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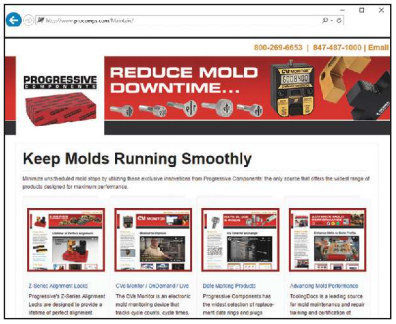

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MoldMaking Technology (ISSN 1098-3198) is published monthly and copyright © 2018 by Gardner Business Media Inc. 6915 Valley Ave., Cincinnati, OH 45244-3029. Telephone: (513) 527-8800. Printed in U.S.A. Periodicals postage paid at Cincinnati, OH and additional mailing offices. All rights reserved.

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

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

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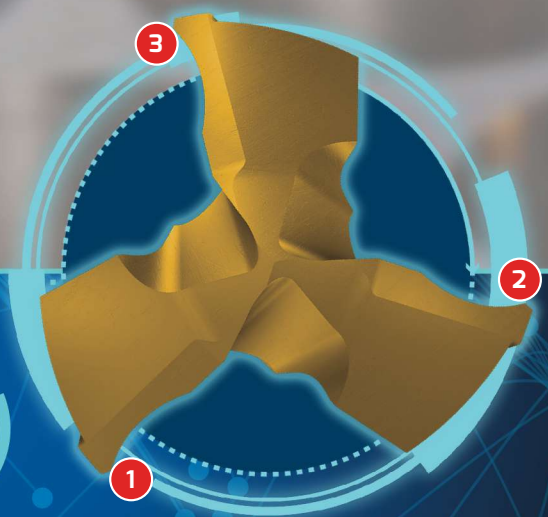

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December 2018 Volume 21 / Number 12

Features

Departments

ON THE COVER

Image courtesy of ALBA Enterprises. This month's cover highlights an ALBA coupler, which can eliminate all threading and un-threading of knock out bars, dramatically reducing the complexity of any mold change. These 100-percent mechanically operated couplers save time, money, and effort, while providing durability and millions of maintenance-free cycles. See related feature on page 28.

Images courtesy of (left to right) Mitutoyo, Mold Trax and Seco Tools.

VIDEO ACCESS

5 TRICKS OF THE TRADE
Great Tips from This Issue

1. Measurement Matters
Moldmakers should use data collection and real-time SPC software to collect measurement data and then relay it back to the CAD/CAM software to refine part programs.
PG. 14.

2. Polishing Pointers
Do not focus on individual polishing steps; instead, focus on the actual finish because the finish provided to the polisher by the machine determines the starting point for the polisher.
PG. 18.

3. Budgeting Business
Set a profit goal for your budget. Then establish revenue targets using sales forecasts and information from the current month's pricing column.
PG. 23.

4. Know Who's in the Room
Identify the knowledge level of your audience before launching an open house event to set appropriate talking points that will engage and excite your audience, instead of confusing and boring them.
PG. 25.

5. The Hard Facts
High-precision holders are crucial when hard milling to achieve maximum tool life. Run-out must be limited to less than 0.0004-inch to maximize tool life.
PG. 46.

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Looking Back to Move Forward

Everyone talks about data. Well, we here at *MoldMaking Technology* discuss analytics a lot when it comes to content, especially because we are producing and sharing content in more places than ever. And, not only do we want to know if all that work is worth it and if our content is reaching you, we want to be able to look back and see what worked, what did not, what is hot and what is not to help us move forward with producing helpful, insightful quality content in 2019.

So, we did just that. We took a look back and here are the top 25 articles published in *MoldMaking Technology* during the past 12 months:

- "Software Technology Is More Versatile, Efficient and Simplified." Software suppliers are working diligently to provide moldmakers with relevant but easy-to-use solutions that speed processes and lower costs.
- "Machine Hammer Peening Automates Mold Polishing." A polishing automation solution eliminates handwork, accelerates milling operations and controls surface geometries.
- "A Can-Do Focus and Family Values Keep Master Tool and Mold On its Game." How a small shop can work "big" by having a team that's multi-skilled and equipped with the right equipment and a can-do attitude.
- "Performance and Price Drive Developments in Mold Materials." Mold material suppliers are working to develop new, improved mold-material grades.
- "Democratizing 3D Printing of Injection Molds." Full-service design and mold delivery, moldmaking materials, and a low-cost, high-precision printer minimize the technical risk of 3D-printed mold tryout.
- "Why You Need a Tool Presetter." Reduce machine idle time with fast, accurate, repeatable, offline cutting tool measurements.
- "Milling and EDM Automation Reshape Summit Tooling's Mold Operations." Summit Tooling President Dan Martin credits the capability to run unattended machining 24/7 to the partnership that his company built with Makino.
- "Canadian Moldmaker Looks to German Shop for Best Practices in Job Scheduling." Taking a peek behind the scenes of a German mold shop inspired a Canada-based mold shop president and CEO to look at job scheduling a whole new way.
- "Hot Runner Technologies Aim to Simplify Moldmakers' Approaches." Hot runner suppliers are developing solutions that remove complexities from the way that moldmakers and molders design, control and maintain their processes.
- "Automation and AM Help W. Fassnacht Werkzeug- und Formenbau" Germany's 2017 Toolmaker of the Year does things small but in a smart way.

For the rest of the top 25 most-viewed articles, visit http://short.moldmakingtechnology.com/top252018. MMT

Christina Fuges

Christina M. Fuges
Editorial Director

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THIS MONTH ON moldmakingtechnology.com

VIDEO: IMTSTV and MMT

Check out the interview with *MMT* Editorial Director Christina Fuges and AMT's Director, International Events & Sponsorship Bill Herman on IMTSTV at IMTS 2018.
short.moldmakingtechnology.com/imts18

BLOG: Wayne Hertlein: Dedication to Industry Honored by SPE Detroit

Wayne Hertlein was honored September 10 as Outstanding Member by thWayne Hertlein was honored September 10 as Outstanding Member by the Detroit Section of the Society of Plastics Engineers (SPE). Wayne has been an active SPE member since 1981. Here, he accepts the Outstanding Member award from newly-elected Detroit Section President Eve Vitale of Series One LLC (Ortonville, Michigan).
short.moldmakingtechnology.com/spewayneh

EVENTS: Amerimold 2019

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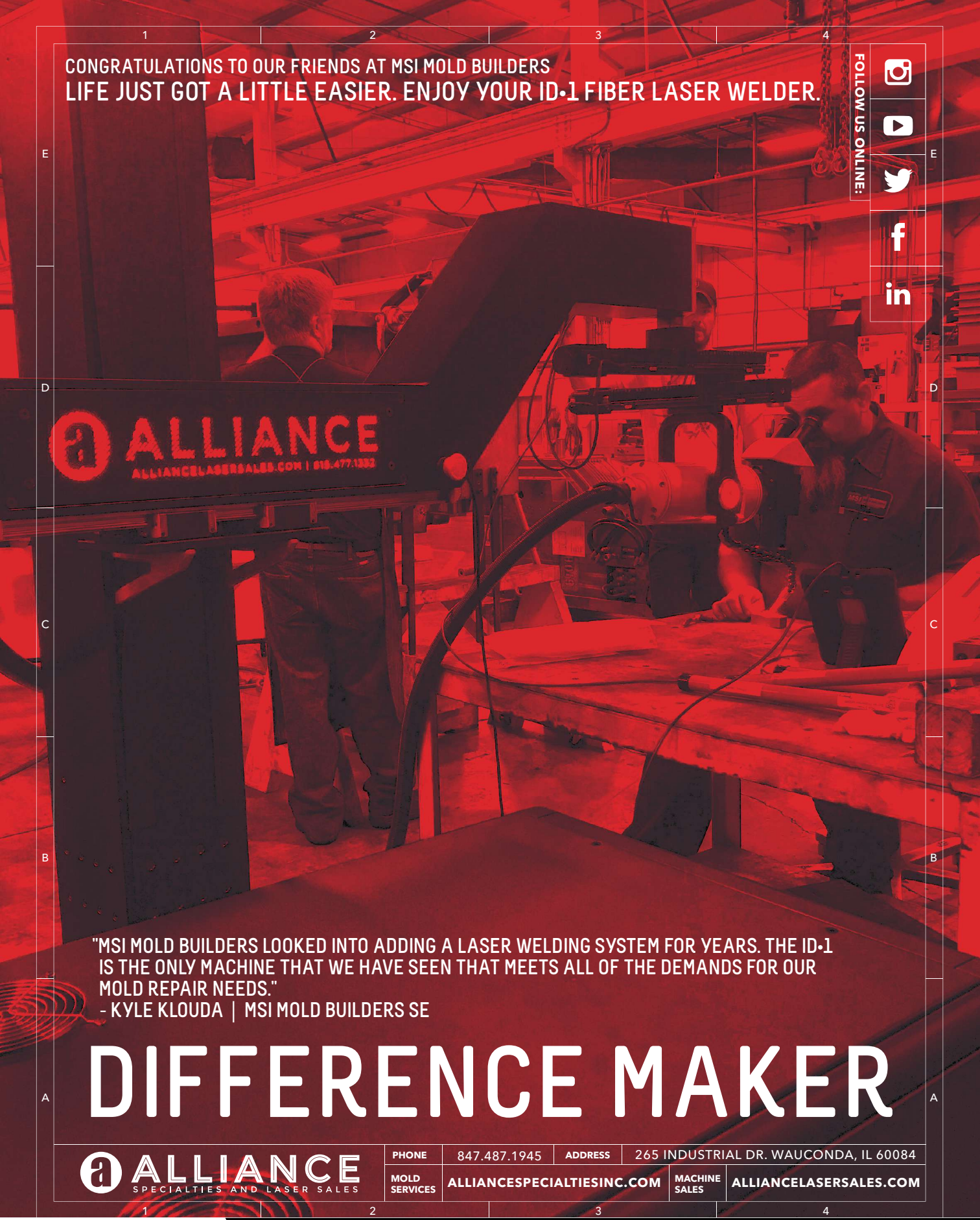
NEWS: AMBA Chicago Gets the Word Out at Student Summit

Eight schools were granted a $250 travel grant to help offset the cost of attending SmartForce Student Summit.
short.moldmakingtechnology.com/ambachi250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Mold Design Checklist

Gerardo Miranda (Jerry)
Global Tooling Manager
Oakley
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A mold design can be like a soup. The designer has ensured that the movements that the part geometry requires are designed (the meat), the gates are properly placed to fill the part (the vegetables) and that the mold fits in the press (the broth). But, has the designer checked that the cavity and core blocks have the proper number of screw holes to retain them in the base, or whether there are any? Having a proper mold-design review and checklist can and will save time to market by ensuring that the designer has even accounted for the small potatoes, or the design details. Oakley has developed an extensive mold-design checklist. Here are some top items. Mold designers check that:

- The mold fits in the desired press. (The designer checks water lines, hot sprues or heater rods and wires, injection locations and mold height minimum and maximum to clear all press tie or safety bars.)
- The gate sizes and locations are correct. (They should be 50 to 80 percent of the part thickness at the gate location.)
- The runners are properly sized. (Working from the part, the runner adjacent to the part should be no smaller than the maximum part-wall thickness and each branch should be sized up by multiplying 1.259 to the previous branch.)
- Venting has been addressed. (The designer starts with a ring vent on the Z puller, which is the first cold slug and initial point to remove unwanted out-gassing. It is self-cleaning with every ejection cycle with a natural dynamic vent.)
- Cooling lines, heater rods and oil lines are adequate and appropriate for the plastic material.
- The part remains on the proper side of the mold for ejection. (The designer reviews the part draft and slide delays to help.)
- Mold components are poka-yoked (mistake-proofed), or they are keyed for proper assembly and timing (or both).
- The leader pins are taller than any other mold components above the parting line to keep the insert interface safe from misalignment.
- Parting-line side or taper locks are in place to protect shut offs (if necessary), or inserts or blocks are designed with interlocking features to protect delicate interlocking features.
- The mold components are made from proper materials to accommodate plastic part requirements, and the component Rockwell hardness ratings differ by more than two points to ensure that interfacing components do not gall.
- The slides are held effectively in the open position. (The designer checks whether a heal lock can be used as a kick-back feature to place the slide back into the open position if it is moved or whether springs are required.)
- The slide or the lifter travel (or both) is enough to clear when the part is ejected. MMT

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Photo courtesy of Creative Technology Corp.

"AMBA's conferences facilitate meaningful connections with key industry leaders," said Carol Ebel, president, Janler Corp., Chicago, IL. "These networking opportunities allow the kind of one-on-one or group discussions with peers that provide tangible solutions and takeaways."

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A Conversation with ...

Franchino Mold and Engineering

Images courtesy of Franchino Mold and Engineering.

Franchino Mold and Engineering starts apprentices in the moldmaking department where they can work with the end product either on mold and die assembly or repairs and learn the terminology, familiarize themselves with mold and die components and their functions and more. Here, from left, Moldmaking Apprentice Travis Dryer, Journeyman Die Welder Derek Wirth and Moldmaking Apprentice Cam Evans work together on a repair job.

How does Franchino Mold and Engineering (Franchino Mold) find and attract the next generation of moldmaking professionals?

Brad Rusthoven, human resources manager: We have partnered with public schools and Michigan's vocational education program since 1962 to hire and provide training for qualified employees. When I was hired in 2010, the apprentice program had lapsed because of the slow economy, so that was one of my first directives—to get it going again. First, we re-registered our moldmaker and CNC machining apprenticeship programs with the U.S. Department of Labor. Then we went back to using the curriculum we previously followed with Lansing Community College (LCC).

To attract new employees, we first tried hiring people "off the street," meaning that we tried to find candidates who, without any background or foundational skills in manufacturing, at least had good attitudes, good work ethic and a willingness to show up on time and to learn the trade from our seasoned employees. That did not work as well as we had hoped, so we changed tactics. We contacted the four career centers located in the Lansing Metropolitan area because most high schools no longer offered shop classes. I connected with the people involved with the machining and engineering programs at those career centers and started to build relationships. I now serve on their advisory committees to help them develop their curricula. We host many tours with these career centers, and we attend their open houses and student showcases where participants or students in as early as eighth grade can walk through and see if anything appeals to them. The best part of these events is that usually the parents are with them, so we can speak with both about career opportunities in moldmaking. I am heavily involved with mock interviews and resume reviews at the career centers, too. As a result, we have a steady pipeline of candidates every year who are invited to come to Franchino Mold, test the waters and see if it is a fit for them.

I still sell potential candidates on the fact that Franchino Mold represents the true, skilled trades. I tell them that moldmaking is more unique than production machining. Everything is custom. They would be more than button-pushers because they would actually use their heads to program tool paths and set up jobs. We are looking for the right attitude and work ethic, good attendance and trainability, of course, but also good problem-solvers. We want apprentices to grow with us personally and professionally.

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- Was founded in 1955 by Richard Franchino. Richard's son Robert is now owner and president.
- Designs, engineers and manufactures medium- to large-sized die-cast dies and plastic injection molds for automotive to construction and consumer products.
- Employs 90, with 25 under the age of 30 and an overall average age of 44.
- Was named Employer of the Year in 2012 by Capital Area Michigan Works and Lansing Community College for its dedication to workforce development.
- Was selected in 2015 as the site for Michigan Governor Rick Snyder's press conference about the importance of skilled trades.

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Journeyman CNC Machinist Chris Cook is a rising star at Franchino Mold and one of *MoldMaking Technology*'s featured 30 Under 30 moldmaking industry professionals for 2018. Franchino Mold's close partnerships with four Lansing, Michigan-area career centers, combined with using private training specific to moldmaking, has made it possible for the company to recruit many qualified apprentices who help perpetuate the business.

Once Franchino Mold recruits qualified apprentices, how does the company ensure that they learn required skills?

Rusthoven: A couple of years after we reestablished our apprenticeship programs, we found a private training institution on the west side of Michigan, Praeco Skills, that offered both moldmaking and CNC machining courses that an individual with a background in the tool and die industry developed. We switched to this program because these courses were very detailed and specific to this industry and were offered in multiple ways, including online, through live webinars and in on-site classes. In addition, there is a shopfloor course component where the apprentices can kill two birds with one stone—they can fulfill some of the curriculum requirements and the work hours while working on the shop floor.

The first-year apprenticeship classes are the same for everyone while they learn the fundamentals. We prefer to start them in the moldmaking department so that they see the end product versus working on machining specific details of components and wondering what their purpose is. They work with our journeymen moldmakers on mold repair, for example, and they get to disassemble molds and learn about all the components and their functions, the terminology and more. On a new mold, they learn to assemble all of those components. After about six months, it is not unusual to have at least one apprentice tell us he or she likes doing that work, and we will put them on the moldmaker career path, which will help them hone those skills. Others may say that they prefer the precision machining side, and we will send them down that career path. Our apprenticeship committee includes the moldmaking supervisor, the machining supervisor, the plant manager, the vice president of operations and

me. We communicate very closely regarding any changes to the curriculum and related topics. We also use skill check sheets, one for each of the four years of the program, to track the apprentices' progress on the aforementioned shopfloor courses. On each sheet, there is a list of skills and responsibilities that must be learned, and when the time is right, the apprentice, together with the journeyman moldmaker, signs off on each skill, indicating that the apprentice has acquired it sufficiently.

We still find a great deal of value in our connection with Lansing Community College, however. Several of our apprentices are taking courses at LCC and earning an associate degree in manufacturing engineering technology design or machining while they are earning their journeyman cards. This is covered under the company's Educational Benefit Program and paid for as long as the students complete the courses and meet the minimum grade requirements for each class.

Regarding benefits, once an apprentice has achieved 90 days of employment he or she begins receiving the same full-time benefits that any employee would get, including medical insurance and a 401(k) plan. Our employee purchase program also kicks in at this time. Our employees call it the Tool Bill because it was historically used as an interest-free way for employees to purchase necessary tools for their jobs. We would pay for the tools and deduct a percentage of the cost out of their weekly paychecks. We have expanded that program to include other purchases, like laptop computers that they use for the online and live webinar components of the apprenticeship program.

When I was hired eight years ago, Franchino Mold only had around 40 employees. We have since more than doubled that number, plus we have 18 apprentices—to give a better perspective on recent growth. Seven of the apprentices are on the moldmaker path, and 11 are on the CNC precision machinist path.

Talk about Franchino Mold's two rising stars who appeared in *MoldMaking Technology's* first 30 Under 30 Feature.

Rusthoven: Chris Cook is the son of our plant manager, Al Cook. Chris came on board in 2014 and got right into the apprenticeship program. He has progressed quickly from a skills standpoint. A couple of years ago, Franchino Mold purchased an OMV Formula CNC Machine that's a true, five-axis mill with three heads so we can do roughing and finishing work. Chris was the one who stepped up and learned to run it, plus he was helping to run other work centers. Now Chris is training someone else to run the machine while he is the team leader of the boring mill work center. It's because of his own work ethic and leadership skills that he's been able to move up so quickly.

Brandon Schafer joined Franchino Mold in 2012 and hit the ground running. He was in the middle of earning his associate degree at LCC for design, and we helped him finish his degree through our education benefit. He has progressed very, *very* quickly with all the design work that he is doing, but he also has turned into the "IT guy" in the design and engineering department. He has shown that he has leadership qualities and a good work ethic as well. That is what we are seeking. MMT

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By Jeremy P. Banks

MAXIMIZING INTELLIGENT MANUFACTURING

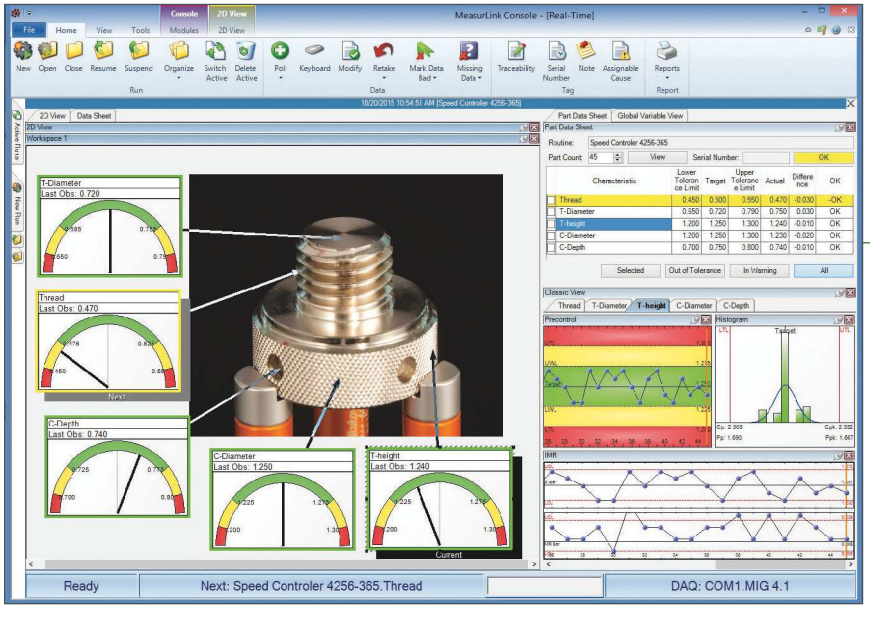
Collecting and using measurement data ensures that mold components can meet customer specifications and reduces scrap and rework.

Shops continue to adopt intelligent manufacturing principles that require connection and communication of data across all machine-tool, sensor and human resources. This data creates a virtual model that tests scenarios to improve uptime and throughput and to predict and better manage production capacity and estimated delivery times. The user also can plan and check continuous improvement activities against this model, which results in more efficient and profitable shops without costly trial and error. The more data that is collected, the more robust the virtual model.

Many moldmakers are already investing in intelligent manufacturing because the promise of improved product accuracy with less re-work and scrap is hard to ignore. Plus, better use of resources results in more on-time delivery and fewer overtime costs.

As shops continue to invest in the infrastructure to support this initiative, they usually focus on process data, such as machine uptime, tool life, cycle time and machine utilization. This information is extremely important to collect, but often other vital information is overlooked. For example, the length of time it takes to machine a mold component is important, but does that mold component meet the customer's specifications?

To put it another way—making more parts faster and cheaper is great, but it does not matter if the parts are out of print. Collecting and using measurement data is just as important as process data. Not only does this ensure that



Data collection and real-time statistical process control (SPC) software makes it possible for manufacturers to collect and manage measurement data to increase the accuracy of their products while reducing rework and scrap. As shops are moving to collect process data from machine tools and manufacturing operations, SPC programs ensure that the vital measurement data is not left behind. From dimensional data that calipers collect and coordinate measuring machines to surface-finish data that profilometers collect, real-time software can guide operators through inspections while reacting to trends and data shifts in real-time.

Images courtesy of Mitutoyo.

As manufacturers move to collect process data, they need to ensure that they do not overlook measurement data. The collection and analysis of measurement data can yield tangible improvements to any process.

mold components meet the customer's needs, it makes it possible for companies to reduce scrap and rework.

Intelligent Moldmaking

Data collection and real-time statistical process control (SPC) software collect data from most gauges regardless of sophistication or brand. The software then communicates the data to the same infrastructure as the rest of a shop's connected devices. Here are a few examples of ways that moldmakers can use this tool to maximize intelligent manufacturing.

Moldmakers use several techniques to produce their products, such as CNC machining, additive machining, EDM and wire cutting. Many mold components also require surface treatments and polishing. A great variety of metrology equipment is used to measure these components. However, too many shops do not use this data beyond verifying part conformance.

Moldmakers should use data collection and real-time SPC software to collect measurement data and then relay it back to the CAD/CAM software to refine part programs, which ultimately yields **more accurate parts**. Many moldmakers are using software to increase CNC programming accuracy and throughput, but there are a large number of variables to take into account when machining complex molds. Many of these programmers are finding that the finished mold does not always match the model.

Some operators use in-machine probing to measure and compensate for this inaccuracy, but not all machine tools are fitted with this type of technology. Real-time SPC software can collect data from many sources, including coordinate measuring machines, non-contact and vision metrology and traditional hand tools like calipers and micrometers. This flexibility eliminates the need for new equipment investment as it enables users to begin this type of activity using existing gauges. All of this data can then be compared to the mold's specifications and sent back to the CAD/CAM software to compensate the program.

Measuring mold components before and after polishing can tell machinists how much material to leave for surface treatment. Polishing is required to meet stringent surface finish specifications, making it a very important part of the moldmaking process. However, multiple operators typically perform this process by hand, and each polisher may remove different amounts of material as they perform their work, despite having proper training and employing standardized techniques.

This can result in molds producing subtly different parts and inconsistencies that do not meet a customer's requirements. The solution is measuring samples before and after each step of the polishing process to determine the amount of material that the polishing removed. Real-time SPC software collects and filters this data by the individual worker, which makes it possible for machinists to compensate for the

Additive manufacturing is just one of the many techniques that moldmakers use. CAD/CAM software can use measurement data to refine this process to increase accuracy and reduce scrap.

exact amount of extra material that an individual polisher removes as they perform their work. This yields more consistent molds and less rework.

Having all of this data in one platform also facilitates **simpler integration with ERP software**. As moldmakers collect more measurement data from a greater variety of sources, data management becomes tedious. Many shops integrate this data into their ERP systems expecting this consolidation to reduce their workload. However, a typical manufacturer has many metrology equipment brands at various levels of sophistication and age, each with its own communication method, ranging from a simple USB output and RS232 serial communication to PC-driven gauges that save data as files. This variety can be time consuming and expensive to integrate into a system that is not designed to collect metrology data.

Real-time SPC software is designed to perform this task. With real-time SPC software, any device with output can collect measurement data. Operators can even use non-digital gauges with data entered via a keyboard. The ERP software can then harvest the entirety of this data from one source, the SPC software's structured query language (SQL) database. This requires only a single integration, saving ERP costs and reducing the effort required to consolidate the data.

This next revolution in industrial technology requires tools like real-time SPC software to help moldmakers achieve intelligent manufacturing. MMT

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By Christina M. Fuges

Rethinking How to Polish

Internal process documentation helps polishers build upon experience and overcome surface finish challenges.

The accuracy, speed and surface finish advantages of high-speed machining and EDM can complicate polishing, requiring polishers to rethink how they polish.

Every shop wants to increase productivity, and polishing is often the bottleneck. Although companies understand the value of polishing, many are not willing to deal with polishing because they do not know how to do it properly.

Polishing longer is not always the answer. Steve Smith, Gesswein & Co. polishing coach, says that the answer is more polishers. His experience has taught him that there should be one polisher for every ten people cutting steel. "So, if you have a 100-man shop cutting steel and programming, then you need ten polishers to keep up. Most shops would have three," Smith says. He also stands by a 10-hour work day. Smith believes that nine hours is optimal, as a polisher's fingers can only take so much of the vibration and abrasiveness associated with polishing.

Machining Effect

Despite the lack of skilled labor, today's shops seem to have enough polishers, but they have a weakness in their machining. They are feeding polishers work that takes them too long, which yields parts that do not comply with the print because the polishers removed too much material. "Polishers must meet tolerances on molding areas, or they must scrap the part, but the amount of material a polisher removes depends on what the machinist puts in," Smith says. The quality of the part that the machinist gives to the polisher determines the amount of time that the polisher spends polishing that part. The longer the polisher polishes, the more likely it is that the polisher changes the shape of the part.

The secret to improving polishing efficiency and part quality is improving the front end, or what is coming into the polishing department. For example, high-speed machining and EDM have advantages in accuracy, speed and surface finish, but these benefits can complicate polishing, requiring polishers to rethink how they polish.

A common polishing challenge is removing the EDM recast layer and the hard layer that high-speed machining creates. Even though high-speed machining produces a surface that is shiny and very fine, there is a layer of really hard steel that reveals the pattern of the cutter when it is polished. If the polisher does not remove the pattern completely, the pattern will still be visible. According to Smith, the key to fixing this is "getting below that layer."

The very fine surface that high-speed machining produces also entices polishers to start off with a 600- or 900-grit

stone. However, polishers realize quickly that they must remove that hard layer first, which means that the soft, finer stones will not work. It is better to begin with a 400-grit stone. Basically, this hard layer requires an abrasive stone, but as polishers remove the hard layer, they start to scratch the softer steel, ripping and tearing the steel as they get through the hard layer. So, although high-speed machining benefits the machinist with cutting, that process does not help the polisher.

For EDM, the hard spot particles can sometimes flip out as the polisher works on the surface, leaving a big pit. Other times, operators finish grinding an area and then use EDM over the grind area until it sparks out to match. Those EDM pits are then below the grind surface. "It's counterproductive," Smith says.

Another example is when machinists do not provide enough overlap with the finisher to remove all of the roughing burn. This requires the polisher to remove deep pits and the recast layer below if the goal is a good polish.

Today, polishers need to learn how to work with these surfaces differently. Experience and having the ability to gauge how much material the polishing removes are essential. The answer is training and practice. If a polisher only polishes something once a month as a minor part of the job, the polisher is never going to become proficient at polishing.

Learning Culture

Another aspect of polishing proficiency is creating a culture of learning. "You need a culture of learning to figure out different polishing strategies and to troubleshoot the cause of a condition," Smith says.

Polishers need experience and common sense to solve problems and to do things faster and more efficiently. This means learning from mistakes and successes and building that experience into documented strategies.

Smith suggests taking a 3D print of the part, inserting an arrow on the surface and noting what was done to achieve the surface finish. He says not to focus on individual steps. Instead, focus on the actual finish because the finish that the machinist provides to the polisher determines the starting point for the polisher. The process is what the polisher uses to achieve the customer's required surface finish. The customer might specify the tool or the method, but not the process.

"Take, for example, the SPI A1 finish from a felt buff. Ask yourself—How are you using that felt? Are you doing it by hand, on a machine, etc.? If you are using a machine, you need to understand that different speeds will give you different shines. Are you using hard felt or soft felt? All of this is part of your internal strategy for each project," Smith says.

That being said, polishers should not document *their processes* for the customer, Smith says, because it will lock them into a particular process. An example is heat-treating steel. Just one point from 50 to 51 can make a difference in how a polisher works on that job. This does not sound significant, but it is. A hardness range from 48 to 52 is a whole world of difference in polishing to the polisher from one part to another. "So, if you have parts that are 48 and others that are 52, the polisher is going to polish differently," Smith says.

As long as the shop is achieving the customer's desired finish, polishing documentation is for internal purposes only. How the polisher goes about it is the shop's proprietary information.

"For example, we had a syringe mold, and the customer wanted to mold polypropylene, which polishes well with a 600-grit stone or a light-glass bead. But, this gave a frosted part, and the customer wanted to be able to see through the syringe. We had parts sticking in the mold. Our solution was first to draw-stone the part (the direction the part pulled off). We then bead-blasted it and brushed it with diamond compound," Smith says. This polishing process was documented internally to improve his shop's polishing efficiency.

> The secret to improving polishing efficiency and part quality is improving the front end, what's coming into the polishing department.

If shops want to produce a quality part every time, they should establish an environment for learning that includes internal process documentation. In the end, that will help polishers overcome challenges such as the impact of HSM and EDM on polishing. "How you do it is up to you. Just keep practicing," Smith says. MMT

About Steve Smith

In 1964 after high school, Steve Smith started working at Wilkin's Mold Polishing, which was the only mold polishing shop in the western part of the United States that trained polishers. In 1972, the company closed its doors. Smith moved to Samson Mold, a 20-person shop where he worked hand in hand with the EDM and grinding departments, learning the value of good communication. In 1979, he got an offer from Caco Pacific to run its polishing department. Five years ago, Smith retired but accepted a position as a consultant and instructor for Gesswein Co.'s polishing course, which to date has taught 400 students across North America.

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By Barbara Schulz

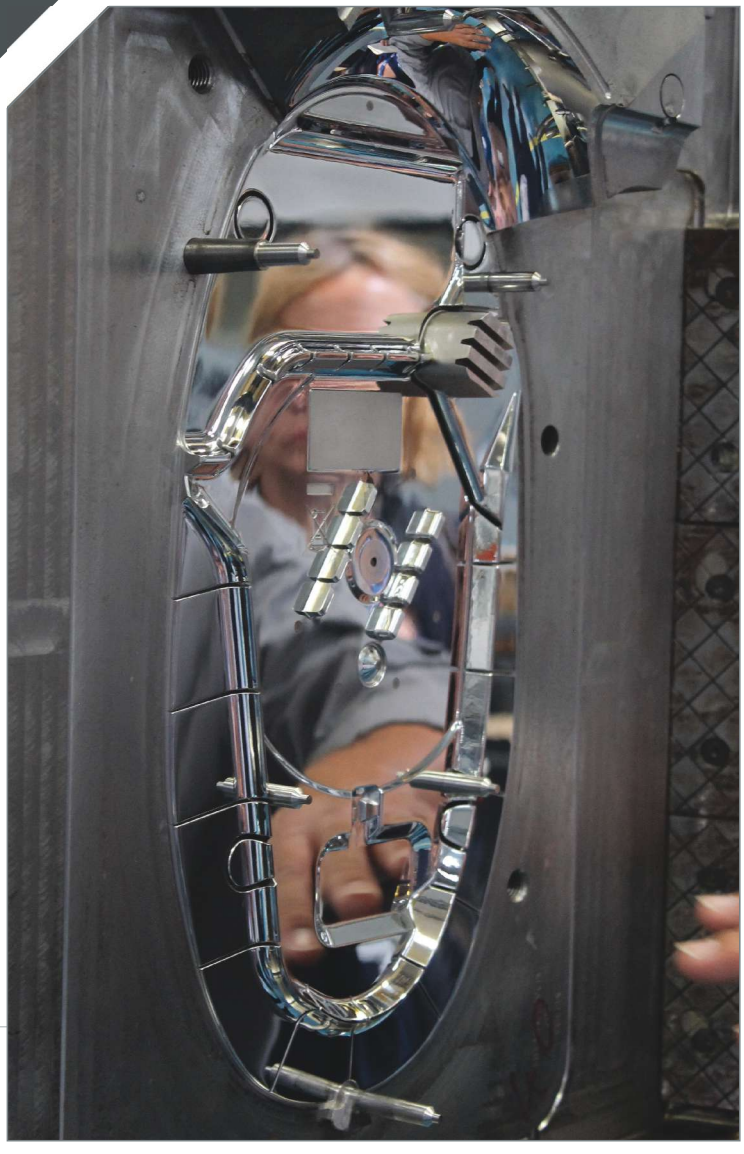
Welcome to the Hub of Moldmaking in Portugal

Portugal today boasts some of the most advanced and innovative moldmaking businesses that have nearly doubled their export and production rate over the past ten years. Here is a look at this country's recipe for success.

With a centuries-old glass-making tradition that crossed naturally over into creating molds for plastics parts in the 1940s, Portugal today is a hotbed of moldmaking and exporting, and molds from Portugal can be found in almost every major end market for plastics.

Portugal's moldmaking hot spots, Marinha Grande and Oliveira de Azeméis, are located just 130 and 270 kilometers north of Lisbon, respectively. The regions combine more than 500 tool and moldmaking companies, many of them in walking distance from one another. The industry in these two regions employs a good 10,500 people, bringing the local unemployment rate down to less than four percent, according to Rui Feteira, commercial manager at a technical plastics company in Marinha Grande.

"Highly skilled people are difficult to find, so like many companies in the region, we invest in automation," the commercial manager says. The company produces injection-molded parts to many Tier-1 suppliers to the automotive industry, which makes up 95 percent of the business. All of the molds that the company needs annually are made by local moldmakers. Five of them are in



Many companies in Portugal are investing increasingly in five-axis machining centers and automation to produce high-end molds for customers in the automotive, packaging, home appliances and medical industries.

Images courtesy of Barbara Schulz.

João Faustino, president of Cefamol, says that prices for molds and tools decreased in 2018, and companies like his own in Marinha Grande, which earn 80 percent of their turnover from the automotive industry, have to adjust and develop strategies to optimize production. He has recently invested in eight new machining centers to be delivered next year, all five-axis with pallet systems and some with two tables to optimize set-ups and increase the degree of automation. "The goal is to be able to run the machines 24/7 unattended," Faustino says.

walking distance, producing high-quality molds in increasingly paperless production environments using the latest five-axis machines with pallet changers and other automation equipment.

Investments in R&D, Automation

Most companies in this region report that they have invested in or have plans to invest in new five-axis machines, software, paperless production, lean management and automation equipment. Some companies also have invested heavily in new, modern buildings and work environments that are sure to attract the best talent in town.

So, what has happened since the GFC, when competition from low-cost countries and the sharp depreciation of the U.S. dollar against the euro combined to wreak havoc on the economy of the small European nation? By 2012, for example, mold exports to North America reached a historic low of just two percent of Portugal's total mold exports. Today, exports to North America have risen to 10 percent, including Mexico, according to Cefamol, the National Association for the Molds Industry.

One reason is government funding through the "Portugal 2020" strategy, which is part of "Europe 2020," a European strategy to foster productivity and employment, among other things. Portugal will receive about 25 billion euros until 2020 to reach the goals defined by the European strategy, such as decreasing the unemployment rate and stimulating the growth of businesses.

The other reasons are new and emerging markets, a strong automotive industry (82 percent of Portugal's molds are for the automotive industry), followed by packaging (8 percent) and the mold industry's own efforts to retool itself.

About ten years ago, the sector's local leaders, in close coordination with the Portuguese Ministry of Economy and Innovation, founded the private, nonprofit Pool-Net Association to manage the Portuguese engineering and tooling cluster. Formally recognized as a legal entity by the Portuguese government in 2009, the cluster's goal is to drive innovation and coordinate firms in the manufacturing supply chain that are engaged in industrial design, engineering and product development, prototyping, tooling, plastic and metal parts production.

Sharp Rise in Product Exports

All this led to Portugal's moldmaking industry being busy with work and realizing a sharp rise in product exports. "We are very proud of this industry, which experienced a growth of 8 percent last year," Portugal's Minister for Economic Affairs, Manuel Caldeira Cabral, says. "Portugal currently exports over 85 percent of production to 86 countries. In 2017, exports reached a value of 675 million euros. Exports and employment have doubled in the last 10 years. Europe is the main export zone, although exports to North America and Mexico are increasing."

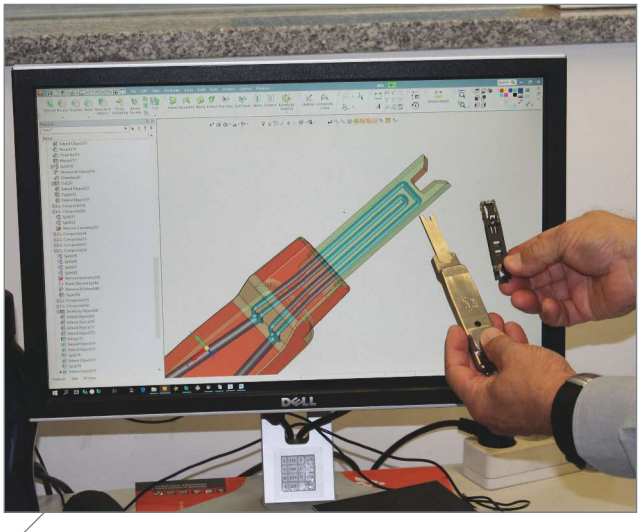
He says, "Our mold exports to the United States are increasing because of a growing demand for molds from various industries. However, in contrast to many other markets such as Mexico, our companies have no local production yet. But, there are very interesting possibilities in the development of relationships with companies in the United States."

The Minister adds that while Portuguese moldmakers are much more integrated into the European supply chain, it is about finding the right way and the right opportunities in

Many moldmakers in Portugal are following the path of digitalization. This company has abandoned paper and uses a software developed in-house which has ensured a digital, paperless manufacturing environment for more than 20 years.

that value chain in other export markets (mainly automotive, which accounts for about 70 percent of production).

But tapping into new markets like Mexico is easier said than done, even though Mexico currently is the seventh largest location in the world for automotive production, and original equipment manufacturers (OEMs) will increase their capacities further to meet growing demand. Many of the Portuguese mold shops are supplying their products to all major OEMs as Tier-1 or Tier-2 suppliers, but since the majority of shops are too small to build up capacities to establish local subsidiaries, some of them have decided to join forces.



Additive manufacturing enables this company to design tools with conformal cooling channels to reduce customers' cycle times.

Key Collaboration

In contrast to many countries' moldmaking industries, collaboration and cooperative manufacturing is common practice in Portugal—which is what five moldmakers (TJ Moldes, Ribermold, Moldit, Mold World and A. Silva Godinho) have done to service their Mexican customers.

"The companies decided to join forces to establish a factory for mold service, repair, maintenance and new molds in Mexico because Mexico is a growing market and local service for mold changes and repair is not sufficient," Cefamol President João Faustino says. Plans are in place to establish a technical center in Mexico similar to Centimfe (Technological Center for the Moldmaking, Special Tooling and Plastic Industries) in Portugal. Moreover, the companies have already been training 14 Mexicans since June 2018 for their new production facility in Mexico.

In Portugal, business is good, Faustino says, but OEM investments are moderate because people are anxious about current changes in the automotive market, like e-mobility, "Dieselgate" and growing competition from China. As a result, prices for molds and tools decreased in 2018, and companies like his own in Marinha Grande, which earn 80 percent of their turnover from the automotive industry, have to adjust and develop strategies to optimize production. Therefore, Faustino has already introduced a paperless factory—similar to many companies in Portugal—lean principles such as 5s and plans to reorganize his production, which currently is divided into several factories according to mold size. In the future, Faustino will organize his factory by type of machining. That is to say, all roughing and finishing operations will be housed under separate roofs.

Additionally, Faustino has invested in eight new machining centers, which will be delivered next year, all five-axis with pallet systems and some with two tables to optimize set-ups and increase the degree of automation. "The goal is to be able to run the machines 24/7 unattended," Faustino says. MMT

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By Charles Daniels

How to Create an Accurate Budget

Proper financial planning is integral to the success of every mold project.

Have you ever received a new project, walked into the shop, set a block on a machine and just started cutting to see what happens? No design, no plans, no programming—just using your experience and intuition? Of course not. What a ridiculous notion! All professional mold builders understand that accurate planning is integral to a project's success.

With this in mind, it is surprising that so many shops operate without a financial plan. As with a mold project, you can only achieve optimal business success through proper planning. A major component of this process is budgeting. Many methods of budgeting and assigning costs are available. Larger companies may require more intricate budgets. This article will focus on the *fundamentals* of basic budgeting and the steps for developing an annual financial plan.

Budget Basics

A budget is an essential tool that helps you communicate goals and spending guidelines. A budget sets the tone for the year and provides the basis for which your shop can measure success. Therefore, it is very important that you dedicate serious effort to this process. Personnel from operations, sales, human resources, purchasing and management should provide input and play a key role in drafting the budget.

Start the process a few months before the next fiscal year. Start by collecting data, such as information on the company's performance history to establish a baseline and information from trade groups, customers and suppliers to predict potential trends. Remember to consider the impact that price increases, customer losses or gains and workforce and capacity changes will have on the operation over the budget period.

Next, set a profit goal. Establish revenue targets using sales forecasts and information from the current month's pricing column. From there, list a detailed account of all expected expenses and subtract them from revenue. Compare the bottom line to the profit goal, and make adjustments as necessary.

The only two ways to increase profit are to raise revenue or decrease costs. Shops should always focus on increasing revenue, as costs can only be reduced to zero, which is not practical. Revenue, on the other hand, can be improved as far as capacity will allow. Several iterations may be necessary, as the objective is to be as accurate as possible with predictions.

Start by collecting data, such as information on the company's performance history to establish a baseline and information from trade groups, customers and suppliers to predict potential trends.

Most businesses do not have revenue and expenses that are evenly distributed throughout the year. To address that, break down the annual budget into periods, such as months. This provides for a much more accurate and useful tool. As I discussed in "Making Sense of Financial Statements," it is vital that you use percentages of income for each line item along with dollar amounts. This will help you identify issues and opportunities throughout the year.

Complete the final document at least one month before the fiscal year

begins. Then schedule a budget meeting to review the entire year and the first period. Moving forward, schedule these meetings immediately before the upcoming period. This provides an opportunity to prepare and review actual year-to-date performance related to the budget.

Budgets on the Move

Budgets should be dynamic. If trends emerge or events occur that contradict previous assumptions, make adjustments to the remainder of the year. This is one area where using percentages is very useful. For example, if raw material expenditures are up for the period, but the percentage of income is in line with expectations because of higher sales, there may not be a reason to worry. If the higher expense is related to an unforeseen price increase, however, make changes to this line item for future periods.

It is important to make changes based only on those things that are outside of the shop's control. Failure to manage income and expenses effectively is not justification for making adjustments. When deficits occur, develop a strategy on how to correct course. Do not allow the budget expectations to deter risk or defer required maintenance.

The process will improve continuously as the team learns lessons from month to month and year to year. Therefore, do not be discouraged by predictions that miss the mark. Be encouraging throughout the process and work hard to ensure that the team views the process positively. Budget meetings do not need to include streamers and cake, but it is necessary to battle the negative connotation that the word "budget" evokes.

Monitoring performance, addressing issues and capitalizing on opportunities are critical parts of successful management. I would say that implementation, analysis and corrective action are equally as important as the act of planning. An apropos quote often attributed to Benjamin Franklin is, "If you fail to plan, you are planning to fail." While budgets alone will not ensure success, mold builders are guaranteed to have a better idea of how their businesses are performing by following these guidelines. MMT

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By Kylee Carbone

Building Manufacturing Awareness

Six best practices for hosting community events that promote industry engagement.

Awareness of manufacturing careers has increased over the past few years, and at Westminster Tool, we believe that community involvement is the key to this positive trend. Most of our success with awareness and recruitment has been a result of hosting community events that encourage engagement across the industry and within our company.

Here are six best practices for hosting a successful community event in your area.

Diversify Your Audience

It is important to note that there are many audiences that need to know about manufacturing careers. Moreover, it is important to realize that it is *not just students*. Your community includes students and school programs, manufacturing peers, teachers, parents and general community members who may be looking for a career change.

While the diversity of these groups may seem overwhelming, the processes and best practices for engaging each of them at an event are very similar to one another. Here are a few ways to engage these groups through a company-hosted event.

- **Community open house.** An open house provides an opportunity to invite everyone in the community to tour your organization, learn about what you do and see how the inside of a manufacturing facility looks. Many people are not aware of what items are made right in their backyard nor the technology that is used to make these items, which often are essential to our day-to-day lives.
- **Tours for local schools and school programs.** Schools are constantly seeking ways to educate students on different career paths and to help them see real-life applications of the concepts that they teach. Inviting students to tour not only contributes to their education and awareness of manufacturing, but also is a great way to interact with the up-and-coming talent pool.
- **Tours for local manufacturers**. Collaboration is a powerful tool that businesses can leverage. Simply by inviting other manufacturers to tour your organization, you can help to share insight into best practices, recent accomplishments and areas in which you excel. For example, if you recently completed a Kaizen that made it possible for you to increase throughput in a previous bottleneck area, invite a company to visit to understand the process so that they can apply a similar technique to their bottleneck. When we help each other improve, we enhance the development of manufacturing within our community.

Image courtesy of Westminster Tool.

Ari Santiago, president of IT Direct and EAMA Industry Partner, hosted a lunch and learn for EAMA members. Santiago identified upcoming technology challenges that were specific to the manufacturing industry and facilitated a discussion that centered around IT best practices. Westminster Tool connected with another EAMA member and gained valuable insight about a phone-system upgrade.

Know Your Audience

It is important to know the audience that you are inviting into your company. Identifying the knowledge level of your audience members will help you set appropriate talking points that will engage and excite them and not confuse or bore them. Be sure to share this information with anyone who is going to be speaking with or presenting to your guests.

For instance, your approach to explaining the EDM process should differ vastly between talking to a group that has never heard of an electrode and talking to a group that is familiar with the idea of manufacturing the inverse of a shape to get the desired geometry. Your speakers are most likely industry experts who consider "spark gap" common vernacular, so they may need a reminder on speaking in more simplistic terms to express their points.

Be Mindful of Timing

Timing is key to produce an engaging event successfully. Be sure to give people plenty of notice regarding the event so that they can make appropriate arrangements with minimal interruption to their schedule. Again, it is important to consider your audience. If you want to have your local school system send a notice home with students, you most likely will need to get approval from the superintendent first. Build extra time into your schedule to accommodate for these approvals the first time you host an event.

Be sure to carefully map out the timing of the event. For starters, ensure that you know how much time you are going to spend for the entire tour, and be sure to lay out the flow and timing. Attendees should have a specific amount of time at each tour station, and the timing should be equal for each stop, enabling groups to move consistently through the shop to prevent a backup from forming.

Be Engaging

Now that you have the community in your doors, it is important to engage them so that you leave a lasting impression. By knowing the members of your audience, you will have a better idea of how to engage them. A key way to do this is to explain not only what your product is, but how those in the audience may interact with the product in their lives. Using props, like a sample of the finished product, is a great way to captivate non-auditory learners.

Another way to make your event engaging is to ask questions and create an environment where attendees are encouraged to ask questions and start a discussion. At Westminster Tool, we typically do this at the start of a tour by saying "No question is stupid!" We also make a point to say that we are there to help them with whatever questions they have.

Collect Data

Collecting information about who attends, including contact details, will help you to plan accordingly. Your approach will change if you have five attendees versus 50. It is also an opportunity to create a database of people who may be interested in future events that you host. At Westminster Tool, we have used resources like MailChimp and Eventbrite to help us host some of our larger events. We also have a database of interested community members to drive participation and spread the word.

Collecting data on what works and what does not work is essential. For example, if showing an end product only seemed to distract a group of students, make a note of it for future events so as not to repeat the mistake.

Provide Impactful Giveaways

Hosting events is a great opportunity for you to promote your organization and manufacturing. Send guests away with brochures that explain how someone can apply for a position, job applications for an interested attendee, flyers for local manufacturing education programs and business cards for anyone interested in shadowing for a future job or who merely has more questions.

When hosting an event for your peers, connect them with the most appropriate person within your team to help them tackle the challenge they are facing or hand out a flyer regarding other ways to get involved with a community manufacturing group. The key is not to let the enthusiasm you created end once they step out the door. MMT

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A Simple Solution to **Quick Mold Change**

Images courtesy of Busse Hospital Disposables.

This is an ejector bar with a threaded rod. One side of the ejector bar must have a corresponding threaded rod to thread into the mold's ejector housing, according to Busse Hospital Disposables's plant manager Dean Cardinale.

This is an ejector bar with a barb. The other side of the ejector bar must be threaded to match the thread of the barb, which enables the quick disconnect capability of the coupler, according to Cardinale.

By Christina Fuges

Jeremy Fennelly was an intern at the University of Massachusetts Lowell back in 1992 when he answered an ad on the recruiting wall from Rubbermaid looking for engineers to work on a six-month system-integration project to help the company cut costs. The project entailed changing the configuration of the company's manual tool-change process, which at the time used cranes and manual hookups into a side-table mold-change system.

The challenge was trying to figure out a way to decouple the ejector rods from the tool, which proved difficult with the waterline and manifold connection configuration that the company was using. Fennelly started researching options and came across an ad for couplers from Alba Enterprises (Alba).

"This coupler looked like it could fit the job with respect to size and durability. We were working on big molds for industrial trash cans, in 1500- to 2200-ton presses. I reached out to Alba, got some samples and figured out a solution," Fennelly says.

The Alba couplers enabled Fennelly to develop a way to index the machine to offset it. That way, when the machine was in operation mode, the mold would stay forward and not pull the coupler all the way back to actuate the decoupling. Then when he was ready to remove the mold from the machine, he could index the coupler back further and a strip ring would automatically decouple it then recess the coupler back into the machine. Fennelly would then use a side table for mold pullout. "It used to take about six to eight hours to change a tool, and these couplers helped us cut that down to 30 minutes with tons of waterlines and connections," Fennelly says.

Fennelly moved on years ago to become a senior principal engineer for Johnson & Johnson, but Rubbermaid *still* purchases a large amount of these couplers from Alba, proving the longevity of these couplers as a solution.

Later in 1994, the plant manager at Busse Hospital Disposables (Busse), Dean Cardinale, had a similar story. Back then, Busse had one of the largest presses that Arburg offered, an 85-metric-ton All Rounder hydraulic injection molding machine and molds with positive-return injection systems. At the time, Arburg had couplings that threaded into the ejector plate and then threaded into a thread on the ejector-bar side. But during mold clamping lockup, the tools go under compression. The hydraulic side of the ejector plate would flex during lockup and snap the couplers. There was no movement or room for flex at all. "Plus, it was arduous. The ejector bars had to be perfect and threaded the same way. It was very manual with proximity switches. There were no programmable Arburgs at that time," Cardinale says.

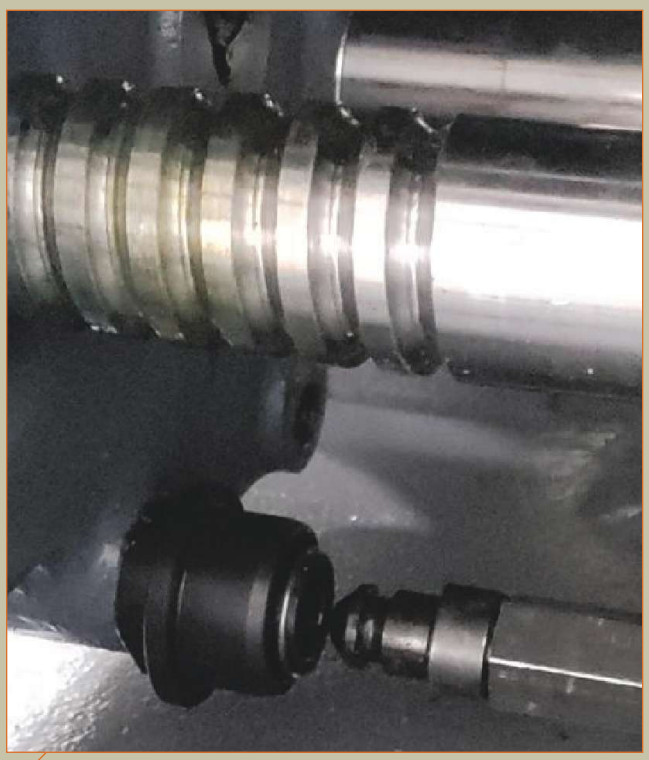
So Cardinale and his team created different types of ejection systems to compensate for all this manual work. They used collar locks that were machined hollow, and then they

BUSSE HOSPITAL DISPOSABLES

PROBLEM: Current method of attaching the ejector plate in a mold to the ejector system in a molding machine was taking too long and breaking couplers regularly.

SOLUTION: Busse invested in an Alba Quick Knockout Coupler.

RESULTS: Busse now has a faster, more reliable method for tying positive return ejection into the mold, which eliminates any magnetic coupler breakage.



This shows the coupler prior to bringing the ejector plate forward.

The ejector plate here is nearly coupled. As the barb is inserted into the coupler, it will reach a point where the collar on the outside of the coupler will click forward, creating a solid connection.

used a regular bolt with a spring to accommodate the flex. It was very time-consuming and labor-intensive.

Eventually, the team invested in a next-generation Arburg molding machine on which operators could load diskettes for all their information. "It was a little computer. All of your movements (injection, nozzle, ejector, clamp) were done within encoded positions, allowing you to create zero positions," Cardinale says. "But, I was fed up with these couplers because I still had to put on ejector bars. So, I started researching online and found couplers from Alba."

This coupler is unique because when the operator puts the barb into the coupler, there is a little bit of a spring-loaded flex, which takes a lot of load off of the machine so that nothing gets snapped. It is that little bit of machining space that provides a necessary buffer. This helped eliminate any manually adjusted coupler breakage and required no threading, turning or lock screws. "You just bring it forward, click, bring it back, and you are done," Cardinale says.

The Beauty of the Coupler

Now, the purpose of a coupler is to have a faster, more reliable method for tying positive-return ejection into the mold. Positive-return ejection requires some form of spring force

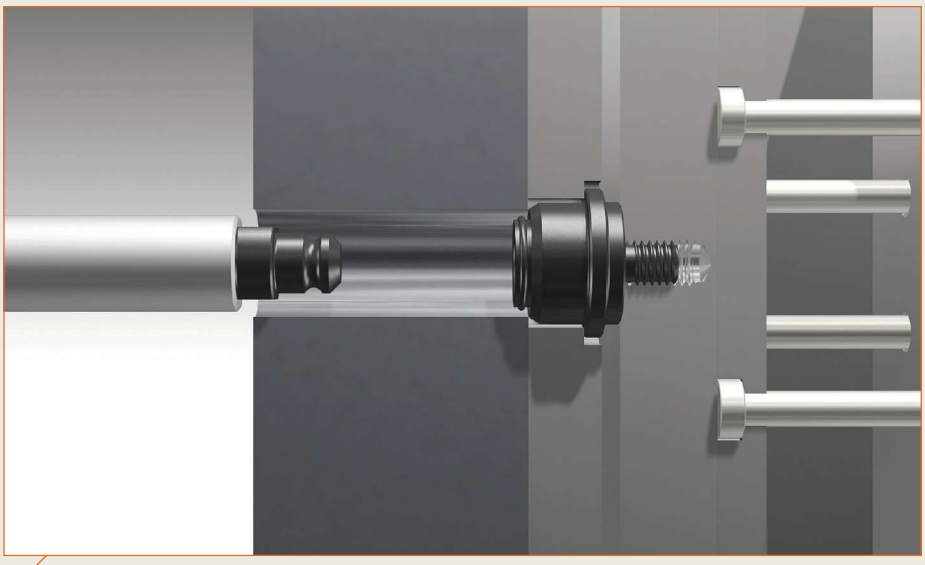
This coupler is designed to provide a quick method of attaching the ejector plate in the mold to the ejection system in the molding machine. It also provides positive ejector plate return while greatly reducing setup time. This coupler is suited for molding machines where the ejector plate on the machine is difficult to reach and is ideal to use when center ejection is desired but impossible to tie-in.

to hold the ejection system in the back position, and spring pressure must be more than the pressure that is required to activate the couplers. However, the real question is: How does someone use a coupler? Cardinale decided to use the coupler in a very specific way.

He took ejector bars from Arburg and contracted a toolmaker to manufacture small adapters that could fit the half 13 thread of the coupler, adapting the coupler to the ejector plate of the press. He then modified the ejector bars on

both sides of the bars to adapt a new system. First, he put a corresponding threaded rod on one side of the ejector bar to thread into the mold's ejector housing. Next, he threaded the other side of the ejector bar to match the thread of the barb, which facilitates the quick disconnect capability of the coupler. (This is a non-typical installation. See the animation simulation photos for a typical installation.)

Then, once he clamped the mold in the press, the ejector bars were threaded into the ejector plate of the mold. In setup mode, he opened the mold to a safe distance in order to perform the quick disconnect sequence—the ejector plate comes forward and clicks right into the coupler. Then he moved the ejector plate back until it physically could not go back any further and hit a zero position on the machine to establish his zero point.



Images courtesy of Alba Enterprises.

A cutaway depicting decoupling during the ejection cycle of a typical barb and coupler assembly installation.

"I just wanted a positive-return ejector system, and this was the best way to do it," Cardinale says.

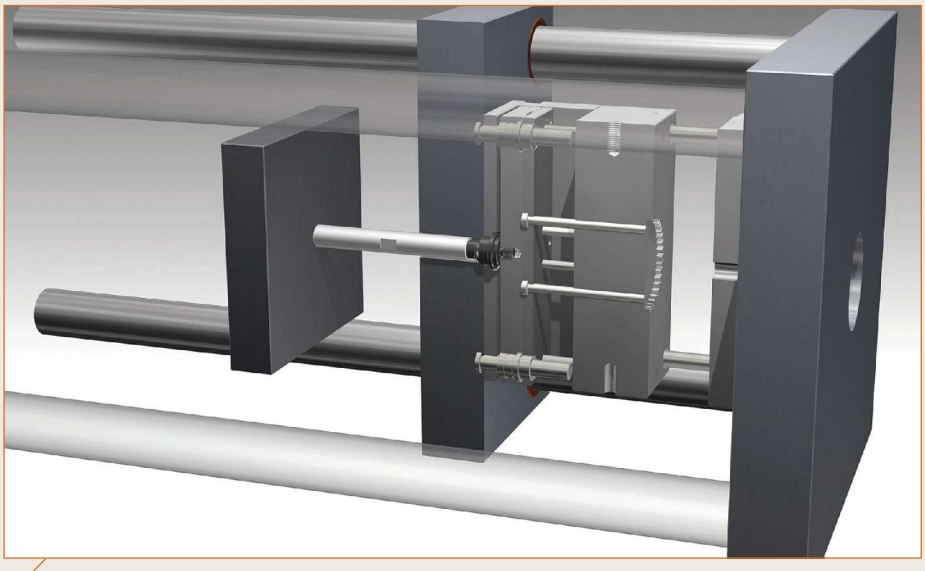
Cardinale adapted this method to all the other presses. He notes also that it is important to size the barb so that it is no bigger than the ejector bar because that enables the operator to pull out the ejector bar without having to take off the barb.

Alba President and CEO Rich Oles says that older injection molding machines are not capable of producing an accurate ejection stopping position, decouple (using full ejector stroke) and recouple on the forward ejection stroke. "Here, it is beneficial to have positive ejector plate return (springs, for example) to prevent the ejector assembly from drifting forward and causing a collision with the end-of-arm tooling."

Lean and Mean

Very early in Cardinale's career, a plant manager gave him a book called "SMED," which stands for Single Minute Exchange of Die, one of the many lean production methods for reducing waste in a manufacturing process. These couplings fit right into lean manufacturing by enabling the operator to change things more quickly, improve accuracy, ease setup and increase durability, Cardinale says. "Now everything is done with quick disconnects, which shaves off a lot of time from mold setups."

Before the Alba coupler, Cardinale would break a couple of sets of couplers every two months, which can get expensive. Today, he runs molding machines five days a week, 24 hours



A cutaway depicting an ejection cycle's positive return during a typical barb and coupler assembly installation.

a day, and the couplers last for years. "I can get five to eight years out of them. Plus, Alba has expanded its line to provide more flexibility in threads" Cardinale says. That is important because with every molding machine operators want to match the thread that they have. When they have to make adapters, they lose some of the stroke distance. Operators want to maximize the amount of stroke that they have for all their machines, so they want that coupling to be flush against that ejector plate. Being able to match the thread to the plate is paramount.

These couplers also have a hex socket for easier tightening to ensure that the couplers are seated properly. The hex socket makes this step a lot easier because couplers can be difficult in regard to fitting a wrench in the limited amount of space available to tighten the coupler into the plate. "The hex socket inside permits a hex socket bit with a 3/8 rachet inside to tighten them easily," Cardinale says.

It is important here to ensure that the coupler and barb are seated against the knockout bar face and in the ejector-plate counter bore. "This distributes the force across a broad surface, ensuring long, trouble-free operation. Failures occur when the coupler is not seated, and the threads take the full force of the plate actuation," Rich Oles says.

Cardinale also warns that the coupling must be flush to the plate and that the knockout bars should be cut to the same length. Specifications on Alba barbs and couplers are very tight. The beauty of that is that distances on the couplings for the tie-ins will yield very level, even pushing, retraction and ultimately no binding on the ejector assembly if the bars are cut exactly to spec. The result is extended ejector assembly life with fewer interruptions from failures. "The more you guide, the better you guide, and the evenness of the guiding of the forward and backward positions means less wear and tear," Cardinale says, "Still today, if I'm using knockouts and ejectors, then I'm using those couplings."

The bottom line is that it is time to seek out solutions like the right coupler if a shop is spending any measurable amount of time performing non-value-added functions, such as threading in-and-out knock-out bars and repairing damaged threads or coining in the ejector plate. Let's face it—the business of injection molding is selling time. So, the more time that a shop spends molding good parts, the less time it spends rescheduling, boosting the amount of its on-time deliveries and increasing how often it hits planned profits. MMT

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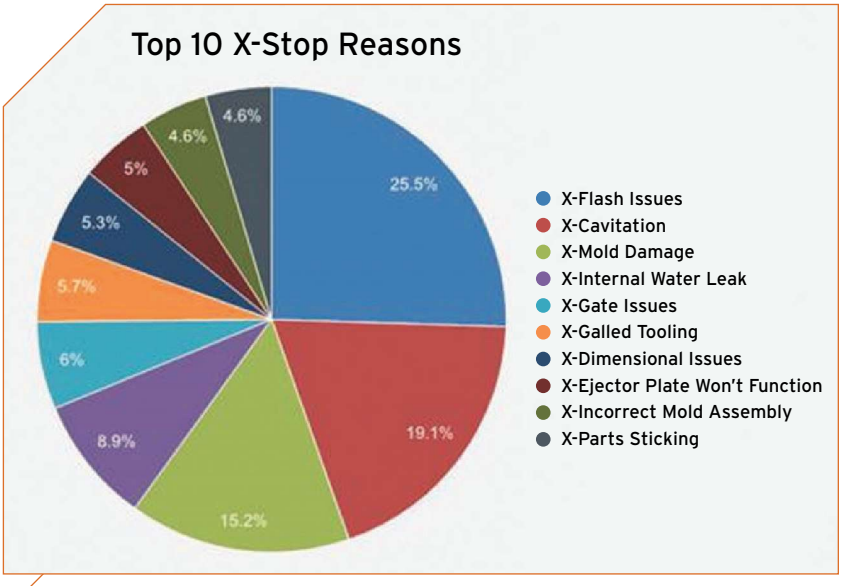
How Will Industry 4.0 **Impact Mold Maintenance?**

By Steve Johnson

Industry 4.0 has been getting a lot of attention from molders as they look to take advantage of connecting processing information with production information *to efficiently produce quality parts on time*. This common goal is the tagline for the MoldTrax electronic maintenance system. For example, MoldTrax collects, analyzes and shares accurate data to drive business success. It only makes sense that as the 4.0 culture continues to grow within the molding industry, the mold repair side of the business starts asking: "What's in it for me?"

Maintenance professionals need to understand how or if a 4.0 culture can help them do a better job of troubleshooting and maintaining their molds, and which piece of this broad range of electronic data could be useful in both short- and long-term maintenance plans. Here is a look at the electronic benefits that are possible for mold repair.



Images courtesy of MoldTrax.

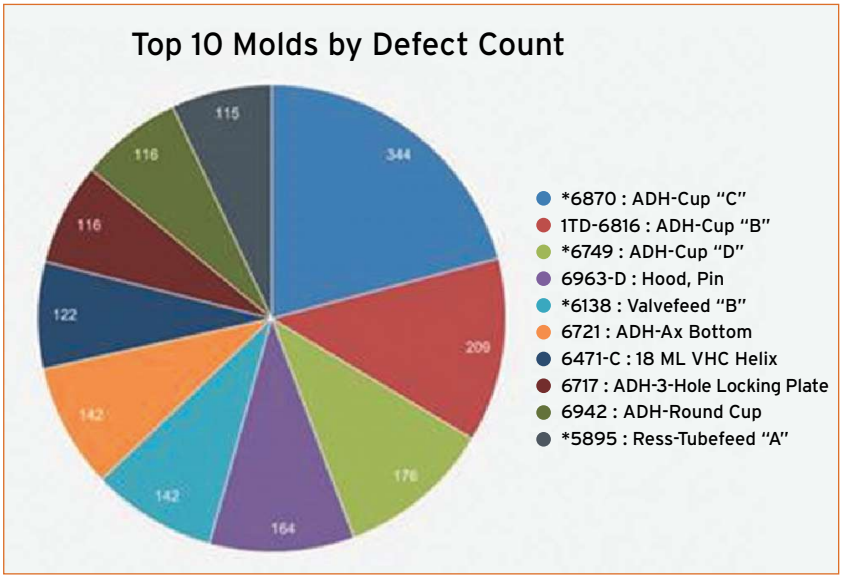
These graphs are examples of metrics that are critical for repair technicians to monitor, but because electronic signals cannot provide this data, it can only be collected via manual entry.

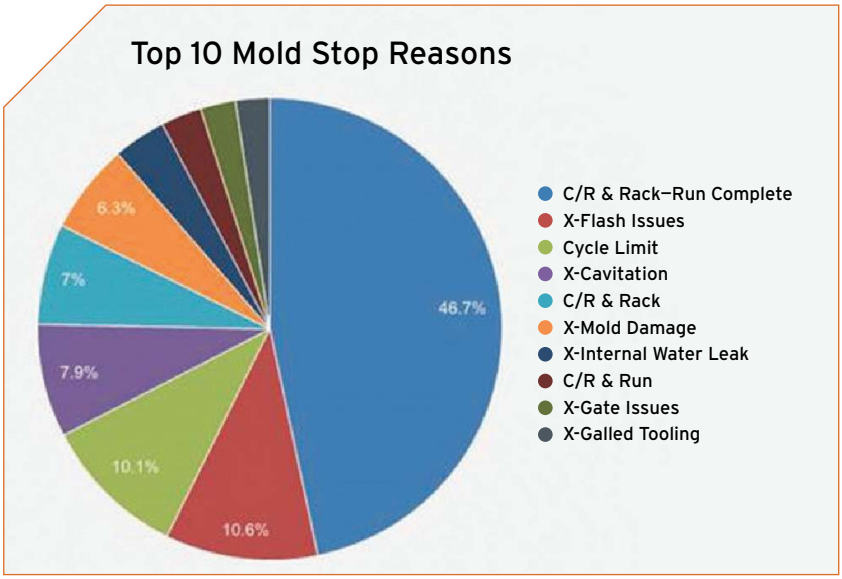
Data Devices

In a typical firefighting repair culture, toolroom technicians do not always know where to start, so they begin at the end and work backward. They examine live electronic data on molding parameters available through products that bolt on or wire into a mold or press. The challenge is knowing what data helps improve troubleshooting efforts and corrective action resolutions.

Five basic functions of these data devices are the date and time that a mold started and stopped, the shot or cycle count (over a lifetime or recently), cycle time (minimum/maximum/average), mold/cavity sensors (the injection pressure, temperature, melt viscosity and clamp pressure) and sensor or micro-switch failures. These features are captured through an electronic signal and fed to numerous host systems, which analyze the information and then feed it back to the user in a report, graph or chart that provides clues to the current mold or part situation. Each supplier configures the data to "signal" the usefulness of the information to various segments of a molding operation.

From there, a technician must determine the value of this data. At first glance, the data can serve as an alert function

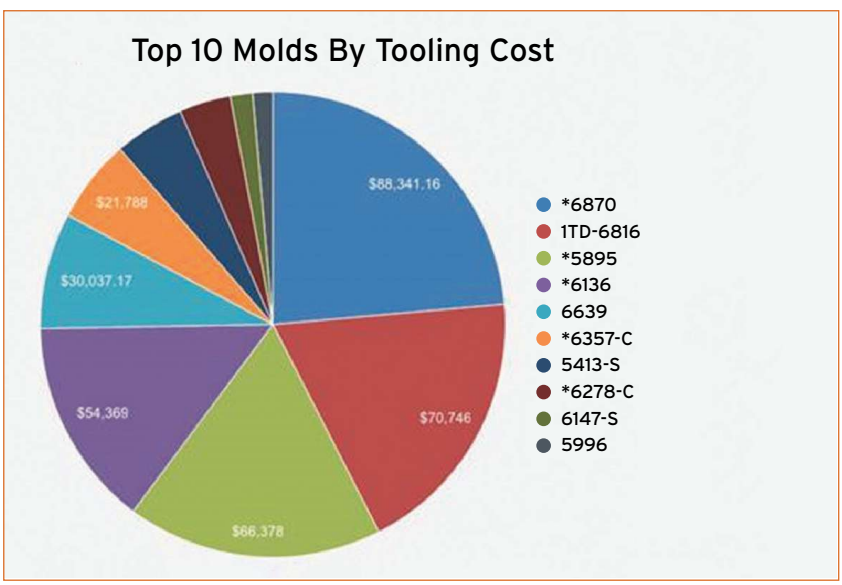




when something is amiss or when a technician is attempting to solve an issue with the mold, part, press or people. For example, the data indicates when a preventive maintenance (PM) run is due or overdue, how many cycles are run during a specific timeframe, if a mold cycle time is in or out of an accepted range, when the mold starts or stops, how long a machine is idle or down and when process conditions exceed a set range.

Once this data is implemented and tested, and technicians have determined a verified range, they can maintain a more consistent process, which helps them troubleshoot mold function and part quality issues and more accurately forecast tooling life. Without process consistency, it can be difficult—if not impossible—for technicians to determine a root cause, leaving them with few options, like simply cleaning the mold or sticking in new tooling and hoping the issue magically disappears.

Sometimes the issue does disappear, which provides a continued endorsement of a costly, firefighting maintenance strategy. In reality, the issue disappeared because something in the process changed, not the inclusion of new tooling. For example, injection pressure spiked during the run and caused flash, someone increased clamp pressure and eliminated flash, a technician turned up the nozzle heaters too high, the mold sat idle for too long, or the mold overran its specified PM cycle count. Electronic data will provide insight into these situations, helping technicians to determine the proper corrective action. However, electronic data is not enough on its own.



More Than Data

It takes human interaction to fill in the blanks that these live data signals create. Before a toolroom tackles an issue, the technicians need to know exactly which issue that they should examine. It takes skilled technicians to prioritize the issues that they must investigate. Some larger companies have thousands of documented mold and part issues in their databases. Imagine trying to chase all the "out-of-range" issues that live electronic signals provide.

For example, what if during only one run, a host system was flagged indicating that a mold experienced a clamp or an injection pressure increase along with a cycle time and mold temperature change? What if the result of these changes were negligible and the mold still produced good parts during the run? What if the mold had a couple of cavities blocked for non-fill, flash or a burn during a run? The answer is unclear. The technician either sets up a DOE (Design of Experiment) to chase these process-related issues or hopes that they go away during the next production run. Perhaps the data is so confusing that the best answer is to stick in new tooling, give it a good cleaning and hope for the best.

As useful as some electronic data is, these signals will not tell technicians:

- Why a mold stopped.
- Where and when a runner or part got hung up.
- The material status.
- The occurrence of the tooling or the component galling or locking up.
- The corrective action that was taken, when it was performed, the technician who was responsible or the length of time that the action took.
- The tooling that was required for the corrective action.
- The mold or cavity position of the defect occurrence.
- The reason that the press door was opened (which shut down the operation).
- Which operator was on break, leaving the door open.
- The part quality issues.
- The mold life.
- The frequency and maintenance costs of the issues.

Human involvement *will* provide clarity to these issues. Technicians must enter data manually to document the issues that stop or slow production and create substandard parts. Once the issues are documented, technicians must monitor the issues to prioritize targets and goals accurately based on frequencies, tooling and labor costs and critical customer requirements.

Typically, when a mold lands on a bench for PM and repair, a work order spells out the *current* issues that the repair technician must address. A continuous improvement culture requires technicians to identify what they need to fix now and the high-frequency or high-cost issues that have plagued the mold during past runs and the typical corrective actions. Technicians should also perform defect position analysis to identify defect patterns and trends quickly. This analysis is at the heart of a continuous improvement maintenance strategy, arming repair technicians with the right data to make more informed decisions.

The bottom line is that most molders, including toolroom managers, are too busy with daily activities to chase every parameter that is electronically signaled to be "out of range" or "suspicious" or that "could" cause an issue. The toolroom team must set goals and targets based on actual mold performance issues (with manual entries) to ensure that the issues they are chasing through DOEs or root-cause analysis are worth the effort.

Electronic data and the range of connectivity surely will improve a toolroom's ability to produce quality parts on-time and efficiently, but in the world of maintenance, entries that are accurate and manual will always be required to give technicians the necessary information to attack real issues and measure real improvement. MMT

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Steve Johnson is president of MoldTrax, which provides specialized course work, hands-on bench training, maintenance software, maintenance products, toolroom design and maintenance efficiency auditing.

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Understanding Business-Meal **Deductions**

By Michael J. Devereux II, CPA, CMP

On October 3, 2018, the IRS provided mold shops interim guidance concerning the deductibility of business meal expenses. In Notice 2018-76, the IRS clarified that shops will still be able to deduct 50 percent of their business-meal expenditures, just not expenditures associated with entertainment.

Background

The Tax Cuts and Jobs Act (the Act), which became law in December of 2017, eliminated the ability of mold shops to deduct expenditures for entertainment, amusement or recreation. While the Act repeals the deduction for entertainment expenditures that are paid or incurred after December 31, 2017, it does not specifically address the deductibility of expenses for business meals.

Before the Act, mold shops generally could deduct 50 percent of the meals and entertainment expenditures that they incurred by carrying on their trade. As a result, many shops accounted for meals and entertainment in one account because the same tax treatment applied. However, mold builders now need to account for meals and entertainment separately, as no deduction is allowed for entertainment in 2018 and beyond.

Mold shops should document these five requirements for each business meal to ensure that they may continue to deduct 50 percent of their business meals.

Guidance

The IRS intends to propose treasury regulations providing guidance on the deductibility of expenses for business meals. As a result, this guidance is interim but gives mold shops something to consult until the IRS issues additional guidance.

Before the Act, expenditures for entertainment, amusement or recreation were not deductible unless the shop could establish that the entertainment was directly related to the active conduct of business during, immediately preceding or immediately following the entertainment. The Act repealed this exception and disallowed a deduction for all entertainment expenditures. Otherwise allowable meals remain deductible and are subject to the 50-percent limitation.

Shops may deduct 50 percent of such an allowable business-meal expense if the expenditure meets all of the following conditions:

- The expense is ordinary in nature and is paid or incurred during the taxable year in which the mold shop is conducting business.
- The expense is not lavish or extravagant.
- The shop or an employee of the shop is present during the meal.
- The food and beverages are provided to a current or prospective customer, consultant or similar business contact.
- The food and beverages are purchased separately from the entertainment, or the cost of the food or beverage is stated separately from the cost of the entertainment (in the case of a meal provided during or at an entertainment activity).

Mold shops must meet all five of these requirements to deduct 50 percent of the business meals, and the notice specifically states that the disallowance for entertainment expenditures may not be circumvented by artificially inflating the amount charged for food and beverages.

The notice provides three examples addressing the deductibility of business meals:

- The shop buys tickets to take a customer to a baseball game and also buys the customer a hot dog and drinks. The IRS explains that 50 percent of the cost of the hot dogs and drinks is deductible, while the cost of the baseball tickets is not.

- The shop brings a customer to a baseball game but purchases tickets for a suite, in which food and beverages are included. The cost of the food and beverages are not separately stated on the invoice. As a result, the shop is not entitled to any deduction for the event.
- The shop brings a customer to a baseball game, but the cost of the food and beverages *is* stated separately on the invoice. By separately stating the cost of food and beverages, the shop is entitled to a deduction equal to 50 percent of the cost of food and beverages but still is not entitled to a deduction related to the ball game.

New Guidance

This new guidance provides some clarity for mold shops to determine which meal expenditures remain partially deductible and which do not. The tax code requires mold shops to substantiate their expenditures in the event of an examination, so they should segregate the cost of meals and entertainment going forward.

Most shops should consider establishing a separate general ledger account for entertainment expenditures. Also, mold shops should document these five requirements for each business meal to ensure that they may continue deducting 50 percent of their business meals. MMT

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Maximum Mold Group

In this column, *MoldMaking Technology* invited the owner of this year's Leadtime Leader winner to share some of his thoughts on the impact of winning the Award.

How has the Leadtime Leader Award impacted your company since gaining the title this past June?

Dave LaGrow, president, Maximum Mold Group: We have been able to further *solidify our family/team environment*. The employees were part of the process of applying for the award, and winning was a great accomplishment for them. They know that when they work together for a common goal, it truly works.

MoldMaking Technology Editorial Director Christina Fuges chats with Dave LaGrow, owner of this year's Leadtime Leader winning shop Maximum Mold Group about the impact of winning the 2018 title.

We also received a lot of *complimentary (free) marketing* through *MoldMaking Technology*'s blog, social media, enewsletter, feature video, cover story, podcasts, Amerimold panel discussion and awards presentation.

Most importantly, we have *gained two new customers* as a result of the exposure that we received. We also broadened our network of tool and die manufacturers, who we occasionally approach to exchange ideas, share workloads and discuss pending legislation or taxation that might impact our business.

What was the most surprising thing you discovered about your company as you moved through the Leadtime Leader process (questionnaire, article and video)?

LaGrow: We were surprised to learn that our employees and their families took pride in being a part of the questionnaire, articles and video production. They appreciated that we tell them that they are doing a great job. They also loved the swag from *MoldMaking Technology* and wear it proudly. Also, we were surprised to learn how essential marketing and networking are to becoming a successful company.

How has your view of marketing changed since winning the award? What plans have you put in place to up your marketing game?

LaGrow: Before winning the award, we maintained websites and went to a couple of trade shows. Since winning the award and being able to capitalize on the marketing that *MoldMaking Technology* provided, we realize that additional focus on marketing is necessary because it does pay-off when it is done right.

We also attended several new trade shows this year. We plan to do more shows next year as well to strengthen our network further and promote Maximum Mold Group to achieve additional growth.

You mentioned that you acquired two new customers from the exposure that the award afforded you. Can you elaborate a little on how that unfolded?

LaGrow: Maximum Mold Group is made up of three small companies, each serving a diverse customer base from three distinct locations. Max 1 has 28 employees, Max 2 has 13 employees, and Max 3 has 34 employees. Based solely on each shop's size, we would not win large projects in the past. However, after winning the award and being able to tell our story, we have been able to prove that having three separate locations does not mean that we cannot handle a large tool-build package.

You also noted that your network of tool and die manufacturers has expanded. Can you explain a little more about what that means?

LaGrow: We rely on local tool and die shops to share ideas or discuss workload balancing, but after the exposure from the award, we have expanded our network. When we call companies out of the area to join our network, they now are more open to working with us, which has helped us establish some wonderful working relations, especially with past winners.

What are some current or pending pieces of legislation or regulations that might impact your business?

LaGrow: The tariffs that have been enacted and additional discussions about changes to shipping to companies outside of the United States. While we support enacting a tariff on steel coming in from China, U.S. steel companies cannot keep up with manufacturing orders at this time. We believe this should have been a graduated scale to help with in-process orders for 2018-2019. MMT

EDITOR'S NOTES

In this column, *MoldMaking Technology* invited this year's Leadtime Leader winner to share some of their thoughts about some hot industry topics.

For more information on how to enter our Leadtime Leader Awards program, or if you have a question for any of the Leadtime Leaders, please e-mail Christina Fuges at cfuges@gardnerweb.com, or visit short.moldmakingtechnology.com/leader

News and Reviews from **Industry Organizations**

American Mold Builders Association (AMBA)

The AMBA recently launched its newly designed website, amba.org. "We've been getting great feedback," Kym Conis, executive director, says. "Resources for visitors are more easily accessible and overall, the new site is easier to navigate with mobile-friendly features. It also provides tools to assist with workforce development, which is AMBA's primary focus." Conis says that the site also features a new "Careers in Mold Building" page where students, parents and teachers can find useful information on careers in moldmaking, including about mold building, career paths, FAQs, testimonials and videos. Additionally, each page provides the opportunity for students to connect with an AMBA member in their geographic location. "The new site also will include new recruitment tools for members, such as grants, scholarships and videos, along with marketing materials and more," she says. Regarding events, the AMBA will host a Plant Tour Workshop in conjunction with Plastec West on February 8, 2019, at Pyramid Mold & Tool in Rancho Cucamonga, California. The 2019 AMBA Leadership Summit is scheduled for February 27-March 3, 2019, at the Marriott Resort & Royal Beach Casino in St. Kitts.

The Chicago Chapter of the AMBA participated at IMTS 2018 in September by having a booth and guiding students on tours of the metalworking event. "We displayed many plastic parts, and some steel mold components to show the mold function. Our tabletop CNC machine was a hit, but many asked if it was a 3D printer," Chuck Klingler, AMBA Chicago president, says. "Most of the students that stopped by our booth did not know what a plastic mold is or what a moldmaker is. They became very interested when we discussed how many products in their world are made from plastic! I really thought that we spread the 'moldmaker' image and plastics-industry work opportunities to many, many students and some parents who previously had no knowledge of the various opportunities in our industry. I felt very good about it—and rewarded! The student interest was real. How cool is that?"

Canadian Association of Mold Makers (CAMM)

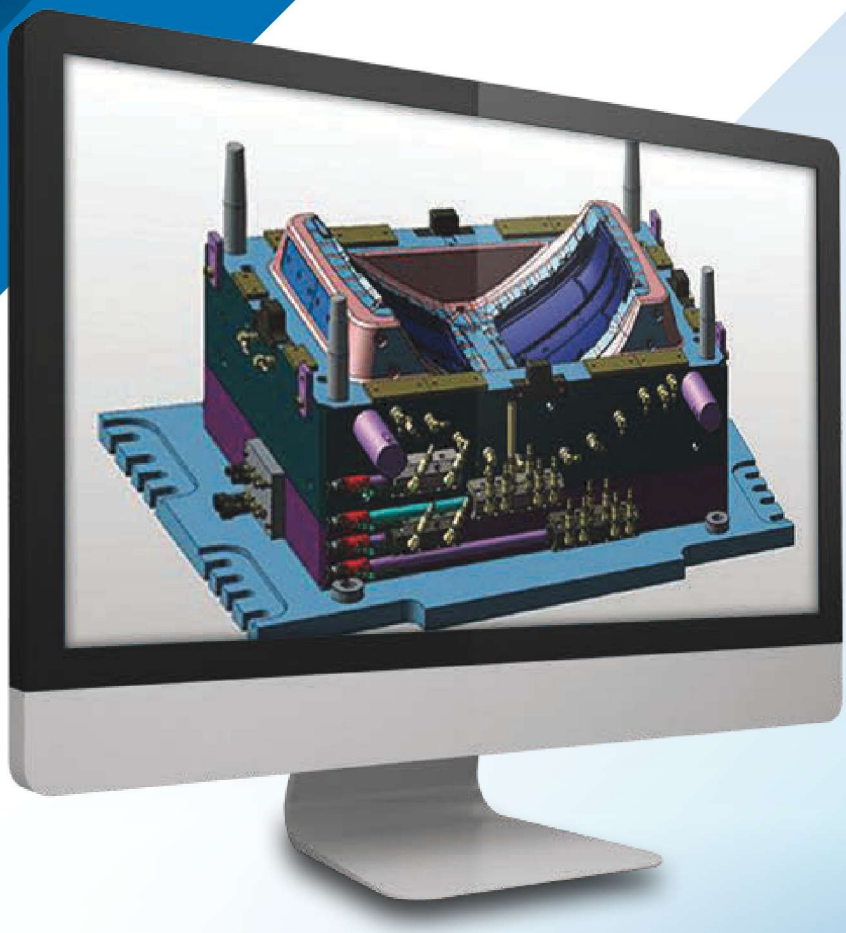
CAMM Chairman Jonathan Azzopardi and Executive Director Diane Deslippe report that membership in the organization continues to grow, and new corporate sponsorships also have gained in number. This was a core objective for the organization during 2018, and it will continue to be so in the coming year. CAMM is exhibiting at Automotive Meetings, the International Manufacturing Forum for the Automotive Industry, which will be held in Querétaro, Mexico, February 19-21, 2019, and is looking to have a showing of member companies there. Additionally, CAMM is working to organize a large Canadian pavilion at Plastimagen, which will be held in April 2019 in Mexico.

Representatives from CAMM will attend The International Conference and Exhibition on Reinforced Plastics (ICERP) in Mumbai, India, January 10-12, 2019. "India is becoming our focus for several reasons," Deslippe says. "Over the past four years, we have attended the India Auto Expo with the Automotive Parts Manufacturer's Association (APMA). Windsor's close affiliation with India has brought manufacturing companies from India to Ontario to meet with CAMM shops since, because of the time difference, several CAMM shops are establishing engineering facilities in India. The Canadian government is working to open up trade with India." She adds that CAMM is taking the opportunity to gain some insight into India's manufacturing technologies, including the different materials that they use. "ICERP also will provide the opportunity to follow up on the relationships that we are starting to formulate." CAMM also is exhibiting at Plastico Brasil, the International Plastic and Rubber Exhibition, March 25-29, 2019. Like India, Brazil represents another avenue for widening CAMM members' opportunities for trade and business partnerships.

The Mold Technologies Division of the Society of Plastics Engineers

The SPE Mold Technologies Division is ramping up for ANTEC 2019, which SPE-Inspiring Plastics Professionals produces and which will be held March 18-21, 2019, in Detroit, Michigan. ANTEC is the largest and most respected technical conference in the plastics industry and features more than 550 technical and business papers, over 60 marketing presentations, plenary and keynote speakers and many networking and exhibitor events for students and plastics professionals. The Mold Technologies Division will present a session of technical papers related to moldmaking and mold design, plus host special invited speaker Matt Melonio, president of Providence Texture, who will discuss the latest laser technologies for the mold industry. Watch for updates on speakers and topics at the Division's website: https://mtd.4spe.org. MMT

MOLDMAKING SOFTWARE



Design Strategies Improve Workflow and Part Quality

Design and engineering is essential to building a better and more cost-effective mold with shorter leadtimes. *MMT* breaks down the variety of software available to help overcome the daily challenges faced from data, quoting, designing and programming—including computer-aided design (CAD), computer-aided manufacturing (CAM) and data management software.

Photo (left) courtesy of Kubotek;
photo (above) courtesy of Siemens PLM

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Index Remains in Lower Range

October 2018 – 52.9

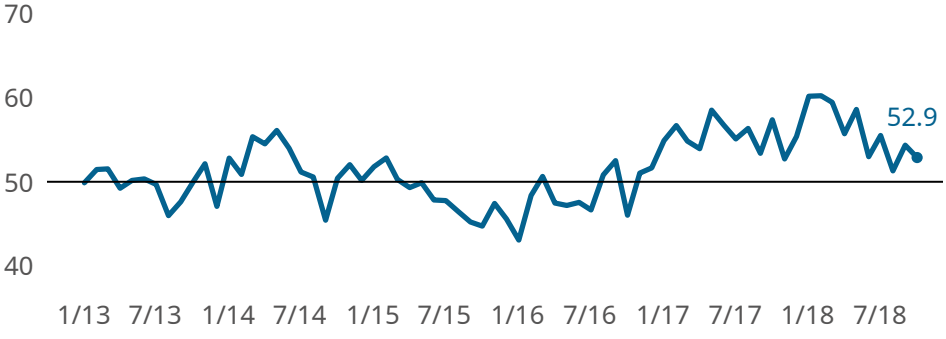
Registering 52.9 for October, the Gardner Business Index (GBI): Moldmaking moved slightly lower as backlogs and exports both significantly weighted on the Moldmaking Index's latest performance. Compared to the same month one year ago, the Moldmaking Index is down 8.2 percent. Gardner Intelligence's review of the underlying data for the month reveals that the Moldmaking Index was lifted higher by supplier deliveries, new orders, production and employment. The averages-based index was pulled lower by contracting backlogs and exports.

The latest round of U.S. and Chinese tariffs, which have been implemented in escalating fashion, took effect in late September. The total effect from the many rounds of tariffs that have taken place under both governments have significantly impacted the cost of aluminum, steel and mold products. In addition, the rising value of the U.S. dollar against the Chinese Yuan has put U.S. manufacturers at an additional disadvantage when competing abroad. Under the current conditions, moldmakers will have to master their supply chains and seek to replace lost opportunities abroad with new domestic opportunities. MMT

ABOUT THE AUTHOR

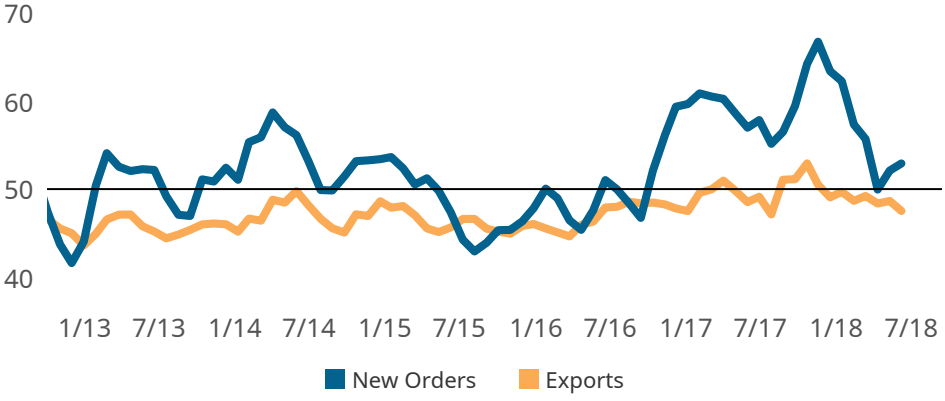
Michael Guckes is the chief economist for Gardner Intelligence, a division of Gardner Business Media (Cincinnati, Ohio, United States). He has performed economic analysis, modeling and forecasting work for nearly 20 years among a range of industries. He is available at mguckes@gardnerweb.com

Gardner Business Index (GBI): Moldmaking



October's Moldmaking Index reading indicated modest industry expansion. The Moldmaking Index was led higher by supplier deliveries, new orders, production and employment.

New Orders and Exports (3-Month Moving Average)



Moldmakers reported strong expansionary readings in new orders during September and October despite facing an accelerating contraction in exports.

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Homeowners Drive Appliance Market More than Homebuyers

Limited construction of new homes may affect demand for appliances in multiple ways.

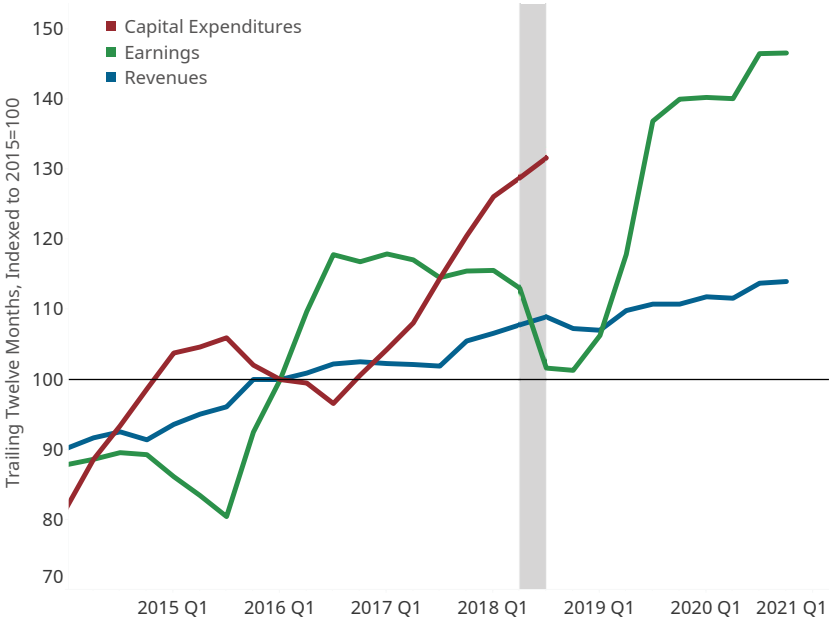
Those who pay attention to the housing market in 2018 have heard a lot of lackluster news. Stock indexes that track the housing sector, like the iShares U.S. Home Construction ETF (ITB) and SPDR S&P Homebuilders ETF (XHB), have fallen over 30 percent between their first quarter 2018 highs and their valuations as this article goes to press. Equities analysts in this sector see unaffordable home prices, the rising costs for home building materials and rising interest rates as three of the most significant factors that restrict greater growth in the market. But, if they were to see price as merely a tool that balances supply with demand, and if they were to think about how limited supplies and strong demand can influence prices, then the picture of the market would look significantly different.

On the supply side, U.S. New Housing Permits during the first three quarters of 2018 averaged 111,000 units monthly, which is the highest reading since 2007 and more than double the 2009 average. According to Realtor.com, the average U.S. home in September was on the market for 65 days, down 6 percent year-over-year. During the same time, prices were up 7 percent. However, in many non-rural markets, the median days on the market have been far fewer, while median home prices have grown much faster. In combination with the well-known fact that manufacturing and construction labor is in incredibly short supply, this data is one of the biggest reasons that the volume of new homes being constructed is not higher.

This leaves a market in which people can sell their home easily, but struggle to find another. This indicates that the market is not weak but rather is underserved significantly, which has two major implications for appliances. On one hand, the limited construction of new homes tamps demand for appliances going into new homes. On the other, these same conditions may entice current homeowners to upgrade appliances. A strong labor market and increasing wage growth support home improvements. In fact, data indicates that U.S. inflation-adjusted, residential, fixed investment in home improvements has increased in the last four years ending in 2017, growing over 30 percent.

Financial data from publicly traded firms in the home furnishings and fixtures market—as opposed to data from the housing construction market—supports this underlying macroeconomic picture. Real revenue growth—calculated using a 12/12 rate of change at 4.7 percent—is slightly greater than the overall national growth rate. Furthermore, since early 2017, the home fixtures and furnishings market has increased capital expenditures growth at over 10 percent on a trailing 12-month basis, suggesting that the industry is seeking new ways to use technology to solve its labor shortage and one of its fundamental constraints in increased new-home construction levels. MMT

Appliance Industry Actual and Estimated Results



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FOR MORE INFORMATION:
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Machines Feature Automation, Hybrid Capabilities and More

Matsuura USA offers its MX-330 five-axis vertical machining center with 10 pallets and 90 tools, the tough and robust VX-660 vertical machining center and the new MX-520 five-axis vertical machining center with four pallets and 90 tools.

In addition, the company offers the H.Plus-400 machining center with PC12. According to the company, the H.Plus series delivers long periods of reliable, unmanned operation, high accuracy and efficient production.

Matsuura pairs the LF-160 linear motor machine with a robotic system to showcase the machine's high-speed, high-precision and high-accuracy capabilities. Matsuura developed the LF-160 for ultra-precision machining dies, molds and optical parts with a focus on small workpiece processing and unmanned operation. The LF-160's spindle achieves minimized dynamic runout and high resolution.

Matsuura also offers the Matsuura Lumex Avance-25. The Matsuura Lumex Avance-25 metal laser-sintering, hybrid milling machine is a powder-bed metal additive manufacturing platform with subtractive machining capability. The Matsuura Lumex Avance-25 combines selective laser sintering with high speed milling.

The series' Avance-25 relies on one-machine, one-process manufacturing of complex molds and parts by fusing metal laser sintering technology with high-speed milling technology. The Hybrid technology creates a "finished" part with a machined surface finish and with accuracy, without inducing the additional variation caused by multiple machine set-ups and part handling. The machine enables production of complex parts through total manufacturing by digital engineering using 3D data.

The Matsuura Lumex Avance-25 achieves high accuracy in part fabrication because the metal powders are melted and sintered with a laser, while the surfaces are precisely milled at high speeds. Matsuura says that moldmakers can incorporate 3D cooling channels into molds in the single setup, thereby increasing cooling efficiency and enabling high-cycle injection molding with improved quality and precision.

Matsuura / 651-289-9700 / matsuurausa.com

3D Printing with ABS Reduces Part Weight and Production Time

Baker Industries' original equipment manufacturer customer was seeking a creative solution to reduce the weight of a traditionally machined aluminum mill fixture. Customarily, this fixture is used to hold parts in place during the trimming process. However, fixtures that are too heavy can result in component damage or destruction.

By 3D printing the mill fixture using ABS thermoplastic material instead of machining it from aluminum, Baker Industries was able to reduce the tool's weight by 70 percent, which served to protect the parts that were being trimmed and provide a safer solution for employees handling the tool. In addition to reducing the weight, 3D printing the tool enabled the customer to save time on production. The team was able to print the tool in approximately fifty hours, which saved the customer a week of lead time that the customer normally would have needed to machine the tool.

Because of the high-precision tolerances and the complexity required for this application, the change in approach did not significantly lower the cost, but instead was rather comparable. Overall, Baker Industries was able to offer the customer a lightweight solution that enhanced the mill fixture's functionality and reduced the customer's lead time at a comparable cost.

Baker / 586-286-4900 / bakerindustriesinc.com

Vertical Machining Center Reduces Handwork in Complex Molds

Makino's V90S is a next-generation vertical machining center (VMC) for five-axis continuous processing. This high-precision VMC evolved from Makino's three-axis Vi series and has an updated spindle and tilting and rotating axis unit that Makino says supports tighter tolerances and decreased machining and polishing times. The V90S combines quick machine movements and accuracies with software for high-speed motion control. Makino says that the V90S is designed for high-speed finishing of multifaceted, 3D contours and that it cuts cycle times and reduces handwork in complex dies and molds.

To maximize work-zone volume and load capacity, the V90S can accommodate workpiece sizes up to 2200 x 1500 x 700 mm and weighing 5000 kg. Examples of such workpieces include the inner panels of automobile doors and front grilles. The X, Y and Z axes (2000 x 1300 x 800 mm, respectively) provide swift movements with rapid traverse rates of 58,000 mm/min and cutting feed rates of 40,000 mm/min. The V90S's A axis tilts at ±30°, which is wide enough to machine holes for an angular pin, while the C axis rotates at ±60°, ensuring that the tool tip can be positioned to provide optimum contact with the workpiece. Makino says that this extends tool life, provides the required surface finish and minimizes post-machining hand processes.

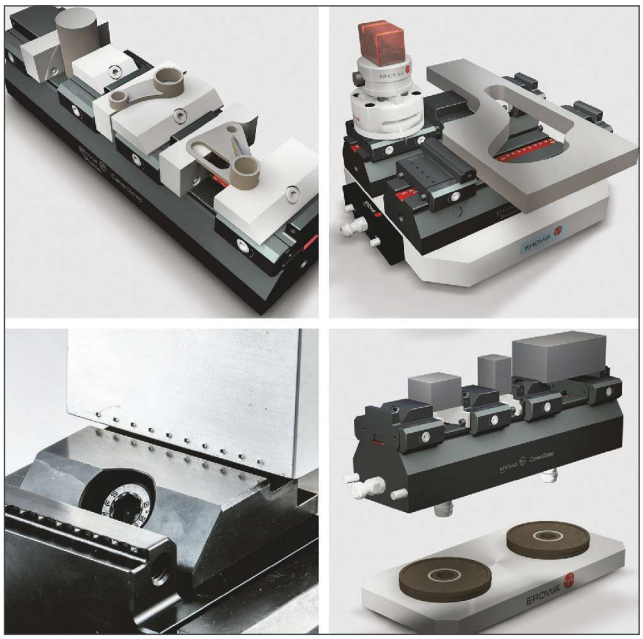
Makino / 800-552-3288 / makino.com

Deep-Hole Drilling and Milling Machines Streamline Moldmaking

Unisig features its USC and USC-M Series machines that combine deep-hole drilling and milling capabilities, which the company says enable mold shops to reduce setup time, increase accuracy and eliminate mold design restrictions. The USC Series column-type machines generate highly accurate holes ranging to 1.5" in diameter in large workpieces. They are available in table-weight capacities ranging to 50 tons and are suitable for mold plates and frack pumps.

These machines enable the processing of large and small parts with four-sided machining capability in a single setup. The USC-M series machines use two independent spindles for gundrilling and BTA drilling and another CAT 50 machining spindle. When this additional capability is combined with a rotary workpiece table and programmable headstock inclination, accurate deep-hole drilling and all standard high-performance machining capabilities are available within the working envelope. The seven axes of control on the M-Series machines use the B, A, X, Y and Z axes for five-axis machining operations, the W axis for the combined gundrilling and BTA deep-hole drilling spindle and the U axis for machining. This provides 3+2 machining to make deep-hole drilling and machining of compound angles faster and improves productivity and throughput by reducing setups and eliminating transfers to multiple machines.

Unisig / 414-252-3802 / unisig.com



Clamp Elements Are Versatile for Small-Batch Parts Production

The clamping elements of **Erowa**'s CleverClamp system are specifically tailored to the manufacturing of one-off and small-batch parts. The company says that they are simple to handle and serve a wide variety of applications while decreasing set-up times, increasing machining times and improving productivity.

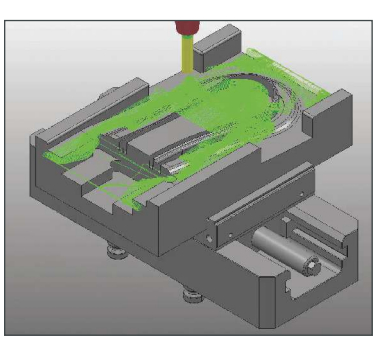
The basic rails of the CleverClamp system are calibrated to fit the Erowa UPC and Erowa MTS production tooling systems. The wide range of clamping elements can be quickly positioned on the serrated base rails and can be used either horizontally or vertically. The base rails provide the flexibility to attach workpieces of varying shapes and sizes in a limited amount of space. An added feature of the CleverClamp system is that it can be universally automated. This increases customer's machine use by making use of marginal and night hours when the CleverClamp system is combined with an Erowa automation solution.

Erowa Technology Inc. / 800-536-4894 / erowa.com

New Feature on CAM Software Simplifies Five-Axis Programming

PowerMill 2019 from **Autodesk** offers three- and five-axis programming tools to help manufacture complex parts with new additive and subtractive technology. Autodesk says that introducing enhanced three-axis high-efficiency roughing and new five-axis collision avoidance tools will generate more efficient tool paths with fewer tool retractions, shorter cycle times and increased tool life. Automatic Tool Tilting is a new option to simplify five-axis programming regardless of the model shape or the toolpath type. The user defines the required shank and holder clearance distance and PowerMill does the rest. Collisions and near misses are identified and automatically avoided with smooth machine motion, which helps prevent dwell marks and other imperfections.

PowerMill's new setup entity helps synchronize the connection between tool paths and NC programs. Autodesk says that this enables users to add tool paths to a setup and have confidence that the changes they make are automatically passed to the associated NC program. Users can use setups with fixture offsets to simplify the programming of parts using multiple operations or fixture locations. All manufacturing data can be sent to Fusion Production for cloud-based collaboration.



Autodesk / 877-335-2261 / autodesk.com

Mold Cleaner Uses Dry Ice for a Deeper, Non-Abrasive Clean

Cold Jet's i³ MicroClean cleaning method is a non-abrasive cleaning method that helps facilities clean molds in-place at operating temperatures. According to the company, this cleaning system enables the cleaning of intricate cavities that other methods cannot reach. It extends the life of equipment by eliminating the need for chemicals, wire brushes and abrasive pads and enables increased cycles between preventative maintenance while reducing scrap.

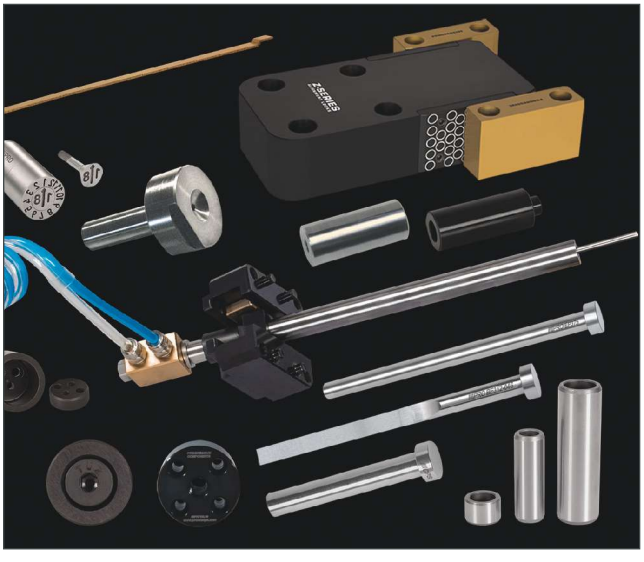
Cold Jet / 513-831-3211 / coldjet.com

Components Catalog Reveals Extended Components Line

Progressive Components' V12 catalog highlights product advantages including a variety of standard mold base components to complement its existing line, cooling products that are readily machined and reach throughout cores previously not feasible, expanded through-hardened pins for large automotive and appliance tools, advancements in mold maintenance and monitoring technology and new alignment lock configurations.

The catalog provides standardized options for plate sequencing and more economically feasible routing cooling. It also provides options for eliminating custom per-mold machining with new ejection and alignment standards. The company is also advancing its mold maintenance and monitoring technology. With the debut of the V12 catalog, Progressive Components has its most comprehensive product line offering in the company's history.

Progressive Components / 847-487-1000 / procomps.com



Milling and EDM Cell Demo Highlights Latest Automation Solutions

Makino's D200Z-graphite 5XC vertical machining center has a 30,000-rpm spindle. The graphite mill is integrated within an automated cell using a Makino EDNC6 sinker EDM machine and an EROWA ERC80 robot. The robot shuttles electrodes and work pieces between the two machines, using EROWA's JMS Pro automation cell control software. This cell showcases the latest advancements in automation and productivity.

Makino / 800-552-3288 / makino.com

High-Speed Mill Features Three-Axis Linear Motor Drive

EDM Network and Chmer EDM offer the linear motor drive, HM4030L dust-free, graphite, high-speed mill. The mill features a three-axis linear motor drive that uses a Siemens 828D CNC control and drives and Chmer EDM linear motors. The optional dust-free oil shroud is unique to the Chmer high-speed mills and is offered on all three standard models HM43GT (graphite only), HM65GT and HM86GT (graphite and hard metal). These are all available in both ball screw as well as linear motor drive configurations. EDM Network and Chmer EDM offer a model configured for companies that already have a vacuum system, or EDM Network and Chmer EDM can set it up for both.

EDM Network Inc. / 888-289-3367 / edmnetwork.com

Five-Axis Machines Cut Cycle Time and Tooling Costs

Makino's Sinker EDM technologies save cycle time and tool costs in die and mold component manufacturing using a five-axis continuous (5XC) machining approach. DAF and EDNC-Series machines feature improved Z-Axis Jump Speed that uses a core-cooled ball screw to achieve speeds of 20 meters per minute with a 1.5G acceleration for processing plastic-injection mold support rib details. The machines are also designed to reduce electrode wear and enable rough and finish EDM using a single electrode. In addition, the company's improved Hyper-i control enables easier and more productive EDM operation, Makino says. Off-line CAM software, called EDCAM, utilizes 3D CAD information for Sinker EDM programming.

The company says that its 5XC approach to die and mold component manufacturing results in greater cycle time savings, improvement in surface quality and reduced cutting tool costs by changing the milling cutter selection and eliminating the number of milling tools needed to complete a part.

Makino / 800-552-3288 / makino.com

Compact Five-Axis Gantry Milling Machine Preassembled for Quick Startup

Zimmerman's FZU five-axis gantry milling machine is a lightweight option for prototype, tool and moldmaking. The machine is particularly suitable for machining aluminum and casting resins like Ureol. The FZU is distinct from other Zimmerman machines like the FZ33 in that the FZU is a compact, preassembled machine that Zimmerman assembles in-house and then transports to the customer so that setup and startup require minimal effort.

The FZU gantry machine is thermo-symmetrical, meaning that the milling spindle, guides and other accuracy-determining components are arranged so that their heating is either compensated or so that they can expand in uncritical directions. The base frame consists of a steel-welded construction that forms a continuous U-shape. The machine gantry's centrally guided Z-slide has an octagonal section that makes it stable. The FZU five-axis gantry milling machine is approximately 3,500 mm x 7,500 mm x 5,000 mm with a weight of approximately 35 tons. The machine includes the new VH10 milling head, which achieves an extremely high-power density. The VH10 head replaces the VH12, which is not a Zimmermann product.

Zimmermann / 248-305-9707 / f-zimmermann.com/us

Drill Has Coating to Facilitate Chip Evacuation

OSG USA's A Brand represents a new evolution in cutting tool technology. OSG USA says that the A Brand is a tooling brand that is composed of OSG's latest high-performance threading, drilling and milling innovations. The A-Drill series features the Exocarb ADF drill. The Exocarb ADF enables one-step drilling to simplify machining time and tool management and is suitable for a wide variety of drilling applications including inclined surfaces, curved surfaces, counter-boring, eccentric holes, thin plates and so on. The Exotap A-Tap Series is a tap line made from powdered metal HSS with OSG USA's proprietary coating that was developed to facilitate chip evacuation in a wide variety of work materials over a wide range of machining conditions.

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

AM Powder Designed to Create Conformal Cooling Channels

Uddeholm announced the launch of Corrax additive manufacturing powder, a product designed for the additive manufacturing of tooling components. Uddeholm says that using Corrax additive manufacturing powder enables the creation of conformal cooling channels to reduce cycle times. Uddeholm maintains that Corrax powder is excellent for additive manufacturing tooling applications because of high demand, short run series and the ever-increasing need for shorter lead times.

Uddeholm announces its 350th anniversary as a manufacturer of industrial tool steels in 2018. Based in Hagfors, Sweden, Uddeholm has delivered high-alloyed steels since opening in 1668. Uddeholm provides tooling solutions through technical know-how, advice and support to customers from over 90 countries around the world. Uddeholm serves customers in a wide range of industries, providing local stocking and technical support for tool steels, mold materials and specialty alloys. Uddeholm says that continuous development of new products and solutions has shaped the success of Uddeholm today. Uddeholm opened its first facility in the United States in 1925.

Bohler-Uddeholm Corp. / 800-638-2520 / bucorp.com

CUTTING TOOLS

How to Hard-Mill **Effectively**

Image courtesy of Seco Tools.

Hard milling is a highly effective strategy for machining complex features on 2D and 3D parts, such as mold cavities, gates, heat-sinks and even die pockets in tool steel above 48 HRC. However, the devil is in the details.

By Jay Ball

Hard milling requires the utmost attention to detail to achieve maximum performance and tool life and tight tolerances down to 0.0001 inch. These tips help machinists get the most from hard milling.

Maintain a constant chip load and feed rate. Machine tools rapidly fluctuate feed rates when machining complex surfaces and cutter paths, which drastically reduces tool life. Machinists must understand that when machining complex surfaces, machine tools do not reduce rpm in conjunction with feed-rate reductions. So, if the machine cannot maintain programmed feed rates 80 percent of the time, operators should record the average feed rates and then reduce the feed rates and rpm accordingly. For example, if an operator programs a 30,000 rpm and a 150-ipm feed rate, but the machine can only maintain an average feed rate of 75 ipm, the operator should reduce the rpm to 15,000. The subsequent reduction in rpm will increase tool life by 50 percent and impact cycle time negligibly.

Do not leave extra stock for finishing. When machinists are machining tool steels above 48 HRC, extra finish stock will reduce output and wreak havoc on surface finish and tool life. A general rule for finish-stock allowance is 1 to 2 percent of the finish-cutter diameter. Most cutting-tool manufacturers base their finishing cutting data on 1 to 2 percent of the tooling diameter engagement, so leaving more than that decreases productivity. For example, when using a tool with a 0.5-inch diameter, leave no more than 0.005 to 0.010 inch of finish stock.

Leave consistent stock on all surfaces. After a machinist roughs a complex surface, he or she should run a rest-rough and semi-finish tool path to ensure consistent finish stock on all surfaces. For example, when a machinist roughs out a complex 3D surface using a 12-millimeter ball-nose end mill, and the intended finishing cutter diameter is 8 millimeters, a safe practice for ensuring 0.003 to 0.006 inch of stock on all surfaces is to rest-rough with a 10-millimeter ball-nose end mill and then semi-finish with an 8-millimeter ball-nose end mill. Then the machinist should finish mill with a new 8-millimeter ball-nose end mill to ensure all surfaces have a consistent surface finish. This practice also extends finishing cutter life and enables the machinist to use the finishing ball-nose end mill as a semi-finishing tool when the life of the finishing tool ends.

Use strong, precise toolholders. High-precision holders are crucial when hard milling to achieve maximum tool life. Run-out must be limited to less than 0.0004-inch to maximize tool life. Machinists can achieve this level of precision with most shrink-fit holders, milling chucks, high-precision collet chucks and select end-mill holders. A precise holder ensures process accuracy, whereas a less secure holder can cause unpredictable tool life and produce out-of-tolerance surfaces.

Follow recommended cutting parameters. Cutting data is optimized according to the tool's design and for specific material groups, as some common hardened tool steels present unique challenges, so machinists should use recommendations as a starting point. The machinist can make modifications depending on the application. MMT

CONTRIBUTOR

Jay Ball is the product manager for solid end mills for Seco Tools.

FOR MORE INFORMATION

Seco Tools / 800-832-8326 / jl.ball@secotools.com / secotools.com

YEAR IN REVIEW

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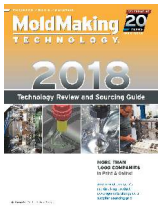

2018 Technology Review and Sourcing Guide

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