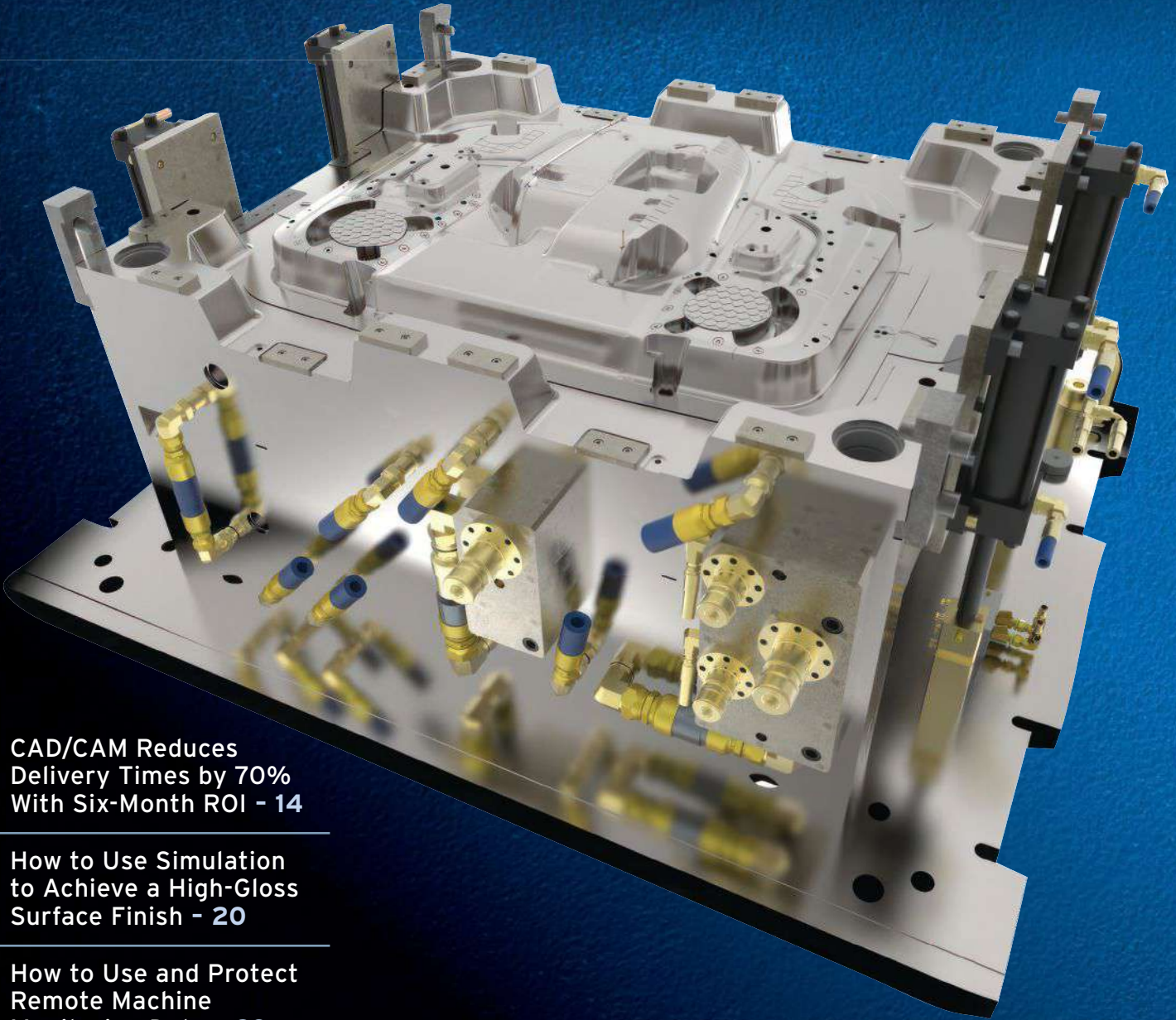


MoldMaking

TECHNOLOGY



CAD/CAM Reduces
Delivery Times by 70%
With Six-Month ROI - 14

How to Use Simulation
to Achieve a High-Gloss
Surface Finish - 20

How to Use and Protect
Remote Machine
Monitoring Data - 23

Partnership for
Hands-On Moldmaking
Education - 26

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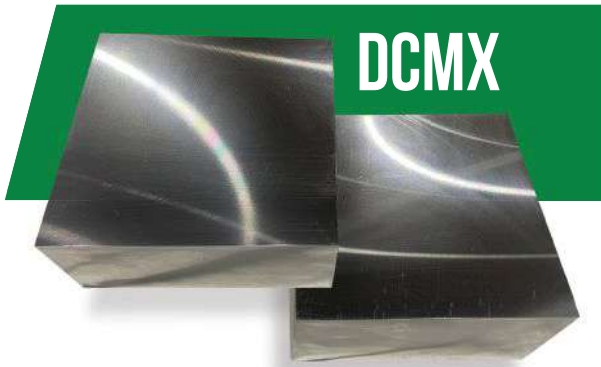
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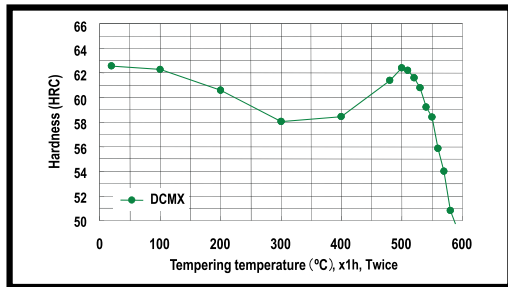
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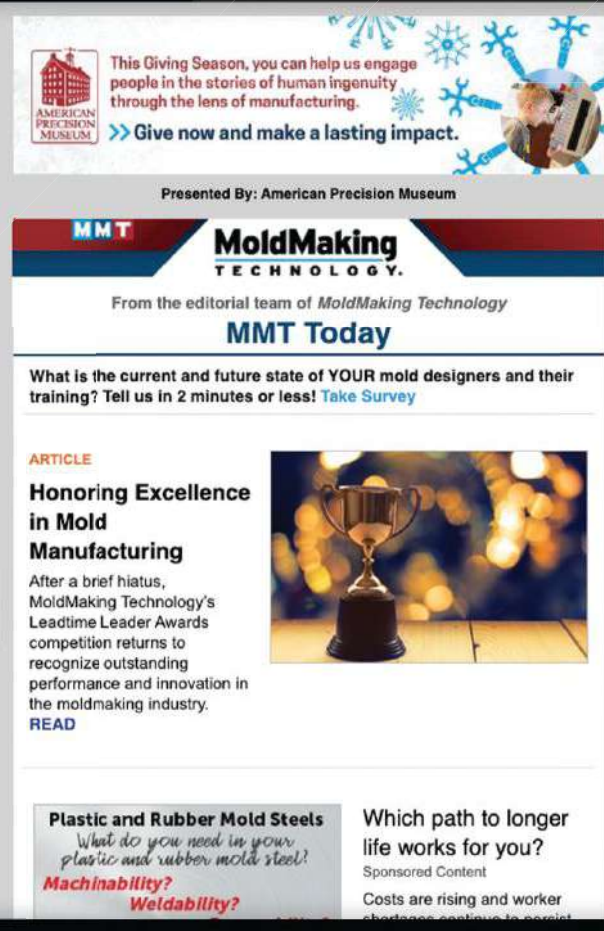


Stay Informed Between the Issues

MMT Today is your essential biweekly breakdown of news, tips, trends and topics in mold manufacturing.

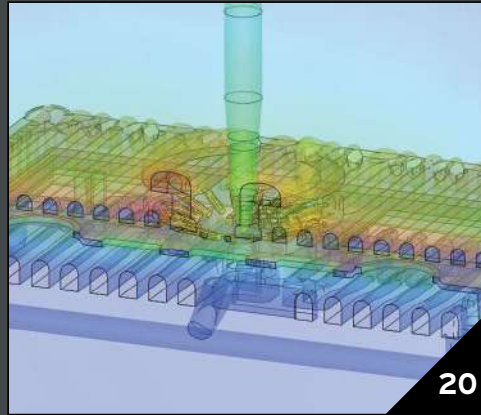
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CAD/CAM Software Reduces Delivery Times by 70% With a Six-Month ROI

Single integrated CAD/CAM package reduces translation errors, simplifies design process, improves shop efficiency and shortens tool lead times.

20 Software/Surface Treatment

How to Use Simulation to Achieve a High-Gloss Surface Finish

Combining simulation, conformal cooling, and a rapid heat and cooling process can predict and produce the required surface finish for high-gloss plastic parts.

23 Data Management/Machining

How to Use and Protect Remote Machine Monitoring Data

Collecting, analyzing and securing machine data in real time can substantially improve productivity, profitability and customer satisfaction.

26 Workforce Development

Mold Builder/High School Partnership Offers Hands-On Moldmaking Education

Electroform teamed up with Hononegah High School to give engineering and manufacturing students a hands-on moldmaking experience — including the design process, machining of components, assembly and mold sampling.

30 Mold Design/Sustainability

Innovative Mold Building Enhances Packaging Material Efficiency, Elevates Recyclable Design

A manufacturing-focused design and optimized tooling enhance material efficiency in packaging for a new medical instrument.

32 From the MMT Archives/Software

Managing all That Data

Product data management may have a bad rap, but making it a priority rather than an afterthought can help make the most of your design and machining information.




ON THE COVER

Cover image courtesy of Cimatron Inc. This month's cover shows the fixed half of a two-cavity mold for an automotive lower front door speaker panel. The tool has 16 separate lifter assemblies and lots of complex cooling channels and baffles due to the large number of ribs within the speaker core inserts. Part of the Sandvik Group, Cimatron provides mold-makers with an integrated CAD/CAM software solution for the design and manufacture of plastic injection molds and sheet metal stamping dies, as well as programming 2D to five-axis CNC milling machines. Find out more by reading how TK Mold & Engineering Inc. has been using Cimatron software for two decades to increase shop productivity, profitability and shorten tool delivery times on page 14.

Image courtesy (left to right): TK Mold & Engineering, SimpaTec and Beckman Coulter.

 VIDEO ACCESS

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A Look Ahead: Engineer, Build, Maintain, Manage



This issue's lineup sets the tone for the variety of topics, technologies and trends that we will cover in 2024. Notably, the continuing impact of CAD/CAM on delivery times and lead time reduction, ensuring a rapid return on investment via features and functions that streamline processes and enhance design precision.

For *software and surface treatment* methods, we highlight the use of *simulation* for achieving a high-gloss surface finish. Moldmakers can predict and produce the exact surface finish required for

high-gloss plastic parts through the strategic combination of simulation, conformal cooling, and a rapid heat and cooling process.

Data management and *machining* are crucial, emphasizing the pivotal role of remote machine monitoring. Real-time collection, analysis and secure handling of machine data are catalysts for substantial improvements in productivity, profitability and customer satisfaction.

The intersection of *mold design and sustainability* sees advancements that enhance material efficiency, employing a design for manufacturing approach and optimizing tooling design — such as adding ribs, flutes and structure — to boost packaging material efficiency.

Robotics, simulation software and metal 3D printing can significantly reduce the labor required during the moldmaking process, allowing for shorter lead times and lower costs.

Speaking of labor, *workforce development* remains a key focus. We highlight collaborative initiatives between mold builders and educational institutions. A notable example involves a partnership that provides engineering and manufacturing students with hands-on moldmaking experiences covering the entire spectrum, from the design process to assembly and mold sampling.

We also continue to *expand MMT's editorial advisory board* with a seasoned professional and president of a North Carolina mold shop who is passionate about high-speed machining, apprenticeship programs and the strategic growth of mold shops.

In this ever-changing, competitive industry, a commitment to innovation is required and remains evident. Through our ongoing *profiles*, we spotlight mold builders who, for example, use dedicated R&D facilities to pioneer new mold, machinery and automation technologies, staying at the forefront of high-precision mold manufacturing.

Also, due to reader feedback, fundamental principles are being brought back for a second look in a new series, *From the MMT Archives*.

As we begin the New Year, these emerging themes will influence the moldmaking community as it adapts to technological progress and a dedication to achieving excellence. If you have a topic that you'd like covered in *MMT*, reach out to me at cfuges@gardnerweb.com. [MMT](#)

Christina Fuges

Christina M. Fuges
Editorial Director

Follow MMT on:   Follow @MMT_ChristinaF

MMT TIPS

5

TRICKS OF THE TRADE

Great Tips from This Issue

1. From the Start

CAD/CAM with digital connectivity, templating, a standard mold component catalog, and direct integration with a cutting tool library and tool management system, as well as automation of repetitive processes, makes the design process more efficient from the very start.

PG. 14

2. The Power of Three

Injection speed, holding pressure and mold temperature influence the quality of high-gloss surface finishes. Variothermal temperature control can avoid these longer cycles.

PG. 20

3. Capture and Release

Remote monitoring systems can capture and analyze data related to process parameters, burn/cut conditions, operation stability and alarms. Monitoring these variables ensures that the production process remains within nominal operating conditions.

PG. 23

4. Project Success

Five aspects to a student/shop project: basic overview of moldmaking, shop tour, simple project scope, small component assistance, on-site visits and weekly classroom support.

PG. 26

5. Don't Delay

Simulation can help you understand how molds move across the shop floor, enabling the identification of backups before they happen.

PG. 48

THIS MONTH ON SOCIAL MEDIA

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#MMC23 #MMTBreakingTheMold

Joe Cherluck • 2nd
Vibration & Hot Plate Welding | Injection Molding | Tool Manufacturer | ...

At the 2023 Mold Making Conference, I was at a table with Tony Demakis (Alliance Specialties and Laser Sales) and a few others in the industry. Tony made the statement that we do a great job at this conference speaking to other manufacturers, but we fail to tell the rest of the world the importance of what we do.

In October, we were honored to be the recipient of the Comcast RISE award. Part of the package is a thirty-second TV Spot that will air locally. Keeping in mind Tony's comment, I asked my team to use this opportunity to create a commercial, not about us, but one that reflects the importance of manufacturing in our society and is a great career choice for the younger generation to take seriously.

The challenge is to get that message out in 30 seconds. Please take a look and leave a comment to let me know if we hit the mark...



#shopvisits #MMTtravels

Christina Fuges @MMT_Chri...
Snapshot of @MMTMag recent visit to IL
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@PlatinumTooling @IngersollTools
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- Christina Fuges** • 1st
MoldMaking Technology
Joe Cherluck this is GREAT! Your team 'very quickly' tells the story of the importance of manufacturing / #moldmaking! And I love seeing an MoldMaking Technology Editorial Advisor in there! Isaac Trevino 🙌
- Guy O'Gara** • 2nd
Automated Machine Systems, Inc.
Joe, you hit the bull's-eye. What a great message. This commercial needs to be seen by a national audience. We need manufacturing in America. Manufacturing jobs are a great alternative to a four year degree for many (both short-term and long-term pay off).
- Tony Demakis** • 2nd
Making a difference in the plastics industry through mold finishing and repair.
Love this! Glad I could inspire you to do more and tell your story and the story of what we do. Congrats to you and your team for all the recognition definitely well deserved.
- Adam Besso** • 3rd •
Hands-on Quality Systems Manager
That was well done
- Timothy J. Ford** • 2nd
Manufacturing Sales, Marketing and Business Development
Good Morning! Please read Joe Cherluck's post, watch the video and leave a comment...

#profile #MMTShapingTheMold

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#MMTRespectTheMold #thankful

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Liked by holocaustrucci and 8 others
moldmakingtechnology Happy Thanksgiving to our @moldmakingtechnology readers celebrating in the U.S. today!

#MMTChat #automation

MMT CHATS



Key Principles of an Automated System | MMT Chat

- Dale Kwilecki** • 2nd
Moldmaker at Oscar Inc.
I have known Demetre since my apprenticeship in 1978! Definitely one of the great mold makers in the world! A savvy businessman, and knows how to make things happen! I am glad Demetre has been a part of mold making career! I wish Amelia much success carrying on the tradition.
- Oliver Lindenberg** • 2nd
creating visions and executing strategies to turn around, develop and drive sustainable...
Well done, Demetre

5 Hot Runner Tips for Moldmakers and Molders
Best practices for initial hot runner tryouts and effective preventive maintenance.



#InCaseYouMissedIt

Meet New Board Member, Gabe English

By Christina Fuges

Gabe is a seasoned professional and the president of Western Carolina Tool & Mold located in Mills River, North Carolina. In his role, Gabe leads a team that specializes in the design, construction, repair and engineering modifications of plastic injection molds.

Gabe's responsibilities encompass the entire spectrum of the operation, ranging from customer relations and project management to quoting, cost analysis, job planning, engineering, talent development, financial decision-making and equipment procurement. He brings a wealth of experience to the table, having graduated from Blue Ridge Community College in machining technology and completed his North Carolina apprenticeship in 2003, accumulating a total of 8,000 hours of hands-on experience. Gabe's commitment to professional growth is evident through his attendance at numerous training classes over the years.

Before assuming the role of president at Western Carolina Tool & Mold, Gabe held pivotal positions, including production manager at Daystar Machining Technologies and shop foreman roles at A&M Tool Inc. and Alliance-Carolina Tool and Mold Corp. With 24 years in the mold building industry, he has experience in every facet of the trade — from bench work, programming, EDM, hard milling and high-speed machining to mold design and engineering, electrode design and manufacturing.

In recognition of his outstanding contributions, Gabe was nominated for the SPE Moldmaker of the Year in 2022. Beyond his professional achievements, he actively engages with the community, participating in Henderson County Economic Development initiatives, local machining programs and youth career days/education.

His expertise extends to high-speed machining, apprenticeship programs and the strategic growth of mold shops. As a member of the EAB, he will share insights on industry trends and news. Gabe eagerly anticipates connecting with industry peers, learning about their challenges and contributing his knowledge to foster growth and development.

Gabe's personal journey is closely intertwined with his family, particularly his wife, Holly, who plays a crucial role in supporting the business and managing administrative tasks seamlessly. [MMT](#)



Gabe English, president of Western Carolina Tool & Mold in Mills River, North Carolina, is one of MMT's new editorial advisory board (EAB) members. Image courtesy of Western Carolina Tool & Mold.

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Gabe English, President

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 mold-making industry to serve a three-year term.

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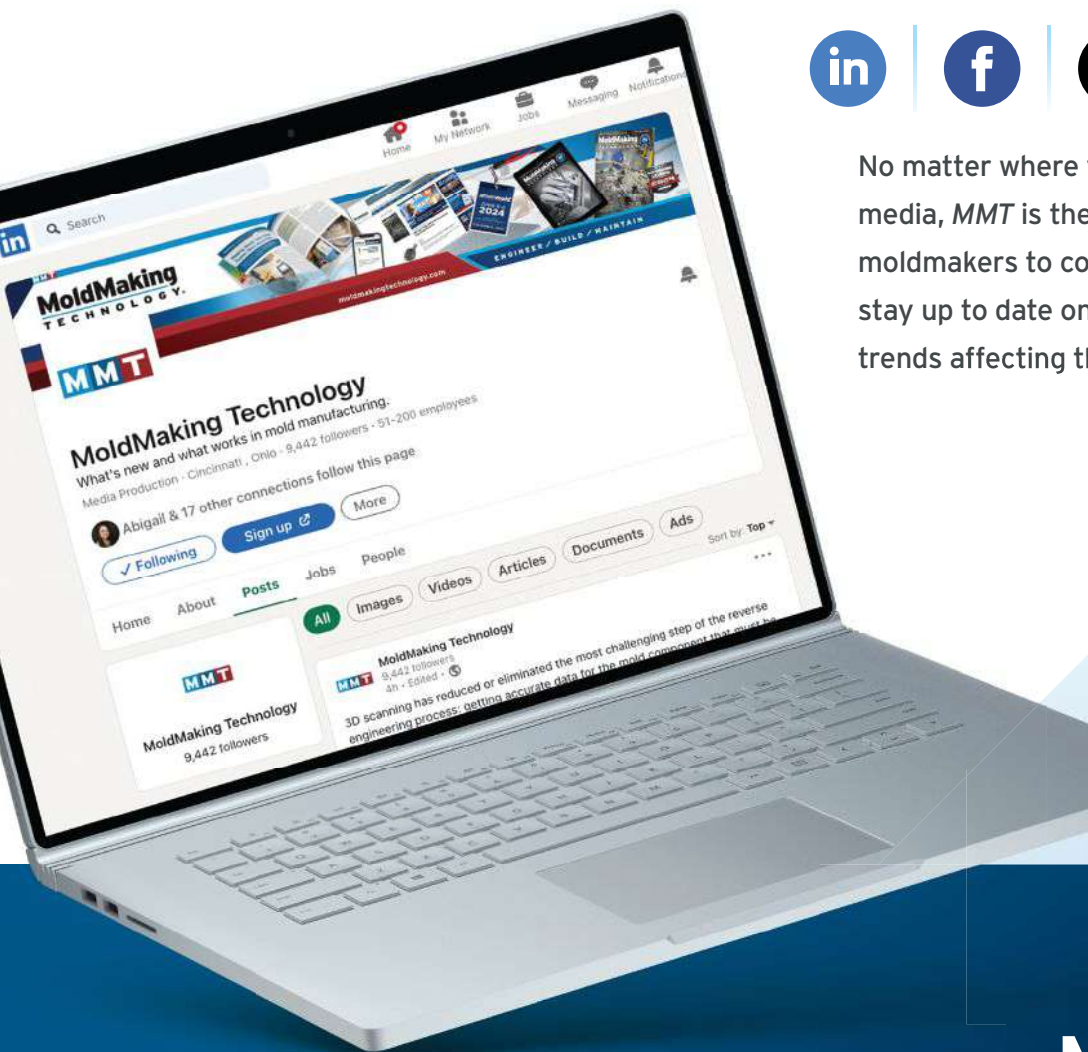
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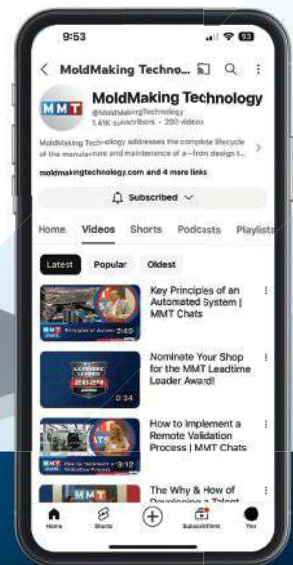
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No matter where you consume social media, *MMT* is there. Join your fellow moldmakers to connect, collaborate and stay up to date on news, technology and trends affecting the industry.



A Conversation With ... Boucherie

By Christina Fuges

Who is Boucherie?

John Williams, president, Boucherie USA:

Founded in 1928, Boucherie is a fourth-generation, family-owned business manufacturing brush-making machinery. Our mold division initially began in 1961 to support the brush block transition from wood to plastic. The company now comprises 300-plus craftsmen, focusing on engineering, innovation and reliability as a partner for precision molds in the consumer, technical and medical industries. Most of our workers are lifelong employees, starting early in their careers and working through retirement from Boucherie. We have two divisions: machine building (brush bristling machines and automation) and our mold division. Machine tool assets are used across divisions.

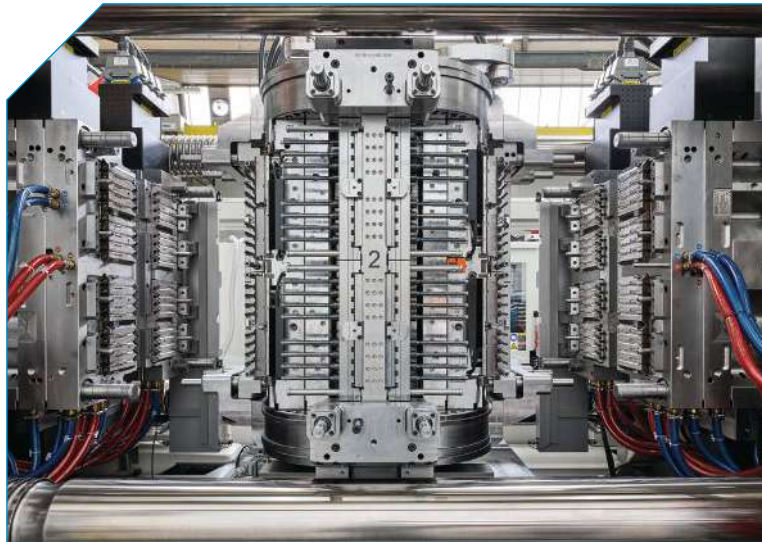
All development, parts, moldmaking, assembly and testing are completed in-house using precise, state-of-the-art technology and high-quality materials. We specialize in mold manufacturing for small, difficult-to-make parts — multi-cavity, single-component and multicomponent index plates, linear transfer or rotary table stack molds, Flexi Cube and other patented designs.

Over the years, Boucherie has gained in-depth expertise in the construction of molds for all kinds of personal, oral care, medical parts, etc., such as two-material syringe plungers, syringe barrels, Y connectors, iso hubs, toothbrushes, razors, screw-driver handles, etc. Our primary focus is on parts requiring very high tolerance, high-cavitation, single- and multi-material tools.

What is Boucherie's chief competitive advantage?

Williams: Boucherie's lifeblood is innovation, developing new mold, machinery and automation technologies in a dedicated R&D facility. In addition to providing the best tooling available, we pride ourselves on technical support before and after the sale. All purchased materials, steels, hot runners and more are of the highest quality.

We provide product design for manufacture (DFM) support and mold flow analysis as appropriate to simplify part and mold design. As an example, with minor customer-perceivable part



Boucherie specializes in mold manufacturing for small, difficult-to-make parts — multi-cavity, single-component and multicomponent index plates, linear transfer or rotary table stack molds, Flexi Cube and other patented designs. All images courtesy of Boucherie.

boucherie

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8748 Gleason Road, Knoxville, TN 37923

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john@boucherie.com

boucherie.com / boucheriemolds.com

- Has been active in machine building and precision mechanics for almost 100 years.
- Founded its moldmaking division in 1961.
- Focuses on multi-cavity and multicomponent molds for medical, consumer and technical parts.
- Supports customers in every step of the process, from design for manufacture (DFM) through prototyping to manufacturing, testing and optimizing molds.
- Experienced team evaluates and optimizes the part design using CAD and CAE design tools.
- Product lifecycle management (PLM) and planning software support subsequent mold design and part production.
- Automated processes promote efficient mold building according to ISO9001-15 quality standards.
- Robotized machine tools run 24/7 in an air-conditioned environment.
- Mold tests and debugging are performed on in-house injection molding machines or full validation on-site on the customer's machine.

modifications, we are able to manufacture a three-component part in two cavity sets. A team of engineers closely looks into every new mold project. For complex or multi-component products, a prototyping program is often desirable, and one or more prototyping molds can be built. After the prototyping phase, our engineering team takes care of the design of the production molds.

Cavities and cores are carefully assembled into the frame. Mold actions, such as slides, lifters, interlocks, mating surfaces and indexing mechanisms, are meticulously checked before the mold is put into the press for a test run. We always test tooling on our own or the customer's injection machines in our shop to help simplify and accelerate installation, operational and performance qualification (IQ/OQ/PQ).

Our mold testing area is equipped with several single-component, bicomponent and tricomponent injection molding machines, ranging from 250 to 5,000 kilonewtons (injection units are available in L, vertical and piggyback configurations). Each machine is housed in a separate room, each of which is closed from an outside view to ensure product confidentiality. For turnkey projects, a separate area is available where new molds can be tested and accepted on injection molding machines, sent to Boucherie by the customer.

We do not skimp anywhere in the tooling process, from robust design to materials to tolerancing and expert assembly. The entire process is monitored from request for quoting (RFQ) to validation according to our quality procedures, following ISO9001-15 requirements.

What is your latest technology investment?

Williams: Boucherie has continued to invest in state-of-the-art moldmaking technology over the years. Our latest addition is a fully automated EDM line where several EDM machines are coordinated by a single linear robot, enabling the continuous production of electrodes and a 3D measuring system to verify the dimensions/quality of the electrodes.

We are also integrating a high-speed milling machine to add functionality to this line, combining EDM and high-speed milling capabilities.

Provide an example of the most significant change to your general approach to business.

Williams: Our overall business approach has stayed consistent over the years. We produce the highest quality molds (SPI class 101 or better), focusing on tooling for difficult-to-manufacture plastic parts. We also relentlessly innovate patented manufacturing methods, like our Flexi Cube molds, to remain a leader in our field and advance technology.

We continue to provide best-in-class before and after-sale



All development, parts, moldmaking, assembly and testing are completed in-house.



Boucherie has gained in-depth expertise in the construction of molds for all kinds of personal, oral care and medical parts.



The Boucherie team carefully assembles cavities and cores into the frame and meticulously checks mold actions before putting the mold into the press for a test run.

service, proactively following up with customers to address any concerns. We treat every program and customer with the utmost professionalism and care and have fun along the way!

What is the most significant way you expect your business to evolve in the next 3-5 years?

Williams: Boucherie’s mold business historically serviced the

brush and toothbrush-making business. Over the years, our moldmaking has expanded to other consumer, technical, pharmaceutical and medical parts. Based on our current RFQs, our business growth, pharmaceutical and medical moldmaking will continue to be the largest segment for which Boucherie provides molds and tooling.

How are you finding and attracting new employees?

Williams: Boucherie recruits new and young talent locally in the greater Izege (Belgium) area. We recruit from the local technical schools for our internship and apprentice programs, giving this young talent exposure to all aspects of the mold building process.

Describe your most notable mold technology.

Williams: Boucherie has developed a unique, patented Flexi Cube mold technology. This technology is perfect

Boucherie has developed a unique, patented Flexi Cube mold technology that enables significantly shorter transfer times between cavities since only the parts are moved from cavity set to cavity set instead of rotating the complete center section of the mold.

for high-volume multishot parts, such as razor handles, pens and medical devices, to eliminate downstream assembly operations. It enables significantly shorter transfer times between cavities since only the parts are moved from cavity set to cavity set instead of rotating the complete center section of the mold. This mold configuration also allows for multiple shots on each mold face, insert molding, parts

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The entire moldmaking process is monitored from RFQ to validation according to quality procedures, following ISO9001-15 requirements.

requiring multishot plastic on all sides, robotic demolding while the mold is closed and more. The motions in the mold are completely servo-driven and can accommodate differing centers between cavities, moving the parts from cavity set to cavity set around a stationary central cube.

The core of this mold is a stack design with a central stationary cube around which various stations are provided. The molded parts are held on carriers while traveling on a track around the central cube. These carriers are moved using servomotors, allowing them to travel different distances. As such, the number of stations, their positions and their function can be selected as needed. This results in maximum mold layout flexibility.

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Simpler applications include two-component molding, with maximum cavitation in a stack configuration or combined with any extra functions. Because the central cube is stationary, the interface with the injection molding machine can be kept simple. It is comparable to a regular stack mold.

The stationary central part also enables an easy and ample supply of cooling water, compressed air, electric and so on without the need for delicate rotating couplings. Our in-house specialists realize all necessary motion controls for the servomotors and come in a separate control box with the mold as one fully integrated package.

This technology completely lives up to its name, Flexi Cube, as it can be easily configured to the part design and customer needs. It is truly unique in the industry. **MMT**

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CAD/CAM Software Reduces Delivery Times by 70% With a Six-Month ROI

Single integrated CAD/CAM package reduces translation errors, simplifies design process, improves shop efficiency and shortens tool lead times.

TK Mold & Engineering operates with a team of 25, plus seven CNC machines, multiple lathes and drills, and a five-axis sinker EDM from two facilities totaling 25,800 square feet/2,397 square meters of space in Romeo, Michigan. Image courtesy of TK Mold & Engineering



The company builds molds for customers in the automotive, consumer goods, aerospace and medical segments and also injection molds products for consumer goods. TK Mold is ITAR registered and ISO 9001:2015 certified. It was named the AMBA Mold Maker of the Year in 2022 and Trail Blazer of the Year in 2023. Image courtesy of TK Mold & Engineering.

Romeo, Michigan-based TK Mold & Engineering Inc. was founded in 2003 by Tom and Krista Barr, who purchased assets and a building that had previously housed another moldmaker. Tom, who describes himself as a third-generation moldmaker, is president of TK Mold, and Krista, who is also a licensed master social worker (LMSW), is director of employee development.

“Team culture is very important to both Tom and me,” explains Krista, who says they actively work to create an environment where all employees have a voice and feel valued. “We hire quality people, do quality work and provide a quality experience. We operate our shop with an ‘all hands on deck’ philosophy. Most of our shop personnel are cross-trained in multiple disciplines and can execute multiple tasks.”

With a team of 25, seven CNC machines, multiple lathes and drills, and a five-axis sinker EDM housed in two facilities totaling 25,800 square feet/2,397 square meters of space, TK Mold designs tools and parts and builds up to six tools/month. The company also makes engineering changes and offers maintenance and repairs on anyone’s tools. Last year, TK Mold added low-volume, custom injection molding (up to 50,000 pieces/year) to ongoing mold sampling services using three presses of 200, 300 and 730 U.S. tons/181, 272 and 622 metric tons. Most mold customers hail from the automotive and consumer goods markets, but the company also makes tooling for the aerospace and medical segments. Most molded products are for consumer goods customers.

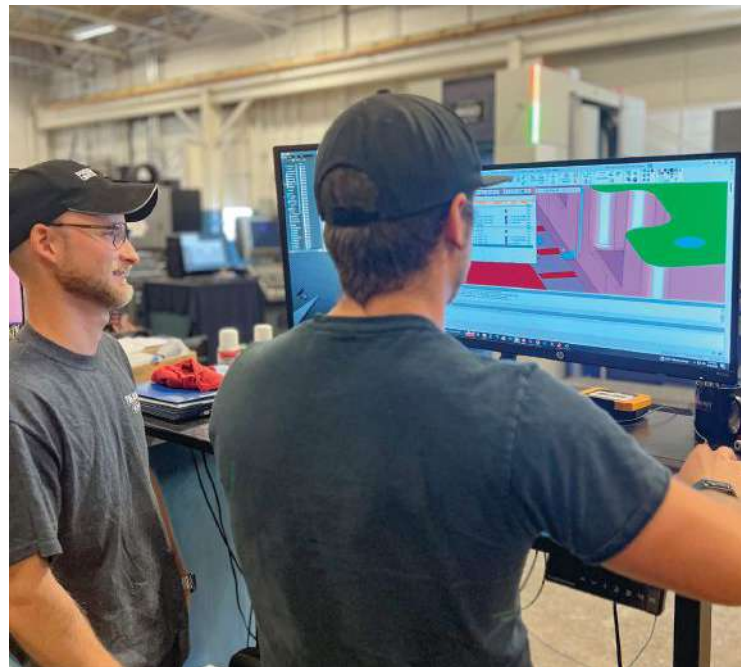
“What sets us apart from our competitors is that from the very beginning, our software was developed to address the needs of the tool and die industry.”



Over the last two decades, 80% of the company's tooling has been produced in steel and the balance in aluminum. During that period, 80% of the tools were for injection molding (straight injection, two-shot, rotary, and pick and place) ranging from one to eight cavities and frequently with side action. The remaining 20% of production tooling was for compression molding. Injection tooling is typically sized for presses ranging from 85 to 730 U.S. tons/77 to 662 metric tons, with the company's sweet spot falling between 200 and 500 U.S. tons/181 and 454 metric tons. Many of these tools are designed for precision molding to hold tolerances of ± 0.050 millimeter/0.002 inch on the AZ axis of a plastic fitting.

Given its customer base, TK Mold is ITAR registered and ISO 9001:2015 certified. It was named the AMBA Mold Maker of the Year in 2022 and Trail Blazer of the Year in 2023. Very active in mentoring young people in toolmaking, the company has a Registered Apprenticeship Program with the U.S. Department of Labor; was named Macomb Career Technical Education Administrator's Association Outstanding Business

Partner for 2018-2019; and Romeo High School Business Partner annually from 2019-2022. TK Mold also received the Macomb County Outstanding Business Award in 2021 and Special Congressional Recognition and Special Senatorial Recognition certificates in 2019.



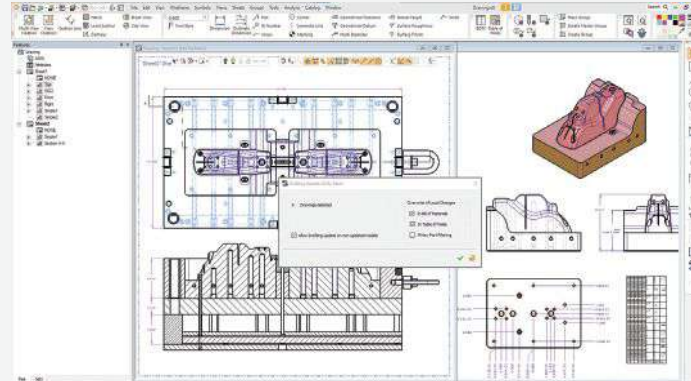
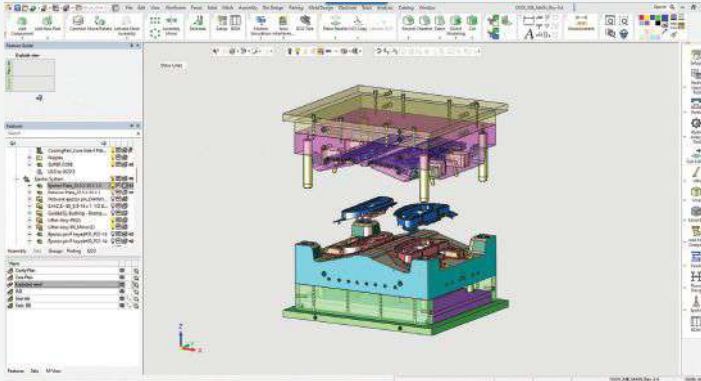
TK MOLD & ENGINEERING INC.

PROBLEM: Ensure the entire team gets the most out of the robust Cimatron CAD/CAM package to increase overall shop productivity.

SOLUTION: Schedule advanced training so everyone, from estimators to designers to CNC and EDM techs, can use the software more efficiently.

RESULTS: Continue to increase overall shop productivity, shorten tool delivery times.

Since its inception, TK Mold has used integrated Cimatron CAD/CAM software to streamline its workflow from quoting and design straight through to machining and EDM to assembly. The company also periodically invests in advanced training to ensure its entire team is using the robust software to its fullest. This has paid off by shortening tool delivery lead times and increasing shop productivity. Image courtesy of TK Mold & Engineering.



Cimatron pioneered many features that make mold design much faster, such as QuickSplit (left), splitting of cores/cavities and slides/lifters to quickly detect potential problems; Quick Compare (right), mathematical comparison of new and old part data as multiple team members in different departments work on a tool; and Quick Electrode (far right), automatic electrode design and toolpath generation as tool geometry is set. Image courtesy of Cimatron.

Benefits of Integrated CAD/CAM

Since its inception, TK Mold has used integrated Cimatron CAD/CAM software to streamline its workflow from quoting and design straight through to machining and EDM to assembly. The company currently has 10 licenses: three Cimatron Designer Solution (CAD), five Cimatron NC Solution (CAM), one EDM Solution (electrode design and manufacturing) and two floating View Only licenses for personnel operating CNC and EDM machines.

“Years ago, we had one guy using a different package, but we switched exclusively to Cimatron as we found that managing data was much easier when everyone used the same software, especially for updates,” notes Tom. “This way, we never have translation issues when moving data between packages. Also, because it was designed for the tool and die industry, Cimatron is very user-friendly for moldmakers.”

“The ability to take a part and start making parting lines with Cimatron’s QuickSplit feature allows us to streamline designs from the time we kick off a job,” adds Jonathan Salter, TK Mold CNC manager. “Cimatron offers many libraries from all the major vendors that allow you to design anything from gates to runners to ejector pins with just a few clicks of the mouse. The tools they’ve incorporated in their software really help with all aspects of design — from slides and lifters to waterlines and mold bases — and shorten the amount of time it takes to move from design to production to completion.”

Designed for Tool and Die

Cimatron began life in 1982 as an Israeli software company named Microcad that focused on developing manufacturing software for the country’s Air Force. Within 2 years, the company introduced its first CAD/CAM packages designed for medium-sized tool shops. In 1990, the company changed its name to Cimatron Ltd. and introduced its first integrated

CAD/CAM package called Cimatron IT. In 2008, Cimatron merged with CNC machining software provider Gibbs and Assoc. and added GibbsCAM to its product offering. The joint company collaborated with LEDAS (now LGS 3D) in 2010 to add motion simulation and crash detection capabilities, which were subsequently licensed and integrated into the package. By 2013, Cimatron was researching additive manufacturing and developing tools to incorporate conformal cooling into

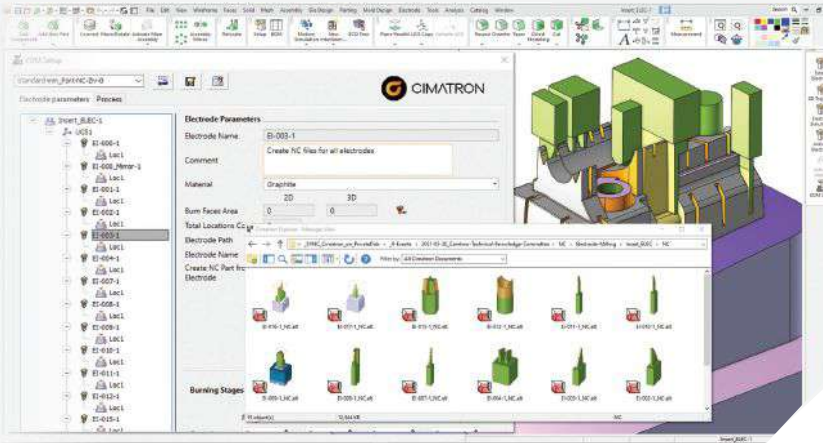
“Cimatron offers many libraries from all the major vendors that allow you to design anything from gates to runners to ejector pins with just a few clicks of the mouse.”



mold designs. In 2015, Cimatron was acquired by 3D Systems, which sold the company in 2020 to Battery Ventures, which, in turn, added SigmaNEST software to the product portfolio before an acquisition by Sandvik in 2021.

“What sets us apart from our competitors is that from the very beginning, our software was developed to address the needs of the tool and die industry,” explains Ralph Picklo, Cimatron Americas sales director. “If you’re designing molds, dies, fixtures or gages, why wouldn’t you use integrated, efficient, user-friendly software dedicated to designing and producing the very things you’re building every day?”

He adds that most major software packages used in the plastics industry offer CAD or CAE or process simulation but aren’t integrated with CAM, and the handful that do offer CAD/CAE/CAM still don’t have specific tools to design and manufacture molds efficiently. With Cimatron, the entire mold design and production functions are fully integrated, yet the system still offers the flexibility to make last-minute



CoroPlus Tool Library and TDM tool management system, as well as automation of repetitive processes, Cimatron makes the design process more efficient from the very start,” Picklo continues. “In fact, it enables a designer to specify a company’s standards and then apply them to every job so they don’t have to reinvent the wheel each time.” He says that as tool delivery times keep getting shorter, companies need software that’s dedicated and streamlined for their industry. “Our software allows multiple users in different departments to work on the same job at the same time, drastically shortening tool delivery times while ensuring all users work with the most current data while tracking all of the engineering changes.” Once the tool is designed, CAM files are produced and then converted to G-code to rough and finish mill in two-, three- and five-axis CNC machines. Additionally, the software generates files to burn electrodes on sinker EDMs without manual input.

changes. That’s why the software can help shops reduce tool delivery times by up to 70% and ROI for the software is typically achieved within 6 months.

“Thanks to our digital connectivity, templating, a standard mold component catalog and direct integration with the

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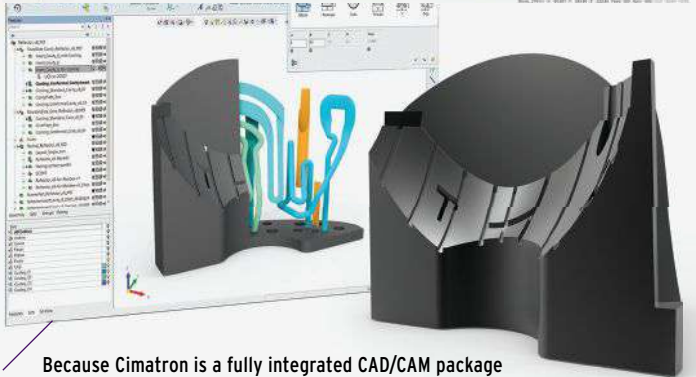
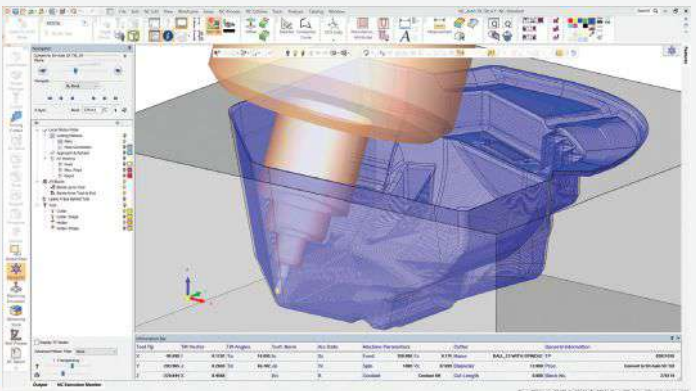
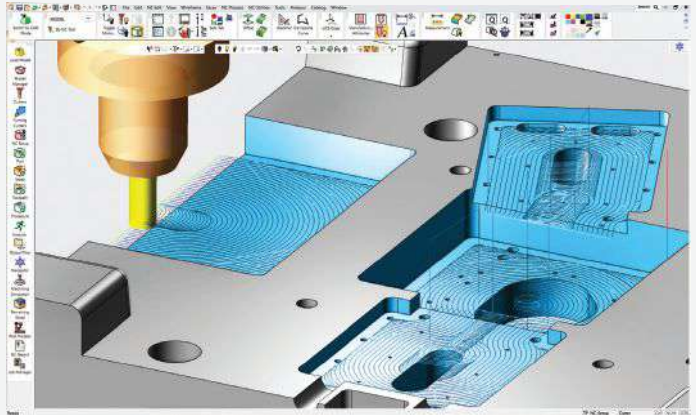
A good example of how Cimatron automates and speeds the design process is an automotive mold TK Mold's team recently completed. "Upon kicking off a job, many of our customers give us a range of different press sizes a mold may go into, which allows us to change mold base sizes to find the one that best fits our customer's needs," explains Salter. "Cimatron enables us to easily apply mold bases in our design directly from a drop-down menu, rather than requiring us to go to the websites of mold base suppliers and download a CAE model for each mold base we think we might need and then manually load it into our CAD package. Features like that really simplified things on this challenging job with a short lead time and many engineering changes. We were able to switch between mold bases of different sizes without having to input more information from external sites."

Staying Ahead of the Game With Advanced Training

Despite using Cimatron for two decades, TK Mold periodically takes the time and invests in having the supplier come in to conduct advanced training, especially as new features are added.

"While you can start using it right away, given how robust Cimatron is, it does take time to master the software," adds Tom. "To maximize our effectiveness and keep shortening our tool delivery lead times, we make it a practice to bring Cimatron in to conduct advanced training for our team and this investment really pays off by allowing us to use the software more efficiently with each major upgrade. The best part of this extra training is that it allows us to ask questions about our processes and tools we're currently working on."

"Tom and Krista always want to take advantage of the latest technology, so they're willing to invest in advanced training sessions that move their team from average users to pro users, which really streamlines their process and makes their shop more profitable," says Picklo, who adds that this should be a lesson to all companies who want to avoid getting stuck in a rut. "I have customers who've told me that if they can knock 1 minute per day off the time it takes each of their 16 designers to accomplish a task, then that multiplier really adds up to significant time savings at the end of the month. Some shops say they can't take the time to do the extra training, but I say to them, they can't afford *not* to take the time." **MMT**



Because Cimatron is a fully integrated CAD/CAM package specifically designed for the tool and die industry, it helps designers and machine operators design machine features like multiple pockets in multiple heights (top), five-axis tilt for milling (middle) and automatic or custom conformal cooling channels in additively manufactured inserts (bottom). Image courtesy of Cimatron.

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Ralph Picklo, Americas Sales Director



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How to Use Simulation to Achieve a High-Gloss Surface Finish

Combining simulation, conformal cooling, and a rapid heat and cooling process can predict and produce the required surface finish for high-gloss plastic parts.

Skillfully applying process simulation at the start of a project — including designing the best temperature control system and comparing alternative manufacturing methods — can streamline your product development and manufacturing process and provide a part with a high-gloss surface finish.

Undoubtedly, the injection molding of high-gloss plastic parts is very challenging. All it takes for a substandard finish is a mold insert with a poor surface finish, an unsuitable

material or the wrong process parameters. For example, the desired level of high gloss may still be achieved by painting the surfaces in a downstream process, but the energy consumed in this painting process contributes to 5-15% of the overall cost of parts manufacture. It's time to find alternative processes.

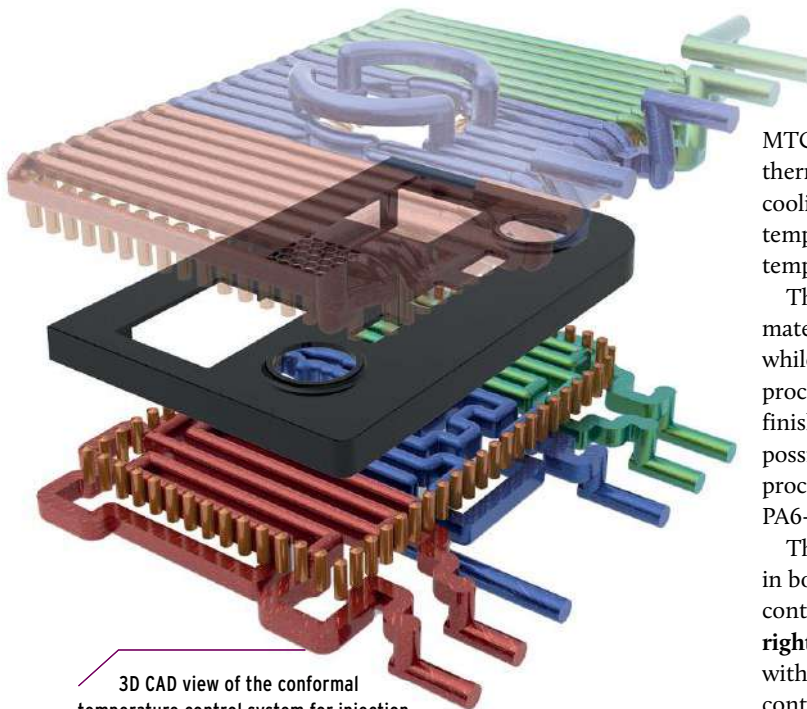
Comparing Variothermal and Traditional Temperature Control

Injection speed, holding pressure and mold temperature influence the quality of high-gloss surface finishes. High mold temperatures can yield ideal high-gloss surfaces, but longer cooling times mean longer cycles. Variothermal temperature control can avoid these longer cycles.

For example, Premec S.p.A., Toolax and Contura MTC collaborated to compare conventional thermal and variothermal control using the same injection mold with conformal cooling for both processes. **Figure 1** shows how a customized temperature control system strongly influences the mold wall temperature.

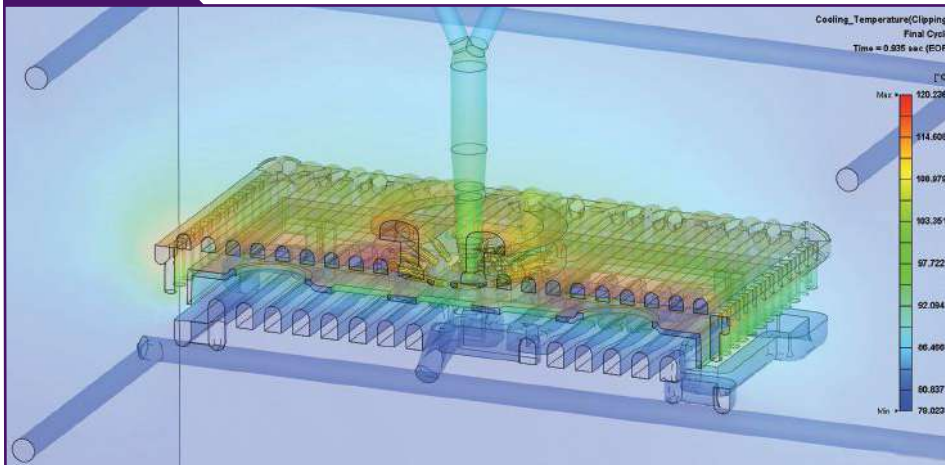
The team evaluated the surface finish of the parts and estimated the cost and energy requirements of both processes while making allowance for any additional painting. They used process simulation to assess whether the molded part's surface finish could be predicted early in the design stage, making it possible to consider the costs that might arise from a painting process. They also analyzed different materials — PC+ABS and PA6-GF30 (a polyamide 6 (PA6) with 30% glass fiber content).

The PC+ABS reference part produced a high-gloss surface in both process variants. Dynamic alternating temperature control produced an ideal piano-black finish (see **Figure 2, right**), free of streaks, weld lines and similar defects, and without downstream painting. The conventional temperature control process also yielded a streak-free finish at first glance. However, weld lines were visible on closer inspection (**Figure**



3D CAD view of the conformal temperature control system for injection molding a fascia with a high-gloss surface. All images courtesy of SimpaTec.

FIGURE 1



The view of the mold interior in the simulation model shows the temperature difference at the end of the filling stage. Variothermal control on the top side leads to higher mold temperatures than on the conventional temperature-controlled side.

2, left), resulting in a downstream coating process to achieve the desired piano-black surface finish and thus greater energy consumption. Injection molding with variothermal control also consumes more energy, so how great is the additional outlay?

For both methods, an injection molding machine's energy consumption was measured, including all additional temperature control units, to produce 40 reference parts. The conventional method consumed 2.882 kilowatt-hours (kWh) throughout the 40 cycles, rising to 7.868 kWh when the dynamic temperature control was added. This represents a 2.7-fold increase in energy consumption. Given an electricity price of 20 cents per kWh (as of 2020), the extra cost per part is just under 2.5 cents.

This is a small increase compared to the downstream painting process needed for conventional mold temperature control, where the extra cost per part for a batch of 25,000 units and a single coat of paint works out at more than 45 cents. That figure excludes handling, possible one-time costs and coating waste of approximately 2%. As a result, the variothermal variant is more cost-effective than the conventional variant (including the outlay needed for the painting process) by a factor of at least 18.

Simulation for Cost Estimation

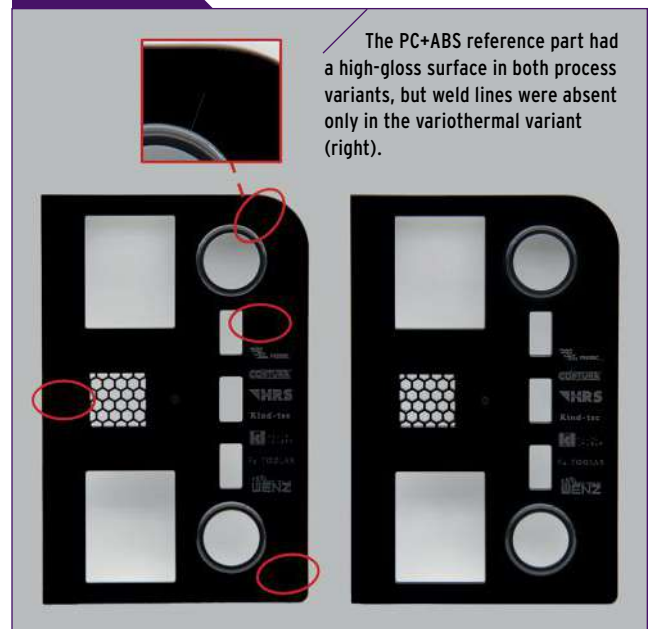
The team used software to simulate the injection molding process under conventional and dynamic temperature control to determine the true cost of achieving a piano-black finish via variothermal temperature control.

Aside from typical results (flow properties, temperatures, pressure and deformation), the simulation also revealed information about weld lines and shear stresses. The temperature of the weld lines at the time of their formation can be used to determine how pronounced they are. When melt fronts

converge at elevated temperatures, the mixing is more extensive. So, the weld lines are less pronounced. In the variothermal variant, this manifests itself on the variothermally controlled side of the part (the visible surface of the top side). The temperature is still so high that the real part shows no signs of weld lines (Figure 2, right).

The simulation revealed the different temperatures of the weld lines. In the variothermally controlled visible surface (top side) of the part, the temperature of the potential weld line is as high as the data points shown in Figure 3, right, indicating that even higher temperatures can be ignored as far as weld

FIGURE 2



Particle tracking shows the temperature of the weld lines as they form. In the variothermal variant (right), the temperature of the melt fronts on the visible surface (top side) is still so high that they do not show up as weld lines.

lines are concerned. Without variothermal control, weld lines of lower temperatures are formed, which can be detected with the help of the data points in **Figure 3, left**. Aside from weld lines, it is also important to compare the shear stresses induced on the part's surface by the two temperature control variants.

The results reveal a visible improvement in the surface finish of the variothermal part but do not guarantee a perfect finish or the elimination of painting.

High Gloss on Glass Fiber

Parts made from PA6 with 30% glass fiber content illustrate the difficulty of achieving a glossy finish without any coating. The finishes resulting from conventional temperature control

FIGURE 3

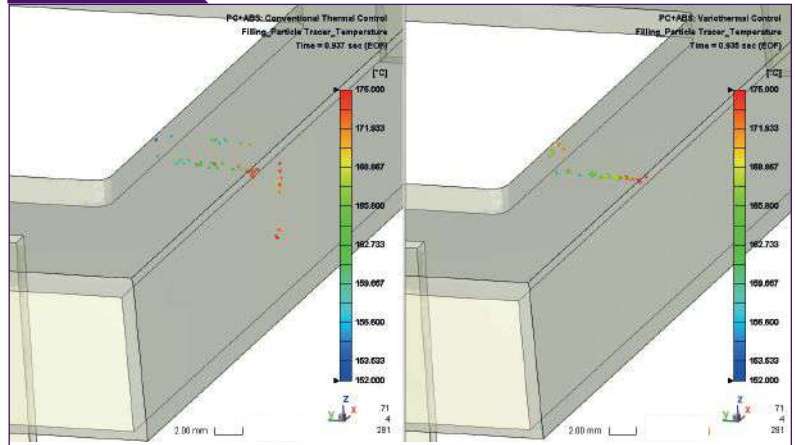
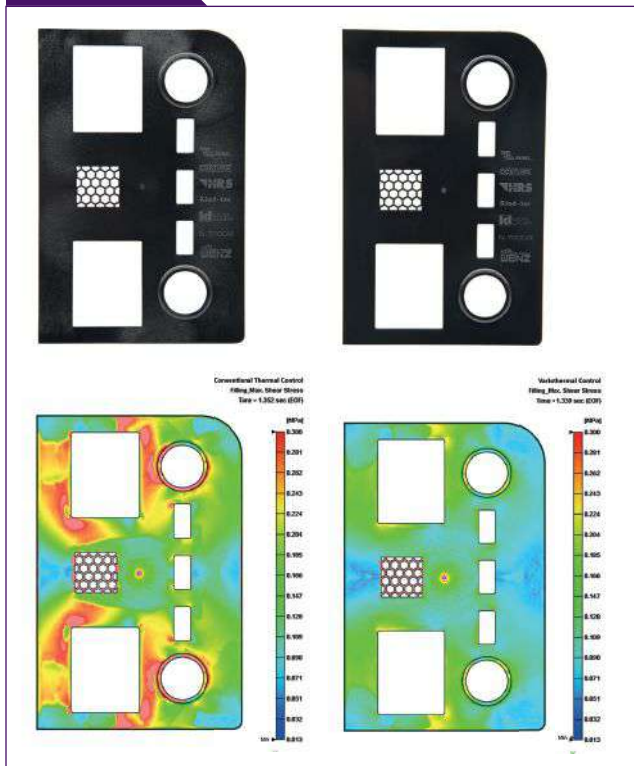


FIGURE 4



The simulation of the shear stresses (bottom) indicates the direction in which the downstream surface quality of the PA6-GF30 real part is likely to trend – shown here is the higher quality surface produced by variothermal temperature control (bottom right).

were so critical that, in some cases, there was no point in considering painting to a high gloss finish due to a lack of feasibility (**Figure 4, top left**).

Choosing dynamic alternating temperature control managed to produce an acceptable surface finish (**Figure 4, top right**) that would lend itself to downstream painting and still be capable of producing the desired high-gloss surfaces. Using variothermal control made it possible to produce this high-gloss surface.

The team used simulation to compare the part surfaces, revealing parallels they could use to predict the outcome. For example, the maximum shear stresses at the end of the filling phase in both variants (**Figure 4, bottom**) and the gradients of the shear stresses suggest a non-uniform part surface. This fact is confirmed in the case of conventional temperature control (**Figure 4, left**).

The less-pronounced shear stress gradients in the variothermal simulation coincide with a higher quality surface on the real part (**Figure 4, right**). Similar to the weld line results, the shear stress simulation can also indicate the direction in which the downstream surface quality of the real part is trending. The test on the PA6-GF30 material also highlights how simulation can predict the feasibility of part production.

For a better interpretation of the absolute values of the shear stresses and the temperatures of the weld lines, use an intelligent, interactive data management platform designed for plastics engineering, which can store information such as model size features, gate sizes, gate types, cooling systems, sampling parameters and CAE simulation results. This step makes comparing subsequent projects a lot easier. **MMT**

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Cristoph Hinse, President and Paula Hohoff, Engineer

| Machine | Prog Complete | Alarm Count | Program End Time | Program Start Time | Program # | Job # | Program Comment | Total Job Time | Job Run Time | Job Stop Time | Parts Cut | Wire Breaks | Wire Used (g) | Wire Type | Wire Size | Material Type | Material Thickness |
|---------|---------------|-------------|---------------------|---------------------|-----------|-------|---------------------------|----------------|--------------|---------------|-----------|-------------|---------------|-----------|-----------|---------------|--------------------|
| EDM011 | ✓ | 0 | 2023-01-11 22:19:24 | 2023-01-11 09:33:54 | 60 | | 057 DB1 | 12:45:30 | 12:11:38 | 00:32:52 | | 4 | 2585 | BS | 0.01 | STEEL | 25 |
| EDM011 | ✓ | 0 | 2023-01-11 07:35:16 | 2023-01-10 10:33:35 | 59 | | 049 DET 101 FH | 21:01:42 | 18:48:35 | 02:13:06 | | 0 | 6099 | BS | 0.01 | STEEL | 20 |
| EDM011 | ✗ | 1 | 2023-01-10 10:24:47 | 2023-01-10 10:19:24 | 58 | | 049 DET 101 FH | 00:05:22 | 00:00:03 | 00:05:19 | | 0 | 0 | BS | 0.01 | STEEL | 5 |
| EDM011 | ✓ | 0 | 2023-01-10 06:03:29 | 2023-01-10 07:54:54 | 56 | | 032 Det.110 Microplot Fix | 00:08:35 | 00:08:27 | 00:00:08 | | 0 | 22 | BS | 0.01 | STEEL | 5 |
| EDM011 | ✗ | 16 | 2023-01-10 06:48:29 | 2023-01-09 08:31:23 | 55 | | 057 DET 501 | 22:17:07 | 08:13:44 | 14:03:23 | | 0 | 1775 | BS | 0.01 | STEEL | 25 |
| EDM011 | ✓ | 0 | 2023-01-06 10:54:15 | 2023-01-06 07:31:06 | 54 | | 960 Form Arbor op2 | 03:23:09 | 03:12:06 | 00:01:03 | | 0 | 1127 | BS | 0.01 | STEEL | 20 |
| EDM011 | ✗ | 2 | 2023-01-06 07:30:50 | 2023-01-06 07:27:52 | 53 | | 960 Form Arbor op2 | 00:02:57 | 00:00:39 | 00:02:18 | | 0 | 4 | BS | 0.01 | STEEL | 10 |
| EDM011 | ✗ | 3 | 2023-01-06 07:25:15 | 2023-01-06 07:14:42 | 53 | | 960 Form Arbor op2 | 00:11:33 | 00:05:24 | 00:06:09 | | 0 | 15 | BS | 0.01 | STEEL | 10 |
| EDM011 | ✗ | 5 | 2023-01-06 06:55:27 | 2023-01-05 12:13:11 | 52 | | 049 Det520 | 18:43:17 | 02:07:15 | 16:36:02 | | 1 | 459 | BS | 0.01 | STEEL | 75 |
| EDM011 | ✗ | 5 | 2023-01-06 11:57:11 | 2023-01-05 08:42:11 | 51 | | 049 DET 509 | 03:15:00 | 01:55:53 | 01:19:07 | | 0 | 433 | BS | 0.01 | STEEL | 10 |

How to Use and Protect Remote Machine Monitoring Data

Collecting, analyzing and securing machine data in real time can substantially improve productivity, profitability and customer satisfaction.

Remote monitoring systems provide accurate and up-to-date data on machine utilization and production rates. All images courtesy of MC Machinery Systems.

Manufacturing is more data-driven than many realize. The only reliable way to identify performance-impacting problems is through data analytics, which can reveal ways to maximize capacity and uptime, prioritize opportunities, test assumptions, find waste and guide continuous improvement processes.

Remote machine monitoring is collecting and analyzing data from machines in real time without human intervention. When considering what remote monitoring system is right for their business, moldmakers should evaluate their specific needs, including the desired level of data collection, whether that data is provided in real time, user-friendliness, scalability and customer support.

For moldmakers, remote machine monitoring can provide several benefits, including improved efficiency, productivity and quality, reduced costs and increased safety.

Capturing Data

Mold builders can gain insight into six key areas with remote machine monitoring:

- 1. Real-time performance monitoring.** Remote monitoring systems enable mold builders to track the performance of their machines in real time. They can gather data on parameters, including machine status and production rates. This information provides valuable insight into machine efficiency, productivity and potential production issues. For example, users can receive an alert so they can react immediately if the machines run unattended and an alarm occurs. This prevents lost production time due to interrupted jobs not being addressed until someone on-site notices the stopped machine.

- 2. Predictive and preventive maintenance.** Mold builders can detect abnormalities or deviations from normal operating conditions by continuously monitoring machine data remotely. This enables early detection of potential issues such as equipment malfunctions or process inefficiencies. Identifying these problems early and scheduling preventive maintenance activities reduces the risk of unexpected breakdowns and downtime. Analytics from the hardware

To make informed decisions, moldmakers must effectively capture, harness and secure data.

maintenance timers, machine data and alarm history can help predict any potential problems.

- 3. Optimized production planning.** Remote monitoring provides accurate and up-to-date data on machine utilization and production rates. This information allows for better production planning and scheduling, including identifying bottlenecks, optimizing machine allocation and making informed decisions to maximize productivity and meet delivery deadlines. For example, by viewing the program history to see when jobs were run and how long they took to complete, operators can better schedule which jobs are run in the machine during manned versus unmanned shifts.
- 4. Improved efficiency and productivity.** Remote monitoring systems provide valuable data on machine utilization, downtime and performance metrics. This data can identify opportunities to optimize the process, reduce idle time and improve overall machine efficiency. Operators can track key performance indicators and implement measures to increase productivity, such as reducing setup times or improving tool changeover processes. For example, by viewing when a block of heavy stopped time was reported, users can filter the program and alarm history to see which programs generated the most stopped time. This can help operators determine if corrective action may prevent the same occurrence from happening again.

Promote a security-conscious culture within the organization to minimize the risk of human error or inside threats.

- 5. Remote troubleshooting and support.** Mold builders can access machine controls and diagnostics remotely. This capability allows for remote troubleshooting, reducing the need for on-site visits and minimizing downtime associated with equipment issues. For example, if the user has a problem with a program, he or she would typically have to email the program file to the support team and wait for them to review, edit and return it — taking hours for a resolution that the remote support team could handle in just a few minutes.
- 6. Enhanced quality control.** These systems can capture and analyze data related to process parameters, burn/cut conditions, operation stability and alarms. Monitoring these variables ensures that the production process remains within nominal operating conditions. Any deviations can be detected and corrected promptly, improving product quality and reducing scrap or rework. One example is monitoring the burn/cut condition remotely. If a user notices that it is unstable or having problems, they are able to remotely connect to their machine controller and make adjustments as if they were in front of the machine.

Saving Costs

Remote monitoring systems help mold builders optimize machine utilization, reduce unplanned downtime and improve overall efficiency. Shops can also save costs by minimizing production disruptions, optimizing maintenance schedules and preventing costly breakdowns.

Additionally, remotely monitoring machines reduces the need for a physical presence on the shop floor, potentially saving travel costs and enabling centralized monitoring of multiple machines or production facilities.



Remote monitoring systems can track the consumption of consumables and materials.

Mold builders can track machine performance in real time. They can gather data on parameters such as machine status and production rates.



Securing Data

Now that you have all of this data from a cloud-based remote machine monitoring system, you must secure it. Consider the following measures to ensure data security:

- **Data encryption.** Employ robust encryption techniques to protect data transmitted between machines and the cloud platform. Encryption ensures that the data remains unreadable to unauthorized individuals even if intercepted.
- **Secure authentication.** Implement strong authentication mechanisms to prevent unauthorized access. This can include multifactor authentication, strong passwords and secure, token-based access.
- **Role-based access control.** Implement role-based access control (RBAC) to grant specific permissions and restrict access based on user roles and responsibilities. Only authorized individuals can access and interact with the monitoring system.
- **Secure communication.** Use secure communication protocols, such as Transport Layer Security (TLS) or Secure Shell (SSH), for data transmission between machines and the cloud platform. These protocols establish secure channels and protect against eavesdropping or tampering.
- **Intrusion detection and prevention.** Employ intrusion detection and prevention systems (IDPS) to monitor network traffic, detect potential threats or attacks and take appropriate action to prevent unauthorized access or data breaches.
- **Regular updates and patch management.** Keep all software components, including the monitoring system and associated software, up to date with the latest security patches and updates. Regularly applying patches helps address known vulnerabilities and strengthens the overall security posture.
- **Security monitoring and auditing.** Implement robust security monitoring and auditing mechanisms to track system

activities, detect anomalies and identify potential security incidents. This can involve monitoring log files, analyzing system behavior, and employing security information and event management (SIEM) tools.

- **Data privacy and compliance.** Ensure compliance with relevant data privacy regulations, such as the General Data Protection Regulation (GDPR) or industry-specific standards. Implement appropriate data anonymization or pseudonymization techniques when necessary.
- **Vendor security evaluation.** If using a third-party cloud platform or monitoring solution, thoroughly evaluate the vendor's security practices and certifications. Verify that they have appropriate security measures and adhere to industry best practices.
- **Employee awareness and training.** Educate employees about security best practices, such as strong password management, phishing awareness and data handling protocols. Promote a security-conscious culture within the organization to minimize the risk of human error or insider threats.

To make informed decisions, moldmakers must effectively capture, harness and secure data. No matter the size of the manufacturing operation, data is critical to efficiency and growth. Remote machine monitoring can help. [MMT](#)

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Mold Builder/ High School Partnership Offers Hands- On Moldmaking Education



Electroform teamed up with Hononegah High School to give engineering and manufacturing students a hands-on moldmaking experience – including the design process, machining of components, assembly and mold sampling.



Electroform not only provided the necessary support and guidance but also served as a bridge between classroom learning and practical application.

Even though manufacturing continues to face the skills gap challenge and it remains the topic of conversation at most industry events, we never tire of hearing and sharing another success story of a shop bringing a young, new moldmaking professional into the workforce!

In recent years, there has been a concerted effort to bridge the gap between the industrial sector and education institutions to address the skilled labor shortage. This collaboration aims to prepare students for careers in fields that are in high demand while meeting the needs of industries that require a skilled workforce.

This time, it's Rockford, Illinois-based mold builder Electroform partnering with Hononegah Education Manufacturing Connection (EMC) to promote manufacturing, but more specifically, moldmaking and molding, by providing real-world, hands-on experience in manufacturing and engineering. EMC was formed 2 years ago to form partnerships between high schools and regional manufacturing businesses that connect local manufacturing companies in the state-line area with Hononegah Community High School (HCHS) students who are evaluating their career choices. To date, Electroform is the only active mold building participant.

Zach Clark is a design engineer at Electroform and serves as technical support on this outreach project with Hononegah and engages directly with the instructor and classroom activities. He was 4 years old and sweeping floors, so officially, he has been an Electroform employee for 4 years. His passion for

Hononegah Community High School (HCHS) students designed and built injection molds for a simple part Electroform came up with to introduce moldmaking to the class: a paperclip. All images courtesy of Electroform.

moldmaking has grown over the years, but it was not there at the beginning. He was more interested in business. “I attended a 4-year college to earn a business degree but then backed up and reconsidered a career. Manufacturing really sparked a fire in me that I’m ready to spread to the next generation,” Clark says.

His father, Wade, approached Hononegah instructor Liz McLevige during a community career fair to join forces on a student moldmaking project as part of the curriculum. McLevige teaches advanced pre-engineering courses and is in charge of the CNC machining classes that would ultimately be integrated into the EMC program.

McLevige’s plastics background made it easy for her to envision a project for the class to work on with Electroform. Eight students, from sophomores to seniors, make up the CAD and machining classes. As part of the program, students have access to a range of equipment and learn skills such as CNC machining, CAD/CAM and robotics.

The first project involved designing and building injection molds for a simple part Electroform came up with to introduce moldmaking to the ECM class: the everyday paperclip. This project enabled the students to dive into the world of moldmaking, CNC machining and practical manufacturing processes. It was a major step for the school and EMC, marking their entry into the world of mold building, a more complex and demanding field.

McLevige initially had reservations about taking on such a challenging project. Her experience as a former project engineer in an injection molding business made her aware of the complexities involved that would present a significant learning curve for both the students and faculty, namely the intricacies of moldmaking and the intense timetable.

However, McLevige recognized the incredible learning potential of this project and the direct connection between classroom learning and real-world applications. The opportunity to create a mold that would produce tangible consumer products, such as paperclips, served as a motivating factor for students and teachers. The students had a chance to see the immediate outcomes of their work, which, in turn, motivated them to take on the challenge — with some students even working overtime!

Electroform not only provided the necessary support and guidance but also served as a bridge between classroom learning and practical application. Clark worked closely with McLevige and the students throughout the project, offering expertise and advice on the moldmaking process.

It was a learning journey for everyone involved. The high school students had to grapple with challenging aspects of moldmaking, such as creating precise dimensions, ensuring accurate CNC machining and learning the intricacies of injection molding. It required a deep understanding of geometry, material

Student Project Scope



Students dove into the world of moldmaking, CNC machining and practical manufacturing processes.

- **Step 1:** Provide a basic overview of moldmaking and how the products used every day come from a mold.
- **Step 2:** Shop tour to introduce the different moldmaking processes – starting with the soft material state, then soft milling, heat treating, grinding, hard milling, wire EDM, and all the different components and assembly.
- **Step 3:** Introduce the project – create a MUD unit and A and B plates of the MUD unit out of aluminum.
- **Step 4:** Assist with some of the smaller components at the mold facility.
- **Step 5:** Visit the facility to experience grinding, hard milling, soft milling, etc. Students watch the moldmaking team complete the work on the plates and get a little hands-on experience.
- **Step 6:** Weekly classroom visits to check on progress, answer questions and lend support.



The students experienced firsthand the importance of precision in moldmaking and the benefits of identifying and correcting mistakes.

Workforce Development

properties and engineering principles. This real-world application of classroom knowledge was an eye-opener for many students, demonstrating the significance of precision and attention to detail in manufacturing.

The project included trips to Electroform's facility, during which the students witnessed the injection molding process and how their molds played a crucial role in producing the final product — the paper clip.

The outcome of this project went beyond the production of paper clips. It empowered students with a deep understanding of manufacturing and a sense of pride in their accomplishments. "As a result, a few students are interested in a formal apprenticeship," McLevige says.

The students not only gained valuable knowledge but also witnessed the benefits of identifying and correcting mistakes in the manufacturing process and the importance of precision in moldmaking. Students discovered that the smallest errors in dimensions, tolerances or toolpath calculations could lead to issues in the final product.

What made this collaboration even more impactful was the commitment to continued improvement. Clark and McLevige understood the importance of refining the curriculum to align with the realities of moldmaking. Lessons learned from the initial project informed their approach to future projects, namely

adding more time to the schedule to get the project done right.

"Liz has gained much respect with the students due to her efforts, which in turn leads them to respect Electroform's efforts," Clark says.

The collaboration between Hononegah HS and Electroform was a clear success. Students were exposed to a dynamic, fast-paced industry and learned valuable skills. The experience also generated enthusiasm for future endeavors, with the number of students participating in the program increasing significantly — growing from eight to 17 students!

This growth underscores the students' eagerness to explore careers in the manufacturing and engineering sectors, demonstrating that hands-on learning, like the Electroform project, is an effective way to inspire and prepare the next generation of skilled workers. [MMT](#)

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Liz McLevige, Instructor



The advertisement features a central image of a HAIMER SAFE-LOCK tooling assembly against a blue background with light streaks. The HAIMER logo is in the top right corner. Below the tooling are four blue boxes with white text: Tooling Technology, Shrinking Technology, Balancing Technology, and Measuring and Presetting Technology. The main title 'HAIMER SAFE-LOCK' is in large white letters, followed by a descriptive sentence and the website URL.

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Innovative Mold Building Enhances Packaging Material Efficiency, Elevates Recyclable Design

A manufacturing-focused design and optimized tooling enhance material efficiency in packaging for a new medical instrument.



This custom thermoformed package can hold and protect 520 pipette tips in four rigid polystyrene trays. All images courtesy of Beckman Coulter.

Beckman Coulter Diagnostics, a global company in clinical diagnostics, unveiled its DxI9000 Access Immunoassay (IA) analyzer in May 2023. This next-generation analyzer addresses clinical laboratories' need for analytical speed, reliability, reproducibility, quality and menu expansion.

Everything on this new instrument was engineered with the most advanced technologies to maximize performance and optimize resources, including the packaging of the DxI 9000 analyzer's related consumable products.

A critical, single-use consumable product for the DxI 9000 analyzer is the highly sensitive polypropylene (PP) pipette tip. This pipette collects a patient's sample from a test tube and dispenses it into the analyzer. This step requires pipettes to remain undamaged to ensure the quality of the analysis.

The Beckman Coulter Diagnostics' Global Plastics team needed a packaging solution seamlessly integrated with the DxI 9000 IA analyzer, minimizing material content and capitalizing on recycling opportunities. Beckman Coulter approached Plastic Ingenuity to partner on designing a custom thermoformed package to hold and protect 520 pipette tips in four rigid polystyrene trays.

Overcoming the Design Challenge

The thermoforming process differs from the injection molding process. It is a manufacturing process where a plastic sheet or film is heated in an oven to a high enough temperature so that it can be stretched into a mold that is formed and cooled to a specific finished shape in a mold (or die) and trimmed to create a usable product. Thin gauge thermoforming is primarily used to manufacture containers, lids, trays, blisters and clamshells for the food, medical and general retail industries. To protect the highly sensitive pipette tips from handling damage, Plastic Ingenuity



Production thermoforming mold being polished. Image courtesy of Plastic Ingenuity.



#1 Resin ID Code for PET found at the top corner of the cover. Image courtesy of Beckman Coulter.



The latest Beckman Coulter Diagnostics DxI9000 Access Immunoassay (IA) analyzer addresses clinical laboratories' need for analytical speed, reliability, reproducibility, quality and menu expansion when identifying and detecting the concentration of specific substances in a sample during a variety of medical testing. Image courtesy of Beckman Coulter.

designed a unique cover and base tray to be as robust as possible yet remain a viable thermoformed PET part.

First, a prototype tool was built for the initial fit, form and functionality trials. To optimize the design, and instead of simply adding material, Plastic Ingenuity initiated a design for manufacturing (DFM) approach. It focused on design features such as adding ribs, flutes and structure to both the cover and base trays that increased overall package strength without compromising the design intent. Subsequently, a production thermoforming tool was designed and built for production purposes, incorporating lessons learned from the prototype tool.

After discussions with Beckman Coulter's Global Plastics team, the Plastic Ingenuity team incorporated a cut-out feature to the package's base tray, enabling laboratory techs and operators to easily reach inside the package when loading the individual pipette trays into the instrument. These design and process improvements resulted in successful test results and the passing of the thermoformed mold validation requirements (the IQ/OQ/PQ phases).

To optimize the design, Plastic Ingenuity focused on design features such as adding ribs, flutes and structure to both the cover and base trays that increased overall package strength without compromising the design intent.

Recycling of PET Packaging Material

PET is the most widely used and recycled packaging material in the world. It serves to protect its contents and is lightweight, with optimized clarity and chemical resistance/wear properties. The best part about PET plastic is that it can be recycled into the production of new PET packaging and other products such as PET bottles.

This specific application uses reground PET material for the thermoformed packaging of the consumables used in the DxI 9000 IA analyzer and suits the environmental sustainability strategy to recycle and reduce waste generation. The #1 Resin ID Code for PET is at the top corner of the cover of the package.

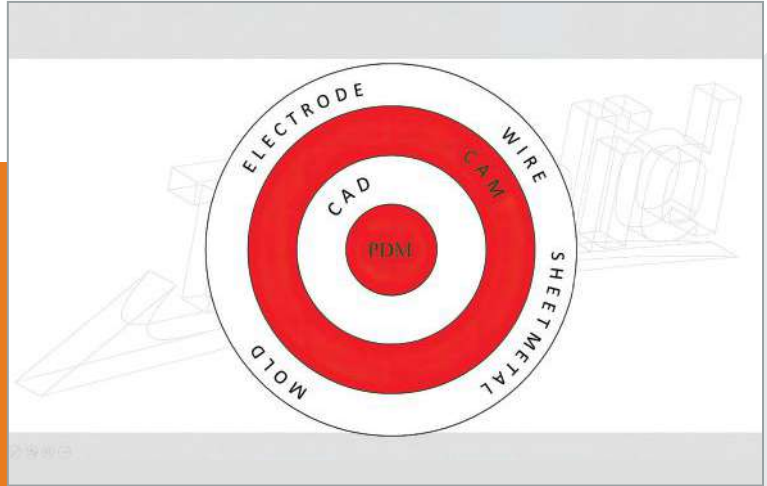
The design improvements to the DxI 9000 analyzer pipette kit packaging unit offered material savings of 58% less plastic when compared to traditional molding methods. Additionally, the tooling improvements enhanced the packaging material efficiency, and the Beckman Coulter team achieved its product protection, material handling and design for recycling goals. [MMT](#)

FOR MORE INFORMATION

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Rob Helmke, Marketing Manager

Managing all That Data

Product data management may have a bad rap, but making it a priority rather than an afterthought can help make the most of your design and machining information.



Fully integrated CAD/CAM is built around a PDM core. All images courtesy of TopSolid.

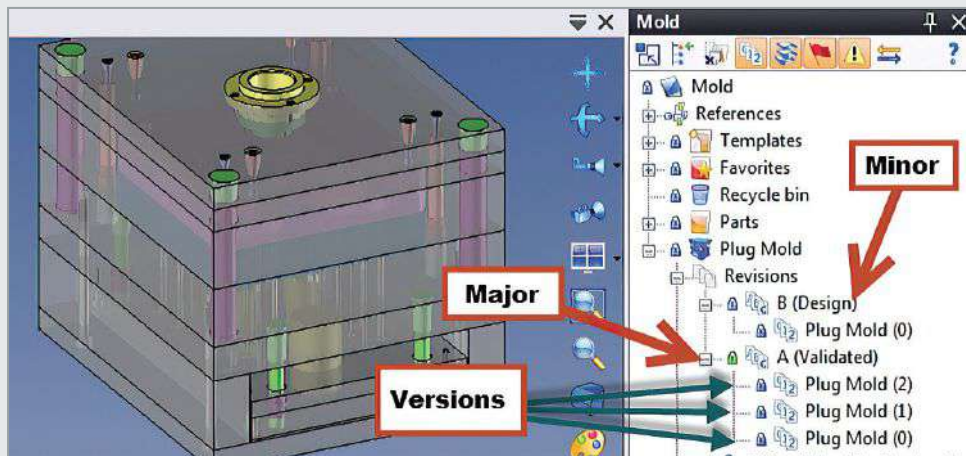
Product data management (PDM) is the use of software to manage product data created by other software. In its simplest form, it manages the storage and versioning of such data, and records who used or modified the data last. A good PDM solution will do this for all data types. For many companies, PDM is thought to be unobtainable, because they expect such systems to be cumbersome to use and implementation costs to be massive. The reality, however, is that every single manufacturing company needs a PDM system in order to be more profitable. Following is some background on how the outlook on PDM has become so negative.

had all of this digital data, we needed a way to manage it. Thus, the ugly stepchild was born: PDM. PDM products were developed about 6-10 years after the birth of the products for which they were written to manage. So PDM was an afterthought.

This is why PDM solutions are considered too cumbersome and expensive to implement. If a PDM product has been developed that late in the game, the level of product integration will be skin-deep at best, right? How can a product easily manage a solution after the fact like this? Well, it can be done, but at a cost. And that cost is usually in the form of an overly generic user interface that will need to be customized to specific

The Data Timeline

Computer-aided design (CAD) technology was invented to streamline the engineering process, enabling engineers to work more quickly and to share their designs more easily. Soon after it was developed came its baby brother, known as computer-aided manufacturing (CAM). CAM software was developed to take the digital design data engineers came up with and turn it into manufacturing information that machines could understand. CAD and CAM revolutionized the world of engineering and manufacturing, however, this revolution also created a problem: *data*. Now that we



Integrated CAD/CAM/PDM tracks both major and minor mold base revisions.

customer needs with a lot of custom workflows to make the software work the way it was intended. The result is a hard-to-use, clunky solution.

A Managed Solution

But what if it didn't have to be this way? What if the entire experience could be changed? What if, instead of making PDM an afterthought, you made it your primary thought, front and center in all your data-related operations? This means finding a software solution that manages all of the information that is created, used and deployed within your manufacturing processes and ensures that everyone involved in these processes works with the absolute latest version of the data. A solution like this would be integrated very tightly inside your CAD/CAM software, so users don't even know they are using a managed solution.

Say you are a mold manufacturer that does everything internally, from the 3D design of the mold and the 2D detailed prints with the bill of materials to pulling electrodes and programming everything in between. You just finished completing a design, and your electrode specialists are pulling electrodes and beginning to program. At the same time, your mold base specialist is programming all of the base work, and the worker assigned to hard milling is programming your high-speed, five-axis mill for the cavity block. And this is a rush job, so you have virtually no time to think. Then the customer sends you a new database with a design change. How do you handle the design change and ensure that everyone gets the necessary updates without too much disruption to the operation?

You have two options. You can continue to manage this project yourself by checking every file to verify if an update is required, then head out to the shop floor to find each person

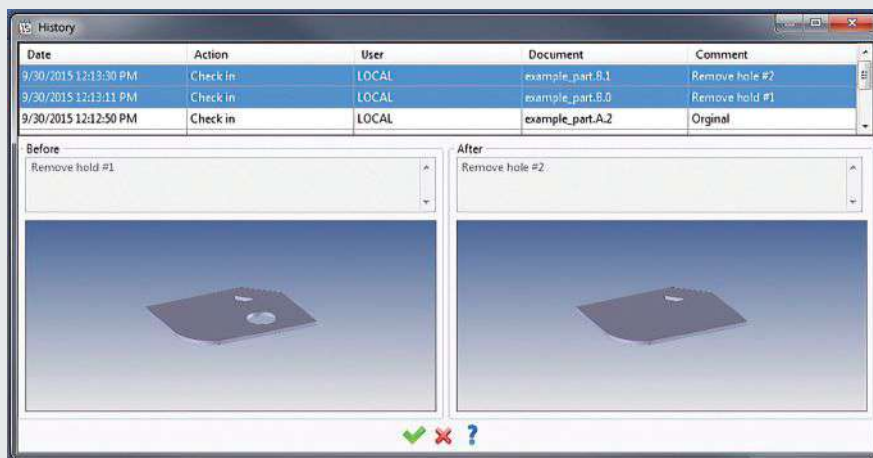
involved in the project, alert them to the changes and inform them that all of their work will likely need to be redone. Or, you can work with a software solution that manages all of this for you: a PDM-based CAD/CAM solution.

In a PDM system, the design changes come through a managed solution. Engineering incorporates design changes, and when the design is approved, the engineers simply "close" the revision. This fires an automatic mechanism that notifies everyone downstream of the changes, instructing them to open their own files and hit "refresh." In some cases, those downstream workers may need to fix or recreate portions of their work, but they will not have to start over again. Moreover, all the changes they and the engineers have made are protected by a previously managed revision. Oftentimes, this change in flow causes only a few minutes of disruption in the manufacturing process. Then everyone returns to doing what they should be doing — manufacturing.

A managed PDM solution like this also offers the benefit of project backup. Imagine a customer sends you a design revision. You make the required changes and then when you go to them for approval, you find they have changed their minds again. They want to go back to the original design. You hope you have a backup of the complete project, including the original design. With a managed solution, you are always protected with just such a backup. You can simply revert back to the previous revision, and all items downstream will return to that revision.

If PDM products are developed properly, with usability and cost effectiveness in mind, and then deployed appropriately, they are worth their weight in gold. Only then can these management solutions become attractive and attainable for the typical mold manufacturer. [MMT](#)

CAD and CAM revolutionized the world of engineering and manufacturing, however, this revolution also created a problem: *data*.



A managed PDM solution offers project backup, which enables users to compare original and revised mold/part designs.

FOR MORE INFORMATION

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November GBI Saw a Drop in Moldmaking Activity

November – 42

Moldmaking activity experienced accelerated contraction to a fairly large degree in November, hitting a new 2023 low. The Gardner Business Index (GBI) Moldmaking ended the month at a reading of 42, a full 3.5 points down from October.

Three closely connected components drove the contraction. New orders, production and backlog all saw accelerated contraction, following what had been a stable month prior for new orders and production. Higher material prices, reported the past few months in both moldmaking and plastics, may be affecting these components as far as reducing new orders which, in turn, contracts production and backlog. Alternately, employment and exports components slowed their contraction in November.

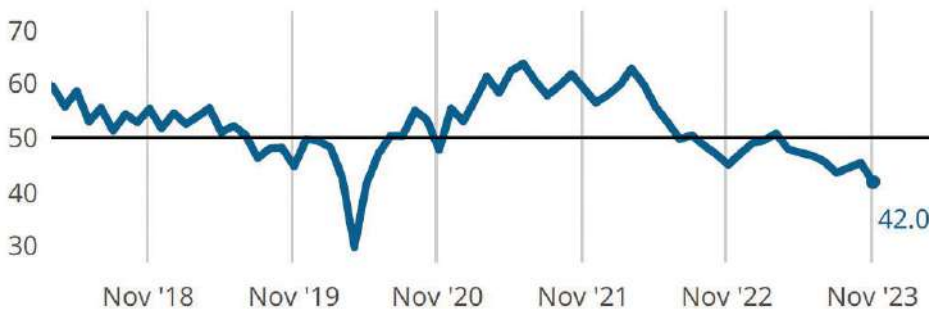
Employment may be returning to a more normative state after aggressively contracting starting in July 2023. [MMT](#)



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 was down 3.5 points in November. All images courtesy of Gardner Intelligence.

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



New orders, production and backlog drove the November drop.



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.*

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CUTTING TOOLS



Gundrill Tool Extends Hole-Making Productivity for Injection Molds

Iscar USA highlights the Tri-Deep gundrill, a tool designed to drill holes with a depth-to-diameter ratio of more than 10X the diameter and up to 150X the diameter ratio. The gundrill is designed to minimize machine downtime and maximize productivity up to 4X

over a conventional braze gundrill. It is useful for drilling cooler lines and heater holes on injection molds.

Part of Iscar's hole-making product line, the Tri-deep gundrill carries three cutting edges with a chip-splitting cutting edge on the TOGT inserts, two cutting edges with a chip-splitting edge on the LOGT insert and a single chip-splitting cutting edge on the ZSGT insert. The insert has a positive rake chip breaker design, producing narrow chips for ensured chip evacuation, with a wiper for high hole surface quality and high feed rates. All inserts are made from IC908, a versatile, PVD-coated grade.

The Tri-Deep is also equipped with Iscar's advanced gundrill technology, which provides optimal geometric and dimensional quality for both deep and shallow drilling. The Tri-Deep gundrill can be run on a CNC lathe, CNC machining center, HBM machine, HMC machine and gundrill machine.

According to Iscar, the gundrill offers direct insert mounting – no adjustment is needed for an accurate hole diameter. It also has two indexable carbide guide pads, one for support and one for dimensional control. The ease of changing these versus resharping on a braze gundrill ensure no downtime, a key feature to satisfy mold builders.

The Tri-deep gundrill is available in diameters ranging from 10-32 mm and in 10, 15 and 25 drilling length-to-diameter ratios. Longer gundrills with up to a 2,400-mm length can be supplied on request from 14-32 mm, and a 1,650-mm length from 10-13.99 mm.

Iscar USA / 817-258-3200 / iscar.com

PVD-Grade Carbide Milling Inserts Address Mold Machining Challenges

Walter USA introduces its Tiger-tec Gold physical vapor deposition (PVD) grade WSP45G, a new generation of indexable carbide inserts for milling that dramatically expands capabilities for slotting, shoulder and copy milling. The new grade can efficiently process demanding machining applications such as interrupted cuts and difficult materials, desirable for mold building, when mold component interchangeability, ever-tightening tolerances and hardened tool steels are common.

This new grade is now reportedly capable of longer tool life, greater reliability and approximately 30% greater performance in stainless steels (ISO M) and heat-resistant super alloys (ISO S), and up to 75% greater performance in steels (ISO P) than comparable grades. With the launch phase now complete, the PVD-grade WSP45G Tiger-tec Gold can be used universally in all standard Walter milling cutters.

According to Walter, the key to the grade's performance is its next generation coating technology and its special layer structure. The gold-colored ZrN top layer is said to facilitate exceptional low-friction characteristics as well as optimized wear detection, thus making it possible to use the full potential of the indexable insert to extend tool life. Next, multiple layers of aluminum oxide (Al_2O_3) increase the inserts' temperature resistance.

All are applied on top of a TiAlN base layer and a premium carbide substrate as a foundation, greatly increasing the overall wear resistance. These properties make the new inserts ideal for challenging conditions, such as interrupted cuts, long overhangs with a tendency to vibrate or wet machining.

Walter USA LLC / 800-945-9554 / walter-tools.com/us



Cutting Tools Portfolio Caters to High Machining Demands

The **Haimer Mill** line offers a range of cutting tools that provide precise and reliable machining for ramping, drilling, milling or slotting operations. These characteristics, according to Haimer USA, make the line an optimal choice for professionals looking for entry-level cutting tools that offer efficient and cost-effective machining solutions.

Haimer Mill solid carbide end mills are characterized by their reliability, versatility and precision. They are adaptable and suitable for use in almost all materials, the company contends, making them ideal for efficient roughing and finishing operations in industries like automotive and medical. The end mills also provide accuracy and consistency for high-quality and consistent parts production.

The Haimer Mill line complements the solid carbide end mills with an array of chamfering end mills, designed to produce an optimal surface finish and precise angles, adding a high level of intricacy to any machining operation. A variety of sizes and configurations are available so that end users are able to select the best tool for the correct specific applications and enhance the quality of their work.

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



Access the related video under the corresponding product post at *MMT* online.



Flat Bottom Drill Supports Stable Counterboring Action

OSG USA Inc. announces the expansion of the company's Phoenix PDZ offering with the addition of the new PDZ-3D indexable flat drills. The flat bottom drills feature enhanced chip breaker geometry, resulting in improved chip formation and

evacuation. The broad lineup includes standard socket head cap screw sizes, enabling fast and stable drilling of counterbores in mold bases.

Phoenix PDZ's flat bottom cutting edge configuration is compatible with a wide range of applications – drilling (including inclined and curved surfaces), counterboring, turning and more. It offers high-precision finishing on flutes, improves rigidity, efficient chip evacuation and reduces cutting force thanks to its four-corner insert design. It is available in inch and metric sizes.

OSG USA Inc. / 800-837-2223 / osgtool.com

Mold and Die End Mills Target Hard Machining

Emuge-Franken's line of hard-cut ball nose and torus end mills line offer significantly longer tool life and optimal surface finishes in hard materials.

More than 20 new solid carbide end mills in the hard-cut ball nose and torus line provide high-performance milling in materials hardened up to 66-70 HRC, as well as in unhardened steel and cast materials. Due to optimized tool geometry and high-performance solid carbide construction, the end mills offer up to 60% longer tool life and produce the highest quality surface finishes, according to the company.

Specifically optimized for hard machining including roughing, pre-finishing, finishing and high-speed cutting applications, Emuge-Franken's end mills feature new precision cutting edge geometry and concentricity, and have a tighter h4 shank tolerance. The ball nose end mill has a diameter tolerance of -0.014 mm and a radius tolerance of -0.007 mm, and the torus end mill has a diameter tolerance of -0.015 mm with a radius tolerance of ± 0.005 mm. A TiAlN tool coating, which indicated high performance in internal and customer testing, significantly extends tool life.

Emuge-Franken USA / 800-323-3013 / emuge.com



All-Round Cutter with Center Cutting Capability Provides Mold Machining Versatility

Tungaloy has expanded its DoMultiRec multifunctional milling/drilling tool line by adding three additional diameter options of modular cutting heads and two new inserts with nose radius variations.

The DoMultiRec multifunctional milling cutter with center cutting capability enables a single tool to perform multiple milling operations, including shouldering, pocketing and drilling.

The cutter's insert integrates a center and peripheral cutting edge on one side. Its double-sided design means that the same insert can be used either for the center or peripheral position for up to four indexings, front and back. Tungaloy says this doubles the cost-per-edge economy when compared with conventional plunge milling cutters using single-sided inserts. Furthermore, the insert features -MM geometry that is developed specifically for the DoMultiRec inserts to ensure strong and sharp cutting edges during various milling and drilling operations.

The inserts are optimally arranged on the cutter so that they create a near-flat surface of the hole bottoms when drilling blind holes.

New modular cutting heads are available in 17 mm (0.669"), 21 mm (0.827") and 26 mm (1.024") diameters. When these cutting heads are coupled with the holders with 16-, 20- and 25-mm-diameter shanks respectively, they provide a clearance between the tool and the workpiece shoulder, enabling the tool to machine very close to the shoulder without the concern for tool collision.

Two new LXMU10T304PER-MM and LXMU120404PER-MM inserts have 0.4 mm (0.016") nose radii. According to Tungaloy, they are especially effective when machining the shoulders requiring a corner radius of 0.5 mm (0.020") or smaller.

Tungaloy-NTK Inc. / 888-554-8394 / tungaloy.com/us



Rineck Shrink Fit Tooling and Machine Technology Offered by Platinum Tooling

A globally recognized manufacturer of tool holding technology, **Rineck** shrink fit tooling and machine technology are now available in the US and Mexico through **Platinum Tooling**. Custom and standard tool holders are available in all common machine connections including CAT, HSK, BT, SK, PSC and straight shank extensions.

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www.platinumtooling.com



Cutter Designed for Roughing in Face, Profile Milling Operations

Sandvik Coromant has launched a new milling concept – the CoroMill MR80 – primarily designed for chal-

lenging roughing operations in a wide range of face and profile milling applications in steel and stainless steel. The MR80 is also recommended for tool steels.

CoroMill MR80 is a double-sided round insert concept with 12 indexing possibilities, higher than regular round insert cutters, meaning more parts for each set of inserts, higher table feed and increased productivity. It is ideally suited to low depth of cut up to 3 mm. While originally designed for machining cast stainless steel components, the product has been further developed to cater to steel milling applications, which require the security of a round cutting edge – such as in mold and die when face and pocket milling mold bases.

“The round cutting edge is considered to be the most secure edge for challenging materials as well as tough cutting conditions,” says Sangram Dash, global product application specialist for indexable milling tools at Sandvik Coromant. With its lightweight cutting geometry, it is also possible to use CoroMill MR80 for difficult machining situations, even with long overhangs. “Often, in mold and die applications, the cutter must go deep into the mold cavity, mounted on a long adaptor,” says Dash. “In both cases, the cutting forces must be limited so that vibration can be avoided. Although CoroMill MR80 is a double-sided negative concept, it works with fairly low cutting forces and is a suitable solution for such applications.”

The CoroMill MR80 assortment offers cylindrical and arbor cutter bodies, with diameters from 32-100 mm, 3-12 cutting teeth, and pitch and shim protection. All cutter bodies feature internal coolant supply. The double-sided E-L50 inserts offer true and easy indexing (6 + 6), with a 3-mm recommended depth of cut.

Sandvik Coromant / 201-794-5000 / sandvik.coromant.com

High-Feed Milling Cutter Range Benefits Moldmaking Versatility

Aiming to deliver cutting tool solutions that redefine the moldmaking landscape, Horn USA is offering its comprehensive DAH milling tools, which offer a range of capabilities including ramping, surfacing, plunge mill-



ing, helicoidal drilling and 3D machining. The DAH37 high-feed milling cutter, for example, features three cutting edges and is fortified with SA4B and SC6A coatings, making it versatile for machining various materials. The DAH82 carbide grade, boasting eight cutting edges, and its counterpart, the DAH84 with a greater depth of cut, represent the latest advancements in high-feed milling technology from Horn's location in Germany – the tools have showcased high performance globally, making their mark in countries like France, Morocco, China, Spain, Italy, Vietnam and the U.S. In Vietnam, for instance, the DAH milling cutters have become indispensable for machining molds for the exhaust pipes of motorcycle brands and crafting molds for everyday items such as spoons and forks.

The DAH82 variant is available as an end mill and as a screw-in milling cutter in 20-, 25-, 32-, 35- and 40-mm diameters. For diameters in excess of 50 mm and up to 125 mm, the larger DAH84 system is used. All tool bodies receive a special surface treatment for high strength and hardness, imparting long-term protection against abrasive wear from chips.

The DG range, featuring replaceable screwed ends, is another option for mold builders, covering everything from diameter and roughing to finishing and high-feed applications.

According to Horn USA, adaptability is what sets its cutting tools apart – whether working with or without coolant, they offer improved tool life, and their lengths are easily adjustable, thanks to Horn's steel or carbide toolholders, which seamlessly screw onto standard chucks.

Horn USA / 615-771-4100 / hornusa.com

Toolholder Series Increases Lathe Efficiency, Precision

Big Daishowa introduces the C3 program, an expansion of the Big Capto toolholder line, designed to increase efficiency and precision for small lathes. This turning equipment, if included in a moldmaker's arsenal, can achieve copper and graphite electrodes, core pins, mold base components and more

The C3 series of Mega New Baby chucks has a clamping range of 0.010-0.630" with a maximum rpm of 30,000, well suited for drills, reamers, taps and finishing end mills. Ultra-slim and strong, Big Daishowa says they provide reliable gripping for even the smallest workpieces.

The Big Capto C3 square holders for turning applications come in left and right orientations. The turning application holders – C3-180-BH16R-2058 and C3-180-BH16L-2058 – are mono-block holders. Their insert clamps are tough and reliable, adding on to the already inherently high rigidity of mono-block holders. The resulting higher rigidity minimizes vibrations and movement



during cutting, improving accuracy and efficiency.

The new square toolholders are available in 90- and 180-degree types. The 90-degree type offers a variety of orientations, including perpendicular to the workpiece. Its compact design also enables work in spaces that are tight or have limited clearance. The 180-degree type, meanwhile, allows the tool to machine harder-to-reach areas of the workpiece.

Due to the limited space for smaller lathes and mill-turn machines with C3 clamping systems, integral C3 turning adapters are compact and rigid with left- or right-hand units for most common turning geometries. C3 boring bar holders also are available to clamp 6-, 8-, 10- or 12-mm boring bars. All turning toolholders feature through-spindle coolant. The tool assembly device, Kombi Grip (model KG32R), can work on C3 tools outside the machine, and cleaning of internal C3 clamping units is quick and efficient using Big Capto spindle cleaner SC-C3.

Big Daishowa Inc. / 888-866-5776 / bigdaishowa.com



Indexable Drill Offers Extended Application Range

Kennametal Inc. has upgraded its Drill Fix indexable drilling platform with Drill Fix Pro, offering customers a cost-effective solution for a wide variety of drilling operations.

“Drill Fix Pro delivers superior surface finish, hole quality and chip evacuation plus increased versatility for a broad range of customers’ needs,” says Michael Hacker, Kennametal’s senior global product manager.

Designed for extended tool life and smooth drilling at high metal removal rates, Drill Fix Pro has outboard inserts that feature a wiper geometry for smoother surface finishes and larger coolant channels for high-volume flow. Other platform advancements include the versatility of the four-time indexable cutting edges that offers an extended application range.

Drill Fix Pro is applicable for machining centers, drilling machines and lathes. While on lathe machines, it can also be used as a boring bar, making use of the X-offset feature in horizontal cutting.

This upgraded platform complements Kennametal’s stainless steel and high-temperature alloy indexable drilling grades KCMS35 and KCMS40.

Kennametal Inc. / 800-446-7738 / kennametal.com

Milling Cutter Handles High-Precision Moldmaking Requirements

To meet exacting mold tolerance surface finish standards, moldmakers must rely on highly precise cutting tools and complex machining techniques. **Guhring Inc.’s** new G-Mold line of high-precision milling cutters offers a significant advantage in meeting these demanding requirements.

Recognizing that moldmaking often involves machining high-strength and hardened tool steels, Guhring has developed a carbide substrate which can withstand the challenges of machining these materials. The very hard, ultra-fine grain substrate ensures optimal edge stability and reliable tool life during the machining process. Additionally, Guhring’s new Perrox coating enables smooth tool surfaces and highly wear-resistant cutting edges.

Guhring’s specialized tool geometry, combined with a distinctive carbide substrate and advanced coating system, provides the ideal solution for machining hardened tool steels up to 65 HRC with precision and performance.

The new G-Mold line provides an expansive offering of ball nose cutters, torus cutters, high-feed mills, finish milling cutters and micromilling cutters. With tool diameters ranging down to 0.2 mm, and cutter form tolerances held within 10 µm, Guhring offers a high degree of flexibility while maintaining extreme precision.

Guhring Inc. / 800-776-6170 / guhring.com



THEY GAVE THEIR ALL. LET’S GIVE SOME BACK.

The iWarriors mission is to honor severely injured soldiers from all branches of the Armed Forces by providing personalized tablets and technology to aid in their rehabilitation and recovery. Support is from the American Mold Builders Association, MoldMaking Technology, and suppliers.



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PVD-Coated Milling Inserts Increase Production Efficiency With Less Downtime

Kyocera Precision Tools introduces the PR18 Series, a lineup of indexable milling inserts meticulously crafted to elevate the mold and die machining experience, amongst other machining applications, across Kyocera's most popular milling lines. At the core of this series



is the company's new PVD coating technology, designed to eliminate frequent tool replacements and costly downtime. Each insert features multiple cutting edges.

The PR18 Series incorporates a proprietary Megacoat Nano Ex coating. The double lamination technique with two nanolayers for abrasion, wear and heat resistance is optimal for durability and high performance. Moreover, improved oxidation resistance and coating tough-

ness suppresses crack growth and remains tougher longer, according to Kyocera. This results in prolonged tool life, reducing the need for frequent tool changes in the middle of production runs. Milling operations also maintain their precision and surface finish.

PR18 grades are available across more than 16 milling series cutter lines. The PR1825 is recommended for steel (wear resistance oriented), the PR1835 for stainless steel and steel (stability oriented) and the PR1810 for cast iron. A compatible cutter series include various milling operations (facing, slotting, ramping, helical milling, shouldering, etc.).

Kyocera Precision Tools / 800-823-7284 / kyoceraprecisiontools.com

Solid Ceramic End Mills Provide High Metal Removal Rates

Greenleaf Corp. highlights its Xsytin-360 end mills – a cutting tool that combines the company's phase-toughened Xsytin-1 substrate with a specialized cutting geometry that is said to offer 10X higher productivity. The strength of the material enables the user to apply chip loads similar to solid carbide end mills with higher speeds common to ceramic machining. These new



ceramic end mills provide increases in productivity over current solid carbide or ceramic products.

Greenleaf says its Xsytin-1 material is engineered to machine a wider variety of materials than any other ceramic in the industry. The structure of this phase-toughened ceramic exhibits high wear resistance and improves thermal shock resistance, which makes the Xsytin-360 end mills highly predictable, versatile, high-performance products.

Xsytin-360 end mills provide high material removal rates and result in increased productivity on a wide range of materials. These end mills are effective at machining a variety of materials, including high-temperature alloys, 3D-printed sintered high-temperature alloys, hardened steels, ductile cast irons and compacted graphite iron (CGI). In hardened steels, the tool life of Xsytin-360 end mills has proven to be equal to high-performance carbide end mills when run at high-end speeds (11,460 rpm), while also removing more than 73 in³ (over 1,200 cm³) of material. Xsytin-360 end mills are ideally suited for machining materials in the aerospace, automotive, mold and die, and power generation industries.

Greenleaf Corp. / 800-458-1850 / greenleafcorporation.com



Cutting Tool Presetter Offers Advanced Productivity in a Smaller Footprint

Lyndex-Nikken, manufacturer and provider of high-performance machine tool accessories, announces the E346V+ presetter, by Elbo Controlli Nikken, delivering the productivity of larger, more sophisticated presetters in a smaller footprint.

The E346V+ presetter helps to optimize spindle uptime, enabling the measurement of cutting tools for mills and lathes to be done offline. It also allows shops to be more productive, as monitoring tool runout helps optimize cutter life and cutting capability. Moreover, the E346V+ presetter inspection tools can see insert and cutter edge wear, helping to prevent scrap parts or poor finishes.

A ground granite base and column, as well as an electro-welded and de-tensioned steel construction with an ergonomic design, give the E346V+ presetter rigidity and accurate performance; it also assures the same perpendicularity accuracy for cutting tools of all sizes. Further enhancing accuracy, the precision spindle system is fully interchangeable. With 1 μm resolution, length and diameter dimensions transferred to machines are also accurate.

A 15" TFT LCD touch screen provides full operator control via an easy-to-use, intuitive icon system for functional simplicity. Free software updates are provided for the life of the presetter, and software includes up to 9,999 machine tool origins and up to 999,999 cutting tool table capacity.

The E346V+ also has an optional tool identification system (TID), a two-way communication between the presetter and the CNC allowing measurements taken from the presetter to be sent directly to the CNC via a QR code without downtime. TID also enables complete customization to manage different configurations according to the cutting tool data required for the specific machine. Users are able to view the status of the tool assemblies and the CNC corrector table.

The measurable range for the E346V+ presetter's X and Z axes are 14.17" in diameter and 18.11" in length, respectively.

Lyndex-Nikken Inc. / 847-367-4800 / lyndexnikken.com



Shell Mill Supports Variety of Rough Milling Strategies

The MaxiMill 251, presented by **Ceratizit**, is a shell mill, also known as a button cutter, that offers various rough milling strategies. Utilizing a stable round insert, the positive mounting position provides a soft cutting action, giving lower cutting forces for a smooth cut.

MaxiMill 251 features six face-mounted inserts, with a 2" cutting diameter (max is 2.5") and a 0.24" maximum depth of cut. Applied in a variety of applications, the MaxiMill 251 can be used for pocketing, mold and die roughing, face milling, slotting and helical interpolation of holes. It is also commonly used in aerospace and energy sectors, as it works well in high-temperature alloys, steel and stainless steel. In addition, the MaxiMill 251 is an optimal cutting solution for unstable pieces, older and lighter machines that cannot achieve the performance needed of high-feed cutters, as well as multi-axis machining.

Ceratizit USA Inc. / 800-865-6638 / ceratizit.com

Indexable Milling Platform Advances Mold and Die Capabilities

Since its debut at IMTS 2022, **Dapra Corp.** announces that its Vapor high-feed indexable milling platform has become a quick favorite among many of the company's North American mold and die and production shop customers.



Vapor delivers high metal removal rates across all mold roughing applications by pairing light depths of cut and high feed rates, increasing the number of teeth in the cut to capitalize on modern machine tool capabilities. Double-sided TRI-X2 trigon inserts provide six usable edges to reduce a shop's overall manufacturing costs.

Versatility is Vapor's calling card, Dapra notes, with multiple fine- and course-pitch cutter bodies

available in a wide range of sizes and lengths, plus modular tooling configurations for long, hard-to-reach applications. All cutter bodies are machined from highly shock-resistant, through-hardened H13 tool steel, then nickel and nitride coated. Re-engineered gullets and insert pockets provide more effective chip evacuation and improved redistribution of cutting forces, extending tool stability and overall tool life.

TRI-X2 inserts are available in multiple geometries and a variety of substrates and coatings, with insert screw sizes for easy indexing. Dapra's "T" edge is reported to be the workhorse in mold shops, providing added strength and life in tool steels. "D" edge inserts are also now available for superalloys, 300 series stainless, AMPCO and gummy materials requiring a sharp edge.

Dapra Corp. / 860-242-8539 / dapra.com

Tool Balancing Equipment Ensures Consistent Moldmaking Results

The Zoller Inc. »toolBalancer« series delivers an advanced tool balancing system that enables moldmakers to achieve high-quality surface finishes and extend the life of cutting tools and machine tool spindles.

The »toolBalancer 550« and »toolBalancer 750« can balance toolholders, tool assemblies and grinding wheels within 0.4 gmm of accuracy, enabling smooth machining that protects the machining center and produces a better part. Machines in this series can balance tools weighing up to 66 lbs with diameters up to 18.9" and lengths up to either 21.6" (»toolBalancer 550«) or 29.5" (»toolBalancer 750«).

Each system is equipped with a high-precision spindle and a balancing adapter that can mount almost any toolholder. The spindle rotates the tool with a variably adjustable speed of 400-1,200 rpm, depending on its weight. A distinctive design element prevents damage from adapters that are incorrectly screwed into the spindle.

Zoller Inc. / 734-332-4851 / zoller-usa.com



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High-Feed Mill Prolongs Cutting Tool Life

Keeping with its 100-year history in cutting tool design and manufacturing, **M.A. Ford** introduces the TuffCut HF high-feed mill (FHFP). This solution is engineered with a rolled cutting face that provides increased strength and prolonged tool life, adding cost savings. With a multi-flute design and a positive axial rake, the FHFP performs well in a range of difficult materials 52 HRC and under. It also achieves high metal removal roughing in 3D shapes, and is well suited for long-reach applications into deep/tight pockets and slots.

M.A. Ford's FHFP series is offered in metric sizes from 6-16 mm in diameter and multiple neck lengths from 3xD to 8xD. Tool life has been enhanced in several ways. For example, coated with the company's ALtima Q coating, the FHFP provides optimal heat and wear resistance. Its central coolant design also enables excellent chip evacuation to prevent recutting of the chips along with a cutting geometry that thins the chip, providing reduced cutting forces and heat.

M.A. Ford / 800-553-8024 / maford.com



Moldmakers Maximize Tooling Investments With Carbide Drill

For those moldmakers machining ferrous metals, hardened steels and superalloys, custom PCD, CBN and carbide tooling from **West Ohio Tool Co.** boosts cutting efficiency and provides extended tool life for maximum tooling

ROI. Among the company's custom PCD and carbide tooling is the EdgeX4 drill that is said to consistently exceed expectations in holmaking performance, precision and reliability.

EdgeX4 drills feature a solid-wafer PCD cross-center tip, bonded to the carbide drill body via a proprietary process. The design prevents premature breakdown of the drill point compared to outboard tip drills.

In actual applications, West Ohio Tool says the EdgeX4 provides performance equal to or better than conventional tooling, but at a lower cost per hole. While there are many variables to consider such as the machine, the workholding, the operator and design of the tool, EdgeX4 drills, depending on application, typically exceed 800,000 to 1 million holes, running 3-5X faster to reduce processing time by up to 75%, according to the company.

West Ohio Tool's portfolio covers carbide and PCD custom drills, reamers, mills, end mills, grooving and internal forming tools. Its EdgeX4 tools include the line's helix, straight, full nib and ball nose variants.

In addition to cutting tool design, the company uses its expertise to help customers determine the best tool to use by researching all aspects of the project from work materials and machining parameters through application support, providing what West Ohio Tool says is 75% faster turnaround and delivery times than the industry standard.

West Ohio Tool Co. / 937-842-6688 / westohiotool.com



Versatile End Mills Key for Moldmaking Operations

IMCO Carbide Tool Inc. has developed a new series of Pow-R- Feed M936 end mills with the versatility to machine a slot for wire channels, cut a helical entry into an insert pocket, rough the pocket with a traditional or HEM tool path and face off the rough block to square it up, all without a single tool change.

Designed for faster part cycles and high speeds, regardless of a machining station's horsepower, the M936 designs feature wiper flats and flute geometry ideal for producing good surface finishes on workpiece sidewalls and floors. Open-ended face geometry enables their use for downward cuts. The series is also ideal for machining 3D impression shapes.

One of the most distinctive features of the M936 six-flute is its extended tool life in die steels, thanks to the variable helix and variable index effects on vibration damping, a specially engineered carbide core and an AlTiSiN slippery-smooth coating, which also prevents chip buildup and enables high feed and metal removal rates. Free cutting action for the M936 end mills means reduced heat transfer to the workpiece and less risk of warpage.

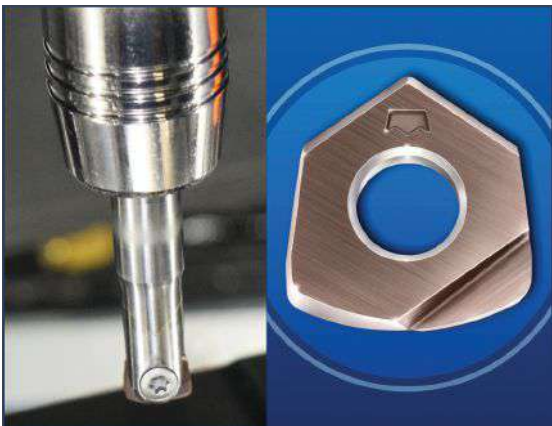
"This is the cutter for any programmer machining steels, stainless steels and titanium on three-axis to five-axis CNC machining centers who wants to run fast and helical enter, ramp, slot and peripheral mill at optimal feed rates," Matt Osburn, vice president, technical director for IMCO, adds.

IMCO Carbide Tool Inc. / 800-765-4626 / imcousa.com



Ball Lens Inserts are Engineered for Productivity, Surface Finish Gains

Millstar, a part of **Cole Tooling Systems Inc.**, manufactures insert and solid carbide tooling for conventional profile machining, high-speed milling and hard milling. The company highlights its ABL series inserts, which use an innovative hybrid ball lens design to provide a large end face radius – typically equal to the diameter. This enables up to twice the stepover during machining operations, decreasing cycle time without sacrificing surface finish.



ABL tooling is well suited to three- and five-axis milling. Even on specialty machines with smaller spindles, ABL's features have been shown to significantly increase productivity. With its distinct blend of versatility and precision, ABL can also improve efficiency by reducing or eliminating the need for multiple cutters.

Millstar's ABL is capable of achieving optimal surface quality in almost any material, and improving cutting performance in hard-to-reach areas of a complex workpiece. This makes the ABL series an ideal option for a wide variety of circumstances, including mold and die applications.

ABL is available in HSN or HNC grades to meet application demands, even when working with very tough mold and die steels. Both grades are effective with heat-treated materials up to 72 HRC.

Millstar / 586-573-9450 / Millstar.com

Cole Carbide Industries Inc. / 586-757-8700 / colecarbide.com



Face Milling Inserts Dedicated to Workpiece Material Range

Dormer Pramet, working with a variety of segments including mold and die manufacturers, offers customers a new assortment of versatile face milling inserts. Five variants of square-shaped positive inserts have been added for depths of cut up to 6.4 mm. The range is suitable for a variety of general engineering and maintenance and repair operations (MRO) machining, with several application-specific geometries and grades available for machining any workpiece material.

The Pramet SDMT 13 pressed inserts are designed with economy in mind. Its M geometry enables light and medium cuts, while R geometry is focused more on roughing. Both geometries are versatile for milling steels, cast irons and hard steels.

The Pramet SDET 13 precision ground inserts are dedicated for use in specific workpiece material groups. Sharp F geometry is the ideal choice for secure machining of stainless steels and heat-resistant super alloys. A polished, extra sharp FA geometry is said to allow for productive machining of non-ferrous materials. An additional wiper insert XDET 13 is also available to provide high surface quality in larger diameter cutters and high feed rates.

A wide assortment of cutters is available to support the new range of inserts. The (I)SSD13F comes in Weldon and Shell styles, with a wide range of sizes from 32-250 mm (1.25-10").

A carbide shim on the insert seating gives extra stability and process security, while protecting the cutter body for high durability. These cutters also utilize internal coolant delivery for improved chip evacuation to achieve high surface quality.

Dormer Pramet / dormerpramet.com

Sharpening Solution to Give End Mills New Life

Darex has been in the business of drill bit sharpeners for more than 50 years. Knowing that the average quality end mill easily costs several hundred dollars, the company is finally applying its sharpening expertise to an upcoming end mill solution in the form of a new attachment for its XT3000 drill sharpener.



The LEX600 end mill attachment will enable users to sharpen the primary and secondary grind on the tips of two-, three- or four-flute end mills up to 5/8", giving new life to these tools while cutting cost. While not a cutting tool itself, the sharpening solution is directly beneficial to managing cutting tools – specifically those that are commonly used by moldmakers to create shapes and holes for a

mold during milling, profiling, contouring and more. Ultimately, Darex notes, its new end mill sharpener emphasizes its attempt to keep sharpening simple. A 30-day trial is offered to those that purchase directly through Darex. Join the company's mailing list at its website for release date updates.

Darex LLC / 800-547-0222 / darex.com

DATA MANAGEMENT

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 Adbeca.

Q: What is project business automation for a mold builder?

A: PBA is a category of software solutions designed to help project-based businesses integrate all core project business processes into one end-to-end system. More specifically, PBA replaces the wide range of disparate applications that project businesses normally use and integrates all those functionalities (ERP, project management, project estimation and cost management, supply chain, production, enterprise PPM, professional services automation, etc.) into one solution.

How to Focus Better on the Business Side of Projects With Nontraditional ERP



Q: What is the first step in developing a mold maintenance plan?

A: The first step is to get your team to speak the same language by creating standard terms for Mold Stop Reasons, Defects, Corrective Actions and Tooling. Once these are created, you must work with your IT, CMMS or work order system provider to get these terms into your system via drop-down boxes. The drop-down boxes are critical to limit the amount of journal entries, and to ensure measurable data. Standardization of shop practices must go beyond the hands-on techniques that we learn at a

bench. It must also include our documentation methods and how we interact with data to understand where our opportunity lies for improvement.

Step 1 of Your Maintenance 4.0 Documentation Strategy

Image courtesy of MoldTrax.



Q: What is visual search for moldmaking?

A: There are three types of visual search engines for shapes:

1. **Image>Image:** This type is used for product visual search, almost always retail. It works by using a photo of the desired product, such as shoes. It then uses this digital photo to find similar digital photos, either on the internet or on an online retailer's website.

2. **3D>3D:** This category encompasses both two- and three-dimensional engineering drawings with searches conducted in a company's secure database, not on the web. A software system may specialize in one of these platforms, or both, or may cross between 2D and 3D.

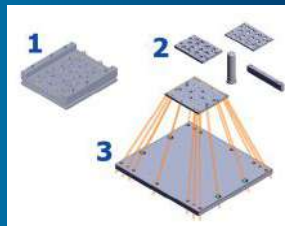


Image courtesy of VizSeek.

3. **Cross-Platform:** Cross-platform search technology allows users to perform the Image>Image and 3D>3D searches above, as well as perform searches across file or platform types.

Understanding Visual Search in Mold Manufacturing



Q: What is the primary benefit of model-based definition (MBD)?

A: Faster turnaround time as a project begins with the customer submitting its part design to the molder as a 3D CAD model that includes nominal sizes and locations of the geometry that are accurate to 5 or 6 decimal places. This model serves as

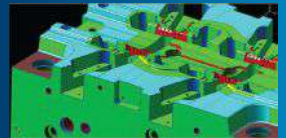


Image courtesy of Superior Tool and Mold.

the basic unambiguous definition of size and form with no required dimensions.

The Role of Model-Based Definition in Precise Mold Design



Q: What are ways to make molds "smart" or "intelligent"?

A: Technology options for smart tooling include asset tags, mold monitoring, remote validation, real-time monitoring and asset management in one system and system cooling to measure water flow and temperature.

5 Ways to Make Your Tooling Assets Smarter



Image courtesy of Progressive Components.



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Why is Tooling Digitalization on the Rise?

Editorial director Christina Fuges chats with the Consumer Division of Johnson & Johnson's Bob Vancoillie about OEM corporate initiatives for digitizing tooling.



Simple Steps to Get Your Social Media Campaign Started

MMT catches up with Gail Now's chief curiosity officer Gail Robertson to talk about the importance of using the curiosity tool to tell your stories as part of a marketing strategy that includes social media.



Consulting How and When to Use Laser Technology



Wisconsin Engraving president Pete Kambouris and marketing manager Jon Carlson share the benefits of using their laser technology expertise to alleviate customer bottlenecks.



A Man on a Mission to Tool up Fellow Mold Builders

Moldmaking Technology's Christina Fuges sits down with Charlie Harris — a man who has made it his mission to find and donate cutting tools with the mold building community.



How to Protect Your Hot Runner Systems

Chad Root, managing partner for Fast Heat by Spark Industries, reviews some molding machine integration concepts that protect hot runner systems, the molding machine, reduce scrap and help keep a log of events.



Project Reveals Added Benefits of New P20 Grade Steel in Machinability, Cycle Time and no Stress Relief

Shane Appel, polymer manufacturing engineer with General Motors, shares about a project conducted with Omega Tool and Finkl Steel to prove the dimensional stability of a new grade of P20 steel.



50 Years of Growth and Community at the AMBA

Moldmaking Technology's Christina Fuges sits down with AMBA executive director Kym Conis and board member Tom Barr of TK Molds to talk about the association's 50-year anniversary and the next 50 years.



30 Under 30 Honoree, Adding Skills and Enjoying the Moment

Christina Fuges invites M.R. Mold & Engineering technical center manager Valeria Magadan as a guest on this MMT Chat, where she shares her journey to moldmaking, the daily challenges and what she likes best about her career so far.





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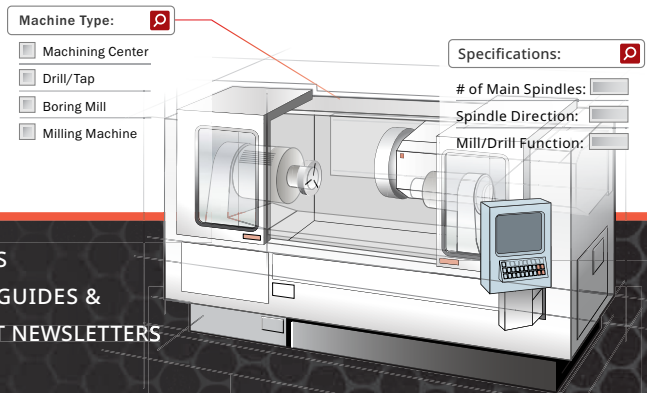
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Three Technologies to Help Fill the Skills Gap

By Ethan Rejto

The moldmaking and plastics industry faces an unprecedented labor crunch exacerbated by a fragile international supply chain and rapidly growing domestic demand. With reshoring on the rise, the issue of tooling lead times and costs has reached a critical point. Robotics, simulation software and metal 3D printing can significantly reduce the labor required during the moldmaking process, enabling shorter lead times and lower costs. Shops embracing these technologies are solving labor shortages and ensuring longevity as labor scarcity continues.

1. Robotics

Shops can use robots to automate parts of the toolmaking process, for example, an EDM cell that automatically swaps sinker EDM electrodes, allowing the machine to run lights out without needing a user to

Robotics, simulation software and metal 3D printing can significantly reduce the labor required during the moldmaking process, enabling shorter lead times and lower costs.

change the electrodes manually. A shop can also palletize workpieces, automatically enabling robotics to move pieces from machine to machine. These systems help to eliminate the impact of part setup time and reduce your non-value-added costs by providing a constant flow of parts to the machines, keeping

them running. Palletization also improves tolerances and part consistency since tools aren't being reconfigured when moved between machines. While setup can be expensive and requires highly skilled labor, palletization combined with robotics can dramatically increase shop and machine efficiency.

2. Simulation

To ensure you optimize the labor you *do* have, simulation products help understand how molds move through your shop, enabling the identification of backups before they happen. For example, discrete event simulation software that models and simulates a digital twin of your shop floor — including robots, automation, material handling systems and people — to improve shopfloor performance. Once the digital twin is created, experiments can be run to determine the results of different equipment and labor distributions.



Westminster Tool, a precision toolmaker located in Plainfield, Connecticut, palletized its sinker EDM electrodes and integrated robotics to swap the electrodes during burning, allowing the EDM cell to run lights out with minimal user interaction. Image courtesy of Westminster Tool.



Nicolet Plastics used Mantle's metal 3D printing technology to print three complex inserts, requiring only a few hours of user interaction. Nicolet could remove all sinker EDM work required, decreasing lead time from 6 weeks to 2 weeks. Plus, the printed insert only needed 10 hours of hands-on moldmaking time. Image courtesy of Nicolet Plastics.

3. Metal 3D Printing

Metal 3D printing can automate up to 95% of a mold build with minimal user interaction. For example, printing H13 tool inserts that are close to final after printing. Depending on the surface finish and tolerance required, printed inserts only require grinding to fit into the mold base and finish the ejector pin holes. This small amount of finishing is enabled via technology that prints parts with a D2 surface finish comparable to sinker EDMs and tolerances of ± 0.001 inch per inch. Since the printer requires no user interaction during printing and only an hour to set up, it reduces the amount of labor required to build a tool, enabling moldmakers to focus on other critical tasks and increase shop throughput. [MMT](#)

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