ENGINEER / BUILD / MAINTAIN

AUGUST 2018

MoldMaking TECHNOLOGY®

CELEBRATING 20 YEARS 1998-2018

IMTS2018 Product Showcase PG 56.

HMCs Are Not Just for Big Manufacturing PG 12.

Accuracy, Finish and Productivity Needs Drive Cutting-Tool Solutions PG 18.

Guidelines for Advanced Hot Runner Manifold Channel Design PG 24.

CT Scanning Accelerates Adjustments and Corrections on Injection Molds PG 34.

MMT

moldmakingtechnology.com

A property of Gardner Business Media

VOLUME 21 / NUMBER 8

"We spec only Progressive's Ejector Pins. Their sizing is the industry's most consistent, and where others' gall, Progressive's perform."

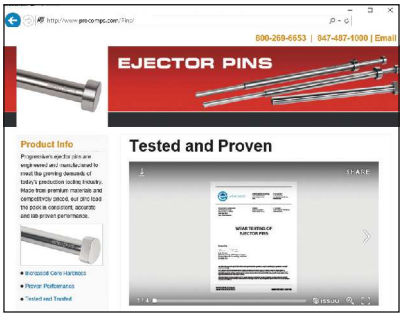
Steve Kieffer, Termax LLC

ENGINEERED FOR PRODUCTION

Molders can experience a high rate of mold downtime due to ejector pins failing. To eliminate this, turn to Progressive:

- Best surface finish and hardness for 420SS inserts
- No dishing or nicking due to a 48-50HRC core
- Consistent quality, no need to size holes for pins

Don't let inferior components bench your tools. Call Engineering at 1-800-269-6653 to discuss how the Progressive advantage can generate profits for you.



VIEW TEST RESULTS AND CUSTOMER TESTIMONIALS AT **PROCOMPS.COM/PINS**

PROGRESSIVE COMPONENTS

Takumi

The *Art* of Productivity

Introducing: **Takumi U800**
High Speed 5 Axis
Gantry Machining Center

See us at IMTS Booth 338420

At Takumi, we implement stringent processes to design and build rigid and reliable machining centers that exceed our customers' expectations. Our new U800 5-axis gantry machining center features an extremely rigid design, with the trunnion table mounted directly to the heavy duty cast frame.

Learn more at: **takumiusa.com/art**

Takumi CERTIFIED ISO 9001

Takumi USA | 7220 Winton Drive | Indianapolis, IN 46268
TAKUMIUSA.com | 844.302.3792 | info@takumiusa.com
Machine shown with options. Information may change without notice.

A division of Hurco Companies, Inc.

MMT
MoldMaking TECHNOLOGY®

Publisher
Ryan Delahanty . . . . . rdelahanty@gardnerweb.com

Publisher
Joe Campise . . . . . jcampise@gardnerweb.com

Editorial Director
Christina M. Fuges . . . . . cfuges@gardnerweb.com

Senior Editor
Cyndi Kustush . . . . . ckustush@gardnerweb.com

European Correspondent
Barbara Schulz . . . . . bschulz@gardnerweb.com

Managing Editor
Karen Cornelissen . . . . . kcornelissen@moldmakingtechnology.com

Art Director
Carla M. Turner . . . . . cturner@gardnerweb.com

Advertising Production Manager
Chris Larkins . . . . . clarkins@gardnerweb.com

GARDNER Business Media, Inc.

6915 Valley Avenue
Cincinnati OH 45244-3029
P 513-527-8800
Fax 513-527-8801
gardnerweb.com
moldmakingtechnology.com

Subscription Inquiries:
For questions or issues related to your subscription, please call 513-527-8800 or email subscribe@moldmakingtechnology.com

ALSO PUBLISHER OF

- *Modern Machine Shop*
- *Products Finishing*
- *Plastics Technology / PT Handbook*
- *Production Machining*
- *CompositesWorld*
- *Additive Manufacturing*
- *IMTS Directory*
- *Products Finishing Directory*
- *NPE Official Show Directory*
- *Automotive Design & Production*
- *Modern Machine Shop Mexico*
- *Products Finishing Mexico*
- *Techspex*

MoldMaking Technology (ISSN 1098-3198) is published monthly and copyright © 2018 by Gardner Business Media Inc. 6915 Valley Ave., Cincinnati, OH 45244-3029. Telephone: (513) 527-8800. Printed in U.S.A. Periodicals postage paid at Cincinnati, OH and additional mailing offices. All rights reserved.

POSTMASTER: Send address changes to *MoldMaking Technology* Magazine, 6915 Valley Ave., Cincinnati, OH 45244-3029. If undeliverable, send Form 3579.

CANADA POST: Canada Returns to be sent to IMEX Global Solutions, P.O. Box 25542, London, ON N6C 6B2. Publications Mail Agreement #40612608.

LOGIQMILL
ISCAR CHESS LINES

Profile Milling
Radius Master

IMTS2018
Visit ISCAR Booth #431800 West Building

TOR6MILL
PROFILING

Radial Profile Insert
for Die & Mold and
General Applications

Double Sided Inserts with 6 Round Cutting Edges

- High Positive Rake Angle
- Innovative Insert Design
- Variety of Cutting Geometries
- Cost Effective Insert

MACHINING INDUSTRY 4.0 INTELLIGENTLY

Member IMC Group
ISCAR
www.iscarmetals.com

Features

Departments

ON THE COVER

Image courtesy of Makino. TK Mold of Romeo, Michigan, changed from a traditional moldmaking approach to a more production-oriented method. The company no longer requires setup time for projects that results in spindle idle time that detracts from productivity. Moving to the Makino a61nx horizontal machining center that is featured on the cover, rather than to another vertical mill, the shop gained access to multiple-faces of complex molds in a single orientation. Now, gravity aids the flow of chips from the component, producing longer tool life and better surface finishes. The a61nx pallet changer makes it possible to set up the next project while running another job. Now, TK Mold spends more time machining and less time doing set-ups. See the related story on page 12.

Images courtesy of (left to right) Tungaloy America Inc., Sodick Inc. and Surfacetec.

VIDEO ACCESS

5 TRICKS OF THE TRADE
Great Tips from This Issue

1. To the Max
Refining indexable insert designs maximizes the number of cutting edges per insert, providing for maximum economy when roughing.
PG. 18.

2. Hot News
For multi-cavity molders, new production capabilities with metal additive manufacturing can enable the design of higher-density injection gates and simplify the manifold stack.
PG. 24.

3. On the Line
Some EDM machines use linear motors that run on magnetic plates versus ball screws for travel, which allow for faster travel speeds in the XYZ axes.
PG. 38.

4. Don't Drag It Out
Heating the manifold before the nozzles and bridge allows the manifold ports to slide more easily across the rear of the nozzles during expansion, minimizing drag.
PG. 42.

5. It's the Pits
The choice of aluminum for an anode assembly frame yields an even current distribution throughout the assembly, minimizing pitting in the plated surface.
PG. 80.

FUSION PRODUCTION

Make your manufacturing smarter

Autodesk® Fusion Production software combines production scheduling, job tracking, and machine monitoring into a single, complete tool. Get real-time visibility and instant access to your production data across multiple devices.

Use this information to help you understand current shop-floor status, identify underperforming processes, and make decisions to improve overall equipment effectiveness (OEE) and operational efficiency.

Connect people, data and machines
Learn more about Autodesk Manufacturing Software
www.autodesk.com/MAKE

IMTS2018
BOOTH **133222**
EAST BUILDING
September 10 - 15, 2018

Plan of Attack

So far, this year has been a big one for *MoldMaking Technology*. We celebrated our 20-year anniversary, partnered up for podcasts with *The Manufacturing Alliance*, produced video interviews, commemorated the 15-year anniversary of the Leadtime Leader Awards, conquered NPE2018 and once again hosted a successful Amerimold.

All of this activity and excitement has led to added exposure and a lot of interesting conversations about a multitude of moldmaking challenges, including:

- implementing a CRM,
- integrating simulation with existing CAD/CAM software,
- deciding between a vision system or a coordinate measuring machine,
- on-the-machine scanning technology,
- monitoring machine performance,
- increasing precision with the right controls,
- modifying machine designs,
- applying waterjet cutting,
- determining how to use 3D printing,
- making the move to five-axis machining,
- producing tool paths to increase efficiency and improve surface finish,
- using the cloud to improve levels of collaboration,
- adapting more complex machining strategies,
- achieving economy in finish milling,
- utilizing optimized roughing,
- attaining repeatability of processes and surface quality,
- reducing or avoiding hand polishing,
- making investments in hard-milling,
- expanding the number of vertical or horizontal machining centers,
- adding CAM software for toolpath optimization,
- using magnetic workholding for maximum workpiece access and
- employing deep-hole drilling and milling.

Technology can address many of these challenges, so it is a nice coincidence that we are closing out the big year with the nation's largest manufacturing trade event. IMTS takes place next month from September 10–15 at McCormick Place in Chicago, Illinois, and is the perfect venue for checking out the latest in everything manufacturing so that shops can solve big and small challenges—from eliminating bottlenecks and increasing productivity to reducing downtime and improving quality.

However, with a show this size, you need a plan of attack. To help you focus your trip on the most moldmaking-relevant technology that will be on display in the halls and down the aisles of McCormick Place, check out **pages 56-78** for the IMTS Exhibitor Product Showcase, which will continue in next month's issue as well.

Now go attack that technology! MMT

Christina Fuges

Christina M. Fuges
Editorial Director

Follow MMT on: Follow @MMT_ChristinaF

THIS MONTH ON moldmakingtechnology.com

SLIDESHOW: Scenes from Amerimold 2018

The industry's main event hosted plant tours, tech talks, in-booth demos, video interviews, podcasts, technology displays, awards ceremony, 20-year anniversary toast, Top 10 t-shirts and even an 80s party. To cover it all, the *MoldMaking Technology* team put together a slideshow recap.
short.moldmakingtechnology.com/ame18

ZONE: IMTS

The biennial International Manufacturing Technology Show (IMTS) is the largest and longest-running manufacturing technology trade show in the United States. Taking place September 10–15, 2018 at McCormick Place in Chicago, Illinois, the show is a blend of the here-and-now and the what's-to-come in manufacturing technology. This Zone includes a comprehensive collection of information about products on display that are most relevant to moldmakers as well as coverage of other news and events pertaining to the show.
moldmakingtechnology.com/zones/imts

PODCAST: NPE2018 Wrap Up Podcast with the MMT Team

The *MoldMaking Technology* team did its best to walk the miles of aisles to see and report on the latest technology and trends.
short.moldmakingtechnology.com/npe-18wrap

BLOG: Just a Smartphone and Some Simple Concepts

Video is a dynamic way to tell your shop's story and gain the attention of current and potential customers, and *MoldMaking Technology* is always looking for compelling process and people videos to support stories for its online video archives.
short.moldmakingtechnology.com/smartphone

GoldENgineering

POWER·FEED 13+™

Aggressive, High Feed Milling!

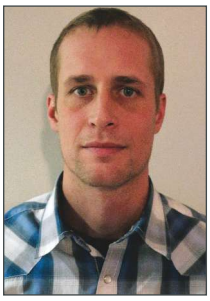
- Improved high feed milling up to 2mm DOC
- Double sided insert technology, offering 6 cutting edges for great economy
- Unique insert pocket seat design with thicker insert and larger insert screw provide stable machining
- High rake chip former for smooth, free cutting, shearing action during machining
- Through coolant cutter bodies
- Multiple stock standard grades, edge preps & cutter densities for application flexibility

Member IMC Group

Ingersoll Cutting Tools

845 South Lyford Rd · Rockford, IL 61108-2749 · 866/690-1859 · e-Fax: 815/227-6299 · www.ingersoll-imc.com

Dealing With the Inevitable: **Succession Planning**



Ryan Katen
President and General Manager
Micro Mold Company Inc.
Erie, Pennsylvania
814-838-3404 ext. 238
rkaten@plastikoserie.com
plastikoserie.com

Ryan Katen, MMT *EAB member and General Manager at Micro Mold Co. Inc., says that every successful company will be confronted with "passing the torch" at least once and hopefully multiple times. There are different ways to go about succession planning, depending on the specifics of the individuals and the company that is transitioning its leadership.*

I can speak to what we did to ensure a smooth transition and how it worked for us. To begin with, my father told me he had three choices: Pass the company on to his children (if they were interested and it was a fit—the preferred option), sell the company to a third party or close the company. Obviously, closing the company would have been the last resort. We took the following steps to form a solid succession plan that was based on his experience and, more recently, my experience and my brother's experience.

First, you must sit down with all of the shareholders and discuss what each of your individual goals are and what your vision is for the company's future. It is important to treat the discussion like you would any other issue where your goal is to devise a solution that you can all support. Every company is unique, and you will not always see eye to eye, but it is never too early to have this discussion. In our case, we discussed our plans for exiting the company someday. We also made plans for potential, unexpected departures and how the company will financially and logistically handle those events. Without those plans, an unexpected situation could cripple a company financially.

Next, meet with a lawyer and an accountant. They will ensure that you consider all of the possible exit scenarios, like death, disability or retirement and whether you have children or a spouse who may wish to run the company and your employees. We have worked with most of our people for a long time and they mean a lot to us. We do not want to jeopardize their jobs by putting the company in a very dangerous situation financially. The lawyer and the accountant can create the plan based on all of this information and your current shareholder agreement. They also will call your attention to any potential issues, like tax penalties, and help you avoid them. Once the succession plan is written, make sure you understand and agree with what you are signing. If something happens, the succession plan legally dictates what will happen.

Finally, recognize that a company's vision and goals change over time, as do the plans of your shareholders. We have revisited our succession plan twice since we took over our company in 2011. A good plan can help the next generation get started on the right foot. A bad one could leave it extremely vulnerable and prone to failure. MMT

MAKINO

Booth 338700 - South Hall

PREPARE

Things are about to change.

IMTS2018

International Manufacturing Technology Show

September 10 - 15, 2018 · McCormick Place · Chicago

A Conversation with ...

Burteck LLC

Image courtesy of Burteck LLC.

Burteck LLC's fully developed Molding Tech Center is used for mold testing and qualification and turn-key services for customer-owned equipment. Every mold is put through rigorous qualification procedures before shipping. Equipment ranges from 110 to 340 tons along with two-component and liquid silicone rubber (LSR) capabilities.

Since 2015, Burteck LLC has become a total mold solutions provider by adding a variety of new capabilities. Can you review these changes and updates to your service portfolio and explain their value to your customers?

Burteck Program Manager John Eastham: The main changes and updates over the past three years are the creation and subsequent expansion of Burteck's Molding Tech Center and its addition of LSR mold-building and testing capabilities. We also added a significant amount of new mold-making and inspection equipment.

The Molding Tech Center opened with an Arburg 110-ton all-electric press, which covered about 80 percent of the molds that we were manufacturing. Soon after that investment, we added an Engel 340-ton, tie-barless press for testing larger, two-component molds. This installation was somewhat unique because we retrofitted a standard single-shot molding machine into a two-shot machine by adding a third-party rotary table, a second injection unit from Boy Machines and a central automation system to tie all the pieces together. This retrofit enabled us to add two-shot testing capabilities for a fraction of the cost and the lead time of a traditional two-shot machine.

In 2017, we added an Arburg 165-ton all-electric machine. The latest addition to the shop is an Engel 180-ton, tie-barless machine configured for LSR molding, complete with a Graco LSR pump and static mixer.

On top of those four Burteck-owned machines, we dedicated space and resources for customer-owned equipment to offer turn-key solutions. We currently have three of these systems in-house. Customers who are building molds with us and who also are purchasing new equipment can drop-ship the equipment to our facility where we develop the mold, machine it and use any other auxiliary equipment in a cohesive work cell.

Lastly, we added two GF Machining Solutions wire EDM machines, two Zeiss coordinate measuring machines (CMMs), five GF Machining sinker EDM machines and a 3R Work Partner 84-station robot system to service the new EDM machines.

Explain the motivation behind these advancements.

Eastham: Burteck has always been a strong mold builder with high-quality, competitive pricing and lead times. We believed

BURTECK
PROVIDING GLOBAL SOLUTIONS LLC

863 Marshall Phelps Road
Windsor, Connecticut 06095
860-219-1406
860-856-0162
burteckllc.com

- Uses offshore partners to manufacture plastic-injection and LSR molds, ranging from prototype to high-cavitation, interchangeable production molds.
- Offers services in its Windsor, Connecticut facility and through partners in Shanghai and Cixi, China.
- Provides support from product changes to maintenance and repair.
- Employs a workforce with over 20 years of experience in mold building, engineering and project management.
- Works with original equipment manufacturers and molders in the medical, automotive and consumer-products industries.
- Offers class 101 molds with fast turnarounds because of its extensive tool manufacturing capabilities and capacity.

that the next step in value-add, and to separate Burteck from the competition, was to deliver a mold to our customer that is production-ready. The Molding Tech Center affords the us the ability to do functional testing, process development, qualification and pre-production runs if they are required before mold shipment. This advancement eliminates the need for our customers to allocate additional production and tooling capacity for multiple tests. Customers who purchase a molding machine or who re-task existing equipment and build a mold with us can also purchase turn-key services in the Molding Tech Center.

All of this technology and process investment has upgraded our equipment, reduced bottlenecks and established capacity for throughput gains.

You stated that your U.S. workforce has doubled. Can you explain how and why?

Eastham: A mix of additional sales from existing customers and new customers who were interested in Burteck's new capabilities and offerings drove that recent growth. We hired staff for the Molding Tech Center, which included two molding process technicians, a machine operator, a quality inspector and a Tech Center manager. We also hired a CMM inspector, a wire EDM technician, two additional project engineers to support tooling and turn-key programs and additional EDM technicians, CNC machinists, moldmakers and apprentices.

We work with the manufacturing programs of local vocational high schools and community colleges from which we hired four individuals. We also use industry networking, recruiters, websites like Indeed and CareerBuilder and social media platforms.

Burteck is known for its plastic injection mold work, so why has it placed a recent focus on LSR molds?

Eastham: It was an easy decision. We simply believe that the demands of LSR molds align perfectly with our craftsmanship, pricing and lead times.

How did the company gain the expertise in this specialty?

Eastham: A few employees have prior experience with LSR from other companies, which gave us some initial confidence that our craftsmanship would pass the LSR "test" from a flash and functional standpoint.

We had an existing customer for which we were building thermoplastic molds, and the customer asked if we would be willing to partner three, 2-cavity LSR molds. We took this as an opportunity to jump into this process and technology. The results were highly successful. The mold functioned without any flash on the parting line, or seal offs, so we decided to add LSR tool building to our list of capabilities.

What has been the growth of the LSR-mold segment of your business so far, and where do you see it headed?

Eastham: At this point, LSR mold building is a small percentage of our business, but it is increasing. We wanted to implement our mold-testing work cell fully before releasing our LSR sales strategy. NPE2018 was the official launch of our LSR tool-building capabilities. We exhibited a two-cavity, polycarbonate and LSR two-component mold, running a medical tube port in an Engel 55-ton, tie-barless machine. The mold used a servo-driven index plate for the transfer of the first shot to the second shot and a Kipe Molds Cold Deck-MicroDeck combination for the LSR portion. The exhibit demonstrated the concept of using the first-shot thermoplastic substrate as a tooling component for the LSR overmold.

In the near future, we see great growth opportunity in LSR work. Our customers are experiencing long lead times with other LSR mold builders. In some cases, those other mold builders are even declining the work. We believe this will open up a new customer base for Burteck, first with customers requesting LSR mold builds and then with those customers contracting us for thermoplastic and two-shot applications as well. MMT

By Bill Howard and John Einberger

HMCs Are Not Just for Big Manufacturing

Horizontal machining centers can help reduce the coolant, perishable cutting tools and labor costs associated with running a machining center in shops of any size.

Now more than ever, increasing productivity is crucial for shops that want to maintain their competitive position in the marketplace. It is the driving force compelling shop owners to make informed, smart decisions that will keep their companies not only in business, but profitable. The challenge for owners is figuring out what will help them meet their needs today *and* what will help them continue to meet their needs three to five years down the line. For example, should the next purchase be another vertical machining center (VMC), or is it time to invest in a horizontal machining center (HMC)?

According to HMC and VMC consumption data from the United States Manufacturing Technology Orders (USMTO), there are traditionally almost four times the number of VMCs sold as HMCs in a given year. In 2017, there were approximately 7,800 VMC units sold and 1,600 HMC units sold. The reason for this difference in sales is that many more operators are comfortable with VMCs, and historically VMCs are much less expensive.

HMCs on the Rise

The 2018 Capital Spending Survey by Gardner Intelligence shows that despite the initial expense, shops are turning toward HMCs more for increased productivity, process flexibility and cost reduction. This survey collects statistics on budgeted spending on machine tools, testing equipment, software etc., which are then projected across the metalworking industry based on plant size.

Of the $7.5 billion of projected spending on machine tools in 2018, $1.8 billion (or almost 25

Images courtesy of Makino.

When an HMC uses a tombstone-type fixture, it can provide twice as much work to the spindle as a VMC. This tombstone fixture has a pattern of bushing and threaded holes for use with zero-point, quick coupling components that are used to locate and clamp a large mold and die workpiece on an HMC, providing quick, productive part change-over.

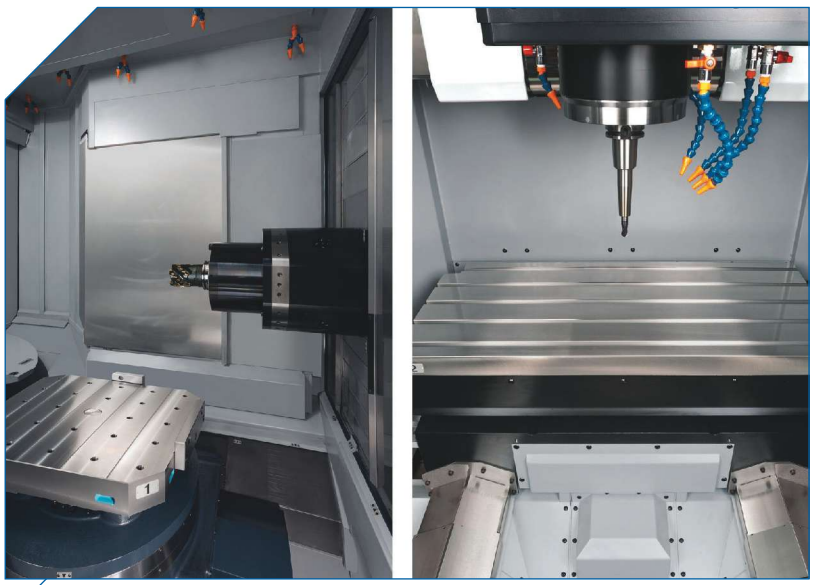
percent of all spending) will be on HMCs, compared to $1.6 billion on VMCs. These projections would make 2018 the fourth year within the last 10 in which investment in HMCs outpaced spending on VMCs, despite the higher unit volumes of VMCs on the market.

This projected spending data points to the growing recognition of the benefits associated with HMCs and supports the trend that horizontals are acknowledged for the enormous value that they bring to manufacturing. All the same, a lingering concern is whether HMCs are a moneymaker for the "large shops" in the aerospace, automotive and die and mold industries but not for other, smaller ventures, too. The answer lies in the advantages that HMCs offer to any shop—regardless of size—that has the goal of reducing costs and increasing productivity.

Additional data in the Capital Spending Survey backs this up. It shows that job shops plan to spend almost $800 million on HMCs in 2018. This amount is more than four times the projected spending on HMCs by larger automotive and aerospace manufacturers. This data is encouraging news because job shops, including mold building shops, are perfect examples of the types of metalworking facilities that have a lot to gain by using an HMC. Increased productivity and reduced costs result in increased sales and profits, and these basic economic factors are as true for the small shops as they are for the big guys. The bottom line is that *any* business that offers its customers lower costs and a faster turnaround time is much more competitive than one that does not offer these benefits.

HMC Functions and Features

The work envelope, workpiece access and gravity provide HMCs with their biggest advantages in the manufacturing of mold and die components. For example, **chip management**, which is essential for cutting-tool durability, comes naturally for an HMC. Its design and construction enable gravity to assist with pulling the chips away from the part and into the chip-management area, decreasing wear and tear on perishable cutting tools. Also, the workpiece on the vertical plane and the horizontal positioning of the spindle in this system move the chips away from



The biggest advantages of HMCs in the manufacturing of mold and die components are a result of its work envelope, workpiece access and gravity.

The Key to HMC Automation

With fewer skilled workers available to set up, program and run machines, shops must develop automated processes to keep producing parts. This is an area where HMCs shine because not only can one HMC perform the same amount of work as multiple VMCs, it also can produce a greater number and variety of parts without human intervention. The key is the index table (or full contouring fourth axis) under the work.

Take, for example, a part that needs machining on six sides at one minute per part. An HMC using the index or fourth axis addresses all six sides of the part in two setups. HMC cycle time is:

Operation 1: three minutes (3 sides)

10-second pallet change

Operation 2: three minutes (3 sides)

Total HMC Cycle Time = 6.17 minutes

Now, consider the same application on a VMC. This machine requires six fixtures or chucks to address all six sides of the part. Also, between each operation, the operator must remove the finished part and move it to the next operation. VMC cycle time is:

Operation 1 setup: one minute

Operation 1: three minutes (3 sides)

Operation 2 setup: one minute

Operation 2: three minutes (3 sides)

Operation 3 setup: one minute

Operation 3: three minutes (3 sides)

Operation 4 setup: one minute

Operation 4: three minutes (3 sides)

Operation 5 setup: one minute

Operation 5: three minutes (3 sides)

Operation 6 setup: one minute

Operation 6: three minutes (3 sides)

Total VMC Cycle Time: 24 minutes

the cutting area, reducing the need for re-cutting and improving tool life and surface finish.

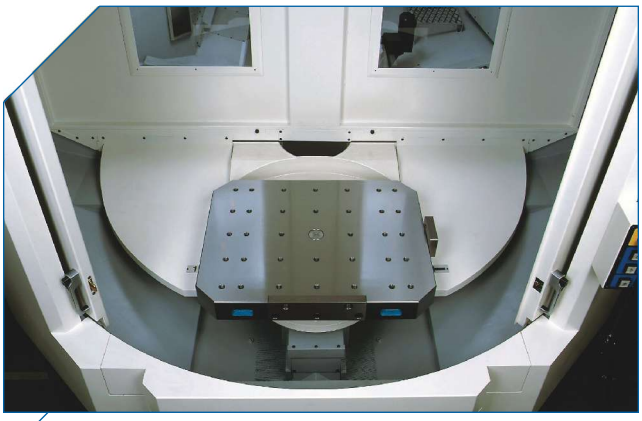
Basically, placing the core and cavity on a vertical fixture in an HMC provides better access for the spindle to reach both the core and the cavity. Also, gravity aids the natural flow of chips and coolant from the core and the cavity. By contrast, if the core and cavity were flat on the table of a VMC, both would retain chips and coolant. The flat orientation makes it difficult to remove chips and coolant from the cutting area, so the spindle and cutter continuously encounter a collection of chips and coolant. This results in "re-cutting" of the chips, "rubbing" them against the surface to be machined, which causes additional tool wear and poor surface finish on the cavity.

The key to **coolant longevity** is maintaining good coolant performance as long as possible without needing to clean or recharge the coolant system. HMCs offer better coolant management than VMCs. The flat orientation of a VMC delays or prevents the coolant that "pools" in the cavity and core from returning to the machine coolant filtration system. This affects the machine's ability to handle chips efficiently. Typically, HMCs have more coolant volume and higher sophistication in coolant filtration. This lengthens the coolant's serviceable life and minimizes the labor and expendable investment.

Another HMC advantage, permitted by its chip-management design, is the typical use of an **index table (or full contouring fourth axis) under the work or pallet**. This table facilitates indexing or rotating the workpiece relative to the spindle, which provides angular access to the workpieces for shorter, stiffer tools that can produce better surface finishes. This also provides access to multiple sides of the workpiece. Minimizing workpiece handling, reducing lead time, cutting costs and improving quality by consolidating multi-face features into a single setup.

Most VMC designs do not include an indexing (or rotary) table under the workpiece, which prohibits positioning the workpiece relative to the spindle. A VMC requires the part to be handled or re-fixed for each operation, which means that the machine and spindle are idle. So, not only does the HMC approach provide more parts to the spindle in a single setup, which amortizes non-cutting time over more parts, it also requires less handling and fewer setups, which increases spindle utilization time on the HMC.

Also, when comparing an HMC to a similar VMC, the HMC provides significantly more usable workspace at a ratio of more than two to one when considering the total working volume. The HMC,



HMCs typically use a pallet changer, like the one shown here, which helps to maximize productivity by preventing part loading and unloading and change-over times from impacting machine cut-time.

when using a tombstone-type fixture, could provide twice as much work to the spindle as a VMC.

HMCs increase **spindle utilization** by reducing parasitic, non-cutting time. Spindle utilization on an HMC is around 85 percent. On a VMC, the percentage may only be 25 to 40 percent. The single largest killer of VMC spindle utilization is part-loading and part-unloading time, as the spindle must be stopped and remains idle during part loading and unloading.

Consider the following example:

HMC:

- It has a 6.17-minute total cycle (floor-to-floor)
- HMC was in-cut for 6 of those 6.17 minutes
- Spindle utilization is calculated by dividing 6 minutes by 6.17 minutes, which is 0.972, or 97.2 percent.

VMC (with a one-minute load and unload time):

- It has a 24-minute total cycle (floor-to-floor)
- VMC was in-cut for 18 of those 24 minutes
- Spindle utilization is calculated by dividing 18 minutes by 24 minutes, which is 0.75, or 75 percent.

Here, the VMC uses a one-minute load and unload cycle time, considering that the operator would need to remove the finished part, clean chips from the locators of the fixture, locate the raw (in-process) part and then clamp the new part in place. This is a very simple example, but it illustrates that the HMC spindle utilization is significantly higher than that of the VMC.

The increased spindle-utilization capability enables HMCs to out-produce comparable VMCs. Having one HMC that yields the same amount of production as several VMCs decreases not

only the labor portion of the cost equation but floor space, tooling and utility requirements as well. It also reduces fixture and maintenance costs and streamlines manufacturing.

HMCs also typically use a **pallet changer**, which maximizes productivity by preventing part loading and unloading and changeover times from impacting machine cut-time. The automatic pallet changer enables parts to be preloaded onto fixtures and can exchange a fresh pallet of parts for a completed pallet in seconds. The pallet changer separates loading and unloading from spindle cutting, which keeps the spindle busy, maximizes productivity and prevents part-handling times from impacting throughput. It also enhances the flexibility of the HMC to juggle various jobs. Equipped with a pallet that provides significantly more work-mounting surface around the periphery of a tombstone-type fixture than a comparable VMC, the HMC presents more parts to the spindle, further minimizing non-cutting times.

A VMC that includes a table changer (at additional expense) still yields a significantly longer exchange time than that of an HMC pallet changer. A typical HMC pallet changer may take only 10 seconds, while a VMC table change would take one to two minutes. The issue with most VMC table changers is that they are an option to the base VMC, so they must use the basic VMC kinematic design to provide the table-changing capability, which requires some steps to unload, reposition the machine saddle and load a table to the machine.

An HMC with a pallet changer puts more workpieces in front of the spindle, so it facilitates unattended operation, which makes HMCs far less dependent on the person loading and unloading the machine. The pallet changer provides a buffer between part loading and cutting, which permits the machine to run through breaks, lunch and even unattended into the evening. Also, because tool magazines on HMCs often hold a larger number of tools than those on VMCs, setups and change-overs are minimized and unattended operation is extended.

Some smaller shops are hesitant to make a move because the initial investment is significant. But, with today's demands for increased productivity, mold builders must consider *all* aspects of an HMC to make the best decision. MMT

CONTRIBUTORS

Bill Howard is the vertical product line manager at Makino. John Einberger is the horizontal machine tools product line manager at Makino.

FOR MORE INFORMATION

Makino / 800-552-3288 / william.howard@makino.com / makino.com

KOR-LOK®

SIDE-ACTION SYSTEMS

Be proactive – Reduce mold size and complexity, while eliminating tryout issues, mold tweaks, and expensive maintenance.

- Preload cores for perfect parts.
- Save $$$$ with a smaller cylinder.
- Simplify mold operation and design.
- Smaller mold base = low cost parts.
- Fully Preloads at only 1,500 psi.
- Stays locked without hydraulics.
- 400° F systems available.
- Rush 0-2 day shipping available.

KOR-LOK® SIDE-ACTION SYSTEMS	VS.	TRADITIONAL SIDE-ACTION SYSTEMS
YES!	Mold OPEN Core Out	YES!
YES!	Mold CLOSED Core OUT	CAN'T DO IT!
YES!	Mold CLOSED Core IN	YES!
YES!	Core PRE-LOADED Against FULL Injection Pressure	CAN'T DO IT!

Designed & Made in USA

3D Parametric CAD files now available online

VISIT OUR WEBSITE FOR PFA'S ENTIRE FAMILY OF PRODUCTS

PFA INCORPORATED

N118 W18251 Bunsen Drive
Germantown, WI 53022
(262) 250-4410
Fax (262) 250-4409

pfa-inc.com

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.

Accuracy, Finish and Productivity Needs Drive Cutting-Tool Solutions

Cutting-tool suppliers are using advanced coatings, new thread designs, education and collaboration to help moldmakers maximize results.

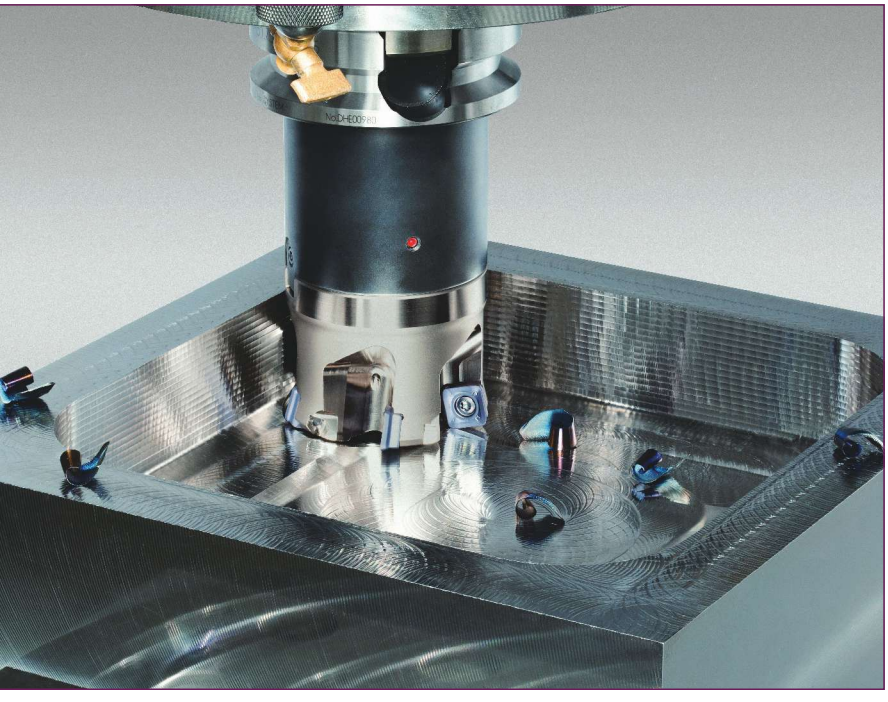


Image courtesy of Tungaloy America Inc.

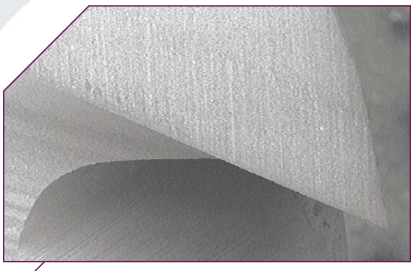
Moldmakers want better cutting-tool performance. *MoldMaking Technology* reached out to cutting-tool suppliers to gather intelligence about the current trends and challenges that they are seeing and what strategies are in place to respond to customers' needs.

The Need for Higher Feeds and Speeds

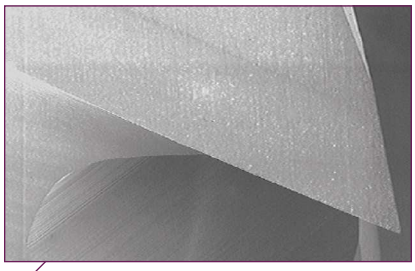
Ultimately, moldmakers strive for faster metal-removal rates to be competitive and profitable, and cutting-tool suppliers are hearing it loud and clear. Jay Ball, product manager for Solid Carbide Endmills North America at Seco Tools LLC (Troy, Michigan), says, "Customers are starting to adapt more complex machining strategies like 'optimized roughing' and complex five-axis machining using barrel-style cutting tools into their daily manufacturing processes." He says that optimized roughing is attained by using well-defined tool paths with a constant arc of contact, taking large depths of cut (DOC) and small radial stepovers combined with high feed rates. Using barrel-style tools enables larger DOC compared to standard ball-nose geometry when finishing complex 3D surfaces. "Moldmakers are starting to use these tools to help reduce finishing cycle times to increase throughput," he says.

William Fiorenza, product manager for Die and Mold at Ingersoll Cutting Tools (Rockford, Illinois), says that economy in finish milling is every bit as important as optimizing roughing. "Finish milling consumes a considerable amount of time. Most 3D contour finishing is performed with a solid-carbide, ball-nose end mill or a ball insert with an indexable carbide blade. Finishing times tend to be long with the programmed stepovers and stepdowns being tied to a desired surface finish," he says. "While CAM companies offer some very powerful programming algorithms to help reduce the time in the cut for ball-nose-type

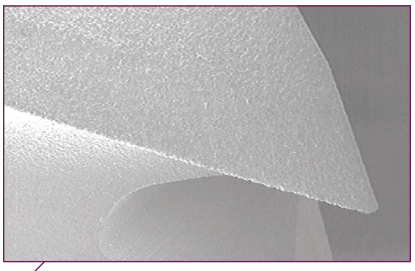
Mold and die makers are adopting high-feed milling solutions like this milling cutter, which is designed for high metal-removal rates, good chip evacuation from the use of a wavy cutting edge, a large chip gullet on its cutter body and air blow functions. Optimized rake angles on the cutting edges reduce cutting force and facilitate the machining of a wider variety of materials with extended tool life and higher stability in machining.



This zoomed-in view shows a cutting tool's edge that does not have any coating applied. It is almost impossible to detect the difference between the uncoated tool and the tool with the proprietary coating.



This zoomed-in view shows a cutting tool's edge with a proprietary two- to three-micron diamond coating.



This image provides a zoomed-in view of a cutting tool's edge. The cutting edge here has an 18- to 20-micron standard diamond coating, which is very detectable.

Images courtesy of Crystallume.

finishing, there are part features that can benefit from other types of geometries. We are starting to see the development of indexable tooling that incorporates larger radii. When this is designed into indexable, precision tooling, it allows for shorter cycle times because one can take greater stepdowns and still maintain a good finish. Die and mold builders will undoubtedly find a home for this type of tooling."

Ed Francis, vice president of Imagineering at Crystallume (Santa Clara, California), says that many mold shops have started to hard mill as much as possible to cut down or eliminate the machining of graphite electrodes for EDM. "This eliminates multiple instances of fixturing the mold as various operations are performed on it," he says. "However, it is still a challenge for very fine detail since the small diameter tools with the reach required may deflect too much. The tolerances on the molds and parts that moldmakers produce have also become tighter—a couple of microns in some cases—necessitating that the tolerance of the cutting tools also becomes tighter. Customers sometimes ask me what kind of exotic molds require these new, tight tolerances, and I tell them to think of a multi-blade razor where one blade is a few tenths taller and peels off a layer of your skin. Even a commodity item like a razor needs these types of tolerances."

Bill Pulvermacher, director of Product Marketing for YG-1 Tool Co. (Vernon Hills, Illinois), says, "The challenges are always about the time, the repeatability of the processes and the surface quality to reduce or, even better, avoid hand polishing." He says that customers also are requesting carbide-grade indexable inserts to machine the finish. Kedar Bhagath, chief technical officer at Tungaloy America Inc. (Arlington Heights, Illinois) says, "Inserted-type cutters are desired for cost savings and to avoid regrinding, while head-exchangeable types also help to avoid having to regrind edges."

Steve McBride, manager of the High Tech Group for OSG USA (Glendale Heights, Illinois), says that typically, in deep hole drilling of over three times the tool diameter, it is acceptable to do multiple pecking. This means that the machinist drills three times the diameter in one peck and then begins pecking or drilling in smaller depths until the required depth is reached. "These multiple pecks cost a lot of cycle time. A machinist may have a drill that will drill up to 30 times the diameter in one continuous peck and at faster feed rates. The reduction in cycle times is mind boggling for anyone who has not used one," he says.

Customers are starting to adapt more complex machining strategies like optimized roughing and complex five-axis machining using barrel-style cutting tools into their daily manufacturing processes.

Smoothing the Roughing Process

Drew Strauchen, vice president of Marketing and Business Development at Haimer USA (Villa Park, Illinois), says, "We are seeing more customers using anti-pullout shanks in conjunction with high-helix end mills for roughing, in which the helix is greater than 30 degrees." He explains that I-machining (also called full-radial engagement trochoidal milling) has become a popular machining method for roughing, but because of higher degrees of engagement between the high-helix end mill and the workpiece, the process often generates greater pullout forces for end mills with diameters larger than 0.375 inch. Forces that can cause the end mill to twist and pull out like a corkscrew opening a bottle of wine. "Using an anti-pullout shank prevents the cutting tool from pulling out of the tool holder because special drive keys match the spiral-shaped grooves on the cutting-tool shank, creating frictional clamping forces and a positive locking form-fit," he says. "This also helps increase

productivity because it enables faster permissible speeds and increased tool life."

Ingersoll Cutting Tools's William Fiorenza notes that many cutting-tool companies continue to refine indexable insert designs to maximize the number of cutting edges per insert. "This provides for maximum economy when roughing," he says. "Additionally, insert rake-face geometries and edge preparations continue to be optimized for specific material types and cutting conditions." He explains that rake-face geometries and edge preparations serve to reduce cutting forces through insert design features that create freer cutting and sheering action while still maintaining strength. They also help reduce cutting forces in short and long tool-reach milling applications, reduce the amount of heat that goes into the workpiece and do a good job of carrying away the heat produced during the cutting action via well-formed chips that absorb that heat. "The die and mold industry often contends with extended reach applications that require long length-to-diameter ratios," he says. "Well-designed insert geometries, cutting-edge preparations and coatings help them deal with these challenging applications as well as others, including interrupted cuts, re-cutting of chips, full-channel cutting or large radial engagements and milling specialty mold and die steels, soft non-ferrous materials and some high-temperature stainless steels."

> I witness a lot of 'waste' in terms of carbide utilization. Simply put, most people are not using what they are paying for.

"Roughing with high speeds have become a reliable practice with customers," Kedar Bhagath of Tungaloy America Inc. says. "Customers are moving away from traditional button-insert cutters and adopting high-feed milling solutions that provide a constant approach angle of 10 to 17 degrees versus using a round insert where the approach changes for each DOC. Tooling materials are getting harder than the traditional P20 or H13, with anything over 36 HRC increasing the possibility of insert chipping and subsequent damage to the body of the tool if the cutting parameters are not optimum. Generally, machining of hard mold bases usually requires that the DOC and cutting speeds be lowered to achieve consistent tool wear. Yet, depending on the machines in question, larger DOC capabilities in high-feed machining are in demand, driving tool makers to develop better geometries and insert grades to higher reliability and consistency."

OSG USA's Steve McBride says that OSG USA offers exchangeable head and solid-carbide end mills with three to six flutes that are specifically designed for machining very deep applications in the range of six to 20 times the tool diameter. "This depth range is very difficult to machine using typical end mills because of extreme tool push off," he says. "Most customers decide to use EDM on these deep applications, resulting in much longer cycle times and an overall higher cost. The bottom line here is that machining cycle times can be greatly reduced by using solid-carbide tools to eliminate EDM processes wherever possible."

Jay Ball of Seco Tools says that many cutting-tool companies have invested heavily in advanced multi-flute geometries (with five, six, seven and nine being the most common) because more flutes enable faster feed rates which in-turn reduce cycle times. "By adding variable geometry to help break up chatter and harmonics, incorporating unique chip splitters to aid in chip evacuation in deep-pocketing applications and incorporating the latest in carbide substrates and coatings, multi-flute tools are leading the way in process optimization." However, with so many new strategies and cutting tools flooding the market, it can be hard to determine which advanced strategy is best for the customer's application, according to Ball. "Each strategy has its benefits, but there are also certain criteria that must be taken into consideration to make these strategies effective, like machine limitations (lack of rpm, horsepower, feed-rate capabilities and so on), not having the right programming software to take advantage of new strategies or simply that the specific component that the customer is trying to machine does not contain adequate features." For example, he says that optimized roughing is better-suited for straight-walled parts and is not always the best solution for complex 3D surfaces. "High-feed roughing would be a better option in this situation."

Getting More Value Out of Every Cut

Every machinist worth his or her salt knows how important it is to keep cutting tools in good, working

Image courtesy of Haimer USA.

Because full-radial engagement trochoidal milling has become a popular machining method for roughing, new products like this anti-pullout shank are being introduced to prevent the cutting tool from pulling out of the tool holder. Here, special drive keys match the spiral-shaped grooves on the cutting-tool shank, creating frictional clamping forces and a positive locking form-fit.

condition by monitoring them and setting them up properly for each job. But, there is so much more to consider when looking to prolong a cutting tool's utility before having to spend money to replace it.

Haimer USA's Drew Strauchen says that moldmakers can benefit by using fine-balanced cutting-tool assemblies that are physically inspected and modified as needed to provide perfect balance characteristics, which in turn have a positive impact on tool life and part finishes. "Unbalance creates centrifugal forces during spindle rotation that creates vibration, which translates to less tool life, poorer finishes, increased spindle wear, more runout and ultimately leads to a reduction in cutting speeds (or metal-removal rates). The faster they go, the more obvious the unbalance problems become," he says.

Crystallume's Ed Francis says that moldmakers want longer-lasting and tighter-tolerance cutting tools. "Coatings have advanced with the latest AlTiN coatings for hard milling with the addition of small elements (at less than 1 percent) that promote hardness at high temperatures, like carbon, silicon, boron, oxygen or yttrium," he says, adding that another trend in both PVD and diamond coatings is a move toward a nanocrystalline coating structure to ensure good uniformity and to maintain tight tolerances when using carbide cutting tools. He says that the measurement of cutting tools to microns also is quite difficult for most shops, so they need to rely on information that the manufacturer supplies. Measuring the diameter and the end radius of an end mill within a micron is a very difficult task, even for the manufacturer. "Currently, most programs would need to be reprocessed if the tool changes diameter from what was programmed. Crystallume is responding by tightening the tolerance of the cutting tools it sells, adding advanced coatings and supplying individual tools that are accurately measured. Also, some of the new five-axis machines can compensate for tool diameter and radius, making it easier for moldmakers to correct any variations that may occur," he says.

National Product Manager-Milling at Iscar (Arlington, Texas), Thomas Raun, says that the introduction of new coatings that are harder and more wear-resistant has resulted in moldmakers gaining up to 50-percent greater tool life, especially in hard-milling applications that generate higher temperatures in the cutting zone. Product offerings for indexable-type cutting tools also continue to advance, he says. "To press an insert with basic geometry is simple. To press an insert with aggressive geometries, which results in more effective shearing of material (especially

difficult-to-machine materials), is one of the aspects that separates the best cutting-tool manufacturers from the average."

Still, Raun believes that moldmakers are not making the most out of their cutting-tool investments, and this plays into the overall theme of low productivity. "Moldmaking is inherently a 'one-off' environment, so there is usually a lot of programming and set-up time. There can be pressure to get machine tools up and running and not a lot of time to think about how the cutting tools are being applied. Better that the boss walks by a machine that is up and running, even if it is not operating effectively in terms of how the cutting tool is functioning," he says. "I witness a lot of 'waste' in terms of carbide utilization. Simply put, most people are not using what they are paying for." To help remedy that situation, Raun says that Iscar has created many apps and software packages, including the Iscar Tool Advisor, which users can leverage to gain quick access to cutting-tool recommendations and cutting parameters. Users can input application requirements, and the software selects the best available solutions. Examples include cutting-tool recommendations, cutting data, power requirements and productivity outcomes for each suggested result.

Solutions in Education and Collaboration

The die and mold industry faces some of the same challenges as every other industry, in terms of its people, systems, machines, tooling, software and hardware, according to YG-1 Tool's Bill Pulvermacher. But, the die and mold industry also faces some unique challenges with difficult, long and complex roughing cycles and very long and sometimes very complex finishing cycles that require hand finishing and other laborious tasks. "This is where YG-1 Tool, in partnership with machine tool builders, CAM software developers and some forward-thinking end-users works to design and develop effective cutting-tool solutions," he says. "For example, YG-1 Tool has developed roughing end mills with chip splitters that allow the tools to take much longer length of cut, stay in the cut longer and remove more material in less time through trochoidal and high-speed milling. The chip splitters make smaller chips that are easier to clear, and balanced cutting forces (which help attain longer lengths of cut) enable the end-users to get the most out of their CAM software and the speed of the machine tool." Additionally, newly developed barrel cutters help to finish workpieces much more productively, Pulvermacher says. "This finishing technique, utilizing the five-axis

machine tool and innovative CAM software, promotes notably longer tool life, produces better finishes and a much quicker cycle time on what is normally a long and tedious cycle."

Similarly, Iscar's Thomas Raun says that collaboration with CAM companies has resulted in built-in strategies that optimize cutting-tool use in terms of tool path and the cutting parameters that are being applied. "In the future, Iscar will continue its efforts to work with CAM companies to make the programming of cutting tools quicker and more productive. This will have a positive impact on the challenges of poor cutting-tool utilization and of effectively keeping the machines up and running," he says.

Jay Ball of Seco Tools says that education is a key element in driving customers to the best cutting-tool solutions. "To help customers adopt new, advanced cutting-tool strategies, Seco Tools is taking a new approach with its literature and training materials and is incorporating more technical cutting data, 'tips and tricks' and advanced machining calculations," he says. "On the digital side, Seco Tools has invested in a cutting-data or cutting-tooling solution on its website called 'Suggest,' which is an advanced, online product-selection tool that will guide users to the right metal-cutting solutions that are perfectly matched to unique application requirements."

He says that some of these solutions may include the recently launched range of hard-milling end mills with optimized cutting geometry for machining tool steel from 48 to 65 HRC.

Ingersoll Cutting Tools provides annual, live seminars to help die and mold manufacturers properly apply the right cutting-tool technology on a project. The company uses a combination of classroom discussions, multimedia presentations and live cutting demonstrations to introduce a wide variety of products and solutions to fit various machining needs. While most of these seminars are held at Ingersoll Cutting Tools's headquarters in Rockford, Illinois, the company also has mobile seminars to bring solutions to customers across North America. MMT

FOR MORE INFORMATION

Crystallume / crystallume.com
Haimer USA / haimer-usa.com
Ingersoll Cutting Tools / ingersoll-imc.com
Iscar / iscarusa.com
OSG USA / osgtool.com
Seco Tools LLC / secotools.com
Tungaloy America Inc. / tungaloy.com/us
YG-1 Tool Co. / yg1usa.com

By William Sames, Ph.D.

Guidelines for Advanced Hot Runner Manifold Channel Design

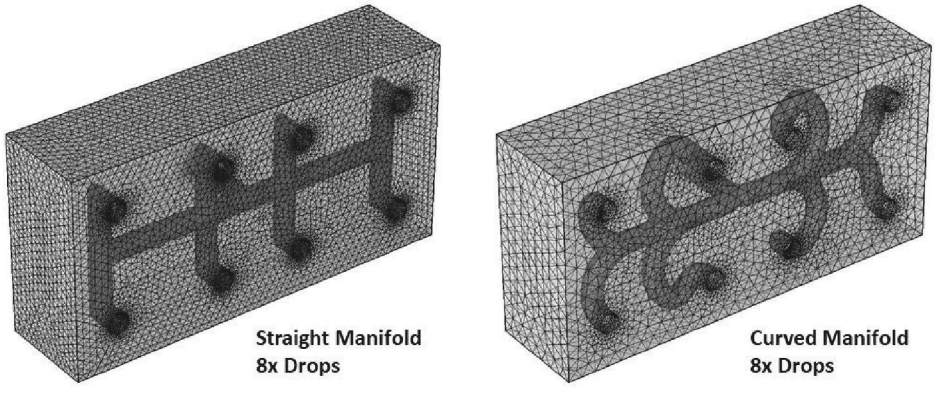
Recent simulation research highlights the difference between a drilled, straight manifold channel design and a curved channel design produced via additive manufacturing.

Hot runner manifold channel design is essential for the operation of an injection mold, impacting change-out time, part quality and even the number of possible drop locations in the mold. The key to advancing manifold design is having the ability to manufacture and implement curved channels in blocks of steel.

Cross-drilling and plugging a block of steel produces the simplest manifolds. Advanced manifolds may use brazed plug inserts to round internal corners or two-piece brazed manifolds to achieve curved internal channels without plugs. However, plugs are a complicated solution that can still leave drag spots. Brazed plates can be successful, but they have limited size and potential quality issues because of the weakness of braze joints (which are basically a metal "glue"). Manifolds are typically subject to the hottest temperatures and the highest pressure of either the mold or the hot half, making steel strength critical for maintaining the mechanical integrity of the hot half.

Curved manifold channel design produced by metal additive manufacturing (AM) is a new method capable of achieving a better balance of fill across drop locations (or equalized residence time of the polymer), according to a recent research project by Oak Ridge National Laboratory (ORNL) and HTS International Corp., with the simulation

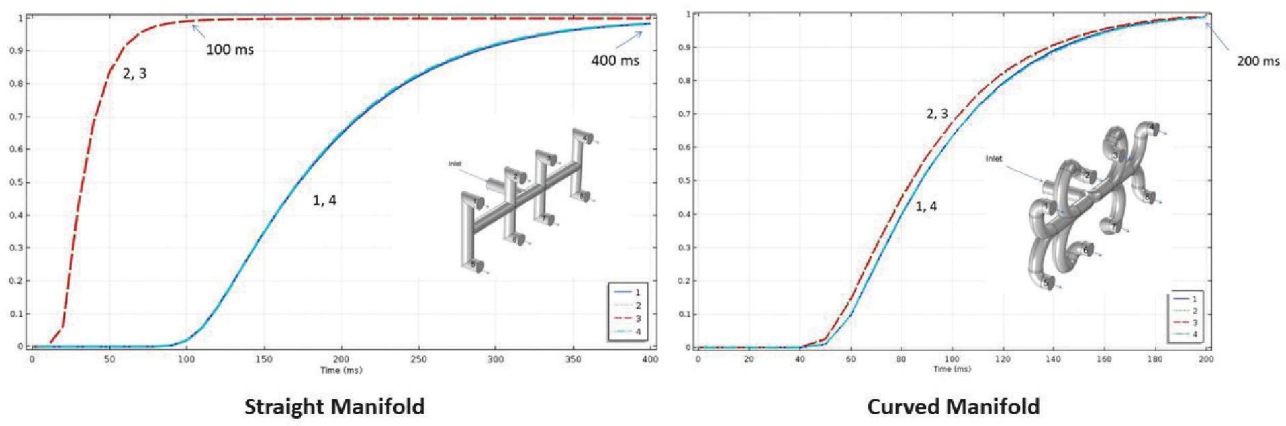
FIGURE 1



Figures courtesy of HTS International Corp.

These manifold CAD models show straight versus curved designs analyzed for an eight-drop system.

FIGURE 2



These graphs show fill fraction versus the residence time for straight (left) and curved (right) manifolds. The simulation results show equalization of residence time for the curved design.

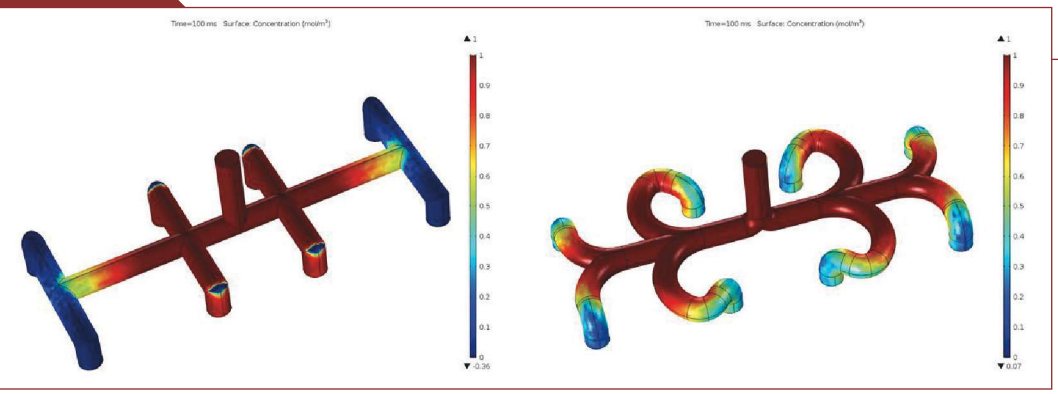
effort headed by Dr. Prashant K. Jain and Dr. John A. Turner of ORNL. The findings in the research mean faster color changes, improved hot runner system stability and reduced pressure requirements. Hybrid metal additive manufacturing equipment has made it possible to produce smooth internal surface finish for H11, H13 and 420 SS variants of components. Hybrid AM involves a machining step during layer buildup, which offers superior surface finish to the standard printed finish from power-bed processes.

To date, metal additive manufacturing has produced advanced, curved manifolds H11 (1.2343) at a footprint of 600 millimeters by 400 millimeters. This is three to five times larger than the size of previous generations of curved manifolds produced using brazing technologies.

The R&D began in 2017 in an effort to understand and publish guidelines for proper hot runner manifold channel design. These guidelines are relevant for hot runner manifold construction, independent of the method of manufacturing. Some of the basic findings are summarized here to showcase the considerable difference between a drilled, straight manifold design and a curved channel design.

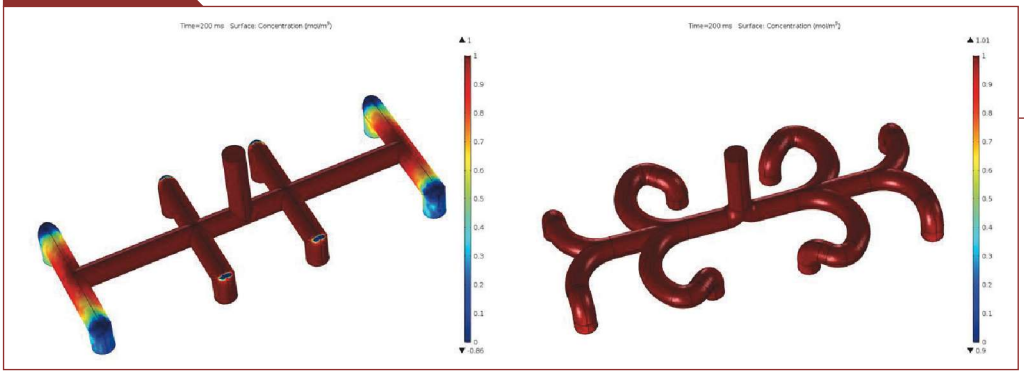
Curved manifold channel design produced by metal additive manufacturing is a new method capable of achieving a better balance of fill across drop locations.

FIGURE 3



These images depict surface concentration at 100 milliseconds of simulated time for both straight (left) and curved (right) manifold designs. The straight design shows fill of the inner drops before the outer drops and incomplete fill at the sharp edges on the inner drops.

FIGURE 4



These images depict surface concentration at 200 milliseconds simulated time for straight (left) and curved (right) manifold design. The curved design shows completed fill for all drops, while the outer drops of the straight manifold design are still filling.

Assumptions. This research was performed under the assumptions that polypropylene melts at uniform temperature, which is equal to 250°C (plus or minus 30°C) and that the polypropylene had a Newtonian, laminar flow. The pressure boundary was at an inlet of 10 kilopounds per square inch, and the research was performed using an isothermal steel manifold.

The curved manifold (see **Figure 1 on page 24**) was designed for equal flow channel length. Other parameters could be optimized, including pressure drop and residence time. The results of the simulations were significant: residence time (or the time that the polymer spends in the manifold channels) was nearly equalized along the different flow paths. The residence time was cut from 400 milliseconds to 200 milliseconds in the outer channels (see the labeled positions 1 and 4 between the graphs in **Figure 2 on page 25**), while the residence time was increased from 100 milliseconds to 200 milliseconds in the interior channels (see the labeled positions 2 and 3 between the graphs in **Figure 2**).

A look at the normalized, surface-concentration profile further validates the equal filling profiles in the curved manifold compared with the conventional manifold (see **Figure 3 on page 25 and Figure 4**). While the cases shown represent two extreme ends of the manifold design spectrum, the benefits of removing constraints on the shape of the manifold channels are clear. For multi-cavity molders, new production capabilities with metal AM can enable the design of higher-density injection gates and can simplify the manifold stack. For single-cavity molders (as in many automotive molds), these new capabilities enable the strategic placement of drops in complex arrangements.

These benefits occur because patterns are developed without regard for intersecting cross-drill patterns, and curved channels can add path length into a reduced footprint for drops closer to the manifold inlet. Curved channels also reduce the path length for drops located further from the manifold inlet. Lastly, curving channels in a single manifold body reduce stack height instead of having to stack symmetrically drilled manifolds to achieve uniform channel length in high-volume tools. MMT

CONTRIBUTOR
Dr. William Sames is CEO of HTS International Corp.

FOR MORE INFORMATION

HTS International Corp. / 865-410-8880 / hts-ic.com

CREATE THE FUTURE

Challenge Conventional Thinking From *VISION* to *REALITY*

CNC Milling and High Speed Direct Laser Melting, Matsuura has ***REVOLUTIONIZED*** the AM Marketplace

With Matsuura's LUMEX *FREEDOM* of *DESIGN*, make the impossible, *POSSIBLE*

Matsuura's INNOVATIVE and UNIQUE combination of technology platforms enables the production of parts and molds in a method that has never been possible nor imagined.

SEE US IN ACTION:

IMTS2018

McCormick Place
Chicago, IL
Sep 10 - 15, 2018
South Hall, Booth 338148

***Register for a free gift at the show! Email us at* MatsuuraLUMEX@MatsuuraUSA.com**

Learn more about the Matsuura LUMEX Avance Series

matsuurausa.com | MatsuuraLUMEX@MatsuuraUSA.com | 800-518-4584

By Christina M. Fuges

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

Moldmaking on Full Display at NPE2018

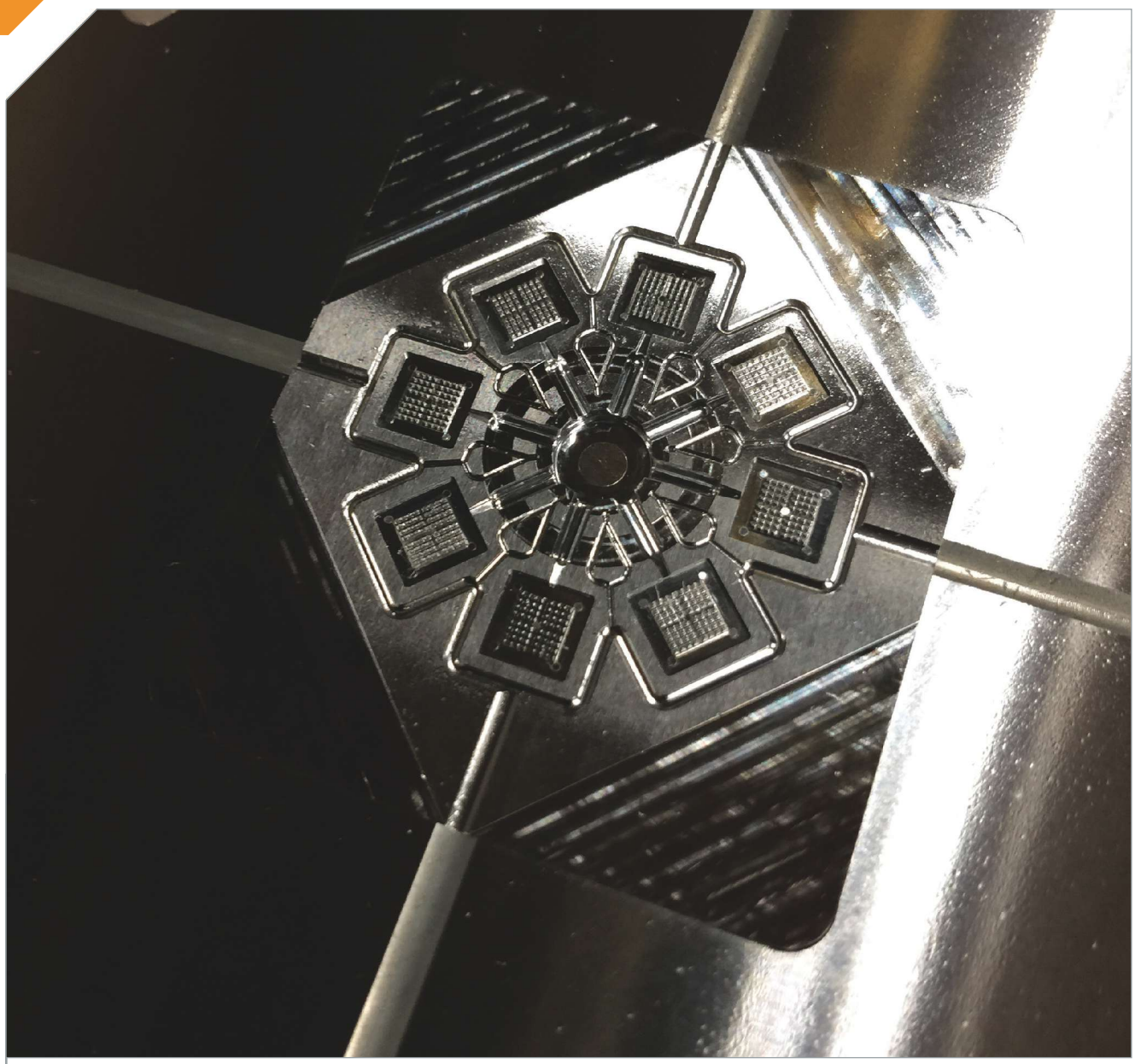
Collaboration is the name of the game, as more than 60 North American mold builders showcased their capabilities in shared demonstrations across the show floor.

Burteck is getting into liquid silicone rubber molds, and the shop used NPE2018 as an opportunity to showcase what it can do with this LSR medical demo part.

Collaboration was the key takeaway from NPE2018 for the *MoldMaking Technology* (*MMT*) team. Mold builders did not confine themselves to the traditional role of working solely at their booths. Instead, they partnered with other companies in multiple booths to showcase their wares.

The *MMT* team counted more than 60 North American mold builders who exhibited, and that is a big number compared to NPE2015. Collaboration was everywhere on the show floor among mold builders, molders and molding machine manufacturers who demonstrated molds, tooling, hot runners, mold components and processes. Here is just a sampling.

Burteck is getting into liquid silicone rubber molds, and the shop used NPE2018 as an opportunity to showcase what it can do. The demonstration was a 2+2 Polycarbonate/LSR overmold. The first shot used a four-drop, MoldMasters direct-gated hot runner system. A servo-motor index plate transferred the part 90 degrees to the eject position, where the second-shot molded parts were stripped off and then rotated another 90 degrees to put the first-shot parts in position for the overmolding. This is simultaneous injection using a standard injection-molding machine with a center inject for the first shot and Kipe MicroDeck for the second shot—a cold deck married up to a servo-driven injection plunger.



Mold Craft brought micro molding to NPE2018, where it molded two variations of a 100-micron filter screen. The Mold Craft booth ran a two-cavity micro mold using POK resin in a Wittmann Battenfeld MicroPower 15-ton press, and the Sodick/Plustech booth ran an eight-cavity micro mold using PPSU (solvay polyphenylsulfone). Both molds had 0.004-inch by 0.004-inch shutoffs (100 micron) and 0.013-inch and 0.008-inch wall sections with a part weight of less than 0.007 grams in POK and 0.0095 grams in PPSU. Mold Craft managed both R&D projects from the part design to mold-cavity design and finally processing. The shop also introduced its Production Quality Prototype (PQP) product offering that provides engineering-quality sample parts in a prototype micro mold and provides proof of concept for customers developing a new part intended to run in a micro mold. This is a parts-to-print process for projects using any engineering resin.

Mold Craft ran a two-cavity micro mold using POK resin in a Wittmann Battenfeld MicroPower 15-ton press and the Sodick/Plustech booth ran an eight-cavity micro mold using PPSU (solvay polyphenylsulfone).

MMT Team Shares NPE Technology and Trend Recap

Plastics is a massive industry, which was quite evident considering the size of NPE2018. It was the largest NPE show to date, making it a difficult show to experience and cover at the same time. However, the *MMT* Team did its best to walk the miles of aisles to see and report on the latest technology and trends. Here are three trends:

1. **Mold monitoring and process control.** Numerous companies are improving their methods of monitoring molds and the molding process using sensors, monitors, software and the cloud to collect, analyze and share data, which ties directly to Industry 4.0.
2. **Additive manufacturing.** Many molders and mold builders were walking the 3D/4D Printing Zone truly interested in these technologies. It seems as though something has clicked in their minds, enabling them to see additive manufacturing as an avenue to new business opportunities (in which they accept lower-volume work) and a method to help customers save time and money (via 3D-printed, conformal-cooled inserts).
3. **Conformal cooling.** Numerous shops are buying technology to produce conformal-cooled inserts (which are made from vacuum-brazing and 3D-printing technologies). The news on the street is there is a lot of business out there for conformal-cooled inserts, if provided by shops with the tooling expertise to get it done right. On top of that, with conformal cooling taking off, exhibitors showcased solutions for largely unforeseen challenges, including systems for cleaning clogged water lines and for monitoring them so that clogging does not happen at all.

A few technology highlights included:

- **Mold materials.** High-polish, corrosion-resistant stainless steels, specialized aluminum mold plate and pre-hardened steels were on display.
- **Hot runners.** Nozzles for multi-cavity applications; screw-in nozzles for better sealing and ease of assembly and disassembly; small nozzles; a combined hot runner system with 3D-printed conformal-cooled cores for automotive lens molding; sequencing and temperature controllers; servo-driven valve gate systems; actuator cooling without separate cooling lines; side-mounted cylinders and side gating hot runner solutions were on display.
- **Mold components.** Couplers that automatically connect and disconnect via standard machine motions; ball-guided ejector bushings; guides for inclined pins; standard mold-base components; new, readily machined cooling products reaching through cores that previously have not been feasible; through-hardened pins for large molds; new alignment locks; centering units; double-rack lifters; water manifolds and collapsible cores were on display.
- **Surface treatment:** Laser texturing, diamond, electroless nickel coatings and a four-axis laser for engraving and texturing were on display.
- **Mold maintenance and repair:** Dry ice blasting, micro TIG welders and mobile laser welders were on display.

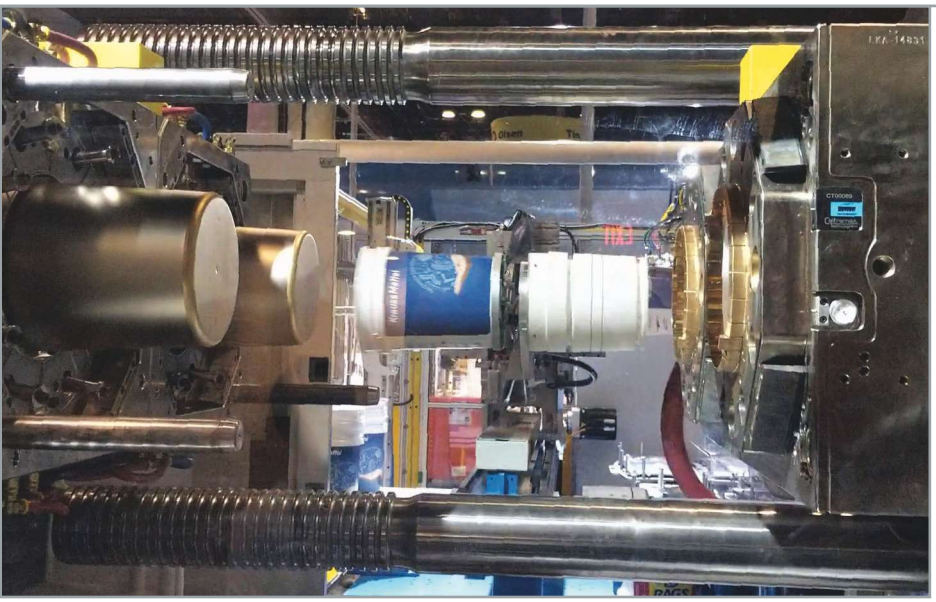
Listen to *MMT* editors discuss the show at short.moldmakingtechnology.com/npe18wrap.

A single-rotating element system exhibited at NPE2018 by X-Cell Tool, JP Grosfilley (JPG) and Milacron made this cup.

X-Cell Tool, JP Grosfilley (JPG) and Milacron collaborated at NPE2018 to showcase Milacron's new Quantum-series injection molding machine and introduce the international partnership between X-Cell Tool and JPG to bring indexing technology to the United States. This was accomplished by running a single-cavity, double-wall cup, injection-molded with JPG's indexing system in 35 seconds. Basically, the indexing system manipulates the components of a mold to change the positions of mold components and in conjunction with a robot that is relocating molded parts, which makes it possible to overmold the two parts together. The machine molded the two cups apart from each other, and then with another shot, the mold sealed them together. Then, when the mold opened, the mold components would switch, and a robot would place one cup over the other cup. Then, the mold would close and inject again to seal the cups together. The single-rotating element system exhibited at NPE made the cup, but for more complex applications there are bi- and tri-rotating elements to expand the capabilities within the molding cycle to accommodate products with things like multiple materials or colors, in-mold assembly or other components placement such as filter media or water. An indexing plate bolts right into the injection machine and has a servo motor in the center with a single rotating element or with bi-rotating or tri-rotating elements that yield a variety of additional movements of mold components inside the mold.

Westminster Tool and Maruka Toyo have been strategic partners since 2009 when Westminster Tool opened its technology center. Maruka Toyo was an integral part in supporting Westminster's launch of an internal mold-qualification center complete with three Toyo—presses (110-, 150- and a 300-ton). In exchange for its support, Maruka gained a local New England facility to provide product demonstrations and training for customers. Westminster Tool was located in the Maruka Toyo booth at NPE2018 where it ran a development tool for a medical, drug-delivery safety cap. The challenge of the safety-cap customer was to build a development tool that would directly demonstrate and replicate a production environment. The customer needed this to determine which tolerances could be held and ensure that the tool would survive the duration of development cycles. Typical prototype tools do not exceed a few thousand cycles, versus a Class 101, which is guaranteed to run one million cycles. Westminster Tool addressed the challenge by providing the customer a Class 101 tool, which featured a hot runner system, valve gate and stripper plate with bypass shutoffs.

Westminster Tool was represented in the Maruka Toyo booth at NPE2018 where Westminster Tool ran a development tool for this medical, drug-delivery safety cap.



A Calframax dual-cavity, five-gallon container mold runs in the Krauss Maffei machine.

For the first time, **Calframax** attended NPE with its very own booth, but more importantly, the company partnered with Krauss Maffei and BMB to display its technology for tools that make industrial pails in record speed. They ran two molds. One was a single-cavity, five-gallon container mold, while the second was a dual-cavity, five-gallon container mold.

These two molds run 13 to 15 seconds per cycle, depending on the design of the pail and the speed of the injection press. This means that molders can make, on average, 26 percent more pails per year. These two molds gained quite a lot of attention, as current and potential customers were able to to see how much extra product Calframax could provide them per year without sacrificing quality.

M.R. Mold was one participant in a collaborative demonstration producing this headlamp optic.

M.R. Mold was one participant in a collaborative demonstration that produced a headlamp optic. Zeiger Industries molded an automotive LED headlamp optic made from Dow's Dowsil MS-4007 moldable silicone on a Milacron-FANUC Roboshot a-S55iA with its new iHMI Controller. Zeiger's Plug-n-Play Conversion Kit incorporated a Wexco 777 water-cooled barrel, a Zpringlok LSR pre-closed check-ring valve, a ZSAR PM zero-compression ratio screw, liquid silicone rubber (LSR) screw and proprietary barrel and screw sealing device. M.R. Mold's two-cavity, LSR, fully automatic mold, which incorporated a single-drop cold runner system, ran in the production cell comprising an ELMET TOP 5000P dosing system and a Thermal Care air-cooled EQ3A01 portable chiller. A Yushin YC-100S-11-8 robot with an E-Touch Compact controller, a custom engineered end-of-arm tool and a Yushin indexing conveyor enabled the cell to run fully automatic. Sigmasoft provided a virtual molding simulation of the filling and curing process.

M.R. Mold also partnered with R.D. Abbott Co., a full-service elastomers supplier, which showcased a Liquid Additive Manufacturing (LAM) 3D printer in the booth. R.D. Abbott Co. developed this LAM 3D printer in collaboration with German RepRap GmbH and Dow Silicones. German RepRap's LAM platform combined with Dow's 3D Printable EVOLV3D LC 3335 LSR is potentially capable of printing functional prototypes and enables small manufacturing trials of complex parts. Also, the material's properties closely match those of molded LSR, facilitating an easy transfer into injection-molding processes for high-volume manufacturing.

A balanced multi-tip melt distributor designed for high-production molds, like this 1000-ul pipette tool from Cavaform, improved cycle times, produced straighter parts and reduced maintenance time.

Mold builders strive to achieve 100-percent straight parts on any mold build, but the many dynamic process variables make this a challenge. For example, most people in the mold building arena try to mold pipette syringes, or deep-draw parts, with a single side gate. However, this puts stress on the core pin, which causes deflection. Others use unconventional methods to fine-tune the mold to produce parts to specification, but this may require stressing the core steel in a way that causes premature wear to the molding components. Basically, unless a mold builder uses a perfectly balanced hot runner system, the process will not yield 100-percent straight parts.

Cavaform decided to take on the challenge of developing a better solution. Its engineering team developed a double side-gated hot runner concept using a balanced manifold that fills each part through two gates. The gates fill the cavity simultaneously, creating a uniform flow front as each part is filled. At NPE2018, Cavaform partnered with Wittmann Battenfeld to run its (patent-pending) eight-cavity, 1000-ul pipette mold in a EcoPower 110 press to successfully mold a straight pipette. The mold's two, balanced, hot side gates prevent core-pin deflection by providing equal pressure on both sides.

Proper Tooling joined forces with Krauss Maffei to lightweight a 2014 model-year F-150, center-console armrest assembly for NPE2018.

For all you truck lovers, **Proper Tooling** hooked up with Krauss Maffei to lightweight a 2014, model-year F-150, center-console armrest assembly for NPE2018. This project was more than a year in the making and was the brainchild of Proper Tooling's Director of Engineering Michael Tabbert. The original assembly comprised an inner-armrest substrate, outer-armrest substrate and outer-armrest skin. The entire assembly was 1,186 grams and contained 17 components, four assembly steps for inserting components, four required Philips screws for installation of the inner substrate and seven Torx screws for latch and hinge assembly. The current design yielded a 150-millimeter long crack in the ABS substrate part from load in the armrest's center, a cracked screw boss, manual hand wrapping of soft overmold material and excessive warp on the inner and outer substrate materials. The optimized NPE2018 design featured a composite sheet, outer-lid skin (TPV), inner-lid substrate (PP), outer-lid substrate (PP) and TPV overmold.

Proper Tooling engineers used the data that they accrued during the structural analysis to optimize the product design, and they re-ran a series of structural analyses. They determined that composite-sheet thickness of 1.0 millimeter was optimal. The conformal-cooled mold ran in a Krauss Maffei GXW 450-2000/1400 multi-component injection molding machine cell and spin-form press with two shot stations: first shot substrate (PP) and second shot overmold (TPV). Krauss Maffei's FiberForm process combines the thermoforming of organo sheets and injection molding into a single process, which results in fiber-reinforced plastic components that are particularly lightweight yet feature a high level of strength. Manufacturers can use a silicone roller to apply paint for a simulated stitching on the armrest.

The new concept design reduced components from six components to two, yielded a 20-percent weight savings and a 15-percent waste reduction, and now the end product can withstand 160 pounds of force versus the previous 80 pounds of force.

FOR MORE INFORMATION

BMB / bmbgroup.com
Calframax / calframax.com
Cavaform / cavaform.com
Dow Silicones / consumer.dow.com/en-us.html
Extreme Tool & Engineering / extremetool.com
FANUC / fanucamerica.com
German RepRap GmbH / germanreprap.com
JP Grofilley / grosfilley.fr/en
Krauss Maffei / kraussmaffei.com/en
Maruka Toyo / marukausa.com
Milacron / milacron.com
Mold Masters / milacron.com/our-brands/mold-masters
M.R. Mold / mrmold.com
Proper Tooling / propertooling.com
R.D. Abbott Co. / rdabbott.com
Sigmasoft / sigmasoft.de
Sodick / sodick.com
Westminster Tool / westminstertool.com
Wittmann Battenfeld / wittmann-group.com
XCell Tool / xctam.com
Yushin / yushinamerica.com
Zeiger Industries / zeigerindustries.com

By Barbara Schulz

CT Scanning Accelerates Adjustments and Corrections on Injection Molds

Industrial computed tomography scanning (CT scanning) is a quality-assurance technique that is making its way into mold shops for speedy adjustments and corrections on injection molds, but only if it is used correctly.

Computed tomography scanning, or CT scanning, is like having X-ray vision. One can see into a part and dimensionally measure features and structures without destroying the part while simultaneously taking numerous, accurate measurements.

CT scanning quickly provides moldmakers and molders with the ability to overlap actual scan data with that of the original CAD model, or the "perfect part," showing user-defined pass or fail criteria, comparing actual values to nominal values, and displaying in graphics the out-of-tolerance variances in easy-to-see colors. The process can be used to reverse-engineer existing products and create files that, in turn, can generate tool paths for mold, die or fixture tooling.

If this technology is such a great thing to have, why don't all moldmakers own a CT scanner to produce the "perfect mold" and ultimately have the mold produce the "perfect part?"

The most obvious reason is the high investment cost. Steffen Hachtel from F. & G. Hachtel GmbH & Co. KG, a plastic injection molder based in Aalen, Germany, explains that a CT scanner costs between 300,000 and 600,000 euros, and annual maintenance costs amount to 10 to 15 percent of the initial investment. The company currently runs four GE scanners and one Nikon CT scanner. Despite the high cost, the most significant benefit of CT scanning for injection-molded parts can offset the high price tag in the long run. That is, CT scanning easily indicates the amount and location of any shrinkage and warpage that has occurred throughout the part, significantly accelerating tool qualification before production molding, especially for complex parts.

However, there is one caveat. Very often, parts are not accurate according to the drawing specs data, Hachtel says. Comparisons of the CT scan data with the original drawing show that massive deviations can occur, which might lead a moldmaker to believe that the mold is wrong, but that is not necessarily the case.

Image courtesy of Susanne Schröder.

Is CT scanning a blessing or a curse? For Steffen Hachtel, it is certainly a blessing, as it allows for speedy adjustments and corrections on injection molds, but only if it is used correctly.

"If the final molded part does not conform to specs, people conclude that the mold was not designed and machined precisely, when in reality, the mold is often not to blame. The measurement alignment, drawing or data interpretation might be wrong. Additionally, the warpage is often not from the mold design but results from the chosen part geometry. The lesson here is that if CT scanning technology is not used correctly, it can lead to misinterpretations and wrong conclusions," Hachtel says.

Using CT scanning properly, drawing the appropriate conclusions and reaping all of its benefits requires knowledge of comparing CAD data with CT data and knowledge of

shrinkage and deformation during the molding process and during de-molding.

Putting CT Scanning to Work: Measurement Comparisons and Evaluations

With so many obstacles to overcome, how can CT scanning be a blessing and not a curse? What does it take to use the technology in a way that actually lets a moldmaker increase accuracy and speed up the process? For Hachtel, it is many years of experience in the company's own moldmaking facility and a high level of expertise in the injection molding process.

As early as 2008, Hachtel pioneered the first 3D-computed tomography method as a way of qualifying plastic components that were manufactured in-house and in combination with simulation methods to optimize mold design. Although it was initially treated with skepticism, expertise in industrial computed tomography is now highly valued, particularly when it is combined with the moldmaking activities of injection molders, moldmakers or end users. The company grew from one employee and one CT scanner to what is now eight employees and five CT scanners.

Sample components are almost exclusively qualified with CT scanning. "The voxel data models obtained from computed tomography and the CAD models of the component make it possible to make comparisons. Currently, this is our main piece of equipment for making tool optimizations," Hachtel says.

CT scanning opens up opportunities to understand the complete process, from design to the end-use part, and it makes everything transparent. "You can also outsource CT scanning and then analyze the part and compare it to the CAD data in-house, keeping the intellectual property in-house, optimizing shrinkage and proving the reproducibility of the processes," Hachtel says.

Hachtel also uses VG Studio Max software from Volume Graphics for the most critical measurement comparisons and evaluations. The software offers a corresponding module that makes it possible to compare nominal and actual values. A best-fit function is used to overlay CT and CAD data sets in any position in free space, making it possible to calculate deviations in advance. It is possible to question the alignment according to a drawing (as in the era of tactile measurement technology), and quite often it turns out not to be useful.

> Computed tomography scanning, or CT scanning, is like having X-ray vision.

For first article inspection and quality control, the CT measuring data of the digitized components can be directly compared with the original CAD master data. Moldmakers can use such a full-surface comparison of the nominal and actual values to determine quickly whether the defined tolerance limits have been maintained or to control which areas of a component have been deformed.

The measured data and the CAD model are then imported into the inspection software VG Studio Max. After the alignment to the CAD coordinate system (reference point-system registration 3-2-1, Best-Fit), the software immediately visualizes any deviation using a color plot of the entire component surface, which permits quick, easy interpretation.

"It is important to compare the measured data with the CAD data and not with the drawing because very often, the drawings don't take the whole process, the shrinkage or deformation

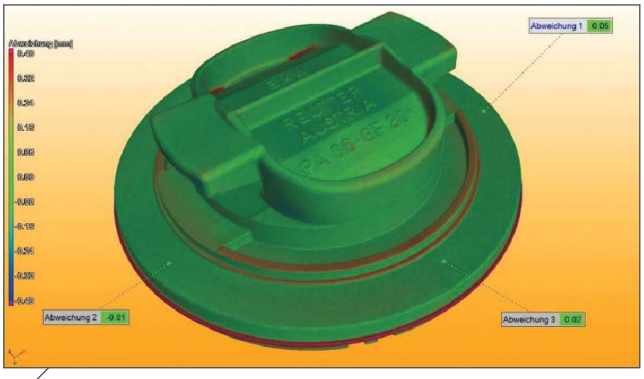


Image courtesy of F. & G. Hachtel GmbH & Co. KG.

CT scanning quickly provides moldmakers and molders the ability to overlap actual scan data with that of the original CAD model, or the "perfect part," showing user-defined pass or fail criteria, comparing actual to nominal values and displaying in graphics out-of-tolerance variances in easy-to-see colors.

during molding into consideration," Hachtel says. "Capturing the actual contour is vital in moldmaking, as properly fitting items otherwise seem to come from molds that do not conform to the drawing specs, which compensate for shrinkage and deformation during the production process and de-molding."

To align the scanned part with the CAD model, the VG Studio software has different segmentation tools, allowing data sets to be separated into different components, materials or regions of interest. Segmentation is the basis of many data-analysis tasks, making it a highly important functionality that helps users complete their tasks.

For Hachtel, regions of interest and best-fit alignment, where the average deviation between scanning and CAD is as little as possible, works well. Comparisons of nominal to actual values are visualized using false color rendering. For example, green represents areas within tolerance and red represents areas that are out of tolerance.

"In our opinion, it is illogical to measure all the dimensions (as this yields extremely long measurement protocols), and then compare them against dimensions that are within tolerance. This is an old-fashioned procedure," Hachtel says. "Today's comparisons of nominal and actual values that are available with CT scanning technology quickly and reliably show the component areas that are out of tolerance."

He cites a car's central bow or "main strut" as an example of a part that displayed deviations of 3 millimeters when the scanned data of the final part was compared to the drawing data, using the suggested alignment method in the drawing. "If you concentrated on the areas of interest, where the part had to fit in its final assembly and which in our case were the fittings, the deviation was only 0.2 millimeter, so the mold was good and no correction was needed. If you compared your CT data to the drawing and the given reference points, you might have thought it was necessary to re-design your mold, which, in fact, is not always the case. However, it is important that the moldmaker or mold designer optimize and analyze the part, not the customer, as analysis, assessment and design should be performed simultaneously." MMT

CONTRIBUTOR

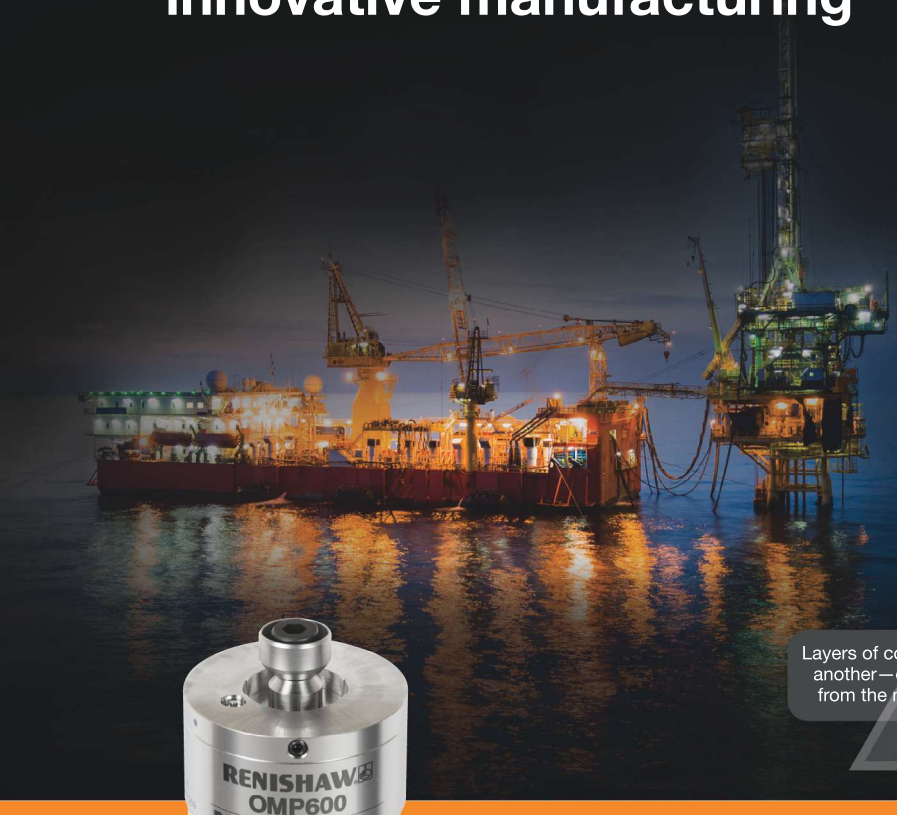
Barbara Schulz is Gardner Business Media's European correspondent. She can be reached at bschulz@gardnerweb.com.

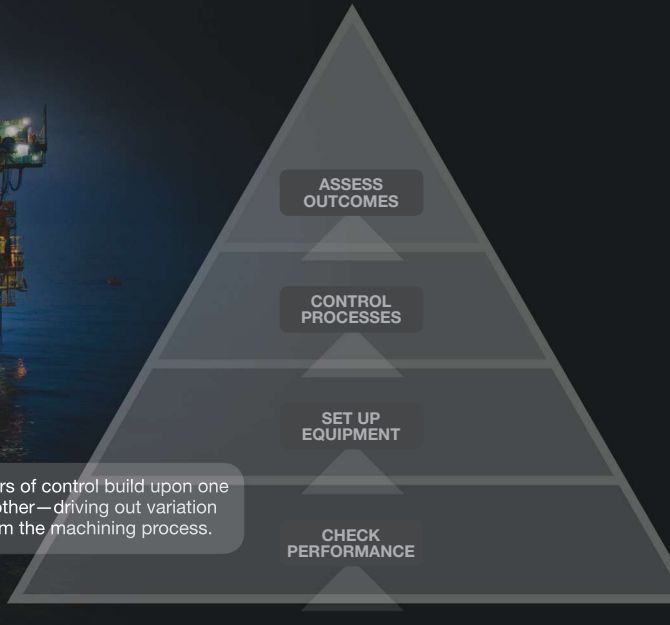
FOR MORE INFORMATION

F. & G. Hachtel GmbH & Co. KG / fg-hachtel.com
General Electric / ge.com
Nikon / nikon.com
Volume Graphics / volumegraphics.com

RENISHAW
apply innovation™

Your partner for innovative manufacturing





Layers of control build upon one another—driving out variation from the machining process.

OMP600
High performance machine tool probe for workpiece inspection, job set-up, in-cycle gauging and increased confidence in unattended machining.

As manufacturers ourselves, we understand the challenges you face. For 45 years, Renishaw has been creating breakthrough innovations that solve manufacturing problems and increase productivity across the entire energy sector. Our suite of advanced solutions allows manufacturers to work to ever-tighter tolerances and significantly improve throughput. From additive manufacturing to post-process control, our proven technologies are found at the forefront of intelligent production systems.

Allow us to show you how the integration of innovative manufacturing techniques improve overall productivity and how we can be your partner for innovative manufacturing.

www.renishaw.com/energy

See us at IMTS2018
BOOTH #135509
BOOTH #431607

Renishaw Inc 1001 Wesemann Drive West Dundee, IL, 60118
T 847-286-9953 F 847 286 9974 E usa@renishaw.com
www.renishaw.com

Linear-Motor Drive on **Sinker EDM Machine Speeds Productivity**

Image courtesy of Action Mold and Machining Inc.

This Sodick Inc. AG60L Sinker EDM machine significantly increased the speed at which Action Mold and Machining is able to set up and burn workpieces and then run them unattended without failure. The EDM machine also helps the company economize on materials and requires less maintenance from the team. Note the tool-changer carousel to the right of the tank. The company has since added a Sodick AG100L Sinker EDM machine to its EDM arsenal for burning larger workpieces.

By Cynthia Kustush

Action Mold and Machining: The name embodies the mission and the slogan of the veteran-owned, Grand Rapids, Michigan-based company, which states, "For quick-turn repair and engineering changes, we are your 'Emergency Room for Molds.'" The company is known for fast service, so when it became clear that the current EDM machinery was not capable of keeping up with the speed of business in the mold industry anymore, Action Mold and Machining (Action Mold) invested in its first Sodick machine, an AG60L sinker EDM machine. That was five years ago, and Lead EDM Operator Bob Valk says, "With all of the past machines on which I have worked at Action Mold and previously, Sodick surpasses other brands in speed, setups, ease of maintenance and reliability."

Linear Motor Equals Better Burning

Valk has more than 30 years of experience as an EDM operator and says that he has worked on several high-end EDM machines, but Sodick Inc. is the brand that stands out for high productivity without failure or the need for constant supervision. It is for this reason that Action Mold invested in a second Sodick product, an AG100L sinker EDM machine, two years later. "It has increased our burn times by 25 to 30 percent," Valk says. "Setup time is substantially faster because the linear motor travels are so much faster."

He explains that Sodick's EDM machines use linear motors that run on magnetic plates instead of ball screws for travel, and that has allowed for faster travel speeds in the XYZ axes. "There are no gears that have to move together to move that table, which is the case with ball-screw action. The linear motors react faster and more smoothly," Valk says, adding that EDM machines using ball screws also take longer to set up. "With the ball screws, the machinist has to jog that table to indicate a block to get it set up properly, which takes a lot longer than with the Sodick linear motor. The Sodick tables do not move, adding stability to the machine, and the machinist can put the indicator in the upper head, and the head moves back much more quickly." He adds that a stationary table also enables the user to put a heavier block of steel onto it without hindering speed. If the table moves, as it does with ball-screw action, an excessively heavy workpiece could cause damage to the EDM machine.

According to Sodick Inc.'s Additive Business Development Manager Evan Syverson, the Sodick feed rate is 94.5 inches per minute. He says, "Additionally, in the Z-axis direction, a Sodick EDM machine has a 120-feet-per-minute jump speed." Valk says that the faster jump speed is significant because it

ACTION MOLD AND MACHINING

PROBLEM: Slow travel speeds in the X, Y and Z axes, inefficient setups and higher maintenance, premature electrode wear and other difficulties that prevented unattended machining.

SOLUTION: AG60L and AG100L sinker EDM machines from Sodick Inc.

RESULTS: Significantly faster setups and burning speeds, less maintenance, the ability to run unattended without failure and notable cost savings on materials.

makes the reaction time of the electrode substantially faster when it pulls out of the EDM cut as it is burning. "In other words, I can pulse the electrodes quicker, which allows me to flush them faster and achieve a better burning process as a result."

Sodick Inc.'s Evan Syverson explains that other EDM machines have a completely different flushing process and that it comes back to the Z axis, which must jump as part of the flushing of the workpiece. "In general, to flush debris from the workpiece during machining, a manufacturer will either one, drill holes in the electrode through which they pump flushing fluid, or two, use an exterior spray nozzle to spray the workpiece with fluid. Option two only works in a small subset of applications, and option one usually will leave an unfinished area on the workpiece where the hole was because the electrode obviously cannot burn where the electrode has a hole," he says. "In contrast, the Z axes on Sodick EDM machines can move so quickly that they create a vacuum force that blows the debris away from the work area. Thus, no flushing holes are needed."

Bob Valk says, "My favorite aspect of a Sodick EDM machine is having the ability to burn small, deep ribs into steel without any problems." He explains that accuracy in EDM depends on the flushing because not having the ability to flush the debris results in consequences. "On our old EDM machine, debris was not flushed well, and we would frequently get arcs that cause pits to form in the bottoms of the ribs, which could destroy the electrode. He says that with a Sodick machine, he could have an electrode measuring 0.020 inch that has to burn an inch deep, and because of the speed at which the machine moves and its acceleration, he can set it up, start the burn and walk away without worrying about arcing.

"On the AG60L, we have a 12-station tool changer that allows me to burn overnight, unattended, and it has never failed in operation," he says. "Unattended burning has increased our profitability and has increased how much work we can produce during the day and at night."

Economical EDM, Even on Hard-to-Machine Materials

When working with materials that are harder to machine, Valk says that his Sodick EDM machines power through and are very economical. "As EDM technology evolves and becomes faster, we're not really limited by how difficult it is to machine the steel." He says that Action Mold serves the aerospace, automotive and medical and dental industries, which often require Action Mold to work with unique materials like Ampco that are difficult to cut. The abrasiveness of Ampco wears out electrodes more quickly than other materials. He says, "Previously, we would have had to mill anything in this material on a CNC machine, but I have had great success burning it in less time and with less wear on the electrodes because of Sodick's linear motor and control technology."

According to Syverson, the hardness of the machined material does not influence the EDM process. Rather, it is the material's electrical conductivity and abrasiveness that can pose challenges during the cutting process. Regarding conductivity, he says, "The shape or waveform of the electrical discharge will impact how efficiently material is removed, while the polarity of the discharge can also impact how fast the cutting is performed and how much wear the electrodes will experience. Sodick has generators and a cutting-condition database in its controls that help operators easily achieve the optimal settings for very fast burning."

Valk's ability to burn abrasive materials faster than a CNC could mill them is because of the Sodick machine's jump speed in the Z axis, Syverson says. "Milling abrasive materials like Ampco wears down end mills more quickly in a machining center, thus limiting the speed at which a CNC machine can mill. Sodick EDM machines, on the other hand, still can be quite fast because the jump speed in the Z axis enables the user to burn more frequently."

Valk adds that he has also noticed that he uses fewer electrodes on the Sodick EDM machines. "When I'm burning Ampco with a Sodick EDM machine, I only need three electrodes to finish one location as opposed to needing four with other machines," he says. "That's a 25 percent reduction in machining time to cut carbon, which can be substantial, plus the savings that I gain in the cost of the graphite and cutting tools. I have also found that I can run EDM using a less expensive graphite and still get the same quality and tolerance as I would get with a higher-grade graphite, which makes it even more economical. Because we can do more with less material expense and in less time, Sodick machines have enabled our company to quote jobs more competitively."

He says that previously, for example, Action Mold might quote 1,000 hours for a new mold. With the time and material savings just in EDM using Sodick machines, the Action Mold team might be able to reduce that job quote to 950 hours. This also can be a significant cost saving for customers needing repair work or engineering changes, he says, because often molds come into the shop without valuable CAD data, so CNC milling is not an option. The company's coordinate measuring machine is used to reverse-engineer the mold details to create electrodes.

When asked how the Sodick EDM technology compares with hard milling, Valk says, "I know that hard milling is a big trend now, but increasingly there are steels and alloys of harder and harder grades in development, and having the ability to hard mill these materials requires more and more expensive equipment. We try to avoid that situation to keep our pricing competitive and also because EDM technology is getting faster with linear motors and can usually do the work faster—at times as much as 50 percent faster."

Powerful Controls

Valk says that when he is performing a job, Sodick Inc.'s EDM controller enables him to select any finish, regardless of tolerance. "The control is smart and very user-friendly, even for an entry-level machinist, and the controller gives the operator multiple choices of finish, tolerance, electrode size and orbit, making the work flexible in speed." For example, he says that whether the size of the electrode the machinist is using is like a pencil or like a coffee can, the control will tell the machinist how much voltage and amperage is necessary to establish what the machinist wants to finish. It also recommends how undersized the electrode needs to be to get the final product machined with EDM, which is a great benefit since, with other EDM machines he has used, putting more power through the electrodes to accelerate the process often creates pits in the steel that are too deep to clean during the finishing process.

According to Valk, Sodick Inc.'s Motion Controller Technology, which controls movements of the axes and monitors spark-gap changes, ensures an instantaneous response to the user's data transmission. This helps accelerate the EDM process while ensuring accuracy, quality and very little maintenance. "Sodick has a 10-year positioning-accuracy guarantee on its machines," he says. "That is very valuable because, if the machine ever goes out of tolerance, Sodick will fix it." MMT

FOR MORE INFORMATION

Action Mold and Machining / 616-452-1580 / actionmold.net
Sodick Inc. / 888-639-2325 / sodick.com

DREAM it. DESIGN it. SHAPE it.

shaping your dreams

The A Brand®

A Brand is OSG's premium tooling brand that represents the quality assurance OSG guarantees to each and every customer. A Brand products (A-Drills, A-Taps and A-End Mills) are designed to exceed evolving manufacturing needs with a level of quality, reliability and satisfaction that can only be delivered by OSG's A Brand tooling master class! Standard or special tooling, OSG designs new and innovative products specifically to shape our customers' dreams.

800-837-2223 • www.osgtool.com

Celebrating 50 Years of Innovation in the USA!

IMTS2018

Booth: 432080

Manifolds: To PM or Not to PM, Part 2

By Steve Johnson

The June issue's article on manifolds and preventive maintenance (PM) presented opinions on the frequency of hot runner manifold disassembly, cleaning and repair from the manifold manufacturer, a manifold cleaning and repairing company and the molders running these systems.

"Environmental factors" were mentioned in the article, as each party noted difficulties with identifying and controlling critical factors, their influence on manifold performance and the resultant costs when they failed to identify and control those factors in an accurate and timely manner.

Understanding environmental factors and their potential impact on performance is key to developing accurate and timely PM work instructions, which technicians perform at optimal, scheduled times instead of waiting until the manifold starts causing issues or exhibits diminished performance. Diminished performance is a reduction in cavitation that occurs because the cavities freeze off, or they are lost to part quality, heater or thermocouple issues, seal failure or other mechanical problems.

The goal of PM is to maintain the hot runner system in a way that is cost-effective while ensuring that it runs consistently and reliably, which maximizes performance (in terms of the part quality, cavitation and cycle time) and manifold component life (in terms of the heaters, thermocouples, valve pins, nozzles and tips). The difficulty with achieving this goal is in a molder's understanding of manifold characteristics and the impact of environmental factors.

Images courtesy of MoldTrax.

A piston housing installed with too much force created this steel burr and sheared the o-ring. Also, many of the small air passages that actuate the piston or the valve-pin assembly clogged, causing the valve pin to lose pressure and operate sluggishly. The result was a long gate on this part.

Facing the Factors

Here are three common environmental factors that a molder must understand, monitor and control when running and maintaining a hot runner system. This information will provide the necessary data so that molders can develop accurate and timely PM plans.

Resin and Processing Issues

Degraded plastic and contamination in the melt stream is the main culprit of a total manifold teardown. The result is black or brown specs or streaks in the molded part, which requires a hot aluminum-oxide sand bath (such as those that Procedyne offers) to remove the residue from the manifold channels completely. The manifold must be removed from the mold frame and completely stripped of components before being inserted into the sand bath. Heat-sensitive resins, incorrect shot size (or residence time), color changes, improper start-up or shutdown procedures cause many contamination issues.

Unfortunately, even the necessary in-house equipment and tools will not guarantee success without better troubleshooting for the root cause. Some resins are simply difficult to process, which can cause problems that require the expertise of a resin supplier. For example, a medical company ran an ABS with a white-colorant titanium dioxide (TiO_2) that stuck to the manifold's channel walls and required gun drilling because a hot sand bath would not remove all of the residue. On top of that, the sticking did not occur after a specific number of cycles. It ranged between 350,000 and 2,000,000 cycles, making a solid PM frequency difficult. The company's solution was to buy a second manifold, so operators could quickly swap out the failed one as necessary. This strategy helped solve some production issues, but scheduling would still back up. The company believed that incorrect TiO_2 or colorant levels caused the inconsistency, so the company began comparing the production data (press, run dates and cycles) with the resin lots. This data made it possible to have more meaningful conversations with the resin supplier.

Abrasive and corrosive resins will wear out nozzles, valve tips, valve bushings and gate inserts. As this tooling wears, residue invades piston cups and manifold bushings. As nozzle tips wear, processors are forced to crank up the nozzle temperatures to compensate, which further compounds flash and burned material.

Operators must perform color changes according to manufacturer instructions and use maintenance manuals for any required tools or fixtures. Technicians should use nozzle-tip

insulators and high-temperature purging compounds when switching from a dark to a light color.

Production Issues

Preventing manifolds from fully expanding during start-up is number one on the leak list or is the root cause of total encapsulation. Many manifolds and components are designed to be completely dependent on an appropriate soak time to fully seal the rear of the nozzle to the manifold, and the nozzle's front seal (which is radial) to the cavity gate. However, production requirements usually rule, so unfortunately, the "hurry-and-get-it-running" mandate is all too common, even as more emphasis is directed toward educating processors about how critical a proper start-up is. Molders need to either use the manufacturer's recommended procedures or create their own and be diligent in doing so.

Other mistakes, such as shutting off the water and leaving on heaters over a weekend, will quickly degrade the plastic in the manifold as well as critical seals and o-rings. This also will cook applied lubricants in piston cups and other valve-gated components. Another bad practice is turning the water on *after* the mold has reached the processing temperature. This does not speed the start-up process.

A better idea is to heat the manifold before the nozzles and bridge. This allows the manifold ports to slide more easily across the rear of the nozzles during expansion, minimizing the drag between these two components. Operators should perform the reverse when shutting down the manifold. This approach—because nozzles heat up quicker than manifolds—reduces the chance of burned material, as the operator waits for the manifold to reach processing temperature.

Another big concern is the presence of contaminated resins in silos, conveying lines, gaylords, hoppers, hoses, dryers, grinders and any other resin paths. Proper cleaning before the plastic hits the mold is essential because these resins stick and clog manifold flow passages, nozzles and nozzle tips.

Controllers, electrical connectors and cables also need a maintenance plan for periodic inspections and testing as well as a designated storage area.

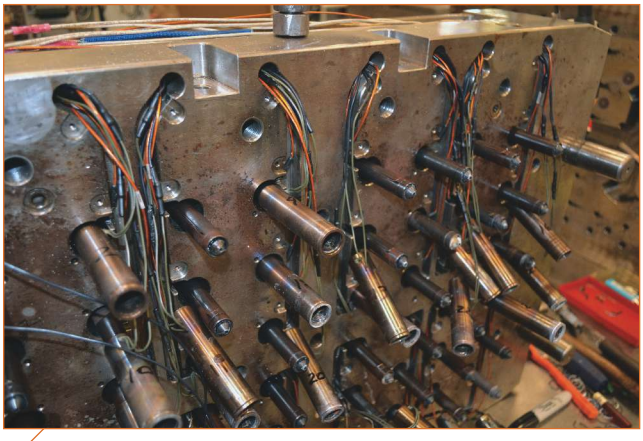
Maintenance Issues

Repair technicians must clean and inspect moving parts for wear, damage and lubrication levels, especially when the tooling is close tolerance, and operating in unclean conditions that are high in heat and under pressure. Otherwise, small scuffs turn into minor leaks that result in major leaks. Improper removal, cleaning and reassembly of delicate tooling and critical seals will influence manifold performance and, in some cases, void the manufacturer's warranty. It is imperative for repair technicians to possess a working knowledge of the impact of heat expansion and residue levels on preload, seals, valve-pin function and stack height. Electrical knowledge is also key for proper heater and thermocouple inspection, testing, removal and installation.

When a manifold runs too long in between cleanings (or in this case about 1,500,000 cycles) a high level of residue contamination clogs air passages in the plates and components. Technicians must clean all plates and tooling thoroughly before reassembly. Cleaning this 48-cavity mold by hand would be mediocre and time-consuming, so an ultrasonic tank is indispensable in this instance.

Valve-gated systems that are air-based, oil-based or mechanically actuated add another level of complexity for technicians even though they all contain the same basic parts (valve pins, valve-pin bushings, cannisters or piston housings, pistons and a variety of internal and external seals). A lack of proper lubrication, rough handling of components during a PM or incorrect assembly will create dings, scratches or burrs that cause wear.

Technicians often overlook the cleaning of air lines through the mold base and small inlet holes that actuate the valve pistons, which affects operating pressures. Valve-pin actuation pressure reduces when these lines and holes get clogged from dirty air or off-gas weeping. This results in uneven and sluggish movement from one cavity to



Seventy-five percent of this mold's heaters stuck hard on the nozzles, even though technicians coated them with an anti-seize during the last PM. Removing these without damaging the heaters or thermocouples takes special tools and techniques.

another, causing uneven fill, shorts and long gates.

Long gate is the number-two culprit for manifold disassembly and repair. Fixed-gate systems also suffer from long gate but for different reasons. Fixed gates rely on a proper nozzle-tip configuration a relative distance to the gate and land area. Both systems require proper cooling and verification using timely flow-restriction analysis with a baseline water pressure versus a known gallons-per-minute (GPM) figure on all plates, cavities and cavity-gate inserts.

From a maintenance standpoint, technicians need to concentrate on more thoroughly controlling their part of the manifold-performance equation to reduce the amount and impact of environmental variables. This strategy will yield more accurate PM frequencies and instructions, improving manifold performance and defect consistency. MMT

CONTRIBUTOR

Steve Johnson is president of MoldTrax, which provides specialized course work, hands-on bench training, maintenance software, maintenance products, toolroom design and maintenance-efficiency auditing.

FOR MORE INFORMATION

MoldTrax / moldtrax.com / 419-281-0790 / steve@moldtrax.com

HEIDENHAIN

IMTS2018

Lake Side Center:
Booth #135226

Student Summit:
Booth #215108

+ **Connected Machining** – Efficient Processes through Customized Networking

The workpiece comes into being at the machine, and the responsibility lies with you—the specialist in the shop. Your knowledge and skill are crucial for efficient production. But for this to happen, you need to be able to leverage your know-how and make use of all available information. **Connected Machining** from HEIDENHAIN makes this possible. Regardless of your individual setup, **Connected Machining** turns your machine control into the hub of a process chain with a completely digital flow of information.

HEIDENHAIN CORPORATION, 333 East State Parkway, Schaumburg, IL 60173 847-490-1191 www.heidenhain.us

Angle Encoders + Linear Encoders + Contouring Controls + Position Displays + Length Gauges + Rotary Encoders

The Impact of Tax Reform on Capital Expenditures

By Michael J. Devereux II, CPA, CMP

The Tax Cuts and Jobs Act (the Act) impacts how mold builders account for income and compute tax liabilities in 2018 and beyond. The Act introduces dozens of new provisions and significantly modifies or eliminates others.

Many of the provisions are taxpayer-friendly, including how mold builders account for capital expenditures. Those expenditures include the purchase of equipment, machinery, tooling, plants and buildings and even a parking lot. The following explains how the new law impacts the purchase of capital assets.

Bonus Depreciation

Mold builders are allowed an additional bonus-depreciation deduction related to qualified property in the year that they place the qualified property into service. Bonus depreciation has always been temporary in nature but has been part of the tax code since 2001. Since then, mold shops have been entitled to a bonus, accelerated depreciation for qualified property, ranging anywhere from 30 to 100 percent of the asset's cost basis. Before the Act, the bonus depreciation amount was 50 percent of the adjusted basis for assets that were placed in service before 2018, and it would phase out as it decreases to 40 percent in 2018 and 30 percent in 2019.

The bonus depreciation is an acceleration of depreciation. For example, if a mold shop buys a new lathe, then the lathe qualifies as a seven-year Modified Accelerated Cost Recovery System (MACRS) property for $250,000 on September 1, 2017. The shop will claim a bonus depreciation deduction of $125,000, with the remaining $125,000 of the tax basis recovered over the life of the asset.

MACRS is the current tax-depreciation system in the United States, under which the capitalized cost (or basis) of tangible property is recovered over a specified life by annual deductions for depreciation.

Bonus depreciation for the eligible property is automatic. Mold builders can elect out of the bonus depreciation for any class-life of property. The mold builder makes the election concerning a class-life of property and not for a particular asset. For example, a mold builder that purchased both a five-year MACRS property and seven-year MACRS property in a tax year may choose to elect out of bonus depreciation for the five-year MACRS property but claim the bonus depreciation for the seven-year property.

Qualified property that is eligible for bonus depreciation includes tangible personal property with a MACRS asset life of 20 years or fewer, certain off-the-shelf computer software and qualified improvement property. Also, the property's original use has to have commenced with the taxpayer. That is, the property has to have been new under the old law.

The Act retroactively increased the bonus-depreciation percentage to 100 percent for property placed in service after September 27, 2017 and through December 31, 2022. Beginning in 2023, the bonus-depreciation percentage is phased-down as follows:

- 80 percent for property that is placed in service during calendar-year 2023
- 60 percent for property that is placed in service during calendar-year 2024
- 40 percent for property that is placed in service during calendar-year 2025
- 20 percent for property that is placed in service during calendar-year 2026

Mold builders may elect to claim the 50-percent bonus depreciation instead of the 100-percent bonus depreciation for qualified property that they place in service during the first tax year ending after September 27, 2017 (which is the calendar year 2017 for most businesses).

Also, the Act modifies the definition of qualified property to include used property that was not used by the taxpayer before it was acquired by the taxpayer. That is to say, *used* machinery, equipment and other qualifying property may now qualify for bonus depreciation as long as the mold builder has not used or leased the property before purchase.

This is the first time that tax law has included used pieces of equipment in what it defines as qualified property since the introduction of bonus depreciation in 2001. The provision is certain to impact the merger and acquisition (M&A) market, as firms structure numerous deals as asset sales for federal income tax purposes. That is, if a company is purchasing all of the assets of another company, the buyer may be able to write off 100 percent of the purchase price allocable to the qualifying property. This

IMTS2018

September 10 – 15, 2018

SOUTH BUILDING
BOOTH 338900

More information
imts.dmgmori.com

DMG MORI

acceleration in the recovery of the purchase price may increase the value of the acquisition and increase the purchase price.

Mold builders who own their own plants in a real-property trade or business, who have average annual gross receipts from over the past three tax years that exceed $25 million and who are highly leveraged with debt may consider electing out of the new interest expense limitations and use the Alternative Depreciation System (ADS) in lieu of claiming the bonus depreciation. This may preserve their ability to deduct their interest expense on debt that was used to acquire the plant.

Section 179

Before the Act, mold shops were allowed to immediately expense up to $500,000 of the cost of Section 179 property. This amount is indexed for inflation and was $510,000 for property that was placed in service in 2017.

This provision has generally been used by small and medium-sized businesses, as the benefit was phased out once the eligible purchases exceeded $2,000,000 (or $2,030,000 in 2017, as the phase-out also was indexed for inflation). If the mold builder exceeded the phase-out amount in a given year, the amount of Section 179 deduction available for immediate expensing decreased by the amount that exceeds the phase-out amount. For example, for tax year 2017, mold builders could no longer claim a Section 179 deduction if the amount of the eligible purchases exceeded $2,540,000 (or $2,030,000 plus $510,000).

The Act increases the Section 179 limit from $500,000 to $1 million and also increases the phase-out threshold to $2.5 million. This means that the Section 179 amount is not phased-out until eligible purchases exceed $3.5 million. Also, mold builders may claim up to $25,000 of Section 179 on eligible SUVs purchased and used in the business.

The Act also amended the definition of eligible Section 179 property to include qualified improvement property and improvements made to a mold builder's manufacturing plant, such as a new roof, heating, ventilation and air-conditioning property and fire protection and security systems.

The Section 179 changes apply to property that mold builders place in service in the tax year beginning after December 31, 2017.

Like-Kind Exchanges

A like-kind exchange enables mold builders to defer the gain related to the sale of property that is used in the mold builder's business as long as like property is purchased within the appropriate time frame and used by the mold builder.

The Act limits the benefit of a like-kind exchange to real property. Like-kind exchanges are no longer available for personal property.

The Act has made drastic changes to how mold shops account for capital expenditures. Because of the increased benefit of bonus depreciation and Section 179 coupled with the expanded definition of qualified property, mold builders are poised to reduce their federal tax liabilities. Proper cost segregation may mean added benefit to those mold builders who take steps to classify the appropriate class life to property and use the new provisions provided by the Act. MMT

CONTRIBUTOR

Michael J. Devereux II, CPA, CMP is a partner and director of manufacturing, distribution and plastics industry services at Mueller Prost.

FOR MORE INFORMATION

Mueller Prost
314-862-2070
mdevereux@muellerprost.com
muellerprost.com

OKUMA
OPEN POSSIBILITIES

IMTS2018
BOOTH 338500

BEING ON THE CUTTING EDGE NEVER GETS OLD

Okuma's OSP-P open-architecture control gives you access to new ideas, technologies and apps every day. So whatever challenges you're facing, there's a great chance that someone from the Okuma community can help. Or you can help yourself by creating your own machine-tool app. Okuma's open-control platform puts the power of innovation in your hands. Use it to fuel your business.

See where Okuma can take you.

To learn more about Okuma at IMTS 2018, go to okuma.com/IMTS

CONTACT YOUR LOCAL OKUMA DISTRIBUTOR

ARIZONA CNC EQUIPMENT
www.arizonacnc.com

EMEC MACHINE TOOLS, INC.
www.emecmt.com

HEMAQ
www.hemaq.com

GOSIGER
www.gosiger.com

MORRIS GROUP, INC.
www.morrisgroupinc.com

HARTWIG
www.hartwiginc.com

THOMAS SKINNER & SON
www.thomasskinner.com

News and Reviews from **Industry Organizations**

Canadian Association of Mold Makers (CAMM)

Members of the Canadian Association of Mold Makers (CAMM) recently participated in a civic project that required their metalworking skills on a more artful level than even moldmaking requires. "Our Rotary Club is 100 years old this year," Janet Kelly, Chair of the Rotary Club of Windsor (1918) Centennial Legacy Projects Committee, says. "The City of Windsor has a five-year plan to develop pieces of the river front and asked us if we would like to work with them to develop the piece of land just west of the Festival Plaza," she says.

Enter CAMM, whose members were asked to partner with the Rotary Club by machining and assembling five sculptures (two large and three smaller versions of the same design), which were designed out of aluminum by Windsor's landscape architect Stefan Fediuk. "CAMM Chair Jonathan Azzopardi of Laval International and Mike Hicks of DMS (Canada) Ltd. were instrumental in bringing fellow CAMM members, including Cavalier Tool and Mfg., Omega Tool Corp., Windsor Mold Group and Integrity Tool and Mold, into the project. CAMM stepped up largely to build the sculptures for us and helped us with some design modifications because they had better ideas than we did," Kelly says. "They're very creative. The sculptures needed to be cut, polished and coated—it was quite a process."

On May 29, 2018, Rotarians and CAMM members alike gathered at the Centennial Plaza to officially open it to the public. Visitors to the plaza's main entrances were greeted by the large-sized gateway markers that feature shell-shaped gears meant to communicate that the Rotary Club's service to the community is eternally ongoing, according to Kelly. These, and the three smaller versions placed at other entrances, welcome visitors in 40 languages.

The Mold Technologies Division of the Society of Plastics Engineers

The Mold Technologies Division of the Society of Plastics Engineers (SPE) honored Charles (Chuck) Klingler, vice president of Janler Corp. in Chicago, Illinois, as Mold Maker of the Year. The award was presented during Amerimold 2018 in Novi, Michigan.

Each year, the SPE Division recognizes individuals who have supported and advanced the moldmaking industry by making contributions above and beyond the norm. Both a Mold Maker of the Year award and a Mold Designer of the Year award are presented along with a $500 honorarium that is donated to the trade-related education program of the honorees' choosing. Lake Park High School in Chicago will be the beneficiary of Chuck's honorarium. SPE named James Baldwin of Western Carolina Tool and Mold in Horseshoe, North Carolina, the SPE Mold Designer of the Year. His grant money will go to benefit the Blue Ridge Community College Educational Foundation for its mold design and injection molding programs.

American Mold Builders Association (AMBA)

The American Mold Builders Association (AMBA) supplemented activities that were offered during Amerimold week by hosting an educational tour of Quest Industries in Lapeer, Michigan. Attendees were treated to an informative and in-depth view of how the company uses its enterprise resource planning (ERP) system *backward* to optimize the way it schedules and moves work through the shop. That's right. The company plans jobs by looking at the delivery date first and then working backward. This strategy did not happen out of the gate in 2006 when Quest purchased its JobBoss ERP software, but today, JobBoss is its primary ERP system with the addition of Unipoint quality management software. As discussed in *MoldMaking Technology*'s May feature, Exact Synergy Enterprise (ESE) is the glue that ties all of the information together so that detailed information about every job, from start to finish, is always accessible to anyone who needs it.

Additionally, the AMBA conducted a Tech Talk session at Amerimold that presented workforce development strategies for closing the skills gap. Representatives from four AMBA member companies participated: Tim Myers with Century Die Co., Britteny Willis with Paragon D&E, Kylee Carbone with Westminster Tool and Tom Barr with TK Mold and Engineering. The representatives from these companies shared how they are creating apprenticeship and training programs, are partnering with area schools, are developing software training and are investing in equipment or software. These companies discussed how they are hosting open houses, are developing videos and other promotional materials and are participating in career fairs and industry advocacy at government and community levels. MMT

KITAMURA®
Machining Challenges-Simplified®

From every perspective, the Kitamura SUPERCELL-300G brings high-impact productivity to your shop floor. Owners love that these high-speed, 5-axis horizontal workhorses don't just save time, they create time. Instead of a 2-shift, 80-hour week, now you can operate lights-out, 24/7 for 168 hours. Machinists love the 20-pallet/174-tool capacity. And clients love your shop's new-found responsiveness and flexibility. It's a win-win-win, made easy. Learn how online or call for a demo today. **kitamura-machinery.com 847.520.7755**

[SHOP FLOOR PRODUCTIVITY]

KITAMURA®
MAKES [ ] EASY.

JIM HAYSSEN
Owner Bradford Machine Company

JOHN THERRIEN
CNC Mill Supervisor

DAVID SQUIRES
CNC Milling Machinist

See us at IMTS 2018
Booth 339148

CELEBRATING 85 YEARS

Index Marks Sharp Deceleration

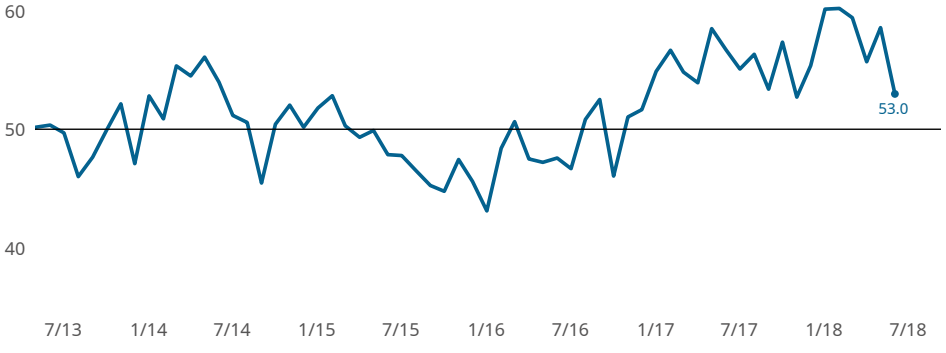
Slowing growth in new orders and production affects the Moldmaking Index, at 53.0 for June 2018.

Registering 53.0 for June, the Gardner Business Index (GBI): Moldmaking experienced a sharp drop after posting its fourth highest reading during the prior month. During the first half of 2018, the Moldmaking Index averaged 57.9, which is better than the average 55.5 from the 2017 calendar year. The Moldmaking Index fell by 6.9 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 and employment drove the Moldmaking Index's average-based calculation higher while production, new orders, backlog and exports reduced the Moldmaking Index's average-based calculation. Only exports reported contraction in June, while production and backlog registered only slightly above 50, a value that indicates "no change." The latest survey data suggests that the current market expansion may be nearing maturity as slowing growth in new orders and production is eclipsed by increasing growth in production throughput, which is indirectly measured by supplier deliveries and employment. MMT

ABOUT THE AUTHOR

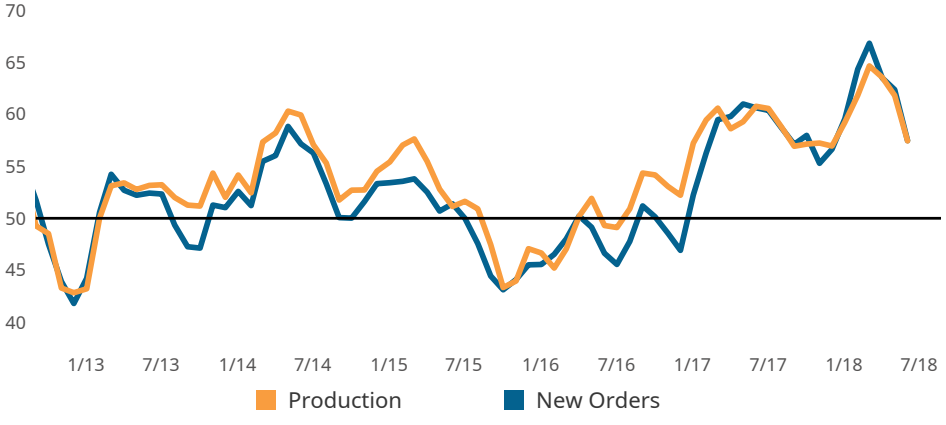
Michael Guckes is the chief economist for Gardner Intelligence, a division of Gardner Business Media (Cincinnati, Ohio, United States). He has performed economic analysis, modeling and forecasting work for nearly 20 years among a range of industries. He is available at mguckes@gardnerweb.com

Gardner Business Index (GBI): Moldmaking



Supplier deliveries and employment were the primary supporters of June's Moldmaking Index. All other components registered lower readings in comparison to readings from the prior month.

Production and New Orders (3-Month Moving Average)



Readings for new orders, production and backlog have slowed sharply since the beginning of the year. All three metrics registered only slightly above 50 in June, indicating only very slight expansion from the prior month.

G-SERIES

Precision at the highest level

Visit us on IMTS!
IMTS2018
10th – 15th of September 2018
South Building, Stand 339033

GROB 5-axis universal machining centers stand out due to their absolute precision and reliability in the automotive, medical and mechanical engineering industries, in tool and mold making as well as especially in the aviation industry. The proven 5-axis simultaneous technology with horizontal spindle position enables you to machine parts of various sizes and materials in a flexible and failure-free way while offering maximum stability of the machine. Fast chip-to-chip times and the innovative further development of our spindle technology guarantee a high economic efficiency and productivity.

GROB

www.grobgroup.com

Contact: GROB SYSTEMS, Inc. I Bluffton, (Ohio, USA)
Phone: +1 419 358-9015 I E-Mail: info@us.grobgroup.com

Growth in Electronics Outpaces National Economy

Data through the first quarter of 2018 points to an industry in the midst of above-average growth.

Gardner Intelligence has collected and reviewed the reported financial results of over 90 publicly traded electronics firms through the first quarter of 2018, and it has found an industry that has been experiencing above-average growth that is likely to continue. Calculated on a year-over-year basis, inflation-adjusted revenue growth at the end of March was 6.9 percent. Earnings before interest, taxes, depreciation and amortization when measured using the same technique was up 4.0 percent at the end of the first quarter. In comparison, May 2018 figures from the Federal Reserve indicate that U.S. total economic growth increased 2.5 percent, which suggests that the industry grew more than twice as fast as the overall economy.

Year-on-year capital-expenditure growth ending in the first quarter of 2018 showed more than an 11-percent increase. However, these elevated figures are, in part, a result of contracted spending between the fourth quarter of 2016 and the third quarter of 2017.

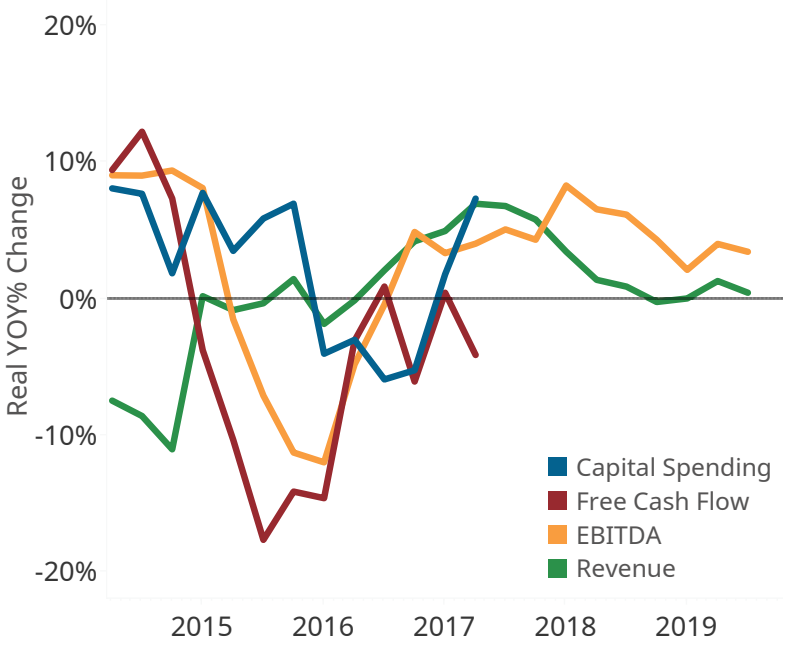
Among all firms reviewed in this study, 56 are tracked by one or several Wall Street analysts who also provide forecasts for revenues and earnings. Aggregating these forward-looking results, revenue growth will slow from nearly 7 percent in mid-to-late 2018 to nearly unchanged (or 0 percent) between the third and fourth quarters of 2019. Similarly, growth in earnings is projected to climax in late 2018 at just over 8 percent before slowing to a low of just above 2 percent in late 2019.

Capital spending data that Gardner Intelligence has independently collected from shops and fabricators corroborates this view. Data on expected spending hit a recent low in mid-2017 and has since rebounded through the latest available data collected in May.

One area of continuing concern within the electronics industry is the relative underperformance of small machine shops and fabricators (or those with fewer than 20 employees). Since early 2017, small shops have reported periods of both modest expansion and contraction. In comparison, larger shops with more than 100 employees have experienced history-breaking growth during the same period.

Applying Gardner Intelligence's multi-lens analytics approach to the electronics industry, the combination of actual and forecasted financial results, macroeconomic data and proprietary survey data all suggest that industry growth will exceed overall economic growth for the country. Machine shops and fabricators of all sizes are likely to benefit over the next 18 months with a bias toward larger shops experiencing greater opportunities for growth. MMT

Electronics Industry Actual and Estimated Results

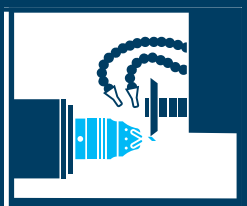


PRESENTED BY GARDNER INTELLIGENCE

FOR MORE INFORMATION:
Michael Guckes, Chief Economist, Gardner Intelligence
mguckes@gardnerweb.com / gardnerintelligence.com

Equipped by

SCHUNK



from ø 3 – 20 mm
flexibly clampable
Mechanical tool grinding toolholder PRISMO3

Less than 3 µ
run-out accuracy
Tool grinding toolholder with hydraulic expansion technology TENDO WZS

Up to 80 bar
Coolant-proof or with peripheral cooling
GZB-S intermediate sleeves

IMTS2018
Visit Us Sept 10–15
West Bldg 432010

Superior Clamping and Gripping

SCHUNK®

Everything for your Grinding Machine

The broadest tool grinding toolholder program with 14 standard machine interfaces.

schunk.com/equipped-by

IMTS2018

SEPTEMBER 10-15, 2018
McCormick Place, Chicago IL

IMTS.com

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

Medium-Format AM Machine Reduces Downtime

Trumpf Inc.'s TruPrint 3000 is a medium-format additive manufacturing machine geared towards the large-scale production of complex metal parts. The machine can make parts from a variety of weldable materials including steel, nickel-based alloys, titanium and aluminum. The machine uses laser metal fusion (LMF) technology and processes parts measuring as large as 300 mm in diameter and 400 mm tall. The laser's beam diameter measures between 100 and 500 microns. The system supports preheat temperatures ranging to 200°C.

The TruPrint 3000 features exchangeable build and powder supply cylinders to enable quick change-over and reduce downtime to as little as 30 min. between build jobs, the company says. The exchangeable cylinders save operators time by enabling them to prepare a new set of supply chambers or unpack a finished build outside of the machine in a separate unpacking station. The system is equipped with two 75-L supply cylinders that contain enough powder to complete an entire manufacturing process.

Trumpf Inc., North, Level 3, Booth 236217

Redesigned Chucks Connect to Smartphones Via Bluetooth

Erowa's SmartChucks line has been redesigned to combine precision and stability with wireless signal transmission. The design includes an integrated LED strip that displays the status of the chuck while in operation. It is able to indicate if the chuck is open, closed, improperly clamped or has insufficient clamping force. This functionality enables an operator to check the status at a glance.

The company has also developed a mobile app that compliments the chucks, which is said to retrieve clamping equipment data on a smartphone. Status requests and additional information regarding the life-cycle can be checked at any time via Bluetooth technology.

Erowa Technology Inc., East, Level 3, Booth 135037

Five-Axis Series Targets Tooling, Optics

Mitsui Seiki (USA)'s Vertex Hybrid G series of five-axis VMCs (models 55-5X, 75-5X and 100-5X) offer high speed, lights-out milling and grinding of die and mold, optical, and tooling components. The machines are capable of 0.0003" (7.5 µm) precision in 3+2 or simultaneous five-axis machining, and their main spindles rotate as fasts as 25,000 rpm. Air spindles enabling speeds ranging from 40,000 to 90,000 rpm can be changed via ATC.

FANUC 3D volumetric compensation features enable volumetric calibration according to ISO10320-2 standards and the use of in-process 3D (NIST) traceable measuring capabilities. A part spinning process produces tangential planetary work spindle alignment, emulating the U-axis motion of jig grinding equipment. The machines can employ trochoidal dynamic power or high-speed cutting strategies for tools rotating as fast as 90,000 rpm.

Key features include automatic, in-process grinding wheel dressing and size measurement and wheel calibration. Acoustic emission sensors and software-guided application strategies monitor milling and grinding process finishes.

The VMCs feature cast iron beds and a solid "box-in-box" design that contribute to rigidity, stiffness and agility. Positioning accuracy is 0.001 mm (0.000040") in the X, Y, and Z axes, ± 6 arc seconds in the A axis, and ±4 arc seconds in the C axis.

Hand-scraped guideways contribute to precision. A thermal compensation system facilitates size consistency, and glass scales provide a minimum resolution of 0.001 mm.

Mitsui Seiki (USA) Inc., South, Level 3, Booth 338519

AMERICAN MADE

FIBER LASER WELDING SYSTEM

BY MOLD MAKERS FOR MOLD MAKERS

a1D-1

FIBER LASER WELDER

STARTING AT ONLY

$1669.00/MONTH

THE ONLY LASER WELDING SYSTEM THAT CHECKS ALL THE BOXES.

- ☒ 450 WATT FIBER LASER WITH ZERO MAINTENANCE COSTS
- ☒ LOWER OPERATING COSTS AND POWER CONSUMPTION
- ☒ CONSISTENT PRECISION LASER WELDING POWER
- ☒ X,Y, Z MOTORIZED TRAVEL FOR LARGE WORKING RANGE
- ☒ MINIMAL HEAT OUTPUT MEANS NO CHILLER
- ☒ GAS LENS MEANS FILTER. BETTER AIR FLOW & CLEANER WELDS
- ☒ 220V SINGLE PHASE POWER REQUIREMENT
- ☒ HEAD TILT AND ROTATION FOR ERGONOMICS
- ☒ MOST VERSATILE AND AFFORDABLE SOLUTION
- ☒ MADE IN THE U.S.A.

ALLIANCE
SPECIALTIES AND LASER SALES

PHONE	847.487.1945	ADDRESS	265 INDUSTRIAL DR. WAUCONDA, IL 60084
MOLD SERVICES	ALLIANCESPECIALTIESINC.COM	MACHINE SALES	ALLIANCELASERSALES.COM

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 Celos Cockpit enables users to view the entire production process at a glance. This feature improves production transparency on all order statuses, bottlenecks, waiting times and causes. It enables workflows and machining processes to be digitally mapped, controlled and optimized. The interface's Open Connectivity feature enables network integration with machines from other manufacturers, technological areas and manual workstations.

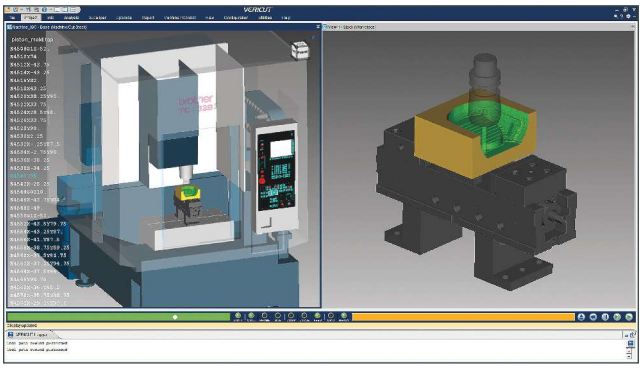
DMG MORI, South, Level 3, Booth 338900

Fiber Laser Welding System Uses Diode Pumps for More Power

The ID1 fiber laser welding system from **Alliance Specialties and Laser Sales** uses Fiber Solid State (FSS) laser technology, which generates laser power through a series of diode pumps instead of crystals and mirrors. This removes many of the intricate parts found in typical YAG lasers and results in virtually zero maintenance for the user, according to the company. The machine's design also offers high beam quality, air cooling for high ambient air temperatures, low power consumption, long diode life (ranging to 100,000 hours), fewer necessary optics, and easy integration and service.

The swivel design provides unlimited head position configurations for greater job flexibility, 4.5-ft. travel and full 360-degree rotation. Alliance says that every part of this system is easily adjustable, giving the operator versatility and flexibility to meet most laser repair demands. It is designed to be manually adjusted, which eliminates the possibility for mechanical failure and offers the ability to focus on specific areas, ultimately reducing wear.

Alliance Specialties and Laser Sales, North, Level 3, Booth 236570



Software Performs CNC Simulation Plus Physics-Based Optimization

Version 8.2 of **CGTech's** Vericut optimization and verification software simulates an expansive range of CNC machine types and manufacturing operations. The list includes drilling and trimming, waterjet machining, riveting, and milling and turning. It can simulate robots and parallel kinematic/hexapods as well. It operates independently but can be integrated with CAM systems.

During machine simulations, the software detects collisions and near-misses between all machine tool components and user-defined objects. Users can also set up "near-miss zones" around the components to detect over-travel errors. In Review Mode, the software can simulate machine movements while stepping or playing backward.

A customizable heads-up display (HUD) shows the NC program or status item on top of Views. The HUD monitors the NC program and important machine functions while keeping simulation Views as large as possible. Program Alerts highlights errors and warnings, and, when running multiple NC programs, it highlights programs with errors in red.

Force is a physics-based NC program module that analyzes and optimizes cutting conditions throughout CNC program operations. Force is available for turning and milling machines. Force Turning facilitates changing and limiting chip thickness and feed rates while cutting in corners, diameters and tight spaces. Force Calibration creates Force Material Files from dynamometer test data. It includes a Design of Experiment (DOE) planner, validates data and shows statistics.

The software also adds realism to additive simulation to improve verification of additive build processes. These processes include the buildup of overlaps, acute corners, tight overlapping bead paths and double deposits (overlapping start/end points). An alert message will appear when the laser focal point is too far from the part's surface, when there are excessive overhang conditions or when there is too much build up at corners and overlaps.

CGTech, East, Level 3, Booth 133346

Six-Axis Machine Reduces Setups, Saves Space

Promac's Levante GTR six-axis multifunctional working center offers a compact footprint and a large machining envelope. It enables roughing, semi-finishing, finishing and deep drilling operations in a single setup. The machine can use drilling tools as long as 23". Designed to accommodate automation, the machine suits automotive, aerospace, energy, mechanical and prototyping applications. It can produce medium to large, complex parts.

Promac Srl, South, Level 3, Booth 339449

Gaging System Measures Larger Parts with Speed, Repeatability

Renishaw's Equator gauging system is designed for speed, repeatability and ease of use in manual or automated applications. The Equator500 system gauges larger parts than previous models. It has has a working volume of 500 mm in diameter and as high as 400 mm.

Other products on display are the RenAM 500Q multi-laser AM system, the XM-60 diagnostic laser measurement system, the Sprint scanning measurement system and the Revo multi-sensor measurement system.

Renishaw Inc., East, Level 3
Booths 135509, 215215, 431607

Software Streamlines Machine Programming

Autodesk's FeatureCAM 2019 is designed so that instead of having to program a machine stage by stage, the operator can program it using everyday shop terms, such as 'turn,' 'bore,' 'bolt,' etc. The software is said to have sufficient intelligence to recognize needs and requirements from such terms and will automatically adopt the right speed and torque strengths without having to be instructed line by line.

New in FeatureCAM 2019 is the Directed Automated Feature Recognition (DAFR) capability, which automatically recognizes holes, bosses, sides and pockets in a single workflow, which enables faster programming. While standard AFR slices the model in the active Z axis and produces complete features as it makes its way down the model, DAFR allows the user to select the features they want even before recognition begins.

Autodesk Inc., East, Level 3
Booth 133222

Five-Axis Line Targets Die/Mold, Aerospace

Takumi USA's series of five-axis machining centers includes the U600 model (XYZ/AC Travels: 24.4" x 39.4" x 19.7"/+30°-110° x 360°) and the U800 model (XYZ/AC travels: 31.5" x 39.3" x 29.5"/±120° x 360°). Both machines utilize a trunnion-style, two-axis table and the Heidenhain TNC 640 control. The machines are designed for die/mold, aerospace and high-speed applications that require tight tolerances.

The U800 isa gantry machining center with a high-torque table (800 mm platter) with an 80-rpm, twin-torque motor in the A axis and a 100-rpm, single-torque motor in the C axis. It will be shown cutting a 20" tall, 4140 steel replica of the famous *Venus De Milo* sculpture to showcase its rigidity, speed and surface finish capability.

Takumi USA, South, Level 3, Booth 338420

Measuring Equipment Detects 3D Printing Defects

Zeiss's optical 3D scanners, CT scanners, high-resolution X-ray microscopes and coordinate measuring machines (CMMs) detect 3D printing defects and downstream processing problems. The company's CT scanners enable users to check the interior structure of components and identify defects or dimensional errors. Optical and X-ray systems can be used to inspect outer and interior surfaces.

The company's measuring equipment and scanners enable users to compare measurement data across all manufacturing steps. The equipment is meant to help companies quickly determine if downstream processes, such as heat treatment and removal of components from the build plate, affect a part's final dimensional characteristics.

Zeiss IM & MIC, East, Level 3
Booths 135502, 215406, 215618

Deep Hole Drilling and Machining for Moldmakers

Unisig will feature a custom machine from its R&D lab. The machine will demonstrate the extreme depth-to-diameter ratios possible with the latest control technologies. It possesses CNC motion control capabilities to produce accurate, off-center gundrilled holes. The company will also introduce its expanded line of deep hole drilling and machining centers designed for moldmakers. These machines complement the company's existing USC-M series of four- to seven-axis deep hole drilling and machining centers. Four-sided machining capability enables manufacturers to process large and small parts alike in a single setup.

Unisig Deep Hole Drilling Systems, South
Level 3, Booth 339159

3D Printing With ABS Reduces Part Weight and Production Time

A **Baker Industries** original equipment manufacturer customer was seeking a solution to reduce the weight of a traditionally machined aluminum mill fixture. Customarily, this fixture is used to hold parts in place during the trimming process. However, fixtures that are too heavy can result in component damage.

By 3D printing the mill fixture using ABS thermoplastic material instead of machining it from aluminum, Baker Industries was able to reduce the tool's weight by 70 percent, which served to protect the parts that were being trimmed and provide a safer solution for employees handling the tool. In addition to reducing the weight, 3D printing the tool enabled the customer to save time on production. The team was able to print the tool in approximately fifty hours, which saved the customer a week of lead time that the customer normally would have needed to machine the tool.

Baker Industries, North, Level 3, Booth 236372

Machining Center Combines Five-Axis Milling with Laser AM

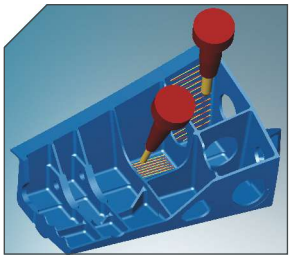
Okuma America Corp.'s MU-8000V Laser EX multitasking machine combines five-axis machining with a Trumpf laser, providing both additive and subtractive manufacturing capabilities. It enables complete part production on one machine.

The machine implements laser metal deposition (LMD) technology to provide users with the ability to cut parts of different sizes and shapes. LMD supplies powder from nozzles and performs laser melting and bonding to parent material. This enables the combination of various types of materials, as well as three-dimensional fabrication and cladding. Variable control of laser spot diameters (from 0.4 to 8.5 mm) increases efficiency and resolution, according to the company. This combination of features enables mid-process part inspection and material exchange, coolant use in the work envelope and greater process speed.

Okuma America Corp., South, Level 3, Booth 338500

CAM Software Improves Workflow, Enables Machine Simulation

Open Mind Technologies's HyperMill CAM software includes a range of features: greater blending capabilities, 3D-optimized roughing and finishing, global fitting, rotational abilities for CAD electrode applications and virtual machining simulation. Virtual machining enables real-time communication between the machine tool controller and a remote simulation, which improves workflow.



For 3D Z-level Shape Finishing, the Automatic Face Extension capability can be used to extend selected milling surfaces, which reduces the need to modify the milling faces in the CAD system. Barrel cutters can also be used for 3D Z-level Shape Finishing. 3D Optimized Roughing improves machining when using free tool geometries.

The Maxx Machining finishing module enables the use of conical barrel cutter technology to reduce machining cycle times. It is suitable for planar, ruled and curved surfaces found in five-axis components. The module offers functions for finishing, roughing and drilling.

Open Mind Technologies USA Inc., East, Level 3, Booth 133351

Drills Tackle Tough Materials, Flat Holes

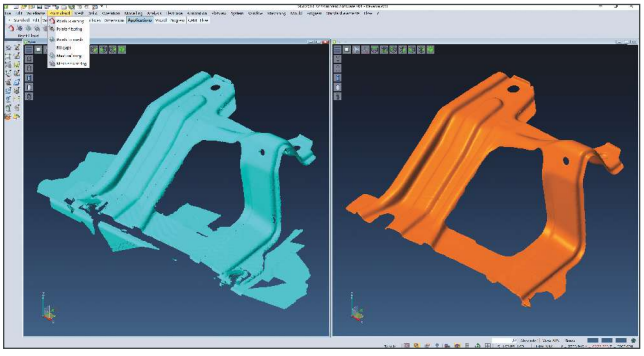
OSG USA's A-Drill series includes the Exocard AD, ADO, ADO-SUS and ADF drills.

Suitable for both ferrous and non-ferrous materials, the Exocarb AD and ADO carbide drills are designed to provide high-point strength with low cutting force. EgiAs coating, which features high-wear and heat-resistance characteristics, contributes to extended tool life. A coolant-through option is available.

The Exocarb ADO-SUS coolant-fed carbide drill features a coolant hole shape and tool geometry designed specifically for drilling difficult-to-machine materials like stainless steel and titanium.

The Exocarb ADF carbide flat drill is designed to machine flat holes without a separate end mill. One-step drilling reduces machining time and eases tool management. It is designed for work on inclined surfaces and curved surfaces and can perform counterboring, eccentric-hole and thin-plate operations.

OSG USA Inc., West, Level 3 & Annex, Booth 432080



Software Platform Updates Provide Improved Functionality

Version 2018 R2 of the Visi software platform from **Vero Software** provides a module for reverse engineering, along with improvements for CAD and CAM processes. The platform is useful for the mold and die market.

The reverse engineering modules enable loading of a points cloud and the relative mesh created by setting different options for refining and smoothing.

The platform contains almost 250 new items, including updates to direct-modeling capabilities that provide additional editing for both solids and surfaces.

The Edit Face module provides the ability to edit solid bodies by moving or pulling selected faces. Concentric faces can be automatically selected and edited as well. Enhancements to both Surface Extension and Fill Holes enables the user to work directly on a solid body's faces and not just on the surfaces, which saves time.

Toolpath Mirroring copies the current project, mirroring all its toolpath operations. This can be achieved on any two-axis, three-axis, 3+2-axis, four-axis or five-axis toolpath. Improved workplane management, improved face selection on solids, and new contextual toolbars are additional features.

Workplane management eases use as a workplane is automatically orientated as soon as the desired face of a solid is selected during any operation. Updates to the faces selection tool enables matching faces to be selected by providing specific conditions such as planar, cylindrical and fillet face types, along with radius condition, orientation and colors.

Vero Software, East, Level 3, Booth 133114

CNC's Touchscreen Interface Contributes to Ease of Use

The ProtoTrak RMX CNC from **Southwestern Industries** functions on ProtoTrak machines designed for toolroom applications. A touchscreen interface contributes to ease of use. The controller also delivers context-sensitive instructions as users require them. Bulleted text, diagrams and videos are available as well. Defaults enable users to teach the controller idiosyncratic programming and machining styles. The Auto Geometry Engine feature includes the Tap-to-Guess function, which enables users to tap a point on the on-screen drawing to approximate the beginning, end or center of a geometry. Adaptive Machining enables users to increase the metal removal rate by 500 percent or more, the company says, through the selection of programming options.

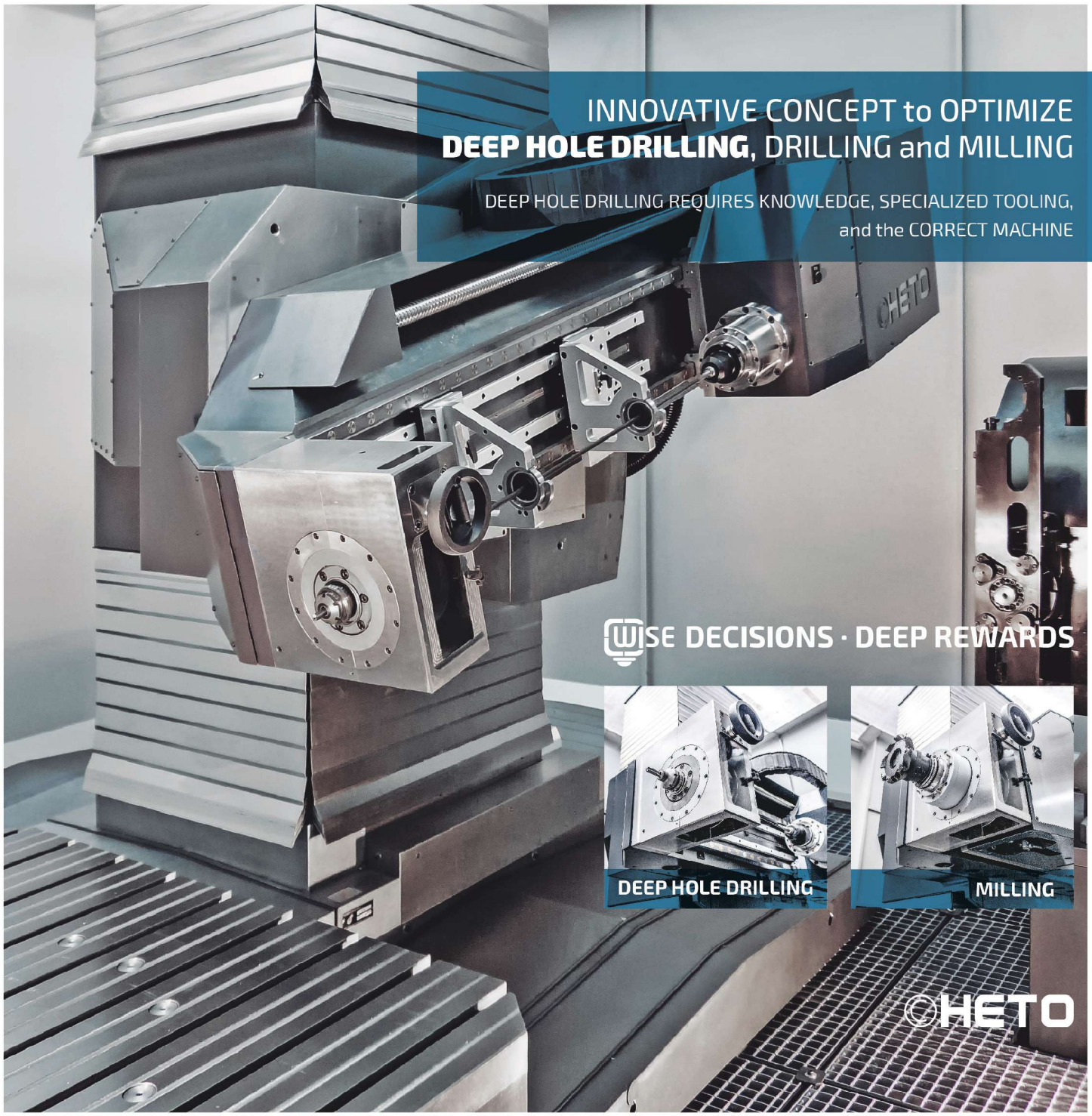
Trak Machine Tools, South, Level 3, Booth 338032

CHETO

CNC DEEP HOLE DRILLING WITH MILLING

Management System ISO 9001:2015
TÜVRheinland CERTIFIED
www.tuv.com ID 9105076158

www.cheto.eu



North America Exhibition

IMTS2018
september 10-15
Chicago, IL
East Building-Level 2, booth 121229

Find your local distributor at www.cheto.eu

CHETOCORPORATION, S.A.

NORTE 2020 · PORTUGAL 2020 · UNIÃO EUROPEIA · Fundos Europeus Estruturais e de Investimento · CE

End Mills Enable Trochoidal Milling, Fine Finishing

YG-1 Tool Co. will display the V7PlusA series of end mills, which features four- and six-flute models, and the Titanox series, which offers four- and five-flute models that provide better performance in heavy cutting, trochoidal milling and fine finishing, according to the company.

The six-flute models from the V7PlusA series offer improved cutting geometry, making them more applicable to trochoidal and peel milling. For heavier cuts, the four-flute models provide variable-helix and unequal pitch design, which helps to eliminate vibration.

YG-1 Tool Co., West, Level 3, Booth 432442

EDM Provides Friction-Free, Accurate Column Movement

MC Machinery's MV2400-ST EDM is designed for large-part production and is capable of performing submerged cutting as low as 16.5" deep. With an annealing length over 21", the machine can thread the maximum workpiece height both at the start point and through the gap for broken-wire recovery.

The machine's linear shaft-motor drive and glass-scale feedback contribute to accurate, friction-fee column movement through the X and Y axes. The machine also features the Mitsubishi M800 series control with a 19" touch-screen, providing a user-friendly interface.

The control uses rotational and tilting functionality while showing job-monitoring data in a single view. The navigation interface provides smooth job operation, enabling the quick and accurate completion of production jobs, according to the company.

MC Machinery Systems Inc., South, Level 3, Booth 338158

SINCE 1958
"60 Years of Excellence"

die mold | PRECISION EXCELLENCE

VisionGauge® | 500 Series

- Digital Optical Comparator
- Magnification: 5X, 10X, 20X, 50X, 100X
- Eliminates Mylars
- Automatic Part Documentation
- LED Illumination

NIGATA | HN50E-5X

- 5-Axis Horizontal Machining Center
- 50 Taper Geared Spindle
- Superior Heavy Duty Dampening
- Hand Scraped & Ground Box Ways
- Scale Feedback on All Axes (std.)

YASDA | YBM Vi40

- Full Simultaneous 5-Axis Precision Center
- 24,000 RPM BIG-PLUS 40 Taper
- Direct Drive Self-Adjusting Spindle Preload
- Advanced Thermal Displacement

IMTS2018
SOUTH HALL | **BOOTH # 339119**

Methods
877.668.4262 | methodsmachine.com

Hybrid Machine Fuses Laser Sintering with Milling

Matsuura's Lumex Avance-25 metal laser sintering hybrid milling machine fuses laser sintering with high-speed milling technology. Using 3D data for digital engineering, the machine serves the precision mold and die market. Complex geometries can be fabricated in one piece, shortening lead times and reducing manufacturing costs.

Internal geometry can also be incorporated into molds, such as 3D cooling channels that increase cooling efficiency and enable high-cycle injection molding.

Matsuura Machinery USA Inc., South, Level 3, Booth 338148

Wire EDM Improves Positional Accuracy

Makino's UP6 Heat wire EDM is designed for precision stamping and fine blanking applications. It is also suitable for die tooling for electric motor stators. The machine features a stationary work table designed to improve positional accuracy, and it uses a programmable, rise-and-fall, three-sided work tank that improves ergonomic access to the work zone. This configuration also simplifies requirements for automation.

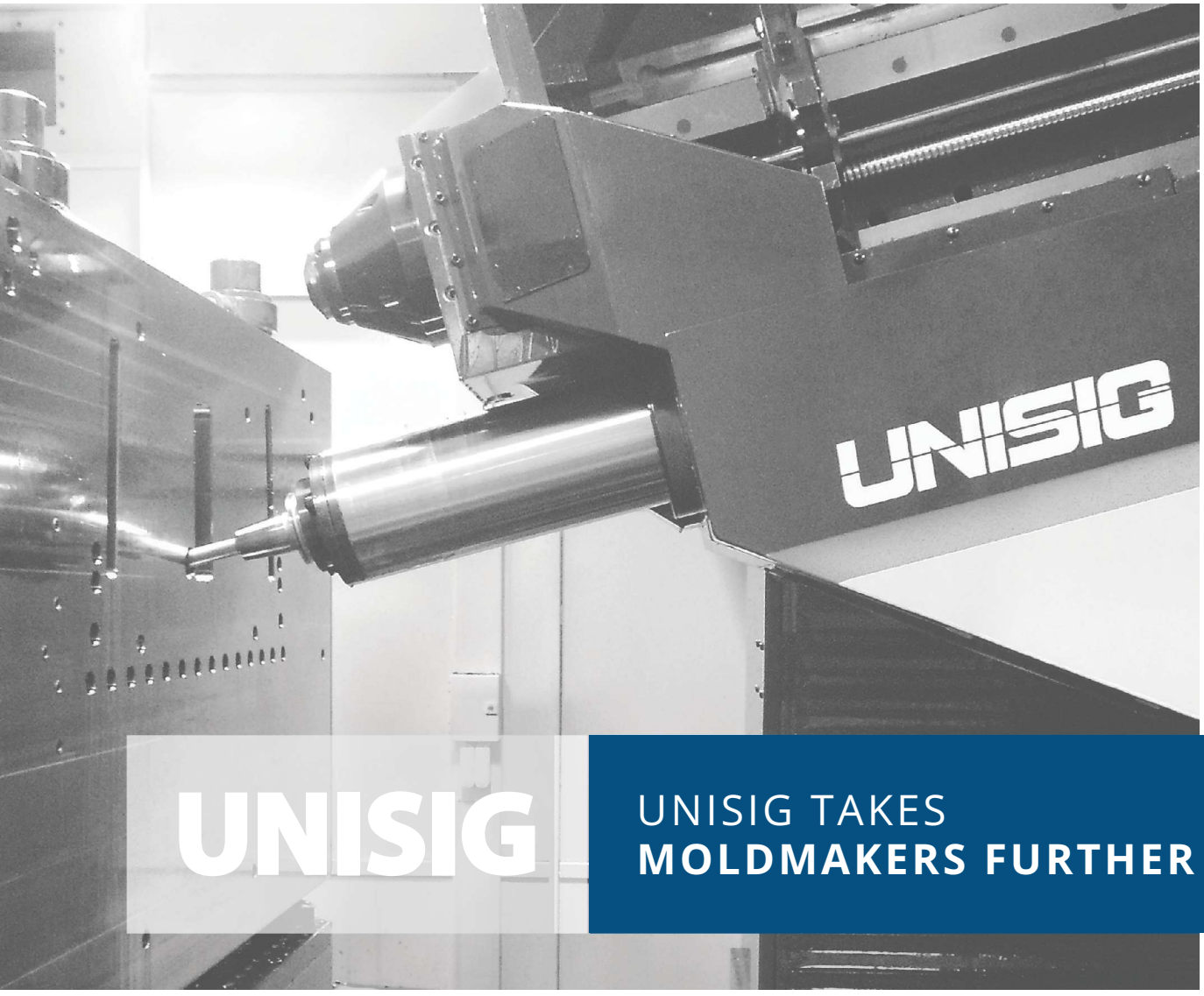
Several features are designed to improve long-term thermal stability, including integration of the dielectric fluid reservoir into the base casting of the machine. Chilled dielectric fluid is circulated through the machine's casting to facilitate active thermal cooling and maintain machine temperature. The machine uses a Hyper-i control with a 24" HD touchscreen, which comes with the HyperConnect Industrial Internet of Things (IIoT) network-connectivity function for remote machine monitoring.

A wire-drive system uses AC motor tensioning, which expands the range and stability of wire tension and reduces maintenance requirements. A wire-threading system provides both jet and jet-less threading modes. It can rethread the wire in the gap at a break point.

Makino Inc., South, Level 3
Booth 338700

VISIT US IN BOOTH #339159 AT IMTS 2018!

UNISIG.COM



UNISIG

UNISIG TAKES **MOLDMAKERS FURTHER**

Increase your mold manufacturing versatility using the power of gundrilling with the leaders in deep hole drilling, UNISIG. Offering complete solutions for everything from simple to complex mold components, UNISIG machines help moldmakers improve efficiency, throughput and precision with outstanding part-processing versatility at an exceptional value.

Take your moldmaking operations further with UNISIG today. Find out more at UNISIG.COM.

UNISIG
DEEP HOLE DRILLING SYSTEMS

UNISIG machines are engineered and manufactured in the USA

HMC Cuts Large Aerospace Parts

The FZH HMC from **Zimmermann** is designed for parts as large as 630" x 122" x 39". Minimum part size in the X axis is 161". Said to be well-suited for the aerospace industry, the machine features an updated pallet handling system and traveling column. The traveling column is water-cooled and avoids deviation increases as the slide extends. Rather, as the guide carriage distance increases, rigidity increases as well. The stepped drive guide contributes to constant geometry along the Z axis, as well as rigidity in sensitive areas of the workpiece.

Zimmermann Inc. - Corporate HQ South, Level 3, Booth 339336

Entry-Level EDM Features Break-Through Detection

Methods Machine Tools will display Ocean Technologies' compact, entry-level River 300 EDM drill. It features break-through detection and an HP1+ power supply for reduced wear and shorter burn times with low energy consumption.

The machine uses linear guideways and a 100L DI/Filter. The XYZ-axis travels measure 11.8" x 7.9" x 11.8" (300 x 200 x 300 mm). Its W-axis travel measures 13.8" (350 mm). Table dimensions are 13.8" x 9.9" (350 x 250 mm). Maximum workpiece height is 11.8" (300 mm) with workpiece weight capacity at 330 lbs (150 kg).

E-Learning software is featured on the machine, enabling new operators to easily run it while seasoned operators can review particular processes on the fly.

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

Okamoto

Emerging Abrasives Technology

Surface, Profile, ID, OD and more. . .

Count on us for the widest range of top quality grinders.

Saddle & Rotary Type Surface Grinders & Precision Form Grinders

Linear B Series, PRG Rotary Series ACC-DX, ACC-SA, ACC-NC Series

Manual / Automatic / MDI Control / CNC

Grinding Capacities (W x L): 6" x 12" to 20" x 40"

ACC-CHiQ Series

CNC Double Column Surface Grinders

Grinding Capacities (W x L): 32" x 80" to 32" x 140"

Column Type Surface Grinders

ACC-CA, ACC-DX, ACC-iQ, ACC-DXNC Series

Automatic / MDI Control / CNC

Grinding Capacities (W x L): 16" x 24" to 32" x 80"

IGM Series Internal Grinders

MDI Control / CNC Single &Twin Spindle Models

Grinding Capacities:
Maximum Diameter to be Ground:
0.24" ~ 6" / 0.24" ~ 8"

Maximum Grinding Stroke: 5" / 8"

OGM Series Cylindrical Grinders

MDI Control / CNC

Grinding Capacities (OGM-8•20):
Swing over Table: 8.6"
Center Distance: 20"

Grinding Capacities (OGM-12 Series):
Swing over Table: 12.6"
Center Distance: 20" / 36"/ 59"

Also available OGM-8•20UDX with DX Control.
Perfect for toolroom applications.

UGM-5V CNC Universal Grinder

Grinding Capacity:
Maximum Diameter to be Ground:
2.75" ~ 19.7"

Maximum Grinding Stroke: 10"

UGM-1224NC 3-Spindle CNC Universal Grinder

Grinding Capacities:
UGM-12•24NC Swing: 12", Center Distance: 24"
UGM-12•40NC Swing: 12", Center Distance: 40"

Visit us at
IMTS2018
North Hall, Booth 236834

Okamoto Corporation **www.okamotocorp.com**

Industrial-Scale 3D Printer Facilitates Cost-Effective Production

EOS North America's EOS P 500 3D printer is intended for laser sintering applications on an industrial scale. The printer is designed to produce high-quality, cost-effective polymer parts. Its software tools are intended for ease of use. The machine offers materials flexibility with operating temperatures as high as 300°C. Its modular design enables integration with future machine adaptions.

EOS North America, West, Level 3 & Annex
Booth 432007

Robotic Drag Finisher Automates Cutting Tool Honing, Polishing

Bel Air's AutoHone robotic reverse drag finisher improves cutting tool honing and polishing workflow with very little operator involvement. The automated system achieves short cycle times and consistent results. In the reverse drag finishing process, the machine quickly moves process media, producing a high-energy "wave" that streams across the workpiece. The machine's six-axis robotic arm enhances control and precision over the workpiece's angle of introduction into the media. This results in complete, even and repeatable finishing processes.

Bel Air Finishing Supply, North
Level 3, Booth 237547

CAM Software Increases Cutter Life, Reduces Spotting Time

CGS North America Inc. sells and supports Cam-Tool and CG Camtool for SolidWorks. Cam-Tool has been designed for the mold and die industry. CGS's surface-based CAM-calculation engine produces accurate NC data and makes the software useful in high-accuracy 3D machining. The benefits of accurate NC code include increased cutter life and improved surface finish and accuracy. These result in reduced spotting time.

CGS North America Inc., East
Level 3, Booth 133006

HWACHEON

If You Don't Know Us, You Don't Know What You're Missing.

- **Top Innovator of Machine Tool Technology**
- **Top Mold & Die Machine Builder**
- **One of the Largest Independently Owned Machine Tool Builders**
- **66 Years of Machine Tool Technology**
- **Machines Packed with Innovative Features**
- **Quality, Reliability and Low Cost of Ownership**

Hwacheon meticulously builds machine tools, and we personally use those machine tools to manufacture casting products for top tier automotive manufacturers. Like you, we demand decreased cycle times and higher production. Constant testing and perfecting, plus 66 years of technology, have resulted in industry-exclusive innovations, and made us an industry leader. Contact us today to learn more about what makes Hwacheon the name you need to know.

Smart Solutions for Perfect Machining.

Hwacheon Machinery America, Inc.
Chicago Technical Center
555 Bond St., Lincolnshire, IL
60069 Tel. 847-573-0100

HWACHEON
www.hwacheon.com

YouTube Linked in

Come See Us at IMTS – September 2018/Booth #338119

3D Printing Platform Enables "High-Speed Digital Molding"

3D Systems's Figure 4 3D printing series consists of Figure 4 Production, Figure 4 Standalone and Figure 4 Modular models. The light-based UV curing process offers reduced production time compared to heat-based curing processes. The platform is said to deliver Six Sigma repeatability (Cpk > 2) across all materials, and data on Figure 4 Production show part-print speeds ranging to 100 mm/hr. The Figure 4 platform uses a process that 3D Systems describes as "high-speed digital molding," providing manufacturers the accuracy, reliability, repeatability and uptime of traditional molding but producing parts without the costs and time-consuming aspects of tooling.

3D Systems, West, Level 3 & Annex, Booth 431608

Milling Tools Resist Chatter, Pullout

New geometries for **Haimer**'s Power Mill line of solid carbide end mills and and Duo-Lock line of modular milling heads include designs for aluminum and mold steels. Unequal flute and helix designs provide chatter-free machining. The company's tools are made from K20-K40-grade fine-grain carbide.

The latest tools include two- and three-flute end mills for aluminum, which are available in solid carbide or as a modular interface (Duo-Lock), four- to 10-flute end mills for working in steel, and various specialized cutting tools. Special tools include a multifunction chamfer spotting tool, four- and five-flute roughing mills for steel, a quadrant end mill, and ball nose end mills for steel and aluminum. All are available as solid carbide end mills or Duo-Lock interfaces. The company also offers the Basic Mill line of solid carbide end mills and Duo-Lock milling heads for roughing, finishing and drilling. All tools are available with the optional Safe-Lock anti-pullout system.

Haimer USA, West, Level 3 & Annex, Booth 431546

CAMX

THE COMPOSITES AND ADVANCED MATERIALS EXPO

October 15-18, 2018: Conference / October 16-18, 2018: Exhibits
Kay Bailey Hutchison Convention Center / Dallas, TX

Co-located with

IFAI Industrial Fabrics Association International

COMBINED STRENGTH. UNSURPASSED INNOVATION.

www.theCAMX.org

BIGGER AND BOLDER IN DALLAS, TEXAS

CAMX – the Composites and Advanced Materials Expo, is –

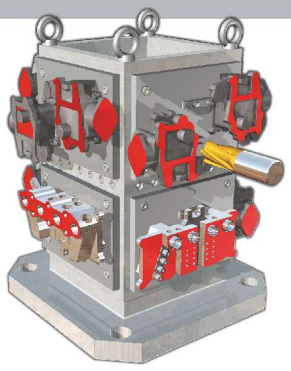
- the one source for products, solutions, networking and advanced industry thinking.
- the largest global marketplace in North America.
- a conference program with over 300 technical and business sessions.
- the gateway to expand your reach into untapped markets and applications.

Find Everything You Need in One Amazing Event.

Register Today!

PRODUCED BY ACMA American Composites Manufacturers Association · sampe North America

OFFICIAL MEDIA PARTNER CW CompositesWorld



CAM Software Improves Productivity, Extends Tool Life

Missler Software has launched version 7.12 of its TopSolid'Cam CAD/CAM software. The software offers features aimed at reducing production times and features several improvements over previous versions. Barrel cutter tool paths facilitate efficient programming. The Dynamic Machining module for turning and milling is said to reduce cycle times, extend tool life and lessen machining malfunction. Improved algorithms enable users to spend less time in the modeling phase. The software also provides the ability to machine a group of parts in a single program.

Missler Software - TopSolid, East, Level 3, Booth 133236

Various Motion Control Systems and Software On Display

Heidenhain offers motion control components and systems that can connect equipment from many machine tool builders. The company's Connected Machining package supports users as they introduce digital order management into their production processes.

The company's StateMonitor software evaluates machine data from the company's TNC controls or other CNC controls with the MTConnect protocol interface. The evaluation process can be monitored on-site or by using mobile devices via a secure IT structure.

Connected Machining systems enable analysis of data and reduce downtimes, according to the company. They improve metal removal rates, productivity and accuracy while supporting machine operators.

Heidenhain Corp., East
Level 3, Booths 135226, 215108

THE COMPETITIVE ADVANTAGE FOR U.S. MOLD BUILDERS.

AUGUST 2018 | MONTHLY UPDATE

EVERY DAY IS MANUFACTURING DAY

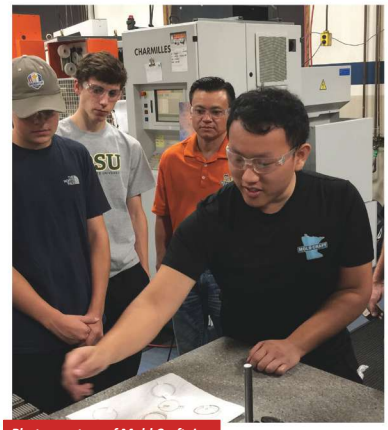


Photo courtesy of Mold Craft, Inc.

On October 5, 2018, manufacturers across the nation will rally in support of Manufacturing Day. Joining, and escalating, the movement, AMBA member companies continue to make great strides in addressing the skills gap crisis - making every day Manufacturing Day!

Taking on the epic challenge, mold builders are partnering with local schools and connecting with students at all grade levels. From plant tours and job shadowing to new apprenticeship programs, robust CTE (career and technical education) programs and creative e-marketing campaigns, the collective push in educational outreach is making an impact.

Membership in the AMBA provides mold builders access to resources that help promote the mold building industry and grow the future sustainability of their businesses.

Join today and make Manufacturing Day every day. Visit amba.org to learn more.

"AS A PASSIONATE THIRD-GENERATION MOLDMAKER, I FELT PROUD TO AWARD AMBA'S AMMA GRANT TO OUR SCHOOL DISTRICT'S MACHINING AND MANUFACTURING PROGRAM – A WIN FOR THE STUDENTS, THE INDUSTRY AND TK MOLD!"

TOM BARR
President, TK Mold & Engineering
AMBA member 4 years

COMPETITIVE ADVANTAGE • WORKFORCE DEVELOPMENT

EDUCATIONAL OUTREACH

1. SCHOLARSHIP PROGRAMS
2. AMMA GRANTS
3. RECRUITMENT TOOLS
4. EDUCATIONAL OUTREACH CONTEST
5. SKILLS CERTIFICATION/ TRAINING TOOLS

UPCOMING...

AUGUST 1
EDUCATIONAL OUTREACH CONTEST
DEADLINE: AUGUST 31

SEPTEMBER 11–12
PLASTICS FLY-IN
WASHINGTON, D.C.

SEPTEMBER 19
PEER NETWORKING FOR SENIOR LEADERS
VIRTUAL ROUND TABLE

OCTOBER 1
WAGE & BENEFITS SURVEY
DEADLINE: OCTOBER 31

Double-Column Machines Combine Speed, Stability

The latest additions to **Hurco**'s BXi CNC machine series are the BX50i, with X-, Y- and Z-axis travels measuring 37.4" x 53.2" x 23.6", and the BX60i, with X-, Y- and Z-axis travels measuring 52.1" x 63" x 27.6". The rigidity and thermal stability of the double-column design, combined with the weight of the machines, provide accuracy and improved surface-finish capabilities. Designed for the moldmaking and aerospace industries, the machines are suitable for high-speed machining applications that require tight tolerances.

The double-column design is said to minimize machine distortion and thermal deformation. Also contributing to rigidity is a ladder-style bridge. This design supports the head casting, keeps the spindle centerline close to the supporting structure and isolates the bridge from part weight.

The machines feature integrated WinMax control software and the UltiMotion motion system. The control software supports multiple programming methods, including conversational programming, NC programming and a Hurco-specific feature called NC/Conversational Merge.

The UltiMotion system is designed to determine the tool's optimal trajectory, ensure consistent programmed feed rates and reduce cycle time. Compared to conventional systems, it is said to improve cornering velocity and reduce machine jerk. It includes up to 10,000 blocks of dynamic look ahead and adapts to toolpaths. It improves on CAM output through improved handling of machine mechanics and dynamics.

The BX50i has a table size of 59.1" x 37.8" and a table load capacity of 5,512 lbs. Its axes run as fast as 1,535 ipm. It features direct drive ballscrews. Its motorized, 47-horsepower spindle can rotate as fast as 18,000 rpm, and its spindle taper is HSK 63A. Spindle torque ranges to 88 ft-lbs at 2,800 rpm. It has 30 automatic tool changing stations and weighs 28,600 lbs.

Hurco Companies Inc., South Level 3, Booth 338319

Cutting Tools Resist Heat, Hold Size

Useful for moldmaking applications, **Crystallume**'s Demon line of cutting tools is designed for extended cuts in difficult materials. Long tool life reduces the need to switch tools midway through the application. According to the company, the tools generate very little heat, hold size well, cut parts within tolerance and reduce the need for polishing. They also feature a coating designed to improve high-temperature stability for machining hardened steels.

Crystallume, West, Level 3 Booth 432079

Modern Machine Shop TOP SHOPS

IMTS2018

2018 TOP SHOPS WORKSHOP

SEPTEMBER 13, 2018 | IMTS
McCORMICK PLACE | CHICAGO, IL

REGISTER TODAY!

BUILD YOUR MACHINING BUSINESS

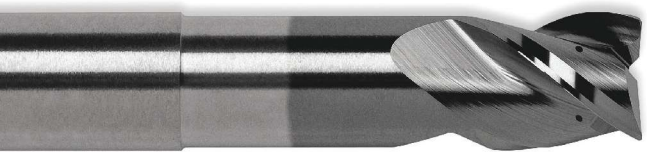
Modern Machine Shop Top Shops Workshop is the place to build your business. The event will connect the leaders in machining and metalworking – the top shops, the top suppliers, the top innovators.

Gardner Business Media Metalworking Group

Modern Machine Shop | PM Production Machining | MoldMaking Technology | Additive Manufacturing | AD&P | TECHSPEX

TopShopsEvent.com

IN PARTNERSHIP WITH: NTMA | AMT The Association For Manufacturing Technology



End Mills Achieve Greater Depth of Cut in Aluminum

RobbJack's FMHV two- and three-flute end mills are designed for high-horsepower, high-velocity aluminum aerospace machining. The company says its Mirror edge geometry progressively reduces vibration at greater Z-depths of cut. Anti-pullout shank technology prevents tools from pulling out of the holder. Well-suited for high-speed machining of deep pockets and thin walls, the tools are available with through-coolant holes and a DLC coating that extends tool life in roughing applications. Overall length and reach length are designed to maximize gripping force in tight-tolerance toolholders. The company reports that a 1" diameter, three-flute FMHV with through-coolant holes and DLC coating can achieve a peak metal-removal rate of 713 ipm³ (72 lbs of 7075 aluminum per min.).

RobbJack Corp., West, Level 3 & Annex, Booth 432079

3D Printer Can Run for a Week Hands-Free

Sodick's large-capacity OPM350L metal 3D printer/CNC machining hybrid expands the usable work area over its OPM250L model, and introduces the Material Recovery System (MRS) unit. With the MRS unit in place, the printer can run for a week without any human intervention, the company says, consuming just 30 kg of metal powder. The machine and the MRS unit enable manufacturers to 3D print metal parts nearly 14" in the X, Y and Z axes and machine these surfaces to below 9 root square mean in one setup. With an in-process correction system, the printer can recover from would-be build failures without operator intervention.

Sodick Inc., East, Level 3, Booth 134802

Insert Drill's Redesign Improves Chip Control

Seco Tools LLC will spotlight its redesigned Perfomax indexable insert drill. Designed for more aggressive drilling parameters as well as improved chip control and evacuation, the drill's flutes have updated helix angles and smoother chip flute exits. An engineered wave pattern reduces contact between chips and flute surfaces. The fronts of the Perfomax's flutes have been hardened with a laser to prolong tool life. A hardness of HRC 60 enables the drill to withstand chip erosion for longer periods of time.

Perfomax drill bodies are available in diameters ranging from 0.594" to 2.375" (15 to 59 mm); in length-to-diameter ratios of 2×D, 3×D, 4×D and 5×D; and in most spindle interfaces.

Seco Tools LLC, West, Level 3 & Annex, Booth 431564

MORE IMTS 2018 PRODUCTS TO COME
Check out the IMTS 2018 Exhibitor Product Showcase in the September issue for more of what will be on display at the show.

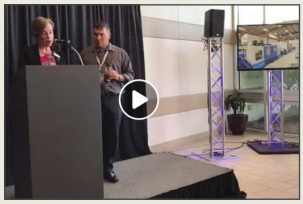
ADVERTISERS' INDEX

THIS MONTH ONLINE SOCIAL MEDIA

YouTube Videos

MoldMaking Technology's Editorial Director Christina Fuges and Senior Editor Cyndi Kustush sit down during event break down to quickly recap Amerimold 2018.
youtube.com/c/moldmakingtechnology

Popular Posts



This year, *MoldMaking Technology* streamed the Leadtime Leader Awards live on Facebook. Watch Christina Fuges introduce the 2018 Leadtime Leader, Maximum Mold Group of Benton Harbor, Michigan.
facebook.com/moldmakingtechnology

Hot Tweets

@MMTMag

Virtual reality (VR) comes to trade shows! Check out Christina Fuges getting a "reality check" at Amerimold 2018. twitter.com/MMTMag

Conversations

It's hard to believe that NPE2018 is behind us. The *MoldMaking Technology* team talks about the show and recaps show highlights, which includes everything from plastics industry initiatives, new exhibits and zones and the technology that was on display.
linkedin.com/company/moldmakingtechnology

SURFACE TREATMENT

Advancing Anode Assembly Fabrication

By Luis Gonzalez

Fabricating a conforming anode assembly is a necessary step when chrome plating injection and compression molds, but not all plating operations approach this step in the same way.

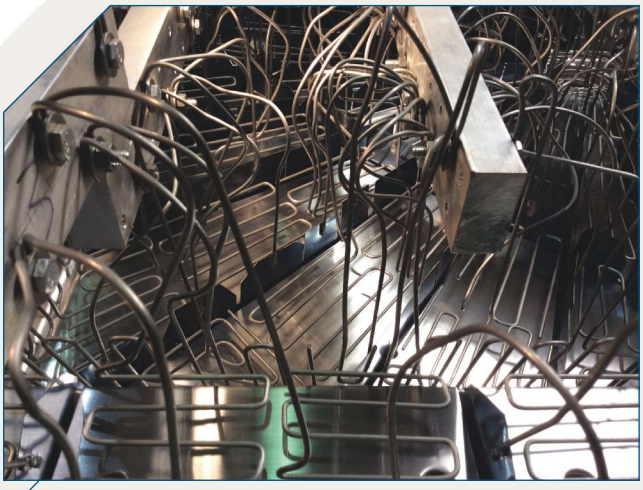
While a conforming anode is only one element in the electroplating process, the quality of the assembly strongly impacts certain critical parameters, such as plating film thickness, uniformity over geometrically complex molding surfaces and pitting control. Anode materials have evolved, but the current standard for functional plating of molding surfaces is still a system of individual, steel-wire anodes.

Platers used to fabricate anodes with malleable, perforated lead sheets. These sheets worked to a point, but some people believed they had a potentially unsafe impact on the working environment. An ISO14001-registered operation has incentives to seek alternative options, like custom-building the anode assemblies on a base frame of square, aluminum bars with mild, steel-bent wires that are individually attached to the frame and conformed to the tool's specific geometry, for example.

Deep grooves for stiffening ribs are seen in many tools and can potentially encounter release failures well before the rest of the mold unless they are plated to the same tolerances required of the entire tool.

Aluminum as a choice for the frame yields a more-even current distribution throughout the assembly, which has a significant impact on minimizing pitting in the plated surface. Minimal pitting is a primary performance requirement for many customers' projects, especially for in-mold finishing tools.

The number of wires that are required depends on what it takes to conform to the geometry, which can be 300 or more for a large, complex tool, like a fiberglass bathtub or for an automotive body panel. This network of individual wires makes it possible for the overall assembly to become an inverse duplicate of the forms to be plated, which is critical for maintaining a consistent plating thickness within a narrow tolerance range over very geometric, complex surfaces.



Images courtesy of Surfacetec.

Precise placement and fixity of the bladed anodes ensure that they remain centered within the grooves during the plating operation, avoiding burning of the groove surfaces by contact, which leads to areas of inconsistent plating film thickness.

As with every mature process, there is always room to evolve. The anode component of the plating process is no exception. For example, many chrome-plated tools, especially those for high-percentage, glass-filled parts, have grooves for stiffening ribs in the molded component. These grooves can experience release failure well before the rest of the mold. Reliably chrome plating the grooves to the same tolerances as the rest of mold will increase the lifecycle and maintenance intervals, and improved release and resin flow will decrease cycle time.

One solution for accomplishing these benefits is a system of individual blade anodes that rests within the grooves. This common method has been refined to enable the blades to remain centered within the grooves while submerged in the plating bath. This is a critical step for preventing the blades from contacting the mold and causing burning of the groove faces, which leads to unplated areas or inconsistent film thickness within the grooves. Another refinement addresses the current differential between the wire and blade anodes, ensuring uniform plating thickness with both anode types.

Molds with grooves for stiffening ribs that use these methods can yield groove-wear patterns consistent with the wear on the rest of the mold, which improves molding performance, tool life cycle and maintenance intervals. MMT

CONTRIBUTOR

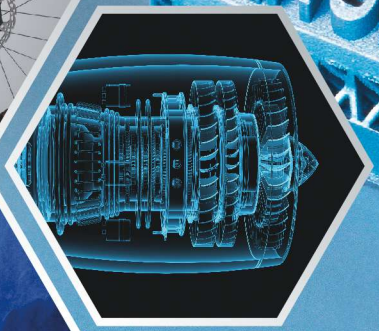
Luis Gonzalez is president of Surfacetec.

FOR MORE INFORMATION

Surfacetec / 630-521-0001
luis@surfaceteccorp.com / surfaceteccorp.com

Additive + Production

Additive Manufacturing focuses on the industrial applications of 3D printing technology to make functional parts.



Get practical, applications-based info on the machines, materials and methodologies being used to grow end-use tools and components.

PRINT | ONLINE | EMAIL | CONFERENCE

ADDITIVE MANUFACTURING®

A PROPERTY OF:

GARDNER Business Media, Inc.

additivemanufacturing.media

SERVICE
SERVICE
SERVICE
SERVICE
SERVICE
SERVICE
SERVICE

Steel Plates

Mold Bases

Hot Runners & Controllers

Components

Industrial Supplies

DME®

Aftermarket Parts & Service - **Anytime**

From purging your systems to full hot runner service, DME's expert Service & Sales Teams support you with the newest technologies, aftermarket parts and control systems. All from your single source supplier - DME.

Innovative, and energized with **new products and services** for you - **it's DME today!**

Call Toll Free at: 800.626.6653
Or visit us at: www.dme.net/services

Need After-market Parts!
Check out DME's entire portfolio, available on-line 24-7.
store.milacron.com

MILACRON®