MMT ENGINEER / BUILD / MAINTAIN

moldmakingtechnology.com

# MoldMaking TECHNOLOGY®

MoldMaking Technology 25 YEARS



OCTOBER 2023 / VOL. 26 / NO. 10

A property of Gardner Business Media

# TIME FOR A CHANGE!

## EFFICIENT YEAR-END CHANGEOVERS

Molders' Toolroom Managers are never short of hot projects, and year-end Date Plug changeovers shouldn't be one of them. Progressive understands this and works to streamline the process:

- Online template allows for quick identification of original supplier.
- Our team can review past orders to determine this year's needs.
- Plugs are in stock, ready to ship, and come etched for trouble-free reordering next year.

Whether you need to reorder Progressive plugs from last year or have molds with plugs from other sources, we've got you covered. Call 1-800-269-6653 to partner with the date marking leader.

**PROGRESSIVE COMPONENTS**

Plastics News BEST PLACES TO WORK 2023

**NEW CATALOG: PROCOMPS.COM/V15**
**PLUG TEMPLATE: PROCOMPS.COM/DATE**

# TAKUMI®


TakumiUSA.com

## When precision matters.

# H SERIES

### UNRIVALED PERFORMANCE + ACCURACY

The Takumi H series of double column CNC machines are built for speed, accuracy, and high quality 3D surface finishing needed for die/mold machining. With an extremely rigid and thermally stable design, these 3-axis models feature high-speed direct drive spindles with up to 15,000 rpm. Learn more at TakumiUSA.com.

A DIVISION OF
HURCO COMPANIES, INC.

**TAKUMI USA** • (317) 614-1513 • (844) 302-3792
7220 WINTON DRIVE • INDIANAPOLIS, IN 46268

*Machines shown with options. Information may change without notice.*

**MACHINE INFORMATION**
SCAN THE QR CODE


MMT
MoldMaking TECHNOLOGY®

**V.P. Plastics Media**
Ryan Delahanty . . . . . rdelahanty@gardnerweb.com

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

**Managing Editor**
Grace Nehls . . . . . gnehls@gardnerweb.com

**Digital Assistant Editor**
Cara Decknadel . . . . . cdecknadel@gardnerweb.com

**Editorial Assistant**
Katie Leesemann . . . . . kleesemann@gardnerweb.com

**Copy Editor**
Jann Bond . . . . . jbond@gardnerweb.com

**Contributing Writer**
Peggy Malnati . . . . . pmalnati@garpub.com

**Art Director**
Susan Kraus . . . . . skraus@gardnerweb.com

**Advertising Production Manager**
Becky Taggert . . . . . btaggert@gardnerweb.com

GARDNER Business Media, Inc.

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

Richard G. Kline | Chairman
Richard G. Kline, Jr. | President
Melissa Kline Skavlem | Chief Marketing Officer
Ernest Brubaker | Chief Financial Officer
Tom Beard | Executive V.P. Custom Content
Bill Caldwell | Advertising and Production Director
Kate Hand | Executive V.P. Content
Allison Kline Miller | Chief Events Officer
Dave Necessary | Executive V.P. New Product Development
Jeff Norgord | Executive V.P. Marketing & Creative
Jan Schafer | Director of Market Research

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

**ALSO PUBLISHER OF**

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

*MoldMaking Technology* (ISSN 1098-3198) is published monthly and copyright © 2023 by Gardner Business Media Inc. 6915 Valley Ave., Cincinnati, OH 45244-3029. Telephone: (513) 527-8800. Printed in U.S.A. Periodicals postage paid at Cincinnati, OH and additional mailing offices. All rights reserved.

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

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

The information presented in this edition of *MoldMaking Technology* is believed to be accurate. In applying recommendations, however, you should exercise care and normal precautions to prevent personal injury and damage to facilities or products. In no case can the authors or the publisher accept responsibility for personal injury or damages which may occur in working with methods and/or materials presented herein, nor can the publisher assume responsibility for the validity of claims or performance of items appearing in editorial presentations or advertisements in this publication. Contact information is provided to enable interested parties to conduct further inquiry into specific products or services.

PRINTED WITH SOY INK

# Ø1.26" Cost Effective Indexable Milling Heads

**MULTI-MASTER**
INDEXABLE HEADS

**New 1.26" MULTI-MASTER Head** for Roughing, Semi-Finishing & Finishing with Ramp Down Capabilities for **Cost Savings and High Productivity.**

**40,000 Indexable Solid Carbide Endmill Options**


NEOLOGIQ
MACHINING INTELLIGENTLY

Member IMC Group
ISCAR
www.iscar.com

**October 2023** Volume 26 / Number 10




## Features



**ON THE COVER**
Cover photo courtesy of Tebis America Inc. This month's cover photo demonstrates the use of circle-segment milling via the barrel cutter pictured in collaboration with advanced CAM technology to help mold manufacturers increase their efficiency, save time during the machining process and increase surface finish quality. Leveraging Tebis 4.1 – a complete parametric-associative CAD/CAM system and its digital twins – enables manufacturers to automate the design and build process. Read the related feature on **page 16**.

Image courtesies (left to right): Mayer Tool and Engineering Inc., Alliance Specialties and Laser Sales and *MoldMaking Technology*.

VIDEO ACCESS

## Departments




The prestigious industry award for North American mold manufacturers is BACK!

*MoldMaking Technology*'s Leadtime Leader Award returns for 2024. Does your shop have what it takes to be a Leader?

LEARN MORE AND NOMINATE YOUR BUSINESS HERE.

MMT LEADTIME LEADER 2024 AWARD


# Your Melt Logistics® partner
## for successful mold making

For parts with shot sizes from a fraction of a gram to multiple kilograms, INCOE provides Hot Runner Technology solutions throughout the entire process — from engineering mold review and filling simulation to on-site technical support.

Our global commitment is to be your Melt Logistics® partner — producing value in your process — and ultimately delivering satisfaction where it counts.

INCOE®

HOT RUNNER SYSTEMS

**www.incoe.com**

**North America | Europe | Asia | South America**

© 2023 INCOE® 05/23

# Did You Know?

Back in 2021, *MMT* sent a call for help to the mold manufacturing industry to update the guidelines and practices to standardize and streamline the mold procurement process. Namely, the Plastics Industry Association (PLASTICS) "Customs and Practices of the Mold Making Industry" document.

Revisions were prepared by the Equipment Manufacturers & Moldmakers Council, led by Progressive Components' Glenn Starkey, MSI Mold Builders' Toby Bral and Accede Mold & Tool's Camille Sackett, along with industry feedback.

Did you know that the updated guide was released earlier this year? Here are three important reasons why you should care according to the revisions' leadership team:

1. **Why is this document important?** Nothing can sink a relationship between a mold builder and its customer more than a miscommunication that causes delays and revisions. The Customs and Practices Guide spells out commonly held practices for quoting, holding tolerances and payment structure, facilitating clear communication between mold builders and buyers. Especially with a new mold buyer, this document really sets the tone for communication and the typical expectations of a new mold build.
2. **Why did the group decide it was time for an update?** The guide was originally issued in the 1970s and became invaluable in establishing terms such as a "Class 101" mold. But, it hadn't been updated for more than 25 years, so it included references to obsolete technologies, methods, expectations and terms.
3. **What is the call to action?** Check it out! Mold builders and buyers are encouraged to read and reference the document in RFQs and mold estimates. The team believes this document can be a useful educational tool, especially for those new to the mold buying and development process. Please take a look through it and use it as part of your training for new mold buyers or moldmakers, new project managers, salespeople or management. Everyone wins when there aren't miscommunications and misunderstandings, so the team asks the industry at large to take the work that has been done and help further spread best practices for our industry.

The guide is complimentary for PLASTICS members and can be purchased by non-members. It can be accessed online at **short.moldmakingtechnology.com/PLASTICSguide**. MMT


Christina M. Fuges
Editorial Director

Follow MMT on: Follow @MMT_ChristinaF

## MMT TIPS

5 TRICKS OF THE TRADE

### Great Tips from This Issue

**1. Go Digital**
To automate programming and design, you must create digital versions of all your entities – tools, machines and clamping devices. Every piece of equipment must have a digital twin.
**PG. 16**

**2. Cool Clean**
Modern, water-based cleaning equipment uses a closed-loop system and a unique pulsating action with heated water to attack a plugged channel from both directions. This approach overcomes an airlock and dislodges the blocking material.
**PG. 20**

**3. Ask First**
For metal additive, all of the work happens in the front end before you ever start making parts. Engineers should establish the entire part production process from part design to finishing, request prints for the part and go through all of the notes to fully understand all of the requirements.
**PG. 26**

**4. Saving Design Time**
By CT scanning existing parts up front, you can build reality into a mold versus uncovering it the hard way during mold trials. CT scanning the parts eliminates the time and cost of learning them all over again.
**PG. 30**

**5. You *Can* Do More With AL**
Aluminum tooling is a low-cost alternative to steel tooling for lower production quantities up to one million shots. Case hardening can produce even higher quantities beyond one million.
**PG. 48**

MMT

ENGINEER / BUILD / MAINTAIN

# WHY BECOME A LEADTIME LEADER?

MoldMaking TECHNOLOGY


The Leadtime Leader Awards, presented by *MoldMaking Technology*, honor those outstanding North American mold manufacturers who best demonstrate overall innovation, efficiency, quality and commitment within their moldmaking operations while raising the bar in terms of mold engineering, building, repair and management.

## DOES YOUR SHOP HAVE WHAT IT TAKES?

Winning the Leadtime Leader Award can be a life-changing experience for you and your shop. You'll gain industry recognition, build brand awareness, attract new customers, boost morale, distinguish your shop as an industry leader and much more.

## ADDITIONAL WINNER BENEFITS:

- Cover of June's MoldMaking Technology
- Feature story in the June issue and online
- Video feature on moldmakingtechnology.com
- Exposure in Plastics Technology magazine
- Complimentary 10 x 10 booth at Amerimold
- Two full registration passes for Amerimold
- Awards presentation at Amerimold
- Guest spot on MMT Chats

## How becoming a Leadtime Leader impacted our past winners:

*"Becoming a* MoldMaking Technology *Leadtime Leader really shows the industry that change is good. Teamwork is essential, and new technology wins the race. Being recognized as the industry leader by* MoldMaking Technology *has resulted in a noticeable boost in employee morale and has presented opportunities that may not have been available to us prior to the win."*

**Brian Bendig, President, Cavalier Tool & Manufacturing**

---

*"Winning the Leadtime Leader Honorable Mention Award was an honor for the entire Dynamic team. We have worked hard and will continue to do so to differentiate ourselves in this highly competitive market with technology, customer service and our dedicated team of employees."*

**David Miller, President, Dynamic Tool & Design**

## SCAN HERE TO NOMINATE YOUR SHOP TODAY

PRESENTED BY:

MoldMaking TECHNOLOGY

SPONSORED BY:

PT Plastics Technology

amerimold 2024
Where Mold Manufacturing Connects

For complete information, eligibility requirements and nomination forms, please visit **short.moldmakingtechnology.com/leadtimeaward** or contact Christina Fuges at **cfuges@gardnerweb.com** or **(800) 579-8809**

# Meet New Member, James Jergens

By Christina Fuges

James is general manager for Triangle Tool and Penn-Erie Tool of The Plastek Group based in Erie, Pennsylvania, managing the tooling team who builds complex injection molds for the packaging industry.

His business objective is to work with excellence in character and performance to meet or exceed customer expectations and to generate an excellent return for the company. His personal objective is to spend as much time with family and friends as possible and to change the world through these relationships.

Image courtesy of The Plastek Group.

**James Jergens, general manager of Triangle Tool and Penn-Erie Tool, The Plastek Group, is one of *MMT*'s new EAB members.**

James brings a wealth of experience to the *MoldMaking Technology* editorial advisory board (EAB), including injection mold design and manufacture, management, international mold sourcing, supplier development, product design for plastics, steel-to-plastic conversions, design of deep draw dies for steel stamping, stamping dies, CAD/CAM and tool financing. He is also trained in CMM, quality system management and lean manufacturing.

He has experience with MoldFlow, SigmaSoft, program manager, tool engineer, SolidWorks, Unigraphics, Logopress and Cosmos FEA.

On top of that, James has two patents to his name: Tip Resistant Valve Plugs – US 9,222,588 B2 and Cross Car Structural Beam – US 5,934,744.

While serving on *MMT*'s EAB, James will share insights on trends, industry news, hot topics and story leads with the editorial team for business issues, software, culture, shop floor/process/workflow, equipment, mold materials, mold components, disruptive technologies, training and workforce development and global strategies.

He looks forward to helping the moldmaking industry further by mentoring the next generation on how to build molds using science and good leadership methods that drive profit and sustainability. James also hopes to continue networking with fellow moldmaking professionals.

James is passionate about improving efficiency in the toolroom and helping molders and OEMs better understand their next mold purchase. He has presented both topics at the MoldMaking Conference in 2022 and is featured in related articles in *MMT* and via *MMT* Chats.

James has five children, with one working for Husky Technologies in Vermont. When he is not working, James likes to mountain bike, cruise in his Jeep and snowshoe. MMT

### FOR MORE INFORMATION

Triangle Tool and Penn-Erie Tool, The Plastek Group
614-406-0934 / James.Jergens@plastekgroup.com / plastekgroup.com
James Jergens, General Manager

## 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.

**Corey Bratton**
*Operations Manager*
Quality Mold Inc.
Erie, Pennsylvania
814-866-2255 Ext. 104
CBratton@qualitymolderie.com
qualitymolderie.com

**Mike Close**
*Senior Tooling Engineer*
SMC Ltd.
Devens, Massachusetts
715-247-3500
Mike.Close@smcltd.com
smcltd.com

**Justin Jagels**
*Owner and President*
J Squared Design Services LLC
Arkansas City, Kansas
620-724-3392
jjagels@jsquaredds.com
jsquaredds.com

**James Jergens**
*General Manager*
Triangle Tool and Penn-Erie Divisions, The Plastek Group
Erie, Pennsylvania
614-406-0934
James.Jergens@plastekgroup.com
plastekgroup.com

**Jenny Kotulak**
*Project Manager*
Integrity Tool & Mold
Tecumseh, Ontario, Canada
519-737-2650
jkotulak@teamintegrity.com
teamintegrity.com

**Adam Nartker**
*Business Development Manager – Plastic Injection Molds*
Diversified Technologies International (DTI)
Livonia, Michigan
248-686-1767
anartker@dtiglobal.net
dtiglobal.net

**Camille Sackett**
*Vice President of Sales and Project Management*
Accede Mold & Tool Co.
Rochester, New York
585-254-6490
CamilleSackett@accedemold.com
accedemold.com

**Isaac Trevino**
*Business Development Manager*
Best Tool & Engineering
Clinton Township, Michigan
586-792-4119
isaac.trevino@bteplastics.com
bteplastics.com

**Bob VanCoillie**
*Senior Manager Global Mold Management CoE*
Johnson & Johnson Consumer
Fort Washington, Pennsylvania
215-273-4875
BVancoil@its.jnj.com
jnj.com/healthcare-products/consumer

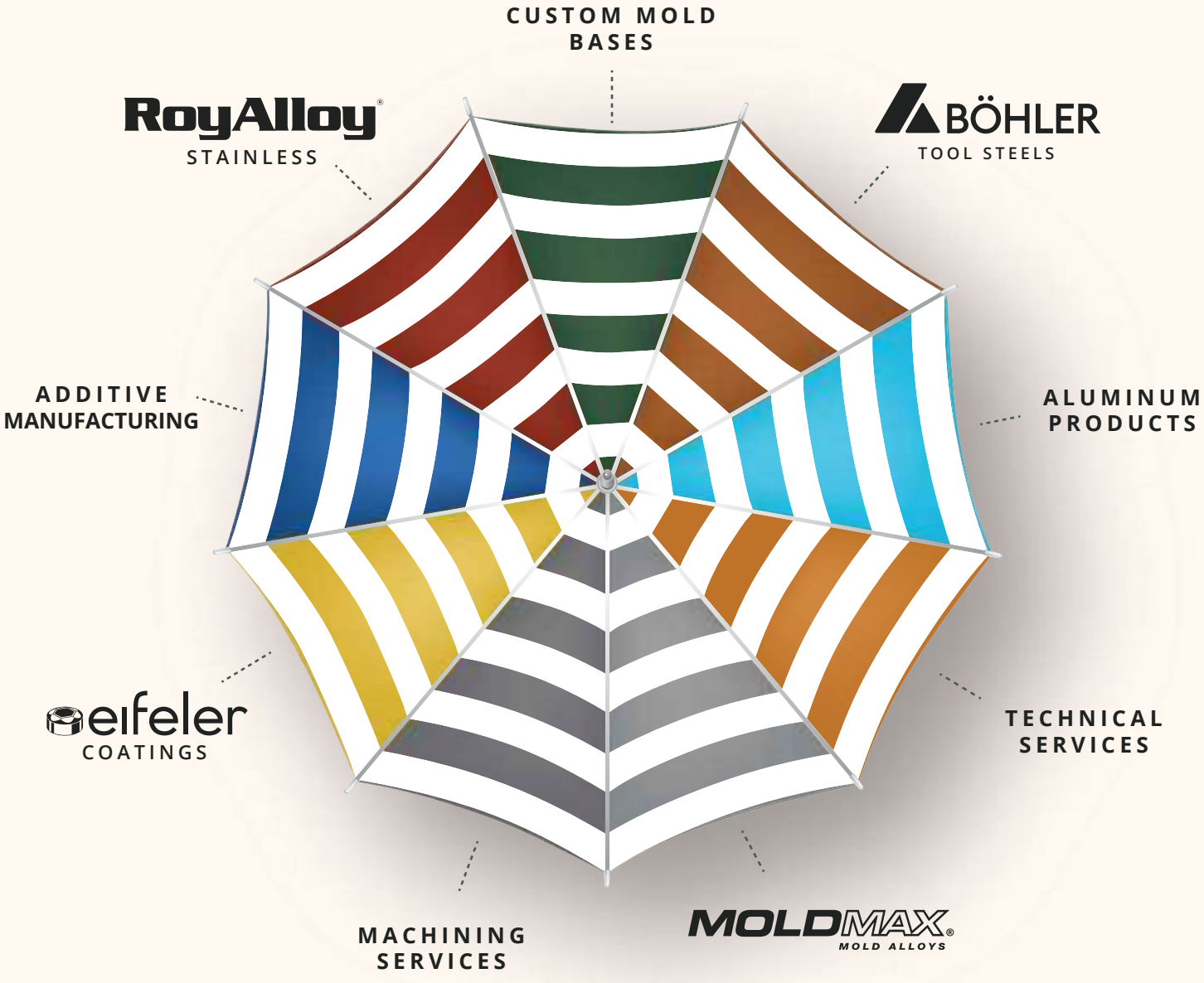
**Nick Vitelli**
*Engineering Lecturer*
Penn State Erie,
The Behrend College
Erie, Pennsylvania
814-898-6000
npv102@psu.edu
psu.edu

**Marion Wells**
*Founder and Managing Partner*
Human Asset Management
Flossmoor, Illinois
248-345-9378
mwells@humanassetmngt.com
humanassetmngt.com

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

# WE HAVE YOU COVERED

EDRO's umbrella of innovative solutions covers all your needs for high performance plastics tooling




MATERIALS | MOLD BASES | PVD COATINGS | ADDITIVE

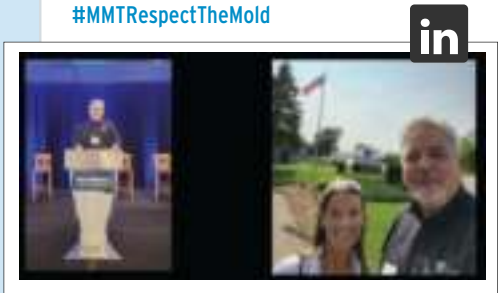
EDRO

(888) 368-3376 | INFO@EDRO.COM | EDRO.COM

## Follow Us

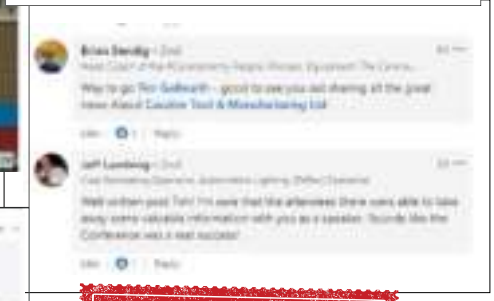
- MoldMaking Technology
- @moldmakingtechnology
- @MMTMag
- MoldMaking Technology
- moldmakingtechnology

#MMTRespectTheMold

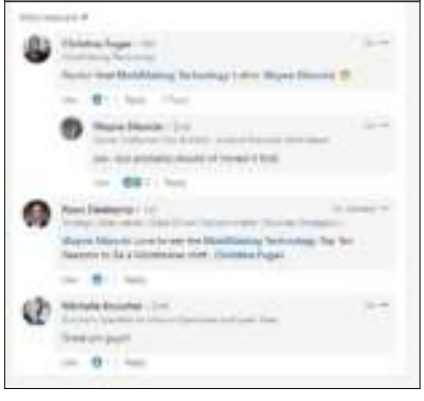


#MMTAdvancingTheMold

#molddesign #AI



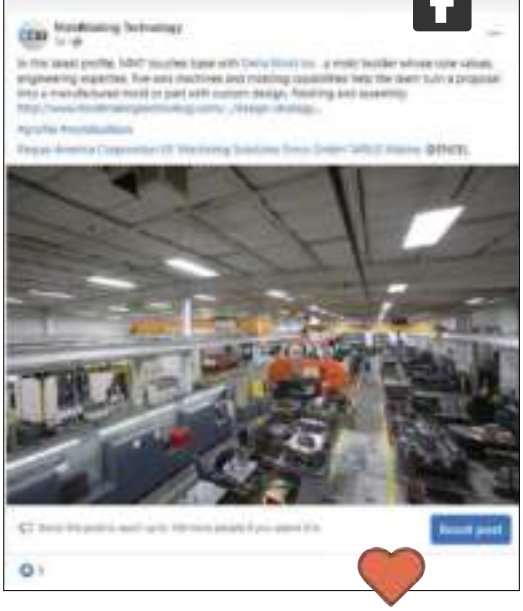
#InCaseYouMissedIt



#MMTAdvancingTheMold #design


#casestudy #milling


#profile #fiveaxis



# SOCIAL MEDIA

## Be a part of our community, and follow us on social media!

Share, like and comment to strengthen our moldmaking community and to stay up to date on the latest happenings, technology and trends from throughout the industry.

## A Conversation with ...

# Mayer Tool & Engineering Inc.

By Christina Fuges


All images courtesy of Mayer Tool & Engineering Inc.

Mayer Tool & Engineering (MTE) specializes in designing and building quality injection molds for the plastics industry. From concept to completion, they handle everything from initial mold design and engineering to the final product.

**What is Mayer Tool & Engineering, and what is your chief competitive advantage?**

**Patrick Roussey II, president, Mayer Tool & Engineering:** Mayer Tool & Engineering (MTE) is a family-owned business founded in 1982 that sees customer success as the top priority. Our chief competitive advantage is the team's ability to adapt, problem solve, brainstorm and work together to support our customers' needs.

We are located in a 14,000-square-foot facility in Sturgis, Michigan. We specialize in custom injection mold building for the plastics industry, including product development from initial concept to mold sampling. For 40 years of business, MTE has provided exceptional tooling across multiple industries with the same end goal: customer success. Our company's achievements can be credited to the collaboration of our 30 employees working in office administration, project management and sales, engineering, molding, shipping, CNC/EDM, tooling and mold building.

One of MTE's biggest strengths is our diverse customer base, which continues to grow. Industries served include automotive, appliance, lawn and garden, hunting and fishing, RV, marine, packaging and consumer goods. Collaborating with these various markets enables us to adapt and proactively seek new manufacturing techniques that exceed our customers' expectations. We have a supplier/partner in Shenzhen, China, to serve the offshore tooling needs of the industry.

> We are committed to evolving as a full-service mold builder by constantly improving our low-volume production and sampling capabilities, which has led to an enhanced and streamlined experience for customers who rely on our cost-effective tooling and molding to launch new products.

In addition to mold building, we provide expert processing with our five in-house molding machines ranging from 77 to 500 tons. On-site molding capability provides customers with all of the necessary information from process reports, short shot studies, videos from the trial and sample parts. Nearly all molds are sampled at MTE before shipping.

MTE relies on collaboration among its 30 employees working in office administration, project management and sales, engineering, molding, shipping, CNC/EDM, tooling and mold building to get the job done.

**What is the ideal customer relationship?**

**Roussey:** We value great working relationships with all of our customers. Whether with an OEM supplier or a molding facility, a high level of communication is key to best supporting our customers from start to finish of every project.

### What is the most significant change in your general approach to business?

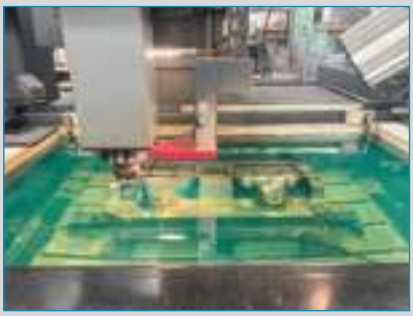
**Roussey:** The biggest push of late is finding and bringing in new talent ready to be coached, so Mayer Tool has invested in the training and apprenticeship program. It's about finding talent and matching the skillset with the right mentors to facilitate that training through time spent on the bench and during machine operation.

Another thing to note is the push for less traditional manufacturing techniques. This may not have been the case in years past, but lately, MTE has been extremely open to new methods that may be more suitable than standard processes. For example, MTE has been exploring additive manufacturing (AM), conformal cooling and 3D printing improvements.

### What is the most significant change in your use of technology?

**Roussey:** Technology continues to evolve in the industry — from AM to improved automation practices. For MTE, an automated end-of-arm tooling (EOAT) robot has been the latest advancement added to the shop. The robot is linked to a new 500-ton Tederic injection mold machine that aids large part sampling. This upgrade in our molding department allows us to test and prove out any EOAT we build for our end customer's high-volume production needs.

A newer update in office technology for us as a small business has been implementing a VPN login system for remote work. While we currently have two full-time, off-site project managers that use this daily, this option also allows additional MTE employees to be available to our customers while traveling or outside the office.



**Equipment List**

- Fourteen milling machines with various automation capabilities
- One horizontal boring mill
- Six EDMs with varied automation
- Three drilling machines
- Eleven grinding machines
- One manual CMM
- One electronic touch probe
- One laser welding machine
- One TIG welder
- Five molding machines

MTE provides exceptional tooling across multiple industries with the customer's success always in mind.

**Mayer Tool & Engineering Inc.**
**1404 North Centerville Road**
**Sturgis, MI 49091**
**269-651-1428 / 269-651-4144**
**patroussey@mayertool.net / mayertool.com**

- Designs, builds and runs quality injection molds for the plastics industry.
- Each project is supported from start to finish in-house, from product design through mold sampling.
- Certified for its quality management system and registered by NSF-ISR to ISO 9001.
- Provides an offshore moldmaking option with full domestic support
- Equipped with extensive CAD/CAM capabilities, including 2D and 3D design, solid modeling, tool pathing and toolpath verification.
- Works from piece part drawings, 3D wireframes, surfaced or solid files.
- State-of-the-art workstations use Cimatron V16 and Mastercam solids to develop plastic components.

MTE offers expert processing with five in-house molding machines ranging from 77 to 500 tons.

MTE is committed to growing as a full-service mold builder, continuing to manufacture cost-effective tooling and molding to launch new products.

## Reeling Them in Early: Exposing HS Freshmen to the Trades

Instructor Jeff Wanamaker is a graduate of Sturgis High School's Trojan Manufacturing. He returned to his alma mater not only to teach but to improve and grow the program. Through Trojan Manufacturing, students as young as 9th and 10th grade can see how products are made as they work through four programs: building trades, design, welding and machine tools. Then, in their junior and senior year, they can choose a program to focus on. When students complete the program, they'll have 700 hours, which earns them credentials and a machining certificate.

The program also includes an opportunity for students to participate in the Michigan Industrial Technology Education Society (MITES) competition. The Sturgis Manufacturing class had a solid showing at the latest MITES meeting. MITES is focused on leadership and education. Its goal is to empower students and teachers to grow, lead, collaborate and advocate for education in the industrial and technological education fields and workforce initiatives. Each year, they have a regional and state competition for students to showcase their work. During my visit to the school earlier this year, I was able to see the work up close and meet the students in person. Impressive!

**How do you expect your business to evolve regarding technology and business strategies in 3-5 years?**

**Roussey:** Our key business strategy is to use the correct tools when our customers need us. We strive to do whatever is required to continue growing our MTE capabilities to contribute to our customers' success.

For example, our recent focus is on software for CNC programming, job tracking and employee training. These areas provide the foundation for each mold build and the company. We will continue to invest in equipment and technology to assist our employees because numerous innovative and time-saving devices are on the market.

We are also committed to evolving as a full-service mold builder by constantly improving our low-volume production and sampling capabilities. This has led to an enhanced and streamlined experience for customers who rely on our cost-effective tooling and molding to launch new products. Typically,

MTE's recent focus has been on software for CNC programming, job tracking and employee training.

these customers come to us from niche markets and very quickly see the benefits of our full-service business model.

In addition to expanding capabilities, we are looking at new technologies that enable us to supply components quicker and as cost-effective as possible. Technology is changing quickly in this trade and staying at the forefront of technology is very important to us.

**Does your company have a difficult time finding and attracting new employees? Please tell us how you are addressing the skills gap.**

**Roussey:** There is no denying a shortage of qualified employees in the industry, particularly in the last 10 years. MTE is fortunate enough to presently employ very skilled, well-trained moldmakers. However, there will be a gap between this talent and the next generation of moldmakers. We are bridging that gap by providing apprenticeships and working closely with local high school (see "Reeling Them in Early: Exposing HS Freshmen to the Trades" sidebar) and university programs.

We see positive results by connecting the tried-and-true techniques of Mayer's experienced team with those who come on board with an innovative perspective in manufacturing skills. The biggest point we try to make with those interested in moldmaking is that it is not just a job, but a career.

Besides investing in state-of-the-art equipment to assist with productivity, we believe fostering a healthy, family focused, positive work environment helps pull in and retain the necessary labor force.

**Describe the most interesting/notable mold project your company was awarded.**

**Roussey:** This question is easy. The most meaningful project we've participated in was PPE tooling during the pandemic. The entire MTE team and our customers came together to build tooling to help protect the medical professionals, first responders and pharmacy staff fighting the virus. I hope and pray we never have to build tooling for something like this again, but it was great to see so many people working together for one cause.

During these particular tool builds, the focus was on speed and getting these components to the heroes on the front lines as quickly as possible. With everything they went through, it was great that the manufacturing community could help support them in this way. This is what being an American is all about. It's coming together in a time of need and supporting each other through good times and bad. I am proud that MTE could be part of the PPE supply chain at that crucial time in our history. MMT


By Michael Thiessen

All images courtesy of Tebis America.

# How to Automate Process and Design

## Moldmakers can improve their operations and stop wasting time by taking these six steps for process and design automation.

It is no secret that being a mold builder today isn't like it used to be. Challenges, including the growing cost of doing business, increased low-cost country competition and the seemingly never-ending talent gap, require businesses to focus on driving efficiency throughout their organization to remain competitive.

As a result, many mold shops are turning to automation to streamline manufacturing operations. But, as with many things, "automation" is a broad topic, and there are multiple forms of automation to consider. All too often, when automation is used in the manufacturing environment, people automatically think of robots, cobots or vision systems. And while these are viable solutions for some manufacturers, for moldmakers they can make significant operational improvements and reduce wasted time with process and design automation.

The automation journey is a marathon, not a sprint, requiring planning (i.e., training) and strategy. Let's start with the foundation, your mindset. If your mindset is to see every mold as unique, you probably view automating mold design as undesirable or impossible. This isn't true — it's like thinking any shoe will be adequate for your marathon.

Many of your molds include identical parts, which makes it possible to automate the general design by developing a template with your CAD/CAM software. Any variations in size, color, tolerance or surface area can be modified utilizing parametric features and, with the right software, can be programmed into the design.

This level of automation is achievable regardless of your shop's size or type of tool produced. However, it requires time and focus. Automation is not a quick fix (i.e., sprint), but it *can* deliver a significant return on investment when correctly implemented. This can be done by following several key steps in your automation planning.

Mold builders can standardize operations by creating templates for automated design and manufacturing processes.

### 1. Prepare Your Business

Before committing to a marathon, you must assess your overall health — whether your body can take on the task. The same is true for automating your operations. You need to assess all aspects to determine if your machinery, equipment and people are capable of automation. Things to ask yourself: Is your equipment old? Do you have current machine technology? Is your software capable of the programming level needed for automation?

Once your capabilities assessment is complete, you must make an investment plan for the required equipment and technology and work to standardize your tooling operations. These key activities serve as the foundation for automating your processes. However, having the right people on board is equally important for all of this. Marathons aren't necessarily a team sport, but automating your business is, so it may require you to hire different talent or identify and train interested team members.

Mold builders can automate the general mold design by using CAD/CAM to develop a template.

### 2. Research the Right Solution

Once you have identified the gaps, it's time to identify the right solutions and partners to ensure you have the tools to simulate and automate. In doing so, conducting due diligence in your research is important to identify the technology and technology partners that will address your needs and simplify your current systems. For example, creating and simplifying processes will be difficult if your business has multiple software programs that don't interact or work collaboratively.

Use the experience of others by leveraging your peer network and associations, such as the American Mold Builders Association (AMBA), to learn about process automation best practices and identify potential partners through referrals.

### 3. Create a Digital Layout

To automate programming and design, you must create digital versions of all your entities — tools, machines and clamping devices. Every piece of equipment must have a digital twin. This will allow you to predict and estimate what the machine can do within a certain time for specific mold designs. With this information, you can make, develop and test a build process before establishing it as a benchmark.

### 4. Create Templates

The next step is to create templates for automated design and manufacturing processes — 2D, 3D, five-axis, simple parts, partial template, etc. — to help standardize operations. Think of a template as a training route. Start with a basic route based on desired distance and make changes to customize or adapt the route to your growing level of fitness.

Creating and using templates as a map for the structure or design of a mold and the manufacturing process can eliminate


A mold shop must assess all aspects of the operation to determine if its machinery, equipment and workforce are capable of automation.

some guesswork, save time, and help standardize and improve quality. Additionally, it enables you to operate more machines with fewer people.

**5. Simulate Before Releasing the Jobs**

You have your templates, automated design and development processes and are ready to build your first mold. However, before you take that step, run a full simulation on all of your machines.

You can integrate your programming and machine simulation with the correct software solution. This will identify any potential issues or crashes and insulate your business from them, helping to ensure your shop is ready to run the automation race.

**6. Analyze the Data**

To optimize your business and ensure your automated processes are achieving your desired goals, you need to collect and analyze data from all aspects of the company. The key to doing this is having the right manufacturing execution system (MES) and enterprise resource planning (ERP) system feeding you the necessary information to make informed business decisions and determine how to best meet your customers' quality and delivery needs.

The marathon of automating your manufacturing operation allows you to maximize your team, ensuring that employees deliver value and optimize machine use. It also makes your shop a desirable place to work for the next generation of manufacturers.

Remember, automation does not replace people. You will always need skilled talent to operate your moldmaking business successfully. By incorporating automation into your business, you move people from performing low-value tasks to high-value ones. Ultimately, automation allows you to achieve more with better efficiency, helping you cross the finish line with on-time delivery and cost-competitive tools. MMT

**FOR MORE INFORMATION**

Tebis America Inc.
248-524-0430 / info@tebisusa.com / tebis.com
Michael Thiessen, Sales Manager


# CAMX

THE COMPOSITES AND ADVANCED MATERIALS EXPO

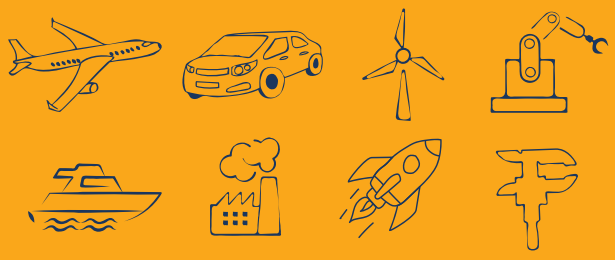
**OCT 30-NOV 2 | 2023**

Atlanta, GA, USA www.theCAMX.org

## DON'T MISS OUT

Join us in Atlanta to source the materials, innovations, and connections that drive performance.

**REGISTER TODAY**



## #CAMX2023

Sign up for CAMX Connection and follow CAMX on social media at **#CAMX2023** for live updates during the event.

**theCAMX.org/registration**

## WE FORM THE FUTURE

COMBINED STRENGTH. UNSURPASSED INNOVATION.

Scan to Learn More

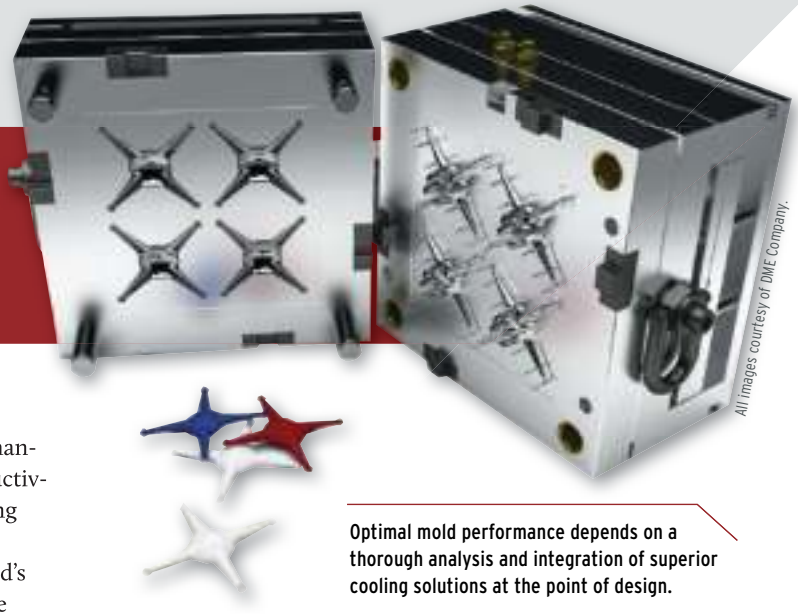
Produced by ACMA sampe North America

Official Media Partner GARDNER Business Media, Inc.

By Dwayne Hicks, Jeremy Sutch and Tyler Boss

# Ensuring a Mold's Thermal Integrity

A review of common mold cooling issues and possible solutions, including 3D printing applications.



All images courtesy of DME Company.

Optimal mold performance depends on a thorough analysis and integration of superior cooling solutions at the point of design.

With ever-increasing energy and materials costs, manufacturers are more motivated to improve productivity by streamlining processes, dramatically cutting human resources and budgets and optimizing production processes. For example, shops pay more attention to a mold's thermal dynamics during design, molding and preventative maintenance (PM) to reduce cycle time, decrease energy consumption, improve plastic part quality and increase yield.

Manufacturers have optimized hot runner systems, gating and finite element method (FEM) simulations to control better fill and cycle times. However, what is rarely discussed is cooling. The cooling cycle can be as much as 70% of a part run cycle, so thermal management to reduce overall cycle times is critical for process optimization. Lower cycle times and lower scrap rates equate to higher part production.

### The Cooling Challenge

Adding and removing heat is a fundamental and critical part of the molding process. Most molders and designers are so accustomed to the process that good thermal management practices are often overlooked, and are not always scrutinized the way they should be to optimize the molding process.

With higher expectations on designers and manufacturers and lead times progressively becoming shorter, companies simply cannot afford to ignore any solution that might help create a scenario where optimum part quality, less scrap and less human interaction can be achieved. All of these requirements are now being built into the organization's production specifications so that no stone is left unturned.

At one point in time, cooling the part surface was generally an afterthought, usually squeezed in with room available after all of the mold design and action components were in place. With this tactic, designers addressed cooling or warping issues after the project went to tryout, sometimes leading to frustration and added cost. Ultimately, these practices resulted in parts that could not be qualified and lead times that could not be met.

Some things may never change when building molds — for example, drilling channels into mold blocks. Designing channels in the cavity (or A side) is easier because outside of the drop or sprue (and some screw holes), there is usually less interference in those plates. The real challenge is the ejector half (or B side) because ejection, lifters, core pins and other components present obstacles to addressing those hard-to-reach areas and keeping the part surface at an even temperature.

When developing a new mold or hot runner system, the design engineer routes the cooling channels to deliver the most effective cooling of the cavity. The goal is to maintain the integrity of the polymer and cool the part to the ejection temperature as quickly as possible. Often the waterlines are gundrilled. This approach can yield suboptimal cooling and a finished mold with a narrow process window, increasing the risk of deterioration in the watercooling line performance over time. The molding process is impacted when the mold temperature shifts from its upper or lower process limits. So, to avoid part quality issues, process conditions may need to be modified.

The calcium impurities of water also impact cooling lines. For example, the oxygen inside the water attacks the mold's surface, causing corrosion that form "traps" in the cooling channels that capture impurities and create scale. Scale has

an insulating effect that significantly reduces heat transfer, forcing a change to molding process variables that often increase cycle times.

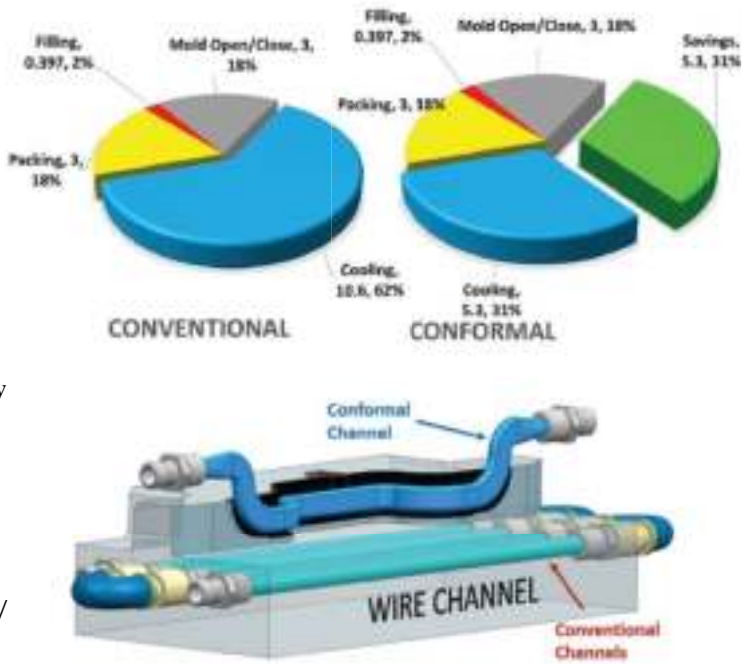
Even with the best-filtered water and anti-corrosion agents, cooling channels corrode over the mold's life. Advanced cooling channel flow monitoring systems reveal this degradation, but current PM programs often have no effective way to correct this.

### 3D-Printing Cooling and Cleaning Solutions

Today's sophisticated cooling channel monitoring devices can be a harbinger to detecting cooling channel degradation if they are effectively integrated into manufacturing control processes. They help to monitor the pressure, temperature and flow rate of both the input and return cooling lines, which indicates the cooling process' stability and verifies efficiency. This method can identify wasted energy and variations in pressure noting blocked waterways, enabling manufacturers to make calculated changes with real data and adjust temperatures and/or pressures to achieve desirable results. Then, when the mold is removed from production, steps can be taken to clean and remove any blockage that may have reduced mold efficiency.

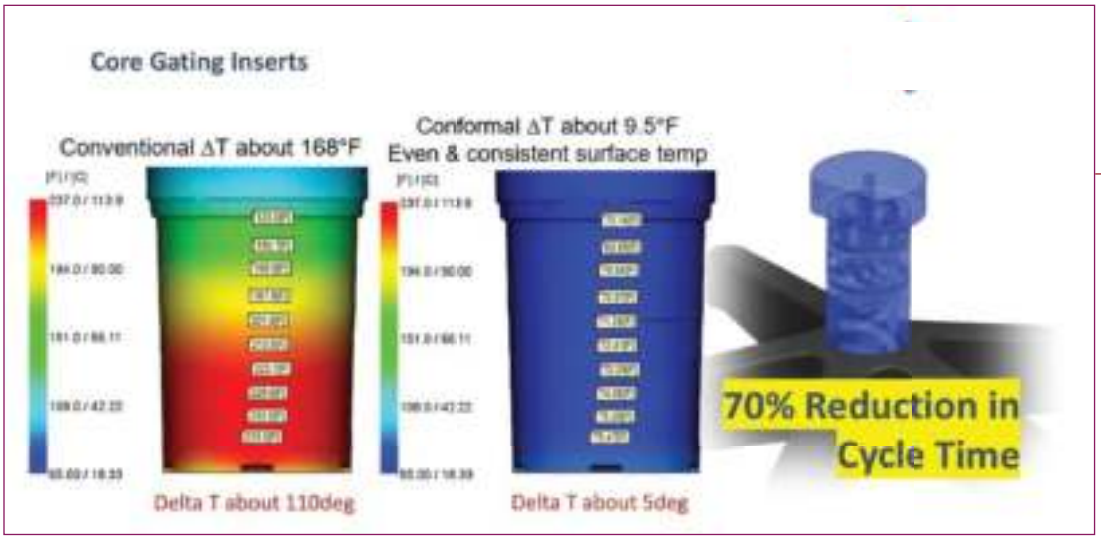
Recent advancements in **cooling channel cleaning technology** have met this need. The cleaning process must unplug any blocked line by removing debris and descaling the surface of the channels. Traditionally, toolrooms use acids to break down scale to open clogged channels. However, this often perpetuates the problem long-term, as the acid can pit the cooling channel surface, worsening scale buildup.

Modern water-based cleaning equipment uses a closed-loop system and a unique pulsating action with heated water to attack a plugged channel from both directions. This approach overcomes an airlock and dislodges the blocking material. A three-component system removes scale and rust: (1) heated water with (2) a mild chemical agent and (3) a pulsating action of the water.




Cooling is the largest portion of the molding process, so considering alternative approaches, such as conformal cooling, can yield improvements and savings.

Like mold design, the molded parts also present challenges that hold up cycle time, such as the features of bosses, cores, deep ribs, and lifter and die locks. Conventionally, these




Average cycle time reductions concerning conformal-cooled inserts are about 30% and can be as high as 70%. These higher reductions are enabled more with standing core features. However, this technology has countless practical applications for driving cycle time down.

features are cooled with baffles or cascades, which can fall short of cooling the entire feature, leading to hot spots.

However, using direct metal laser sintering (DMLS) and sinter-based additive manufacturing (SBAM) to create these components solves these problems. For example, **printing conformally cooled metal inserts** — for core features or isolated areas holding up cycle time or affecting the part quality — with elaborate channel designs that allow cooling closer to the part surface. (Note: 3D-printed inserts are also used for heating applications such as connector plugs with high percentages of glass fillers. Higher temperatures are introduced to these areas for a better surface finish for mating conditions.)

This technology can also be used in **lifter heads and slide noses.** The methods in which we deliver liquid media to lifter systems may vary, but introducing complete cooling coverage to these components effectively shortens cycle time while improving part quality. Slides can also be very limited for cooling via conventional means, but 3D-printed slide noses are highly accessible to provide even cooling.

Regarding hot halves, the design engineer intends to route the cooling channels to deliver the most effective cooling of the cavity to maintain the integrity of the polymer. Insulating the hot runner system is a relatively easy and non-invasive way to lower melt processing temperatures, reducing part cooling time and power consumption. Some insulating products are ineffective, while others contain harmful substances. Still, with advancements in nano-microporous insulating materials, great strides have been made in reducing energy consumption and minimizing thermal transfer from manifold systems to mold blocks.

For example, cold spots exist in even the most advanced hot runner systems. The resin is often processed at higher-than-necessary temperatures to prevent freezing in these cold spots. Effectively **insulating the hot runner** can minimize thermal variation across the system, which in many cases allows the resin to be processed at lower temperatures. Getting the melt into the cavity at a lower temperature means less cooling time to ejection. Case studies have proven that temperature reductions of only a few degrees can significantly impact cycle time, resulting in a less expensive part and increased capacity of the molding cell (see "Case Studies Using Hot Runner Insulation" sidebar).

3D printing also has **advanced gating applications**. Much time is spent at mold tryouts waiting for the press to open


## Case Studies Using Hot Runner Insulation

*Mold more product on the same machine in less time.*

Projected Savings based on cycle time (only):
- 120,000 part production run / 1 cavity = 120,000 IMM cycles
- 120,000 cycles - cycle time saving 6.6 seconds = 220 hours
- **220 IMM hours available for other jobs**
- Average IMM operation cost = $100
- Average IMM operator cost / hour = $40
- 220 hours saved - $140 / hour = **$30,800 savings**
- Plus possible emissions savings depending on power generation

| PROCESS SHEET | | | | |
|---|---|---|---|---|
| | | | Actual Processing Values | |
| Polypropylene (GF) Processing Guidelines | Low | High | W/out Hot Runner Insulation | With Hot Runner Insulation |
| Barrel Zone 1 | 400°F | 440°F | 470°F | 430°F |
| Barrel Zone 2 | 400°F | 440°F | 470°F | 430°F |
| Barrel Zone 3 | 420°F | 440°F | 470°F | 430°F |
| Barrel Zone 4 | 420°F | 440°F | 470°F | 430°F |
| Nozzle | 420°F | 440°F | 450°F | 415°F |
| Hot Runner Manifold | 430°F | 450°F | 450°F | 410°F |
| Hot Runner Nozzles | 430°F | 450°F | 450°F | 410°F |
| Mold (Cavity Plates) | 100°F | 140°F | 130°F | 110°F |
| | | | | |
| Hot Runner Startup Time to 440/450°F | | | 32 mins | 26 mins |
| | | | | |
| Cycle Time | | | 74.3 sec | 67.7 sec |

Note: Case study results of hot runner insulation installed on a two-drop hot runner system, processing a glass-reinforced polypropylene (PP) part (automotive tail lamp housing).

Projected Savings based on cycle time (only):
- 106,000 part production run / 1 cavity = 106,000 IMM cycles
- 106,000 cycles - cycle time saving 5 seconds = 147 hours
- **147 IMM hours available for other jobs**
- Average IMM operation cost = $100
- Average IMM operator cost / hour = $40
- 147 hours saved - $140 / hour = **$20,580 savings**
- Plus possible emissions savings depending on power generation

| PROCESS SHEET | | | | |
|---|---|---|---|---|
| | | | Actual Processing Values | |
| Polypropylene (Talc-Filled) Processing Guidelines | Low | High | W/out Hot Runner Insulation | With Hot Runner Insulation |
| Barrel Zone 1 | 410°F | 440°F | 482°F | 428°F |
| Barrel Zone 2 | 410°F | 440°F | 464°F | 419°F |
| Barrel Zone 3 | 410°F | 440°F | 464°F | 419°F |
| Barrel Zone 4 | 410°F | 440°F | 446°F | 410°F |
| Nozzle | 420°F | 450°F | 518°F | 410°F |
| Hot Runner Manifold | 530°F | 473°F | 450°F | 410°F |
| Hot Runner Nozzles | 420°F | 450°F | 473°F | 410°F |
| Mold (Cavity Plates) | 100°F | 140°F | 266°F | 2,300°F |
| | | | | |
| Hot Runner Startup Time to 475°F | | | 18 mins | 10 mins |
| | | | | |
| Cycle Time | | | 46 sec | 41 sec |

Note: Case study results of hot runner insulation installed on a two-drop hot runner system, processing a talc-filled polypropylene (PP) part (automotive air box).

because the material in the sprue has not solidified. Those sprues can now be cooled with conformal bushings, which cools the sprue 40% faster. And conformal gate bushings — designed to target the tip, so the heater bands do not work harder to sustain minimum temperatures — reduce stringing and blemishing.

### Plan During Design

Understanding that even a thin layer of scale on a cooling channel can change the thermal transfer to the mold is essential to maintaining consistent process windows over periods of time. Regimented, targeted maintenance can ensure process windows have only slight fluctuation and scrap rates are low.

With pre-thought in the initial stages of the design process and PM, the thermal integrity of molds will be sustainable for extended periods, creating higher quality parts. And assessing part geometry in the design phase to include conformally cooled inserts can deliver higher yields of part production. The ROI on these components can be relatively short in some cases and can even create a scenario where production quotas can be met months earlier, releasing molding machines for other product runs.

### Cool Effects

Cooling is a critical phase of the molding process. It sometimes represents 70% of the overall cycle and impacts part quality. The cooling design should be considered up front in the design phase and maintenance cannot be ignored.

For example, conformal cooling can greatly aid the balance of a mold's thermal transfer. However, processing water over time causes scale and debris buildup. This buildup is accentuated by the complex circuitry associated with conformal cooling, so it must be removed to control the thermal process.

A robust mold cooling design and a predictive mold maintenance program will yield major benefits and increase the ROI of any molding project. MMT

#### FOR MORE INFORMATION

DME Company / 800-626-6653 / 248-398-6000
dme@dme.net / dme.net
Dwayne Hicks, Additive/Conformal Cooling, Design/Thermal Analyst
Jeremy Sutch, Hot Runner Manager
Tyler Boss, Molding Process Manager

NPE2024
The Plastics Show | MADE FOR YOU

Produced by PLASTICS INDUSTRY ASSOCIATION

# NPE2024: THE PLASTICS SHOW IS BACK

## REGISTRATION NOW OPEN

With 55,000+ leaders from 110+ countries representing every industry — from automotive to healthcare, consumer products to construction and more — NPE is the largest plastics trade show in the Americas and one of the most innovative business events in the world.

We can't wait to bring the plastics industry back together in Orlando, May 6–10, 2024. Will you be there?

For more information and to register, visit **NPE.org/MT**

By Julia Hider

# The Benefits of Vertically Integrating Metal 3D Printing and Machining

**Having 3D printing and machining within one organization enables Addman's engineers to collaborate and consolidate so it can quickly make successful metal 3D-printed parts.**

All images courtesy of Addman Group.

Addman Group was founded to bring additive manufacturing (AM) capabilities to American Industrial Partners' businesses. The company now includes facilities across the country with capabilities ranging from metal and polymer 3D printing to precision machining and injection molding.

Metal 3D printing and machining are complementary processes. But understanding exactly how the two processes interact is specialized knowledge that varies from part to part. Vertically integrating 3D printing and machining gives manufacturer Addman Group the ability to manage the whole manufacturing process, ensuring that 3D-printed parts meet customer needs. "Anybody can print you a paperweight," says Bob Markley, executive vice president at Addman. "We want to give you a functional component that drives your program forward and makes you look like a friggin rockstar."

### Racing to 3D Printing

Markley is a self-described "recovering race car engineer" who founded 3rd Dimension Industrial 3D Printing outside of Indianapolis in 2013. "I know we've only really been around about 10 years now," he notes, "but that makes us one of the most tenured companies in North America doing metal additive." The company started with a laser powder bed fusion machine from 3D Systems, but it wasn't long before the company expanded into machining. "We very quickly realized that almost everything we were printing needed to be machined in one way or another, either removal from the build plate, cutting threads, mating surfaces, tighter tolerance or surface finish refinement," he says.

3rd Dimension's first subtractive machine tool was a secondhand wire EDM. It was quickly joined by a manual mill, a manual lathe, two CNC mills and two CNC lathes, which

Many 3D-printed metal parts require post-machining to remove support structures, add features such as threaded holes, and meet surface finish and tolerance requirements. Addman has both machining and metal 3D printing capabilities, making collaboration easier.

it acquired when the racing team it had been outsourcing its machining work to closed down. The company also brought on a machinist.

Addman was formed in late 2020 as an additive manufacturing (AM) center of excellence for American Industrial Partners, a private equity firm that invests in industrial businesses and their portfolio of brands. 3rd Dimension was its first acquisition in early 2021. Since then, Addman has expanded its 3D printing technology and machining capabilities by acquiring several other companies. In late 2021, it added Domaille Engineering, which is a machining business with three facilities in Rochester, Minnesota; Glen Burnie, Maryland; and Wright City, Missouri. The Domaille Family of brands has since been folded into a new CNC line of business, called Addman Precision. Around the same time, it also acquired Castheon, a company in Thousand Oaks, California, that specializes in refractory materials such as niobium C103, a high-temperature alloy that's particularly suitable for space applications.

> If the part is determined to be best suited for 3D printing, the company does a deep dive to determine any potential manufacturing challenges and how to address them.

It also purchased Harbec in Rochester, New York, which Markley describes as "a mix of everything that we have," including a diverse machining operation, metal and polymer 3D printing capabilities, tool and die making, and injection molding. Harbec also brings deep AM technologies experience to the organization, having implemented its first direct metal laser sintering (DMLS) machine from EOS sometime in the early 2000s, according to general manager Chris Piedici.

Addman's latest addition is Dinsmore Inc., an Irvine, California-based business that specializes in fast turnaround polymer AM, from fused filament deposition (FFF) to selective laser sintering (SLS) for prototyping and production applications.

Between its facilities, Addman has access to a wide range of machine tools, including three- and five-axis vertical machining centers (VMCs), four- and five-axis horizontal machining centers (HMCs), CNC lathes, mill-turns, wire EDMs and grinding machines. This range of capabilities is especially helpful, because sometimes 3D-printed parts require specialized machine tools. For example, 3D-printed parts are getting larger. Because Addman has access to a five-axis machine with a large work envelope, it can produce large metal 3D-printed parts to complete.

### Parts and Requirements

As far as the types of parts being 3D printed, Markley says, "It's a little bit all over the place. We see a few different value drivers." Common themes are using 3D-printed parts as a replacement for castings, which have had "absurd" lead times for a while.

It's also a good application for refractory materials, such as the ones Castheon deals with, that go into spaceflight components such as thrusters. Because these materials are hard to get and very expensive, it's important to use as little of it as possible so that the "buy-to-fly ratio" is lower. These materials are also difficult to machine, and 3D-printed parts require less machining than parts made from stock. The Harbec facility also 3D prints mold tooling with conformal cooling channels.

Regardless of the material, process and end use, 3D-printed parts have requirements that need to be met. "Everything that would go into a machined part, we still have with the additive component," Markley says. These include tolerances and surface finish requirements. If the AM process can't meet these requirements on its own, the part needs to be machined. In fact, Markley says that most of the 3D-printed parts Addman produces need some form of post-processing.

### Collaboration

"For metal additive, all of the work happens in the front end before you ever start making parts," Markley explains. Addman's engineers establish the entire part production process from part design to finishing. Engineers request prints for

Before engineers at Addman's Harbec facility hit print on a part or mold, such as these 3D-printed molds used to make personal protective equipment (PPE), representatives from all relevant departments (additive manufacturing, machining, tooling and injection molding) meet to discuss the project.

3D-printed parts, such as this sample impeller, can be difficult to machine. They can also be difficult to hold, especially if they have thin walls or other delicate features.

This prototype part for Lockheed Martin was printed from 316 stainless steel, and, like many of Addman's 3D-printed parts, required post-machining. This particular part required machining on all sides.

the part and go through all of the notes to fully understand all of the requirements.

The first question they ask is, does the part really need to be 3D printed? This is another benefit to having machining and 3D printing within the same organization. "We're going to help our customer find the correct manufacturing modality," Markley says, whether that's 3D printing and machining or just machining. If the part or volume is more suited to machining or injection molding than 3D printing, Addman can and will machine or mold it — the process could better suit the customer's needs.

Engineers also consider whether these needs could change over time. Piedici points out that maybe AM is the best solution for short-term production, but machining or injection molding makes the most sense in the long term.

If the part is determined to be best suited for 3D printing, the company does a "deep dive" to determine any potential manufacturing challenges and how to address them. The team collaborates closely with customers throughout this process to ensure that the final parts meet their needs. "Surface finishes, tolerances, etc., can all direct costs, but they may or may not be critical to the customer's end design," Markley says. "So having a team that speaks both languages is certainly an advantage."

Collaboration is also internal. Harbec assembles a team for larger projects that includes leaders from relevant departments (AM, machining, injection molding, etc.). "The communication — having a machinist under the same roof as my additive engineers — is gold," Markley says. This is key because engineers have a number of considerations to take into account when machining 3D-printed parts:

- How will the part or parts be removed from the build plate?
- How will the support structures be removed — manually or via machining?
- Are there any features that can be used as datums for machining, and how will they be picked up?
- How will the part be held for machining?
- Does the part require extra stock? If so, how much and where?

These are all important to consider before printing because by the time a 3D-printed part reaches the machining process, it's had a lot of value added to it and is therefore expensive to scrap. "It's very different than starting from a piece of billet," Markley notes. "So having that integrated solution is invaluable."

### Hold On

One particular challenge that requires extra consideration is workholding. "It becomes absolutely critical to make sure you have good reference points to pick up on that part and that it's held solidly," Markley says.

This becomes even more of a challenge when 3D printing is used to create certain features. "One of the key advantages of metal additive manufacturing is you only have to put material

where you need material. So that tends to see extremely thin walls and low-rigidity parts," he says. "So it's not only how do you hold the component, but how do you hold that component still when you have such thin-walled components, and then make sure that you don't cut through your walls and you still have plenty of material left for the design to meet the requirements."

That's why engineers often design 3D-printed parts around fixturing, adding tabs or features to locate the part. Another option is machining the part while it's still attached to the build plate, which is good for drilling and tapping holes or cutting thin walls when holding the part would be more difficult after removal from the build plate.

Addman also takes advantage of its polymer 3D printing capabilities. Not only can it 3D print polymer workholding for machining metal parts, it also 3D prints polymer versions of metal additive components, which it then machines to test workholding solutions. "Think of it as cutting aluminum part before you cut the titanium. It's significantly less expensive to screw up a $30 plastic part than a $30,000 metal part," Markley says. "That's just a good gut check to make sure that everything goes according to plan."

**Consolidation**

In addition to ensuring part quality, having all of these processes within one company enables customers to consolidate their supply chains. "We work with a wide variety of customers that don't just want one manufacturing modality," Markley says. "Our customers want an integrated supply chain solution where they've got one vendor number, they've got one person or a small team that they deal with, to figure out how to get parts."

Addman is also able to consolidate all of its AM knowledge and expertise and share it across the organization. 3D-printed materials cut differently than materials produced through conventional methods. Markley notes that when a shop buys material, it gets a mill certification report that provides a certified record of the physical and chemical properties of the raw material. But when a shop 3D prints a metal part, it creates the material's physical and chemical properties. For example, the printed material can have different grain structures because the cooling rate causes it to solidify differently than stock material. This gives printed parts different properties that cut differently than stock material, and understanding these details helps in machining these parts.

Another potential benefit to consolidation is shorter lead times. Harbec stocks a variety of metal powders, and, depending on the part's geometry, can have 3D printers running within 24 hours. As an example, Piedici describes how, at the beginning of the COVID-19 pandemic, Harbec was able to quickly build molding tooling to make medical cassettes for COVID-19 tests. "We got geometry on a Friday and were molding parts on a Monday," he says.

Harbec wouldn't have been able to achieve this feat without having access to both additive and subtractive technology and teams that know how to collaborate. "That's the potential of departments that can work together," Piedici says. "You can solve really critical engineering problems within a short period of time, bringing people together to think both additively and subtractively."

At the end of the day, AM is a way to make parts. "It's just like any other manufacturing method in that there are rules and limitations that we still have to abide by," Markley says. "There's just *different* rules and limitations." MMT

*Reprinted from sister publication* Modern Machine Shop.

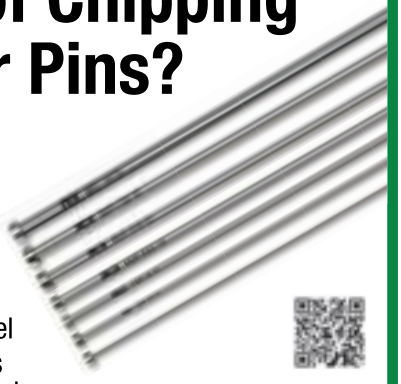
**FOR MORE INFORMATION**

Addman Group / 888-266-1837 / addmangroup.com
3D Systems / 888-598-1438 / 3dsystems.com
EOS North America / 877-388-7916 / na.eos.info
Harbec / 888-521-4416 / harbec.com
Julia Hider, Senior Editor, *Modern Machine Shop*

PCS COMPANY / Ejector Pins

Tired of Chipping Ejector Pins?

NEW!
M-2 Ejector Pins



- Wear resistant high speed steel
- Can be used as ejector or core pin
- Through hardened to 60-63 Rc
- Wide variety of sizes and in stock now

We are the industry leader in ejector pins.
Contact us today!

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

By Hillary Thomas and Seth Hale

# TAKE TIME TO SAVE: Six Steps in Mold Design to Reduce Back-End Troubleshooting

**Westminster Tool shares how the one week it typically takes to perform these six steps in the design phase can save three weeks or more in an overall tool build.**

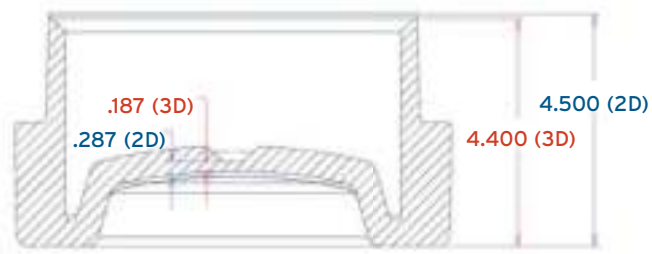
When you go to a moldmaker, what are you really buying — just steel or something more? The reality is you're paying for the plastic part, and not just any part, but a dimensionally stable component that will meet the part print shot after shot for the millions of cycles the tool will be running. With that in mind, why aren't molders and moldmakers discussing plastic quality sooner?

Back in 2017, Westminster Tool implemented a more proactive plastic-quality design process. At that time, we looked at what we called our five "biggest losers." These projects were our least successful regarding timing, budget and part quality. We took a deep dive into all of them to find the root causes of the problems, and what we discovered was that in all five cases, the crux of the issue was plastic part quality — issues with tolerances and dimensions that we easily could have avoided in the beginning if we had just had the right discussions with our customers.

As a result of that deep dive, Westminster Tool now completes six steps on every project during design: Compare 2D prints to 3D models; computed tomography (CT) scan existing parts if there are any; complete a dimensional risk analysis;

All images courtesy of Westminster Tool.

When you buy a mold, you're not just buying steel — you're buying parts that meet specified tolerances.




C/L SECTION

Take care to ensure that your 3D model matches the part's 2D drawings.

understand quality expectations and Cpk goals; perform a Moldex3D simulation; and define and align quality plans.

Why is it important to take these steps early in the process? Since Westminster Tool initiated this new protocol, we have found that one week added in the design phase — how long it takes to complete these six steps — can eliminate more than three weeks on the back end in terms of troubleshooting, adjustments and more. In addition, the money and time expenditure to make an alteration to a mold design is far lower than having to make corrections to manufacturing. Since making these changes, our on-time delivery and successful initial first article inspections (FAIs) have drastically increased.

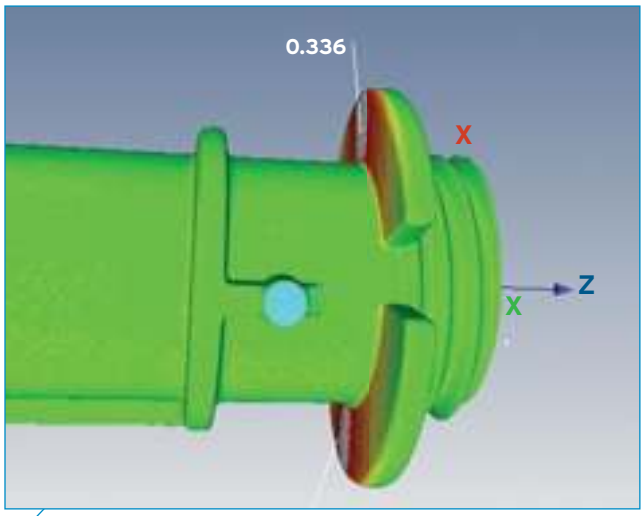
### 1. Compare 2D to 3D

At the end of the day, the customer is paying for the plastic part's dimensions and meeting tolerances and quality requirements. To accomplish that, one of the first things Westminster Tool does during design is to take the 3D model and fully dimension and detail that model to ensure it matches the dimensions on the 2D part print. Since that print is what everything will be measured to, it is the true definition of success. Putting this comparison into our process helps us to identify any risk areas where the plastic dimension in the 3D model does not match the 2D expectation for that part.

Alerting to any discrepancies during the design phase greatly reduces lead times because 2D print changes typically require multiple approvals from the OEM level and can take upwards of two weeks. That's not something you want to be waiting on at the end of the project during the inspection phase. In addition, thoroughly reviewing the part's dimensions and tolerances provides a fundamental understanding of its ultimate fit, form and function.

### 2. CT Scan Existing Parts

Any time Westminster Tool builds a mold for a customer looking to boost production or replace an existing mold for a current product, we send existing parts for a CT scan. Why? Because over the life of a tool, many adjustments and changes can be made to the steel that are never noted or make it back to the




In red you can see a discrepancy from the part print, which ended up being draft that was added to aid in ejection. Without CT scanning, this would have been learned the hard way during sampling.

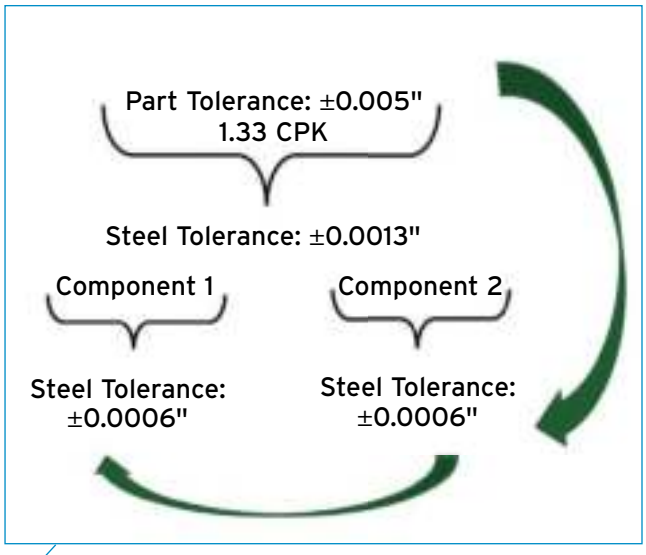
original tool design. For example, draft or polish is added for ejection, or additional crush is added to overcome flash. Over the life of a tool, an array of challenges can be addressed but never actually make it back to the original part or tool design.

By CT scanning existing parts up front, we can build reality into our tool versus uncovering it the hard way during mold trials. With most capacity tools, those lessons have already been learned, and CT scanning the parts eliminates the time and cost of learning them all over again.

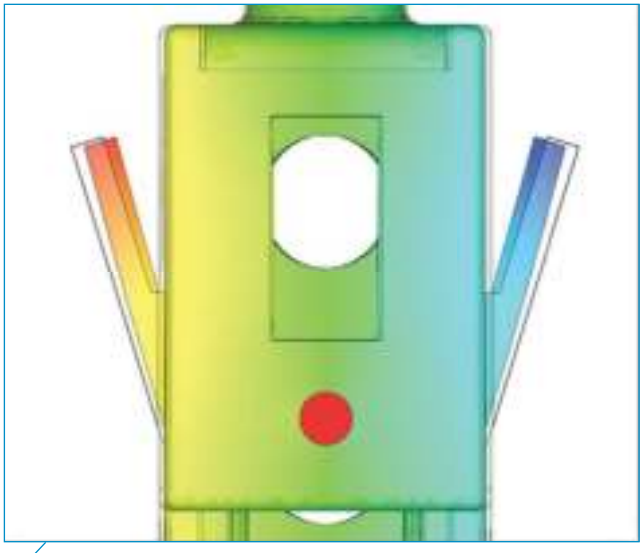
### 3. Conduct a Dimensional Risk Analysis

An internally created worksheet allows us to evaluate the risk level associated with any given plastic tolerance. Created using the "SPI Standards and Practices of Plastics Molders," this document analyzes a specific plastic material's ability to meet tolerances for various features. Every resin has its own shrink and warp characteristics further influenced by part geometry. Because of this, every material can potentially achieve a different level of quality.

If we find a specification that's tighter than the fine or standard tolerance, that makes us aware of a risk that this particular tolerance will be difficult to achieve in the plastic that's been chosen, based on the design of the part. That doesn't mean we'll try to open the tolerance or say we won't meet it. Instead, it starts a conversation about what mitigation plans can be implemented to ensure we meet the customer's quality requirements. Those plans could involve anything from steel-safe dimensions to designing inserts so that we could modify them and still use them in the tool without a big impact on cost and time.




Ensuring steel is capable of holding the required tolerances is critical.



Westminster Tool uses Moldex3D flow simulation to compare what the molded part will actually look like to the 3D model, accounting for warpage and more.

**4. Cpk**

Historically, if the tool builder isn't performing mold validation or inspection services, Cpk (process capability index) isn't something a customer would expect to ask or worry about. Holding 50% of the print tolerance for our steel tolerance should ensure the steel can hold that tolerance, cavity to cavity, over the tool's life. However, when the customer wants a 1.33 Cpk or higher, that 50% of the plastic tolerance might not be good enough to satisfy quality demands over the tool's life.

> Since Westminster Tool initiated this new protocol, we have found that one week added in the design phase — how long it takes to complete these six steps — can eliminate more than three weeks on the back end in terms of troubleshooting, adjustments and more.

For example, a 1.33 Cpk tells us to not only use a more narrow margin of plastic tolerance for that dimension — ensuring that we're tighter than that 50% — but it also ensures that the precision of the steel features we create is extremely accurate, eliminating one variable from all the variables in the injection molding process that could cause a dimension to be out of tolerance.

**5. Simulate and Analyze**

Moldex3D is a flow simulation and analysis software allowing Westminster Tool to examine the entire molding process. Using this software not only enables us to design an effective and efficient tool but also helps us understand the final molded part quality based on that injection mold design. This also ensures that any design choices or proposed changes are data-driven and not just based on know-how or experience. Decisions around the size and location of gates, cooling channels and runners can be tested iteratively without cutting steel.

**6. Align Quality Plans**

Whether or not Westminster Tool is taking on inspection, we request the customer's quality plan up front during the design phase. Typically, that quality plan includes the specific features and dimensions the customer is trying to hit and the tolerances and preferred measurement method. Understanding measurement methods sets up Westminster Tool for success by informing us how we'll measure parts coming off the tool.

This could involve creating a fixture or designing a CMM program to take measurements. Aligning these methods with the customer during the design phase reduces any chances of delays at the end of the project. Even when we are just performing a first-parts-off-tool trial and sampling parts internally, we can inspect these first-off parts and ensure they're meeting quality requirements right at our own press. This reduces the lead time involved in sending out parts for inspections, waiting for approval and shipping the tool.

**Defining Success First**

At the end of the day, it's important to understand expectations for all parties involved to succeed. The OEM, contract

manufacturer, tool builder and whoever else participates in the project must be on the same page about exactly what success looks like. If our definitions differ, time and cost will catch up to us eventually.

Here are the questions you can ask if you have access to a part's quality plan.

- What is your requirement for first-off-tool?
- What is your requirement for mold factory acceptance test (MFAT)?
- Do you need to meet a Cpk? If so, how many shots are required for it?
- How are you going to perform Cpk inspection?
- Will there be any in-process checks required?
- Is there an acceptance plan your mold builder must meet before shipment?

In addition, here are some questions for capacity or existing tooling:

- When was the last FAI performed?
- How many versions of this part are on the market?
- What challenges did you have to overcome in your original MFAT?
- Do you have a log of tool history and modifications?

Remember to think about the end of the project at its beginning. That mindset will set you up for success by understanding the definition of success from the start and how you plan to measure it. Once you have that definition, you must consider any risks or obstacles that could keep you from achieving it. Finally, your entire team must be willing to invest up front to minimize cost or time delays on the back end. A major shift like this can seem daunting for some companies, but getting support and buy-in from all personnel involved is key. Shifting the conversation about quality requires full transparency and open communication, but the benefits outweigh the challenges. The one week we have added to design has paid off on every tool. MMT

**FOR MORE INFORMATION**

Westminster Tool
860-564-6966 / sales@westminstertool.com / westminstertool.com
Hillary Thomas, Vice President, and Seth Hale, Mold Designer


By Peggy Malnati

# Repairing the Unrepairable: Laser Welding to the Rescue

Image courtesy of Medbio LLC.

Medbio LLC is a contract molder and toolmaker that designs and produces or subcontracts 100 injection molds/year that, in turn, are used in-house to mold a wide variety of medical devices and diagnostic equipment in Class 7 and Class 8 cleanrooms.

Moldmaker/molder Medbio LLC sent unscrewing cores with damaged micro-threads out for repair via laser welding and polishing, slashing nine weeks off lead time to produce new inserts.

The FDA-registered, ISO 13485- and 9001-certified molder and moldmaker now known as Medbio LLC was founded in 2004 in Grand Rapids, Michigan. Over the last two decades, the company has grown through acquisitions and name changes. It was acquired in 2021 by plastic caps and plugs manufacturer Protective Industries Inc. that brought combined company resources to 17 facilities globally with a cumulative century of experience in contract medical device manufacturing.

Medbio produces and subcontracts production of roughly 100 injection molds per year for its molding operations to form various medical devices and diagnostic equipment in engineering thermoplastics and liquid silicone rubber. Given the diversity of parts it molds, these tools can range from single-cavity/low-volume to 8- to 32-cavity/Class 101 production. All molds are produced in tool steels, often hardened steels, owing to the need to maintain tight tolerances and provide long tool life.

The company operates 119 thermoplastic injection presses and two silicone liquid injection molding presses in ISO Class 8 or 7 certified cleanrooms at its three Michigan and one New York State molding facilities. Clamp tonnage ranges from 17 to 440 tons/15 to 36 tonnes. Among that total are a series of micro-molding presses equipped with microbarrels capable of shooting parts as small as 0.08 gram/0.0028 ounce.

In addition to designing and producing molds and molding, assembling and packaging parts, Medbio also provides part feasibility reviews, 3D prints its polymer additive end-of-arm tooling (EOAT) and fixtures, offers tool transfer services and produces a simplified prototype/bridge tooling option in P20 called Prototype Plus.

## Micro-Threaded Core

Given the types of tools Medbio designs and builds, and the parts it molds, many of its mold components are quite challenging to produce in the first place and equally challenging to repair should they become worn or damaged. Case in point, earlier this

Image courtesy of Medbio LLC.

Medbio also provides part feasibility reviews, 3D prints its polymer additive molding-automation components, offers tool transfer services and produces a simplified prototype/bridge tooling option.

year, a two-cavity tool the team had been using since 2018 for a long-running program got damaged. To demold neat acetal parts from each cavity, the tool was equipped with specially built unscrewing cores that had to be removed by a special EOAT.

Those unscrewing cores featured polymer-coated and very thin 0.014-inch/0.36-millimeter micro-threads. The H13 mold (hardened to 52 HRC) already had 300,000 cycles on it and had been giving the molding team periodic challenges with parts sticking onto the micro-threaded cores. The parts were designed with "ears" that the EOAT grabbed to help unscrew the part from the insert. Unfortunately, the ears would sometimes break prematurely, making removing the part from the insert impossible for the EOAT. In that situation, technicians manually demolded parts — often using brass pliers — which, over time, damaged the polymer coating, led to more part sticking and eventually resulted in damaged micro-threads. Although Medbio had originally commissioned two spares for each core, all spares had been damaged and none were usable.

This situation created a serious challenge, as building new unscrewing cores would take 10 weeks and customer stocks of the critical medical parts weren't high. While Medbio's mold services team does make many repairs in-house, and the company already owned a laser welding system, the intricacy of the threads and the challenges of making repairs, blending the repairs back into the rest of the metal and polishing them was deemed beyond their capabilities. The team also felt that the threads were of such fine resolution that the cores would be too difficult to print via metal additive manufacturing.

While the team had already been developing a new mold for this program, it wasn't ready and would still need to undergo a rigorous customer validation program before it could be put into production. Given this extremely challenging repair, the team sent both damaged cores to Alliance Specialties and Laser Sales to get the mold back in operation as quickly as possible.

### MEDBIO LLC

**PROBLEM:** Medbio's micro-threaded inserts were damaged and needed repairs quickly for tight tolerance medical parts whose customer was running low on inventory.

**SOLUTION:** Sent inserts to Alliance Specialties and Laser Sales to repair via laser welding and polishing.

**RESULTS:** Inserts were back within a week, parts were requalified and Medbio was back in production that same week.

### Sculptors in Steel

Founded in 1978 by a moldmaker-turned mold polisher, and eventually a mold services provider, the Alliance family of companies offers many highly useful services to the tool and die industry from four locations in Wauconda and Prairie Grove, Illinois and Montclair, California. Alliance Laser Sales Inc. produces and sells its line of American-made laser welding and engraving equipment and specializes in laser welding and engraving services for both high-volume production needs and plastic injection mold repair and finishing. Alliance Specialties Corp. provides the tool and die industry with mold finishing and polishing, mold repairs, preventative maintenance, refurbishment and hot runner cleaning. Typical welding work includes restoring cut edges, repairing shutoffs, making engineering changes, fixing water leaks, repairing broken cutters, fixing cutter gouges, making engraving changes and repairing voids caused by EDM arcing.

Just on laser welding repairs alone, Tony Demakis, Alliance president, says that the company has completed more than 60,000 jobs in the tool and die industry in the last 20 years. The Alliance team was an early adopter of laser welding when the technology came to market two decades ago.

"When we first tried it, we realized this was great technology that could revolutionize the industry and make repairs faster and easier," Demakis says. "We knew this was something that other companies would start to offer, so we brought the service inside, bought our first machine from Germany and then

Image courtesy of Alliance Specialties and Laser Sales.

Above are the two side-by-side inserts showing damaged threads (left); one insert during laser welding repair work (middle) and the same insert after repairs and polishing were complete (right).

partnered with that company to rep their products while also offering laser welding services."

Eventually, after bringing suggestions to the machinery OEM multiple times on how to improve the equipment to better serve customers and being rebuffed, the relationship was severed and Alliance began designing and building its own laser welding equipment and repping other brands. In the intervening years, laser welding has undergone many technical advances, some developed by Alliance, and the team has built deep experience in the intricacies of laser welding.

What are the benefits of laser welding versus tungsten inert gas (TIG) welding? Laser welding is extremely fast and doesn't require the substrate to be preheated and later cooled. It causes very low heating, minimizing workpiece distortion, permits very thin materials to be welded in close proximity to thermally sensitive materials, and enables joining of materials with different coefficients of thermal expansion (CTEs) and materials that normally can't be welded. Laser welding is unmatched in accuracy and can produce extremely fine welds (0.1-1.0 millimeter/0.004-0.040 inch and at times as small as 50 microns) using wires as thin as 0.0762 millimeter/0.003 inch. Since it involves minimal deposition of welding materials, little to no post-weld machining is required, and since no electrode is used, there is no risk of introducing contaminants to the metal structure. In addition, there is no turbulence to destroy the protective inert gas atmosphere, there is no concern about arcing, since the beam moves in a linear path only and is unaffected by magnetic fields, and it facilitates welding in difficult areas like tight and deep geometry.

Image courtesy of Medbio LLC.

A 10-week lead time for new inserts required Medbio to send out two specially built unscrewing cores with damaged micro-threads for laser welding repair.

### Close Communications

While Medbio has only been using Alliance's services for 15 months, Alliance has become Medbio's go-to source for laser welding and other mold repairs. "We even purchased an ID1-Fiber laser welder from Alliance, which is so easy to use that even *engineers* can be trained to operate it," chuckles Micah Barbera, Medbio toolroom supervisor.

How difficult were the Medbio micro-threads to repair? "Given the projects people send us, our work is largely triage and repairing the unrepairable, so nothing is that challenging anymore," notes Rick Hendry, Alliance laser welding foreman, who completed this Medbio repair. "This project used finer wire — five-thousandths — and the thread size, thinness and intricacies, plus the precision we had to achieve, made it challenging, but this is what we do every day. You have to know your settings and how to dial it in, plus not get frustrated and give up." Hendry repaired both core inserts and returned them to Medbio within a week.

"If something is in our facility, it's bad for our customer and our customer's customer because everyone is losing money, so we get things turned around as quickly and efficiently as possible," explains Mike Zender, Alliance mold maintenance manager, who describes his welding team as *little sculptors in steel*. "We're an extension of our customer's toolroom. We have to live inside the guidelines they set and recreate something that already exists while meeting our customer's needs."

"Given the complexity and timing of this

Image courtesy of Alliance Specialties and Laser Sales.

Laser welding offers a host of benefits for tool and die repairs over TIG welding.

job, Alliance is the only shop we felt super confident could do it and do it right," explains Steve Trierweiler, Medbio senior project engineer. "They have six laser welders on staff and a neat business model. They don't build molds but are here to help support mold builders and molders on the service side."

"The core inserts were ready to install when we received them, although we did have to go through customer qualification tests again," recalls Tim Smith, Medbio senior tooling engineer. "We passed and were back to molding that same week, which is good as our customer was almost out of parts."

Smith adds that Medbio was so impressed with Alliance's work on the unscrewing cores that they've already sent several other challenging projects to Alliance and have been equally pleased with the results. MMT

### FOR MORE INFORMATION

Alliance Specialties and Laser Sales Inc.
847-487-1945 / Info@AllianceLaserSales.com / alliancelasersales.com
Mike Zender, Alliance Mold Maintenance Manager
Medbio LLC
616-245-0214, ext. 113 / info@medbiollc.com / medbiollc.com
Tim Smith, Senior Tooling Engineer


Regal Components

Higher Standards for Molds and Dies

Call Us: 800-760-5715 Visit Us: regalcomps.com

**Custom precision core pins, sleeves, ejectors, blades and punches**

Molders with non-standard requirements can order custom precision core pins, sleeves, ejectors, blades and punches from Regal Components. Custom components are used in molding a variety of medical, electronics and consumer products that require extreme precision, such as needles sheaves, closures, nipples, pipettes, IV connectors, shavers, electronic components and writing instruments.

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, PM1 0V420SS for greater control over thermal transfer, tensile strength, hardness and other physical properties. The molding surface can be polished, coated and/or plated.

Call Us: 800-760-5715 10 Almeida Avenue, East Providence, RI 02914

727-299-0800 727-499-7109 sales@regalcomps.com regalcomps.com

# Contraction is the Consistent Trend for Moldmaking

## August – 43.7

Moldmaking activity has contracted for the fifth month straight, ending August at 43.7, down two points from July.

All Gardner Business Index (GBI): Moldmaking components contributed to this overall contraction. Most significant in August was the contraction of employment, dropping a full three points from July when it was just hovering above flat. While noteworthy, contraction in employment is not surprising given that it was accompanied by another month of contraction for new orders, production and backlog, each of which is related to employment. When new orders contract, production catches up to backlog and then contracts. Add the employment surge thanks to the pandemic, and it is due to contract in line with these other components.

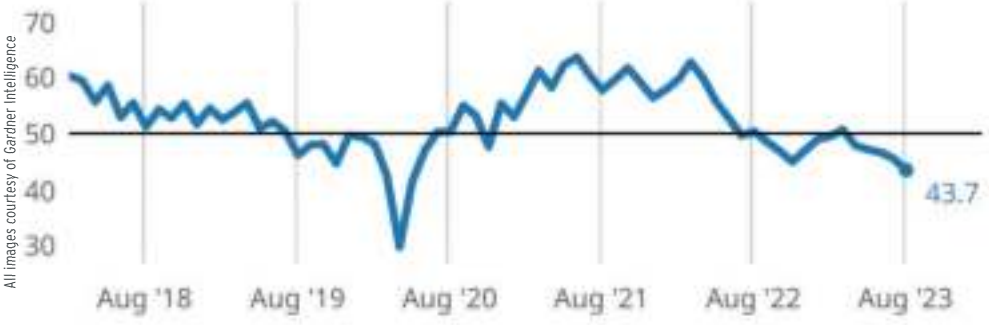
Supplier deliveries inched about as close as possible to flat without landing at 50, the line between contraction and expansion. Supply chain disruption in the rearview mirror is a good thing. At the same time, demand levels that are easily and quickly met are associated with concerns about volume robustness.

Exports steadily contracted again as well. Sentiment regarding future business expanded a bit faster in August, suggesting that despite current trends, there is still optimism that things will improve in manufacturing. MMT

**ABOUT THE AUTHOR**

**Jan Schafer, MBA, is the director of market research for Gardner Intelligence, a division of Gardner Business Media (Cincinnati, Ohio, U.S.). 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**

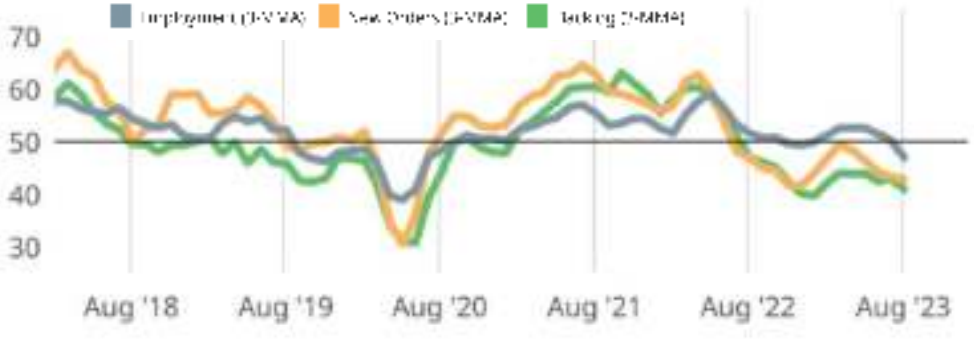
**Gardner Business Index (GBI): Moldmaking**




GBI: Moldmaking activity dropped two points in August.

All images courtesy of Gardner Intelligence

**Employment, New Orders and Backlog (Three-Month Moving Average)**




Backlog and new orders components are related to the contraction in employment.

PRESENTED BY GARDNER BUSINESS INDEX

**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.*

*Make Better Decisions for*

# COMPETITIVE ADVANTAGE

**You know a lot about your business, customers and prospects. And you know there's more to know...**

**If your business is related to manufacturing, we have knowledge and insights for YOU! Any information we do not have, we can get through custom research.**

Our access to 334,000 manufacturing professionals at more than 171,000 facilities, combined with industry knowledge and research/analysis expertise, means you can be better informed to make better decisions.

Take advantage of one of our industry research programs or collaborate on a custom project and reel in the benefits.


## INDUSTRY PROGRAMS

- Gardner Business Index
- Capital Spending Projections
- Top Shops Benchmarking
- World Machine Tool Report
- Industrial Buyer Influence Insights

## CUSTOM PROJECTS

- Brand Perception
- Market Landscape
- Need-Gap Assessment

LEARN MORE AT

**gardnerintelligence.com**

GARDNER INTELLIGENCE

# #ICYMI

Content you may have missed. Read full stories with the QR codes provided. (This content is collected based on analytics and represents a variety of content and topics such as videos, products, features, etc.)

## How to Change Out Molds in 10 Minutes or Less

In this process demonstration, Engel, in cooperation with Stäubli Corp., showcases a quick mold change system that averages 10 minutes but can take as little as seven, which is particularly beneficial to mold builders involved in short-run production molds.

## Key Pain Points and Leverage Areas of Advanced Tooling

*MMT* editorial director Christina Fuges chats with Dr. Ahmed Arabi Hassen, R&D staff scientist, Oak Ridge National Laboratory (ORNL), about advanced tooling research and development. ORNL and the University of Toledo, College of Engineering conducted road mapping sessions to solicit input from industry leaders on research that will benefit U.S. tooling manufacturers.

## SPE MTD 2023 Mold Designer of the Year

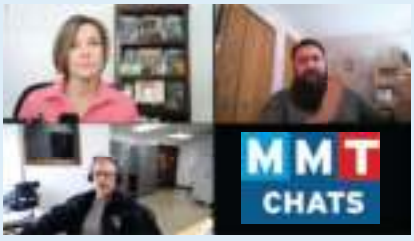

Newly named SPE Mold Technologies Division 2023 Mold Designer of the Year, Chuck Heitmeyer of Allied Moulded Products, talks about his passion for mold design. Heitmeyer has more than 40 years in mold design.


## Turning the Tables on Me … Conversation All About Moldmaking

*MMT*'s Christina Fuges was a guest on Tebis' All-Axis podcast where she and host Michael Thiessen talk all things moldmaking, covering topics such as the evolution of moldmaking, the pandemic's impact on the industry and more.

## 30 Under 30 Honoree, Cultural Innovator, Leader Grower, Improvement Maker

Hillary Thomas, Westminster Tool's vice president, talks about leading cultural change, driving strategic company improvements, growing and supporting leaders and spreading awareness of manufacturing and its benefits to the community.




## The Need for Broader Additive Manufacturing Education to Understand Its ROI, Part 2

This *MMT* Chat continues the conversation with Action Mold and Machining, as two members of the Additive Manufacturing team dig a little deeper into AM education, AM's return on investment, and the facility and equipment requirements to implement AM properly.

## Insights and Best Practices for Mold Care

*MMT* editorial director Christina Fuges sits down with Michael Muth, president of Slide Products, to discuss what products and practices he considers to have helped the moldmaking industry the most when it comes to caring for molds.

## Explaining Moldmaking Versus Mold Manufacturing

In order to train the next generation of moldmakers, it is important to differentiate between a moldmaker and a mold manufacturer. *MMT*'s Christina Fuges sits down with Don Smith, Scholle IPN's North American tooling manager, to discuss the distinction.

## MOLD MAINTENANCE

**Commonly asked questions about the various technologies, processes and strategies used in moldmaking along with their answers and additional sources of information.**

Image courtesy of MoldTrax.

**Q: What are the proper steps to a mold maintenance plan?**
**A:** The eight stages of systemized repair: PM preparation, disassembly, troubleshoot, correction action, clean, assembly, final check and stage/rack. Each of these stages can be broken down into 10 vital steps. For example, final check:

- Verify all available cavities are open and those unavailable are blocked.
- Verify current cavity identification numbers are correct.
- Air/water check all cooling circuits.
- Electric test manifolds, heaters, probes and thermocouples.
- Check knockout rods and components for uniformity, length and condition.
- Complete repair sheet form and return to the mold maintenance office.
- Enter repair sheet data into the maintenance system.
- Tag and place salvageable tooling into appropriate rework bin.
- Track mold location and status.
- Stage mold in appropriate location.

*Hands-on Workshop Teaches Mold Maintenance Process*

**Q: What is a way to maintain and clean conformal cooling channels?**
**A:** Use an advanced channel cleaning system with Industry 4.0 capabilities and patented technology that combines chemical and mechanical action to free and dissolve unwanted material in both conventional and conformal cooled channels.

*Full Automatic Waterline Maintenance*


Image courtesy of *MoldMaking Technology*.

**Q: What are some key steps to preventative hot runner maintenance?**
**A:** Clean hot runner controllers by taking them apart once or twice a year. Take the cards out and check for dust and that the fans are operating properly. For the hot runner itself, take it apart and check seals and make sure tips are within spec; then once the system is reassembled, use the hot runner controller with mold diagnostics that give you temperature, make sure wires are correct, and heaters and thermocouples are working.

*Hot Runner Maintenance Tips*

Image courtesy of *MoldMaking Technology*.

**Q: What does a mold cleaning program look like?**
**A:** A complete mold cleaning and surface treatment program includes a thorough cleaning of the mold, flushing the cooling channels, checking the cooling channels' flow rates, performing a leak integrity check, coating the cavity, core, pins and slides for wear protection, and coating the cooling channels to prevent scale, rust and leaks.

*Components of a Complete Cleaning and Surface Treatment Program*

Image courtesy of Alcadyne.

**Q: What should a mold builder ask before sending out a mold for maintenance?**
A: When will the tool be ready to go out? When do you need it back? Do you have any pictures of the tool and/or the damaged area? Do you have any last shots or piece parts? Do you have drawings, pictures or files?

*Questions and Considerations Before Sending Your Mold Out for Service*

Image courtesy of Alliance Specialties and Laser Sales.

For more information, visit each FAQ's original article with the QR codes provided.

## MOLD MATERIALS

### Cast Plate Aluminum Alloy is Suitable for Production Mold and Dies

Alimex ACP7 from **Alimex Precision in Aluminum Inc.** is a cast aluminum alloy from the 7000 series that is quickly gaining popularity among North American moldmakers. In the past, aluminum tooling was only used for testing and building prototypes, typically producing 50 to 1,000 parts. Today, especially with the 7000 series aluminum, it is used in production dies for 50,000 to 100,000+ shots.

Alimex ACP7 offers moldmakers a product that is highly beneficial for applications that require high mechanical properties, material stability and excellent machinability. The alloy's high hardness properties, typically around 121 HB, also enable good polishing quality and wear resistance. The mechanical properties of ACP7 are similar to those of a 7075 alloy, the company notes, but ACP7 has more consistent properties throughout the material, especially in thicker gauges used for die-making. ACP7 is available in thicknesses up to a max of 19.5", and is fully stress relieved for optimal machining qualities.

According to the company, ACP7 is more cost-efficient and readily available than similar 7000 series rolled products used in the market. ACP7 is also weldable, and as the mill producer, Alimex has MIG and TIG welding guidelines available. Coatings for aluminum molds, particularly in injection molding or die-casting, are often essential to enhance mold durability, reduce friction and improve the release of molded parts. ACP7 also works well with many of these coatings.

Alimex sells ACP7 to moldmakers through its metal distribution partner network. The company is also directly available for product technical advice and can help find suitable distributors for customers at any time.

**Alimex Precision in Aluminum Inc. / 803-339-0757 / alimexamericas.com**

### Micro-Milled Steel Plate Cuts Mold Build Times by 10-15%

**Steel 21** supplies A36 and 4140 grade steel plate for plastic injection and compression molds and base plates. Its team uses customer-supplier CAD date to flame-cut details (high-definition plasma cutting through 2" and Oxyfuel through 8" thick) and then finish plates with the company's patented "21 Micro Milling" process. This enables the "ground" plate steel to hold tolerances that are said to be three times flatter and five times smoother than a Blanchard grind and reduces build times for moldmakers by 10-15%.

Steel 21 highlights its timely communication and dedication to quality. The company only uses ASTM-certified plate to guarantee high-quality material and checks every plate with an indicator to ensure it is within its customer's requested tolerance. Steel 21's goal is to help customers become more efficient through its innovative processes and passion for consistent improvement.

In addition, Steel 21 offers Machine Complete services, producing build plates that are ready for mounting upon receipt. A36 and 4140 hot-roll steel for molds, dies or baseplates are available.. Pin plates, clamp plates, ejector plates, manifolds and rails are all additional products offered.

**Steel 21 / 616-884-2121 / steel21.com**

## CUTTING TOOLS

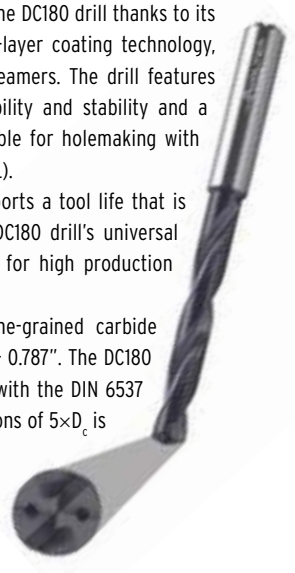
### Solid Carbide Drill Designed With Mold Machining in Mind

**Walter USA** is launching a new tool, the X-treme Evo Plus drill, in the DC180 *Supreme* product range. Designed to boost productivity and process reliability in mold and die, general mechanical engineering and other applications, the solid carbide drill with internal coolant is highly effective for drilling steels, stainless steels, cast irons, non-ferrous metals, heat-resistant super alloys and hard materials (ISO P, M, K, N, S and H workpiece groups). Being a *Supreme* category drill, the cutting tool is said to be designed not just with high tool life in mind, but also process parameters and productivity.

Users can achieve maximum productivity with the DC180 drill thanks to its Krato-tec aluminum titanium nitride (AlTiN) multi-layer coating technology, which was specifically developed for drills and reamers. The drill features a straight cutting edge to ensure process reliability and stability and a 140-degree point angle. X-treme Evo Plus is suitable for holemaking with emulsion, oil or minimum quantity lubrication (MQL).

When compared to competing drills, Walter reports a tool life that is about 50% longer. An additional benefit is the DC180 drill's universal application at high cutting speeds. It is suitable for high production volume applications with a large number of holes.

The WJ30EZ-grade drill comprises a K30F fine-grained carbide substrate and is available in diameters from 0.118 - 0.787". The DC180 Supreme in dimensions of $3\times D_c$ is in accordance with the DIN 6537 short standard, and the DC180 Supreme in dimensions of $5\times D_c$ is in accordance with the DIN 6537 long standard.



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

## CUTTING TOOLS

### Solid End Mills are Suitable for Heavy-Duty Roughing Steel, Stainless Steel

**Sandvik Coromant** is expanding its offering of CoroMill Plura HD solid end mills for heavy-duty roughing in steel and stainless steel with two new grades. This new generation of grades features the Zertivo 2.0 coating, which combines high productivity with an exceptional metal removal rate and high process security.

CoroMill Plura HD is Sandvik Coromant's optimized solution for heavy-duty applications up to 2×D in steel and stainless steel (ISO P and ISO M), offering safe and efficient solid end milling. The new Zertivo 2.0-coated grade further improves tool life, process security and productivity.

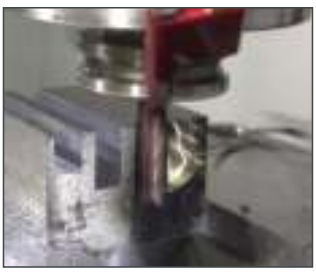
"With Zertivo 2.0, we are applying our comprehensive knowledge in coating technologies to our solid round tools," says Antti Wikström, global product manager, solid end mills, at Sandvik Coromant. "This gives us an opportunity to offer unique, custom-made coatings that can handle our customers' machining challenges with superior performance and tooling efficiency."

The new grades enable a 30% increase in cutting speed recommendations for the primary ISO P and ISO M application areas, as well as secondary ISO K and ISO S materials, thanks to their optimized flute shape, which offers effective chip evacuation. The grades designed for stainless steel machining come in two variants: one with internal coolant for improved temperature control and chip flow, and one without internal coolant.

The standard assortment offers diameters from 2-25 mm, a 2×D depth of cut, 4 to 5 teeth and a ramping angle of 5 or 7 degrees. Tailor-made options are available within the Customized Solutions range.

**Sandvik Coromant / 201-794-5000 / sandvik.coromant.com/en-us/pages/default.aspx**

### Roughing End Mill Line Combats High Metal Removal Operations



To meet customer demands, **Kyocera SGS Precision Tools** has expanded the Z-Carb HPR high-performance five-flute end mill line with more than 900 new tools featuring new long, extended reach and chip breaker options to combat a wider variety of high metal removal roughing operations and optimize surface finishes.

Utilized extensively in automotive, general machining, mold and die and other industries, Z-Carb HPR's five-flute design is engineered to increase productivity by 20-40% over conventional three- and four-flute end mills. The line features variable indexing geometry, which improves chatter suppression over symmetrical designs, and is equipped with various lengths, reach, square and corner radius styles, along with new chip breaker options to address different machining situations.

Z-Carb HPR end mills are coated with Ti-Namite-M for high heat resistance and tool life enhancement, and Ti-Namite-A for wear, edge buildup resistance and extended tool life, ensuring high performance in difficult-to-machine materials like titanium, stainless steel, cast iron, high-temp alloys and more. Special tooling design attributes are available upon request.

The series' cutting diameter is 1/8 – 1", and length of cut 1/4 – 3". Special options include internal coolant, weldon flat and chip breaker.

**Kyocera SGS Precision Tools / 330-688-6667 / kyocera-sgstool.com**

## MOLD COMPONENTS

### High-Speed Steel Ejector Pins for Plastic Injection Molds

**PCS Company** introduces M-2 ejector pins, an enhancement to its extensive line of high-quality, precision ejector pin products for plastic injection molds.

M-2 ejector pins are made of high-speed steel, which gives them higher wear resistance and better machineability than other currently available pins, according to PCS. Pin diameters range from 1/32" through 1/4" with lengths of 6" and 10". The diameters are precisely ground to provide dimensional stability and high surface finish quality .

"The M-2 ejector pins were added for customers who, increasingly, are requiring the specification of M-2 high-speed steel for their particular molding

applications and tool designs," Paul Hauser, product manager, says.

M-2 ejector pins are through hardened to 60-63 RC, with a diameter tolerance of 0.0003". Additional features include eliminating chipping from form work and their ability to be used either as an ejector pin or core pin

**PCS Company / 800-521-0546 / pcs-company.com**

## HOT RUNNERS

### Single-Shot Nozzle Guarantees Efficient Injection Temperature Control

The Single Shot H6300 from **Hasco** offers an optimal price-to-performance ratio in the field of single nozzles and features improved temperature control. The range, extended with hardened nozzle tips, as well as single-hole and hot tip torpedo options – which are also used with the Vario Shot – increases this nozzle's application possibilities.

The Single Shot comes in two sizes and is suitable for the production of small- and medium-sized injection molding with a shot weight of up to 800 g and immersion depths of more than 170 mm.

The interchangeability of the relevant wear parts, including tips, melt chambers and the thermocouple, facilitates servicing and maintenance. The heating unit, which is connected to the body of the nozzle with only one control circuit, is said to guarantee a uniform temperature over the full length of the nozzle.

Because of the suitably adapted heating-capacity distribution and the gentle conveyance of the melt through generously dimensioned flow channels, a homogeneous temperature profile and low-shear mold filling are ensured. Through the optimized position of the thermocouple and the efficient insulation from the mold, plastics with a more limited temperature range can also be reliably processed.

When developing this nozzle, Hasco aimed to achieve the largest possible melt throughput plus a compact design and maximum stability. Its construction, with only one control circuit, reduces the time required for design. The energy requirement for the Single Shot during use is reported to be particularly low.

Even with the Single Shot nozzle, users do not have to dispense with a variety of injection options. A range of torpedoes and screw-on melt chamber variants are, for example, available. In addition to the classical pin gate, these also permit the nozzle geometry to be readily introduced into the cavity plate and, in the event of wear, allow rapid restoration of gate quality. Extended melt chambers are available for gates to free-form surfaces or sub-runners with a sprue.

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

### Hot Runner Cooling Design Lowers Energy Consumption, Maintenance

**Oerlikon HRSflow** has developed a hot runner injection molding system, HRScool Evo, in which the hydraulic cylinder that positions the pin does not require separate, active water cooling. Since the technology's improvements announced in 2022, the company cites energy consumption reduction at the drops by up to 10%, depending on the system size and application. Moreover, eliminating active water cooling reduces the total number of components for the hot runner.

Hot runner system cylinders act as high-precision actuators, and typically use water cooling to ensure the optimum working temperature is maintained. With HRScool Evo, a thermally insulating air gap toward the cavity is used to reduce the heating of the cylinder and the thermal loss of the manifold.

In addition, use of a highly heat-conductive cover on the opposite side ensures optimum heat dissipation toward the cold clamping platen. The company notes that the height can be adjusted via telescopic supports, enabling molders to tune heat transfer and thermal uniformity over the entire hot runner system to maximize part quality.

Massimo Rossi, R&D director at Oerlikon HRSflow, stated in a release that in addition to energy efficiency, the elimination of lines and connections required for water cooling means these components can no longer become clogged or corrode. In addition, the ability to remove the actuators while the needles remain in the hot runner system further reduces maintenance, and limiting the design to a thermally insulating and thermally conductive element allows for a more compact design.

**Oerlikon HRSflow / 855-477-3569 / hrsflow.com**

### Melt Pressure Sensor Takes Measurements Directly in the Nozzle

**Kistler** has introduced the Type 4004A piezoresistive melt pressure sensor, featuring a front diameter of 3 mm, which enables it to operate directly in injection nozzles and small extruders. In these spaces, it can measure both pressure and temperature in direct contact with the plastic melt, with potential applications in hot runner systems and additive manufacturing.

With an operating and measurement range of up to 350°C, the 4004A melt pressure sensor can be used directly in the hot runner to deliver precise measurements of pressure and temperature in injection nozzles and extruders.

For the two different processes, the 4004A features two separately calibrated pressure ranges, going up to 2,500 bar (36,000 psi) for hot runners and up to 1,000 bar (14,500 psi) for additive manufacturing. Changes in the pressure signal could detect debris in small nozzles, wear in the nozzle or melt backflow.

Access to key parameters comes via transducer electronic data sheets (TEDS), and since the sensor's diaphragm is made of hardened steel with an IP65 degree of protection, the 4004A can be used for applications involving fiber-reinforced plastics. It can also be operated in medical and food packaging sectors since no oil or mercury are used to transmit the signals.

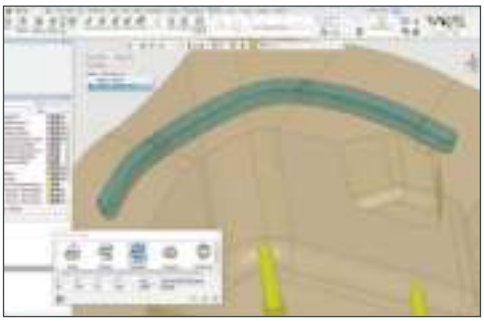
The temperature-compensated pressure signal can be accessed via the analog output or the sensor's RS232 interface. This allows it to connect to Kistler's ComoNeo process monitoring system.

**Kistler Instruments Corp. / 864-963-5685 / kistler.com**

## SOFTWARE

### Mold/Die Software Establishes Higher Productivity for Mold Development

**Cimatron**, CAD/CAM software supplier for the mold and die industry, has released version 2024 of its product with stronger core capabilities, while incorporating new technology through collaboration with Sandvik Coromant. Cimatron 2024 simplifies and automates many tasks for mold designers for higher productivity, and more options for digital connection.



Moldmakers are said to gain powerful CAD enhancements for rib construction with added functionality for working on multiple curves in a single operation and automatically extending rib geometry to part side walls. In addition, Cimatron 2024 can now create partial ribs in complex scenarios where a complete rib cannot be produced. Within mold design, the construction of 3D runners has been improved, providing better design control based upon constant volume, vertical orientation or section orientation.

Electrode design is a critical aspect of the mold production process. Version 2024 includes automation for the Burn Body operation to optimize the electrode body shape, control of electrode extensions and non-cutting rules for manual construction.

Another significant release, an enhanced automatic feed control (AFC) routine, has been redeveloped and optimizes stock removal for roughing operations by automatically controlling the feed rate, resulting in smoother motion, faster machining times, longer tool life and fewer changes on the machine spindle and axes.

A new option for pre-drilling during roughing operations prevents cutters from plunging into blind pockets. Cimatron 2024 also introduces a new three-axis deburring procedure to create chamfers or fillet shapes along sharp edges, as well as five-axis updates that allow the automatic use of remaining stock from previous three-axis operations during roughing, and enhances the five-axis auto tilting feature.

Several notable CAM features involve Cimatron 2024's On Machine Inspection Probing module, tool paths and implementation of an NC Template Manager. Moreover, the software establishes a direct integration with the CoroPlus Tool Library and TDM tool management system, giving users access to a collection of more than 900,000 cutting tool items.

For a more detailed list of updates, visit Cimatron's website.

**Cimatron / 877-596-9700 / cimatron.com**

## INSPECTION & MEASUREMENT

### CMMs Give Moldmakers Precision, Sustainability, Ergonomic Operation

A new generation added to the **Zeiss** Prismo family of CMMs raise the standards of precision measurement. Zeiss' four devices, Prismo, Prismo fortis, Prismo verity and Prismo ultra, deliver maximum accuracy at high measuring speeds, reduce the carbon footprint and enhance user safety.

Zeiss Prismo devices, which carry a DGUV type certificate, are used when tolerances of a few micrometers or less are specified for components. All four members of the new generation are suitable for use in the controlled environment of a laboratory and in the harsh environment of a production line.

Sustainability, energy efficiency, noise reduction and ergonomic operation are some demands the Zeiss Prismo family meet. The PowerSaver feature, for example, automatically disconnects Zeiss Prismo from the power supply after a preset time and sets the control to standby.

Improved handling include a more flexible storage option; a new front cover design for easier manual loading of heavy parts; and safety laser scanners.

**Zeiss Industrial Quality Solutions / 800-327-9735 / zeiss.com/metrology**



BORIDE
Engineered Abrasives

Michigan manufacturer & global distributor of high-quality abrasives.


BorideAbrasives.com • info@borideabrasives.com • 231.929.2121

## INSPECTION & MEASUREMENT

### Compact Digital Inspection Microscope Supports Immediate Information Capture

**Vision Engineering** highlights its VE Cam, a simple-to-use compact digital inspection microscope for a wide range of applications.

The VE Cam is a complete, standalone system for circuit board examination, PCB debug activities or for discovering imperfections, and to trace problems in a wide range of industrial applications. It is ideal for applications from goods-in quality inspection to shop floor inspection of turned parts, and suitable for manufacturing electronics, plastics, ceramics, mechanical engineering and AM.

VE Cam is available in two variants with differing fields of view (FOV), VE Cam 50 (50-mm FOV) and VE Cam 80 (80-mm FOV). Showcasing new and established features that are available on Vision Engineering's EVO Cam II, the VE Cam enables users to do more within a smaller footprint.

The microscope does not require a PC, keyboard or mouse. With Wi-Fi screen sharing, results can be shared wirelessly to smart devices and displays with screen mirroring. Enhanced productivity features include 10 user programmable presets, six hotkeys for instant one touch access to most commonly used presets and a configurable interface.

**Vision Engineering Inc. / 800-644-7264 / visioneng.us**

## MOLD MAINTENANCE, REPAIR & SURFACE TREATMENT

### All-in-One Mold Repair and Polishing Kit

**Boride Engineered Abrasives** has launched its first Mold Repair Starter Kit. This convenient, cost-saving, all-in-one repair and polishing kit includes a variety of the company's most popular products to get users from start to final finish. Well-suited for beginner polisher and expert polisher alike, the Mold Repair Starter Kit comes in a portable, lightweight plastic case that can be carried directly to the mold for instant repair or neatly stored at a workstation.

"We developed this kit to provide an all-in-one solution for easy mold repair and mold polishing. It's everything you need with the purchase of one item," says Lesley Murphy, Boride's marketing and sales manager. "It's perfect for those who want to try a variety of products and avoid having to order high minimum quantities."

A complete list of what the kit includes can be found online.

**Boride Engineered Abrasives / 800-662-0336 / borideabrasives.com**

MMT

ENGINEER / BUILD / MAINTAIN

MMT TODAY

**Stay current with *MoldMaking Technology* content that helps to drive mold manufacturing success.**

Delivered every Tuesday and Thursday, this e-newsletter includes information from the *MMT* editorial team and industry experts, including:

- Technical Features
- Application Stories
- Tips
- Video Interviews (*MMT* Chats)
- Webinars
- News
- Industry Data
- Product/Services
- Events

**Subscribe to *MMT Today* for FREE**
**moldmakingtechnology.com/subscribe**

**moldmakingtechnology.com**

MoldMaking TECHNOLOGY

PRECISE ALIGNMENT
TOP MACHINED BAR LOCKS

- For long-term alignment of multi-plate and large molds, machined from parting line.
- Six Bar sizes pair with corresponding Guides.

PROGRESSIVE COMPONENTS
WWW.PROCOMPS.COM/NEW

## ADVERTISERS' INDEX



MoldMaking Technology 25 YEARS

THANK YOU FOR CELEBRATING 25 YEARS WITH US!

*MoldMaking Technology* 25TH Anniversary
MARCH 28-30, 2023 | PTXPO | ROSEMONT, IL

TIP

MOLD MATERIALS

# Five Benefits of Aluminum Tooling

Image courtesy of *MoldMaking Technology*.

No matter what mold material you choose, always consider part design, resin, part quantity, part geometry, mold builder, molder and industry-standard mold maintenance.

By Bob Lammon

Aluminum as a mold material can support complex designs, tight tolerances, high aesthetic finishes, unfilled/filled resins and production volumes without compromising quality. The phrase "production quantities" is highly subjective and often used to imply that steel tooling is the only choice. The fact is that most projects' production quantities can be accomplished easily by aluminum tooling.

Aluminum tooling is a low-cost alternative to steel tooling for lower production quantities up to 1 million shots. Case hardening can produce even higher quantities beyond 1 million. A multicavity tool can bring the production capacity to several million for certain plastic resins.

Today's aluminum options are better than steel alloys for many mold projects, but you must do your homework. Review the following five reasons to consider aluminum tooling:

1. **Design Validation**
   Education during the design phase when working with an aluminum prototype tool speeds up the final production tool build and part manufacturing. Using aluminum, you can consider complex designs and hard-to-fill resins to validate the final design concept.
2. **Mold Cost Savings**
   Aluminum tooling will always be cheaper than steel tooling. While aluminum is pound-for-pound more expensive than steel, aluminum weighs less and is often less expensive. The major cost savings on an aluminum mold is realized through faster machining efficiencies and longer-lasting cutters because aluminum cuts faster and easier than steel and burns and polishes faster when EDM is necessary.
3. **Part Savings**
   Aluminum's greater thermal conductivity makes processing easier and more consistent for each production run, which allows technicians a bigger process window for the best setup to validate the part for production. Faster process cycle times also increase profits and improve available capacity.

   Because aluminum molds heat up and cool down faster than steel molds, faster mold setups can be achieved with less scrap for startup and shutdown. Lastly, lower injection pressure can often fill aluminum molds, yielding less machine and mold wear and electrical costs.
4. **Part Quality**
   Aluminum's natural thermal conductivity also reduces hot and cool spots in a mold, translating into a more stable part. The resin flow through an aluminum mold is normally faster and more consistent, producing a higher-quality part with less scrap.

   To validate a new part design before it's launched into production, consider aluminum because it enables technicians a larger process window even with very intricate and challenging parts. Aluminum also offers dimensional stability where heat deformation affects critical design tolerances, yielding greater success with complex designs.
5. **Speed-to-Market**
   Too often, designs from OEMs take several weeks or months, with first-off part deliveries already behind schedule. Aluminum molds are built faster than steel molds, process more easily and bring a project to market quicker thanks to the material's improved tensile strength, machinability, low weight, thermal conductivity, uniformed distribution of mechanical properties, electrical conductivity, dimensional stability and high wear resistance. MMT

## FOR MORE INFORMATION

Phoenix Proto Technologies
269-467-8300 Ext. 202 / bob.lammon@phoenixproto.com / phoenixproto.com

My TechSpex has a great new foolproof interface, huge database and advanced filtering options that make it the go-to platform for all my machine tool sourcing needs.

**"Saves me so much time and effort!"**

★★★★★

# TECHSPEX

## The Machine Tool Search Engine

TechSpex, the world's largest online database of new machine tools, introduces its refreshed and modern user-friendly interface.

Browse by machine attributes including **type**, **size**, **spindle speed**, **horsepower**, **performance metrics**, **geographical location** and more! You'll find all the important details about machine tool builders and distributors.

Set up your free account today and revolutionize how you discover the tools and supplies your shop needs to thrive.

### SEARCH & EXPLORE

Investigate more than 600 machine tool brands and 7,500 machine models in one premier database.

### COMPARE & SHARE

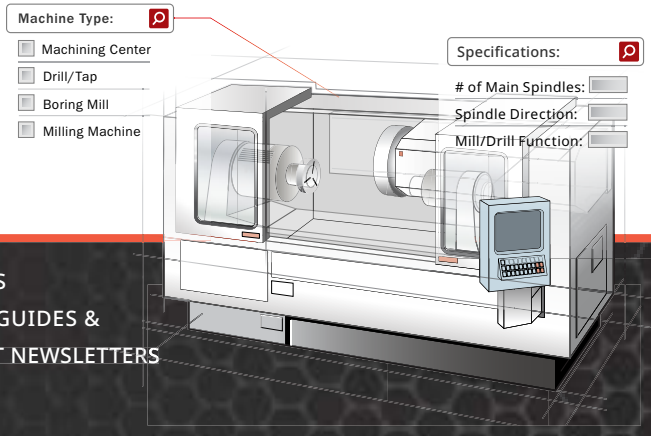
Save your search data and collaborate with your team members inside the tool.

### CLICK & COLLECT

Request quotes with one click from one or more sellers for simplified decision making.

**Your Search for Machine Tools Starts Here ›**

**techspex.com**




ADVANCED SEARCHES | COMPREHENSIVE EQUIPMENT PROFILES
EXPERT INSIGHTS & ANALYSIS | SUPPLIER DIRECTORY BUYING GUIDES & WHITEPAPERS | VIRTUAL MACHINE TOOL TOURS | NEW PRODUCT NEWSLETTERS

# E-Multi®

## EXTEND YOUR CAPABILITIES INTO 2K MULTI-SHOT APPLICATIONS


- ✓ Easily and economically convert your single shot injection machines to 2K multi-shot.
- ✓ Provides precision processing and repeatability.
- ✓ Broad shot range: 0.26 – 42.0 oz (7.7 -1,237g)
- ✓ Suitable for applications across a wide range of industries.
- ✓ All electric: lower energy consumption and suitable for clean room applications.
- ✓ Compatible with a wide range of thermoplastic materials including PCR and Bio-Resins.
- ✓ Available for Liquid Silicone Rubber (LSR)





Mold Masters®

**CONTACT US TODAY!**
905-877-0185 • info@moldmasters.com
www.moldmasters.com