturing, inefficiencies are amplified and mistakes become expensive, making honing far more than just a finishing operation.

That reality changes how honing should be viewed, Peersman believes. Rather than a straightforward machine purchase, it is better understood as a precision-critical process that deserves strategic planning from the outset, because the decisions made before honing begins often determine how efficiently and consistently it will perform.

Therein lies the value of establishing strategic, smart honing processes. For example, he says that approach can maximize labor efficiency. Traditional honing depended heavily on operator experience. Skilled operators understood abrasive behavior, stock-removal patterns, tooling wear and the subtle adjustments needed to maintain bore geometry throughout the cycle. That expertise remains important, but modern honing systems increasingly embed much of that process knowledge directly into the machine.

← **Modern automation has accelerated honing performance and efficiency through automatic correction, load sensing, wear compensation and integrated process control. But those technologies create the most value when they are part of a larger process strategy.** Source (all photos): Sunnen Products Co.



← This SV-3015 vertical honing machine with an integrated air-gaging column is said to combine advanced automation and application flexibility to address a wide range of bore sizing and finishing requirements.

Advanced honing systems now use automatic geometry correction. This is one of the most important advances in modern honing, Peersman explains, because it addresses one of the process's traditional inefficiencies: manual correction during the cycle. As the machine senses load changes and bore conditions, it can make real-time corrections for taper, waviness, while maintaining process continuity. (Roundness correction is achieved by the tool geometry itself rather than by the auto-correction software.)

That improves cycle efficiency in practical ways. Fewer interruptions shorten cycle times, improve machine utilization and increase output per shift. In high-volume environments, even small reductions in cycle time can create significant throughput gains over the life of the machine.

In addition, modern honing process controls reduce that variability by continuously monitoring tool load, managing stone expansion and compensating for abrasive wear. These actions create more stable process conditions from part to part and shift to shift, improving both bore quality and operational reliability.

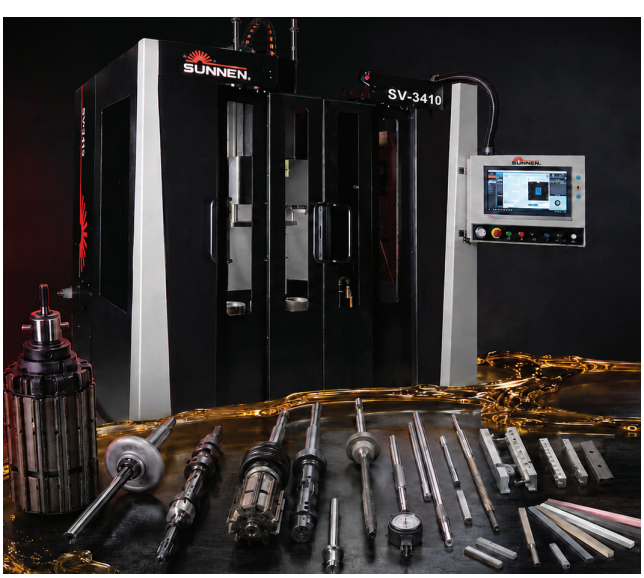
This stability improves more than the finished part. It improves confidence in production planning because cycle times become more predictable, process capability becomes more stable and delivery schedules become easier to maintain.

He points out that modern systems can also store job programs, tooling parameters and machine settings for repeat jobs, reducing setup time and making expertise more repeatable across operators and production runs. Peersman says that might be one of the most important advances in honing today: The machine is no longer just running the process, but actively helping manage it. In that respect, these systems do far more than automate motion. They actively manage the process itself, embedding process intelligence into the machine and reducing the need for constant operator intervention.

The result is not just labor savings but also better labor utilization. When the machine handles more of the process itself, the operator spends less time monitoring the cycle and more time preparing setups, inspecting parts or supporting adjacent operations. In many production environments, this enables one operator to support multiple machines or stages of production.

Peersman says a more capable machine might require a larger initial investment. But if it absorbs growth, shortens cycle times or reduces labor dependency, it often creates stronger operational value over its working life. He believes that is one of the most overlooked aspects of strategic honing machine selection. **PM**

↓ A strategic honing solution includes far more than the machine itself. Tooling affects contact stability and expansion behavior. Abrasives affect stock-removal rates and finish quality. Fluids affect lubrication, cooling and swarf evacuation. Gaging affects process verification and feedback.



| Sunnen Products Co. • sunnen.com

CONTRIBUTED BY **STEPHEN P. BIRMAN, PH.D.**

Turning Measurement Into Machining Control

In many shops, machining and inspection still function as separate activities. Parts are cut, measured, documented and accepted or rejected, but the information becomes paperwork with no control value. The result is familiar on the shop floor: repeated setup corrections, excess inspection, conservative process settings, unstable production and reliance on trial-and-error adjustment.

The limitation is rarely the measuring device. Modern CMMs, gages and vision systems can deliver high accuracy. The real limitation is that measurement is treated as a reporting function instead of a control input. Values are created, but they are not tied directly to the cutting tool, operation or machining condition that produced them. Without that linkage, even high-quality data has limited control significance.

Micronite, an industry-grade software system from High Tech Research Inc., removes that limitation. It embeds validated measurement into the machining loop, connects dimensional change directly to the responsible tool and operation, and converts inspection data into a continuous control model. Instead of waiting for defects, the system evaluates process dynamics during production and calls for action where high-rate trend and variation begins. This addresses the root cause: inspection without process linkage.

In conventional workflows, operators are expected to evaluate a large number of characteristics within a short period of time. Practical human capability is limited, often producing incomplete or poor judgment. At the same time, machining is a continuous, evolving process in which each measurement is part of a connected sequence. However, decisions are typically based on the most recent data point, not on recognition of complex process patterns. When run charts are used, the underlying trend and variation follow mathematical patterns — often stepwise and tool-driven — that cannot be reliably interpreted by visual interpretation. The result is not control, but fragmented reaction. The root cause is not identified: human interpretation cannot resolve high-density, time-dependent measurement into correct, real-time machining actions.

With Micronite, each measurement becomes part of a time-connected data stream tracking turning and milling processes across sequential operations. Instead of isolated inspection events, the process is represented as an evolving condition updated with each result. This removes the gap between data and action and enables correction before nonconformance spreads.

Trend and Variation Starts at the Tool

Dimensional variation originates at the tool under influence of geometry, wear, workpiece machinability, cutting conditions, offsets, fixturing, toolpath dynamics and other variables. Conventional control treats dimensions independently, even when multiple features are driven by the same cutting source. This masks real sources of trend and variation. Micronite aligns control with tool-workpiece mechanics. Each measured characteristic is linked to the cutting tool and operation that generates it. Features influenced by the same tool are evaluated collectively, revealing correlated movement. The true control point becomes clear: the tool, chip formation and workpiece interaction. Offset changes, wear progression, replacement events and setup conditions all determine machining performance. Each intervention creates a new process condition and process profile.

Micronite tracks tool condition, offsets, wear and replacement within a predictive tool-simulated model. The



↑ **Shops do not need more data. They need data that drives action at the machine tool. Start by evaluating these three questions: Are measurement results directly linked to the tool and operation that generated them? Do different measurement systems produce consistent, qualified data for the same part? Do operators receive clear, standardized actions or must they interpret charts under time pressure?**

Source (all images, except where noted): Wiscon Products



↑ Effective machining process control requires validated measurement, linkage to tooling, continuity across operations and decision logic that drives action.

process is not assumed to repeat after intervention. It is measured, qualified and controlled as it actually emerges.

Measurement Variability as a Control Risk

Stable machining can still generate unjustified decisions if measurement is not controlled. In the case of a CMM, calibration confirms repeatability within a configuration, but it does not ensure agreement across different CMMs, probes, setups or fixtures. Systematic differences between instruments can create false alerts. A shift detected on one system might not exist on another. Corrections based on unqualified data can introduce error rather than remove it.

Micronite addresses this by qualifying measurement before it enters the control model. Differences between instruments and configurations are identified and quantified. Only validated data is used for decision-making. Measurement accuracy, precision and interoperability become a controlled layer of the process, not an assumed reference. Isolated operations become a job control chain.

For example, most parts pass through multiple operations, yet control is typically applied locally. Op10, op20 and op30 are often managed independently, with inspection data fragmented across operations. Problems detected in later stages are frequently corrected downstream even when they originated upstream.

Micronite connects operations into a continuous control chain. Measurement, tooling and process data are digitally linked across the entire job-defined control chain. Deviations are traced back to the originating operation and tool. Corrections are applied at the source, not at the point of detection. This reduces the probability of defects and eliminates recurring problems.

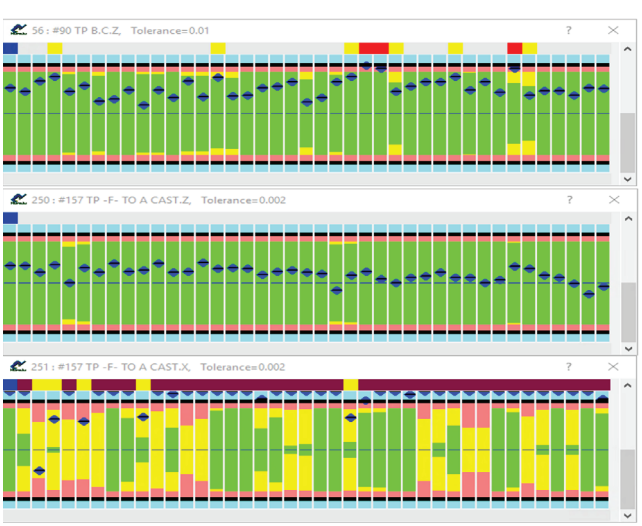
Consistent Decisions and Traceable Actions

On the shop floor, identical data can lead to different operator decisions. One operator adjusts early, another waits and still another acts on the wrong variable. The issue is not experience. It is the absence of consistent guide to action decisions.

At the operator workstation, data is already validated by Micronite and linked to the process. The system evaluates the pattern and issues direct guidance: continue, adjust, change tool or stop. These decisions are based on process profile over time, not isolated measurements. Each action or tool change is recorded with the reason, with optional additions such as tool wear modes/failures, quality FMEA and resulting measurements. It creates a traceable link between action and outcome. Process control becomes consistent across operators, machines and shifts. And predictive control replaces reaction.

While traditional statistical process control/pre-control reacts after variation exceeds limits, Micronite operates differently. AI-based machining models evaluate stepwise process direction, local trend rate and the estimated

↓ With Micronite, AI-based machining models evaluate stepwise process direction, local trend rate and the estimated probability of defects before next inspection. Each measurement updates the current machining state creating a closed-loop system in which decisions are continuously confirmed in production. Source: HTR-Micronite





↑ Micronite embeds validated measurement into the machining loop, connects dimensional change directly to the responsible tool and operation and converts inspection data into a continuous control model.

probability of defects before next inspection. Each measurement updates the current machining state creating a closed-loop system in which decisions are continuously confirmed in production. Reactive systems describe what happened. Predictive control determines what should happen next. That distinction defines whether a process remains stable or needs correction.

Operational Impact: Control Drives Efficiency

When measurement becomes a true control input, operational improvements follow directly. Inspection frequency decreases because process stability is continuously verified. Inspection shifts from repetitive checking to targeted quality confirmation. CMM time is reduced as inspection aligns with stable process capability.

In addition, tool management improves. Tools are controlled based on performance instead of fixed replacement intervals. Stable tools remain in process longer, while unstable tools are identified early. Offset adjustments are applied based on validated process patterns.

Plus, machining efficiency increases. The process avoids unnecessary corrections, reduces drift, limits downstream compensation and minimizes scrap and rework. Inspection transitions from a cost center into a production asset.

Use Inspection as the Process Control Engine

Although the machining industry has focused on measurement accuracy for decades, accuracy alone does not produce control. Effective control requires validated measurement, linkage to tooling, continuity across operations and decision logic that drives action during production.

Micronite can establish this framework. It integrates inspection into machining control, connects variation to its source, qualifies measurement before action and records every intervention within the production cycle. Inspection is no longer the endpoint of production. It becomes the entry point for control. Quality is not verified after machining — it is maintained during machining as a controlled and traceable outcome.

Case In Point: Wiscon Products

Jennifer Rovinski is quality manager for Wiscon Products, a Racine, Wisconsin, machine shop with production equipment including CNC multispindles, multitask turning centers and HMCs. She has found Micronite to be a valuable quality management tool that helps prevent issues before they become problems.

Rovinski explains that one of its greatest strengths is its ability to provide multiple warnings when parts begin trending out of specification, enabling corrective action to be taken early while reducing the risk of nonconforming products. She says the software makes data retrieval simple, with filtering options that enable users to analyze results by a variety of criteria and identify which features require attention and which processes remain stable.

In addition, creating balloon drawings and inspection plans is straightforward and efficient, significantly reducing setup time for new projects, Rovinski says. She also appreciates Micronite's tool-life monitoring capabilities, making it easy to analyze wear trends and optimize tooling decisions. In addition, Rovinski finds the interface to be intuitive and user-friendly for operators of all experience levels, and data from external measurement systems, such as CMMs and vision systems, uploads quickly and seamlessly. PM

| High Tech Research Inc. • htrmicronite.com

ABOUT THE AUTHOR:

Stephen P. Birman, Ph.D., is founder and president of High Tech Research Inc.

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PRODUCTION Machining EMERGING LEADERS 2026

EMERGING LEADERS

Who Lead by Example



This year's group of Emerging Leaders honorees not only lead by example, but also share what they've learned along the way with others.

Who are *Production Machining*'s "Emerging Leaders?" They are individuals, under the age of 40, who face — and even welcome — challenges head-on. Many have transformed the companies at which they are employed, making these businesses more competitive, efficient, organized and overall better places to work.

Those in this year's group of Emerging Leaders come from different backgrounds and set out on their manufacturing careers in different ways. But with this group, one theme stands out. That is, they all lead by example and share what they've learned along the way with others. They all understand that collaboration, communication and team building are imperative to establishing a healthy business culture.

In what follows, it's easy to see why their nominators chose to promote them for our 2026 Emerging Leaders program.

Tyler Beal

President Jayme Rahz of Wooster, Ohio-based job shop Midway Swiss Turn, nominated her shop's general manager, Tyler Beal, as an Emerging Leader after only two and a half years of him working there. "He is already making a measurable impact on our company while continuing to grow into the kind of leader our industry needs," Rahz says, citing his work coaching employees as the shop undertakes new and more complicated tasks, leading the way on shopfloor process improvements, and reinforcing a strong shop culture focused on open communication channels.

Beal picked up the basics of machining from an early age, learning from his uncle, a tool and die machinist for General Motors. After majoring in supply chain and information systems in college, Beal worked jobs as an inventory specialist and machine components buyer until he joined a job shop as an outsourcing specialist. This role gave him insight across the shop, familiarizing him with the importance of each task and area within the company. To this day, he would advise that anyone coming into the industry aim to understand even the least glamorous roles in the shop like sweeping floors or washing parts. At the end of the day, these roles led Beal to a better understanding of everything's importance to smooth operations and profitability.

Beal arrived at Midway Swiss Turn as a business development and supply chain specialist, but swiftly took on more responsibility. "I was the business development person, I was the general manager and I was the quality person," he says, and he had the skills to handle all of these to a degree. What has proved useful to Midway Swiss Turn as the shop grows is Beal's efforts to develop a structure for each of these roles. Over the past year and a half, he has been able to hand off these titles to people within the shop after



The sharing of information and focus on transparency is at the heart of what Tyler Beal (right) wants out of a company culture. Source: Midway Swiss Turn

"Tyler has remained focused on making sure our people grow along with the business." – Jayme Rahz, president, Midway Swiss Turn

coaching and teaching.

"Tyler has remained focused on making sure our people grow along with the business," Rahz says, something that the shop has needed after it saw an influx of jobs after being named a 2025 *Modern Machine Shop* Top Shop. She continues, "Rather than simply solving problems himself, he works alongside people, asks questions, shares knowledge and builds the confidence they need to solve the next problem on their own."

This sharing of information and focus on transparency is at the heart of what Beal wants out of a company culture, as well. He says that he wants to be open so his teammates can understand why the shop operates the way it does, and so that they can offer considered feedback as a result. He says the shop implements numerous ideas from employees, so making sure staff members are on the same page and asking the right questions is vital.

Going forward, Beal says his career goals focus less on titles than on the project of making Midway Swiss Turn among the highest-regarded employers in the field. Key to this, he thinks, is culture, and so he wants to foster the same successful, personal growth-oriented shop culture Midway Swiss Turn has now as when it has triple the number of employees.

Owen Larson

Since joining Tempe, Arizona's Benchmark Precision Technologies in May 2021, Owen Larson has rapidly advanced from buyer to planning manager. But that's just one reason why Michael Gresen, plant manager, nominated Larson to be one of this year's Emerging Leaders.

"Starting in purchasing, Owen built his foundation with improving parts availability to the floor by working with the programs team and production," Gresen explains. "He then transitioned to program management, which enabled him to obtain a deeper understanding of how customers shape our industry. After being successful there, Owen moved back to supply chain as the master scheduler and quickly was promoted to planning manager. He has been able to rebuild the master schedule, improving on-time delivery significantly and increasing overall customer satisfaction. And as he has transitioned into a leadership role, he continues to work with his team to develop new leaders here."



↑ **While Owen Larson (left) is very supply-chain focused, he is often walking the shop floor and suggests his team do so as well.** Source: Benchmark Precision Technologies

Larson also is currently concentrating on the scheduling side of the company's new AI-driven manufacturing facility. "Owen has been working with his team to build the framework for all the inputs over the last year to ensure a successful launch as we transition into a new age of manufacturing," Gresen says.

Like some other Emerging Leaders who have been profiled, Larson says he essentially fell into a career in manufacturing. "The passion for supply chain was built from my experiences in college at Arizona State University," he says. There, I had professors who held C-suite or director-level positions at companies including Dell, Intel and PepsiCo. These were real-world

industry professionals teaching us their thought processes through real-world problems they experienced."

Larson graduated during the pandemic and had mulitple offers to start his career. "I chose joining Benchmark as a buyer because I wanted to start out my career in supply chain management in the procurement role," Larson explains. "I wanted to learn as much as possible and kept asking questions. My goal was to learn as fast as I can and continue to learn. The team at Benchmark gave me that opportunity."

Today, Larson handles machining and assembly planning and scheduling for a facility that's quickly adopting new technology. This includes three- and five-axis milling, turning and welding as well as a new automated grinding cell and sheet metal cell. The goal is to become more automated and vertically oriented.

"I preach to my team to get out on the shop floor and talk to the machinists to learn about the problems that they encounter on a daily basis."

– Owen Larson, planning manager, Benchmark Precision Technologies

"This is something we've been planning for some time now," Larson says. "It's great seeing plans come to fruition, but has posed challenges from the planning and scheduling side for all of us, which we are addressing. For instance, how does this new equipment run compared to existing equipment and what's the most efficient way to plan it? Do we need to change the status quo? We're collecting as much data as we can and making data-driven decision."

And while Larson is very supply-chain focused, he is often walking the shop floor and suggests his team do so as well. "I preach to my team to get out on the shop floor and talk to the machinists to learn about the problems that they encounter on a daily basis," he says. "Same on the engineering side. My goal is for everything to run as smoothly as possible. So if I don't understand the daily problems that a machinist goes through, then I'm not going to be able to properly plan for success. I need to gather and sort through all of the information I can to determine our best course of action. I can't do that without all the data."

Dillon Lewis

Mike Carmendy, vice president of engineering at Lyon Manufacturing, says floor lead Dillon Lewis represents the kind of Emerging Leader our industry needs: someone who combines strong technical ability with a genuine willingness to help others succeed.

"Precision manufacturing's next generation of leaders must understand both the traditional skills that built our industry and the automation and technology shaping its future," he says. "Dillon bridges those worlds. He can set up and troubleshoot an Acme Gridley screw machine while also helping diagnose a robotic machining cell. Just as importantly, he passes that knowledge on to others."

"I always liked working with my hands and tinkering," Lewis says. "I do something once, figure it out and continue to grow from there."

Early on, the career path options as he saw it were college, the military or manufacturing. Lewis chose manufacturing, moved three hours away from home and joined Lyon Manufacturing located in Canton, Michigan.

His first role there was a CNC machine tool operator — a good start, but essentially a button pusher, as Lewis

↓ **Dillon Lewis (right) took the lead when the shop began adding machining automation technology, which has been one of his most significant contributions at Lyon Manufacturing to date.** Source: Lyon Manufacturing



"Precision manufacturing's next generation of leaders must understand both the traditional skills that built our industry and the automation and technology shaping its future." – Mike Carmendy, vice president of engineering, Lyon Manufacturing

describes. After a month and a half, though, he knew he needed to take on more responsibilities.

For example, the company's screw machine department gained a big customer and needed operators for those legacy machines. Lewis stepped up to learn how to run them. In fact, he took it upon himself to figure out how to refurbish an Acme Gridley that was retrofitted in the 1980's with a PLC. "Even though nobody told me to, I gutted it and completely rewired it, and now it runs like it originally did," he says.

Lewis also took the lead when the shop began adding machining automation technology, and Carmendy says this has been one of his most significant contributions to date. "As we implemented robotic machining cells, Dillon stepped forward and learned to troubleshoot the robots and associated equipment when few others were willing to take on that responsibility," Carmendy explains. "Rather than viewing automation as someone else's problem, he took ownership of understanding the technology and helping make it successful on the production floor."

"I don't ever want to stop learning," Lewis says. "I want to take the lead on whatever project comes up."

Carmendy says what distinguishes Dillon most is his approach to leadership. "He does not limit himself to the responsibilities of his own position," Carmendy explains. "When an operator needs help, a machine has a problem, quality identifies an issue, or engineering needs assistance implementing a process, Dillon gets involved. He shares what he knows, works through problems with others, and is respected because he is consistently willing to help."

It's clear Lewis leads by example when taking on new projects even if not asked to, and, just as importantly, he shares what he's learned along the way as any good leader would. Carmendy says he trains new employees, troubleshoots machines, supports operators and works directly with quality and engineering to resolve manufacturing problems. His leadership is practical and hands-on: when something needs to be learned, solved or improved, Lewis gets involved and then helps others understand it as well.

"Dillon isn't merely the person who knows how to fix things," Carmendy concludes. "He is becoming the person others turn to when they need help."

Savannah Smucker

In his nomination of SpiTrex MDI Vice President of Operations Savannah Smucker for *Production Machining*'s Emerging Leaders, the company's director of milling and programming, Ted Force, cited a number of business metrics. These include increasing sales by more than 100%, an on-time delivery rate of more than 98%, and being recognized as the number one supplier by the company's largest customer for four years running. But he says her contributions to the company's culture are more impactful.

"While these business achievements are significant, Savannah's greatest accomplishment has been the culture she has built within our organization," he says. "She has fostered an environment where employees are encouraged to learn, grow and succeed. She has



→ **One of Savannah Smucker's greatest accomplishments has been the culture she has built within her organization, fostering an environment where employees are encouraged to learn, grow and succeed.** Source: SpiTrex MDI

strengthened collaboration and created a workplace where people feel valued and empowered."

Smucker is the fourth generation in her family to work in precision machining, growing up in her family's medical device manufacturing shop. "One of my fondest memories from working in my parent's shop was when I asked an inspector to teach me how to use a micrometer for the first time, so I could help check parts," she reminisces. "I also specifically remember working with my younger sister to assist the packaging department in packing bent tips for a dental customer. I always loved the feeling of being part of the team, even as a young kid."

"[Savannah] has fostered an environment where employees are encouraged to learn, grow and succeed. She has strengthened collaboration and created a workplace where people feel valued and empowered." – Ted Force, director of milling and programming, SpiTrex MDI

After earning a psychology degree and working for a short time in public health, Smucker returned to the family business to serve as an assistant to her grandmother, who was the company's vice president and head of sales and marketing, where she fell in love with the business and industry. Determined to stick around, Smucker knew she would need experience on the shop floor. "I saw an opening for a second shift wire EDM operator position and I took it," she says. "I did not tell my dad. I did not tell my grandmother. I just went for it."

Smucker eventually moved into business development, sales and marketing before finding her way into operations. "I realized that I wanted to be close to where everything was actually happening," she says. "I loved being on the shop floor, being alongside the team, solving problems and seeing firsthand how the decisions we made impacted our people, our customers and the business." Smucker was drawn to the culture, which felt more like a family than workplace.

"Manufacturing is hard work, it's fast-paced, things change constantly and there are always problems to solve, but we work hard and have a lot of fun doing it," she says. "At MDI, when you join our team, you become part of a family. You're not just coming to work for a company; you are becoming part of something we are all building together."

Smucker says she has had a number of role models and mentors in her life that supported her throughout her career, starting with her grandmother, Mary Burton. "She was a machinist herself," she says. "She always encouraged me and told me to never give up."

The list also includes her Emerging Leaders nominator, Force. "He has been in the industry 40-plus years," she says. "He has taught me so much about the industry and where this career could take me. He's watched me grow through all of my roles in the last nine years and he has cheered me on every step of the way." She also cites the influence of her father, Ed Burton. "He is one of the hardest working people I know" she notes. "From the time I was young, I saw his grit and determination to make something great, even through challenging times. He taught me that success isn't defined by the easy seasons, but by how you lead through the difficult ones. I hope I can carry on my dad's legacy with the same grit and determination he showed throughout his career."

Eric Van Orden

Paramount Machine's Area Lead Eric Van Orden is no stranger to the pages of *Production Machining*. Editor-in-Chief Derek Korn wrote about the shop and his efforts to optimize its Swiss-type equipment in various ways such that they could accommodate batch sizes down to five pieces. So it's no surprise that Art Santana, company operations manager, nominated him for this year's Emerging Leaders program.

"Eric is the ultimate analytical machinist. If it does not make sense, he will dig until it does in order to machine the best part possible." – Art Santana, operations manager, Paramount Machine

"Eric is the ultimate analytical machinist," Santana says. "If it does not make sense, he will dig until it does in order to machine the best part possible. He does not stop because the challenge is too difficult. That is when



↑ Eric Van Orden (left) has relied on those he has trained to train others. He says that helps reinforce what they've learned by being able to have to explain it back.
Source: Paramount Machine

Eric gets everyone involved so the problem becomes the solution and everyone has a chance to offer input."

Salt Lake City's Paramount Machine was started by Eric's father, Steve, but it wasn't a foregone conclusion that Eric would join the family business. "I wanted to get my master's in business and then a law degree, he says. "In my mind, that would be kind of a lethal combination enabling me to basically do anything I wanted career-wise if I had them."

At that time, he was working for American Express and figured he'd get those degrees, climb the corporate ladder and see where it all took him. "But after some reflection, I thought if I run a machine and work hard to learn a trade, I think I'll be just as happy and successful," he says. "And the people in the shop who were in their 20's — just six or so years older than me — certainly seemed happy and also had nice houses and 'toys' like trucks and four-wheelers. So I called my dad and after a few weeks, he found a spot for me."

Van Orden didn't start at the top. His first duties included hand finishing aluminum parts. Today, though, he performs a part of the company's machine programming, manages the shop's in-house tool management system/database, works with vendors and suppliers relative to tooling issues and more.

"It's funny, though, that others come up to me with a problem and start by saying, 'Hey, sorry, I know you're busy and I hate to interrupt you.' But what I like to tell them is that one of the biggest parts of my job description is to be interruptible," he says.

So a more appropriate company title for him might be "problem solver."

Van Orden is also involved in training. "I have a few people who I've trained and have since relied on them to help with training," he explains. "That helps reinforce what they've learned by being able to have to explain it back. If there are more technical or harder questions being asked, they'll typically come to me and we'll go over it all together."

"Making parts that have no round features on Swiss-types? That's Eric," Santana says. "Titanium parts that are paper thin? Him, too. But the best part of all is he keeps no secrets. He makes sure the entire team knows how it was done so they can put that knowledge to use on future projects."

Santana also notes that more than one fourth of the 85-person workforce at Paramount Machine is under 28 years old. "This could have not been possible without the help of trainers such as Eric," he says. PM



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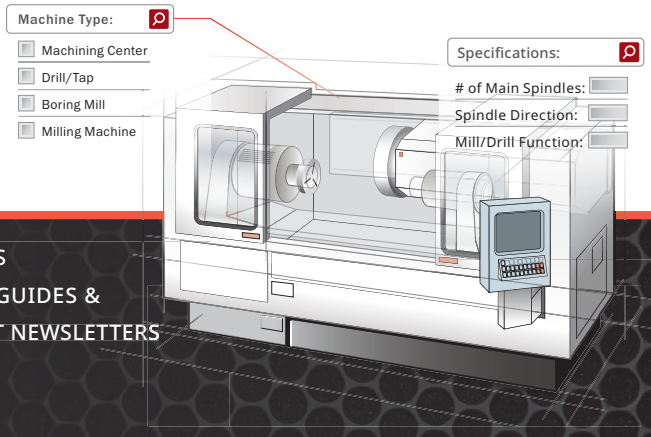
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CONTRIBUTED BY JULIA HIDER

Automated Single-Piece Workflow Revolutionizes Implant Manufacturing

A platform enabling automation of lot sizes as small as one part is helping Mach Medical on its mission for just-in-time orthopedic implant manufacturing.



↑ Mach Medical is a startup medical contract manufacturer that was founded to address the challenges of the orthopedic implant industry, including inventory management. Companies that sell implants generally carry 12 months of inventory, much of which is in transit between hospitals and warehouses.

Source (all photos): *MMS*

Orthopedic implant companies face many challenges, but one of the biggest is inventory management. These companies (and the companies that manufacture the products they sell) must navigate how to produce a wide range of implant types, variants and sizes cost effectively, and then manage that inventory as it moves back and forth between warehouses and hospitals. This equates to high inventory requirements that can drain a company's resources.

Mach Medical is an orthopedic implant contract manufacturer that was founded to address some of the challenges facing orthopedic implant OEMs, including inventory, using advanced manufacturing and automation.

Inventory Control

By nature of their work, orthopedic implant companies generally carry 12 months of inventory to service customers, explains Dave Anderson, co-founder and business development leader at Mach Medical. "A product gets used in surgery and the hospital needs replenishment right away, or they may need six of the same size on the shelf in case they have two or three or four patients stacked up that day that are all going to need a knee for the left side in Size 5."

Further complicating matters is that the inventory is always in motion. According to Mach Medical Co-Founder and General Manager Steve Rozow, orthopedic implants are kind of like shoes — they come in multiple types and sizes. When people want a new pair of shoes, they might go to a shoe store, which stocks each shoe style in multiple sizes for customers to try on. But patients who need orthopedic implants can't go to a store to try different implants. The store (or a predetermined subset of it) needs to come to the patient in the hospital's operating room. Surgeons have an idea of which size implant a patient will need before surgery, but they often have multiple options available in the operating room so they can choose the best fit at the time of the operation, or duplicates in case an implant gets contaminated. Then unused inventory gets sent back, and the used stock is replenished. "That inventory is constantly moving around and supporting surgeries, or maybe camped at a hospital, if the hospital is a high-volume hospital," he says. At least 50% of the manufacturer's inventory is either at a hospital or in transit at any given time. "In order for orthopedic manufacturers to add customers, a lot of times, they have to add that inventory footprint in order to serve those customers," he continues.

The challenges of manufacturing families of parts make inventory management even more complex. "There are minimum order quantities associated with manufacturing that are driven largely by machine setup time," Anderson says. "Let's say you take eight hours to set up a machine to run one SKU. You want to run as many of those parts as you can so you can get a decent per-unit cost before you tear the machine down." But certain SKUs are used more often than others. For sizes that are on the larger and smaller ends of the bell curve of human sizes, if a manufacturer is "making 20 or 50 of an individual SKU, that might be five to 10 years' worth of inventory," he explains. "That's going to sit."

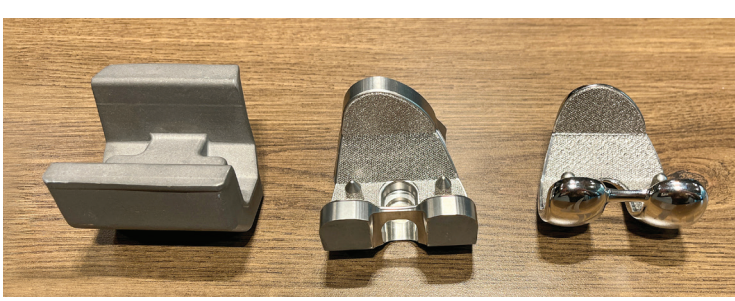
Starting With Standardization

One way Mach Medical tackles these challenges is by standardizing production processes as much as possible. For example, instead of procuring different castings for different implants and sizes, the company starts with a more generic casting for each implant type. "There's virtually no tool development, and it's just off the shelf," Rozow says. While this might mean implants spend more time on the machine and need more material removed than a more customized casting, the flexibility is worth the trade off. "If there's a design change, or the customer wants to tweak things here and there, it's usually a fairly simple program change," he continues. "To accommodate that, we don't have to have tooling changes, which is where bigger costs add up." He adds that as customers scale up implant production, Mach Medical can switch to a custom casting that's more efficient to machine and more cost-effective.

Just as Mach Medical wants to reduce inventory of final products for its customers, it also works to keep its own inventory of castings and other raw materials lean. "We tend to keep pretty low inventories on those and have arrangements with those companies to flow that to us on a fairly tight, JIT-type basis," Rozow says. Its facility in Columbia City, Indiana, is close enough to its raw material and casting suppliers that they can do "milk runs" twice a week to drop off the material Mach Medical needs for a few days at a time.

The raw material goes through an initial production process. Rozow says this typically includes two machining processes, inspection, cleaning and coating (which happens at Sites Medical, Mach Medical's co-located sister company). At this point, the orthopedic implant is starting to take shape but is still incomplete. From this point, the company can turn the parts into multiple SKUs, such as different sizes or right and left versions. Then, as customers place orders, Mach Medical completes the implants

↓ Mach Medical aims to reduce orthopedic implant makers' inventory burden by producing smaller batches of implants faster. One method to achieve this is a system of "supermarket inventory implants," where a casting (left) is partially finished (middle) in larger batches, then completed (right) as needed.





↑ Automation is key to making implants on demand. Mach Medical's cell features an Okuma five-axis machine, cleaning station and CMM all tied together by the Flexxbotics platform, which enables automated production of batches as small as one part.

through final machining operations where they're cut to the correct size and shape, a cleaning process, inspection, finishing processes, and then a final cleaning.

This "flex lot sizing" system gives Mach Medical the best of both worlds: volumes that can make casting and heat treating more cost-effective, as well as flexibility to handle order volumes as low as one part. It also drastically shortens lead times for customers, from 20 weeks to three. Rozow says flex lot sizing and shorter lead times enable Mach Medical's customers to reduce their warehouse inventory. "They can replenish on a shorter cycle, and they don't have to order those outliers as much," he explains.

Automating Single-Piece Workflow

As Mach Medical's strategy relies on getting parts to customers quickly, automation and lights-out machining is key. However, any automation system the company implements needs to be able to handle production of smaller batches of parts so as not to overwhelm customers (or itself) with inventory. "We can set up an economic order size of 20 or 50 femurs that are all the same SKU and automate that all day long. That's pretty straightforward," Rozow says. "But when you load up with one of SKU X, five of SKU Y and three of SKU Z, that's where the behind-the-scenes software advantage of Flexxbotics comes into play because it accommodates single-piece flow."

Mach Medical's Flexxbotics cell automates initial processing of the partially finished implants into final products — final machining, inspection and a cleaning process. With Mach Medical's varying and potentially small lot sizes, the company needed assurance that the cell was grabbing the correct part and loading the corresponding programs for that part. "We've got to protect against our machine and CMM crashing," Rozow says. Flexxbotics provides a platform that enables all of the components of the cell to communicate with each other, including a vision system. A Universal Robots cobot grabs a part off a staging rack and brings it to the vision system, which confirms via a code on the part that the machine tool has the correct tools and program. After machining on an Okuma five-axis machine, the robot brings the part to an ultrasonic cleaning station for in-process cleaning. Then the robot brings the part back to the vision system, which uses the arbor to confirm the part before moving it to the CMM for inspection. If the CMM detects a nonconformance, it moves that part to one of six spots on a staging rack dedicated to nonconforming parts. If that area fills up, the cell shuts down and notifies an operator. Six slots for nonconforming parts may not seem like a lot, but Rozow sees this as overkill given the company's non-conformance rate is less than 1%.

Despite the wide variety of SKUs that run across the cell, Mach Medical has standardized other components in the cell. "The robot is pretty agnostic to anything we bring in there, because of the standardized tooling," Rozow says. The parts are held on fixtures with a common interface the robot uses to move them through the cell.

Standardization also extends to cutting tools, though Rozow says this is trickier. The company starts with a standardized tooling package for the machine tool but occasionally needs to add specialized tooling for complex features. Because tooling is such a cost-driver, Mach Medical continuously works to optimize tool life. It uses Pareto analysis on manually collected tool life data to determine the next priority for optimization. Flexxbotics also increases tool life, keeps part quality consistent and reduces scrap by facilitating closed-loop adjustment of cutting parameters based on data from the CMM.



↑ Flexxbotics also enables closed-loop adjustment of offsets in the machine tool based on data from the CMM. This helps Mach Medical keep scrap rates below 1% and hold tight tolerances on implants.

Mach Medical is still working on proving out and stabilizing its process before expanding unattended machining. Right now, the cell is set up to run for 36 hours, but the company plans to set up a larger shelving system that will enable it to run for longer stretches. "The other thing we'll do is we'll add another machine in," Rozow says. "Once we have that confidence, we'll slide a machine over." A third machine could also be added to the cell in the future.

Not only is this cell enabling flex lot sizing but it also helps Mach Medical to hold tight tolerances repeatably. According to Rozow, customers generally allow for a 1-mm tolerance, but the company uses less than 25% of that. He believes the company is likely merely ahead of the curve with these tolerances though, and as surgeons switch from manual to more precise and consistent robotic bone prep, tolerances for implants will need to tighten.

Shoulders, Knees and Toes

Mach Medical is initially focusing on knee and ankle implants but is planning to extend this production model to other types of implants, such as hips, spine components or even tibias.

The Flexxbotics cell is a step toward Mach Medical's ultimate goal of creating a just-in-time production model for orthopedic implants. "We can take an order in and deliver it within three weeks. Well, that's usually within the surgery scheduling window for a patient," Anderson points out. Further advancements in pre-operative planning software would enable physicians or physicians' assistants to determine which size implants the patient is likely to need, so Mach Medical can make those parts and ship them to the hospital in time for the surgery. Even if the manufacturer ships multiple implants, Anderson believes this could enable implant companies to reduce their inventories by 85%. "That's hundreds of millions of dollars a year in savings," he says. *PM*

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Director of Technical Services & Industry Affairs



Key Takeaways from IMTS 2026

The biggest takeaway: Technologies such as robotics, AI and simulation, which were once considered novel, have now become standard features of the manufacturing landscape.

Walking the floor at IMTS – The International Manufacturing Technology Show this year, I was struck less by a single breakthrough than by how quickly once novel technologies have become standard features of the manufacturing landscape. Robots are now expected, artificial intelligence is being integrated into nearly everything, and simulation is moving from a futuristic concept into a practical tool. At the same time, the sheer number things to see made the show a daunting project to undertake.

Robots to Open

When I first attended IMTS about 10 years ago, having a robot perform an automated task in a booth created an immediate 'wow' factor. The robot itself was the attraction. Today, it is closer to an opening requirement. Nearly every exhibitor with a practical reason to demonstrate automation had a robot in its booth. That shift says a great deal about how far automation has progressed. Robots are no longer presented primarily as futuristic technology, but as familiar components of a modern production system.

Software and AI Were Everywhere

The next major takeaway was twofold. First, there were more software vendors than I had ever seen at the show. Second, nearly all of them were selling either a directly integrated AI capability or an AI-assisted platform. Many of these tools felt less like entirely new inventions and more like reimagined hammers: still a hammer, but with a different design or a fresh coat of paint.

One demonstration that stood out was from a robotics exhibitor. Its setup used an open-source large language model to translate voice commands into Python code that programmed a robot. The system was fenced into a controlled demonstration, but it was still powerful. A user could tell the robot to stack dice with particular numbers facing up, arrange them by color or knock down a tower it had built, and this was just what we asked it to do. I am sure we could have played all day. The concept made practical use of the direct Python execution available on modern controllers and offered a compelling glimpse of how natural-language interaction could make robot programming more accessible.

A Crowded Software Market, but Few Breakthroughs

Despite the number of vendors and new entrants, I saw very little that felt genuinely new. Nothing delivered the kind of technological leap that stopped me in my tracks. In fact, much of the software looked and sounded the same.

Enterprise resource planning (ERP) systems were a clear example. The platforms differed in presentation and feature packaging, but most appeared to perform essentially the same core functions. There were many capable vendors and solid solutions, yet few ideas that felt novel enough to define the next major leap. ERP software increasingly looks like a crowded and mature market.

CAM May Be the Exception

The area most likely to experience real transformation is CAM software. I have never been a consistent CAM user, because it has often felt slow and cumbersome for my purposes. In milling, however, many parts simply cannot be programmed without advanced CAM capabilities. I could see evidence of meaningful evolution in that space, although I am not a frequent enough user to judge where the biggest leaps have occurred. The largest changes in CAM from my perspective were simulation. Several companies are developing advanced simulations into their products, allowing real world tests to be tried digitally before tying up machine time and our performers' time.

Simulation Is Becoming Practical

Simulation may be the development with the greatest long-term potential. Companies are beginning to use game



engines to train machines and robots through repeated tasks in a digital environment. Before the equipment is introduced to the real-world job, the virtual system can complete millions of cycles, identify problems and work through many of the initial pain points.

Only a few years ago, this approach seemed almost like science fiction. Companies talked about digital twins and virtual training, but the technology did not yet feel mainstream or accessible enough for shops to incorporate into their internal workflows. At IMTS, I saw companies using tools such as Unreal Engine 5 to simulate jobs and train automation systems. That transition from an ambitious concept to a usable workflow may prove more consequential than many of the louder AI claims on the show floor. I was able to play with a robot training simulator that allowed me to drive multiple robots in a complex assembly line operation. I think this may be the key takeaway for the year for both training our performers and for greater system reliability.

The Bigger Picture

My biggest takeaway from IMTS 2026 was not that one technology had suddenly changed manufacturing; it was that several technologies once considered exceptional have become expected. Robots are now ubiquitous. AI is becoming a standard part of the software pitch. Simulation is moving into real production workflows. The challenge for manufacturers evaluating these solutions is to distinguish meaningful capability from familiar tools presented in new packaging. The next great leap may not arrive with the biggest booth or the boldest claim. It may come from the companies that turn these increasingly common technologies into solutions that are genuinely easier to use, easier to integrate and more valuable on the shop floor.

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EMILY RILEY
Executive Director



What Strong Precision Machining Leaders Do Differently in 2026

Tanya DiSalvo, president of the PMPA and president and CEO of Criterion Precision Machining, shares her perspective after visiting with over 50 manufacturing facilities across the U.S.

What separates a strong precision machining company from one that simply has good equipment? After visiting more than 50 facilities across the country, Tanya DiSalvo has had a opportunity to crystallize the answer firsthand.

As president of the Precision Machined Products Association (PMPA) and president and CEO of Criterion Precision Machining, Tanya brings an industry-wide perspective on the practical experience of leading a precision machining business. With 28 years in the industry, an extended tenure as PMPA president and more than 50 manufacturing site visits, she has gained perspective shaped by member-to-member conversations and shared insights. She recently took time from her hectic schedule to share with me how that experience in the last year shaped her outlook on leadership, culture and process, and what it takes to build a stronger precision machining company.

Her first point is simple: great shops are process driven. A new building, more floor space or another piece of automation will not correct a weak process. As Tanya puts it, "You cannot automate chaos." Whether the opportunity is robotics, inspection automation or better use of existing equipment, disciplined processes must come first. That same discipline applies beyond the machine tool. Business processes, work instructions and clear expectations help an organization operate without every decision flowing back to the owner.



That matters even more as shops face pressure on margins from material, tooling, wages and outside services. Tanya believes leaders must know their costs, understand customer concentration and protect the capacity needed to serve a mix of business. She still remembers the quiet of Criterion's shop during the 2008-2010 downturn, when over-dependence on a limited customer base made the risk unmistakable. That experience continues to shape how she thinks about diversification and resilience.

Yet her strongest message is about people. "People drive culture, and culture drives performance," Tanya says. Retention, communication and leadership development are operating priorities. She describes "cascading communication" as essential and notes that "people want to be in the know." Leaders should understand the mission, know what information their teams need and communicate it consistently, so employees feel informed, trusted and connected to the work.

Continuous improvement, in Tanya's view, also requires creating room to learn. When something goes wrong, the response should be to understand what happened, document the lesson, improve the process and make that learning available to others so the same issue is not repeated. As she explains, an expensive mistake should become a corrective action and a better process.

For leaders looking ahead, Tanya leaves three questions worth considering: Is your leadership team clear on what it is responsible for? Does everyone understand the company's mission and goals? And what are you holding on to — a process, piece of equipment, customer or responsibility — that may no longer serve the business?

Across 50-plus shop visits, the common thread is not a single technology. It is leadership grounded in people, process, communication and discipline to keep improving. P

Emily Riley, MAT, MBA is the PMPA executive director with over 20 years of experience in supply chain management, R&D leadership, operations, innovation and product development and education.
Email: **eriley@pmpa.org** — Website: **pmpa.org**

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Director of Communications & Events



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Speaking Of Precision Podcast

- Speaking of When Automation Makes Sense
- Speaking of Scrap
- Speaking of All Things IT with Alec Martinak
- Speaking of Tolerances
- Speaking of Data Centers: Separating the Facts from the Headlines with Michael Vay
- Speaking of Sustaining 5S
- Speaking of Threading Fundamentals
- Speaking of The Cloud

ListServe Communities Topics

Have a specific question or challenge? PMPA's ListServes — Technical, Quality, HR, IT and Corporate — let you tap into the right community of peers who've been there, solved that! Here are the top conversations in the Listserve Community last month:

- TECHNICAL: **Thread calculators:** Members shared alternatives to the discontinued ME ThreadPal tool
- TECHNICAL: **Carbide costs:** A sharp increase in carbide prices prompted discussion of tungsten supply, demand and options for recycling carbide scrap
- TECHNICAL: **Software Recommendation:** Member looking for beginner-friendly CAD tools
- TECHNICAL: **XRF Analyzer:** Members compared XRF analyzers for identifying older stock and discussed their usefulness for sorting nonferrous metals and their limits with certain steel grades
- TECHNICAL: **Supplier Needed!** Member looking for high quanities of stainless steel.

Interested in Membership? Email Harry Centa at hcenta@pmpa.org

Past Events

PMPA Southern California Chapter 2026 President's Roundtable



PMPA Indiana/Southern Ohio Chapter President's Roundtable



PMPA Southeast Michigan Chapter 2026 Golf Outing



PMPA Eastern New England & Connecticut 2026 Suppliers Expo and President's Roundtable







DAVID WYNN
Director of Technical Services & Industry Affairs

CRAFTSMAN #152
CRIBSHEET

Make the Best of a Trade Show Day

With a focus on precision-machined parts, PMTS brings the industry together to explore technology, share challenges and find potential solutions for the shop. Start thinking now about what you want to accomplish when you get there.

We go to trade shows to look at all the new toys, learn what is new and catch up with people in the industry. We often get through the doors and get overwhelmed by it all. A very large show can pull us in many directions, and we need to maximize that time, especially if we only have a day to accomplish our goals.

The Precision Machining Technology Show (PMTS), taking place May 4-6, 2027, at the Huntington Convention Center of Cleveland, is an opportunity to put these ideas into practice. With a focus on precision-machined parts, PMTS brings our industry together to explore technology, share challenges and find potential solutions for the shop. Start thinking now about what you want to accomplish when you get there.

Have a Goal

Go to the show with goals in mind. What do you want to accomplish? No matter how dialed in its processes are, a shop always has room for improvement. Figure out what problems need to be solved, and use the show as an opportunity to solve those problems. Find new technologies, tooling, software, procedures, machines or anything that could offer a potential solution.

Take Time to Learn New Things

Set time aside to go and explore in areas you might not otherwise go. Look into areas that are not part of your job function. Seeing potential solutions to problems not in your primary function provides a unique perspective. When a person's primary role is production, they will have a unique perspective on quality, for instance. Wandering a around a little might even spur new production ideas.

Build Connections

No matter how much time we spend honing our skills, we cannot know everything. Someone who has a Rolodex of people (phone contacts, for those under 40) can solve problems faster. They often find the best solutions because they know the experts in subject matter. Next to associations like PMPA (we have a very active listserv), a trade show is a great place to increase your contacts and learn new things.

Bring a Friend

Given the opportunity, it is better to have multiple people from a shop visit a show. Even if both individuals see the same thing, they will each have a unique perspective on it. Having more than one person allows the show to be divided up to maximize coverage and overall benefit. Multiple people allow more problems to solve. If one person can only manage three to five problems, bringing five people could mean they could solve 25 problems. The knowledge is compounded.

Put PMTS 2027 on your calendar and start making your list of shop challenges. Bring your questions, bring a coworker and make time for conversations with people who understand your work. The goal is to return with ideas and contacts you can use long after the show ends. Visit **pmts.com** to explore the exhibitors and plan your visit.

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Turn-Mill Enables Single-Setup Machining of Small, Complex Parts

Index Corp.'s G160 five-axis turn-mill is designed for single-setup machining of small parts of high complexity. The G160 offers a variety of options that allow it to be tailored to a mix of work.

Built on a rigid, vibration-damping machine bed, the G160 incorporates a pair of highly dynamic direct-drive spindles, available with bar clearances of 1.64" (42 mm) or 2.56" (65 mm). Well suited for small parts, the 1.64" version provides 47.9 ft-lbs (65 Nm) of torque with a maximum speed of 7,000 rpm. Accommodating chucked parts to a diameter of 6.9", the 2.56" version provides 125.4 ft-lbs (170 Nm) of torque with a maximum speed of 6,000 rpm. Both options feature main and counter spindles, with an additional Z-axis on the counter spindle.

Providing the ability for full five-axis machining, the G160 includes an upper tool carrier with a B-axis and a direct-drive milling spindle matched to the turning spindles. The milling spindle features an HSK-T40 interface and offers 12.5 ft-lbs (17 Nm) of torque with a top speed of 32,000 rpm for the smaller option or 21.4 ft-lbs (29 Nm) of torque with a top speed of 18,000 rpm for the larger one.

| Index Corp. • index-group.com



INDEX CORP. • index-group.com

Machining Platform Targets Faster Production of Complex Aerospace Workpieces

Ingersoll Machine Tools and Innse-Berardi, sister companies within the Camozzi Group, introduce the IBPMax S machining platform designed for high-performance machining of large structural aluminum aerospace components.

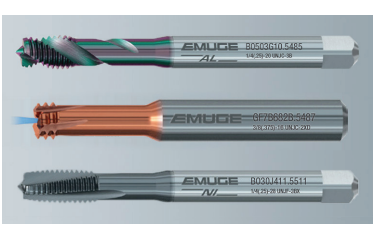
Developed to meet the competitive demands of aerospace manufacturers, the IBPMax S has been engineered to combine structural rigidity, dynamic performance and long-term machining accuracy within a single integrated platform. The machine is designed to handle large, complex aluminum structural components faster while maintaining precision and repeatability. The platform features the Tabm E three-axis head designed to offer high productivity, accessibility and machining flexibility.

The IBPMax S platform and the multiaxis Tabm E head have been engineered together as a fully integrated solution.



| Ingersoll Machine Tools Inc. ingersoll.com

Threading Tools Feature Optimized Cutting Geometry



Emuge-Franken USA provides a line of UNJC, UNJF and MJ taps, thread mills and gages for safety-critical J-thread type threading applications.

Emuge J-thread taps and thread mills are designed for safety-critical, high-stress applications. They are built to a 3B or 4H fit required for the internal thread, meeting SAE AS8879 and ASME B1.15 standards.

Emuge J-thread UNJC, UNJF and MJ taps are material specific with optimized geometry and coating. The AL-GLT-104 coated HSSE taps are designed for through or bottoming tapping applications in aluminum materials, and the TI-TICN coated HSSE taps are designed for through or blind-hole threading applications in titanium alloy material groups. The NI-TICN coated powdered metal HSSE options are designed for through or blind-hole applications in nickel alloys.

| Emuge-Franken USA • emuge-franken-group.com

Turning Grade Improves Stability in Steel Machining

Seco Tools' TP3502 chemical vapor deposition (CVD) coated Duratomic turning grade is designed to provide stable and predictable tool life for ISO P steel applications, even in interrupted machining and mixed cutting conditions. Positioned as a versatile ISO P grade, it is designed to balance wear resistance and toughness across a broad range of applications.

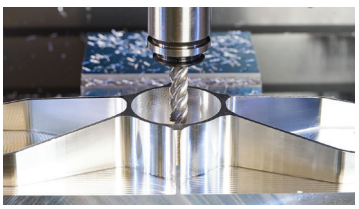
Classified within the ISO P35 range, the TP3502 grade features an updated coating and edge preparation designed to produce a more controlled wear pattern and improved tool life compared with earlier generations. The aim is to enable higher cutting speeds while maintaining process stability and consistent component quality.

TP3502 is a general-purpose grade for steel turning, covering low and high alloy steels as well as selected stainless steels, ductile irons and powder-metal components. These applications often involve interruptions and varying cutting conditions, requiring both toughness and reliable performance.



| Seco Tools • secotools.com

End Mill Features Advanced Flute Geometry



Kyocera SGS Precision Tools introduces the S-Carb H5 high-performance five-flute end mill series, engineered for high-production machining of aluminum and other non-ferrous materials. Combining advanced flute geometry, integrated chip breakers, central coolant delivery and Ti-Namite-B coating technology, the S-Carb H5 is designed to provide high material removal rates, optimized surface finishes and reliable performance across a range of machining conditions.

The S-Carb H5 is designed for versatile, high-efficiency milling and finishing applications. Its open-flute geometry is said to promote efficient chip evacuation, while integrated chip breakers shorten chips for improved chip control and increased axial depths of cut. Optimized end geometry improves ramping, stability, chip control and floor finish, while central coolant delivery further enhances chip evacuation and heat control.

| Kyocera SGS Precision Tools • kyocera-sgstool.com

Short-Body Vises Provide High-Density Workholding in Compact Applications

Kurt Workholding's TL4SCS and TL6SCS TriLock short-body vises feature Carvesmart quick-change jaws, providing high-density workholding and flexibility for compact CNC machining environments.

Designed for smaller machining centers, the 4" TL4SCS and 6" TL6SCS combine Kurt's 3-in-1 TriLock vise technology with a quick-change dovetailed jaw system. The compact designs allow shops to maximize machine table capacity while maintaining rigidity, precision and repeatability.

The TL4SCS is 14.192" long, while the TL6SCS measures 18.961" long. Both models feature 100 mm and 125 mm through-body mounting patterns compatible with common machine tables from Haas, Brother, FANUC Robodrill, Mazak and others — making them well suited for high-density use with four to five vises mounted on a single machine table.



| Kurt Workholding
kurtworkholding.com



Integrated Software Connection Provides End-to-End NC Program Control

Datanomix and Hexagon have expanded their collaboration with a connection between Hexagon's Cloud and Datanomix G-Code Cloud + DNC. Programmers continue to work in Esprit Edge before uploading the NC program and its supporting documents to Hexagon Cloud. From there, revision control, Digital Production Bundle assembly and controlled delivery to the machine are automated.

How it works:

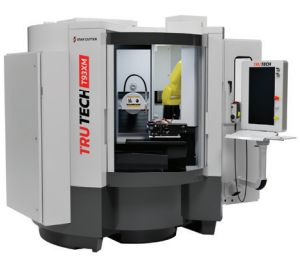
- Program the part in Esprit Edge
- Upload the NC program, print, setup sheet and tooling docs to Hexagon's Cloud
- Datanomix G-Code Cloud + DNC versions everything and files it by part number
- Once approved, the package lands at the operator's Machine HUD as one Digital Production Bundle — the same workspace they already use for production monitoring
- Edits at the control come back to engineering as change requests, so the programmer decides what makes it into the next approved revision

Automated delivery from cloud to shop floor. Engineering approves the revision, and it syncs to G-Code Cloud + DNC and lands on the floor. Nothing reaches a machine that wasn't released.

A visible feedback loop to engineering. Edits made at the control are recorded against the delivered program and returned to the programmer. What changed at the machine becomes part of the record instead of getting rediscovered on the next run — or worse, never discovered at all.

For shops running medical, defense and aerospace programs, NC code is a controlled asset, offering encryption, version control, role-based access and a complete audit trail. Once uploaded, programs authored in Esprit Edge are managed in a platform built for CMMC 2.0, where every change is logged with who, what, when and why. Manufacturers can also run compliance scans across every program in G-Code Cloud.

Datanomix • datanomix.io
Hexagon Manufacturing Intelligence • hexagonmi.com



Centerless Grinder Features Expanded Automation Capabilities

Star Cutter's Tru Tech T93XM-A high-precision centerless profile grinder features expanded robotic automation and redesigned software to support longer unattended production runs and simplify operation.

Designed for manufacturers producing high-precision cylindrical components, the T93XM-A performs profile, plunge, peel, infeed and through-feed grinding. This enables manufacturers to process a wide range of part geometries and perform multiple grinding operations on a single machine platform.

The latest T93XM-A incorporates a six-axis FANUC 200iD robot and a five-pallet configuration, increasing capacity by 67% to support longer periods of unattended production, according to the company.

Star Cutter has also redesigned the automation software with an intuitive operator interface and integrated 3D simulation. Instead of programming individual pallet layouts, operators select the desired pallet array, load the parts and begin production. This streamlined workflow is designed to reduce setup requirements and make automation more accessible.

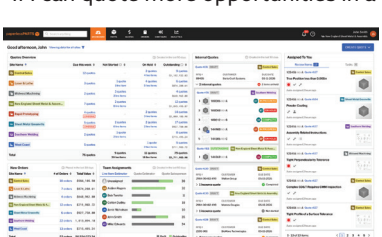
Star Cutter Co. • starcutter.com

Software Features Enhance Centralized Visibility

Paperless Parts' software solution is designed to provide centralized visibility and coordination across a portfolio of businesses. According to the company, the solution connects organizations without forcing sister companies to abandon the systems that made them successful in the first place. It does so with three features:

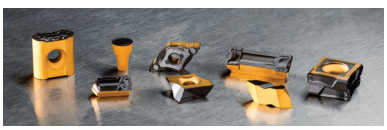
- A multisite dashboard, a centralized command center gives leadership aggregated visibility across all sites
- Internal quoting, which allows shops to transfer parts and quotes between sites within the organization
- Multisite search, which allows users to search across all businesses within an enterprise, eliminating costly inefficiencies or undercutting sister sites

"With the new multisite features from Paperless Parts, what maybe in the past could take as many as 10 minutes per instance, now takes 15 or 30 seconds to do," says Jamie Goettler, chief revenue officer at BTX Precision, a beta user of the feature set. "If I can quote more opportunities in a day, that's more at-bats, which means more hits, which means more revenue."



Paperless Parts
paperlessparts.com

Tooling Portfolio Boosts Precision, Productivity



Kennametal Inc. announces several tooling innovations and expanded product offerings, which span turning, milling, threading and tooling systems. They include:

- **KCP25C:** Seven product lines now feature the KCP25C steel turning grade
- **KCU20B:** A laydown threading grade compatible with most threading systems
- **Alumax VM:** Solid end mills engineered for high-speed aluminum machining and demanding aluminum applications
- **KOR expansion:** KOR 5DS and KOR 6DT end mills now feature KCSM15A grade technology for improved milling
- **Turret Adapted Clamping Units (TACU):** Expanded connection options that provide greater compatibility across a wider range of machine tool brands.

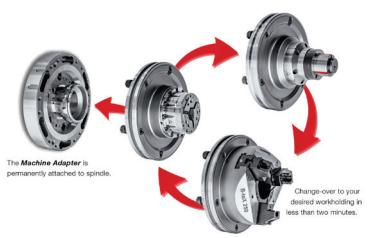
| Kennametal Inc. • kennametal.com

Workholding System Enables Quick Changeovers

Hainbuch America Corp.'s Centrotex quick-change workholding system is designed to enable complete clamping device changeovers in less than one minute.

Engineered for high-speed workholding changeovers, Centrotex can deliver repeatability of 0.003 mm or less between the machine adapter and clamping device, with no need to indicate or realign after every changeover.

The interface simplifies setup procedures, increases flexibility through machine-overlapping use of clamping devices, and supports both power-actuated and fluid-actuated workholding systems. For heavier clamping devices, the optional Monteq mounting aid improves handling, safety and operator ergonomics.



| Hainbuch America hainbuchamerica.com

Mechatronic Grippers Offer Flexibility, Precision for Automated Work Cells

SMW Autoblok's Motiact mechatronic gripper series is designed to perform precise, consistent and accurately monitored gripping operations for moving parts, pallets and chucks in and out of CNC machines and automated work cells.



These grippers are equipped with an incremental measuring system to promote gripping pressure, linear positioning and speed control as standard features. All models feature a Profinet or I/O Link interface to promote seamless integration into existing systems.

There are four series of Motiact grippers featuring a range of sizes and gripping forces:

- **MX-S (Small Parts):** 3- / 6- / 8-mm strokes per jaw and gripping force of 40 / 150 / 250 N. It is well suited for cobot applications, pick-and-place tasks and handling delicate or smaller workpieces.
- **MX-M (Universal):** 8- / 13-mm strokes per jaw and gripping force of 1200 / 1800 N. It is well suited for machine-tending applications, with a substantial weight capacity and gripping force to accommodate various workpieces
- **MX-U (Universal):** 55-mm strokes per jaw and gripping force of 300 N. It is designed for a larger range of products, part families, delicate parts and medical applications where parts must be handled carefully.
- **MX-L (Long-Stroke):** 55- / 99-mm jaw strokes per jaw and gripping force of 27,000 / 40,000 N. With a maximum weight capacity of up to 200 kg, these robust, larger jaw stroke grippers are designed for larger part applications.

Motiact grippers can be paired with SMW Autoblok's optional contactless inductive coupling system, eliminating cables while supporting full 360-degree continuous rotation of the end-of-arm tooling. These grippers are rated up to IP67 for durability in demanding environments.

Designed to be self-locking, Motiact grippers maintain their gripping force and position mechanically even in the event of an unexpected power failure. Equipped with absolute or incremental measurement systems, the grippers enable constant monitoring and adjustment of jaw positions.

| SMW Autoblok Corp. • smwautoblok.com

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Jeff Norgord, Executive Vice President, Brand

I certify that the statements made by me above are correct and complete.

Grinding Machines Feature Conversational Software for Streamlined Production

Okamoto Corp. provides high-precision surface, rotary and cylindrical grinders, all of which are said to provide exceptional rigidity, flexibility and long-term reliability. The systems are available with upgraded controls, added functionality and conversational software.

Okamoto's ACC-818Sa-iQ CNC surface grinder is engineered for manufacturers seeking higher precision, improved functionality and simplified operation in a compact footprint. Combining Okamoto's double-V hand-scraped guideways and mechanical rigidity with the next-generation Sa-iQ conversational control, the machine is designed to provide ease of use, versatility and performance dependability.

The ACC-818Sa-iQ features a heavy-duty Meehanite cast-iron base, robust slide assemblies and premium-grade components throughout. All sliding surfaces are hand-scraped to promote optimal straightness, long-term accuracy and optimized vibration damping.

Okamoto's iQ software simplifies the ACC-818Sa-iQ's operation with an intuitive conversational interface. Even complex



grinding cycles can be configured quickly by following on-screen prompts, reducing the need for G-code programming. Using conversational programming, operators enter key parameters such as stock removal, dressing conditions and multistep sequences in just a few steps, enabling consistent, high-precision results with minimal training, according to the company.

Also equipped with iQ conversational control, the PRG-iQ precision rotary surface grinder is designed to provide stable, repeatable precision for both high-mix production and dedicated process environments. The machine, built on Okamoto's high-rigidity column structure, is engineered for high-accuracy surface grinding with exceptional rigidity, intuitive operation and process stability.

| Okamoto Corp. • okamotocorp.com

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Shield Yourself from 'Inherited Facility Liability'

Facilities that lack integrated environmental monitoring, verifiable energy performance records and the digital infrastructure to demonstrate ongoing compliance are increasingly being treated by lenders, insurers and Tier 1 customers as compromised assets, regardless of their machining capabilities. For contract manufacturers that own or lease their facilities, this shift in the regulatory baseline redefines what it means to be a competitive shop.

The regulatory environment evolving in 2026 is not a single mandate but a convergence of requirements across multiple jurisdictions. California's updated Title 24 raises requirements on electrification, mechanical efficiency and indoor air quality. New York City's 2025 Energy Conservation Code applies updated ASHRAE 90.1 standards to commercial buildings. Nationally, JLL research projects more than 40 U.S. cities will have active building performance standards in place by 2026, covering the majority of large commercial buildings nationwide.

For manufacturers, this matters well before your lease renewal or your next facility expansion. A building operating today without the mechanical integration and digital infrastructure required to demonstrate ongoing compliance will generate financial exposure for owners within months. The penalties are real. Washington D.C.'s Building Energy Performance Standards carry maximum fines of $10 per square foot of gross floor area. Boston's BERDO 2.0 imposes $1,000 per day for noncompliant buildings over 35,000 square feet. New York City's Local Law 97 charges $268 per metric ton of CO_2 over the allowable annual limit. These are direct charges against your operating budget.

There is also a performance accountability question emerging with direct relevance to manufacturing operations. Energy codes increasingly require continuous metering data retained at 15-minute intervals for multiyear periods. A facility that cannot produce this data cannot demonstrate compliance, regardless of what its utility bills suggest. For shops running three-shift operations with high-draw CNC equipment, compressed air systems and climate-controlled workholding areas, the metering gap is a compliance gap.

Digital continuity is a facility asset. When manufacturing facilities change hands or when leases turn over, mechanical service records, commissioning reports and equipment histories are routinely lost. For insurers, that gap is an underwriting risk. For lenders evaluating a facility purchase, it is a due diligence problem. For incoming operators, it means running a building in which infrastructure history is unknown.

Specifying systems that generate transferable facility operational data and commissioning to documentation standards that outlast any individual lease or ownership period creates a measurable asset, not just a compliance checkbox. And though the traditional model has treated a manufacturing facility as a fixed cost, it is becoming increasingly misaligned with how facilities are underwritten and valued by lenders, insurers and acquirers evaluating a manufacturing business.

A facility with verified predictive maintenance records, compliance documentation and integrated monitoring is a fundamentally different asset than one without it, even at the same address and vintage. The difference shows up in insurance premiums, financing terms and in due diligence when a customer or acquirer evaluates your operation. Therefore, facility obsolescence is not only a business risk but also a facilities management problem.

The shift from deferred maintenance to facility obsolescence is not a future problem — it is a present one which is accelerating. Manufacturers that understand the operational and regulatory context their facilities are entering are better positioned to manage it. That means auditing current mechanical systems for monitoring capability and integration gaps, specifying IoT-enabled HVAC, compressed air and environmental controls on any upcoming capital project, commissioning to documentation standards that persist beyond the current lease or project team, and understanding the compliance trajectory of your facility.

The facilities being operated today will be navigating building performance standards, energy disclosure requirements and customer environmental mandates for the next 20 to 30 years. Whether those facilities are resilient assets or liabilities will depend on decisions made now, long before any of those requirements come due. **PM**



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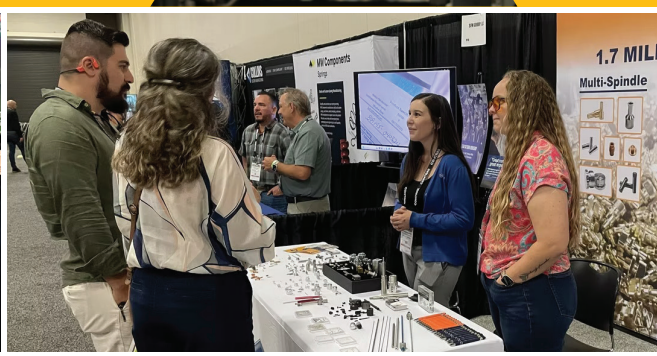
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