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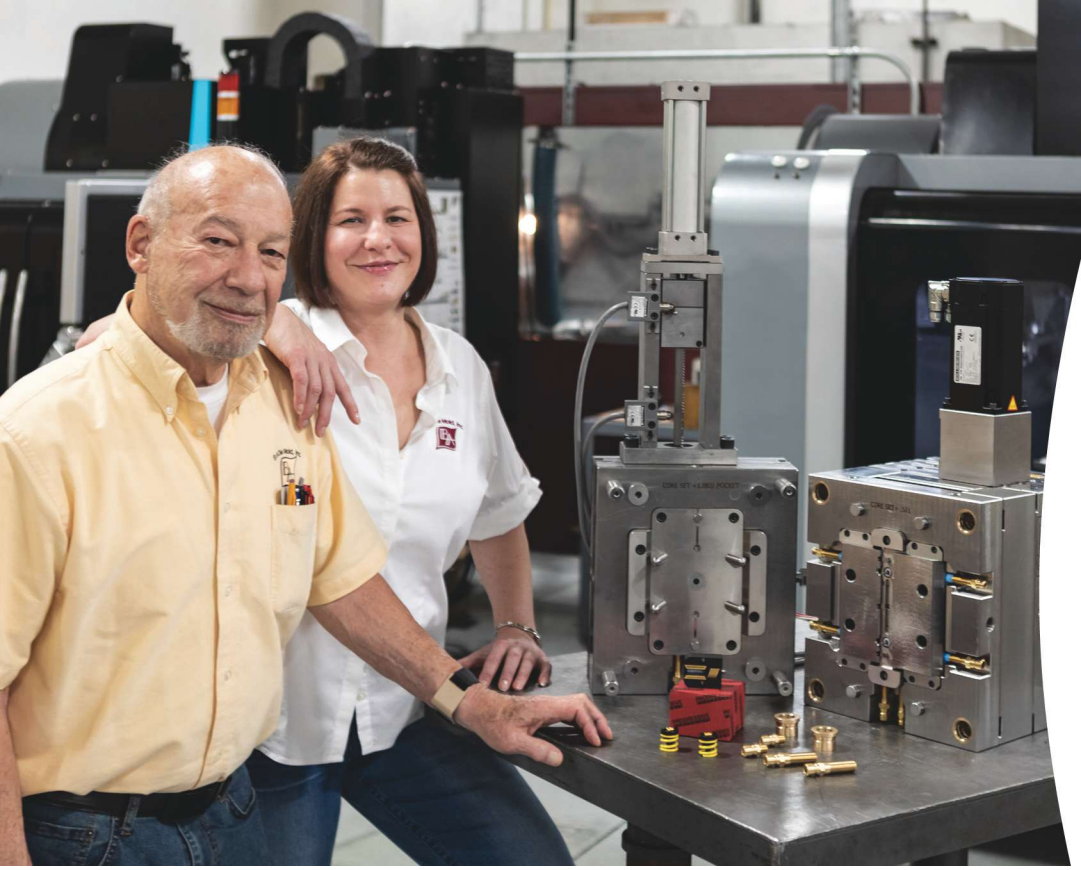

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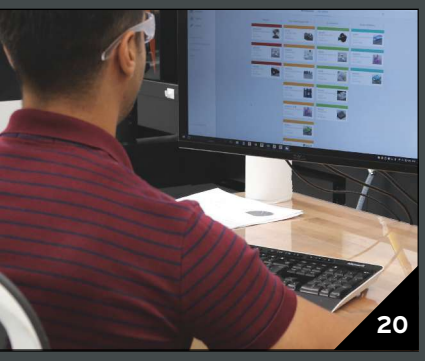

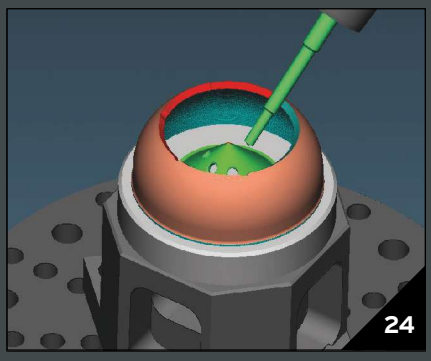

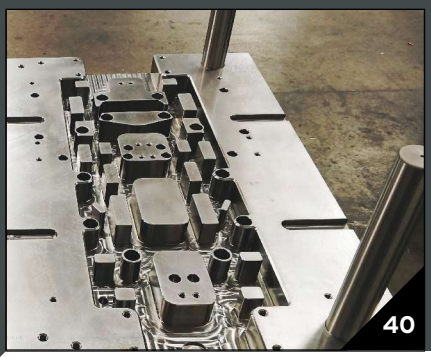

Features

Departments

ON THE COVER

Image courtesy of Heidenhain Corp. This month's cover shows an operator using a Heidenhain control. The Global Program settings in the Heidenhain TNC come into play particularly in large-scale moldmaking and are available in Program Run, MDI and Manual Operation modes. These modes can be used to define various coordinate transformations and settings as well as enable the operator to tilt the tools with an electronic handwheel to blend surfaces after a mold repair. These modes then act globally for the selected NC program without having to change the NC program for this purpose. See the related story on **page 14**.

Images courtesy of (left to right) Autodesk, CGTech and Dramco Tool Co. Inc.

VIDEO ACCESS

5 TRICKS OF THE TRADE

Great Tips from This Issue

1. Messaging Madness
It is difficult to find a young person who is motivated by the same things as a more experienced moldmaker, so it is time to change the message we use to recruit young people.
PG. 8.

2. Smarty Pants
Smart manufacturing offers the ability to monitor the status of job sheets and workstations, so users can see which machines are operating, which are idle or which are offline at a glance and then assign jobs.
PG. 20.

3. Your Final Answer
Simulation provides one final chance to review the "as-printed" design. If there is a question, you can revisit the build parameters.
PG. 24.

4. Tinker Toys
Automation means 24/7 operation and fewer operators, but the important thing is that you can achieve a much higher throughput because "you do not need to tinker with the process all the time."
PG. 28.

5. Mirror, Mirror on the Wall
Mirror-edge geometry synchronizes the vibration of the end mill with the vibration of the mold. This synchronized movement eliminates the chatter, improving the finish.
PG. 64.

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Miles of Moldmaking

Moldmaking is unique. A moldmaker has to understand the big picture. Moldmakers must consider part design, mold-cavity design, material selection, machining, programming, validating, assembly, testing and sampling. Digging a little deeper, moldmakers can find that the geometry of the molded part can be challenging with tight dimensional tolerances, strict flatness specifications and thin walls. Complex mold actions may be required to create some part features, and working with multiple materials, multiple sets of mold cores and multiple sets of cavities is part of the daily workload. On top of all that, cycle times and lead times are often very aggressive.

In a nutshell, the complexities and tight tolerances of mold work make it very demanding. Modern moldmaking is utterly dependent on accurate, repeatable and efficient technologies throughout the design and build stages. All of this requires additional resources, more elaborate planning and closer project management.

Today, there is a trend toward more complex parts, more precise parts and consolidating multiple existing parts into a single part, which means more complex, precise mold designs and more complex machining, maintenance and repair processes and strategies. The industry is also continuing to experience the need to automate and digitalize production processes. This means that moldmakers must be innovative and invest in the latest equipment to stay ahead of the competition. However, technology is not enough. Moldmakers must combine technology with organizational systems and management systems with cost control and qualified human resources.

IMTS is a place that offers mold shop owners, engineers, designers, builders, machine operators and toolroom personnel miles of technology, networking and resources to help them eliminate bottlenecks, increase productivity, reduce downtime and improve quality.

The Gardner Intelligence Capital Spending Survey asks metalworking shops about their intended spending on equipment for the coming year. Moldmakers who participated in the 2018 survey indicated vertical machining centers, horizontal machining centers, CAD/CAM software, vision systems and robots as their top five equipment-type purchases for 2018.

Some of this technology will be showcased throughout the halls of McCormick Place during IMTS this month, as we demonstrated in the August issue's IMTS Exhibitor Product Showcase. We continue that coverage in the IMTS Exhibitor Product Showcase on **page 52** with a look at even more technology, equipment, products and services for moldmakers at this biennial manufacturing event. You can also check out the IMTS Zone at *MoldMaking Technology* online for the latest news and stories on the show. And, be sure to stop by Booth 236600 in the North Building to say hello. MMT

Christina Fuges

Christina M. Fuges
Editorial Director

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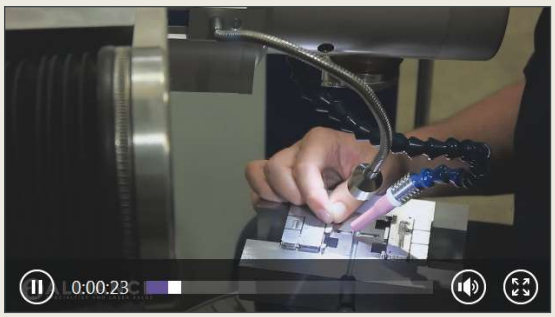
THIS MONTH ON moldmakingtechnology.com



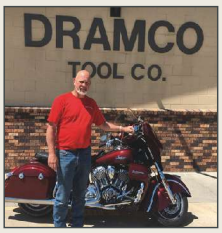
VIDEO: A Look at Full Solid State and Nd:YAG Laser Welders

Alliance Laser Sales takes a look at the efficiency, cooling and mobility features and functions of Nd:YAG laser and full solid state (FSS) laser systems to help you make the best choice of beam source for your laser-welding application.
short.moldmakingtechnology.com/laserbeam

SLIDESHOW: On Display at IMTS 2018

IMTS 2018 is fast approaching! This year, it will be held September 10–15, 2018 at McCormick Place in Chicago, Illinois. Check out the blog at *MoldMaking Technology* online for slideshows that offer a preview of some of what will be on display at the show.
short.moldmakingtechnology.com/imts18show

NEWS: Mold Builder Pushed His Limits for Our Wounded Warriors



Grand Island, Nebraska-based Dramco Tool owner Larry Patten pushed his limits in the 2018 Hoka Hey Motorcycle Challenge. Larry used this ride as an opportunity to raise money for iWarriors, a charity that is close to his heart in a number of ways. iWarriors provides iPads to our wounded soldiers as a tool to help them communicate with their families during the healing process and also to help in the healing from PTSD and TBI.
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BLOG: CAMM Members Contribute Skills for Windsor Rotary Centennial

Members of the Canadian Association of Mold Makers (CAMM) contributed time and skills to create sculptures for the new Rotary Club of Windsor (1918) Centennial Plaza.
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Recruiting Millennials: It Starts with "Why?"

Ryan Pohl
Founder
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MMT EAB member Ryan Pohl, founder of Praeco Skills LLC, has shared his expertise with MMT readers over the years by contributing editorials about workforce development, and his sound advice and effective strategies have rung true for many. Here, he offers more tips for recruiting and retaining a Millennial workforce.

As author and consultant Simon Sinek says in his 2009 book, "Start with Why: How Great Leaders Inspire Everyone to Take Action," answering the question "Why?" is the number one strategy when it comes to inspiring talent. In this case, I am referring specifically to the next generation of plastic mold manufacturers. This is the critical question that all mold manufacturing companies must answer if we hope to recruit and retain the right Millennials that we need to keep the industry strong.

The challenge for the current leaders of mold manufacturing companies is recognizing that the "why" that motivated them to get into the industry has changed over the years. It is difficult to find a young person that is motivated by the same things, so the message that current leaders use to recruit young people must change. Where members of the older generation likely started out in this industry so that they could provide a good financial living for themselves and their families, buy a nice house, have a nice car and work with their hands, the younger generation is more focused on other benefits that the trade provides. These benefits include being part of a team, giving back to the community and having the opportunity to be creative while solving complex problems.

Countless studies have shown that newcomers to the trade are concerned more about the relationships that they will make and what differences they can make in the world. In recruiting efforts, it becomes essential to speak about:

- the countless people whose lives are positively impacted by manufacturing,
- the economic importance of having a strong manufacturing base—and how almost every industry is dependent on us creating physical products that have tangible value in the market place and
- how millions of people are raised out of poverty through the economic engine of manufacturing.

These are proven truths of this trade and fantastic reasons *why* a person should commit to establishing a career in the trade.

The list could go on and on, but the key is that every company that is looking to hire and keep its young people should take the time to answer the question—and then sell it. Sell it to the local schools and to every employee in the shop. If companies create a culture that speaks to the "why," they will keep the youngest generation engaged, and we will have the talent that we need to keep the industry moving for years to come. MMT

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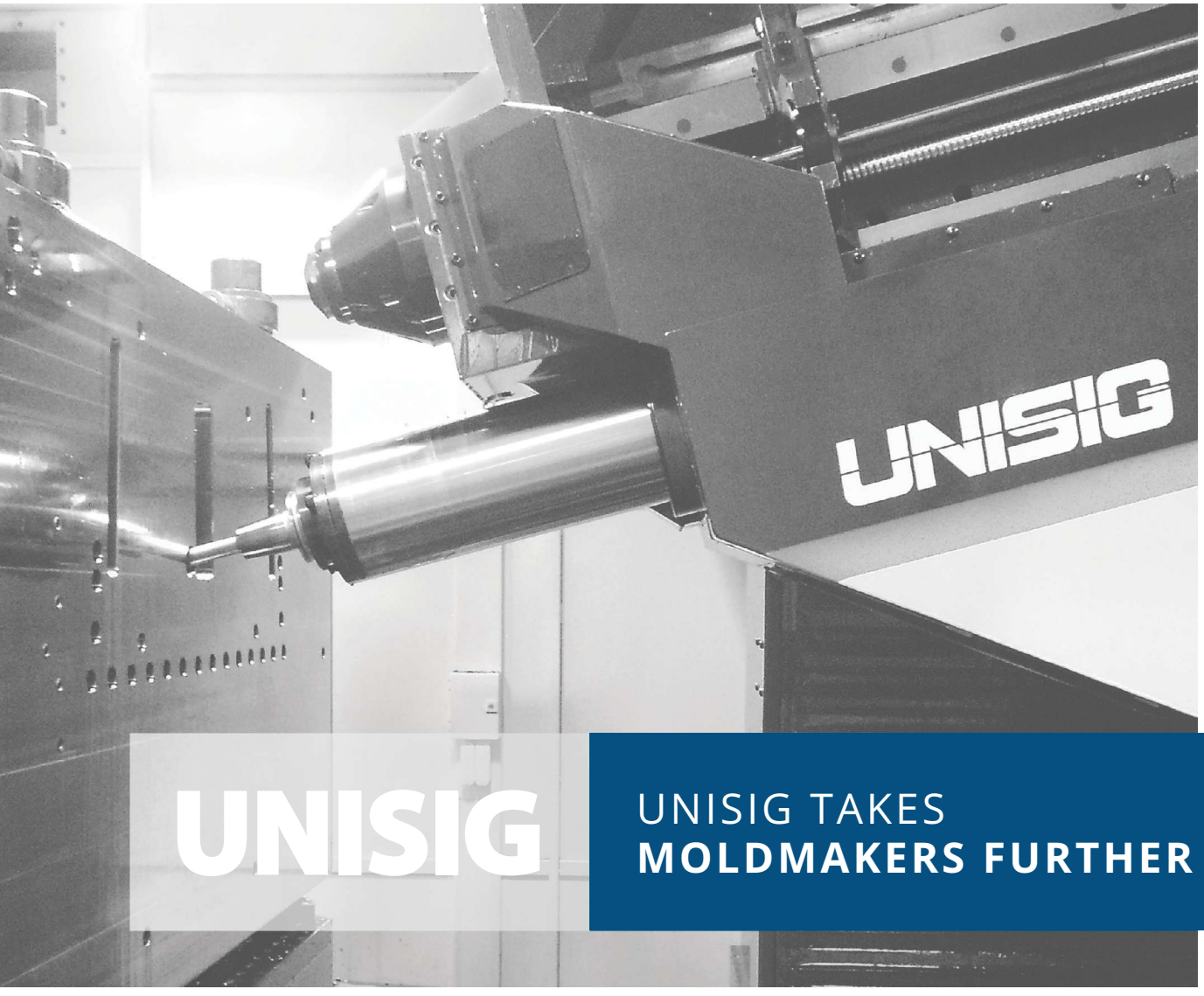

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A Conversation with ...

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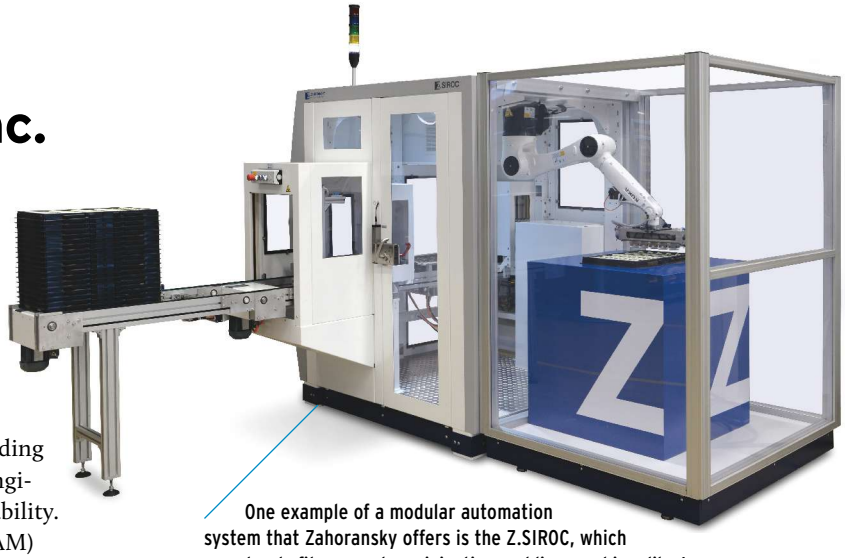

Images courtesy of Zahoransky USA Inc.

One example of a modular automation system that Zahoransky offers is the Z.SIROC, which seamlessly fits around any injection molding machine, like Legos. This modular automation cell is used for taking parts out of the injection molding machine and into the next station for assembly or to re-insert parts back into the mold for a secondary molding process.

At NPE2018, Zahoransky USA Inc. exhibited and featured an array of injection moldmaking capabilities. What capabilities seemed to catch the most attention from potential customers?

Product Sales Manager, Molds, Andrew Cummings: We have many years of mold building experience and have gained a reputation for engineering molds that perform with extreme reliability. Where Zahoransky Automation and Molds (ZAM) really brings value to the table is with turnkey solutions and our ability to integrate automation in or around the injection molding process. At Zahoransky USA Inc. (Zahoranksy), we say, "from the pellet to the pallet—we can provide solutions." For example, some of our customers have full lines that we built entirely, from the sub straight to the over-molded, inspected and packaged product. Cells like this run production 24/7 and can have as few as one operator for four machines. Another example, we run 100 percent all of the design and builds for all GUM brand interdental brushes. We impress potential customers by showing them that the right manufacturing solution for their products can be attained with only one vendor.

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- Was founded in 1902 in Todtnau, Germany, by Anton Zahoransky to produce tufting machines for brush making.
- Is known as the pioneer in brush production.
- Has more than 800 full-time employees working in 10 branches in seven countries, including the United States.
- Is family-owned and operated.
- Is currently led by Managing Director Ulrich Zahoransky, member of the family's third generation and a grandson of the company founder.
- States in its motto, "We are not perfect, but we are perfectly different."

A market leader in mold and tool making for toothbrushes and related dental products, Zahoransky also builds custom injection molds for medical technology and medical devices, packaging, consumer and personal care products.

When did Zahoransky first introduce "in-mold" and "near-mold automation" to its moldmaking services, and how does the company determine what is required?

Cummings: We are implementing in-mold automation for much of our customer base. We also have superb standalone injection tools, specializing in two- and three-component applications. We are continually refining how we design the molds and automation systems, and of course this begins by being completely dependent on the molded product. Typically, we work with customers that have injection molding needs beyond just the tool. We make extremely reliable tooling, but with our expertise in integrating automation, we go far beyond that. We ask customers for more than just part specifications. We ask them what they want to do with the product after it is molded. We discuss assembly processes and packaging options. After initial discussions with the customer, we send the information to Germany where our engineers develop two to three possible solutions. Take, for example, a project for a three-piece cap and closure for e-cigarette liquid caps. The mold is a 48-cavity tool times three, or 144 cavities total. The mold produces three separate parts, each molded from different materials, and uses the end-of-arm tooling to grab the 144 parts and assemble them right outside the mold as the mold closes and begins molding another 144 parts. This is accomplished with a 500-ton Arburg machine and three injection units, each of which injects a different resin. This is a standard configuration

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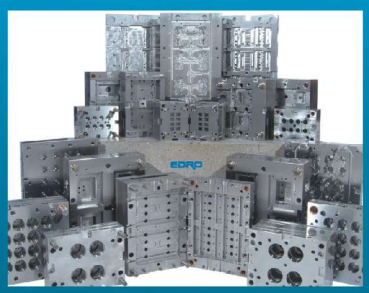

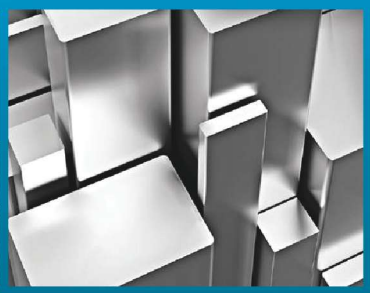

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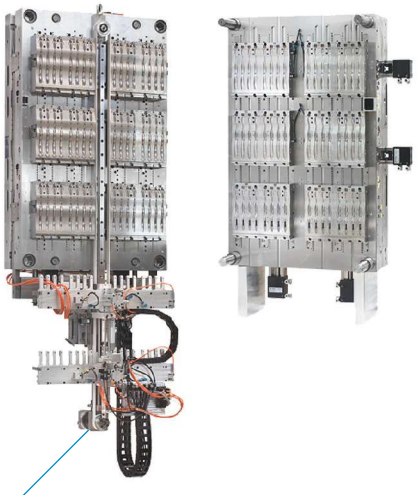
that Arbug supplies. This cell is completed with our integration of automation using the end-of-arm tooling for assembly.

Depending on the parts that the customer is molding and assembling, there is flexibility in how we configure the injection units. For example, we can configure them side-by-side, piggy-backed or vertically. Regardless, the parts would still meet customer requirements. This just gives our customer the flexibility to use different injection molding machines or standard injection molding machines. The customer might be limited by space and the ceiling height, so they may want, for instance, side-by-side injection units and not vertical injection units.

Provide an example for in-mold and near-mold automation, and explain how these approaches to injection molding fundamentally are changing the way Zahoransky's customers produce their end products.

Cummings: Honestly, we call it in-mold assembly (IMA), but typically assembly is done outside of the mold. If the assembly is done inside the mold, then it can only happen when the mold is open, which does not apply to the system I described. If assembly is done right beside the mold, the advantages are huge. For one, the customer can start to mold more parts while assembling simultaneously whereas with in-mold assembly, the customer would have to wait until the assembling is completed before the customer can shoot the next shot for molding.

Fundamentally, we are on the cutting edge of injection mold



Zahoransky is probably best known for the molds it builds to make toothbrushes and other oral care products. This toothbrush handle and head mold is part of the company's Z.Platform line, which enables quick product changes for up to six components using a fully automated, quick-changeover system with gripper heads to change out modular mold inserts. The company says that this system accelerates product changeovers and reduces tool costs by approximately 50 percent.

building and making this process as efficient as possible. Our expertise enables our customer to run the entire operation in-house from one manufacturing cell, often resulting in the reduction of injection-molding cycle time by having cooling towers and robots integrated right next to the mold, using any combination of our strategies to optimize the injection molding process.

Often the customer can see a reduction in total product manufacturing cycle time (molding to assembly) by integrating an assembly process using end-of-arm tooling. For example, as cycle time is dependent on the size of the part that the customer is molding, we are able to take a razor body with a thick handle and reduce the cycle time by 15 seconds by using an integrated cooling tower and robot.

Innovation is a reaction to customer needs that is combined with internal engineering and testing. In every way possible, we strive to create better ways to build molds that make 100-percent good products with a fully automated process that can run day in and day out. A great example of this kind of innovation is our Z.BLIZZARD needle syringe cell. The cell uses our Z.NFS (an automated needle housing and feeding system) to automate the feeding and bending of needles before they are inserted into an injection mold and over molded. We developed it, and it is standard for molding clear plastic vials using cyclic olefin copolymer (COP) and cyclic olefin copolymers (COC). In this case, 1-ml disposable syringes were being over-molded. A cell like this will give the customer 100-percent good parts that it can mold in a clean room and fill with drugs immediately off the press. To this day, we are the only company in the world that has this technology. Zahoransky has sold several of these systems to North American customers.

FOR MORE INFORMATION

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Does Zahoransky have any plans to further expand its presence in the United States?

Cummings: Yes, we just moved a German technician to our mold repair facility in Atlanta, Georgia. Soon, we would like to build our own mold shop and start building molds in the United States to support our growing North American customer base. MMT

By Cynthia Kustush

This article is part of a series of roundtable discussions with industry suppliers addressing recent trends in moldmaking, the challenges moldmakers are experiencing and the latest solutions that are or will be available to resolve them.

VIDEO

Access the related video under the Videos tab at *MMT* online.

Image courtesy of Heidenhain Corp.

Automation and Connectivity Are the Main Drivers of Machine-Tool Innovation

Machine-tool and EDM suppliers are advancing their offerings to include automation, better controls, machine monitoring and new five-axis capabilities.

Because moldmakers know that machining makes up most of the mold-building process, they continually seek ways in which to cut time and costs out of that process while maintaining high quality. *MoldMaking Technology* queried machine-tool and EDM suppliers about the machining trends and challenges that they are seeing and how they are working to help customers make those cuts to time and costs.

All About Automation

Automation is not just for use in high-production manufacturing environments anymore. It is the most prevalent trend in machining for moldmaking today. Every machine-tool and EDM supplier participating in this roundtable feature says that automation is the dominating factor when it comes to increasing productivity. "Parts are becoming more complex and the time to market shorter. Therefore, there is the need to produce the parts faster," António Fernandes, commercial engineer at Cheto Corp. S.A. (Oliveira de Azeméis, Portugal) says. "When we talk about automation, we talk about efficiency in every process step. This is the big challenge that the moldmaker is facing—the shifting of his production paradigm."

Machine-tool suppliers are adding automation features like this visual setup control (VSC) system from Heidenhain Corp., which works like facial recognition software in that the user photographs and stores the "perfect" machining setup in the machine. When the next part is loaded into the work area, the CNC compares that part to the "perfect" setup. If the system detects any deviation, the machine alerts the user and stops or moves to the next pallet and repeats the process.

Andre Ey, vice president of Die Mold Technologies at Makino (Auburn Hills, Michigan), says that his customers are implementing automation with various levels of complexity to increase the use of their machinery and the overall throughput of their companies. "The challenge lies in truly identifying their total process streams to efficiently automate," he says.

Michael Cope, product technical specialist for Hurco Companies Inc. (Indianapolis, Indiana), says he believes more shops are moving toward automation simply to use more hours in the day. "It is becoming increasingly important, especially in moldmaking where runtimes can be extensive," he says. "With the usefulness of today's automation choices, like pick-and-place units, shops can set up a list of jobs that will run lights-out and will capitalize on those hours that are otherwise lost."

Tom Houle, director of Lumex N.A. at Matsuura Machinery USA Inc. (St. Paul, Minnesota), concurs, adding that yet another reason for automating is the skills gap. "We hear from moldmakers across the country that the biggest challenge they face is the lack of skilled labor. This issue is driving them to automate their machining processes using pallet pools and high-capacity tool changers to achieve true, lights-out manufacturing."

Anthony Fettig, CEO at Unisig (Menomonee Falls, Wisconsin), says that in addition to external, part-handling automation, it is exciting to see further achievements in the way of internal automation like probing for tools and workpieces and closer connections between CAM, CAD and ERP systems to eliminate lost time and extract full capacity from an asset. "Maximizing internal automation is something that can be done without increasing a machine's footprint or reshaping an entire plant," he says. "Upgrading to a higher-technology machine with some of these features can make a dramatic change to throughput." Fettig adds that it can be challenging for moldmakers to have so many choices of new products designed to increase productivity, especially when they are coming from numerous suppliers. "All of this technology needs to be pulled together, and the ultimate goal is full integration with a company's information technology systems to help achieve goals that span many different areas of the business."

Machine Monitoring

Connectivity is also critical today, machine-tool suppliers say. Many moldmakers install devices to track the activity of the molds that they build, but now data is being collected from all corners of the shop to drive efficiencies.

"Digitalization of manual processes is the biggest shift we have seen in recent years. Companies are learning the value of collecting and analyzing reports coming directly from the machine itself," Max Preston, director of sales and marketing at Smart Attend Inc. (Aurora, Ontario, Canada) says. "Shops are capturing more machining parameters and logging more information than ever before. Operators and managers use this information for more accurate quoting, live part-quality management, tighter lead times and deliverables and for building more accurate capacity studies."

Gisbert Ledvon, TNC business development manager for Heidenhain Corp. (Schaumburg, Illinois), says that moldmakers are increasingly getting involved in networking and monitoring their machining centers to determine where the bottlenecks are when mold production is delayed. "Many mold shops implement custom solutions," he says. "We at Heidenhain see the importance of collecting machine data, but we do not want to collect just raw data. We also enable the operator to feed information into the system with a push of a button using predefined problems." Ledvon says that problems can include not having a sister tool, or having a CNC program that needs editing and so on. This way, the manager or supervisor gets the real picture of why the mold insert was not completed on time. "We provide key data and graphs that are really easy to understand and that can be downloaded into an Excel file for future record keeping or analytics. It is a really reliable, plug-and-play solution, specifically for shops that just want to get started analyzing their efficiency without hiring a data analyst who does not build molds," he says.

> When we talk about automation, we talk about efficiency in every process step. This is the big challenge that the moldmaker is facing–the shifting of his production paradigm.

Unisig's Fettig sees customers using 3D-laser and electronic-ball bar inspections, which are performed at machine-tool installations to "fingerprint" accuracy and use it as a benchmark for future alignment services or in the event of a machine collision. He also says that connectivity between machines makes them easier to monitor and program from a centralized location, plus it lets the original equipment manufacturer access customers' machines for diagnostics and updates.

Makino's Andre Ey agrees that machines are getting smarter and more connected. "Sensor technology and predictive algorithms can inform customers in a preventive way about the machine's status, potential downtime and service needs," he says. This advanced connectivity also enables more efficient scheduling of parts delivery and trouble shooting in real time using digital tools.

Better Controls and Motion-Control Systems

With newer, smarter machines comes the need for controls that are powerful enough to capitalize on the advanced machining capabilities. For example, Michael Cope of Hurco Companies Inc. says that more shops are adopting the high-feed tooling as a choice for cutting, which challenges machine-tool builders to create controls and motion-control

systems with enough power, speed and look-ahead to keep up and accommodate the faster feed rates and direction changes associated with these high-feed end mills and tooling.

Heidenhain Corp.'s Ledvon concurs, saying that it is a matter of "first part, first fit," meaning that moldmakers do not have the luxury of cutting several test parts to tweak the machine, program and tool path as they might in a production environment. "Heidenhain offers unique closed-loop technology on five-axis machine tools comprising an entire motion-control system CNC, angle encoders on motors and linear glass scales for maximum position accuracy," he says. "All of this is supported by software features like dynamic efficiency and dynamic precision to ensure that the cutting tool machines the mold insert the way that the programmer wants it to."

Also, Heidenhain Corp. introduced visual setup control (VSC) with which the Heidenhain TNC can automatically monitor the current setup or machining situation during a program run. This optional feature snaps reference photos of the first parts of a series. The user specifies multiple places in the NC program where the control must perform an optical comparison between the nominal condition and the actual one. If an error is detected, the TNC reacts in a manner selected by the user.

Unisig's Fettig speaks of similar safeguards. He says, "Having machine, fixture, workpiece and tool-simulation capabilities within the machine control enables more optimized machining cycles to save time while reducing or eliminating the possibility of a crash from a programming error."

Image courtesy of Cheto Corp. S.A.

This deep-hole drilling with milling machine from Cheto Corp. S.A. is one of several new, "multi-use" hybrid machining centers, the technologies of which are designed to help moldmakers machine more efficiently and economically.

The Combination of Subtractive and Additive Machining

Everyone is talking about additive manufacturing (AM) and how it fits into the moldmaking world. Many machine-tool suppliers have introduced products on multiple levels of the AM spectrum. To assist the moldmaking community, for example, Matsuura Machinery USA Inc. launched a hybrid, additive, metal 3D printer late last year. It enables programmers to produce integrated core and cavity sets, which Tom Houle says replaces the need for a toolmaker to fit inserts into a multi-piece complex assembly. "This same machine will also run unattended, reducing the typical activity of moving a component from machine to machine or department to department to complete all the required operations," he says. "Our one-machine, one-process approach reduces manufacturing time by up to 50 percent."

Evan Syverson, manager of Additive and HSM Business at Sodick Inc. (Schaumburg, Illinois), points to the way that EDM technology has evolved in recent years. "There was a time when sinker EDM was the default means of producing molds," he says. "Today, sinker EDM is just one of several different processes that potentially may be involved. Other processes that may be involved include hard milling, which has increasingly taken on importance as manufacturers attempt to avoid the added process of making electrodes for EDM."

Responding to this trend, Sodick Inc. is offering new post-processing solutions for moldmakers who are implementing 3D printing into their production, he says. "Because equipment used in secondary operations or post-processing traditionally has not been designed with additive in mind, it has been very expensive for moldmakers to get equipment with adequate specifications for their printed molds. Many have had to purchase premium machine models to overcome a single specification that disqualified the equivalent economy models. Beyond additive machines themselves, Sodick is developing

dedicated EDM products specifically with the capacity and features needed for 3D post processing, making it much easier to finish 3D molds once they have been printed."

Finally, Pat Crownhart, Product Manager at MC Machinery Systems Inc. (Elk Grove Village, Illinois), says that many moldmakers are working with aging sinker EDM technologies that make producing high-accuracy work a challenge. "If you can maintain speed and reduce wear it is a big efficiency win, not to mention cost reducer, for moldmakers," he says. "To alleviate this problem, we have added completely new machine circuitry that limits damage to the electrode with each discharge. When it takes millions of sparks to complete a mold cavity, preventing damage to the electrode with each discharge means the most difficult burns will see the greatest efficiency increase because you are making fewer electrodes."

New Machining Advantages

Tom Houle of Matsuura Machinery USA Inc. says that the emergence of cost-down, high-quality and automated five-axis machining has helped the moldmaker become more competitive while achieving higher accuracy. "These 'self-contained factories,' with high-capacity tool changers (that can change at least 330 tools) and pallet pools (that have 32 pallets) added days of unattended and reliable five-axis production," he says.

"With the aid of five-axis machines, we can machine more of the part without the use of EDM electrodes, jig grinding and hand polishing," Dale Mickelson, Yasda product manager for Methods Machine Tools Inc. (Sudbury, Massachusetts), says. "The materials that are molded today, like silicon, flow like water and require better than 0.0002-inch accuracies on shut-offs. Dies made to cut thinner and more exotic materials also require better than 0.0002-inch accuracy on the cutting edge," he says. "Methods imports some of the most accurate machines in the world that can achieve 0.00002-inch accuracies and the ability to cut 92-HRC carbide dies using cutters with special diamond coatings and advanced geometries."

Michael Cope says that Hurco Companies Inc. has designed a line of bridge-style machine tools that are more thermally stable for moldmaking and will help reduce the problems that exist from the build-up of heat that is present in a traditional C-frame machine because of the faster feed rates and spindle speeds associated with high-speed machining. "In addition to machine-tool design, offering machines with higher-rpm spindles, faster acceleration and deceleration and the dual contact type of

toolholders (like HSK and BigPlus) will also help our customers achieve better results," he says.

Clare Welham, marketing coordinator for Schunk (Morrisville, North Carolina), also notes the increase in the use of higher-rpm spindles for moldmaking. She says that these spindles require machinists to think differently about how to make chips, so moldmakers are trying new approaches like chip-thinning techniques. "Schunk is addressing these challenges by using toolholding systems that are capable of a high number of rotations per minute, that clamp the tool concentrically and are accurate, repeatable and balanced. They are also easy to use, thereby eliminating the guess work of precision toolholding. High-precision I/D and O/D workholding is capable of micron precision." Another advancement is intelligent toolholding systems with sensors that have the ability to communicate with the machine to make automatic adjustments when needed, she says.

Likewise, Mickelson says that Methods Machine Tools Inc. supports customers by guiding them in choosing the best holders, cutters, fixtures and programming techniques to achieve the highest part accuracy and finish. "Methods teaches the customer when to use five-axis and how to get the best finish and the most tool life using all the different techniques offered in the most popular software programs," he says. Additionally, Methods Machine Tools Inc. built a new tech center in Acton, Massachusetts, that features new materials testing, cutters testing, holders testing and so on. "All the latest products that come out will be tested here and shared with customers that purchase Methods machines."

Cheto Corp. S.A.'s CEO Carlos Teixeira says that a new machine concept for small-size, deep-hole drilling with milling has recently been introduced. "We expect that with this new equipment, our clients' production planning and use of resources will change because the machine will provide both deep-hole drilling and milling 'all in one' and will process the parts in a way that is simpler, faster and more accurate," he says.

Likewise, Makino has introduced new machine tools with advanced features. "The machines will have an optimized footprint, reducing floor-space requirements," Ey says. "They will come automation-ready and will have connectivity and smart sensors. They are equipped with the latest processing capabilities like collision safeguards to meet the agility and volumetric accuracy that is necessary for continuous five-axis cutting. Makino provides all of this to help increase its customers' competitiveness."

Just as these suppliers are evolving technologies to meet the moldmaking industry's needs, the way that moldmakers are finding and partnering with suppliers, customers and other moldmakers is also evolving—digitally. One example is through OrderFox.com (Chicago, Illinois), an internet resource for the CNC industry. President Brian J. Smith explains that if a company has a machine down and a deadline that it cannot miss, the company can confidentially find the right production partner to help meet the deadline. If a company has extra capacity and is looking to take on additional work, the company can access the platform and search for additional work within its area of expertise. "We are not a machine-tool builder, a technology integrator or even a software company but rather a technology platform that is focused on building industry partnerships and overall industry growth," Smith says. MMT

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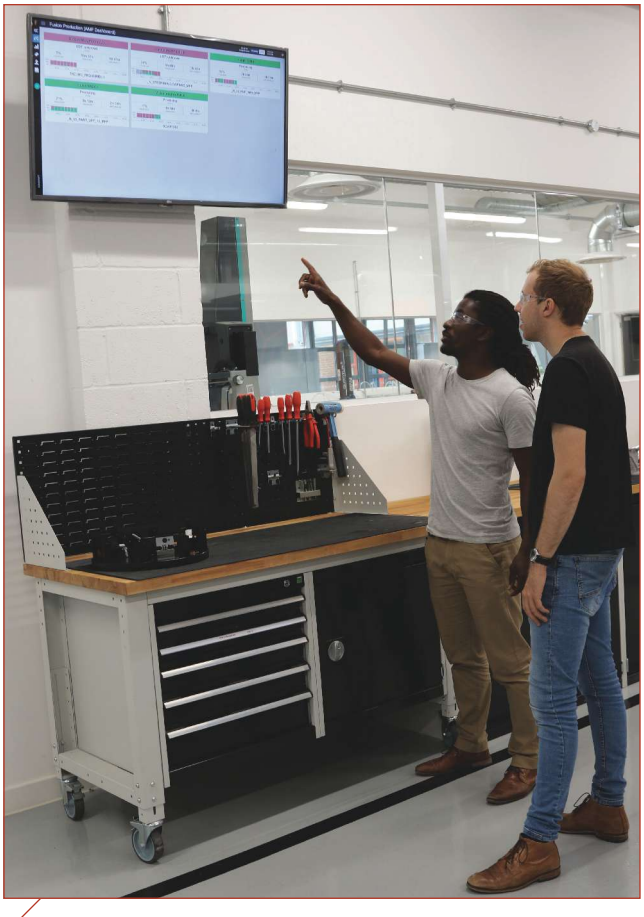
By Sanjay Thakore

Using Real-Time Production Data

One approach to smart manufacturing is using a single, cloud-based tool for production scheduling, job tracking and CNC machine monitoring.

Smart manufacturing, also known as Industry 4.0, refers to a wide range of practices that use advanced technologies in a variety of combinations, from robotics and automation to additive manufacturing and cloud computing to big data and analytics.

For mold builders, some of these practices are commonplace, while others have yet to be adopted. However, one approach that virtually all mold manufacturers can benefit from is using real-time production data to make informed decisions and to improve performance.



Images courtesy of Autodesk.

Real-time dashboards of CNC equipment provide instant updates on in-cycle status, helping identify immediate issues.

In theory, this means gaining a unified view of every job across production, which makes it much easier to plan work, adapt to changes and find ways to run the shop floor more efficiently.

In the context of smart manufacturing, it is more appropriate to imagine smart manufacturing's potential impact on the everyday challenges of producing high-quality molds on time and on a budget, rather than a far-away future state that may or may not be feasible for your shop to achieve.

Assessing the Everyday Challenges

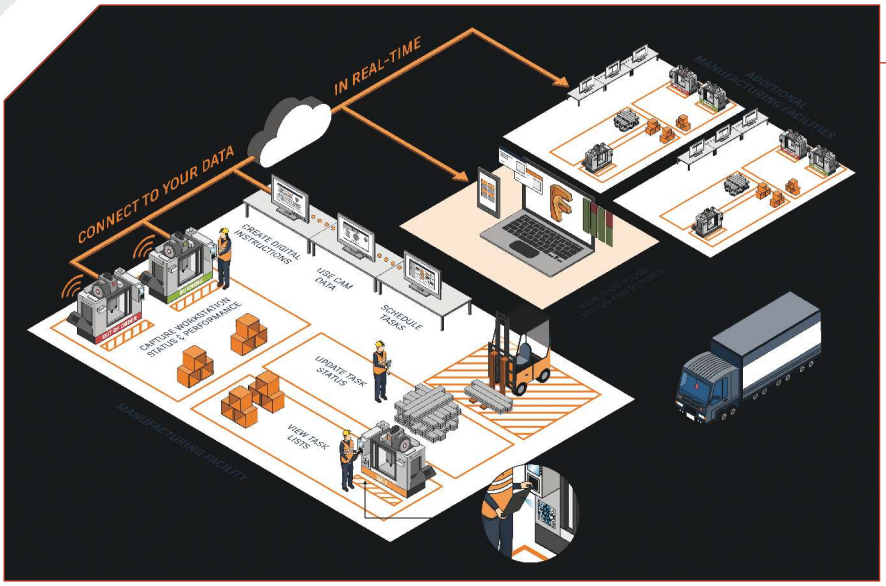
Every shop is familiar with the difficulty of managing the following processes throughout each work day.

Scheduling. Planning and tracking jobs through production can be a challenge because it often involves multiple businesses working on different phases of a mold at different times or in different time zones. In other cases, shops rely on time-consuming, manual processes, such as custom spreadsheets or the more traditional paper-and-pencil method. These elements make it difficult for you to see what is happening at any given moment with any given job.

When you cannot see what jobs are in the process, it becomes that much more difficult for you to predict workloads relative to available capacity. Mismatches can lead to poor scheduling, lower throughput and missed opportunities. Many shops work around this by having someone run from machine to machine checking job status, but that is inefficient and imprecise.

Managing changes. In the real world, manufacturing is rarely a smooth and uninterrupted process that always moves forward as planned. Customers change their orders. Suppliers miss deadlines. Parties do no communicate critical information. Data is inaccurate. CNC machines and tools break. You must deal with these variables quickly, or a waterfall of consequences can turn a small issue into a delay that compromises your shop's profitability or even your reputation.

Improving performance. Reliable data is the foundation of process improvement. Today, it is a constant struggle to find the data that you need on things like downtime durations for



Combining scheduling, tracking and machine monitoring gives visibility into shopfloor status and performance. Doing this as a cloud tool gives an extended line-of-sight across multiple facilities.

machines, cycle times and quality issues. Paper files cannot share information, and many manufacturing software applications are not capable of communicating with each another. Disjointed methods can limit the ability of mold builders to extract and analyze data from multiple concurrent processes. Generating reliable data requires substantial manual data entry. Analyzing that data is even more time-consuming.

Applying a "Smart" Approach

The goal of smart manufacturing is to retrieve critical metrics continuously and move them to a central location that is easy for all to access. Ideally, smart manufacturing enables you to identify improvement opportunities more easily, make sure operators are using each machine to its full capacity and even understand which kinds of jobs are the most profitable. Excelling in any one of these areas could give your shop an edge. Improving all three would almost certainly set your shop apart from key competitors.

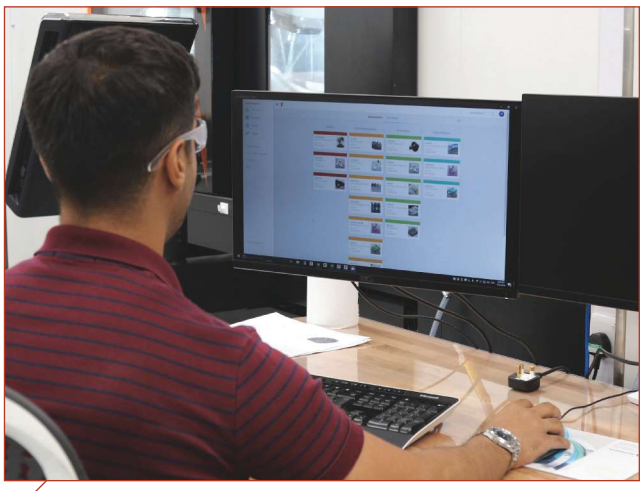
Cue a single, cloud-based tool for production scheduling, job tracking and CNC machine monitoring. All three of the aforementioned challenges are the result of not knowing something about a process when it would be extremely convenient to know it. A single, cloud-based tool for production scheduling, job tracking and CNC machine monitoring offers a way to solve this problem. It connects machine- and application-level data that you can access through a mobile app or web browser. You can see the value of this approach across the entire shop floor.

Start by eliminating manual processes. This single, cloud-based tool can create digital work instructions, dispatch job sheets, schedule tasks, track jobs, monitor workstations and view performance reports. Once you have created your instructions and dispatched the job sheets to the shop floor, you can track them through production.

With the ability to monitor the status of both job sheets and workstations, you can see at-a-glance which machines are operating, idle or offline and then assign (or reassign) jobs accordingly to optimize utilization, reduce downtime and improve throughput. This makes it easier to spot-check a job's progress against the deadline, especially if the customer changes that deadline midstream.

And, you can capture a "snapshot" of these details to give customers or vendors a progress report at any time. This gives a centralized view of real-time information from the shop floor.

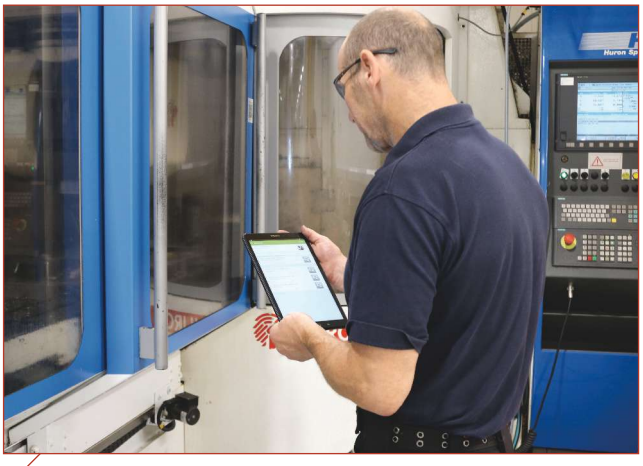
Knowing where everything is at any moment in time has a huge impact on mold manufacturers. Digital scheduling would help you better manage capacity and make decisions that are based on actual workloads instead of estimates or guesswork. Digital work instructions could reduce the risk of mistakes. And, unplanned downtime at any workstation would be evident, which would enable you to address potential issues more rapidly and reroute other work before bottlenecks occur.



View a job's status against due dates to stay current on works in progress.

After a job runs, data about how it moved through production provides insight to which job instructions, job sheets and workstations produced the highest-quality mold tools. This kind of analysis could be vital to identifying the source of scrap, rework or other issues. More realistic time-to-market calculations could also improve the accuracy of quotes for similar jobs.

It is also important to generate automatically a detailed product history that facilitates traceability as well as useful information on how your shop manufactured a mold. This could help your shop meet record-keeping requirements. Plus, capturing institutional knowledge about how to make specific parts can be useful if you need to program a similar job in the future.



Access across mobile devices helps operators stay up to date with the current schedule and their specific tasks when they are on the go.

Making Multiple Decisions

The realities of discrete manufacturing mean that each day involves multiple decisions. When unplanned machine downtime disrupts production, you ask yourself, *Will it be more efficient to move the job or wait for a repair? How long will that repair take? If the repair is successful, how many more jobs can the shop take on today? This week?* Typically, you must deal with these situations on the fly, choosing a course of action without the benefit of complete, accurate data from the workstations in question.

It is not just in-progress data that is important, but also the data that lets you understand how your shop floor is performing and that helps incremental process improvement. For example,

with a single, cloud-based tool for production scheduling, job tracking and CNC machine monitoring, CAM programmers can gain insight into how CNC machines are actually performing, cross-referencing feeds and speeds to validate machining time, tracking setup times against part programs and seeing how utilization rates are affected by various parameters within an NC program. This information helps identify issues and leads to better tool paths and subsequent NC programs.

Maintenance engineers can view reports of CNC faults or warnings that pop up across machines. From this data, they could understand the need to schedule a machine for maintenance if a warning repeatedly arises. The production schedulers can begin to iteratively optimize their estimated schedules based on data that shows how long jobs take to complete or how long a particular NC program takes to run. This means their future schedules will be a better representation of what is happening on the shop floor.

There is potential to deliver a great deal of value to your shop by unifying your production and creating closed-loop feedback, all in parallel with the benefits of cloud computing. The benefits add up to measurable competitive advantages, including:

- **Higher speed**: Fewer or faster rework loops let your shop ship more parts faster. In many situations, speed is a higher priority than cost.
- **Higher efficiency**: Together, better utilization of machines and better optimization of production schedules enables your shop to achieve higher throughput with less effort.
- **Higher quality**: Knowing the details of scrap rates creates opportunities for your shop to resolve problems earlier and apply successes broadly to increase the overall yield of quality.
- **Higher profitability**: Less scrap reduces costs, while improved efficiency and throughput help your shop manage higher workloads and serve more customers.

The value of connecting your manufacturing data collection and integration of various software tools cannot be understated. The more data that you collect now, the more opportunities your shop will have to realize improvements that increase your margins, even if your approach is limited in scope. MMT

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By Gene Granata

Know What to Expect Before Starting with Additive Manufacturing

Machine simulation can help to provide a clear picture of the additive manufacturing process from the first to the last step.

As with other segments of the manufacturing industry, 3D printing is making significant inroads into the mold, die and toolmaking market. Whether it is mold inserts with conformal cooling channels, mold repairs, rapid prototype and bridge tooling, or 3D-printed "show-and-tell" models for quoting and customer approval purposes, those who have made the leap to additive are finding it an important tool in the manufacturing toolbox.

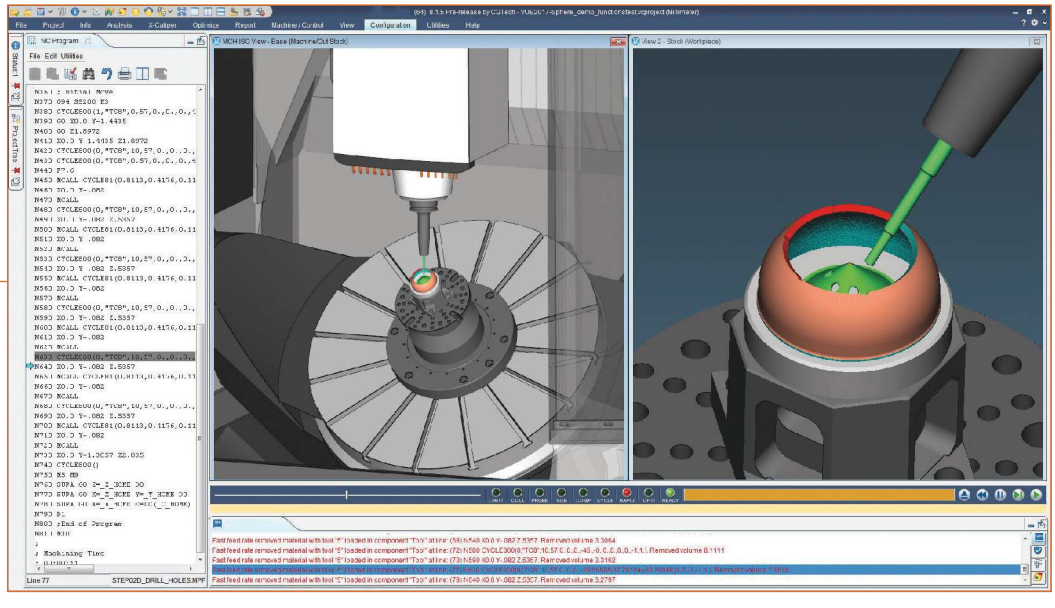
Yet challenges exist because metal additive, powder-bed and spray-deposition technology are still relatively new. The correct "recipe" of laser parameters, such as traverse speed and power levels, material feed rates and gas flow, are often a best guess or are determined by slow trial-and-error on the machine tool. The behavior of the feedstocks and powders that you would use with 3D printers is similar.

Additively manufactured part geometries are in a constant state of flux as designers and engineers learn the best ways to leverage this new technology. Warping from thermally induced internal stress and the occasional "crashed build" is not uncommon. Then, once the product leaves the 3D printer, secondary machining processes are usually needed to ream and tap holes or skim-cut critical surfaces.

To make matters worse, there is no chance to open the door and peek in on the burgeoning workpiece as there is with a CNC machining center or lathe. Therefore, it behooves machine owners, programmers and operators to know what to expect before pushing the cycle start button and to have a clear idea of the manufacturing process from the first step to the last. The best way to accomplish this is with machine simulation software.

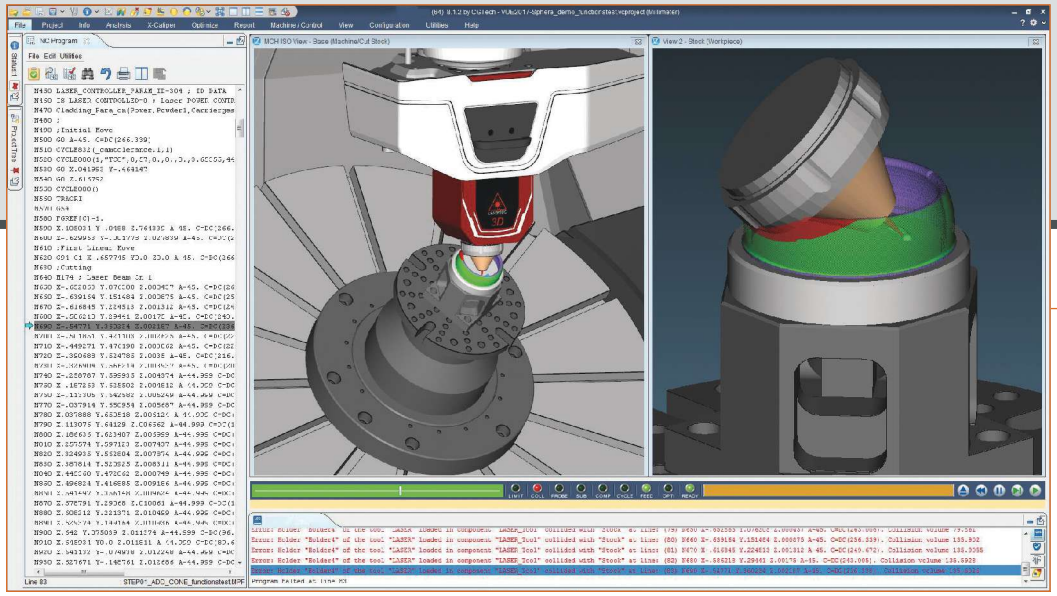
Determining the Need for Machine Simulation

Some people argue that machine simulation software is all about collision checking, and because the additive manufacturing process is always working on the top layers of the



Simulation can detect critical machining errors in the machining process before those errors occur on your CNC equipment. Errors include things like collisions between machine components or expensive additive equipment and non-cutting-tool shanks or holders damaging the part (shown).

Images courtesy of CGTech.



Simulation aids NC programmers by showing when planned setups or the sequence of operations will not work to manufacture the part. Since simulation is run offline at a programmer's desk, there is no need to tie up expensive hybrid equipment on prove-outs.

workpiece, there is very little of the crash potential that is common in traditional machining.

While that statement is valid for some additive machines, the reality is much deeper. On metal-based additive machines especially, build rates are quite slow. You might spend tens or even hundreds of hours printing a part only to find that you missed something during the design process, used an incorrect recipe of additive parameters or wish that you had built something differently.

If there is a question, you can revisit the build parameters or consult with the customer and avoid the unpleasant phone call you might otherwise have to make later.

Then there is the question about which would be faster: building a part additively or through traditional fixturing and machining. More effective cost quoting up front is necessary for your shop to answer this question correctly and with confidence.

Why would you not want to spend a few minutes simulating the build ahead of time to make sure that your expensive machine tool does not just waste thousands of dollars building something that will head straight to the recycling bin? Simulation also provides one final chance to review the "as-printed" design. If there is a question, you can revisit the build parameters or consult with the customer and avoid the unpleasant phone call you might otherwise have to make later.

Moving to the Next Level

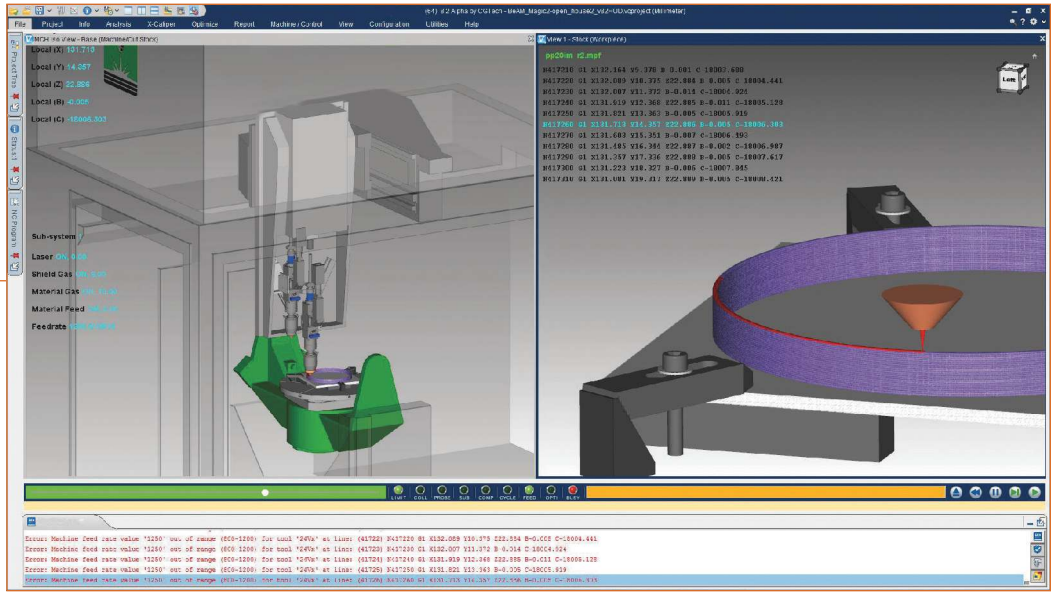
Hopefully, your shop is already leveraging toolpath simulation software to verify and optimize traditional machine tools. If that is the case, then you already know that the best way to verify how a machine will react to one of your tool paths is to simulate the actual post-processed G-code that will drive the machine. No more do you wonder whether an unexpected hiccup in the post-processor will send a half-inch ballnose end mill careening into the workpiece. Gouging and uncut material is clearly identified as are wasted motion and less-than-ideal machining values.

These benefits extend to additive manufacturing as well. Building a part that does not match the intended design and errors like leaving voids and unexpected material are clearly visible. Laser activity, including things like gas flow, wattage and powder deposition, is no longer a guessing game. You can maintain detailed build history for archival purposes or to conduct a post-build forensic analysis in the event of a failure. You can quickly reveal the precise identification of root-cause NC program, tool (additive or subtractive) and block of NC code with a single mouse click.

There are even more reasons to simulate with a hybrid additive machine. Collision avoidance comes back into play but takes on a new level of complexity as metal is added to and subtracted from the workpiece. You can watch the entire manufacturing process virtually. You can stop and restart it at any time, rewind or fast-forward as you need, zoom into problem areas and visualize each discrete step of the hybrid additive machining cycle.

Looking Ahead

Maybe you are not ready yet, and the thought of spending a million dollars or more for completely new manufacturing technology (that is, at least, new to you) has you lying awake at night. With simulation, you can eliminate much of the



Simulation provides clear, unobstructed viewing of additive and subtractive processes, enabling NC programmers to judge the quality and efficiency of their programmed paths while ensuring that no errors occur, like using a machine feedrate beyond the acceptable range for proper material deposition.

mystery. Simulation models for all major additive and hybrid machine tools usually are available. Just plug in your 3D model and some NC code to start kicking the tires. You can easily validate build speeds and machining capabilities before the first dollar of hard-earned cash ever leaves your checking account.

Take that a step further. Say you have a new machine but are still grappling with how to quote additively produced molds and tooling. Simulation provides accurate cycle times, material statistics, power consumption and more while identifying potential problem areas. You can experiment with different production strategies and determine the best approach. That way, it is easier to determine which part features your shop should print and which part features your shop should machine. You can visualize and validate end-to-end all of the "hand-shakes" made along the entire manufacturing process, including steps like additive and subtractive processes, secondary machining and post-build finishing, which possibly could help you avoid costly rework.

> Those who can determine most quickly when and how to utilize this technology to make better parts, faster, and at a lower cost will be the ones to define success.

Leaving Old School Ways Behind

You may be thinking, *Hold on. We have been doing this for 30 years. Our moldmaking techniques have been laboriously (and sometimes painfully) refined. Why would we upset our applecart by investing in a technology that is still rapidly evolving, is quite expensive and for which very few people can operate and program the machinery?*

Similar questions were posed when the first paper-tape NC lathes and mills hit the showroom. Maybe you were not an early adopter back then either, but can you imagine a world without CNC machine tools now? The same will be said about additive manufacturing and probably much sooner than anyone can imagine. Those who can determine most quickly when and how to utilize this technology to make better parts, faster and at a lower cost will be the ones to define success.

Machine simulation makes 3D printing on CNC additive and hybrid machines safer and much less scary. And, for those who are not afraid of anything, it makes the entire manufacturing process, including auxiliary operations, far more efficient and profitable. You have come this far, so why not take the extra step? Get simulating. MMT

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By Barbara Schulz

Standardized, Automated Processes Facilitate the Leap to Industrial Moldmaking

Germany-based moldmaker Hofmann successfully made the leap to industrial tool and moldmaking and capitalized on the possibilities that automation and standardization offer.

From humble beginnings in 1958, Hofmann Innovation Group (which now operates under the brands Hofmann, Ihre Impulsgeber and Hofmann, and Ihr Möglichmacher and which is based in Lichtenfels, Germany), has developed into one of the most renowned companies in the plastic processing industry. With distinct simulations and consistent part optimization, Hofmann designs and produces molds for the automotive, home appliances, medical, packaging and electronics sector. Around 400 employees and partners in Spain, China and Turkey generate a turnover of 56 million euros (as of 2016).

Images courtesy of Susanne Schroeder.

Hofmann's automated milling line includes four Hermle C42U machines, a washing and measuring station, 60 pallets and space for 400 tools. According to Hofmann, the cell is as efficient as 10 stand-alone machines.

Managing Director Stefan Hofmann says that the key to success is automation and standardization throughout the entire manufacturing chain. He took up the reins of the family business in January 2018 from his father Günter Hofmann. More than 10 years ago, Hofmann reacted to pressure from low-wage countries by turning to automation and standardization in an effort to cap costs.

But, low-cost countries have not been the only sources of pressure. The market demands high flexibility, components are becoming ever more complex, and there is increasing pressure on manufacturers, including mold shops, regarding prices. Additionally, a skills shortage poses a challenge, and of course consumers demand components of high quality but are largely unwilling to pay a higher price. Therefore, even small and medium-sized enterprises, and perhaps even especially small and medium-sized enterprises, need to address the issue of automation.

Addressing Automation Is a Must for SMEs

But the topic of automation is diverse, ranging from zero-point clamping systems on milling centers with pallet changers to linked, fully automated manufacturing cells. Multiple clamping is the most basic type of automation. In a next step, for example, parts can be provided on a pallet in front of the machine, and the pallets can be changed either manually or automatically. The final step could be to link multiple machines through a handling system or robots, and this is what Hofmann has selected.

The company started with its EDM department, which, according to Hofmann, was the ideal place to launch the first automation project in his mold shop. "We started our first automation efforts in our EDM department," he says. "Because electrode milling and EDM are time-consuming processes,

they ideally are suited for automation. The implementation is relatively straightforward. It is a good opportunity to learn when you are just beginning with automation, because if something goes wrong at the beginning, throwing away an electrode is not a big deal. But, with a finished workpiece, it would not be that simple. Of course, you need to control the entire process and to do so, you should never start with the most complicated process. Today, we are milling around 25,000 electrodes per year—even the Chinese cannot work any more efficiently!"

To control the process, Hofmann works with transponder chips based on RFID in its automated EDM line that CERTA makes. CERTA is a medium-sized software and process consulting company and a 100-percent subsidiary of Erowa Group in Büron, Switzerland. The system assigns electrodes to workpiece holders and makes them available in the CERTA central process control system, preventing errors during the insertion of the parts into the machine. When machinists insert the workpiece (or in this case, electrode) into a magazine, the system immediately recognizes it in the corresponding magazine position. The system also provides the data centrally. Machinists therefore can change workpieces correctly and flexibly.

NC programs for processing, offset data for tools, tool positions in magazines as well as pallet and loading information are provided centrally in the CERTA process control system based on the order. All of the required information is on the chip. "We insert the tools via barcode, and the system does the rest automatically. Thus, clamping errors and the like are practically eliminated. But of course the whole process has to be simulated before going into production."

The process for determining the offset data of the electrodes is fully automated at the presetting station. The necessary geometry data, dimensions and tolerances are automatically transferred from all popular CAD systems to the measuring machine. The required measuring points are defined in the CAD plug-in. If deviations occur in the target or actual comparison during the measuring process, the required process steps are automatically initiated. This may involve remanufacturing or reworking, for example.

After successfully automating its EDM department, the company also largely automated its milling lines. Hofmann runs two fully automated lines, a smaller line with two Hermle C50U units and a robot and a larger line with four Hermle C42U machines, a washing and measuring station, 60 pallets and space for 400 tools. According to Hofmann, the latter is as efficient as 10 stand-alone machines. "Even though automation makes up half the investment, it is still worth it," Hofmann says.

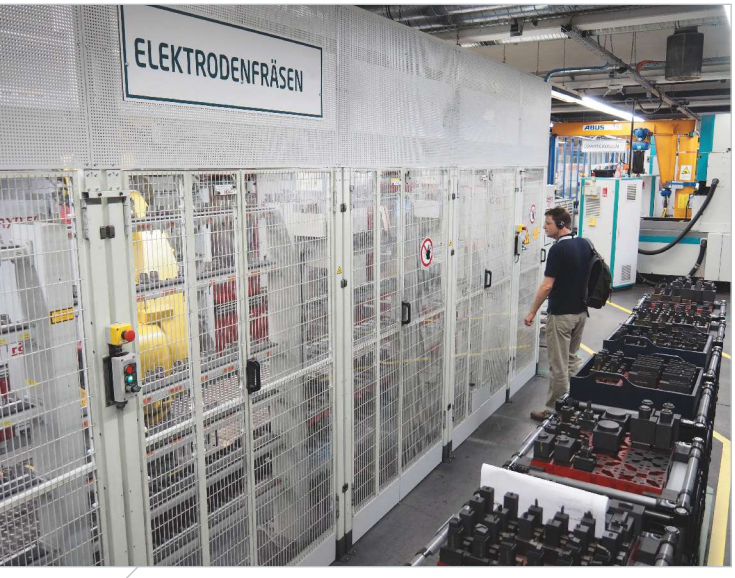
Automating the milling lines was not the easiest task, Hofmann says, because fully automated milling of hardened mold inserts involves much more tool wear and requires even higher accuracy than EDM die-sinking and electrode milling. As a result, the process has to be highly standardized and needs more than machines, pallets and robots.

Standardization Is the Prerequisite for Automation

"You need to organize the material flow properly, be transparent about planning and control operations and identify standardization and modularization potentials throughout the entire order-fulfillment process, from costing to design and programming to production."

To ensure data consistency throughout the streamlined production process, Hofmann uses Siemens NX. "Apart from designing and using our own standard components to build our molds, we count on standardized design," Hofmann says. "You need standard elements that are always designed exactly the same. That is one key aspect of it, but you must also standardize the process itself. Reduction is key here. Take, for example, reducing the number of tools. When you have 500 tools, it is unrealistic to think you could operate an automated line. Fifty would be a good number, because your tool library remains manageable, and you can reduce potential sources for error. And these 50 tools will have to do, no matter what." Hofmann explains that you must also standardize programming through libraries, configurations and attributes to execute the process in a secure and uniform manner. "An automated workflow from design to NC code helps reduce programming time and eliminates errors. Since we never manufacture the same workpieces, standardization and process reliability are crucial for us," he says.

Four EDM machines from OPS Ingersoll are connected via a robot. Hofmann started its first automation efforts in its EDM department. Because electrode milling and EDM are time-consuming processes, they are ideally suited for automation.



Röders electrode milling machines produce around 25,000 electrodes per year. To control the process, Hofmann works with transponder chips based on RFID. The system assigns electrodes to workpiece holders and makes them available in the CERTA central process control system, preventing errors during the insertion of the parts into the machine.

Automation Facilitates Higher Throughput and Increased Accuracy

For Hofmann, automation means 24/7 operation and fewer operators, but the important thing is that you can achieve a much higher throughput because, he says, "You do not need to tinker with the process all the time." He adds that automation frees his employees to focus on value-adding and creative tasks. Most of all, they can determine their working hours, which are more flexible. Automation prevents their hours from being determined by the machine. "The robot acts as a buffer—whether we work manned or unmanned, the process is always the same. Everything is standardized," he says. MMT

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FOR MORE INFORMATION

CERTA / certa-systems.com
Hermle Machine Co. / hermlemachine.com
Hofmann Innovation Group / hofmann-impulsgeber.de
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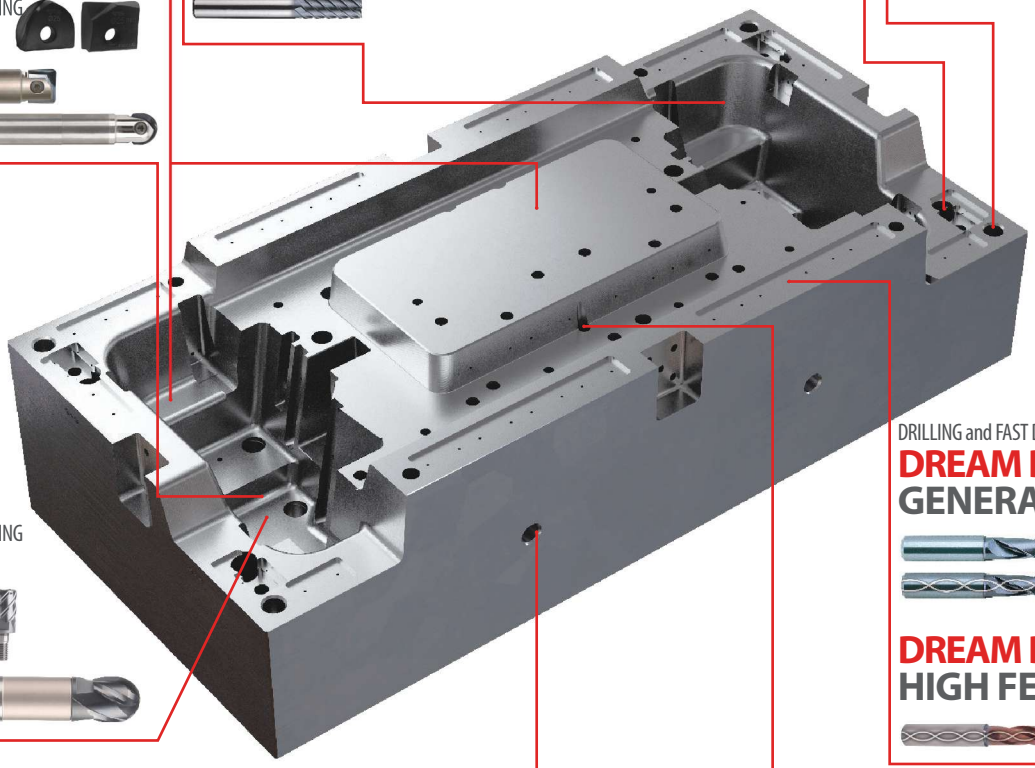

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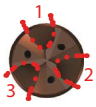

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BLUE RING TAPS

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The Event for Mold Manufacturing 2018
Suburban Collection Showplace, Novi, Michigan

Scenes from Amerimold 2018

From technology demonstrations and tech talks to awards and arcade games, Amerimold had much to offer the industry this year.

Amerimold, the industry's main event, hosted plant tours, tech talks, in-booth demos, video interviews, podcasts, technology displays, an awards ceremony, a 20-year anniversary toast, the unveiling of this year's "Top 10" t-shirts and even an 80s-themed networking party. Here are some of the highlights.

▲ At its booth, **Hasco America Inc.** had its Z1545 gear housing and Z1547 rack unit, which the company says enable the simple, reproducible and inexpensive installation of stack molds. DLC-coated slideways minimize wear and extend maintenance intervals.

▼ **RobbJack Corp.** showcased its die and mold series carbide end mills. The end mills bore a proprietary coating technology that the company says significantly reduces wear and helps the cutters last over 450 percent longer than comparable tools in hard-metal applications.

▲ **Ohio Carbon Blank Inc.** featured its new GraphimatorEZ which reduces graphite purchasing bottlenecks that result from incorrect data entry in the ordering of graphite blanks. The three-step automation process includes extracting the CAD data (x,y,z) from molds and dies as an Excel file, importing an Excel file of CAD data into the GraphimatorEZ for instant pricing and exporting pricing data for online ordering or purchase-order completion.

▲ **Grob Systems Inc.** put a spotlight on milling technology with its G350 five-axis universal machining center, which offers a compact design and plenty of rigidity. Users can perform overhead machining and machining in any angle. Three linear and two rotary axes enable five-sided machining as well as five-axis simultaneous interpolation.

▲ **Millutensil SRL** built its BV26E-R spotting press for user safety and comfort. For validating and handling molds up to 980 millimeters by 750 millimeters in size, this spotting press occupies a small footprint. The press is equipped with linear scales, so the company says that mold builders can relax knowing that their molds are being accurately validated.

"It's always good to show your face at Amerimold. Not only is it an affordable venue for meeting new prospective customers, but it is also great for catching up with industry peers."
–Francine Petrucci, president, BA Die Mold

Amerimold 2018 Post Show Highlights

Demonstrations and Tech Talks

▼ Jerry Janczak of **Alliance Specialties and Laser Sales** and Rich Oles of **ROI Industries** shared some best practices for executing an effective plan for cleaning, inspection and resolution of hot runner system issues in the most efficient way possible to get a mold back into production. Included in the demonstration were reviews of the essential components of this process, including fluidized-sand bath cleaning, the use of a borescope for internal documentation and testing and live thermal imaging to communicate complex thermal-dynamic problems within a hot runner system to ensure absolute, accurate results.

▲ Steve Johnson, president of **MoldTrax**, partnered with Alex Beaumont from **Beaumont Technologies**'s **AIM Institute** to provide Amerimold attendees with an array of useful mold maintenance and repair strategies to optimize mold performance, maintain efficiency, maximize part quality and minimize machine downtime on many different types of injection molds.

▲ The **American Mold Builders Association (AMBA)** moderated the Amerimold Tech Talk, "Best Practices in Closing the Skills Gap: Local Activism Moves the Dial." The sentiment on activism proved true during the workforce development panel. AMBA Executive Director Kym Conis moderated the panel, which included (from the left) Tim Myers of **Century Die**, Britteny Willis of **Paragon D&E**, Kylee Carbone of **Westminster Tool** and Tom Barr of **TK Mold and Engineering**. These AMBA member companies shared how they are making an impact within their communities to fill the skills gap.

▲ On day one of Amerimold, **Haimer USA** conducted a showfloor demonstration titled "Don't Crash Before You Take Off." The Haimer team showed how combining the latest in shrinking, balancing and presetting technology can save a mold shop money in the form of faster cycle times, less machine downtime, higher accuracy, longer tool life and absolute process reliability.

▲ **Progressive Components**'s Lorena Fisher demonstrated the benefits of monitoring mold activity by highlighting new mold and machine maintenance tracking capabilities that take mold monitoring to the next level for the mold builder, molder and original equipment manufacturer (OEM). The company also demonstrated the new capabilities of Progressive's CVe Live system, including optimal mold-to-machine identification, asset tracking for misplaced tools and a file cabinet option for mold information on tools running anywhere.

"Amerimold 2018 was a great success. The value we get out of this trade show is priceless. Not only did I get to investigate new technology that we can apply to our shop, we also generated some potential leads for new business."
–Gabe Meldrum, plant manager, International Mold Corp.

▲ Greg Pozzo of **Makino** demonstrated the company's new D200Z five-axis VMC on day two of Amerimold with the objective of showing moldmakers how the company's 5XC (continuous-cutting) technique for die and mold component manufacturing can result in large cycle-time savings, improvement in surface quality and reduced cutting-tool costs.

▲ The future of making things brings with it big changes in how things are designed, made and used. It is disrupting every industry, including mold manufacturing. During this presentation, Jamie Sciturro, an **Autodesk** automotive technical solutions executive, explained how mold builders could enter the future of making things by using mold-flow simulation, virtual-reality validation and laser texturing. Don Snow, president of **CS Tool Engineering,** shared how his shop has embraced new technology to help the team explore multiple options. The team optimizes designs and moves from design to production seamlessly while also using the latest advances in manufacturing for prototypes and production runs and capturing, analyzing and managing data in real time.

Amerimold 2018 Post Show Highlights

Leadtime Leader Awards

▶ *MoldMaking Technology*'s 2018 Leadtime Leader winner is **Maximum Mold Group.** The shop was honored at the annual Leadtime Leader awards ceremony at Amerimold 2018, which was aired through Facebook Live. *MoldMaking Technology* also hosted Maximum Mold Group on ***The Manufacturing Alliance*** podcast**.** The standout factors that stole the win for the shop include its growth from a small mold builder into a large business group, its team and family environment, shorter lead times from the increased capacity of the business group and increased in-house design and engineering capacity. Additional aspects include investment in high-speed machining centers and manufacturing efficiency, commitment to international travel to work with customers, diversification, service, workforce development efforts and a sales team comprising of all journeyman moldmakers.

▶ Dave LaGrow leads this winning company, but he made sure to give most of the credit to his team on the night of the ceremony. Here, **Progressive Compenents**'s Glenn and Don Starkey, who continue to sponsor the Leadtime Leader competition, pose with *MoldMaking Technology*'s Christina Fuges and Cyndi Kustush after presenting **Maximum Mold Group** with its award.

▲ Every good shop has a good team, and **Maximum Mold Group** has a good team. "We are a family, and we treat each other accordingly. I take pride in that. I believe it takes more than the owner to run a business that is family-oriented," Dave LaGrow says.

▲ *MoldMaking Technology* has recognized outstanding performance and innovation in mold manufacturing through its annual Leadtime Leader Awards (LLA) Competition since 2003. This year is the award's 15-year anniversary, so *MoldMaking Technology* Editorial Director Christina Fuges brought together a few LLA winners for a live ***Manufacturing Alliance*** podcast with Tony Demakis to have a conversation about what this award has meant to their companies. Panelists included Tim Peterson, owner and vice president of **Industrial Molds** (2012 winner), Ray Coombs, owner and president of **Westminster Tool** (2014 winner), Tim Galbraith, sales manager of **Cavalier Tool** (2015 winner) and Dave LaGrow, owner and president of **Maximum Mold Group** (2018 winner). Key areas of discussion included the company today versus the company in the year of its win, the biggest change since winning and advice for shops thinking about entering the competition.

Visit short.moldmakingtechnology.com/everylla15 for the live podcasts of the 15th anniversary panel and the 2018 winner.

"Amerimold stimulates change for both moldmakers and technology suppliers."
–Dale McCartney, GM/VP Business Development, Ohio Carbon Blank

▲ ▶ The 80s made a comeback, and it was totally rad! What a blast as Amerimold shed its casino-themed networking event for a party that took guests back to the decade of Michael Jackson, Pac-Man, parachute pants, Miami Vice and even some foosball competition. This time competitors were stylin' with their 80s era shades, of course!

▶ A fun souvenir that is now a popular tradition at Amerimold, the annual novelty t-shirt hit the mark again with its wit-infused top 10 reasons to be a moldmaker:

10. You get to work on bigger cavities than a dentist.
9. You can talk about non-Newtonian fluids as if you're smart.
8. Injecting, packing and holding is not just for paramedics.
7. Being *baffled* and *turbulent* while keeping it cool is a good thing.
6. You can illustrate the difference between thermoset and thermoplastic at breakfast with pancakes and butter.
5. *Core shift* doesn't always mean that your values are off.
4. It's a great way to vent constructively.
3. No matter how ridiculous your idea is, we'll mold it!
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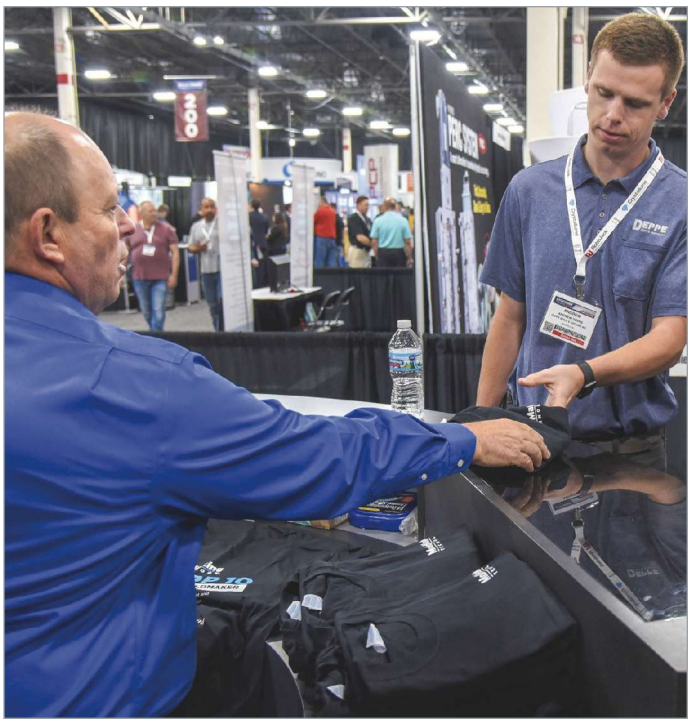
This year's Top 10 were submitted by Paul Mikac of **Silgan Closures**, Ralph Neufarth of **iMFLUX**, Stephen Sawdon of **Wesco Services**, Danny Scher of **ICOMold** and Sean Diamond of **Ideal Mold Design**. The number one was submitted by Paul Magro of **Cavalier Tool**.



Amerimold 2018 Post Show Highlights

Live Podcasts and Video Interviews

Visit short.moldmakingtechnology.com/ame18after for this video and podcast!

▼ Amerimold may have concluded, but the *MoldMaking Technology* editorial team and video crew gathered to do one last recap of what was an experience-filled success of a show.

"We had another very successful show in 2018 and increased our lead generation by close to 20 percent."
–Bill Genc, sales & technical director, Missler Software

▲ *MoldMaking Technology*'s Editorial Director Christina Fuges interviewed **ROI Industries**'s Rich Oles about the use of thermal imaging to analyze thermal dynamics in hot runner systems. Senior Editor Cyndi Kustush and Christina caught up with other key technology suppliers on camera to discuss some of the industry's hot topics. VMC Applications Team Leader for **Makino** Greg Pozzo discussed continuous five-axis machining. OEM Sales Manager of **Progressive Components** Lorena Fisher discussed mold monitoring. **Haimer USA** President Brendt Holden covered Industry 4.0. Technical Solutions Executive for **Autodesk** Jamie Sciturro discussed the future of making things and how it relates to mold manufacturing. Look for these videos at *MoldMaking Technology* online next month. MMT

FOR MORE INFORMATION

Alliance Specialties and Laser Sales / 847-487-1945 / alliancelasersales.com
American Mold Builders Association / 317-436-3102 / amba.org
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How becoming a Leadtime Leader impacted our past winners:

"Becoming a MoldMaking Technology Leadtime Leader really shows the industry that change is good. Teamwork is essential, and new technology wins the race. Being recognized as the industry leader by MoldMaking Technology magazine has resulted in a noticeable boost in employee morale and has presented opportunities that may not have been available to us prior to the win."

Brian Bendig, President, Cavalier Tool & Manufacturing

"Winning the Leadtime Leader Honorable Mention Award was an honor for the entire Dynamic team. We have worked hard and will continue to do so to differentiate ourselves in this highly competitive market with technology, customer service and our dedicated team of employees."

David Miller, President, Dynamic Tool & Design

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For complete information, eligibility requirements and nomination forms, please visit short.moldmakingtechnology.com/leader, or contact Editorial Director Christina Fuges at cfuges@gardnerweb.com or at (800) 579-8809

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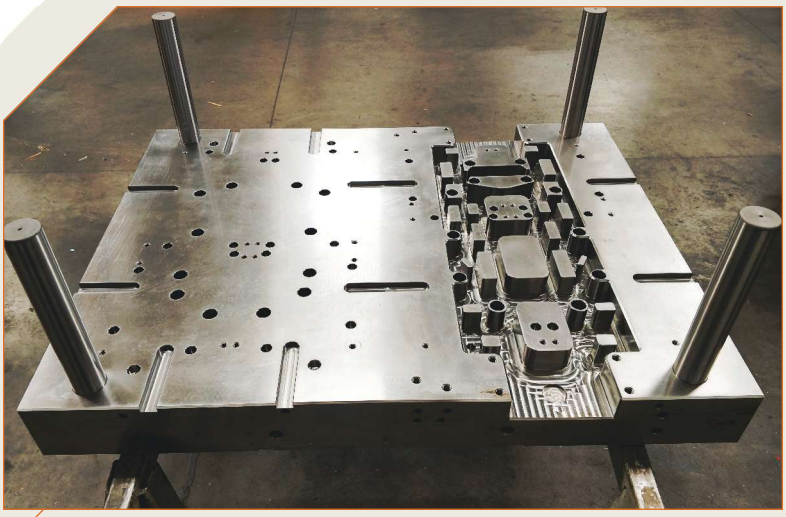
Pre-hardened Mold Steel's Composition Makes **Moldmaking Process More Efficient and Straightforward**



Images courtesy of Dramco Tool Co. Inc.

Dimensional stability is a prime reason why Dramco Tool Co. Inc. chooses NAK-55, a pre-hardened mold steel from International Mold Steel Inc., when building compression and injection molds that require very tight tolerances. NAK-55's uniform hardness is another benefit because it protects the mold against wear from abrasive materials during the molding process.

By Cynthia Kustush

When Dramco Tool Co. Inc. (Grand Island, Nebraska) was tasked with building a compression mold for an aerospace customer that would run carbon-fiber reinforced epoxy SMC, the company knew that dimensional stability in the mold material would be critical. Dramco Tool Co. Inc. (Dramco) chose to build the tool with NAK-55, a pre-hardened mold steel that International Mold Steel Inc. (Florence, Kentucky) offers.

"We knew from experience that there are inherent problems with using a softer steel like P20 for this type of compression molding application," Dramco President Larry Patten says. This tool was for an airframe part and measured about 40 inches long by eight inches wide and six inches deep, he says. The customer required Dramco to hold surface tolerances to 0.003 inch in several places down the length of the mold. "We needed to use a hard-enough material to hold up to the amount of production that the customer required over the life of the tool (which the customer specified as a 10-year program of full production), but we did not want to spend a lot of time on the front end of the tool build by going all the way to the hardened tool steels like H13 if we did not have to. NAK-55 fit the bill."

DRAMCO TOOL CO. INC.

PROBLEM: Dramco had too many extra steps in the machining process using other material options, and it had to deal with multiple warpage issues.

SOLUTION: Dramco used NAK55, a pre-hardened mold steel from International Mold Steel.

RESULTS: Dramco experienced greatly improved machinability with no warpage, better weldability with no witness marks, the removal of extra steps and a more economical use of resources.

Dimensional Stability Saves Time and Money

Patten explains that Dramco manufactured this mold for about $110,000 using NAK-55. If Dramco had built the mold using hardened tool steels, the price would have easily cost about 20 percent more. It also would have required at least three more weeks to complete. "If we built the tool out of H13, for example, many more steps would have been required using wire and sinker EDM because H13 is a harder material to machine," he says. "Keeping in mind that this part is 47 inches long, we would have been required to rough it out, leaving at least 0.10 inch of extra material because we know when it goes through the heat-treat cycle it will move, or warp, and we would have been required to machine that off in its hardened state.

"Alternatively, if we built the tool using P20, rough machining would release a lot of stress that was already in the workpiece, but it would also introduce some stress," he says. "When the machinist loosens the clamps after roughing, he or she might find that the part has a 0.03-inch bow to it, making it necessary to heat-treat it to remove any residual stress before re-machining it to make it straight again. With NAK-55, the machinist machines it, and it is complete. It's a stable tool steel that does not move when large amounts of the

cavity are removed because it comes from the mill with no stress in it. All of the extra steps are not needed."

Paul Britton, president of International Mold Steel, says, "When machining steel (hard spots or soft spots), the machinist releases the stresses and the steel moves. The degree to which it moves depends on what type of steel the machinist is using. In this type of application, whether it is P20 or H13, Dramco must do some sort of thermal cycle through the machining process. Dramco does not have that part of the equation with NAK-55. That is why a lot of companies use it when they must maintain tight tolerances, especially on long parts."

Britton explains that it begins back at the mill. NAK-55 is manufactured using a double-melt or vacuum-arc re-melt (VAR) process. In other words, where P20 is a quench-and-tempered steel and H13 goes through a quench-and-temper cycle, NAK-55 is age-hardened, sitting at 950°F for a specific number of hours so there is no stress as is typical in quenched and tempered steels, only uniform hardness.

Uniform Hardness Improves Wear Properties

In addition to eliminating stresses and providing better stability, choosing NAK-55 over hardened tool steels also gave Dramco a more-uniform hardness to protect against wear from running abrasive materials in this mold. "The problem with running carbon-fiber reinforced epoxy SMC when we are compression molding is that we have to run at an elevated cure temperature, and the material contains up to 40 percent carbon-fiber reinforced glass, which is very abrasive," Patten says. "Since NAK-55 has a 40-42 Rockwell hardness rating, we can machine it, and yet it is hard enough to hold up to the abrasion of running the tool."

NAK-55 polishes better than P20, according to Dramco President Larry Patten, who says his polishers are taking their SMC tools up to a B2 finish using a 400 stone, which polishes very well up to that finish. NAK-55 allows for an effective substraight when coatings are applied at temperatures not exceeding 950°F, if machinists desire extra surface protection.

NAK-55 works very well with coatings for those who desire further surface protection, Britton says. The even distribution of NAK-55's hardness allows for an effective substrate when coatings are applied given that the temperature does not exceed the age-hardening point of 950°F.

Patten says that NAK-55 conducts heat better than other tool steels, too.

"Thermal conductivity properties are probably more significant in injection molding, but they do benefit Dramco with this job in that NAK-55 produces a more evenly cured part more quickly," Britton says. "All thermal conductivity is based on chemistry. The less alloy element that there is in the steel, the better thermal conductivity the machinist can achieve."

For example, chrome has a high thermal-conductivity quotient, so the more chrome the mold material contains, the more the mold will retain heat during the processing cycle. NAK-55 has zero chrome in it. The material Dramco is molding must stay in the mold and cure at temperature, then cool outside of

the mold. NAK-55's better thermal conductivity allows more heat to be drawn out of the mold than is the case with other types of tool steels.

Material Provides Better Weldability and Surface Treatment

Patten says that NAK-55 is very weldable, and that weldability is especially beneficial when it comes to repairing a compression mold that will run for many years. "Any tool that runs for 10 years is going to need repair at some point," he says. "Somebody's going to drop a bolt in there or crash it. Or in this case, with running a very abrasive SMC, there may be wear in critical areas that will need restoration. The benefit is that NAK-55 is one of the easiest mold materials to weld. In fact, the machinist can weld a cavity in NAK-55 and make it absolutely impossible to tell where that weld was, even under an optical polish."

According to Britton, when a machinist welds NAK-55, the material softens. To restore its original base material properties, the machinist only has to re-age it at 950°F. "The weld and the base material are identical. The machinist will see no evidence of the weld on the part," he says. By comparison, if the cavity is made from P20 and is welded, the heat-affected zone hardens. "Depending on the surface finish that the machinist is trying to achieve, a difference of even a couple of Rockwell points between the base material and the weld will show evidence of the weld on the molded part, so the machinist has to color match it or bring it down."

> [NAK-55] is a stable tool steel that doesn't move when large amounts of the cavity are removed because it comes from the mill with no stress in it. All of the extra steps are not needed.

Speaking of surface finishes, Patten notes that NAK-55 polishes better than P20. "We're taking these SMC tools up to a B2 finish using a 400 stone, which polishes very well up to that finish," he says.

Britton concurs, saying, "It can go up to an A2 or A3, but NAK-55 does have sulfur in it, so the machinist has to be careful about that when polishing because sulfur-bearing steel will only have polishability to a certain level. That goes for all sulfur-bearing steels. Sulfur is basically dirt, but it aids in machinability, and what it gives in machinability it takes away in polishability."

Extending Cutting-Tool Life

Another side benefit that Patten says that he has noticed when machining NAK-55 is the cost savings that he has gained in cutting-tool usage. "It is difficult to produce hard numbers on that, but I would say that our tooling costs are on par with machining P20 and significantly less than machining H13," he says. "P20 is about 30 HRC, and we do experience hard spots that can cause premature cutter wear, whereas we do not get any variance in hardness with NAK-55 because it is a very uniform steel, so tool life is extended. This is especially helpful in gundrilling operations."

Britton says, "Anytime dimensional stability is critical to a project, NAK-55 is a nice option, whether for the type of application Dramco had for this aerospace customer or in others like injection molds, blow molds, injection blow molds and so on."

"We have been building this type of mold since 2000, and NAK-55 has always been in our back pocket," Patten says. "Stability matters, even in a 12-inch part. We can't pigeonhole NAK-55 for use only with long pieces. I can get stresses that make a 12-inch part move when I do not want it to, and I need to protect for it. We use NAK-55 for small inserts. It is just another tool in our arsenal to use specifically when we need a good, pre-hardened material that is well above 40 Rockwell and is stable." MMT

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Tax Reform Limits and Eliminates Popular Deductions

By Michael J. Devereux II, CPA, CMP

The Tax Cuts and Jobs Act of 2017 (the Act) limits, or outright eliminates, deductions that mold shops are accustomed to claiming. These include the Domestic Production Activities Deduction (eliminated), business entertainment expenditures (eliminated), interest expense (limited) and net operating losses (limited). The changes to these tax provisions will certainly have an impact on mold builders' tax liabilities.

While the U.S. Treasury has yet to issue substantive guidance on these new provisions, the following is an overview of these limitations before the issuance of U.S. Treasury Regulations.

The Tax Cuts and Jobs Act of 2017 (the Act) limits, or outright eliminates, deductions that mold shops are accustomed to claiming.

The Domestic Production Activities Deduction

Introduced in 2004, the Domestic Production Activities Deduction (DPAD) provides for a deduction equal to 9 percent of the taxable income that is associated with a mold shop's U.S. manufacturing activities. The Act capped the deduction at 50 percent of the W-2s associated with the otherwise qualifying production activities. The Act eliminated this deduction for tax years beginning after December 31, 2017. For calendar-year mold shops, 2017 is the last year for which they are eligible to claim the Domestic Production Activities Deduction. Fiscal-year taxpayers will claim their last DPAD in the year that ends in 2018.

> While the Act is likely to reduce the federal income tax liabilities for most mold shops, mold builders should evaluate the changes to determine how the changes may impact their tax liabilities in 2018 and beyond.

Entertainment Expenditures

Generally, mold shops could deduct 50 percent of both meal and entertainment expenditures that were directly related to or associated with their business before the Act. Also, meals provided to employees for the convenience of the employer were 100-percent deductible before the enactment of the Act. However, the Act disallows a deduction for business entertainment expenses effective January 1, 2018. So, all forms of business entertainment (including but not limited to sports tickets, fishing trips, golf outings and theater tickets) are no longer deductible beginning in 2018 and beyond.

The deduction for business meals is still allowable, subject to the 50-percent limit. Also, the Act eliminates the ability to deduct meals that are provided to employees for the convenience of the mold shop for amounts paid or incurred after December 31, 2025.

The U.S. Treasury is expected to issue guidance concerning these provisions, including how mold shops can split expenditures between meals and entertainment when both types of expenditures are associated with the same event.

Interest Expense

Historically, mold shops have been able to deduct their interest expense in the year that the expense was paid or accrued, without limitations. The Act limits the ability of some large mold shops to deduct their interest expense when it is paid or incurred. Mold shops with average annual gross receipts of more than $25 million for the prior three tax years may have limited ability to deduct their interest expense in tax years beginning after December 31, 2017.

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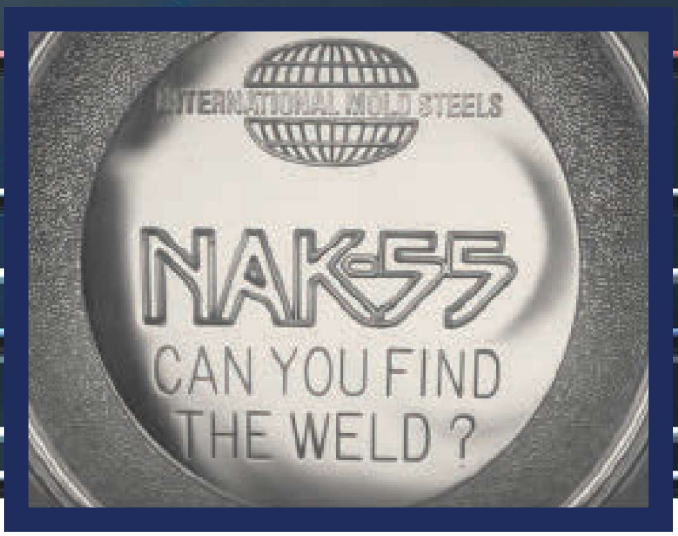
NAK55 (38-42 HRC)

Easy to Machine – 30-50% easier than P20
Very Stable – does not need stress relieving
Capable of the perfect weld – polished and textured surfaces



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The Act limits the deduction for the net interest expense (which is defined as interest expense, less interest income) that is incurred by a mold shop to 30 percent of the shop's adjusted taxable income. For the first four years that this provision is in effect (tax years 2018 through 2021), adjusted taxable income means taxable income determined without regard to depreciation or amortization. For tax years 2022 and beyond, adjusted taxable income takes into account deductions for depreciation and amortization. Disallowed interest expense is carried forward to future tax years indefinitely.

Net Operating Losses

Before the Act, net operating losses (NOLs) could be carried back to the company's two prior tax years to offset income in those years, allowing shops to request refunds from prior years. Also, NOLs could be carried forward for 20 tax years, allowing the shop to offset future income of the company. Further, there was no limitation on the amount of taxable income that shops could offset for regular income tax purposes before the Act.

The Act disallows a deduction for business entertainment expenses effective January 1, 2018.

For losses arising in tax years *beginning* after December 31, 2017, the Act limits the net-operating-loss deduction to 80 percent of the taxable income of the year in which the loss is carried. Also, the NOL carryback provisions are repealed for tax years *ending* after December 31, 2017, and shops may carry forward those NOLs indefinitely. As a result, a fiscal-year mold shop with a tax year ending after December 31, 2017 may not carry back NOLs arising in its tax year that includes December 31, 2017.

While the Act is likely to reduce the federal income tax liabilities for most mold shops, mold builders should evaluate the changes to determine how the changes may impact their tax liabilities in 2018 and beyond. MMT

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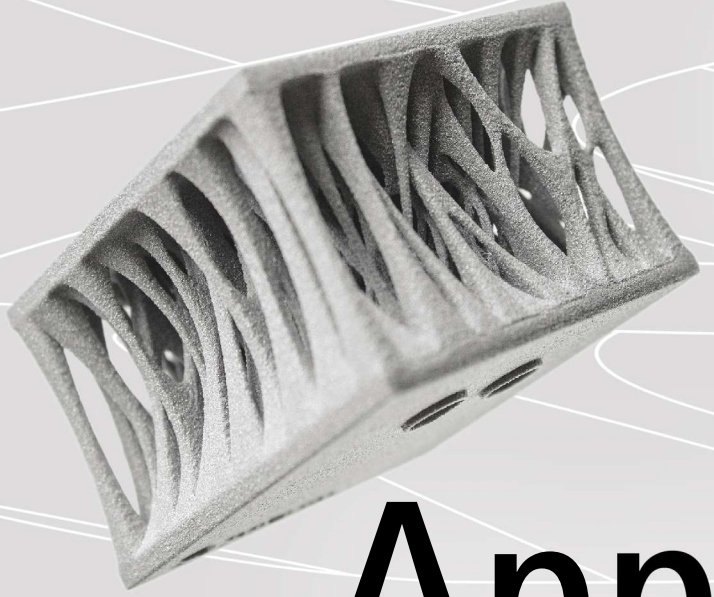

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Index Sees Small Turnaround

Supplier deliveries, production and employment marginally boosted the Moldmaking Index, at 55.4 for July 2018.

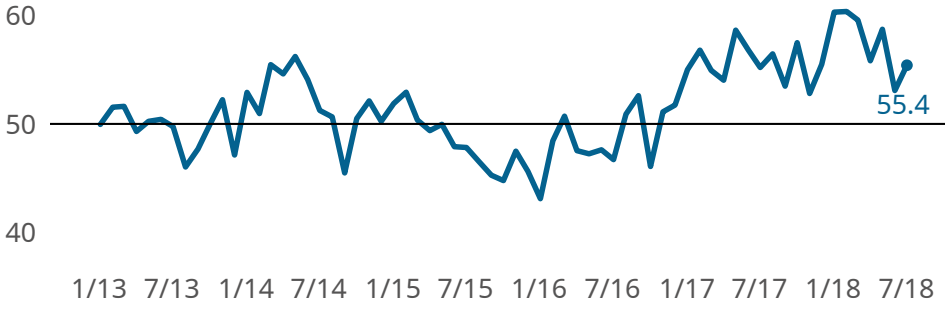
Registering 55.4 for July, the Gardner Business Index (GBI): Moldmaking increased modestly after experiencing a significant slowdown in growth in the first half of the year. Since the beginning of the year, the Moldmaking Index has fallen 8.3 percent. However, the Moldmaking Index is up 0.3 percent from the same month one year ago. Gardner Intelligence's review of the underlying data for the month reveals that growth in supplier deliveries, production and employment drove the Moldmaking Index's average-based calculation higher while new orders, backlog and exports pulled the Moldmaking Index's average-based calculation lower. Only exports reported contraction in July. Backlog registered 50.0, a value that indicates "no change" from the prior month.

One common trend among all manufacturing technologies, including moldmaking, is the ongoing rapid expansion of supplier deliveries. The last record-high reading for supplier deliveries before the fourth quarter of 2017 was 60.9, which occurred in late 2011. Since the beginning of 2018, readings for supplier deliveries have been above 60.9 in four of the last seven months. MMT

ABOUT THE AUTHOR

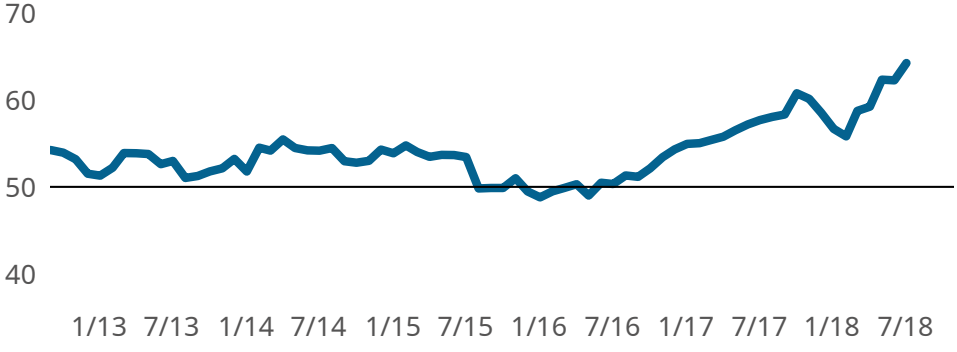
Michael Guckes is the chief economist for Gardner Intelligence, a division of Gardner Business Media (Cincinnati, Ohio, United States). He has performed economic analysis, modeling and forecasting work for nearly 20 years among a range of industries. He is available at mguckes@gardnerweb.com

Gardner Business Index (GBI): Moldmaking



July's Moldmaking Index data was primarily supported by supplier deliveries. In recent months, supplier deliveries and employment have sustained the Moldmaking Index, rather than new orders and production (as was the case previously).

Supplier Deliveries (3-Month Moving Average)



2018 readings on supplier deliveries have significantly surpassed historical highs set during the economy's recovery from the Great Recession. In four of the first seven months of 2018, the reading for supplier deliveries beat the last record, which occurred in the fourth quarter of 2011.

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THE COMPETITIVE ADVANTAGE FOR U.S. MOLD BUILDERS.

SEPTEMBER 2018 | MONTHLY UPDATE

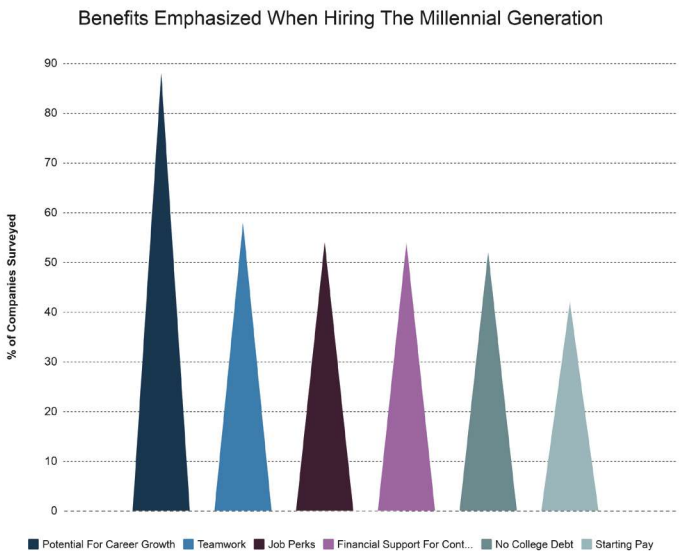
INFORMATION IS POWER

Without a doubt, information is power! This is why the AMBA is focused on providing members with industry data that enables them to make better, more informed decisions. With the right statistics, member companies can gauge their operations and processes against industry standards to train, improve efficiencies and increase profitability.

In a recent AMBA report on recruiting the millennial, U.S. mold builders reported best practices on recruiting the millennial generation. According to the report,

"WHEN HIRING MILLENNIALS, THE TOP FOUR BENEFITS TO EMPHASIZE INCLUDE CAREER GROWTH, TEAMWORK, NO COLLEGE DEBT AND FINANCIAL SUPPORT FOR CONTINUING INDUSTRY EDUCATION."

Looking for more? The AMBA provides leading-edge benchmarks in areas such as industry trends, wage and benefits, HR policies, ops and plant floor management, workforce development and sales procedures.



For a copy of this report and others, like the AMBA "Wage and Benefits" or "State of the Industry" reports, visit AMBA.org.

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SEPTEMBER 11 — PLASTICS FLY-IN
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SEPTEMBER 19 — PEER NETWORKING FOR SENIOR LEADERS
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Automotive Industry Beats Expectations

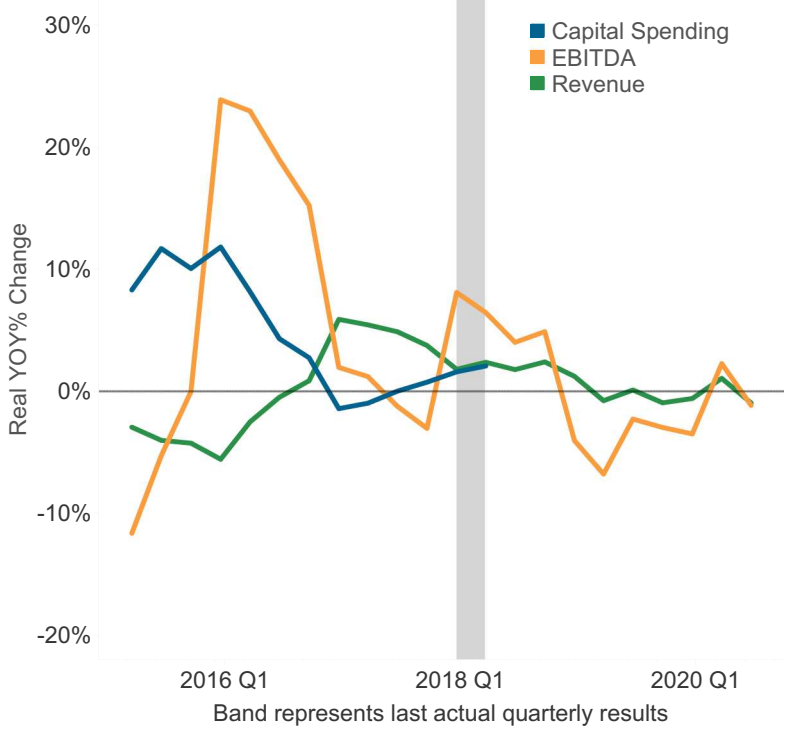
Through the first half of 2018, the automotive industry experienced a level of growth that exceeded the expectations of most experts.

Of the many economic factors that have an impact on the automotive industry, strong employment levels and wage gains are likely two significant factors behind the automotive industry's performance in 2018. The industry has exceeded the expectations of many experts since the end of 2017. Working counter to these factors is an eroding financial picture in which banks are less willing to provide credit. Additionally, vehicle-loan default rates are well above their long-run levels prior to 2008. The recent net effect of these influences largely has been to offset one another, if not slightly to the benefit of the industry. In the first half of 2018, monthly light-truck and SUV sales remained near the one-million unit market, while car sales during the second quarter were flat, halting an otherwise downward trend.

While the exact reasons for any given firm's future may be unique to that firm's circumstances, the collective results of this forecast may shed light on the general direction of the industry in the coming months and years. Reviewing Wall Street's financial projections for 23 automotive firms with cumulative first-quarter revenues of $223 billion reveals a somber outlook for the industry between the second quarter of 2018 and mid-2020. Overall, earnings and revenues by the end of 2018 are projected to be modestly better than a year ago. However, the cumulative projections for 2019 indicate a flat to a slightly downward trend in revenues and contracting earnings.

Although the Gardner Business Index data is not projected, examining only the automotive data seems to support Wall Street's notions that the industry may need to prepare for a more challenging environment in 2019. In the five quarters ending with the first quarter of 2018, Gardner Intelligence's data indicated that new orders and production were the fastest growing economic industry drivers. However, by the second quarter of 2018, readings for new orders and production had declined, giving way to higher readings for supplier deliveries and employment. Generally, these are considered lagging indicators, as both are slower to respond to economic growth. While this transition of drivers is no guarantee of an immediate economic slowdown, it is consistent with an industry coming off of peak expansionary times. MMT

Automotive Industry Actual and Estimated Results
(3-MONTH MOVING AVERAGE)



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Here is a sampling of what will be on display at this year's show.

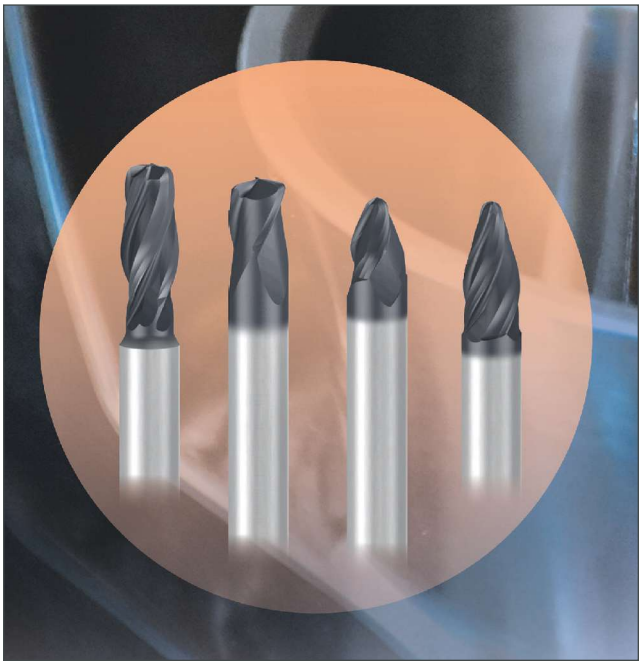
Data-Collecting Platforms Monitor Status, Recommend Maintenance

FANUC America offers the FANUC Intelligent Edge Link and Drive (FIELD) system and the Robot LINKi Zero Down Time (ZDT) platform.

The FIELD system collects machine data and monitors the operating status of manufacturing equipment in real time. Third-party application developers can create and sell FIELD applications that improve the efficiency of equipment, production throughput and process quality using an industrial API interface to access the data and perform analytics.

The ZDT platform, a cloud-based solution available to manufacturers who purchase FANUC robots, offers predictive analytics that can prevent unexpected downtime by identifying component failures in advance. It also recommends proper intervals for routine equipment maintenance activities. ZDT enables users to schedule regular production downtime for maintenance and mechanical hardware replacement. Users can also monitor the manufacturing process using a web portal, which provides a clear picture of device health, equipment usage and energy consumption. ZDT data can also help customers reduce overall life cycle costs, according to FANUC. The company estimates that ZDT has saved users over 1,300 hours of unexpected production interruptions.

FANUC America, North, Level 3, Booth 236270, North Level 1, Booth 215605, South, Level 3, Booth 338919



Circle Segment End Mills Increase Material Removal

Emuge Corp. has introduced circle segment cutters, a class of end mills designed to enable more material removal with fewer passes in five-axis machining. They are said to reduce cycle times by over 80 percent and to produce smoother surface finishes. The end mills are ideal for machining turbine blades, impellers and blisks, as well as in moldmaking applications. They feature unique forms with large radii in the cutting area of the mills, enabling a larger axial depth of cut during pre-finishing and finishing operations.

The solid carbide end mills are offered in four geometries: barrel-shaped, oval form, taper form and lens-shaped. Oval and taper form mills are ideal for curved shapes such as blades or straight-walled pockets, freely engaging more of the cutting edge. Barrel mills provide effective flank milling to the sides of spiral grooves and similar applications, while lens-shaped mills are designed for narrow channels or in lands on molds. CAM software, such as the more recent versions of HyperMill or Mastercam, is required to support and compute the geometries of the end mills for maximum performance.

Emuge Corp., West, Level 3 & Annex, Booth 431536

Shop Control Software Suits Make-to-Order Manufacturers

E2 Shop from **Shoptech** is a user-friendly shop control package available as an SaaS or on-site solution.

The system is designed for job shops and make-to-order manufacturers that require customer-specific quoting and job orders, the ability to purchase material specific to jobs and inventory, and the flexibility for changing schedules. The system is available with Complete Accounting. It can interface with QuickBooks if needed.

Shoptech Software Corp., East, Level 3, Booth 133252

Deep-Hole Drilling Series Targets Die/Mold, Medical Industries

Mollart offers deep-hole drilling equipment for applications including medical parts with micro-holes, biomass pellet dies with multiple holes and dies and molds with deep cooling holes.

The company offers single and multi-spindle gundrills and BTA drilling centers, multi-station micro-drilling machines and special purpose in-line and rotary transfer machines. Also available are combination machining centers with integrated gundrilling stations that can reduce lead time and enable single-cycle production.

Mollart America, South, Level 3, Booth 339190

Twin Spindle Mill/Turn Center Performs On-Center Work

Lico's LND-65D-S3 from **Absolute Machine Tools Inc.** is part of the LNDD series of twin spindle multi-slide mill/turn centers. It is an 11-axis mill/turn center that is designed to produce parts faster than conventional twin spindle, multi-turret machines with up to five tools in the cut simultaneously.

This machine has a bar capacity of 65 mm (2.56"), a maximum turning length of 475 mm (18.7") and employs independent two-axis cross-slides that can overlap each other and the turret. The turret works on either the main or the counter spindle and can perform on-center work on both spindles simultaneously. An eight-position turret with optional live tooling and Y axis is standard.

Absolute Machine Tools Inc., South, Level 3, Booth 338536

Handling System Eases Operator Access, Provides Storage

Hermle Machine Co.'s C 42 machining center will feature the company's HS Flex work handling system. The handling system is said to be a powerful and compact automation tool that fits both the company's Performance-Line machining centers and High-Performance-Line models. A flat mineral casting bed holds three axes of the handling unit and offers ergonomically convenient access for the operator.

The system also functions as a storage module, with one module installed as standard and an optional second module available. The modules are structured as a rack, offering customization in the pallet/workpiece arrangement. Up to four rack shelves can be ordered with a total ranging to 20 pallet storage spaces per module, providing up to 40 pallet storage spaces when two modules are installed.

Hermle Machine Co., South, Level 3, Booth 338136

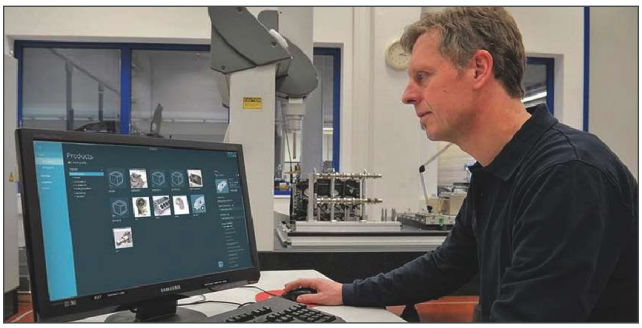
Tightening Fixture Ensures Precision

Big Kaiser's Torque Fit is a tightening fixture for collet chucks with an integrated torque measuring system. This device is designed to ensure that a collet chuck is correctly tightened.

The tightening fixture notifies the user of a correctly set torque value via an audible buzzer. If overtightening occurs, the error LED light will flash.

The tightening fixture was developed to replace multiple torque wrenches and has adapters available for all common machine tool interfaces such as CAT, BT, SK, HSK and BIG CAPTO. For maximum convenience, torque values for all Big Kaiser-made collet chucks are preset. The operator can, however, use a generic setting to tighten any collet chuck with a torque value up to 80 Nm (60 foot-pounds).

Big Kaiser, West Level 3 & Annex Booth 431610



Software Collects Measurement Data from Multiple Devices

Hexagon's HxGN Smart Quality is an online quality data and measurement resource management software platform. It collects data from multiple manufacturing phases and provides statistical analysis, visualization and workflow management and process optimization. It is said to structure data in a way that provides insight into production and improvements in process. The remotely accessible software enables users to manage quality requirements in real-time. It collects and stores data from any number of devices in one database.

Hexagon Manufacturing Intelligence, East, Level 3
Booth 135202, North, Level 3, Booth 236700

Self-Centering Vise Features Reversible Jaws

Hirschmann Engineering is displaying the Kohn ZSS 80 AUT self-centering vise. Designed for use with all zero-point clamping systems, it is available in two bed lengths and clamping ranges. Built for medium-size and large workpieces, the vise is said to be lightweight enough for mid-range robotic systems. The vise features reversible, two-stepped jaw attachments with grip bars for non-machined surfaces and has a centering accuracy of ±0.02 mm. The vise can be mounted directly to the machine or used with the company's 9000 pallet system.

Hirschmann Engineering USA Inc., East, Level 3
Booth 134812

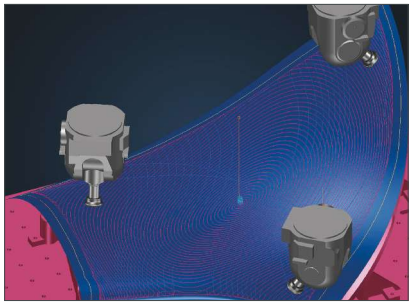
Grinding Center's Spindle Speed Promotes Precision

United Grinding offers the Magerle MFP 50 and MFP 51 grinding and machining centers are designed for productivity, flexibility, safety and performance in a compact design. As a five- or six-axis system, the machine performs grinding, milling and drilling in a single part clamping. Spindle speeds ranging to 10,000 rpm enable high-precision machining. The coolant nozzle, controllable via two axes, provides unrestricted freedom of movement and precise positioning of the coolant jet.

The MFP 51 has an extended range of functions. The 66-position toolchanger and the automatic diamond roll change enable efficient machining of several different workpieces without altering the tooling, according to the company. The coolant supply can be adapted to the process with the automatic nozzle changer, optimizing grinding results.

The company will also feature the Blohm Profimat XT grinding machine, the Studer Favorit CNC 1,600-mm grinding machine, the Walter Helitronic Power 400 grinding machines, among others.

United Grinding North America Inc., North, Level 3, Booth 236802



CAD/CAM Software Optimizes Five-Axis Milling

Version 4.0 of **Tebis America**'s CAD/CAM software provides optimized functions in five-axis simultaneous milling. Features include adaptive and contour parallel roughing strategies, simple machining of connected milling areas in isoparametric surface layout, and integrated tilt direction preview when milling between vectors.

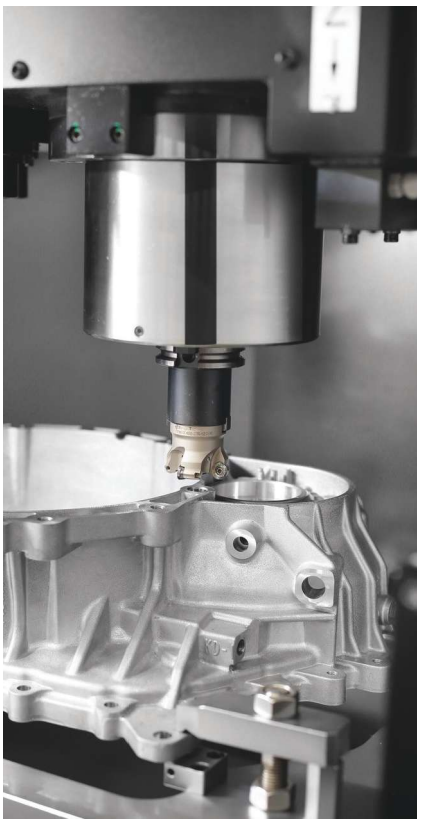
The company is also displaying its ProLeis Manufacturing Execution System (MES) for single-part manufacturing. The system's comprehensive data management, manufacturing planning and manufacturing control functions enable effective control of all individual parts for dies and injection molds at all stages of production.

Tebis America Inc., East
Level 3, Booth 133230

Equipment Provides Vibration Stress Relief

Bonal Technologies' model 2401 equipment is designed as a substitute for heat treatment in stress-relief applications. It features a touch-screen display, two onboard computers and graphic certification. The equipment applies the Meta-Lax vibration stress-relief process for effectiveness and consistency.

Bonal Technologies Inc., North
Level 3, Booth 236282



High-Speed VMC Reduces Non-Cutting Time

Doosan Machine Tools' DNM 5700S is a high-speed version of the DNM VMC that is designed to reduce non-cutting time.

A 25-hp, directly-coupled, 40-taper Big-Plus spindle features 87 foot-pounds of torque and accelerates from 0 to 15,000 rpm in 3.6 sec. Rapid traverse rates have been increased to 1,654 ipm in the X and Y axes and to 1,417 ipm in the Z axis.

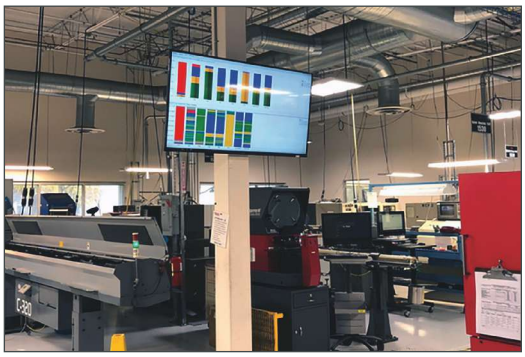
A wide cast frame with eight leveling positions and roller LM guideways on the X, Y and Z axes improve machine rigidity and stability. The VMC also features 3D computerized analysis. Its 51.2" × 21.3" table can hold a maximum weight of 1,764 lbs.

The machine features a 30-tool magazine, with 40- and 60-tool, servo-driven versions available. Easy Operation Package software contributes to ease of use, while an oil-cooled spindle controls heat. The machine comes with a grease lubrication system designed to reduce maintenance costs. It uses a coolant that is intended to eliminate the need for an oil skimmer.

Doosan Machine Tools America, South Level 3, Booth 339100

Software's Data Collection Reduces Machine Downtime

Version 2018.04.10 of the DataXchange software from **Shop Floor Automations** offers several improvements over previous versions. The software's Data Entry screen provides operators with an interface to track machine downtimes and includes a "notes" field to alert others on the shop floor of critical actions. This notification system reduces downtime.



An E-Learning program enables users to take online courses. Configuring reporting options, software installation, initial configuration, shift options, modifying existing machine data and understanding the machine data collection sources are some of the topics covered. The classes are a combination of videos and text modules with a quiz at the end of each lesson. The program is accessible for 12 months. Courses can be repeated for refreshers, and unlimited users have access to the program with one username and password.

In addition, the software gives users the option of monitoring machine data on-site or from the cloud. Text and email notifications alert users to machine issues. It is compatible with MTConnect, OPC UA, FANUC Focas and ModBus.

Shop Floor Automations, East, Level 3, Booth 133240

Horizontal Jig Borer Designed for Extreme Precision

Available from **Methods Machine Tools**, the Yasda YBM 7Ti five-axis CNC horizontal jig borer is designed for high precision in difficult-to-machine, heat-resistant materials like titanium and Inconel. The company says its rotary table design is more rigid than other varieties and provides ample room around the pallet. This facilitates smooth table movements and allows operators to get a closer and clearer view of parts. The 50-taper, 10,000-rpm spindle features a direct-drive system designed to keep forces away from the motor to maintain consistency and repeatability. Automatic adjustment of spindle bearing preload ensures an expansive application range.

To absorb cutting forces and damp vibration, the machine features a 25-ton, H-shaped steel base. All axes have hand-scraped, hardened box guideways. Hardened, ground and lapped guideways enable feeds as fast as 48 m/min. According to the company, the mating faces of the guideways are approximately double the width of more traditional guideways. The machine has a large work envelope, with XYZ-axis travels measuring 49.2" x 39.4" x 43.3" (1,250 x 1,000 x 1,100 mm), a vertical rotation of 360 degrees and a horizontal rotation of ±110 degrees. A two-pallet system has 19.7" x 19.7" (500 x 500 mm) pallets for a maximum loading capacity of 1,102 lbs (500 kg) on each pallet. A six-station automatic pallet changer is also available.

Methods Machine Tools Inc., South, Level 3, Booth 339119

High-Speed Die/Mold Machine Fights Heat, Vibration

Hwacheon's Sirius UL+ vertical die and mold machining center features a 20,000-rpm, built-in motor spindle that provides high-speed cutting; a table size of 47.24" x 23.62"; and a travel range of 41.34" x 23.62" x 21.65" in the X, Y and Z axes, respectively.

The machine frame, a rigid bilateral gate structure, supports the X-axis drive. It diverts load, vibration and heat from the upper section of the machine. These features help to keep the feed drive stable after hours of operation. The short distance between the X-axis drive and the tool's point of contact helps to maintain rigidity and machine precision.

The spindle uses the company's oil-jet lubrication technology. The lubrication system injects a jet of oil directly onto the spindle bearing for effective cooling. The motor and spindle assembly are jacket-cooled to limit displacement caused by heat.

Software components monitor variables related to work environment and machining conditions to improve efficiency and thermal accuracy. Tool Load Detect provides real-time measurement of tool load. High-Efficiency Contour Control, a user-friendly programming interface, offers custom contour control. Cutting Feed Optimization uses an adaptive control method to regulate feed rates in real time. Frame Displacement Control uses thermal sensors to monitor and correct thermal displacement. Spindle Displacement Control monitors temperature at a number of points within the spindle assembly and predicts thermal displacement. Thermal Displacement Control integrates Spindle Displacement Control and Frame Displacement Control.

Hwacheon Machinery America Inc. South, Level 3, Booth 338119

Control Interface Focuses on Digital Workflows

The Celos control and user interface from **DMG MORI** creates a consistent ecosystem for digital production, according to the company. The interface focuses on digital workflows for adaptive production planning and integrated tool management.

The interface's Open Connectivity feature enables network integration with machines from other manufacturers, technological areas and manual workstations.

DMG MORI, South, Level 3, Booth 338900, North, Level 1, Booth 215114

Diamond-Tipped Tools Cut Sintered Carbide

Horn USA's CVD-D-tipped tools are designed for drilling, turning and milling carbide in the sintered state, ranging to a hardness of 2,200 Vickers. Depending on the application, the geometrically defined cutting edges range from extremely sharp and rounded to positive and negative chamfers. With application-specific cutting edge optimization, CVD-D diamond can be useful for roughing work or fine finishing.

According to the company, the tools enable accurate profile machining in the micron range. In terms of roughness, polishability and corrosion behavior, the surface structure is reportedly comparable to grinding and eroding processes.

Horn USA Inc., West, Level 3 & Annex, Booth 431722

Vertical Machining Center Reduces Handwork in Complex Molds

Makino's V90S is a next-generation vertical machining center (VMC) for five-axis continuous processing. This high-precision VMC evolved from Makino's three-axis Vi series and has an updated spindle and tilting and rotating axis unit that Makino says supports tighter tolerances and decreased machining and polishing times. The V90S combines quick machine movements and accuracies with software for high-speed motion control. Makino says that the V90S is designed for high-speed finishing of multifaceted, 3D contours and that it cuts cycle times and reduces handwork in complex dies and molds.

To maximize work-zone volume and load capacity, the V90S can accommodate workpiece sizes up to 2200 x 1500 x 700 mm and weighing 5000 kg. Examples of such workpieces include the inner panels of automobile doors and front grilles. The X, Y and Z axes (2000 x 1300 x 800 mm, respectively) provide swift movements with rapid traverse rates of 58,000 mm/min and cutting feed rates of 40,000 mm/min. The V90S's A axis tilts at ±30°, which is wide enough to machine holes for an angular pin, while the C axis rotates at ±60°, ensuring that the tool tip can be positioned to provide optimum contact with the workpiece. Makino says that this extends tool life, provides the required surface finish and minimizes post-machining hand processes.

Makino, South, Level 3, Booth 338700

Hydraulic Holders Reduce Downtime, Provide Accuracy

NT Tool offers the PHC-SA-C slim-bodied, hydraulic holder with jet-through coolant. Small notches along the sides of the holder bore enable streams of coolant to escape on each side of the cutting tool, while sealing it elsewhere.

The holder's slim body design provides access to narrow workpieces, usually only accessible by shrink fit holders. Unlike shrink-fit holders, hydraulic holders can be chucked quickly with a hex wrench. This reduces downtime, eliminates the need for heat-shrink equipment and mitigates the risk of burns associated with shrink-fit toolholding.

The holder offers consistent 3-µm accuracy, according to the company. The dual clamping-point system provides stability and precision. The oil chamber around the chucking sleeve absorbs cutting vibrations, promoting smooth finishes on work surfaces, as well as more consistent cuts. An electromagnetic, rust-proof coating contributes to accuracy.

The hydraulic holder is available in HSK, CAT, BT and UTS shank styles. It is offered in both inch sizes (1/8" to 1" in diameter) and metric sizes (3 to 25 mm). Custom sizes can be accommodated as well.

NT Tool Corp., West, Level 3 & Annex
Booth 432146

Dry Ice Blasting Reduces Downtime, Improves Part Quality

Cold Jet's i3 MicroClean dry ice blasting technology is a non-abrasive, non-conductive cleaning method that does not use chemicals or solvents. Using compressed air, the technology accelerates dry ice pellets through high-velocity nozzles onto surfaces. The pellets sublimate upon contact and expand 800 times to flush away contaminants.

The technology enables items to be cleaned in place without disassembly and is used to remove production residues, release agents, contaminants, paints, oils and biofilms. According to the company, the dry ice blasting technology reduces downtime, improves cleaning and part quality, lowers scrap rates, improves tool utilization and increases asset life.

The technology makes use of recycled carbon dioxide and eliminates the need for chemicals and water in the cleaning process.

Cold Jet LLC, North, Level 3, Booth 237213

EDM Drill Provides High Production, Unattended Operation

Current EDM Inc.'s FT300 five-axis CNC EDM drilling machine features the Siemens 840DsI control. The fully enclosed machine is designed for production facilities in which machines are placed side-by-side in rows. It is operable and serviceable from both the front and rear machine panels. Moving-gantry design and a stationary worktable increase weight capacity and reduce operator reach for ergonomic part handling.

The machine suits high-tolerance work in the aerospace, medical, automotive and cutting-tool industries. Table travels are 12" on the X axis and 6" on the Y axis, with a part-weight capacity of 30 lbs at the tilt-rotary table. Precision slides and a 6" diameter, 10" high cylindrical work envelope enable accurate positioning and drilling of complex parts such as turbine engine components, nozzles, valves, injectors, medical/dental devices and cutting tools. Drilling aspect ratios greater than 300:1 can be achieved with DI water.

The machine features a 24-station electrode changer for high production and unmanned operation. EDM milling expands capabilities by enabling the machining of three-dimensional shapes such as gates and diffusers. A sensitive servo and finely tuned power supply enable the machine to drill with consistent speed, wear and depth control. It won't bend or collapse long, thin electrodes, and exit-hole break-through speed is optimized for rapid hole-to-hole cycle time.

Current EDM Inc., East, Level 3, Booth 135051

Five-Axis Horizontal Machining Cell Carries 174 Tools

Kitamura Machinery's five-axis Supercell-300G horizontal manufacturing cell features a 20-station automatic pallet changer (APC) with work ID system and a 174-tool, matrix-style toolchanger. The Supercell-300G can run small- to medium-size parts completely unattended. The cell's integrated work ID system employs an IC chip on each pallet, enabling storage and communication of pallet work data to the pallet scheduling submenu. Pallet table size is 200 mm (7.9") in diameter, with a maximum height of 200 mm (7.9"). The integrated design of the pallet pool system enables access to and visibility of all pallets simultaneously. The cell's automatic work handling robot reduces pallet load and unload times and facilitates just-in-time production of a varied mix of parts.

The machine's 360-degree rotary table tilts 30 to 120 degrees on an A-axis trunnion. The fourth and fifth axes employ precision roller gear cam technology, along with a hydraulic clamping system designed for five-axis simultaneous machining. The 20,000-rpm, dual-contact spindle is designed to handle exotic materials common to the aerospace and medical industries.

The 174-tool, matrix-style toolchanger magazine (up to 314 tools available) handles tools up to 350 mm (13.7") in length, 150 mm (5.9") in diameter and 10 kg (22 lbs) in weight. Tool-change time is 1.3 seconds. Compared to a vertical spindle configuration, a horizontal design improves rigidity and workpiece accessibility and chip management. Better chip management translates to improved accuracy, surface finish, part change-over time and tool life.

Kitamura Machinery of USA Inc., South Level 3, Booth 339148

Double-Sided Grinder Features Precise Pneumatic System

Chevalier's FDG-700 double-sided grinding machine features the company's PC-based graphic control with a 10.4" touchscreen monitor for conversational graphic control operation.

The machine also features a high-precision, digitally-controlled pneumatic system that automatically adjusts according to the selected pressure. The high-precision contact measuring system includes grinding height control and dressing monitoring.

The machine is designed for mass production of small and medium-size workpieces that demand high precision and efficiency within a small footprint. The machine has been ergonomically designed for greater efficiency and productivity.

A variable-speed spindle and a high-torque gearbox offer the flexibility to accommodate a variety of workpieces. The machine is said to precisely grind crystals, ceramics, optical glass, semiconductors, tungsten carbide, metal and other hard and brittle materials with optimal surface finishes, flatness and parallelism with narrow tolerances.

The machine features a wheel diameter of 27.5" and accommodates workpiece diameters ranging to 9.85", workpiece thickness ranging to 9.85", and load pressure ranging to 600 kPA. The grinder has upper and lower disc power of 7.5 hp with a speed of 125 rpm, and inner disc power of 7.5 hp with a speed of 75 rpm.

Chevalier Machinery Inc., South, Level 3, Booth 339482

Chip Management Software Improves Tool Life, Accuracy

Milltronics USA Inc.'s ChipBoss enables conversational program users to take advantage of trochoidal machining strategies, previously found only in CAM systems or high-end controls. The software uses proprietary algorithms to calculate tool paths and control maximum allowable cutter engagement. This enables the use of the whole length of a tool rather than just the tip so that profiles can be cut at full depth. This reduces the need to take multiple depth passes. The software works by automatically controlling the tool's chip load, keeping it constant, which improves cycle times, tool life and accuracy of parts. The software works to create a constant chip load, which results in smaller step overs and bigger depths of cut. In addition, it enables use of more of the tool's flute. This spreads the load, heat and wear over a larger area of the tool, increasing tool life. It also reduces the number of times a machine needs to accelerate and decelerate. The Rest Machining feature calculates areas to be machined and uses a smaller cutter to reach those areas, which saves more time.

Milltronics USA Inc., South, Level 3, Booth 338329

Bridgeport V1320 Vertical Milling Center Reduces Vibration

Hardinge's Bridgeport V1320 vertical milling center is an addition to the Bridgeport V-series vertical milling center line. The center is equipped with dual Y-axis ballscrews to improve surface quality, reduce vibration, provide acceleration, improve roundness accuracy and increase tool life.

The center will also come equipped with the Mitsubishi M80, 15" screen. The M80 will come standard with two 32 Gb SD card slots for memory expansion, USB running, touchscreen, high accuracy modes and super smooth surface software. The center will also have six linear guide trucks on the X and Z axis and rear chip evacuation.

Hardinge, South, Level 3, Booth 338738

ADVERTISERS' INDEX

TIP

CUTTING TOOLS

Carbide and **Coating Considerations**

Images courtesy of RobbJack Corp.

The image on the left shows the surface of a cutting tool with a hard metal carbide grade and coating that is typically used for mold machining. The image on the right shows the cutting tool surface with a new carbide grade and coating combination designed to last longer.

By Mike MacArthur

Choosing the correct carbide grade, cutter geometry and cutting-tool coating amid the wide variety of moldmaking materials and available cutting-tool options can be a challenging task for mold builders today. However, keeping an open dialog with your cutting-tool manufacturer will help save time and money. Plus, there are exciting developments with new carbide grades, geometries and coatings that can help solve many mold-machining pain points. Here are two examples to consider when machining aluminum and hardened-material molds.

Mirror-edge geometry. Depending on the material you are cutting, the best tool for your application can reduce the cost of machining your mold by more than 500 percent. Take, for example, a *mirror-edge geometry* that eliminates chatter in aluminum molds. Typically, when carbide tools stick out of the spindle by more than a 3:1 length-to-diameter ratio, chatter becomes an issue, and exceeding the 3:1 ratio is the norm in mold machining.

Mirror-edge geometry can remove as much as 42 pounds of aluminum every minute.

Many machine operators choose to slow things down or are forced to take very shallow depths per pass to remedy the chatter problem. However, the mirror-edge geometry synchronizes the vibration of the end mill with the vibration of the mold. This synchronized movement eliminates the chatter, improving the finish. The other advantage that it offers is the ability to increase rpms to the maximum range of the machine, which greatly improves removal rates.

This technology can remove as much as 42 pounds of aluminum every minute. One mold builder using a mirror-edge geometry took deeper cuts with faster feed rates without chatter. As a result, the mold builder reduced a 49-minute roughing cycle time using three different tool lengths to eight minutes using only one long-length tool. The shop reduced cycle time by 525 percent.

Wear-resistant carbide and heat-resistant PVD coatings. When cutting difficult, hardened materials such as D2 at 62 HRC, getting a ball end mill to last long enough to get through the entire part can be difficult. The desire for mold-component interchangeability and ever-tightening tolerances make it extremely challenging when you are forced to change tools midway through a part. One solution is a newly developed *carbide-grade combination with a heat-resistant coating.* When cutting hardened materials, wear is typically the failure mode. A harder carbide grade with the same mechanical toughness will wear less than a softer carbide grade. Another mode of failure when cutting hardened parts is the high temperatures at the cut. A new *specialized PVD coating* acts as a heat shield during cutting, which extends cutting-tool life.

Using a carbide-grade combination with a heat-resistant coating and a specialized PVD coating can extend cutting-tool life by 450 percent and reduce wear on the ball by 909 percent. This increases 3D accuracy and allows the entire part to be completed with one tool, eliminating the potential of mismatch from the use of multiple tools. MMT

CONTRIBUTOR

Mike MacArthur is vice president of engineering for RobbJack Corp.

FOR MORE INFORMATION

RobbJack Corp. / 844-342-0238 / robbjack.com

Additive + Production

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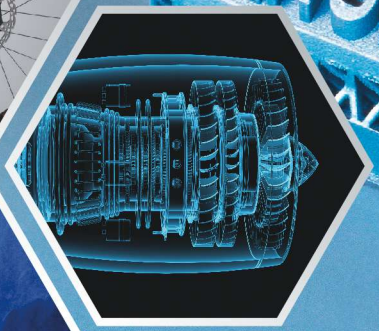

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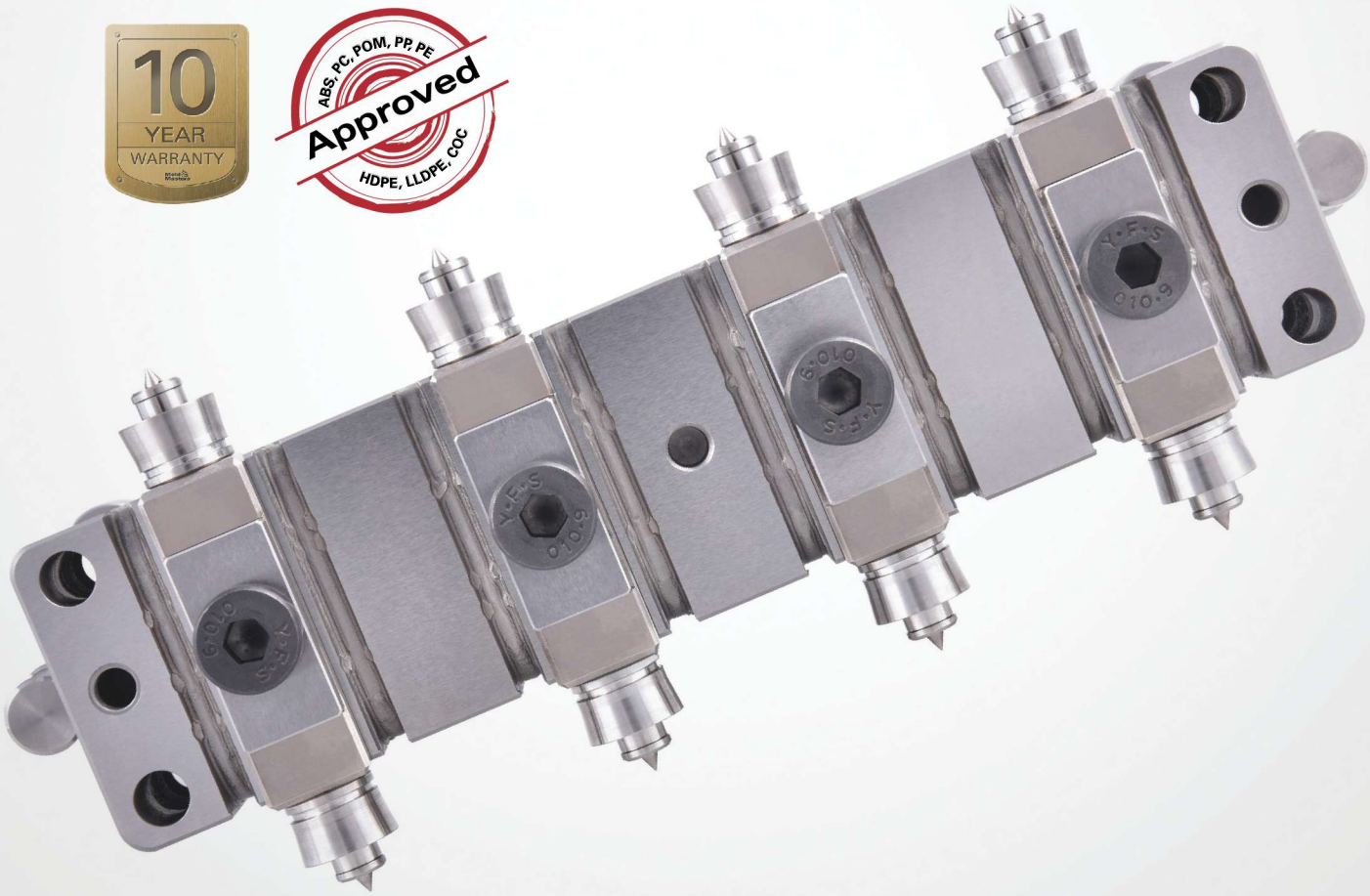

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