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# MoldMaking

## TECHNOLOGY



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**Optimized Virtual  
Machining Enhances  
Mold Manufacturing - 18**

**Powerful Control Functions  
Improve Mold Machining - 22**

**Eight Mold Design Decisions  
that Impact Automation - 32**

**Double-Column Bridge  
Machine Increases Blow  
Moldmaker's Capabilities - 38**

MAY 2020 / VOL. 23 / NO. 5

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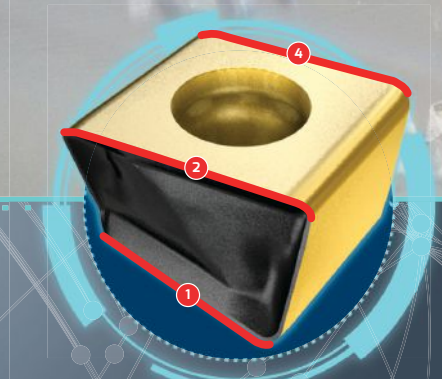
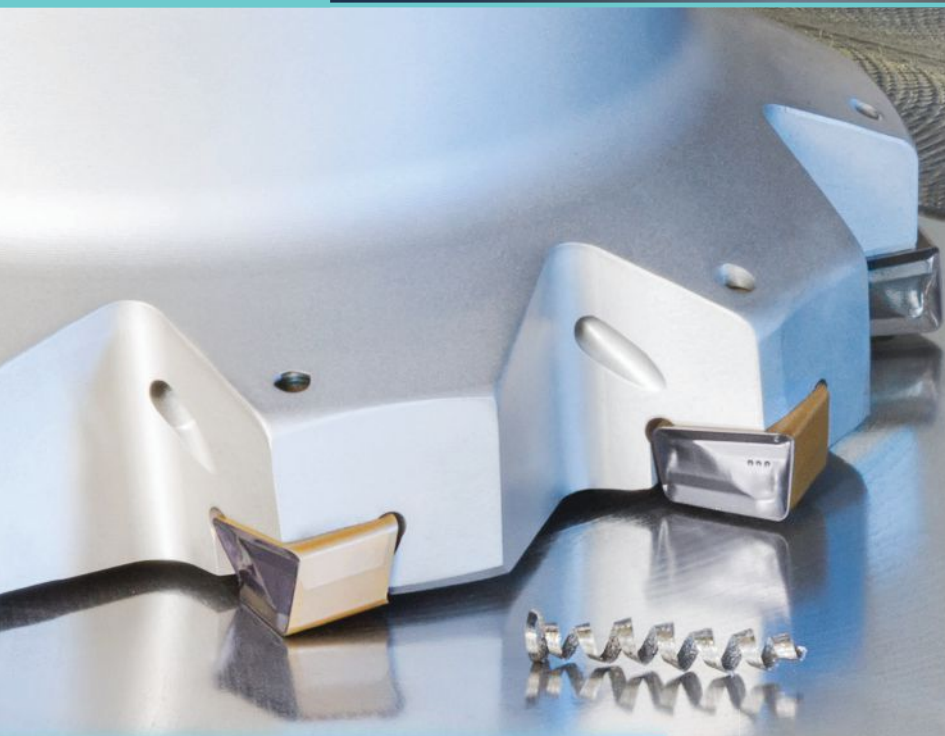
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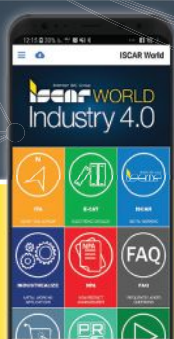


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28



32



38

## Features

### 18 Software

#### Optimized Virtual Machining Enhances Mold Manufacturing

Virtual machining programs simulate computed tool paths, as well as optimize machine tool capabilities and constraints, adding value to the computed tool paths.

### 22 Machining: Powerful Control Functions Improve Mold Machining

Fine tune machine setup, minimize forces and deviations, improve accuracy and manage automation with proper control.

### 28 Industry 4.0: How to Take Advantage of AI for Machine Monitoring

Artificial intelligence can help shops reduce preventative maintenance costs and increase production and efficiency gains.

### 32 Automation: Eight Mold Design Decisions That Impact Automation

Making the right decisions during eight key mold design phases will avoid automation problems and save money on price, installation and operation.

### 38 Machining/Case Study: Double-Column Bridge Machine Increases Blow Moldmaker's Capabilities

High-speed, double-column bridge machining center runs faster and produces better surface finishes, increasing capabilities of blow mold builder.

## Departments

### 6 From the Editor: Turning Challenge into Change

### 8 2020 Editorial Advisory Board: Don Smith

### 10 Profile: A Conversation with LS Mold Inc.

### 16 MMT Connect: Life of a Mold

### 42 Short Runs: A Peek at Digital-Only Stories

### 46 Gardner Business Index: MoldMaking

### 48 Product Focus: Amerimold Connects

### 55 MoldMaking Marketplace

### 55 Ad Index

### 56 TIP: Software

## ON THE COVER

Cover photo courtesy of Open Mind Technologies USA Inc. This month's cover shows virtual machining in action. When using *hyperMILL VIRTUAL* Machining Optimizer, individual part programs can be linked with smooth and safe connections that enable the cutter to remain close to the workpiece with full collision control. Moldmakers save time as compared to having to move the machine to a home or safety position between programming jobs. Also, smooth connections are better for the machine tool mechanics because they eliminate fast moves with hard stops and sudden direction changes. See related article on page 18.

Images courtesy of (left to right) MachineMetrics, Sepro America and M.C. Molds Inc.



# 5

TRICKS OF THE TRADE

Great Tips from This Issue

### 1. Energize and Optimize

An optimized virtual machining process can determine the best solution for each toolpath string automatically.

PG. 18.

### 2. Moving and Grooving

A control with an advanced dynamic prediction function can calculate the contour in advance and adapt axis speeds in time for transitions using acceleration-limited and jerk-smoothing motion control.

PG. 22.

### 3. Say Hi to AI

AI provides more visibility, helping employees reference data when driving decisions. This transparency helps foster a healthier work environment.

PG. 28.

### 4. Robot Power

A robot contributes mightily to shorter cycle times, increased productivity and profitability by removing parts much faster and more consistently than a human operator.

PG. 32.

### 5. It Takes Two

High-speed, double-column bridge design CNC machining centers offer a large envelope and excellent stability to run at higher rpm.

PG. 38.





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## Turning Challenge into Change



Amid all of the negative headlines about the coronavirus, there is positive news. At the risk of sounding trite, “With every cloud, there is a silver lining”, “Look for the best in the worst rather than the worst in the best” and “There is no great loss without some gain.” These are all true, and we are living them out these past few months.

When COVID-19 hit the U.S., I connected with shops across North America to gauge the mood and current impact on business levels. What struck me was not the insight they provided each

time I checked in but their readiness and willingness to help and their consistent look on the brighter side. They were focusing on opportunity and turning challenges into future change. All the while, they were leveraging their networks to take on work aiding in managing the crisis, and documenting their journeys and what they were learning along the way.

For example, most believe that once we get to the other side of this:

- Manufacturing will be busy
- The world will have confidence in plastics again
- Moldmaking will have a new face
- Manufacturing will rethink and reorganize its supply chain
- Recycling will increase (and not just products but the packaging, too)
- Technology such as additive manufacturing, lights-out machining,

Industry 4.0, etc., will be more strongly considered or implemented

- Businesses will implement new ways to communicate, collaborate, learn and increase efficiency.

In my opinion, the often unsung and unseen heroes of manufacturing are mold builders, and the past five months have put the work they do in the spotlight.

Their importance to the products we use every day cannot be more emphasized than with vital medical products and equipment that are

### Cancelled But Still Covered

We commend everyone for the roles they are playing in fighting the “invisible enemy” and our hearts go out to the many people who have been impacted, and continue to be impacted, by this global crisis. Although COVID-19 has forced the cancellation of Amerimold 2020, there's still a way the mold manufacturing community can connect.

Join us June 8-13 for **Amerimold Connects**, a remote event experience that brings the showroom floor right to your home or office. Easily access interactive networking, online forums, free education sessions, virtual booths, as well as the latest insights on tooling, software, processes and technologies (starting with exhibitor product highlights on **pages 48-54**). Register today at [amerimoldexpo.com](http://amerimoldexpo.com), and we hope to connect with you then.

urgently needed in a time of crisis. That message is the same one we used back in 2015 for our MoldMaking Matters Recruitment Video. Maybe it's time to shoot an updated video! Any interested participants? [MMT](#)

*Christina Fuges*

Christina M. Fuges  
Editorial Director

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## THIS MONTH ON [moldmakingtechnology.com](http://moldmakingtechnology.com)



### VIDEO: Hybrid Additive Machining Produces Accurate Parts from Metal Powders

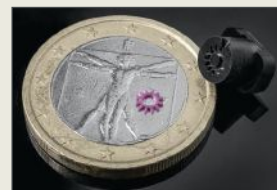
This company's hybrid additive/subtractive machining produces highly accurate parts from metal powders that are melted and sintered using a laser while surfaces are precisely milled at high speeds.

[short.moldmakingtechnology.com/MatAME19](http://short.moldmakingtechnology.com/MatAME19)

### BLOG: Direct Rapid Soft Molds Open Up New Applications in Micro Injection Molding

Direct Rapid Soft Tooling process enables lead times of two hours from file to injected part. With up to 1000 injection-molded parts per tool, the technology unlocks potential applications in small or medium-batch manufacturing.

[short.moldmakingtechnology.com/DRST](http://short.moldmakingtechnology.com/DRST)



### WEBINAR: Takeaways from Panel on Impact of Coronavirus on Manufacturing

The coronavirus pandemic is full of uncertainty, including what the impact will be on the manufacturing industry. Here are a few insights from a recent webinar on the topic.

[short.moldmakingtechnology.com/CovidWeb](http://short.moldmakingtechnology.com/CovidWeb)

### PODCAST: Quick Conversations Can Change the Course of Your Business

This threesome from the American Mold Builders Association Executive Board shares its take on the value of this association and its networking, as well as the changes to come in mold manufacturing.

[short.moldmakingtechnology.com/AMBABoard](http://short.moldmakingtechnology.com/AMBABoard)





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## 2020 Editorial Advisory Board: Don Smith

By Christina M. Fuges

Don Smith comes to the Editorial Advisory Board with 45 years of mold-making experience and a passion for new technology and process development, which include lean manufacturing strategies and principles, predictive quoting software for injection mold tooling and molding cycle optimization, and additive manufacturing methodologies for prototyping and production of injection molds.

His moldmaking career began after completing the Tooling and Manufacturing Association (Park Ridge, Illinois; now Technology & Manufacturing Association; TMA) four-year Related Theory and Industrial Design, Injection Mold Design programs. Don is also a certified Lean Black Belt and a Six Sigma Green Belt.



Don Smith, North American Senior Tooling Manager for Scholle IPN, is one of MMT's new Editorial Advisory Board members.

Today, as Scholle IPN Packaging Inc.'s (Northlake, Illinois) North American Senior Tooling Manager, Don provides direction to the injection molding tooling team with a specific focus on preventative and timely corrective maintenance, injection molds, tooling and tooling repair. Scholle is a global packaging company that engineers and manufactures flexible packaging materials that are safe, natural, economic and sustainable for 22 different markets.

Don is responsible for project leadership on new product development collaboration with facilities in North America.

Don has been actively involved in the industry as an instructor and author at the TMA Oakton Community College Des Plaines Campus for its Advanced Moldmaking and Mold Design Courses. He authored and instructed this completely original course for TMA's School of Design, which is a CAD-based, two-year, four-semester program. He is also an adjunct Faculty member teaching adult education courses.

Don is also a member of the TMA (Manufacturing & Education Career) Apprentice Training Committee, American Mold Builders Association (Chicago Chapter) Education Committee and the National Institute of Metalworking Skills committee. His area of expertise includes mold engineering and problem-solving techniques, as well as business skills for operating a data-driven business and bringing automation into the mold manufacturing world. He has joined MMT's EAB to "give back" to the industry and share his experience. **MMT**

### FOR MORE INFORMATION

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

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

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### A Conversation with ... **LS Mold Inc.**

LS Mold specializes in precision-machined H-13 and P-20 production injection molds and prototype injection molds in aluminum. What else do you do and in which markets are your tools typically used?

**Larry Koning, president:** Given our location in Western Michigan, automotive, furniture and medical device are obviously important to us. However, we also serve customers in the consumer, electronics, recreational vehicle and commercial truck markets. And occasionally we make tools for business machines, lawn and garden, lighting, marine, plumbing, sporting goods and even water purification. It's obviously an advantage to be diversified.

For injection molding, we produce production and prototype single and multicavity tools—the majority with actions—that typically fit presses between 50 and 1,100 tons. We also



**LS Mold Inc.**  
750 Waverly Court  
Holland, MI 49423  
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lsmold.com

- Founded in 1970 and owned/operated by Larry Koning, president and David Koning, vice president.
- Full-service prototype and production tooling for injection molders in aluminum, P20, H-13, S-7 and stainless steels. Injection molds sized to fit presses between 50 and 1,100 tons. Also molds for thermoforming, vacuum forming and foam molding.
- Additional services: complete molding process development, low-volume prototypes, full part inspection (layout), graphite machining, mold repair, mold validation/commissioning, full part production for custom and short runs, rapid prototyping and machining.
- Currently employs 30 team members.
- Served industries include automotive, furniture, medical device, consumer, electronics, recreational vehicles, commercial truck, lawn and garden, lighting, marine, plumbing, sporting goods and water purification.
- Member: American Mold Builders Association, Michigan Manufacturers Association, Holland Chamber of Commerce.
- ISO 9001, Certified 9001

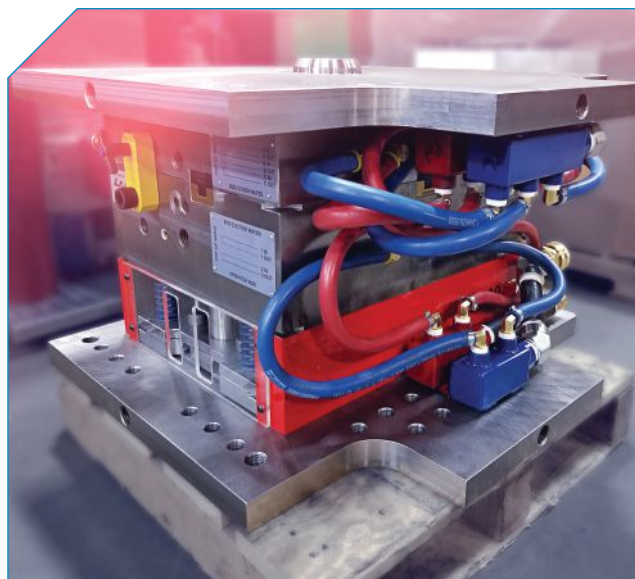


Image courtesy of LS Mold Inc.

Since 1970, LS Mold Inc. has produced production and prototype tooling for injection molders. The company also makes thermoforming, vacuum forming and foam molds. Its customers are found in a variety of markets, including automotive, furniture, medical device, consumer, electronics, commercial truck and recreational vehicles. And occasionally the company produces tools for lawn and garden, lighting, marine, plumbing, sporting goods and even water purification.

build injection tools for gas-assist, rotary two-shot, pick and place and over-molding. On top of that, we have steady work producing tools for thermoforming, vacuum forming and foam molding, and we've done a lot of repair work over the years on blow molding tools.

For years, we also made form and trim dies, but our customer was bought out and that work went away. And prior to the 2008 crash, we also made die-cast molds. In that downturn, our customers closed and took a lot of mold shops with them. Fortunately, we weren't one of them. These days, we do a bit of work for other die-cast toolmakers, but we haven't made an effort to get back into that segment.

Still another thing we do is we provide sampling for our customers or other mold builders, whether it's on a tool we made or that was produced elsewhere, and we'll do short-run production molding for them. We have six injection presses—four Van Dorns, a Cincinnati and a Toshiba ranging in size from 85 to 610 tons in our 25,000-square-foot (2,323-square-meter) facility for just that purpose.

**Are any of your customers uncomfortable with the fact that you mold parts and potentially compete with them?**

**Koning:** We're very careful to support our customers' needs and not be a competitor. People who visit us know who and what we are. If you're a Tier 1, Tier 2 or Tier 3, then maybe



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you have some low-end products that are a burden to higher production, that you really don't want to make anymore but that you still have to produce for your customer. Well, we're very good on low-volume jobs with multiple color changes and with multiple material changes. We have good process people on staff and we can handle the kinds of jobs that bigger molders just don't want to bother with.

We also do tooling samples for customers who are still tweaking their design or want to make sure a new tool coming in from offshore actually works correctly. We do T0-T3, landing tools for different companies to help them work out the bugs in the shop. We work hand-in-hand with all our customers. We try to be a strong asset and very customer focused on everything they want us to do.

**LS Mold offers also offers gundrilling, EDM and machining. Are you typically offering these services to OEMs or to other tool and die shops?**

**Koning:** We actually provide those services to other mold-makers and to OEMs in the Midwest. We've found that for a smaller mold shop, it's hard to survive just on building tools. You have to get through both the highs and the lows. We've found that by being a resource to support other machine



Another service the company offers its customers is short-run production molding, particularly jobs with multiple color or material changes. It maintains six injection presses ranging in size from 85 to 610 tons in its facility and has process people on staff who are adept at the kind of molding jobs that aren't profitable for larger molders.

shops that are both larger and smaller than us, it not only gives us steady business, but it means that those shops don't have to do everything in house. For example, we can do their gundrilling, as we have two gundrills in our facility, or we can provide robotic carbon cutting, which is something we're particularly good and fast at. We're more than willing to do a lot of different things to support ourselves.

**LS Mold also provides mold repair, maintenance and commissioning/validation services. Is this mostly for new tools coming in from offshore or for older tools that just need a little TLC?**

**Koning:** We offer repair and maintenance services for older tools to help extend their life and keep them running well so our customers don't have problems. In most cases, those tools are brought to our shop. We also help validate new tools. Those typically are coming in from offshore; although, with all that's going on with China right now, we're seeing fewer tools from overseas.

After 40 years in the business, we're thankful to still be here. What we've seen in that time is that the good shops roll with the tide and work hard to be the best they can be. It's very important to have good friends and partners in the moldmaking industry. We're very, very focused on local work with local molders. We help them any way we can—with repairs and engineering changes. We've taken this approach for a number of years, and it's worked well for us.

**Your company is extremely versatile in the range of services it provides customers. Is there anything else LS Mold does that we haven't covered?**

**Koning:** Working in the plastics industry and making tools, as we do, we really enjoy working with inventors. And we like to invent things ourselves. Our latest product is called the golf ball tender (golfballtender.com). We worked with

# How can toolmakers step up to the challenges of a global pandemic?

Businesses are operating in an environment unlike anything most have experienced in their lifetime. The challenges placed in front of businesses by the global pandemic are highlighting the need for resilient business processes. Toolmakers that invest in the technology to support such processes are better equipped to withstand these challenges today; they will also be well positioned for the post-pandemic future.

Here are four things toolmakers can do to rise to the challenge:

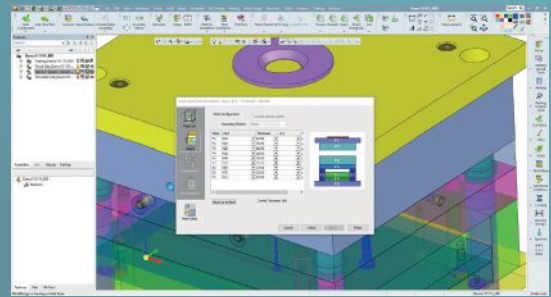
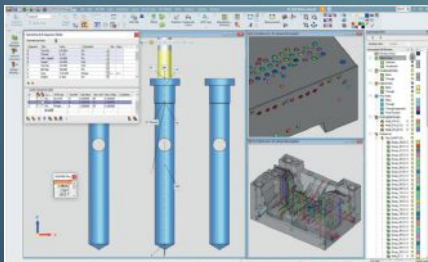
## 1. Formalize internal knowledge to ensure consistency, quality and speed

Yes, we are all getting better at collaborating remotely. Still, there is no substitution for face-to-face interaction between a designer and a CNC expert or a junior programmer and the person who's been at it for ten years and can quickly show you how it's done with a few mouse clicks.

At times like this, it's imperative to turn your tooling software into a repository of your company's know-how and standards. Custom process templates that capture the knowledge of your best engineers are key to ensuring the highest levels of quality and speed are achieved on any job, even at a time of social distancing.

## 2. Use any downtime to encode best practices into reusable standards and templates

While the need for process improvements is routinely recognized by toolmakers, even the best intentions often take a backseat when everyone is busy delivering product and meeting deadlines. Toolmakers that are seeing a slowdown in orders can use any downtime to better prepare for the future – creating new templates and custom catalogs that would translate into speedier delivery and higher quality standards when demand picks up.



*Mold Base - Cimatron's MoldBase tool allows you to generate endless mold combinations using standard and custom catalog parts, cutting hours of work into minutes*

## 3. AUTOMATE COMMON TOOLMAKING TASKS WITH SOFTWARE THAT ANTICIPATES YOUR NEXT MOVE

Purpose-built software that automates routine toolmaking tasks can save valuable time, reduce errors, and allow users to focus their attention on tasks that demand greater attention. Designed with an understanding of the toolmaking process, intelligent automation anticipates the user's next action and puts the right tool at the user disposal at the right time. These smart tools are especially helpful when employees work remotely, as junior programmers don't have your company's experts right next to them to give a helping hand.

## 4. Utilize concurrent engineering to streamline collaboration and accelerate delivery cycles

Using integrated design and manufacturing software that allows NC work to get started while design is still underway – and doing it safely without compromising part data integrity – can eliminate costly wait times. Delivery cycles can be further compressed by allowing multiple designers to work simultaneously on the same project.

There is no denying that many toolmakers are being challenged these days. At the same time, forward-thinking toolmakers can find opportunities for process improvements, with benefits that will last long beyond the current pandemic.

*NC/Automated Drill - Cimatron's Automated Drill application automates hole assignment to the appropriate drilling sequence, saving valuable time and eliminating the risk of errors.*



For further information on how to overcome typical challenges toolmakers might face, join us for our Webinar on 22 April at 2PM EST.



**Further Information:**

[3dsystems.com/software/cimatron](https://3dsystems.com/software/cimatron)







Customers look to LS Mold for both mold repair and maintenance on older tools, as well as commissioning/validation work on new tools from offshore. The company says it is very focused on providing a broad range of services to local molders ranging from mold design and production to engineering changes and repairs.

our local golf pro to develop a soft, rubberized plastic part that fits around any flag pole on golf links to keep people from having to reach their fingers into the hole to retrieve their ball and potentially damaging the hole. It's being sold in Canada and Europe right now and shortly will be available for sale in the U.S. and South America.

We also invented and sell a product we call the Magsterhook ([magsterhook.com](http://magsterhook.com)). It's a line of magnetic hooks for suspended ceilings and is very popular with classroom teachers. Before, when they wanted to change out artwork hanging from the ceiling, such as leaves for fall and snowflakes for winter, it could take hours. The teachers had to drag around a chair and climb on and off it to change whatever was hanging from the ceiling. Now they can change a whole classroom in minutes from the ground. It's much faster and safer. Wedding planners, home offices and churches also use it.

We also produce whip guides used in the gundrill industry.

And, believe it or not, another product we developed and sell to the packaging industry are very realistic looking plastic blueberries. We laser scanned four different sizes of blueberries to make a tool to mold them. They had to be as realistic as possible in terms of weight, size and color. They're used in the packaging industry when a packing machine is being tested to ensure the machine fills, weighs and closes the lid on clamshell packaging correctly. Normally, they either used dog food, which crumbles and makes a mess, or they used real fruit, which is costly and also makes a mess. With our plastic blueberries, they can recalibrate their machines accurately for life. **MMT**



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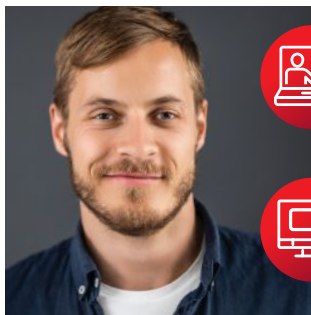


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## We could all use a laugh!

## Want to talk with Phil? Use #IfAMoldCouldTalk

We're entering the third month of wondering what our buddy Phil would say #IfAMoldCouldTalk, and we've loved seeing how creative you all have been, especially Phil. He's always bugging me to see what you guys have submitted each week, so thanks for bringing a smile to our little buddy's face.

It's been interesting for Phil to grow up in the era of the coronavirus. He's been concerned for all his fellow moldmaking community members. But if there's one thing he's learned in his short time on the shop floor, it's that the molders and builders in this industry are strong as hell, and will get through this together and be ready to put the world back together piece by piece when this is all over.



### WE ASKED THE READERS: WHAT DO YOU THINK IS HIS FAVORITE TIME OF DAY?

**TPM Break – When his favorite process technician idles the press to give Phil a quick inspect, clean his parting lines, and verify his lube!**

Debbie Cook, *Daskocil DBA Petmate*

#### Parting time!

Sara Mortensen, *Bales Metal Surface Solutions*

**When they rub me down between shifts.**

James Jergens, *EG Industries*

At the end of March, Phil wanted to know from you all: what do you think is his favorite time of day? As usual, you didn't let him down and gave him some responses that have made him laugh so hard he nearly ejected his pins. You can see some of his favorites from the month to the left.

Keep heading to MMT's social media channels to check out Phil's questions for May, and make sure to submit your answers for every new one! Phil's itching to give out some swag to his most loyal responders, and he's got some great ideas that he'll roll out this summer.

Stay safe, moldmakers! Phil will see you again on these pages next month!

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# Optimized Virtual Machining Enhances Mold Manufacturing

Virtual machining programs simulate computed tool paths, as well as optimize machine tool capabilities and constraints, adding value to the computed tool paths.

**M**odern manufacturing environments are continually evolving. To meet increasing productivity requirements, turnaround times and cost objectives, manufacturers continue to invest in higher technology solutions, such as multi-axis and multitasking machines that enable more complex processes. These processes simplify part setups, reduce handling between setup or machines, enable better (shorter) tooling in many cases and also maximize valuable floor space due to consolidating multiple processes in fewer machines.

Proper application of this equipment and maintaining high billable hours on these machines is essential to today's shops.

However, to successfully realize any of these equipment investments, software plays a major role. CAD/CAM software has traditionally been sought out for its toolpath generation with collision avoidance and manufacturing execution and planning features, but lately, there is also an increased emphasis on machine simulation solutions, also known as virtual machining. This term is beginning to define a class of technology, and as with other software categories, not all solutions are the same. It is helpful to know some background details about simulation tools to gain a real understanding of virtual machining.

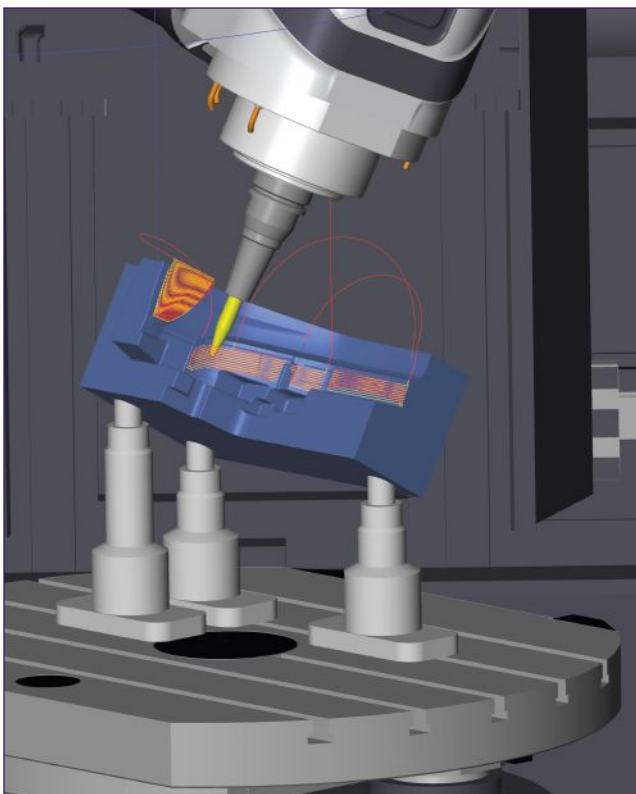
## Simulation Tool History

Early simulation tools focused on reading neutral-language NC formats, such as APT. Simulation would identify gross errors and give some confirmation to the manufacturing process, but the tool paths and movements defined in the postprocessor would first be seen at the machine tool.

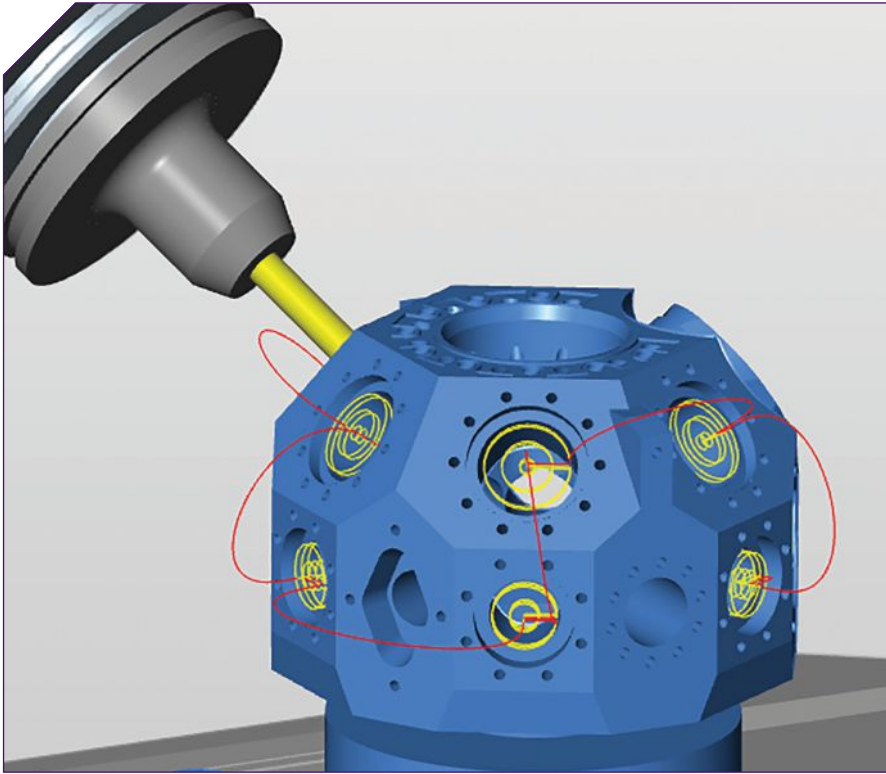
G-code simulators have grown in relevance and provide better feedback to the actual machining situation. Be aware that some of these simulators reverse postprocess code in the background to then be able to simulate all machining formats through a standard processing engine.

G-code simulators need to have a complete understanding of the language commands that are possible at the machine control, either as output by the CAM system or possibly with added codes by the end-user. Otherwise, a command in the part program might not be interpreted properly by simulation software. Also, both CAM neutral-file and G-code formats

In a virtual machining center environment, individual part programs can be linked with smooth and safe connections that enable the cutter to remain close to the workpiece.



Images courtesy of Open Mind Technologies USA.



Optimized infeed movements considerably reduce auxiliary processing time.

regarding the machine tool and its capabilities and constraints. Then, the virtual machining system can optimize and add value to the computed tool paths.

### Optimized Virtual Machining

Virtual machining provides the postprocessor and simulation, and closely models the machining process, reducing the need to confirm tests at the machine and increasing machine tool and machinist efficiency. Digital twin is a common industry term, but not all twins are alike. The standard expectation of the digital twin is geometric modeling with kinematic motion. However, the system should also model the movements from home or tool change positions and handle

often change by version. This is done to enable new toolpath strategies, new types of supported cutters or new capability available in machine controls. These changes provide the need to update simulation “formatters” from time to time. A closed-loop environment, including CAM and simulation, increases the assurance of compatibility.

Using an optimized virtual machining process provides a more efficient solution than depending on the programmer to identify all constraints.

The performance of simulation software has improved continually due to greater capability of computer processors and graphics cards, and improvements to monitor displays. In addition to crisp images and faster processing, current simulation tools model the machine environment

more completely, including tool change, lasers and probes and coolant blocks. Most simulation tools have focused on simulating computed tool paths against machine components. The “tool does not hit the part” result was determined in the CAM toolpath engine and confirmed in the simulation software.

The goals of virtual machining programs are to simulate the computed tool paths and add links and knowledge

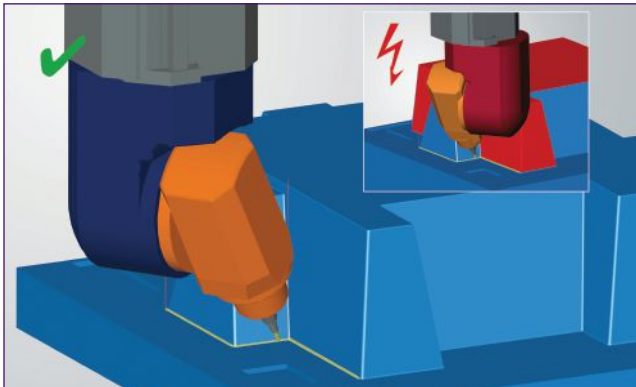
controller commands, such as tool center point control, plane commands, canned cycles and cutter compensation.

By providing a realistic representation of the machining environment, virtual machining can also provide and add valuable information beyond simulation and identification of error conditions. These capabilities improve tool paths that are traditionally calculated in the CAM engine. They incorporate knowledge of the part model, tooling, the toolpath calculation and collision check engine, and the machine tool model with its physical constraints.

In a virtual machining center environment, individual part programs can be linked with smooth and safe connections that enable the cutter to remain close to the workpiece. The benefit is high assurance and time savings, as compared to moving the machine to a home or safety position between programming jobs. Also, the smooth connections are better for the machine tool mechanics compared to fast moves with hard stops and sudden direction changes.

Let’s look at some examples:

**Managing Constrained Linear Axes.** Many toolpath programs may look good on the screen, but they do not ideally utilize the machine axes. One example is vertical toolpath orientations on a five-axis machine. Consider a milled groove surface or a drill pattern at a fixed radius on the part. With a vertical orientation, several solutions are possible using



A virtual machining optimizer CAD/CAM software module analyzes entire machining sequences and considers axis limitations. This photo shows an example of using this module with an asymmetric head resulting in no collision, compared with not using it and having a collision result.

different C-axis positions. Typically, the X and Y axes on a machine are faster than rotary axes. Using a common trunnion style machine design, there may be constraints at 3- and 9- o'clock positions (looking down on the C-axis table) due to potential interference with the trunnion motors.

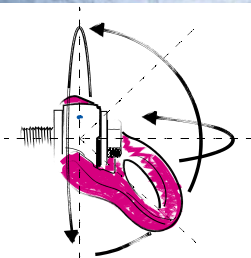
Although the rotary slot or drill pattern may be better machined by using linear X and Y axes, while also considering the trunnion motors, the machining process is improved by focusing the machining at a 6 o'clock position and rotating the part into this tool position primarily using X- and C-axes. Also, making a rotational slot using a rotary axis may interpolate a better part feature.

Similarly, some machines cannot reach beyond the machine centerline. An optimized virtual machining process can invoke rotary motion when needed to avoid attempts to machine in such regions. Some CAM programming environments offer optimizations that are constrained by the programmer to foresee the machine limitations and compensate by using a switch in the software. As with the above rotary slot, an optimized virtual machining process can change an X and Y move into X and C, or possibly due to axis ranges to utilize the Y- and C-axes. Using an optimized virtual machining process provides a more efficient solution than depending on the programmer to identify all constraints.

**Managing Constrained Rotary Axes.** Many machine tools have limited ranges in the rotary axes. This is common in gantry or fork-head style machines where the limitation is a constraint from the machine tool design. A programmer may rec-



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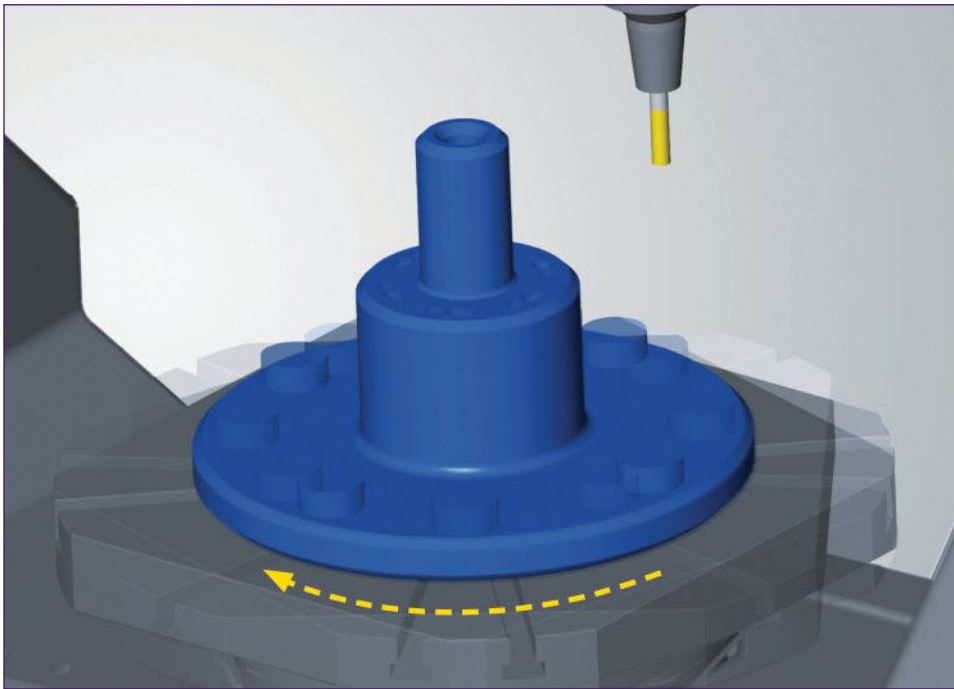
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A virtual machining optimizer CAD/CAM module enables the C-Axis to rotate for collision-free machining.

for five-axis machining usually generate two solutions. Depending on the machine axis ranges, both options may be valid solutions. The typical process is often to select a starting position, and then subsequent positions are determined to be closest to the reference angular location.

The preferred solution is sometimes selected for human factors, such as having the rotary table tilt toward the machinist. Or, in other cases, the preferred

ognize this limitation and avoid programming processes that have continually accumulating rotary movements. But there are some processes such as swarf milling where the cutter is fully engaged with the workpiece, and it is not easy to change the programming strategy. Here, an optimized virtual machining process can anticipate the coming axis limitation and potentially pre-position a rotary table to then enable the entire cut in one motion. Or, if necessary, it can invoke a retract and safe rewind position to continue the cut within the valid machine axis range.

The power of an optimized virtual machining solution is that the best angular option may be determined multiple times during a program.

**Asymmetric Machine Heads.** The collision check in most CAM systems during toolpath calculation is between the workpiece and the cutter, and possibly other revolved objects that are aligned with the cutter. Then the simulation

can identify additional issues, such as the machine head against the part or the machine head against the rotary table. These systems often provide warnings of a collision but rarely override a tool path to create a safe result.

Many milling machines, especially larger machines, may have an asymmetric shape to the machine spindle system, or even just a rectangular housing around the spindle.

The mathematics used to determine the angular positions

solution is determined based on the available tilt axis range beyond horizontal and vertical orientations.

With asymmetric head geometries, one solution may be collision-free while the other solution may result in an interference, or require a long tool stick out length to avoid a collision. The power of an optimized virtual machining solution is that the best angular option may be determined multiple times during a program. After each retract move within the programming, the best solution for the next string of instructions can be determined.

This step can be performed manually in some systems, or is not addressed at all, but on a large mold or die component with many pockets and many retracts, there could be dozens of decision locations. The optimized virtual machining process determines the best solution for each of these toolpath strings automatically and safely links the machining regions together.

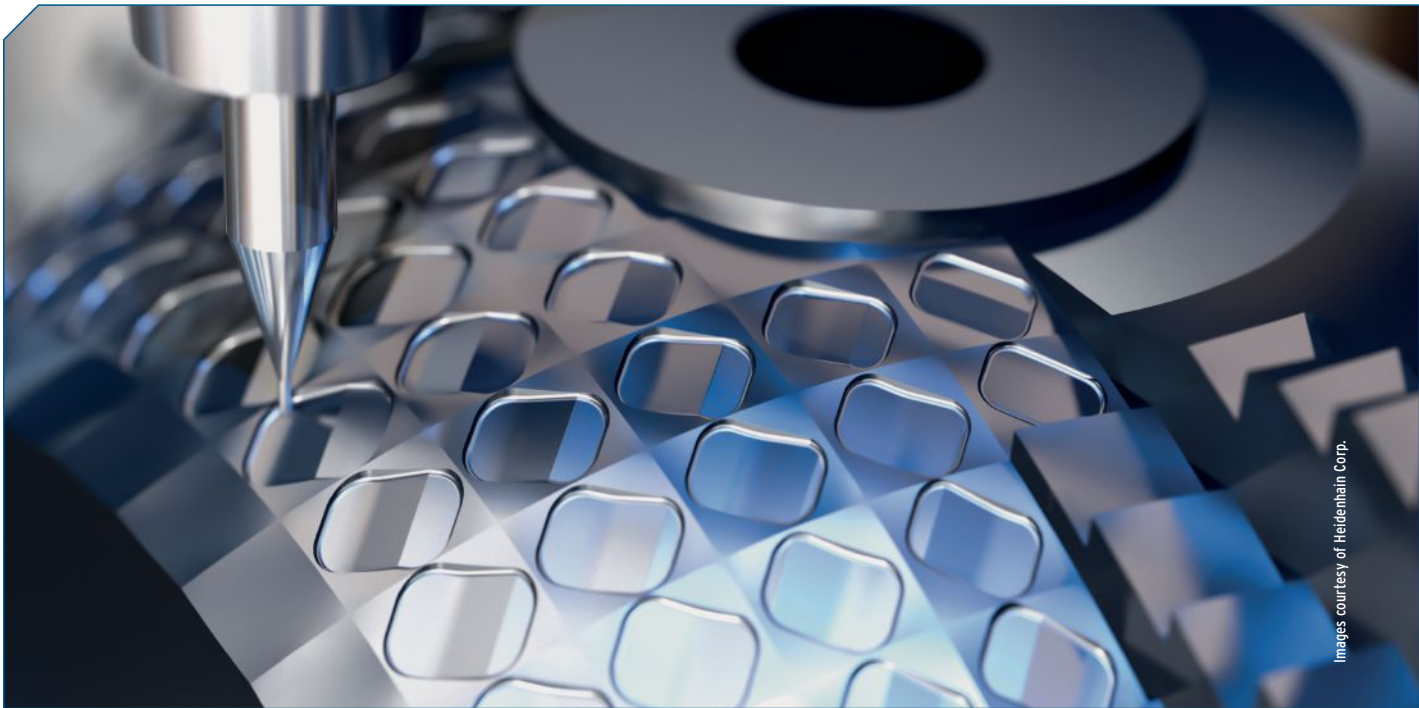
Programmers increasingly focus on software for toolpath calculations and simulations. Simulations are a great way to confirm the machining process without directly using the machine resource. Advanced simulation tools, such as an optimized virtual machining process, add value beyond the verification of computed tool paths and can enhance the machining process. **MMT**

#### FOR MORE INFORMATION

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Alan Levine, Managing Director

# Powerful Control Functions Improve Mold Machining

Fine tune machine setup, minimize forces and deviations, improve accuracy and manage automation with proper control.



**D**imensional and contour errors need to be so low in mold-making as to be barely measurable and must certainly never be visible. These requirements are increasingly at odds with demands for higher productivity and lower costs.

Many powerful control functions offer possible solutions to the key questions that arise between the conflicting demands of a production process that is highly precise and at the same time highly efficient. The user can take advantage of these functions that bring out the best of a machine in any machining scenario while efficiently meeting workpiece accuracy requirements.

Let's take a look at some features and functions of today's advanced control technology.

## Machine Tuning

One particular advanced control technology includes a tolerance function that allows a mold builder to precisely tune the machine setup by adapting the contouring deviation T to the task at hand, individually specifying the path width that is available to the control. The mold builder can so directly influence the maximum attainable contouring feed rate and machining time, in particular for contour elements with

An advanced control technology tolerance function along with an advanced dynamic prediction function result in perfect molds, thanks to a milling machine that has been perfectly tuned to the respective machining scenario.

numerous changes in direction, which is a common characteristic of free-form surfaces. Some machine tool builders also offer their own cycles based on a tolerance function.

In addition to the contouring deviation T that the mold builder enters, these cycles make further modifications to the machine setup that the OEM had programmed for specific machining operations, such as roughing, finishing or pre-finishing.

An advanced dynamic prediction function offers another possibility for optimizing the machining process. It starts with the data quality of the NC program and enables optimized motion control for feed axes in three- and five-axis milling. Insufficient quality of data frequently causes poor motion control, leading to the inferior surface quality of the milled workpieces.

With an advanced dynamic prediction function, a control can dynamically calculate the contour in advance and adapt the axis speeds in time for contour transitions using acceleration-limited and jerk-smoothing motion control. As a result, clean surfaces can be milled in short machining times even for contours with highly irregular point distributions in neighboring tool paths.

The strengths of advanced dynamic prediction are apparent, for example, in the resulting symmetrical feed behavior on forward and reverse paths during bidirectional finish milling and

in the form of particularly smooth feed-rate curves on parallel milling paths.

### Dynamic Motion

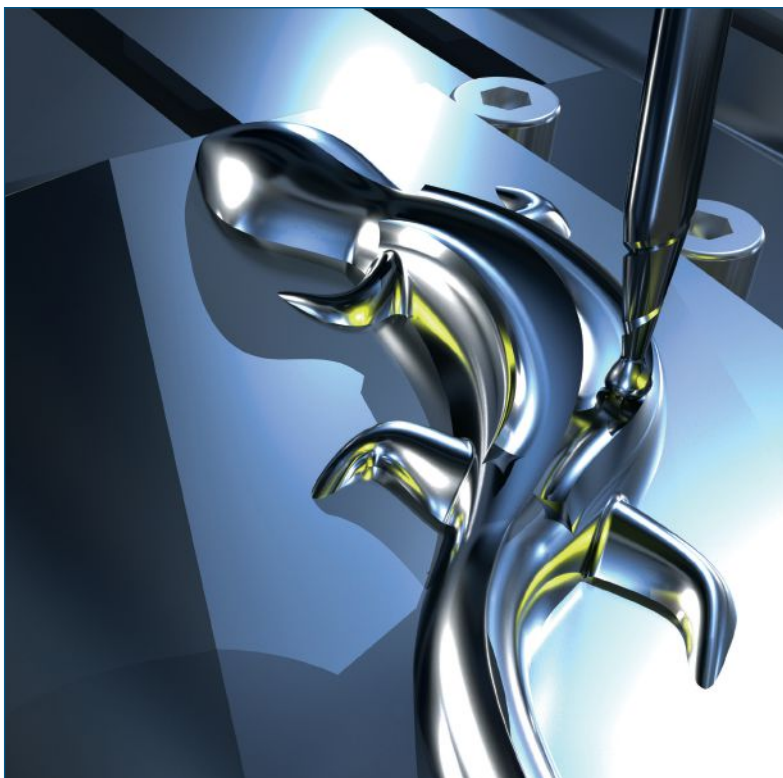
Another collection of functions of advanced control technology combines high accuracies with dynamic motions. These functions minimize not only forces that affect the mechanics of a machine tool during operation, but also the resulting deviations at the tool center point.

A cross compensation function compensates for forces that are introduced by dynamic acceleration processes and that briefly deform parts of the machine, leading to deviations at the tool center point. Regardless of the actual acceleration, cross compensation makes either more precise production with better surfaces possible, or it significantly reduces the machining times by increasing the jerk.

An active vibration damping function suppresses dominant low-frequency vibrations and permits fast vibration-free milling. This makes it possible to set high jerk values. Machining times can be reduced without compromising surface quality. In particular, the combination of cross compensation and active vibration damping helps reconcile the contradictory requirements of accuracy and speed. In practice, this functionality provides greater efficiency during the milling of high-quality, free-form contours.

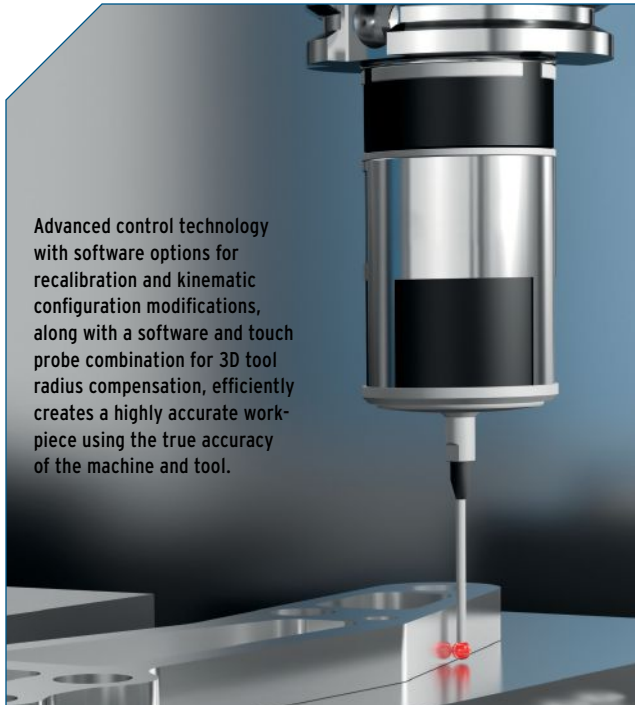
A load adaptive control function continuously determines the current mass for linear axes, or the mass moment of inertia for rotary axes, and adapts the feedrate control to the values measured at any given time. This improves the dynamic accuracy of the axis for every situation under load, enabling the use of optimized jerk values for the feed axes on the workpiece side. The result is a shorter machining time since the feed axes reach the desired positions sooner. In addition, this function compensates for all changed friction values and therefore ensures higher contour accuracy.

Clean surfaces can be milled in short machining times, even for contours with highly irregular point distributions in neighboring tool paths.



Advanced control technology combines a high level of accuracy with dynamic motions.





Advanced control technology with software options for recalibration and kinematic configuration modifications, along with a software and touch probe combination for 3D tool radius compensation, efficiently creates a highly accurate workpiece using the true accuracy of the machine and tool.

## Accuracy Improvements

Accuracy requirements are becoming ever more stringent, particularly in the realm of five-axis machining. Complex parts must be manufactured with both precision and reproducible accuracy, including over extended periods of time. However, during machining, machine components are subjected to relatively high-temperature fluctuations. So, the kinematic transformation chain should be adapted correspondingly. There is a software option that not only handles the recalibration but also saves all data regarding modifications to the kinematic configuration.

A triggering 3D-touch probe is used to measure the position of a precise calibration sphere at various rotary axis settings. The result is a report providing the current actual accuracy during tilting. If desired, the software can also automatically optimize the measured axes simultaneously, and requisite modifications to the machine data are also automatically implemented. The mold builder needs no detailed knowledge about the kinematic configuration of the machine and can recalibrate the milling machine in just a few minutes. If the calibration sphere is permanently mounted on the machine table, then this procedure can even be performed as an automated step between the individual machining processes.

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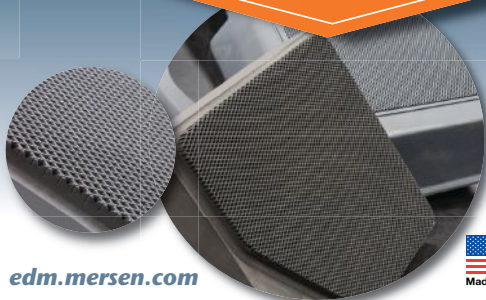
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A batch process function and monitoring software make process monitoring and automation easy.

Radius cutters whose geometry deviates from the ideal circular shape also negatively affect the machining result, since the contact point of the cutter radius with the workpiece as calculated by the control do not match the value for that of the actual radius.

A software and touch probe combination is a powerful method for three-dimensional tool radius compensation. A compensation table enables the specification of angle-dependent delta values that describe this deviation. The control uses this data to compensate for the radius value defined at the current tool contact point on the workpiece.

For the contact point to be determined with precision, the NC program must be generated with surface-normal blocks (LN blocks) by the CAM system. These surface-normal blocks define the tool position and the contact point on the workpiece, and optionally specify the tool orientation relative to the workpiece surface.

## Automation Monitoring

If the machine tool provides perfect machining results, then the associated processes should also run in an optimized manner. Intelligently networked systems for job planning, job management and job monitoring should provide a comprehensive view of job lists, running processes, work progress and any necessary interventions.

A batch process function organizes pending jobs clearly and in a logical manner. To accomplish this, the user creates a line-up of jobs directly on the control. These might be jobs for the approaching night shift, for an entire day or for the upcoming weekend. The batch process function checks this job list and provides important information prior to machining, such as when manual interventions will be necessary and how long the machine will be utilized. This function helps to precisely plan the machining sequence and facilitate a smooth execution of pending jobs.

Monitoring software provides a fast, real-time overview of the current machine and job statuses for all connected machines. This software enables machine data acquisition and provides information about machine messages. The user can maintain an overview of each machine tool and job at all times. The user can also access the monitoring software from any device featuring an up-to-date web browser. **MMT**

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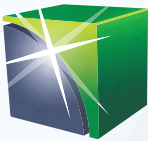
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# How to Take Advantage of AI for Machine Monitoring

Artificial intelligence can help shops reduce preventative maintenance costs and increase production and efficiency gains.

While buzzwords such as predictive maintenance, artificial intelligence, digital twin and augmented reality have promised to enable the fabled digital transformation of manufacturing, when it comes to Industry 4.0, most practical applications start and end with machine connectivity. And when it comes to driving value, look no further than answering these questions: “What’s happening?” and “Why is it happening?”

Most manufacturers are unable to see what’s happening on the shop floor in real-time because their machines are not connected to any data collection or data visualization system. This inability to see and use data to drive continuous improvement

leads to massive inefficiencies that affect every component of a company’s operations, from the shop floor to the C-Suite.

Here is a look at where artificial intelligence (AI) lands within the analytics journey and its relationship to technologies such as machine monitoring and data collection.

## Making the Move to Machine Monitoring

Manufacturing industry is progressing with taking advantage of AI for machine monitoring, but manufacturers are tackling some difficult challenges. As a whole, manufacturing struggles with modernizing effectively in the face of antiquated and ingrained cultural traditions. Often the metric

in manufacturing is the tangible end product, so as long as the end product looks good and sells, we sometimes don’t want to bother with the rest of the process. This makes it hard to drive change and modernization.

For machine monitoring specifically, it gets even harder. Manufacturers can be hesitant to have their data leave the shop, so most machine monitoring companies do an on-premise implementation. This approach leads to siloed data, which makes it tough to aggregate enough data and across sufficiently diverse domains to train an AI model. Imagine if



Images courtesy of MachineMetrics.

Mold builders can collect and transform data through universal machine connectivity and cloud data infrastructure.





AI will be able to help manufacturers drive down costs through preventative maintenance and increase revenue through increased production and efficiency gains.

Netflix tried to build a recommendation engine but only had data from one household.

During the last few years, there have been one-off, single-purpose models that aren't very helpful outside their respective domain or company. Another option is a pure-cloud solution

The ultimate goal of AI for machine monitoring is not to replace humans, but to supplement their expertise with additional, computer-guided capabilities to make the shop run smoother.

(not an on-premise solution) that pulls together a representative sample of manufacturing processes across the discrete manufacturing space. This approach helped develop more general-purpose AI algorithms for detecting failure on multiple different types of processes and machines.

Even after tackling the issue of siloed data, there remain many outstanding issues, both technical and cultural. For example, data can be very messy and inadequately labeled; employees may resist any implementation of AI in the shop, seeing it as an affront to their job security; and there can be a general lack of understanding of AI's current capabilities and

limitations. Manufacturing is slowly working through these problems, so AI adoption will only become greater.

### Assessing the Options

Today, there are several forms of machine monitoring used in manufacturing environments beyond sensors on machines. The two general types are the low-cost/free types that are specifically for small manufacturers, and the huge, enterprise-level applications that need to be customized for different manufacturers, like the ones sold by giants like IBM.

On the low-cost end, these can be quick to implement but have extremely limited capabilities, such as only displaying when a machine is up or not and what percentage of the time the machine has been used. They can also be buggy and unmaintained. Generally, they're known as lightweight solutions that solve one very specific problem, such as tracking parts or monitoring uptime, but not both.

On the higher-cost, enterprise end, these require long implementation timelines and a huge upfront cost. Today, there are plug-and-play vertically integrated IoT platforms that are also feature-rich and extensible to create continuous value and innovation.

Computer vision is another area that's maturing in manufacturing. Installing cameras inside the machine and around





the shop floor is helping manufacturers automatically identify product defects, track inventory and generally make the shop a more automated experience. Again, this is in its infant stages, so impact is limited, but as time goes on, this type of technology will only get better.

## Monitoring the Future

The ultimate goal of AI for machine monitoring is not to replace humans, but to supplement their expertise with additional, computer-guided capabilities to make the shop run smoother. We find that shop culture gets better with more visibility. Employees can reference data when driving decisions, and transparency

helps foster an environment that's healthier in the long run.

As to replacing jobs, when a piece of software is able to automatically track the number of parts created and how

AI and machine learning algorithms uncover data-driven insights to diagnose and predict problems, and communication workflows deliver notifications to the right person at the right time that optimize processes.



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often the machine is up or down, workers' time is freed up to do higher-value tasks, like running initiatives to improve efficiency across the shop floor with data collected by the computer program. The higher revenue that the company realizes can be reinvested into worker-training programs, so that workers doing rote tasks can be retrained for positions focused on management and strategy.

I predict that AI will be able to help manufacturers drive down costs through preventative maintenance and increase revenue through increased production and efficiency gains. However, I warn readers about the danger of yielding decisions purely to AI without human context. Smart managers will always seek to understand why the AI recommendation occurred and supplement it with human input. Just like with relying on AI for anything, like self-driving cars, you need to still stay awake or you're going to crash and burn.

My final advice for the manufacturer who wants to start incorporating AI-based machine monitoring is to start with the basics. Walk before you run. If you have no digitization or automated visibility into your processes, start with descriptive analytics. Just knowing when your machines are or are not running can help to uncover obvious things about the business. For example, discovering that machines are

sitting idle for two hours at the beginning of the first shift. Something like this can help save thousands of dollars right off the bat without any fancy machine learning algorithms.

As to costs and considerations, it's important to get buy-in from not just one party, but multiple key stakeholders in the business before embarking on a machine-monitoring project, even without AI. It's a complicated venture into new, pioneering territory for most shops and can easily fail without organizational maturity and a steadfast eagerness to see change and improve.

Evaluating if your company is the right fit for machine monitoring and advanced analytics is important. Managers should be considering what types of efficiencies they're looking to drive and realize it's not a magic box that will solve all their problems without some effort. The journey into AI and machine monitoring is a partnership that requires constant learning and a thirst for knowledge on all sides. **MMT**

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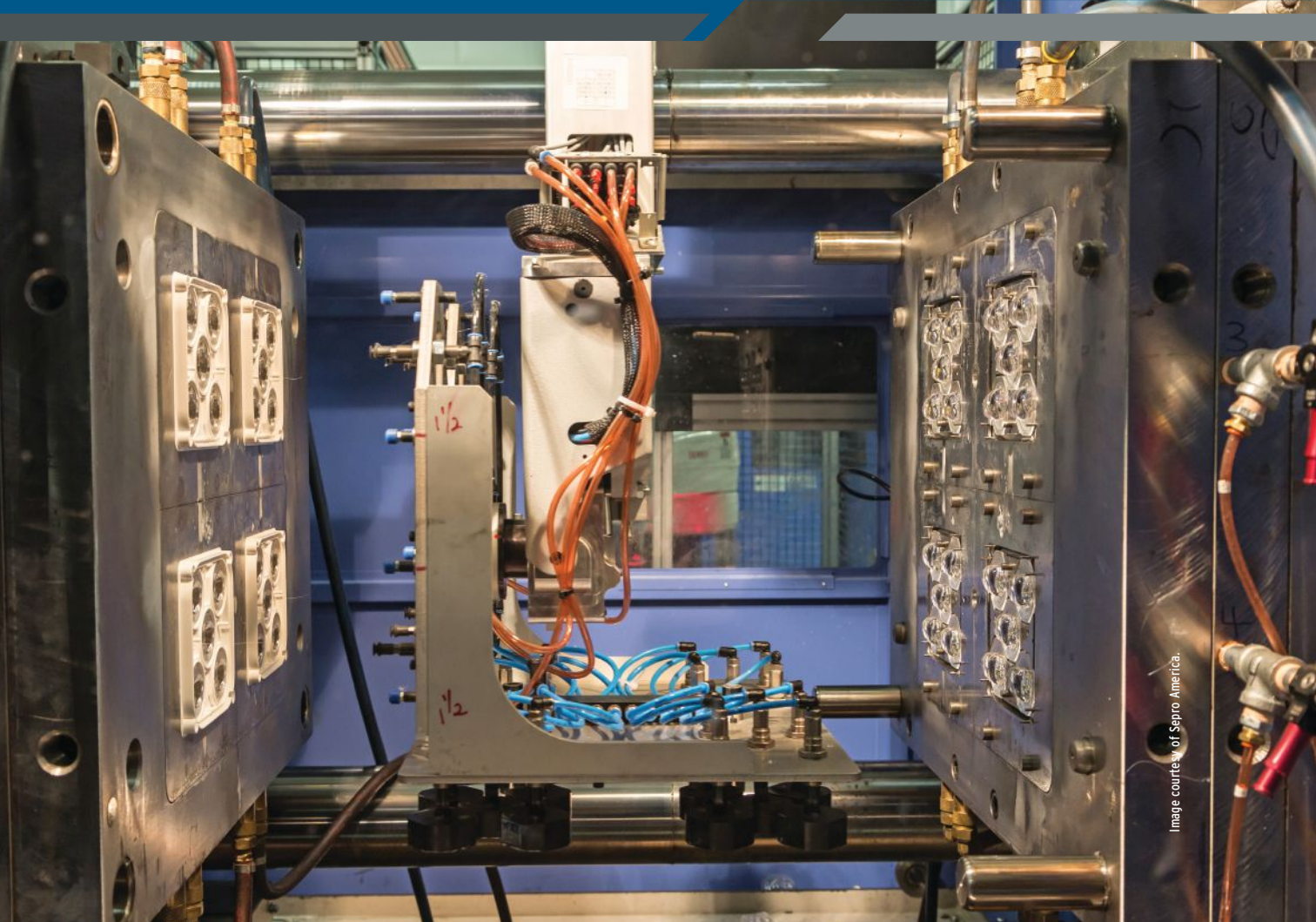
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# Eight Mold Design Decisions That Impact Automation

Making the right decisions during eight key mold design phases will avoid automation problems and save money on price, installation and operation.

**A** mold design almost always involves a certain amount of compromise. The part design may include features that could make the mold either difficult to construct or difficult to operate. So, the part designer, the molder and the moldmaker need to do the best they can to resolve areas of conflict or disagreement, and this usually requires compromise. It is the same with robots and automation.

There are eight specific areas of mold design during which the right decision can avoid problems for the robot or auto-

mation supplier and possibly save money on the purchase, installation or operation of the equipment. But compromise is always going to be necessary, so each of the following tips can be read with the assumption that they are preceded by the phrase, "If possible."

---

Tooling rotated 90 degrees to pick up finished molded parts.



### 1. Do not place inserts on the same side of the mold from where parts will be removed.

When the molded part requires inserts, it is always better to design the mold with the inserts positioned on one side of the mold and the parts retained on and removed from the other. This approach permits insert and part grippers on opposite sides of the robot's vertical arm and avoids problems.

For example, when an insert, part and grippers are on the same side of the end-of-arm tooling (EOAT), the robot must grip the parts and then shift either vertically or horizontally to place the inserts. These extra motions add complexity and cost to the tooling.

Also, the EOAT needs more area to accommodate the two operations on one side. However, when the EOAT is larger (press tie-bar spacing typically determines robot size), it gets in the way of the machine tie bars or with the robot itself. This situation requires the robot to be mounted in an offset position, which in turn may need more beam length, resulting in higher costs.

Also, when all the tooling is on the same side of the arm, there is an uneven weight distribution that can challenge the payload, torque and inertia restrictions on the robot, which means more compromises on the tooling. The EOAT weight should be evenly distributed on opposite sides of the arm.

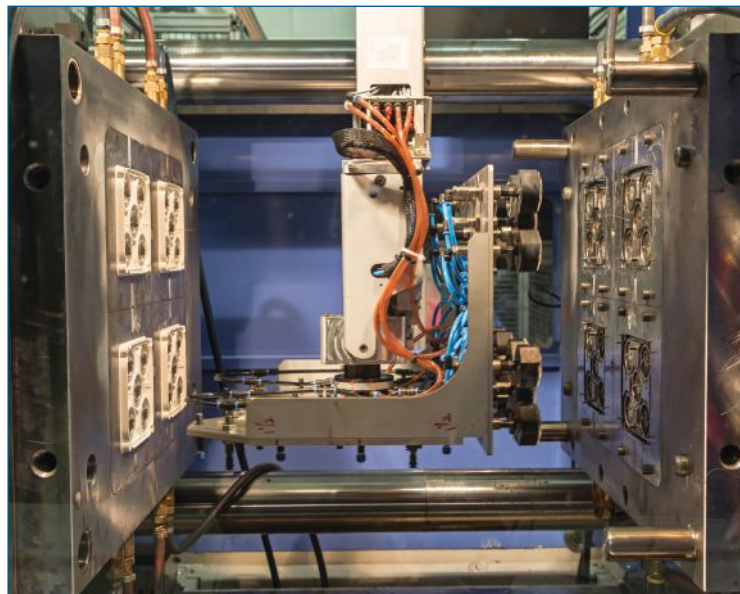
### 2. Avoid mold-locked parts.

Robots are not designed to physically pull a part off of a core or out of a cavity, as that movement places undesirable stress on the grippers and the arm. Avoid any mold lock or undercut, so when everything is working properly, the mold ejector system will start pushing the part out of the mold, and the robot only needs to

A robot contributes immensely to shorter cycle times, increased productivity and profitability simply because it removes parts much faster and more consistently than a human operator.

grab the part and extract it from the mold. Some robots on the market have features that allow a robot arm to move as the ejectors push the part away from the mold.

If the molded part has a significant undercut or is locked behind a mold component, the EOAT will need a secondary mechanism that can lock onto the mold and part, so that an actuator (ejector) can pull the part free. This, of course, increases tooling cost, adds weight (that the robot must handle) and lengthens cycle time. A molder/mold builder



Balanced end-of-arm tooling and a robot placing inserts on one side of a mold.

can avoid these results if they design the mold with slides that eliminate mold locking.

### 3. Design the mold so it shuts off on the inserts.

A robot is not designed to take an insert to a hard stop or to seat the insert in a position on the mold because these movements put unnecessary stress and wear on the robot. Instead, position inserts at a mold shutoff, so the mold closing pushes the insert into its final position. This is a simple way to ensure that the insert(s) cannot slip out of position due to machine vibration or material flow.

And, if the insert is going to be placed on a locating pin, make sure you allow a generous lead or bullet nose on the pin. Using a short, sharp mold pin makes it more difficult for the robot to place the insert properly. Using a long pin with a generous chamfer will simplify the programming needed to move the insert into its proper position.

### 4. Watch what you put on top of the mold.

A robot contributes immensely to shorter cycle times, increased productivity and profitability simply because it removes parts much faster and more consistently than a human operator. However, the robot must get in and out of the mold space as quickly as possible. A molding machine that must wait an extra fraction of a second for a robot to get out of the way will increase costs over time.

The key is to minimize the amount of gear on top of the mold, such as electrical boxes, water lines, or even slides or

unscrewing actuators. If possible, mount this extra ‘stuff’ on the side of the mold, so it does not interfere with the robot as the mold closes.

## 5. Pay attention to gating.

All other things being equal, robot manufacturers will always prefer to automate a hot runner mold. The robot cycle is shorter (less time spent outside the mold) since

there are no additional operations needed to separate parts from the runners, which is important for a fast-cycling part where the robot cycle time could be a limiting factor. The EOAT can be much simpler, too, since gripping and degating the runner will not require additional components.

Cold runner subgate or tunnel gate systems are the next most automation-friendly approach since degating is accomplished by the mold opening or by the ejection system. The robot only needs to pick the parts as they eject, and the runner simply falls out of the way, or more commonly, the robot picks both parts and runners and deposits them separately.

The customer ultimately reaps great benefits when a mold builder understands how they can impact automation design and implementation for the automation supplier.

Problems arise with edge-gated molds because they require a mechanism to remove parts from the runner system, such as cutters on the EOAT (adding cost and complexity) or a degating fixture outside of the mold (adding a secondary operation and extending overall robot cycle time).

If edge gates are necessary, position the gates so there is room for a cutter to get in and cleanly sever the runner near the part’s surface. Otherwise, you may need to leave a small section of the runner/gate that requires removal via a secondary operation.

However, sometimes edge gates can offer an advantage in automation. For example, when the robot is not allowed to touch the part. In these cases, the robot grips only the runner system upon ejection, and the parts remain attached until they are outside of the mold when they can be clipped onto a conveyor or other device for proper handling.

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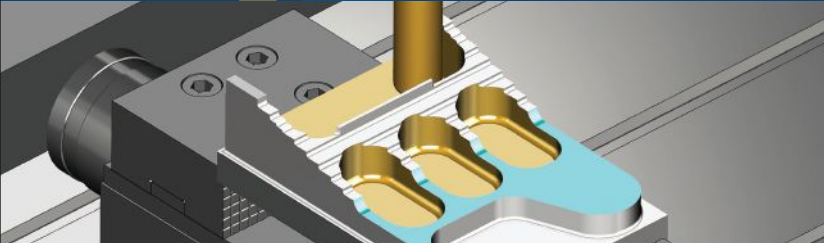
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## 6. Locate left- and right-hand cavities.

Often, parts must be molded in two opposite-handed configurations in the same mold. When two parts are molded in a four-cavity mold, it is common to see the like cavities

Using a long pin with a generous chamfer will simplify the programming needed to move the insert into its proper position.

positioned diagonally to one another. For example, one left-hand part is molded in the upper left corner of the mold and the other in the lower right corner with the right-hand components in the other corners. This approach is used to balance material flow

or to simplify gating, but it does create problems when it comes to automation.

For example, once the parts are removed from the mold, most customers want like parts to stay together with left-hand parts placed on one side of a conveyor and right-handed parts on the other. If the parts come out of the mold diagonally opposite one another, this is either not possible or requires more complicated automation

with multiple wrist rotations. Whenever possible, keep like-handed parts on one side of the mold to ease positioning after removal.

## 7. Use mold locators.

Be generous in the use of mold-locating features. A center sprue bushing is enough to center the mold on the platen, but even a torpedo level is not accurate enough to ensure the mold is perfectly plumb and level. If a mold is not remounted exactly the same way every time, it may be necessary to reprogram critical robot positions to ensure proper operation, or you may need to reposition the mold. In either case, these adjustments increase mold changeover time and impact productivity.

## 8. Design the sprue and runner with gripping in mind.

In most cases, the robot is going to need to grip not only the parts but also the runner. So, the moldmaker must include features in the sprue/runner system that the robot can grip. Options can be as simple as using a one-inch-long sprue or building one or more vacuum pads (half-inch circular pockets along the length of the runner), which are inexpensive vacuum cups on which the EOAT can latch.

Although both options yield a nominal increase in runner material waste, molders will see the return on investment in reliable runner removal.

Robot manufacturers are equipped to develop a solution for almost any mold, so don't view these eight tips as absolute. However, the customer ultimately reaps great benefits when a mold builder understands how they can impact automation design and implementation for the automation supplier. [MMT](#)



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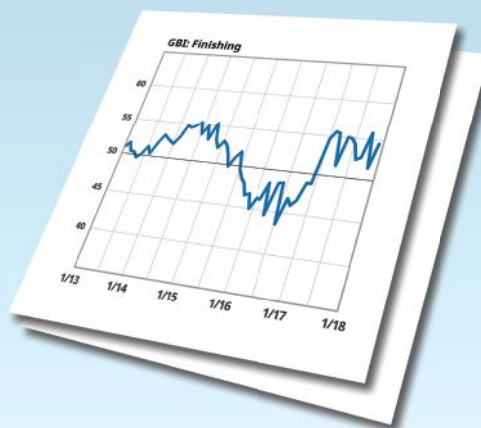
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# Double-Column Bridge Machine Increases Blow Moldmaker's Capabilities

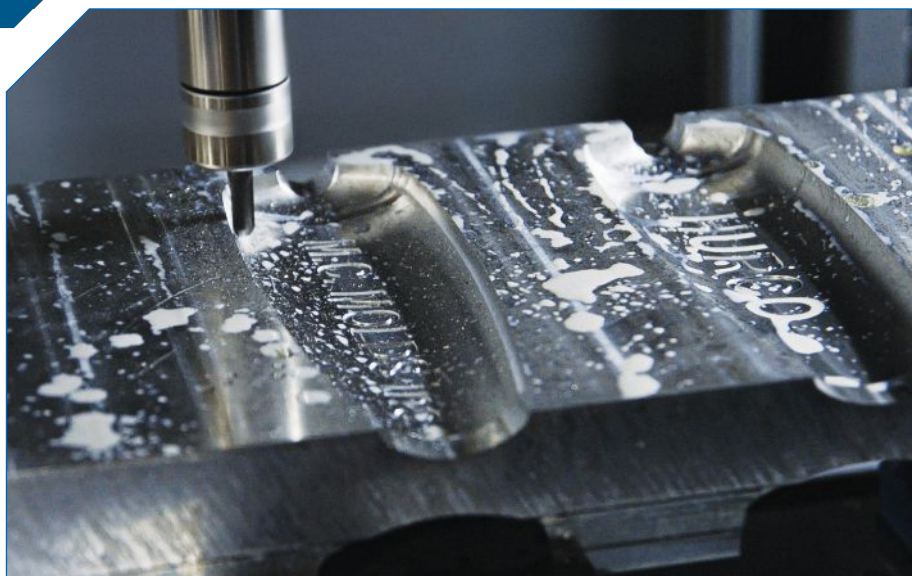
High-speed, double-column bridge machining center runs faster and produces better surface finishes, increasing capabilities of blow mold builder.

**M**.C. Molds Inc. (Williamston, Michigan) was cofounded by Robert Palazzolo in 1984 to serve the blow molding industry. Not only is the state home to many automotive, furniture and medical device companies, but it also has consumer packaging companies that needed and wanted a local toolmaker who understood blow molding and could make effective tooling for it.

Although the company also designs and produces molds for vacuum forming and thermoset urethane foam, and offers custom machining to other tool and die shops, M.C. Molds has stuck close to its roots. Today, it designs and manufactures molds in aluminum, beryllium-copper and stainless steel for extrusion and injection blow molding customers globally in the packaging, medical, automotive, agriculture, lawn and garden, toys/ornaments and laboratory-equipment markets, and also designs blow-molded bottles. A sister company—founded by another Palazzolo in 1992 in Williamston—called JBJ Products & Machinery Inc. (JBJ) produces downstream trimming machines and fixtures for blow molding customers. Last year's workload was high enough that M.C. Molds ran three shifts/day, six days/week.

## Long-Stroke Blow Molding

As demand for plastic packaging—especially in the personal-care segment—escalated, blow molding machinery OEMs introduced double-shuttle long-stroke blow molding machines two decades ago to increase machine capacity. Most commonly found on high-volume dedicated extrusion



Images courtesy of M.C. Molds Inc.

Due to the industry trend toward larger, multi-cavity blow molds, many moldmakers' existing machining envelopes are no longer large enough to produce each mold half in a single piece. That necessitates either making each half in multiple pieces, purchasing a new machining center, or being unable to bid on the largest tools—a situation that Michigan-based M.C. Molds Inc. found itself in circa 2018.

blow molding lines, the machines are equipped with two sets of molds—which may be single cavity, but more commonly are multicavity—that slide back and forth on a shuttle while the blow molding machine drops multiple parisons simultaneously. As parisons reach the desired length, the mold on the left parts and slides to the right to envelop the parisons, closing and trimming them before sliding back to its original position as resin freezes off and parts are ejected. As the first mold returns to the left, the machine drops another set of parisons, and the second tool on the right opens, slides to the left, closes and repeats the process.

“As blow molding machine manufacturers continue to add parisons to increase output, mold length requirements extend accordingly, and, before you know it, your existing machining envelope is less capable of cutting those tools out of one single piece,” Joe Palazzolo, M.C. Molds general manager-manufac-



turing explains. “Over time, you either have to upgrade your equipment or make tools in multiple pieces. And you may find yourself unable to bid on the largest molds anymore.” That’s the position M.C. Molds found itself in circa 2018 when the company decided to purchase a new machining center.

### Keeping it in the Family

The M.C. Molds team knew what it wanted. “The things we looked for in a new machine were quality of construction, versatility of the control, and we knew we wanted a bigger, more robust machine,” David Keesaer, M.C. Molds vice president operations explains. “Once tool design is complete, and it goes out to the machine level, we do everything we can in one setup to ensure alignment of both those tools. Before we purchased our new machine, we couldn’t do large molds. We couldn’t do one big, long, multi-cavity tool.”

Another challenge was floor space. At that point, M.C. Molds still shared space with sister company JBJ in a 12,500-square-foot/1,161-square-meter building that didn’t have especially wide doors (JBJ has since moved nearby to its own building).

“Because we wanted faster metal removal rates, as well as a bigger machining envelope, great surface finishes, and a good price point, we looked at double-column, bridge-style machining centers that were more robust and could run at higher rpm without risking tool growth,” Palazzolo adds.

Many people had opinions on what they should buy. JBJ was a long-time customer of Hurco Companies Inc. (Indianapolis, Indiana) and had several Hurco machines in the shared space. Additionally, another Palazzolo family member worked in a lab equipped with Hurcos at nearby Michigan State University (East Lansing, Michigan). And M.C. Molds itself had purchased a three-axis, high-speed milling machine from Hurco a year before. While they were pleased with their VMXi60 model, that machine didn’t have enough travel to cut the largest blow molds the company was being asked to produce.

M.C. Molds turned to distributor Braun Machinery in Grand Rapids, Michigan, for help deciding which model, out of the nearly 80 that Hurco currently produces, would best meet



Founded to serve the local blow-molding industry in 1984, M.C. Molds, Inc. (Williamston, Michigan) met the need of local consumer-packaging companies for a nearby toolmaker that understood blow molding and could make effective tooling for it. Today, the company not only produces extrusion and injection blow molding tools for customers all over the world in a number of industries, but a sister company makes trimming machines and fixtures for the segment.

their needs. Braun had helped M.C. Molds select its first Hurco and is one of Hurco’s oldest and most successful distributors. A full-service operation, Braun also provides remote diagnostics, machine servicing and training.

After meeting with M.C. Molds’ team in Williamston to learn more about the company’s needs for its second Hurco, and with further visits to Braun’s showroom and Hurco’s booth at the 2018 IMTS in Chicago, the Braun team recommended a new line of CNC machining centers introduced in 2016 that were said to be ideal for moldmakers.

### Ideal for Moldmakers

For over five decades, Hurco has focused its intellectual property and manufacturing expertise on making machining more efficient and profitable for companies around the world. Hurco pioneered “conversational” programming in the early 1970s and is still well-known for the flexibility and versatility of its machine controls.

The BXi Series of high-speed, double-column bridge-design CNC machining centers offers a large envelope and excellent stability to run at higher rpm thanks to the ladder (H-) design of the Z-axis and the weight of the machines (averaging 28,000 pounds/13,000 kilograms). This is said to help the structurally stronger and heavier machines produce better surface finishes regardless of what tools are running on them. They come equipped with an 18,000 rpm HSK 64A spindle, a 30-tool changer magazine, and Hurco’s patented UltiMotion technol-

### M.C. MOLDS INC.

**PROBLEM:** Industry trends toward larger, multi-cavity blow molds for long-stroke blow molding machines made it difficult to properly machine larger molds in a single piece on existing equipment.

**SOLUTION:** Purchase a high-speed, double-column bridge machining center from Hurco.

**RESULTS:** Now the mold builder can machine larger blow molds in one piece and do so faster and with better surface finish.

M.C. Molds turned to distributor Braun Machinery for help deciding which model, out of the nearly 80 that Hurco currently produces, would best meet their needs. Braun had helped M.C. Molds select its first Hurco and is one of Hurco's oldest and most successful distributors. A full-service operation, Braun even provides remote diagnostics, machine servicing and training.



Image courtesy of Braun Machinery.

ogy, which provide very-high accuracy, thermal stability and surface-finish capabilities.

M.C. Molds selected the BX50i model with XYZ travel of 53.2 by 37.4 by 23.6 inches/1,350 by 950 by 600 millimeters and maximum table weight of 5,512 pounds/2,500 kilograms. BX50i is a three-axis model, but by purchasing the optional adaptor rotary table, which can be installed/removed in about 30 minutes or less, M.C. Molds gained a fourth axis when cutting holes at challenging angles, saving the team the time of moving a part off the Hurco and onto one of their five-axis machines.

"The BX50 is really ideal for moldmakers," Tim Navalta, Braun Machinery sales engineer says. "It offers many advantages, including a larger envelope, higher speeds and better surface finishes. When you're making a bottle mold, any imperfection in tooling is going to show in the final product. Plus, Hurco's control is very user-friendly and good for the kinds of programs that M.C. Molds runs."

"The fact that this model's H-frame design braces each side of the machine means the head travels across the column fully supported with no overhang," Jim Braun, Braun Machinery general manager adds. "In contrast, with C-frame designs, where the spindle hangs further out past the centerline of the table, you can have some sag or deflection from the high cutting forces. But with a bridge-style frame, you can run faster with higher accuracy and better finish over the lifetime of the machine."

"The versatility of Hurco controls, the ease of use, the simple training—that's our niche, and it really helps our customers get up to speed and start making money quickly," Michael Cope, Hurco product technical specialist/senior applications engineer adds. "It can really break the bottleneck in the CAD office. Plus, the power of this technology is that as customers learn more, they unlock more capabilities, and their machines can teach them more."

To meet the increasing demand for plastic packaging, blow-molding machinery OEMs introduced double-shuttle, long-stroke blow molding machines two decades ago to increase machine capacity. These presses can produce parts ranging in size from a few ounces to 10 liters, with or without handles and with calibrated necks that are trimmed prior to demolding. Multicavity tooling can produce up to 30 containers per molding cycle.

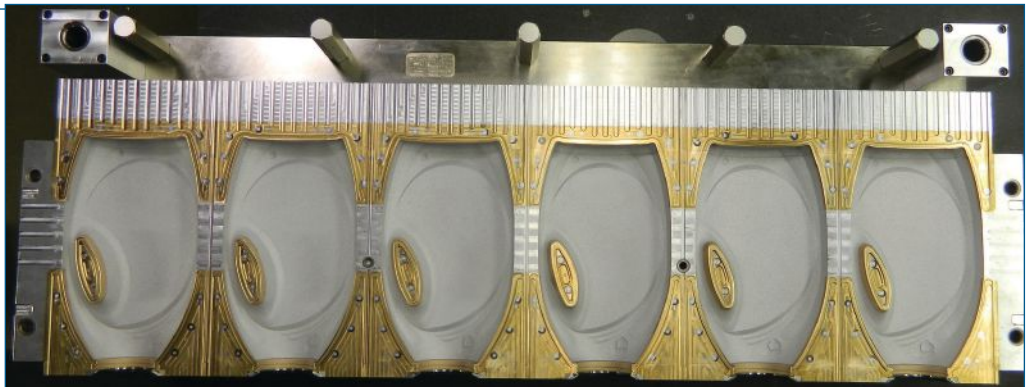


Image courtesy of M.C. Molds Inc.



### Bigger, Faster, Better

Since it was installed in October 2018, the new Hurco has helped M.C. Molds compete for larger blow molding tools and expand its capabilities.

"We use the BX50 on a variety of operations—from cutting cavities to drilling and thread milling to programming part details at the machine's controls using Hurco's WinMax software," Palazzolo says. "Not only did we gain a bigger machining envelope that produces great cavity surfaces, but the WinMax software is truly a powerful controller for running NC programs and programming at the control. The software has several features that make conversational programming and machining faster, such as the DXF transfer, Tool Material Library and AdaptiPath."

"The control features that I find most useful are definitely the AdaptiPath [trochoidal milling], which allows me to put together any kind of lines, arcs and frames for different 2D pocketing," Jordan Wade, M.C. Molds machinist and primary BX50i user says. "The way you can thread mill on the Hurco allows for different types of features. We actually use the thread milling for boring holes and profiling, too. Also, the 3D import feature allows you to really step your game up at the control. I mean, the way you can pick a surface and it will generate the program or the cutter path, it just blows my mind."

"The BX50's long X-axis and wide Y-axis has increased our work envelope and improved our cavity finishes on long-stroke blow molds," Palazzolo adds. "Before purchasing that machine, it was difficult for us to justify running lights-out on smaller molds that have shorter run times. The BX50 allows us to load two sets of molds—four mold halves—on the table in a single setup and cut

Said to be ideal for moldmakers, the BXi Series of high-speed, double-column bridge-design CNC machining centers offer a large envelope and excellent stability to run at higher rpm and provides very high accuracy, thermal stability, and surface-finish capabilities.

several cavities on the weekend running lights-out, reducing our lead times and helping our customers get into production faster." **MMT**

### CONTRIBUTOR

Peggy Malnati is a Detroit-based contributing writer for *MoldMaking Technology* focused on application stories and shop profiles. She has provided writing and communications services for the global plastics and composites industries since 1984. [pmalnati@garpub.com](mailto:pmalnati@garpub.com).

### FOR MORE INFORMATION

M.C. Molds Inc. / 517-655-5481 / [mcmolds.com](http://mcmolds.com)  
 Joe Palazzolo, General Manager-Manufacturing  
 Hurco Companies Inc. / 800-634-2416 / [hurco.com](http://hurco.com)  
 Michael Cope, Product Technical Specialist/Senior Applications Engineer  
 Braun Machinery / 616-698-6400 / [braunmachinery.com](http://braunmachinery.com)  
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## Moldmaker and Steel Supplier Stand and Deliver during Coronavirus Outbreak

By Christina M. Fuges



With the help of its steel supplier, this mold manufacturer delivered a die-cast mold from concept to completion in less than a week for a component that was holding up ventilator production.

Bill Berry, President and Owner of Die-Tech & Engineering (DTE) in Wyoming, Michigan, took on a complex die project from in Minneapolis, Minnesota, for a component that is critical to current ventilator production.

DTE and Twin Cities Die Casting are just two of the many American manufacturers coming together to help our nation through the COVID-19 crisis. DTE and Twin Cities Die Casting are working to help Ventec, a leading supplier of ventilators, to quickly ramp up production. DTE is currently working on tooling for 10 more parts.

While quoting the job on Friday, March 20, 2020, Berry was already arranging to get the steel for the die. It was delivered overnight and in production by 2 am Saturday morning.

His team continues to work through the night to get the job done—including last-minute mold design changes! The job was completed and delivered as of March 25, 2020. And, it's important to note that a job of this scope is normally eight weeks or more. Berry believes that the combined creativity and innovation of American

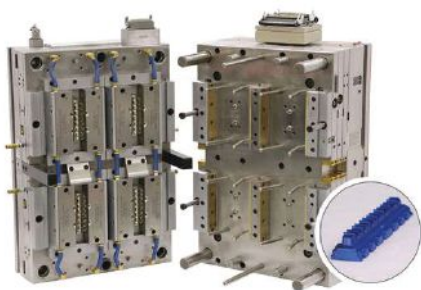
manufacturers is pivotal to the quality of life and security we enjoy today.

Three other Bico steel workers volunteered to come in for Saturday work (once they had the remaining steel dimensions that were needed to start) to complete the other support materials and custom saw cut work for the remainder of the die build. This work was delivered by 5PM on Saturday.

[short.moldmakingtechnology.com/DTECovid](https://short.moldmakingtechnology.com/DTECovid)

## Answering the Call: Plastics

By Robert Schiavone



Mold builders and processors in the plastics industry are undergoing change that will require them to adapt or risk failing.

Today, as we experience the COVID-19 pandemic and the world's reaction, we notice a new, very interesting impact: the changing perception of plastics. In a nutshell, the entire mold manufacturing supply chain must stand together to promote the industry to make people realize the impact it has on the economy.

The days ahead are unclear, so right now we must hunker down and focus on the bottom line. It's a survival game. Forecasting is going to be a guessing game. Market share and definitions of markets will change. We will see a stronger reshoring of suppliers, and there's going to be a start of appreciation of manufacturing again in America. However, to survive long term, we have to adapt, or we will fail.

For example, this means supply chain relationships must change:

- Molders must stop viewing moldmakers as a commodity.
- Moldmakers need to get involved with the OEM and the molder as early as possible.
- Molders must stop hiding what moldmakers they use.
- Molders must be more transparent between moldmaker and OEM.
- Toolmakers must better understand end markets.
- All must better understand consumer behavior and how it relates to a particular packaging design.

When this virus is over, U.S. manufacturing will be stronger, but don't just hope to ride the wave. Be proactive. Get your moldmaker and molder together with the OEM and develop a marketing and communications plan that helps transform the image of manufacturing.

[short.moldmakingtechnology.com/RDLCovid](https://short.moldmakingtechnology.com/RDLCovid)

An interview with Amanda Wiriya, manufacturer and support manager with Wepco Plastics, shares some more positive news (including lessons and opportunities) recognizing the work the industry is doing to help the country move through the coronavirus crisis.

Amanda Wiriya: This crisis really changed our company's outlook and definition of leadership. It was a call to action that we needed to take a more in-depth look at what we consider leadership. By the hour, things can change drastically. We focus on the little things to keep morale up. Something small, but we wanted to support them, encourage them, take care of a meal for them. When we say, we're in this together, we mean it.

Sixty-five percent of our business is medical, so we usually have a high sense of urgency for a lot of things that we get out. However, right now that urgency is obviously yesterday, last week or last month because we're reactive now, not proactive to what our customers are facing. To us, the solution to that is old-fashioned Lean principles. We carry them out every day, but recently we've stepped back and asked ourselves if we are still staying true to these principles.

If you're making something that could save someone's life, we want to make sure that we can follow that sense of urgency and get it out as soon as possible. However, to get all of this out and converted into revenue, you need a team, so our challenge is finding a way to keep our employees safe while we execute these orders.

[short.moldmakingtechnology.com/WepcoCovid](http://short.moldmakingtechnology.com/WepcoCovid)



## Molder/Mold Builder Provides Multi-Level Support of Local Community During COVID-19

By Christina M. Fuges



Amanda Wiriya of Wepco Plastics talks about leadership, skills and coming together as a team to help the local community during the coronavirus outbreak.

Have you tried 3D printing a mold insert only to have it underperform during the injection molding process as it succumbs to the demanding conditions? Well, surface modification may help to bridge this gap between injection molding and 3D printing. The right coating on a 3D-printed mold might prove to reduce the impact of wear, friction, harsh chemicals and materials or heat, increasing mold life and performance. This line of thinking is now extending to 3D-printed production parts, too.

It all comes down to low awareness of surface modification options and how they can solve some of additive manufacturing's material limitations, according to John Marr, CEO of Alcadyne, located in Longmont, Colorado. He has been working with traditional molding and tooling companies for years and is now looking for companies to partner with to prove the benefits of surface modification in the world of additive manufacturing.

Alcadyne is in the thin film vacuum coating business, specializing in physical vapor deposition (PVD) and atomic layer deposition (ALD) technologies. The company coats injection molds and tools, and R&D and production parts for the semiconductor, aerospace and medical industries, with metals, ceramics, and oxides and nitrides of metals to help them hold up better against wear and tear.

PVD coats a material surface without requiring a medium to transfer the coating, as in plating or anodizing. This means you can coat almost any material with another metal or ceramic material. This is talking about micron-layer thicknesses, so they don't knock the part out of engineering tolerances. This is why PVD is often used on injection molds that require tight tolerances but must also hold up against wear and tear.

[short.moldmakingtechnology.com/PVDCoat](http://short.moldmakingtechnology.com/PVDCoat)

## PVD Coatings Solve Common 3D-Printed Mold and Part Problems

By Christina M. Fuges



The right surface modification solution can alleviate a few common additive manufacturing pain points that typically require creating new molds or parts.

## PODCAST: Educators in Mold Maintenance

By Christina M. Fuges



Steve Johnson of MoldTrax and Steve Wilson of Cold Jet chat about mold maintenance in this podcast episode.

In this episode of The Manufacturing Alliance Podcast, the two “Steves” of mold maintenance (Steve Johnson of MoldTrax and Steve Wilson of Cold Jet) chat about mold maintenance, as well as their passions and hobbies.

Here are just a few tidbits of their conversation:

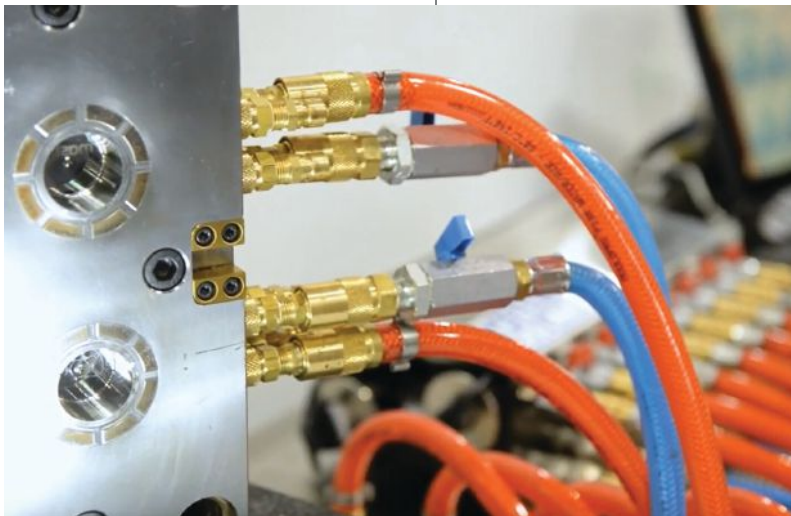
- Mold maintenance does not involve a three-pound hammer and a chisel... Well, sometimes it does. You just need to know when.
- We play with dry ice. It's a very hands-on application, but not complicated.
- The mold maintenance job is 50% hand skills and 50% gray matter, what you know about what you are working on.
- We run 'em too fast and too hard, don't take care of them enough and when we do, are rough when we take 'em apart with the wrong tools and training.
- Regardless of what tool you have in your hand, your ability to control that tool relies on how well you can read the resistance from the tool because you can overpower it.
- Hobbies help you handle tools.
- Learn better how molds function and the critical aspects of each one.
- A messy sticky note mold maintenance binder inspired Mold Trax software.
- People are not looking to be sold to; they want solutions.

Listen to the whole conversation online.

[short.moldmakingtechnology.com/EduPod](http://short.moldmakingtechnology.com/EduPod)

## VIDEO: How Water Flow Monitoring Optimizes Mold Production

By Christina M. Fuges



Rebecca Hamstra of Progressive Components explains why monitoring water flow in injection molds is so important for optimizing mold production.

Progressive Components' Sales Account Manager Rebecca Hamstra discusses why monitoring water flow in injection molds is important, and how having the ability to monitor and control the temperature flow and pressure in each water line can help optimize mold production.

Rebecca Hamstra: The cooling portion of the injection molding process is 60 to 80%. Having that optimized can increase production as well as take care of our product asset of our molds. For the OEMs, having a good baseline of what our cooling flow and temperature through a mold is going to give us a good optimization into the next supply chain for the injection molders.

As far as the mold builders are concerned, having good flow through each circuit and having a good pressure leak test that they can perform is an advantage, so as a mold moves through the supply chain it is not only optimized but it is also making sure that it is performing at what they expect it to perform as. And as for the molders, making sure that they have a good baseline of cooling pressure and temperature in each one of the cooling lines and being able to monitor cooling lines throughout production runs, knowing that we're not seeing scaling or debris

in the lines or leakages. This can really prevent mold stoppages and also help with preventative maintenance moving forward with that tool and production.

See the whole video online.

[short.moldmakingtechnology.com/waterflow](http://short.moldmakingtechnology.com/waterflow)

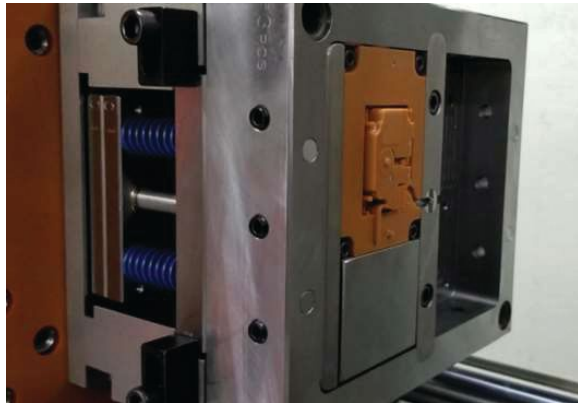


Solving specific problems and sharing best practices is the way Fortify is educating mold manufacturers and molders about its ceramic fiber-reinforced, 3D-printed cavity and core sets for low-volume prototyping.

Ben Arnold of Fortify and John Eastham of Ideal Systems team up for a free webinar that presents a little history of Fortify's technology platform (digital composite manufacturing), details on the beta machine set to hit the market in early June 2020, the importance of ceramic fiber reinforcement, material properties and tolerances, part selection, design guidelines, ejection, ramp up and operation, cooling and cycle time,

and best practices for using reinforced 3D-printed tools.

Learn more from this webinar online. [short.moldmakingtechnology.com/Fortify3D](http://short.moldmakingtechnology.com/Fortify3D)



In this webinar, Fortify breaks down ceramic fiber-reinforced, 3D-printed cavity and core sets for low-volume prototyping.

## WEBINAR: The Key to Digital Tooling Is Ceramic Fiber Reinforcement

By Christina M. Fuges

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# Index Adjusts to Fight COVID-19

March 2020 - 43.0

The GBI: Moldmaking registered 43.0 in March, with all-time lows set for new orders, exports and employment. These readings represent the breadth of change occurring within the metalworking industry and do not represent the rate of change. March's data reported an unusual combination of events as supplier deliveries moved upward, while all other components contracted sharply. In normal times when demand for upstream goods is high, supply chains cannot keep pace with these orders. The resulting backlog of supplier orders thus lengthens delivery times. This delay causes surveyed firms to report slowing or lengthening delivery times, which, by our survey's design, reports that change as an increase in the supplier deliveries reading. Efforts to slow COVID-19's spread have significantly disrupted supply chains worldwide. Due to this, supplier deliveries lengthened and the reading increased.

At this time, it is particularly important for readers to complete the GBI survey sent to them each month. Your participation enables the best and most accurate reporting of COVID-19's true impact. [MMT](#)



## ABOUT THE AUTHOR

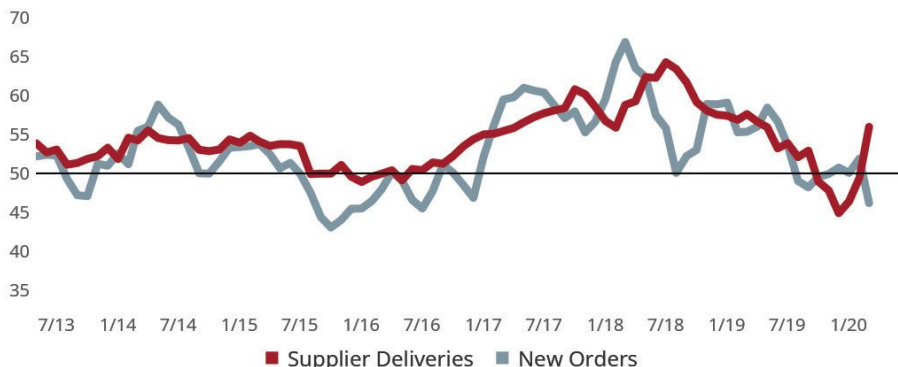
Michael Guckes is the chief economist for Gardner Intelligence, a division of Gardner Business Media (Cincinnati, Ohio, United States). He has performed economic analysis, modeling and forecasting work for nearly 20 years among a range of industries. He is available at [mguckes@gardnerweb.com](mailto:mguckes@gardnerweb.com)

### ■ Gardner Business Index (GBI): Moldmaking



Moldmakers reported challenging conditions in March as the Index registered its second lowest reading in recorded history. All business activity components reported challenging conditions.

### ■ Supplier Deliveries and New Orders



Survey respondents reported a steep contraction among most elements of business activity. The reading for supplier deliveries is designed to increase when supplier deliveries slow under the assumption that suppliers are experiencing higher backlogs and need longer to get parts to manufacturers. In the current situation, it is COVID-19's massive disruption to the world's supply chains that is causing longer delivery times.

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## amerimold CONNECTS

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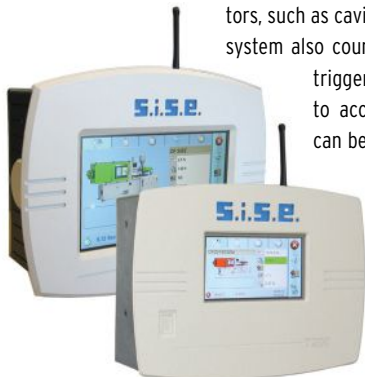
Although COVID-19 has forced the cancellation of Amerimold 2020, this does not stop *MoldMaking Technology* from arming you with technologies and strategies to help better manage and operate your business through the impact of this crisis. Here, we highlight products, equipment and services that exhibitors would have displayed at this year's show. However, you can still join us June 8-13 for Amerimold Connects, a remote event experience. Register today at [amerimoldexpo.com](http://amerimoldexpo.com).

MMT and its sister brands at Gardner Business Media have been working hard to bring our audience the latest information on how manufacturing is being impacted by COVID-19. Visit [moldmakingtechnology.com/covid-19](http://moldmakingtechnology.com/covid-19). Stay safe and healthy.

### Smart Mold Box System Monitors Molds From Any Location

**SISE Plastic Control Systems Inc.** launches its smart mold box, available to moldmakers and tooling engineers to monitor a mold over its lifetime, anywhere in the world. The system, along with its software, counts overall cycles in addition to reading and acting upon key indicators, such as cavity temperature and pressure. The system also counts good and bad parts, and can trigger alarms or command the robot to accept or reject parts. Information can be exported to production monitoring systems and can help improve OEE.

**SISE Plastic Control Systems Inc. /**  
404-495-5968 /  
[sise-plastics.com](http://sise-plastics.com)



### Round Latch Lock Units Enable Optimum Movement

**HASCO** has developed the round latch lock units Z1780/ and Z1782/ especially for applications when a second parting line or additional ejector plate is necessary. For example, on three-plate or molds with dual ejector assemblies to enable defined movement and latching of the moving plates. The compact round latch locks have multipoint locking around the circumference, enabling optimum movement. The round latch locks with pulling and pushing action can be mounted in many different ways.

**HASCO / 877-427-2662 / [hasco.com](http://hasco.com)**

### Mold Cleaner Complies with Air Quality Regulations in the Workplace

**Slide Products, Inc.** introduces X-EMPT, a mold cleaner for plastics processors that complies with air quality regulations in the workplace. The mold cleaner contains only EPA-exempt VOC compounds. The cleaner surpasses California's CARB standards and has no chlorinated solvents.

According to the company, the cleaner is designed to clean molds that have cooled to temperatures ranging from 32 to 200°F (0 to 149°C). Spray it on and it works fast, removing sticky, waxy, oily buildups before quickly evaporating with no wiping needed. Because it leaves no residue, it also cleans without wiping.

**Slide Products, Inc. / 847-541-7220 /**  
[slideproducts.com](http://slideproducts.com)

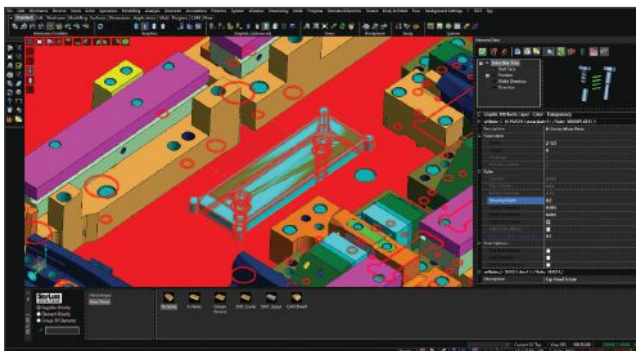




### Five-Axis Machining Requires Fewer Setups for Parts with Complex Geometry

**Maximum Mold Group** displays the benefits to having a large capacity five-axis CNC. By using the five-axis technology versus conventional three-axis machining, fewer setups are required to create a part with complex geometry. Five-axis machining eliminates the need and the cost of creating the fixtures because the part can be held once and rotated so that the geometry is created. Five-axis machining also enables the cutting tool to remain tangential to the cutting surface. Lower cycle times and costs are achieved because more material can be removed with each pass of the tool. Better surface finishes result by using the five-axis capabilities on contoured geometry.

**Maximum Mold Group / 269-468-6291 / [maximummold.com](http://maximummold.com)**



### 3D Models in Components Library Eliminates Busy Work for Tool Designers

**SelfLube** announces 3D models for its entire product line of precision mold and die components are fully incorporated into the VISI CAD components library. VISI users will be able to use VISI's powerful "Builder" tool to select a 3D model for any of the company's 10,000+ components and quickly insert it into the 3D model for the tool being designed with a few mouse clicks. According to the company, this eliminates busy work for tool designers to provide more time to design great tools.

**SelfLube / 800-690-3600 / [selflube.com](http://selflube.com)**

### Control Technology Includes Features to Create Programs on the Fly

**Heidenhain Corp.** showcases its latest in control technology, including the TNC 640, a high-performance, mill-turn control with a workshop-oriented operational design. New features include global programming setting for mold repair and blending of parting lines, TCPM tool center point management for better surface finishes and accuracy in 3D surface machining, and a CAM-viewer option that enables importing of CAM files directly into the TNC, so operators can create programs on the fly.

Heidenhain also offers its StateMonitor software for connected machining and the latest in touch probes for controls. The StateMonitor software is for CNC manufacturing personnel who are implementing connected systems as part of the Industry 4.0 initiative. The software is an option with TNC controls and connects with PC systems to enable users to view data and evaluate control processes remotely and in real-time.

The touch probe, model TS460, is ideal for part set up and in-process inspection. The collision protection feature, along with the part cleaning function, ensures a secure and accurate set up or inspection of mold components not only on Heidenhain CNCs, but on all major CNC brands, as well.

**Heidenhain Corporation / 847-490-1191 / [heidenhain.us](http://heidenhain.us)**

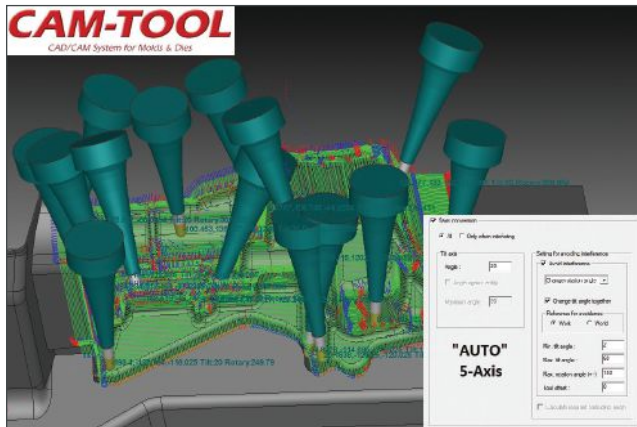


### Moldflow Analysis Solves Part Design Concerns

**CAE Services** uses Moldflow to analyze, identify and solve part design or warpage related concerns before cutting steel. The company's staff can evaluate all aspects of the part and mold design from gate size/locations, SVG timing sequences, identifying weld line locations, optimizing cycle times and applying windage to reduce warpage. The company is GM-certified and has the largest Moldflow expert certified team in North America, having analyzed thousands of projects from appliance to automotive to medical. As an Autodesk Moldflow channel partner, CAE Services offers a single point of contact for "Everything Moldflow", including consulting, software implementation and training.

**CAE Services/MoldVac / 630-761-9898 / [caeservices.com](http://caeservices.com)**

## AMERIMOLD CONNECTS



### Software Decreases Movement for Smoother, More Accurate Tool Paths

Cam-Tool by **CGS North America, Inc.** has improved its simultaneous five-axis conversion (auto) function. The process has been updated to decrease movement of extra axis when unnecessary. This reduced movement in the machine results in smoother, more accurate tool paths. With the ongoing movement towards the barrel cutters, the software has expanded its functionality of barrel cutters by adding 3D Offset Cutting and Curve Control Along Surface to the list of many other tool paths that support barrel and lens cutters. When it is combined with simultaneous five-axis machining, this can show large reductions in cycle times while increasing surface finish.

Improving the drilling functions has been updated with the addition of G01 cross hole drilling. G01 cross hole drilling controls the feed rate when crossing holes, and it recognizes the crossing section of previous processes and changes the feed rates accordingly. This improves deep hole drilling by reducing the feed rate only at the crossing section, while improving tool life by avoiding chipping when breaking through cross holes.

The Show tool shape for preparation of five-axis machining enables users to display the tool shape on the screen and to visualize it against their model. The tool axis direction changes the tilt and rotation angle for 3+2 machining; therefore, the direction makes work plane creation a smooth process.

**CGS North America / 519-737-6009 / [camtool.com](http://camtool.com)**

### Automation Technology Enables Flexible Capacity Adaptation

**Grob Systems Inc.**'s automation technology enables flexible adaptation to capacities and guarantees coordinated pallet handling. The company offers self-made automation components for its entire product range, from semi-automatic to fully automatic production. The automation solutions ensure an efficient production process and guarantee optimal workpiece handling. All fully automatic technologies can be adapted to the specific customer needs.

The linear pallet storage system (PSS-L) is ideally suited as a modular system for individual machines or for interlinking multiple Grob machining systems. With it, up to five machine tools can be connected to a pallet storage racking with a maximum of 87 tool pockets. An increase in machine utilization and economic production can be achieved and a longer unmanned production period can be made possible.

PSS-L is a modular, expandable system consisting of at least one basic module. It is also system-flexible and can be expanded by up to four extension modules and additional setup stations. The basic and extension modules are available with up to three storage levels and ensure a fast pallet change thanks to a dynamic shuttle transfer system. The accessible setup station can be flexibly extended and positioned, with the possibility of crane loading; it also features a modern, flexible production control software with 24-inch touch screen panel that visualizes and organizes production orders. Other advantages of the PSS-L include a high storage capacity with a small footprint, a cost-conscious acquisition investment and visibility into the work space and the pallet storage locations.

**GROB Systems, Inc. / 419-358-9015 / [grobgroup.com/en](http://grobgroup.com/en)**



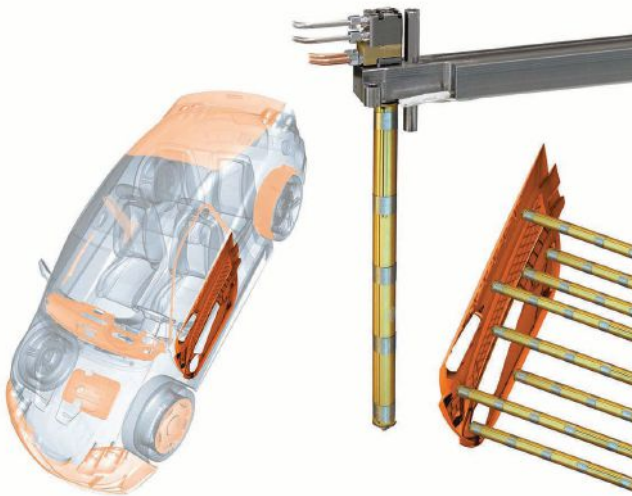
### Pneumatic Cylinders Install Without Removing the Hot Runner

**HRSflow** announces its extended portfolio of compact and small cylinders which require limited installation space. The series of pneumatic cylinders can be installed without removing the hot runner from the mold plate. Designed for excellent thermal insulation minimizing heat transfer from the manifold, they do not require cooling for a wide range of polymers. The modular design concept and a reduced number of parts offer easy maintenance.

Additionally, the company introduces compact hydraulic cylinders, requiring only small cut-outs in the tool. With improved design, they minimize heat transfer from the manifold, reducing heating energy consumption. The hydraulic cylinders enable quick tooling change and lower energy consumptions. Further variants offer a microswitch for end position detection as well as an adjustable version to compensate the position of the needle without mechanical reworking.

**HRSflow / 616-228-6900 / [hrsflow.com](http://hrsflow.com)**





### Compact Nozzle Design Simplifies Cutout Geometry

**INCOE Corporation** presents its DF nozzles with MultiPower heaters for the Direct-Flo product range. Available for the DF 8, 12, 18 and 22 nozzle series, the compact design simplifies the cutout geometry, lowering mold costs and increasing freedom in mold design. MultiPower products have multiple controlled temperature zones required for precision processing.

**INCOE Corporation / 248-616-0220 / incoe.com**



### Precision Machined Components Support Variety of Molding Technologies

**Custom Mold & Design** designs and builds high precision, fast cycling molds and precision machined components to support a variety of molding technologies, including thermoplastic, elastomeric, silicone, metal injection molding, rubber and ceramics. The company specializes in cold deck systems, which provide advantages such as being easier to clean and maintain, eliminating issues and shortcomings, reducing lead times and longevity due to robust design. A cold runner system in a liquid silicone injection mold is the equivalent of a hot runner system in a thermoplastic injection mold.

**Custom Mold & Design / 651-757-4000 / custommold.net**

### Shrink Fit System is Industry 4.0-Ready for Shop Floor Communication

**Haimer's** power clamp comfort i4.0 shrink fit system sets new standards regarding digital connectivity and communication of tools and machines for manufacturing. Each system comes with a seven-inch touch display and an intuitive software package that provides simplified usability. Features like illustrated functions, clear symbols, larger fonts and a robust color display make for a user-friendly interface. The system is network compatible and Industry 4.0-ready for communication on the shop floor. In the machine shop of the future, data will be the key to making the entire enterprise more efficient and productive. Balancing, presetting, shrink fit equipment and machine tools will interface and communicate with each other.

**Haimer USA / 630-833-1500 / haimer-usa.com**



### Universal Spindle Machines Offer Intuitive Gundrilling

**UNISIG's** universal spindle machines offer precise, intuitive gundrilling and machining for mold manufacturers. Designed and engineered for versatility and speed, the USC-2M and 3M models enables moldmakers to increase productivity while incurring savings through the life of the machine. This is made possible through exceptionally quick changeover times between processes. The machines are constructed from a rigid frame, which enables heavy milling capabilities with accuracy. The machines are also installed above the floor, lowering installation costs. The USC-2M and USC-3M come with a 60-position automatic tool changer, CNC Heidenhain controls and a 40 hp machining spindle capable of 4,500 rpm. Machines are rated for nominal drilling depths of 1,500 mm (2M) and 1,800 mm (3M), along with 50 mm gundrilling diameter.

**UNISIG Deep Hole Drilling Systems / 262-252-3802 / unisig.com**

## AMERIMOLD CONNECTS

### Software Includes 3D, Five-Axis Machining Enhancements

**Open Mind Technologies** offers the advanced capabilities of hyperMill 2020.1 CAM software, including powerful 3D and five-axis machining enhancements for complex machining applications, including mold and die. In addition, it increases ease-of-use, overall programming performance and includes key new automation and additive manufacturing strategies. For highly productive rest material machining, the software offers corner rest machining strategies for 3D and five-axis techniques that provide significant benefits in complex machining applications. Enabled by a simple instruction, corners can be machined largely by vertical stroking motions. Then traditional z-level steps can be used to blend with the vertical section and the lower floor area.

HyperMill Maxx machining finishing module is the CAM programming source enabling the use of conical barrel cutters to reduce cycle times over 90% and is ideal for planar, ruled and curved surfaces.

**Open Mind Technologies USA / 888-516-1232 / [openmind-tech.com](http://openmind-tech.com)**

### Self-Venting Mold Steel Designed for Injection Molding Applications

**Molder's World Inc.** announces its upgraded Vortex, a self-venting mold steel specifically designed for injection molding applications. Using Vortex in appropriate areas eliminates gas buildup, reduces injection pressure, lowers cycle times and gloss levels, and substantially reduces scrap and reject rates. Though primarily used for speaker grill insert, interior automotive and medical applications across the globe, Vortex can be used in nearly every molding application where gas buildup is problematic. Vortex® is available in a range of sizes, as well as square and rectangle stock, precision ground press fit vent pins and standard venting core pins.

Molder's World also offers design help at no charge as well as manufacturing and cleaning services for Vortex and Porcerax II applications.

**Molder's World Inc. / 513-469-6653 / [moldersworld.com](http://moldersworld.com)**

### Wire EDM Accommodates Parts with Larger Machine Travels

**Decatur Mold** provides quality molds and services, operating 24/7 for short leading lead times for builds and repairs. The company operates in the automotive, appliance, container, medical, electrical, military and consumer industries. The company's experience includes over-molding, hydraulic ejection, unscrewing, gas assist, insert molding, two shot tools and more. Not only does the company typically build molds for 1000 ton presses and under, but it has repair capabilities.

Its service department has 30-ton crane capacity, laser and traditional welding, multiple CMM machines and a spotting press to ensure the best quality repair.

The company purchased a new Makino U86 CNC wire EDM, which provides larger machine travels and work tank to accommodate parts. While the machine has the physique to tackle extremely large part details, it retains the fineness and precision capabilities of smaller machines. The machine utilizes a stationary work table design that improves accuracy by eliminating variables such as workpiece and di-electric weight shifting that can negatively impact machine movement.

**Decatur Mold, Tool & Engineering, Inc. / 812-346-5188 / [decaturmold.com](http://decaturmold.com)**



### Heating Platens Reduce Mold Surface Temperature Variation

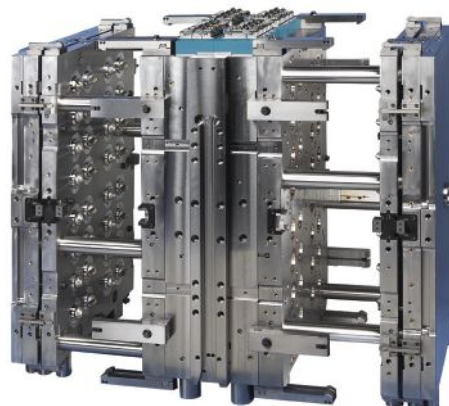
**Venango's** MultiZone heating platens with control system reduces mold surface temperature variation, delivering the precise control to ensure faster recoveries, saving time and money. With MultiZone heating platens, temperature uniformity improved from 25 degrees off target to only 0.4 degrees.

**Venango Machine Co. Inc. / 814-450-3322 / [venangomachine.com](http://venangomachine.com)**

### Complete Solution of Mold Materials and Services Provides One Stop Shop

**Edro Specialty Steels** offers a complete solution of mold materials and services for the plastic tooling industry. The company's addition of Bohler tool steels, MoldMax copper alloys, and PVD/DLC coating services, as well as additive manufacturing, complement the existing business of Edro RoyAlloy, mold bases, aluminum and machining services. The one-stop shop solution provides customers the freedom to order all their materials from one source and reduce critical lead times. The company also provides a team of highly educated material science engineers who work directly with customers on their tooling problems. These engineers have experience in all aspects of tooling, including mill production, heat treating, machining and maintenance, with the added benefit of a complete product portfolio ensuring a solution can be found for customers.

**EDRO Engineering and Specialty Steels Inc. / 909-594-5751 / [edro.com](http://edro.com)**

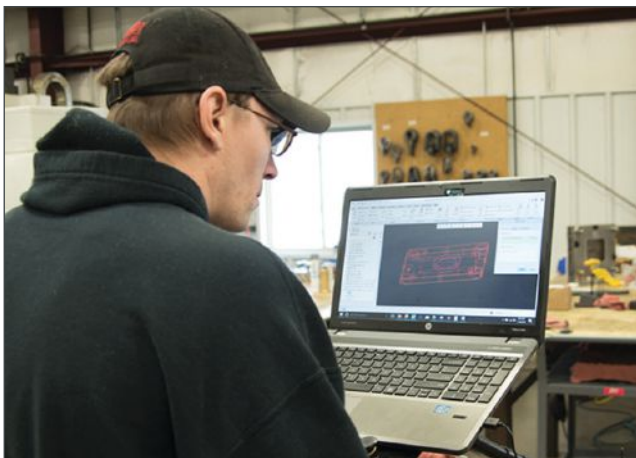




## Aluminum Plates Ideal for Molding and Tooling Industry

**Vista Metals Corp.** supplies a wide range of cast aluminum plate products to the molding and tooling industry. Duramold-2 is a premium grade of mold plate produced in a modified 2618 aluminum alloy. Duramold-5 is a more common grade of mold plate produced in an AA 5083 alloy. Both Duramold products are offered up to 38" thick and 94" in width. These can be combined with the company's ATP-5 tooling plate, also produced in an AA 5083 alloy for a large variety of gauges and tooling equipment.

**Vista Metals Corp. / 909-829-6109 / vistametals.com**



## Laser Welder Performs Internal Mold Repairs and Engineering Changes

**M&M Tool and Mold LLC** has expanded its customer-based capabilities with the addition of an ID1 450-watt fiber laser welder from Alliance Specialties. Used to perform timely internal mold repairs and engineering changes it not only benefits customers, but also its sister companies, Forest Tool Inc. in Crandon, WI and Rowley Tool & Die in Green Lake, WI. The company's strategic tooling team offers professional 3D design, manufacture, project management and final inspection capabilities from start to satisfaction. M&M Tool is a member of AMBA, ITAR Registered, QMED Approved that prides itself on combining the craftsmanship of the past with the technology of today to manufacture "Quality Tooling for the Molding Industry".

**M&M Tool and Mold LLC / 920-336-6474 / mmtoolandmold.com**

## Double Ejection Systems Designed to Control Sequence of Plate Openings

**CUMSA USA** double ejections systems are designed to control the sequence of the double ejections or plate openings. The difference in the three models (EX, EZ, EY) is the plate opening movement. Each type comes in four rod diameters: 14,20,32 and 50mm. All styles feature external setup, easy installation and simple maintenance.

The EX is the external superior plate separator that can be used in a pre-opening plate movement of the mold, as well as a double ejection system. The EY external double ejection line is designed for molds where the upper set of ejection plates are separated and the machine actuates the lower set of ejector plates. The EZ external plate synchronized is designed to enable synchronized mold plate opening regardless of location.

Extension rods are available for the EX, EY and EZ lines, enabling the use of the external double-ejections systems in taller molds.

**CUMSA USA / 248-850-8385 / cumsa.com**

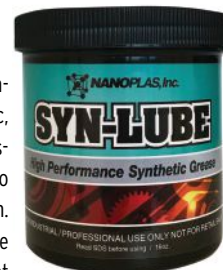


## Synthetic Grease Withstands High Mold Temperatures

**Nanoplas** adds a new product to its family of high-performance greases. Syn Lube is a fully synthetic, food grade grease designed for the most difficult industrial applications. With a temperature range of -100°F to 500°F, it can be used in almost any molding application. The synthetic formula includes anti-oxidants, extreme pressure and anti-wear additives that meet the most stringent requirements for industrial environments.

The grease does not break down, so it will not bleed into the molding cavity and cause scrapping of parts. It can also be applied in much smaller amounts to avoid over-lubrication of grease, significantly reducing its use. End users have seen as much as 10 times longer life between applications with the grease, reducing maintenance costs and press downtime. Syn Lube is registered as an NSF H-1 level product, so it can be used in molds for medical products, food containers and other food grade applications.

**Nanoplas, Inc. / 616-452-3707 / nanomoldcoating.com**



## End Mill Series Reduces Wear and Lasts Longer

**RobbJack** highlights its die/mold series end mills. Made with a revolutionary coating technology, the company's DM/MDM carbide end mills reduce wear and last longer than comparable tools in hard metal applications. The end mill offers tighter tolerances, lasts longer in difficult areas like parting lines and produces better finishes that reduce or eliminate the need for polishing.

The company also announces the FMHV series end mills, designed for high horsepower and high velocity machining in aluminum moldmaking. The FMHV series feature mirror edge geometry, reducing vibration. The FMHV tools are ideal for high speed machining of deep pockets and thin walls.

**RobbJack/Crystallume / 916-645-6045 / robbjack.com**



## AMERIMOLD CONNECTS

### Pump/Filter System Provides Fast, Eco-Friendly Rust Removal

iD Additives, Inc. introduces the newest addition to its Eco-Pro 360 line of rust removal and preventative products. The Eco-Pro 360 XL Cart is a mobile, heavy-duty integrated pump/filter system for cleaning internal cooling passages in molds and other products. It works with the company's iD Eco-Pro 360 solution, which provides fast, eco-friendly rust removal on injection molds, heat exchangers, blown film dies and other products. The XL Cart more than doubles the output of the company's standard Eco-Pro cart and is ideal for larger molds and chill rolls for extrusion.

iD Additives, Inc. / 708-588-0081 / [idadditives.com](http://idadditives.com)



### Round Pallet Enables Machining with Easier Access Around Workpieces

FCS North America Inc.'s M6 round pallet is designed to address mold and die makers' need to machine small components. The shape of the pallet enables machining with easier access all around the workpiece, eliminating the potential risk of interference with corners. The pallet is made of steel and is 180 mm in diameter; the grid step is the standard M6 with 15 mm spacing. It can be quickly mounted onto two FCS manual or pneumatic chucks. The pallet can be handled manually or by automation, with a dedicated gripper.

FCS North America Inc. / 519-737-0372 / [fcssystem.com](http://fcssystem.com)

## THEY GAVE THEIR ALL. LET'S GIVE SOME BACK.

The iWarriors mission is to honor severely injured soldiers from all branches of the Armed Forces by providing them with personalized tablet computers. With help from members of the American Mold Builders Association, Moldmaking Technology, and industry colleagues, we can give the gift of technology to assist these brave men and women with rehabilitation and recovery.



[www.iWarriors.org](http://www.iWarriors.org)



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and donation details please  
visit our website at  
**iWarriors.org**

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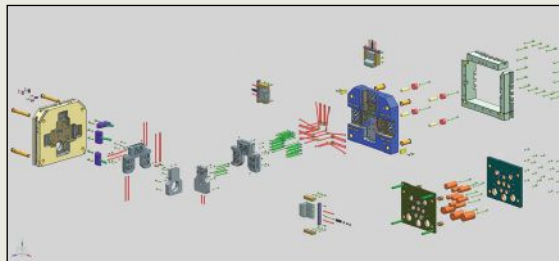
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## ADVERTISERS' INDEX

3D Systems .....	13
Additive Manufacturing Conference .....	27
American Mold Builders Association .....	25
American Precision Museum .....	31
Amerimold Connects .....	15
Caldwell Group, Inc., The .....	20
CGTech .....	34
DME Company .....	Back Cover, 2
Finkl Steel .....	41
Gardner Business Intelligence .....	37
Gesswein & Co., Inc., Paul .....	26
Haimer USA .....	36
HORN USA .....	7
Hurco North America .....	1
INCOE Corporation .....	5
Iscar Metals, Inc. ....	3
iWarriors .....	54
MC Machinery Systems, Inc. ....	30
Mersen .....	24
Methods Machine Tools, Inc. ....	17
Meusburger US, Inc. Standard Molds .....	11
MMS Top Shops .....	35
Okuma America Corporation .....	9
Phoenix Laser Solutions .....	14
Progressive Components .....	Inside Front Cover
RUD .....	20
SUR/FIN 2020 .....	Inside Back Cover
Techspex .....	47

## THIS MONTH ON SOCIAL MEDIA



### YouTube™ Videos

These companies worked together through the night to build and deliver a complex tool needed to help increase ventilator production for the coronavirus outbreak.

[youtube.com/c/moldmakingtechnology](https://youtube.com/c/moldmakingtechnology)



### Popular Posts

Capitalize on technology investment to carve out competitive advantages serving the moldmaking industry.

[facebook.com/moldmakingtechnology](https://facebook.com/moldmakingtechnology)



@MMTMag

### Hot Tweets

Our mascot Phil is tired of this pandemic madness. He wants to know how you all are holding up. Don't forget to submit your responses to our #IfAMoldCouldTalk campaign!

[Twitter.com/MMTMag](https://Twitter.com/MMTMag)



### Conversations

Due to coronavirus and its effect on supply chains, many mold manufacturers will be faced with some tough business decisions. Which is why proper mold maintenance and care are key. If you're stuck working with what you have, you need to make sure what you have works.

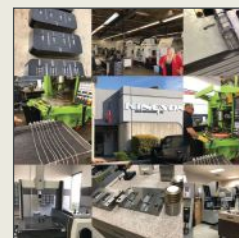
[Linkedin.com/company.moldmakingtechnology](https://Linkedin.com/company.moldmakingtechnology)



### Photo Share

@moldmakingtechnology visiting @kingson\_mold. Great shop, impressive workmanship and interesting story. We'll be covering them soon; look for a podcast.

[Instagram.com/moldmakingtechnology](https://Instagram.com/moldmakingtechnology)



## SOFTWARE

# 5 Ways to Cut Programming Time

By Matthew Raleigh

If you are a mold builder looking for ways to reduce programming times and improve your machining processes, then consider these five steps:

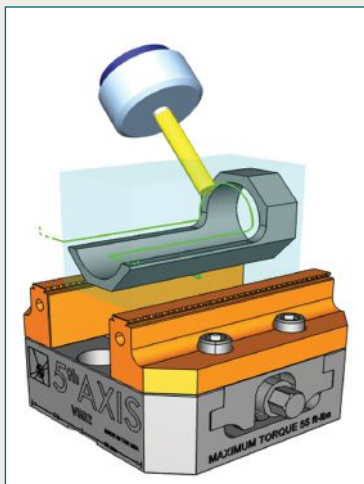
### 1. Import CAD Files

Use CAD to design and help program faster rather than doing the math on your own. Working with a variety of customer file types that may come your way is a huge time saver, especially when working with solid model files or wireframe drawings. If you can open them, you can measure them, edit them and even convert them to g-code.

### 2. Cross-Posting

Write a g-code for multiple types of machines, machine configurations and controllers, and easily switch between control types and machine configurations using a postprocessor. This step gives you the ability to wire g-code for the machine you currently have and the one you'll get in the future. Writing

hundreds of lines of g-code in seconds, programming all kinds of two-axis, three-axis and beyond CNC movements is possible. So is cutting everything from basic hole cycles to complex hard milling on full full-axis and multi-axis machines.



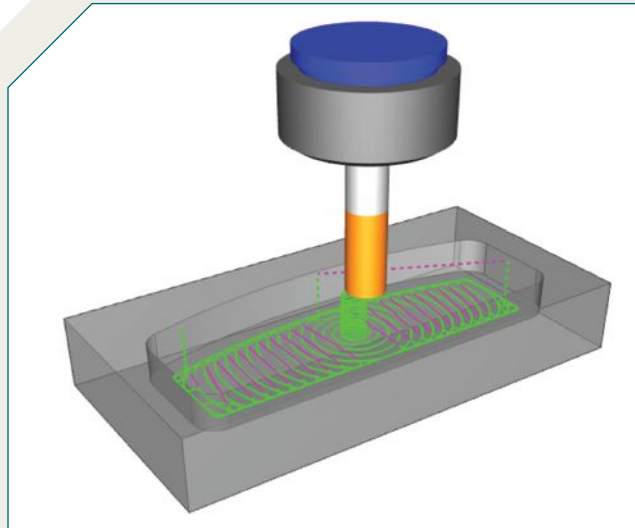
Flexible programming workflow eliminates redundant tasks and allows machinists to reuse toolpath settings and establish standard processes.

### 3. Simulate and Report

Document your programming process with live feedback as you fine-tune your toolpath features. Prove out processes

before the job material, equipment or tooling is available. Seeing what's going on

before you get out to the machine can make a huge difference. Thinking something through is one thing; seeing it in real-time is another. Before you set up a single work offset or optimize



Images courtesy of BobCAD-CAM.

Reduce your cycle times, extend tool life, and minimize wear and tear on your equipment with modern toolpath strategy.

fixturing for a production run, don't you want to see what you planned out in your head? For example, the direction the tool is moving, length the tool is sticking out, clamp fixtures or work holding obstacles, the time it takes, amount of stock and clearance. Simulating and reporting helps you avoid costly mistakes and gain a greater understanding of job requirements.

### 4. Save and Load Machining Features

Create single operations per feature or customize multiple operations tied to a single feature. This flexible programming workflow eliminates redundant tasks. Reuse your toolpath settings and establish standard processes. Each tool, material, setup and machine must work together to achieve a delicate balance. For example, how aggressively you cut, the stock you leave for the finish and how quickly you move. Testing, experience and learning from the experience of others will help you capture best practices and continually apply them.

### 5. Use Adaptive Tool Paths

Take advantage of what current technology has to offer modern cutting strategies on today's powerful and fast CNC machines. Cut deeper, run smoother and increase material removal rates. For example, adaptive tool paths are quickly becoming the standard for two-, three-, four- and five-axis roughing. Reduce your cycle times, extend tool life and minimize wear and tear on your equipment with this modern toolpath strategy. [MMT](#)

### FOR MORE INFORMATION

BobCAD-CAM Inc. / 877-262-2231 / [bobcad.com](http://bobcad.com)  
Matthew Raleigh, Training Manager



# SUR/FIN 2020

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### CONNECT

Meet with peers and connect with industry experts during the conference sessions and with industry suppliers on the showfloor.

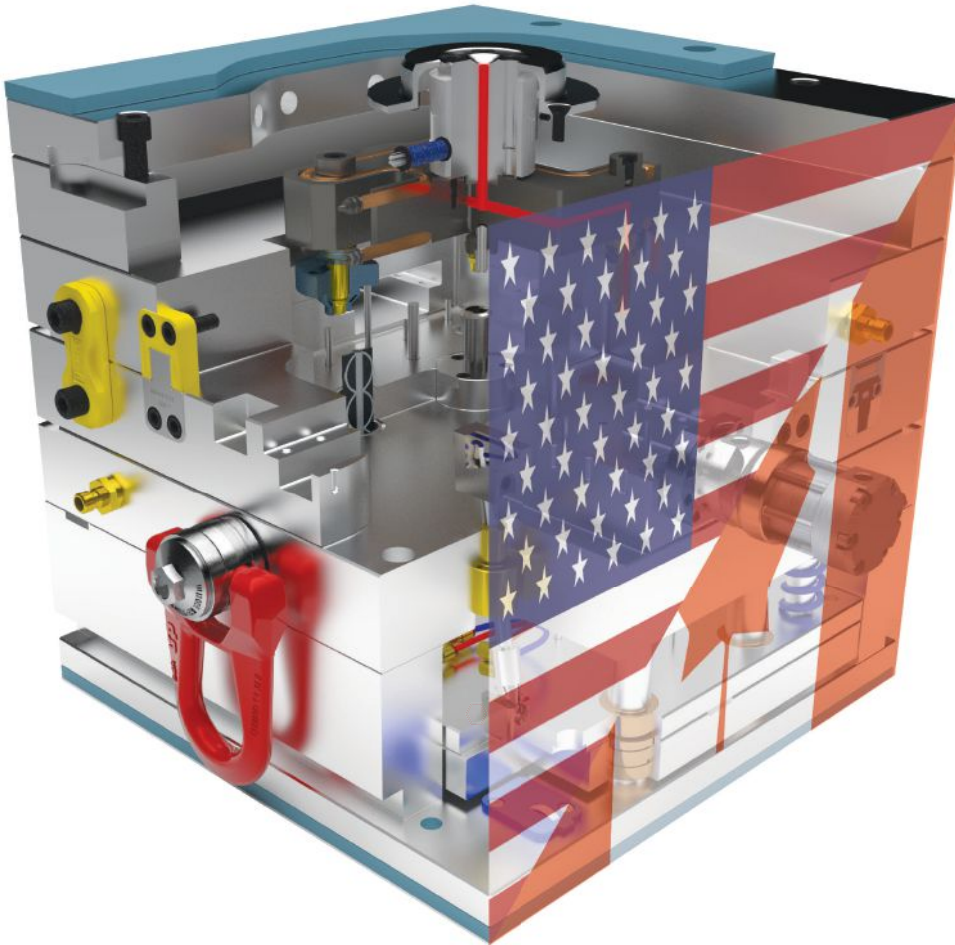
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# STAY STRONG



**DME would like to thank all of the mold shops and molding facilities across North America who stepped up in the time of need and supplied the products required by our healthcare heroes.** You rallied to manufacture tooling for medical equipment and PPE at a speed never previously achieved. Tools that would normally take weeks were manufactured in days. The “can-do” attitude and engineering prowess that makes our Industry so special was fully displayed.

Your work again showed why a strong and vibrant mold making industry is so critical to the success of North America.

**Together we will re-build our economy, grow our jobs and bring prosperity to all.**



*With You Every Step of The Way*

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