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# MoldMaking TECHNOLOGY


Meeting Machining and Mold Building Needs - 10

Improving Efficiency of Drill Cycle Time - 18

Making Informed Hot Runner Decisions - 24

Maintaining Additive Tooling - 28

APRIL 2020 / VOL. 23 / NO. 4

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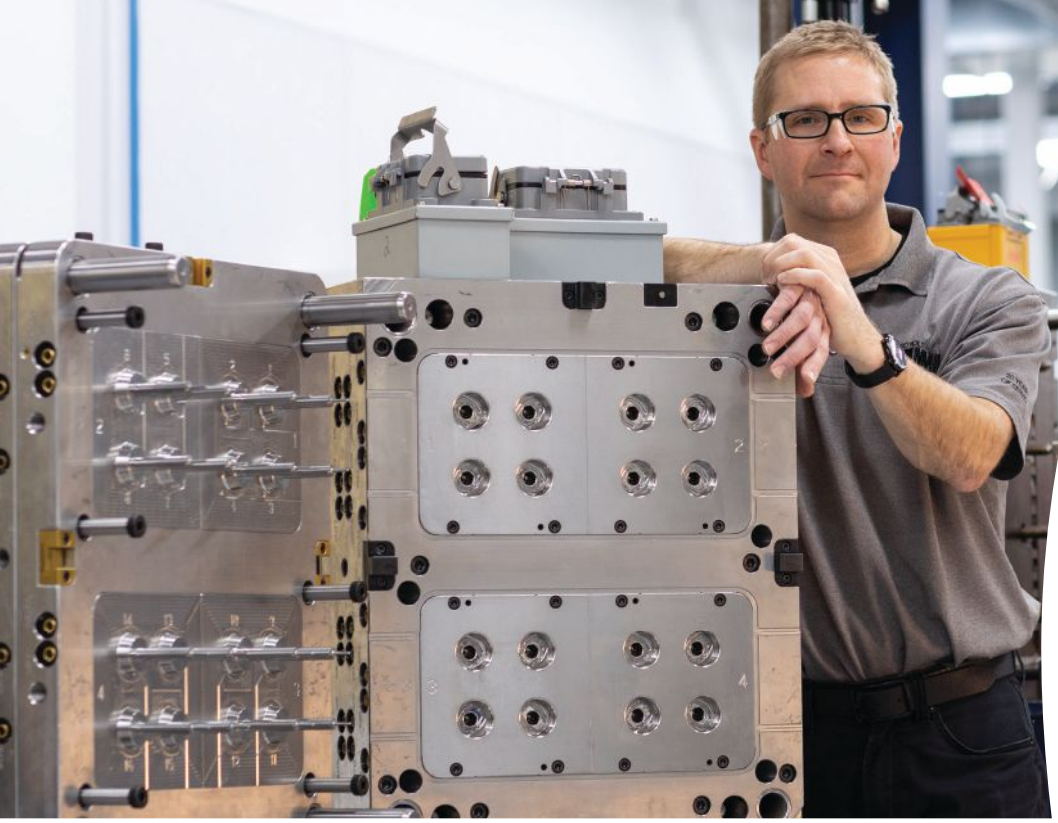

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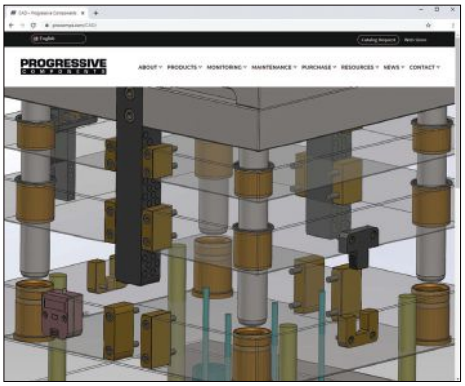


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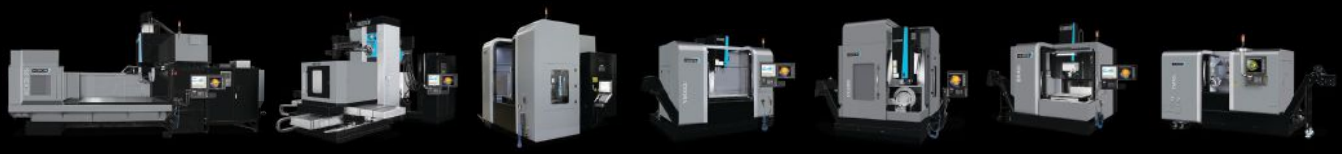

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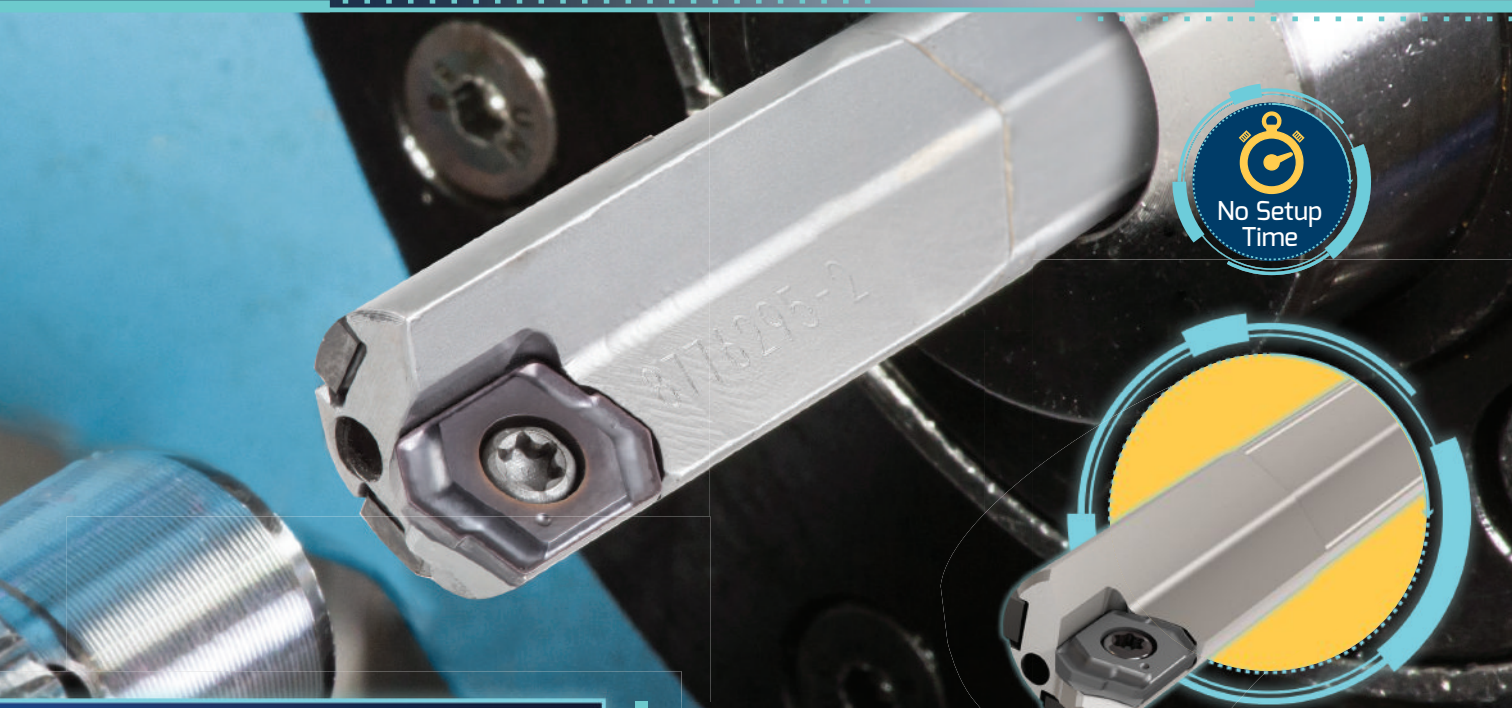
# Small Diameter Deep Drilling Master



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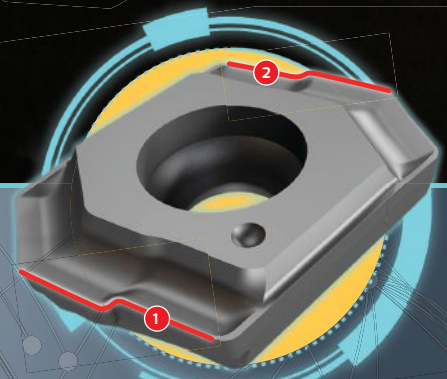
## Small Diameter Deep Drills with New Chip Splitting Insert Concept

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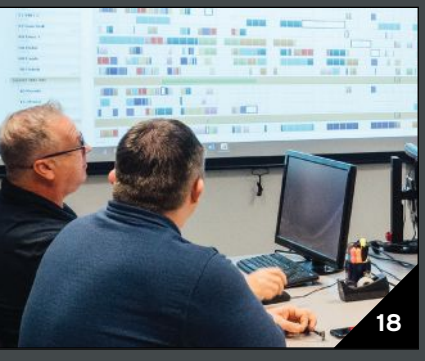
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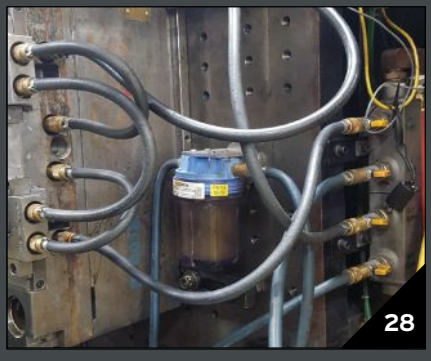
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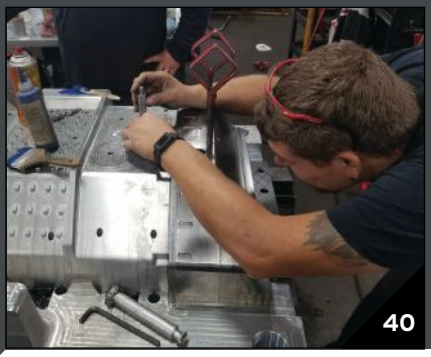
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**ON THE COVER**
Cover photo courtesy of Class Tool & Die Inc. This month's cover shows a core for a plastic injection mold to produce a funnel used by RV owners to more easily fill their water tanks with a hose. The part is setup in an Okuma five-axis machine to machine three sub-gates in the top of the core. See related article on page 10.

Images courtesy of (left to right) MSI Mold Builders, Tanques DeLimpieza Ultrasonic (TLU) and 2K Tool.

VIDEO ACCESS

5 TRICKS OF THE TRADE
## Great Tips from This Issue

**1. Two for One**
The cost of an entire hot runner system may take longer than a year for payback. Consider a hot/cold combination or at least a heated sprue bushing.
**PG. 24.**

**2. Clean Up**
Once you eliminate major solids from the process cooling system and optimize the cooling flow through the conformal cooling circuits, it is time to create a maintenance plan.
**PG. 28.**

**3. Press Facts**
Once the material and tonnage is identified, multiply the number of mold cavities by the part's footprint (square inches) and weight (grams or ounces) to identify the required molding press.
**PG. 32.**

**4. So Much More**
Digital transformation involves a lot more than buying technology. Its application requires a clear direction on the company's business objectives.
**PG. 36.**

**5. Be Wear Aware**
Ensure that mold half temperatures do not exceed a 20°F variance between the stationary and movable halves to avoid mold damage.
**PG. 40.**

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**No issue to let your machine run through weekend? Really??**

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# Meaningful Interactions, Fast

Late last year, I told you about *MMT's* informal cross-generational pilot mentoring program, which we decided to launch after realizing that the skills gaps challenge does not end when a company hires workers. We discovered that once the next generation enters the workforce, the two generations are struggling to get through to the other or understand each other's perspective, and we believe that mentorship can help.

Well, we are a few months into our pilot program, so here are a few key takeaways:

- Vulnerability, honesty and trust are necessary to the process.
- No prior relationship may be key to success.
- Busyness cannot be an excuse for lack of participation.
- Self-awareness is an immediate outcome.
- Mentorship allows more effective "venting" because both the mentor and mentee help each other calibrate.
- Both generations have more in common than they thought.
- Mentorship is not a one-size-fits-all. Some require a plan and formal communication, and others do not.
- Time to process is necessary.

I hope these points entice you to register for Amerimold 2020, where I will be moderating a panel discussion with the pilot program participants. They will share their experiences and reveal how mentorship can help bridge the great generational divide. We'll end the presentation by explaining that no matter what format your mentorship takes, you need a sustainable process to make everything the mentee and mentor learn stick. We will leave the audience with some resources that can help interested attendees seriously consider mentorship.

To go even further with this topic, we are following up the panel with an opportunity for you to take a personal deep dive into mentorship by participating in a special **Speed Mentoring** event that will take place off the show floor in a private conference room. Here *MMT* EAB member and talent consultant Marion Wells of Human Asset Management will lead experienced industry professionals and eager new talent through a session that offers them a chance to connect and gain knowledge from dozens of different perspectives from the international talent that makes Amerimold so special.

To make this event as organized and productive as possible, we are asking those interested to register at AmerimoldExpo.com. There is a $50.00 registration fee. On the form, you will be asked three questions.

The Speed Mentoring event will consist of a quick 30-minute session during which participants will have five interactions with potential mentors and mentees. The goal is to help you find a connection to begin mentoring.

If you have any questions about this program, feel free to email me at cfuges@gardnerweb.com. MMT

Christina Fuges

Christina M. Fuges
Editorial Director

Follow MMT on: Follow @MMT_ChristinaF

## THIS MONTH ON moldmakingtechnology.com


**VIDEO: How to Correctly Diagnose Hot Runner Electrical Issues**
Watch to learn how misdiagnosing temperature control issues caused by defective or incorrectly wired components can make finding root cause and solving the problem difficult and time consuming.
short.moldmakingtechnology.com/ASAME19

**PODCAST: Accomplished Women Empowering Accomplished Women in Manufacturing**
*MMT*'s Christina Fuges is used to leading discussions with the people behind today's mold building on the Manufacturing Alliance podcast, but being on the other end of the conversation is quite a different experience.
short.moldmakingtechnology.com/WAMPod

**BLOG: Technology on Display at Amerimold 2020!**
Your friends at *MoldMaking Technology* and Amerimold are partnering up to give your company some FREE publicity with the Amerimold Exhibitor Product Showcase. See how you can submit yours today!
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**EVENT: Ready, Fire, TEAM! at AMBA Conference 2020**
AMBA Conference 2020's (April 29-May 1 in Indianapolis, IN) theme, Ready, Fire, TEAM!, is designed to inspire moldmaking professionals to focus not just on building a team, but on how crafting the right team the right way can lead to consistent success.
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# 2020 Editorial Advisory Board: **Charles Daniels**

Christina M. Fuges

The next member of our new editorial advisory board is Charles (Charlie), Daniels. Charlie brings a unique finance background to the board in addition to sales, marketing and operations experience (and an active social media presence). He is currently the chief financial officer of Wepco Plastics in Middlefield, Connecticut.

Wepco Plastics is a family-owned company offering American-made parts through collaborative design, creative production quality, prototype tooling and rapid part production. The team specializes in rapid prototyping and short-run plastic injection molding with four-axis aerospace machining, fixturing and secondaries. Charlie has been with the company for seven years in his CFO role, developing and continuously assessing the company's short- and long-term financial strategy by monitoring budgets, economic climate and the industry's outlook. He also works to grow the business by focusing on improving operational and financial processes, cost containment, asset management and building strong internal and external relationships.

Charles (Charlie) Daniels, chief financial officer for Wepco Plastics, is one of *MMT*'s new Editorial Advisory Board members.

Charlie holds a bachelor's degree in hospitality management and a master's degree in business administration with a concentration in accounting. He is a certified management accountant, a Six Sigma Green Belt and a Continuous Improvement Champion certified by ConnStep.

Before Wepco, he was a small business consultant, mentoring in budgeting, debt elimination, benefits, bookkeeping, improving credit, setting and reaching financial goals, financial statements, marketing, employee engagement and achieving exceptional customer service.

Outside of Wepco Plastics, Charlie is Chairman of the Central CT Advanced Manufacturing Employer Partnership, as well as the Chairman of Hebron Schools Innovation Council. He also serves on the Goodwin College Advanced Manufacturing Council and the Middlesex Community College Advanced Manufacturing Council. He was recognized as CFO of the Year in 2017 by the Hartford Business Journal, as well as part of the 2018 American Mold Builders Association Educational Outreach National Campaign.

He is excited to share his expertise with and passion for lean, six sigma, change management and workforce development with the board. However, he is also looking forward to discussing challenges and solutions involving business issues, culture, workflow and training. MMT

**FOR MORE INFORMATION**

Wepco Plastics / wepcoplastics.com

## EDITORIAL ADVISORY BOARD (EAB)

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

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

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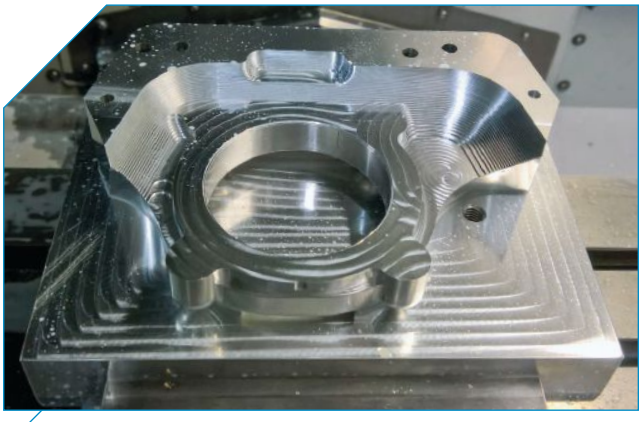
## A Conversation with ...
# Class Tool & Die Inc.



Images courtesy of Class Tool & Die Inc.

Class Tool & Die produces prototype, bridge and production investment cast and plastic injection tooling for customers nationwide in a broad range of industries. Shown above is a tool insert for an injection mold that is still in the process of being cut.

**What do you consider to be Class Tool & Die's specialty in the plastic mold-building segment? What kind of equipment helps you serve those customers?**

**Josh Rogosienski, operations manager:** Class Tool's specialty with the plastic injection market is both prototype and production aluminum tooling. We're extremely efficient in machining aluminum, so sometimes we can produce a new aluminum tool in just days. And sometimes we provide aluminum bridge tooling to help customers produce parts while permanent hard tooling is being built—especially when the design might still be changing as they evaluate samples. Since we also make investment cast dies as well as plastic injection molds, we usually have at least one tool being built at all times. If one area slows down, the other is usually busy, so diversification helps us out.

**Class Tool & Die Inc.**
**740 Swan Drive**
**Mukwonago, WI 53149**
**262-363-0902**
**classtd.com**

- Founded in 1992 by Jerry Rogosienski, owner and CEO.
- Full-service prototype, production, and bridge tooling for plastic injection molders and investment casters in aluminum, hardened, P20 and tool steel. Injection mold sizes to fit presses below 400 tons.
- Additional services include CMM inspection, CMM machining, production of fixtures/gauges/jigs, graphite machining, mold repair, SLA/SLS/3D printing/rapid prototyping, CAD/CAM, complete design services, tool repair and maintenance, and N/C programming.
- Currently employs 10 team members.
- Served industries include automotive and motorcycle aftermarket, motorsports, aerospace/defense, agricultural equipment, industrial, lighting, marine, medical device, recreational vehicles, sporting goods, firearms and commercial trucks.
- Member: Tool, Die & Machining Association of Wisconsin and American Mold Builders Association.
- ISO 9001 and International Traffic in Arms Regulations (ITAR) certified.

**Jerry Rogosienski, founder and CEO:** We have seven machining centers, two Swiss lathes, and one CNC lathe. We have a three-axis, a true five-axis and a horizontal four-axis machining center for mold work. The horizontal one is great because you can put the A half of a mold in one side of that machine and the B half in the other side and just go home. You don't even have to worry about chips sticking. We added the Swiss lathes to make various inserts, lifters, slides/action for our injection molds. Five of our seven machining centers are from Okuma America Corp. in Charlotte, North Carolina. We've slowly transitioned over to one control on the shop floor. Not only does that make setups and programming go faster, but it also makes it easier to cross-train employees, and shortens the learning curve for new team members. We use Solidworks for design and engineering, then Surfcam, HSMWorks and Delcam Powermill for machining.

**Another service your company offers is tool repair and maintenance. What exactly does that entail? Will you work on a tool you didn't make?**

**Josh:** On the repair and maintenance side, we offer that service because some molders don't have an internal tool room to solve issues that can arise as a tool gets used. After an initial e-mail exchange, we have a truck and we'll drive out to the customer, meet with their engineers to go over exactly what's needed, then bring it back to our shop. We also have customers who bring their molds to us. We'll do whatever we can to fix the tool and get it back to them as soon as possible. There've been times when a customer dropped off a tool and sat in our lobby while we made a new ejector pin to replace one that broke. And other times customers dropped off a mold on their way home in the evening and picked it up again on their way back to work the next morning. To us, it's all about customer service. We

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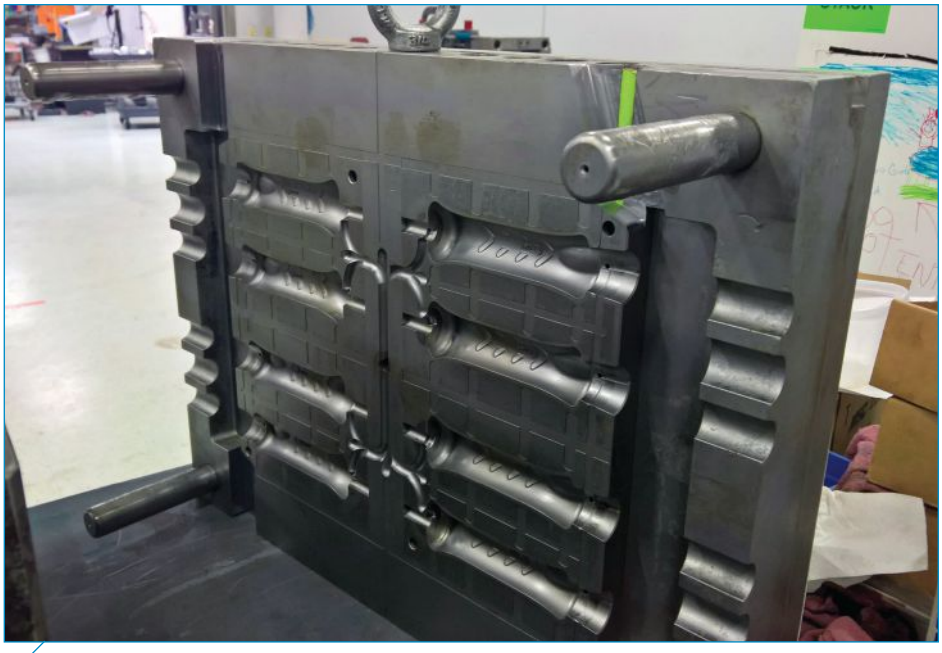
always try to be flexible to help our customers out. We're busy enough that we dedicate one to two guys every week doing just mold repair and maintenance.

**Jerry:** Sure, we'll work on a mold we didn't make ourselves. We'll do whatever our customers want and need. There are a lot of prima donna toolmakers out there, but we're not one of them. Even when you're making a tool, you're still just supplying a service.

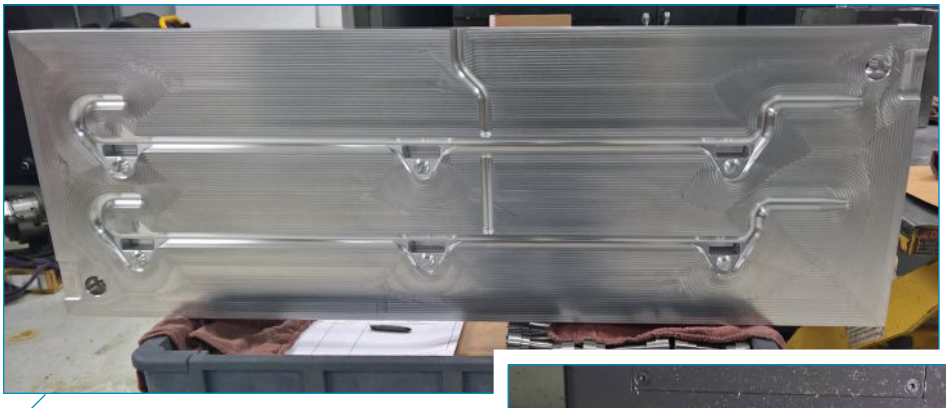
**Your company's roots are in investment cast tools. Do you still make many dies for that segment? If yes, what markets are they used in?**

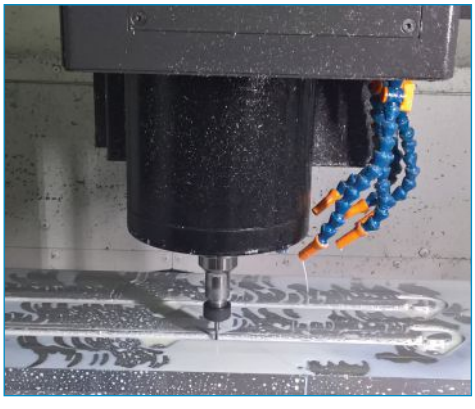
**Jerry:** Back when I was an apprentice, I started at a job shop where we made investment cast tooling. Later, I went to work for a plastic molder. Eventually, I left that company to work for a pattern shop doing small investment casting next door. That was fun because you could make a tool and then very quickly see parts being made from it. Next, I worked for a toolmaker closer to home producing aluminum tooling for plastics. When I started this company, we began in the investment cast area, although as we grew, we also added more and more plastic tooling.

**Josh:** Our company's roots are definitely in building investment cast tooling, and it's still a core area for our business today. We produce tools for various foundries located in Southeastern Wisconsin and throughout the Midwest. The tools are used for lots of different industries



Since 1992, the Rogosienski family has produced investment cast and plastic injection tools for customers in the automotive and motorcycle aftermarket, motorsports, aerospace/defense, agricultural equipment, industrial, lighting, marine, medical device, recreational vehicles, sporting goods, firearms and commercial trucks markets. At present, three generations of the family work in the company and do their best to help customers every day. Shown above is the A-side of an 8-cavity injection mold that will produce handles for prybars. Artwork shown behind the tool is courtesy of fourth-generation family members who hopefully will join the company in due time.





Owing to their experience and efficiency machining aluminum, Class Tool & Die can sometimes turn around a new aluminum injection mold in a matter of days. They also offer aluminum bridge tooling for customers who want to produce parts while permanent hard tooling is being built. And they've had a 3D printer for producing investment cast waxes for a decade. These rapid prototyping services help Class Tool ensure their customers get to market faster. An example of their investment cast tooling work is shown above. The top photo shows the B-side of an aluminum tool and the bottom shows the A-side of the same tool, which is 35 inches/89 centimeters long.


Here is a collection of machined parts produced for the medical device, marine and industrial market segments.

but, being in the Midwest, they often tend to be for agriculture, heavy equipment—including automotive—and for the firearms industry. Our 10,000-square-foot (929-square-meter) facility is roughly 30 minutes west of Milwaukee and is equipped to provide just about any service our customers might need.

**Your company has turnkey capabilities: you can do everything from providing part design to making molds to producing parts. And you also offer CMM machining. Can you tell us about those services?**

**Josh:** We like to get involved in the design process early so we can help our customers avoid issues wherever possible. Sometimes a part model calls for sharp corners that would be both costly and a nightmare to try and mold, only to find out that that feature wasn't necessary in the first place. Whether we're machining a part or making a mold, we try and work with our customers' engineers on DFM (Design for Manufacturing) to make the whole project go smoother for all parties involved. We always try and go above and beyond what the customer asks for.

**Jerry:** For some customers looking to shorten their lead times, they come to us for the whole project, meaning that we'll build the tool for either investment casting or plastic

injection. Then we'll turn to investment casters or plastic molders we trust to get the parts produced for that customer. We can even provide finish machining for parts that require tight tolerances, then inspect the parts and ship them to the customer. For over a decade, we've also had a 3D printer for making investment cast waxes so we can stay current with the advances in additive manufacturing. In the future, we expect to be able to print parts for jigs and fixtures to help get those parts out the door faster.

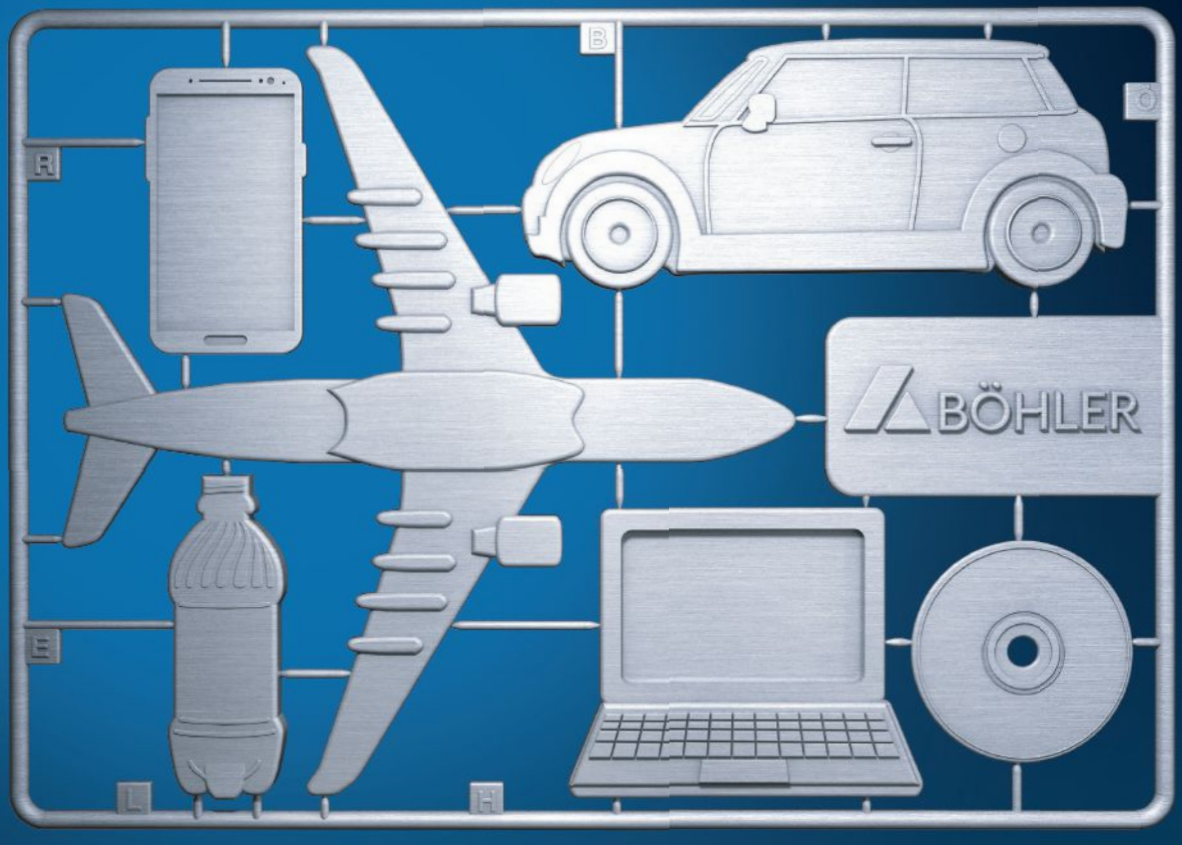
**Josh:** Since we have vertical machining centers, plus horizontal four-axis and a true five-axis center for our mold work, we've also diversified into machining parts. Those jobs can range from a single prototype piece to an order of 100,000 or more. Those customers are mostly in the automotive and motorcycle aftermarket and defense industries, which is why we're both ISO and ITAR certified. With our Swiss lathes, we run our high-production jobs where we can make a new part every 28 seconds. Most of those jobs are stainless or tool steel. On the machining side, we also produce small quantities of machined parts for customers where the volume is too low to justify a mold and not quite right for 3D printing.

**You have several generations of family members working at your company. Is it hard to find young people who want to work in your industry?**

**Josh:** We now have three generations working at our company, so Class Tool is the true definition of a family shop. My father started the company in 1992 when my oldest brother graduated from high school. I joined the company two years later, and my two younger brothers joined four years after me. We're all certified journeymen moldmakers. This past year, my oldest son decided to join the family business after he graduated high school, and two of my oldest brother's boys work here off and on while going to college. We've worked together so long that any one of us can do any job that gets thrown at us, although we've each developed our specialties. We're fortunate in having home-grown employees. They wanted to get into manufacturing, so they work for us while also attending tech school for welding.

**Jerry:** We're also fortunate that there are enough businesses in this area and we have a technical college not far away, so this part of Wisconsin is still a hub for skilled machinists. What's really important is that they have their hearts in their work, they're not just here for a paycheck. MMT

BÖHLER

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| BÖHLER M340 ISOPLAST® | ★★★★★ | ★★★ | ★★★ | ★★★ |
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# Ew gross, Mold!

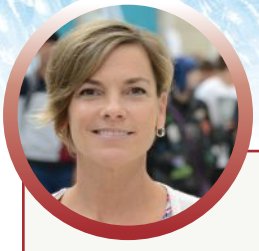
## Want to talk with Phil? *Use #IfAMoldCouldTalk*

It's the second month of life for our friend, Phil, and he was over the moon with the responses from the moldmaking community this month! Phil loves to laugh, so those of you who gave him a good chuckle were at the top of his list.

### Coronavirus?! Not this mold!

Phil's been VERY curious since he came to be, and you've been amazing with your responses in our #IfAMoldCouldTalk campaign. He's been asking me if he should be worried about this Coronavirus thing, but I've assured him that the infection rate in plastic molds is pretty low.

At the beginning of March, Phil sent you all a picture of a pretty disgusting mold and asked what you thought he'd say if he found himself in that kind of condition. He had some favorites from the community's response, and you can check those out to the right.



### WE ASKED THE READERS:

**WHAT WOULD MOLDY PHIL SAY IF HE WAS IN THE CONDITION OF THE PIC SHOWN AT RIGHT?**

Man, what a party. I'm never drinking again.
Andy Baker, *X-Cell Tool & Mold, Inc.*

CLEAN ME! Steve Wilson, *Cold Jet LLC*

It's hard to find good help now a days. Guillermo Sotupo

Oops, I s*** myself.
James Jergens, *Ernie Green Industries*

We're in hot water today!
Sara Mortensen, *Bales Metal Surface Solutions*

Phil's been chattering non-stop about his Amerimold trip in June, so if you want to join him in Novi at the premier event in moldmaking, head to amerimoldexpo.com to register today!

Our little buddy should have plenty more questions for you all in April! He's been mumbling about ***training and safety*** lately, so make sure to keep your creative juices flowing on those topics.

### *#IfAMoldCouldTalk*

Stay tuned to MMT's social media channels for the next #IfAMoldCouldTalk question.

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By Peggy Malnati

# Innovative Indexable Deep-Drilling Tools Greatly Increase Gundrilling Productivity

New drill tools for deep-hole drilling increased feeds, speeds, reduced tool-change downtime and helped the company avoid purchasing a backup gundrill.

Founded in 1971, MSI Mold Builders (MSI; Cedar Rapids, Iowa and Greenville, South Carolina) designs and builds prototype and production plastic molds in steel and aluminum. These molds are used for injection, structural foam, blow, gas-assist and reaction-injection molding plus structural web processes. The ISO 9001:2008 certified company serves a diverse customer base in the computer/business equipment, consumer electronics, appliance, medical diagnostic, materials handling, sporting goods, lawn and garden, heavy equipment, aviation and commercial truck markets.

### Lean, Leaner, Leanest

Since 2001, MSI has been committed to applying lean manufacturing, Six Sigma and 5S principles to increase productivity, reduce waste, improve safety and ensure quality and customer satisfaction.

"As customers continue to demand shorter mold-delivery times and ask us to hold the line on costs, we have to find ways to continuously improve the speed and efficiency with which we make molds to maintain profitability," explains Eric Kolsto, MSI director of technology and training. "Fortunately, we've seen dramatic quality and efficiency improvements since we started down the lean-manufacturing path. We've pushed moldmaking errors to nearly zero, allowing us to build higher-quality tools on very-aggressive delivery schedules that bring greater customer value."

### Rate-Limiting Step

As a process-driven organization, the Cedar Rapids team sought efficiency improvements by continuously scrutinizing the company's workflow—from order entry to shipping finished tools to the position of every machine on the facility's 35,000-square-foot/3,252-square-meter shop floor. An important bottleneck

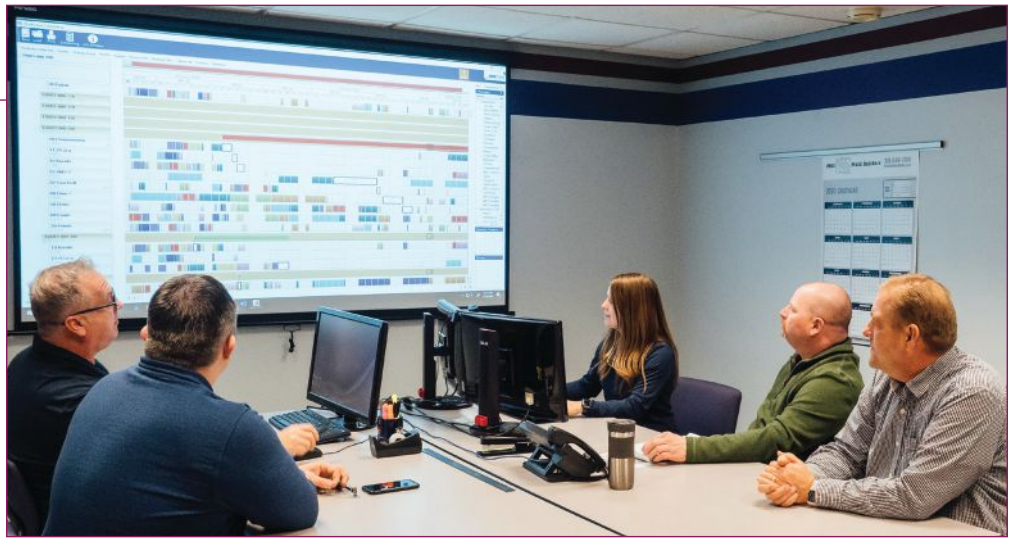


Image courtesy of MSI Mold Builders.

MSI Mold Builders designs and builds prototype and production plastic molds in steel and aluminum for a wide range of plastics processes and industries from plants in Cedar Rapids, Iowa, and Greenville, South Carolina. Since 2001, the company has been deeply committed to applying the principles of lean manufacturing to increase productivity, reduce waste, improve safety and ensure quality. Here, members of the Cedar Rapids team attend a daily MDI (managing for daily improvement) meeting.

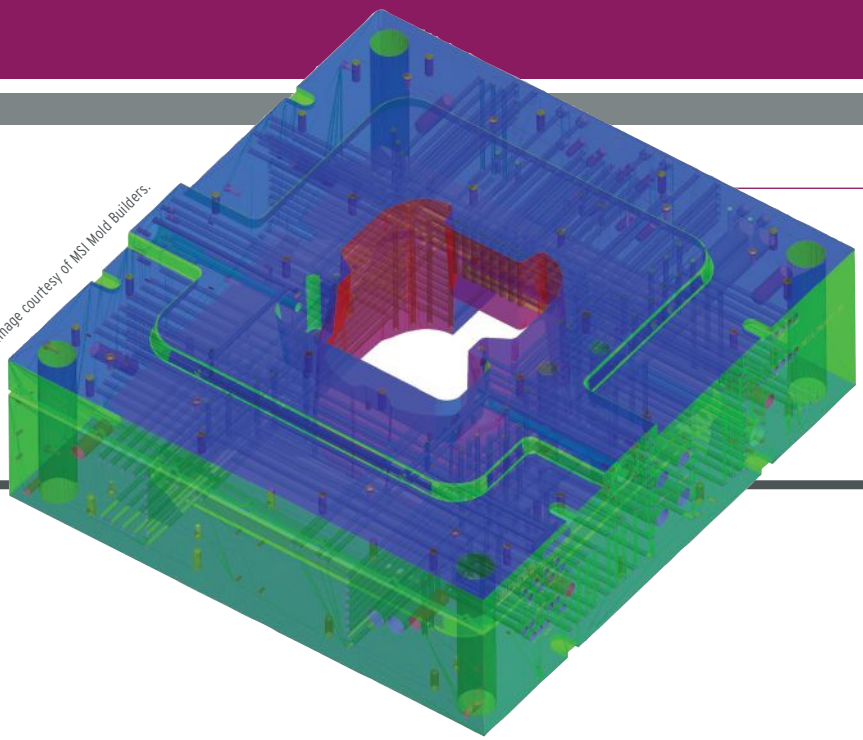
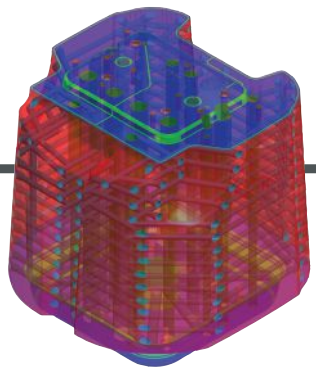


Image courtesy of MSI Mold Builders.

One challenging mold MSI produced a few years ago spent a month on the gundrill machine while the team literally drilled a quarter of a mile of waterlines into it.



was that every mold the company built had to pass through the facility's single Tarus CNC gundrill.

"That machine was operating at 120-percent capacity with two shifts/day using it," recalls Kolsto. "We gundrill all our air, water and oil lines, as well as our ejector pin ream and clearance holes. Once you get over 8 inches (20 centimeters) in aluminum and 4.5 to 6 inches (11-15 centimeters) in steel, it's faster and more efficient to gundrill and you get better results."

That meant the Tarus' workload had increased significantly over the last decade as MSI shifted work from less-efficient to more-efficient processes. In turn, that led to bottlenecks, such as when big jobs held up other jobs on the gundrill. "We did a job a few years ago where a really big tool literally spent a month on the gundrill because the tool required so many cooling lines," continues Kolsto. "We literally drilled a quarter-of-a-mile of holes in that mold." Another nerve-wracking time came when the gundrill was down for six weeks and MSI had to farm drilling work out to toolmakers as far away as Milwaukee, Minneapolis and Chicago because there are few toolmakers in their area that could or would take the work.

## MSI MOLD BUILDERS

**CHALLENGE:** Gundrilling was a rate-limiting step preventing this mold builder from producing molds faster.

**SOLUTION:** Evaluated several deep-drill tool options that increased speeds and feeds, reduced drill changeovers and greatly increased productivity.

**RESULTS:** Avoided regrinding brazed gundrills or buying backup gundrill while increasing shop productivity, quality and profitability.

"It's times like that, when you're trying to grow your business, you ask yourself if you shouldn't buy another gundrill or move work to a less efficient process. However, before you make this type of change, you need to be disciplined enough to review how you're using all your equipment and people."

To that end, MSI conducted time studies to better understand how they were using their Tarus fitted with conventional brazed carbide tools. They looked at how many inches per minute they could drill with each tool before it had to be sharpened or replaced, what rpm they were running at, and how long tool changes took. They even monitored spindle loads. That provided a performance baseline. The study showed that 80 percent of what they were drilling was P20 steel with 9/16-inches (0.563 inches/14.3 millimeter) diameter holes.

### Evaluations Bring Improvements

Because of MSI's size and reputation, suppliers frequently drop by to introduce new technologies and leave samples for the team to try. That was the case several years ago when three different tooling suppliers offered three different types of gundrill tools that the team ran through the same kinds of time studies to see what improvements each offered.

The first supplier brought in first-generation indexable tools that didn't need to be sharpened. Instead, as a tool face dulled, you just indexed the insert and turned a new edge forward. Where before MSI was drilling 0.9-inches/23-millimeters per minute with conventional brazed tips, with the indexable tools they drilled 4.0 inches/102 millimeters per minute. Although there's no data on how often they changed traditional brazed drills, with the indexable inserts, MSI could drill 150 linear inches/381 lineal centimeters before needing to index another edge forward.

Another supplier brought the team a second-generation solid brazed tip with a proprietary grind. With this product, MSI drilled at 4.0-7.0 inches/102-178 millimeters per minute

and could go 65-1,500 lineal inches/165-3,810 lineal centimeters—with an average value was 350 lineal inch/889 lineal centimeters—before the drills dulled. Unfortunately, since this product couldn't be resharpened, when it did dull, it had to be tossed and it could take months to receive replacements if MSI's and its tool supplier's stocks ran low.

A third supplier offered a second-generation indexable drill. This technology enabled MSI to drill 10.1 inches/257 millimeters per minute—a order of magnitude improvement. Additionally, the team could drill 350 lineal inches/889 lineal centimeters per insert edge x 3 rotations (edges)/insert for 1,050 linear inches/2,667 lineal centimeters before needing to replace the insert.

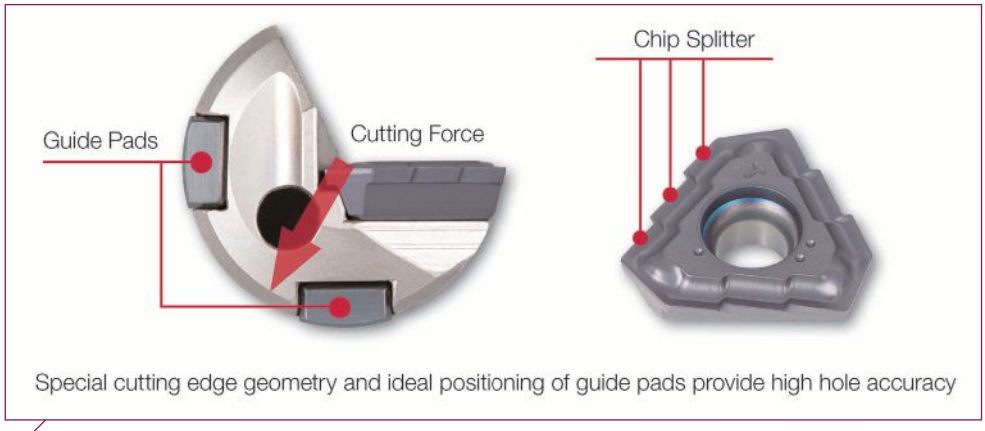



Image courtesy of Tungaloy America, Inc

Tungaloy Corp.'s Deep-Tri drill features a carbide tool insert with multiple cutting edges. As an edge dulls, the insert is quickly indexed and another edge turned outward. Special chip-splitter serrated teeth cut into the insert break up chips so they are much smaller, making them faster and easier to evacuate while reducing scratching on interior surfaces. That, in turn, helps mold builders increase drilling feeds and speeds without modifying drilling machine settings or coolant. Special guide pads stabilize cutting forces throughout the drilling process—especially at intersections with cross-holes—ensuring deep holes are straight and consistent.

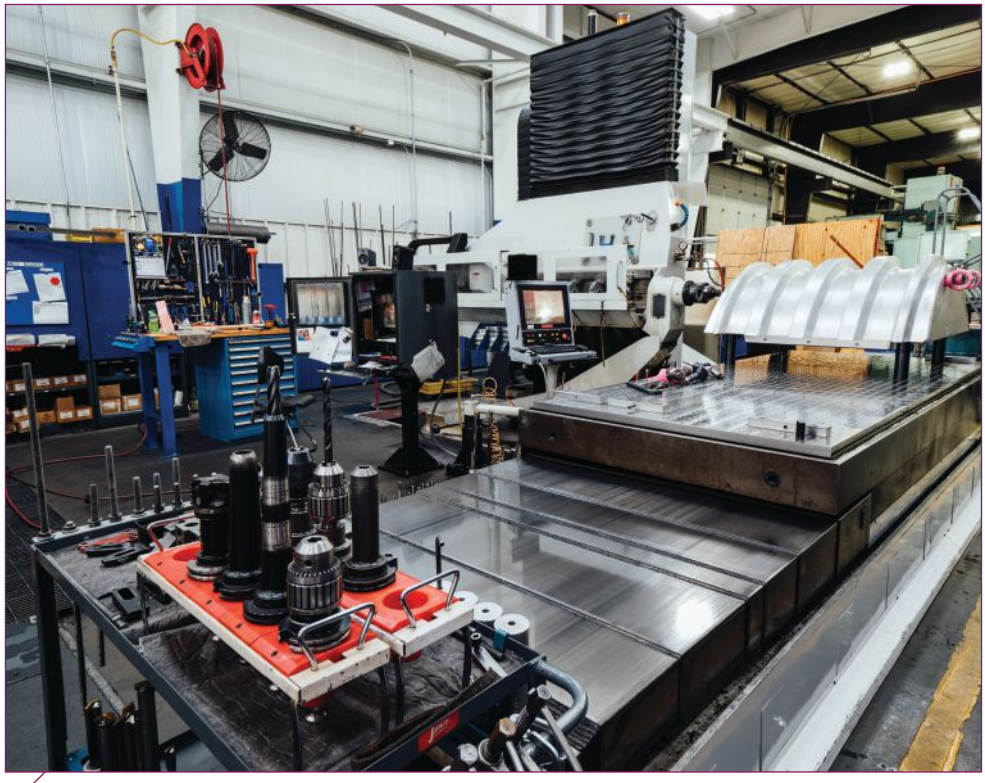


Image courtesy of MSI Mold Builders.

Applying lean manufacturing tools to increase work-flow productivity, MSI found that the rate-limiting step on their shop floor was gundrilling because every mold they made passed through their single Tarus CNC gundrill. That machine had seen a significant uptick in use in the last decade because MSI was drilling far more than cooling lines on it. Conducting a time study helped the team better understand how they were using the equipment. And trying a series of new drills led to significant improvements in drilling feeds and speeds as well as smoother holes and fewer tool changes.

**Twin Heritage**

The product that made such a difference to MSI's productivity was Deep-Tri drill tools produced by Tungaloy Corp. (Fukushima, Japan) and sold by Tungaloy America, Inc. (Arlington Heights, Illinois). Interestingly, this product's heritage draws from two different industries. The first is gundrilling from metalworking. The second is single-tube-system (STS) drilling (also called BTA drilling after the now-defunct Boring and Trepanning Association) for deep-hole machining used in aerospace and oil and gas exploration.

Introduced in 2015, Tungaloy's product features a drill body that stays in the machine. As one edge of the carbide insert and guide

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Image courtesy of Tungaloy America, Inc.

Deep-Tri drills are available in a variety of sizes and with several different insert shapes depending on drill diameter. Standard offerings are 0.47 -1.57 inch/12-40 millimeter in diameter and lengths that are 10x, 15x, and 25x drill diameter for machining centers and lathes, and 31.5, 39.4, and 78.7 inches/800, 1,000, and 2,000 millimeters for gun-drilling machines. Custom products can be developed upon request. Guide pad selection is based on work material: harder (F1122), tougher (F2122), or higher temperature (FH3135). Two different insert geometries also are offered: general-purpose, NDJ and NDL, for lower feed rates when drilling softer materials or using older machines with limited horsepower.

paths begins to dull, it takes less than a minute to index each to a new edge. Each insert is a pure carbide cutting surface carefully honed at just the right angles to produce a sharp, long-lasting edge. Unique to Deep-Tri inserts is a chip-splitter feature. Serrated "teeth" on the cutting edge break up chips into much smaller pieces so they're easier to evacuate, potentially allowing less coolant and lower coolant pressures to be used while drilling at higher rpm. The tool also features two or more pairs of guide pads, which help stabilize the tool so cutting forces stay balanced and holes remain consistently straight as the drill pushes deeper into the workpiece—particularly when it intersects cross-holes. Guide pads also improve hole finish.

Several types of inserts are available depending on drill diameter. The most common model is triangular with three cutting edges and three serrated teeth per edge. It fits tools from 14-28 millimeters/0.55-1.1 inches in diameter. A two-sided insert with two edges and two chip splitters per edge fits smaller diameter tools from 12-14 millimeters/0.47-0.55 inches. For tools greater than 28 millimeters/1.1 inches in diameter, parallelogram-shaped inserts are used. Three parallelogram inserts are used in tandem to accomplish the same functionality as serrated teeth on smaller inserts.

"Our concept with the Deep-Tri drill was to make it indexable with inserts and guide pads, so there was no need to change the whole body when an edge dulled," explains Kedar Bhagath, Tungaloy America chief technical officer. "Now tool changes take less than a minute because all you need to do is index the insert by rotating a new edge forward instead of taking a brazed gundrill out of its machine through the whip guides. That eliminates downtime and saves money. And since the biggest challenge with drilling holes is scarf evacuation, the ability of our chip splitters to break chips up into smaller pieces that are easier to flush out means you can drill much faster." The company reports that versus conventional brazed tips, gundrill feeds and speeds typically increase by a factor of 3.5-4. "Not only can you drill faster, but you can drill better because smaller chips don't scratch the hole, so hole finish is excellent," he adds.

Insert design is said to be critical as is the honing on the cutting edge. "To the naked eye, it looks simple, but the small rounding and rake angles play a huge role in improving machining efficiency," explains Bhagath.

### Revolutionizing Business

Switching to Deep-Tri tools was easy for MSI as no changes were needed to gundrill setup or coolant. In fact, the only change the team made was to drill faster at higher rpm. "The productivity gains we saw represented a very serious improvement that really revolutionized our business," continues Kolsto. His team loves the product and only wishes the tools were available in smaller sizes so MSI could do more of its gundrilling with the technology.

Bhagath adds that not only are mold and die shops making the change, but Deep-Tri drills are now being used to drill deeper holes using lathes and other machining centers. "The hole straightness and diameter tolerances achieved are so precise with this technology that it has opened up new applications and new ways to drill deeper holes for many of these shops," he adds. MMT

CONTRIBUTOR

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By Rick Hagfors

# How to Make an Informed Hot Runner Decision

## A proper hot runner assessment requires evaluating and calculating key runner system variables.

Evaluating the cost justification for a hot runner mold requires careful consideration of cycle time, material type, annual volume, available press size and power consumption, as well as the cost of utilities, resin pricing, allowable regrind percentage and labor rates. Here are three key areas to consider:

### 1. Cold Vs. Hot Process Considerations

Cycle time is the primary cost measure of the molding process, and cooling represents about 80% of the molding cycle (see **Figure 1**). The thicker the part, the longer the cycle time. However, the runner could determine the cooling time, and increase cycle time more than expected if the runner is thicker than the part.

**FIGURE 1**

**Target Minimum Cycle Times**

| Wall Thickness | | ABS | Nylon | HDPE | LDPE | PP | PS | PVC |
|---|---|---|---|---|---|---|---|---|
| Inch | mm | | | | | | | |
| .015 | 0.38 | | | 1.7 | | 1.7 | 0.9 | |
| .018 | 0.44 | | | 1.9 | | 1.9 | 1 | |
| .020 | 0.51 | | | 2.3 | | 2.3 | 1.3 | |
| .025 | 0.64 | | | 2.9 | 2.2 | 2.9 | 1.7 | |
| .030 | 0.76 | 2.3 | 3.1 | 3.7 | 2.9 | 3.7 | 2.3 | 2.6 |
| .035 | 0.89 | 2.9 | 3.9 | 4.6 | 3.6 | 4.6 | 2.9 | |
| .040 | 1.02 | 3.6 | 4.8 | 5.6 | 4.4 | 5.6 | 3.6 | 4.1 |
| .045 | 1.14 | 5.1 | 6.6 | 7.8 | 6.2 | 7.8 | 5.1 | 5.8 |
| .050 | 1.27 | 7.1 | 8.8 | 10 | 8.3 | 10 | 7.1 | 7.9 |
| .060 | 1.52 | 9.2 | 11 | 12.5 | 10.5 | 12.5 | 9.3 | 10 |
| .070 | 1.78 | 12 | 14 | 16 | 13 | 16 | 11.6 | 13 |
| .080 | 2.03 | 15 | 17 | 18 | 16 | 18 | 14 | 16 |
| .090 | 2.29 | 17 | 20 | 22 | 19 | 22 | 17 | 19 |
| .100 | 2.54 | 25 | 29 | 32 | 28 | 32 | 26 | 27 |
| .125 | 3.18 | 35 | 40 | 43 | 39 | 43 | 36 | 38 |
| .150 | 3.81 | 47 | 53 | 56 | 51 | 56 | 48 | 50 |
| .175 | 4.45 | 61 | 67 | 72 | 66 | 72 | 61 | 64 |
| .200 | 5.08 | 76 | 84 | 89 | 81 | 89 | 76 | 89 |
| .250 | 6.35 | 94 | 101 | 106 | 99 | 106 | 94 | 97 |
| *inch* | *mm* | *seconds* | | | | | | |

Chart Based On:

- Injection Time 5%
- Cooling Time = 80%
- Ejection Time = 15%

Example: Material PS Wall Th. 0.045 in.

From Chart T = 5.1 *seconds*

Injection = 0.255 *seconds*

Cooling = 4.08 *seconds*

Ejection Time = 0.765 *seconds*

- *Optimum Cooling Time for Plastics*
- *Maximum Wall Thickness of a specific part.*

Considerations:

- *Optimum Cycle may be restricted by machine dry cycle*
- *Optimum Cycle based on maximum cooling efficiency.*
- *Different Surface Finishes may vary results.*

Image courtesy of Richard Hagfors.

The minute the resin leaves the machine barrel, the material starts to cool and solidify. This, in turn, causes injection pressures to climb and can yield unfilled parts, stress and warp. Limit the l/t ratio (length of flow versus part thickness) to avoid this outcome. Generally, a ratio under 100 is considered general-purpose molding and does not require increased injection pressures.

In a cold runner mold, the l/t ratio is measured from the start of the cold sprue, where the material leaves the heat source and begins to cool, which continues through the entire runner to the furthest point in the part (last point of fill). For example, 1 mm (0.039 inch) thick resin can flow easily 100 mm (3.94 inch). However, if a hot runner is used, the l/t ratio starts at the gate, reducing flow length and the injection pressure required to fill the part.

The higher the ratio, the more injection pressure is required to fill the part. A cold runner is included in the l/t calculation when the molder measures at the point of no added heat. This is one reason hot runners are appealing and can make the difference between molding a good or bad part.

Cold runners can also affect fill time, recovery, and residence time in the machine barrel and hot runner manifold. Every cycle involves the processing of the cold runner, as well as the parts.

Most molders adapt the mold and process to their current machines to optimize performance instead of using mold requirements to size the barrel. Injection molding machines equipped with reciprocating screws have a best-case range, so the process engineer must find the balance among residence time, temperature and pressure to deliver continuous melt to the mold.

Hot runner systems have some limitations. For example, manifold melt channels are typically manufactured in fixed melt channel diameters to limit pressure drop and maintain a consistent flow. The material in the manifold is considered


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part of the residence time, so always consult the material supplier on recommended temperatures and residence times. Also, melt channel size and complexity can impact color change.

**2. Material Considerations**

Most polyolefin resins can be reused without issue. Engineered materials can be limited in regrind content because each time the resin is processed, it experiences another heat history that can degrade melt quality and impact performance, color, rigidity, tensile strength, etc.

Keep in mind, not every runner makes it to the granulator, and not every pellet makes it back to the hopper. While eliminating the cold runner can reduce scrap, a complete hot runner system might not be cost-justified based on low annual volume. The cost of an entire hot runner system may take longer than a year for payback. It might be wise to consider a hot/cold combination or at least a heated sprue bushing. The sprue is typically the thicker portion of the runner, and eliminating that and/or a portion of the runner could have an impact on the cycle time, resin consumption, scrap, etc.

In some applications, a hot runner system might eliminate scrap from unusable runners, but based on the required shot size volume (total volume of parts and runners) relative to the barrel volume, and it might reduce the consumption causing the barrel of the molding machine to be too large. Residence time on engineered materials would increase, which may cause other issues. For example, too small a shot can be challenging to process even with olefins.

**3. Energy Considerations**

Hot runner systems run on electricity like granulators. An injection molding machine takes roughly 1 kiloWatt (kW) to process 1 kg (454 lbs) of resin. Reducing the shot size to parts only can have a significant impact on power consumption. It stands to reason that only heating, melting and processing parts takes less energy than parts and runners.

When deciding between a cold or hot runner system, consider all of these variables, which combined can increase productivity and energy savings, improve material utilization and reduce floor space and noise requirements on the shop floor. MMT

**FOR MORE INFORMATION**

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**CNC TOOLING SOLUTIONS FROM SPINDLE TO WORKPIECE**

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By Jason Murphy

# How to Maintain Additive Tooling

**Implementing additive tooling into a mold can be a daunting task, but maintaining it over the life of the tool can be straight-up scary. Here are three steps to include in your maintenance plan.**

Imagine finally deciding to invest in conformal cooling, then having that investment clog up and everyone saying, "I told you so". The two biggest objections to implementing conformal cooling are channels plugging up or shops believing that they do not have 'perfect water' in their plant to use this approach successfully. The reality is that **all** cooling lines plug up or build up scale, if the toolroom does not properly maintain the inserts. Plus, no shop has perfect water.

Let's explore a three-step maintenance strategy commonly used for additive tooling that incorporates conformal cooling.

### Control Water Quality and Filtration

The first step to success with conformal cooling preventative maintenance is to use localized filtration and to seek expert advice. Water quality is a never-ending challenge when it comes to finding the right balance within your system and there are many solutions to controlling water chemistry. So, if you do not have a subject matter expert in your plant seek out a local service that will help you check the chemistry and provide the right solution.

Whether you are running off a central process cooling system or a local thermolator at the press, place a local filter as close to the mold as possible. The most effective method used by many molders is a 5-micron inline filter unit with a flowmeter on the outlet to monitor the flow rate. The 5-micro filter is very effective as they offer a 7-15 GPM flow, which is sufficient for typical conformal cooling circuits.

Images courtesy of Tanques DeLimpieza Ultrasonica (TLU).

Ultrasonic cleaning requires a technician to disassemble the mold and submerge the inserts in an ultrasonic cleaning unit comprising a series of tanks that use high-frequency vibration to scrub the part surfaces. Use ultrasonics when cleaning any plastic-touching inserts during standard mold preventative maintenance process.

Place a local filter as close to the mold as possible whether you are running off a central process cooling system or a local thermolator at the press.

Filtering individual circuits as close to the mold as possible removes major solids from the cooling source and prevents them from collecting in areas close to the heat source inside the mold insert where calcium builds up.

Placing a flow meter at the outlet enables you to monitor the filter before the flow drops below the cooling circuit's requirements and it starts to reach its end of life. The goal is to optimize filter life before replacement. Adding this step to the cycle checklist, so the team can monitor the filter during production at the expected intervals will prevent clogging.

Placing one filter near each conformal cooling circuit enables a technician to monitor each circuit individually. Also, filtering individual circuits as close to the mold as possible removes major solids from the cooling source and prevents them from collecting in areas close to the heat source inside the mold insert where calcium builds up.

**Boost Conformal Cooling**

Conformal cooling channels in an additive mold inserts are the most restrictive area because the molding surface geometry that you must cool only permits small cooling lines. Plumbing these lines from the manifold or thermolator often starves the circuits because liquid tends to follow the path of least resistance.

> The old saying "An ounce of prevention is worth a pound of cure" is very true when it comes to maintaining your investment in additive tooling.

For example, a manifold with all 3/8-inch NPT (ANSI/ASME B1.20.1 pipe threads) lines out to the mold and 1/8-inch NPT conformal cooling circuits cannot receive the necessary flow due to the increased pressure required to balance the flow. To provide enough pressure to maximize flow through those circuits, install a small inline pressure pump for those circuits off of the manifold. This

approach permits added pressure onto the smaller circuits for optimal flow and avoids adding another thermolator for those specific circuits.

Controlling this flow with a flowmeter ensures that you are achieving the maximum flow rate and consistent production. These small pressure pumps are compact and easily available from industrial supply companies. Look for a pump that is a pressure pump rated for at least 10 GPM. Do not use a flow pump.

Also ensure the pump is rated for the high temperature ranges that your shop uses for process cooling.

### Keep Your Cooling Circuits Clean

Once you eliminate major solids from the process cooling system and optimize the cooling flow through the conformal cooling circuits, it is time to create a maintenance plan that maintains the circuits cleanly and completely during each mold preventative maintenance.

> The reality is that all cooling lines plug up or build up scale, if the toolroom does not properly maintain the inserts.

Here is a look at three highly effective ways to clean your cooling circuits to help you determine which method best suits your toolroom's preventative maintenance program.

1. **Ultrasonic cleaning**. This method requires a technician to disassemble the mold and submerge the inserts in a ultrasonic cleaning unit comprising a series of tanks that use high-frequency vibration to scrub the part surfaces. It is critical to ensure that the entire cooling circuit is full of liquid, so the ultrasonics cavitation power can do the work to clean off any scale buildup in the wall of the circuits.

Perform this step when you clean any plastic-touching inserts during your standard mold preventative maintenance process. Ultrasonics thoroughly cleans out the plate and removes gas residue in the vents to keep the mold breathing efficiently. This cleaning method is a must for any shop performing mold maintenance.

### Defining Additive Tooling

For moldmakers, additive tooling means using 3D printing to produce tooling out of metal, specifically tool steels, that will be used to produce high-volume class 101 molds. This also means sub-inserts that will go into larger molds or mold bases to make this technology economical for implementation. In the near future, this is expected to expand, enabling the production of complete mold plate cavities that form the plastic.

2. **Flush descaling.** A toolroom can run this system between production runs with the mold assembled. The unit acts similar to a thermolator with the cooling circuits hooked up to it. The unit can cycle in the press or on the bench for 1 to 4 hours depending on the scale buildup.

Knowing the flow of each circuit at mold validation serves as a baseline. Descaling units are equipped with a flowmeter to monitor the flow as it cleans. It then identifies the moment the flow matches the original flow rate, so the users knows that the lines are clean and free of scale.

These units also add a layer of protective coating to avoid future scale buildup until the next cleaning. Several unit types are on the market, so do your research and ask for a demonstration to confirm that the unit is an appropriate option for your mold.

3. **Coatings.** Beyond these two preventative actions, advanced coatings are another solution for maintaining optimal efficiency in any conformal cooled additive tooling. For example, ceramic coatings repel scale buildup in the cooling lines that lead to restrictions.

Technicians apply ceramic coatings through a special process that helps it conform uniformly to the substrate, eliminating buildup in corners and flaking, chipping or peeling and preventing corrosion and buildup in the cooling circuits. If your shop is looking for additional protection, coating the circuits provides that extra peace of mind for environments where process cooling is not very stable.

The old saying "An ounce of prevention is worth a pound of cure" is very true when it comes to maintaining your investment in additive tooling. Implementing these simple steps into your process through standardized preventative maintenance will eliminate tooling issues with plugged-up circuits and enable your shop to run production at the quoted cycles, while avoiding defects for the life of the program. These simple strategies can make a big impact on the savings your conformal cooling investment can bring. MMT

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Next Chapter Manufacturing / 616-773-1200 / nxcmfg.com
Jason Murphy, President and CEO

By Robert Vaughan

# Creating an Engineering-Driven Workflow

People and process are two key components of workflow improvement that focuses on engineering better customer solutions at the start of every project.

I started my career in plastics on the west coast in the early 1970s, when the industry was primarily manufacturing-driven with few mold designers or plastics engineers. The workflow started at the top and trickled down to the design department or a contract designer who "cut his teeth" on the shop floor before moving to the drafting board.

The plastics industry needs to become an engineering-driven industry in which companies start a mold design apprentice on the shop floor just like a moldmaker apprentice. This training approach helps the designer learn the equipment and proper mold assembly, so he or she can *see* the various issues a mold builder confronts and then engineer a mold or tool to stop problems before they occur.

How is our industry progressing toward this goal? Is plastic injection moldmaking still a one-person show workflow? Is there collaboration across departments? Are there numerous people involved with every project who do not need to be, creating engineering bottlenecks that delay customer deliveries?

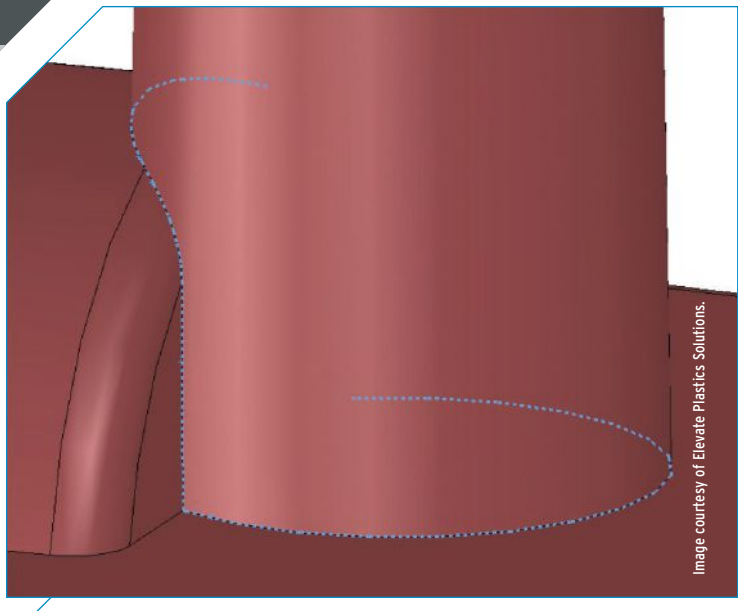


Image courtesy of Elevate Plastics Solutions.

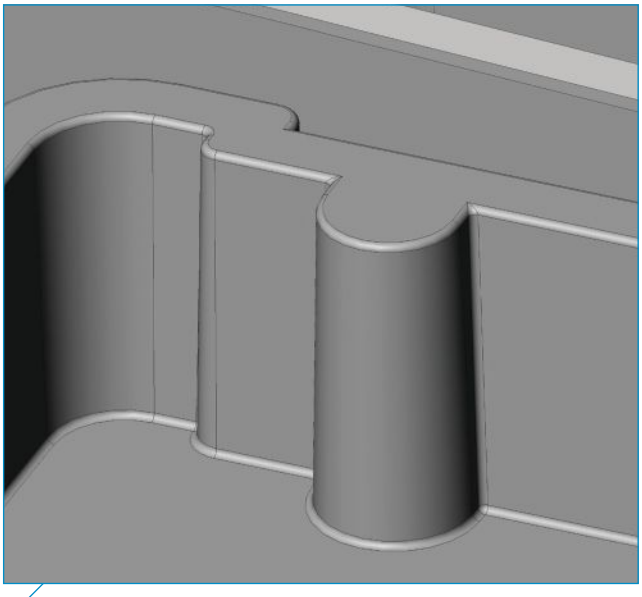
The highlighted curve is where a designer could place a corner radius to remove sharp edges and to ease material flow.

## Process and People

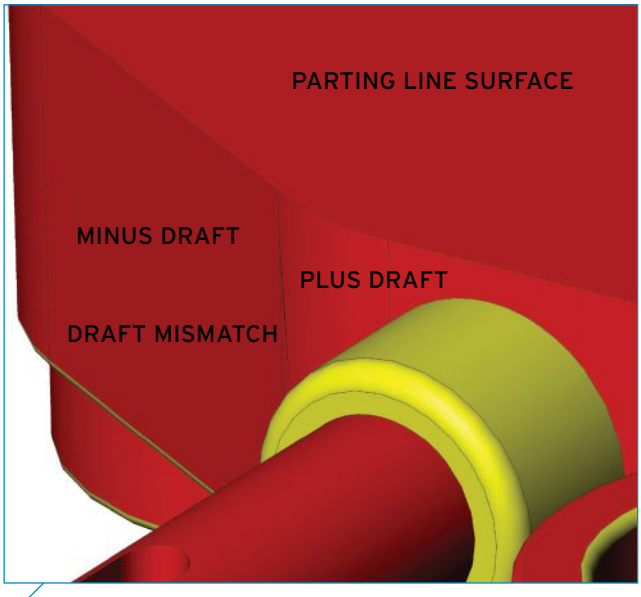
Let's take a deeper dive into how workflow impacts a company's bottom line by breaking down the process and people component to mold manufacturing. The **process** includes everything from new product conception to manufacturing and tooling with budget goals in mind. If this sounds like Six Sigma, Kaizen, lean manufacturing, Pareto charting or Ishikawa (fish bone) diagramming, you are correct. I believe these types of tools are vital to identifying a project's workflow upfront and making decisions on corrective actions.

A common barrier to these efforts is what I refer to as "Napoleon Syndrome". One person who believes he or she is the only one who can get the project done. This syndrome crushes morale inhibits growth and creates poor decision-making. To emphasize this point, consider the book, "The Boys in the Boat", about the 1936 eight-man crew who competed in the Berlin Olympic Games for the United States. The writer follows one crew member but also covers the entire team, including the coach and shell (boat) builder. The perspective of the shell builder is most interesting, as he likens the rowers to instruments in a symphony. Each has a part to play. If one plays out of tune, the result is failure. The goal is to always work in harmony with each other.

**People** in the form of training and mentoring play a critical role in improving workflow also, as I mentioned at the start of this piece, because even the most seasoned veteran in a company will struggle if the work environment is intolerable or condescending. This also includes training for new and



This ejector boss replaces a blade with a pin. A small radius is added at the bottom and a fillet radius where the rib meets the floor of the part.



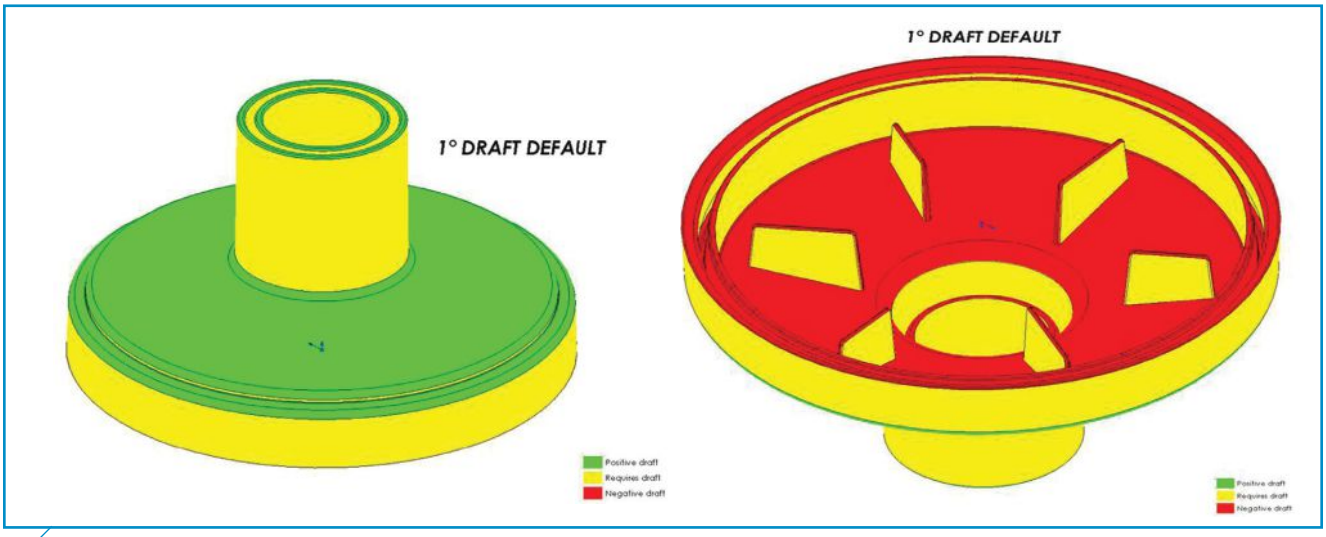

A required stepped shutoff causes this mismatch between drafts for which a slide or lifter will not fix. This same issue can occur with coring for a by-pass shutoff.

younger employees that exposes them to skills beyond their job titles. For example, the trade show season is upon us. Are you sending people to see new technology so they can share what they discover? Did you budget a younger employee with whom you walk the show, mentoring them as you move along the aisles?

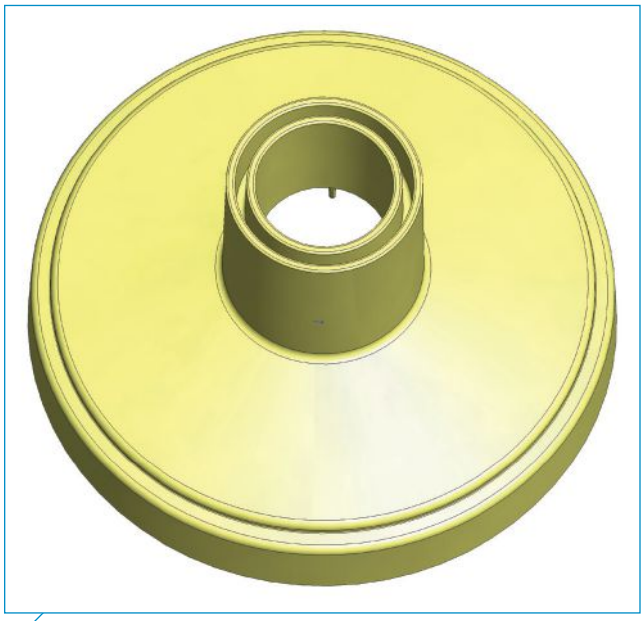
Far too often, a quality employee leaves because they are put into a box or there is a lack of trust. Leaders should ask themselves, are you training those coming up through the ranks to replace you someday or are you harboring knowledge because of the fear of being replaced? So, with the people and process aspects of an engineering-driven workflow in mind, let's begin with a look at how to start your project right.

### Product Tooling Analysis

As a mold designer involved in creating tooling quotes for over




Draft analysis identifies any potential draft concerns. Here the draft setting is one degree. The ejector side of the part has drafted ribs and areas suitable for radii.



Part courtesy of Burrell Clawson, PolySnapJoint LLC. (Newport Beach, CA).

Establishing a baseline clamping force for this filter housing as it relates to press size requires this clamp force calculation:

Maximum area of part minus any voids (through holes) x required force based on material

5.165 sq. in. (Ø2.634-Ø.601) x 2 tons per sq. in. (PE material) = 10.33 tons per part

13 years, I have encountered a number of errors in design decisions, which, if they were considered during the quoting stage, would have saved both time and money down the road for all parties involved.

For example, here are four common areas where mistakes are often made that impact quote accuracy:

- **Draft analysis.** There also needs to be a balance between the depth of a rib and the width (created from draft) where it meets the attached surface. If the rib gets too thick, then the potential of sink becomes an issue. Can the product accept an ejector flat if it is too thin for an ejector?
- **Corner radii.** Product designers will often not include radii at the bottom of a rib. When the plastic material is flowing across an edge, it prefers to move around an edge with a radius rather than a sharp corner, reducing stress in the part. The larger, the better, as long as the radius does not affect fit and function along with increasing the wall thickness that will create sink in the molded material. Most moldmakers will want a .005-inch/.01-inch radius minimum where a part fillet would be.
- **Parting line and bypass shutoffs.** When a stepped parting line is required, the product designer needs to consider the impact on draft, part removal (via a slide or lifter instead of a bypass shutoff) and surface finish (a witness line not meeting marketing requirements). If a bypass shutoff is used, then the mismatch of opposing drafts needs to be considered. Will this be an issue with the part function or appearance?
- **Press selection.** This is very critical, yet so open to interpretation. There are standard (rule of thumb) numbers for the tons per square inch needed to hold the parting line closed during the injection cycle depending on the type of material. Wall thickness needs to also be considered. Once the material and tonnage are identified, multiply the part's footprint (square inches) to identify the required molding press tonnage. This calculation gives a baseline to determine the estimated clamping force required and the minimum press size.

OEMs, custom molders and mold builders must address these areas before the quoting stage, otherwise costs will increase and deliveries can be delayed. MMT

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moldmakingtechnology.com/suppliers/elevateps
Robert Vaughan, Owner

By Paul Vragel

# Understanding and Achieving Digital Transformation

A five-step plan for identifying business objectives and employing digital transformation as an ongoing process for improvement.

Last year, we met Jack and Mike and learned about their successful company and the challenges they faced as they strategized for growth. Through a series of meetings and discussions to overcome these challenges, Jack and Mike resolved to refocus the company on customers by developing processes and systems to prevent problems for customers.

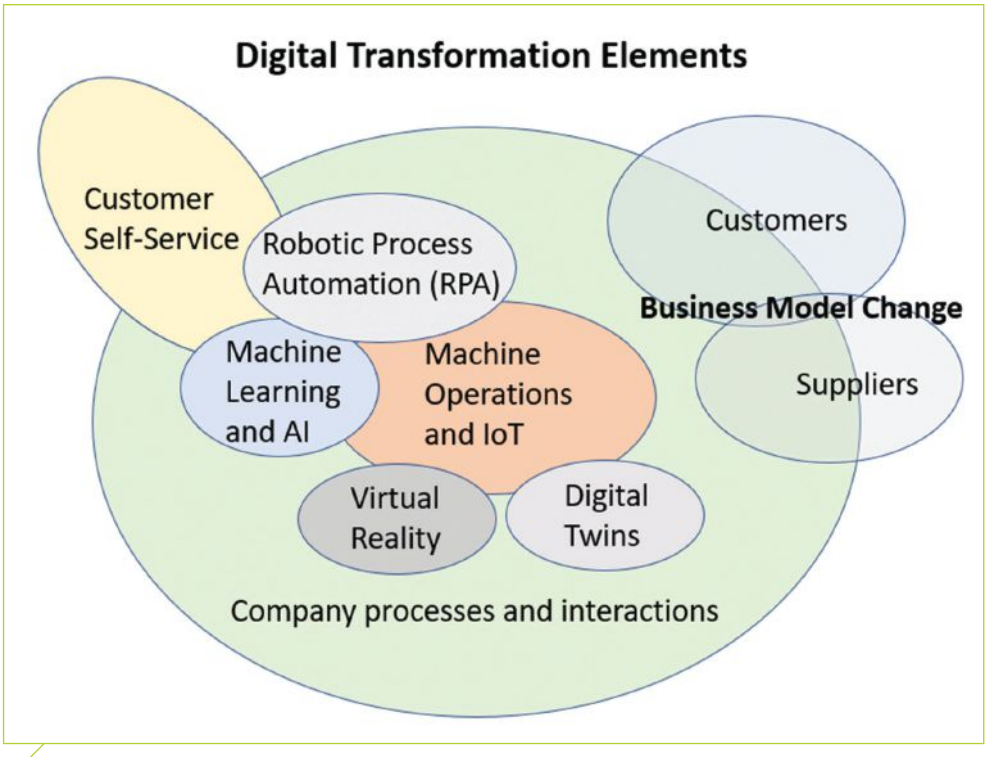
The overall framework they used was called process maturity, which laid out the path for Jack and Mike to systematically develop the necessary problem-prevention-based systems in the company. As a result, they experienced a breakthrough in employee engagement, resulting in enthusiastic buy-in, participation and contribution to change.

The next step was working with their re-energized employees to capture the *real* processes and interconnections within every part of the company. As Jack and Mike started to understand the real processes of the company better, they also started to understand the power of data to help improve outcomes. It was hard to avoid all the press articles and reports on digital transformation, but what it was and how to do it was not clear.

"So when are we going to get started implementing all this digital transformation stuff," Jack jokingly asked Mike one day. Responding in kind, Mike said, "As soon as we figure out what it is exactly!"

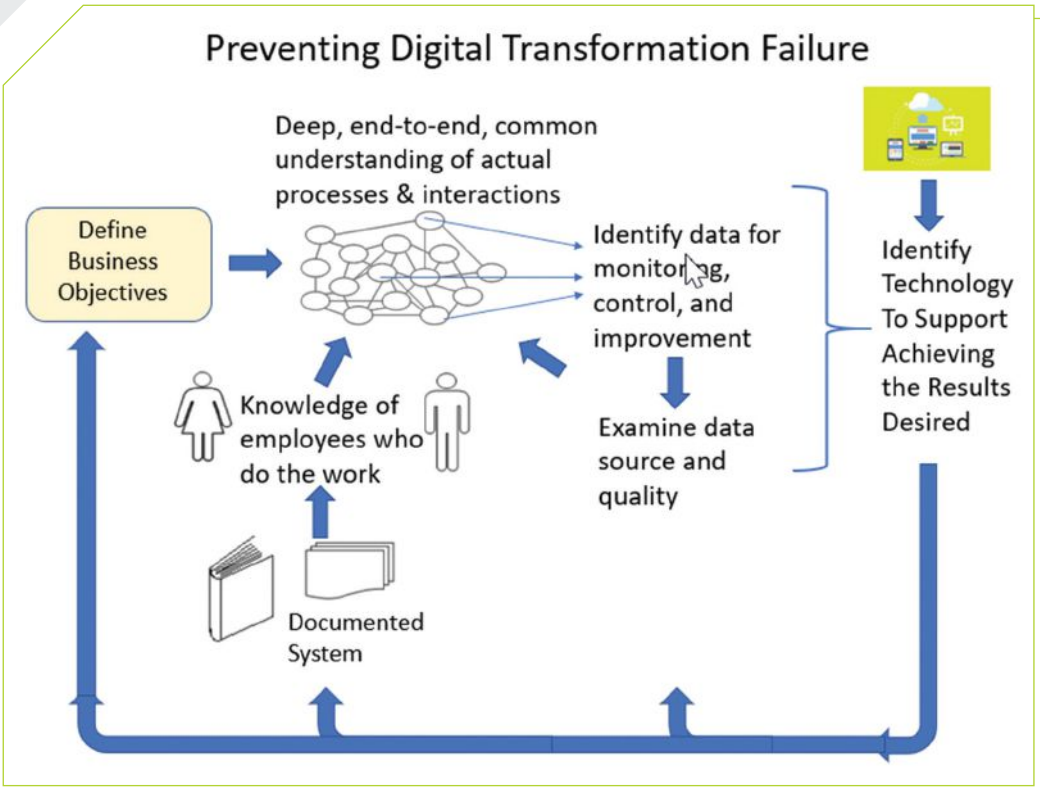
**Defining Digital**

Research on the topic revealed a multitude of terms and meanings for digital transformation, including the Internet of Things (IoT), Industry 4.0, virtual reality, digital twins, robotic process automation, smart applications, machine learning and artificial intelligence. It was clear that digital transformation by itself was a generic term for many different concepts that may include a focus on customer interaction, internal processes, machine operations and/or actions to reduce downtime or improve outputs. Digital transformation could even include completely changing the business model and establishing new ways to work with customers and suppliers.




Images courtesy of 4ABetterBusiness.

Shops must choose the right elements of digital transformation to pursue based on the shop's business objectives.




**Shops can prevent digital transformation failure by determining their business objectives, involving employees closest to the work, developing deep, end-to-end process understanding, identifying data needs, validating data and then choosing technology that meets the shop's needs.**

After much discussion with the team, Jack and Mike concluded that digital data was the only common element among all of these concepts. So, they started evaluating their current data collection, analysis and usage. What they discovered was that the metrics in place were not effective for moving the business forward. Their metrics did not link to the success of the business (they measured activities, but not outcomes); they did not link to the process, yielding ambiguous results; they did not prove useful for monitoring performance or taking action, and they did not allow people to connect their actions to the results.

> As the team resolved these issues, the right metrics became apparent, data quality markedly improved and they were able to establish clear links between data analysis, actions to take and the improved results achieved.

While they recognized data was important, Jack and Mike decided to dig deeper before generating more data. They wanted to get a better handle on the data the company already had and how the team was using it. That exercise revealed the following:

- Data quality was poor. Information in the ERP system was inaccurate and inconsistent, leading employees to develop their systems at a further cost of productivity and accuracy.
- The company was using an overabundance of Excel files, with each one dedicated to a local purpose and not linked to other data.
- The company was collecting data, losing it, then trying to find it again at another point in the process. The excessive number of Excel files, and for example, using different names for the same data, were clearly factors preventing data flow and accessibility.
- Old "rules of thumb" and tribal knowledge were driving many activities. They were not incorporating important knowledge into their decision-making, which created resistance to change, increased employee turnover risk and made it harder to quickly develop productive employees.
- Existing data had no clear ownership in terms of who was requesting the information and what the plan was for collecting, maintaining and acting on the data.

### Going Digital

Jack and Mike often heard tales from colleagues about putting technology in place and then trying to figure out what to do with the data, without much success.

It seemed to Jack and Mike that digital transformation involved a lot more than buying technology. Jack and Mike wanted to set a clear direction on the business objectives for applying digital transformation, identify the type of data that would help them better run the business, and then decide on the necessary technology to provide what the team needed to improve the business.

Jack, Mike and the rest of the team came up with a five-step strategy:

1. Define clear business objectives.
2. Engage the people closest to the work to ensure they have a deep (and common) end-to-end understanding of the processes involved in achieving those business objectives.
3. Establish the data that the team will use to monitor and support the achievement of those objectives.
4. Examine the source and quality of the data.
5. Identify the technologies that will support achieving these results.

The savings from resolving these issues turned out to be a significant source of funding for technology solutions that would further accelerate improvement.

In their eagerness to move on to a solution, in the first project the managers jumped over the second step (engaging people closest to the work), believing that they already understood the processes. As a result, the effort fell apart.

It turned out that the processes worked the way they thought (and according to the documentation) for about 80% of the cases. However, for 20% of the cases, the processes did not work together as documented, and employees were spending 80% of their time on the 20% of cases. These discrepancies made it difficult to establish reliable and meaningful metrics.

For the next project, the managers included step two and engaged the people closest to the work to help identify and resolve issues that were causing loss of productivity and time. The savings from resolving these issues turned out to be a significant source of funding for technology solutions that would further accelerate improvement. As the team resolved these issues, the right metrics became apparent, data quality markedly improved, and they established clear links between data analysis, actions to take, and the improved results achieved.

Jack and Mike began to see digital transformation as an ongoing process integral to business operation. Now, they set out to use the process to understand and tackle the aspects of digital transformation that would provide the biggest bang for their buck. MMT

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Paul Vragel, President

By Garrett MacKenzie

# 8 Ways to Increase Mold Life

## A checklist of molding machine settings and preventative maintenance actions that improve mold longevity.

Tool life is key to a company's bottom line and profitability. With the design and building stages complete, it is time to set the mold in the press and develop a process. Here are key press settings and essential preventative maintenance steps to improve mold life.

**1. Tonnage**

Verify that you are using adequate tonnage for each mold. If an operator uses too little tonnage, the injection pressure can exceed the tonnage requirements and blow open the mold. If an operator uses excessive tonnage, the machine will apply excessive compression on parting lines, vent areas and mold components, damaging the tool.

To avoid these situations, use the following formula to determine the proper tonnage for each mold:

Cavity Area = Length x Width of mold face (in/2)

Parts Area (Pa) = Cavity Area × # of Cavities

Tonnage (T) = Parts Area × *(T) 3 tons/in2

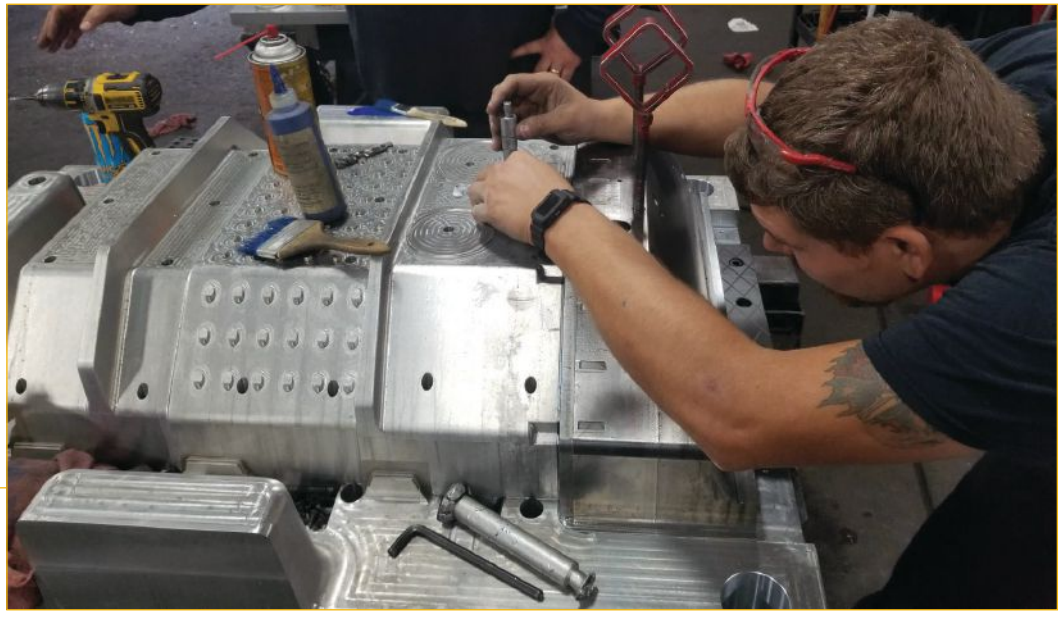
*(Note: thin-walled or high viscosity applications may require up to (T)5 tons/in2)*

**2. Low-pressure close**

Set up a low-pressure close (LPC) on the press to protect the mold. Set the high-pressure lock-up position no higher than 0.05 above the actual mold touch position. Also cycle the mold to reduce LPC pressure until the mold does not lock up. Pressure rises slowly, allowing just enough pressure for the mold to transition from low-pressure to high-pressure lock up. Also, set the mold close timer to 0.5 secs above the actual mold close time requirement. For example, if the actual mold close time is 0.76 secs, set the mold close timer at 1.26 seconds.

**3. Core set up**

Limit core pressures and speeds to the application's requirements. Keep in mind that pressure can limit speed, but speed



Mold life is contingent upon proper setup, implementation and maintenance procedures.

Images courtesy of 2K Tool.

Mark circuits and supply and return requirements clearly to prevent incorrect mold installation.

of lunging that can cause mold drop and potential pin and component misalignment. Ensure the transition from close fast to close slow is smooth and that the close slow condition occurs just before component/pin match up. Ensure the transition between mold breakaway and mold open fast is also smooth, with the open fast segment occurring after all of the components have cleared the pins.

**5. Ejection set up**

Incorrect set points can endanger mold life through over-stroking or improper part ejection that causes parts to close up between mold halves. Base forward positions on the required amount of separation to properly remove parts from the mold. Over-stroking causes excessive strain on ejector pins and lifters. Part extraction should never require bottoming out the ejector plate. To reduce stress on ejection components, ensure pressure set points only use the required amount.

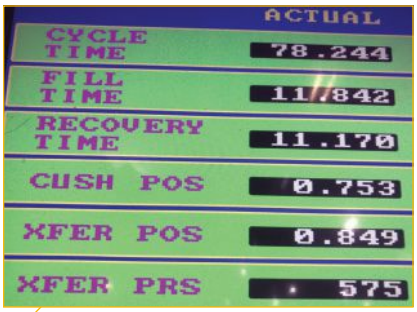
**6. Hot runners and valve gates**

Start up and shut down methods impact mold life. Poor start ups lead

does not affect pressure set points. Fire cores based on position and not time to prevent crash conditions. Core operation affects cycle speed. Closely monitor core operation to identify signs that components are setting or pulling erratically.

**4. Mold open and close**

Clamp speeds are definite drivers of cycle time, but faster speeds are not better, as they can cause tool wear or damage. Monitor close fast speeds for signs




Press settings such as these on the Cincinnati Extreme controller are vital to improving mold life.

to over-packed cavities that require mold tear down and service. Before running parts, manually fire valve gates to verify proper set up and good working condition. Purge plastic through the hot runner drops to verify they are warm and ready for startup. During hot runner shut down, run the barrel dry and immediately reduce hot runner temperatures to reduce the risk of degradation.

**7. Mold watering**

Increased mold temperatures can adversely affect mold life, so limit mold temperatures to minimum requirements for acceptable part aesthetics. Also, ensure that mold half temperatures do not exceed a 20°F variance between the stationary and movable halves. Temperatures above this scope cause improper heat soak conditions and poor tool mating conditions that damage the tool. Mark circuits and supply and return requirements clearly to prevent incorrect mold installation.

Ensuring that the transition from close fast to close slow is smooth, and that the close slow condition occurs just before component/pin match up is important to mold life.

Keep in mind that pressure can limit speed, but speed does not affect pressure set points.

**8. Mold cleaning and care**

Always inspect, clean and grease molds in production environments a minimum of once per shift. Watch for signs of wear, such as galling, parting line wear, burrs and metal shavings. Develop a regular preventative maintenance schedule, keep mold service records and review repetitive service/repair events to establish preventative maintenance frequencies that will help reduce unplanned service events.

Verify that slide slots are greased and that slides are functioning properly. Watch for signs of detent failure and loose gibs. Verify that slide positions are correct as you exit the mold after every cleaning and inspection. Use rust preventative when a mold will not be used for more than six hours, and coat textured and polished areas thoroughly to prevent rust damage.

The difference between the success or failure of a company's tooling approach hinges upon its set up, implementation and maintenance procedures covered in this checklist. MMT

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## VIDEO: Custom Mold & Design Talks Hybrid Additive Manufacturing

**By Christina M. Fuges**


Lester Jones, VP of Custom Mold & Design, discusses the shop's use of its Matsuura Lumex Avance-25 hybrid AM machine for creating conformal-cooled inserts.

A team of 320 people across three facilities—Custom Mold & Design, Paradigme Engineering and Teamvantage—considers itself an engineering company that helps people develop products, not just new molds. The CMD team performs a great deal of ultra-precision part and mold work for a variety of medical devices and equipment, always focused on finding creative ways to solve complex problems. Hybrid machine technology to produce conformal-cooled inserts is how they take advantage of additive technology to make better molds for customers. In this video, Christina Fuges talks with Lester Jones about the key to implementing this technology.

Lester Jones: The key to implementing additive/subtractive machining technology is to make sure that the right people are involved in implementing it. It's a big leap. We need to identify the most creative people, people that are willing to embrace change. That isn't always easy for people.

I think when we initially took on the machine, we ended up getting a broad group of people involved in it, and we found that that was really a mistake. We weren't making any headway because the people weren't having enough concentrated time with it. So we've dedicated an individual who's involved in it 100 percent of the time, which really helped us accelerate our progress.

Using Matsuura's Lumex Avance-25 hybrid AM machine allows us to build the best quality parts for our customers, and if we can do something to increase their efficiency and their molding processes, that is a really great benefit. The real beauty of conformal cooling is that we're able to build components that there's no way we could manufacture. So now we're able to provide that to a customer who needs a complex part and they want to reduce the cycle time. We're learning new ways to make the process more efficient.

Watch the video online to discover more about this technology.

short.moldmakingtechnology.com/CMDAM

## New Series: A People+People Plan

**By Christina M. Fuges**

Julie Poulos, vice president of Red Caffeine growth consultancy, says a People+People Plan is a foundation and activation strategy for scaling your organization.

*MoldMaking Technology* has always focused strongly on technology and process, but over the past few years, we've covered a lot of important business management topics as well. This coverage has included everything from sales and marketing to workforce development to taxes. I recently caught up with a group that focuses most of its sales and marketing energy on manufacturing, specifically mold manufacturing. So, we decided to work together on a limited blog series called "People + People Plan."

Red Caffeine is a growth consultancy in Lombard, Illinois, that uses strategy, branding, marketing and technology to solve common business challenges of brand awareness, lead generation, sales enablement, employer branding and digital transformation. Through its own People + People Plan, they have helped build organizations customers want to use and employees want to join. Their goal is to share the insights and strategies they have learned with like-minded organizations committed to building strategic growth and a healthy culture.

People + People Plan includes accelerating growth for manufacturers by establishing business objectives that impact the pillars of HR and culture, finance, operations, sales and marketing, and technology. It also modernizes your talent strategy to attract and keep top employees and becoming an employer of choice through creating a content strategy to tell your story. It empowers your sales, marketing and HR departments to align on processes, tactics and goals to achieve meaningful outcomes and long-term sustainability.

short.moldmakingtechnology.com/PeoplePlan

## Establishing a Cyber-Secure Moldmaking Operation

By Dr. Johannes Bauer

The integration of information technology (IT) for data-centric computing with operational technology for monitoring and adjusting events, processes and devices throughout a mold shop presents cybersecurity concerns. However, many mold shops today still do not take any measures to secure their data, despite all the intellectual property (IP) represented in the manufacturing and simulation data a mold builder uses to design and manufacture tooling. Here is a recommended path a mold builder should follow to address cybersecurity properly.

A mold builder should first properly plan its network infrastructure, determine the components to hook up and identify the locations that require perimeter security. Networks are incredibly quick and easy to set up, but without proper planning, so-called "flat networks" are created that give equal permission to all components that comprise the network.

Every piece of equipment communicates with every other piece of equipment, and all internal devices are routed to an outside network, such as the internet. So, it is important that devices inside the network with different levels of criticality are isolated from one another, called the least privilege principle. This principle means that if this type of communication is not necessary for the benign operation of the shop, then it should not even be possible. For example, when integrating a Wi-Fi radio into the network, there is no need for that radio to communicate with a CNC machine.

Mold shop ownership must determine what precautions to take for a particular machine and how the vendor will ensure the continued security of a given system.

A mold builder should first properly plan its network infrastructure, determine the components to hook up and identify the locations that require perimeter security.

short.moldmakingtechnology.com/ULCyber

## Webinar Review: A Look at Copper Alloy Molds

By Christina M. Fuges

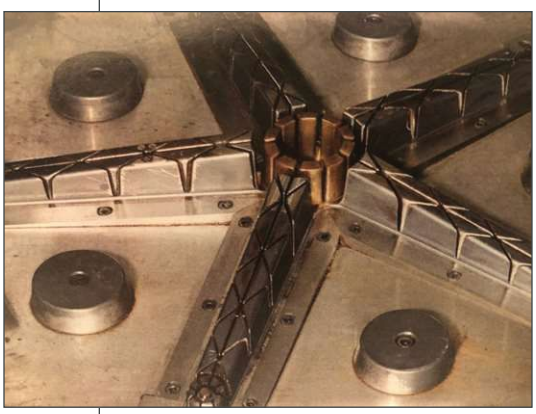
What qualities make a good mold? How does high thermal conductivity aids in productivity? How can you best use a copper alloy and avoid common problems? What are the special fabrication issues when working with copper alloys? These are the questions answered by Materion Performance Alloys and Composites Innovation Pipeline Manager Robert Kusner during the company's webinar on copper alloy molds.

Kusner begins with three basic considerations about mold materials: strength, machinability and thermal conductivity. He also discusses the three main reasons for using copper alloys and the importance of heat transfer to copper.

Why use copper? Kusner explains that copper alloys are gall resistant and can be used in moving components. Not only are they corrosion resistant (though one must be mindful of the material you are putting the copper in), they are biocidal (bacteria cannot live on the surface of copper for more than a few minutes), nonmagnetic and easily machined. Applications for copper mold alloys include core/cavities, inserts, injection/blow molds, core pins and ejector pins (avoid long cooling time with steel), blow mold pinch offs, slides and moving components, hot runner nozzles, sprue bushings and injection press bushings and wear pads.

Check out the webinar online to learn more.

short.moldmakingtechnology.com/CopperWeb



Copper is not strong enough to be used as a mold material, but by alloying copper, it can be made as strong as steel while retaining much of its thermal conductivity.

## VIDEO: What Is Freeform Injection Molding?

By Heather Wintle


FIM, or freeform injection molding, combines the proven injection molding process with the freedom of part design, as explained by Rich Oles, president of ALBA Enterprises.

Rich Oles of ALBA Enterprises introduces the moldmaking world to the freeform injection molding (FIM) process that combines the proven injection molding process with the freedom of part design. Freeform injection molding is the IP of AddiFab. AddiFab has invented a solution that gets cured with a UV light in an additive manufacturing environment, as well as the machine that does the printing.

Rich Oles: The difference with FIM is instead of printing a part, you're actually printing the cavity insert. This gives you all the advantages of additive manufacturing speed, design freedom. There's no limitation undercuts; you have no parting lines, it's just the cavity insert. But it allows you to use the proven technology of all the resins that are available and approved at your suppliers on the market today.

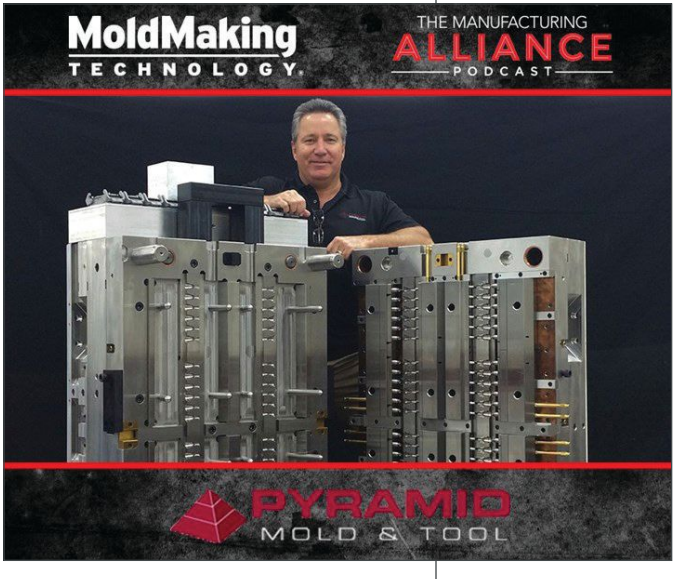
There are three steps to this process. You start out by creating the additive manufacturing insert with the AddiFab machine and using their resin, you inject into that insert with any injection molding resin. Then you remove the cavity insert, and you end up with a component. We literally just took an existing tool, machined the part shape off, put a counterbore in it and shot it. And it works pretty well. You're not limited to this size, and you can combine the printed blocks in a mold unit. So then you can injection mold, any shape size. It's a really, really interesting technology.

See the whole video online to find out more.

short.moldmakingtechnology.com/AlbaDemo

## PODCAST: Always In Pursuit of Teamwork

By Christina M. Fuges




This speed junkie is determined to use teamwork to make better decisions, and it's working, as he explains on this episode of The Manufacturing Alliance.

This speed junkie is determined to use teamwork to make better decisions, and it's working. Tony May is the vice president of business development for engineering-driven mold builder Pyramid Mold & Tool, located in Rancho Cucamonga, California, which focuses on complex, multicavity tools. Tony sat down with *MMT*'s Christina Fuges during an episode of The Manufacturing Alliance Podcast to discuss what the company is up to today when it comes to its workforce, workflow, technology investment and marketing strategies. Here's a glimpse at what they talk about:

- Connection to the National Hot Rod Association
- Our company goal is "We'll Help You Keep Yours"
- Participate and make a difference
- Complaining is not allowed
- Present a problem with a solution
- We all need to understand how technology all works together to implement appropriately
- Pushing change
- I'm so far from what I used to do on the shop floor, so I HAVE to listen to my people.
- Medical moldmaking
- Building molds for Mexico
- Do not mix language with communication skills and intelligence
- Laser engraving is a lifesaver
- Biggest challenge is our fluctuation of work

Listen to the podcast to hear the full conversation!

short.moldmakingtechnology.com/PMTPod MMT

# From Milling and Drilling to EDM and Grinding – Find the Right Fit for Your Molds.

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# Index Falls on Export Activity

## February 2020 – 48.3

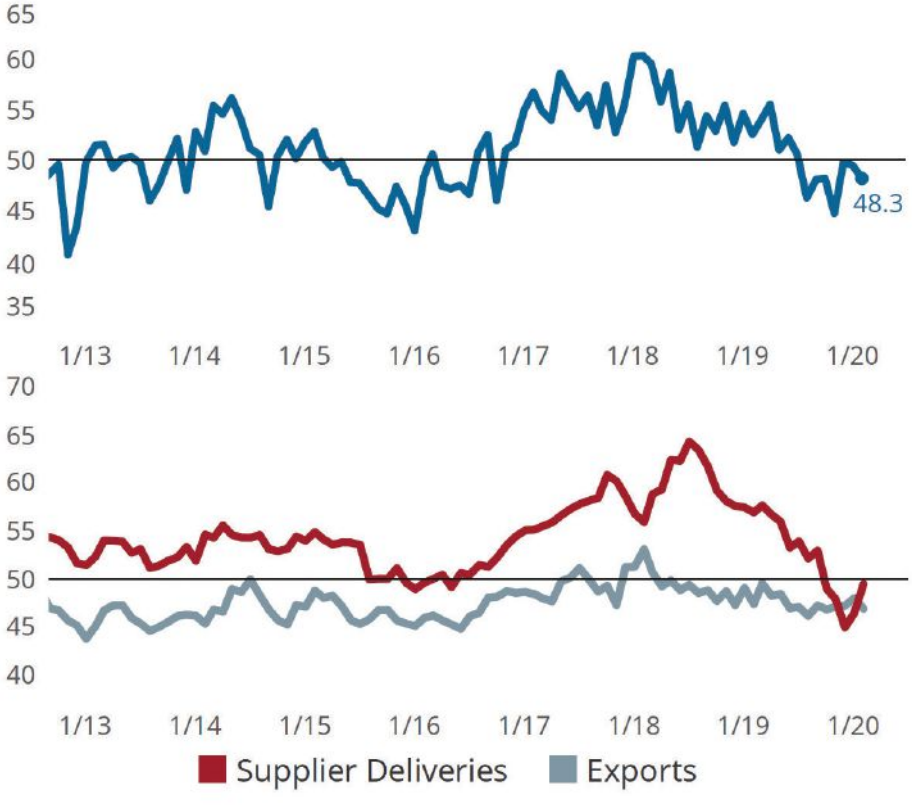
Registering 48.3 in February, the GBI: Moldmaking Index contracted at an accelerating rate. Gardner Intelligence observed that the Index was supported by a jump in supplier deliveries, followed by modestly expanding activity for new orders and production activity. It was pulled lower by a very sharp contraction in backlog and export activity.

The impact of COVID-19, a.k.a. "coronavirus", is expected to have an adverse effect on the Index in coming months. The efforts of Asian governments in January and February to combat the spread of COVID-19, while necessary, has a detrimental impact on the world's supply chain, as workers, companies and cities are affected by quarantine measures. This will most immediately restrict the normal flow of upstream and sub-component goods which are necessary for the proper functioning of the manufacturing sector. Moving forward, the Index will be able to quantify both the negative impact from the virus at present along with the timing and strength of molding's eventual recovery. 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 the true magnitude and duration of COVID-19. MMT

**ABOUT THE AUTHOR**

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

**Gardner Business Index (GBI): Moldmaking**




February's strong expansion in supplier delivery activity was more than offset by a severe contraction in backlog and export activity. The overall result was a quickening contraction in overall business activity. Gardner Intelligence expects that most—if not all—of its indicators will be subjected to shocks from COVID-19. That the virus originated in Asia suggests that American manufacturers in the immediate future should pay particular attention to their supply chains and expect increased volatility in export orders and material prices.

PRESENTED BY GARDNER BUSINESS INDEX

**Stay ahead of the curve with Gardner Intelligence. Visit GBI's blog at gardnerintelligence.com.**

**The further away a reading is from 50 the greater the magnitude of change in business activity.*

## Five-Axis Machine Achieves World-Class Performance for Tighter Tolerances

**Takumi USA** introduces the U800 to its five-axis product line-up. The U series was developed to achieve world-class performance for the die and mold, aerospace and other high speed applications that require tighter tolerances. The U800 is a high speed gantry machining center over the high torque table that includes an 80 rpm twin torque motor on the A-axis and a 100 rpm single torque motor on the C-axis.

The U800 is designed with a one-piece casting to absorb the thrust forces of high rapids and fast cutting feeds. The trunnion table with integral torque motors (instead of gear drives) provides quicker response, higher torque, better positioning accuracy and lower maintenance requirements. The roller type linear ways support faster feed rates, higher rigidity and smoother linear motion. A high performance 20,000 rpm motorized spindle is standard on the U800 to satisfy a multitude of machining requirements.

The U800 is equipped with the latest Heidenhain TNC 640 control that features optimized motion control, short block processing times and special control strategies.


**Takumi USA / 844-302-3792 / takumiusa.com**


## Mini Hydraulic Locking Cylinder Provides Tremendous Preloading Capacity

**PFA, Inc.** announces the release of the 70 series "mini" hydraulic preloading and locking cylinder as part of the Kor-Lok side-action system product line. Providing tremendous preloading capacity in a small cylinder and locking in the preload are the product's primary advantages.

The mini's 8,000 lbs of preload activates force in a new narrow format, enabling multiple small cores to nest together and time independently. Smaller ports and low profile sensors ensure a large competitive advantage to standard compact hydraulic cylinders. Smaller ports and low profile sensors ensure a large competitive advantage to standard hydraulics and other compact hydraulic cylinders. Zero psi locking supports green technologies that save energy by dropping hydraulic pressure during injection. Eliminating the need for always-on independent hydraulic core pull pumps provides further energy savings.

The mini Kor-Lok is available with low profile PNP sensors and traditional mechanical SPDT switches, high-temperature seals, standard multiple and rear hydraulic porting and flexible mold flange mounting and core interfacing accessories.

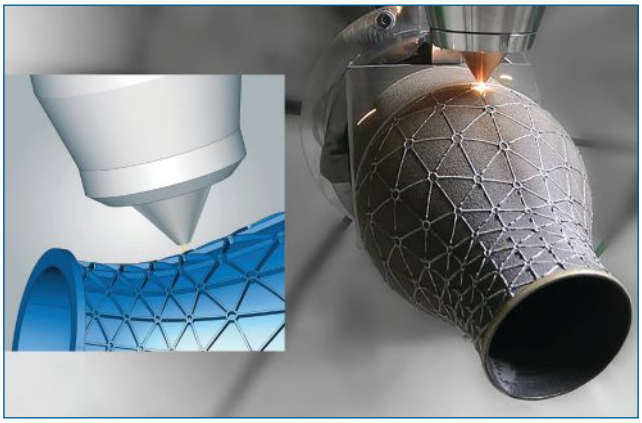
**PFA Inc. / 262-250-4410 / pfa-inc.com**

## Software Combines Hybrid and Additive Manufacturing

**OPEN MIND Technologies** offers an additive manufacturing (AM) capability option in *hyper*Mill CAM software to support 3D printing/additive processes that also provides efficient hybrid processing with simultaneous additive and subtractive processing on one machine. For highly complex five-axis simultaneous processing, the software enables an array of flexible options for directed energy deposition processes and wire arc additive manufacturing (WAAM) .

The software also enables users to program the cladding and milling together. Key additive applications include repair of damaged components, cladding of additional surface skins or creation of new components from a substrate. This also creates options for combining different materials, such as when high-quality material layers have to be applied to carrier materials.

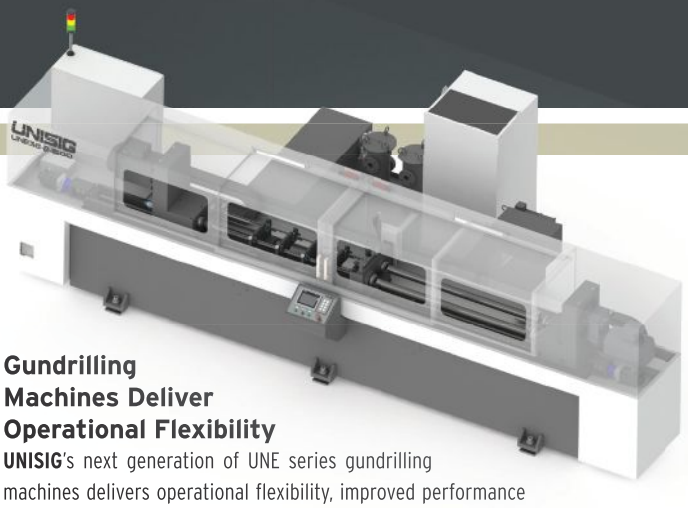
**OPEN MIND Technologies USA Inc. / 888-516-1232 / openmind-tech.com**



## EZ Slider Eliminates Need for Traditional Slide and Lifter Components

**Michmar Engineering** announces the EZ Slider, which eliminates the need for traditional slide and lifter components. The component simplifies 2D machining with no need for complex angular machining set ups. The slider replaces expensive hydraulic cylinders, external limit switches, mounting plates, and it eliminates the manufacture time and materials for additional components. Travel can be readjusted without the need to remanufacture horn pins, slide travel stops or replace slide locks. The component comes in a compact system with limited real estate use, and easy installation and adjustment from parting lines. Full 3D CAD is available for ease of design, and integrated internal stainless steel limit switches with LED illumination are available upon request to give a positive signal that it is safe to continue the molding process. The EZ Slider comes in standard 5 degree increments of deceleration up to 35 degrees, eliminating the need for costly mechanical or hydraulic drivers.

**Michmar Engineering / 519-988-0404 / michmareng.com**




## Gundrilling Machines Deliver Operational Flexibility

**UNISIG**'s next generation of UNE series gundrilling machines delivers operational flexibility, improved performance and effortless operation. The series is engineered to simplify gundrilling for all individuals involved in a facility's manufacturing process. With five models built from two frame sizes, the UNE Series can drill hole diameters from 1.4 to 40 mm and depths up to 3,000 mm. Each machine can fit in close proximity to a shop's existing machining center, lathe or Swiss-style machine for efficient part-processing strategies. For added flexibility to grow with future production needs, all models are robot-ready. The single main spindle servo motor delivers the necessary horsepower for two-spindle machines. When power is applied in single-spindle mode, shops can produce holes with larger diameters, increasing capabilities and adding the potential for new business without adding a new machine. The series features a programmable flow-based coolant delivery system designed to provide the right amount of coolant to the tool's cutting edge, so operators can predict tool breakage and spend less downtime recovering an interrupted process.

**UNISIG / 262-252-3802 / unisig.com**

## Slim Line Chucks Provide Five-Axis Milling Versatility

**Emuge Corp.** has expanded its line of FPC milling/drilling chucks products to include slim line models that are designed to enhance five-axis machining productivity and versatility. Available in the 1/8" to 9/16" size range, the compact, slim design with tapered shape enables easier access to the work, especially in confined areas and for challenging angles. The high precision/performance FPC mill/drill chucks provide unprecedented rigidity, vibration dampening, concentricity, machining speed, and tool life versus conventional chuck technologies for milling and drilling applications.

Unique features and advantages include extremely high transferable torque that provides maximum process reliability; guaranteed long tool life and quality workpiece surface finishes; mechanical drive-actuated with a hex wrench; a simple design that enables quick tool changes in seconds; special holder design reduces vibration, dramatically improves workpiece surface finishes and provides exceptionally long tool life; for maximum safety, the strongest clamping force is provided to prevent the possibility of pull-out.

**Emuge Corp. / 800-323-3013 / emuge.com**


## Additive Manufacturing Metal Powder Designed for Plastic Injection Molders

**Uddeholm** launches AM Corrax powder specifically designed with the needs of plastic injection molders in mind. This powder is purposefully made for additive manufacturing, making it the ultimate choice for tools where superior corrosion resistance combined with high hardness is needed, ideal in plastic extrusion and injection molding applications.

Bohler offers the growing AMPO family of additive powders, which features six powder types for a wide range of applications and printing technology. The AMPO product line is composed of tool steel, high-speed steel, corrosion resistant steel and nickel alloy AM powders. Through rigorous R&D methods, in-house testing facilities and stringent production process controls Bohler ensures a consistent spherical powder and particle size distribution to ensure optimal properties for the additive process.

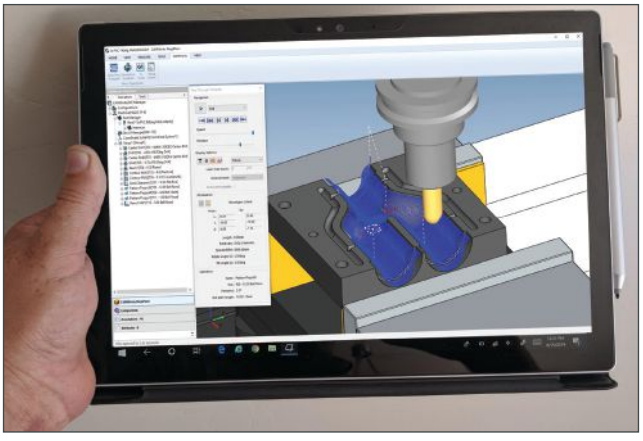
**Uddeholm USA / 800-638-2520 / uddeholm.com/usvoestalpine**

## High-Quality Material Grades Suited for Machining

**Meusburger** presents a wide range of heat-treated for stress relief steels. A total of 31 different material grades are available and can be optimally matched to each other for customer projects. Many of these materials are available from stock as standard plates and bars, which provide a reliable basis for all applications. The comprehensive range at Meusburger includes not only standard plates but also special plates in customized dimensions.

In addition to the selection of plates and bars, the company also offers different machining technologies such as flame cutting, sawing, deep hole drilling, milling, grinding and turning. With flame cuts and milling operations already completed before delivery, customers can save their resources and concentrate on their core competencies.

**Meusburger US, Inc. / 704-526-0330 / meusburger.us**



## Software Streamlines Design to Manufacturing Process

**HCL Technologies** releases CAMWorks ShopFloor, which provides 3D digital models that capture extensive data from part design files so users can produce parts with fewer miscommunications between the design and manufacturing departments. The software reduces errors by eliminating the need to repeatedly transfer part data to 2D drawings. Upon completion of a CAD part file, the designer publishes a CAMWorks ShopFloor file, which is transferred to the machinist. With a complete CAD viewer, the machinist can rotate, zoom, pan and section view the model. They can also take linear, radial, angular and area measurements. In addition to full toolpath simulation, the software also includes a step-through simulation option for each operation.

**HCL Technologies / 408-733-0480 / hcltech.com**

## Shrink Fit System Sets New Standards for Digital Connectivity

**Haimer USA** offers its Power Clamp Comfort i4.0 shrink fit system, which sets new standards regarding digital connectivity and communication of tools and machines for the new world of manufacturing.

Each Power Clamp Comfort i4.0 comes with a 7" durable 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 machine is network compatible and Industry 4.0-ready for communication on the shop floor.

Standard equipment includes a rotary table with three stations, a cooling manager and single spider chuck support for the rotary table. Options include a laser scanner to read and automatically set the shrinking parameters via Data-Matrix codes now incorporated on all Haimer shrink chucks. Another option is the HD coil for shrinking of heavy-duty shrink chucks up to 2" in diameter.

**Haimer USA / 866-837-3265 / haimer-usa.com**

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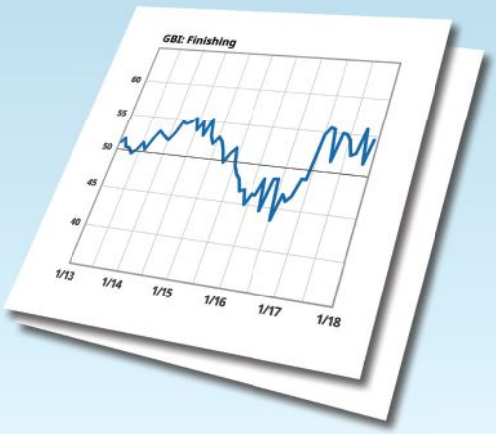


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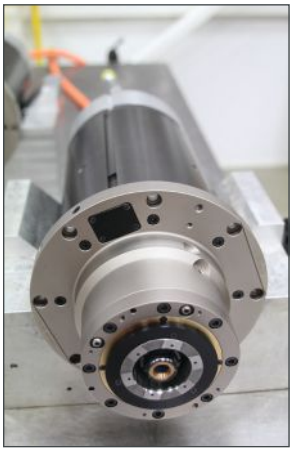
## Spindle Enables Full Participation in Smart Manufacturing

**Absolute Machine Tools** partner PCI SCEMM (a Tongtai company) introduces the e-Spindle, an electro-spindle that integrates sensors and actuators to monitor cutting processes and adjust parameters to optimize tool life and workpiece quality. The e-Spindle technology enables customers to fully participate in smart manufacturing.



The e-Spindle showcases smart machining technology with real-time monitoring of cutting process variables including force, vibration and coolant pressure. An adaptive drilling application illustrates the benefits of ongoing vibration control, and a honing toolholder operation features integrated measurement of workpiece diameter to permit continual control of abrasive honing tooling.

**Absolute Machine Tools, Inc. / 800-852-7825 / absolutemachine.com**

## Internal Cylindrical Grinders Designed for High Production

**United Grinding** offers a full range of Studer internal cylindrical grinding machines that includes universal-type models, as well as those designed for high production and for radii grinding operations. Some models are well-suited for internal, surface and external grinding of chuck components, while others handle all other conceivable internal cylindrical grinding applications. The machines deliver the highest precision and efficiency, especially for flange parts, spindle shafts, spindle housings, rotor shafts, bushings and more. Three models specialize in high-precision internal cylindrical grinding of radii, spheres, balls, cones and diameters. Applications include the manufacture of die plates from carbide and ceramic as well as the production of hydraulic components such as axial pump pistons, guide plates and housings from hardened steel, cast iron and copper.

**United Grinding / 937-859-1975 / grinding.com**

## Toolholders Feature Enhanced Rigidity and Modularity

**Walter USA** adds Walter Capto toolholders and insert widths to its Walter Cut MX grooving system. Capto toolholders feature enhanced rigidity and modularity, while the tapered polygonal shape handles both torsional and bending forces with ease. This interface can be used for lathes, and for turning/milling centers.

With the Capto monoblock tools (C3–C6), the MX system can now also be used on machines with Capto interfaces. In addition, new parting blades are introduced to work with automatic lathes and multi-spindle machines. Walter has completed the range with new grooving inserts and toolholders for larger insert widths. The insert width now ranges up to 0.222" (5.65 mm)—including the very common dimensions of 0.125". Maximum cutting depth is 0.24" (6 mm). These extensions are intended to make new applications possible for users of the MX grooving system, from small-parts production where a high degree of precision is needed; to job shops, where the focus is on fast, precise tool changes and cost efficiency.

The Cut MX grooving system uses dowel pin location to prevent improper assembly of inserts into the holders. The dowel pin location along with the horizontal seating surface also provides the best-in-class positioning accuracy and diameter repeatability for the inserts; thus, eliminating the need for "test cuts" after every cutting edge of insert change. The four-edge indexable inserts can be used even after one or more cutting edge breaks for maximum cost efficiency.

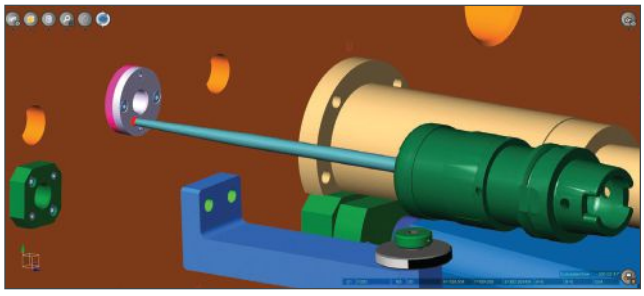
**Walter USA, LLC / 800-945-5554 / walter-tools.com**

## Software Features Automation Functionality

**NCSIMUL** from Hexagon Manufacturing Intelligence is designed to streamline CNC programming and increase shop-floor flexibility. Based on client-server scheduling architecture, the NCSIMUL machining module now includes automation functionality that provides wider control for jobs across various devices by communicating with distant servers. A dedicated graphical user interface now allows tasks such as simulation, cut analysis and 3D movies to be performed on any device. This enables users to follow the status of jobs and receive notifications when they are complete.

The NCSIMUL Automation Module provides a number of significant benefits, including a guarantee that 100% of the program sent to the shop floor is validated by simulation. The system enables users to implement their own automation rules according to constraints and production priorities, and tasks are featured in a command file that can be easily customized to include user-specified parameters. This delivers additional assurance that program verification and simulation accurately follow requirements.

**SPRING Technologies Inc. (NCSIMUL SOLUTIONS) / 617-401-2197 / ncsimul.com**



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## THIS MONTH ON SOCIAL MEDIA

### YouTube Videos

Watch to see how dry ice parts cleaning allows for high specification in the cleaning process, giving parts cleaners the optimum range of possibilities in cleaning their parts and equipment.
youtube.com/c/moldmakingtechnology

### Popular Posts

We obviously want to see just how clever and funny you can be in our #IfAMoldCouldTalk campaign. But Phil? Phil is DYING to hear what you can come up with. Submit your idea today!
facebook.com/moldmakingtechnology

### @MMTMag Hot Tweets

If you do low-volume prototyping, then this ceramic fiber-reinforced 3D-printed tooling option could be worth a listen. Check out this free webinar that presents best-use applications, part and mold design considerations and key lessons learned.
Twitter.com/MMTMag

### Conversations

Tariffs are a tricky topic to cover and difficult to follow, so here's a straightforward update on where the Section 301 tariffs on Chinese-origin products stand.
Linkedin.com/company.moldmaking-technology

### Photo Share

The many "Fuges" faces during a @moldmakingtechnology / Manufacturing Alliance Podcast.
Instagram.com/moldmakingtechnology

MOLD DESIGN

# How to Design **High-Efficiency Capabilities into an Injection Mold/Molding System**

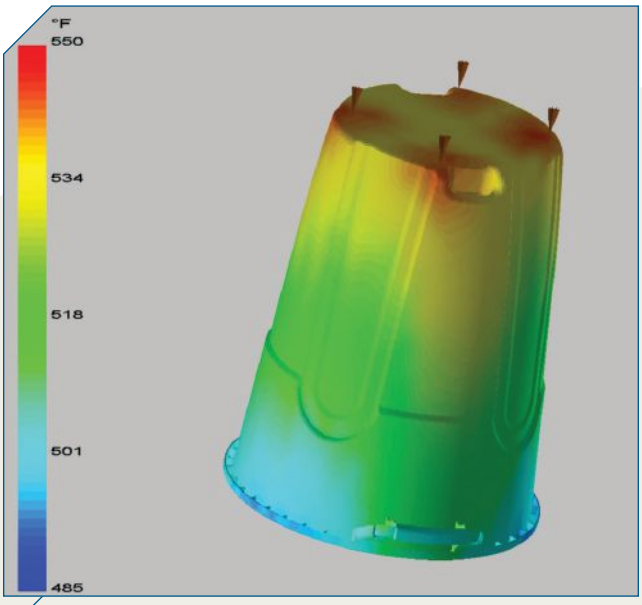


Image courtesy of Advanced Plastics Design.

**Isotherms of a HDPE container at the instant of cavity filling from the flow analysis. Filling conditions are: Injection time: 2.9 sec with slowed finish; Melt temperature: 550°F; Mold surface temperature at equilibrium: 87°F.**

By George Markus

While part quality and profits go hand-in-hand, high productivity alone can impair quality and reduce profits, if not performed correctly. The key is designing high-efficiency capabilities into the mold/molding system, which means computing precise shrinkage and the accurate minimum cycle time based on material, part geometry, required tolerances, filling and maximum-performance, computed cooling. Then monitoring this cycle time with sensor-based quality control to minimize part rejects.

A mold builder can help achieve product quality by defining quality, functionality, dimensional/shape accuracy and appearance; starting with a robust product and mold design, machine selection, and process design. Analysis, design and implementation of the critical quality pathway (CQP) and adherence to the computed control limits of the material, molding cell, mold cooling, process, machine and quality control are vital.

CQP is the uninterrupted movement of polymer molecules and additives from the barrel to the critical regions of the part to achieve the required part quality. Mold cooling computations, such as required size/shape, number and locations, edge-to-part and edge-to-edge distances of cooling passages using the approved, minimum cycle time and the planning of sensor-based quality control are key.

Expert analysis and optimization requires the following steps:

- Send the questionnaire to the customer to determine the objectives of the analysis/optimizations.
- Quote the project.
- Request critical tolerances specs of the part and mold, molding machine parameters and five pounds of material with additives/colorant (if any) for flow (rheological and thermal) and precise shrinkage characterization.
- Complete one or both of these experiments in the molding lab using a unique test mold and highly controlled molding conditions. Based on these experiments, fine-tune the three flow graphs of the resin and its shrinkage master curve.
- Review part design for robustness and DFM.
- Complete "what if" evaluations and finite element analysis.
- Complete an initial flow analysis to judge design feasibility.
- Compute the attainable, long-term part tolerance control with four decimal accuracy.
- Submit the computed, minimum possible cycle time to management for approval.
- Compute shrinkage for the specified part dimensions to four-decimal accuracy. Also, include secondary crystallization-related, post-molding shrinkage upon request.
- Compute cooling channel locations to guide the mold designer based on the approved minimum cycle time.
- Perform precision flow analysis using 10-15 analysis runs to define the 'sweet spot' and robustness of mold filling.
- Evaluate cold runners or hot runners for temperature conditions, pressure losses, shear rates, polymer residence time and effect on the precision of mold filling and packing/holding.
- Evaluate gating for adequacy, shear rate, shear heat and pressure loss.
- Complete precise warpage analysis, if requested.
- Compute the robust process and evaluate the adequacy of machine parameters, such as clamping force, shot size, injection pressure, injection rate, min./max. residence time and plasticizing capacity.
- Review mold design. Complete/explain the analysis report.
- Participate in mold trial runs, design of experiments and for certain medical applications, initiate/maintain the design control document, if requested. MMT

## FOR MORE INFORMATION

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George Markus, Owner

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