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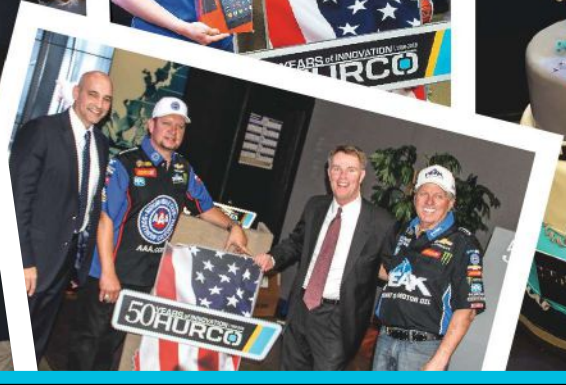

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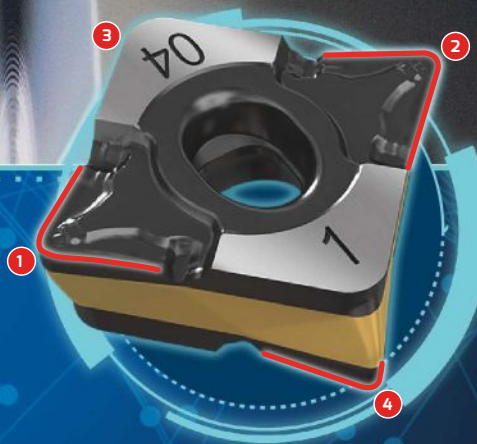

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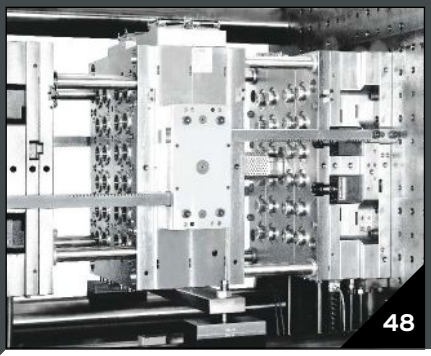

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ON THE COVER

Image courtesy of Westminster Tool. This month's cover shows Westminster Tool team members on the shop floor in Plainfield, Connecticut, applying emotional intelligence, personality profile and learning style tools to improve productivity, yielding better internal and external customer service. This culture change started more than four years ago when ownership decided it was time to face the skilled labor shortage head-on by using a unique hiring approach. See related feature on **page 14**.

Images courtesy of (left to right) Autodesk, Heidenhain, and Schmolz + Bickenbach.

VIDEO ACCESS

5 TRICKS OF THE TRADE
Great Tips from This Issue

1. People Matters
Behavior assessment tools based on a personality profile test help employees to better understand social and learning styles at work and home.
PG. 14.

2. Guiding Light
Simulation software helps engineers reduce material usage by guiding part and mold designs that require less material to create a part.
PG. 31.

3. Welding Wonders
More moldmakers and maintenance personnel are using fiber lasers rather than flash lamp systems because of the higher beam quality and low downtime.
PG. 34.

4. Double Duty
Engineers configured a waterjet into a five-axis machining center and used the TNC control features to create multiple setup kinematics for the milling spindle and auxiliary waterjet feature.
PG. 39.

5. Just Your Type
ESR martensitic plastic mold steel is not easily welded or nitrided, but it does have good corrosion resistance, toughness and machinability. It is also suitable for texturing.
PG. 48.

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What If?

What if your shop had a waiting list of people wanting to work for the company?

What if your shop created an atmosphere that helped everyone reach their greatest potential?

What if employees learned something new every day?

What if you could constantly move, interchange and train people as needed?

What if employees were not afraid to share failures and successes?

What if you improved the quality of life for employees?

What if you hired solely for character and core values and could train for skill?

These are only a few of the questions the owners of Westminster Tool, a small mold manufacturer in Plainfield, Connecticut, asked themselves as part of an exercise to help paint the picture of the shop they desired to be. The answers forced the team to change their hiring approach from one of simply filling positions to finding the right people to grow with the team (see feature story on page 14). Their goal was to be an employer of choice by creating a company where learning and development were top priorities and where the workforce was honest, caring and accountable. This goal required a focus on people with a foundation built on emotional intelligence, continuous learning and improvement, and accountability.

Does all of this sound like gibberish, hogwash, nonsense? Well, all I can tell you is: Seeing is believing.

The first time I discussed culture with Westminster Tool Owner and President Ray Coombs was about four years ago, around the time they entered (and won) our 2014 Leadtime Leader Awards competition. I thought it was all talk. How could what he was describing work? The second time I visited Westminster, I knew something looked and felt different, but I could not decide if it was good or real. The third time it not only felt right, but I saw the training in action. I witnessed two people resolving conflict using their emotional intelligence, learning style and DISC profile tools. I got it. Seeing it in action is believing.

I walked through Westminster's "What If" and witnessed it coming to life throughout the company. I saw employees applying the DISC profile tools on the shop floor and heard about employees applying them at home too. I saw the impact of simple measures when people are empowered to make a change. I saw seasoned experts working side by side with younger, newer employees while teaching each other. I saw young, unskilled talent in leadership positions making a significant impact across the company. I heard about the importance of self-management and self-awareness. I noticed the lack of job titles to encourage dynamic, flexible employees. I learned about Westminster Academy, a framework for defining and tracking the skills employees need to develop. But most impressive was seeing every employee I encountered exude the same pride and passion for his or her work.

So, what are your What If questions? Write them down and then take the answers and start creating the shop you want to be. MMT

Christina Fuges

Christina M. Fuges
Editorial Director

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THIS MONTH ON moldmakingtechnology.com

VIDEO: Interview with Westminster Tool

MMT Editorial Director Christina Fuges joined forces with *Modern Machine Shop* Editor-in-Chief Pete Zelinski and Gardner Business Media videographer Austin Grogan to create a video capturing the unique culture at Westminster Tool that enables them to have a waiting list of people wanting to work at the company.
short.moldmakingtechnology.com/EI2019

BLOG: Moldmaking in Austria, Italy, Slovenia, Germany

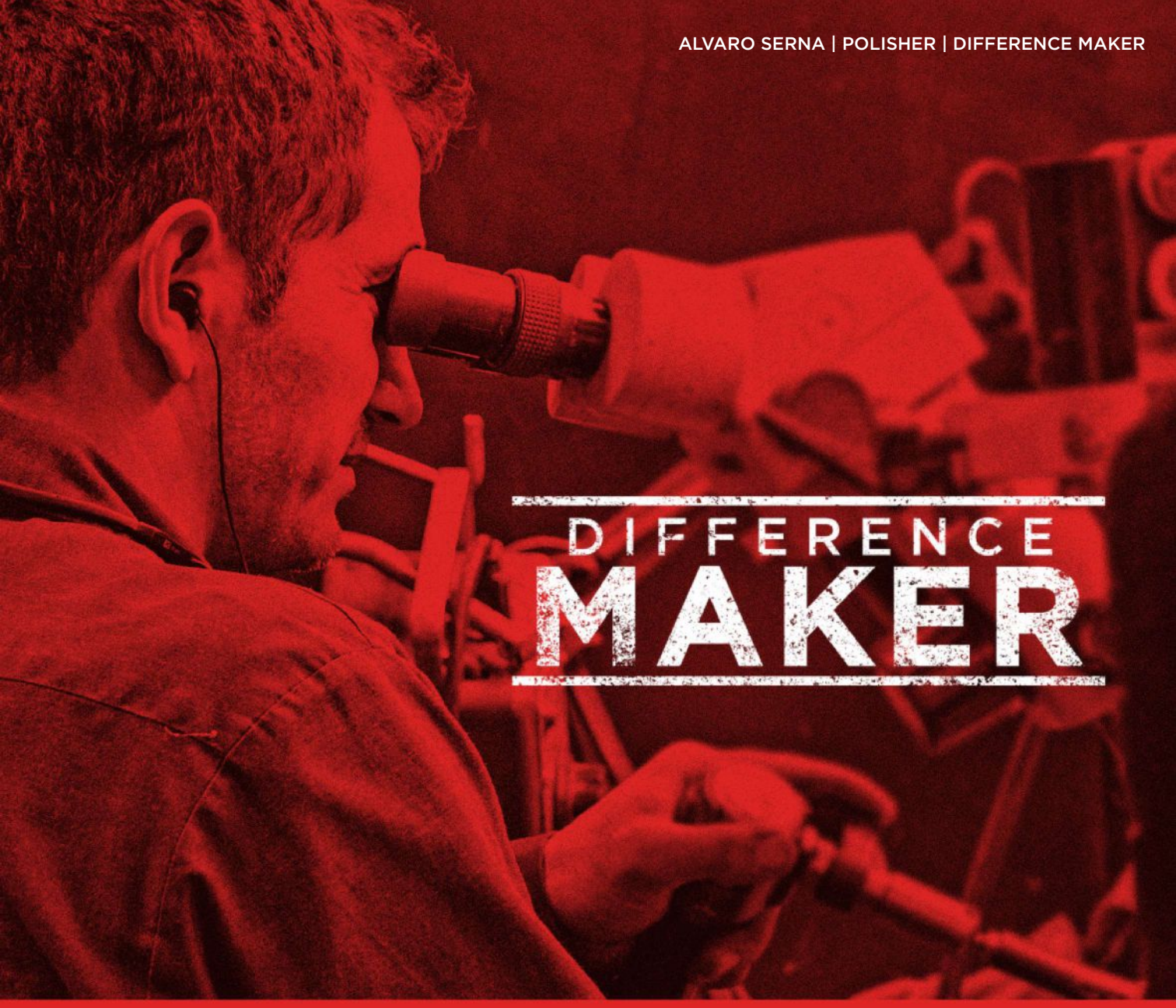
The German Association of Tool and Mould Makers (VDWF) set off on a four-day trip with MMT's European Correspondent Barbara Schulz to visit OEMs, moldmakers and mold shops in Germany, Austria, Italy and Slovenia.
short.moldmakingtechnology.com/vdwfgtrip

WEBINAR: Standard Component Options that Simplify Mold Designs, Reduce Costs and Speed Mold Building

In this free archived webinar, Hasco discusses how to used standard components to eliminate re-work and allow easy and error-free installation by the moldmaker.
short.moldmakingtechnology.com/standardhc

PODCAST: Interview with Legacy Precision Molds

MMT Editorial Director Christina Fuges sat down with The Manufacturing Alliance Podcast to get to know Tom and Tyler VanRee, the father and son team of Legacy Precision Molds. They tackled corporate culture, family values, succession planning and so much more.
short.moldmakingtechnology.com/vanree



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Additive Impressions

By Gabe Meldrum

A small team from International Mold Corp. attended IMTS 2018 specifically to learn about new advancements in additive manufacturing and 3D printing that we could incorporate into our day-to-day moldmaking operations. We discovered plenty of interesting technology in that space, but one standout was the variety of hybrid additive manufacturing machines. It seems more and more machine tool manufacturers are entering this arena.

I've had my eye on the Matsuura Lumex sintering and machining line for a while now. This machine has the potential to virtually eliminate the need for EDM, create self-venting steels and produce conformal cooling lines, reducing cycle times. The team also checked out the Sodick OPM 250L metal 3D printer, which is another hybrid machine that can print and cut at micro layers. Mazak and DMG Mori also displayed their hybrid machines.

The Matsuura Lumex machine has the potential to virtually eliminate the need for EDM, produce conformal cooling lines, reducing cycle times and create self-venting steels.

Another take on this hybrid approach to 3D printing is a metal print head that fits onto the existing tool changer of a CNC machining center. This option caught our attention because it does not require extra floor space for a new machine. You simply adapt your current machine for metal printing. Although we need to conduct further research to understand the required programming and software fully, we are considering this a viable option.

A noticeable trend with 3D printing technology, in general, was automation. Most additive manufacturing machines are fully automated with the intention of supporting production-line manufacturing, with different stages of the process occurring inside the machine. For example, printing in one area of the machine while simultaneously cleaning or heat treating in another area.

We also took a look at the current state of plastic 3D printers. Applications seem focused on automotive, but I believe this technology is a better fit for parts that do not undergo the stress and testing involved in automotive parts manufacturing. It will probably take time for the automotive industry to fully buy into the plastic parts these machines produce. The size of these machines' build platforms is increasing, and so are the speeds. The initial price tags, on the other hand, are coming down every year.

International Mold Corp. has not yet invested in any additive machine technology, as the company is focusing on other growth areas. However, we are committed to staying on top of technology advancements in this area so that we are well informed when it is time to invest. MMT

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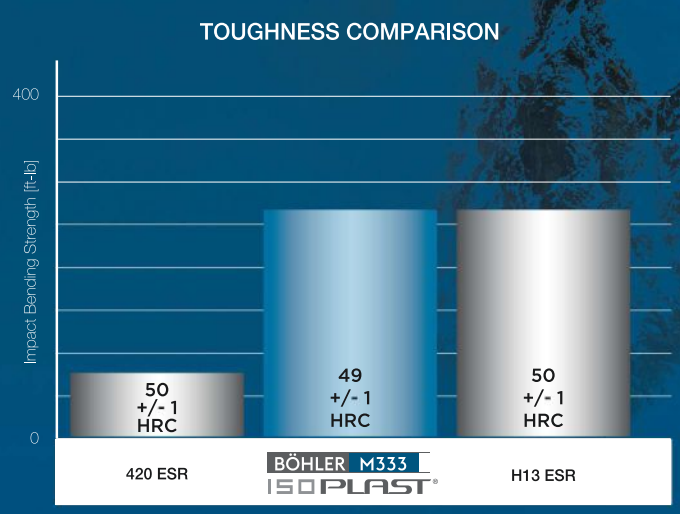

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A Conversation with ...

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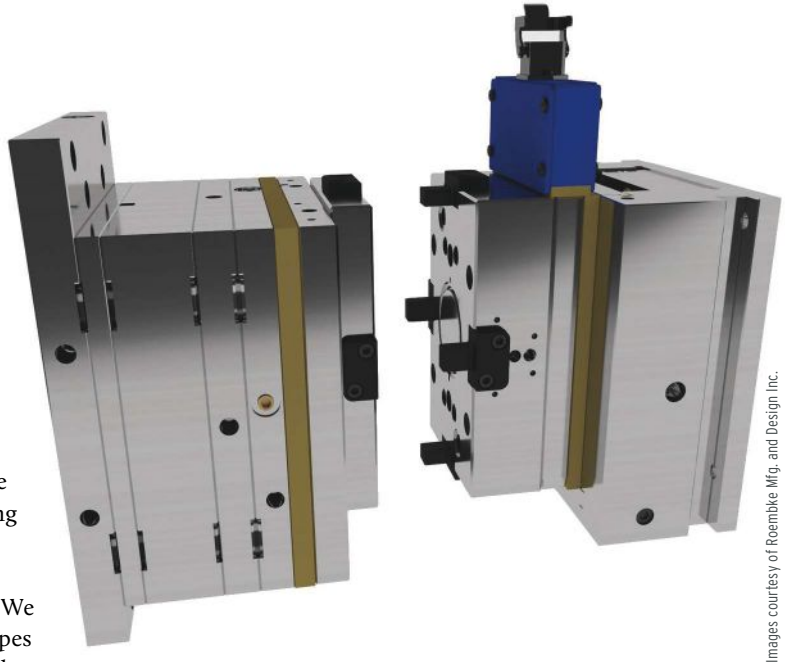

Images courtesy of Roembke Mfg. and Design Inc.

Roembke Mfg. and Design has been dedicated to building molds for rubber products, including liquid silicone rubber and high consistency rubber, since opening its doors in 1977. Through the years, the company has also developed proprietary systems, like this Quick Prototype system, to assist customers with precise design and development of their parts.

Explain Roembke's history and expertise for building molds for rubber products.

Adam Shaal, Business Development Manager: Since opening our doors in 1977 we've always focused on building molds for rubber parts. In the beginning much of it was for automotive use like brake seals, wire harness connector seals, noise and vibration-dampening parts, with mostly wasteless, flashless transfer tooling for the automotive industry. Then in the mid-90s we started to build molds for liquid silicone rubber (LSR). We believe more than 40 years of experience with these types of molds sets us apart from many other moldmakers who started out in thermoplastics and then transitioned to LSR as many high consistency rubber molders began to transition to fully automatic LSR molding.

LSR is a very specialized product, and it takes a lot of experience to build a proper liquid silicone mold because the tolerances that are required to ensure you're building a flashless tool necessitates excellent, skilled employees and top-notch equipment. It's quite a bit different than your traditional plastic injection molds. For example, one of the biggest differences involves the flash point. With liquid silicone, if you have a mismatch or an air gap between your cavities of down to 0.0004 inch, you're going to get flash. Basically, if air can get out then the silicone can get out. Whereas with thermoplastics, you can be upwards of 0.001 inch before you'll see flash because of the material differences and because you're running at lower pressures with thermoplastic.

There are three different types of silicone. The first is room-temperature vulcanization (RTV) silicone that is used for caulking. RTV silicone cures very fast once it is exposed to air. The second level is high-consistency silicone, which is a pre-mixed formulation that cures in-mold with the application of pressure and temperature. It is often used for automotive engine components, extrusions and parts that see heavy compression/decompression cycling. Then there is LSR, which is not premixed. Instead, at the molding machine you have two drums of material. One part contains a platinum catalyst that when mixed kicks off a chemical chain reaction causing the material to cure. Because of this formulation, LSR cures much faster than high-consistency silicone, which is an advantage, especially when cycle times are considered. With high-consistency silicone, you are typically looking at three to five minutes per cycle, but most LSR processing times are around 30 seconds. LSR is heavily used in the medical industry because, so far, no allergies have been indicated like they are with latex. In addition, LSR is processed using a closed system that doesn't require direct material handling or open air exposure until after it has been fully cured.

ROEMBKE MFG. & DESIGN, INC

1580 Baker Drive
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roembke.com

- Founded in 1977 by John and Betty Roembke. Their son Greg is now owner and president.
- Specialty is building molds for the silicone and rubber industries, with a focus on quality, capability and delivery.
- Internal applications center allows the completion of full Factory Acceptance Trials (FAT) prior to mold shipment.
- Developer of proprietary cold deck systems, nozzles and quick-prototyping systems.
- Sells molds and complete molding systems worldwide.

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How does Roembke ensure customers' successes with molding tricky and complex rubber parts?

Shaal: We offer everything from cold-deck systems and quick prototype systems to full production molds and complete, automated turnkey molding cells.

Our proprietary cold-deck system is the equivalent of a hot runner system in plastic. Our customers tell us our systems are much more balanced than other cold deck solutions and they are getting even material flows. But the other thing that sets us apart is we find that our cold decks have a more efficient cooling system. For example, if something happens and the power goes down in the plant, our cold decks can sit a long time before the material cures up. Given that we have the applications center, our guys must live with these systems every day, so we are constantly improving on our cold decks and we have an eye for maintenance and ease of use on these systems, which trickles down to cost savings for the customer.

Roembke Mfg. built a 7,000-square-foot addition to its Ossian, Indiana, applications center to accommodate increased demand for full, turnkey molding systems, including many with automation. The applications center allows the completion of full Factory Acceptance Trials (FAT) prior to mold shipment.

We have full-time application and process development engineers where all they do is test molds that we've made, run trials and sample parts for customers, and debug turnkey molding cells. When you order a mold from us, we are going to run it and test it and get parts from it to ensure it works before we ship it to you.

Roembke has also developed a proprietary Quick Prototype System (QPS) that can be used for both LSR and HCR (high consistency rubber) materials. We prototype parts so that they are molded exactly as they would be in a production setting. This gives our customers the ability to take these parts and put them through true clinical trials or environmental testing versus having a part made from any available material just to get something into a customer's hands. Oftentimes customers will request 5,000 or 10,000 sample parts to get them through their trials while we're building the production mold. We call it a quick prototype, but we build it the same way we would build a production mold using the same steel, same hardness to give them the best chance of success to develop their part.

There are risks when going from a lower grade prototype straight to production. These include parts not functioning due to dimensions. For

example, the part may shrink differently between the two methods. One customer chose to have an aluminum prototype built elsewhere and then tried to go straight to production and the parts failed because the characteristics of the molded part from the cheaper prototype tool did not function the same in a true production setting. The part had excess flash. With our QPS, we can run trials and ensure the automation is going to work and that the parts are going to stick where they need to stick. We know the shrinkage is going to be there. Our customers can test different materials in the prototype tools, and they can take the cavity inserts out of the prototype mold and put them in a production mold and they will work exactly the same way.

Regarding the turnkey systems, we're seeing them really taking hold in the market. In fact, our application center was filled with customers' presses, so we recently added another 7,000 square feet to the building that is dedicated solely for constructing turnkey molding cells. That's the biggest area we're investing in today, with the second biggest focus being on our automation division.

Roembke can build several types of automated systems. It could be simple, end-of-arm tooling to help remove parts from the mold. It could be complex automation with six-axis robots to not only remove the parts from the mold but then maybe do secondary operations at the machine. We also develop downstream automation. For example, a customer might be taking the molded parts and sending them through some form of a secondary operation like adding a slit feature. It could require inspection with cameras, parts assembly—there is a wide range of options.

What is Roembke doing to leverage its expertise in molds and molding rubber products?

Shaal: We partner with the material suppliers and press manufacturers. At trade shows we typically have one or more of our molds running demonstrations in their booths. They also provide us products to test before it becomes commercialized because they can do real-world testing in a true production environment to see how the material is going to react in different situations. But they also want to learn if it's moldable, how clean it molds, how efficient it molds and things of that nature. They provide us with a sample kit and we run parts for them and provide feedback. It's the same thing with press manufacturers. For example, when ENGEL was developing its X-Melt Technology for LSR, they conducted trials with us at our shop to see how it would work. It's a big advantage for us because many times that's where customers start in rubber molding, either with the material or the press.

We have also entered into the training process, and years ago we partnered with RJG Inc. RJG always had their systematic molding for thermoplastic, but they wanted to develop a class focused on liquid silicone. They spent several weeks at our facility when we were doing multiple studies experimenting with different scenarios of LSR molding and we supported them as they developed their training program for LSR. That class happens at our facility at least twice a year now. MMT

FOR MORE INFORMATION

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By Kylee Carbone

VIDEO Access the related video under the Videos tab at *MMT* online.

TRAINING REDEFINED: A Three-Pronged Approach to Solving the Skilled Labor Shortage

A mold builder uses a solid on-boarding program, personality profiles and learning styles to quickly and effectively grow its own skilled workforce.

Workforce development in manufacturing is no longer a buzzword; it's a necessity. This became evident for Westminster Tool five years ago when we failed to fill a toolmaker opening. While our outreach efforts resulted in more than 100 applicants, only four people were qualified candidates, none of whom could satisfy the position due to their availability and location limitations. This lackluster response was the wake-up call that opened our eyes to the value of developing our talent internally.

This realization resulted in a paradigm shift for the company. We switched our hiring approach from filling positions to finding the right people to grow with our team. We needed to hire for character and provide efficient and effective training for skills. Our efforts focused on collaborating with outside support to develop educational programs at local community colleges, develop an internal training program (Westminster Academy) and establish a business philosophy committed to growing people.

In just five years Westminster Tool has completely altered the way we do business. Our core focus shifted from being the smartest to the most curious, and we now strive to identify challenges before they occur. Most importantly, we moved from having stagnant positions to being a dynamic team that is constantly learning and improving. We built strong connections within our community and school systems to ensure we get the best and brightest, and we created a strong internal training program to help them recognize and reach their greatest potential. While our average age has decreased by nearly 20 years, our throughput per person is at the highest it has ever been (by over 60 percent).

Although there were many challenges during our journey to becoming a training organization, the following three initiatives were critical in helping us address the skills gap.

1. On-Boarding Program

We believe it is important to help new employees understand that our number one focus is the consistent growth and development of our people, not being the best at one job. We created a robust on-boarding experience to help new employees better acclimate to this culture. We also make it evident

Images courtesy of Westminster Tool.

The proof is in the numbers. When Westminster Tool changed its hiring approach four years ago, the average employee age was 51. Today it is 35.

Local orientation focuses on the new hire working in his or her area, and acclimating to the company and culture.

to new hires that the company has been eagerly preparing for their arrival by ensuring each employee has the tools he or she needs to be successful, such as an email address, network login, a key fob to access the building and some Westminster Tool swag.

We use the first few hours to review necessary human resources forms and provide a tour of the shop, their initial location, the lunch area and bathrooms. It's all about making the new hire feel welcome and comfortable. Each new hire moves through the same orientation process when joining our team, whether the company hired them as a vice president or production technician.

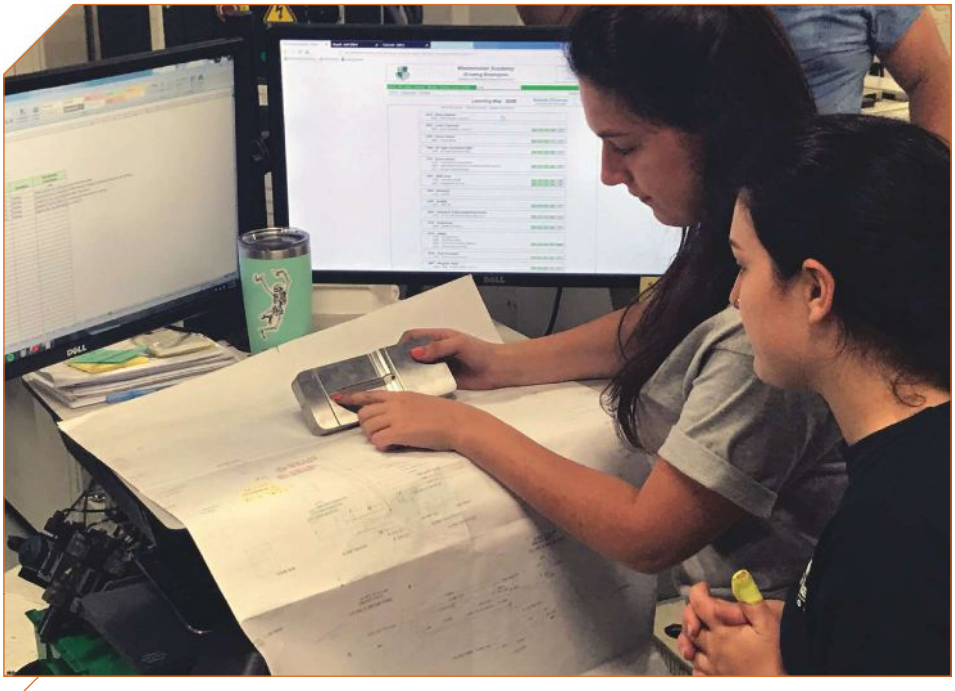
Next, we jump into global and local orientation. *Global orientation* refers to the cultural aspects that all employees must become familiar with to achieve success at Westminster Tool. The Westminster Tool Direction is the key component of global orientation, which includes the company's vision, core values, mission, culture and key performance indicators (KPIs).

- *Vision*: Create a sustainable business environment which improves the quality of life for all who interact with Westminster, while growing employees by helping them to recognize and achieve their greatest potential.
- *Mission*: Westminster Tool is committed to providing a positive customer experience by engaging our customers in identifying their challenges. Westminster's dedication to individual growth is the foundation of success that allows us to deliver manufacturing solutions that exceed customer expectations.
- *Core Values*: Dynamic, Motivated, Curious, Integrity
- *KPIs*: On Time, First Time, On Budget, Customer Service

This aspect of orientation helps ensure that each new hire can communicate the who, what and why of Westminster Tool because that is our organizational compass. For example, when employees decide between doing x or y, they must consider whether the choice aligns with the company's vision and mission. Employees with this level of understanding become a team working toward the same vision of success. We have a written test that measures an employee's level of proficiency on the Westminster Tool Direction that we administer two to three times a year. The current company-wide average on the test is 90 percent. We also use global orientation to review Westminster's services, main customer base, internal systems and improvement system. We spread global orientation over the first five mornings of employment to avoid overwhelming new employees. In the afternoons the new hire is working in his or her area, attending local orientation and acclimating to the company and culture. *Local orientation* is specific to the new hire's position.

Westminster Tool provides continual DISC training, so employees can understand their strengths and weaknesses, identify other styles in people, and adapt themselves to meet the needs of others.

Another key component of Westminster's on-boarding involves eight hours of training on personal development, which includes emotional intelligence, personality profiles, learning styles, lean manufacturing and DMAIC (Define, Measure, Analyze, Implement, Control). Emotional intelligence is the ability to maintain curiosity about another person which is critical to learning and improving the organization. It is impossible for someone to improve if they always think they know the answer. Personality profiles help employees to be curious about another's



Most of the employees at Westminster Tool are kinesthetic, which means they learn best with a hands-on approach and by completing tasks.

Change Isn't Easy

The journey to becoming a training organization did not happen overnight. It required a tremendous amount of grit for the Westminster team to push through the challenging times. It was not easy convincing a rock-solid team that it needed to adapt to being dynamic and curious, especially when most of the team members took a job so they could be the best at the one job for which they were hired.

An equally challenging part of this journey was successfully hiring people who embodied our core values. Through our failures, we learned that it is not as easy to teach someone how to embrace core values as it is a skill, which makes it difficult for them to succeed on our team. We had to completely alter our recruiting and hiring process to focus on finding candidates that would easily integrate into our team to overcome this challenge. What used to be a one- to two-interview process became a 3- to 4-interview process with the first two interviews focusing on core value alignment, not skills and abilities.

All in all, the biggest challenge in making this evolution successful was ensuring that our people were on board and as invested as leadership. Two years into our journey Simon Sinek's book "Start With Why" taught us that before we could move forward, we needed to help every single one of our team members to understand and become as enthusiastic about why we were on this journey, and the importance it played in the sustainability of our organization. Hence, the birth of our Westminster Direction and On-boarding Program.

point of view by understanding that different does not mean wrong. Learning styles ensure we provide training in the best format for the trainee to retain the information. Lean manufacturing ensures we are a continuous-improving organization that is constantly seeking ways in which to eliminate waste and flow value to the customer. DMAIC is a standard problem-solving process used to ensure that we have a universal tool and language for remaining data-driven versus opinion-driven.

While this may seem like a lot of information to cover in a short period, the approach continually evolves to make it easier for new employees to grasp concepts. For example, we now provide additional training at 30-, 60-, and 90-day intervals on orientation topics as well as refreshers through on-the-job training to ensure we maintain a pulse on a new employee's performance and understanding. Those first 90 days are critical to succeeding at the company in the long term, so we take check-ins and feedback very seriously during this period. Most recently, we incorporated periodic testing to ensure that they are retaining and utilizing the information they learned during orientation. This testing provides a great opportunity for us to intervene and re-train before an employee forms inaccurate habits.

Westminster Tool provides training on learning styles because it further improves communication and increases the speed of learning.

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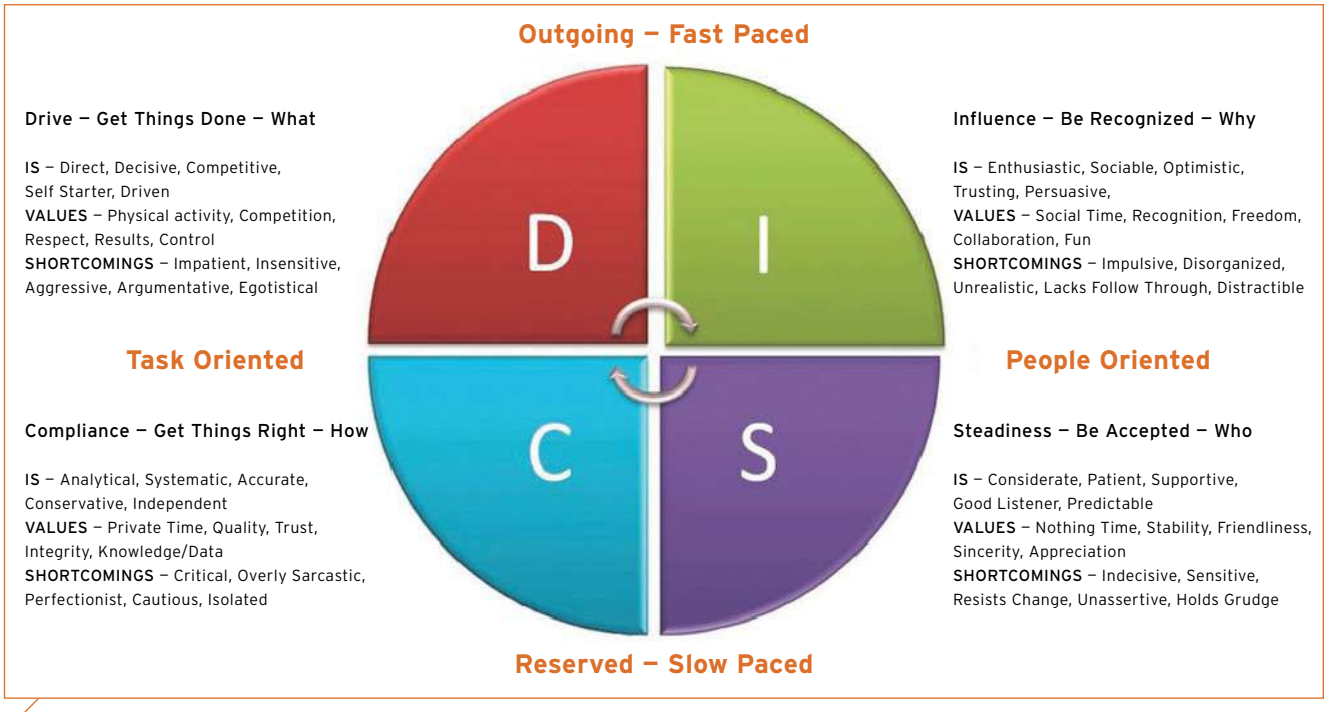


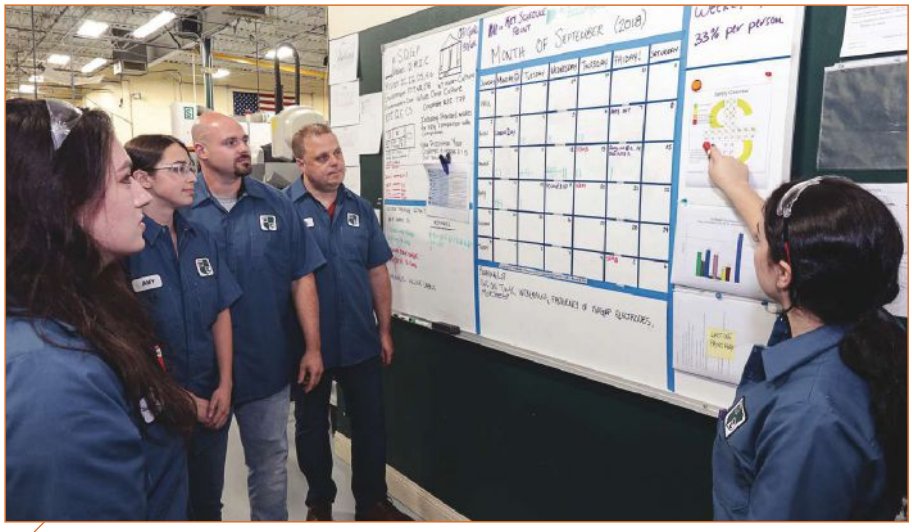
Chart courtesy of Superwoman.ca.

DISC is a personal assessment tool used to improve teamwork and communication by better understanding oneself and others.

2. Personality Profiles

Emotional intelligence is the foundation of Westminster Tool, which demands that we provide employees with tools to help them become more self-aware and curious about another person's point of view, embrace peoples' differences and understand the value that each personality type contributes to the overall team. Emotional intelligence is critical to becoming a learning organization. If an employee assumes he or she knows everything, always has the answer or is always right, it is nearly impossible to help him or her learn and develop new skills. To be successful in rolling out this concept, we use an array of tools to help our employees minimize judgment.

One of the key tools we use is DISC, a behavior assessment tool based on a personality profile test comprising 28-word groupings. Participants identify the words in each group with which they resonate the most or least, ultimately providing a comprehensive profile based on four behavioral groups: dominant, influence, steadiness and compliant (see **chart**). The results not only identify primary and secondary personality traits but also help employees to better understand how they function in their natural state, at work, and how others perceive them. These results provide a detailed explanation of the strengths and weaknesses of each personality type and recommended approaches for working with different personality types.



Westminster Tool switched its hiring approach from filling positions to finding the right people to grow with the team. They began to hire for character and train for skill.

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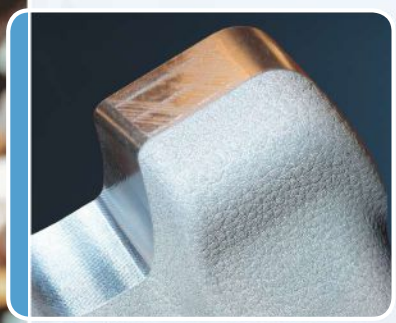

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There is no right or wrong DISC style. Each one has positive attributes that are essential for an individual or team to be successful. Employees are better equipped to navigate conversations when they understand the context of how and why people are different. Westminster provides annual DISC training, as a basic refresher course and to build upon current knowledge. DISC has helped Westminster employees understand their strengths and weaknesses, identify other styles in people, and adapt themselves to meet the needs of others. For example, when an employee is teaching someone a new concept, he or she sets his or her pace and style based on the needs of the "follower." So, if a High D (dominant) trainer who focuses on the big picture needs to teach a High C (compliant) person who is detailed-oriented, simply providing the High C with a high-level overview of the concept will not be successful. The High D must start with the details and work up to the big picture for the High C to receive and process the information effectively.

3. Learning Styles

A learning style is a manner in which a person is best able to learn and retain new concepts. Westminster Tool provides training on learning styles because it further improves communication and increases the speed of learning. The three styles are kinesthetic (learning by doing), visual (learning by seeing) and auditory (learning by hearing). Each person tends to have a dominant learning style for learning new concepts, but everyone is capable of learning through all three styles.

At Westminster, most of the employees are kinesthetic, which means they learn best with a hands-on approach and by completing tasks. This insight helped Westminster develop the most effective training for each employee. For example, insisting a kinesthetic employee sit through a presentation to learn a new concept is not going to yield the desired result quickly. However, when we develop training content for a group environment, we incorporate all three learning styles into the training.

> Even better is when you combine an employee's learning style with his or her personality profile. Westminster uses this strategy to greatly reduce the time it takes to train someone effectively.

Even better is when you combine an employee's learning style with his or her personality profile. Westminster uses this strategy to greatly reduce the time it takes to train someone effectively. The trainer, not the trainee, is responsible for flexing their delivery to the mode that supports their trainee. Learning styles are also a valuable tool for improving interpersonal communication. When an employee understands the learning style of a co-worker, he or she can tailor their delivery to suit that person's need. For example, speaking to someone who is a visual learner is not going to be as impactful as if you communicated via an email or a text.

Bringing it all Together

Integrating new employees as quickly as possible has been the key to success in addressing the skills gap at Westminster Tool. The proof is in the numbers. When we changed our hiring approach five years ago, the average employee age was 51, and we could not find qualified help. Today, the average employee age is 35, and the infrastructure exists to hire for character and train for skill, which includes proper on-boarding and using personality profiles and learning styles to refocus training and communication efforts. MMT

VIDEO: To Solve the Skilled Labor Problem, Change the Culture

MoldMaking Technology Editorial Director Christina Fuges teamed up with *Modern Machine Shop* Editor-in-Chief Pete Zelinski onsite at Westminster Tool in Plainfield, Connecticut, to experience the company's unique culture, and then digitally capture the spirit of the environment to share with the rest of the manufacturing community.

Take a look at this special video project as we go inside Westminster Tool and meet the owners and employees using their emotional intelligence, personality profile and learning style tools to make it all happen.

We also want to send a big THANK YOU to the entire team at Westminster Tool for inviting us into their "house," and allowing us to disrupt operations for a couple of days to share their story.

VIDEO: short.moldmakingtechnology.com/EI2019

CONTRIBUTOR

Kylee Carbone is director of talent development at Westminster Tool. Kylee also serves on *MMT*'s editorial advisory board.

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ING. GERARDO TRUJILLO
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General Manager

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ING. LUIS LIZCANO
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CEO

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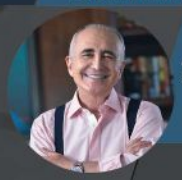

ING. PEDRO FERRIZ
Journalist, Lecturer / Speakser and Mexican Businessman

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By Cynthia Kustush

Today's Workforce Needs More than Metalworking Skills to Thrive

Three mold manufacturing companies share how their workforce development strategies have evolved to meet the needs of today's industry.

Image courtesy of Dramco Tool Co.

MoldMaking Technology has covered a variety of workforce development programs in recent months. Across North America, these programs often reveal a common thread of collaboration and mentorship. We interviewed three shops to find yet more commonality: Shops are expanding their outreach to younger candidates and are teaching life skills in addition to moldmaking skills.

Forging Career Pathways in High School to Produce a Better-Prepared Workforce

Apprenticeships work a little differently in Grand Island Nebraska, the location of Dramco Tool Co. Larry Patten is an owner of Dramco, which specializes in building dies and injection and compression molds with capacities ranging to 1,000 tons. The company has a 37,000-square-foot facility and employs 45 workers, three of whom were recently hired out of a local community college. "We have never had a formal apprenticeship program at Dramco," Patten says. "A number of years ago, we started to focus on hiring students from a two-year technical college program to work part-time in the shop. We offered them the possibility of full-time employment *after* they had taken the required courses and graduated."

In the past, Dramco typically hired about 90 percent of its employees after they had graduated with advanced, technical manufacturing degrees. The new hires came out of community college having learned basic machining skills, Patten says, and they had learned how to build and run a basic mold. That recruitment scenario has changed in recent years.

In 2009, Dramco became part of a task force that would ultimately develop Nebraska's first Career Pathways Institute (CPI), which is geared toward providing career and technical training for students in the Grand Island Public School District and surrounding rural districts. Patten says that it took four years for the CPI to open its doors (it occupies a 66,000-square-foot manufacturing plant formerly owned by Pentair). The opening of the CPI provided new opportunities for Dramco to recruit students at a younger age. This is because high school juniors and seniors gain exposure to manufacturing skills via the Skilled and Technical Sciences pathway, which is one of 10 career pathways that the program offers. Budding machinists, tool and die makers, engineers and others learn entry-level job skills in an industrial setting that sets them on a pathway for success in their chosen career or prepares them for continuing education opportunities like college. They learn

Fredy Nevas (right) is a senior in high school. He has been working part-time at Dramco for about a year and then was able to work over the summer to learn various moldmaking-related skills. Here, he is helping to form laser-cut parts on the company's press brake.

Image courtesy of Dramco Tool Co.

This student is one of Dramco's newest employees who is involved with the apprenticeship program. He is a junior in high school and attends the Career Pathways Institute. He has been working part-time at Dramco for about three months and is shown here honing his skills on a bandsaw and cutting up stock for a new project.

about manual mills and lathes, machine tools, CNC machining, surface grinders, welding and more using the latest equipment from companies like Haas Automation (Oxnard, California) and metalworking-machine supplier Productivity Inc. (Omaha, Nebraska). Guest speakers, facility tours and hands-on activities help to round out the curriculum. "Since our Career Pathways Institute opened, at least four more have opened across Nebraska that operate in a similar way," Patten says.

"Instead of working only with high school graduates through the community college programs, we're now starting sooner with high school juniors," Patten says. "We bring them into our shop during the summer and after school to work part-time. It is important to get our prospects incorporated into the shop culture. They establish relationships with the current employees and become a part of the Dramco Team, which eases the transition from school culture to work culture. In turn, they can put some of the new skills they learn with us to use in the CPI program while they are still in school."

Upon graduating high school, the students go directly into the community college program. They have already earned the first semester credit because of their participation with the Career Pathways Institute. While there is no guarantee of full-time employment, Patten says that during the remaining 1.5 years at the college, Dramco still brings apprentices in to work part-time. "We will typically have three to five apprentices working here at any given time, doing work that ranges from keeping the shop clean to doing basic CNC machine work. It gives us the opportunity to choose who we want to hire at the end based on 3.5 years of experience that we have working with them in our shop," he says.

Dramco works with the instructors at the college (one of whom is a former employee who wanted to teach) when they are looking for new talent or when the school needs some assistance. For example, Patten and his partners visit CPI from time to time to interact with the instructors and the students. Dramco employees answered the call for help with a specific area of programming or machining, and the company has helped with building small tools or shop equipment that the school needed. "We also serve on the advisory boards of both CPI and Central Community College (CCC) to give advice on curriculum and program focus," Patten says. "When a program like this is tuned in to the needs of the industry, it helps companies like Dramco to be very successful."

Last November, the State of Nebraska implemented an apprenticeship policy that allows apprentices as young as 16 or 17 to perform basic machining like grinding, deburring and some milling work while learning a trade. Previously, the law required younger employees to wait until they were 18. Patten says that this affords his company the chance to teach apprentices not only basic machining, but the value of working efficiently and what it takes to complete a job on time. "We're selling time, so it is critical that a new employee understands that it makes a big difference on the profit side if he or she finishes a job in a half-hour versus an hour. That's a concept that individuals don't always get," he says.

Dramco has a scholarship program designed to help students as they go through their apprenticeships. "We budget annually for several $500-scholarship awards, some of which are awarded through the high-school CPI program," Patten says. "We also work directly through the community college, letting them know that we have scholarships available, and they will send us candidates. Other times, those who are working for us part-time will get scholarship help."

Apprentices who graduate and are hired full-time at Dramco spend the first year further honing their skills based on the company's tiered work system. Patten says that there are three designated tiers of toolmakers ranging from entry level to lead toolmaker. Each tier lists the skills and recommended tools required to excel at that tier. For example, a Tier 2 toolmaker hired right out of school can begin working with a lead toolmaker straightaway. "We try to tailor each employee's position within the company to his or her personality and skill set. We are finding that most employees that we hire out of school have rendered our Tier 1 classification useless since they are starting with skills required for Tier 2. The jump to Tier 3 is focused on better decision making and skills that are learned from experience as opposed to what might be termed as basic toolmaking skills. Our goal is to challenge every employee according to his or her individual capabilities. Working with these new programs has resulted in fast-tracking our new employees into productive employees sooner than in the past," Patten says.

Blazing Multiple Trails to Successful Recruitment and Training

MSI Mold Builders (MSI) in Cedar Rapids, Iowa, has a system in place for attracting, recruiting and training new talent that will become its lifeblood for the future. This three-time Leadtime Leader honoree has shared many of its best practices in features published by *MoldMaking Technology* but until now has only provided a glance into its workforce development program.

It should be noted that at last year's American Mold Builders Association (AMBA) annual conference, MSI became the second recipient of the organization's national Tooling Trailblazer Award. AMBA uses the award to honor a member shop that has made a notable impact on the industry through various educational outreach programs. Along with an award to display, MSI also received a $5,000 scholarship check from Progressive Components (Wauconda, Illinois) and has donated it to Kirkwood Community College (KCC), a Cedar Rapids-based institution with which MSI has had a longtime partnership supporting advanced manufacturing and CNC education programs. "It feels great to win this award, especially because it comes from the AMBA and our peers," MSI President Roger Klouda says. "A lot of companies are working hard to promote moldmaking and advanced manufacturing careers at the educational institute level, and for AMBA to recognize us among this group is extra special."

Klouda says that historically, MSI's relationship with KCC goes back at least 40 years and that a good percentage of his employees have come through the training there. "A lot has changed since the early years. Back then, more traditional training was available. Today, people are more specialized in the jobs that they do," he says. "In fact, to stay alive years ago when there were not enough mold shops in the area to have much of a formal apprenticeship program, the companies that were here got together and worked with the State of Iowa to organize training via the Iowa Cable Network (ICN)." He explains that through this collaboration, several high schools and colleges worked together to provide live training over closed circuit television. "Apprentices had direct interaction with the instructors. We would have an apprentice in Fort Dodge or five apprentices from Cedar Rapids, one in Belle Plaine, two more in Des Moines and different people from different companies trained everyone over the ICN. It worked really well until about 2000 when the industry went to hell and everyone stopped hiring."

Klouda says that in 2001, MSI made the transition from a trade-based to a production-based system when the company assessed and reassigned employees to departments where the employees could specialize and excel. The company's apprenticeship program evolved as well, and by about 2008, it became the intern-type program that is in place today.

MSI's intern-style program is like more traditional apprenticeships in that new recruits are expected to attend classes at KCC or another approved local college while also gaining hands-on experience in the shop. But, that is where the similarity ends.

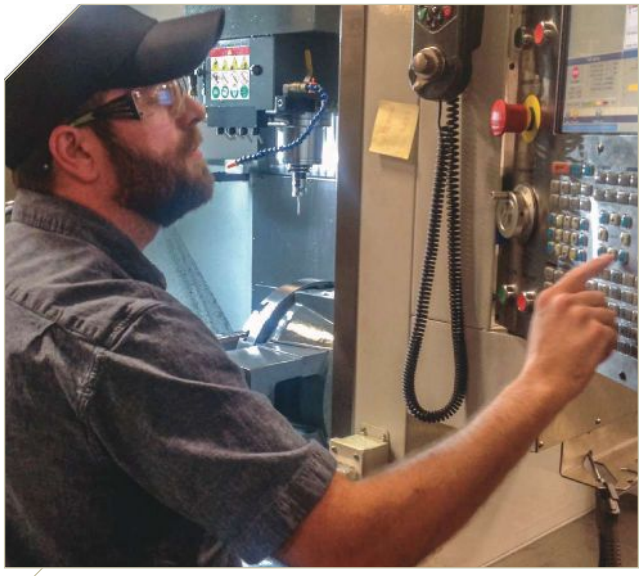

Image courtesy of MSI Mold Builders.

MSI Mold Builders has a dedicated cell composed of all Haas CNC machines for making mold components. It is part of the company's internship strategy in that the interns learn on Haas machines at the community college and can apply what they learn while working in the shop without missing a beat. Here, Shaun Mabe, who just graduated from MSI's program in May 2018, operates the company's UMC 750 CNC machining center as a full-time employee.

"Apprentices are required to work a minimum of 15 hours per week at MSI and attend at least 90 percent of their classes while maintaining a grade of B or above in every class," Dale Larsen, MSI's human resources director, says. "That's the bare minimum requirement for being hired for a part-time internship here. When we hire an intern, we will support his or her training all the way through two years of training (or three years if he or she starts as a high school senior) after we have been able to assess how the intern balances class load, workload—really the whole work-class-life balance." Larsen adds that when the intern reaches the final semester at KCC and is performing well and learning well, there could be an opportunity to become full-time, working more than 30 hours per week and getting full-time benefits.

Klouda adds, "KCC has a number of endowed scholarship funds so that almost any kid who enrolls in the CNC program is going to get a scholarship. MSI pays 100 percent of what is not covered by scholarships."

For its working students, MSI has a dedicated cell composed of all Haas CNC machines for making mold components. The main reason for this is the college teaches them on the same equipment. "They come here from class and they can go to work immediately on these machines," Eric Kolsto, production

manager at MSI, says. "They know how to run them, so no training is required in that regard, and that is by design so that they can just move from machine to machine and it is seamless. Granted, they are building a lot of low-value parts, and it's structured that way on purpose because that's how we want them to cut their teeth, so to speak. If they make a mistake, we're scrapping a $10 part versus scrapping steel that is worth tens of thousands of dollars."

Over the years, MSI has had as many as 11 interns training to become moldmakers. Currently, five are at its Cedar Rapids headquarters, and two are at its Greenville, South Carolina, facility. At times, the company has had interns that are not interested in becoming moldmakers but are important to every other area of the business. "We've recently hired IT interns who assisted with web design. We've also hired industrial maintenance interns and mechanical and industrial engineering interns," Larsen says. "Then, we may do a 90-hour internship with high school students in a number of areas like administration or sales and marketing or things like that. We also host half-day or all-day job shadows and have had parents ask if their son or daughter can hang out with us and see what we do. It's all about trying to generate interest in the manufacturing industry and then in MSI."

MSI places the informal expectation on interns that they replace themselves after a year of training by recommending fellow students at KCC. "We want the program to be self-sustaining. In addition to having a very good relationship with the CNC instructor at the college, who alerts us to potential candidates, our current interns tend to know who might be good at what we do," Larsen says. The company has gained several interns as a direct result. MSI also hosts frequent tours at its Cedar Rapids plant. "Last year, I brought more than 400 college and high school students, their teachers and parents through our facility, explaining everything that we do, how it works and what it takes to get into this field," Larsen says. "Parents are one of the most important spheres of influence for anyone we are trying to bring into this industry—particularly mothers. We believe so strongly in what we do, and we are always willing to invite parents to meet with us. Honestly, it goes extremely well probably 95 percent of the time."

Some Push, Some Pull and a Lot of Passion

Janler Corp. in Chicago, Illinois, is a second-generation, family-owned company with a long and active history in the moldmaking industry. The company specializes in the design and development of complex injection molds and offers in-house injection molding services. It is critical that the company's pipeline of new talent flows with young apprentices that exhibit, as Janler President Carol Ebel puts it, a willingness to pull work and push forward—with a lot of passion.

"Janler has re-instituted its formal apprenticeship program, and management is committed to continually working on content to make it more effective for training the workforce of the future. The program is a work in progress that began over 60 years ago when the company was started in 1952," she says.

Ebel explains that Kurt Mohrbacher, Janler's operations manager, recommended a document that lays out the commitment of the company and employee—laying down the framework of the relationship. "It states our commitment and asks for the apprentice's commitment, and it identifies the pathway to success for a young person interested in becoming a precision machinist or moldmaker," she says. "As we resurrected our apprenticeship program, some of the questions we asked included: What are the outcomes desired today and for the future? What are the current building blocks of the training? Where do we start? In earlier days, an apprentice started in the clean-up area and maybe on a drill and then a Bridgeport. Now our people are learning on CNC lathes and mills, and they learn the old with the use of new technologies. Our apprentices are performing work that adds high value very quickly as a result."

Essentially, the program incorporates formal training that Technology and Manufacturing Association (TMA) provides. The training has a three-year apprenticeship program, combined with community college classroom and lab training, plus mentoring and hands-on experience in the different departments at Janler. The company expects that an apprentice will spend more than 1,000 hours in each of the different departments to obtain, at a minimum, a solid base understanding of the different machining processes and outputs.

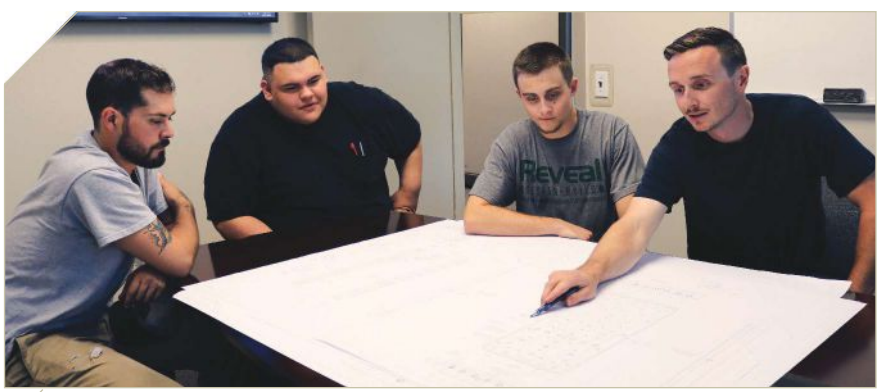

Image courtesy of Janler Corp.

Janler Corp. apprentices (from left): Michael Shogren, Audy Romo and Ethan Schafernak meet with Andrew Appel to strategize next steps for a project. At its core, Janler's apprentice program is geared toward creating a moldmaker, but it is also about teaching life skills and working together as a team to further strengthen the foundation for the future of the company and the industry overall.

Expertise comes after the learning phase, as apprentices spend time building their skills through hands-on experience.

The company uses its Enterprise Resource Planning (ERP) system to track and document the hours an apprentice spends learning the processes in each department in Janler's shop. "The apprenticeship program identifies specific knowledge and skills that the apprentice needs to acquire along the journey, while the ERP system, in essence, gives the apprentice the opportunity to steer the training in order to learn the required skills," Ebel says. "It is a system of push and pull, where the company is engaged in offering the training (pushing it out), and the apprentice is engaged in gaining skills as fast as he or she can (the pulling)."

Ebel adds that Janler has recently decided to include another dimension to its apprenticeship training: regularly scheduled lunch-and-learns to quicken the exposure to the plastic engineering world. She says that these sessions are designed to expose the employee to experts supporting the process of mold building. The intended 26 sessions a year include the concepts and technical details of steel selection, heat treating, surface treatments, mold design features, CNC tooling, mold set-up, the molding machine, materials, metrology, safety, mold and machine maintenance and operations-management concepts. In addition to the industry skills, the company offers sessions on life skills related to personal budgeting, 401k and health benefits and financial and legal concepts such as leases and mortgages. "It's important to share life's lessons—to influence and expose young people so that they can make healthy decisions. The trade is demanding, and starting out on a solid foundation is important. These are high-skilled positions. Moldmakers end up as project managers, manufacturing engineers, tooling engineers and plastic experts through experience and training. We need our people to be that well-trained. Mold manufacturing is here to stay, and the training needs to address all aspects of it," she says.

Mohrbacher emphasizes that at its core, Janler's apprentice program is geared toward creating a moldmaker. "My definition of a moldmaker is a guy who understands how a mold functions. He knows what happens when plastic is injected, what a vent does and how cooling works, and so on," he says. "I will go a step further and say a true, all-around moldmaker should be able to understand the design of a mold. He should understand how to build the mold and understand the outcome of the mold sampling process, and that is what we are teaching our young employees."

"The basis of our system is passion and motivation," Ebel says. "We cannot create this—it is within the person and continues to grow along their journey. We've had guys we selected that appeared to be good in the interview, and we talk to them a lot about our core values. Are they intelligent and independent? Do they seek real answers, and are they determined? Do they pull work, and are they team players and problem solvers? Are they open to challenges? Those are our core values. If candidates have that kind of personality and possess that kind of determination and passion, this could be the place for them, because they need those attributes to be a good moldmaker."

Mohrbacher says, "We have witnessed the industry go from mold shops at every corner to now, when we talk to people about getting into the mold industry, and they have no idea what we are talking about. They don't teach this stuff in school anymore. Shop classes are just coming back. Everybody was expected to go to college and get four-year degrees. They're not realizing that many guys in this trade make more money than guys out there with PhDs."

Janler currently has four apprentices ranging in experience from being entry level to having three years of training. New recruits are found using more traditional methods including the internet and referrals. Ebel says, "As an employer, we can offer the training and the opportunity to master a skill. We have found that it does not always work out. Still, we must keep adding to our bench. We have lost employees to competition after investing in three and four years of training, but we know our program is supporting the development of an industry of highly skilled people, and we believe our efforts will be rewarded in return."

The Janler team supports efforts to educate other mold shop owners as well as the public about the need for apprenticeship programs and training. Ebel, who has served as Janler's president since 1989, was the first woman to chair the board of the TMA. She also served as chairman of the TMA Education Foundation, the mission of which is to provide funding to schools building technical training programs. She received the organization's Rose Mottl Leadership in Manufacturing Award in 2013 for her contributions to the manufacturing industry. Her brothers, Alan Klingler and Charles Klingler, both vice presidents of Janler, serve the industry as well. Charles currently serves as president of the Chicago Chapter of the American Mold Builders Association. He is very active with its education committee and its efforts to promote moldmaking as a viable career.

"I think when a company has an apprenticeship program, and that company commits to training, it is evidence of the company's confidence in the future growth of the industry," Ebel says. "We believe passion is a critical component to success. We wake up passionate about the business, and we want our entire team to feel the same way." MMT

FOR MORE INFORMATION

American Mold Builders Association / amba.org
Career Pathways Institute / careerpathwaysinstitute.org
Dramco Tool Co. / dramcotool.com
Haas Automation / haascnc.com
Janler Corp. / janler.com
Kirkwood Community College / kirkwood.edu
MSI Mold Builders / msimoldbuilders.com
Productivity Inc. / productivity.com
Progressive Components / procomps.com
Technology and Manufacturing Association / tmaillinois.org

By Barbara Schulz

An Unconventional Company Culture

Austrian moldmaker Haidlmair focuses on its 550 people in a very unconventional way, as it continues to be a leading specialist in building high-quality tools for beverage crates, folding boxes and garbage containers.

Images courtesy of Barbara Schulz.

Globally known for building high-quality tools for beverage crates and more, moldmaker Haidlmair focuses on its people in a very unconventional way. Here, at the company's headquarters in Nussbach, Austria, employees can use the company's tennis court, driving range, restaurant or the company-owned boats at a local lake.

A fleet of 22 all-electric cars is waiting to be picked up by their new owners at BMW Knöbl in Steyr, Austria. The BMW i3s will complement Haidlmair's fleet of company cars and will be available for business and private use for the company's employees.

Based in Nussbach, Austria, a small town in the Austrian state of Upper Austria (which comprises 90 percent of farmland and forest) tool and moldmaking company Haidlmair wants to transform parts of its fleet to eco-friendly e-vehicles that are charged with electricity generated from renewable energy sources, while at the same time offering their employees access to company cars at a very competitive rate.

This unconventional approach to creating a unique company culture makes all the difference when retaining employees and their happiness. However, this is just the latest of many initiatives the Haidlmair family has taken to create a special workplace. Company founder Josef Haidlmair, who established the company in 1979, and his sons René and Mario Haidlmair, have always focused on their employees. The reason is not just because of the company's rural location where it is hard to find new staff, but because they understand that a company's culture is a reflection of what an organization stands for, and as the voice of a business, employees are key to ensuring that it succeeds.

"When you provide a work environment that your staff enjoys spending time in, it can help to improve their performance," Mario Haidlmair says. "One of the most important things is that our people feel at home in our family business, that they trust us and know they can always approach us with *any* idea, complaint or problem. Everyone should be able to voice their perspective respectfully. Trust is the cornerstone of any company that thrives. Moreover, we have created an environment designed with an air-conditioned production area, LED light-

When you provide a work environment that your staff enjoys spending time in, it can help to improve their performance.

Josef, Mario and Rene Haidlmair focus on their 550 people in a very unconventional way to create a unique company culture which makes all the difference when retaining employees and their happiness.

To date, Haidlmair has built around 1,500 molds for beverage crates which has become synonymous for the Austrian-based company which also run a 40,000-sq-ft. modern facility in Ontario, Canada.

ing and the necessary safety measures to help people feel comfortable where they work ."

Happy, Supported People Are Productive

Many companies try to build a culture that thrives, but it's easier said than done. While identifying a desired culture is easy, implementing and practicing it every day is hard. Haidlmair takes culture one step further by focusing on boosting employee motivation and morale by creating an unconventional workplace through unconventional means.

What are these unconventional means? Haidlmair shares a few here:

Recreational activities: Team outings are a great way to facilitate bonding with team members, reduce employee stress and give them the chance to get to know one another outside of the office. Haidlmair has always put a lot of effort into creating recreational facilitiesfor their employees that are unique. For example, a tennis court, a driving range, a Go-Kart garage and a company-owned guest house, including a restaurant and night club.

Even more unique is Haidlmair's bi-annually organized, all-inclusive vacation offer for all its employees (280 of all 550 employees work in Haidlmair's HQ in Nussbach, the remaining employees work in Germany, Hungary and Canada), which is subsidized up to 95 percent by the company. "This year we went to Cyprus; two years ago we stayed at a hotel in Mallorca, Spain," Mario Haidlmair says. "It's always fun. These trips are something special and offer heaps of opportunities for our employees to get to know each other, which is the nuts and bolts of our business."

Employee incentives: Apart from recreational activities, which include company-owned boats at a local lake for employees to use free of charge, the so-called "Haidlmair Card" gives employees access to discounts at local shops, fitness studios, skiing and 15 other sports activities. Additionally, the company has invested in land and houses to help young employees rent apartments at an affordable rate.

Innovation: Employee creativity and innovation are essential for the success of any business, so Haidlmair has rented a small mountain hut in a very remote area in Upper Austria, with no internet or phone connection and

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Haidlmair is constantly investing in state-of-the-art equipment, including an M2 Cusing multilaser from Concept Laser and an automated production line comprising four DMU 80 five-axis milling machines, three set-up stations and an automatic pallet rack system with 132 positions.

limited power, to offer a unique space for creativity, communication and collaboration. Many of the company's new developments and ideas have their origin in this unique spot.

Education and training: Education and training is of utmost importance at Haidlmair. "More than 80 of our employees in Nussbach are skilled toolmakers. So far we have trained 200 apprentices in-house and many of them remain with the company," Haidlmair says. "We have been running our training workshop since 1985 and constantly invest in the latest machinery. Today, our apprentices are trained on a DMC 635V, a Hermle C20U, Emco Emcomat 20D and FB-600L, a DMG ecoMill 600 V and a turning machine from Voest. Each year, eight to 12 trainees begin their four-year training at our training workshop."

> Haidlmair has always put a lot of effort into creating recreational facilities for their employees that are unique. For example, a tennis court, a driving range, a Go-Kart garage and a company-owned guest house, including a restaurant and night club.

In addition to classic CNC programming on the milling and turning machines, apprentices learn how a digitalized value chain works, starting with CAD/CAM design and downloading programs right through to company-specific process chains. This comprehensive and practical training in the digital value chain is the reason why all newly-hired skilled workers at Haidlmair start off in the training workshop.

All trainees also get to use the largest CT scanner in Austria and an automated production line including four DMU 80 five-axis milling machines, three set-up stations and an automatic pallet rack system with 132 positions. A special feature is that the four five-axis machines act as a networked cluster or a uniform manufacturing system. The workpieces are loaded and unloaded via the automated pallet changer, which allows for unmanned 24/7 operation.

Trainees who stand out with excellent performance are even given the opportunity to gain experience at one of the company's foreign locations in Canada and Hungary. While the former is too small to implement the same dual training model (around 35 people work in the Toronto-based factory), Haidlmair together with other companies in the region has established a dual education program in Austria called "KTLA," which combines on-site training with a university or higher education degree. The Hungarian subsidiary has adopted the apprenticeship program, which is something Mario Haidlmair is extremely proud of, as the country does not support any apprenticeship programs.

The latest achievement in terms of training is the Haidlmair Academy, which in cooperation with the Limak Austrian Business School, offers postgraduate training for managers. This added training enables employees to gain a degree in management, like an MBA.

"Forward is the direction," Mario Haidlmair says. "This is my motto and I never tire of repeating it every day. It's true for technology and production technology but even more so for people." MMT

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By Mark Hennebicque

Optimize Mold Designs with Fewer Risks

Mold builders can improve product performance, manufacturing throughput and cost savings with simulation optimization tools.

Most shops can relate to the need to save money while developing and manufacturing a product, including the mold. Let's face it: there is a reason people still use the old phrase "time is money." Any opportunity to save time affords the time to work on another task, such as making another part, or avoid the need to stay late to finish the last job of the day.

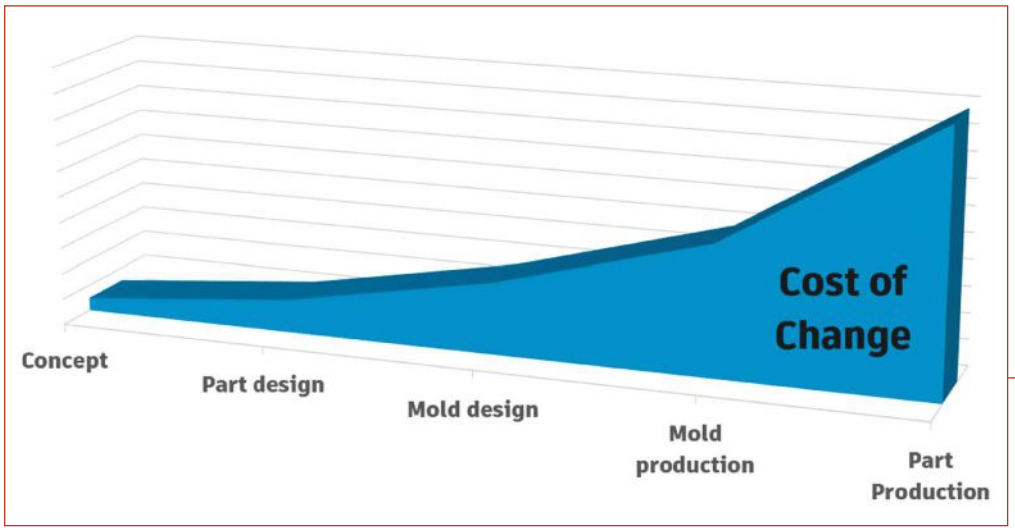
Traditional efforts to achieve higher efficiency in design and manufacturing processes have been unable to affect any real change within day-to-day workflows. However, today the manufacturing world is finally changing and changing fast. Technology trends like Industry 4.0 are almost forcing manufacturers to evolve to optimize work processes for higher profitability. Gone are the days of wasting time using dated workflows which, in many cases, engineers and operators have not updated in decades.

Solutions do exist to ease this evolution for mold manufacturers who agree that the most expensive mold is a reworked mold that engineers must modify, test and transport to and from the tool shop, delaying the overall project timeline. Simulation tools can minimize, and in some cases eliminate, these delays.

Simulation Situations

Optimizing a mold shop's work process will impact its manufacturing efficiency while helping the shop remain innovative. One work process optimization innovation is **cooling simulation**. Engineers often neglect this process area, despite customers commonly squeezing cooling channels in a mold as a last-minute detail, using parameters based solely on past experiences and assumptions. Even then, many engineers are skeptical of investing the time required to use advanced tools, such as simulation, to determine if the cost of cooling optimization will be worth the reward. This hesitation can be a result of their lack of knowledge and understanding of the behind-the-scenes calculations simulations use. While we should respect their traditional workflows, adopting new technologies like simulation upfront will ultimately yield long-term savings.

Simulation tools introduce the ability to optimize the plastic product development cycle from concept to design to production with fewer risks than physical testing. Engineers who experiment with cooling designs *before* cutting



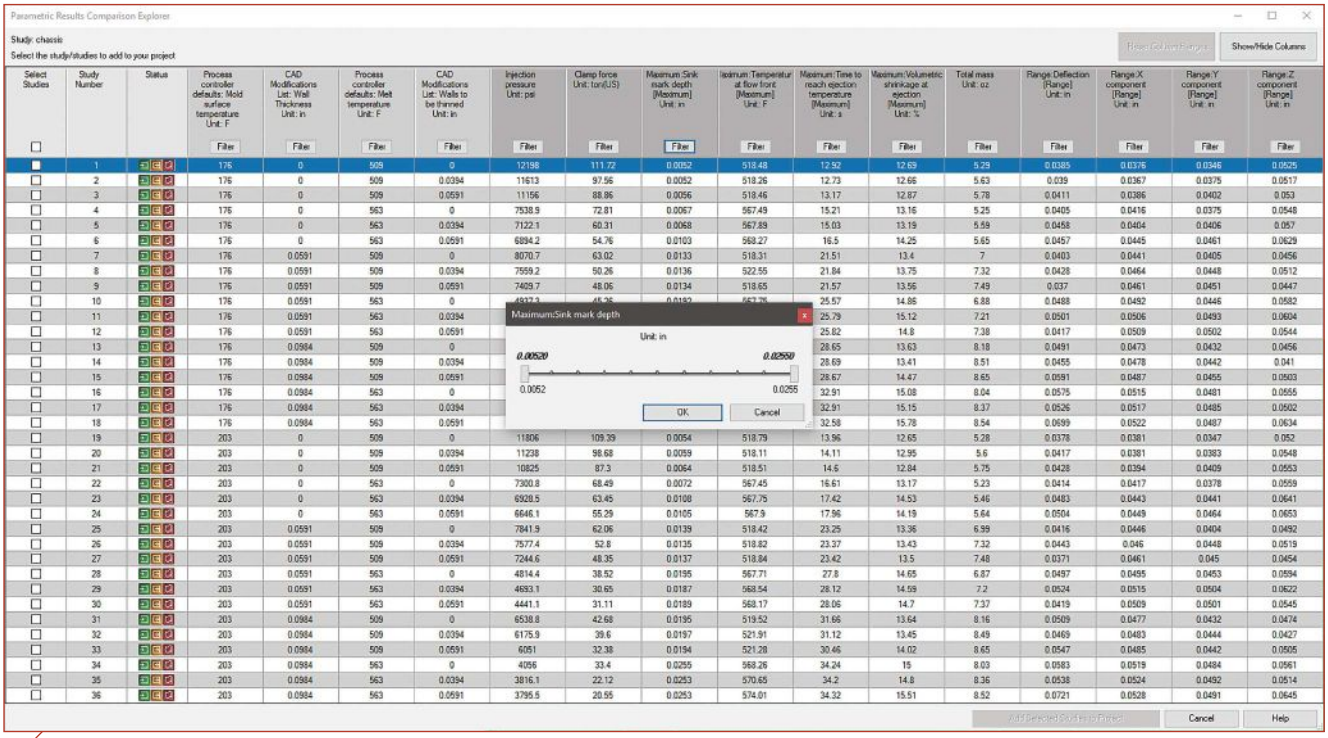
Images courtesy of Autodesk.

Using simulation software from the beginning of a project can shave between two and three weeks off the average project design cycle.

Simulation software allows engineers to view the cost benefits and feasibility of 3D-printed conformal cooling channels as well as test the impacts on product performance.

mold steel will be able to test more options more quickly, broadening the breadth of design possibilities. Plus, the ever-increasing complexity of part designs is also increasing the sophistication of cooling channels. Simulating cooling channel design iterations will help engineers determine such factors as hotspot locations when extracting more heat to improve part quality or cycle time reduction opportunities.

Additive manufacturing (specifically, metal 3D printing) enables mold designers to innovate cooling designs by integrating conformal cooling channels into their molds that allow the cooling channels to follow the contour of the part. This approach was previously very costly and difficult to achieve due to the shape of these channels. The ability to extract more heat through conformal cooling helps to not only create uniform cooling but also ensure part quality, and potentially reduce cycle time. When engineers use additive simulation software, which simulates 3D printing of a part, they can predict and mitigate part distortion, machine crashes during printing, and part tolerancing on those parts, further optimizing the print before using any physical material.



Simulation software displays results of an optimization in tabular form, including a combination of variable values used in a particular study along with the requested quality criteria.

Metal 3D printing provides solutions for innovating old processes but also introduces new challenges. Additive technology is a heat-intensive manufacturing method that is prone to distortion (unlike traditional drilled cooling channels). Understanding this fact before initiating 3D printing is a tremendous advantage, given the higher costs associated with metal 3D printers and powders.

Not only does simulation help with cooling designs, but it also helps guide engineers through other design challenges. For example, **material usage reduction**. Simulation helps engineers develop part and mold designs that reduce the amount of material necessary to create a part. Engineers can do this through automated geometry modifications using a parametric analysis during which the simulation software runs several comparable analyses, while adjusting things like wall thicknesses, to identify the necessary balance between part quality and wall thickness. Without the use of simulation, it may be difficult to predict where material can be removed without impacting the part's structural or quality properties up front.

Simulation tools introduce the ability to optimize the plastic product development cycle from concept to design to production with fewer risks than physical testing.

Additionally, environmental pushes are causing the use of **more recyclable materials**, which may be less stable, physically and chemically, than traditional engineered materials. It is imperative engineers simulate these materials upfront to prevent downstream issues in the design process, such as unexpected cavity filling difficulties or part shrinkage. Simulation can also help analysts understand the robustness of the design and process during production by revealing the process sensitivity when adjusting for slight material batch variations or environmental variations.

When operators optimize these types of issues at the molding machine through a design of experiments (DOE) or other setting variation method, they tie up resources and use unnecessary material and energy creating several unusable parts. Simulating a DOE means less time is required for physical testing to locate a processing window. Engineers who use simulation instead of a trial-and-error approach to determine optimal conditions save press operators' time and avoid the risk of a production shutdown to optimize designs and processing conditions.

Shopping for a Simulation Solution

With various simulation products available to predict plastic injection molding, deciding which one to choose can be daunting. To help identify which would be right for your shop, here are a few factors to consider:

- Short-term goals for using simulation: What exact question(s) need to be answered?
- Long-term goals for using simulation: What other uses are being considered for simulation? For example, optimizing press schedules and cycle times to maximize profit margins, or exploring benefits of other molding techniques, such as microcellular injection molding.
- Adoption time investment: How long will it take to start using the simulation software? Are there classes, support, or resources available to help? Is the software's user interface easy to navigate?
- Fitting simulation into the existing workflow: What other software must simulation interact with (other FEA, CAD, or visualization tools)?
- Maintenance: How frequently does the software get updated? What is included within updates (new features, bug fixes, etc.)?
- Hardware requirements: What processing power, memory, or graphics requirements are needed, and will existing systems meet those as technology advances/develops? Is there a cloud-based option to help keep hardware costs down?

After a company completes its research on simulation software to identify the desired options, it is important to test each option. Shops should also speak with the technical sales teams of each simulation software supplier about their requirements and concerns, and request a demonstration on how their programs will improve productivity and part quality. Additionally, ask for trial versions or limited-term licenses to try out each product.

Using simulation optimization tools upfront in new mold and product design and injection molding will improve product performance, raise manufacturing throughput, increase cost savings and strengthen innovation. MMT

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By Cynthia Kustush

This article is part of a series of roundtable discussions with industry suppliers addressing recent trends in moldmaking, the challenges moldmakers are experiencing and the latest solutions that are or will be available to resolve them.

Welding Solutions Are More Efficient, Flexible and Affordable

As welding technologies advance, moldmakers have more options for repairing molds faster, cheaper and with minimal training required.

Image courtesy of LaserStar Technologies Corp.

Fiber laser systems feature an air cooled, self-contained laser source, which utilizes a semiconductor diode as the light source rather than a flash lamp as used in ND: YAG laser welding systems. Here, a gentleman uses a fiber-laser welding system to repair a large injection mold.

Companies are putting much more emphasis on and investment into the equipment and skills required to keep molds running longer between preventive maintenance stops. This month, *MoldMaking Technology* turns its focus to mold repair trends and challenges with an emphasis on welding technologies. We asked experts from a few welding equipment suppliers to share their take on current needs and solutions.

Welding Trends and Challenges

Because moldmaking is metalworking, and mistakes happen, welding will always be an essential process in the moldmaking industry. But like so many other technologies, welding methods continue to evolve, offering options besides traditional TIG welding that make even the most seasoned moldmaker question what the best choice is for repairing his molds.

"Moldmakers see value in user-friendly solutions and are actively seeking more economical and faster approaches to maintaining and repairing their molds. They are doing whatever they can to minimize downtime," Ross Rocklin, president of Rocklin Manufacturing Co. (Sioux City, Iowa), says. His customers often face immense costs and challenging logistics when sending molds out for repair. For example, a customer in Mexico sent an expensive mold to Europe for repair. Two weeks and $20,000 later, not to mention the cost associated with the downtime, the repaired mold returned from Europe. "We provided them with a simple solution to complete future repairs themselves, in the press, with no prior welding experience necessary," he says.

But downtime is not the only factor that moldmakers must be concerned about when looking to make complete and efficient welding repairs.

"All welding can be affected by different materials and coatings," Doug Niggemann, vice president of Alliance Laser Sales (Wauconda, Illinois), says. "A very thin surface coating can usually be welded over with varying results. For example, laser welding over a thin layer of chrome usually works out well, whereas laser welding over nickel almost always results in pitting when bringing the workpiece back up to a high polish. There are so many combinations of materials and coatings that each project is different and only years of experience and knowledge can help avoid issues."

Niggemann says it is important to ask questions about the mold before settling on the welding method to use. "Maybe the workpiece has been welded before and nobody knows, or

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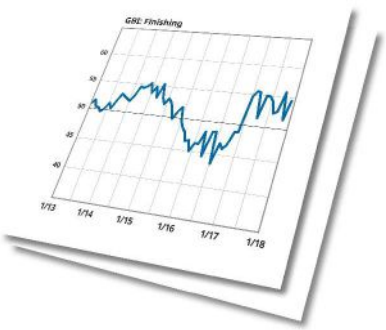

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maybe the base metal is imported, and the type is unknown," he says. If a mold has been plated, the welder needs to know what coating has been applied and how thick it is. If the coating will be reapplied after repairs, it may be better to remove the coating before welding. If the coating will not be reapplied, Niggemann says he would recommend laser welding over TIG welding because it uses a minimum amount of heat and will affect a much smaller area of the coating.

Rocklin says, "One key advancement in mold repair is the ability to cost effectively deliver precision welds on both ferrous and non-ferrous molds, such as those made from aluminum and copper. Our micro welding solutions include a non-arcing, spot welding process for repair of minor damage to ferrous molds, and a plasma-pulled arc micro welder that produces a laser-quality weld on both ferrous and non-ferrous molds. Both units are primarily focused on minor defects and repairs, although the pulled-arc welder can complete structural welds, too."

Comparing Welding Technologies

Greg Gesswein, president of Paul H. Gesswein and Co. Inc. (Bridgeport, Connecticut), says that molders and moldmakers have historically had limited options for repairing molds. TIG welding, which gives off a lot of heat and is used for larger welding repairs with large diameter wires, is one of them. "Then on the micro side are laser welders which are fantastic and use very small diameter wires for making micro repairs," he says. "But shops rarely would invest in TIG welders because they were too expensive, and they would need a dedicated welding specialist in the shop. What do you do when that specialist is on vacation or out sick?" Greg Gesswein says.

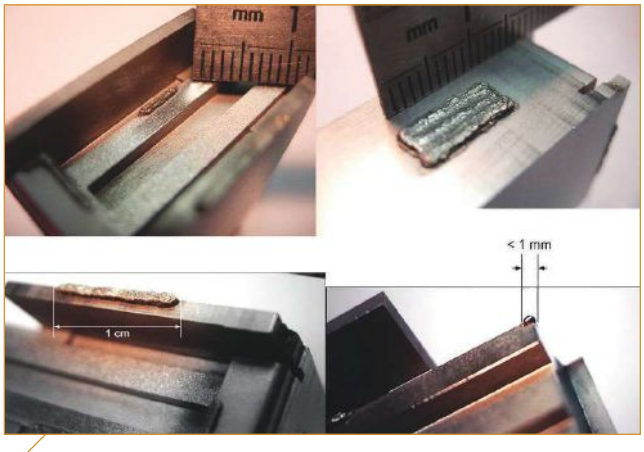

Image courtesy of Rocklin Manufacturing Co.

One key advancement in mold repair is the ability to cost effectively deliver precision welds on both ferrous and non-ferrous molds, such as those made from aluminum and copper. Examples of micro welds performed using a plasma-pulled arc micro welder that produces a laser-quality weld on various materials are shown here. Wider ranges of materials used and short learning curves, in addition to affordability, have made it possible for moldmakers to bring welding systems in house, reducing both costs and leadtimes.

Mike Moosey, Applications Engineer for LaserStar Technologies Corp. (Riverside, Rhode Island), says that laser welding has been a popular choice for mold repair and restoration for many years because it provides very precise, strong welds without some of the drawbacks associated with traditional welding methods like MIG, TIG and spot-welding. "All arc and spot-welding processes transfer a significant amount of heat to the base material (the heat-affected zone), which can affect the metallurgical structure around the weld and/or result in shrinkage or warpage of the workpiece," he says. No physical contact between the laser head and the workpiece, and precise control of the laser-beam spot size and energy, which enables accurate micro-welding of miniature components, are additional advantages of laser welding over traditional methods, according to Moosey.

The number one advancement in welding for the past 15-20 years is without a doubt laser welding, says Alliance Laser's Niggemann. "Beyond that is the development of FSS or Full Solid-State Fiber laser systems. This is because fiber laser uses less energy consumption, creates less ambient heat, has no disposable or replaceable parts and is more consistent and accurate than previous YAG systems. The advancement of this technology makes laser welding a much more affordable option for tool rooms and mold shops to invest in."

Moosey concurs and explains that Nd: YAG lasers (Neodymium-doped Yttrium-Aluminum-Garnet) are liquid cooled and they utilize a flash lamp as the light source inside of a resonator cavity. The flash lamp is a consumable item that needs to be replaced periodically depending on usage. Over time, as the flash lamp decays, the laser energy output decreases, requiring the user to make parameter adjustments to compensate.

"Flash lamp systems require regular preventive maintenance to the cooling system, like flushing and filling the cooling system fluid and replacing filters, etc.," Moosey says. "Nd: YAG systems do a great job, and there are literally hundreds of shops that use them every day. However, fiber lasers are becoming an increasingly popular choice because of superior beam quality when compared to Nd: YAG. Fiber laser systems feature an air cooled, self-contained laser source, which utilizes a semiconductor diode as the light source rather than a flash lamp. They require virtually no maintenance and the diodes never decay and do not require replacement like flash lamps."

Blair Learn, president of Alpha Laser – US (Meadville, Pennsylvania), says, "The scope of products, including materials, and sizes and shapes of systems, that are available to repair molds is becoming much wider as familiarity with laser systems grows." He adds that laser-welded repairs are typically easier and faster to execute than TIG welding, therefore they are less costly owing to the time saved by not having to pre- and post-heat. Additionally, he says today's

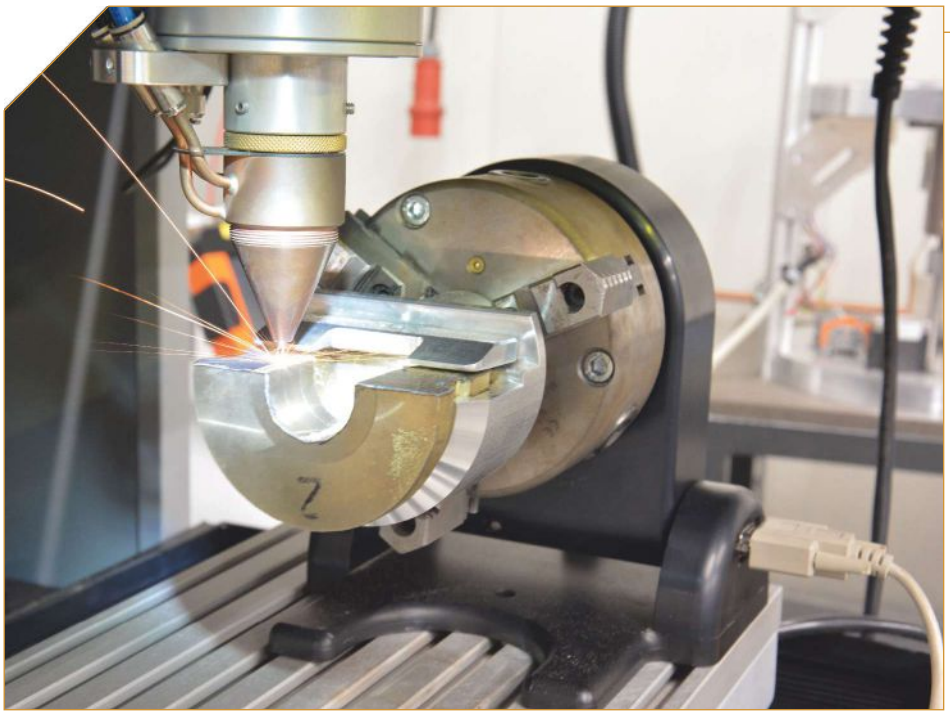

Image courtesy of O.R. Lasertechnology GmbH.

Contour parallel repair of worn fitting surfaces on a brass tool is shown here using powder DMD. Due to the very efficient energy input into the powder additive the deposition speed can be increased, reducing total process time by 40 to 50 percent (in comparison to wire welding).

laser welders can execute welds much faster than before because of the versatility of movement systems that now allow the welder to get into position much quicker. "The higher wattage power supplies also allow the welder to perform welds as much as 10 times faster than they could with lasers on the market three or four years ago," he says. "The accuracy of laser versus conventional welds yields much quicker weld removal times."

Moldmakers see value in user-friendly solutions and are actively seeking more economical and faster approaches to maintaining and repairing their molds.

Every supplier interviewed emphasized the difference in training requirements between TIG or Micro TIG welding and laser welding. "Now that more manufacturing is being done domestically, everyone we talk with is desperate for trained craftsmen, including toolmakers, experienced staff for press setups, etc.," Learn says. He points out that the demand for highly-skilled welders has lessened since laser welding has become more affordable and easier to use.

Gesswein agrees, saying, "With laser welding, employees only need about an hour of practice to get started with simple welds and soon they are doing more complex repairs. It is not unusual to find shops with two or three employees who know how to laser weld."

Still, conventional TIG welding has its place. "You would use TIG or micro TIG welding when you need a large amount of weld and the parts themselves can handle the heat and stress associated with the TIG process," Alliance Laser's Niggemann says. "Conventional welding, depending on the scenario, may result in a faster and less expensive weld job. That said, it will most likely take longer to machine or refinish, adding to the overall cost. It all depends on time and budget; every customer and scenario is different."

New Systems, New Ways to Weld

Marco Göbel, Product Line Manager Robots and DMD at Coherent | OR LASER, notes the introduction of additive manufacturing (AM) into mold repair. "By offering machines that can do (semi-) automated repair by laser cladding with powder (also called Direct Metal Deposition or powder DMD), repair becomes much more cost-effective versus replacement of damaged components," he says. "Often cracks and edges are repaired and/or modified using AM. The main challenge is to meet the high material requirements for the mold and the repaired material. Additionally, because of the very efficient energy input into the powder additive, the deposition speed can be increased. This reduces total process time by 40 to 50 percent (in comparison to wire welding)," he explains. "Ideally, the repaired or modified material should blend in perfectly or even exceed the substrate's material strengths (e.g. for edges)."

How does it work? Göbel explains that DMD is a welding technique which uses powder with a high-energy-focused laser to build the weld on a substrate to repair or modify high-value parts. A melt pool is generated via laser radiation and additive material (the powder) is fed into that melt pool. Almost any metal alloy may be used in powder DMD, including steels, nickel, cobalt, titanium and aluminum. The use of powder DMD will be even more important as moldmakers

begin manufacturing their mold cores or components using additive manufacturing alone, Göbel adds.

Blair Learn says that last year, Alpha Laser introduced a robotic system for laser welding molds and dies that can also perform powder DMD. "The introduction of FSS fiber laser welding technology has made it possible to also use powder deposition because of a continuous wave operating mode, which allows the welder to run more automatically and change directions more easily as the powder is fed coaxially around the beam. It has only recently become possible to use powder additive with smaller-wattage laser systems that capably balance the heat input and they are more affordable. This is a major benefit to laser welding." However, Learn says that much more testing needs to be done to determine when powder DMD is the right method for mold repairs because it puts more heat into the part."

Gesswein and Co. recently introduced a micro TIG welder that uses very little heat. "It is possible to use the small diameter wires to get those micro repairs finished," Gesswein says. With its new welder the user can make contact exactly where he or she wants to weld and the electrode will reciprocate backwards automatically so when it fires a shot, it's at the right height.

Alliance Laser introduced a new, mobile FSS fiber laser system that combines the high-power output of a 450-watt machine with the fine precision of a lower-wattage system. Niggemann says this is possible because the system generates laser power through a series of diode pumps instead of the crystals and mirrors used in most YAG lasers, and with fewer parts to replace, maintenance time and costs are reduced. "We have also been able to reduce the cost by creating a system that has only the features necessary for executing perfect welds," he says.

No matter what a mold shop's welding needs may be, a solution is sure to be found as supplier companies continue to develop new and better systems that are easier and more economical to use. MMT

FOR MORE INFORMATION

Alliance Laser Sales Inc. / 847-487-1945 / alliancelasersales.com
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Control is Key to Connected Machining

Krones Inc. in Franklin, Wisconsin, is a subsidiary of a company based in Germany that routinely manufactures redundant parts in its plants throughout the world. Krones recently developed a way to streamline this process and provide optimized parts to end users faster and better.

The approximately 8,000-square-foot moldmaking area within Krones' 300,000-square-foot facility is equipped with four Heidenhain iTNC 530-controlled machines doing cavity work. It also houses two smaller auxiliary machines, a quality control department with a coordinate measuring machine (CMM) and an assembly area. This Krones location is primarily focused on manufacturing and supplying parts for its large blow molding, filling, labeling and packing operations installed throughout North America, Central America and the Caribbean. Common jobs include manufacturing molds for stretch blow molding machines that produce PET plastic bottles for water, soda and other liquid products. A typical part-lot size is 40 pieces (20 mold sets) in an average four-hour cycle time.

"We are making very tight-tolerance, similar mold parts at each location, all requiring high accuracy and highly-polished surface finishes down to Ra (arithmetic average of the roughness profile) right out of the five-axis machine," John Vincent, Krones' Head of Manufacturing Technologies, says.

As part of the pilot program started three years ago, Krones took steps to connect to its affiliates in China and Germany. Using a Forcam digital software system (similar to Heidenhain's new StateMonitor software), staff programmed the Heidenhain controls in the three locations to connect and interact as required.

KRONES INC.

PROBLEM: The disconnected manufacturing process was slowing delivery of redundant parts made in plants throughout the world.

SOLUTION: Programmed Heidenhain TNC controls to connect its five-axis machines in its toolrooms across global facilities.

RESULTS: Streamlined manufacturing processes across three locations, allowing Krones Inc. to measure the actual usage of any machine at any time.

Images courtesy of Heidenhain.

Krones' Ryan Anderson is working on one of four Heidenhain iTNC 530-controlled machines doing cavity work.

"This setup allows us to measure the actual usage of any machine at any time. Plus, when a machine stops, next-step protocols are provided including the ability to enter cost codes for tracking the cause of any downtime," Vincent says.

Making the Right Connection

There is connectivity among all 65 CNC-controlled machines at the Wisconsin facility. To test the connectivity, they ran programs from both Krones plants in Germany and China, which were then selected within their software systems in Wisconsin and ran without any issues. This is particularly helpful for customer development work, Vincent says.

For example, Krones recently had an order for a new bottle on a Monday and designed the mold that same day. Vincent then sent an email to a Chinese colleague, whose moldmaking department has six Heidenhain iTNC 530s, requesting a program for the project. When they came into work Tuesday morning, they loaded the program from the Chinese colleague into the iTNC 530 and started running it.

Whether made out of glass, PET or aluminum, Krones Inc. machines and processes millions of bottles, cans and specially-shaped bottles each day, including this mold for a plastic bottle.

"We completed the part that same day for customer review, and this is a part that probably has a cycle time of five hours, so it isn't something on which we can minimize run time. This process is one that our customers continually request be done quicker, and we are happy to now be able to do it," Vincent says.

Connected Machining

Krones Inc. has been using the Heidenhain TNCs in its moldmaking departments for some time, with change-outs to updated machines approximately every five years. "I'm a huge fan of the Heidenhain controls. Particularly in the moldmaking industry, these controls have a leg up on the competition as far as being able to achieve excellent and accurate surface quality at high speeds," Vincent says. He likes many features, he adds, including the manual probing routine on the machine via soft keys right on the control.

Krones machinists receive training on the controls, though Vincent adds that once his employees learn the Heidenhain control, they usually don't want to go back to another. The TNCs are conversational, and while Vincent admits that many new employees are hesitant to try something new, after some training they don't want to run anything but the TNCs.

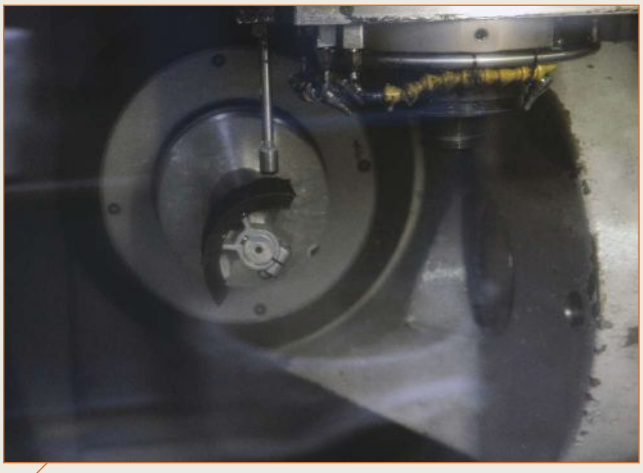
Vincent adds that he and his staff find many TNC control features easy to use, making special mention of the ability to do things on the fly and add checking programs by the operators, as well as the way the tool table systems work. Krones uses a tool data management software that integrates well with the TNC to assign a number to every tool assembly in the plant. Using the TNC, they can call out a number, and no matter where it is in the machine tool magazine, the operator can pull it.

> This connected machining has been going strong on a daily basis over the last year, and we are now working to expand it to other departments.

"It's easy since you don't always have to have tool number one in pocket number one. This is a real benefit to us and not something I see with other controls," Vincent says.

Here, Krones Inc. staff is using the extended tool management feature where they can load and unload from the list of tools by simply using a mouse to drag and drop. Plus, a tool usage list provides more details, and an import function allows for reading and exporting CSV files.

Another important TNC control feature used by Krones is the Heidenhain DNC option, which provides the ability to communicate with external Windows applications. The shop



Close-up of a Krones five-axis milling machine, modified with a waterjet head, cutting a plastic component.

Krones Inc. operators working two machines with Heidenhain controls, demonstrating connected machining.

Krones makes very tight-tolerance, similar mold parts at each one of its locations, all requiring high accuracy and highly-polished surface finishes down to Ra right out of the five-axis machine.

also uses the Remote Desktop Manager, enabling the user to operate one or more Windows PCs directly from the TNC. "We frequently use the TNC Remote to load programs into the machine's control from various locations," Vincent says.

Krones also employs a unique manufacturing system in a different area of the shop that uses an iTNC 530 control on a machining center that produces pallets for bottle-labeling machines. In this system, Krones engineers configured a waterjet into a five-axis machining center. They were able to use the features in the TNC control to create multiple setup kinematics to handle using the normal milling spindle as well as the separate auxiliary waterjet feature.

"We are using a GF Mikron machine with a pallet changer (up to 21 parts), and all the data is set up so that an operator can pull in the appropriate program. Then the machine moves successfully between milling and water jetting as needed," Vincent says. "This connected machining has been going strong on a daily basis over the last year, and we are now working to expand it to other departments."

Importance of Training and Support

To keep this large organization at the top of its game, Krones' culture includes daily employee support and training as needed.

"As we look to the future of manufacturing and global connectivity, we know that it is important to know what today's advanced capabilities offer. We understand that it's beneficial to have skilled staff who can and want to interact with our machines to customize and optimize the end products," Vincent says.

Vincent explains that continuous improvement is part of this process. They set the program up so employees can meet in groups weekly. He also adds that the company provides both in-house and external machine training to Krones employees. Last year, for example, eight employees were sent to Heidenhain's North American headquarters in Schaumburg, Illinois, to participate in a four-day TNC control training session.

Training at Heidenhain encourages full use of conversational control in various ways and enables greater creativity for the operator to fully use its features. "I'd say 95 percent of Krones programs come from a CAD system, but when using a Heidenhain control, our operators can easily fine-tune them, right at the control as needed. This access yields improvements that the company would not realize otherwise. Plus, it allows our operators to take ownership of their work," Vincent says. MMT

FOR MORE INFORMATION

Heidenhain Corp. / 847-490-1191 / heidenhain.us

Tax Reform: Changing the Rules of Business Losses

By Michael J. Devereux II, CPA, CMP

The Tax Cuts and Jobs Act has changed the way many mold builders account for their business losses. The new rules impact the tax treatment for business losses regardless of a company's structure (C corporation, S corporation, LLC or partnership).

For example, the Act limits the net operating loss (NOL) deduction to 80 percent of the taxable income of the year in which the shop carries the loss, for losses occurring in tax years beginning after December 31, 2017. Also, the NOL carryback provisions were eliminated for tax years ending after December 31, 2017. However, these provisions do allow for losses to be carried forward indefinitely (a change from the previous 20-year limit).

In the Fall of 2018, then-Chairman of the Ways and Means Committee, Kevin Brady, indicated that there are approximately 70-80 technical corrections Congress must address to make minor clarifications to the Act. One of these clarifications involves the timing of the rule changes related to net operating losses. The issue is the effective date of the repeal of the ability to carryback net operating losses two years. While the statutory language states that the carryback provision is repealed for losses arising in tax years *ending* after December 31, 2017, the Congressional conference committee reports provide an effective date for tax years *beginning* after December 31, 2017.

> Owners of flow-through entities are limited in their ability to use losses from flow-through entities to offset other income.

The American Institute of Certified Public Accounts (AICPA) listed *the effective date of the net operating loss changes* as a necessary technical correction. The AICPA recommends that the limitation disallowing the carryback of net operating losses be effective for tax years *beginning* after December 31, 2017, as this language would be fairer to fiscal year taxpayers.

The Act also introduced a new limitation on *excess business losses for flow-through companies* (S corporations, partnerships and LLCs). Generally, flow-through entities do not pay federal income tax. Instead, the owners of these entities pay federal income tax on their share of profits and losses.

Owners of flow-through entities are limited in their ability to use losses from flow-through entities to offset other income. Before the Act, owners of flow-through entities had to overcome three hurdles to use losses generated by the flow-through business:

- Owners must have a sufficient basis (stock basis and debt basis) to deduct losses generated by a flow-through entity.
- The owner of the business must be at-risk to use losses generated in a given tax year.
- Losses from flow-through entities in which the owner has an interest, but does not materially participate, may only offset income from other passive activities or companies. Material participation is when an owner is involved in the operations on a regular, continuous and substantial basis.

The Act now has a fourth limitation for owners of flow-through entities that generate a loss. For tax years beginning after December 31, 2017, and before January 1, 2026, the Act provides for the disallowance of a noncorporate taxpayer's excess business losses, even if the owner has sufficient basis, is at risk for the loss and materially participates in the business. Instead, these losses are carried forward indefinitely and treated as part of the taxpayer's net operating loss.

The Act defines excess business losses as the excess of the aggregate deductions attributable to the taxpayer's trades or businesses, over the sum of the aggregate gross income and gain of the taxpayer, plus a threshold amount. For married taxpayers filing a joint return, the threshold amount is $500,000. For other individuals, the threshold amount is $250,000. Both threshold amounts are indexed for inflation.

For owners of S corporations and partnerships, each shareholder's or partner's proportionate share of income, gain, deduction or loss is taken into account. For example, let's assume Christina and her husband own 100 percent of three S corporations: Company A, Company B and Company C. In 2018, Company A incurs a $300,000 loss, Company B incurs a $400,000 loss and Company C has $100,000 of profit. Christina materially participates in all three businesses, has sufficient stock basis and is at risk for the losses incurred by Companies A and B. She files a joint tax return with her husband, who receives over $1,000,000 in compensation from his employer. In aggregating the flow-through income from Christina's companies, her CPA determines that she would be able to use a $600,000 loss against her husband's income, minus the new excess loss limitation ($300,000 + $400,000 - $100,000). However, because of the new excess loss limitation's rules, Christina and her husband will only be able to deduct $500,000 of the loss against other income. The remaining loss of $100,000 will be treated as an NOL and carried forward to future years.

These new limitations on the ability to use NOLs or excess business losses could significantly impact a mold builder's ability to use those losses to offset other income. Mold builders who incur losses must plan properly to ensure the greatest and most appropriate amount of loss is used to offset other income. MMT

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Moldmaking Index Moves Higher

November 2018 – 55.4

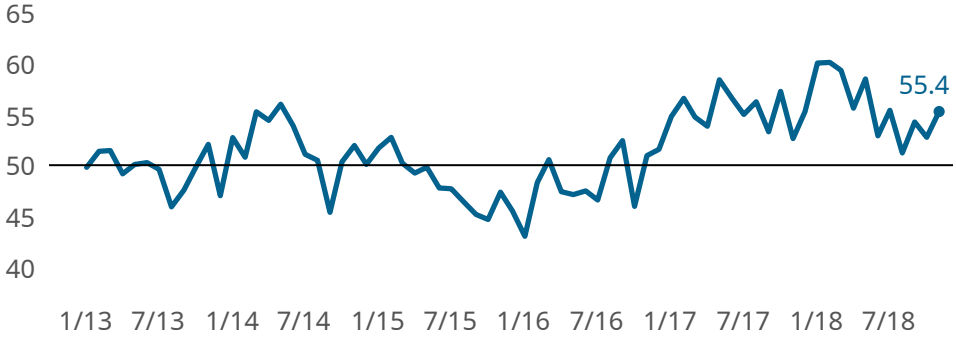
Closing November at 55.4, the Gardner Business Index (GBI): Moldmaking moved higher on a surprise expansion in new orders at a level not experienced since the first quarter of the year. Compared to the same month one year ago, the index is up 4.9 percent. Gardner Intelligence's review of the underlying data for the month reveals that a very strong expansion in new orders and supplier deliveries lifted the index higher. The averages-based index was pulled slightly lower by slowing production growth as well as exports, employment and backlogs. No index components contracted during the month.

Strength in new orders came from a significant turnaround in exports, which expanded at one of the fastest rates since at least 2012. Exports, which contribute to the new orders reading, in part suggest that foreign orders played a significant role in the latest new orders reading. In addition, the comparatively stronger expansion in new orders relative to production during November in part explains the strongest expansion in backlog levels in six months. MMT

ABOUT THE AUTHOR

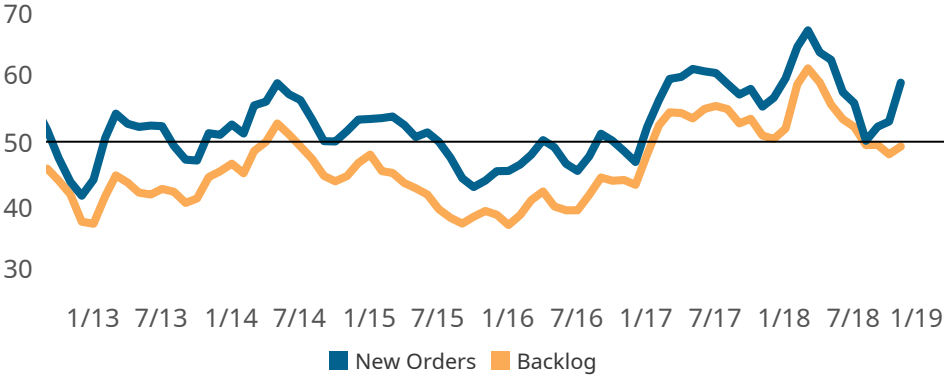
Michael Guckes is the chief economist for Gardner Intelligence, a division of Gardner Business Media (Cincinnati, Ohio, United States). He has performed economic analysis, modeling and forecasting work for nearly 20 years among a range of industries. He is available at mguckes@gardnerweb.com

Gardner Business Index (GBI): Moldmaking



During the last four months the Moldmaking Index has been trending higher, indicating an accelerating rate of growth. The index was led higher by supplier deliveries and new orders, which received a boost from export demand in the latest month.

New Orders and Exports (3-Month Moving Average)



Moldmakers reported a strong increase in new orders, which expanded at a faster rate than production, lifting the backlog reading to a recent high.

Automotive Industry Continues Trajectory

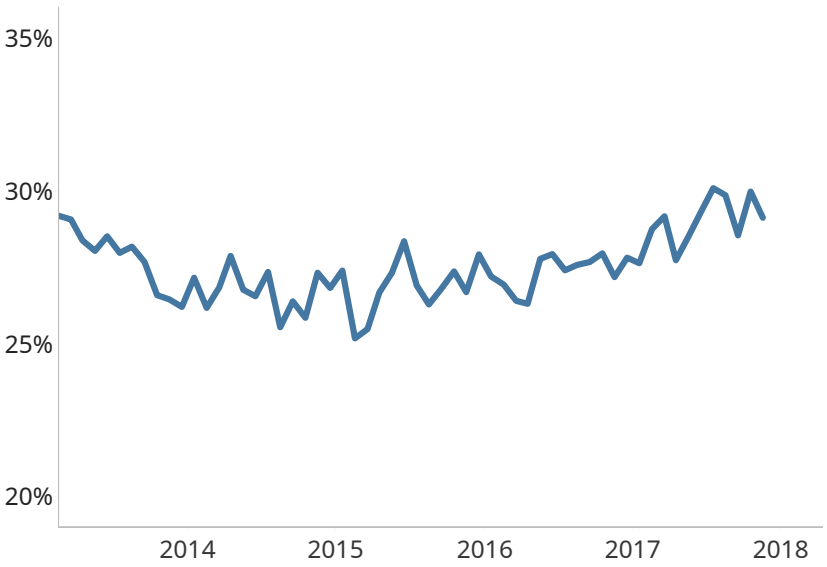
If trade tensions escalate and interest rates increase throughout 2019, the automotive industry may find it harder than expected to expand.

During 2018, the automotive industry tracked along the same trajectory as the prior year. Unit sales data for 2018 showed continued and growing preference for SUVs and light trucks over cars. This trend is not new, as unit car sales, which peaked in June of 2014, have experienced an average 7.5-percent rate of annualized contraction in the 17 quarters since then. Truck and SUV sales continue to offset the weakness in car sales, which has kept total vehicle sales since mid-2015 at a monthly average of 1.4 million vehicles, or 17.3 million units on an annual basis. Looking forward to 2019, there are several factors such as interest rates and tariffs which will have significant near-term effects on the automotive market.

This year is also the third year that interest rates have increased, raising the cost on all other loans. The latest data for 2018 indicates that the current vehicle interest rate of 6.16 percent is 10 percent higher than a year ago and over 22 percent higher than two years ago, when the average rate was just over 5 percent. Initially, these rate increases—which increase monthly finance payments—did not slow the growth in financing amount, which peaked at over $30,500 during the first quarter of 2018. As of the latest data available in October, the average amount financed has now fallen over 2 percent, or over $600 per vehicle.

Furthermore, recent tariff data indicates that new U.S. trade laws enacted during 2018 have produced asymmetrical effects that have hurt U.S. exports more than they have helped domestic sales. Seasonally adjusted figures from the Bureau of Economic Analysis indicate Canadian and Mexican imports of U.S. automobiles have declined 20 percent from a year ago. One would have to go back to 2011 to find such low levels of Canadian and Mexican imports of U.S. vehicles. The value of U.S. automotive manufacturing shipments between April and the latest available data from September furthermore indicates a 10-percent decline.

Total Imports as % of Total Domestic Sales
(3-MONTH MOVING AVERAGE)



Although many of the latest trade regulations have had relatively little time to make their impact felt, the underwhelming change in U.S. import consumption is evident in the sector. The ratio of domestic to imported cars and trucks sold in the U.S. during the second-half of 2018 has not indicated a shift in this ratio through October. The market share of imported vehicles sold in the U.S. during the second half of 2018 has yet to indicate a significant change.

The sheer number of factors impacting the automotive market simultaneously make it difficult to predict the path of the automotive industry in 2019. If trade tensions escalate and interest rates increase throughout 2019, the automotive industry may find it harder than expected to expand. MMT

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EDM

EDM-Compatible Oil Captures Fine Graphite Particles

EDM Network and Chmer EDM offer an exclusive series of dust-free graphite mills to eliminate graphite dust while milling graphite electrodes. These mills are available with ball-screw drives and three-axis linear motor drives with precision glass scales for optimum precision and speeds. Fourth and fifth axes are available with Siemens 840D CNC controls and drives.

EDM-compatible oil in the oil shroud surrounds the 30,000-rpm spindle, capturing all of the fine graphite particles in the oil curtain. The particles are then filtered through two 30-micron filters before the system returns the particles to the oil reservoir to be reused. The use of the oil while high-speed milling also can prolong cutter life, reduce graphite chipping and improve electrode surface quality. The graphite electrode does not experience any detrimental effect after being soaked in the oil. Larger models can high speed mill hardened metals up to Rc63.

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

Large Sinker EDM with Linear Motor Drives Enables High-Precision Mold Features

Sodick introduces the AG200L, its largest sinker EDM at nearly 10 feet wide with a work tank 15 percent larger than the AQ20L. The AG200L was designed for simplified operability so users of the smaller AG100L and AG80L models can easily add the AG200L to their capabilities.

The AG200L's rigid, cast-iron construction improves stability and reduces deflection under heavy workpieces. As the only large-sized sinker with linear motor drives, this line of sinker EDMs is uniquely suited for adding high-precision features, such as ribs and subgates, into large molds, according to the company.

Standard AG200L specifications include a work-tank size of 118" x 70.8" x 37.4" and XYZ travels as large as 78.7" x 47.2" x 31.5". All axes are driven by Sodick's patented rigid linear motors with glass scale feedback.

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

New High-Speed Advanced Automatic Wire Feed System Improves Threading Capability

The new **Fanuc** Robocut C800*i*B-20 wire EDM from **Methods Machine Tools** offers new features for increased accuracy, efficiency and throughput. This EDM is available with a larger Z-axis configuration and can accommodate workpieces with a maximum size of 49.21" x 38.38" x 19.68" with a maximum weight of 6,613 pounds. The C800*i*B-20 wire EDM is ideal for a wide range of work, including large molds and stamping dies, and complex aerospace parts.

Fanuc's new high-speed advanced automatic wire feed AWF3 system helps to thread a wire within the machine's maximum 500-mm work thickness *submerged* with an automatic wire recovery to 150-mm work thickness *submerged* when cutting non-parallel plane workpieces.

Improved pitch error compensation over the entire cutting area, mapped by grid patterns to within +/-2 microns, increases accuracy. Factory tests show that a 0.0002-inch positioning accuracy and 0.0001-inch repeatability are fully ensured, even during long burns, according to the company.

A new *i*Pulse2 flexible pulse control improves straightness, corner accuracy, surface finish and cutting speeds by keeping the gap consistent according to discharge status and cutting shape.

Also, the innovative new Fanuc core stitch slug retention feature prevents slugs from dropping, saving time and increasing efficiency. The core stitch function allows operators to set stitch points, which is ideal for long, unattended machining and multi-workpiece cutting.

FANUC America / 888-326-8287 / fanucamerica.com
Methods Machine Tools Inc. / 877-668-4262 / methodsmachine.com

New Wire EDMs Feature Ergonomic Enhancements

The new GE-SAi and GE-SAiL AccuteX CNC wire EDM machines from **Absolute Machine Tools** feature ergonomic enhancements and a choice of either traditional ball screw (SAi) or AccuteX linear motion (SAiL) axis drive systems. GE (Great Economy) series machines are engineered for reliable, economical production of small parts and components. The new ergonomic, space-saving design includes a drop door and three-sided table, (back rail optional) as well as AccuteX-patented, fully annealing, automatic wire threading (AWT) and the ability to perform submerged machining up to 8 inches (195 mm) deep.

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

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MOLD MATERIAL

How to **Avoid Tool Steel Corrosion**

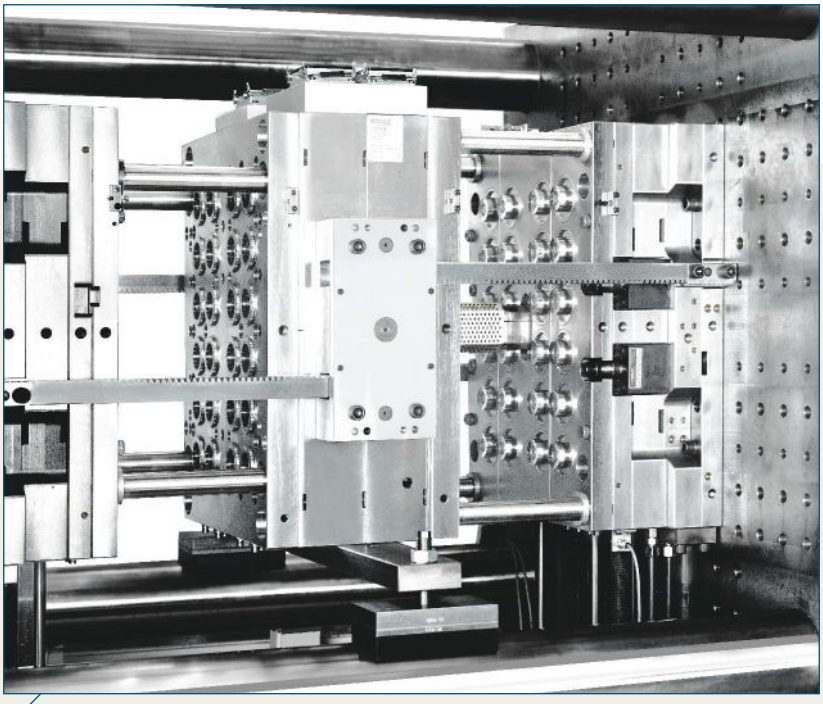

Image courtesy of Schmolz + Bickenbach.

This pre-hardened free machining stainless steel mold base material resists corrosion associated with high humidity environments and when corrosive resins are used in molding. This material has a homogeneous microstructure and re-sulphurized chemistry for optimal machinability, minimal levels of course carbides for better cutter life, reduced carbon for improved weldability, and lower carbon and higher chrome content for improved corrosion resistance.

By Dr. Hans-Gunter Krull, Daniel Kipp, Dr. Philipp Niederhofer, Kathrin Eger

One of the most important requirements for extending mold life is improved corrosion resistance. Stainless steel is common in plastic mold manufacturing because it is very resistant to condensation, cooling water and acid precipitation.

Plastics, in general, are not considered chemically aggressive. However, molds can be subjected to highly corrosive stresses under operating conditions during molding. These stresses range from extreme climatic influences to PVC usage, which can release hydrogen chloride if exposed to temperatures around 170°C for long periods of time. Hydrochloric acid can also form during PVC production when the air is humid. Another factor influencing stress is the mold design when features like complex engraving or cooling channels are included.

Striking a balance between corrosion resistance, hardness and machinability are key to selecting the right tool steel, but the most important factors are processing, polishability, operational environment and wear resistance.

Striking a balance between corrosion resistance, hardness and machinability are key to selecting the right tool steel, but the most important factors are processing, polishability, operational environment and wear resistance.

Here are three tool steel types to consider:

ESR martensitic plastic mold steel has excellent wear resistance after quenching and tempering to the desired work hardness. It is suitable for applications requiring good polishability and can also be used in plastic injection molding, form presses and extruders. This mold steel type is not easily welded or nitrided, but it does have good corrosion resistance, toughness and machinability. It is also suitable for texturing.

Precipitation hardening steel is extremely corrosion resistant. This material also requires no additional hardening and tempering by the customer because it already has a work hardness of 38-42 HRC after hot forming and heat treatment. It also has high strength and toughness. This material is primarily used for molds that demand resistance to condensation and cooling water. Its high wear resistance also makes it an alternative steel material when processing plastics like PVC or amino plastics whose acid can attack steel.

Special steels with alloying elements, such as chromium, manganese and sulfur, offer hardness, high corrosion resistance and excellent machinability. Their properties are largely determined by targeted metallurgical treatment for sulfur dispersion and heat treatment. In this process, the steel is heated to a temperature of 800°C under controlled conditions and quenched in water or a polymer. This treatment promotes a uniform microstructure, resulting in a dimensionally stable product. MMT

CONTRIBUTORS

Kathrin Eger, Daniel Kipp, Dr. Philipp Niederhofer, Dr. Hans-Günter Krull are with Deutsche Edelstahlwerke.

FOR MORE INFORMATION

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THE DIFFERENCE BETWEEN AN ATTEMPT AND AN ACHIEVEMENT

THE TOOL

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