


MoldMaking

TECHNOLOGY



Mill Better, Drill Faster,
Reduce Setups, Increase
Productivity - 12

How to Machine Micron-
Level Precision Molds in
One Try - 16

Modular, Flexible
CAM Speeds Five-
Axis Programming,
Boosts Profitability for
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How to Lower Cycle
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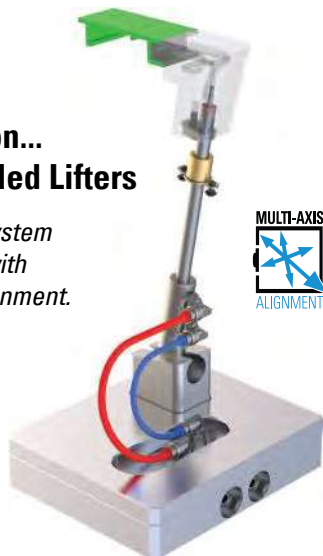


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POSTMASTER: Send address changes to *MoldMaking Technology* Magazine, 6915 Valley Ave., Cincinnati, OH 45244-3029. If undeliverable, send Form 3579.

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

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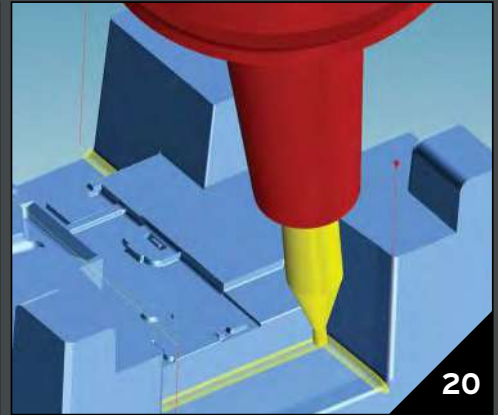
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MSI Mold Builders now squares, plus drills and taps eye-bolt holes on 50% of all its tools in a single setup on a milling/drilling center with a universal spindle.

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How to Machine Micron-Level Precision Molds in One Try

On-machine measurement intelligence and modification technology helps mold builders overcome machining variables and quickly produce micron-level tolerances.

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P and C Tool improves mold quality, minimizes secondary processes, takes on new business opportunities and increases profitability with new integrated CAM software.

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How to Lower Cycle Times With the Right Tool Steel

Combining excellent mechanical properties, high wear resistance and thermal conductivity in a specialty tool steel yields cycle reduction time.

ON THE COVER

Cover photo courtesy of MSI Mold Builders. MSI Mold Builders eliminated a bottleneck at the start of the mold building process where the team squares blocks and drills and taps eye-bolt holes, allowing them to quickly and safely move large blocks averaging 8,000 pounds. By switching to a five-axis Unisig milling/drilling center with a universal spindle, total mold production time was reduced 10-15%, helping the company increase capacity 5% each year. On the cover, two team members inspect the most recent operation on the cavity side of a large infrastructure enclosure mold and plan the next step. See feature on page 12.

Image courtesy (in order): MSI Mold Builders/Creative Technology Corp., Jingdiao North America and Open Mind Technologies Inc.

 VIDEO ACCESS

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Most-Viewed Content of 2022



What better topic for my final editor’s message of 2022 than the most-viewed *MoldMaking Technology* content over the past 12 months? It’s also a great way to find out what topics are resonating the most with the audience to help guide upcoming content.

Below is the top-viewed piece per content type (e.g., features, tips, columns, etc.). Check out this list and be sure to scan the QR code above for any items you may have missed!

- Feature** — “How to Achieve the Best Mold Finish”
- Tip** — “Five Ways a Hot Runner Is Key to Processing Reinforced Materials”
- Case Study** — “Advances in P20 Steel Potentially Eliminates Need for Stress Relieving After Rough Cutting”
- Profile** — “Mold Builder Matrix Tool Inc. Uses Counter-Intuitive Approach for Mold Challenges”

- Product** — “Automated, CO₂-Based Blast Systems Specializes in Cleaning Mold Surfaces”
- News** — “SyBridge Technologies Acquires Wachusett Precision Tool”
- Video** — “Explaining Moldmaking Versus Mold Manufacturing”
- MMT Chat** — “5 in 5 with Roembke Mfg & Design”
- Back to Basics** — “How to Eliminate Chatter”



Images courtesy of (top left, top middle) Omega Tool Corp., (bottom left, top right) Matrix Tool Inc., (middle, bottom right), MMT.

MMT Today Item and Webinar — “VIDEO: How to Change Out Molds in 10 Minutes or Less”
Most Popular Area on the Website — ENGINEER — Design and Manufacturing Software and Data Management
View these articles online at short.moldmakingtechnology.com/mostviewedc22 or the QR Code provided above. **MMT**

Christina Fuges

Christina M. Fuges
Editorial Director

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MMT TIPS

5

TRICKS OF THE TRADE

Great Tips from This Issue

1. Time-saving Tips

The rotating table of a milling/drilling center is a big benefit with its ability to handle big blocks and drill to depths of 71 inches per side without changing setups.

PG. 12

2. One and Done

The digital processing capability of a high-speed machining center’s CNC system makes machining micron-level precision molds in one pass possible.

PG. 16

3. Pick and Choose

Depending on the geometry and machine kinematics, intelligent algorithms in the right CAD/CAM enable users to choose between five-axis machining with a fixed tool angle, automatic indexing or true simultaneous machining.

PG. 20

4. Special Effect

Molds and inserts made of a specialty steel grade can dissipate the process heat from the mold surface within a shorter time, reducing cycle times and increasing process efficiency.

PG. 24

5. Laser Guided

Lasers can fully replicate the pattern on high-volume textured molds that show wear, requiring a reapplication of the surface pattern.

PG. 46

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- 2 Simple and High-Rigid Design
- 3 Small size & high performance dust collector

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- 2 Wide LM guide for 3-axis(X/Y/Z)
- 3 Application of C3 class high precision ball screw
- 4 Spindle coolant system
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Top Three Editorial Advisory Board Favorites

By Christina Fuges

With so much content to read on top of your daily responsibilities, it's always nice to have some recommendations to narrow your focus, help you prioritize and ensure you don't miss out on a piece of content that could impact how you do business moving forward.

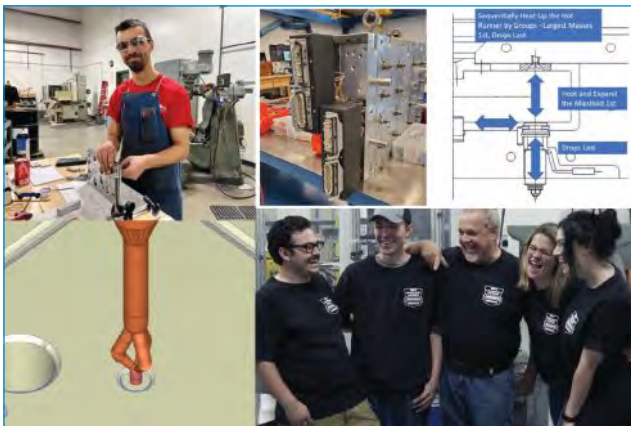
Below is a recap of *MoldMaking Technology* articles (along with excerpts) dating back to 2000 that our editorial advisory board (EAB) members noted as some of their favorites. Here are the top three:

3. September 2019 issue: Injection Molding Simulation Prediction Vs. Actual

Simulations have come a long way in the last three decades. Still, if we seek to prevent dimensional variation, we must understand what provides the highest level of accuracy so we can make good injection mold engineering decisions.

“There are four analyses to run with hundreds of results for each. Don't worry; we won't talk about them all, just some higher level ones. The first type is a filling analysis showing shear heating, shear rates, shear stress, air traps, knit/meld lines, clamp tonnages and injection pressure. Then we have the packing analysis to provide clamp tonnage, gate seal, potential sinks and voids. Finally, cooling helps to determine the overall cycle time based on wall thickness and material section (metal and plastic), as well as cooling line placement. Warp is inherent to most, if not all, plastic molded parts. It's just a matter of scale.”

2. December 2012 issue: Part 1 — Finding, Training and Retaining Employees



Images courtesy of (top left) Tri-Par Die and Mold Corp., (top right) Fast Heat by Spark Industries, (bottom left) RJG Inc., (bottom right) Westminster Tool.

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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Get to know MMT's EAB members at short.moldmakingtechnology.com/EAB

Before beginning your search, sit with your management team and list the non-machining skills, accomplishments and attributes you know someone must have to be successful at your company.

“Develop relationships with the schools in your area — both high schools and colleges. Meet with counselors and advisors to tell them you are looking to hire. Make sure they understand that you know you are not going to get someone with machining skills. Counselors and advisors interact with hundreds of people and are often the first to hear about it when someone is looking for a job.”

1. August 2000 issue: Teach Yourself Polishing Schools for mold polishing do not exist, and most veteran polishers don't want to teach the subject, so here are a few simple polishing guidelines.

“It's an unfortunate reality that far too many polishers destroy the dimensions of the part all because of ignoring the following rule, “You can't use as much steel as you wish to put on a polish. You only have the depth of the tool mark.” That simple rule is from where 99% of all ruined dimensions come. The polisher does not understand where a dimension is; the dimension that the moldmaker intended is exactly at the bottom of the tool mark and not 0.0001 further.”

To read each complete article, visit this article online at short.moldmakingtechnology.com/EAB22favorites



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#TGIF #MoldMaking #AdvancedManufacturing #Halloween



Christina Fuges @MMT ChristinaF · 15h
Replying to @AccedeMold and @MMTMag
Ok, now that's AWESOME @AccedeMold! Happy Halloween 🎃

#WomenInManufacturing #MMTMfgMonth

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Published by Zoho Social

The manufacturing world wouldn't be the same without the strong women who influence our industry's future! Here we honor 10 of many women who have impacted manufacturing: <https://www.moldmakingtechnology.com/.../women-impacting...>

#MMTMfgMonth #WomenInManufacturing #MfgMonth

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Here we spotlight the General Sessions of the MoldMaking Conference on November 8 & 9 in Charlotte, North Carolina: [#MoldMakingConference](https://www.moldmakingtechnology.com/.../the-moldmaking-.../MoldMakingConference) #MMC #RespectTheMold #MfgMonth

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Christina Fuges · 1st
@MoldMaking Technology · Nov 5

Untapping the Potential of At-Risk High School Students to Fill the Mold Engineering Skills Gap

Jeff Metz believed the future of moldmaking was in design and engineering, so he sought out a new generation of design engineers with innovative ideas and problem-solving skills to push design to the next level. As a result, the company started designing molds around cooling efficiency, which translates into a reduction in cycle times, dimensional stability and increased parts per hour. In addition, they built engineering models around guaranteed cycle times.

However, this mission needed the right people in place. As he started to put the team together, Metz realized it was difficult to find skilled workers, especially design engineers. After many discussions around the topic, something kept coming up: unpaired resources. In other words, groups of people who might not investigate the field on their own, Anova Innovations.

Click here to find out how he is solving the problem: <https://lnkd.in/g/KGqV6>

And then consider registering for our #MoldMakingConference Nov. 8&9 in Charlotte, NC to hear his story live: <https://lnkd.in/g/0B8e.6p>



Untapping the Potential of At-Risk High School Students to Fill the Mold Engineering...

NICK HAYES · 2nd
Quality Engineer at Design Spin Corporation/Instructor St. Clair College
I always say that some of my best students in the machining and engineering fields at the college are the ones most mainstream teachers said would never accomplish much. Give them a chance to succeed and they will show you what they can do! @stclaircollege

Met-L-Flo, Inc.
Great way to build the industry and help at-risk youth!

Kyle Milan · 2nd
Technical Sales and Marketing for Industrial & Manufacturing Companies
Great article, thanks for sharing. Love seeing the potential in these young students.

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Mill Better, Drill Faster, Reduce Setups, Increase Productivity

MSI Mold Builders now squares, plus drills and taps eye-bolt holes on 50% of its tools in a single setup using a five-axis milling/drilling center with a universal spindle.



Image courtesy of MSI Mold Builders/Creative Technology Corp.

MSI Mold Builders identified a bottleneck at the very start of its manufacturing process where it squared mold blocks and drilled and tapped eye-bolt holes to rapidly and safely move large blocks around the floor. This typically involved six setups on two different machines and each setup took 30-60 minutes.

MSI Mold Builders (MSI) of Cedar Rapids, Iowa, and Greenville, South Carolina, specializes in designing and building large-tonnage prototype and production molds for use in the medical, packaging, agricultural, truck, appliance, power sports, heavy equipment, aviation and materials handling segments. For over 20 years, MSI has been firmly committed to lean manufacturing, applying Six Sigma and 5S principles to identify choke points, reduce waste, improve safety and quality, and increase productivity and customer satisfaction. A few years ago, the Cedar Rapids team identified the first step in their mold building process as a bottleneck, preventing the company from reducing lead times and increasing capacity.

Reduce Setup, Boost Productivity

“The core and cavity sides of our molds tend to be very large blocks that average 8,000 pounds [3,629 kilograms],” explains Chris Waterbury, MSI Cedar Rapids production manager. “Given their size and weight, these blocks are difficult to handle, so our first step is to square the blocks and then install eye bolts, which allows us to move blocks through our manufacturing process quickly and safely.” Historically, blocks would first go into a horizontal boring mill to be squared on all four sides; then, they’d be moved to the gundrill to have the eye-bolt holes drilled. This process typically required six setups between the two machines, and each setup typically took 30-60 minutes. “What we wanted was to find a single machine where we could both square our blocks and drill and tap for eye bolts — ideally using fewer setups,” he says.

“Roger Klouda, our president, is always looking for new and innovative ways to improve our operations,” adds Steve Hoeger, MSI COO. “As MSI continues to grow, we need to keep improving our operating efficiencies. So, as luck would have it, at a show, Roger saw a new Unisig product that he thought would help us shorten lead times, increase capacity, and improve safety and quality — an all-in-one machine that was specifically designed for moldmaking and unique in the size blocks it could handle.”

The machine in question was part of the USC-M series, a group of machining centers from Unisig that had indeed been designed to meet the needs of the moldmaking industry and were able to both mill and deep-hole drill. Two of the four machines in this family have a universal spindle that both mills and gundrills, while the other four have two spindles — one that mills and the other that gundrills and produces deep holes using the BTA process, which is even faster than gundrilling.

The model that interested the MSI team was the USC-3M, a 3+2 axis machine that can rough mill but also gundrill to a depth of 71 inches/180 centimeters on each side, as well as drill angled holes at +30° and -15°, which provides more flexibility where waterlines are placed, helping moldmakers improve cooling and reduce cycle times for their molder customers. Additionally, the machine has a rotating table that is 63 × 78 inches/160 × 198 centimeters and can hold a block of up to 66,150 pounds/30,005 kilograms while providing travel of 122 inches/310 centimeters in the X-axis, 69 inches/175 centimeters in the Y-axis and 51 inches/130 centimeters in the Z-axis.

“We were excited about this machine because it looked like it would do exactly what we needed at the front-end of our process and greatly improve lead times,” says Waterbury. The team visited Unisig headquarters outside Milwaukee to learn more.

Experts in Deep-Hole Drilling

Unisig was founded in Elgin, Illinois, in 1981 and relocated to Menomonee Falls under its current ownership in 1995. In 2011, Unisig set up Unisig GmbH in Germany to better serve European customers. The company offers complete deep-hole drilling systems, including machines, tools and automation — all designed and built in the U.S. and serviced by a global sales



Image courtesy of MSI Mold Builders/Creative Technology Corp.

MSI Mold Builders specializes in design and construction of large-tonnage prototype and production molds sized to fit presses ranging from 250 to 6,600 tons. The 51-year-old company employs a team of 90 between its Cedar Rapids, Iowa, and Greenville, South Carolina, facilities.

and service organization. Throughout its history, Unisig has built expertise in deep-hole drilling, which is illustrated by the breadth of equipment it produces — from machines that can drill delicate 1-millimeter/0.040-inch-diameter holes in titanium medical components, to machines that can drill 500-millimeter/20-inch-diameter holes over 10 meters/30 feet deep in massive, high-strength steel forgings for the power industry.

“Our purpose is to be the answer to any deep-hole drilling problem in any industry anywhere in the world,” explains Anthony Fettig, Unisig CEO, who started as an engineer at the company in 1994. “To accomplish that, we listen carefully to our customers to understand what they need, then we build a product in line with their vision. Plus, we invest in ourselves to keep expanding and growing this market organically.”

For example, he recalls that no one had ever heard of the company when Unisig first considered getting into the moldmaking industry. However, after speaking with mold builders for several years, Unisig recognized that there was pent-up demand for a machine that could mill *and* drill well. “What struck us was that existing options were underpowered and couldn’t offer aggressive CNC machining,” continues Fettig. “We knew our priority was to engineer a machine that could mill aggressively and still had enough power and sophistication to drill fast, yet also had the accuracy that would enable you to trust the machine. In addition, our goal was to help mold builders get more work done with less setup so they could cut calendar days off their production schedule. That, in turn, would enable them to be more flexible on engineering changes by not having to reprocess molds multiple times as they moved through production.”

MSI MOLD BUILDERS

PROBLEM: Eliminate bottleneck at the front of mold building process where large blocks are squared, eye bolts are installed, and waterline and various holes are drilled.

SOLUTION: Purchase of a five-axis Unisig USC-3M combination milling and drilling machine.

RESULTS: Diverted 50% of traffic from an old gundrill, reduced total machining time per tool by 10-15% and increased mold output by 5%.



Image courtesy of MSI Mold Builders/Creative Technology Corp.

Since installing the Unisig USC-3M milling/drilling center, MSI estimates it saves six to 10 hours of setup time at the start of its mold building process, which equates to 10-15% of total machining time. This savings has translated into the ability to produce 5% more molds annually.

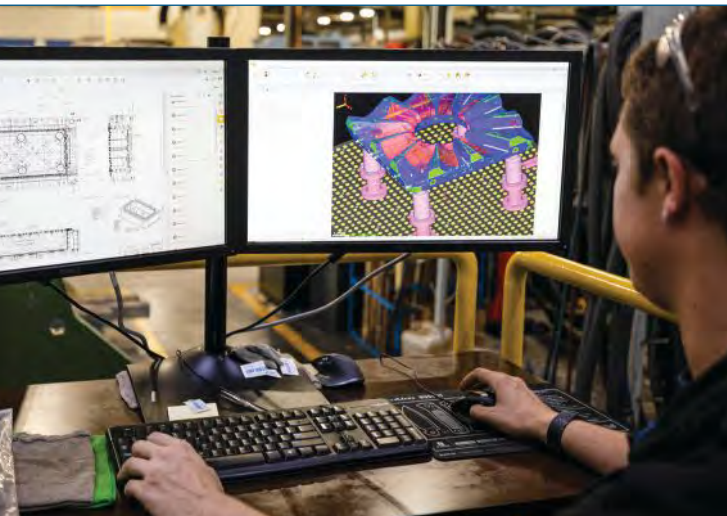


Image courtesy of MSI Mold Builders/Creative Technology Corp.

MSI has firmly committed to lean manufacturing for over two decades, applying Six Sigma and 5S principles to identify choke points, reduce waste, improve safety and quality, and increase productivity and customer satisfaction.

Unisig introduced its first USC-M series machines in 2006 — the M is for mold building — and introduced its first models (the -3M and smaller -2M) with universal spindles that could mill and drill in 2018 when indexable gundrills became viable. “We have a bias toward clean, simple-to-use and very capable machines because if you get the foundational things right, then you have a competitive advantage,” adds Fetting. “There’s a reason our headstock weighs what it does and why we engineer powertrain dynamics and frame stiffness/rigidity the way we do, as these aspects are really important to get right for effective milling. Our USC-3M has a 30-ton table capacity. It’s a very big, strong machine whose weight capacity is much higher than a typical horizontal boring or milling machine. However, we felt it needed that, as well as very good reach and very high volumetric accuracy, to open up opportunities for our customers to process molds differently. Some people think we overbuild our machines, but we believe we’re taking our massive experience in deep-hole drilling and using it to futureproof our products against changes.”

Fetting recounts his deep respect for the mold building industry and how discussions with mold building customers helped Unisig improve its own manufacturing operations. “Moldmakers are very good at machining. Their influence while we developed the USC-M series inspired the adoption of technologies in our plant, such as modular fixturing, offline tool setup and full process simulation, which helped us be more productive. They totally changed the way we think about machining, and what we learned from them made us a better company.”

Reduced Setup Pays Off

MSI ordered its new USC-3M model with a standard 60-position toolchanger, Heidenhain controllers and glass scales standard; no additional customization was added. The machine has been operating since February 2021, and the MSI team has already seen marked improvements in productivity.

For starters, every new mold that passed through the Cedar Rapids facility previously spent time on the company’s single gundrill. Now, 50% of that volume — all the biggest mold blocks — has been diverted to the Unisig, where blocks are squared and eye-bolt holes are drilled and tapped. As a result, MSI estimates that all the setup time it previously expended to machine each side of the block and to move blocks back and forth from one machine to another at the start of its process has been reduced to a single setup on the Unisig, saving 10-15% of the total mold machining time, which has enabled MSI to increase its overall capacity by a minimum of 5% each year.

“We’ve absolutely seen an impact on our process,” says Waterbury. “Conservatively, that Unisig saves us six to 10 hours of setup time in the first step of our operation. That helps reduce errors and improve quality, plus it’s much safer not moving those big blocks around multiple times. The machine’s

Image courtesy of Unisig.



MSI purchased this Unisig USC-3M, a 3+2 axis machine that can rough mill and gundrill to a depth of 71 inches/180 centimeters on each side, as well as drill angled holes that provide more flexibility where waterlines are placed, helping molders cool and eject parts faster.

rotating table is a big benefit, and its ability to handle big blocks and drill to depths of 71 inches per side without changing setups is a real time saver. We also really like its large tool-changer. It all adds up to fewer setups, and its size and capabilities are really good fits with what we do here.”

“We hadn’t specifically been looking for a particular kind of machine,” adds Hoeger. “Rather, we just wanted to find ways

to multitask to increase our business capacity and solve the problem of how to get our biggest blocks ready to go to the next step. This machine has done all that for us, and we’re very happy with its capabilities. It’s a multifaceted machine that solves our bottleneck and meets our needs. Plus, we really like that Unisig is close by in Milwaukee if we have a problem or need a part.”

Why should a moldmaker considering a hybrid milling/drilling machine purchase a Unisig? “We mill better, we drill faster, our volumetric accuracy will enable them to trust the machine and we have the reach and travel to enable them to hit all four sides of the block if they want so they can work from the center of the table, not the corners,” says Fettig. “Also, because we listen to our customers and have vast experience in deep-hole drilling that no one else can touch.” **MMT**

FOR MORE INFORMATION

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How to Machine Micron-Level Precision Molds in One Try

On-machine measurement intelligence and modification technology helps mold builders overcome machining variables and quickly produce micron-level tolerances.

Machining a micron-level precision mold on the first try is difficult to achieve. Machining the mold two or more times is often necessary to reach the required micron-level tolerance. Variables such as the machining environment, machine stability, cutting tool wear, and accuracy and operator experience impact micron-level machining results.

The opening image shows a 300- × 195-millimeter (M333, HRC50) part produced on a high-speed mill using a polycrystalline diamond (PCD) cutting tool continuously for 80 hours. The tool wear was less than 0.8 μm, which achieved a mirror Sa surface finish within 10 nanometers.

The precise fit of this machining sample begs three questions:

1. How were these parts machined?
2. How can they fit so perfectly together with a disappearing parting line?
3. How can this be done with no secondary operations?

On-machine measurement and intelligent modification technology integrated into the control of a high-speed machining center is one way to overcome these variables. These functions identify and eliminate any inherent deviations in key machining elements, which yields efficient, stable machining of micron-level precision molds.

Here's how it works and what to consider.



All images courtesy of Jindiao North America

The precise fit of this part was possible with on-machine measurement and intelligent modification technology integrated into the control of a high-speed machining center.

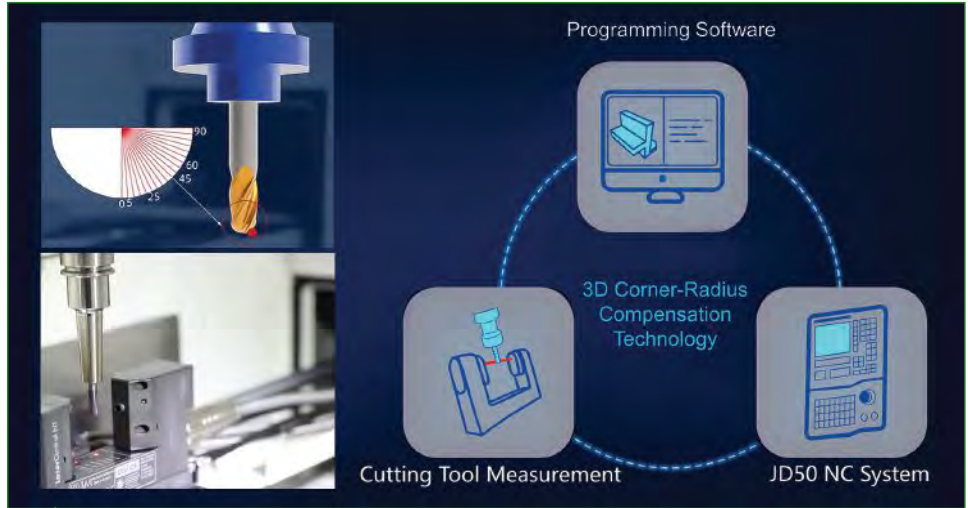
Key Features and Functions

A high-speed precision machining center with **integrated on-machine measurement and intelligent modification technology** has a set of measurement systems in the machine's control. First, the measurement points are created in the CAM system. Then, after the program is created, the NC code, measurement points and the part's solid model file are imported into the control. The operator machines the part and then selects the critical measurement points program. An accuracy heat map of the solid model file appears on the control, which visually indicates to the operator if the part is within tolerance.

The **digital processing capability** of a high-speed machining center's CNC system makes machining micron-level precision molds in one pass possible. For example, the proper digital processing capability will acquire data acquisition from various measuring instruments and temperature sensors to form a closed-loop, on-machine measurement and intelligent modification function, which efficiently and accurately carries out the measurement work on the CNC machine. It's like having a CMM built into your high-speed mill.

Regarding **part size measurement**, on-machine measurement and intelligent modification technology uses a probe that performs a preliminary inspection of the machined workpiece. Like a CMM, the control creates an accuracy heat map and informs the operator if the part is within spec. The operator can also export the measurement results and heat map image with the machining data.

Then there is the **cutting tool**, for which there can be an inherent deviation between the actual cutter size and the theoretical cutter data during manufacturing. Even the most accurate cutting tools have a tolerance.



The on-machine measurement and intelligent modification control function permits contour measurement of the cutting tools.

With on-machine measurement and intelligent modification technology in conjunction with the CNC system, the operator can use the laser tool calibrator to measure the inherent deviation of the cutting tool's radius and perform multipoint compensation according to the cutter's contour. After each tool is 3D measured, its actual value is automatically stored in the control, yielding more accurate machining results.

The operator can also measure **cutting tool wear** with on-

On-machine measurement and intelligent modification technology turns traditional machining into digital control.

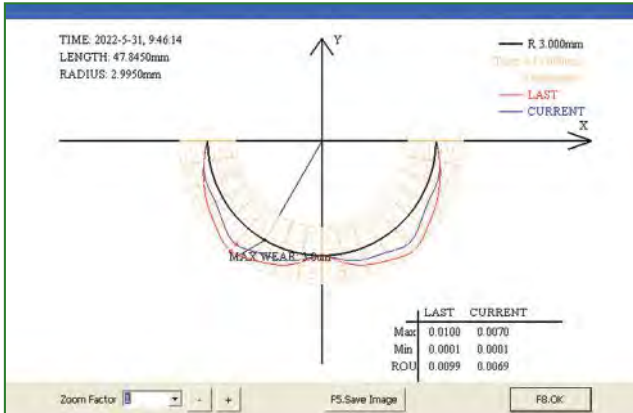
machine measurement and intelligent modification technology that uses a laser tool calibrator to measure the change in cutting tool size due to wear.

If wear exceeds a specific range — especially in the finishing process — it is necessary to carry out corresponding correction work to ensure that the following cutting tool removes the proper amount of material. For example, the control gives directions to measure the cutting tool after a specified time and if the wear is more significant than expected, the control changes to a new cutting tool.

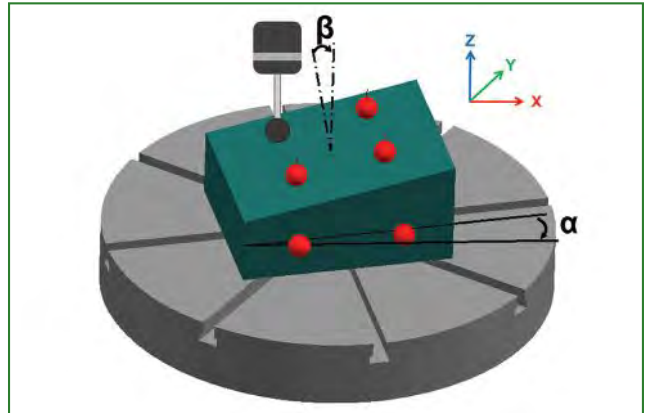
Tool wear can also lead to **uneven surface finish**, which causes the workpiece



On-machine measurement and intelligent modification produced this mirror Sa surface finish within 10 nanometers.



Contour deviation comparison of a cutting tool before and after machining.



Integrated on-machine measurement and intelligent modification technology offers workpiece position compensation.

material to be inconsistent with the machining model. On-machine measurement and intelligent modification technology uses a probe to measure the allowance according to the set value. Then the detection map of the remaining surface stock is output in real time. This feature directly analyzes the detection data on the machine tool side.

Another challenge is manually aligning a workpiece with an imprecise indicator or inexperienced operator that consumes labor time and produces inaccurate results. High-precision machining centers that **automatically align the workpiece** in X, Y and Z planes are more accurate and reduce setup time. For example, modeling features that

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Components can be ground to a tolerance of ± 0.000050 inches, with tips as small as 0.002 inches and lengths up to 14 inches. Custom details such as tapers, rings, vents, ribs and spirals can be shaped using wire EDM. In addition to standard tool steel, components can be made of powdered steels, stainless steel and copper alloys including M-2, A-2, H-13, S-7, PMM-4, PM10V420SS for greater control over thermal transfer, tensile



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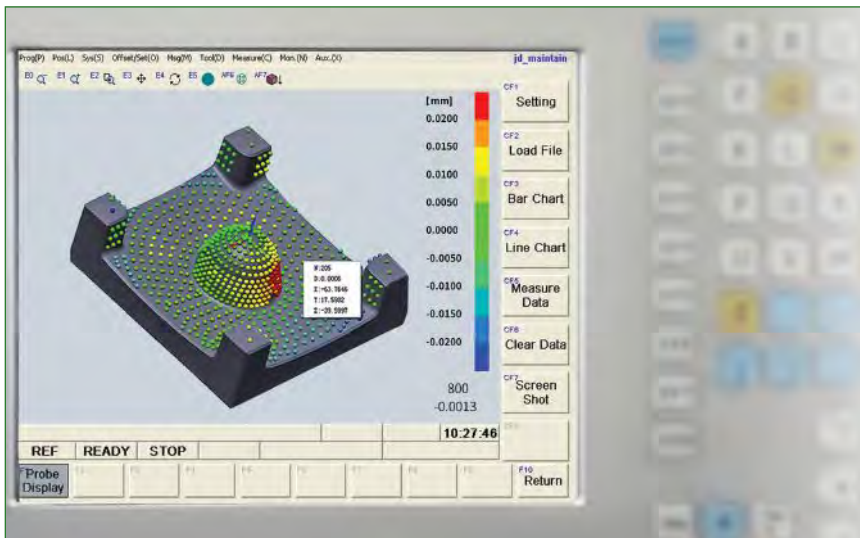
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The control creates an accuracy heat map showing if a part is in spec and can be exported with the machining data.

define the workpiece coordinate system for the machined material improves high-speed machining accuracy.

Machine tools are very sensitive to heat when performing precise machining. On-machine measurement and intelligent modification technology can use a probe and standard ceramic ball to judge whether the current machine tool state is stable and make necessary corrections to adjust for a less desirable machining environment.

These modification functions also monitor changes during processing by using various sensors built into the machine tool to detect problems and notify the operator. Alerts prevent the machine tool from working in an unstable state and preserve workpiece accuracy.

Mold Machining Advantages

High-precision machining centers with on-machine measurement and intelligent modification technology can achieve stable machining of micron-level molds by accurately judging, compensating and correcting inherent deviations such as tool errors and material deformation. It can also achieve long-term continuous process-

ing of PCD cutting tools and produce surface finishes down to the nanometer level.

This technology turns traditional machining into *digital control* that reduces quality problems caused by inexperienced operators, saves time when measuring parts on the machine and reduces the impact of external inherent deviations on production, improving a shop's overall machine tool utilization rate. [MMT](#)

ACKNOWLEDGMENT

Thank you to Jingdiao's Jason Wong for his contribution to this article.

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Modular, Flexible CAM Speeds Five-Axis Programming, Boosts Profitability for Moldmaker

P and C Tool improves mold quality, minimizes secondary processes, takes on new business opportunities and increases profitability with new integrated CAM software.

When a custom mold builder put a new five-axis milling machine into production, there was excitement about what the technology could bring to the table. Increased efficiency and accuracy, reduced setups and better access to part features are some of the well-known benefits of five-axis milling. However, it helps when you also have good CAM software to support it.

Founded 23 years ago, P and C Tool has 15 employees in its 10,000-square-foot Meadville, Pennsylvania, facility, designing and manufacturing plastic injection molds and die-cast tooling. P and C also offers general contract machining, including emergency repairs, spare cores and cavities, jigs, fixtures, secondary operations and intricate aerospace parts. Its machining capabilities range from three- and five-axis CNC milling,

wire and sinker EDM to CNC turning, surface and cylindrical grinding, and laser welding.

“P and C Tool was founded on the belief that there is a better way to build molds that provides quality tools with extremely short lead times. We combine high-tech CNC processes with skilled moldmaking that minimizes errors and maximizes machine time,” Ed Leech, P and C Tool’s director of engineering, says. With this in mind, the company continues to invest in the technology.

“We get into many single-cavity molds. As a result, most components are one-of-a-kind and custom-engineered, making profitability a challenge. We get one shot to make them right and it’s always in a hurry,” Leech says. To be profitable, the P and C team needs to keep spindles running to minimize idle time and meet tight delivery schedules.

In 2019, P and C procured a Roeders five-axis milling machine. Since P and C specializes in custom-designed molds, most parts are uniquely engineered to close tolerances with seal surfaces as fine as 0.0001 of an inch. Early on, the team encountered problems keeping up with the Roeders’ capabilities due to the lack of throughput from the CAM software package that had been in use at P and C Tool for over 20 years.

“We had way too much spindle downtime while parts were being programmed, and we were unable to keep pace with production requirements. Again, because most everything we build is a one-off, each part needs a new program,” Leech explains.

Leech decided to investigate new software and came across a variety of *hyperMILL* CAM software videos on YouTube from OPEN MIND Technologies. He wanted to learn more about the CAM system.

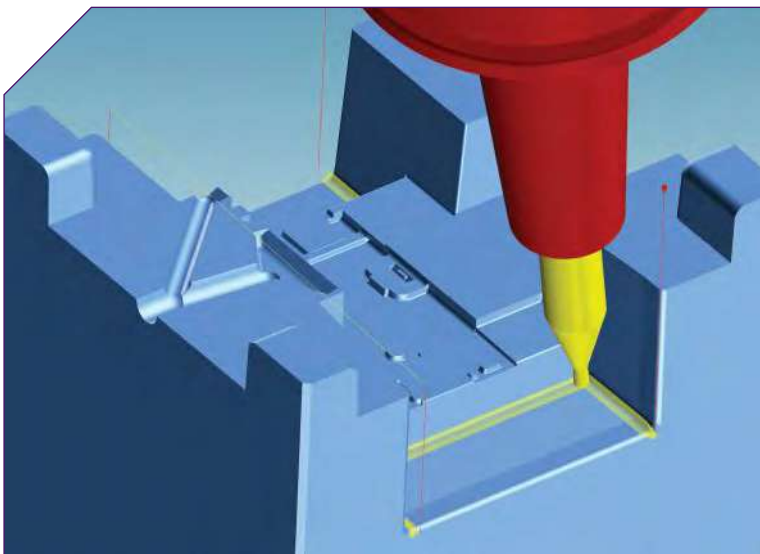


Image courtesy of OPEN MIND Technologies.

hyperMILL's five-axis rest machining automatically creates 3+2 orientations for complete machining of tight, deep corners with minimal tool stick-out.

CAM Answers Speed Requirements and More

Leech evaluated many CAM packages before finally pulling the trigger and acquiring *hyperMILL*. “But,” he says, “*hyperMILL* was so much faster than everything else I tried; it made the decision an obvious one. In addition, OPEN MIND’s demonstration team was the only CAM provider able to easily handle every off-script programming situation on the fly.” After an initial but quick ramp-up period, the results have exceeded the expectations of P and C Tool not only due to *hyperMILL*’s capabilities, but also because of OPEN MIND’s support in making the transition as seamless as possible.

OPEN MIND Technologies’ *hyperMILL* software is a modular and flexible CAM solution for 2D, 3D and five-axis milling, mill turning and high-performance machining strategies with everything integrated into a single interface. This complete integration enables fast, easy five-axis programming using the latest operating concepts, reduced machining times and tool wear, improved process reliability and accurate, high-quality surface finishes.

Intelligent algorithms ensure automatic tool collision detection and avoidance with *hyperMILL*, and challenging features, such as high and steep walls, free-form surfaces and deep cavities, are automatically calculated and machined easily. Depending on the geometry and machine kinematics, users can choose between five-axis machining with a fixed tool angle, automatic indexing or true simultaneous machining.

One of the most significant aspects of the transition to *hyperMILL* was initially something Leech was quite apprehensive about. Leech had previously written all his postprocessors for P and C’s machines. However, he says that the postprocessor from OPEN MIND’s *hyperMILL* is fully kinematically constrained and works perfectly. “Each time I need a tweak, I call support at OPEN MIND, and they send me a new post that I drop right in, which saves us weeks in postprocessor development,” Leech says.

Multiple CAM Benefits

P and C Tool has received many benefits since the switch to *hyperMILL*, all of which meet its speed and quality

P AND C TOOL

PROBLEM: CAM programming and profitability challenges with plastic injection mold and die-cast tooling work.

SOLUTION: Roeders five-axis mill with OPEN MIND Technologies’ *hyperMILL* CAM software.

RESULTS: *hyperMILL* eases programming bottleneck, increasing throughput on five-axis work, improving profitability.



Image courtesy of P and C Tool.

For this single-cavity die-cast tool with parting line injection, all shutoffs, gates, runners and interlocks were machined in one operation to 0.0001-inch tolerances. Complete programming time with *hyperMILL* for finishing was less than an hour.



Image courtesy of P and C Tool.

This 2+2 die-cast family tool is an example of an extremely detailed parting line with inside corners milled to 0.0078 inch. With a texture requirement on the molding surfaces, it is often harder to keep a toolpath off of those surfaces than it is to machine them. The ease of adding extension surfaces and stop surfaces with programmable offsets in *hyperMILL* let P and C Tool finish the shutoffs right up to the molding.

requirements while keeping the five-axis machine humming. Toolpath calculation and the postprocessing time are two to three times as fast as the company’s previous software.

Leech notes that besides being faster, *hyperMILL* enables for greater experimentation and trial of different creative methods because there is not a long wait for a complex toolpath to calculate. As a result, P and C can try new things and alternative solutions without bogging down the programming process.

Additionally, toolpaths are not just calculated fast; they also run fast on the machine.

Leech says there is virtually no “air cutting” or tool breakage, even when stepping down from one end mill to smaller end mills in hardened steel. *hyperMILL* keeps track of the stock and keeps the tool in the cut.

In addition, multiple toolpaths can now be worked on simultaneously, allowing the programmer to quickly jump

from one to the next while toolpaths are calculating in the background. “We can have many different parts open and work on them concurrently with one *hyperMILL* seat,” Leech says.

The postprocessor OPEN MIND built for P and C Tool is so safe and secure that Leech can run parts without worrying about crashes. He continuously puts new parts and programs into the machine. He leaves the milling operation unattended for up to 10 hours, so there is time for other projects,

including programming the next part. As a result, Leech says, “*hyperMILL* has tamed the complexity of five-axis machining so that even one-of-a-kind parts feel more like production work.”

Versatility is another aspect of *hyperMILL* that P and C appreciates. Because the software is not tied to a strict, level-based stock progression, its team can mix and match stocks, geometries, parts, cover surfaces and guiding surfaces within a single program.

Taking advantage of *hyperMILL*'s trochoidal (high-performance roughing) toolpaths has been impressive. “With a single click of the high-performance tab, this toolpath strategy keeps the cutting tool buried deep in steel without breaking the end mill,” Leech says.

The tool library in *hyperMILL* is integral to the functionality and is fast and easy to use. It is upfront for adding new tools, reusing old tools, creating different toolholders, modifying tool lengths, setting up limitless materials, cutting parameters and machines. “But the best part is keeping an exact representation of every cutting tool in every machine for quick and easy retrieval and use,” Leech says.

Tremendous Toolpath Strategies

Leech believes that the five-axis rest machining toolpath alone is worth the price of admission. It performs five-axis pencil milling where the previous tool size and the surfaces to be machined are selected, and then *hyperMILL* generates a five-axis toolpath that flows around all corners. In comparison, the previous software's toolpath was quirky, inefficient and generated spotty results.

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Using other software, P and C Tool director of engineering Ed Leech saw a lot of air cutting when stepping down from one end mill to the next, especially on small, detailed areas and deep grooves like in this 4+4 family tool. The deep grooves in these cavities were roughed with a 0.039-inch toric end mill, and there was virtually no air-cutting and zero tool breakage, even though the previous tool was a 0.118-inch ball end mill.

“hyperMILL’s five-axis rest machining is super fast and smooth, and I rarely have to input any five-axis control over it manually. There is even a smooth overlap option that feathers the cut of a smaller tool into the larger tool, so there isn’t a mismatch,” Leech

says. He points out that a 0.0001 of an inch mismatch between end mills can visually look much bigger than it is. The hyperMILL smooth overlap strategy helps to eliminate that problem.

hyperMILL has cut P and C Tool’s five-axis programming time in half or more, and the team can now keep up with the Roeders machine. “And it has also improved our toolpaths, so the cut time is faster,” Leech says.

Since it is a two-fold increase in speed, P and C has increased the type of milling work it can do and increased profitability, even enabling the company to take on higher cavitation work while still keeping up with single-cavity jobs. The quality of the work has also been improved, minimizing the need for additional EDM and grinding operations.

Single-cavity, custom molds can be challenging, as each component requires a new CAM program. However, hyperMILL eased this programming bottleneck for P and C Tool. Leech reports the shop has easily seen a 50% increase in throughput on five-axis work since its implementation. [MMT](#)

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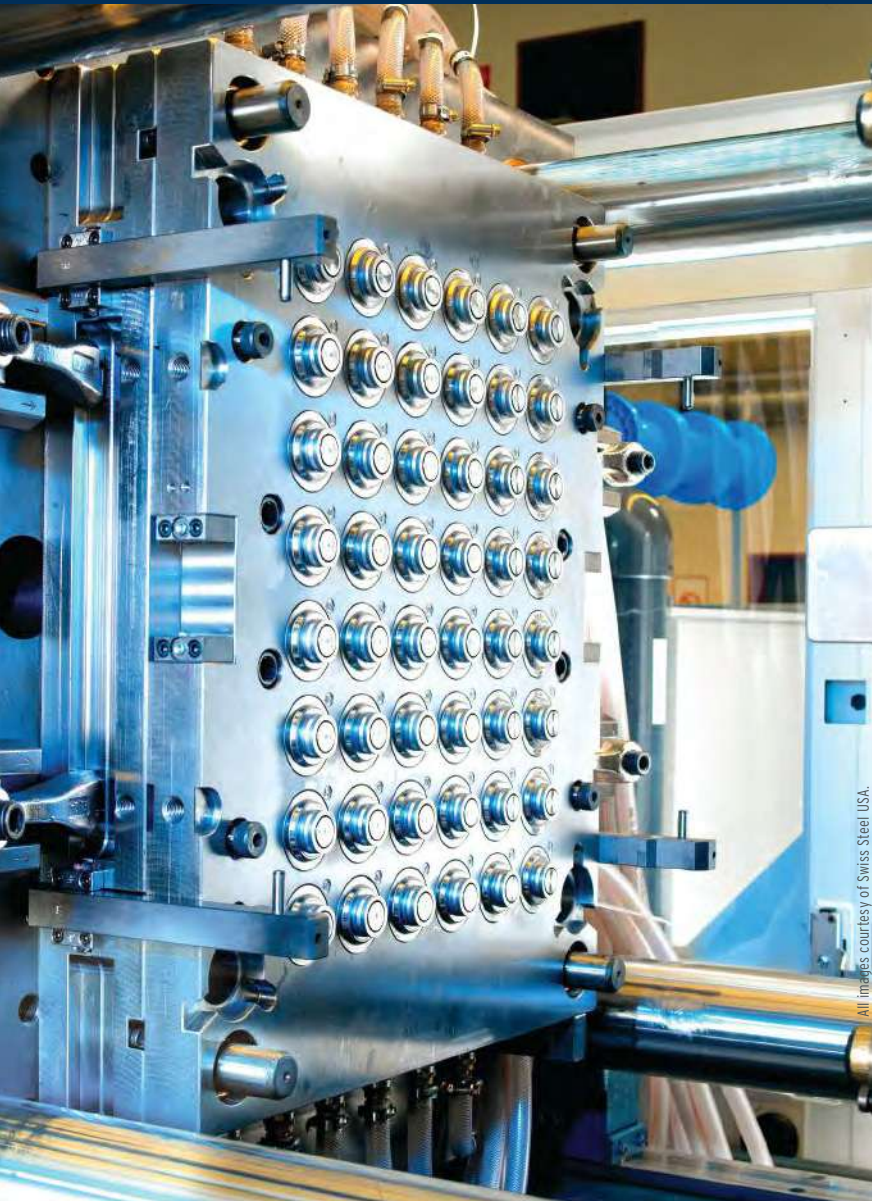
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How to Lower Cycle Times With the Right Tool Steel

Combining excellent mechanical properties, high wear resistance and high thermal conductivity in a specialty tool steel yields cycle time reduction.



All images courtesy of Swiss Steel USA.

A tool steel quenched and tempered to 45 HRC offers a combination of high thermal conductivity, thermal fatigue resistance and good wear resistance, making this specialty steel particularly suitable for applications such as low-pressure die casting, high-pressure die casting (for the gate runner and biscuit area) and plastic injection molding.

Here are three steel properties to consider when selecting your next mold material to lower cycle times, and a review of how a new specialty remelted tool steel holds up:

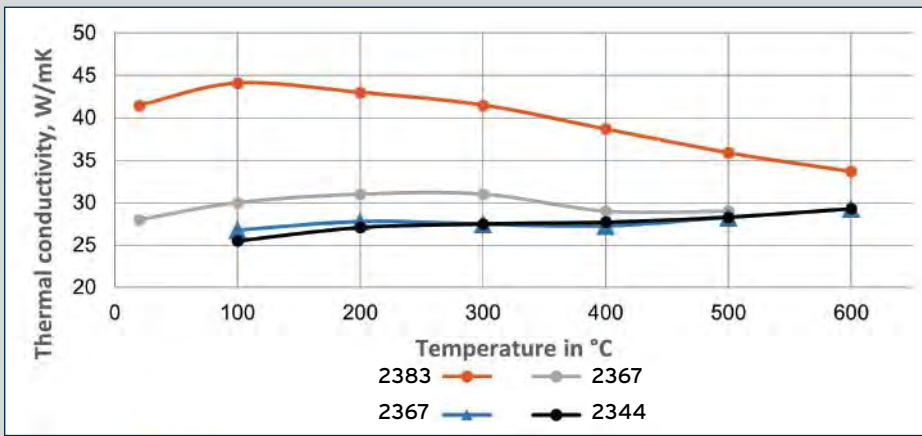
1. Thermal Conductivity

This specialty remelted tool steel achieves a significantly higher thermal conductivity in the hardened and tempered condition of 45 HRC to 50 HRC than conventional hot work tool steels such as 1.2343 (AISI H11) or 1.2344 (AISI H13) (see **Figure 1**).

At room temperature, the thermal conductivity is 41.5 W/mK and reaches its highest value of 44.0 W/mK at 100°C. This is about 70% higher compared to 1.2343 and 1.2344, which show thermal conductivities of 25.5 W/mK and 26.8 W/mK at room temperature. The thermal conductivity of this specialty remelted tool steel exceeds conventional hot work tool steels, especially in the range of 100-200°C, which is equivalent to the working temperature in injection molding applications.

Molds and inserts made of a remelted special steel grade can dissipate the process heat from the mold surface within a shorter time.

FIGURE 1



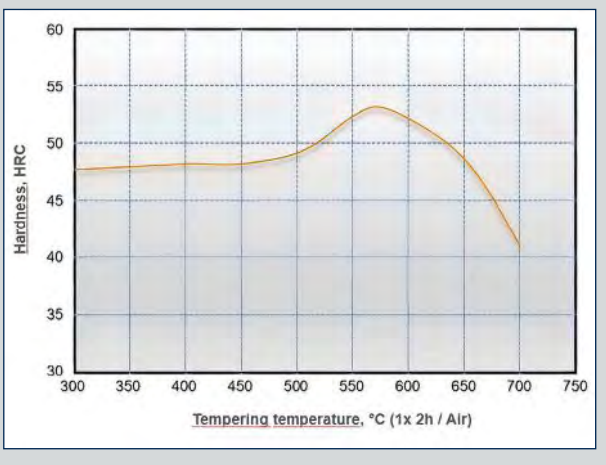
Thermal conductivity of a new specialty remelted tool steel (2383) compared to other hot work tool steels in a quenched and tempered condition with a hardness of 45 HRC.

FIGURE 2

Brand Name	C	Si	Mn	Cr	Mo	V	Ni
Specialty Remelted Tool Steel	0.45	0.30	0.90	—	1.50	1.50	0.90

Chemical composition in weight %

FIGURE 3



Tempering diagram of a new specialty remelted tool steel.

Molds and inserts made of this specialty grade can dissipate the process heat from the mold surface within a shorter time, resulting in shorter cycle times and higher process efficiency. In addition, temperature differences between the surface and the mold core are minimized, lowering the mold's thermal stresses and reducing cracking (see Figure 2).

2. Heat Treatment

The heat treatment (hardening and tempering) differs from conventional hot work tool steels. Molds and inserts should be hardened in the temperature range from 1,050°C to a maximum of 1,090°C, depending on their size. The hardness after quenching is approximately 52 HRC. The secondary hardness maximum of this new specialty remelted tool steel (2383) is around 53 HRC, reaching roughly 570°C (see Figure 3).

The steel should be tempered twice, similar to other hot work tool steels. Due to its tempering resistance, it is important to temper this steel at higher temperatures to obtain hardness values comparable to those of H11 and H13. Even larger dimensions can easily be quenched and tempered and generate a homogeneous martensitic microstructure.

3. Polishing

Polishability is a critical tool steel property, so polishing trials were conducted to test the performance of this remelted specialty steel (the study used remelted H11 material). The processing time for standard high-gloss polishing is equivalent to H11 ESR. **MMT**

FOR MORE INFORMATION

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 John Stocker, Director of Sales



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Wepco's Journey with Metal 3D Printing

By Christina M. Fuges

The moldmaking industry is growing, and Wepco is one of many companies that understands the importance of breaking into the 3D printing sector with the help of grants and partnerships. In this MMT Chat, I have the pleasure of speaking with Wepco's director of manufacturing support, Amanda Wiriya, about the shop's journey into 3D printing, as well as its efforts to inform the community about a growing industry.



Christina Fuges: Whether it's the polymer side of 3D printing or the metal side, you've been on a journey with Wepco Plastics. The first time I heard about it — did you win a grant with [the] University of Connecticut?

Amanda Wiriya: Way before our world changed, we were fortunate enough to get a grant through University of Connecticut, which is about 45 minutes from where we are at Wepco. And we really just wanted to test out the idea of 3D-printed molds. We knew it was coming. We wanted to get ahead of it. We wanted to see, "How does that work with what we do?"

Learn more about Wepco Plastics' journey at short.moldmakingtechnology.com/WepcoAME

This MMT Chat episode is brought to you by ISCAR with New Ideas for Machining Intelligently.

MMT's editorial director, Christina Fuges, talks with Wepco's director of manufacturing support, Amanda Wiriya, about Wepco's 3D printing journey and the initiative the company is taking to bring awareness to the moldmaking industry.



Simplify Mold Management of Your Tooling Fleet

By Cara Decknadel

In this digital demo from Progressive Components, the company's monitoring business manager, Sujit Sheth, demonstrates its asset management and mold monitoring software, ProFile. ProFile makes it possible to monitor all your assets in one place — a challenge many mold builders face.



Sujit Sheth: It's always critical to understand what our molds are doing at all times, but not only what they're doing. Where are they? What I wanted to share with you is a little bit about ProFile, which is our asset management system. ProFile works as an asset management system for production, so we're not looking at it like you would from a typical ERP standpoint where you're focused on financial metrics. We're really looking at what's more useful to the production floor, the tooling teams and those that are closest to the asset on a day-to-day basis.

For more information on ProFile and how it can help manage and monitor molds, visit short.moldmakingtechnology.com/ProFileMoldMonitoring

Progressive Components' Sujit Sheth presents at PTXPO 2022 about ProFile. The management software enables mold builders to monitor all their assets in one place.





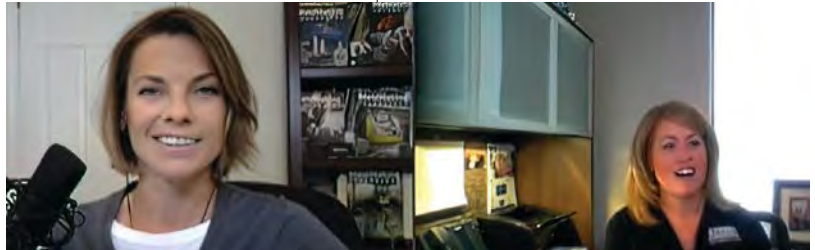
From drafting in middle school to engineering at Eastman Kodak to mold design for small family-owned mold builder Accede Mold and Tool where she has moved up into a variety of engineering, marketing, quality management and sales roles, Camille Sackett has her share of stories and insights.

Here are just a few tidbits from this conversation to whet your appetite for our full conversation:

- Accede's culture promotes the freedom to become who and what you want to be here.
- Open and shut to cube molds is still amazing.
- Leadership that embraces failure as a means to learning.
- Mentorship versus sponsorship.
- The value of asking for help and leaning into the discomfort of not knowing.
- Breaking the barrier between the engineering and production departments.

To hear more about Camille's journey, visit short.moldmakingtechnology.com/MMTChatsNeverStopLearning

This episode is brought to you by ISCAR with New Ideas for Machining Intelligently.



Never Stop Learning Is the Motto of This Engineer Turned Sales & Project Manager

By Christina M. Fuges

Christina Fuges sits down with Camille Sackett who shares on the value of truly focusing on quality, leading customers to success, building culture, mentoring and continuous life learning – and her love of audiobooks and podcasts.



If you've been following *MoldMaking Technology* for at least the past three years, you've heard of and read about Marion Wells.

You're probably pretty familiar with her passionate rantings about workforce development challenges through our *MMT Chats* video interviews, Amerimold presentations and *MMT EAB* columns. But you don't really know Marion.

Among many things, *MMT EAB* member Marion Wells, founder of Human Asset Management, is also the inaugural sponsor of the Strategic Targeted Achievers Recognition (STAR) Scholars Program for the College of Engineering, Department of Material Science and Engineering at the University of Wisconsin-Madison to attract a more diverse future workforce.

Marion is asking her industry colleagues to join her by making a donation to help fund the STAR Scholars program to raise awareness of materials engineering and diversify the field by attracting more women and minorities into the industry.

To learn more about Marion and the STAR program, visit short.moldmakingtechnology.com/STARprogram

MMT editorial advisor, Marion Wells, is asking industry colleagues to join her by making a donation to help fund the STAR Scholars program to raise awareness of materials engineering and diversify the field by attracting more women and minorities into the industry.

Materials Science + Steel + Scholarships = Success

By Christina M. Fuges





Access the related video or article at MMT online via the corresponding QR code.

Digital-only content you may have missed. Read full stories at links or QR codes provided.

Medical Mold Demonstrates Predictable Manufacturing

By Cara Decknadel



Dave Tomic, president of Eden Manufacturing and Eden Tool, talks with Christina Fuges, MMT editorial director, about the predictable manufacturing Eden utilizes in its facilities.

How does this medical mold demonstrate the use of predictable manufacturing and how can a shop apply this principle effectively? Dave Tomic, president of Eden Tool and Eden Manufacturing, shares his answer with MMT's editorial director, Christina Fuges. At Eden Tool,



predictable manufacturing is at the core of everything it does. Tomic uses a medical mold project for a retractable needle to explain predictable manufacturing and how to implement this principle in any shop.

He discusses the critical part features and challenges of this SPI Class 101+ tool, its mini-tunnel gate and longer-lasting components.

Also, tune in to find out who won the Mike Eden Mold Builder Scholarship.

Dave Tomic: Predictable manufacturing is understanding all the variables in the whole manufacturing process. Understanding your cutters, your holders, your heat. Your variables, how to control them and what to do, so you can put a part into a machine, and you can have it come out within microns of where you expect it to come out.

To learn more about and see how Eden Tool utilizes predictable manufacturing, visit short.moldmakingtechnology.com/EdenToolMedicalMolds

IMTS 2022: From Precision Products & Professionals to Podcasts & Parties

By Christina Fuges



AMT's Bill Herman and MMT's Christina Fuges discuss all things moldmaking on the "big stage" in the Grand Concourse of McCormick Place during IMTS Shop Talk.

Four years since the last IMTS and this 2022 event served up plenty of product line expansions, technology enhancements, candid conversations about business challenges and deep discussions about using technology and training to stay competitive.



Omega Tool, Eden Tool, CDM Tool, United Tool and Mold, Precise Tooling Solutions, Superior Tooling, Die Tech, Westminster Tool, Triangle Tool, Janler, Innovation Mold, Delta Mold, Century Tool, Michiana Global Mold, Intralox, R&D Leverage, Met-L-Flo, Custom Mold, Nypromold, Tessy Tooling, Evco Plastics, iMFLUX, Hanson Mold, Concept Molds, Accutech Mold, Integrity Mold, Decatur Mold and Redoe Mold. These are a handful of mold builders not just walking IMTS, but seriously investigating product and equipment purchases.

This activity aligns with a recent informal reader survey that revealed many of MMT's readers are building more molds than last year and running more machine hours. They also noted they want to buy more mold steels, aluminum, cutting tools and machines. Mold builders are after technology to help them improve surface finish, efficiency, accuracy, setup and cycle times, and IMTS served it up!

Moving moldmaking forward takes the right technology, processes and partnerships to develop solutions that improve mold building efficiency, and IMTS is a great place for that to happen.

Learn more about all the great happenings that went on at IMTS 2022 at short.moldmakingtechnology.com/MMTatIMTS2022



MoldMaking Technology editorial director Christina Fuges reveals five best practices for improving efficiencies in culture, technology, process, measuring success and staying competitive in five minutes: hire for work ethic, machining, molding, relationships and appropriate technology investment.

This special MMT Chat Series delivers five best practices in five minutes on ways to improve efficiencies. The guest is Joe Cherluck, president of Best Tool and Engineering in Clinton Township, Michigan.

Christina Fuges: How do you create and maintain an employee-centered culture?

Joe Cherluck: Okay, very simple. In one term: you live it. I started this company because of what I value. Stability, family values. In the past years, culture has become a buzzword in many larger companies, and they come up with culture statements. Most cases, that is just not enough. I strongly believe a man-woman business is not what they say — but what they do in their actions every day.

To listen to all of Cherluck’s answers on the rapid fire MMT Chats 5 in 5 series, visit short.moldmakingtechnology.com/BTE5
This episode is brought to you by ISCAR with New Ideas for Machining Intelligently.



5 in 5 with Best Tool & Engineering



By Christina M. Fuges

Christina Fuges sits down with Joe Cherluck to get his answers for the five featured questions in all 5 in 5 MMT Chats. Cherluck is president of Best Tool and Engineering.



After working with an automation advisory company on a recent article about how to start automating a moldmaking operation, they sent me this perspective piece from Søren Peters, CEO of HowToRobot.com and Gain & Co on the state of manufacturing and how robotics can move it forward with a little patience and understanding.

“Robotics is still relatively young, especially outside of the heavy manufacturing industries. As with any sizeable technological advancement, change is difficult. Leaders struggle to understand how to deal with the technology and the people who need to operate it lack the skills to do so. Many fear the technology simply because they lack knowledge about it and otherwise promising projects derail. As a result, robots are gathering dust in shopfloor corners or not living up to expectations, causing people to lose faith in the technology. This can be avoided.”

The simple truth is that robotics is hard. When you haven’t experienced failure and seen the real-life possibilities and limitations of the technology, how do you navigate the many pitfalls?

For the full commentary on robotics integration and human-robot collaboration, visit short.moldmakingtechnology.com/HumansAndRobots

It’s time to rethink what a manufacturing job is and what we can comfortably leave to robots.

A Few Words on Humans and Robots Working Together to Revitalize Manufacturing

By Christina M. Fuges



Moldmaking Industry GBI Follows Industry in Contraction Trend

October – 47.1

The Gardner Business Index (GBI) Moldmaking contracted for the second month in a row, closing October at 47.1, a low not seen in nearly two years. The 1.6-point decrease from September reflects a directional trend that other industries — in addition to moldmaking — are manifesting, including metalworking and plastics processing.

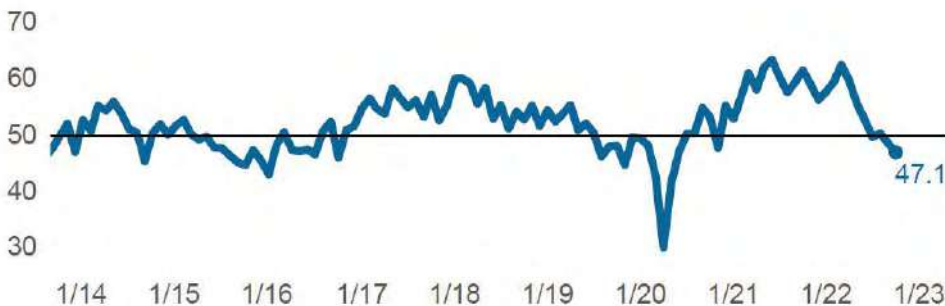
Similar to September, more components contracted than expanded for the month — four out of six components, to be exact. Backlog and new order readings remained neck and neck, and exports continued its own steady rate of contraction. Employment continued its growth mode in October to the same degree as September, though anecdotal evidence suggests employment is still not at sufficient levels. Supplier deliveries continued to lengthen at a rate that lands it in more typical territory. **MMT**



ABOUT THE AUTHOR

Jan Schafer, MBA is the director of market research for Gardner Intelligence, a division of Gardner Business Media (Cincinnati, Ohio, United States). She has been an essential part of Gardner Intelligence for over five years, and has led research and analysis in various industries for over 30 years. Jan is available at jschafer@gardnerweb.com

■ Gardner Business Index (GBI): Moldmaking



Moldmaking contracted for the second straight month in October.

■ Backlog, Production and New Orders (3-Month Moving Average)



New orders continued to contract in October, but at a slower pace than September. Not surprisingly, backlog and production contracted as well.

All images courtesy of Gardner Intelligence.



Stay ahead of the curve with Gardner Intelligence. Visit Gardner Intelligence's website at gardnerintelligence.com.

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

For the complete article, visit the corresponding short links or QR codes provided.

Evergreen MMT content to assist with training, cross-training and upskilling.

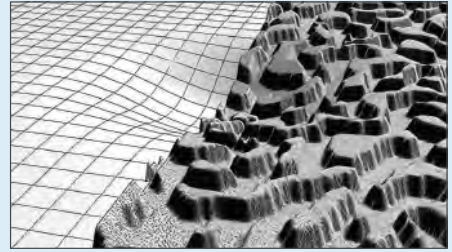
With the lack of a skilled talent pool in addition to curricula and training missing the fundamentals of mold design, build, maintenance and repair, *MoldMaking Technology* can help. Each month, we will highlight a few articles from our archives that are still searched often and stand the test of time when it comes to providing basic, how-to information. This month we are focusing on surface treatment.

Understanding Texture Repair

Developing a texture repair plan will help get a damaged mold up and running.

Suppose a mold needs to produce parts immediately, but it has a damaged texture. This can be an everyday occurrence within a molding facility as lifters or pins break and hit the tool surface, causing rust to develop or unacceptable texture wear to appear. These situations call for an action plan to help get that mold back up and running.

short.moldmakingtechnology.com/TextureRepair



Questions and Considerations Before Sending Your Mold Out for Service

Communication is essential for proper polishing, hot runner manifold cleaning, mold repair, laser engraving and laser welding services.

Many mold manufacturers build a network of specialty shops to whom they outsource steps of a project to help meet required deadlines and stay on budget. These relationships demand communication at every step to ensure a quality mold on schedule. This means that before a job hits the floor of that specialty service provider, the mold builder and service shop managers must communicate expectations and requirements.

short.moldmakingtechnology.com/SendingMoldsOutforService



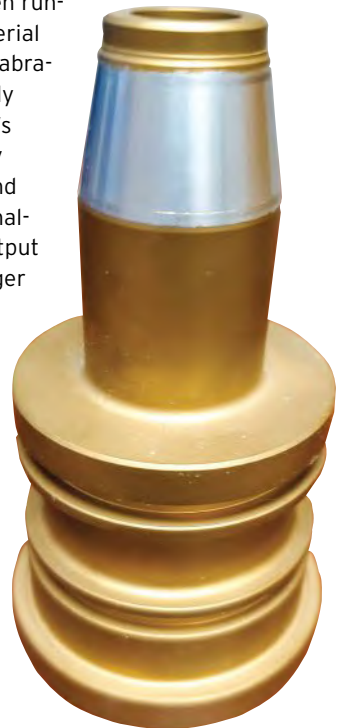
How to Protect Soft Base Materials

Choose a suitable mold coating to take the abuse and save your base material.

A common issue manufacturers experience when running soft base material components is the abrasive material quickly attacking the mold's surfaces, especially at the gate, vent and end-of-fill. Other challenges are poor output from the start, longer cycle times, mold cleaning, components designed without draft and frequent engineering changes (design or material).

Selecting the appropriate engineered coating to better manage or overcome these challenges is essential.

short.moldmakingtechnology.com/ProtectSoftBaseMaterials



For more Back to Basics content, visit moldmakingtechnology.com/hashtag/basics

2022 MOST-VIEWED PRODUCTS

Mold in a Day Technology Slashes Tool Production, Eliminates Supply Chain Headache

Next Chapter Manufacturing highlights its transformative “Mold in a Day” (MIAD) technology to accelerate the injection molding process, meeting the challenge of supply chain disruptions.



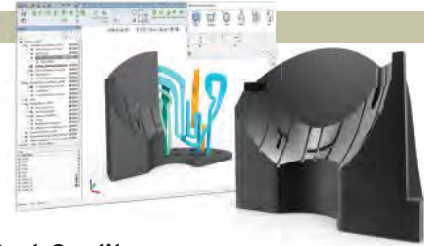
Currently, the company says, it can take weeks or even months for production tooling to be completed so that it can be used to produce parts. However, with MIAD, which employs the additive manufacturing (AM) process, Next Chapter is said to be able to slash that

timeline from weeks or months to hours while maintaining the same high quality and tolerance standards of conventional molds.

MIAD is made with an exceptionally durable, reinforced photopolymer. Like some other molds, MIAD is 3D printed. Unlike other molds, MIAD is treated with a proprietary coating that reportedly offers up to 10 times the durability and longevity of other 3D-printed molds. As a result, difficult-to-use resins like filled resins, PBT, POM, PEEK, Ultem and engineered resins can be used to produce an average of 2,000 parts off one set of inserts.

Next Chapter Manufacturing / 616-773-1200 / nxcmfg.com

End-to-End Conformal Cooling Design, Production for Faster Cycle Times, Boosted Part Quality



To avoid longer cycle times, warpage and sink marks on injection molded parts, **Cimatron** presents its intelligent conformal cooling channel design for faster cycle times, better part quality and a more efficient cooling process.

Cimatron's end-to-end solution reportedly enables moldmakers to detect areas that would benefit from conformal cooling channels, from using its dedicated toolset to design the mold with an optimal combination of conventional and conformal cooling channels, to preparing the mold component for 3D printing and postprocessing. Cimatron's conformal cooling solution is also available as a standalone seat that can work alongside other mold design systems.

According to Cimatron, the car reflector headlight example above demonstrates how its conformal cooling solution reduces injection molding cycle time and significantly improves part quality: Cycle time reduction by 17% (from 40.3 sec to 33.4 sec); warpage reduction by 62%; part temperature deviation reduced by 73%; sink mark affected areas reduced by 50%.

Cimatron / 877-596-9700 / cimatron.com



Integrated Software Platform Adds Product Design, Simulation Extensions

Autodesk Inc. has made available the Production Design Extension and Simulation Extension, which have been added to Fusion 360, the company's integrated 3D CAD, CAM, CAE and PCB software for product design and manufacturing. These extensions improve the platform's performance, user experience and efficiency.

The Product Design Extension extends the core 3D design and modeling capabilities of Fusion 360 with access to design tools that automate and simplify the creation of features that are natively aware of the manufacturing process. Users are able to create highly intelligent features that automatically update when the material changes. Access to geometric patterning tools, advanced volumetric lattice technology and more are also made available.

The Simulation Extension enables the user to improve product performance in Fusion 360 with access to an assortment of simulation capabilities including structural, thermal, explicit and includes the new injection molding simulation study type. These two extensions are part of a slew of January 2022 updates and additions.

Autodesk Inc. / 877-335-2261 / autodesk.com

Automated, CO₂-Based Blast Systems Specialize in Cleaning Mold Surfaces

Cool Clean Technologies Omega CO₂ cleaning solutions specialize in cleaning mirrored finishes and micro molds, by removing thin films, residues and oils from the mold surface that create defects on a molded part.

Cool Clean does not require pellets or blocks of dry ice to operate. The Omega CO₂ cleaner produces dry ice from a high-pressure gas or liquid CO₂ source by expansion to create the CO₂ crystals used to clean the molds. The Cool Clean system's CO₂ supply is nonperishable and contained in a cylinder or tank for on-demand, continuous cleaning.

Cool Cleaning Technologies LLC / 651-842-8600 / coolclean.com

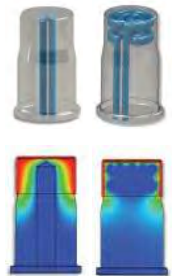


Vacuum Brazing Services for Conformally Cooled Mold Cores, Cavities

Polyshot Corp. calls attention to its vacuum brazing services to fuse multi-component mold cores and cavity assemblies for conformal cooling purposes, improving mold cycle time, part quality and part repeatability.

Created with Polyshot's Plate Fusion technology, the company says it is able to reduce cooling times in injection molds by as much as 60%. Polyshot is able to braze H13 and 420 stainless steel materials. Applications include mold cores and cavities in which cooling lines cannot be drilled, high-volume production where reduced cycle times lead to higher output per machine and more.

Polyshot Corp. / Pure Technology Corp. / 585-292-5010 / polyshot.com



These products represent only a small portion of what is available on moldmakingtechnology.com. A more comprehensive list can be found at moldmakingtechnology.com/products



New Metal 3D Printing System Accelerates Mold Insert Production

Mantle highlights its new metal 3D printer, which can produce precision metal mold inserts from a CAD file in a fraction of the time and cost of conventional manufacturing without requiring programming. These tool steel inserts can be used for prototype tooling, production tooling and conformal cooling applications.

The technology combines additive 3D printing of metal pastes with subtractive machining to meet the requirements of the tooling industry, including a surface finish of 1-4 $\mu\text{m Ra}$, comparable to EDM; accuracy within 0.004" across 4" inserts; fine features and sharp details; and a distinctive conformal cooling design.

The company says it has developed two tool steel materials, including P20 and H13, and has demonstrated that these materials perform in a manner comparable to traditional tool steels. The materials are said to be stable for secondary operations and use the same processes for machining, grinding, EDM operations, laser welding, coating and polishing.

Moreover, Mantle tools have been used to produce more than one million end-use parts for customers. These tools have been produced with shorter lead times and lower costs than tools made traditionally, according to the company.

Mantle Inc. / 415-655-3555 / mantle3d.com



Corrosion-Resistant, High-Hardness Mold Steel for Optimal Surface Finishes

Uddeholm's Tyrax ESR is a premium corrosion-resistant and high-hardness (up to 58 HRC) mold steel. It offers excellent polishability, the company says, making it the obvious choice for applications where surface finish is of the highest importance. Moreover, a high-gloss surface finish can be achieved in three polishing steps compared to five steps for AISI 420 ESR, reducing overall polishing time by 40-50%. Uddeholm Tyrax ESR is reported to be a suitable upgrade from AISI 420 ESR, AISI S7 and AISI 440C.

Tyrax ESR is ideal for molding high-performance plastics often filled with glass fiber reinforcements and corrosive, flame-retardant additives. The material is also suitable for long run production molds in the following application areas: lens and lighting molds, medicals molds, injection plastic molding, vinyl extrusion and plasticizing screws.

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



3D-Printed Tooling Platform Ramps Up Injection Mold Tooling Capabilities

Injection mold tooling investments are formidable barriers in many development projects. In a novel collaboration, companies **Nexa3D** and **Addifab** have teamed up to provide faster, cheaper and greener injection mold tooling via a novel 3D-printed injection mold tooling platform.

Addifab is the inventor of Freeform Injection Molding (FIM), 3D-printed soluble tooling. Nexa3D is a U.S. manufacturer of high-performance 3D printers for industrial applications. Through this collaboration, Nexa3D will supply its NXE 400 system, including the industrial 3D printer as well as wash and cure units, to users of FIM, while Addifab will supply its proprietary tooling resins and postprocessing equipment.

The combined solution enables injection molders to additively manufacture complex injection mold tooling in hours rather than weeks or months. Most thermoplastic materials, including reinforced high-performance feedstocks, are compatible with these tools. The 3D-printed tool elements are reported to work seamlessly with conventional metal tooling to bring down costs of complexity and mold complex components that would be difficult to mold with metal tooling alone. Moreover, Nexa3D's printers increase productivity, enable the ability to manage larger parts and reduce substantial waste.

Addifab / 650-526-8121 / addifab.com

Nexa3D / 800-797-0633 / nexa3d.com



Laser Welder Optimizes Mold and Die Repair Expenses

Using **Sunstone Welders'** Orion Combo 200 laser welder, companies are able to easily maintain or repair expensive molds on their own.

From its generator to the fiber optic output, the Orion Combo 200 is said to make fast work of shaping and adding metal to worn or damaged molds and dies. Mounted on an articulating arm, the Orion Combo 200 easily moves to any position needing repair. The power range is adjustable from 0.1 to 200 joules, applicable for work on a wide variety of metal types and applications including edge repairs; hole repairs; identification engraving; small weldments; EDM pit repairs; adding material for shimming; tool repairs; and porosity repairs.

The laser welder has several additional features:

- Pulse-shape settings configure the weld to specific metallurgic characteristics.
- High-efficiency components run cooler, reduce stress on critical-wear parts, maintain notably longer service life and reduce maintenance.
- Repeatable control over laser parameters.
- High-efficiency fiber optics deliver higher average power output with fewer joules.

Sunstone Welders / 877-786-9353 / sunstonewelders.com



Ejector Pins With Ventilation Surfaces Improve Mold Performance

Hasco America unveils its new ejector pins Z401 with ventilation surfaces to ensure that the air in the cavity can easily escape, improving mold performance. Specific to this product, the extra-long ventilation surfaces extend over a large part of the ejector pins, so the pins can be easily and individually shortened to the desired length.

The new ejector pins are available in different diameters (1-12 mm) and lengths (100-315 mm, depending on the diameter), and can be interchanged directly with conventional ejectors Z40 or Z41. Overall, Hasco says it is able to comply with customers' individual requirements, offering maximum flexibility, especially in the field of demolding.

Hasco America / 877-427-2662 / hasco.com/en

EDM

Contract Wire EDM Services Meet Prototype, Production Mold Demands

Xact Wire EDM manufactures components for both prototype and production molds used in a variety of applications, from overmolds and insert molds to micro injection molding for surgical devices. The company's contract wire EDM services can also be used for cavity and component rebuilding or repairs.

Wire EDM is ideal for working with the hardened and pre-hardened metals frequently used in moldmaking such as P20, S7, H13 and 420 stainless steel. Xact says it can perform EDM cutting directly on the mold or by using wire EDM blanks to manufacture specific mold components or inserts.

Xact's injection mold building customers are often faced with strict demands, requiring a proven, cost-effective wire EDM cutting and EDM hole drilling in any conductive material, including hardened tool steels. With over 50 EDM machines and 24/5 capability, the company is able to offer its clients high precision with short lead times.

Moreover, because Xact exclusively provides EDM services, it is said to be the ideal partner for companies in the injection mold industry and often functions as an extension of a moldmaker's own in-house EDM capabilities.

Xact Wire EDM Corp. / 800-798-9228 / xactedm.com



Large Mold Shops can Boost Electrode Wear, Cycle Times With Workhorse Sinker EDM

The Gantry Eagle 1400 sinker EDM, according to **MC Machinery Systems**, is a true workhorse for all large mold shops, offering enhanced electrode wear – requiring less maintenance and costly downtime – and improved cycle times for high return on investment (ROI). It combines the latest in technological innovation with a human-centric design for utility across a number of projects, materials, industries and more.

Importantly, the Gantry Eagle 1400 retains the high-precision accuracy customary to the Gantry Eagle line but offers more working space to handle even larger jobs – maximum workpiece size is 59.4" W × 101.2" D × 31.1" H (1,500 × 2,570 × 790 mm).

Another feature, the Eagle PowerTec power supply, reduces burn time and electrode wear without sacrificing accuracy. Using an adaptive current-shape generator, each discharge pulse is reported to calculate and create the ideal current shape to meet the exact discharge requirements at that moment. Moreover, combined with Eagle Power Jump, PowerTec reduces burn time by up to 50% while drastically reducing electrode wear – especially in graphite.

For fast, user-friendly operation, the Gantry Eagle 1400 also features a dual 32-bit, PC-based CNC control that enables faster data processing and servo control. The machine's fixed table traveling gantry construction provides thermal stability and rigidity and features a four-sided drop tank design that allows work area access from all sides.

The EDM machine retains a fully integrated machine base fluid system, a direct drive AC smart servo system, dual ball screw gantry drive and a 3D lateral servo system. It also highlights an easy-access dual filter system and dielectric fluid emission. An automatic lubrication system enhances on-board automation capabilities.

MC Machinery Systems Inc. / 630-616-5920 / mcmachinery.com



Highly Functional, Compact-Designed Sinker EDM

Belmont Equipment & Technologies' exclusive Maxicut Series ZNC EDM sinker machines have been a proven provider for the industry, including moldmaking, aerospace and production applications, the company reports.

The MX-236CW ZNC EDM Sinker features Windows control and a compact machine design. The EDM generator attached to the machine body and an oil reservoir in the base of the machine reduce floor space and eliminate cables on the floor. The system uses Belmont's On-Board Technology which provides EDM settings that are selected through a user-friendly technology database.

This sinker has a footprint of 92" wide × 93" deep, with X, Y, and Z travels of 15.7" × 11.8" × 7.2", respectively. The available open height is 19.6" and a maximum workpiece weight is 2,200 lbs.

Belmont says the MX-236CW has several useful features, such as a programmable Z-axis which enables the operator to automatically control depth and generator settings from roughing to finishing cycles. Conversational G- and M-Code programming simplifies programming and makes functions easier to learn.

Additional notable attributes include a linear glass scale with 1-micron resolution and the ability to interface with ancillary devices, such as rotary tables, indexers and workpiece handling systems. Optional features include Belmont's Adaptive Logic control which constantly guards against arcing and shorting of the electrode under poor cutting conditions.



Belmont Equipment & Technologies / 800-356-4811 / belmont4edm.com



Sinker EDM Complements Mold and Die, General Parts Machining Applications

YCM Technology (USA) Inc. announces the latest in its lineup of application-based machining solutions, the Exeron 316 sinker EDM machine. The new release complements an array of comprehensive

machining solutions developed for mold and die and general parts machining associated with medical equipment, automotive, aerospace, defense and energy applications.

The Exeron 316 sinker EDM machines are available exclusively through YCM Technology as part of the YCM Alliance, which includes YCM Machine Tools (milling, turning and wire EDM), Trimill Machine Tools (gantry-type portal milling), Exeron (sinker EDM and ultra-high-speed milling) and KMC (head changing milling).

The machine boasts high-precision, single-digit micron tolerances, and what is said to be one of the largest work envelopes in its class. Supporting parts up to 17,000 lbs on a 68.9" × 53.1" table, and a travel of (X) 59.1" × (Y) 46.5" × (Z) 31.5", the sinker EDM is efficient, flexible and reliable.

The Exeron 316 Sinker EDM is also built to last with heavy ribbed and welded construction for added strength and stability. Digital AC servo direct drives and glass scales are said to provide maximum travel and control dynamics in all axes. The ability to raise and lower the tank – when filled – provides greater access to the workpiece while saving time, since users don't need to fill and empty the tank.

YCM Technology (USA) Inc. / 310-735-8610 / ycmcnc.com



Die-Sinker EDM Series Fits Needs for Enhanced Automation, Speed, Surface Finish

Combining the power of discharge control technology with rigid linear motor control and the latest artificial intelligence (AI), the **Sodick Inc.** ALG die-sinker EDM series provides stable machining for every product, every time, the company

reports. Improved performance and faster machining speeds are additional features inherent to the product series.

When it comes to making accurate, high-quality molds, the ALG Series uses a newly developed SP Power Supply to double motor response speed, improving the quality and speed across the entire discharge machining range. These machines also incorporate the Arc-less 4 circuit to greatly reduce electrode wear, improving speed and surface finish.

With an ever-growing demand for automation in job shops, Sodick says its ALG sinker series was designed to fit a wide range of automation needs. It is equipped with a three-sided, automatic vertical machining tank controlled automatically and has a high affinity with workpiece/electrode replacement systems using automatic electrode changers or robots, enabling continuous automatic operation with high-precision and high-speed machining.

Sodick Inc. / 888-639-2325 / sodick.com

AUTOMATION

Manufacturing Execution System Automates Task Scheduling for Forward-Thinking Mold Shops

One of the largest challenges facing mold shops is having available work prepared and ready for the automation cell. This is where **R.E.R. Software's** InFocus suite and, more specifically, AutoPlan shine, the company says.

AutoPlan is said to remove all of the struggles that are associated with manual scheduling. A living schedule, AutoPlan is continuously shifting and reacting to real-world situations and complexities in a manufacturing facility. It is aware of the status of all parts, and plans the work in the exact order required to make sure work is queued to maintain the due dates.

AutoPlan is a state-of-the-art manufacturing execution system (MES). Compared to what Microsoft Project does with one job, R.E.R.

says AutoPlan does it automatically with the company's entire workload. The software understands each resource capability and knows what work can, and cannot, be performed on it. Moreover, when combined with InFocus AutoTrack, AutoPlan is in constant communication with all equipment in real time, logging hours to the correct task every time, also automatically.

R.E.R. Software Inc. / 800-705-9969 / RERSoftware.com



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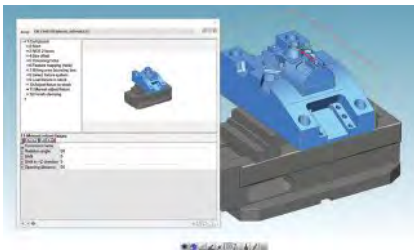


Visit www.pcs-company.com

Phone: 800-521-0546 | email: sales@pcs-company.com

CAM Software Automation Recognizes, Remembers and Standardizes Complex Process Flows

Parts with similar geometries – such as component families and variants, recurring shape elements, features such as holes or pockets and repetitive processes – provide an ideal opportunity to implement automated CAM programming. **Open Mind Technologies'** *hyperMILL* CAD/CAM software now offers new automation technology and a comprehensive Automation Center, all of which help to reduce programming times, standardize processes, eliminate human error and improve overall throughput in the moldmaking industry.



hyperMILL CAM programmers are provided with a toolbox full of closely inter-linked technologies to automate individual or complex processes. This makes it easy to define and adhere to manufacturing standards.

The feature and macro technology in *hyperMILL* enable programming knowledge to be saved for reuse at a later date. Geometry information from the CAD model is automatically applied during CAM programming. In addition to standard features such as holes and pockets, almost any geometry information can be processed. It is also possible to combine geometries into a Customized Process Feature (CPF) by using colors, shapes or layer names. The manufacturing knowledge required to process the recognized features is stored in the macros and can be called up automatically. A Programming Assistant wizard streamlines the creation of machining frames and reference points. And automation can also be used to properly open vises and then use a check surfaces.

A tool database provides extensive technology data, enabling users to select the right tool with the right machining values for each machining operation. Using Virtual Tool, *hyperMILL* can now automatically choose the most suitable tool for the respective machining process.

Finally, the various technologies can be used individually or managed centrally using the *hyperMILL* Automation Center, making it possible to standardize and automate complex process flows in *hyperCAD-S* and *hyperMILL*.

Open Mind Technologies USA Inc. / 888-516-1232 / openmind-tech.com

Moldmaking Operation Visibility is Enhanced Through Smart Factory Solution

For today's competitive mold builders, evolving shopfloor technology is swiftly becoming a necessity to compete amidst workforce limitations, supply chain disruptions and a global marketplace. The Scytec DataXchange machine monitoring solution, available through North American manufacturing integrator **Shop Floor Automations**, is one such smart factory technology. This solution helps manufacturers gain automated visibility across all collaborative and industrial robots, as well as other CNC, fabrication, assembly and legacy or manual equipment, according to the company.

By pulling data from all devices within a manufacturing cell and synthesizing it with a company's enterprise resource planning (ERP) and other core systems, moldmakers can identify and take informed action on the following intelligence, and more:

- **Actual setup and run times.** By comparing a company's estimates to its actuals, users are able to increase the accuracy of job costing, providing a better handle on margins and overall profitability. The visibility afforded by these actual times guarantees easier and more reliable planning and scheduling, as staffing requirements become predictable.
- **Machine statuses.** Uptime and downtime records and notifications to maintenance, production and management can ensure service is planned for and executed when and as needed.
- **Completed quantity.** Inventory of raw materials, intermediates and finished goods can be affected in real time by machine processing, as it occurs.
- **Scrap quantity.** Material requirements may be altered based on the volume of actual scrap produced, adding to the dependability of planning and scheduling.
- **Scrap codes.** Opportunities to reduce waste may be presented through reason code analysis.



Shop Floor Automations Inc. / 877-611-5825 / shopfloorautomations.com

Cobot Integration Boosts Repeatable, Reliable Toolroom Production

Fast Heat by Spark Industries is highlighting the **ReadyCobot**, a collaborative robot solution enabling tool shops and molders to overcome labor shortages, improve quality and lead time, improve flexibility and ultimately reduce costs. Applications that can be performed by the ReadyCobot include assembly; bin picking; palletizing; inspection; machine tending; loading and unloading; drilling, milling, sanding or screw driving; and packaging.

Features include six-axis hand-guided or drag-and-drop programming via the wireless app, up to 39-lb payload, 52" working radius, max speed up to 3.5 m/s, repeatable to ± 0.02 mm, configurable I/O integration and force control natural human-cobot cooperation.

According to an injection molder of caps with seal inserts, they could easily complete a 20,000 product run in 24 hours – three times faster than if it were done manually while reducing scrap by 1-2%. With a constant stream of jobs, the company expected to achieve ROI in six months.

Proof-of-concept videos are created in Elkhart, Indiana, by sister company, Root Industrial, and ReadyCobot, a division of long-time automation integrator Tube Form Solutions.

Fastheat by Spark Industries / fastheatbyspark.com

Tube Form Solutions, ReadyCobot Div. / 574-295-5041 / readycobot.com



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CNC Automation Applications Integrate AGVs, AMRs for Intelligent Control in the Mold Shop

Within the past few years, the number of **Fastems'** CNC automation solutions utilizing automated guided vehicles (AGV) or autonomous mobile robots (AMR) has multiplied, and the demand keeps rising, the company reports. Typical AGV applications include material intralogistics, delivering tools to machines and moving machining pallets between production process phases. The common goal of all the AGV projects is timely, safe and economical transfers of production items, and Fastems is actively developing ways to use these technologies efficiently with CNC automation.

There are automated vehicles in many production shops, whether it's in aerospace, defense, machine or mold building. When it comes to CNC automation and AGVs or AMRs, Fastems notes that these solutions can be of great help

in reducing manual transfers and forklift operations, reducing buffer sizes, increasing the automation level and making production flow more predictable and reproducible.

Fastems' manufacturing management software (MMS) is said to bring higher intelligence for AGV use by overseeing all production orders and resources and scheduling everything for timely customer deliveries. In

practice, MMS schedules production based on customer orders and available production resources such as machine tools, cutting tools and raw materials, then prompts the AGV's fleet management software to perform the right transfers at the right time. Moreover, in the event that the unexpected happens – an urgent customer order comes in, or a machine breaks – MMS adjusts the production (including the AGV movement) so that the most urgent jobs still get done in time and all the needed resources are in place when needed.

Fastems LLC / 513-779-4614 / fastems.com



Upgraded Turning Center Series Drives Precise Machining, High Productivity

DN Solutions introduces the new Puma DNT 2100 and 2600.

The DNT Series will replace the popular Puma GT 2100 and 2600 models, with upgrades in enhanced rigidity, usability and accuracy, and a focus on convenient operation and easy maintenance. This DNT Series comes in a two-axis and a milling version, with a 25 hp (18.6 kW) or 35 hp (26.1 kW) motor that turn the machine's spindle at speeds ranging from 3,500 to 4,500 r/min.

Like the GT Series, box guideways are applied to all axes on the DNT Series to prevent vibration and ensure dynamic rigidity during heavy-duty cutting. Rigidity enhancements consist of an improved bed design, which includes increased guideway span and saddle width, a higher rigidity bearing arrangement in the main spindle and adoption of a high-rigidity, low-temperature live tool drive that guarantee precise machining and exceptional productivity.

Convenience features on the DNT Series include an ergonomic control panel with adjustable height iHMI touch screen for quick and easy operation, a wider maintenance space and the addition of an inverter type chip converter with a 45° incline cover design for better chip handling.

The Puma DNT Series is said to improve on machining accuracy by optimizing the spindle structure and adopting the thermal compensation function (optional). A low heat generation bearing in the new live tool drive also help to minimize thermal deformation.

The maximum turning diameter of the two-axis models is 15.7" (398.8 mm) to 18.1" (460 mm) and the maximum turning length is 21.6" (549 mm) to 42.4" (1,077 mm). The milling versions come with a maximum turning diameter of 12.6" (320 mm) to 14.7" (373 mm). The maximum turning length is 19.7" (500 mm) to 40.5" (1,029 mm). The BMT-55 live tooling turret has speed of 6,000 r/min powered by a 7.5 hp (5.6 kW) motor.

DN Solutions / 973-618-2500 / dn-solutions.com



Plug-and-Play Robotic Cell Streamlines Low-to-High Volume Part Loading, Unloading and Palletization

The LoadMate Plus Machine Tending Robotic Cell from **Absolute Machine Tools** and partner **Mitsubishi Electric Automation** streamlines part loading, unloading and palletizing in low-to-high volume applications. It features portability, easy setup and programming, high performance and a safety-first design that make it appropriate for both job shops and larger scale production environments.

Mitsubishi and Absolute jointly designed the plug-and-play cell. It consists of a Mitsubishi industrial robot, a wheeled stainless steel base, a clear polycarbonate cell enclosure featuring a safety door with an interlock switch and a side table extension. The cell accommodates Mitsubishi six-axis RV-series robots ranging in load capacity from 7-20 kg and reach up to 1,388 mm. Integrating the robot cell with a CNC machine is a one-step process using a single Ethernet cable, Mitsubishi's Direct Robot Control function and the Mitsubishi M8 series control. The LoadMate Plus can also interface with other control types via remote I/O connectivity.

Built-in casters enable users to move the LoadMate cell from machine to machine. The cell enclosure is designed to handle heavy payloads and significant part momentum. Additional guarding and fencing may not be necessary when the cell is positioned correctly in tandem or in close proximity to the CNC machine. Depending on the application, the cell can be secured in position using built-in ratchet pads or an optional floor-mount latching system.

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

Mitsubishi Electric Automation / 847-478-2100 / us.mitsubishielectric.com



MACHINING

Robot Guide Streamlines the Automation Process

Designed to decrease the apprehension and intimidation some manufacturers might face during their initial foray into robotic automation, the new **KUKA** Robot Guide makes the process fast and easy to apply the right automation to specific application needs. In only three steps, users are presented with KUKA robot options based on industry, application and environment.



Within the guide, users are able to choose between a variety of industries, including automotive, food and beverage, medical, plastics, electronics and metal, then drill down to almost any application environment. KUKA's family of robots are suited for applications requiring extreme precision and

repetitive tasks with fast cycle times as well as for those within large foundry operations. Application categories include arc and laser welding, machining, measuring and inspection and range from applying/gluing and painting, to handling and assembly. Users can also indicate whether the robot will work autonomously in an isolated environment or collaboratively with humans.

From there, customers can select case studies, application videos, white papers, parameters and details of each suggested robot's technical specifications.

KUKA Robotics Corp. / 800-459-6691 / kuka.com

High-Precision Touch Probe for Grinders/Lathes Enables High-Accuracy Molds, Components

Heidenhain's TS 750 high-precision touch probe is now available for in-process workpiece measurement in grinding machines and lathes. The highly durable probe offers the ability to state the reproducibility of its jobs at increased probing speeds with low probing force, the latter of which Heidenhain says is an important benefit when working with soft or delicate workpieces. Ultimately, when dialing into mold applications, the machine is a solution for high-accuracy parts grinding.

The TS 750 operates with high-precision pressure sensors with force analysis for generating the trigger pulse. The forces that arise during probing are processed electronically. This method is said to deliver extremely homogeneous, 360° probing accuracy. It offers a high probing speed of up to 1 m/min and does not require a minimum speed.



In addition, due to its low probing forces of approximately 1.5 N (axial) and 0.2 N (radial), the TS 750 can attain high probing accuracy ($\pm 1 \mu\text{m}$) and repeatability with almost no effect on the measured object. Only on further deflection do the forces of the springs take effect until the machine stops.

Heidenhain Corp. / 800-233-0388 / heidenhain.us

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



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High-Frequency Milling Suits Compact Gantry Milling Machine to Moldmaking Tasks

The German-made Endura 700Linear series from **Fooke**, a specialist for large and very large gantry milling machines, has been sold and proven in numerous applications, the result of its power and reliability. Machines in this series have been continuously optimized since 2004, characterized by an optimal ratio of structural rigidity and motion control, combining for high productivity and improved machining quality. The series also meets customer expectations in



terms of a large machining area, a small footprint and foundationless installation.

A large, compact Endura 700Linear portal milling machine features travels up to $5,500 \times 3,500 \times 1,500$ mm (X, Y and Z). The modular layout enables an extension of X-axis travel to an XL version. Its intelligent design enables it to be installed on a solid industrial floor, Fooke says, and takes only a few days to be assembled and put in operation.

The series' five-axis options are equipped with direct drives in all axes (linear and torque motors). Different milling heads with high-frequency milling spindles (HSK63A or HSK100A) can be selected. Thus, this series is available for various machining tasks – whether for machining CFRP/GFRP workpieces in the aircraft industry, modeling block material and aluminum in model and prototype construction or cast iron and steel in mold and die-making.

Consistent high precision due to the machine's temperature stability, and thermal decoupling from short-term temperature fluctuations through Thermo Guard are additional features.

Fooke USA Inc. / 248-218-5880 / fooke-usa.com

Hybrid 3D Printer Offers Five-Axis Simultaneous Machining for Mold and Die Applications



DMG MORI's latest hybrid 3D printer offers increased application possibilities by providing easier process integration and component potential for mold and die professionals. The Lasertec 3000 DED hybrid combines laser deposition welding by means of a powder nozzle and five-axis simultaneous machining – including turn and mill technology – in one workspace setup.

Thanks to the space-saving compactMaster spindle, the machine offers sufficient room for a wide range of components, so that mold builders, semiconductor, medical and aerospace sectors can use the hybrid machine for a variety of applications. With the combination of subtractive and additive manufacturing (AM) in one workspace, the machines are especially well suited for the production of prototypes and small series as well as in the repair and coating of components.

Simultaneous machining in three linear axes as well as in the C-axis and the B-axis is said to offer significant added value in the machining of even more complex workpieces. The compactMaster spindle functions as the B-axis, into which cutting tools or the powder nozzle head for AM can optionally be inserted. Even then, the length of the compactMaster spindle is only 550 mm.

The maximum component size is $400 \times 1,321$ mm with the B-axis at 90° . If this is rotated by 180° , component dimensions of 670×932 mm are possible. With a size of $6,876 \times 4,510$ mm, the Lasertec 3000 DED hybrid also requires the smallest footprint in its class, the company says.

The machine has a 3-kW laser that enables focus diameters of 3 mm and 1.6 mm. If the powder nozzle head is not needed, it can be stored in a separate compartment. This helps it remain free of metal chips.

On the software side, the AM Assistant supports AM. It enables better control of the coating process, such as monitoring the melting temperature and the distance between the melting point and the powder nozzle. An optical sensor also ensures reliable and automatic powder flow. Laser sensors on the machine cladding and windows, as well as a fog extraction system, also ensure a safe working environment.

DMG MORI USA Inc. / 847-593-5400 / us.dmgmori.com

Jig Grinder for Mold and Die Increases Rigidity for High Precision

Hardinge highlights the Hauser 2,000, a newly debuted jig grinder for mold and die that combines highly accurate grinding with hard milling features. It enables a high finish (0.01 Ra), an ideal feature for some of its customers who use it for injection molds.

The six-axis machine is a dual-frame design, increasing the rigidity of the grinder, and therefore ensuring high precision; its electrical connection, heat exchangers and other systems are also made separate from the main cell to reduce vibrations and ensure optimum quality. Moreover, no transverse forces are created – the prerequisite for ultra-high geometric precision machining, according to the company. Its layout is said to aid in thermal stability.

X, Y, C, U, Z and W axes are CNC controlled, as a standard, with Fanuc 30i, and a maximum of 47-mm U-axis. The machine also features hand-scraped guideways in the X- and Y-axis. Atypical to these types of systems is an exchange grinding spindle. Proven technical features include automatic taper grinding, automatic grinding tool changer (ATC) (with 22 magazine positions) and automatic pallet changer (APC). Optimization in stroke speed and stroke frequency is said to lead to reduced grinding cycle time.



Hardinge / 800-843-8801 / hardinge.com

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Form Grinder's Advanced Design is Ideal for Mold Base Prep, Inserts

The PSG-1224CANC from **Okamoto Corp.** is a full-function, two-axis, simultaneous CNC form grinder ideal for surface, slot, step, form and contour grinding. It's well suited for mold base preparation and grinding of formed inserts/profiles on mold inserts, featuring advanced column design and construction, consistent accuracy and ease of use.

The form grinder incorporates heavily ribbed Meehanite construction throughout. Its ultra-rigid integrated T-Base construction and traveling column design features a heavy-duty column assembly with extended vertical slides. Full-contact double-vee ways are said to ensure true longitudinal tracking and precise positioning. A rigid wheelhead assembly delivers long-term accuracy and reliability even under demanding grinding conditions. A three-point, table-mounted dresser with auto dress/dress compensation simplifies flat and form grinding wheel dressing. Table feed, crossfeed and vertical feed are executed through a conveniently located, easy-to-use control panel on the front of the machine. Table feed control boosts productivity by enabling simple setup of up to four different stroke positions, Okamoto says, which is ideal for multiple workpiece grinding.

The grinder has a table working area of 12" W × 24" L with a 924 lb load capacity. The 12/14" D × 1.5" W × 5" B grinding wheel is driven by a 7.5-hp grinding wheel spindle. The distance under the 14" wheel is 12.5". The PSG-1224CANC features a Fanuc Oi-MF+ 10.5" LCD two-axis controller with Teach-Input that is said to simplify operation even to users unfamiliar with CNC. Okamoto says it also has an easy setup semi-automatic cycle and high-productivity shift-plunge rough grinding cycle.

Some of the many standard accessories include grinding wheel with adapter, spindle inverter, three-point table mounted dresser, wheel guard with coolant nozzle, table splash guard and more. A wide selection of optional accessories are available.

Okamoto Corp. / 847-235-3500 / okamotocorp.com

Free-Form, Mold and Die Machining Cycle Times Cut With Multitasking Machine

Mazak North America says its Integrex i-100HS multitasking machine offers a small footprint and simultaneous five-axis capabilities along with maximum versatility, high precision and throughput for complex part applications. The system is also said to ensure the shortest possible machining cycle times, especially in fine-increment programs for free-form, mold/die machining.

The Integrex i-100HS combines the abilities of a high-powered turning center and a full-function machining center to produce small- and medium-sized workpieces in single setups. It employs a main and second spindle headstock with a 203-mm (6") chuck and 61-mm (2.4") diameter bore mounted on a 11-kW (15 hp), 6,000-rpm integrated spindle motor for handling a range of applications, from heavy-duty cutting at low speed to high-speed cutting of nonferrous materials. It also offers an optional 74-tool automatic tool-change magazine with Kennametal's KM4X spindle connection.

A vertically mounted milling spindle provides 24 kW (32 hp), 12,000 rpm and a rotating B-axis range of -30° to +240°. A roller cam drive for the B-axis is said to ensure higher accuracy and rigidity while providing zero backlash. A 36-tool (72-tool optional) magazine enables for fast tool changes and provides ample tooling for continuous part processing.

The machine also provides a Y-axis travel of 210 mm (8.27") and vertical X-axis of 450 mm (17.72"). The machine accommodates parts up to 500 mm (19.690") in diameter with a maximum machining length of 854 mm (36.620")

It also uses the Mazatrol SmoothAi which is said to offer extreme productivity advantages to the most demanding machining operations. The control incorporates a variety of

advanced programming functions said to make it easy to use and ensure high-speed, high-accuracy machining performance.

Mazak North America / 800-231-1456 / mazakusa.com



High-Speed, Five-Axis Mold Machining Achieved via Extended Barrel Series

Successful five-axis milling requires tools to reach into angles and pockets, and most machines cannot perform detail work fast enough or efficiently. The extended barrel 625HSK-L100 from **Air Turbine Spindles**, however, is reported to solve this issue.

Reaching 100 mm into pockets and angles, the 625L100HSK63 mills at 50,000 rpm in high-speed steel (HSS), proving 6 to 10 times faster cycle times in milling, marking and finishing operations. This enables mold builders to make any CNC machine a high-speed machine, Air Turbine notes, while dramatically accelerating mold machining capabilities.

As an example of the extended barrel's features, Istanbul-based Basar Technologies auto-loaded the 625L100 to mill HSS medical parts on a Hermle machine. Milling at constant high speed 24/7 with no duty cycle, Basar received higher surface feet per minute (SFM) and improved finish quality. This was made possible through the spindles' patented O-Ring, which increases air flow volume to match cutting – keeping the tool at rated high speeds of 25,000-90,000 rpm with up to 1.4 hp available to handle tools up to 1/4" capacity. At these high speeds, Basar Technologies was also able to achieve the required temperatures to extend end mill life. Now, Basar's Hermle machines are able to perform lights-out operations at 50,000 and 65,000 rpm with a full automated toolchanger (ATC), producing parts faster with no secondary finishing required.

Air Turbine Tools Inc. / 800-840-4019 / airturbinetools.com

Cylindrical Grinding System Extends Into Mold and Die Machining

United Grinding has developed the Studer S36 to meet the demand for suitable, productive grinding of external grinding of chuck and shaft components. This concept is capable of extending into mold and die and aerospace industries, as well as the production of parts for the hydraulic and automotive industries. The S36 is positioned between the compact S11 for small workpieces and the S22 for medium-sized workpieces. New functionalities for changing requirements are said to supplement proven concepts.

The S36 has a fixed grinding head, with grinding wheel angles of 0°, 15° or 30° available. The distance between centers is 650 mm (25.6") and the maximum workpiece weight is 150 kg (330 lb). A Granitan machine bed and a workhead with high-precision roller bearings are foundational staples in the S36, United Grinding contends.



An important feature is the S36's large grinding wheel, which has a diameter of 610 mm (24") and a maximum width of 125 mm (4.9"). "The S36 can speed up the production of round and non-round die can punches due to the wider grinding wheel this machine can accommodate," Hans

Ueltschi, VP of Cylinder Division at United Grinding, explains. "This results in a lower cost per part when compared to other Studer machines."

In addition, the machine comes with the company's C.O.R.E. operating system, which includes a touch panel and intuitive operation. Data exchange between machines or third-party systems is made possible via an integrated umati interface. This interface also provides access to the United Digital Solutions products directly at the machine and without the installation of additional hardware.

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

Intelligent CNC Surface Grinders Meet Mold and Die Market Demands

Intelligent, dynamic and affordable are three words that are said to describe the driving forces behind **Chevalier Machinery's** newly designed Smart-IV Series of CNC surface grinders.

They're also the benchmarks required by the medical, energy, semiconductor, aerospace, mold and die, and processing industries to meet current and future market demands.

With six machine sizes available, this series is capable of producing complicated shapes along with finer finishes, resulting in highly accurate workpieces, according to the company. Heavy-duty slide rails, a one-piece base casting and hardened wheelhead guideways create a solid, rigid machine structure that minimizes vibration, movement and displacement. A fully enclosed cover design provides more protection to the operator, preventing cutting coolant splashing and oil mist dissipation while avoiding grinding danger.

A next-generation SMART iControl incorporates additional production efficiency, Chevalier notes. An intelligent grinding assistant system sets parameters based on prioritizing the machining process for precision or speed in order to improve application efficiency. The SMART grinding path feature automatically minimizes air-cutting strokes during grinding of irregular shapes such as I, L, Z or triangular. It also automatically removes invalid cutting strokes and improves overall processing efficiency up to 40%. A grind CAM built-in function enables users to import CAD files for wheel and part profiles, and convert file data to processing paths. Intelligent auto wheel dressing, in-machine dynamic balancing, a workable soothing function and TaskLink+ are additional features provided.

The Smart-IV Series also features tools to secure big data with Chevalier's iMachine Communications System (iMCS), which enhances machine efficiency in the factory while enabling remote monitoring and diagnostics to track machine performance and identify potential problems.

Chevalier Machinery / 800-243-8253 / chevalierusa.com



Three-Axis Milling, Jig Grinding Machine Precisely Machines Large Molds

The RXU 2000 is a high-precision, three-axis milling and jig grinding machine for large dimensions from machine tool company **Roeders**. The machine is reported to achieve maximum precision when workpieces and molds with particularly large dimensions have to be machined. Designed for exceptional accuracy combined with high performance in machining hardened materials, the plant has a working area of 2,000 × 1,800 × 800 mm. The work table is designed for loads of up to 5 tons. The Z-axis stroke has been intentionally limited in order to ensure maximum accuracy.

Roeders says the RXU 2000 is suited for 3D milling as well as for jig grinding, vertical grinding or profile grinding. This combination of operations in one setup on the same machine is particularly ideal for many jobs in machine and moldmaking including large mold plates (such as for progressive dies); large, flat injection molds with fine contours (for seals); machine components (like guide rails); and large, high-precision workpieces.

Linear direct drives in all axes as well as a distinctive temperature manage-

ment system for the entire machine ensure optimized accuracy, even during long machining jobs. Both the Z- and Y-axis feature rigid and sturdy Roeders Quadroguide design. The machine bed dampens vibrations. Accuracies of less than 5 μm can be achieved in the entire working area, the company claims, as well as a roundness of 1-2 μm, depending on the size of the bore.

A spindle with 101 Nm (S1), 22,000 rpm and HSK A63 achieves high metal removal rates. Alternatively, spindles with up to 80,000 rpm are available, depending on the application. On request, the machining center can also be equipped with an additional high-precision air bearing spindle.

Roeders of America Inc. USA / 845-680-7020 / roeders.us





Twin-Turret Multitasking Machine Is Suitable for Superimposed Machining

Methods Machine Tools is now distributing Nakamura-Tome's SC-100X2 twin-turret multitasking machine, which utilizes two tools on either side of the upper turret for superimposed machining. Methods spokespeople say this makes it well suited for Swiss-style parts greater than 25 mm in diameter.

Superimposed machining lets shops take on complex contracts and complete them faster than other mainstream machining methods. Operators can also use the upper and lower turret simultaneously, giving the SC-100X2 the flexibility of a true twin-spindle machine. The machine's design also contributes to a faster cycle time while maintaining precision and accuracy in line with other Nakamura-Tome machines.

The SC-100X2 automatically unloads the workpiece once complete, minimizing manual intervention and downtime. When the machine completes a cycle, the parts catcher grips the part and places it on a conveyor, removing it from the machining environment.

Software from Nakamura-Tome enables users to use a **Fanuc Oi-TF Plus** control to program superimposed and multi-turret jobs as easily as single-turret operations. The software package also includes Nakamura's NT-Nurse system, NT-Smart Sign, NT-Navigator, oscillation turning and thermal compensation artificial intelligence.

Methods Machine Tools / 978.443.5388 / methodsmachine.com

Fanuc America / 888-326-8287 / fanucamerica.com

Affordable, Versatile, In-House Regrinding Operations Aimed for Mold Shops

Walter's latest addition to its comprehensive machine lineup is the compact Helitronic G 200 tool grinding machine, a key solution for affordable, versatile in-house regrinding operations in a mold shop. In a floor space of less than 24.8 square feet, the Helitronic G 200 offers grinding and re-sharpening of rotationally symmetrical cutting tools ranging from 1 to 125 mm (0.039" to 4.92") in diameter with a grinding wheel up to 150mm (5.91"), ideal for moldmakers, who typically utilize a high volume and mix of cutting tools. The Helitronic G 200 can reportedly accommodate a maximum tool length of 235 mm (9.25") and a tool weight of up to 12 kg (26.45 lbs).

The ergonomic design integrates a swiveling multifunction touch panel with a 21.5" monitor, facilitating easy operation and accessibility to the working area. A low-vibration solid mineral cast bed and C-frame construction offers high damping capabilities and thermal stability, which Walter says results in maximum grinding precision. The linear X, Y and Z axes are built to high-quality standards, and the rotating A and C axes are equipped with torque motors to provide a long lifetime with minimum service effort.

The Helitronic G 200 uses the Helitronic Tool Studio grinding software from Walter, simplifying programming, simulation and makes operating the machine a breeze, all important factors in ensuring more productivity for a mold shop.

Walter Maschinenbau GmbH / 49 7071 93930 /

walter-machines.com

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



Five-Axis Volumetric Compensation Updates Eases Adoption Pain Points when Mold Machining

Grob Systems developed its volumetric compensation cycle, Grob swivel axis calibration (GSC), for the company's five-axis universal machines more than seven years ago. Where the industry standard is compensating the machines using four data points, Grob's GSC feature enables it to compensate with more than 50 data points. This enabled the company to more accurately map out any errors that exist.

Nevertheless, there were still challenges, one being the difficulty customers like mold builders faced to adopt GSC into their process, which meant removing workpieces from the machine to run the calibration. This also meant that the compensation couldn't take into account the workpiece and fixture weight, as well as any thermal drift seen by the machine. To overcome this, Grob updated the compensation points by measuring a tooling ball permanently mounted in the machine. With this newest development, GSC Advanced, the cycle alone takes about two minutes to run and can be ran as often as desired using a simple macro call. For example, it can be run before final machining of complex cores or cavities in the mold, when cutting part geometry that requires critical blends along with parting lines cut to net zero to eliminate spotting.

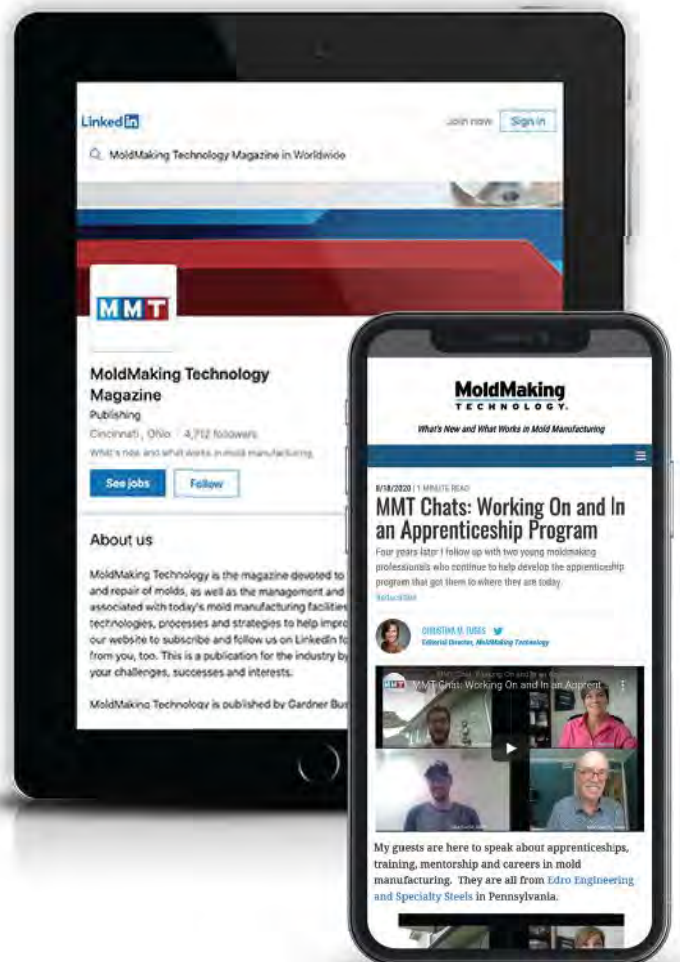


Grob Systems Inc. / 419-358-9015 / grobgroup.com

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How to Eliminate Streaks and Weld Problems with Laser Technology

By Richard Polenick

The increased use of plastic parts has increased the application of textured surfaces to their finish. Textures can be applied for aesthetic and functional purposes.

Pattern designs have progressed from simple, leather-like or random deep surfaces to very shallow stipple or geometric shapes that display intricate, delicate appearances.

Traditionally, shops use acid etching to apply mold textures into steel surfaces, which requires a lot of upfront preparation — disassembling the mold, cleaning the surface and manually protecting areas not to be textured.

First, texture areas are blasted for pattern adhesion, and then a transfer film is manually placed and carefully mated to assure the texture does not show any mismatches. Acid is then applied to chemically etch away the metal and create the desired surface pattern. After exposure, the mold is blasted again to remove any residues and for gloss adjustment. This process can take days for simple patterns or several weeks for more complex and custom patterns. Laser texturing, however, is an alternative option that applies the controlled use of digital lasers to ablate or remove the metal in a designated pattern.

Digital laser technology does not require any preparation. It also offers freedom of design, safety, higher quality, unlimited design options, blended patterns with seamless transitions and features not possible with acid etching. In addition, five-axis CNC lasers apply patterns directly to the surface with no environmental issues for chemical disposal.

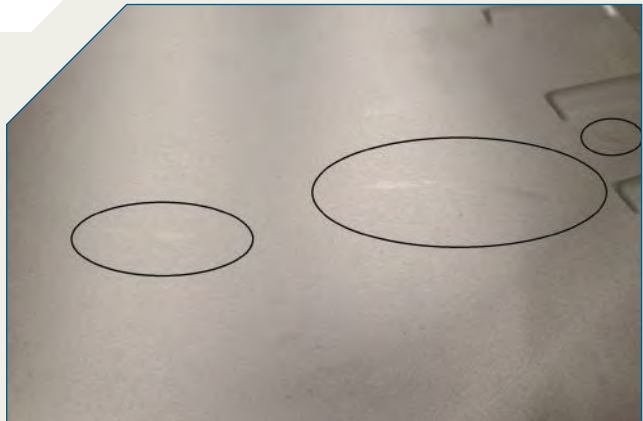
Laser texturing is an alternative option that applies the controlled use of digital lasers to ablate or remove the metal in a designated pattern.

Eliminate Streaks

The occasional appearance of streaks in the textured steel surface can arise from

acid etching. These areas appear as lighter or darker lines in the desired pattern and transfer to the surface of the molded plastic parts.

Steel suppliers have traced texture streaks to elemental segregation within the steel blocks used for molds. Segregation occurs when certain steel elements separate during initial metal solidification and form areas that react differently when applying a texture with acid etching. Segregation is present to some degree in all steels and is a natural phenomenon that is difficult to measure or predict inside a raw mold block.



All images courtesy of Custom Etch Inc.

The segregation marks circled are outside of the cavity impression.

Tackle Weld Repair

A textured mold can sometimes require welding for repair or design revisions. The weld deposit is likely slightly different in chemistry or hardness from the original base metal. Using acid to retexture the weld area may not match the original texture.



Laser texture shows no segregation.

Lasers are unaffected by weld or hardness issues and will produce a result as good as the original.

High-volume textured molds will show wear that requires a reapplication of the surface pattern. Lasers can fully replicate the pattern, whereas a second acid-etched texture may vary slightly.

This is critical when multiple new molds are required to display identically matched textures, such as family molds for interior automotive parts. Automotive OEMs demand perfect texture matches despite possible differences in the mold materials used. [MMT](#)

FOR MORE INFORMATION

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- Leveraging Partnerships to Problem-Solve
- The Mold Builder's Guide to Additive Manufacturing
- Save Time, Money: Use a Mold Design Checklist
- Design Your Tools for Moldability...and Maintenance
- Twelve Steps to Make the Right Investment Decisions



February:

- P20 That Potentially Doesn't Require Stress Relieving After Rough Cutting
- Questions and Considerations Before Sending Your Mold Out for Service
- Cutting Mold Machining Costs in Half
- The Role of Model-Based Definition in Precise Mold Design
- Optimizing a Mold's Thermal Performance



March:

- What is Additive Manufacturing's Place Alongside Traditional Moldmaking?
- Staying Sharp to Remain Competitive
- Still Learning After All These Years
- Lessons From a Nine-Year Succession Plan
- Free Money! A Guide to Grant Funding



April:

- Streamline Mold Measurement
- Helping High-Precision, Multiaxis CNC Machines Maintain Tight-Tolerance Control
- Time to Take Welding in a Different Direction
- A Different Approach to Pricing
- How to Succeed Your Moldmaking Business and Build Community Wealth



May:

- The Path to a Highly Polished Mold
- Compact Mold Components are Critical to Keep Connector Program Cost-Competitive in North America
- Workhorse Shrink-Fit Machines Yield Repeatability
- Variable Density-Coated Tool Steel for High-Wear Molds
- Transforming Moldmaking into a Digital Industrial Manufacturer



June:

- Customized CAM Strategies Improve Five-Axis Blow Mold Machining
- Speed, Productivity Gains and High Uptime Ease Decision for Second Five-Axis Machine



- "I Need Help!" Theory of Constraints Marketing
- R&D Tax Credit Refresher
- PTXPO Post-Show Highlights: "Molds Make a Difference" at the Plastics Technology Expo!

July:

- 2022 Technology Review and Sourcing Guide
- A review of more than 70 of this year's moldmaking product developments, as well as listings of top suppliers in 11 different categories.



August:

- Heart of the Machine: Investing in Higher Accuracy, Repeatability, Productivity
- Start Simple with Automation
- Evaluating Metal Powders for Conformally Cooled Mold Inserts
- Three Advances in Vision Measuring Technology for Moldmaking
- It Starts with the Part: A Plastic Part Checklist Ensures Good Mold Design



September

- Ten Things You Need to Know About Circle Segment Milling
- Quickly Troubleshoot New Molding Defect with Moldfilling Software
- Using Automation to Minimize Mistakes and Speed Mold Build Process
- How to Overcome Five Common Hot Runner Cable Connection Problems
- Four Questions to Ask Before Your Next Technology Purchase



October

- Laser Texturing Technology = Untapped Moldmaking Potential
- What to Look for in Aluminum Mold Alloys
- Answering the Call for Mold Engineering Help
- How to Prepare for the Rise of AM in Moldmaking
- Control Helps Push the Limits of Five-Axis Micro Mold Machining Accuracy



November

- Solving Hot Runner Challenges when Molding with Bioresins
- What You Need to Know About Leader Pins and Bushings
- Reducing Cutter Breakage When Micro Machining Hard Mold Material
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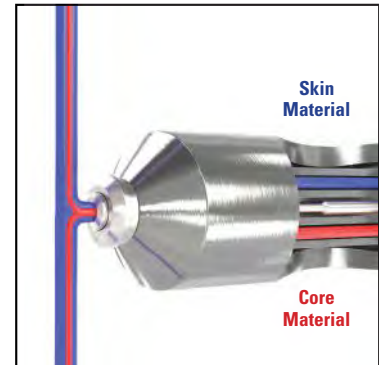
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