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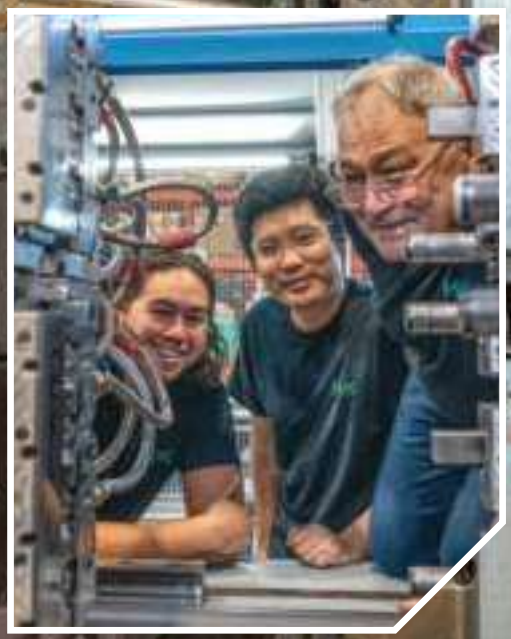

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30 UNDER 30

BACK FOR 2025!

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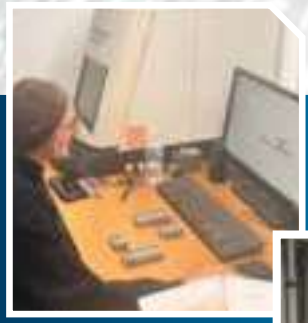
Young professionals are vital to the moldmaking industry, and it is important to acknowledge those making strides in shaping the industry's future. *MoldMaking Technology* is recognizing our industry's young talent through our 30 Under 30 honors program.



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Features

ON THE COVER

Cover photo courtesy of: MPC Advanced Machining. This cover demonstrates how teamwork fuels cube mold innovation. MPC's cube mold technology revolutionizes high-volume production with multi-material and multi-component injection molding in a single cycle. By rotating between stations, this innovative mold enables simultaneous injection of different materials or colors, overmolding or producing multiple parts at once. The system reduces cycle times and boosts production efficiency, delivering complex, high-quality parts faster and more cost-effectively. See Profile on page 10.

Source (left to right) | APSX, Hwacheon Machinery America Inc., Dynamic Tool Corp.

Departments

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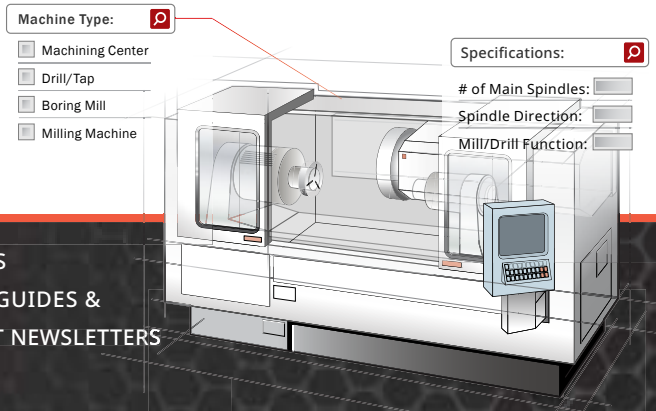

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Top 2024 Must-Reads

As 2024 winds down, it's time to reflect on the content that captured your attention the most. Consider this a gift, and just in time for the holidays! Below is a list of *MoldMaking Technology*'s most viewed articles, webinars and videos of the year. Take a moment to catch up on any you may have missed by using the QR code below. Happy viewing!

Feature — "Ejector Pin Selection Guide"

Tip — "Understanding Diamond Compounds"

Case Study — "Integrated CAD/CAM Streamlines Electrode Manufacture, Improves Quality"

Profile — "Father/Daughter Team Takes Mold Business into the Future"

***MMT* Chats** — "Award-Winning 2024 Mold Maker of the Year"

Video — "Dynamic Tool Corporation – Creating the Team to Move Moldmaking Into the Future"

Sources | (Top row, left to right) MMT Staff, DMS, Accede Mold and Tool, Boride Engineered Abrasives, (Bottom row, left to right) B.A. Die and Mold, Dynamic Tool Corp.

Product — "3D-Printed Hot Runner Nozzles Yield Consistent Temperature"

Webinar — "Efficient Mold Design with Advanced Automation—Core/Cavity Design"

***MMT* Today Item** — "Confronting the Mold Design Talent Drought"

Social Media Post — "Q&A with Gabe English of Western Carolina Tool & Mold"

ICYMI — "A Fresh Perspective from a Young Female Newcomer to a Mature Male-Dominated Industry"

Most Popular Website Area — Latest Issue Page MMT

View these articles online at **moldmakingtechnology.com** or with the QR code provided here.

Christina M. Fuges
Editorial Director

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MMT TIPS

5 TRICKS OF THE TRADE

Great Tips from This Issue

1. Shoulder Weight
If the length of the shoulders varies by a significant amount, any plate in contact with the bolts can cock and possibly bind. It is incumbent on the toolmaker to measure the shoulders and possibly machine them to a uniform length.
PG. 20

2. Swiss Cheese
Desktop Swiss lathes enable advanced users to craft precise custom ejector pins and inserts, streamlining mold production and reducing costs.
PG. 24

3. Make It Work
A VMC for mold work should have a machine frame with a rigid bilateral gate structure, which firmly supports the X-axis drive and diverts load, vibration and heat from the upper section of the machine evenly throughout the frame.
PG. 28

4. Think Again
Rethink outdated job descriptions to align roles with modern manufacturing needs, attract new talent, and retain employees with clear career paths.
PG. 32

5. Cut It Out
Using pre-cut pins eliminates the need for in-house cutting and measuring, freeing up skilled staff for complex tasks, reducing inventory, and ensuring quality through specialized supplier equipment.
PG. 46

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WEBINARS

PRESENTED BY:

HEXAGON

On-Demand Webinar

5 Areas to Improve in Progressive Die Manufacturing with Next Generation Automation and Innovation

Join this webinar where Hexagon will explore how state-of-the-art CAD/CAM technology can drive your business forward.

PRESENTER: Jared Lipinski, Senior Applications Engineer | Hexagon

PRESENTED BY:

BASF | FORWARD AM

On-Demand Webinar

Learn to Mold 1000+ Parts Using 3D-Printed Mold Inserts: Introducing Ultrasim3D NextMold

Forward AM's commitment is to facilitate this technological transformation, enabling your business to leverage the full potential of 3D-printed mold inserts.

PRESENTERS:

Dave Constant, Sales and Business Development Manager | Forward AM

Florian Fischer, Head of Service and Solutions | Forward AM

Eric Bowersox, Director | Beaumont Advanced Processing

PRESENTED BY:

simform

On-Demand Webinar

3D Printing Design Freedom: Blessing and Curse for Conformal Cooling

Explore strategies and tools to help tool designers and tooling managers maximize the benefits of 3D printing while minimizing manufacturing and design costs.

PRESENTER:

Arnaud Divialle, Innovation Director | Maya HTT

PRESENTED BY:

CIMATRON

On-Demand Webinar

Efficient Mold Design with Advanced Automation: Core/Cavity Design

In part two of this series, discover how Cimatron's CAD/CAM software accelerates mold design by intelligently crafting components like slides and lifters while ensuring accuracy and error prevention for ejector pins.

PRESENTER:

David Lindemann, Sr. Application Engineer | Cimatron

Scan QR code to register.

Register at:
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Experts Weigh In On 2024

By Christina Fuges

Industry leaders share key insights on workforce, technology, sustainability and strategic growth impacting moldmaking.

As we move through 2024, moldmaking continues to evolve, facing challenges and opportunities. Our editorial advisory board members share valuable insights on key trends and hot topics shaping the community this year.

A recurring theme is the critical need for *workforce development*. The EAB has emphasized the importance of attracting and retaining young talent through robust apprenticeship programs, promoting a culture of innovation, continuous improvement and open-mindedness toward new ideas from younger generations.

Providing hands-on experience with advanced technologies is the suggested way forward. Members recognized the need to bridge the gap between academic learning and practical skills, with some institutions offering specialized certificate programs and technology electives in areas such as mold design.

The growing emphasis is on collaboration between educational institutions and industry. This includes providing students access to advanced equipment and technologies, offering industry-sponsored projects in academic programs and developing specialized training to address the industry's needs. These partnerships are vital for preparing the next generation of moldmakers and addressing the skills gap in the industry.

Effective leadership and mentoring tie into these workforce challenges. Members recommended empowering team members to make decisions, communicating the "why" behind projects and strategies, tailoring communication styles to different generations and creating a safe environment for idea sharing and innovation to promote creativity and problem-solving skills.

Technological advancements continue to play a significant role in addressing labor shortages and improving efficiency. Automation and robotics are at the forefront, according to the EAB, with AI integration in design and programming processes gaining traction. Advancements in 3D printing for mold building, increased use of simulation software for mold flow analysis and implementation of five-axis machining and robotic molding are enhancing productivity.

Sustainability has also remained a hot topic in moldmaking. Companies are adopting environmentally responsible practices such as minimizing non-part-related plastic waste, reducing energy consumption through eco-friendly equipment, recycling shipping materials and designing molds for longevity and ease of maintenance.

In terms of *strategic planning and business development*, companies are aligning their people strategy with their business strategy, identifying skills and talent required for growth and maintaining existing customer relationships while pursuing new markets. Some are leveraging social media platforms for business development and customer outreach.

They've also noted a few less-mentioned challenges, including rising interest rates affecting equipment investments, the increasing competency of overseas mold builders and balancing traditional expertise with innovation.

Ultimately, the EAB's insights throughout 2024 highlight the industry's shared challenges while showcasing its resilience and adaptability, with workforce development, new technology adoption and strong leadership positioning moldmaking for a successful 2025. MMT

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A Conversation With ...

MPC Advanced Machining, Div. of Molded Precision Components

By Christina M. Fuges

MPC Advanced Machining employs a team of approximately 20 highly skilled professionals, including moldmakers, engineers, designers, machinists and apprentices. Source (All images) | Molded Precision Components and MPC Advanced Machining

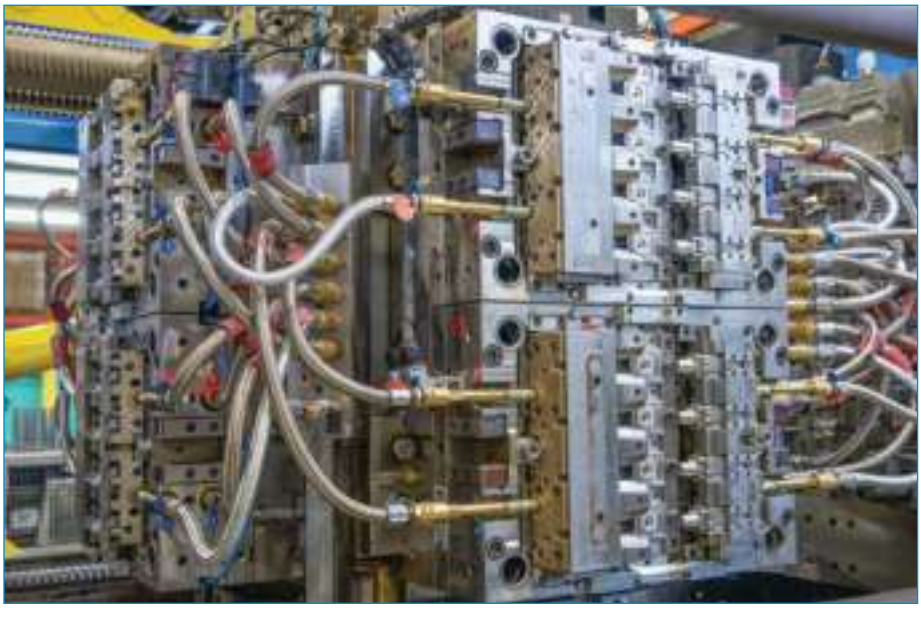
Who is MPC Advanced Machining?

Darryl Gratrix, Tooling Manager, Molded Precision Components: MPC Advanced Machining is a division of Molded Precision Components (MPC) that specializes in high-precision mold building and CNC machining services. This division has been operating for several years as part of the broader MPC company, which has a rich history dating back to its founding in 1980. It has been under the current ownership since 2006.

MPC Advanced Machining operates out of a state-of-the-art facility that spans over 70,000 square feet. The two facilities are located at 165 and 239 4th Line South, Oro-Medonte, Ontario, Canada. Included are engineering offices, metrology and inspection labs and two machine shops. The facility is equipped with cutting-edge technology and advanced machinery, including high-speed (CNC machine centers (42,000 rpm), wire and sink CNC EDM and precision grinding from suppliers such as GF Machining Solutions, System 3R and Mitutoyo.

The division employs a team of approximately 20 highly skilled professionals, including moldmakers, engineers, designers, machinists and apprentices. The entire MPC company has a workforce of around 85 employees with a significant portion dedicated to the machining division. We currently have one moldmaker apprentice, two machinist apprentices and one millwright apprentice.

This team is involved in the design, development and maintenance of high-precision molds, including multi-cavity and complex molds used in various industries such as automotive, medical and consumer goods. We specialize in producing molds and molded parts for the most demanding applications, most often tight tolerance and functionally critical parts such as gears, housings and fittings. We produce some highly complex molds requiring insert molding and overmolding.



MPC Advanced Machining specializes in manufacturing molds and molded parts for the most demanding applications, most often tight tolerance and functionally critical parts like this innovative cube mold technology that enables multi-material injection and efficient high-volume production through synchronized rotation.

We build complex multi-cavity molds, including sophisticated tool actions, rotary cores, hot runner systems, valve gates and three-plate tools. We also have developed gear tooling technology to make all types of precision gears including worm, helical, spur, sector and internal gears. We can design and build molds with up to 32 cavities.

This division offers various machining services, including CNC milling, turning, wire and sinker EDM, precision grinding and mold assembly. We also offer inspection, measurement and reverse-engineering services including CMM, 3D blue-light scanning and highly detailed reporting. Last but not least, we provide mold repair, maintenance and engineering support to ensure that molds operate at peak efficiency.

CNC milling and sinker EDM machines use multi-pallet automation with robotic tending to run parts fully unattended. This technological shift has allowed MPC Advanced Machining to reduce lead times, improve consistency and take on more complex projects with greater accuracy.

What are your chief competitive advantages?

Gratrix: Our chief competitive advantage lies in our ability to deliver highly precise and complex machining solutions, supported by a team of skilled professionals and state-of-the-art technology. However, other shops have similar equipment, so our main edge comes from the processes and systems we have implemented to fully utilize this equipment, often achieving better results than what the manufacturer advertises.

For example, we program and set up our FORM200 sinker EDM using Cimatron's EDM package, unlike most companies that still do it manually, which can lead to numerous data entry errors. We measure 100% of our electrodes on our tool room CMM and then transfer all the offsets electronically to the sinker EDM using software developed by our CMM programmer/operator.

We also have team members in the tool room and engineering department who do computer programming as a hobby. We have been able to harness their passion for programming and align it with our company's needs. On top of that, we

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- Established in 1980
- Specializes in high-quality plastic parts, including gears and complex assemblies
- New ownership (since 2006)
- ISO 9001/TS 16949 certified
- Full-service engineering, product development and precision injection molding facility with in-house tooling
- Known for added-value expertise, complex component design consultation and advanced tool design
- Capabilities include 2D and 3D design, in-house 3D printing, FEA, Mold flow analysis, CNC, EDM and precision grinding
- Delivers innovative, cost-effective solutions for ultra-tight tolerance components
- Employs top engineers, welcomes high-performing college interns.
- Uses production, process and metrology systems; measures to sub-micron levels (0.0009 mm)
- Serves international customers with high-precision injection molding (35 to 400 ton press range)

have employees who are more satisfied with their jobs because they're able to combine their passion with their work. All of this enables us to consistently meet the rigorous standards of industries like automotive and medical, ensuring exceptional quality and reliability in every project.

The company motto is simple: "Our purpose isn't just to make plastic parts — it's to create a workplace where people are treated well and can thrive."

How has the company most recently changed how it uses technology?

Gratrix: In the past two years, we have adopted advanced automation and robotics in our machining processes, significantly enhancing production efficiency and precision. Our CNC milling and sinker EDM machines are now using multi-pallet automation with robotic tending to allow us to run parts fully unattended. This technological shift has allowed us to reduce lead times, improve consistency and take on more complex projects with greater accuracy.

Key machines in our facility include a GF FORM200 sinker EDM, GF Mikron HSM500, 3R WorkPartner automation unit between a FORM200 and HSM500 and a Mitutoyo Stratos 540 CMM. Key software includes Cimatron-Electrode design, sinker EDM programming, milling CAD/CAM, Solidworks-Design, Esprit for wire EDM programming and various MPC-developed programs. This software implementation has helped increase our throughput. Our record for setting up electrodes in one day is 70, which is considered impressive for those familiar with sinker EDM.

How have you changed your general approach to the business?

Gratrix: In the past two years, we have strategically focused on expanding our services beyond internal projects by actively attracting outside business. This shift began with establishing MPC Advanced Machining as a dedicated division, allowing us to leverage our high-precision capabilities and industry expertise to serve a broader range of customers and industries.

In July 2024, we implemented ProShop as our tool room ERP software, improving our operations through efficiency, automation and real-time data access. This paperless system streamlines everything from quoting and scheduling to production tracking and quality management, minimizing manual input and reducing errors. With real-time visibility into production processes and equipment use, we can quickly adapt, reduce downtime and make data-driven decisions. Its quality management tools ensure we consistently deliver high-precision products and the customizable and scalable features support our growth, ensuring optimized processes as capabilities expand, particularly with our cube technology.

> "But it's really the smiles on the faces of the employees that is the biggest change. That's honestly the thing I'm most proud of in our tool-room. Over my 11 years here at MPC, the culture change has been remarkable."

But it's really the smiles on the faces of the employees that is the biggest change. Honestly, that's the thing I'm most proud of in our tool room. Over my 11 years here at MPC, the culture change has been remarkable. The team genuinely enjoys coming to work now, and we have fun working together. What's even more exciting is that we've recently been able to extend that positive culture to our relationship with the engineering department, which has historically been a challenge in most manufacturing environments. As we all know, the tension between tool rooms and engineering is pretty infamous, but we've broken down those barriers. Now we're working more closely and effectively than ever.

When joining MPC, the company aimed to create a unique culture, different from typical manufacturing environments.

The experienced team at MPC guides and trains the next generation of moldmaking professionals and helps to improve cross-departmental collaboration.

However, some initial behaviors contradicted this vision, particularly within team interactions. Leadership acknowledged that achieving the ideal culture was a work in progress and took steps to address the issues. With a focus on leading by example and creating a respectful environment, efforts to promote positive change became more effective. Over time, changes in leadership and addressing toxic behaviors contributed to a healthier and more collaborative workplace culture. We're not perfect, but we've built a team that enjoys working together. While differences remain, especially between older toolmakers and younger engineers, I emphasize the importance of mentoring. Our experienced team is responsible for guiding and training the next generation, which helps strengthen collaboration across departments.

One of my proudest moments was hearing a student say MPC stood out because our employees were happy and engaged, unlike other shops. Our owner's belief is simple: Our purpose isn't just to make plastic parts — it's to create a workplace where people are treated well and can thrive.

Cube technology improves injection molding by providing enhanced precision and consistency, enabling the production of complex geometries with greater efficiency and reduced cycle times, ultimately leading to higher-quality molded parts and increased productivity.

How are you addressing the skills gap?

Gratrix: MPC is addressing the skills gap by partnering with the Simcoe County District School Board and the Simcoe Muskoka Catholic School Board, and participating in the Ontario Youth Apprenticeship Program (OYAP). This initiative allows high school students to begin their apprenticeship training in skilled trades while earning their diplomas. We offer Advanced OYAP for Precision Metal Skills, where students complete a co-op during their final semester of high school and start their Level 1 apprenticeship schooling at Georgian College. This gives them a significant advantage by finishing Level 1 and gaining about 1,000 apprenticeship hours before graduating.

We also host tours for high school guidance counselors to introduce them to modern manufacturing. Many are surprised by how clean and advanced our facility is, and we're now part of the field trip roster for Simcoe County high schools. I also participate in professional development events for high school teachers to promote skilled trades education and clarify employer expectations.

One of my personal goals is to introduce two to three weeks of skilled trades curriculum into Ontario's mandatory Grade 10 careers course. This would ensure all students are informed about the opportunities in trades.

MPC also participates in local events like the LEVEL UP skilled trades open house and the Ontario Apprenticeship Summit. We maintain a strong relationship with Georgian College, where 23 of our 75 employees are graduates, and I serve on the Program Advisory Committee for Precision Skills to help ensure the program produces competent graduates.

We actively promote careers in skilled trades through community outreach and social media, emphasizing the rewarding opportunities in machining to attract and develop the next generation of skilled professionals.

Describe your apprenticeship program.

Gratrix: We have implemented a robust apprenticeship and training program, partnering with local schools and industry organizations to nurture talent from the ground up. Our apprenticeship and training program is designed to develop skilled trades professionals through hands-on experience, mentorship and structured learning.

Six key aspects of the program are:

- Provides a combination of on-the-job training and classroom instruction. Apprentices work alongside experienced tradespeople to gain practical, real-world experience while also receiving formal education in technical skills, safety protocols and industry best practices.
- Collaborates with local colleges and programs to provide apprentices with access to high-quality education. This partnership allows apprentices to complete their in-class training while working, ensuring they learn the latest industry stan dards and technologies.
- Pairs apprentices with experienced mentors who guide them through the learning process. These mentors provide personalized instruction, share industry insights and help apprentices develop both technical and soft skills needed to succeed in the field.
- Emphasizes advanced machining techniques to prepare apprentices to work on complex, high-precision projects.

- Helps apprentices earn certifications in their trade, such as a Red Seal Certification, which is nationally recognized across Canada.
- Supports ongoing development through continued education, specialized training and opportunities to upskill in new technologies and areas of expertise.

Share the most interesting mold project your company was awarded.

Gratrix: We were awarded a notable project involving the development and implementation of innovative cube mold technology for the automotive industry. The cube technology offers significant advantages to customers by allowing multi-material and multi-component injection molding in a single cycle. This approach results in faster production times, increased efficiency and lower

"Our main edge comes from the processes and systems we have implemented to fully utilize our equipment, often achieving better results than what the manufacturer advertises."

costs by consolidating multiple processes into one machine cycle. The cube mold rotates between different stations, enabling simultaneous injection of different materials or colors, overmolding or even the production of two different parts at once.

This technology is especially beneficial for high-volume production, as it reduces the need for secondary operations and increases overall throughput, ensuring faster delivery of high-quality, complex parts. Customers in industries such as automotive, medical devices and consumer products benefit from improved product design flexibility, reduced lead times and enhanced cost-effectiveness.

One particular project required the design and manufacture of a highly efficient cube mold system capable of producing multiple parts simultaneously, significantly reducing cycle times and increasing production efficiency. The success of this project showcased our ability to deliver cutting-edge solutions that meet the demands of high-volume production environments, further establishing the company as a leader in advanced tooling and manufacturing technologies. MMT

By Perc Pineda, Ph.D.

Opportunities and Challenges Within the Current Economic Cycle

Report analyzes moldmaking trends, pricing, labor shortages, capital costs, competitiveness strategies and construction spending challenges.

Moldmakers must continue to monitor economic shifts to plan for plastics industry growth opportunities.
Source | Getty Images

Those in the plastics industry recognize the significant role that plastics and plastic products play in manufacturing. Plastics are used across various applications and end markets due to their cost-effectiveness and unique material properties. As a result, the manufacturing sector is the primary customer for the plastics industry. Additionally, the relationship between plastics and manufacturing is cyclical, with both industries experiencing growth and contraction in accordance with the broader economy.

The U.S. economy grew at a solid rate of 3.0% in the second quarter. However, there are areas where performance has been lackluster, overshadowed by strong growth in other sectors. Advanced estimate from the Bureau of Economic Analysis shows that GDP grew 2.8% in the third quarter. This indicates that while the overall economy is expanding, there are significant disparities at the microeconomic level.

For example, while GDP is humming at rates above the U.S. long-run average growth rate, housing market activity has declined, and manufacturing activity, on-trend, has flattened. As shown in **Figure 1,** the Industrial Production Index on manufacturing has moved sideways, and the Industrial Production Index on construction supplies, which captures plastics in the home building space, decreased following the increase post-COVID-19 recession in April 2020. So, it can be said that it is a strong U.S. economy, excluding housing and manufacturing. Weakness in overall manufacturing in the economy had

knock-on effects on moldmaking. The extent of the spillover effects can be analyzed using proxy data.

Moldmaking Metrics and Proxies

The latest GBI Moldmaking, which was **42.8** in October, is another indication of weaker-than-expected moldmaking activity. Other than the GBI there are moldmaking proxies that provide key information.

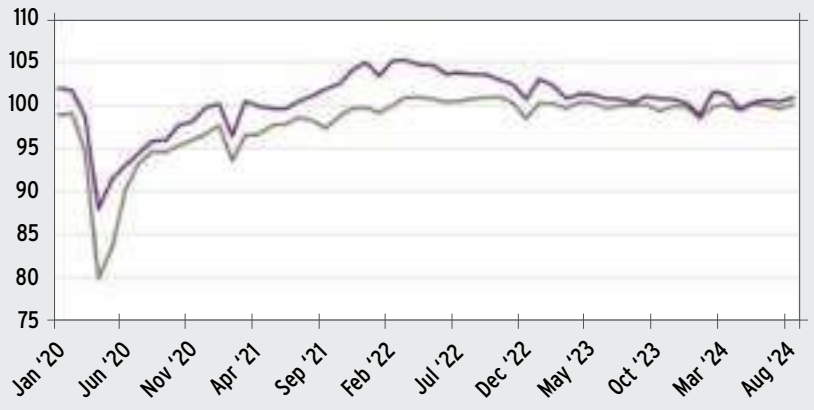
In the hierarchy of the North American Industry Classification System (NAICS), the six-digit national industry classification for industrial molds (NAICS 333511) falls under the four-digit industry group (NAICS 3335) for metalworking machinery. In the PLASTICS Quarterly forecast from the Plastics Industry Association, estimates for industrial molds are derived from the broader measurement of metalworking machinery (**see Table 1**).

Manufacturers' new orders for and shipments of metalworking machinery have been decreasing. The result is a predictable rise in inventory. As shown in **Figure 2**, new orders for metalworking machinery peaked in October 2021, reaching $3,149 million, and since August 2022 have oscillated around $2,701 million monthly.

Shipments, on the other hand, peaked in November 2022 valued at $2.923 million and thereafter also downtrended to a monthly average of $2,738 million. Total inventories of metalworking machinery have continued to increase since bottoming at $5,814 million in December 2020. Since then, inventories have been on the rise.

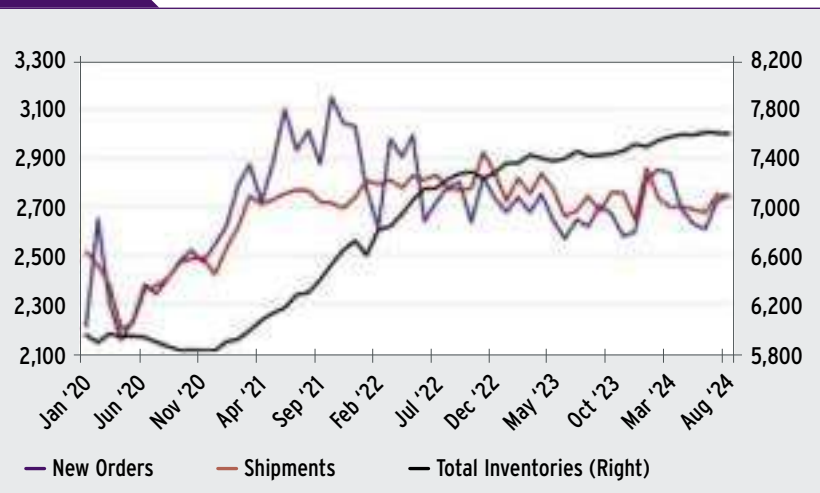
As the end of the year approaches, businesses that began strategizing for 2025 midway through the year are hoping for sustained economic growth. Broad-based economic expansion is essential for manufacturing to regain momentum, which would, in turn, benefit other sectors like the plastics industry supply chain.

FIGURE 1 Industrial Production Indices (2017=100)



Industrial production stagnates in manufacturing while declining in construction, signaling economic sector-specific challenges. Source | Board of Governors of the Federal Reserve System

FIGURE 2 Metalworking Machinery ($ Millions)



Metalworking machinery shows declining orders and shipments since 2022 peaks, while inventories rise steadily. Source | Board of Governors of the Federal Reserve System

Price Stability Is Key

Economic growth anchored in stable prices is essential for the plastics industry. According to the 2024 Size and Impact Report on the plastics industry, material costs are a significant expense. In 2023, they accounted for 46.0% of the value

TABLE 1 **North American Industrial Classification System (NAICS) Hierarchy**

3335	Metalworking Machinery Manufacturing
33351	Metalworking Machinery Manufacturing
333511	Industrial Mold Manufacturing
333514	Special Die and Tool, Die Set, Jig, and Fixture Manufacturing
333515	Cutting Tool and Machine Tool Accessory Manufacturing
333517	Machine Tool Manufacturing
333519	Rolling Mill and Other Metalworking Machinery Manufacturing

Industrial molds (NAICS 333511) forecasts derive from broader metalworking machinery industry data measurements. Source | U.S. Census Bureau

of shipments in plastics conversion and 38.0% in molds for plastics manufacturing. While stable prices support economic health, price volatility challenges businesses, including manufacturing.

The Producer Price Index for industrial mold manufacturing, specifically for metal injection molds used in plastics, rose 1.4% year-over-year in May, down from a peak 3.7% increase in October 2022. Although price increases have moderated this year, potential shocks from rising energy and steel costs could add upward pressure.

Skilled Labor Crisis Continues

Broad-based economic growth also requires flexible markets, enabling businesses to adjust labor inputs in response to changing conditions. However, finding skilled labor in manufacturing has been an ongoing challenge for the U.S. economy, affecting competitiveness both domestically and internationally.

According to PLASTICS estimates, labor costs in moldmaking for plastics accounted for 28.1% of revenue in 2023. Since June, the average hourly wage in manufacturing has risen faster than headline inflation. The latest Bureau of Labor Statistics data indicates that wages increased by 5.0% in September, while inflation was 2.4%. For most Americans, employment is the primary source of income, supporting consumption. Real wage growth, when accompanied by productivity gains, fuels sustained economic growth.

Higher Capital Costs Impede Growth

The higher cost of capital has created headwinds for the U.S. plastics industry, as its primary market — the manufacturing sector — faces an interest-rate-driven slump. Higher interest rates push up the required rate of return on capital, which in turn raises risk aversion, potentially stalling new product introductions and projects requiring new tooling.

In 2023, capital expenditures (CapEx) in moldmaking for plastics fell to $238.1 million, a 34% drop from 2022, reflecting the strain of elevated interest rates. The Federal Reserve's 50-basis-point rate cut in December may be followed by additional cuts in the coming year, potentially rebalancing CapEx across the economy. However, achieving the Fed's longer-term target rate of 2.9% will depend on where the economy stands in the business cycle

New Strategies For U.S. Competitiveness

It is no secret that Asian economies have aggressively pursued industrial policies to achieve global competitiveness. While the U.S. has not done so in the previous years, think tanks are critiquing the recent American-style industrial policy, as reported by the Center for American Progress: "How Biden's American-Style Industrial Policy Will Create Quality Jobs," October 27, 2022. The Inflation Reduction Act, the CHIPS and Science Act and the Infrastructure Investment and Jobs Act, reflect the Biden Administration's bid to boost economic growth.

Clean energy and climate change are at the core of the Inflation Reduction Act, with a goal of achieving a net-zero economy by 2050. This includes incentives for renewables and alternative sources of energy — wind, solar, hydroelectric, etc. Alternative sources of energy come with both challenges and opportunities. The CHIPS and Science Act is aimed at bringing the semiconductor industry back to the U.S. Its spillover effects are hoped to revitalize domestic manufacturing. Whether the CHIPS and Science Act will accomplish its goal remains to be seen — too soon to tell.

> "A sustained path toward stable prices, increased productivity and a skilled labor force is essential for realizing sustained growth across the plastics and manufacturing industries."

Limitations of Increased Construction Spending

In August, the U.S. Census Bureau estimated the nominal value of construction spending in manufacturing at $238.3 billion, up from $201.5 billion in August of the previous year and nearly double the $129.7 billion recorded in August 2022. While analysts in financial markets may view this increase in construction spending as an indicator of rising manufacturing activity in the U.S. economy, such conclusions seem speculative. The Inflation Reduction Act provides for

tax incentives encouraging the adoption of energy-efficient upgrades in new and existing buildings.

An increase in manufacturing structures does not necessarily equate to greater manufacturing output. A more reliable benchmark for assessing the impact of the CHIPS and Science Act is the share of manufacturing as a percentage of GDP, which can only be meaningfully evaluated over time.

Looking Ahead

The U.S. plastics industry remains an essential contributor to the broader manufacturing sector. This applies to all components of the plastics industry supply chain, such as moldmaking, reflecting both the opportunities and challenges within the current economic cycle. If there is one thing the business community is eagerly waiting for after the Presidential election, it is how the Federal Reserve navigates interest rate setting and the broader macroeconomic policy of the U.S., affecting materials costs, labor constraints and capital investment shortfalls that continue to impact growth.

> "U.S. plastics sector awaits post-election Fed policy while navigating growth challenges amid mixed economic conditions."

Despite robust GDP projections in 2024, the economy faces uneven microeconomic conditions, particularly in housing and manufacturing. A sustained path toward stable prices, increased productivity and a skilled labor force is essential for realizing sustained growth across the plastics and manufacturing industries, supporting their roles as pillars of the U.S. economy. MMT

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By Jim Fattori

Shoulder Bolts: Why They're Too Important to Ignore, Part 1

These humble but essential fasteners used in injection molds are known by various names and used for a number of purposes.

I especially enjoy writing articles on subjects that are important to our industry but are rarely given the attention they deserve. Maybe it's because these topics are not often, if ever, discussed in schools, training seminars or SPE functions. This month's article on shoulder bolts is a good example of an important subject on which very little information is readily available. There is so much to know about this common fastener and how it directly affects the performance and longevity of your molds.

What Are Shoulder Bolts?

Shoulder bolts are used in in a variety of ways and for various purposes. Their two primary functions in injection molds are limiting the distance a plate travels and pulling a plate during mold opening. Shoulder bolts are frequently used in three-plate molds "and stripper-plate molds. While the generic name of this type of fastener is shoulder bolt or shoulder screw, these applications have inspired other, often more common names, such as range bolts and stripper bolts, based on their function.

"The thread neck is the weakest point of a shoulder bolt."

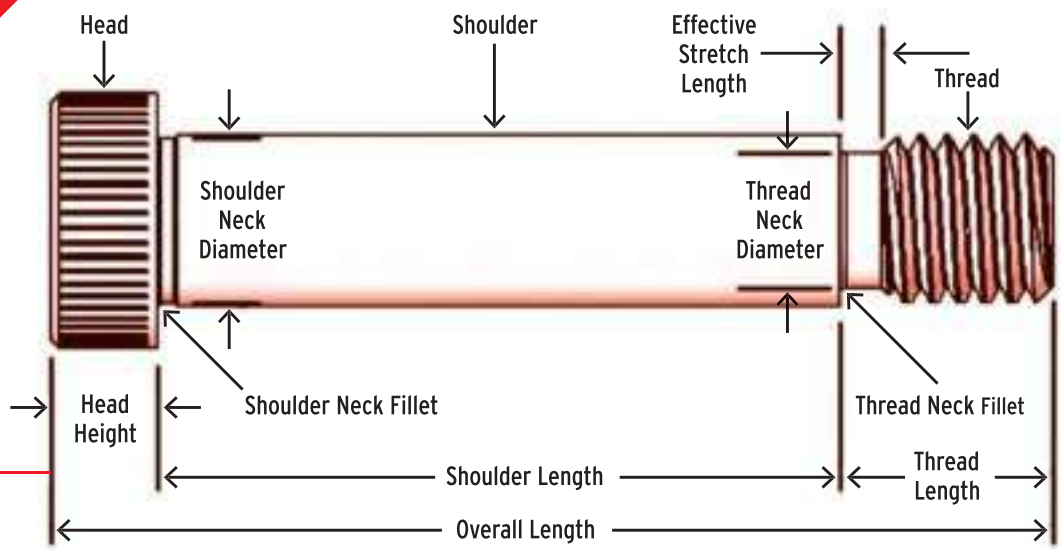
As seen in the accompanying diagram, shoulder bolts have three main sections: the head, the shoulder and the thread. You specify a shoulder bolt by its shoulder diameter and shoulder length. For example, a ⅜ × 2 shoulder bolt has a shoulder diameter of ⅜ inches and a shoulder length of 2 inches. If you purchase this ⅜-inch bolt from a mold-component supplier, the thread will be ⅝-18 UNC, not ⅜-16 UNC. The overall length of a shoulder bolt is the height of the head, plus the length of the shoulder, plus the length of the threaded portion. This nomenclature is very different from that of a standard bolt.

Shoulder bolts are available in both standard and precision grades. The diameter of the shoulder of a standard shoulder bolt is typically 0.002 to 0.004 inches smaller than its nominal value. Precision-grade shoulder bolts are only 0.001 or 0.002 inches smaller. Precision-grade shoulder bolts are typically used in applications where the shoulder acts as a shaft for a sliding or rotating component, such as a bushing or bearing. In these instances, the shoulder is referred to as a journal.

Tolerance and Torque

The tolerance on the length of the shoulder is typically ±0.005 inches. However, some suppliers have length variation as much as 0.020 inches. Several mold-component suppliers don't even specify this tolerance. That can be a major problem. If the length of the shoulders varies by a significant amount, any plate in contact with the bolts can cock and possibly bind. The more likely scenario is that the head of the shortest bolt will break prematurely due to uneven load. Therefore, it is incumbent on the toolmaker to measure the shoulders and possibly machine them to a uniform length.

Most manufacturers include a slight reduction in diameter directly under the head. This is called the shoulder neck. It enables the head of the bolt to seat flush against its mating surface. Most manufacturers add a radius between the shoulder and the head of the bolt to reduce the notch effect. If the bolt has a radius, make sure that any washer or mating surface clears the protrusion. Otherwise, the load applied to the head of the bolt will be concentrated over a very small area and can cause the head to crack.



This diagram offers variety of shoulder bolt terminology. Source | Jim Fattori

All manufacturers include a slight reduction in diameter at the end of the threads where they meet the shoulder. This is called the thread neck. It is necessary for manufacturing and lets the shoulder seat flush against its mating component. The thread neck is the weakest point of a shoulder bolt because it has the smallest diameter. This is why the torque values for shoulder bolts are about 40% less than the torque values for standard bolts with the same thread size and pitch, as shown in **Table 1.** If a shoulder bolt is over-torqued, it will most likely fracture at this location.

Properly torquing a shoulder bolt is very important. When you torque a bolt, it stretches like a spring. This spring-like tension reduces the chances of a bolt coming lose due to external forces such as impact and vibration. The amount a bolt will stretch is directly related to its "effective length." For the sake of simplicity, the effective length of a shoulder bolt is the distance between the face of the shoulder and the closest engaged thread, as shown in the diagram. As you can see, shoulder bolts have a very short effective length. They will not stretch very much, and therefore will not have a lot of holding force. That is why shoulder bolts have the nasty habit of coming lose. The chance of one coming lose when affixed to a heat-treated component is even greater. Using a thread-locking compound can help, but properly torquing the bolt is best. So, what is the best way to torque a bolt? **Table 2** lists various methods used to torque or preload bolts and the accuracy of each method.

"Always clean and lubricate the bearing surfaces of a bolt."

It probably comes as no surprise that the torque accuracy of someone going by feel is very poor, but you would think that using a torque wrench would be very accurate. The reason why the torque wrench variation is as much as ±25% is due primarily to the coefficient of friction. The torque applied to a fastener must overcome frictional forces before any preloading takes place. If the assembly is not clean and lubricated, there is a considerable amount of friction at two locations — the bearing surface under the head (or in the case of shoulder bolts, the shoulder), and the thread-to-thread contact surfaces. Approximately 50% of the torque applied to a bolt is used to overcome the head-bearing friction, and about 35% is used to overcome the thread-contact friction. Therefore, 85% of the torque value is used strictly to overcome friction and only 15%

TABLE 1 **Torque Values for Standard Bolts & Shoulder Bolts**

Alloy-Steel Bolt Torque, ft-lb		
Thread Size/Pitch	Cap Screw	Shoulder Bolt
1/4 – 20	17	10
5/16 – 18	35	21
3/8 – 16	62	36
1/2 – 13	152	89
5/8 – 11	283	166

TABLE 2 **Preload Methods and Associated Accuracy**

Alloy-Steel Bolt Torque, ft-lb		
Type	Method	Variation, %
Torque	Impact Wrench	±45
Torque	Feel (Operator's Judgement)	±35
Torque	Torque Wrench	±25
Tension	Turn of the Nut	±15
Tension	Load-Indicating Washers	±10
Tension	Fastener Elongation	±3 – 5
Tension	Strain Gauges	±1

TABLE 3 **Load-Distribution Chart for Threaded Fastener**

Thread #	% of Load
First	34
Second	23
Third	16
Fourth	11
Fifth	9
Sixth	7
Total	100

is used to preload the bolt. The error percentages in **Table 2** apply just to that 15%. If these two frictional surfaces are lubricated with cadmium plate, molybdenum disulfide, anti-seize compounds, etc., the friction is reduced by roughly 10% and thus, a substantially greater preload is obtained with the same amount of torque.

Therefore, always lubricate the threads of any bolt during assembly, as well as under the head or shoulder. Interestingly, the friction factor is at its highest value the first time you torque a new bolt. It gradually lessens with each subsequent loosening and tightening.

The turn-of-the-nut method for torquing a bolt can be as simple as rotating the bolt, or nut by ⅓ , ½ or ⅔ of a revolution past snug. Snug is defined as the point where you can no longer loosen the bolt by hand. The amount of revolution is based in part on the effective length of the bolt. However, since there are so many variables with this method, it should be considered a rule of thumb.

There are companies that offer sophisticated equipment to measure the tension, not the torque, on a bolt, but they are fairly expensive and thus overkill for moldmakers. There are also mathematical calculations, which are very accurate, if you have a degree in engineering and nothing else to do with your time. In critical applications, you might consider using a load-indicating washer. There are several different types of these washers on the market. They are commonly known as DTI's, or Direct Tension Indicators. They are not very expensive, very easy to use, and as **Table 2** shows, extremely accurate.

Materials and Thread

The industry-standard shoulder bolt in the United States is made of medium-carbon-alloy steel, heat treated, quenched and tempered to 32-43 Rockwell C (as per ASTM A574), with Class 3A UNRC (Unified National Rolled Coarse) thread and a minimum

Additional Advice

• Strip-strength calculations are based on the assumption that the correct number, letter, or fractional tap-drill size was used prior to threading the hole.

• One common misconception is that if you strip a female thread and repair it with a wire-thread insert, the strip strength will be reduced. For most brands of threaded inserts today, their unique designs improve the load distribution over the first six threads. That means the threaded insert used to repair a stripped thread can actually be stronger than the original thread.

tensile strength of 160,000 psi, which meets ANSI/ASME B18.3 specifications. Yes, that's a mouthful, but if you are ordering bolts from a general supply company, be very careful that they meet these specifications.

The "R" in UNRC indicates the bolt was made using the rolling process, which dramatically increases its fatigue life. The "A" in class 3A means that it's an external thread. If it was a "B" it would mean an internal thread, like for a nut.

The "3" in class 3A describes the fit of the thread. For UNRC external threads there are three standard classes of fit: 1A, 2A and 3A. At one time, there was a class 4 thread, but it is now obsolete. There is also a class 5 thread, but this has an interference fit. Thread classes 1 through 3 are "clearance" fits. That is, they assemble without interference. The higher the class number, the tighter the fit. Class 1 threads have an extremely loose fit, with an intentionally significant amount of play. This class is used for quick and easy assembly and disassembly. Threaded rod or "all-thread" is an example of this class of thread. A Class 2 thread has the best balance in terms of performance and economy. It has enough clearance to minimize any galling or seizing, and sufficient clearance for lubricants, thread-locking compounds, platings and coatings. Nearly 90% of all commercial fasteners are this class of thread.

Moldmakers don't use "commercial" fasteners. We use class 3 threads, which are for close-tolerance applications, where safety is a design consideration. This fit class has only a little clearance for lubricants or thread-locking compounds. That is why sometimes a bolt may be a little difficult to install, and you might think your tap has worn out.

Has anyone ever given any thought to the strength of the thread on a shoulder bolt? Why would you?

The length of the threaded section is a fixed value. You get what you get, but that's OK because screw manufacturers use the correct thread length to achieve the maximum holding power. However, there are times when you have to make a custom shoulder bolt in order to satisfy a problem when a standard size is not available — typically when a very long shoulder is needed. That's when knowing some additional information about thread strength is important.

Ideally, you want the bolt to break in tension before it strips the threads. This depends on two things: the strength of the material that the bolt is screwed into, and the amount of thread engagement. If the strength of the steel into which the shoulder bolt is screwed into is greater than the strength of the steel of the bolt, and there is sufficient thread engagement, the bolt will not strip the threads. It will undergo tensile failure first. But what if you have a mold with a shoulder bolt screwed into mild steel or aluminum? It's not going to take a lot of force to strip those threads out, no matter what the thread engagement length is. In a case like this, try to install a hardened nut or threaded bushing that is retained in the back of the plate.

Next, what is the minimum amount of thread engagement required to prevent a bolt from stripping? There is a rule of thumb that says the amount of thread engagement for a bolt should be 1 to 1.5 times its nominal diameter. You should know by know how I feel about rules of thumb. There are some mathematical formulas available to calculate the optimal amount of thread engagement, but there is a much easier way that is sufficiently accurate. **Table 3** breaks down the load distribution over the first six threads of a carbon-steel threaded fastener. As you can see, the first six threads account for 100% of the holding power. If you simply divide the number 6 by the pitch of the fastener, you get the minimum required thread-engagement length. For example, for a ¼-20 bolt: 6 ÷ 20 = 0.30 inches of engagement.

> "The first six threads of a fastener account for 100% of its holding power."

While this value is correct for the amount of thread engagement, it does not account for the lead-in on the tip of the thread, nor does it account for the runout, or thread neck. These two areas account for about another three threads. Therefore, to calculate the overall distance from the end of the shoulder to the tip of the thread, use 9, instead of 6, divided by the pitch. If you check a supplier's catalog, you will see that the overall thread length that comes with standard shoulder bolts is very close to 9 divided by the pitch. MMT

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By Christina Fuges

An Integrated Desktop Approach to Mold Production

Versatile, scalable, additive machining and molding systems optimize moldmaking operations and support training initiatives.

As moldmakers face increasing pressures to deliver faster and more cost-effective solutions, integrating 3D printing (3DP), machining and desktop injection molding into the process can offer significant advantages for both novice and advanced moldmakers.

Desktop Molding

Desktop injection molding machines provide a gateway into industrial-grade molding without the complexity or high cost of traditional large-scale machines. A compact, user-friendly design enables for quick setup and operation, making the machines a good option for moldmakers looking to cross-train or train the next generation of workers.

"By enabling hands-on experience with real-world materials, these machines make it easy for novices to understand injection molding fundamentals, such as material behavior, cooling times and pressure parameters, without the steep learning curve typically associated with larger systems," says Kubi Kara, president of APSX LLC.

Desktop injection molding machines can handle a wider range of materials, including but not limited to polypropylene (PP), glass-filled polypropylene, FDA-approved plastics, polyethylene (PE), thermoplastic polyolefin (TPO), nylon, polycarbonate (PC), acetal (Delrin), ABS and PC/ABS.

"These materials should have a Melt Flow Rate (MFR) of 3 g/10 minute or higher (ASTM D1238) for optimal performance," says Kara. The machine typically uses standard size (approximately 0.125 inch diameter) virgin plastic pellets. Some customers also use recycled plastic material. Plus, it's possible to process metal injection molding (MIM) feedstock pellets with these machines.

A mold produced on a desktop resin 3D printer. Source (All images) | APSX

An automatic desktop plastic injection molding machine can make injection molding affordable and easy, including this heavy-duty machine for continuous or single-cycle plastic part production.

A highly precise, rigid, portable desktop CNC milling machine machines a mold. This machine can mill aluminum, steel, bronze, brass, delrin wood and plastics with high precision.

While desktop machines operate at slower speeds compared to traditional industrial machines (with typical cycle times around 60 seconds), they offer some interesting capabilities. For example, one mini automatic plastic injection molding machine provides 5,000 psi injection pressure and 5 tons of clamp force.

"Due to its unique design, it can produce large parts comparable to those made by 30-plus-ton industrial machines. The maximum shot size is 30 cu-cm (1.83 cu-in), which can be used to produce palm-sized parts," says Kara.

Desktop Swiss

Advanced users can leverage desktop Swiss lathes for high-precision tasks like creating custom ejector pins and inserts. These components are crucial for fine-tuning part ejection and improving overall mold quality, yet they often require tedious manual machining. A desktop Swiss lathe can eliminate this bottleneck by producing these components with precision, reducing both lead times and labor costs.

"The precision and surface finish of mold components produced by a desktop Swiss lathe can be comparable to those created through existing processes. For example, a compact CNC Swiss lathe can achieve high-quality surface finishes through careful programming with high-level details. While this process may be slower, the results can be excellent. Machining can be programmed at a faster pace in cases where finish is less critical," Kara explains.

> "In combination with a desktop CNC machine, which is capable of machining aluminum molds for prototype and small-batch production, this setup can help experienced moldmakers accelerate the entire moldmaking process."

In combination with a desktop CNC machine, which is capable of machining aluminum molds for prototype and small-batch production, this setup can help experienced moldmakers accelerate the entire moldmaking process. The ability to quickly iterate on mold designs using 3D printing, followed by precision machining and injection molding, offers an end-to-end solution that can enhance workflow efficiency.

3D Printing

To optimize the integration of 3D printing into moldmaking, Kara says, "SLA (stereolithography) technology is preferred over FDM (fused deposition modeling) due to its superior surface finish and precision. SLA parts are chemically bonded, dense and isotropic, making them suitable for detailed mold creation, including surface textures directly from the printer."

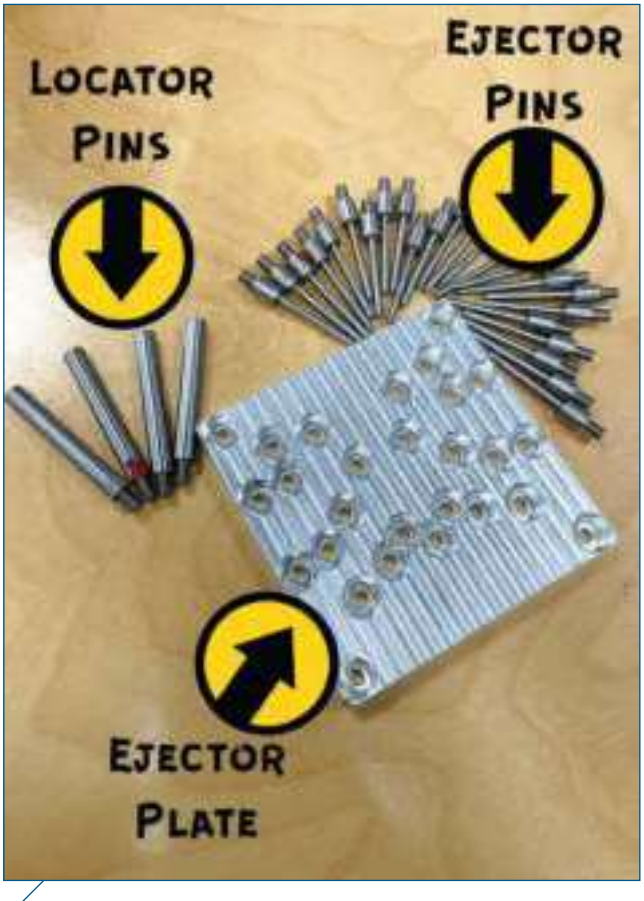
When selecting materials, it's essential to choose ones that can withstand the clamping force, injection pressure and high temperatures typical in molding.

"Some recommended options include Formlabs Rigid 10K or High Temp, Asiga FusionGray, Markforged Onyx, and Nexa3D xMold or xCeramic. You can achieve 500 plus cycles by using these 3D printed molds. For optimal results, print at 50-micron layers and ensure proper post-processing, which may involve CNC machining or hand sanding after post-curing to refine the mold surface," says Kara.

Scalability and Cost-Effectiveness

By adopting these desktop technologies, moldmakers can create high-quality molds while minimizing the need for outsourcing or expensive machinery. These electric, automated systems not only streamline production but can also provide the flexibility to handle various custom part applications. When considering scalability for larger production runs, Kara suggests two main options:

- Add more desktop units as demand grows until space constraints are reached.
- Use desktop units to test the market, then transition directly to industrial-size machines if there's sufficient demand.



A mold plate and ejector pins made with a desktop Swiss CNC machine.

An aluminum mold made with ejector pins using a desktop Swiss CNC machine.

The transition point from desktop to traditional large-scale injection molding machines depends on various factors, including space constraints and market demand.

"The initial investment difference between desktop units and industrial machines can be substantial, so the transition should be carefully planned, considering all aspects of operation, including learning curves, continuous maintenance and potential spare part needs," says Kara.

Learning Curve and Training

The learning curve for experienced staff to become proficient with the 3D printing and desktop CNC machining aspects of this integrated manufacturing approach is relatively quick for those with relevant technical backgrounds.

"Basic proficiency can typically be achieved within a few weeks of hands-on experience, while mastering more advanced functions may take several months of practice," says Kara.

Specialized training programs, including workshops, certifications and manufacturer-specific training programs, are available to expedite the learning process. These cover everything from machine operation to material selection and advanced techniques, supporting both cross-training of employees and the education of the next generation of moldmakers.

Making the Move

Whether you're a novice learning the ropes or a seasoned moldmaker looking to optimize your operations, desktop machines may offer a versatile, scalable option to meet the

A precise, rigid desktop CNC Swiss lathe can machine metals and plastics.

demands of today's fast-paced manufacturing environment. Embracing these tools also supports the cross-training of employees and addresses the skills gap, ensuring that the skills required for high-quality moldmaking are accessible and attainable for all levels of expertise.

"While a detailed cost-benefit analysis comparing this integrated desktop system to current moldmaking processes would require further study, particularly regarding industrial machinery operating costs, the potential benefits in terms of flexibility, training opportunities and rapid prototyping capabilities make this an attractive option for many moldmakers looking to stay competitive in an evolving industry. These desktop systems are not new. Many reputable organizations, including the NAVY, ARMY, NASA, and several global companies, have been using them since 2017 for various purposes," says Kara. MMT

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By Robert Nedler

Moldmakers Deserve a Total Production Solution

Stability, spindle speed and software are essential considerations for your moldmaking machine tool.

Speed, precision and stability are the key attributes of a mold machine. With the increased accuracy demanded by sophisticated molded assemblies, particularly in the automotive supplier industry, mold shaping machine tools continue to break new ground in precision, speed and multi-axis cutting.

For mold work, which typically takes light, high-precision cuts, a vertical machining center (VMC) offers the most effective design for machining complex shapes and surfaces. Spindle construction, thermal stability, and bed and column design are more important considerations than horsepower and torque. A mold machine should provide you a total production solution, from tool selection to final product.

> "Start at the heart of the machine tool: Structural stability is key to consistent precision machining."

Structure

Start at the heart of the machine tool: Structural stability is key to consistent precision machining. Typically created with finite element analysis (FEA) and CAD, the structure of the machine base and column are the foundation of machine stability. The design may be realized as weldments or in cast iron. Iron is arguably more effective at vibration dampening while offering superior stability.

For mold work, a VMC offers the most effective design for machining complex shapes and surfaces. Spindle construction, thermal stability, and bed and column design are more important considerations than horsepower and torque. Source (All images) | Hwacheon Machinery America Inc.

Designed using 3D simulations and FEM analysis, leading machines are built for high structural rigidity, which can translate to quality product results and the elimination of hand-fitting of mold components.

A VMC for mold work should have a machine frame with a rigid bilateral gate structure, which firmly supports the X-axis drive and diverts load, vibration and heat from the upper section of the machine evenly throughout the frame. These features will help keep the feed drive stable after hours of operation. Also, the short distance between the X-axis drive and the tool's point of contact will be a plus for maintaining rigidity and for enhancing machining precision.

Spindle = Speed

An integral spindle will provide outstanding performance in high-precision machining with the reduction of noise, vibration and heat. Because the high-speed motor is mounted directly on the assembled spindle shaft, there are no parts for transmission of power, resulting in reduced noise and vibration, minimal power loss and improved cutting efficiency.

Acceleration/deceleration time may be reduced as a result of a compact integral spindle, contributing to improved cycle times and surface finishes.

A high-performance spindle, which integrates oil-jet cooling and lubrication technology will ensure consistent quality results after hours of operation. The oil-jet cooling and lubrication system injects a jet of oil directly onto the spindle bearing for effective cooling. The motor and spindle assembly are jacket-cooled to limit displacement caused by heat. Temperature is thus stabilized in a short time.

This large-capacity VMC can accommodate up to a 5,500-pound table load with 17 inches between columns. Smaller and mid-range machines are available.

Software Suite

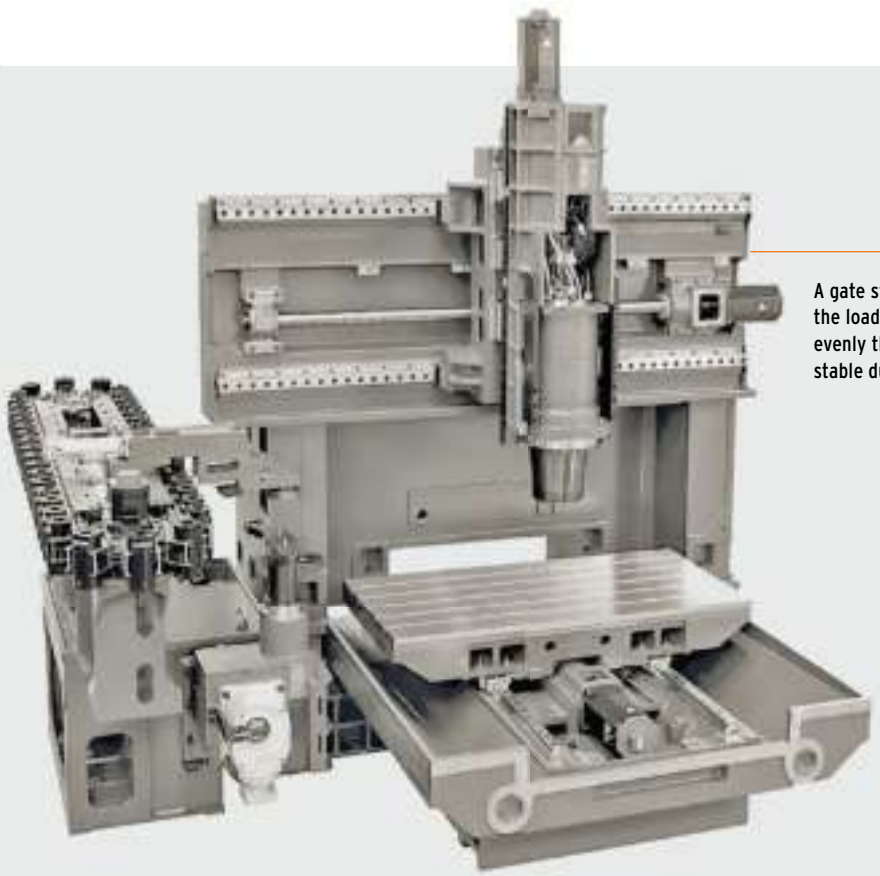
Another important consideration is the available suite of mold machining software components, which can positively impact the safety and the work efficiency of your organization and the quality of your output.

Thoughtfully designed machining software components will monitor different variables related to work environment and machining conditions, then make adjustments for high quality results and optimum machining efficiency. Software such as this would be specifically developed to increase thermal accuracy and machining performance.

Tool load detection software provides real-time measurement of tool load, ensuring consistent and safe machining. This software can ensure accuracy and performance by constantly monitoring tool damage and deterioration for prevention of complete tool failure that can cause workpiece damage. Such a system will measure tool load very frequently (e.g., every 8 milliseconds).

A contour control system will offer an easy-to-use programming interface that provides a precise, custom contour control for the selected workpiece while supporting longer machine life and reduced process time. Such software will offer different options for cutting speed and accuracy, and for surface finish and geometry. A customizable display can provide real-time monitoring and easy access. This software is able to be used with existing NC systems and is compatible with G-code programming.

A cutting feed optimization routine that utilizes an adaptive control method to regulate the feed rate in real time will



A gate structure firmly supports the X-axis drive and distributes the load, vibration and heat from the upper section of the machine evenly through the frame. This arrangement keeps the feed drive stable during operation.

sustain a consistent cutting load while machining. As a result, cutting tools are less prone to damage and machining time is reduced. This system controls the feed velocity to maintain consistent cutting load. Features to look for include a graphic display of tool load and feed rate, convenient operation using G-code programming and a number of data sets for specific tool and process control.

Another mold machine consideration are highly sensitive thermal sensors — mounted at various locations in the machine castings where thermal displacement is possible — that can permit software monitoring and correction of detected thermal displacement.

Spindle displacement control is also possible with the right software. As a spindle rotates at high speed, centrifugal forces and heat expand the spindle taper, causing error in the Z-axis. This axis accuracy is vital to precision mating of mold components. In addition to a high-precision cooled spindle, software can be used to constantly monitor temperature at a number of points within the spindle assembly, predicting thermal displacement. The system can then make necessary adjustments and effectively minimize thermal displacement, preventing Z-axis error due to taper expansion as the spindle rotates at high speed.

Toolholding

At any speed, a machine tool spindle is subject to centrifugal forces that increase as speed increases. At high speed, centrifugal force is strong enough to make a spindle bore grow slightly. As a collet segment rotates, the clamping mechanism gains centrifugal force and causes the relatively thin walls of the tapered shank to deflect radially at a faster rate than the wall of the spindle. This contributes to a stronger contact between the shank and the spindle, without affecting the axial position of the cutting edge, as it is determined by the face-to-face contact between the flange and the receiver.

An HSK toolholder has contact on the spindle face and taper. When the spindle begins to grow, the face contact prevents the tool from moving up the bore.

Most commonly, shrink-fit toolholders are used in mold machining due to total contact between tool and holder, approximating a solid carbide tool. This avoids the effects of temperature and vibration on the tool, supporting machining precision and high-quality mold surfaces.

Summary

A well-designed mold machining center with an optimal machining system — including spindle, software frame and toolholders — delivers a total production method from tool selection to final product and provides the best choice for high-precision applications of various types and materials. MMT

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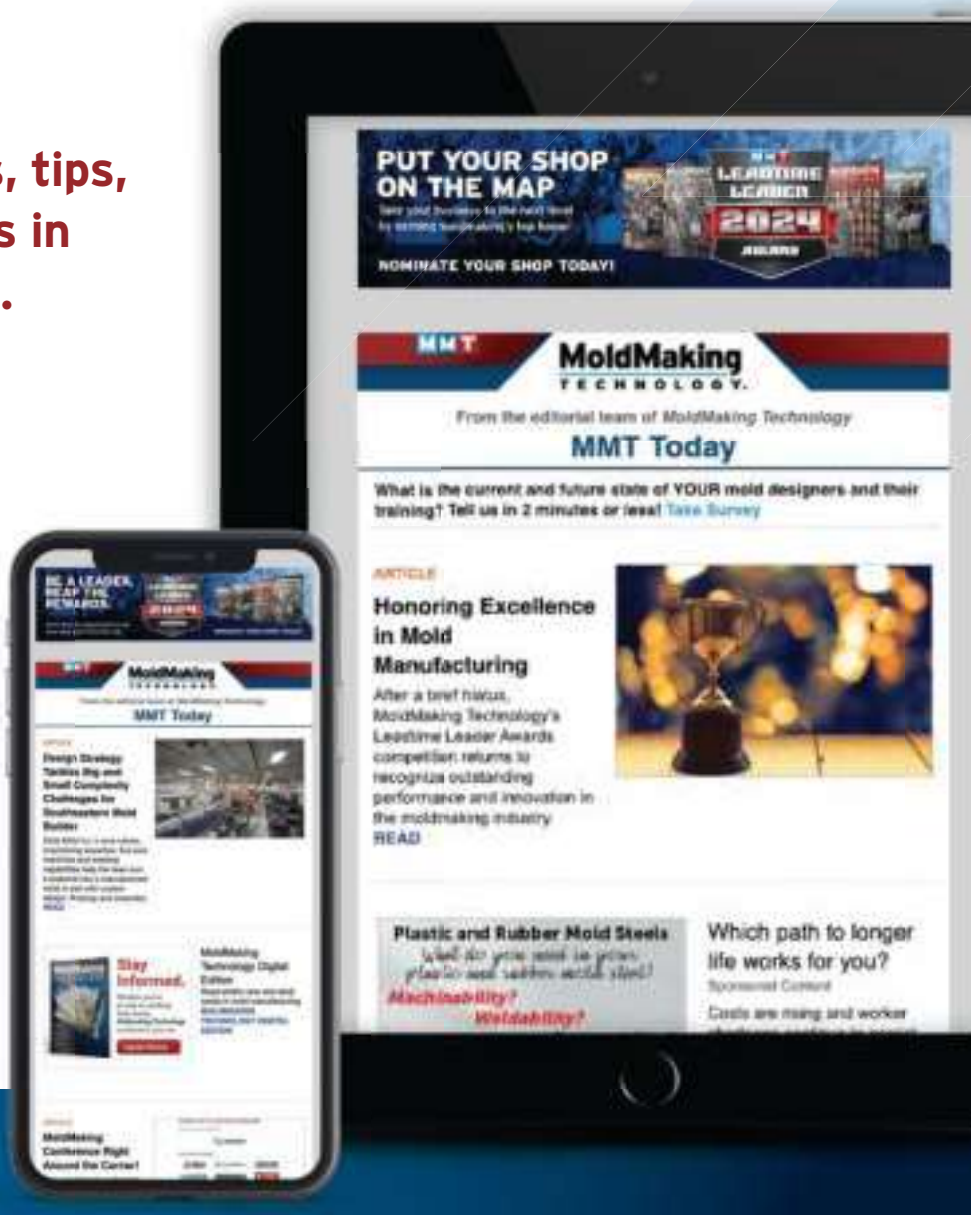

MoldMaking TECHNOLOGY

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By Christina Fuges

Strategies for Delivering a Qualified Talent Pipeline for Manufacturers

Clearly communicating your company's values, culture and purpose is essential for attracting and retaining talent. Source | Thinkstock

Insights into the importance of talent in maintaining national competitiveness, the impact of global events on the workforce and practical strategies for developing and implementing effective talent plans.

Talent isn't just important — it's the cornerstone of national competitiveness. According to a Deloitte study, access to skilled talent outranks factors like taxes and access to materials when it comes to a country's competitive edge. But here's the kicker: The U.S. has been grappling with a talent shortage for years.

"Back in 2011, we were already talking about a skills gap, with 600,000 job openings in manufacturing. Fast forward to today, and the challenges remain, exacerbated by the aftereffects of the COVID-19 pandemic," says Jeannine Kunz, chief workforce development officer with SME.

The pandemic didn't just disrupt supply chains; it fundamentally reshaped the workforce landscape. "We have 1.7 million fewer people working now compared to February 2020. Younger workers represent a changing market, with participation rates for 16 to 24-year-olds down 17% since 1989.

And women's labor force participation is particularly impacted, with 617,000 women missing from the labor force if 2024's participation rate matched what it was in February 2020," says Kunz in a U.S. Chamber of Commerce "Data Deep Dive: Women in the Workforce study.

However, there *is* good news. Marion Wells, founder of Human Asset Management and *MMT* Editorial Advisory Board member says we've made tremendous strides in changing the perception of manufacturing. Initiatives like Manufacturing Day and Women in Manufacturing have helped reshape the industry's image, making it more attractive to the next generation. This shift is further supported by the launch of programs like "SME Ready to Hire".

SME has partnered with Cengage Group to provide manufacturers with access to pre-screened, pre-trained, and pre-market talent. This enables manufacturers to focus on team building and retention. According to Kunz, the

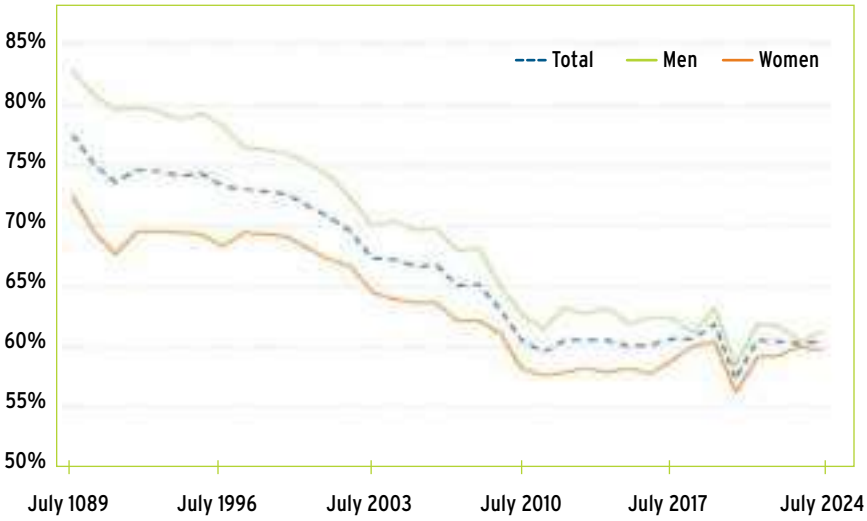
timing is critical, as the U.S. manufacturing sector could need up to 3.8 million new employees by 2033, with potentially 1.9 million jobs remaining unfilled.

The Ready to Hire program thoroughly screens all candidates, saving manufacturers time and effort by presenting only the most qualified individuals for open roles. "Candidates must meet all program requirements, including soft skills development and specific technical instruction before they are referred to employers. New hires will receive hands-on training on-site, evaluated by experienced technicians essential for establishing a skilled workforce," says Kunz.

This program not only delivers strong individual candidates, but also ensures that multi-location providers receive the same qualified, consistent and predictable candidates for every facility. "The Ready to Hire program guarantees retention for all referred candidates up to three months from the hire date, a critical time period for long-term retention," says Kunz.

To provide opportunities to all qualified candidates who are eager to learn, the program is free to individuals. Training programs are focused on in-demand roles such as CNC machinist, welding technician, robotics technician, press operator, additive manufacturing and electrical vehicle technician. Individuals can also train to receive SME's Certified Manufacturing Associate (CMfgA) Certification.

Labor Force Participation Rates of 16- to 24-year-olds in July, 1989-2024



Source | U.S. Bureau of Labor Statistics. Data are not seasonally adjusted.

Source | U.S. Chamber of Commerce (uschamber.com)

Crafting Your Own Talent Strategy

So, what should manufacturing companies do to address these challenges *internally*? Wells offers a roadmap. First, *assess your current state*. Start by asking tough questions like: Are we updating our technology? Do we have the right skill sets? Should we rethink our work processes? This honest evaluation sets the foundation for your talent strategy.

Next, *focus on the future*. Consider your goals for the next five years, focusing on three key areas: process, people and technology. Remember, the workforce we are trying to attract is primarily Gen Z. Their expectations and values should be factored into your planning.

Changing old attitudes remains a significant challenge, particularly in apprenticeship programs, including the problem of outdated views and treatment of apprentices. "Be clear about your culture and say that mutual respect is a core value," says Wells. She also advises *setting expectations* for both apprentices and mentors to ensure a supportive learning environment and helping employees understand their role in the bigger picture to engage apprentices and connect all employees to the company's mission and customer impact.

To overcome negative perceptions, Wells suggests using the company website and article to share information about the industry's evolution and advancements that can help shift public opinion. It's crucial to highlight the positive changes and innovations in manufacturing that often go unnoticed.

Don't forget to *engage parents in the recruitment process*. "When it comes to recruiting the next generation, convincing parents of the benefits of manufacturing careers is crucial," says Wells. A business case analysis comparing the costs and benefits of college versus a manufacturing career can help parents see the financial and career advantages of pursuing a path in manufacturing.

Wells also emphasizes the importance of *data-driven decision-making*. "Most companies don't use data-driven decisions in human resources, but you need to," says Wells. Analyze workforce data, turnover rates and employee satisfaction to inform your strategy. This approach enables for more targeted and effective talent management.

Another crucial step is *rethinking role segmentation*. Many companies are still using outdated job descriptions. Wells suggests reevaluating roles to better align with modern manufacturing needs and employee expectations. This can help attract new talent and retain existing employees by providing clear career paths.

Don't forget to *plan for external trends*. Consider how factors like digitalization and AI will impact your workforce needs in the future. This forward-thinking approach will help you stay ahead of industry changes and prepare your workforce for future challenges.

Finally, *develop clear communication strategies*. Ensure your company's values, culture and purpose are clearly communicated. This is crucial for attracting and retaining talent, especially among younger generations who often prioritize purpose-driven work.

Moving Forward

The mold manufacturing industry is at a crossroads. While facing significant challenges in workforce development and talent acquisition, there are also opportunities for shops willing to adapt and innovate. By developing comprehensive talent strategies, leveraging data and clearly communicating of values and opportunities, mold builders can attract and retain the skilled workforce they need to thrive in the future.

As Kunz puts it, "Manufacturing is a high-tech, high-touch industry crucial to national security and economic prosperity, yet its story often goes untold." Programs like Ready to Hire are essential steps in bridging the talent gap and reshaping the narrative around careers in manufacturing. MMT

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Marion Gilbert Wells, Founder and Managing Partner

By Christina Fuges

2024 Moldmaking Insights: A Year in Review

Scan to view the full list.

A look back at the top moldmaking trends of 2024, as revealed through *MMT*'s analytics. This review highlights the most popular technical articles, case studies, tips and best practices that captured the industry's attention over the past year.

Ejector Pin Selection Guide

This guide provides insight into making informed decisions to optimize mold performance and longevity. Ejector pins, critical components of a mold's ejection system, vary in material, treatment and coating based on the application. Selecting the right ejector pin requires balancing these characteristics, considering factors like part size, shape complexity and mold temperatures. Common materials include H13 steel, stainless steel, copper alloys and high-speed M2 steel. Each material offers unique benefits like strength, wear resistance, hot hardness and corrosion resistance, making them suitable for different molding applications. Surface treatments, such as nitriding or chrome plating, further enhance pin performance by improving wear resistance and durability.

Source | PCS Company

Read the complete article online at: short.moldmakingtechnology.com/ejector-pin-selection

Modular Tooling Systems Enable Versatility in Hole-Drilling Operations

Moldmakers now have efficient, adaptable drilling tools to meet the precision and depth requirements of various mold components. Drilling operations in moldmaking are diverse, ranging from simple screw-threaded holes to deep coolant channels. This article highlights that this variety necessitates a range of specialized tools, including traditional solid carbide drills and modern indexable systems, which enhance versatility and reduce tooling costs. Precision alignment holes benefit from multi-flute drills that eliminate secondary boring, while deep holes for cooling are improved by indexable gundrills. These modular systems reduce resharpening and inventory costs while improving productivity.

Source | Iscar USA

Read the complete article online at: short.moldmakingtechnology.com/modular-tooling-system

Dynamic Tool Corporation – Creating the Team to Move Moldmaking Into the Future

This article shares the story of *MoldMaking Technology*'s 2024 Leadtime Leader winning shop with more than 40 years of offering precision tooling, emphasizing education, mentoring and innovation. Company ownership and dedicated employees worked together to gather the information necessary to showcase why they took the title — from the company's commitment to excellence, integrity, safety and customer service, as well as inspiring growth and quality in manufacturing. The article also highlights their innovative engineering, design and development solutions for optimizing the production of plastic components and products. They also discuss the team that makes it all happen, both now and in the future.

Source | Dynamic Tool Corp.

Read the complete article online at: short.moldmakingtechnology.com/LLA24-Dynamic-Tool

Most-Viewed Content

Hot Runner Truths, Myths and Overlooked Areas

This article provides a user-centric view of hot runner benefits and complexities. Hot runners offer significant advantages for injection molding, such as reducing cycle time and eliminating cold runners and sprue. Although they increase mold complexity and upfront costs, these systems provide long-term benefits, especially in high-volume or high-cost resin applications. Key to their performance are components like thermocouples, which regulate temperature and tip designs, which affect color changes and fill pressures. Advanced designs and better controllers have reduced issues, although challenges like drooling, sprue sticking and gate vestige persist. Addressing these requires understanding orifice sizes and cooling needs.

Source | Incoe Corp.

Read the complete article online at:
short.moldmakingtechnology.com/Hot-runners-truths-myths

Reasons To Use Fiber Lasers for Mold Cleaning

Contaminants like rust, dirt, grease and oil can severely impact the injection molding process, leading to surface defects, increased mold corrosion and heightened wear and tear. This article reviews a solution to prevent these issues that cause costly damage and downtime. Traditional cleaning methods, such as chemical, ultrasonic and steam cleaning, have their drawbacks, including potential damage to mold surfaces and inefficiency with temperature-sensitive molds. Fiber laser cleaning offers a fast, precise and reliable alternative. It minimizes cleaning risks by transforming contaminants into vapor or dust without damaging the mold. The portable laser cleaner, weighing 50-60 pounds, allows for efficient on-site cleaning, extending mold life and reducing maintenance needs.

Source | Rocklin Manufacturing Co.

Read the complete article online at:
short.moldmakingtechnology.com/1024-mmt-rocklin

Tackling a Mold Designer Shortage

The moldmaking industry faces a significant challenge: a growing shortage of skilled mold designers and engineers. This article highlights a survey conducted by MoldMaking Technology, revealing that while many shops have maintained or increased their number of mold designers over the past five years, the supply still lags behind the industry's needs. Key concerns include the declining availability of mold design expertise, potential shortages within five years, and dissatisfaction with on-the-job training. To address this, the industry must prioritize targeted education and innovative approaches. Collaboration between businesses and educational institutions is critical to ensuring a sustainable workforce for the future of mold design and engineering.

Source | Stock, Copilot

Read the complete article online at:
short.moldmakingtechnology.com/mold-design-shortage

The Lowdown on Guided Ejection Systems

This article explains how guided ejection systems, which include guide pins and bushings within the ejector housing, significantly extend mold longevity by supporting, guiding and aligning ejector plates and connected components. These systems prevent the weight of ejector plates from causing wear and damage to mold parts, ensuring proper alignment and movement. They are particularly beneficial for molds with heavy ejector plates, complex ejection components or long ejector strokes. While they increase mold costs, guided ejection systems reduce downtime and repair expenses by preventing issues like flash and component wear. Mold base suppliers offer various sizes and configurations, allowing customization to meet specific mold design needs.

Source | Injection Mold Consulting

Read the complete article online at:
short.moldmakingtechnology.com/1124-mmt-Injection-Mold

Precision Meets Innovation at IMTS 2024

The MMT team attended IMTS 2024 and shares some key advancements in moldmaking, emphasizing automation, precision machining and digital integration. With a focus on increasing efficiency, exhibitors showcased five-axis machining centers, AI-driven CAM software and additive manufacturing solutions. Collaborative robots, automated systems and smart manufacturing technologies were featured to address labor shortages and reduce costs. Innovations in EDM, cutting tools and quality control systems were also prominent. Sustainability and workforce training were emphasized through energy-efficient machines and virtual training tools. Overall, IMTS 2024 demonstrated that embracing advanced technology is crucial for moldmakers to enhance productivity, precision and competitiveness in a rapidly evolving industry.

Source | *MMT* Staff

Read the complete article online at:
short.moldmakingtechnology.com/IMTS-recap

The Critical Role of Management Representatives in ISO 9001

A Management Representative (MR) plays a critical role in an ISO 9001 quality management system (QMS), overseeing the implementation, maintenance and effectiveness of quality processes. The article explains how the MR ensures compliance with customer requirements, coordinates internal audits and promotes awareness throughout the organization. Although ISO 9001:2015 no longer mandates an MR, appointing one remains beneficial for managing QMS processes and facilitating communication. For small businesses, an MR helps ensure consistent quality, enhances productivity, and demonstrates a commitment to industry standards. However, the MR should support, not replace, top management's involvement in the QMS.

Source | Stock, Claude

Read the complete article online at:
short.moldmakingtechnology.com/management-rep-ISO

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Father/Daughter Team Takes Mold Business into the Future

BA Die Mold Inc. celebrated 56 years in the moldmaking industry, led by founder Alan Petrucci and his daughter, Francine, who is president. In this profile, Alan reflects on the company's resilience, attributing its success to skilled employees, innovative unscrewing technologies and a commitment to high-quality mold manufacturing. Memorable milestones include building their plant and earning patents for complex mold systems. Francine shares her vision for the future, emphasizing employee development, leveraging new technologies like 3D printing and maintaining strong customer relationships. As Francine takes the helm, Alan plans to retire at 85, confident in the company's continued strength and legacy.

Source | BA Die Mold Inc.

Read the complete article online at:
short.moldmakingtechnology.com/father-daughter-mold-biz

Confronting the Mold Design Talent Drought

This post shares industry feedback on the critical shortage of skilled mold designers facing the industry as we approach 2030, with only 0.7% of workers satisfied with their on-the-job training. Key challenges include declining apprenticeship programs, reduced vocational education options and difficulty finding qualified instructors. While some initiatives are emerging, the industry needs a comprehensive solution. This requires changing the public perception of manufacturing careers, rebuilding educational programs, strengthening industry-education partnerships and addressing training costs. Industry leaders emphasize that waiting for government intervention isn't enough—companies must take active roles in developing talent pipelines and modernizing training approaches.

Source | *MMT* Staff

Read the complete article online at:
short.moldmakingtechnology.com/design-talent-drought

Understanding Diamond Compounds

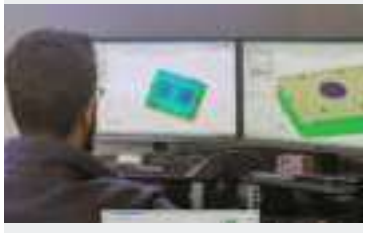
Professionals in mold and die polishing frequently turn to diamond compounds for final or mirror-finishing applications. This tip explains the four main categories of these compounds. Versatile compounds offer consistent particle distribution and wide thermal processing range using synthetic diamonds. Premium compounds use natural diamonds for optimal cutting and finishing. Economical compounds provide a cost-effective option with synthetic diamonds for general use. Fast-cutting compounds blend both natural and synthetic diamonds for quick, superior finishes. All varieties are engineered for precision finishing, with different concentrations and grades available to match specific application requirements and surface finish needs.

Source | Borride Engineered Abrasives

Read the complete article online at:
short.moldmakingtechnology.com/diamond-compounds

Integrated CAD/CAM Streamlines Electrode Manufacture, Improves Quality

The case study shares how PTI Engineered Plastics, a Michigan-based custom injection molder, streamlined its electrode design and manufacturing process using Cimatron's integrated CAD/CAM software. The company's 35-person toolroom recently completed a complex EV charging plug prototype in just 5 weeks, a project that previously would have taken 10-12 weeks. Using Cimatron's Quick Electrode feature, PTI automated many repetitive functions in electrode design and programming, significantly reducing manual work. The software's user-friendly interface allows operators of varying skill levels to create complex electrodes efficiently. This implementation helped PTI shift from producing 800 simpler tools annually to under 300 higher-quality, more complex tools, while improving overall manufacturing efficiency and business performance.

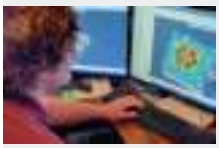


Source | Cimatron and PTI Engineered Plastics

Read the complete article online at: short.moldmakingtechnology.com/integrated-CAD-CAM

Navigating the Future of Mold Design and Manufacturing

This Q&A with a mold designer discusses key industry challenges, including staffing shortages, training needs, shortened lead times and increasing competition from overseas manufacturers. He shares efforts to build local manufacturing interest through school outreach, though he faces resistance from high schools prioritizing college paths over direct employment. He also highlights how 3D printing has enhanced design capabilities by enabling physical prototyping. Regarding future trends, automation is expected to significantly impact the industry, particularly in adapting to one-off parts production. While AI's role in design is mentioned, he remains cautiously optimistic, suggesting it will enhance rather than replace human designers. The article also notes improvements in CAD software user experience and accessibility.



Source | J Squared Design Services LLC

Read the complete article online at: short.moldmakingtechnology.com/future-of-moldmaking

Quality Tool & Die Enhances Performance With Advanced EDM and Milling Technologies

The article details the success story of Quality Tool & Die (QTD), a Pennsylvania-based company that transformed through strategic equipment investments. After being acquired in 2005 by Brad McDowell and Chad Kearns, the company overcame initial financial struggles and evolved from a manual operation into a sophisticated tool-building enterprise. Key to their transformation was the adoption of Mitsubishi EDM machines and an OPS Ingersoll five-axis milling machine with automation. The new equipment, particularly the Mitsubishi SV12P sinker EDM with artificial intelligence and the five-axis mill, significantly improved productivity by enabling unmanned operations and reducing electrode consumption. The company has grown 10-15% annually and expanded to 30,000 square feet, now employing 30 people across tool shop and injection molds divisions.

Source | MC Machinery Systems

Read the complete article online at: short.moldmakingtechnology.com/1124-mmt-Quality

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3D Printing Innovates Hot Runner Manifold Design

Source | Hasco America Inc.

This article details a 3D-printed manifold technology that significantly improves color change efficiency for injection molding. The design features separate floating modules screwed onto a conventional manifold, allowing flexible cavity placement. The key innovation is its ability to eliminate flow shadows by dividing and merging the melt channel where the valve stem enters, preventing material trapping that typically causes color change issues. Testing showed the system achieved pure white material in the first cycle.

Read the complete article online at: short.moldmakingtechnology.com/3DP-hot-runner-manifolds

Ultra-Fast Femtosecond Laser Texturing Helps Produce EV Lighting Lens Molds

Source | Microrelleus (Barcelona, Spain)

The electric vehicle industry is driving innovation in automotive lighting through edge-lighting systems, which use LEDs around lens edges for illumination. This article details a Ultra-fast femtosecond laser texturing technology that can meet the required special micro-faceted patterns in plastic lenses that can't be achieved through conventional moldmaking methods. This solution allows manufacturers to test patterns directly on plastic lenses before applying them to production molds. It creates sharper, more intricate details than traditional nanosecond lasers and produces minimal heat-affected areas. While costly, the system's dual-platform capability allows shops to use both laser types, expanding their application range and reducing product development time. This advancement supports the growing "shy tech" trend in EV design, emphasizing cleaner, button-free interfaces.

Read the complete article online at: short.moldmakingtechnology.com/laser-texturing

Mentorship Matters: A Fresh Perspective from a Young Female Newcomer to a Mature Male-Dominated Industry

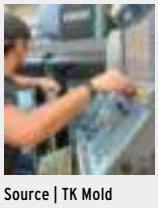
Source | Accede Mold & Tool

Jane Huot, a 23-year-old mold designer and project manager, recounts her one-year anniversary with Accede Mold & Tool this past summer and her first business trip. Jane traveled from New York to Arizona with Camille Sackett, VP of Sales & Marketing, and Angie Steingass, Marketing Manager, to a conference sponsored in part by Accede geared for women in the rubber and plastics industries. Jane assisted with the setup and staffing of her company's exhibit and attended conference sessions. After the conference, Jane shadowed Camille on sales visits to customers' facilities. She shares the indelible mark this experience left on her professional growth.

Read the complete article online at: short.moldmakingtechnology.com/moldmaking-mentorship

Software Reduces Delivery Times by 70% With Six-Month ROI

This article shares how TK Mold & Engineering invested in advanced CAD/CAM training so everyone, from estimators to designers to CNC and EDM techs, can use the software more efficiently. With a team of 25, the company operates in two facilities, designing and building up to six tools per month. They also offer maintenance, repairs and low-volume custom injection molding. Their customers span the automotive, consumer goods, aerospace and medical sectors.

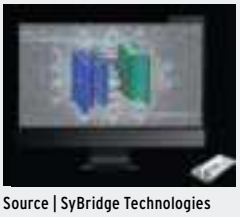


Source | TK Mold & Engineering

Read the complete article online at: short.moldmakingtechnology.com/CAD-CAM-reduces-time

How to Make Data Work for Mold Productivity and Performance

Manufacturing is evolving through digital integration, with a focus on connecting scattered data across the product lifecycle through a "digital thread." According to SyBridge Technologies' VP Charlie Wood, this approach enables digital twins and machine learning applications. Two key developments are highlighted: digital design libraries, which use parametric design for standardized components, and advanced conformal cooling through additive manufacturing.



Source | SyBridge Technologies

Read the complete article online at: short.moldmakingtechnology.com/data-productivity

Contraction Slows in October

Many components contracted less while some stayed flat.

MIKE SHIRK
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Gardner Intelligence
Mike has been an essential part of Gardner Intelligence for over six years and has led research and analysis in various industries.
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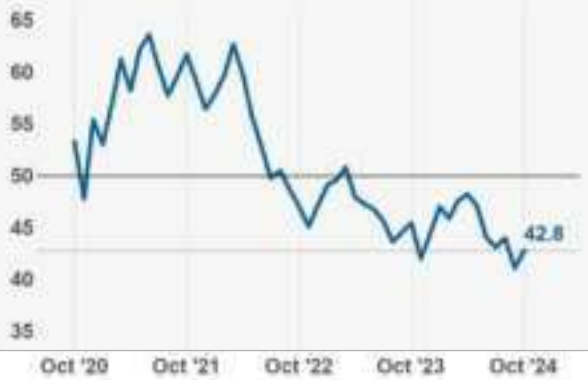
Gardner Business Index (GBI): Moldmaking



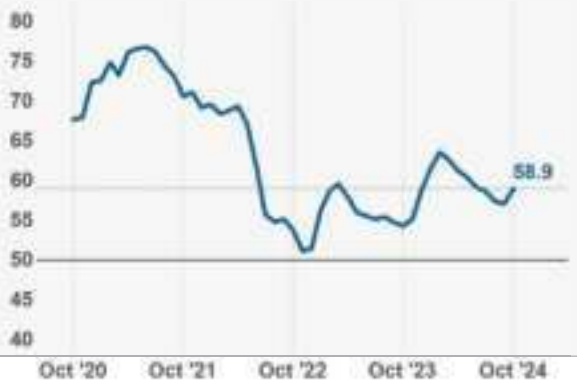
The Gardner Business Index (GBI) is an indicator of the current state of moldmaking based on survey responses regarding new orders, production, backlog, employment, exports and supplier deliveries. Over 50 is expansion, under 50 is contraction. The October GBI shows the moldmaking market remains in a state of contraction, but contraction slowed from September by more than 1.5 points. Materials prices increased again while prices received remain mostly flat.

GBI Components Scorecard

The Gardner Business Index (GBI) Components Scorecard reports the monthly change rate of primary moldmaking market factors contributing to the overall monthly index reading.

Shade = distance from 50 (darker shades are further from 50)
Direction = change (Pointing up is better)

GBI Future Business Index



The GBI Future Business Index is an indicator of the future state of the moldmaking market considering industry respondents regarding their opinion of future business conditions for the next 12 months. Over 50 is expansion, under 50 is contraction. The index remained positive and improved by nearly two points over the previous month.

Mold Maintenance, Repair and Surface Treatment

Scan to view the full list.

Laser Cleaner Minimizes Mold Cleaning Risks

Rocklin Manufacturing Co.'s LC/RR 1500 Laser Cleaner offers a simple, fast and precise alternative to minimize mold cleaning risks. When the 1500-watt fiber laser beam contacts the surface, it interacts with the coating on the mold (but not the mold itself) and then cleans the mold surface by transforming the coating into vapor or dust that then flakes off. This can be done very quickly and since the unit is an all-in-one, portable laser cleaner, can be brought directly to the mold.

When a mold is contaminated with rust, dirt, grease or other substances, it can damage the injection molding process and harm the quality of the molded products. These contaminants can cause surface defects that are then transferred to the molded parts, producing increased mold corrosion and triggering wear and tear on mold surfaces. The mold release process could also be impeded as grease and oil make it difficult for the molded part to separate from the mold, causing lengthy cycle times as well as damage to the part during ejection.

Because the laser can be precisely controlled, this enables selective cleaning of specific areas on the mold. Laser cleaning is a non-contact process, eliminating the risk of wear and tear associated with abrasive cleaning methods. It's also a dry process that doesn't require the use of consumables or chemicals that can carry environmental and safety risks.

The laser's low heat generation avoids thermal damage to molds with temperature sensitivities and the power can be adjusted based on the contaminant type. Moreover, there is no residue left behind and there is an extended life for molds, ultimately alleviating wear and tear in the cleaning process. The fiber laser source can be used for up to 100,000 hours with minimal maintenance required.

Rocklin Manufacturing Co. | 712-255-7957
rocklinmanufacturingco.com

Ejector Pin Grease Enables Optimal Molding Environment

Slide Products Inc.'s clear, high-temperature Super Grease is a formulation that offers a remedy in fighting contamination, discoloration of parts and helping to avoid premature replacement of molds/machines. Thixotropic properties offer stability during sudden temperature changes. The paintable, clear, non-yellowing formula works for medical and food grade plastic parts as Super Grease is NSF certified in such environments.

Moving components within the mold have tight tolerances for optimum performance. Attempting to combat a gumming issue quickly with an inferior or generic greasing spray may provide temporary relief but could eventually create sticky parts and potentially cause considerable downtime.

When servicing a poorly greased mold it's critical to use the correct product as soon as possible. It's also important to note that mixing different compounds (such as a petroleum-based versus synthetic) can exacerbate problems.

Slide factory representative, Jeff Lewis recalls an unpleasant situation that occurred where a machine became unstable due to inadequate lubrication and ended up taking five hours to resolve. It had been shipped without being properly lubricated and then seized up when started:

"I remember having to sit on the floor for hours with a polishing stone, straightening and re-polishing the pins just to ensure the machine would be ready and available for production in the morning," says Lewis.

Super Grease holds real-time benefits across multiple molding and mold making daily challenges. It contains PTFE with no silicones and will not bleed out. The product is available in aerosol and non-aerosol choices that include 3-oz. tubes, 14-oz. tubes, 7-lb. cans, 35-lb. cans and 400-lb. drums.

Slide Products Inc. | 800-323-6433 | slideproducts.com

Mold Cleaning System Assists Clogged Water Lines in Injection Molds

The Eco-Pro 360 from **iD Additives Inc.** provides safe, effective cleaning of clogged water lines in plastic injection molds.

Eco-Pro 360 is a water-based, eco-friendly plastic mold cleaner that effectively removes rust and provides long-term rust protection, all while being non-aerosol, non-flammable with no VOC's as well as user-friendly.

The iD Eco-Pro System is comprised of the Eco-Pro cart (two sizes) and was created for using the Eco-Pro 360 chemical. It is a preventative maintenance cleaning system with a pump and filter combination unit. It removes, protects and helps prevent rust and limescale within the cooling passages and water lines in the mold. The built-in filter function enables the Eco-Pro 360 solution to remain at peak performance for optimal reusability.

iD Additives Inc. | 708-588-0081 | idadditives.com

Electroless Nickel Plating Benefits Plastic Injection Molds

Bales Metal Surface Solutions offers electroless nickel plating to benefit plastic injection molds in terms of mold performance, durability and product quality. One of the primary reasons for electroless nickel plating a plastic injection mold is its uniform coating ability.

This enables an even layer of nickel-phosphorus alloy to be deposited over complex geometries, including intricate mold features and deep cavities. This uniformity ensures that the entire mold surface receives the same level of protection, leading to consistent product quality.

Another critical reason is the increased corrosion resistance provided by electroless nickel plating. Plastic injection molds are often exposed to moisture, cooling agents and various chemicals used in molding, which can lead to corrosion over time.

Bales Metal Surface Solutions | 800-215-6653 | balesusa.com

Spotting Presses: From Mold Spotting to Series Production

Millutensil SRL offers a diverse range of spotting presses that meet the precision demands of the moldmaking industry. The BV Series is specifically designed for small to medium-sized molds, ensuring meticulous spotting, validation and maintenance capabilities. For larger molds, the MIL Series accommodates medium to giga-sized molds, with two distinct lines: the Classic, optimized for plastic molds and the Compact, designed for the requirements of die-casting molds. This versatility is backed by Millutensil's patented, exclusive features, providing moldmakers with solutions for control and adaptability in mold positioning.

Dedicated accessories, including the rotating table for multicolor or multi-component molds, offer flexibility essential to today's varied production demands. This modular setup ensures that Millutensil presses can address an array of specialized mold testing and production requirements, tailored to customer needs.

In a significant evolution, Millutensil spotting presses now support automatic cycle functions – enabling presses to go beyond traditional testing to pre-series and small-scale production. Increased clamping force across models supports these small production runs directly on the press, creating a seamless bridge between mold validation and early production, and providing robust stability and accuracy.

The Youmil model represents the height of these advancements, integrating automatic cycle programming and exclusive, patented solutions for efficient mold testing and pre-series production. This feature-rich model enables moldmakers to conduct extensive production testing in near-production environments, improving accuracy and speed in bringing molds to market.

Millutensil's BV and MIL Series spotting presses – with the Youmil model leading in small series production capabilities – offer a robust portfolio of solutions for moldmakers, enabling precise, flexible and efficient mold maintenance and production.

Millutensil SRL | 390229404390
millutensil.com

Digital Dry Ice Cleaning Technology Enables Mold Component Surface Preparation

Cold Jet highlights its PCS Ultra, a digital dry ice cleaning technology to prepare substrates prior to coating. This technology is useful to mold builders as they must account for the incalculable number of polymers and blends in the industry today. Many times, mold builders will incorporate various coatings (i.e., DLC's) which require the mold components to have the proper surface treatment prior to coating.

The PCS Ultra offers the maximum working range of performance of any dry ice blaster in the marketplace, enabling mold builders to select 28 different particle sizes ranging from 0.3 to 3 mm depending on the level of aggression needed to prepare the component. Programmable process application recipes can be stored in memory via the 7-inch LCD color screen with HMI.

Dry ice provides cleaning properties for mold builders. It is dry, eliminating the need for component drying; it's non-abrasive, eliminating concern for altering the finished component dimensions; and environmentally friendly as well as sustainable, eliminating the use of solvents or harder media.

Cold Jet Connect provides mold builders with Industry 4.0 / IOT monitoring and analytics capabilities. The entire surface preparation process, as well as the machine status, can be remotely monitored and reported. This provides more process stability and high-quality cleaning compared to other traditional methods. These features can also increase the component production rate, while consistently ensuring optimized execution.

Moreover, the PCS Ultra has automation and integration capabilities. From semi-automated solutions to fully automated solutions, including the incorporated manufacture of dry ice pellets, is available. This enables mold builders to carry out surface preparation tasks lights out.

Cold Jet | 800-337-9423 | coldjet.com/plastics

Stain Removal for Optimized Injection Mold Maintenance

Nanoplas offers its Zap-Ox stain removal for optimized injection mold maintenance. Ensuring molds are stain and oxidation-free is essential to maintaining high-quality production and minimizing costly downtime. The compoany says Zap-Ox is a powerful cleaner specifically designed to remove oxidation, rust and other stubborn stains without etching metal surfaces. This formulation promotes effective cleaning across various metals, easily bringing metal back to its original state.

Nanoplas says Zap-Ox provides can tackle tough oxidation and rust stains with ease. A small amount of Zap-Ox can penetrate difficult buildups, lifting stains without aggressive scrubbing – saving time and preserving surface integrity. This feature helps improve productivity during maintenance, enabling manufacturers to maintain seamless operations and reduce unscheduled downtime.

Consistently use of Zap-Ox helps prevent the buildup that often leads to premature wear in injection molds and metal tools. Regular cleaning with extends the lifespan of costly equipment, reducing the need for replacements and ensuring optimal mold performance over time. For injection molders, this translates to both cost savings and enhanced process reliability.

As an NSF listed C1 formula, Zap-Ox is acceptable for use in both medical-grade and food-grade molding operations. Suitable across multiple surfaces, Zap-Ox eliminates the need for numerous specialized cleaners, simplifying maintenance routines while promoting sustainability through minimized waste.

Nanoplas | 616-452-3707 | nanomoldcoating.com

2024 MOST-VIEWED PRODUCTS

3D Printed Hot Runner Nozzles Yield Consistent Temperature Profile

Selective laser melting (SLM) metal 3D printing, combined with artificial intelligence (AI), produce **DMS** Monolith hot runner nozzles, tailored precisely to part and process specifications.

According to the company, the innovation lies in the 3D printed air spaces that provide insulation to the nozzles from the mold, ensuring a consistent temperature profile. This capability facilitates the processing of challenging materials within narrow temperature windows, while simultaneously reducing energy consumption and heat input into the injection mold, enabling more economical and sustainable part production.

Nozzles are delivered at the optimal length for a specific mold design at no additional cost and each nozzle is distinctively produced to seamlessly integrate with the mold, including an imprinted union nut to simplify installation and maintenance.

In addition, the hot runner manifold supports are made with insulation through the SLM process, branded as Energy Blockers. This enhancement leads to a 52% reduction in overall system energy consumption compared to conventional hot runner systems using titanium ceramic supports.

Witosa products are now available in the U.S. at DMS' website.

DMS | 800-265-4885 | dmscomponents.com

Sintered, Porous Mold Steel Eliminates Gas Buildup

Molder's World Inc. draws attention to Vortex, a self-venting mold steel that it says is quickly becoming the industry standard. Specializing in self-venting mold steels since inception in 2001, Molder's World is most well known as the preeminent distributor of Porcerax II prior to its discontinuation. Vortex, as its replacement, is claimed to be the most exciting development in the company's 20+ year history.

Vortex uses a system of microscopic, interconnected pores with an average diameter of 7 μm (0.0003") interspersed throughout the steel. As pressure builds inside the mold, the gases present are forced directly through the Vortex, eliminating gas buildup, reducing injection pressure, lowering cycle times and gloss levels, and substantially reducing scrap and reject rates, enabling molders to save money in the process.

When compared to Porcerax II, Vortex is roughly 15% harder (43 HRC average), stronger (TR: 834 MPa) and less expensive than Porcerax II was prior to its discontinuation.

Though tool shops and molders may primarily identify Vortex for its use in speaker grill insert, interior automotive and medical applications, Vortex can be used in nearly every molding application where gas buildup is problematic. A variety of square, rectangle and round sizes, as well as self-venting core pins and plugs, are available.

Vortex is produced in the U.S. and is globally used in automotive, medical and commercial injection molding applications as well as lost-core wax molds.

Molder's World Inc. | 513-469-6653 | moldersworld.com

Hydraulic Gating Cutting Reliably Separates Molded Parts

Ermanno Balzi S.r.l. has been engaged in the production of components and accessories for molds since 1995. Among the solutions the company offers for the molding of plastic materials is its hydraulic gate cutting technology, which enables the separation of the molded part from the gate during the molding cycle via the axial movement of a cutting tool operated by a mini cylinder.

The cutting, more precisely described as a material displacement, is carried out in a closed mold at the end of the holding phase when the polymeric material is still hot. The high pressure required by the process can be provided through a hydraulic power unit or a pressure multiplier applied to the mold and controlled by the injection molding machine.

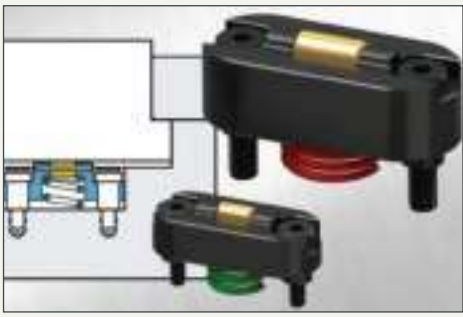
There are multiple advantages in this production process, including the elimination of external cutting equipment; repeatability of a cut with high aesthetic quality; the possibility of using larger injection points without requiring external gate removal systems; and the elimination of risks for the operator during manual gate removal. Applications with different materials and types of gates are possible, including film and diaphragm injections.

Ermanno Balzi S.r.l. | 39-030-2120868 | ermannobalzi.com

Slide Lock-Style Slide Retainers Prevent Wear

Progressive Components announces the expansion of its line of SRT slide retainers with the slide lock-style slide retainer. Slide retainers ensure proper movement of molds as well as prevent any interference with the ejection of the molded part.

Compatible with previous standards, the slide lock-style slide retainer's roller design will not wear the bottom of slides, providing greaseless performance in medical and cosmetic applications.



Holding 25 to 50 lbs each and featuring color-coded springs to indicate force rating, Progressive's slide lock-style slide retainers are offered in three sizes:

- SRTLK-25A with a green spring to hold 25 lbs.
- SRTLK-25B with a longer, blue spring to hold 25 lbs.
- SRTLK-50A with a red spring to hold 50 lbs.

Use optional cleats for retention on the slide or machine the V-groove for roller retention at the bottom of the slide.

Progressive Components | 800-269-6653 procomps.com

Reliable, Efficient 3D Printer for High-Quality Tool Steel Components

Trumpf Inc.'s TruPrint 2000, now featuring a larger, square build plate, is designed for reliable 3D printing of tool steels like maraging steel, crucial in tool and die manufacturing. It also comes with basic spot configuration with 80 µm.

The updated model is optimized for mass production, ensuring high productivity with features like automatic multilaser alignment (AMA), automatic corrective recoating and powder bed monitoring for high quality. A square build plate – with a build volume of 200 × 200 mm and a height of 200 mm – enables high quality even in the corners of the build plate, all without disturbing any screws. An optional 500-w integrated fiber laser and 80 µm beam diameter makes the TruPrint 2000 highly efficient when it comes to manufacturing high-quality components from various metal materials, meeting stringent quality standards for tool and die, moldmaking and other industries.

Trumpf Inc. | 860-255-6000 | trumpf.com

Cube Mold Technology Advancing Injection Molding

Cube Mold technology enhances the production of plastic products by offering technical and economic benefits. This injection mold features a central rotating cube that can split and counter-rotate, with additional gear elements on the exterior. Developed by Rainer Armbruster of **Foboha**, part of Barnes Molding Solutions, the Cube Mold has evolved since its creation in the mid-1990s.

Cube Molds double the number of cavities compared to traditional two-component turntable molds, with minimal increase in footprint. This design increases production and reduces cycle time by up to 40%, particularly when integrated with a removal handling system. Unlike conventional molds, which require handling systems to move between mold halves, Cube Molds enable removal on the outside.

For smaller-volume productions, the Compactcube system enables flexible machine configurations with minimal modifications. Designed for clamping forces between 1,000 to 3,000 kN, the Compactcube can either double the number of cavities or enable the use of smaller machines, reducing space requirements by about 25%. This is useful in cleanroom environments for medical manufacturing.

The Reversecube offers thermal separation for processing materials with different temperature requirements, enabling the assembly of complex components within the mold. The CITI (Cube with Integrated Turning Inserts) variant includes additional rotating elements on the cube's exterior, enabling the production of 3K parts. This technology has been applied in the beverage industry to produce multi-material components in a compact and efficient manner.

As Cube Mold technology approaches 30 years, its design continues supporting ongoing injection molding developments.

Foboha (US) | 770-362-7973 | foboha.com

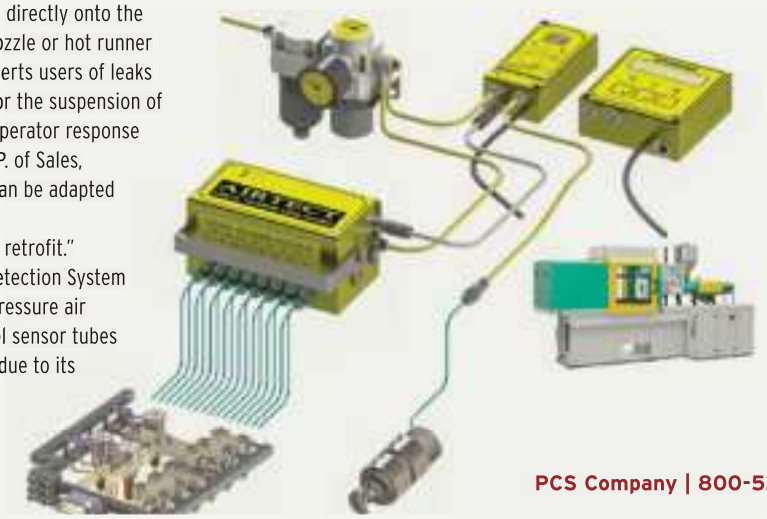
Plastic Leak Protection System Protects Injection Molding Machine Nozzles

PCS Company introduces its Airtect Plastic Leak Detection system to provide round-the-clock, direct protection of injection molding machine nozzles and manifold systems, reducing unwanted downtime and costly repairs.

"The Airtect Plastic Leak Detection System is a tool that can be installed directly onto the injection molding machine nozzle or hot runner manifold system. It quickly alerts users of leaks in the form of an alarm and/or the suspension of production, enabling faster operator response and repair," says Company V.P. of Sales, Derrick Jones. "The system can be adapted to any hot runner system, either new or retrofit."

The Airtect Plastic Leak Detection System passes tiny volumes of low-pressure air through robust stainless steel sensor tubes to quickly detect most leaks due to its "self-teaching"algorithm.

The starter kit comes with a small controller, an air regulator, silicone tubing, stainless steel tubing and PU tubing. Users can build onto the starter kit with additional accessories that make it possible to perform full hot runner manifold leak detection.



Airtect Plastic Leak Detection Systems are available in several configurations depending on the number of zones being monitored. Options include:

- Single and dual IMM injection nozzle leak monitors
- Fixed standard and standalone leak alarm manifolds in 4- and 8-zones.
- Modular leak alarm manifolds which allow multiple molds to work with the LA500 or LM2050 controllers. Available in 4-, 8-, 16- or 24-zone systems.
- Modular standalone leak alarm manifolds for 4-, 8-, 16- or 24-zone leak detection capability.

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

TIP

MOLD COMPONENTS

Streamlining Mold Assembly With Pre-Cut Pins

Mold builders can greatly improve process efficiency and reliability with pre-cut ejector and core pins. Source | Hasco America Inc.

By Brenda Clark

Remember the classic game of pick-up sticks? Now, imagine your workbench covered in a jumble of ejectors and core pins of various diameters and lengths. It's a familiar sight for many moldmakers, but one that's ripe for improvement.

In today's competitive market, moldmakers are under increasing pressure to reduce build times and costs. One effective strategy is to focus on high-precision cavity and core machining while sourcing pre-cut pins and other standardized components from reliable suppliers.

4 Pre-Cut Pin Benefits

1. **Time Savings:** Eliminate the need for in-house cutting and measuring.
2. **Resource Optimization:** Free up skilled staff for more complex tasks.
3. **Inventory Management:** Reduce stock of full-length pins.
4. **Quality Assurance:** Benefit from supplier's specialized cutting equipment.

Supplier Selection Guide

1. **Comprehensive Inventory:** A wide range of diameters, materials and styles in stock.
2. **Precision Cutting Services:** Ability to cut to exact specifications.
3. **Multiple Tolerance Options:** Flexibility to meet various mold classifications.
4. **User-Friendly Ordering:** Clear, detailed online catalogs or ordering systems.

Tolerance Options

A quality supplier should offer multiple tolerance ranges to suit different mold building requirements:

- Standard: +2/0 mm (+0.078"/0)
- Precision: +0.01/-0.01 mm (+0.0004"/-0.0004")
- Extra Close: 0/+0.02 mm (0/+0.0008")
- Close: 0/+0.1 mm (0/+0.004")

These options enable moldmakers to select the appropriate tolerance for their specific application, considering factors like mold classification and molding materials.

Delivery and Efficiency

While there may be a nominal fee for cutting services, it's typically far less than the hourly rate of even entry-level employees. The time saved and increased efficiency more than justify the investment.

> Optimize your mold assembly process with pre-cut pins and focus your expertise where it matters most, rather than having your process resemble a game of pick-up sticks.

Suppliers can often deliver pre-cut pins faster than moldmakers can process them in-house. By stocking longer pins and cutting to order, suppliers can offer quick turnaround times, usually within a week for standard orders.

Using pre-cut ejector and core pins in your moldmaking process can greatly improve efficiency and reliability. Partnering with a trusted supplier will help you streamline your workflow, reduce assembly time, and ultimately deliver high-quality molds faster and more cost-effectively.

As the moldmaking industry evolves, embracing these customized yet "off-the-shelf" solutions will be crucial for staying competitive. Optimize your mold assembly process with pre-cut pins and focus your expertise where it matters most, rather than having your process resemble a game of pick-up sticks. MMT

FOR MORE INFORMATION

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877-427-2662 / 828-650-2600
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Brenda Clark, Engineering Manager

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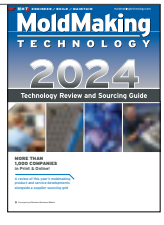

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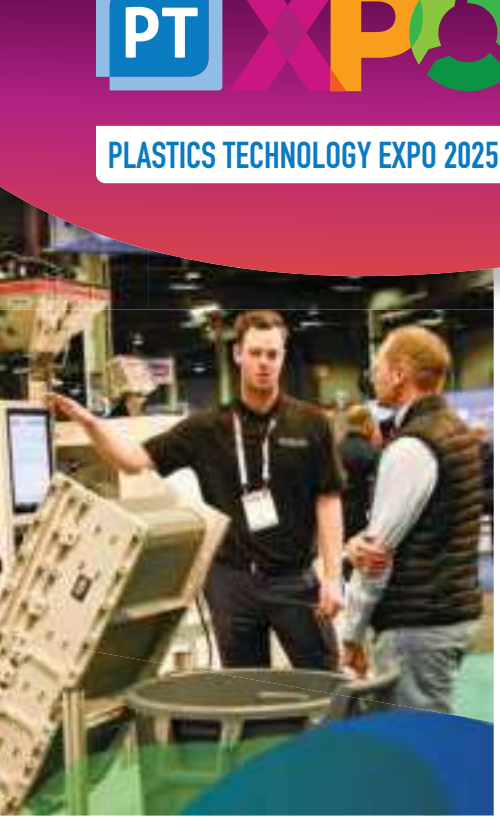

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