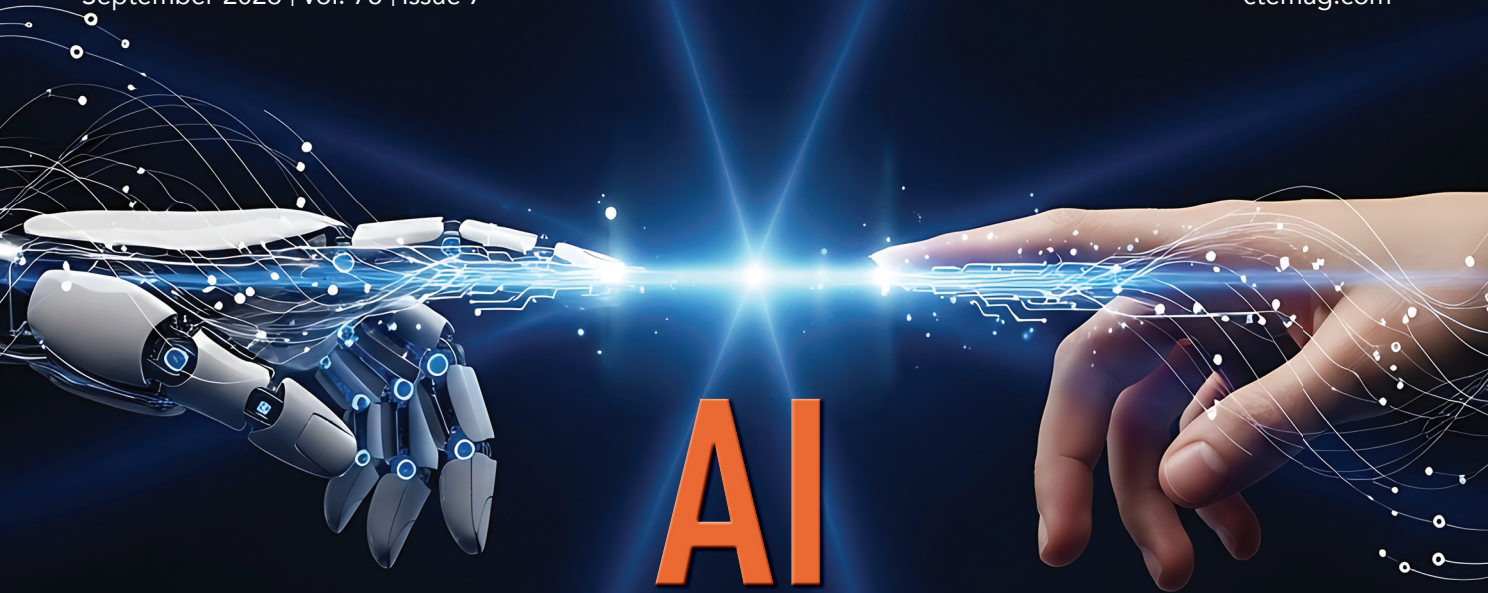


CUTTING TOOL ENGINEERING®

September 2026 | Vol. 78 | Issue 7

ctemag.com



AI ADVANCES MANUFACTURING

Smarter processes put human creativity
and expertise at the center

Also in this issue

- Adapting a machine to handle your situations
- Keeping proven technology productive in today's shop
- Turning design failures into better solutions

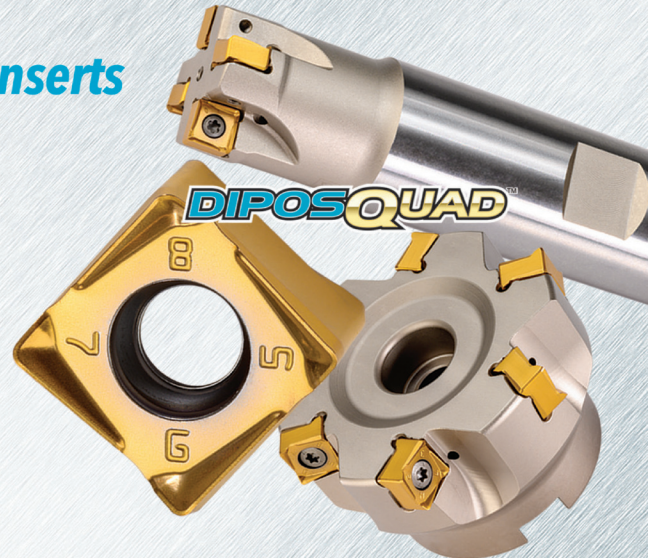




Double Up!...

*Ingersoll's DiPos Series of Milling Inserts
Provide Twice the Value*

- **DiPosDuo:** 90°, backdraft & hi-feed versatility with 4-edge economy
- **DiPosTrio:** 6-edge economy for 90° rough, finish & plunge milling
- **DiPosQuad:** True 90° shoulder mills with 8-edged inserts
- **DiPosHexa:** 45° face mill with 12 robust edges and high feed rates
- **DiPosPenta:** Same 10-edge insert fits hi-feed and 65° mills



See these products and
more at booth 431522

 **IMTS2026**



845 S Lyford Rd - Rockford, IL 61108
815.387.6600 // ingersoll-imc.com

Table of Contents

September 2026 Volume 78 Issue 7



A. Richter

A before and after machining look of lighting fixture components for a medical application at Mid-West Screw Products. **To learn more, read Best of Both Worlds on page 17.**

COVER STORY

- 14 AI Advances
Manufacturing
Toward Industry 5.0**
Artificial intelligence sets
the table for collaboration
with human creativity.

FEATURES

- 17 Best of Both Worlds**
Chicago screw machine
shop tackles components
for a host of industries with
screw and CNC machine
tools.
- 22 Revisiting screw
machines**
Could your shop benefit
from this tried-and-true
technology?
- 24 Parking Lot of Ideas**
Encouragement for
continually chasing design
improvements.

DEPARTMENTS

- 2 Lead Angle**
- 4 Metalworking Product
Review**
- 6 Industry News**
- 9 Machinist's Corner**
- 11 The Daily Grind Podcast**
- 27 Productive Times**
- 32 Ad Index**



121 S. Wilke Rd. Ste. 200
Arlington Heights, IL 60005
847-498-9100
www.ctemag.com / www.mfgaxis.com

Publisher

Dennis Spaeth
dennis@ctepubs.com

Editorial

Gina Stahl, Creative Director
gina@ctepubs.com

Alan Richter, Editor-at-Large
alan@ctepubs.com

Contributors

Cutting Tool Engineering regularly features
writing by numerous industry experts and
practitioners, such as Jeffrey Badger, Robert
Layng, Christopher Tate and Brandt Taylor.

Advertising Sales

Tom Tobiason, Account Executive
630-248-0686
tom@ctepubs.com

Dave Jones, Central
708-442-5633
dmj_jonesmedia@yahoo.com

Corporate Staff

Chief Executive Officer
Dennis Spaeth
dennis@ctepubs.com

Digital Developer
Tim Spaeth
tim@ctepubs.com

Circulation

Innovation Network LLC
cte@circumatic.com
cte.circumatic.com

PUT MANUFACTURING IN THE MAILBOX

A brochure from the College of Lake County (CLC) in Grayslake, Illinois, recently arrived at my home in nearby Buffalo Grove. It was CLC's fall 2026 Community & Workforce Education mailer, the kind of publication that presents a wide range of classes and programs.

What caught my attention was right on the cover: "Explore manufacturing — Pages 5-6."

That is good exposure for manufacturing, and our industry needs more of it.

Open to those pages and the message is direct: "Manufacturing is hiring. Here. Now." CLC says Lake County is home to more than 1,300 manufacturers and that roughly 3,000 manufacturing jobs are available locally at any given time. Some require short-term training. Others require a willingness to learn.

The brochure also makes a point we sometimes miss. Manufacturing is not only about running a machine. Manufacturers need machinists and technicians, of course, but they also need people in human resources, accounting, marketing, information technology and operations, supply chain, customer service and sales. A modern plant is a complete business, and it offers more careers than many people realize.

CLC is using the mailer to promote behind-the-scenes tours, short-term training tied to real jobs and paths from workforce training to academic credit. It says manufacturing bootcamps are being planned in industrial technology and precision machining. The college directs interested readers to visit learn.clcillinois.edu for further details. Those are practical steps. Just as important, CLC is putting them in front of households that may not otherwise search for manufacturing education.

That is the part worth copying.

For years, manufacturers have said that parents, students and job seekers do not understand the careers our industry offers. We cannot wait for people to find us. More community colleges should give manufacturing this kind of space in the material they send to the public. More manufacturers should help those colleges with tours, advisory committees, equipment, apprenticeships and real job information. Industry associations should help spread the same message.

People cannot choose a career they never hear about. They cannot picture themselves in a modern shop if all they know is the outdated image of manufacturing that many of us have worked to change.

College of Lake County put manufacturing on the cover and gave it two full pages. That is good for students, job seekers, local manufacturers and the community. More people should know about it, and more schools should follow the example.

If you are at IMTS this month, stop by CTE booth 432313 in the West Building, Level 3, Tooling & Workholding area. Tell us what your company, school or community is doing to make manufacturing careers visible. Good ideas deserve to be shared.



about the author

Dennis Spaeth, a 46-year veteran journalist, is the owner and publisher of Cutting Tool Engineering. Contact him at 847-714-0176 or dennis@ctepubs.com.



A PATTERN OF INVENTION

See the latest pioneering tool grinding from WALTER at IMTS 2026



IMTS UNVEILING
DAY 1, 10:15 A.M.

In the 1950s, the world's first automated tool grinder was invented. The turn of the century saw the introduction of 2-in-1 tool grinding, also brought to market by WALTER.

For decades, the company has boldly advanced the tool grinding art form. From September 14-19 in Chicago, you will see the newest advancements.

- **NEW!** VISION LASER
- **NEW!** HELITRONIC GRINDING MACHINE
- HELITRONIC POWER 400 DIAMOND
- HELITRONIC MICRO
- HELICHECK NANO



IMTS2026 BOOTH #236802

See WALTER (and everyone else in the UNITED MACHINING SOLUTIONS family) at IMTS.



Metalworking Product Review

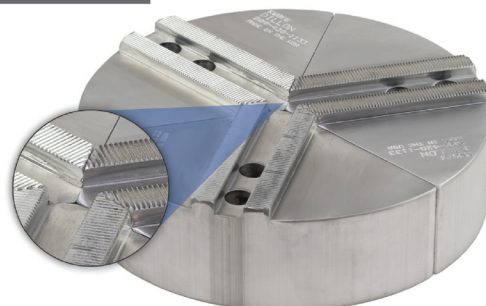
Member IMC Group
Ingersoll
Cutting Tools



MILLING-INSERT SERIES EXPANDS EDGE ECONOMY.

Ingersoll Cutting Tools' DiPos milling-insert series provides several choices for edge economy and application range. DiPosDuo combines 90°, backdraft and high-feed capability with four cutting edges. DiPosTrio uses six edges for 90° roughing, finishing and plunge milling, while DiPosQuad provides eight-edge inserts for true 90° shoulder milling. For face milling, DiPosHexa supplies 12 cutting edges for 45° work, and DiPosPenta uses one 10-edge insert in both high-feed and 65° milling cutters.

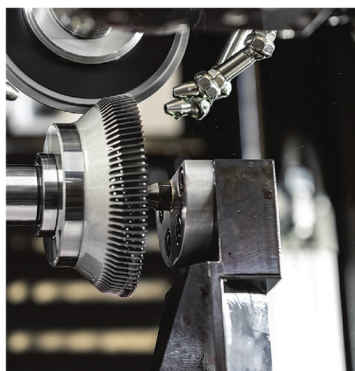
Dillon



FULL-GRIP PIE JAWS EXTEND WORKHOLDING RANGE.

Dillon Manufacturing's full-grip pie jaws use precision-milled 1.5 mm serrations with a stated tolerance of less than 0.0001" to hold workpieces securely. Offered in 6061 aluminum, 1018 steel, brass or cast iron, standard diameters range from 6" to 24", with larger custom sizes available. The jaws can be modified to heights up to 10" and widths beyond the chuck-face diameter. Their broad contact area is designed to increase driving friction while reducing part distortion during high-speed machining, boring, tapping, drilling and finishing.

Since 1927
Star
STAR CUTTER COMP.



GRINDING PORTFOLIO COVERS PRECISION APPLICATIONS.

Star Cutter's grinding-technology portfolio includes five-axis tool grinders, centerless grinders, cylindrical grinders and broach grinders. The systems are intended for precision, repeatable applications ranging from blank preparation through finish grinding. Star Cutter pairs the machines with application engineering, automation and service support for complex tool production in medical, gear manufacturing and precision tool operations. The portfolio incorporates TRU TECH grinding systems alongside Star's tool grinding and broach grinding platforms, giving manufacturers multiple machine configurations under one supplier.

LYNDEX NIKKEN



ZERO-POINT CLAMPING REDUCES SETUP TIME.

Lyndex-Nikken's zero-point clamping system provides a modular alternative to conventional T-slot tables and vises. The platform is designed to reduce setup and changeover time while increasing machine capacity, with clamping components that can be arranged for varied workpieces without sacrificing positioning accuracy. One clamping stud is used rather than separate zero, floating and free pins. Lyndex-Nikken says the system provides repeat accuracy of less than 2.5 µm and can support milling, turning, EDMing and quality-assurance applications.

High Performance Solid Carbide End Mills

SilverLine for Versatile Machining

Select SilverLine for universal machining across steel, stainless, and cast iron. Push speeds and feeds with confidence—our multi-layered coating holds up under heat and load. Keep cuts stable and predictable so your team gets consistent results part after part. Made in the U.S. and stocked locally in inch sizes.



IMTS 2026

Visit us in booth #431900



CERATIZIT is a high-technology engineering group specialized in cutting tools and hard material solutions.

Tooling a Sustainable Future

ceratizit.com



CERATIZIT
GROUP

AMERICAN PRECISION MUSEUM NAMES DIRECTOR OF EDUCATION

Citing his ability to bring more young learners through its doors, the American Precision Museum (APM) in July promoted Mike Fenzel to serve as director of education and help position the museum as a leading destination for hands-on learning and workforce inspiration.

Located in Windsor, Vermont, the museum mission is to preserve and celebrate America's precision manufacturing heritage while inspiring future innovators through exhibits and hands-on educational experiences. Building on traditional STEM education, the museum's approach emphasizes the essential role of manufacturing in turning scientific discoveries and engineering ideas into real-world products. APM educational programs offer students an opportunity to gain practical experience in design, problem-solving, teamwork and innovation — all while exploring career opportunities in advanced manufacturing.

Since joining the museum in 2024, Fenzel has been a driving force behind the museum's STEM+Manufacturing (STEM+M) education initiatives, according to an APM news release announcing his promotion. APM credits Fenzel with leading the development for its second generation of *A Maker's Journey STEM+M Education Kits*, which are now being used by classrooms throughout Vermont, New Hampshire, western Massachusetts and the south suburbs of Chicago. He has also played an instrumental role in expanding museum educational programming, giving more young learners opportunities to engage with interactive exhibits and discover how manufacturing has shaped the past — and continues to shape the future.

"Mike's passion for education, cre-

ativity and commitment to the museum's mission has made a lasting impact on the American Precision Museum and the communities we serve," said APM Executive Director Steve Dalessio. "His leadership has strengthened our educational programs and inspired thousands of students to see themselves as tomorrow's innovators, makers and problem-solvers."



Ben DeFlorio

Mike Fenzel brings hands-on STEM+M learning to the next generation of makers.

Fenzel began his museum education career in 1999 before spending more than 20 years at the Montshire Museum of Science in Norwich, Vermont, where he developed engineering and maker education programs.

As director of education, Fenzel will introduce more opportunities for students, teachers, families and lifelong learners to explore designing, making and manufacturing — including new maker experiences in the Gene Haas Center for Manufacturing Inspiration.

"I am thrilled to help expand the museum's makerspace and STEM+M programming," Fenzel said. "Helping students understand not only

how things are designed, but also how they are made, gives them a deeper appreciation for innovation, and opens doors to exciting future careers. I'm excited to build on that work through new experiences in the Gene Haas Center for Manufacturing Inspiration."

Construction of the Gene Haas Center for Manufacturing Inspiration should be completed by December 2026.

For more information about the museum, visit the APM website at americanprecision.org.

AUTOMATE 2026 BREAKS RECORDS

The Association for Advancing Automation (A3) in June celebrated its most successful Automate show to date, with Automate 2026 drawing more than 50,000 registrants and 1,230 exhibitors to McCormick Place in Chicago.

Hosted by A3, Automate 2026 filled 425,000 sq. ft. of show floor space with the latest technologies in robotics, artificial intelligence (AI), machine vision, motion control and

industrial automation. The event reflected the continued growth of automation across industries as companies look for practical ways to improve productivity, address workforce challenges, strengthen supply chains and remain competitive.

"Automate 2026 was the strongest show we have ever had, not just in size, but in the quality of the technology, conversations and connections taking place across the show floor," said A3 President Jeff Burnstein. "The energy in Chicago was incredible. From humanoid robots and industrial AI to machine vision, motion control, autonomous mobile robots and industrial automation systems, attendees saw firsthand how quickly this industry is moving and how much opportunity lies ahead."

The scale of the event was visible throughout McCormick Place. Keynotes were packed throughout the week, the show floor featured product launches and live technology demonstrations, and programs focused on women, students, educators and emerging professionals attracted strong participation. The Latin America Networking event and Women's Empowerment Forum attracted hundreds of attendees, underscoring the industry's growing focus on leadership, inclusion and the next generation of talent.

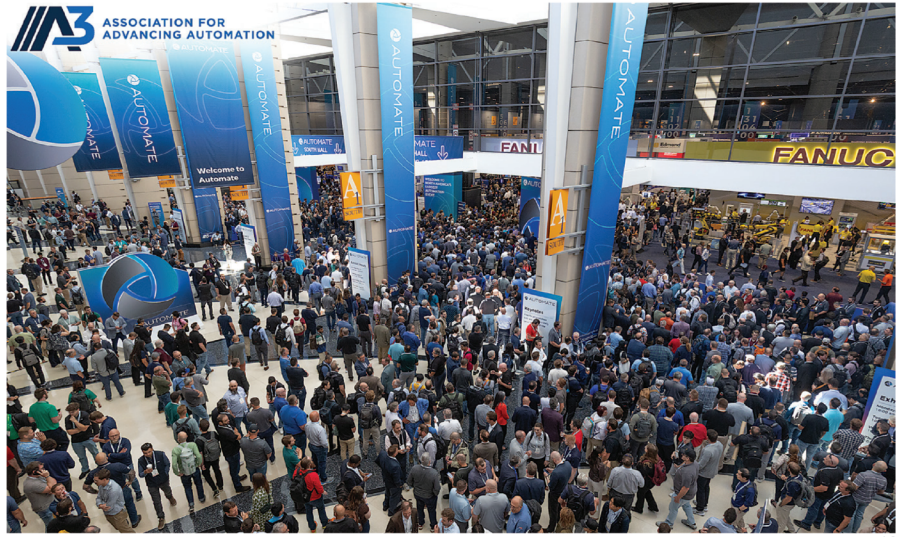
The conference program also reached a new high, with more than 1,600 registrants and 140-plus sessions focused on industrial AI, robotics adoption, workforce transformation, U.S. competitiveness, supply chain resilience and the expanding use of automation beyond traditional manufacturing.

Key highlights from Automate 2026:

- **Humanoid Robot Pavilion:** Humanoid robotics was one of the major draws at Automate 2026.

The new Humanoid Robot Pavilion, sponsored by NVIDIA, gave attendees a close look at humanoid robots and the enabling technologies behind them.

- **Humanoid Robot Forum:** For the first time, A3's popular Humanoid Robot Forum was hosted during Automate and attracted more than 1,100 registrants.



Automate 2026 draws record attendance at Chicago's McCormick Place in June.

- **Automate Startup Challenge:** Early-stage robotics and automation companies competed for \$10,000 and the title of Startup Challenge Champion. Mbodi was named the 2026 winner for its platform that allows users to teach industrial robots new tasks through natural language and simple demonstrations.
- **Automate Innovation Awards:** The innovation awards recognized new products and technologies introduced to the market in 2025. Winners included InfinityCrane and SkyRunner from CeiliX in the automation systems category; Flux AI from Standard Bots in the vision, AI

and software category; and AC-TILINK-JD from Synapticon in the components, hardware and enabling technologies category.

- **Joseph F. Engelberger Robotics Awards:** The robotics industry's most prestigious honor was presented during a dinner and ceremony recognizing Hiroshi Fujiwara, executive director of

the Japan Robot Association, and Robert Little, co-founder of ATI Industrial Automation.

- **Students and Educators:** Automate 2026 continued to expand its focus on the next generation of automation talent through the Education Pavilion, A3 NextGen Theater, Student Challenge, A3 NextGen Student Tours and programming focused on curriculum, career pathways, hiring and workforce development.

Automate Rewind

For those unable to attend Automate 2026, Automate Rewind is now available. This digital library features recordings of keynote sessions, the-

available. This digital library features recordings of keynote sessions, theater talks, Automate LIVE interviews, and exhibitor spotlights, ensuring the wealth of knowledge shared at the event remains accessible.

A3, a global advocate for the benefits of automating, is on a mission to promote automation technologies and ideas that transform the way business is done. Members of A3 represent more than 1,450 manufacturers, component suppliers, system integrators, end users, academic institutions, research groups and consulting firms.

CUTTING TOOL SHIPMENTS TOTALED \$258.9 MILLION IN APRIL

Shipments of cutting tools, measured by the Cutting Tool Market Report, a collaboration between AMT – The Association For Manufacturing Technology and the U.S. Cutting Tool Institute (USCTI), totaled \$258.9 million in April. The value of shipments decreased 0.1% from the previous month of March, but was up 21.1% from April 2025.

Year-to-date shipments totaled \$964 million, up 17.2% from the same period in 2025. Unit shipments decreased slightly in April after rising the previous two months.

"While shipments are up in the early months of 2026, much of the increase is due to inflation rather than increased units," said Mike Stokey, president of USCTI and executive vice president and owner of cutting tool manufacturer Allied Machine & Engineering. "Raw material pricing and supply continue to be challenges for cutting tool manufacturers. These are unprecedented times, but I am cautiously optimistic."

Alan Richter, Cutting Tool Engineering's editor-at-large, underscored the challenge created by surging raw material prices. "In-

creased shipments are partially the result of robust metal cutting activity across multiple industries," he said, "but the cost of raw materials to produce cutting tools has surged over the past year or so, driving up costs and inflating shipment values.

"In one instance," Richter added, "an aerospace manufacturer reported the cost of carbide tools has risen 30% to 50% over the previous three months."

The Cutting Tool Market Report is jointly compiled by AMT and USCTI, two trade associations representing the development, production and distribution of cutting tool technology and products. It provides a monthly statement on U.S. manufacturers' consumption of the primary consumable in the manufacturing process — the cutting tool. Analysis of cutting tool consumption is a leading indicator of both upturns and downturns in U.S. manufacturing activity, as it is a true measure of actual production levels.

FABTECH 2026 BUILDS UP THE NEXT GENERATION

FABTECH, a metal forming, fabricating, welding and finishing trade show and conference, will host an expansive education program Oct. 21–23 at the Las Vegas Convention Center featuring 180-plus expert-led sessions across a dozen tracks focused on modernization and workforce development. The program is intended to provide attendees practical tools and strategies to solve today's manufacturing challenges.

"This year's program is built to invest in every generation of manufacturing talent, making it easy for someone brand new to the industry and a 20-year veteran alike to find sessions that move their career, and their business, forward," said Tracy

Garcia, CEM, FABTECH group director at SME.

The event also will bring together the technologies, approaches and insights manufacturers need to thrive in the AI-driven era, covering automation, smart factories, workforce transformation and real-world business results.

Tracks in this year's education program put two challenges at the center of nearly every session:

- How shops modernize without breaking what already works?
- How shops build a workforce that can run what the technology on the shop floor?

Key themes

- **AI & Smart Manufacturing Transformation** — industrial AI strategy, shop-floor intelligence, digital twins and connected factory ecosystems.
- **Automation, Robotics & the Autonomous Factory** — adoption roadmaps, collaborative robotics, and real-world ROI.
- **Operational Excellence & Cost Optimization** — reducing downtime, lean practices, and predictive maintenance.
- **Workforce Development & Leadership Evolution** — upskilling, career pathing, and closing the labor gap.
- **Digital Transformation & Connected Factory** — ERP modernization, real-time data and cybersecurity for digital shops.
- **Advanced Fabrication Technologies** — laser, forming and finishing innovations.
- **Business Growth & Competitive Advantage** — capital investment, scaling and regional supply chain strategy.

For more information, visit fabtech-expo.com. **CTE**

CUTTING EDGE ACCESSIBILITY

By Brandt Taylor

Last month I discussed my introduction to circle segment end mills (CSEMs). These tools can be used to gain increased production and profitability in finish milling operations.

EMUGE-FRANKEN has developed four varieties of CSEMs that can achieve better surface finish and in shorter cycle times when making parts on a five-axis machining center. These coated solid carbide tools can cut metal with a hardness of up to Rockwell C 60 (Rc60), and employ a convex radius on the cutting edges that result in a better surface finish on the transition between adjacent cuts and/or a larger step over distance than other tools I've used can produce. In many operations their performance should be compared with what can be done with a ball end mill.

The four varieties of circle segment end mills offered by EMUGE — barrel, taper, oval and lens — each feature a distinct cutting-edge geometry intended for a particular part geometry.

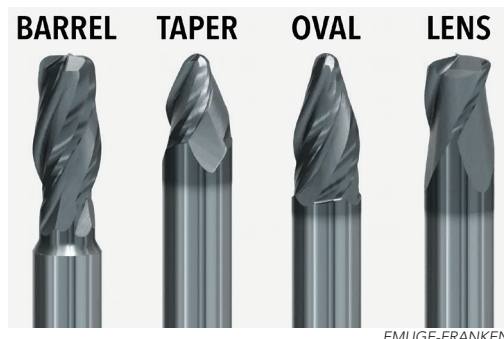
Barrel-shape: the flutes on the side of this CSEM are curved, with the center of the curve's radius on a plane at the middle of the flute length. The tool transitions into a smaller radius at the end of the mill. Barrel CSEMs are good for finishing curved surfaces. A barrel CSEM with a shank diameter and flute OD of 10 mm has a side radius of 50 mm. That's the same radius as a ball end mill with a 100 mm OD. Shops that switch from a 100 mm ball end mill to a 10 mm barrel CSEM for finishing processes could reduce cycle times

by 90% — and achieve better surface finishes.

I have experience milling curved profiles. If a process that takes 60 minutes with a ball end mill on a three-axis machine can be done in six minutes with better surface finish using a barrel CSEM on a five-axis machine, that is food for thought. (At EMUGE's Advanced Productivity Center in West Boylston, Massachusetts, the company has the ability to prove this, milling real parts in real time.)

Taper-form: This CSEM has been around for a long time. When making molds, the walls of mold cavities often need to be tapered, and a taper CSEM will get the job done on a three-axis machine. Even better, doing this on a five-axis machine enables the tool and toolholder interface to get closer to the cut for better rigidity, which allows for faster metal removal and/or better surface finish.

Other tapered end mills, meanwhile, have abrupt angles at both ends of their flutes, a distinct disadvantage compared to taper CSEMs. If, for example, a 250 mm long surface is finished in six passes with a tool that has 50 mm long flutes, there will be surface finish ir-



regularities where adjacent passes overlap. If, however, the straight flutes have circle segments on both ends of the tool, the surface finish will be more consistent.

Oval-form: though similar to the taper form, the flutes on oval-form CSEMs have a large radius instead of a straight taper. That's good for cutting curved surfaces.

Lens-shape: this CSEM is a cross between a stub end mill and a ball end mill. The end of the mill has two radii. A large radius across the face is joined to the flutes on the side of the mill by a small radius. In effect, the corner of the cutting edge has a fillet. A tool with a shank diameter of 10 mm has a face radius of 20 mm, the same as a ball end mill with an OD of 40 mm. This CSEM is good for cutting a curved surface at the bottom of a pocket.

A Fundamental Focus

In short, circle segment end mills are all about accessibility of the cutting edge to the workpiece. Anything that helps make better quality parts in less time works for me.

For shops considering CSEMs for a specific milling operation, EMUGE offers tool and machining recommendations based on the geometry of your workpiece. **CTE**



about the author

Brandt Taylor is the owner of Taylor Engineering, a Berlin, Massachusetts-based machine shop.

He can be reached via email at gbrandttaylor@gmail.com.



Machine Tool Accessories for Medical Applications



The challenges of manufacturing high-precision medical parts, often from exotic, hard-to-machine materials, are well known. **Platinum Tooling** can help.

Heimatec live tools, including 48,000 rpm speeders, enable advanced machining operations such as drilling micro-holes and complex milling. These capabilities increase throughput while dramatically improving efficiency, precision and productivity for intricate components like screws and pins used in the medical industry.

Hommel & Keller QUICK® knurling and marking tools offer precision and superior surface quality for machining medical and dental instruments.

Tecnifac collets and carbide lined guide bushings for Swiss-type CNC lathes are vital to medical machining, precisely holding and guiding material to produce complex parts like surgical instruments and implants. Ultra-precision grades offer runout accuracy of 5 microns or less, with specialized carbide for exceptional wear resistance.

For your next challenge, look to **Platinum Tooling** for solutions!
Contact us today!



See Us At
Booth 432201

IMTS
2026



platinumtooling.com

GETTING A GRIP ON TOOLHOLDERS

By Robert M. Layng

Whether you own and operate a shop or work for someone else, you've likely experienced a common problem that I've witnessed myself and heard about from others in the industry — the shortage of toolholders for a CNC mill.

Because I work in a prototype shop that serves engineers from a half dozen or so different disciplines — mechanical, civil, electrical, chemical and environmental (a civil subfield) — our CNC mill has a running backlog of high-mix, low-volume part runs. Amplifying this backlog is an inconvenient

The Daily Grind™
PODCAST
EVERY MONDAY
7AM CT / 8AM ET



truth of sorts: that CNC mill is an integral part of a hands-on laboratory

class with which I am involved and we lock up the machine's queue until the lab is completed.

There are two distinct issues we face at our shop. One is when the mill is running at full capacity, which means there is a pretty good chance that the toolholder I am going to need will not be available. The other issue is when I need to perform a certain operation, and while I may have, for example, the slitting saw I need, I won't have access to a dedicated toolholder for the slitting saw. I have a few drill chucks, various Weldon-type holders, and a couple of ER collet chucks, but no dedicated arbors (see figure 1).

Figure 1



All images: Lafayette College

We do, however, have a slitting saw mandrel on an R-8 taper for use in our knee mills. This is where the doctrine “adapt or fall behind” comes into play. Enter the solution — an R-8 to CAT40 adapter made by Fitz-Rite Products of Troy, Michigan (see figure 2). The use of this adapter is a rather simple four-step process:

1. First, back out the pull stud atop the taper, which exposes a captured drawbar screw.
2. Next, insert your R-8 tapered toolholder into the mating pocket until you’ve hit the drawbar screw, aligning your key slot with the drive key in the adapter.
3. Then, using a 3/8" hex key, turn the screw until you’ve bottomed out, giving it just a little bit of torque to make sure the screw doesn’t back out.
4. Finally, reinsert the pull stud and snug it down with the appropriate wrench.

Once assembled, the adapter and toolholder can be added to your machine’s tool library and managed like any other tool in the lineup.

This adapter has seamlessly negated the need for the parts requiring a horizontal slot to be moved to another machine (see figure 3). As an added benefit, the slitting saw I used was of a large enough diameter that I was also able to run the cutter along the bottom of the part and cut it off to size, eliminating yet another secondary operation. The part, in this case a replacement handle for the Civil Engineering department’s land surveying tripods, simply fell off to the side of the vise after the cutter completed its pass (see figure 4).



Figure 2

Another way in which this adapter has boosted our capabilities is when we need to deck the top surface of a part in-process along with other operations. While we have a dedicated 4" face mill on its own CAT40 attachment, the drive shoulder on which it is affixed is too wide to fit inside the grippers on our automatic tool changer. Using the same assembly method as laid out earlier, I inserted my 1.500" diameter face mill.

A great example of this setup in use is when we used to do a run of custom connectors for our Civil

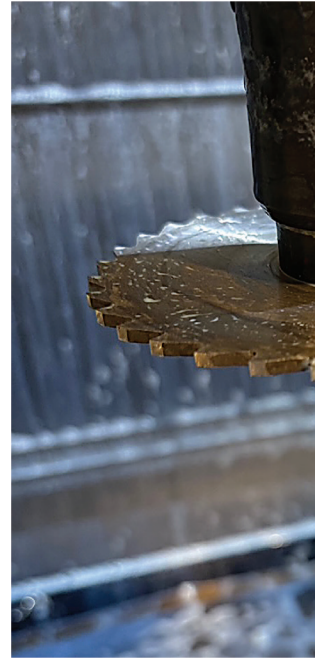


Figure 3

Engineering department’s yearly “Steel Bridge” build competition. The parts were of a rather successful design, so successful that it’s been consistently banned by the competition judges for the past few years and likely will continue to be banned for the foreseeable future.

According to Stephen Kurtz, Ph.D., P.E., associate professor of Civil Engineering at Lafayette College: “These things were so successful that the judges have made a subset of ‘Lafayette Rules’ specifically banning the things that we have made that work so well.”

This is why I’m highlighting the details of their efforts for you all.



about the author

Robert M. Layng is an engineering technician/machinist at Lafayette College in Easton, Pennsylvania, specializing in prototyping and practical design. He can be reached at layngr@gmail.com.



Shout out: A special thanks to Stephen Kurtz for access to some background information and a few sample parts to photograph. And an extra thank you for his permission to use these parts as inspiration for these articles. I will share more of those photos in next month’s Daily Grind column, “Facing My Simplest Problems.” **CTE**



Figure 4

RushMachinery

Grind better.

Building and Servicing Machines since 1983!



1983

2026

Featuring new innovations at IMTS 2026



Speak with our experts at IMTS in Booth 237233!

IMTS2026

Booth 237233

rushmachinery.com • Since 1983

☎ (585) 554-3070 • mail@rushmachinery.com • Rushville, NY USA

AMT
Proud Member

AI ADVANCES MANUFACTURING TOWARD INDUSTRY 5.0



Artificial intelligence sets the table
for collaboration with human creativity.

By Jim Mayfield

If you happen to live deep in the woods — as in lost in Russia’s Siberian Taiga deep — you might view artificial intelligence (AI) as a flash in the pan. But anyone near manufacturing understands AI is not only here to stay, but an operational imperative. Its practical applications and significant returns on investment will only continue to drive outcomes for the future.

Some view AI as helping manufacturing move toward Industry 5.0, a framework that complements Industry 4.0 by prioritizing human-centricity, sustainability and resilience.

Currently, Rockwell Automation research suggests that, on average, AI augments about 34% of manufacturing operations, according to the company’s 11th Annual State of Smart Manufacturing Report. What’s more, that percentage is expected to grow to 54% by 2030. Rockwell’s report, based on

responses from more than 1,500 manufacturers, also found that 53% of respondents named AI and machine learning (ML) as holding smart manufacturing’s greatest potential for future business success.

AI is moving decidedly from a conceptual schematic on the drawing board to real-world application across the manufacturing spectrum. With only about 18% of respondents stating their AI efforts remained in pilot stage, the Rockwell report described the result as “marking the decline of the pilot-heavy phase that dominated previous years.”

Building on Digitalization

The fourth Industrial Revolution, if you will, was introduced in 2011, shifting manufacturing from local automation to interconnected smart factories and real-time data collection on a massive level. With digitalization, plant managers could remotely monitor machines and manufacturing cells on

the shop floor. Web browsers, tablets and mobile devices became their eyes and ears. Manufacturers programmed machines with rule-based alerts that eliminated the need for constant observation by an operator.

Connectivity’s prime advantage was the ability for shops to funnel real-time data from machines on the floor to centralized databases and cloud storage platforms.

With manufacturing data increasingly connected and accessible across systems, the stage was set for AI.

“There is a very strong link between the two,” said Robert Meshel, responsible for AI initiatives across the parts business line at Siemens Digital Industries Software. “Digitalization is mainly about how to capture and store the data, verify the data and then feed it to the software for decision-making and prediction.

“AI takes all the information collected and processed on the shop

floor and throughout other departments of an enterprise and gives it context. It's really about how to interpret the data and then make a decision," Meshel said.

AI Core Functions

Physical AI refers to systems that are designed to perceive, understand and act in a dynamic environment. It pairs smart algorithms with actuators and sensors to operate in a closed loop system and perform three primary functions.

- **Perception:** Gathering real-world data using hardware like cameras, microphones, light detection and ranging (LIDAR) systems and temperature sensors.
- **Reasoning:** Processing this sensory input through various AI models to gain understanding of spatial context, physics and intent.
- **Action:** Controlling machines, robotic arms and vehicles through this closed-loop system to physically manipulate objects or navigate space.

The technology has unlocked applications that were previously thought to be impracticable, said Amar Dhaliwal, general manager of FANUC America Corp.'s Automation Systems Group.

"We've been using physical AI to track moving parts, adjust end-of-arm tooling and compensate for variations in real time," Dhaliwal said.

Generative AI can assist with CAM programming, product design and the creation of process alternatives, while other forms of AI support workflow and supply chain optimization and simulation.

Common Applications

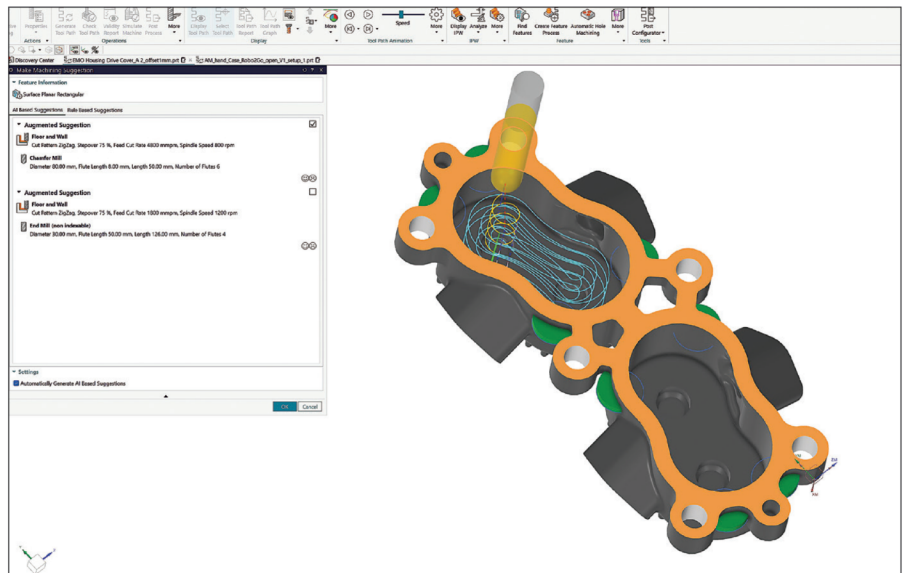
AI capabilities are expanding into

virtually every manufacturing level from initial product design and machine path creation to anticipating maintenance downtime.

Predictive maintenance is among the most widely deployed manufacturing AI applications. By using smart machine tools and processes, AI analyzes performance, historical maintenance data and real-time cutting information to identify early warning signals. In the process, AI can generate alerts and mainte-

mand planning and scheduling systems analyze sales and market signals to predict shifts before they happen. Manufacturers can also anticipate and address bottlenecks by tracking materials, shipments and supplier performance. On the floor, AI analyzes job priorities, material availability and manufacturing capacity to sequence more efficiently.

One of the fastest growing applications at the shop level is AI-assisted quoting and estimating. By



Siemens

New NX X cloud-based CAD software from Siemens includes AI capabilities.

nance recommendations that help reduce unplanned machine downtime and maintenance costs.

AI-powered quality inspection is another leading application. Using visible light, infrared and X-ray computer vision systems, some AI systems can detect defects as small as 0.1 mm (0.0039") at production speeds. Deep learning models can outperform older rule-based systems in complex inspection applications and can be improved through continuous, controlled re-training as shops encounter new types of defects.

Supply chain forecasting, de-

embedding AI into quoting workflows, engineers evaluate and compare varying production methods, materials and cost differences to determine the most effective solution while maintaining required tolerances and quality.

Benefits

Understanding AI's tangible benefits is straightforward. Faster, more efficient designs, predictive maintenance, supply chain analysis and vastly improved quality control all improve manufacturing economics. But AI also has positive implications on the loss of institutional memory

caused by a shrinking skilled workforce.

From a CAM sector perspective, for instance, manufacturers can use AI to streamline the process while maintaining high-quality processing.

"The CAM process requires a lot of tribal knowledge, people with experience, and no new skills are coming in," said Meshel. "There is a very clear shortage of skills in this domain."

Siemens and others are developing AI-driven CAM to analyze alternatives, automate decisions and generate machining strategies that were previously created by engineers with years of experience. Moreover, engineers can verify and optimize these strategies for variables like cycle time and tool wear.

"It becomes a truly agentic flow where the system makes decisions about the right way to process a specific part," he said.

Before Implementing AI

Large manufacturers may have the capital resources and existing operational and information technology infrastructure to implement AI on a broad scale. Small- and medium-sized enterprises require more focus and should explore out-of-the-box solutions offered by Siemens and other AI developers rather than building and implementing a solution from scratch.

For smaller shops "to succeed with physical AI solutions, there needs to be a clearly defined target ROI use case," Dhaliwal said.

Identifying specific challenges and pain points is essential to effectively deploy AI, experts agree.

"It's better to be focused on very specific issues and challenges rather than trying to go wide like we sometimes see with larger enterprises," Meshel said.

What AI won't do

The latest wave of AI development has sparked controversy in the larger context, with claims and speculation of adverse effects and unintended consequences. But its uses in manufacturing are practical and utilitarian, designed to re-

interface will be a collaboration as opposed to a superseding labor force.

"The AI will need to collaborate with humans. It is not a replacement," he said. "AI is a tool, and people will still make decisions based on states of the machine."

*'AI is going to be augmenting.
It's going to be a multiplier for the employees.'*

duce risk, improve output and increase revenue. Experts say the notion that AI will replace the human workforce is simply a myth.

"There's lots of sensitivity about AI actually replacing people, and this is not the case," Meshel said. "Generally, in the industrial domain, AI is going to be augmenting. It's going to be a multiplier for the employees. It will make them much more powerful, much more efficient to do more in less time."

Dhaliwal believes the AI-human

It does not provide a fully autonomous lights-out factory, and the process drift will still require human intervention and engineering decisions at some point."

Getting the early advantage

Many shops are currently using AI to address and solve specific problems and pain points: issues with quality control, stubborn unplanned downtime on a critical machine or inefficient quoting processes, for example. As cloud access becomes more affordable and data sharing capabilities improve, shops will leverage AI-driven tools from specific applications to applications across their enterprise.

"Physical AI is scaling across manufacturing facilities, plants are starting from the ground up with digital twins at the outset and workflows are increasingly being managed by customized (AI) agents," Dhaliwal said.

While the window of opportunity to capitalize early on AI's advantages is open, that window is closing. Shops that do not presently consider how to tailor the technology to their enterprise may ultimately diminish their opportunities to capitalize on the creative collaboration AI provides. **CTE**

contributors

Siemens
(972) 987-3000
www.siemens.com

FANUC
888-326-8287
www.fanucamerica.com

about the author

Jim Mayfield is an Indianapolis-based freelance writer covering manufacturing, technology and business for national publications and wire services. He can be reached at jimmayfield.writer@gmail.com.





A. Richter

Mid-West Screw Products operates and maintains single- and multiple-spindle screw machines at its Chicago facility.

BEST OF BOTH WORLDS

Chicago screw machine shop tackles components for a host of industries with screw and CNC machine tools.

By Alan Richter

Mid-West Screw Products Inc. operates vintage mechanical screw machines and modern CNC equipment to produce parts made of various workpiece materials to serve numerous industries, including some medical applications.

Medical parts do not necessarily go into a human body or get used

as surgical instruments when a physician performs an operation. For example, Mid-West produces fixtures for medical lighting installed over patient beds and in examination rooms, Lisowski said. Other medical parts the manufacturer makes include plastic devices for inserting suppositories.

Now at its third location with two buildings, one having 1,951 sq. m (21,000 sq. ft.) and the other with 464

sq. m (5,000 sq. ft.), Mid-West dates to 1946, when Walter A. Lisowski founded the company. (Though Walter E. Lisowski's birth certificate lists him as Walter Edward Lisowski Jr., the family later discovered midwife birth documents for his father that thwarted plans for raising a Junior. "I don't even know if (midwife documents) are considered birth certificates, but after naming me Walter Edward, he found out his

name was Walter Albert.”)

When Lisowski’s father passed away in 1984, the company trustees in charge of taking care of his mother, Virginia, asked the foreman to run the shop. The foreman declined, Lisowski recalled, telling the trustees, “I’ve got a family of my own. I don’t want to take care of another family, but I don’t want to lose my job.”

As a result, the trustees proposed selling the company, but Lisowski requested running Mid-West for at least a year as he was already working at the shop. “I was a young whippersnapper, and I ran the secondary department and made deliveries and that kind of stuff.”

That “stuff” included helping move equipment from Mid-West’s second location to its current one, he said. “That was 1965. I blew a transmission in my Chevy pulling machines on skids down the alley.”

Now 81, Lisowski said he has no succession plan for the business.

As the Screw Turns

Mid-West had about 10 single-spindle Brown & Sharpe and Index screw machines at the time of the move to its current location, Lisowski said, leaving room to spare in the building. “I used to roller skate out there.”

He added that Mid-West had the German-made Index machines custom-built with eight tools in a turret instead of the standard six and grew to two lines of 10 screw machines each before incorporating Acme and New Britain multi-spindle screw machines into the operation. Many of the screw machines were built in the 1940s through 1960s. “We repair our own machines here. We keep them running.”

Mid-West reports that the capabilities of screw machines, which operate using mechanical levers



A. Richter
Walter Lisowski, president of Mid-West Screw Products, examines a couple of coated cams from the shop’s wall of cams.

'We repair our own machines here. We keep them running.'

and steel cams, allow multiple processes to be completed simultaneously. A single-spindle machine cuts one bar of material at a time while a multi-spindle machine processes multiple bars of material that are fed and machined simultaneously. Both types of machines have different advantages and uses based on the order specifications of the customer and the volume of parts ordered.

Part runs range from about 50 to tens of thousands of pieces, not to mention prototype production.

In addition to screw machines, Mid-West uses an array of CNC machines, including ones from Haas, Brother, Miyano and EMCO. Lisowski contrasted the operation of a screw machine to a CNC machine by noting that a screw machine uses multiple tools in a turret and multiple slides to come in and form features whereas a CNC machine generally performs one operation at a time. "But then we have a CNC here that's a twin spindle and can work on both ends."

Nonetheless, when the application is appropriate, a screw machine produces parts quicker than a CNC, he noted. "If I can put it in a screw machine, I'll run it three, four, five times faster at a lower cost. And [customers] go, 'How can you do that?' And I said, 'technology.' 'What kind of technology do you have?' I said, 'Old technology.'"

Lisowski used the analogy of different animals to clarify. "The dinosaur makes a few steps and he's on a mile, and a chicken takes hundreds of steps and can't get there yet."

Even with that level of speed at his disposal, Lisowski emphasized that every second counts in manufacturing. "We have a program, where if you could save me one sec-

ond, I'll give you \$100."

Becoming Certified

Because many industries and customers require the internationally recognized ISO certification as a prerequisite for doing busi-

ness, which facilitates entry into new markets, Lisowski realized it was in Mid-West's best interest to become ISO certified. Mid-West is certified to ISO 9001:2015 and ISO 13485, AS9100 Rev. D for aero-

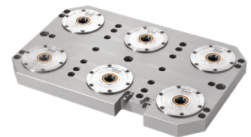
FIVE WAYS TO IMPROVE MACHINING EFFICIENCY

1

REDUCE SET-UP TIME AND INCREASE MACHINE CAPACITY

Solution: Zero Point Clamping System

- A modern alternative to T-slot tables, modular work holding has the flexibility and diversity to hold any workpiece while maintaining high accuracy.



2

ACHIEVE HIGH PRECISION WITH QUICK-CHANGE COUPLINGS

Solution: PSC Polygonal Toolholders

- Per ISO 26623, provides extreme stability and increased rigidity in machining. Modular tapers allow for quick and easy interchangeability of tools for both milling and turning.



3

PERFORM MULTIPLE OPS WITHOUT CHANGING MACHINES OR REPOSITIONING THE WORKPIECE

Solution: Live Tools

- Machine high-quality parts efficiently and effectively with the SK collet system and run-dry features.



4

MAXIMIZE MACHINE UPTIME BY STREAMLINING TOOL SETUPS OFFLINE

Solution: Presetters

- Optimize your workflow and maintain high levels of accuracy with rock solid precision.



5

IMPROVE MACHINE THROUGHPUT EFFICIENCY

Solution: Machine Tending

- Ideal for high mix, low volume production, machine tending significantly boosts spindle time and enhances overall machine efficiency - NO advanced robotics skills needed.



847.367.4800 | sales@lyndexnikken.com | lyndexnikken.com

LYNDEX NIKKEN



'We have a program, where if you could save me one second, I'll give you \$100.'

Best of Both Worlds

space, and ARM 9009 for firearms and armoring.

"I saw that Northern Illinois University in DeKalb had classes in it and they would come to your business and teach you," he said, adding that instructors arrived twice a week for two years. "Where other people were using registrars to teach them what they should do and constantly charging them, so they're making money hand over fist."

In a blog, Mid-West explained that while medical devices can be extremely costly and sophisticated to produce, they also require basic parts in their design. This is where job shops come in because they have the capabilities to make custom parts to customer specifications in the desired time frame. Obtaining ISO 13485 certification doesn't mean that all parts worked on are destined for use in a patient. Many of the parts and projects are for other items medically related. The word medical means more than surgery; all equipment in a hospital or medical facility needs to meet certain standards. Because of this, most companies that make medical equipment and devices will work only with companies that have obtained ISO 13485 certification. Having this certification lets them know that a machine shop will follow the strict requirements needed for the medical industry.

Labor of Love

Mid-West employs 34 people, working a single shift, with some retiring after joining the shop out of high school, Lisowski said. "It's hard to give this up when you love what you're doing."



A. Richter

An Index machine custom-built with eight tools in a turret instead of the standard six.

He added that he remembers the time when a legal Polish migrant, for example, would show up with a suitcase straight from a plane or train to seek employment. "My dad brought him in and showed him what to do."

Now, however, is different, Lisowski noted, and he has difficulty finding interested job candidates who are mechanically inclined and want to get their hands dirty. "I

even advertise on the radio for military people."

He added that Mid-West pays for training for young employees when appropriate. Upon completing a training program for CNC machining, one worker wanted to use his newfound knowledge to trim a second off the production of a part, which consumed 32 seconds, and score the \$100 reward. After timing the revamped cycle,

the stopwatch showed 32 seconds. "He goes, 'Darn, I thought I learned something in school.' You can do the same thing another way, but it doesn't mean it's any faster."

Another challenge when operating a screw machine business is obtaining the cams to control the machines. Lisowski said Mid-West has cut its own cam designs on a special machine since about 1965. After 80 years in business, the shop has a wall full of cams. "We identify all those different cams on a board."

Lisowski emphasized that running a prosperous screw machine shop requires being inventive. "I have to say that our success is through innovation and thinking outside the box. My dad was that way. Somehow through the genes, I guess I became that way. I don't like to fail."

As an example, Lisowski recalled a buyer who presented him with three 55-gal. drums of parts that were scrap because a gauge couldn't be inserted into them. "And he says, 'but the guy that's making them says I can put a gauge in them when they're on the spindle, but as soon as I cut them off, they go cattywampus.'"

The workpiece material was specified on the part drawing and still needed to be used, but Lisowski said he realized that having the material pre-annealed would prevent distortion and enable a gauge to be inserted. "So, he gave me an order for 5,000 or 10,000 and I made tens of thousands, if not hundreds of

thousands of those parts afterwards. And because I helped engineering with that, they brought me into other parts."

For more information about Mid-West Screw Products Inc., call 800-283-6032 or visit www.m-wsp.com.

CTE



about the author

Alan Richter, a 40-year veteran journalist, has covered the metalworking industry for Cutting Tool Engineering for more than two decades and currently serves as its editor-at-large. Contact him at alan@ctepubs.com.





Custom Cutting Tool Solutions

GRINDING SYSTEMS ACROSS PRECISION APPLICATIONS.



- ✓ 5-axis Tool Grinders
- ✓ Centerless Grinders
- ✓ Cylindrical Grinders
- ✓ Broach Grinders

Our grinding technologies portfolio includes machines capable of handling an array of precision and repeatable applications, from blank prep to finish grind with full application, automation, and service support. **Our systems are suited for a wide range of complex tools across the medical, gear, and precision tool industries.**

There's always a solution with Star Cutter.
We find a way or make one.

starcutter.com



REVISITING SCREW MACHINES

Could your shop benefit from this tried-and-true technology?

By Christopher Tate

What do you think of when someone talks about a screw machine? Is it an old single-spindle Brown & Sharpe? Maybe a six-spindle Acme Gridley or a 2-1/4" Warner Swasey? Maybe it's one of the new CNC-controlled machines like those used in medical device manufacturing. Each of these machines evolved from a common ancestor and shares enough DNA that they can all be called screw machines.

Modern automatic screw machines emerged in the 19th century, with Brown & Sharpe among the companies that advanced turret and cam-controlled designs. Those developments helped establish the foundation for today's screw machines.

In case it's not obvious, the screw machine was so named because it was used to manufacture screws. It's hard to determine if the machine was designed with only screw making in mind or if developers had already recognized the impact these machines would have on turned part manufacturing.

Except for some special cases, the average screw is probably not made on a screw machine any longer. Screw machines have niche applications in manufacturing that no other machine tool can fill. It is amazing how many engineers, buyers and shop owners do not fully understand the unique qualities of a screw machine.

So, what is a screw machine? Like everything else in manufacturing, it depends on who you ask.

Some Screw Machine Background

Before the age of CNC controls, screw machines were far more prevalent. They were used to manufacture large volumes of turned parts. They made parts such as brass plumbing fittings, grease fittings and carburetor jets. If the part was turned and you needed a lot of them for low cost, a screw machine was the only choice. During World War II machines with names like Acme Gridley, Davenport, Conomatic and others cranked out billions of parts essential for small arms ammunition. After the war these machines were retooled to turn automotive, appliance, plumbing and other high-volume parts.

These machines are fast because they allow multiple operations to occur simultaneously. Simple machines like a single-spindle Brown & Sharpe could drill and turn simultaneously. The more complex multi-spindle

machines, some of which had eight spindles operating, could create a multitude of features in each cycle. The multi-spindles would rotate multiple pieces of stock through stations where the various features were created. In the last step the part would be cut off and collected. This all happened with virtually no human interaction.

Multi-spindle machines are not as common in U.S. manufacturing as they were in the mid-20th century, but they still have a place. Old Davenports and Acmes are being rebuilt and retrofitted with CNC controls. These upgraded machines are for sale today, and you will probably see one at IMTS 2026 if you attend.

'Screw machines have niche applications in manufacturing that no other machine tool can fill.'

Why are 60-, 70- and 80-year-old machines being rebuilt and retooled? Because the multi-spindle design allows production speed that no other machines can offer. No other turning machine comes close. Screw machines, single-spindle and multi-spindle, routinely have cycle times that are only a few seconds long. Every five or six seconds a completed part comes off the machine. To put that into perspective, a machine with a six-second cycle will produce 600 parts per hour or 4,800 per eight-hour shift. There are, of course, plenty of parts that have longer cycle times, but you can see how these machines are capable of cranking out huge volumes of parts.

Swiss Lathes

There is a subset of screw machines called Swiss lathes, Swiss screw machines or Swiss machines that were developed in the late 1800s in Switzerland. Instead of holding the stock stationary and bringing the turret to the stock, these machines would slide the stock through a guide bushing past the cutting tools that were held stationary. This method keeps the tool

very close to the guide bushing so that the workpiece is well supported, which reduces deflection. The guide bushing arrangement allowed machinists to make tiny delicate parts needed for watchmaking.

Swiss-style machines are very prevalent today especially in the medical industry where they are used to produce bone screws and similar long, thin delicate medical parts. If not for the Swiss machines, medical device manufacturers would not be able to produce many of the parts used to put us back together after injury.

Modern Swiss machines have a significant advantage over the older cam-driven machines. Modern CNC machines can economically produce small quantities. Cam machines required cutting tools that were part-specific, and each tool station had to be set using shims and indicators. Setting up an older machine to make a few hundred or even a few thousand parts was difficult and often uneconomical. However, with modern CNC machines, modern cutting tools and CAM software, a few hundred parts is no big deal.

About the Cost

There is another characteristic that makes screw machines special. They are expensive to purchase and get into production. If you are turning smaller quantities or normal-sized parts, they are not going to be as efficient as a turning center. Screw machines are in a class of their own. Entry into the screw machine business requires parts that must be produced in enormous quantities or parts that simply cannot be turned with common lathes.

Surprisingly, many decision-makers in manufacturing are unfamiliar with these machines. Buyers and engineers could benefit from experiencing the speed and precision offered by this class of machine tool. Coupling the productivity of these machines with a strategic inventory program can provide significant cost advantages.

If you are not familiar with screw machines, it is worth taking the time to look up some videos online to see some of the many applications. It is entirely possible your company could benefit from this amazing technology. **CTE**



about the author

Christopher Tate is the owner of Tate Engineering, a Natchez, Mississippi, firm that helps manufacturers solve efficiency problems. Tate, who holds a master's degree in industrial technology from Mississippi State University, has 32 years of experience in the metalworking industry. Contact him at chris23tate@gmail.com.



VEKTEK
The Productivity Devices Company

IMTS2026
INTERNATIONAL MANUFACTURING TECHNOLOGY SHOW
SEPTEMBER 14 - 19, 2026 • MCCORMICK PLACE, CHICAGO

**NEW PRODUCTS
CREATED BY VEKTEK
BOOTH #431922**



Advanced Hydraulic Unit Integration



- Single Tube Air Inlet
- Any Robot
- Plug and Play



Universal Grippers and EOAT Interfaces

WWW.VEKTEK.COM 800.992.0236

PARKING LOT OF IDEAS

Encouragement for continually chasing design improvements.

By Robert M. Layng

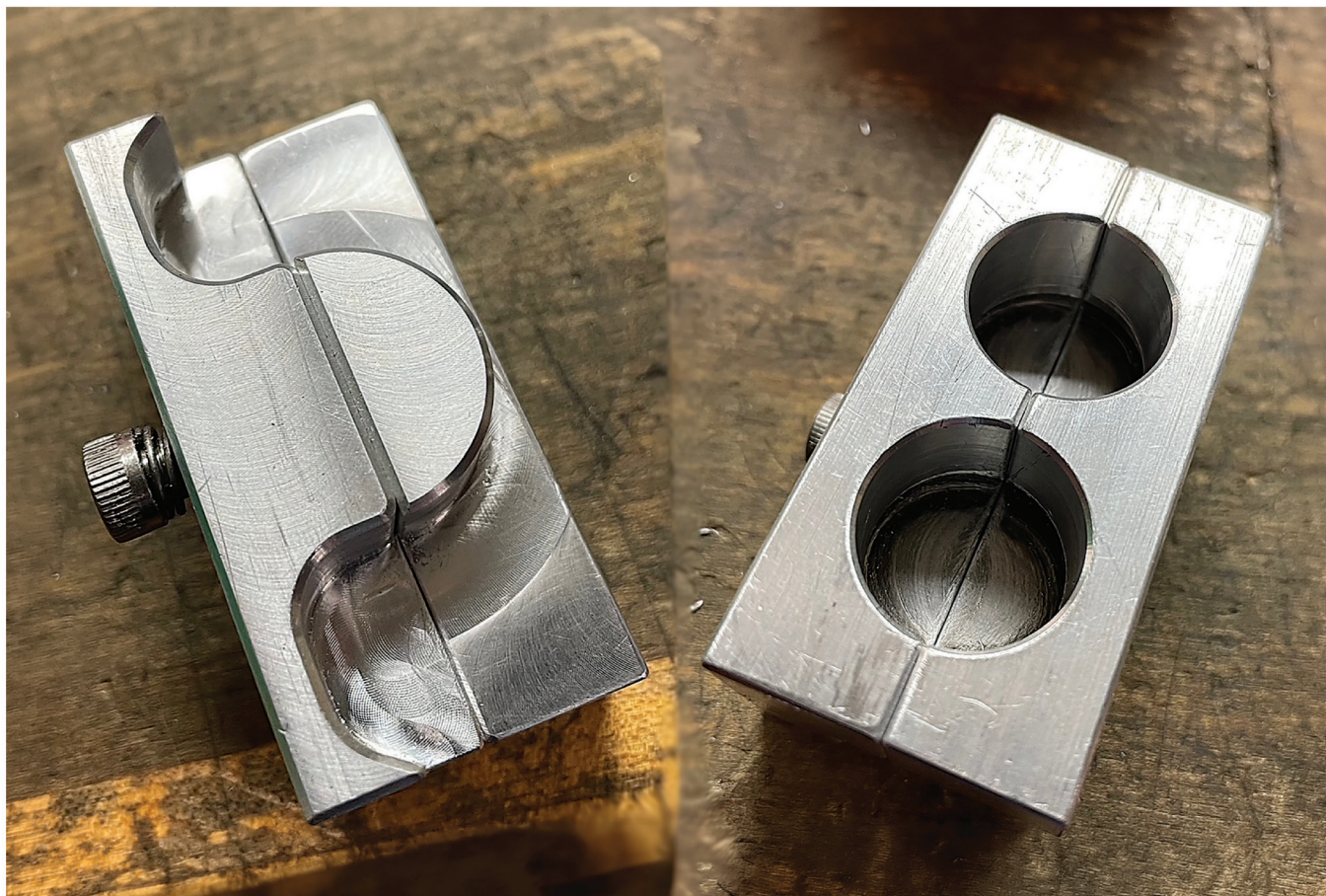
In the research and development (R&D) and prototyping worlds, there is a well-known and necessary evil called the Parking Lot of Ideas. We all may think that the first iteration of a design is going to be the end-all-be-all fix for which we were hoping. We all know much better. In both my private and professional lives — mostly because the brains of most machinists and toolmakers rarely ever shut off — I find myself adding to a vast void of scrapped ideas, terrible one-offs or prior iterations of designs that ultimately proved successful.

I have adopted the practice of having a folder on the desktop of both my office and personal computers with the name “Parking Lot of Ideas,” and I find that it encourages continuous improvement of whatever project I may be toiling over on any given day. It is also a wonderful way to reinforce the “learning from mistakes” theory. A great instructor from my trade school days once told me, “It’s not a failure if you’ve learned something as a result.” I know this isn’t news to most of you, but I felt it necessary to share. That instructor also professed a theory that I pass on to the students that I work with now: “To

never be afraid of failure in a design, more so now while you’re in school. You’ll never know what you can improve upon if you never take that chance!” Plus, if they end up making mistakes on a future employer’s dime, they probably won’t hold that job for very long.

For those of us who work in the R&D or prototyping worlds, especially those of us like me who are in the business of training the next generations; teaching methods that emphasize the practice of learning from design mistakes is a wholly productive way to help budding engineers, machinists, toolmakers, millwrights or the like to flourish!

Figure 1



All images: Robert M. Layng

Allow me to share an example of my own with you.

While in the middle of a round of sporting clays a few years ago, I lamented the fact that I always had loose shells to fumble and load before each station. I decided I needed to design a speed loader. So, I broke out the graph paper and the drafting supplies once I got home and came up with a simple spring-loaded clamp that gripped the hulls (see figure 1). By pressing a button, my design split the clamp open and dropped the shells into the chambers. I had the opportunity to fabricate a set of prototypes.

They were extremely blocky, squared off and not very ergonomic, but they almost worked! Their size meant I kept hanging up on other parts of the shotgun and

couldn't properly line the shells up with the chambers. I needed to come up with a more ergonomic way to accomplish the same goal, meaning I took what worked from the first design and blended edges, shaved away excess material that didn't affect function, and eliminated parts or hardware that only hindered operation. This first iteration ended up in the Parking Lot.

After making a set of loaders in the second version, I took them for a run at the clays course (see figure 2). I found that while they worked better, something was still wrong. They could be lighter, easier to use



about the author

Robert M. Layng, an engineering technician/machinist at Lafayette College in Easton, Pennsylvania, specializes in prototyping and practical design, and can be reached at layngr@gmail.com.



Trust DS4 Ultra-Fine EDM Graphite for Your Toughest Jobs

"The intricate EDM electrodes required to produce our audio speaker grills take 7+ days of machining and 30+ hours of EDM burning. We needed a graphite we can trust to withstand this demanding application. We switched to Mersen's DS4 ultra-fine EDM graphite a few years ago and it's been the best performing graphite we've used. With the DS4 material we have also seen significant savings per electrode."

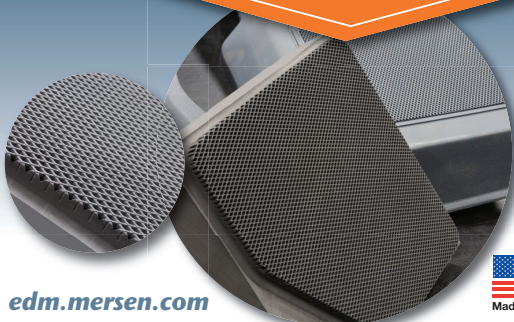
Eric Jacobsen
Hi-Tech Mold & Engineering



DS4 Delivers:

- Excellent surface finish
- Intricate detail
- Easy to machine
- Exceptionally strong
- Saves significant money

Ask your EDM distributor for DS4!



edm.mersen.com



Mersen
Shaping the future of EDM

'It's not a failure if you've learned something as a result.'



Parking Lot of Ideas

and much cheaper to manufacture using conventional tooling and hardware that could be much more easily sourced. Version two's files went into that dreaded folder on my desktop.

Version three was the winner. The inspiration came from legacy parts I had made at my father's shop in my learning days. The idea used a completely different method for holding the shells in place. Instead

of using two halves clamped together under spring pressure, this design used a monolithic body with a T-slot cut into the bottom where the shells slide in, and then spring-loaded pegs keep the shells in place against the T-slot. The pegs are fed in from the top, backed by a small coil spring, and then loaded with a set screw. (See figure 3 for a breakdown of the assembly.)

I have made it a habit to save all of my designs, being that there are valid ideas or principles in each of the iterations. This is to make sure

I can reference them and not make the same mistakes again. The point in all of this is that I would encourage you to set up a folder for your own Parking Lot of Ideas — it will help you to constantly chase improvements.

Shout out: I covered this topic on an early episode of *The Daily Grind* with Dr. Rohan Prabhu, Ph. D. A special thanks to Dr. Prabhu for joining the show that day, and for his excellent advice on organization of the Parking Lot. **CTE**

Figure 2

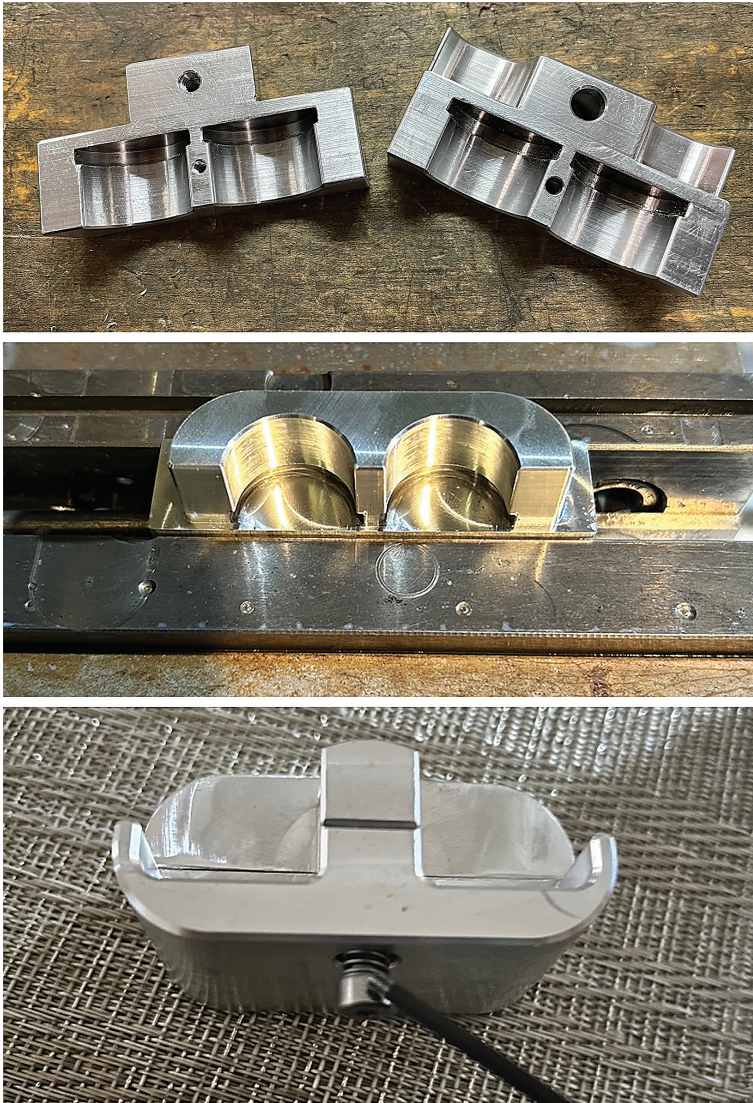


Figure 3



5-AXIS MACHINE REMOVES BOTTLENECK

When it comes to aerial firefighting, Neptune Aviation Services is a well-trusted name. To better support its aerial firefighting work, the Missoula, Montana-based company is transitioning from its current fleet of BAe 146 aircraft to the larger, more advanced Airbus A319, which offers greater capacity for fire retardant and fuel. “We are in the process of purchasing our first Airbus A319 and that’s the future of our organization,” said Pierre Blouin, airtanker shop manager.

To keep its aircraft flying safely, especially aging planes in which the parts and aerostructures are increasingly becoming more difficult to source, Blouin said Neptune has a machine shop to produce parts and repair structures. “We can’t let the lack of parts dictate what we’re doing with these planes and, basically, bring a halt to our organization.”

The shop was primarily using an old three-axis CNC machine to produce simple and complex parts, and the latter frequently required multiple different setups to complete, he added. In addition, the shop has an old CNC lathe and a number of manual machines. The three-axis machine, which Neptune still operates, is able to complete relatively simple parts quickly, but was a “bottleneck” when it came to complex components.

Seeking a solution, Blouin said Seth Cohen, machine shop lead, did most of the research into purchasing a new machine, and Neptune acquired a C 400 five-axis machining center from Hermle USA Inc. in Franklin, Wisconsin.



Hermle USA

Hermle installs the C 400 five-axis machining center at Neptune Aviation.

END USER		SOLUTION PROVIDER	
Neptune Aviation Services 406-542-0606 www.neptuneaviation.com		Hermle USA Inc. 414-421-9770 www.hermleusa.net	
CHALLENGE	Eliminate the bottleneck when manufacturing parts and repairing aerostructures for aerial firefighting planes.		
SOLUTION	A five-axis machining center.		

'We want to bring in some revenue from the machine shop as opposed to just our internal heavy airtanker customers.'

Blouin added that the biggest reason Neptune bought the Hermle was the machine tool builder's high-quality customer service. That enables the machine shop to quickly obtain parts when needed. "They'll even offer us a rep to come out and install the parts, but we're always strapped for time, so they will also offer the instructions for you to install the part, and we've usually taken that avenue."

In addition, he noted that Hermle installed the machine and helped Neptune set up all the needed equipment. "They've been pretty helpful since."

The high level of customer support enables Neptune to comfortably reside in the "path of least resistance" when machining parts, Blouin said. "But also, if something required some more creativity or required us to blaze our own trail and get off the beaten path, that

machine allowed us to do that."

The Hermle machine has through-spindle coolant capability, air blast for dry cutting, a Heidenhain spindle probe to measure and find parts in the machine, a Blum laser to measure parts, an 18,000-rpm spindle, a mist collector and a Lang subplate to which vises and fixtures attach.

About half of the parts Neptune machines are made of aluminum, with 20% made of exotics, 20% made of tool steel and the rest being plastic and non-metallics, Blouin said.

He explained that many of the custom parts needed for the A319 are tied to the installation of the retardant tank and specific to Neptune, since it's the only airtanker company using the plane for aerial firefighting. "Being able to build these parts and to manage the tanker modification in-house means we avoid the delays and costs of outsourcing the project to a third-party machine shop, helping us to complete maintenance much more quickly."

Outlining the company's strategy moving forward, Blouin said Neptune will develop parts for three tiers of external customers in addition to making its own parts. The most immediate will be for repair stations serving the aviation industry, for which Neptune has already responded to multiple requests for proposals. "They use the same rules as we do as far as the FAA goes, and so it's really nice to get those companies as customers because they know what we do and we're generally certified to help each other out."

Next, Neptune plans to pursue other opportunities in the aerospace industry, including NASA and private companies. Longer term, the company aims to enter the contract manufacturing space, producing parts for a broader industrial customer base.

"We want to bring in some revenue from the machine shop as opposed to just our internal heavy airtanker customers," Blouin said, noting that external customers would include ones turned away from shops that are not interested in custom jobs and small runs. "We would be satisfied with helping on those one or two items."

He added that as the customer base increases, Neptune is looking to replace older equipment with newer, better machines.

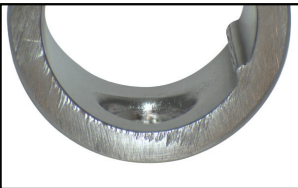
**ORBITOOL®**
DEBURRING TOOLS

Made in USA

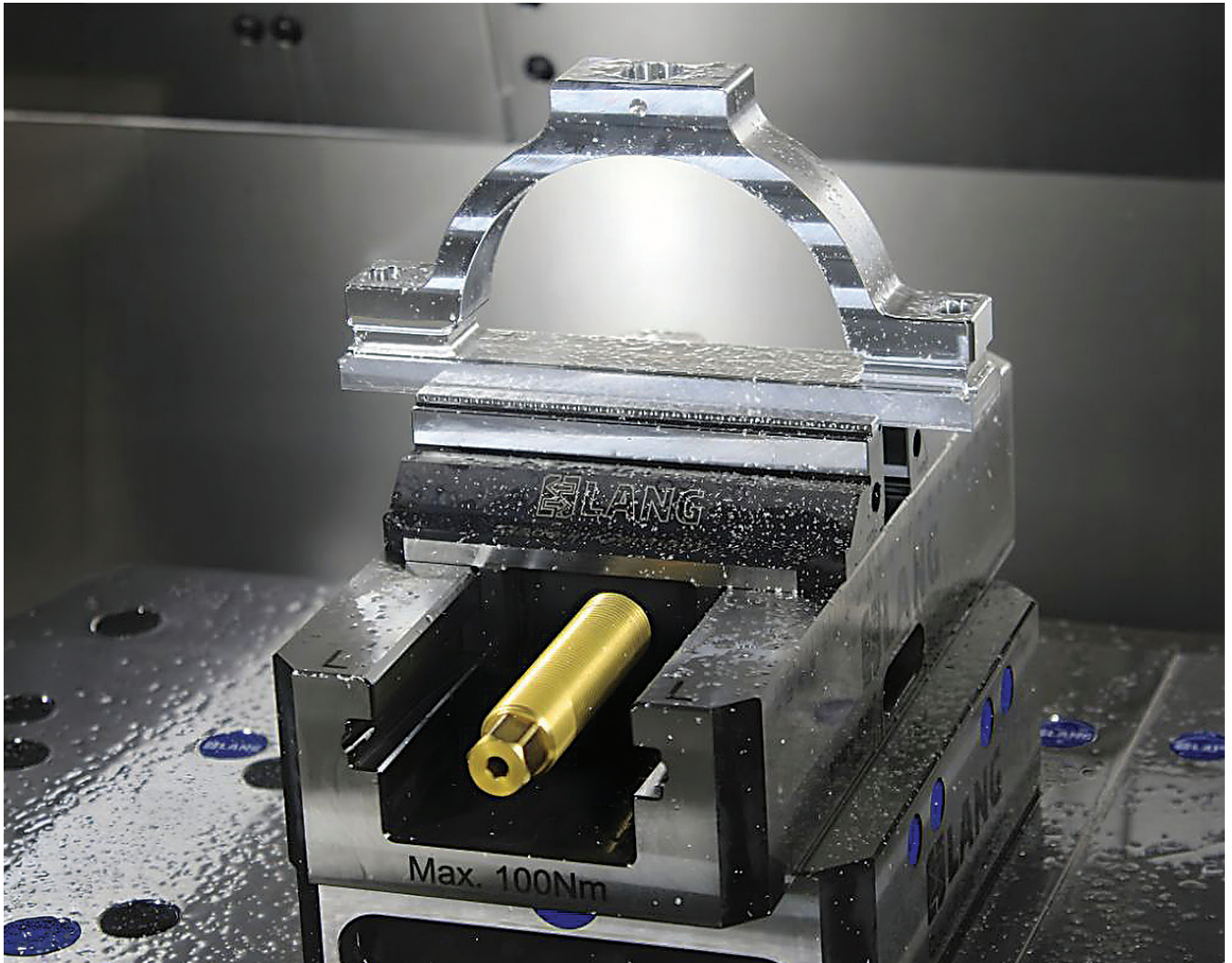


**DEBURR
ANY
CROSSHOLE****GUARANTEED
OR YOUR
MONEY BACK!**

www.jwdone.com



J.W. DONE CORP.
(888) 535-3663 (510) 784-0667 FAX (510) 732-6078



Hermle USA

A component that Neptune Aviation machined on its C 400 five-axis machine from Hermle.

"We're committed to expanding both our capabilities and our team," Cohen said. "This investment in the Hermle C 400 is just the beginning. We plan to continue upgrading our equipment and growing the machine shop. We're also actively hiring skilled machinists to help us take full advantage of what this platform can do. As I like to say, you can't bring in a great racecar driver if all you've got are jalopies. With this machine, we're building a shop that's ready to compete at the highest level." **CTE**

"The best technical course I have taken in any subject. Ever."

— Boris
grinder of airplane engines



High Intensity Grinding Course
2009, Switzerland.

THREE-DAY HIGH INTENSITY GRINDING COURSE

27-29 October 2026
8-10 December 2026

Columbia, South Carolina
Gothenburg, Sweden



www.TheGrindingDoc.com

BRINGING A ROBOTICS VISION TO LIFE

The participants may be young, ranging in age from 12 to 18 and in grades seven through 12, but the FIRST Tech Challenge for robotics is highly competitive. The pre-qualifier tournament for Oregon's statewide competition drew 34 teams, including one from Centro Cultural in Cornelius, Oregon. The Centro Cultural team needed two wood brackets on their robot replaced with metal versions,

said Angeles Godinez-Valencia, education director for the nonprofit community service provider that offers afterschool programs. The wood brackets, she noted, were chipping and not sturdy enough for the competition.

Though student team members regularly design parts for robots with Autodesk Fusion CAD/CAM software and produce those parts on Centro Cultural's laser cutters

and 3D printers, there is no in-house CNC machine tool, Godinez-Valencia said. In previous years when the team required machined metal components, a shop would produce parts for about \$300 each.

However, funds are tight at the community center, requiring students to make do with what they have, she explained. As it turned out, a volunteer at the center and a parent of a team member con-

Left to right: Cole Erhardt, OMIC R&D's associate machine solutions researcher; Mikala Stofiel, OMIC's applied research assistant; Centro Cultural students Alex Hernandez and Oscar Harnandez with the machined parts from OMIC R&D; and John Timmerman, OMIC R&D's machine operator/research assistant.



OMIC R&D

nected Centro Cultural with the Oregon Manufacturing Innovation Center, Research and Development (OMIC R&D) in Scappoose, Oregon, which is hosted by and an integral part of the Oregon Institute of Technology (Oregon Tech). The partnership enables OMIC R&D to turn academic insight into real-world outcomes for manufacturers across the region.

"The students didn't have to pay anything because they were so gracious to do it for free," Godinez-Valencia said.

The Centro Cultural team arrived at OMIC R&D with a clear objective and the raw material — a piece of 6061 aluminum — but needed access to professional machining equipment and expertise to drill and otherwise machine two similar parts, according to the collaborative manufacturing hub.

"At OMIC, we believe that one of the most important investments we can make is in our students," said Don Hendrickson, executive director of OMIC R&D. "When a group of young people show up with a problem to solve and the drive to compete, we want to be the place that helps them succeed. Experiences like these plant seeds for careers in advanced manufacturing and STEM — and that's exactly the kind of community impact we're here to make."

Godinez-Valencia concurred that it's important for young students to connect with organizations like OMIC R&D. "I always say that when they get an opportunity to talk to someone in the field, there's so much that they take away and it's very inspiring to them versus classroom time, which is great, but there's nothing like getting to see what these facilities are and

END USER	SOLUTION PROVIDER
Centro Cultural – Cornelius 503-359-0446 www.centrocultural.org	Oregon Manufacturing Innovation Center, Research and Development (OMIC R&D) 503-543-3306 www.omic.us
CHALLENGE	Economically replace wood parts on a robot with CNC-machined metal ones.
SOLUTION	A collaborative innovation center for manufacturing.

what's available, what the future will look like."

The students presented their design to OMIC R&D, which provided some input and tweaks before creating the parts on an Okuma machine. "It was a really great experience for them," said Godinez-Valencia, noting that OMIC R&D also provided a tour of its facility.

According to OMIC R&D, the engagement with Centro Cultural also highlights the value of accessible, community-focused manufacturing resources for educational programs. As robotics competitions grow increasingly sophisticated, student teams often require precision-machined components that go beyond what school workshops can provide.

Unfortunately for the Centro Cultural team, unlike previous times, it did not qualify for the state competition, but that did not prevent the students from having a first-rate experience. "They learned so many different skills," Godinez-Valencia said. "The big thing is technology is constantly advancing, and so they're learning about different industries and different tools being utilized and not just learning about programming, but the hardware side too. There are all these different engineering skills that they're

gaining — and it's all hands on."

She added that when team members are exposed to the basics, they build based on that information. "They just run with everything that they learn, and I love to see that." **CTE**



INCREASE UNATTENDED CYCLE TIMES, IMPROVE RIGIDITY, INCREASE CAPACITY

***Engineered Support
Real Results***

- ▶ Strong, Low-Profile, High Density, Innovative Solutions
- ▶ Free Design Consultations and Product Recommendations
- ▶ CAD File Support and On-site Visits

We Solve Your Toughest Workholding Challenges




MiteeBite.com
800-543-3580

Booth #431546

GRIP IT. RUN IT. PROFIT.

Thank You! to our SPONSORS



Ad Index

ADVERTISER	FOLIO	ADVERTISER	FOLIO	ADVERTISER	FOLIO
CERATIZIT	5	LYNDEX-NIKKEN	19	RUSH MACHINERY	13
GRINDING DOC	29	MARUBENI CITIZEN-CINCOM	BACK COVER	STAR CUTTER	21
INGERSOLL CUTTING TOOLS	INSIDE FRONT COVER	MERSEN	25	UNITED MACHINING SOLUTIONS	3
J.W. DONE	28	MITEE-BITE PRODUCTS	31	VEKTEK	23
KENNAMETAL	INSIDE BACK COVER	PLATINUM TOOLING	10		

Reviewed by the Engineering Index. Cutting Tool Engineering® (ISSN: 0011-4189) is published nine times a year in print and digital formats. Copyright 2026 by CTE Publications Inc., 121 S. Wilke Rd., Suite 200, Arlington Heights, IL 60005. All rights reserved. Periodicals postage paid at Winnetka, IL 60093 and additional mailing offices. Circulated in the U.S.A. to qualified individuals concerned with the material-cutting function in industry. Editorial, advertising and subscription offices: 121 S. Wilke Rd., Suite 200, Arlington Heights, IL 60005. Phone (847) 498-9100. This magazine is protected under U.S. and international copyright laws. Before reproducing anything from this publication, call the Copyright Clearance Center Inc. at (978) 750-8400. CTE Publications makes every effort to ensure that the processes described in Cutting Tool Engineering conform to sound machining practices. Neither the authors nor the publisher can be held responsible for injuries sustained while following procedures described herein. Postmaster: Send address changes to Cutting Tool Engineering, 121 S. Wilke Rd., Suite 200, Arlington Heights, IL 60005.



Produced in the U.S.A.



HARVI™ II TE

5-FLUTE SOLID END MILLS

**Ultimate productivity and tool life
meet an extreme application range**

HARVI II TE is the only 5-flute end mill you can count on for aggressive cutting parameters like high angle ramping and deep slotting. With the powerful combination of an extremely broad application range and ultimate productivity and tool life, HARVI II TE can make your general engineering, aerospace and defense and medical projects a cut above the rest.

Materials

PRIMARY

P Steels

M Stainless Steels

SECONDARY

S High-Temp Alloys

H Hardened Materials

K Cast Iron

**LET'S TAKE YOUR MANUFACTURING
TO THE NEXT LEVEL**

©2024 Kennametal Inc. | All rights reserved. | 205462-25

kennametal.com/HARVI-II-TE

EXPERIENCE
THE
DIFFERENCE

Cincom **Miyano**

A20-3F7

D25-1M8

L12-2M10

L32-2M12B5-ATC

L20E-3M12B5-Laser

M32-5M8

L20E-3M10 - *With*

*Mitsubishi Aria Robot and
Keyence Vision Check*

ABX-80SYY3

ANX-42SYY- *With
Automation*

BNA-42SY5

BNJ-51SY7

BNE-65-ATC

BNX-65MSY2 - *With
Automation*

RO4-5F6

IMTS Sept. 14-19

Chicago, IL

BOOTH# 339419

Live Demo's Everyday

14 machines with bar loaders

**Visit our Automation Hub
& Tools & Accessories Counter**

Marubeni Citizen-Cincom Inc.