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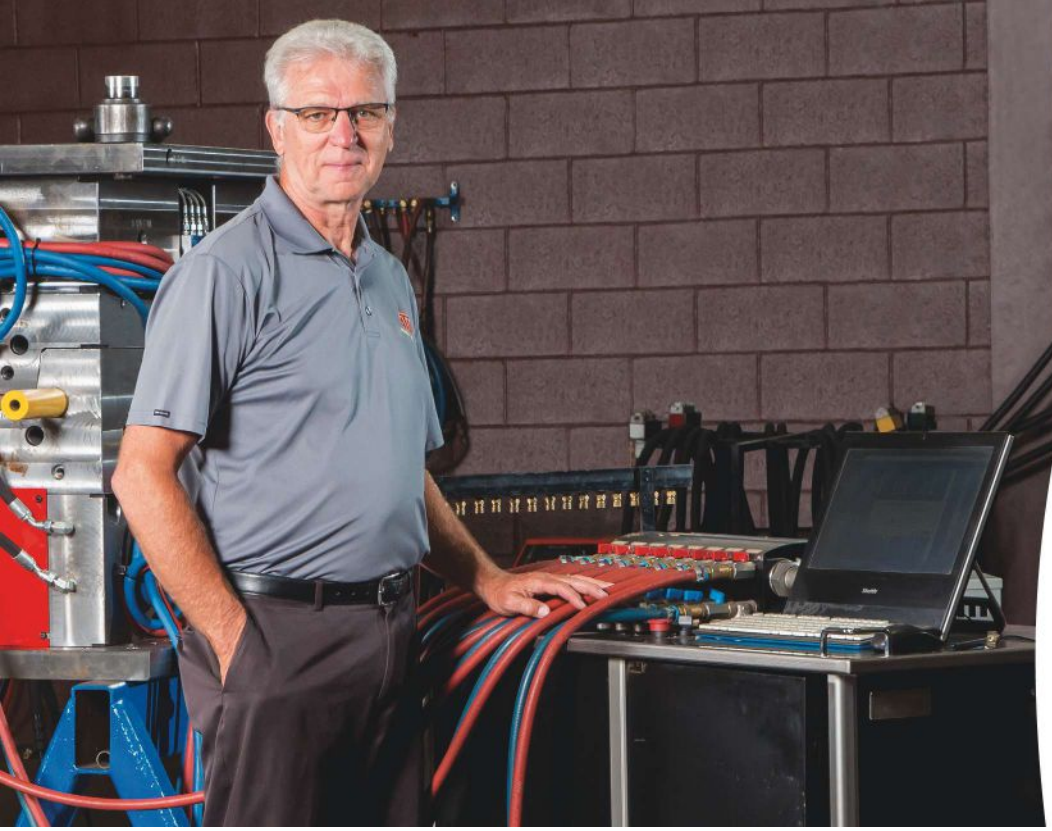

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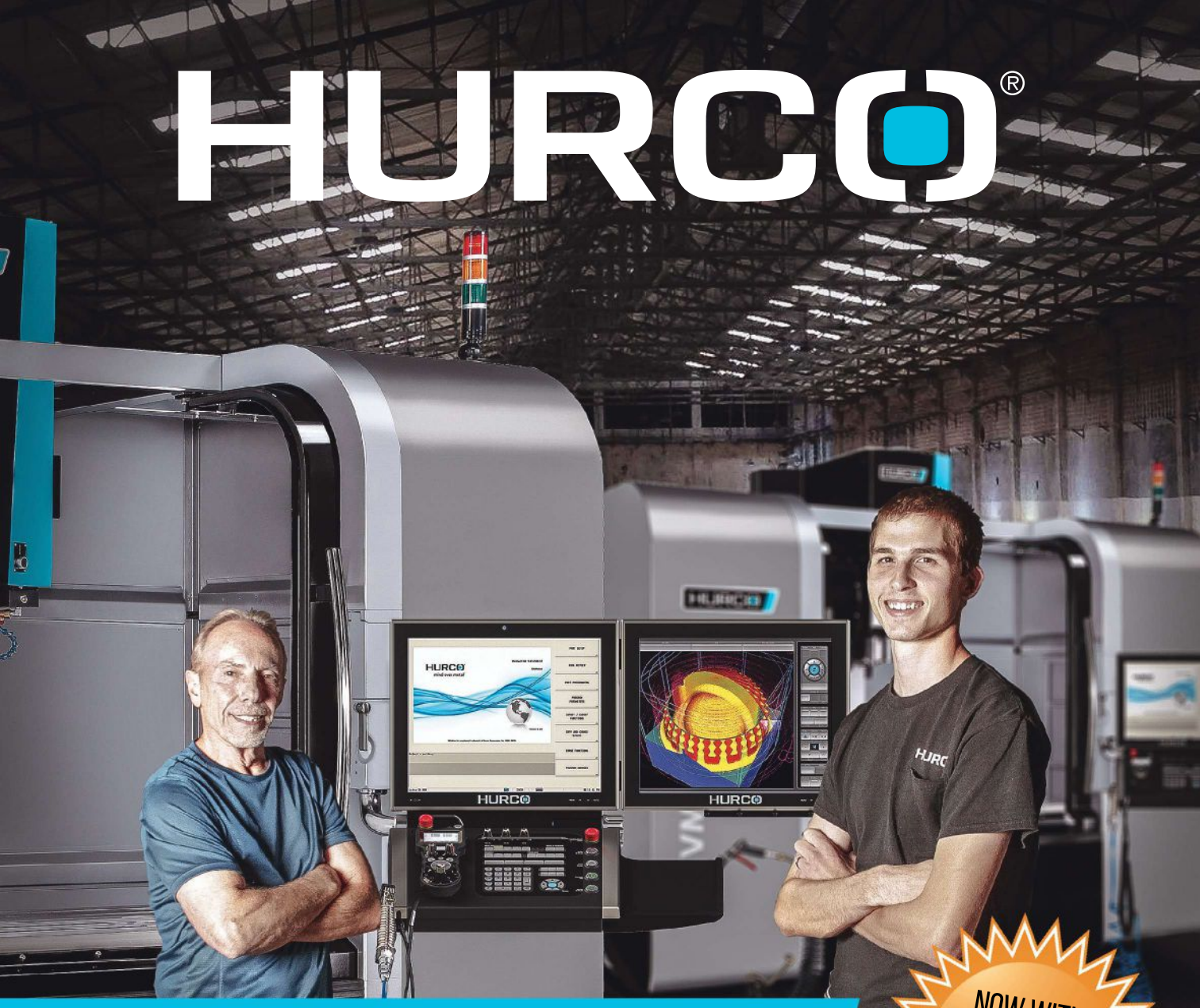

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October 2019 Volume 22 / Number 10

Features

Departments

ON THE COVER
Cover image courtesy of Creative Technology. This month's cover photo shows a plastic visualization model demonstrating conformal cooling produced by Custom Mold & Design (CMD) using the Matsuura LUMEX Avance-25 hybrid machine that performs both milling and laser sintering. See related feature on **page 16**.

Images courtesy of (left to right) Michiana Global Mold, Commercial Tool & Die and Barbara Schulz.

VIDEO ACCESS

5 TRICKS OF THE TRADE
Great Tips from This Issue

1. Go Global
Invest in any Chinese partnership as you would in your home team. Take time to form a trusting relationship, invest in the management, workforce talent and technology.
PG. 10.

2. On Your High Horse
High horsepower and torque on a milling machine improve cutting speeds up to 10% or more during mold machining.
PG. 24.

3. Getting the Down Low
The lower shear of an open hot runner nozzle provides less stress on the melt and more uniform fill temperature than conventional nozzles.
PG. 30.

4. Laser Focused
With laser ablation, texture is applied with short, pulsed lasers using between 30 to 100 W of power, and multiple patterns can be applied to the same substrate all in one setup.
PG. 36.

5. Keep It Simple
Hydraulic preloading and locking cylinders mount fully external to the mold base, providing independent control to keep the mold base smaller.
PG. 48.

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Knowing When You Need Help and When to Give It

I said it before, and I'll say it again: This is *your* industry. This is *your* magazine. I look to *you* to help guide the content that will best serve this industry. I timed this perfectly as 2019 comes to a close and another Editorial Advisory Board (EAB) term comes to an end.

You might be asking, what is an EAB and how does it pertain to me? Well, coming into this industry with no real-world moldmaking experience, I quickly realized that to provide the most appropriate content, I needed to solicit help from those who actually design, build, maintain, repair, purchase and run molds. The help I sought was in the form of a steering committee to provide new ideas and perspectives on the industry and assist the editorial team with the direction of *MMT*'s content.

The Board comprises ten men and women selected based on their experience and knowledge of moldmaking and represents all aspects of mold manufacturing (moldmakers, molders, OEMs, educators and consultants). Each member serves a three-year term. Check out the current board members on page 8 of any issue, or online.

I firmly believe that the active involvement of industry leaders has helped *MMT* consistently cover the industry's most important topics.

As an EAB member, you may:

- Encourage the submission of topics, articles, research, presentations, interviews, profiles and other relevant industry issues.
- Provide occasional guest editorials/viewpoints/commentaries for magazine and/or assist with moderating panel discussions/roundtables at Amerimold's annual conference, where appropriate.
- Represent and promote the magazine's mission at conferences you may attend (especially Amerimold).
- Provide helpful comments/criticism/information to the editor to assist in the development and direction of the publication.
- Help the editors stay on top of moldmaking-related industry trends, news and products.
- Act as a reviewer of editorial ideas, recommendations and contributions.

Some EAB benefits include:

- Industry recognition by assisting in the strategic editorial direction of the publication.
- Name and affiliation listed within each issue of the publication.
- Name and affiliation noted on the magazine's website.
- Preferred opportunities to contribute editorially to the magazine.
- Discounted 10 x 10 booth at Amerimold Expo.

If this opportunity intrigues **you**, or if you have someone in mind for an EAB position, shoot me an email at cfuges@gardnerweb.com to get the process started for our EAB 2020-2023 term. MMT

Christina Fuges

Christina M. Fuges
Editorial Director

Follow MMT on: Follow @MMT_ChristinaF

THIS MONTH ON moldmakingtechnology.com

VIDEO: Tooling 4.0: Connecting Industry 4.0 Technology to Your Molds and Molding Process

MoldMaking Technology Editorial Director Christina Fuges interviews Scholle IPN Senior Tooling Manager North America Don Smith about Tooling 4.0 and the difference between mold design and mold engineering.
short.moldmakingtechnology.com/Tooling4.0

PODCAST: Bringing in Young, Curious Mold Builders

Camille Sackett of Accede Mold & Tool talks developing long-lasting relationships and attracting curious next-generation mold builders with *MoldMaking Technology* and The Manufacturing Alliance Podcast.
short.moldmakingtechnology.com/AccedePod

BLOG: Partnering Up on DFM and TCO

This mold builder focuses on minimizing design and build times by paying close attention to the value of hidden costs in advance.
short.moldmaking/technology.com/DFMTCO

WEBINAR: Developing the Next Generation of Manufacturers

Westminster Tool's Kylee Carbone provides actionable insights for adapting or improving talent development approaches, becoming an employer of choice, developing a strong foundation and retaining talent.
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EAB Picks: Podcasts

MoldMaking Technology has been very busy working to bring educational and insightful content to readers via an array of media. One of these is the podcast. A variety of podcasts, produced in cooperation with The Manufacturing Alliance, have been uploaded and stored on the *MMT* website for everyone's listening pleasure. We polled our Editorial Advisory Board members for their top podcast picks from the *MMT* online archives and following are the most recommended and why.

Interview With Gardner Intelligence—Why? "Listening to this podcast helped me better understand the economics of moldmaking and the industry reports."

"They populate such great data in an easy to consume manner."

Mixing It Up With Maximum Mold Group—Why? "This podcast is inspirational for any owner to understand that without a plan, passion for what you do and vision for your business, it is impossible to be successful."

MMT's Editorial Advisory Board members share their favorite podcast pics.

How *MoldMaking Technology* magazine Came to Be—Why? "Joe Prischak is a personal mentor of my father's and somewhat of a hometown hero because he was instrumental in establishing a strong plastics industry in the Erie, Pennsylvania, area."

Putting Recycled Plastics to Work—Why? "Excellent topic that hits home equally for moldmakers and molders. How can everyone do their part to avoid the industry getting painted negatively to the public?"

Interview With Legacy Precision Molds—Why? "It is fantastic to hear father and son provide different perspectives on culture, people and understanding what makes their company different."

Interview with Mike Devereux our Tax Guy—Why? "This podcast provides a high level overview of things you should be paying attention to, but maybe you aren't."

Let's Talk About Finding and Fixing Problems—Why? "Rich Oles provides a lot of insight into the value of customer service."

One EAB member told us that what she finds interesting about *MMT*'s podcasts is that the content is relatable for the listener, whether it is a story of a mold shop owner's journey or tips for how to handle specific business challenges.

More podcasts are available at moldmakingtechnology.com/podcasts. We hope you will listen in and let us know what other topics you would like to hear in the future. MMT

FOR MORE INFORMATION

The Manufacturing Alliance Podcast / moldmakingtechnology.com/podcasts

EDITORIAL ADVISORY BOARD (EAB)

The EAB enhances the standing of the publication and strengthens its professional integrity through the active involvement of its members.

The Board represents all aspects of the mold manufacturing industry with a balance of moldmakers, molders, OEMs and academia, and various moldmaking segments and job functions. A member is selected based on his or her experience and knowledge of the moldmaking industry to serve a three-year term.

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A Conversation with ...

Michiana Global Mold

Images courtesy of Michiana Global Mold.

The Michiana Global Mold team is committed to servicing its customer from concept to production, including the design, troubleshooting and production phases.

Who is Michiana Global Mold?

Kelly Kasner, Director of Business Development: Since 1964, Michiana Global Mold (MGM) has been a designer and builder of plastic and rubber injection molds for the automotive, medical, industrial and consumer products markets. We specialize in parts with Class A finishes, high complexity and multiple materials.

Our cross-functional design and engineering team works in collaboration with our certified journeyman moldmakers to build tight-tolerance, single to high-cavitation molds with hot/cold runners, collapsible cores, inserts and over-molding, as well as shuttle, stack, unscrewing, two-shot and rotational molds. MGM is an ISO:9001-certified, AMBA and NTMA member.

How does MGM produce production-ready parts the first time?

Kasner: MGM's up-front investment in effective communication with the customer, a thorough understanding of the part and molding process, and adherence to mold standards and quality systems for more than 50 years makes delivery of production-ready parts the first time possible. Our cross-functional teams, which include program managers, production managers, designers and leadmen, who are all journeymen moldmakers, partner with the customer and use a design-for-manufacturing approach to design and build a quality tool to mold each specific part. We use the latest in software and equipment (Unigraphics 3D software and both manual and high-speed machines).

Why is it important that all of MGM's mold designers originate as journeymen moldmakers?

Kasner: Our mold designers typically have an associate degree in tool and manufacturing technology or plastics engineering technology with five to eight years of experience in the field. They are also expected to be strong in problem-solving, operation monitoring, CAD/CAM and moldmaking equipment, and possess a mathematical aptitude and critical thinking skills. These qualities allow our in-house designers to easily collaborate with our program engineers and mold builders to develop tooling and systems to optimize production, efficiency and reduce downstream manual processes.

Can you define the high level of expertise that is needed to take on complex molds?

Kasner: Our team comprises experts who can address complicated injection options, cooling issues, water lines and gate placement because MGM is well-known in the industry for designing and building 'non-standard' molds (not the standard 'open-and-shut'). Our niche in the marketplace is building complex injection molds with more moving features, tighter tolerances, multi-

Michiana Global Mold
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- Designs and builds both domestic and off-shore injection molds for the plastic and rubber industries since 1964 in a 25,000-square-foot facility.
- Molds range from simple prototypes to complex production molds servicing presses up to 500 tons for the automotive, electronics and consumer products industries.
- Performs EDM, CNC milling, drilling, grinding, turning and inspection operations.
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ple and buried cams, hydraulics, split parting lines and delayed/multiple ejections. The majority of our moldmakers and engineers have decades of experience, and our corporate culture offers continuous professional and technical development.

Describe your Chinese partnership. How did you find and develop this partnership, and why? How has this partnership benefited Michiana?

Kasner: MGM is considered a pioneer in China with partnerships spawning over a decade. In 2008, our management team recognized the increased global competition in China and their presence in the U.S. market. Although we recognized the disparity of quality standards, the origin of component issues and a sub-standard workforce training culture, we also discovered companies in China that were motivated to adopt an Americanized culture and related quality standards.

Over several years, our team commenced a process of working with nearly one-hundred shops in China before it found the right company with which to partner. This partnership has driven continued success stories at MGM as we can maximize cost savings using the Chinese labor market while delivering U.S. quality standards in mold design and build.

We use only North American or German steels and components in our Chinese mold builds. All tools include mold-flow analysis and on-premises sampling. Our molds built in China are fully backed and managed by our U.S. team. MGM needs to offer this option when partnering with companies to meet their tooling needs with maximum cost savings without compromising quality, in addition to local service and local support once their tool reaches the U.S.

Can you share any tips or lessons learned for developing and working with a Chinese partner? What is the key ingredient in this partnership?

Kasner: The key is to invest in your Chinese partnership as much as you would in your home team. Take time to form a trusting relationship, invest in the management and workforce talent, and use technology to increase capacity and capabilities. Although a mutually beneficial partnership also includes respect of both U.S. and Chinese heritages, take the time to invest in incorporating an American craftsmanship culture.

The key ingredient is communication. An in-house engineer dedicated to managing our global programs, who is engaged with our customer and our

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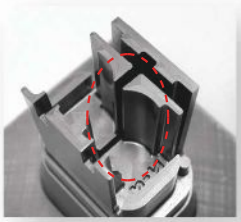
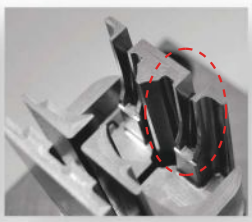


Deep ribs (LxD > 17)



Thin ribs (LxD > 24)

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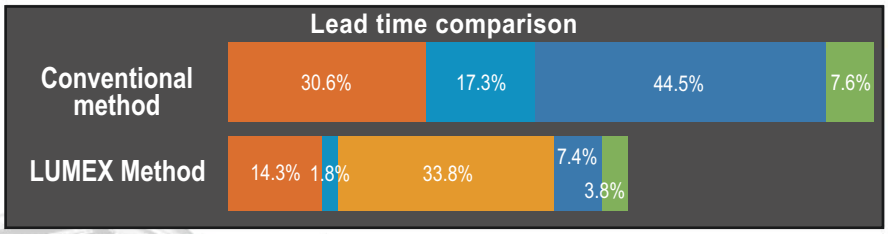

	Conventional Method	LUMEX Method
	Mold & electrode design	Design
	Die/mold NC (PRG), Electrode NC (PRG), MC (PRG), Wire EDM (PRG)	Dedicated CAM
	N/A	Sintering & Milling
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Michiana Global Mold designs and builds highly complex and intricate plastic and rubber injection molds in the U.S. for the automotive, electronics and consumer products industries, in collaboration with its overseas partner.

China team in effective and continuous communication, is critical to the success of our mold build programs.

How do you achieve effective and close communication with customers?

Kasner: Communication experiences are an integral part of MGM's success strategy in developing relationships, not just making sales. Our repeat and loyal customers learn to expect intimate communication, which involves part and design meetings, phone calls, site visits, progress reports, shared files, material certifications, post-delivery support and service. Each team member is responsible for customer service, cultivation, discovery and awareness. MGM opened in 1964 as a family business focused on quality craftsmanship, innovation and customer service, and that family culture still exists today. MMT

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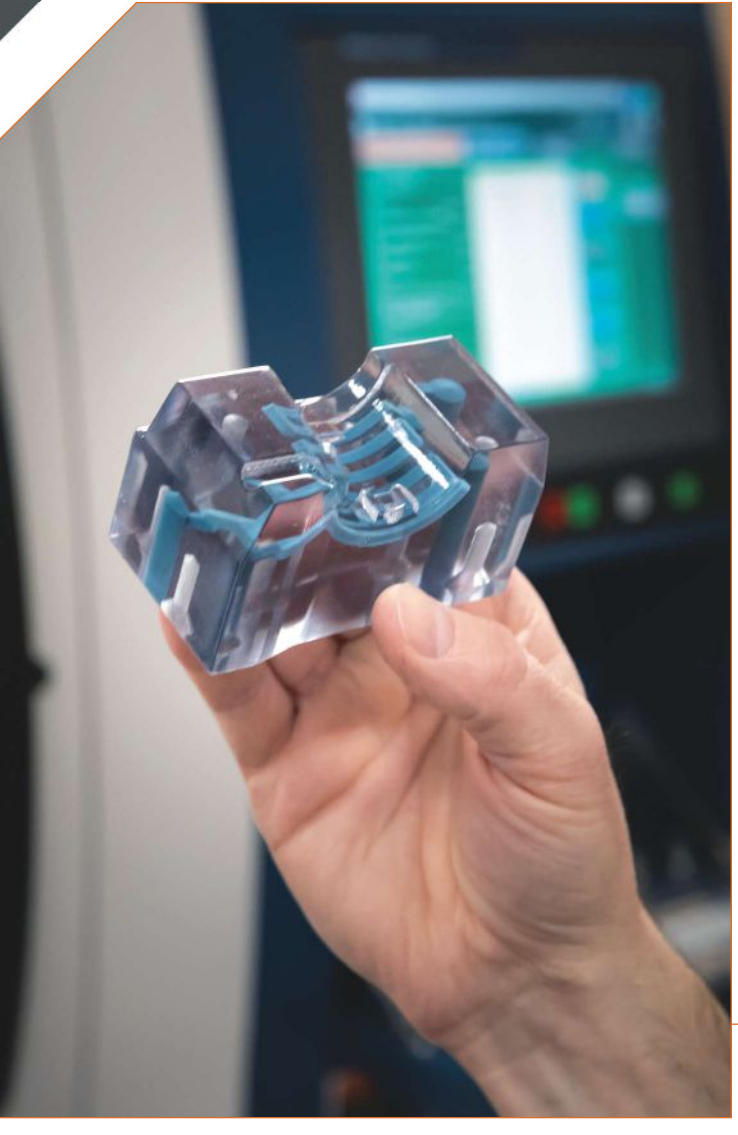
By Christina M. Fuges

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

BUYING AND SELLING ADDITIVE TECHNOLOGY

It is one thing to understand additive technology, but it is another to know when to invest, who to partner with and how to sell its value.



This plastic visualization model of a cooling path demonstrates that conformal cooling made with a hybrid machine has unlimited possibilities to follow virtually any contour with a uniform wall thickness.

When it comes to any new technology, the trick is determining the right time to buy in, and that has been a definite challenge for mold builders looking to invest in additive manufacturing (AM).

"For a while now, everyone has been paying attention to additive technologies. We at Custom Mold & Design (CMD) pay specific attention to the *curve* of new technologies. What I mean is, there is a point at which a shop can buy into technology too early and at a premium price, which ends up being cost-intensive when the technology supplier develops a better model," says Vice President Lester Jones.

He also warns against the other end of the investment spectrum; buying technology after it has been commoditized inhibits what the user can charge because it is so readily available.

"We are around it, use it and see the value of it, but we are not a big manufacturer or consumer in the conventional additive manufacturing sense. We have been using 3D printing to make fixtures and prototype parts, and we have been buying additively produced inserts that we injection overmold for implants," Jones says.

This Minnesota company considers itself an engineering company that helps people develop products, not just new molds. This mission involves 320 people across three facilities—Custom Mold & Design, Paradigme Engineering and Teamvantage—performing a great deal of ultra-precision part and mold work for implants, surgical tools, pacemaker programmers, diagnostic equipment, hospital bed components and chemotherapy delivery systems. The CMD team focuses on finding creative ways to solve complex problems and AM, specifically hybrid machine technology to produce conformal-cooled inserts, is how they believe they can take

Custom Mold & Design is building a new core insert for this cover to reduce warpage and improve cycle time. Note the curve on the left side of the plastic part that should be straight.

Custom Mold & Design's LUMEX Avance-25 hybrid machine from Matsuura Machinery can tackle complex geometries and conformal cooling as shown by this display of part samples.

advantage of additive technology to make better molds for customers.

Buying It

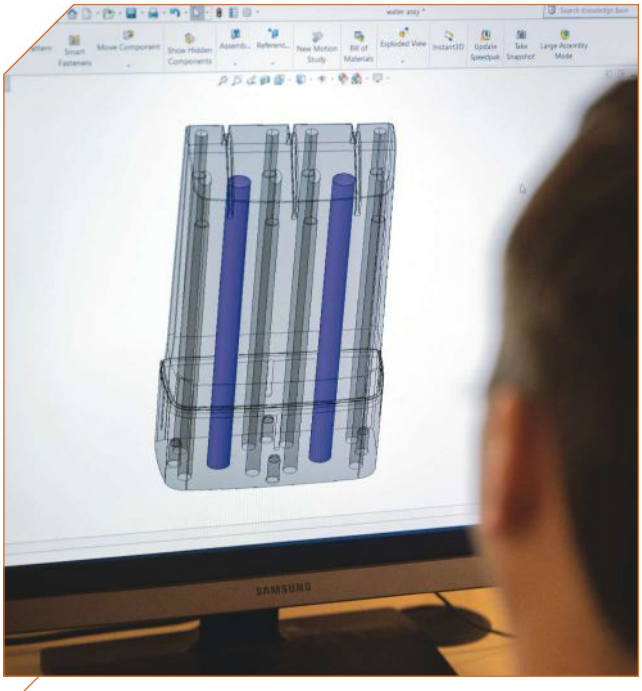
CMD Owner and President Ray Newkirk had his eye on Matsuura's LUMEX Avance-25 machine, which combines powder-bed metal selective laser sintering (SLS) along with high-speed milling in a hybrid platform. This combination of technology in a single platform enables the production of parts and component geometries in a novel way, including conformal cooling features in an injection mold or internal cooling passages in a part.

Newkirk and Jones traveled to Japan to tour Panasonic, which partnered with Matsuura to develop this hybrid process. Panasonic has built hundreds of molds utilizing this practice, and after seeing their operation, Newkirk and Jones felt it was the right time to invest in the technology. It was their belief they would be entering a flatter part of the curve where the likelihood of massive change on the Matsuura equipment was less likely.

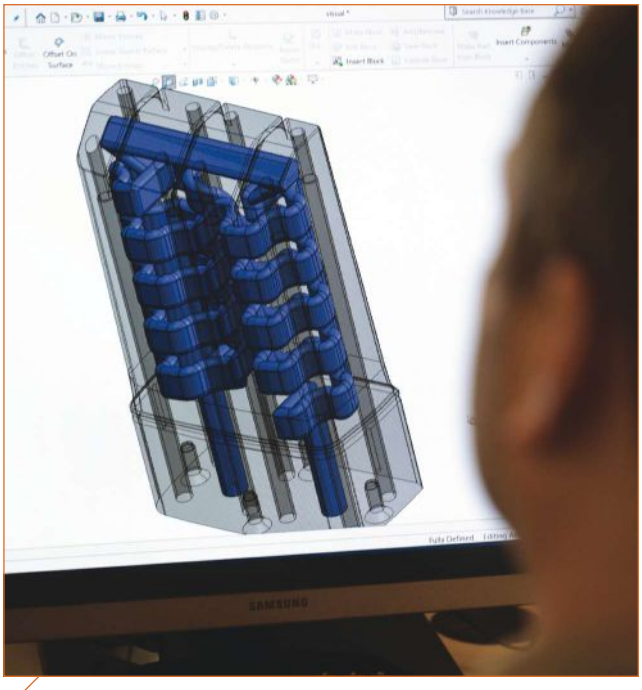
"This hybrid machine is on its fifth version, so Matsuura has been doing this for quite a while. They are constantly making improvements but more on the software side now," Jones says.

But more importantly, it was the *partnership*. "We created a relationship with Matsuura whose goal is not to manufacture product for people (outside of testing to demonstrate the equipment) but to sell the equipment," Jones says. With that in mind, CMD came to an agreement that if Matsuura identified contract manufacturing work to make inserts on the LUMEX, CMD would manufacture them. This agreement helped push us along in our decision to invest. "We believed this was a real opportunity to partner with Matsuura and turn this into something special."

CMD is also in a unique location in Minneapolis/St. Paul, which is also



Conventional cooling used in the original core using baffles in each hole that direct the water flow in and out of the same holes.



Conformal cooling for the replacement core insert, which creates a closed-circuit for the coolant, and provides greatly improved cooling throughout the core.

home to Matsuura's national headquarters. Matsuura has a showroom for its AM technology, but they were looking for a partner to showcase the technology in a real environment. And having the LUMEX amidst CMD's other highly precise machine technology, like its nine Yasda machine tools, does not hurt either. "We are doing real stuff with the technology onsite instead of making pretty trinkets," Jones says.

THE MANUFACTURING ALLIANCE PODCAST
PRESENTED BY
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Listen to the MMT/Manufacturing Alliance Podcast with Lester Jones, Vice President and Tom Caron, Vice President of Sales at Teamvantage and Custom Mold & Design at short.moldmakingtechnology.com/podcasts

Learning It

Another curve of technology is the learning curve, and AM has a tremendous one, according to Jones. "You need to embrace the unknown and accept a temporary lower level of efficiency to achieve success," he says. "You cannot underestimate how big of a step it is to move to additive technology or how much it is going to cost in terms of money and time for people to learn it."

He explains that this step means taking someone proficient at a job and placing him or her where they are going to struggle for a little while. As the workload increases, it may seem counter-productive, but you need to stick with it. The CMD team knew that if they did not push through it, they would never figure it out, and their goal is to be an expert in this arena.

However, another real advantage for CMD is the family of companies it operates within, which includes contract manufacturer Teamvantage and mold builder Paradigme Engineering. "We can take lessons from making a part and then producing an insert for a tool, running it in a mold, and testing it, all in house," Jones says.

A true partnership also comes into play with new technology. "By learning and working together, you both get smarter," Jones says. CMD is Matsuura's local partner in offering contract Matsuura production and in the application of the Matsuura LUMEX technology for the mold industry. However, this role is not new to the organization. The company has worked through this type of learning process with its plastic injection molding machines, for example. It has a similar partnership with Sodick Plustech, who did not have much equipment in operation in the United States when Teamvantage purchased its first Sodick press. The organization learned how to help the technology supplier grow and expand so that Sodick Plustech could better support them.

As CMD identifies issues with the hybrid technology, Matsuura is quick to develop solutions and is committed to keeping the machine current. Matsuura focuses on serving

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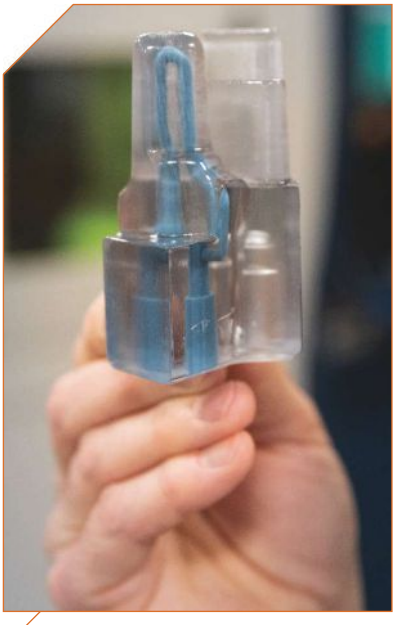
the mold manufacturing industry with these machines, so they work closely with mold builders to continually develop machine technology. As such, they acknowledge that mold builders consider certain aspects of the process that they would not consider themselves.

Mold builders think about the process from a practical standpoint because they are performing mold work all day, every day, whereas a machine tool builder would not naturally think that way.

"For example, the base of the mold insert, where mounting holes and water inlet and outlets are, can be easily produced conventionally," Jones says. This can then be used as the build plate with the laser sintered material added on top for the detailed molding surfaces with conformal cooling lines created inside the block."



Conformal cooling can be especially helpful for deep and complex contours, reducing cycle time and warp, as shown by this plastic visualization model of a cooling path.

"Because we build high-end molds with tighter tolerances, we are zeroing in on all the process parameters that impact accuracy and nailing that down to where we can be a lot more consistent and precise," Jones says. "We are going to ask questions that Matsuura might not have ever thought of, which could help them improve their machine technology and, in the end, sell it to other mold builders," Jones says.

Conformal cooling has been shown to provide significant reductions of 20% or more in molding cycle times. In companies like Custom Mold & Design sister company Teamvantage Molding with over 60 presses in operation, this can amount to huge improvements in productivity.

Using It

Often referred to as a "one machine, one process" system, the Matsuura LUMEX series permits production of the most complex and challenging parts by combining both high-speed milling and laser sintering capability. The system produces highly accurate parts from metal powders that are sintered using a laser while surfaces are precisely milled at high speeds.

Matsuura's LUMEX is an extremely effective method of creating conformal-cooled injection mold inserts. Inserts traditionally produced through machining and EDM contain straight cooling paths whereas conformal-cooled inserts produced with this hybrid process incorporate complex curved, shaped or spiral cooling channels. On top of that, this process easily forms the channels in small, narrow or awkwardly shaped inserts.

"Compared to conventional post process cooling pipes, those created on the LUMEX are more efficient at cooling. Companies have seen improvements of up to 30 percent in cooling effectiveness with up to 40 percent reduction in cooling time. This is what we like to call the 'magic' of conformal cooling," Jones says.

The benefits to the owner of the mold are clear to Jones:

- Improved cycle times, sometimes as much as 50% using conformal cooling
- Improved part yields and enhanced quality
- Shot-to-shot consistency and repeatability
- Lower cavitation for high-volume production parts with a consistent molding cycle (which is 33-50% faster than without conformal cooling)
- Improved injection molding machine usage with faster cycles

The result is a new generation of molds with consistent and accurate cooling across the entire forming area, even within small or complex shaped pockets. This technology also eliminates many of the distortion and poor part quality problems that are traditionally associated with inefficient cooling.

Today, Custom Mold & Design has been working with the LUMEX equipment for a little less than 10 months. Time has been spent training with Matsuura's application engineers, building parts on their own, and now they are experimenting with other ways to use the equipment to establish the limits of the process. There is a lot of collaboration going on between Matsuura engi-

VIDEO: Custom Mold & Design Shares Use of Hybrid AM at Amerimold 2019

Custom Mold & Design Vice President Lester Jones shares how the company uses its Matsuura LUMEX Avance-25 powder metal laser sinter machining with milling capabilities.

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neers, Custom Mold & Design's personnel and customers who are looking for the utmost efficiency in the injection molds they buy.

Selling It

CMD is big on selling the total cost, believing mold builders need to recognize when they have a better mousetrap and then be proud of the fact that it is a better total value for the customer. The most important consideration is the length of time a mold is going to run and remain trouble-free. Cycle time is a significant part of that, and AM can help CMD produce molds that run faster, saving customers money. CMD's approach is to educate customers on the long-term value of a conformal-cooled insert to further justify the purchase of a more expensive mold.

"If a shop can build a mold that cycles at 85 percent of the cycle time previously, then they need to do the math and determine what that 15 percent is worth," Jones says.

CMD truly understands the benefits of 3D-printed, conformal-cooled inserts because their sister company, Teamvantage, quotes plastic parts all day, every day. This competency gives the company an advantage in terms of selling the true cost of an additively produced insert. They are even creating a white paper that shares some of the costing information to more effectively demonstrate the payback period of the mold investment, as a result of reduced cycle time.

However, many times the decision boils down to having the right customer. The right customer will be looking for opportunities to reduce overall costs, not just reduce their supplier's margins. "If your customer is a purchasing agent who only compares the acquisition price of each mold and does not consider the warranty, mold material or number of actions then he or she will never understand the true cost of the mold over its lifetime. They are never going to buy this premium priced product because they do not understand how to value it. We have many examples of tools that run many millions of cycles, and if the customer does not value that, then we are talking to the wrong people," Jones says.

To help sell that more expensive, conformal-cooled mold, simulation software to model and prove out all scenarios is key. Typically, moldmakers tend to design conformal cooling channels using gut-feel. However, today's advanced software does a much better job of designing those systems, predicting efficiency and identifying areas that

a mold builder may overlook when using a gut-feel approach. Currently, CMD contracts out the cooling simulation portion of the mold design. The team is still getting to know the additive piece of the puzzle, but they know the next step from a software standpoint is to roll in the analytical segment.

CMD is also tackling some warpage issues with AM. The shop wants to improve tolerances, but warp is a limiting factor, so anything that they can do to reduce warp will allow CMD to pursue more challenging parts. "Because we build high-end molds with tighter tolerances, we are zeroing in on all the process parameters that impact accuracy and nailing that down to where we can be a lot more consistent and precise," Jones says.

Growing It

Mold builders are good at coming up with creative ways to use equipment. "We are always looking for how we can take technology and apply it to a different problem. We are problem-solvers. We want people to come forward with concerns or issues, and we will try to come up with solutions," Jones says. And additive manufacturing technology is no different.

However, the CMD team is also conservative by nature. They are only committing to what they *know* they can do, which means that they are prepared to walk away from work they determine too risky. They need a series of successes, so they are trying to be smart about the projects they take on. They want to make sure that they are slowly building up an installed base of molds running successfully rather than having some catastrophic failures.

Success to Custom Mold & Design is a satisfied customer, which means a mold that runs faster. With this additive technology, customers can have a mold that runs 20% faster than a mold manufactured using conventional methods.

"We set the LUMEX machine in the facility in a way that we can have a second one next to it. We hope that we find ourselves busy months or a year down the road needing to add another machine. Then we will know we have been successful!" Jones says. MMT

FOR MORE INFORMATION

Custom Mold & Design / custommold.net
Paradigme Engineering / paradigme.net
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By Keith Foster

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

Images courtesy of Commercial Tool & Die.

Five-Axis Machine Modifications Reduce Cycle Times

Expanding the capabilities of a portal milling machine reduced cycle times and improved quality of large-section automotive and truck molds.

Commercial Tool & Die (CTD) deemed a recently acquired portal milling machine an ideal solution for the large-section automotive and truck molds this injection and compression mold builder produces, but this was not a purchase-and-place investment scenario.

As CTD Plant Manager Darin Hall explains, "We saw great potential in the FZ40 Compact portal milling machine from Zimmermann after encountering it at an IMTS event in Chicago, but there were certain modifications that we required on the machine."

CTD is one of three business units operated by Commercial Tool Group (CTG) in Grand Rapids, Michigan. The other two units are CG Plastics and CG Automation & Fixture. Founded in 1953, CTG has grown from a small mold shop into a major supplier of injection and compression molds, fixtures, automated equipment and robotic handling devices to the automotive, appliance, heavy truck, RV and appliance industries, providing turnkey solutions to manufacturers of various plastic and composite parts.

CTG views technology as the foundation of its continued growth, so maintaining an aggressive technology investment strategy across all three business units is vital, especially at CTD, where they are "building the future of tooling," according to the company. This strategy is why selecting a machine tool supplier committed to working with CTD to design and build a machine exactly to its specifications was key.

The management team of Commercial Tool & Die (CTD) and Zimmermann collaborated to produce a machine best suited to the application needs. The Zimmermann FZ40 Compact five-axis portal milling machine with the company-designed VH60 milling head and a 16-metric-ton table load capacity is well suited for the large molds produced at CTD. Zimmerman made several customer-driven modifications to the machine, including upgraded probes, upgraded laser tracker, redesigned tool changer for larger tools and longer Z-axis. Most of these modifications will now be offered by the machine builder as standard options. Two more Zimmermann milling machines will be installed in the near future at CTD.

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Z-axis extension and software finetuning on the movements of the Z- and C-axis produce the optimum in surface finish for CTD, allowing diamond buffing on the machine and eliminating hand polishing.

Seeing Potential

The CTD team was immediately impressed with the FZ40's open design, overhead gantry, extremely solid base and rigidity. Its overall weight of 136,687 lbs and over 17-ton table weight capacity was twice that of the competing machines that Hall and his team considered. Plus, the powerful milling head features 137 horsepower and 424 ft-lb torque max, which allows steel and titanium machining. Also, the FZ40's accuracy, with its rotary axis accuracy to 0.0001 degree, matched the demands of CTG's optics and lens injection molds. And, the A- and C-axis clamping forces up to 4425 ft-lb of the VH60 milling head would allow the team to take full advantage of HSK100 tool torque and horsepower ranges.

Hall further notes that the rigidity provided by eight mounting elements on the machine was a real bonus for CTG, especially over long runs that produce the optimum surface quality required for automotive Class-A parts. On top of all that, CTD employs monitored, unattended machining operation, so the reliability and repeatability of the Zimmermann machine had high appeal.

Exceeding Potential

However, as Hall points out, there were certain machine enhancements CTD required. "We usually get pushback from machine builders when we request design changes, but the Zimmermann team was very responsive and flexible."

Zimmermann has substantial experience in Germany with moldmakers using the FZ40 Compact, a machine designed specifically for the moldmaking market due to its open table design and gantry style multi-axis forked head configuration, but the company knew the machine's capabilities could be expanded to meet the needs at CTD.

For example, mechanical and electrical changes in the machine's design, as well as changes to the software on the Heidenhain CNC, which involved complex algorithms for detection and data calculation in the motion control scheme of the machine, were required to suit CTD's applications.

More specifically, CTD requested modified probes with extended lengths, extended Z-axis by 6 inches to accommodate longer tools, increased tool change capability from 12 inches to 16 inches to change longer tools and increased C-axis rotation to accommodate the larger, longer tools for five-axis programs.

Also, fine-tuning of gear boxes and motors to a 10% or more higher-load capacity in cooperation with Heidenhain engineering. Lastly, a new tool changer design for the extended lengths within the machine's work envelope that are required by the extended Z-axis dimensions. "This was a unique challenge, as we were working hard to maintain the overall footprint and work envelope of the machine," Zimmermann President Cornelius Keisel says.

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Commercial Tool & Die President JD Bouwman and Zimmermann U.S. President Cornelius Kiesel seal the deal on the modified FZ40 Compact five-axis portal milling machine.

All the modifications CTD required were thoroughly discussed, analyzed for feasibility and implemented in the final design of the machine. The process included fine-tuning the Z- and C-axis individual movements to achieve maximum surface finish quality, which the Zimmermann process engineering team simulated and validated onsite by the CTD inspection team.

"This allows us to eliminate most hand polishing operations, a substantial cost saver for us," Hall says, "Secondary hand polishing requirements had been the norm here but are

now radically reduced or even eliminated by the precision of the machining on the FZ40 Compact."

As a result of the expanded capabilities, CTD was also able to take advantage of the high horsepower (137 horsepower) and torque (424 ft-lb) on the machine to improve cutting speeds up to 10% or more during mold machining. The CTD team used very aggressive machining strategies, running the spindles at speeds to 8,000 RPMs with HSK100 spindle technology that did not sacrifice RMS surface quality, as evidenced by the coordinate measuring machine (CMM) and laser checks performed onsite.

CTD also uses Zeiss CMM and Creaform laser 3D inspection technology to facilitate its quality control on the machine. CTD customers, especially in the automotive sector, demand such accuracy and process/workpiece validation. In production, the FZ40 Compact data are transmitted by the CNC to the CTD Epicor system, an ERP protocol that tracks all performance to plan, work schedules, comparative shift analysis and overall equipment effectiveness.

CTD also uses Powermill CAM software with CAM-to-machine tool integration, so they can perform part inspection before removing the workpieces from the machine. With the large mold sections typically produced at CTD, this feature is a significant advantage, as it yields a substantial reduction in logistics and material handling time in the shop.

The more flexible and powerful machining capability on this modified Zimmermann milling machine helps CTD machine parts more efficiently, which allows them to quote shorter lead times to customers and prospects to win more jobs.

Making an Impact

Zimmermann also offered CTD a lease-to-buy agreement that allowed the shop to use the machine during the runout on the modifications. CTD documented and reported the results back to the builder, further improving the technology.

The more flexible and powerful machining capability on this modified Zimmermann milling machine helps CTD machine parts more efficiently, which allows them to quote shorter lead times to customers and prospects to win more jobs. "Zimmermann machine technology has improved our process with at least a 10 percent reduction in cycle times and no compromise in surface quality," Hall says.

These results and Zimmerman's service made the teams' decision to purchase additional machines easy. Not only were CTD's requirements met on the new machines ordered, but they are highlighting the traditional green color scheme of Zimmermann with the Commercial gold coloring.

When the impact of all the machine modifications for CTD was realized, Zimmerman decided that it made sense to make these options available to others in the industry. Many of the changes will now become standard options on the machine in the future. MMT

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Keith Foster is vice president of sales and marketing for Commercial Tool Group.

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By Barbara Schulz

Flat vs. Round—Does an Injection Nozzle Need to be Round?

A new nozzle design developed by an Austrian-based mold builder abandons the usual round opening for a wide slit to allow for up to 25% faster cycle times, lower shear and injection pressure.

Hot runners—originally invented to ensure clean sprues and reduce rejects—are playing an increasingly important role in molds to control injection molding processes. The path to this was paved by valve gate systems, which control the flow of plastic into the mold cavity using mechanical shut off pins that allow the hot runner nozzle to open and close at the tip. The ability to accurately control the flow of material through the gates enables stable processes and higher component quality with shorter cycle times, particularly in sequential and cascade injection molding.

There have been numerous incremental advances in hot runners over the last years, and one of the latest is from mold builder Haidlmair Group (North American plant in Concord, Ont., Canada), which has developed an open hot runner nozzle shaped like a sheet extrusion flat die. Called the Flat Die Unit (FDU), it passes melt through a long slit (there are currently three different sizes available) instead of a circular hole like a conventional nozzle. The result is said to be faster injection of more melt through a thinner gate opening, with lower shear and injection pressure, lower melt temperature and up to 25% faster cycle time in several projects.

Haidlmair says the FDU is particularly suitable to polyolefins, including recycled

Images courtesy of Barbara Schulz.

Seen at Moulding Expo 2019 in Stuttgart, Germany: Called the Flat Die Unit (FDU), this hot runner system passes melt through a long slit instead of a circular hole like a conventional nozzle.

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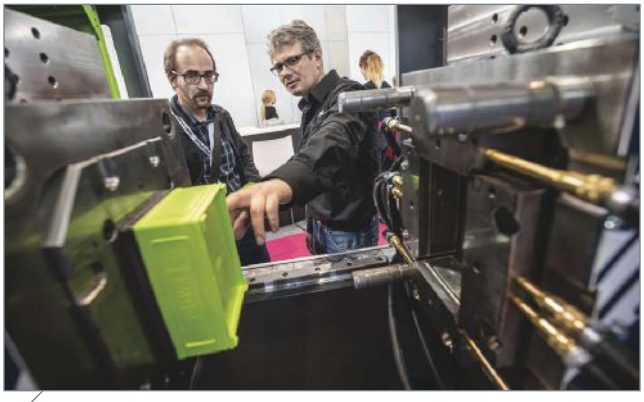


Up to now, the FDU has been available only with Haidlmair molds. But Moulding Expo 2019 in Stuttgart, Germany, saw a newly-founded separate company, FDU Hot Runner GmbH based in Frankenthal, Germany, which is ready to supply the nozzles to other moldmakers.

material. Up to now, the FDU has been available only with Haidlmair molds. But Moulding Expo 2019 in Stuttgart, Germany, saw a newly-founded separate company, FDU Hot Runner GmbH based in Frankenthal, Germany, which is ready to supply the nozzles to other moldmakers.

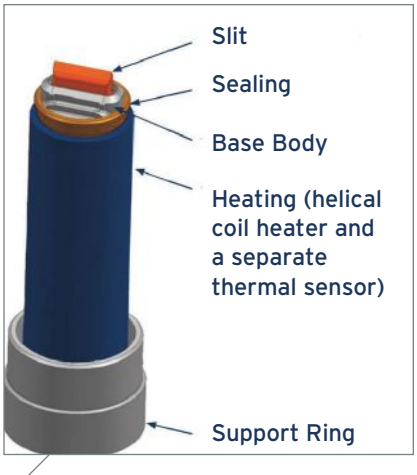
"Originally, the FDU was a research project developed with the know-how of Haidlmair Group in Austria drawing on the company's experience in extrusion flat dies for film and sheet," Andreas Kißler, CEO of FDU Hot Runner explains. "The idea was to transfer the experience in this field to injection molding and hot runner technology to increase productivity and throughput especially for large parts, but also other applications. There was no other similar product on the market, so Haidlmair decided to develop their own hot runner system, the FDU."

The product was presented to the public in 2016 and has been continuously developed ever since. For some time now, the system has been ready for series production and has already demonstrated its advantages in many Haidlmair tools as well as in other customers' tools, including some from the automotive industry.

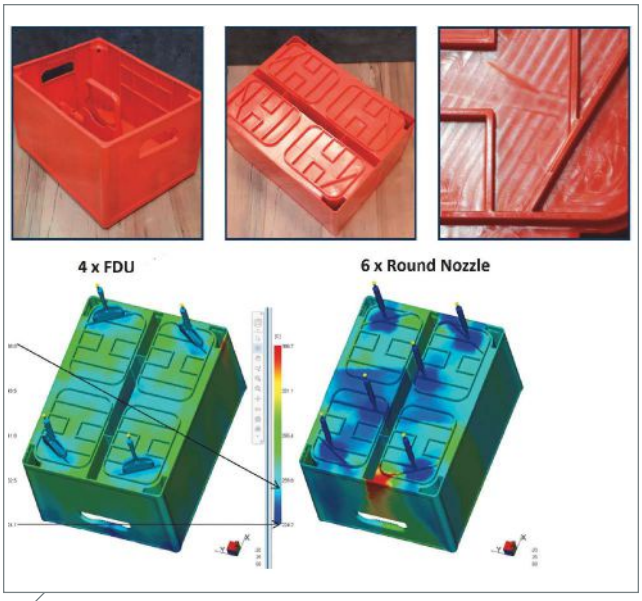
According to Kißler, the FDU is particularly suitable for the use of polyolefins. "However, recycled plastics have also been used in some projects," Kißler says. "Due to the wide slit in which the melt flows over a triangular shape into the mold, larger particles in recycled materials can more easily pass than in conventional systems."

Reduced Shear Rate

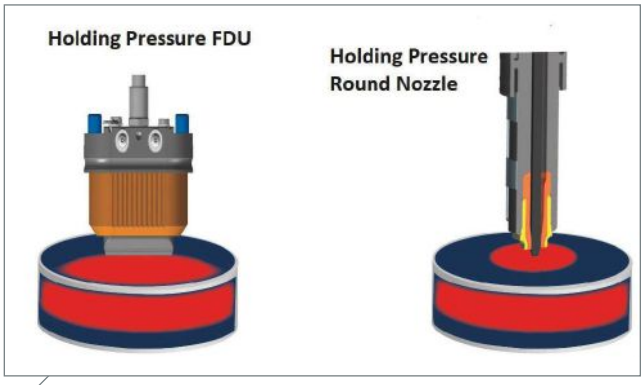
The special nozzle is particularly suitable for large parts because it can handle more melt volume with less shear than conventional systems, which are round and, according to Kißler, are available with a maximum diameter of 10 mm because the heat needs to be dissipated to ensure precise temperature control of the molten plastic to avoid degradation. "To achieve the same amount of molten material flow



Flat Die Unit (FDU) design and components.



The lower shear provides less stress on the melt and more uniform fill temperature than conventional nozzles. The simulation of this injection-molded toolbox illustrates the more uniform fill temperature distribution and as a result a 25% cycle time reduction, according to the company.



In order to increase the density of plastic to compensate for the shrinkage after the mold cavity has been filled with plastic, pressure holding is necessary to continue to exert pressure to the melt plastic. The FDU's special design is said to ensure a more even pressure distribution.

through the nozzle, you need a 10 mm diameter in a round conventional system for a cross-sectional area of 50 mm². We realize the same cross-sectional area with a slit of 25 by 2 mm. The advantage is that we are only 1 mm away from the cooling cavity wall, while the center of the round nozzle is 5 mm away, which limits the design in terms of size to realize adequate cooling."

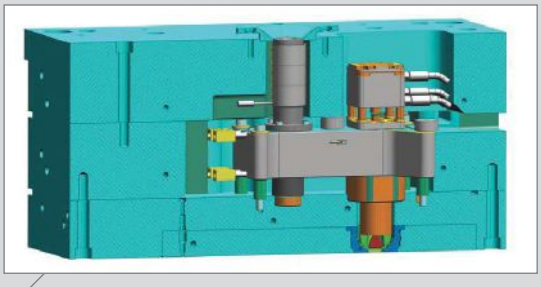
Nozzle sizing is important for maintaining sufficient molten material flow or injection rates, especially for molding parts with low wall thickness or unfavorable flow distance/wall thickness relation. "We simulated the molding of a popcorn cup, for instance, which exhibited a flow distance of 285 mm and 0.75 mm wall thickness, which according to the Moldflow software simulation was not possible using conventional open round nozzles. Our system managed to keep the required injection rate into the cavity because of the higher volume flow rate."

Since the shear rate of the material—which is important because small variations will cause a large shift in the viscosity—is proportional to the injection speed, the injection speed is limited by the size of the nozzle. If the material is subjected to large amounts of shear forces during the cavity filling stage due to high injection speed, this will make the mold filling incon-

The result of the FDU design is said to be faster injection of more melt through a thinner gate opening, with lower shear and injection pressure, lower melt temperature, and up to 25% faster cycle time in several projects.

The technology can be experienced live at the K 2019 trade fair in Düsseldorf this month (October 16 - 23). In addition to some tools on various partner booths, Haidlmair's booth features a tool for a creased plastic pot produced from regranulate, equipped with a newly developed valve gate version, the FDU SLS (Slot Lock System), which is equivalent to valve gate systems using mechanical shut off pins (as opposed to open runners).

FDU Hot Runner GmbH will be demonstrating its new FDU SLS (Slot Lock System) at K 2019 at the Haidlmair, booth E49-6, Hall 12.



Schematic illustration of the FDU SLS (Slot Lock System) integrated into a tool.

sistent, resulting in shot to shot inconsistency. The larger cross-sectional area of the FDU allows for reduced injection pressures and higher injection speeds, reducing cycle times, Kißler explains.

Optimized Holding Pressure

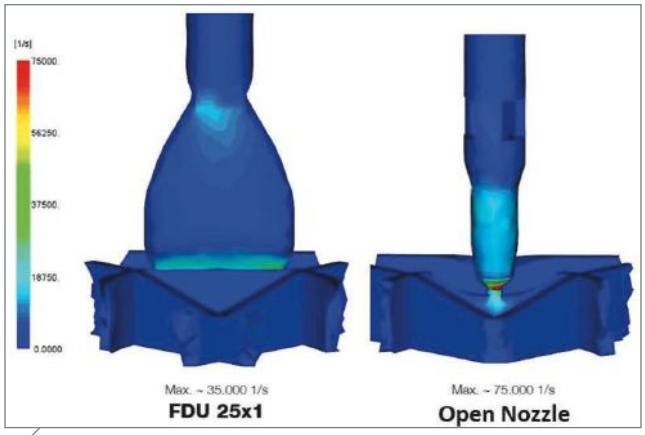
In order to increase the density of plastic to compensate for the shrinkage after the mold cavity has been filled with plastic, pressure holding is necessary to continue to exert pressure to the melt plastic. "In the holding process, the plastic flow rate is very low, so the flow is no longer a leading role here; pressure is a main factor affecting the packing process," Kißler says. "In the holding period, due to the high pressure, the plastic part can be found to be compressed locally. In the area of high pressure, the plastic is more compact, so the density is higher. While the pressure is lower for some other places, the plastic is loose and the density is lower. So, the density distribution changes with position and time. Our special design of our flat die unit ensures a more even pressure distribution."

Another advantage of the FDU's design is said to be the avoidance of free jet formation at the gate ("sausage injection molding"), which occurs with rising injection speed and results in non-uniform mold filling and surface faults. If assistance cannot be provided here by suitable mold design, the machine must be operated at a low injection speed.

FDU vs. Conventional Open Round Nozzles

Kißler describes several comparisons of molding parts with the FDU vs. conventional open round nozzles.

In one case, an FDU 58 mm long by 0.5 mm wide provided 5.9 times the flow volume of a 2.5 mm round nozzle with



Simulation of a maximum shear rate with an injection time of 3 seconds. Compared to a conventional open hot runner system, the shear rate using the FDU is said to be around 50% lower.

approximately equal shear rate. Because the FDU gate is only 0.5 mm wide, it allows for faster gate freeze than the round nozzle. In another case, one FDU molded a 500 g polypropylene (PP) part with the same fill rate and shear rate as two 2.5 mm round nozzles, but at 5-10% lower cycle time.

Kißler claims that the lower shear provides less stress on the melt and more uniform fill temperature than conventional nozzles. An example is the image on page 33, showing an injection-molded toolbox, illustrating the more uniform fill temperature distribution and, as a result, a 25% cycle time reduction.

Another example involves the manufacture of a box for meat transportation, where the FDU molded the part with a 17% reduced cycle time compared to a valve gate system and a 200-bar reduced pressure. In another case, a pallet made from PP (MFI 15g/10min) was injection molded with an FDU with an injection pressure of 700 bar (specific), injection time was 3.6 seconds, holding pressure 5 seconds, resulting in a claimed cycle time reduction from 58 to 42 seconds. MMT

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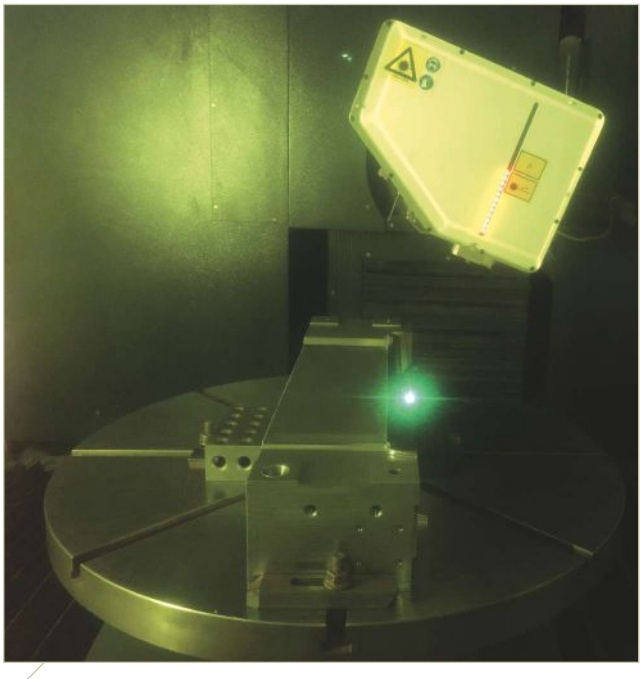
By Cynthia Kustush

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

The Advantages of Digital Laser Technology for Mold Texturing

Understanding the nuances and benefits of laser ablation and when to use it.

"Recognizing your manufacturing constraints and acting on them can lead to opportunity." So says Tim Shamrock, sales manager of Custom Etch Inc., a company specializing in texturing and engraving for many types of molds, including injection, blow, compression, thermal pressure/vacuum and extrusion. In November 2011, Custom Etch became the first North American company to purchase an AgieCharmilles Five-Axis Laser 1000 system and a six-pallet loading system from GF Machining Solutions. Up to that time, Custom Etch used only the traditional transfer and photo-printed acid etching processes, which are exacting manual processes requiring a high level of expertise.



Images courtesy of Custom Etch Inc.

With the advent of five-axis laser texturing for molds comes a broader range of patterns and textures that are available for all types of products including water bottles, automotive lenses and decorative interior components, according to Tim Shamrock, sales manager for Custom Etch Inc. In many cases, laser texturing can be applied faster than using traditional chemical etching, plus lasers are very precise because they work off of digital CAD files.

Shamrock, who has many years of practical experience in mold texturing, shares his perspective on the advantages of using laser ablation technology to texture molds, including faster turnaround, more uniform patterns, higher precision and more. In addition, he sheds light on the continued relevance of traditional chemical etching.

Understanding Texturing Tactics

When determining what texturing method to use, it is important to first understand how they are applied.

Shamrock explains that the traditional method of acid etching requires a lot of time-consuming upfront preparation, including disassembling the mold, cleaning all residual oil from all surfaces and manually laying out texture limits (where texture stops). The technician then begins wrapping the exterior of the mold with tape and/or a spray masking product to protect the areas that will not be textured. This is followed by sandblasting of the exposed surfaces so that the texture pattern will adhere to them. The texture pattern is printed out, like a template, in the form of a film or wax transfer, and the technician then manually applies it using the pattern transfer process. "It can take several printing jobs, going back and forth and measuring both halves of the mold to make sure the textures matches perfectly across parting lines," he stresses. Then acid is applied to, in effect, chemically mill away metal and etch the pattern into the mold.

Once the acid etching process is complete, the mold is sandblasted again to remove any remaining residue from the acid etching process and for gloss adjustment, if necessary. The mold parts are cleaned and if there are stains or damage from over-blasting non-textured areas, repairs are made, inspections and quality control steps are taken, and components are packed and shipped back to the customer. From start to finish, using the acid etch method can take, on average, four to five days for simple pattern applications and up to two to three weeks for more complex pattern applications, such as for automotive lens molds. Some customized patterns can take even longer.

THE COMPETITIVE ADVANTAGE FOR U.S. MOLD BUILDERS.

OCTOBER 2019 | MONTHLY UPDATE

COMPETITIVE ADVANTAGE • INDUSTRY • PUBLICATIONS

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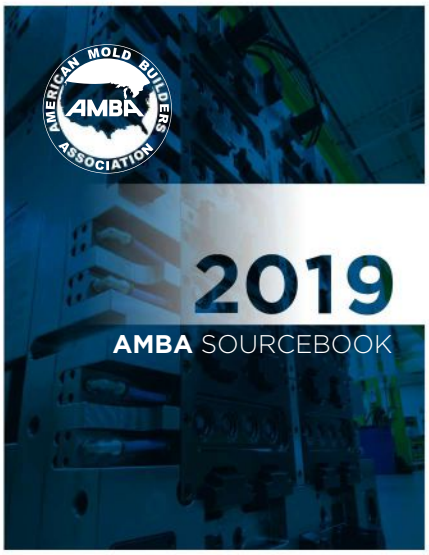

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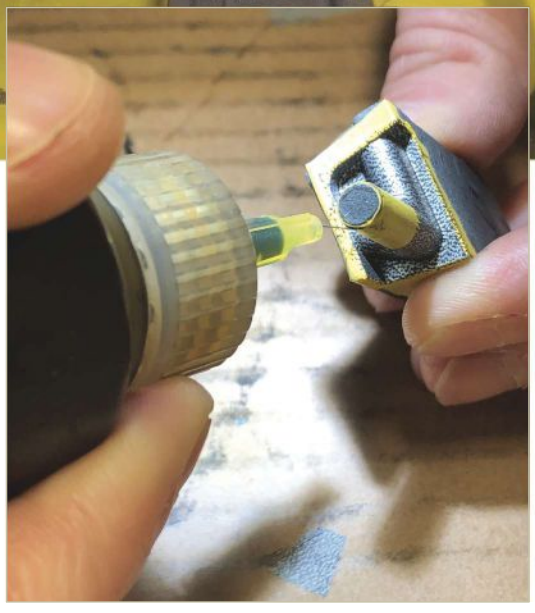


Traditional acid etching is a painstaking process that requires highly skilled technicians who can manually apply patterns onto a mold's surface, as shown here. Only one half of the mold can be worked on at a time, so it can take weeks to chemically texture an entire mold, depending on the pattern's complexity. With laser texturing, molds can remain intact and need no masking (shown here, in yellow) nor cleaning or polishing, saving valuable time. Inset: An up-close view of the fine masking process that must be done before acid etching even very small mold components like this one.

"With laser texturing, not only do we not have to disassemble the molds to establish precision textures, but only minimal cleaning is needed to remove mold saver (product applied to molds to protect them when not in production) and no sandblasting or taping is required," Shamrock says. Basically, Custom Etch's engineering department inputs the 3D mold cavity data and chooses the texture file images that match the desired patterns. Textured surfaces are mapped using UV mapping software and verified for correct texture direction and orientation. Once complete, the CAM program is uploaded to the laser texturing machine for processing. GF Machining Solutions recently introduced new software, including Smartpatch, which allows examination of the pattern before it is laser machined onto the mold, and Smartscan 3D, which provides UV mapping for texture applications and 3D simulation to optimize every patch that is machined.

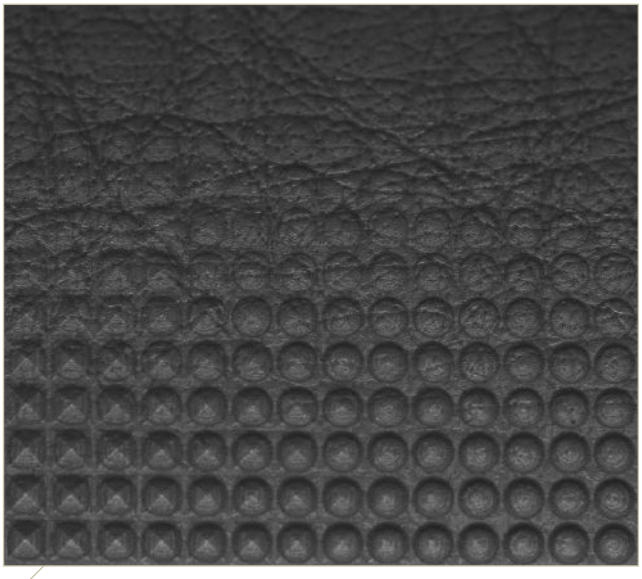
"Because of laser texturing technology, we experienced a huge shift from using all chemical etching at our facility to using 10 percent laser texturing almost immediately, and since then that percentage has increased year over year," he says. "Currently it is at a solid 35 percent, but it has reached 50 percent. The number fluctuates based on each job's texturing requirements."

Laser Ablation Advantages

Timing and quality are paramount to the molding industry, but Shamrock points out that mold texturing is typically one of the final processes in a truncated timeline. "Minimizing the processing timing constraint using laser ablation technology allows us to fulfill large orders efficiently and with the highest quality," he says. "It increased our capacity for future programs as well. For example, in 2014 we realized that precision application of patterns using laser technology would be beneficial in high-polished substrates like those found in automotive lens applications." He says this is because there is no risk of damaging the highly polished surfaces because the laser positioning is so precise, and its radius is very small. Texture is applied with short, pulsed lasers using between 30 to 100 W of power. Additionally with laser ablation, multiple patterns can be applied to the same substrate all in one setup.

Because laser ablation technology eliminates so many tedious manual steps, and the overall laser finish provides uniformity, consistency and better diffusion properties, Shamrock says processing time for the lens molds has been reduced from two to three weeks using traditional texturing methods to only five to 10 workdays. When processing bottle molds, Custom Etch reduced the texturing process to two hours from eight hours for each mold. The use of automation further increases throughput, he says.

Laser systems work from digitally created files versus using a print, and/or paint pens in multiple colors, to manually map the areas to be textured and with what pattern(s), so critical details can be discussed in a virtual meeting with customers via Skype, GoToMeeting or other means using CAD files. "We have reduced travel time while ensuring that everyone involved can participate from anywhere," Shamrock says. "We work directly off the mold data to address molding concerns with the applied texture. Efficiency and accuracy increase tremendously because rendered parts can also be reviewed, rotated and aligned for pattern congruence without the need for further interpretation. The data is both available and transferable and it



Can you see the three patterns that have been applied to this part using laser texturing? At the top is pattern one (leather-like); at the left is pattern two (conical); and at the right is pattern three (round). With flexible, five-axis laser texturing, multiple patterns can be applied using a single CAD program with no need to stop for any adjustments.

can easily be incorporated into current texture maps (as GIF and TIM files)."

Laser ablation also provides the ability to apply texture while leaving a consistent finish across dissimilar mold materials, including welds. Shamrock explains that many times, molds will be constructed from different materials to employ the different properties specific to the material like cooling, hardness, venting and to prevent wear, galling and corrosion. Also, welds, which may be compatible to the primary substrate, may not necessarily have the same composition and properties as the primary substrate, he says. Texturing at its core is the process of changing the surface finish of the substrate and there are "recipes" for removing metal at a specified rate, leaving the surface with a desired finish. "These recipes are formulated to react with the chemical makeup of the metal substrate. Unfortunately, there are many substrate compositions that may require different recipes and to complicate things further, that desired surface finish may be similar but not precisely so," he says.

"Over the decades, texture houses refined this process to minimize this; however, laser texturing removes material and the finish is the same. It doesn't matter if it is H13 and P20 or aluminum and BeCu or a QC10 substrate with a QC10 weld. Considering most textures are aesthetic, it is a big deal to have everything look the same," he continues, adding that laser texturing is also superior to acid etching on corrosive resistant substrates, 300 series stainless, Titanium, Nitride, EDM and other materials.

Finally, he notes several other time-saving benefits like the fact that multiple molds can be processed at the same time in the large format laser systems like the AgieCharmilles Laser 4000 5Ax (which has part size capability of up to 4000 by 3000 by 1500 mm and workpiece weight capacity of 50,000 pounds). "Laser texturing is a green process, because we do not use caustic materials that involve strict hazardous waste removal procedures," Shamrock adds.

Accepting Laser Limitations

Shamrock says it should be noted that some of the large aluminum pieces Custom Etch works on can be done using laser ablation, but it is not as economical as acid etching. "Most of them have patterns that require significant metal removal," he says. "Acid requires less time and resources to accomplish this. In fact, acid etching can be a very economical way of texturing certain jobs and so there will always be a need for the process." An example is the lawn and garden or architectural markets where there is a demand for texturing to simulate stone/slate or flagstone on everything from flowerpots to flooring. "These patterns typically require depth of pattern of 0.010 inch to 0.025 inch of metal removal, which necessitates a series of etchings," he explains. "However, the amount of time required to laser ablate would be much more due to the preciseness of the metal removal process. Experiences like this also gave rise to a hybridization of the texturing process. We can maximize the general efficiency of acid etching for depth and use the precision of laser ablation to detail the same pattern."

Shamrock says at Custom Etch, the packaging and automotive industries are currently the biggest users of laser texturing technology. "We use laser texturing technology on about 90 percent of the packaging molds we process because most packaging applications require repeatability, efficiency and the ability to process a number of molds in a short timeframe," he says. "If you're talking automotive lens molds, it's 100 percent laser." Regarding the architectural products market, Shamrock says laser ablation has provided access to a larger pallet of digital pattern options that are not achievable using the manually applied acid etching process, so they are seeing an increase in laser applications for those customers.

> We can now blend patterns, morph them and/or get as angular with them as we want.

Laser Precision Prevails

The exactness of laser technology has made it the optimum choice for mold texturing because of its quality and repeatability, according to Shamrock. "Because CAD files indicate precisely where the pattern layout is needed, we eliminate the chance of error." While this is a strong argument for

enlisting laser technology, he notes there is a functional benefit as well. "Traditionally, texture was held to a visual standard. Patterns were visually compared and inspected using a set of plaques. As patterns became more refined, so did the standards to inspect them. There were ways to manipulate the surface texture, but one was still limited with blast media and acid because 3D patterns and technical grains are not attainable with the acid process. "Texturing with acid has come a long way, but it still has many restraints," he explains. "The main restriction is gravity. Acid etches downward. Yes, it can be pumped and rotated but it will still etch downward and then outward from newly exposed surfaces, leaving a radius and an undercut on exposed surfaces There are no 90-degree etchings. Instead, geometries become two-dimensional one level at a time.

"Laser texturing has few constraints," he continues. "Today's patterns, such as the Laser Tech 6000 Series developed by Tenibac-Graphion, offer many new applications using laser technology and we can control factors beyond just Surface Roughness (Sa), Texture Direction (Std) and Texture Aspect Ratio (Str). This is because the laser gives us many options to manipulate a pattern. We can provide a pattern with the same depth and roughness but with many different possibilities in direction, surface area and so on. This provides the end-user with options for friction, refraction, scatter, volume. We can now blend patterns, morph them and/or get as angular with them as we want."

Today, Custom Etch has three Laser 4000 5Ax systems, three Laser 1000 Ax systems, a new AgieCharmilles Laser S 1000 U (part of a new series of digital, all-in-one five-axis laser texturing systems introduced earlier this year) and a Laser 1200 5Ax.

"Laser technology enables the user to address critical constraints in timing, quality and capacity," Shamrock says. "More patterns can be applied, replete with directional changes (think of wrapping a patterned fabric over a three-dimensional surface. The pattern direction will change due to stretching and compressing to conform to the surface.), more seamlessly than ever before, and new markets will be opened to those who embrace the technology." MMT

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Custom Etch Inc. / 724-652-7117 / tshamrock@custometch.com / custometch.com

Index Contracts Sharply

August 2019 - 46.4

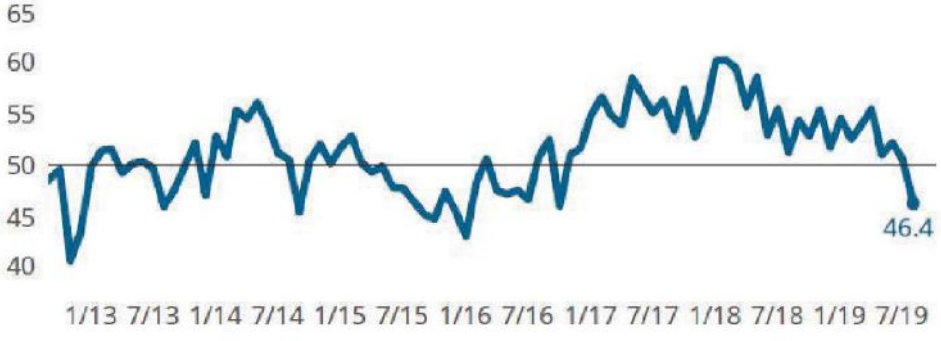
The Gardner Business Index (GBI): Moldmaking contracted sharply in August, falling more than 4 points to 46.4. Index readings above 50 indicate expanding activity while values below 50 indicate contracting activity. The further away a reading is from 50, the greater the change in business activity. The latest reading marks a nearly three-year low in the Index. Gardner Intelligence's review of the underlying data for the month found that all components recorded contracting readings. Such an instance last occurred only in late 2015. Supplier deliveries, employment and production reported values only slightly below 50; in contrast, exports, new orders and backlogs all reported significantly worse contracting activity.

In the year-to-date period, new orders activity has expanded faster than production in only one month (May); this has been in part possible through the reduction of backlog levels. Contracting readings in both exports and new orders implies that domestic orders are no longer offsetting weakening foreign orders. Export orders initially showed signs of contracting activity in 2018. 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



The Moldmaking Index reported its first contracting reading since the fourth quarter of 2016. In an unusual move, all Index components registered simultaneous contractionary readings.

Production and Backlog (3-Month Moving Average)

Production activity contracted during August in part due to weakness in new orders and exports. Production activity has been one of the stronger components of the Moldmaking Index in 2019, but this may be in part due to survey participants having relied on backlogs in recent months to sustain production levels.

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MOLD COMPONENTS/HOT RUNNERS, K 2019

Cylinder Design Eliminates Need for Water Cooling Actuators

The new HRScool cylinder design from **HRSflow** eliminates the need for water cooling of the corresponding actuator due to the twice optimized temperature management system. This system includes insulating supporting columns with a minimal contact surface, reducing the input of heat from the hot runner to the cylinder housing. It includes a cover with a large, flat surface made of thermally conductive material. The integrated telescopic design enables maximum heat dissipation from the cylinder to the cold platen.

Since HRScool eliminates the need for elements such as cooling lines, channels and connections, assembly and handling costs are reduced, problems with clogged cooling circuits and hydraulic fluids degradation are decreased, machine availability increases and operating costs are lowered. The system's compact design takes up less space in the molding tool, resulting in an optimum uniform temperature distribution along the entire hot runner system and achieving higher molding quality. With the bayonet coupling, the valve pin can remain in the hot runner system when cylinders need to be removed.

HRSflow / 616-228-6900 / hrsflow.com /
Booth D05, Hall 1 at K 2019

Hot Half Solutions Integrate to Customers' Tool Designs

Mastip delivers a complete hot half solution to integrate with customers' tool designs. All aspects of the hot half design, manufacture, assembly and testing are completed by the company's team of engineers to ensure reliability and performance is provided. A Mastip hot half is backed by a three-year leak proof warranty. From simple small cavity thermal gate systems to complex high cavity valve gate systems, the company can provide systems to meet customer requirements in standard high quality mold bases or stainless steel plates.

Mastip, Inc. / 262-644-9400 / mastip.com /
Booth E02, Hall 1 at K 2019

Mold Components and Hot Runner Products Designed for Customer Specifications

At K 2019, **Hasco** will display mold base and hot runner technologies. The company's P1 plate range expands to include developments and additions that supplement the standard component portfolio. Innovations in the field of demolding, heating/cooling, high-temperature applications, sensors, hydraulics and cylinders round off the range and make a key contribution to boosting efficiency and achieving cost efficiency. The company offers variable and customer-specific configuration options for a wide range of installation spaces. DLC-coated components offer optimum gliding properties. Development of the company's app makes it possible to calculate thermal insulation sheet surface temperatures by entering individual parameters, such as plate type, mold temperature and plate thickness.

The company will also present products under the "Hasco hot runner" brand. The Single Shot individual nozzle has been designed as a single nozzle with maximum temperature homogeneity and generous flow channel cross-sections. Different tip geometries guarantee an optimum tear-off quality and ideal heat conduction right through to the gate. The Hot Half system with a single needle valve provides efficiency and safety with a complete, ready-to-connect system, suitable for immediate production. Another highlight is the screw-on Vario Shot nozzle, which permits ready-to-mount systems, designed and produced according to individual customer specifications.

HASCO America, Inc. / 877-427-2662 / hasco.com /
Booth C06, Hall 1 at K 2019

Insulator Block Protects Monitoring Devices in High Temperatures

Progressive Components announces the release of its insulator block, which installs on the outside of the mold and is used to protect the company's CounterView and CVe monitor from temperatures when molding high-temperature resins.

The maximum temperature for a CounterView is 120°C/250°F, and a CVe monitor is 90°C/190°F. When using an insulator block, both units will perform with mold temperatures up to 180°C/360°F. The block can be installed on either half of the tool, but for the CVe monitor, the stationary side is recommended for optimal cable routing. It is available in both inch and metric versions, complete with $^{1}/_{4}$-20 or M6 screws.

Progressive Components / 800-269-6653 / procomps.com / Booth C46, Hall 1 at K 2019

Double Date Stamp Reduces Costs and Space

Cumsa showcases its Double Date Stamp Ø16 Blank. The stamp allows two different indications on the plastic part without the need for two date stamps, reducing costs and space required. The standard version (12 months + years) saves to periodically change the central insert during 5/6/10 consecutive years. The same height is always maintained between all the rings.

CUMSA USA / 248-850-8385 / cumsa.com / Booth E45, Hall 1 at K 2019

Software Package Offers Design Validation Behind the Desk

Moldex3D's eDesign solution package offers an interactive interface, which facilitates part and mold modeling, provides auto meshing technology and enables users without advanced CAD knowledge to work. With 3D models, users can visualize flow and thermal properties, design products with quality, reduce development costs and shorten time to market. Other benefits include modeling a part with complete runner and cooling systems, performing 3D numerical analyses with accuracy, and generating reports automatically.

Moldex3D, EPS FloTek / 888-66533933 / epsflotek.com / Booth A94, Hall 13 at K 2019

Tooling Technologies Offer Value, Productivity and Flexibility

For the first time, **Husky** will be running its new HyPET HPP5e system at K 2019, designed to deliver better energy savings, system reliability, preform quality and user friendliness. The system will be producing preforms made from 100% recycled PET. The company will also showcase its broad portfolio of tooling technologies to achieve maximized value, productivity and flexibility. This includes the NexPET Mold, a flexible mid-volume tool for shorter production runs and frequent changeovers, as well as introductions of a versatile, energy-efficient platform of PET preform molding solutions. The company will spotlight the latest hot runner and controller developments, including the Altanium mold controllers and Ultra Helix 250 T2 valve gates, which are designed to maintain superior gate quality for millions of cycles for small parts. The company will also preview its Next Generation Operating Model, a digitalized end-to-end manufacturing system that offers enhanced capabilities to deliver solutions and enables customers to more quickly respond to changing consumer trends.

Husky Injection Molding Systems / 802-859-8000 / husky.ca / Booth A61, Hall 13 at K 2019

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ADVERTISERS' INDEX

TIP

MOLD COMPONENTS

How to Use Hydraulic Locking Cylinders to **Improve Plastic Injection-Molded Part Profitability**

By Mark Scanlan

Profitability impacts everyone in the mold supply chain because the mold builder, molder and OEM must consider both mold cost *and* cost per part, which is highly dependent on mold complexity. The challenge is finding the most creative solution to meet requirements at the lowest overall cost for the mold builder, molder and OEM. Hydraulic locking cylinders can provide a solution.

Mold builders can easily produce right-sized *simple* molds because part size fundamentally defines mold size. *Complex* molds, however, often push the limits of design creativity with demanding part quality and larger side-action footprints. Higher quality demands better-performing fits to maintain part dimensionality, and complexity often makes action design more expansive for relatively small parts. When you increase both mold and machine size, you get higher mold costs, slower process speeds and higher costs per part.

Driving profitability in the right direction requires driving the mold base size back down to lower costs and preloading slides for optimal part quality.

Smaller mold bases and improved structural integrity equal increased value-add at lower costs.

Complex mold designs in smaller mold bases. A designer can easily solve the mold base problem by moving the majority of the side action to the outside of the mold base with standard NFPA-style or compact hydraulic cylinders that mount to the mold base externally, but capturing slides takes room inside the mold base. Hydraulic preloading and locking cylinders mount fully external to the mold base and provide independent control to keep the mold base smaller, without the drawbacks of compact or standard cylinders. Locking cylinders can also be "quick mounted" to allow installation after setting the mold to fit into the smallest machines and accommodate long core strokes.

Complex interfaces with better part quality. Timing complex actions is challenging particularly those with multiple core shutoffs, due to core overtravel, sequencing and simultaneous insertion. A better option is to preload cores into position on a hard stop using hydraulic locking side-actions.

Image courtesy of PFA Inc.

Hydraulic locking cylinders capable of preloading side-action cores allow a mold to produce complex parts more profitably.

This method ensures zero movement of slide faces during placement and injection, while moving the mounting support locations away from the part to the more rigid outer mold base structure, enhancing the integrity of the mold cavity structure and fit.

Competitive advantages for the supply chain. An optimized mold can be placed in a smaller press that inherently runs faster, and a mold that performs better with a smaller footprint can command premium prices, yielding a lower cost to manufacture—a win for the entire supply chain.

For example, a mold that costs the builder less, but also runs at a lower cost per part in a smaller machine with improved part quality, justifies a higher performance-based price, benefiting the mold builder. Higher quality parts produced from a high-performance mold at competitive pricing supports lean manufacturing initiatives, increasing the molder's value as a supplier to the OEM customer. The optimized mold then eliminates waste and produces the most efficient cost structure and thus, more profitability. MMT

CONTRIBUTORS

Mark Scanlan is vice president of PFA, Inc.

FOR MORE INFORMATION

PFA Inc. / 262-250-4410 / pfa-inc.com

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We are celebrating our 40th Anniversary, and on behalf of the entire Alliance family, we want to thank you for being our partners in this journey. We wouldn't be here without you.

There have been many changes over the years, but one thing has remained unchanged: our grit. It is that grit that makes us who we are and defines our company. When you look around the shop you will see grit coloring our hands, dusting our benches, and swirling through the air. Small remnants of dirt from delivering on promises rain or shine, little pieces of left behind polishing stones, grease, sand and plastic from the molds we clean, abandoned splinters of welding wire and laser engraving soot are just a few of the examples of grit that surround us daily. It is threaded into the fine detail of our lives and no matter how much you clean there will always be a hint of grit that is left behind.

That GRIT is the kind you find in our hearts. The GRIT of courage and strength to start a company from nothing. The GRIT to put it on the line and to try new things that no one else thinks possible. The GRIT that provides the passion and perseverance to take on challenges no one else could. The GRIT to do whatever it takes to not only get the job done, but done right. The GRIT that Alliance was built on is a special grade. It makes us who we are and holds us together as a family. GRIT is in our blood and it flows through our veins, feeding the hunger to be better each and every day. The same Alliance GRIT that started as a dream in a garage 40 years ago is alive in every single person that calls this place home. It is our GRIT that makes the difference between us and every other company out there, and it's the reason why we will continue to be a dominant force in the industry for the next 40 and beyond.

GRATITUDE. RELATIONSHIPS. INTEGRITY. TENACITY.

SeVG® PLUS

Mold Masters®

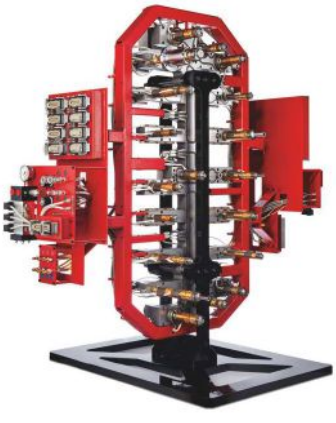
SUPERIOR PROCESS CONTROL FOR DEMANDING APPLICATIONS

Flow front accelerations and hesitations can cause visible surface defects, especially on large parts.

LIGHTING

EXTERIOR

INTERIOR



SeVG+ (Sequential electric Valve Gate) is a servo driven actuation system that provides absolute control and precision over individual valve pin opening and closing profiles. Fully adjust pin position, acceleration, velocity, stroke, timing and sequence. Critical capabilities that greatly enhances molded part quality by controlling resin flow that can cause surface defects and other issues. Available for all molding applications including large automotive and optical lenses requiring Class "A" surface finishes.

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