Improving the Flow of END Mold Repair and Engineering Changes - 18

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How to Pre-Estimate Tooling Costs - 24

On-Machine In-Process Inspection Improves Machining Accuracy - 28

How to Become a Better-Informed Mold Purchaser - 32

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- 24 Software: How to Pre-Estimate Tooling Costs The right costing software can help to improve mold quoting and production.

28 Machining

On-Machine In-Process Inspection Improves Machining Accuracy High-speed machining with on-machine in-process inspection, machining management and control technology reduces machining times and eliminates manual bench work.

32 Business Management: Upping Your Mold Purchasing Skills Six questions every purchasing manager must answer to improve his or her buying skills and create more value for the company.

35 Software

Unique Five-Axis CAM Programming Helps Moldmaker Meet Strict Specs

When it comes to hard milling and tough surface finish requirements, X-Cell Tool finds one CAM software's approach answers the call for perfection.



TRICKS OF THE TRADE Great Tips from This Issue

1. Get What You Need

Technology is essential for a new facility, but an investment strategy should include spending money on what you have to have for the size work you do. PG. 18.

2. Know It All

Advanced feature recognition helps to identify advanced geometrical parameters and features that are major cost drivers for product and mold costing and required for corresponding cost models. PG. 24.

3. It's All **About Control** A high-speed machine tool with on-machine in-pro-

cess inspection measurement adjusts the machine tool during the machining process, controlling the dimensional accuracy of the final mold. PG. 28.

4. Money Matters

A way to get extended terms To assess corrosion is factoring the receivables to a bank that understands the automotive tooling process. This can reduce the initial tool cost and pay for the cost to factor the receivables. PG. 32.

5. Be Wear Aware

resistance and determine the appropriate testing method, the mold builder must understand the type of corrosion that may occur. The corrosion behavior is a system property. PG. 48.



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ON THE COVER

This month's cover image shows some of the United Tool and Mold Liberty, South Carolina, team using a SXKH spotting press from Dynamic International (Pewaukee, Wisconsin) to conveniently check and finish its large plastic injection and blow mold and die work in a comfortable, safe position. See the related story on page 18.

Images courtesy of (left to right) Siemens Digital Industries Software, Jingdiao North America Inc. and X-Cell Tool and Mold.

VIDEO ACCESS



CELEBRATING 40 YEARS OF GRIT

We are celebrating our 40th Anniversary, and on behalf of the entire Alliance family, we want to thank you for being our partners in this journey. We wouldn't be here without you.

There have been many changes over the years, but one thing has remained unchanged: our grit. It is that grit that makes us who we are and defines our company. When you look around the shop you will see grit coloring our hands, dusting our benches, and swirling through the air. Small remnants of dirt from delivering on promises rain or shine, little pieces of left behind polishing stones, grease, sand and plastic from the molds we clean, abandoned splinters of welding wire and laser engraving soot are just a few of the examples of grit that surround us daily. It is threaded into the fine detail of our lives and no matter how much you clean there will always be a hint of grit that is left behind.

That GRIT is the kind you find in our hearts. The GRIT of courage and strength to start a company from nothing. The GRIT to put it on the line and to try new things that no one else thinks possible. The GRIT that provides the passion and perseverance to take on challenges no one else could. The GRIT to do whatever it takes to not only get the job done, but done right. The GRIT that Alliance was built on is a special grade. It makes us who we are and holds us together as a family. GRIT is in our blood and it flows through our veins, feeding the hunger to be better each and every day. The same Alliance GRIT that started as a dream in a garage 40 years ago is alive in every single person that calls this place home. It is our GRIT that makes the difference between us and every other company out there, and it's the reason why we will continue to be a dominant force in the industry for the next 40 and beyond.

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Are You Ready?



A few years ago, I introduced the industry to my son Gabriel, who has Williams Syndrome (a disorder caused by the deletion of genetic material from a specific region of chromosome 7, which includes 26 to 28 genes that impact both physical and cognitive abilities). I decided to share my story (which, by the way, compelled people to reach out to me about their children-a testament to this wonderful industry) because at the time, my husband and I were attending every conference, lecture, seminar and trade fair that we could find to get up

to speed, and more importantly to get ahead of what was to come with Gabriel's development. It was then that I used my personal experience to craft a message encouraging mold builders to get out of their shops to learn something new and connect with people who have the same challenges. I was specifically motivated to help you get up to speed and get ahead of the challenges coming your way in the world of mold manufacturing by attending Amerimold.

Well, my life with my son provides another appropriate example. This time, it's about readiness. Readiness for my husband and I is focused on preparing for the multitude of challenges and opportunities Gabriel will face once he transitions from school to the work world. The readiness I am talking about for you is different but no less important.

Last year we presented workforce readiness with the expert help of new Editorial Advisory Board member and talent consultant Marion Wells of Human Asset Management through an industry workforce readiness survey and panel discussion at Amerimold 2019. This month, I present to you *technology readiness* because it goes hand in hand with workforce readiness to create the mold manufacturing ecosystem. And just like any ecosystem, yours is also threatened by predators: your competition and the changing landscape of mold manufacturing.

To keep your ecosystem thriving, every mold builder must strike a balance between workforce and technology readiness as 2030 approachesthe impending deadline for the shift in both the people and process sides of mold manufacturing.

In a nutshell, technology is defining the work you do-whether that involves Industry 4.0, additive manufacturing, robotics, artificial intelligence, the circular economy or any advanced manufacturing technologyso evaluating and adjusting your workstreams in alignment with each new technology implementation is critical. This requires better planning.

Last year, we focused on the people, and this year we are going to focus on the tools to give your people-namely, technology to be more effective and to protect your investment. It's time to start seriously thinking about how your manufacturing process will change in the next 10 years, so you can start planning to be technology- and workforce-ready. We will be developing our 2020 content in that spirit of readiness-focusing on what works and what's new with both workforce and technology.

heistina Fuges

Christina M. Fuges Editorial Director





THIS MONTH ON moldmakingtechnology.com



VIDEO: On-Machine Measurement Technology for Standardized Moldmaking: Amerimold 2019 Jingdiao's online measurement and intelligent modification technology eliminates interruption of the continuous production process by measuring the parts on the machine. short.moldmakingtechnology.com/JDAMEDemo

PODCAST: What Do Rhinos Have to Do with Repair?

United Tool and Mold's journey to a successful mold repair and engineering changes service provider has a lot to do with risk, reward...and yes, rhinos! short.moldmakingtechnology. com/UTMRhinos



BLOG: Planning for the 2030 Workforce Challenge

Marion Wells of Human Asset Management discusses what the year 2030 means to mold builders, the importance of



shop culture and an upcoming collaborative project on mentorship.

short.moldmakingtechnology.com/2030video

WEBINAR: When It Comes to Cutting Tools, It's Not About Price, It's About Performance

The dirty little secret about cutting tool cost is that it's not about price, it's about overall costs. This free archived



webinar discusses all the details of cutting tool performance testing.

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2020 Editorial Advisory Board: Marion Wells

By Christina M. Fuges

MoldMaking Technology has always had an Editorial Advisory Board (EAB) comprising people with expertise within their respective business, industry, technology and profession to help guide the direction of the brand's content. We do this because **you** are the experts. The response to my call for new members for the 2020-2023 term was overwhelming but provided a stellar pool of candidates, from which I was able to put together a balanced board of moldmaking professionals across North America who represent various ages, genders, job functions, mold types and end markets. This col-



Marion Wells, a talent consultant with Human Asset Management, is one of *MMT*'s new Editorial Advisory Board members. umn will introduce a new member each month (see masthead to the right for the full board).

Meet Marion Wells. Marion is a talent development consultant and partner in Human Asset Management (HAM), which offers services focused on talent development, organizational strategies, program management, and sales and marketing improvement for small to midsize manufacturers. HAM's strategies result in manufacturing clients building and strengthening their talent pipeline, their organization and their customer relationships. Marion offers clients an incredible breadth and depth of experience using continuous improvement process tools to drive change in program management and sales and marketing.

Marion works with companies that aspire to achieve significant organizational results through the development of their human capital. She has more than 20 years of business solution experience in manufacturing and the automotive industry, which gives her credibility, experience and understanding of how businesses function. She works with leaders who are committed to balancing the reality of industry and organizational challenges with the need to effectively lead others.

HAM addresses employees' core competencies, current strengths and skill gaps to ensure they are better contributors, improve employee engagement and help organizations retain the best. All of this helps organizations understand who has what competencies and how to combine complementary strengths within a team to generate value. Marion also serves as a chair for West Michigan Tool & Die's Corporate Governance Committee and is a member of their Management team.

Marion has been leading the charge in helping businesses future-proof their organizational culture to embrace the ongoing generational shift occurring in today's workforce, and that is why Marion is on MMT's board and that 1 continue to work with her workforce development projects, such as MMT's informal mentorship pilot program.

FOR MORE INFORMATION

Human Asset Management / humanassetmngt.com

EDITORIAL ADVISORY BOARD (EAB)

The EAB enhances the standing of the publication and strengthens its professional integrity through the active involvement of its members.

The Board represents all aspects of the mold manufacturing industry with a balance of moldmakers, molders, OEMs and academia, and various moldmaking segments and job functions. A member is selected based on his or her experience and knowledge of the moldmaking industry to serve a three-year term.

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A Conversation with ... Accu-Die & Mold Inc.

You have a full-service die-cast mold building shop. What are your capabilities?

Dan Lausch, V.P. manufacturing: We specialize in highpressure, horizontal die-cast tooling for aluminum, magnesium and zinc. In addition to building tools, we also offer CMM inspection, full-part inspection and layout, mold repair and laser welding.

Our 31,000-square foot [2,880 square-meter], climatecontrolled shop is equipped with 22 CNC machining centers. We have two Makino F5 high-speed machining centers, two Makino horizontal A-61NV high-speed machining centers, and a YCM NTV158A that we use to hard-cut cavities. We also have two Makino U6 heat wire EDMs and a Charmilles ROBOFIL FI440 wire EDM. Our EDM machines are a Charmilles Technologies Robo Form 55 CNC EDM and Charmilles Technologies Robo Form F085. We have four 50-taper machines and 16 40-taper CNC machines that the moldmakers use to build required details. We also have hoist capabilities to 20 tons. We work primarily with hardened steels-mostly P-20, stainless and H-13, although occasionally we also use HD steel and bidirectional forged steel. To support our customers, we have the capability to reverse engineer from a part print or a supplied cavity insert to a usable cavity model. In addition to die and mold design, we also offer CAD/CAM, complete design



Accu-Die & Mold, Inc. 7473 Red Arrow Highway Stevensville, Michigan 269-465-4020 accu-die.com

- Full-service die-cast mold manufacturer founded in 1991 by Dan Reifschneider, owner.
- Specializes in high-pressure, horizontal die-cast tooling to fit in 350-1,600 ton die-cast machines.
- Builds die-cast tooling for aluminum, magnesium and zinc. Also has experience in squeeze-cast, low-pressure, gravity, metal-injection and permanent molding tools, plus occasionally makes plastic injection molds.
- Currently employs 44 team members.
- Industries served include automotive, appliance, furniture, medical devices, agricultural equipment, industrial, recreational vehicles, sporting goods, commercial truck.



A four-axis milling machine processes a workpiece in Accu-Die's well-equipped shop.

from part to product, jig and fixture design, mold design, N/C programming, and we even do some R&D. We use AutoCAD, CADKEY, CATIA, Mastercam, SolidWorks, Surfcam and WorkNC. We're ISO 9001:2015 certified.

Most of all, we're known for our service and engineering, the quality and first-time success of our molds, for on-time delivery, and for being cost-competitive.

Your company specializes in die cast tooling, but you still occasionally make molds for the plastics industry. Given that you can work in both areas, why focus on metal die casting?

Lausch: Interestingly, both our owner and I did stints as plastic toolmakers early in our careers. To be honest, we feel that die-cast tooling is a very demanding field owing to the violence of that process compared to plastic molding. You're building tools to survive molten metals at temperatures of 700 to 1,260°F [371 to 682°C] and shot pressures from 8,000 to 10,000 psi [55 to 69 MPa], depending on part size. Because metals are much better thermal conductors than plastics, you can get heat out of parts much faster, which means die-cast cycle times are quick—an average of 50-60 seconds, although they can be as short as 16 seconds and as long as 2-3 minutes, depending on part thickness. And with different metals, you're



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HUD Mirror Mold Prototype HUD Mirror Mold Test Piece

Size: 11.8×7.9×2.0 in. (each) Material: M333(HRC50) Machine: GRA300 **Highlight:** Surface roughness Sa<10nm, Sv<35nm.



Mold Insert of Automobile **Engine Cylinder**



Spiral Bevel Gear Mold Test Piece

Size: ϕ 3.5×1.4 in. Materials: DC53 Die Steel(HRC62) Machine: GRA400 Highlight: The accuracy reaches level 1 DIN 3965 / 86.



Size: 8.3×6.8×9.2 in. Material: H13(HRC52) Machine: GRA400 Highlight: Corner cleaning with R0.5mm ball-end tool.

Fresnel Lens Mold Test Piece

Size: ϕ 1.2×2.4 in. Material: S136(HRC50) Machine: GRA200 Highlight: Finishing with R0.1mm PCD tool for 99h.











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always dealing with chemical reactions—essentially galvanic corrosion.

Given the typical 600 to 800°F [316 to 427°C] temperature delta between the molten metal and the tool temperature, thermal expansion changes are very rapid. Hence, to protect die-cast tools from thermal shock, we have to build them very robust just to survive. For example, we need much thicker mold bases but, unlike plastics, they're not in plate form. Our mold bases are mostly a solid structure with a pocket for the cavity.

We also have to design for very-low shrink —on the order of 0.06-inch [1.52 mm]. While we do have tooling action for complex parts, we mostly use slides because lifters wouldn't survive. Even then, they have to be built a lot more robust because of process conditions. And given the low viscosity of molten metals, which are close to that of water, it's not easy to have a 1:1 shutoff as you do with polymers, so virtually every die-cast aluminum part has to be post-mold trimmed. You just can't make shutoffs tight enough not to have some flash.

Another thing to understand about plastic vs. die-cast tools is their longevity. It's very common to get injection molding tools guaranteed for 1-million shots. However, because of the chemical reactions between metals and the heat and pressures, the useful life of a die-cast tool is typically between 150,000 and 200,000 shots. Another difference is that all die-cast machines use hydraulic clamping pressures because you can't generate sufficient pressures using electric servo machines as you can in plastics molding. Still another difference is that die-cast molds fill in milliseconds. These materials don't have



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laminar flow, so you don't have to worry about shear tearing apart the molecular structure as you do in polymers.

Also, with metals, you want to cool very fast to get a fine grain structure for good properties. In a crystalline plastic, you'd want to cool more slowly to allow a good crystal lattice to grow for a stiffer part before ejecting. All in all, we find diecast tool building to be technically challenging, and it's where we've opted to build our expertise.

Your company really values apprenticeship programs. Can you tell us more about your experienced team?

Lausch: We believe that a trained workforce is the only way to handle all the complexity that's involved in producing highquality, precision tooling. For example, we have journeyman moldmakers overseeing all our die builds, and each of those people was an apprentice first. In fact, our owner, as well as all our machine operators, sales team, designers, toolpathers, lead men and machinists have been through the moldmaking apprenticeship program. Of our 44 current employees, 22 have completed their apprenticeships and three more are in the process of finishing the program. These 22 people are the backbone of our organization because of the knowledge and experience they've gained. It's not uncommon for a customer to call and ask to speak with the mold builder who produced their tool in order to ask a couple of questions. This has created a sense of ownership among our entire team and it instills pride in everything that we build.

We're lucky to have such a skilled workforce. The apprenticeship program is part of that, but it's also a function of the region we live in here in Southwestern Michigan. This area has a very strong tradition of tool and die building capabilities.

Since automotive is an important part of your customer base, and that market is in the midst of radical change right now, what trends are affecting your own business? Lausch: One of the most important changes we're seeing in the auto industry is the shift from internal combustion engines to electric vehicles (EV). Honda announced it will be all-electric in Europe by 2021 and Ford just announced it'll launch 25 new EV models by 2025. Fleet electrification is going to be a fact of life before too long, so we're trying to stay out in front of this technology. With EVs, you no longer have an engine but you do have a motor and that presents new opportunities for die-cast parts on these vehicles. And with all the focus on lightweighting in automotive, we see the aluminum

and magnesium content of cars increase year after year, so that's another opportunity that helps us.

The steel and aluminum tariffs did bite us early on. It's typically three months from the time we submit a quote until we're awarded a job, so any quote that went out before the tariffs took effect meant we had to honor the price and eat the additional cost. However, it's pretty much evened out now. And while the trade wars have led to some slowdown in our automotive business, we're very fortunate to be as diversified as we are.

Of course, as with other manufacturing services, a lot of die casting has left the U.S. and moved to lower-cost countries. That goes for die-cast tool manufacture as well. Initially those countries aren't known for their quality, but as time goes on and they get more experience, and as OEMs invest in the supply base, their quality comes up. I don't care whether you're talking to customers in automotive or non-automotive, no one wants to pay more for their tools. That means you always have to find new ways to innovate without adding cost.



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This is your chance to name our new friend and make your mark on the MoldMaking community! Tweet or submit your ideas today! #IfAMoldCouldTalk

The moldmaking industry comes to life when conversations turn toward the challenges of a mold build, the absurdity of customer requests, the outrageous employee mistakes, or the unrealistic expectations of next-generation moldmaking professionals.

Yet, one of the many things the men and women of this industry do well is laugh at themselves. They are the hardest working people I know, but they can always find humor and

joy in the daily frustrations of their work. Hence, *MMT*'s everpopular "Top 10 Reasons to Be a Moldmaker" t-shirts.

Well, recently I found another way for mold manufacturers to unleash their sharp wit and wisdom gleaned from years of experience: Introducing the **"If A Mold Could Talk"** campaign!

Consider the life of a mold, what it goes through, from design, to first shot, to maintenance and repair. It's basically *MMT's* version of a meme! We can't wait to find out what you think we should call our new industry mascot! Submit your ideas on **moldmaking technology.com/zones/amerimold** or Tweet using the hashtag **#IfAMoldCouldTalk**. We need your ideas by **Jan. 31**, so act fast! —*Christina Fuges*

Then consider what a mold would say as it passes through quoting, designing, machining, inspection, molding, polishing, assembly, cleaning, welding, etc.

It's basically MMT's version of a meme! But before we ask you to share your mold rantings given a scenario, let's first give this character, this industry mascot, a name.

We'd love to hear your ideas for what we can call our new buddy! Head on over to our website moldmakingtechnology.

com/zones/amerimold to submit your idea. We need your ideas by Jan. 31st, so act fast!

We'll announce the winning name on our social media channels and in March's issue of *MoldMaking Technology Magazine*. Make sure to follow us on Twitter at @MMTMag to stay up to date with our new friend's adventures, and to play along with us as we learn what our little friend's voice sounds

like. If you want to tweet your ideas, use the hashtag #lfAMoldCouldTalk so we can all follow along.

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Mold Maintenance and Repair

By Christina M. Fuges



Charging Forward

A new perspective on competition, training and workflow redefines this shop's core competency in repair and engineering changes, and charges the team toward continuous improvement.

veryone talks about training, but what about "rhinoceros training"? "Go after a rhinoceros-size goal: one equal to your potential and do not underestimate yourself." That's exactly what Scott Phipps, owner of United Tool and Mold (UTM) did back in 1995. The first step to rhinoceros training is to grab a sheet of paper and write in capital letters:

"I AM A RHINOCEROS! I HAVE A DAMN-THE-TORPEDOES SPIRIT! I AM FULL OF ENERGY, AND I CAN'T WAIT TO GET UP IN THE MORNING AND START CHARGING!"

It is this exact attitude that pushes Phipps to wake up every morning with the answers to the torpedoes from the previous day, polish his horn and head into the mold jungle to eagerly tackle the obstacles of the day ahead. He has learned the hard way that the world will always have obstacles that force you to change, but if you charge ahead with audacity and learn from your past torpedoes, you will begin to more easily navigate the future. "It takes an eyes-wide-open approach to life and two-inch-thick skin to survive this mold jungle. That's rhinoceros training," Phipps says.

The second step is to write a sentence announcing the fact that you have reached whatever goal you are after and the

United Tool and Mold employs 80 people with an average age of 38 across its Rainbow City, Alabama and Liberty, South Carolina facilities. The company's "Rhino" philosophy continues to help the team tackle challenges and take advantage of all opportunities to grow. date you want it to be a reality." Phipps wrote, "UTM will be the customer's partner and will handle any size mold with no limits and no boundaries by January 1, 2000."

Although today Phipps considers that Rhino goal accomplished, he knows that he must keep his eyes wide open and remain eager to continually charge. He lives a "never be satisfied" lifestyle and continually sets goals. "Plan your work. Work your plan. Then as you start to reach a goal, set another goal," Phipps says. "It's a process. You have to think differently from the norm to be truly successful. You have to stand out and be confident with purpose."

This training approach has pushed Phipps through tough times. It changed how he approaches life, which not only includes attitude but spirituality, finances and family too. *Rhinoism* is not only *his* philosophy but the company's philosophy as well. Today, Phipps is charging toward a new goal. It's a never-ending journey of continuous improvement.

Charging Ahead

Phipps came across the concept of rhinoceros training in a very simple book by Scott Alexander called, "Rhinoceros Success," which has become the rule book for this South Carolina-based mold repair and engineering changes services provider. Rhino



/ This wall mural sums up the UTM mission well: "3 Hours, 3 Days, 3 Weeks." This rule means from the time a mold hits the floor, it must be in process within three hours, fixed within three days and complete within three weeks. reminders adorn the walls of each facility, setting the tone for the attitude of this shop. A mentality that *charges* these problem-solvers forward to improve every day.

Today, UTM employs 80 people with an average age of 38 across two facilities—one in Rainbow City, Alabama and its newest building in Liberty, South Carolina. Phipps credits the Rhino philosophy for helping him, and his team overcome a myriad of challenges and capitalize on all the growth opportunities.

Earlier time spent (1998-2001) in Japan, England, Korea and China prepared Phipps for this next step in the company's growth. It changed how he looked at competition, training and workflow. He witnessed how shops worked together to learn, get better and compete in the global market.

Then by 2003, Phipps chose to focus exclusively on repair and engineering services because he saw what was happening in the global manufacturing market and couldn't compete or spend the money to invest in the necessary capital for the traditional moldmaking model.

UTM is a service provider, not a tool shop. The team takes care of the maintenance side of things and does what it needs to (for anything that forms a part like blow molds or injection molds) to keep manufacturing up and running.

"We were the first shop to focus 100 percent on mold repair and engineering changes, and from 2007 to 2011 when the economy was low, our business was really high. In that time frame, we added onto our Duncan, South Carolina building, increased our mold handling capacity to 50-metric-ton molds (120K lbs) and added multiple locations to provide our services globally," Phipps says.

By 2010, many shops disappeared, but UTM was thriving. UTM was on top of its game, but Phipps recalls how complacency seeped in just when the market started to change. In 2012-2013 mold, shops started to *manufacture* molds instead of *building* molds. They were picking up the European way of manufacturing, including new processes, technology



Listen to the MoldMaking Technology/ The Manufacturing Alliance Podcast with Scott Phipps and Patrick Brisson of United Tool and Mold as they settle in and share personal stories and shop strategies for mold repair and engineering changes. short.moldmakingtechnology.com/ podcasts

and equipment investment. UTM was not one of those shops.

Phipps' team was doing the same things within the same facilities and was relying only on tribal knowledge, which saw the company's sales and market position start to flatten. Mergers and acquisitions were also picking up throughout the marketplace. It was then that Phipps decided to make some business changes.

"We were the first shop to focus 100 percent on mold repair and engineering changes, and from 2007 to 2011 when the economy was low, our business was really high."



UTM is a service provider, not a tool shop. The team does not simply sell a mold, it offers a service. They don't just want to get a damaged mold running, they want to ensure that the mold will continue running long after the repairs are completed.



This Linmax B-3040 linear five axis machining center from Dynamic International eases the machining of the large mold work UTM takes on.

Go with the Flow

Phipps made a conscious decision to commit to his people and combine two of the companies under one roof with a new facility in a new location. "It's the first time in my life I was able to make a building the way I want it. I did not cut any corners. I did things I never thought I would do. It's all part of our growth," Phipps says.

The goal was to be like a Google facility and change the whole image of toolmaking to bring the next generation in and to reset the bar for UTM being the leader in repair and engineering changes again.

The new Liberty, South Carolina facility is about making sure the people understand how the work is going to flow. The 60,000-square-foot facility has 14 cranes up to 50 tons, and a workflow where the dirty stuff comes in one side and the clean stuff goes out the other side, with a command center in the middle where the toolmakers, programmers and purchasing sit. It is essentially "the hub" from which work feeds. Once work leaves the front office and enters engineer-

ing, it stays in that room until it goes out the back door. The team is trying to keep work from moving backwards. It's all about flow.

Phipps put the purchasing department in the hub, too, because UTM is a repair and engineering house, and the team can't plan everything that is going to break or how fast a customer needs it. "The hub is intentionally centralized, open, and accessible to everyone to ensure the efficiency of the workflow," Phipps says. UTM is a service provider, not a tool shop. The team takes care of the maintenance side of things and does what it needs to (for anything that forms a part like blow molds or injection molds) to keep manufacturing up and running.

He also placed the coordinate measuring machine near

the hub as work travels through and comes off the CNCs, as well as tool and component vending machines to help control inventory. "It's not the cost of the ejector pin, it's the cost of the labor and waiting. We are firefighters who need access to the tools, so we can get started on a job and get it done," Phipps says.

Technology is, of course, essential, but Phipps' investment strategy for the new facility is to "spend money on what we have to have for the size work we do: spotting presses and eye bolts, for example." Key technology and equipment include SXKH spotting presses, a linear five-axis machining center, a fluidized bed for mold component and hot runner cleaning, laser engravers, laser welders, laser scanners, PowerApps for job tracking, ERP, VISI CAD/CAM and workstations uniform-





The workflow of the new Liberty, South Carolina facility is streamlined via easy loading and unloading, speed of logistics and a team split into an engineering group and a repair group.

The UTM workflow has dirty stuff coming in one side and clean stuff going out the other side with a command center in the middle where the toolmakers, programmers, and purchasing sit and from which work feeds.

ly equipped with hoses, eyebolts, reels, iPads and flatscreens showing job status.

A 3D model of the new facility was key to building it right. "If we didn't use the 3D model we would have made mistakes," Phipps notes. "For example, the way we positioned our big five-axis machine would not have allowed the crane to get to it." Even the color scheme was purposeful. Phipps chose a cheerful yellow-gold for office and European blue walls in shop part way up throughout the building. I can't forget the state-of-the-art kitchen, outside porch area with grills, tables, umbrellas and cornhole, not to mention the nice restroom perk for the women of UTM.

The new facility has changed a lot of things. "I would



UTM's management team is key to optimizing the capacity of the two separate facilities, the shop's guick-turnaround mentality, and the team's "Rhino Charge" attitude.

never have imagined that a new facility would attract customers as it has. It's become a marketing piece. They want to come here and be a part of it. They want to support it. And the employees have pride in it, which attracts other young employees and so on. It's been overwhelming. Even BMW wants to hold its meetings at the new building," Phipps says.

Rhinoism is not only *his* philosophy but the company's philosophy as well. Today, Phipps is charging toward a new goal. It's a never-ending journey of continuous improvement.

People Impact

Phipps did not just set out to transform workflow with a new facility; he set out to transform tribal knowledge into a process by improving the flow of information (data) and work (repair and ECs). This entailed resetting the bar for his people with a "3 Hours, 3 Days, 3 Weeks Rule." From the time a mold hits the floor, it must be in process within three hours; then within three days, a crashed mold must be fixed; if it's an engineering change, it must be in process. "Within three weeks, the job is complete," Phipps says.

Although the new facility's ease of loading and unloading and speed of logistics is key to this rule, splitting the team into an engineering group and repair group is also vital to the new workflow. Molds come in for engineering changes or repairs, so the shop floor is separated into two areas. Trucks come

VIDEO: United Tool and Mold Talks with MMT About

Expansion, Competitiveness and Its Culture of Rhinoism

UTM President Scott Phipps shares the strategies and technologies behind how his team tackles the shop's daily mold repair and engineering changes.



See the video on moldmakingtechnology.com

through and unload the dirty work to the back on one side. That's the *three hours*. Once it is there, the work should be in the unload area no more than three hours. Then within three days, it should be in process (being worked on).

UTM manages this flow by flexing its muscle with three 10-hours shifts: 6 am, floaters/project managers at 7 am; noon shift, then the weekend shift. They also pull resources from other facilities, if necessary.

In addition to bringing work in, UTM offers service onsite. For that value-add, Phipps emphasizes the importance of mechatronics to handle hydraulics and electronics when it comes to the service side of mold building. "So, we grab talent from the mechatronics class at the career center. We are developing service-oriented tool guys. They are not becoming journeyman toolmakers," Phipps says. "Toolmakers can build molds to the numbers. We make molds work."

"I finally understand what I'm doing after a lot over the years when I didn't know what I was doing. So now it's my job to try to understand what I did and help others and teach them, especially my people and help them reach higher."

Phipps says he'll know if what they have established in Liberty is successful if it's sustainable. His goal for the next five years is to train up the next generation to take it over and keep it going someday. He wants to help them to manage it and take it to the next level.

Keep on charging!

FOR MORE INFORMATION

United Tool & Mold Inc. / 864-859-8300 / utminc.com Alliance Laser Sales Inc. / 847-487-1945 / alliancelasersales.com Alpha Laser - US / 814-336-9000 / alphalaser-us.com Dynamic International / 262-521-1100 / dynamicintl.com VISI by Vero Software / 248-922-9293 / visicadcam.com



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How to Pre-Estimate **Tooling Costs**

The right costing software can help to improve mold quoting and production.

old manufacturers must deliver high-quality molds to customers faster than their competitors and then help them design products right the first time. Ultimately, moldmakers are striving to pull together the multiple pieces of the mold design process to integrate and manage design within the product development process.

According to studies, 70 to 80% of the total product cost is determined during the initial stage of product design. During the last stage of the product's life cycle, a large portion of product cost continues to incur, so it is important to pre-estimate tooling costs.

One of the key challenges that mold builders face is competing in the global market to produce tooling at a competitive cost while maintaining part quality. While most companies estimate tool cost based on experience or spreadsheets, they

often end up with wrong calculations-either quoting too high and then losing the order to the competition or incurring extra costs during the remainder of the manufacturing process that yields a financial loss.

It is very difficult for moldmakers to estimate how much time and money they invest in mold quoting each month. Mold builders spend a considerable amount of time and money each month quoting molds that will never become actual jobs. This way of doing business cannot work in the long run.

One solution is an integrated application for tool cost calculation in CAD software that helps mold builders accurately calculate mold costs based on recognition of cost-driving geometric parameters such as surface area, volume, wall thickness, feature ribs, openings and undercuts.

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Calculate accurate total tool costs including labor, material and machine costs.

This application can make the quoting process more efficient and accurate while eliminating dependencies on thirdparty applications. 3D models that are designed in or imported from the CAD software are analyzed for manufacturability considering the draft angle, wall thickness, mold flow and plastic injection. Costing parameters are then identified through feature recognition automation. Then the product cost management integration comes into play, which calculates the tool costs, including labor costs based on the costing parameters.

Advanced feature recognition also helps to identify features that are major cost drivers for product and mold costing and required for corresponding cost models. This software supports primarily in connection with product cost management integration, which includes both product and mold costing.

Product costing provides an enterprise-wide platform for managing calculations and the basis for standardized costing methods, models for fact-based calculations and transparency into cost drivers. With mold costing, the mold builder can create timely, reliable cost estimates for quotation and tool cost analysis. Product cost management integration includes injection molding, die casting and stamping tools, as well. Users can read the 3D data automatically or manually create the geometry parameters.

Geometric parameters and features can be entered manually into the geometry object, or the CAD software can be leveraged to populate the geometrical parameters and features within the geometry object in a semi-automated way. While features are detected automatically, inspecting the results and manually interacting with the data is always required.

The CAD system also recognizes geometrical parameters and features for a single part and converts them into cost drivers for product and mold cost calculation.

The software also detects advanced features such as ribs, undercuts, bending areas, etc. that are required to calculate mold costs, especially in an early phase when no mold design is available. After the user identifies all of the cost drivers, they will use this information to deliver quick and accurate estimates.

Costing software can help mold builders manage advanced feature recognition to stay ahead of the competition.

Mold manufacturers face many challenges, including producing a high-quality tool while keeping the costs low. Implementing a software solution that provides an integrated end-to-end workflow from costing/quoting to tool manufacturing will yield many benefits and deliver competitive success.

FOR MORE INFORMATION

Siemens Digital Industries Software / 800-498-5351 sw.siemens.com

Daks Azhagappan, Product Manager, NX Tooling and Himanshu Iyer, Product Marketing Manager, NX



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On-Machine In-Process Inspection Improves Machining Accuracy

High-speed machining with on-machine in-process inspection, machining management and control technology reduces machining time and eliminates manual bench work.

S electing the right cutting conditions before machining is critical for precision machining. The wrong conditions can lead to tool deflection and tool wear, which diminishes the dimensional accuracy and surface quality of subsequent workpieces.

Generally speaking, manufacturing engineers and machinists who analyze material hardness, workpiece characteristics and tool selection before machining can obtain a set of suitable cutting parameters. However, most develop the appropriate parameters by test cutting and adjusting because there are no corresponding means to quantify the optimal cutting parameters.

An alternate solution is a high-speed machining center with on-machine in-process inspection, full-scale precision machining management and control technology that uses workpiece inspection to quickly assist machinists with determining suitable cutting parameters that can reduce machining time and eliminate mold fitting time.

Understanding Machining Requirements

An automotive lamp mold is 500 by 900 by 260 mm (19.7 by 35.4 by 10.2 inches) and 600 kg (1,320 lbs) and requires a front and rear mold that each have different dimensional accuracy requirements for different key positions. So, to machine the mold without requiring manual bench work to get the perfect fit, reaching the required dimensional accuracy levels is critical.

Here are key dimensional requirements for the front and rear molds that a machinist must consider to produce a quality product:



Testing On-Machine In-Process Inspection and Measurement

FIGURE A

Figure A shows a precision H13 test mold, on which a machinist used on-machine in-process inspection after finish machining to measure the actual surface allowance. Unsuitable cutting capacity and insufficient rigidity resulted in an allowance deviation range from 0.003 mm to 0.006 mm (compared to the nominal allowance of -0.003~0 mm).



FIGURE B

Figure B shows that by optimizing the cutting parameters and strictly controlling the tool holder system, the deviation range of the fine positioning surface was reduced to -0.003~0 mm.





A rear lamp mold made from LKM hardened mold steel.

Front Mold

The front mold made from NAK80 hardened mold steel determines the lamp's appearance, so it has a higher surface quality requirement than the rear mold.

- Parting surface. The main function of the parting surface is to seal off the plastic to prevent flash and burrs, so machining accuracy of the parting surface is ±0.01 mm.
- Product (seal-off) surface. Tolerance is within ±0.02 mm, but the surface finish must be better. Otherwise, product appearance will be diminished.
- Kiss-off surface: The front and rear molds are fitted together so the plastic cannot enter and to form the product's holes. The tolerance requirement is +0.015 mm.
- *Fine positioning:* The positioning accuracy of these precise



On-machine measurement results of a front lamp mold.



On-machine measurement results of a rear lamp mold.

positioning modes for front and rear mold fitting (e.g., conical, square, etc.) is 0.01 mm.

- *Guide pillar hole and guide pillar:* The accuracy required to ensure the correct fitting of the front and rear molds is lower than that of fine positioning. The guide pillar and guide pillar hole must be a clearance fit of 0.01 mm~0.02 mm.
- *Positioning corner*: The accuracy of a coarse positioning corner is lower than that of fine positioning at 0±0.015 mm.
- *Fitting surface*: The required tolerance is 0±0.015mm (**see Figure 1**).

Rear Mold

The rear mold (**Figure 2**) is non-surface related, so it has a lower surface quality requirement and is made from LKM 50# hardened steel.

- *Positioning corner.* The required tolerance is negative to within -0.03~ -0.01 mm for coarse positioning and easy mold fitting, relative to the front mold.
- *Slider groove.* The customer positions the slider, which has a required tolerance of -0.02 mm.
- *Wear block groove*. The wear block is positioned with the fitting surface of the front mold and can be replaced after wear.
- *Over-cut fit surface.* The tolerance of partial fit positions must be negative and controlled between -0.01 to -0.03 mm.

Achieving Required Machining Accuracy

A high-speed machine tool equipped with on-machine in-

process inspection measurement including a probe and laser tool measurement system can quantify the machining process, which allows the machine tool to adjust during the machining process and control the dimensional accuracy of each key position of the final mold.

The front mold's tolerance as indicated by the on-machine in-process inspection system is as follows: parting surface -0.00827 ~ 0.00575 mm, positioning surface -0.0202 ~ 0.0282 mm, kiss-off surface +0.012 mm and product surface +0.01 mm (see Figure 3).

The rear mold' tolerances are:

parting surface 0.000150.01099 mm, positioning surface -0.021-0.013 mm, kiss-off surface +0.008 mm and some fit positions -0.01-0.02 mm (see Figure 4).

The cutter yielded a glossy surface finish with exceptional consistency, as there was no tool vibration, over-cut at the root part or burr at the edge.

The red lead on the parting surface was in good condition after machining at 90% with a uniform distribution. This final fitting result proves the success of standardized moldmaking using machining processes that include on-machine in-process inspection.

FOR MORE INFORMATION

Jingdiao North America, Inc. / 847-906-8888 / jingdiaousa.com Hans Hansen, Director of Engineering

Upping Your Mold Purchasing Skills

Six questions every purchasing manager must answer to improve his or her buying skills and create more value for the company.

olds are considered a commodity. A statement all too familiar to most of us, as it has become the general attitude within the injection molding industry that hires employees who do not fully understand the complexity of manufacturing an injection mold. I want to share a perspective that may help facilitate the buying and selling of molds, as I have experience working on both sides of the process, selling injection molds to buyers and buying injection molds as a purchasing manager.

Six Questions

Mold buyers have a unique job in which they can either set up a manufacturing process for success or cause the company to lose profitability. A lack of understanding exactly what they are purchasing hurts productivity. Purchasing only on price and delivery is not the proper matrix for evaluating a mold. Putting part size, the number of slide actions, steel type and manufacturing location into a spreadsheet does not calculate the best mold price. The calculation is much more complex than that.

Here are six questions every purchasing manager should answer to improve his or her buying skills and create more value for the company.

• What is the function of an injection mold? A cooling fixture that forms a part out of heated plastic. The faster a mold can dissipate the heat of the melted plastic, the faster the cycle time will be. What does your company sell? Press time. My goal is to find suppliers who will engineer melt delivery systems and cooling systems to reduce cycle time and scrap. There are times that the mold cost will increase, but through some simple justification tools, cycle time and scrap reduc-

| | | Vendor Scoring and Rating | | | | |
|--|----------------------|---------------------------|------------|------------|------------|------------|
| | | 21.00 | 30.50 | 9.50 | 14.50 | 6.00 |
| Key Criteria | Importance
Rating | Supplier 1 | Supplier 2 | Supplier 3 | Supplier 4 | Supplier 5 |
| Quality - overall tool appearance, types of components used, surface machining, handwork, and ability of tools to
meet EGI customer specification. | 10 | Same | + | a. | + | Same |
| Design and Programming - software and staffing. | 7 | Same | Same | + | Same | (F) |
| Project Management - systems, procedures and staffing | 7 | Same | + | Same | Same | Same |
| Manufacturing - equipment, procedures, and staffing. | 8 | + | Same | Same | + | Same |
| Tool tryout | 5 | Same | æ., | σ. | Same | Same |
| Delivery - Ability to meet timing and proven to consistently meet delivery date with design, first sample,
maturation, shipping, texture and final delivery | 9 | Same | + | + | Same | Same |
| Management, company culture, and company health | 9 | + | Same | Same | Same | + |
| Supplier experience in manufacturing tools of that produce similar parts. | 6 | Same | Same | + | Same | Same |
| Support of manufacturing plant after tool delivery. Higher rating for suppliers with support shops near
manufacturing site. | 9 | Same | Same | Same | Same | Same |
| Suppliers overall impact on project cost | 7 | Same | + | Same | 1.7 | Same |
| Section Group | Total Score | 21.00 | 30.50 | 9.50 | 14.50 | 6.00 |

This decision matrix provides a method for evaluating a tooling vendor's cost, quality, delivery, experience level, business type, company culture, financial health and ability to meet objectives.



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Builder Educating Buyer

Every mold builder should take a look at how they are educating their customers about their molds because many mold buyers hold business degrees but are not technical. I empathize with the challenges of purchasing managers who must buy an item that they don't fully understand because I worked as a mold buyer.

I have been working in the injection molding industry my whole life. I grew up in the family mold shop behind my childhood home. As a young adult, I worked at custom molding companies specializing in highly engineered plastic parts. I have managed both large molds shops and small injection molding companies. For 10 years, I owned and managed a tooling company that built and sourced injection molds and progressive dies. As the market changed, I decided to take a position in purchasing as career development. Today, I am the operations manager for tool manufacturing and sourcing at Ernie Green Industries. My role involves managing a 25-man mold shop that specializes in high-tolerance medical parts and a team that sources domestic tooling as well as best-cost countries for medical and automotive tooling. Ernie Green Industries is a tier one automotive supplier and medical molder.

Years of experience as a buyer has taught me the value of taking the time to work alongside a customer to help them understand what your company offers that can make them successful. For example, explain the technology the shop is adding to mold to reduce cycle time and to increase mold life, offer creative financing methods to increase their cash flow and EBITDA, and be a trusted advisor to assist them with making wise decisions on tooling purchases.

Molds are considered a commodity purchase, but if both the buyer and builder work together, they can create a successful partnership and meet both company objectives.

tion can pay for the increased cost. Other items like the size of the mold, number of slide actions, type of steel and location of the tool build all affect the overall cost and performance of a mold. I recommend working with your tool engineers or suppliers to gain a better understanding of what you are purchasing and how to justify the costs. Sometimes paying more for the mold will increase productivity in production and increase overall company profitability.

- How many suppliers do you utilize? I have reduced my supplier base to increase my buying power. I will source a package of tools to the supplier's strengths to reduce my cost. When I started as a purchasing manager at EG Industries, a tier one automotive supplier and medical molder, the company had more than 40 approved mold suppliers. I reduced this to 20 mold suppliers. I approved each supplier based on what type of molds they were best at building and by location. Sourcing into the supplier's sweet spot allows me to negotiate the best cost, quality and delivery balance. My first program at EGI was a \$5 million tooling program. With buying the right mold and sourcing packages of tools, I was able to reduce my tooling budget by \$450k or 11%.
- Do you pay suppliers on time? Another way to reduce cost is by having a reputation for paying promptly. Not paying ontime increases the risk the supplier has in collecting its money and the need to use bank financing. I recommend talking to your suppliers and negotiating a cost down for early or prompt payment. I would expect a cost reduction of 2-3%.
- Does your company need extended payment terms? Payment terms are tough because we need to increase cash

flow and company EBITDA by extending terms. However, there are other means to accomplish the same objective. Some shops are large and financially stable enough to offer extended payment terms. Canadian mold shops have an advantage over USA shops because they utilize Export Development Canada to obtain government insurance on receivables. This reduces banking risk and allows the shop to get better interest rates and larger lines of credit. Another means to get extended terms is factoring the receivable to a bank that understands the automotive tooling process. By using this process, I was able to reduce the initial tool cost, which paid for the cost to factor the receivables. This was a win-win situation for my company and its suppliers. I encourage you to work with your finance team and suppliers to find a solution that helps you meet your objectives.

- Is your supplier healthy and going to be around to meet your needs? One of the worst things that could happen during a mold build is a supplier going out of business. The business end of mold manufacturing is tough. Banks dislike mold builders because they are hunters and gatherers that don't know from where the next job will come. I look for financially healthy suppliers who maintain a culture that empowers employees, invest in the future through equipment and apprenticeship programs and have a succession plan in place. These factors help determine if a business is being properly managed or if the business is managing them, which is never a good idea. Many mold builders are privately held, so it takes some work to find out these items, which is the reason I recommend taking the time to get to know the owners and senior leadership.
- How do you know you chose the right supplier? Many factors impact the decision to award business. I use a Pugh matrix to create a selection method that not only evaluates cost, quality and delivery, but the supplier's experience level along with the type of business, company culture, financial health and ability to meet my objectives. This selection process is a scientific method that allows me to be more objective about my decision-making process and provides a quantifiable reason for choosing one supplier over another.

If you follow some of the above recommendations, I am sure that you will be able to find creative ways to reduce your mold costs and increase the strength of your supplier relationships.

FOR MORE INFORMATION

Ernie Green Industries / 585-295-8951 x 6226 / egindustries.com James Jergens, Operations Manager

Unique Five-Axis CAM Programming Helps Moldmaker Meet Strict Specs

When it comes to hard milling and tough surface finish requirements, X-Cell Tool finds one CAM software's approach answers the call for perfection.

Moldmakers looking to drive continuous improvement using advanced, five-axis CNC machining centers often must contend with the learning curve that comes with the switch from tried and true three-axis machining approaches. Even when machine operators feel they have mastered the five-axis capabilities, there are additional adjustments based on operator knowledge and customer requirements. One of these is having the right software to coax the five-axis technology to produce at the optimum level. X-Cell Tool and Mold (Fairview, Pennsylvania) recently underwent this learning experience with its Yasda YMC-430 RT 10 five-axis Micro Centers.

X-Cell is *MoldMaking Technology* magazine's 2019 Leadtime Leader Award-Winning shop and has a continuous improvement mentality entrenched in its culture. The company maintains a lead time of between 14 and 16 weeks for complex 32- and 64-cavity molds and was looking to invest in new technology to grow its hard-milling capabilities and optimize its finish machining operations. They invested in the first of two YMC-430 RTs in 2018 (the other delivered in 2019 was the YMC-650 Micro Center). It wasn't long before X-Cell realized that its current CAM software was not suitable to the Yasda's speed and agility.

"The Yasda is a very high end, five-axis machine that is guaranteed to be able to hold 0.0001-inch tolerance throughout its window and produce finishes that need almost no polishing," Jim Cummings, general manager, says. "The software we were using for making very complex electrodes and for hard milling could not get the Yasda where it needed to be in terms of tolerances and surface finish. We needed to find a software that could give us more accurate tool paths. I asked our Yasda representative what software they recommended, and they said CAM-TOOL."



X-Cell Tool and Mold learned how essential the right CAD/CAM is to get its Yasda five-axis Micro Centers to produce at the optimal level.



CAM-Tool uses surface-based calculations, creating a high number of NC data points that are directly offset off the workpiece's surface, so you're getting a true representation of what your model is.

Surface-Based Tool Paths Make Finishes "Incredible"

Cummings says that he took Yasda's recommendation and purchased the software on a 30-day trial basis to be sure it was going to do what he needed it to do. "I wanted to see the software in action, programming our work instead of going to CGS, so I picked on-site training at our facility," he says. Ryan Weekes, B.B.A., president of CGS North America (Oldcastle, Ontario, Canada), and his team spent two days at X-Cell training the lead programmer and demonstrating CAM-Tool features; then they let X-Cell run with it for a week or so, came back to fine tune things and answer questions. Cummings says it didn't take long to validate the claims.

According to Cummings, prior to using CAM-Tool, X-Cell used the old software to program complex, hard-milling jobs (for machining materials ranging from 50RC to 65RC) or an electrode using the former software, but the results were less than acceptable. For example, X-Cell tried to manufacture some very involved electrodes for a customer, and they were rejected for little mismatches between tools and very small tool marks. "When the machining was completed, you could

X-CELL TOOL AND MOLD INC.

CHALLENGE: Unable to achieve customerrequired tolerances and surface finishes in hard milling applications.

SOLUTION: CAM-TOOL CAM software with unique, surface-based approach to programming.

RESULTS: Polishing process is virtually eliminated, tighter tolerances are realized and cutting tool life extended.

see and feel the lines from where the machine cut," he says. "Those lines measured about 0.0001 to 0.0002 inch." The problem, he says, is that when making an electrode, if those lines are present, they will burn into the steel and are difficult to polish out. "The stone is rubbing low spots and high spots, and the lines never seem to want to disappear," he says. "When I took the same approach using CAM-Tool—same entry, same feed rates, everything, all those little flaws were gone. The surface finish was incredible."

Asked what feature in CAM-Tool makes it so much more superior, Cummings says it is in how it calculates the tool path using the surface model not a mesh.

"Most people don't realize that CAD/CAM software can actually cause accuracy issues," CGS's Weekes says. "They think that once they create that NC code and get it to the machine, that all NC code is created equal. It's not." He explains that most CAM software uses triangulation mesh (like a net made of little connected triangles) over a solid model to calculate tool paths, so the resulting tool paths are often approximate and therefore not as accurate. CAM-Tool uses surface-based calculations, creating a high number of NC data points that are directly offset off the workpiece's surface, so you're getting a true representation of what your model is. "Many of the newer machines from Yasda, Roeders and Makino have controls that prefer to have as many points as possible because it helps the machines run more accurately and efficiently. CAM-Tool puts out more points than any other software that I have seen, so when your NC code goes to the machine, it is getting more accurate code to follow."

Cummings adds, "CAM-Tool was developed for hard milling and we use it only for hard milling and machining electrodes. I would say our surface finishes got 25 percent better."

More than that, Cummings says his polishers tell him that workpieces are polishing up to two times faster than usual. "We just worked on a mold for a large medical part and the mold had 64 identical cavity inserts in it," he says. "Each insert had to have an optical diamond finish. Our polishers said they were amazed at how quickly they could achieve that level of finish." He estimates that when X-Cell's polishing department is working on parts machined using CAM-Tool, they are cutting about 25 to 30% off the time required to attain desired finishes.

"I have the best cutters and high-RPM machines, and I can program in the other software and still not get to that finite finish," Cummings says. "CAM-Tool is the software for writing programs that match the capabilities of the newer cutters and machines. It's the complete package that gets us to those highend finishes."

Tighter Tolerances Meet Tough Requirements

In addition to improving surface finish, CAM-Tool has helped X-Cell achieve much tighter tolerances than it ever had before. Cummings says the standard tolerance on most of the company's work is 0.0002 inch, so tool paths need to be perfect, and



Stock model inconsistencies in other CAM systems results in extra cutting.

right the first time. But before CAM-Tool was implemented, X-Cell put its old software to the test for a very important project and he says it was challenging, to say the least.

"We have a customer that requires extremely tight tolerances on an electrode we were making for a government project I can't go into detail on," Cummings says. "The part had to be absolutely perfect. We machined it and the customer would check it and come back to us saying it was a tenth off here and a tenth off there. We would think, okay, but it was cut right to the model, but being an ITAR (International Traffic in Arms Regulation) situation, it has to go through every kind of scrutiny." After further attempts were rejected, X-Cell purchased CAM-Tool and used it to machine the exact same electrode. "They checked it 100 different ways from Sunday and could not find a flaw."



 $\checkmark\,$ A constantly updated stock model allows CAM-Tool to only machine in the necessary areas.

Weekes says that CAM-Tool calculates the location of component points in the tool path using CGS's proprietary algorithm, corresponding to the curvature of the shape of the model. "That algorithm works in the background and takes the actual surfaces and projects points from it, offsetting the surfaces that you're trying to cut and creating more accurate tool paths." He says most other software creates an STL (mesh) file in the background and uses that to import triangulated geometries into the CAM system to calculate the tool path, which, as mentioned previously, is not as accurate.

Cummings says X-Cell still uses the other software for programming on other machines, "but when it comes to real hightolerance 3D geometries, I have to go to the more advanced software that is CAM-Tool. Both have their place, but CAM-Tool improved our tolerances by 0.0001-0.0002 inch."

Roughing Strategy Keeps Cutter on Path, Saving Time

"Another unique thing about Cam-Tool is that the cutter stays down in the cut longer than it does with our other software, which cuts machining times," Cummings says. For example, if he programs the other software in the same exact way the cutter tends to lift out of the cut, go to a different location and start again. "CAM-Tool stays in the cut."

Weekes says Cummings is referring to CAM-Tool's Z-level roughing strategies using stock model recognition, and how the software sets up the stock model at the beginning of every project and references it continuously throughout the machining cycle. He offers an example. "Say X-Cell is roughing a part using a half-inch cutter. They will cut as much as they can with that cutter and then index to a quarter-inch cutter or something smaller. But they don't want to use that smaller cutter and recut the entire part, so with our stock model recognition feature, CAM-Tool is able to understand that it only needs to cut in the areas that the half-inch cutter could not get into. CAM-Tool constantly updates the stock model. It understands where the remaining stock is and ensures that the most effective roughing strategy is being used."

As a result, Cummings says X-Cell is realizing longer cutting tool life on top of more efficient machining times. "Our Yasda operator mentioned to me that he believes he's going through about 10 percent fewer cutters because of the Z-level roughing function in CAM-Tool. We have probably gained 10 to 15 percent in tool life," he says. "When you put a \$90 cutter in there, 10 percent adds up over the course of a year."

FOR MORE INFORMATION

CAM-TOOL by CGS North America, Inc. / $844\mathchar`-737\mathchar`-6009$ / camtool.com

Maruka USA / 201-280-7102 / marukausa.com Yasda Precision America Corp. / 847-439-0201 / yasda.com X-Cell Tool & Mold / 814-474-9100 / xctam.com



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PODCAST: Self Reflection, Supreme Standards, Scuba Diving and Super Powers

By Christina M. Fuges

Each year, the moldmaking industry helps us recognizes outstanding performance and innovation through this Awards program. *MoldMaking Technology*'s Leadtime Leader Awards (LLA) is the culmination of the entire mold manufacturing process. A quality mold delivered on-time is the result of a team of professionals working together from sales, design and manufacturing to validation, delivery and support. Recently, I sat down with Tony Demakis of The Manufacturing Alliance Podcast to

> chat with *MoldMaking Technology*'s 2018 and 2019 winners during Amerimold: Charlie Krietner of Maximum Mold Group and Brian Dippel and Mike Novel of X-Cell Tool & Mold, respectively.

Here are just some of the outtakes from our conversation:

- In striving for continuous improvement, this is just another mark off the list.
- The next generation wants to know they are making a difference in the world. Making an impact.
- If we could have super powers they'd be rest, retirement, ability to fly, power to not wear multiple hats at work.
- Work until the work is done.
- Nothing is fast enough, clean enough or good enough.
- Video and feature exposure helped us show who we really are. Helped convey how big we actually are. We have capacity. We have lots of hands through the group.
- New technology that we added has made the most impact.
- Self reflection made us have to look deeply into what we really do and how we really do it.
- Hobbies of these moldmakers: wood working, scuba diving, ship wrecks in the Great Lakes, sky divers; fast vehicles, working out, making money; and, working on cars and ATVing.

• Take time to learn who you really are and what you are doing is actually special! short.moldmakingtechnology.com/LLAsPod

3 Lessons from a Professional Development Day at Cardinal Manufacturing

By Kylee Carbone

The Cardinal Manufacturing Team and Founder/Technology Education Instructor Craig Cegielski hosted a workshop for high school teachers called "Starting or Growing Your School-Based Enterprise Workshop." As this was my first visit to a revenue-generating high-school program like this, Cardinal Manufacturing far exceeded my expectations. There are three key findings from this workshop that I want to share with the entire moldmaking community: (1) student safety, (2) program sustainability and (3) community.

Safety

Cardinal Manufacturing goes above and beyond to build up safety knowledge and awareness *before* a student is permitted to run any equipment. The student body's



Westminster Tool's Director of Talent Development & Marketing Kylee Carbone (and an *MMT* Editorial Advisor) visits Cardinal Manufacturing with Plainfield High School teachers Bernie Dennler (right) and Tim Lafayette (left).

The 2018 and 2019 Leadtime Leader Award winners discuss how entering the competition made them look deeply at their businesses.

MoldMaking

deep sense of respect for the power of these machines and the necessary safety precautions are evidence of this program's hyper-focused attention on safety.

At Eleva Strum, K-12 students are located in one building. This model allows students in sixth, seventh, and eighth grades to attend related classes in the same area as Cardinal Manufacturing, which means some students end up with seven years of manufacturing-related training by the time they graduate as seniors.

Sustainability

The self-sufficiency of Cardinal Manufacturing's program is sustainable regardless of the district's budget because it generates revenue, which they then take and re-invest in the business on new equipment, tooling or building upgrades. On top of that, nothing goes to waste. If a piece of equipment can't be used, the students will barter or sell it for equipment that will strengthen the program.

Community

To find out how the Cardinal Manufacturing Team interacts with its local community, read the full story online. short.moldmakingtechnology.com/3Lessons

Attending Gardner Business Media's inaugural mold and die event in Querétaro: Meximold was a fact-finding mission for me. Gardner's Mexico team did a phenomenal job of creating an impressive first-time event in Mexico. Over two days, inter-

national exhibitors showcased everything from additive manufacturing, machine tools, and software to hot runners, mold components, molding equipment, molds and more to more than 4,000 visitors!

What I saw were tooling engineers, tool room technicians, and plant floor managers, mostly from OEM and tier supplier facilities who were hungry for work and thirsty for knowledge.

Manufacturing is beginning to boom in Querétaro. Mold maintenance and repair are continuing to grow, but it's moldmaking that is front and center. Mexico considers itself a player in the tooling sector, so the people are motivated to learn and grow.

Mexico is not without its challenges, of course. The culture, lack of skilled labor, payment terms and tax structure are the ones most often mentioned. However, none of these are impossible to overcome. Mold builders are naturally creative thinkers and innovators, so surely you can tackle this if you believe it's worth your while.

I left the show thinking that Mexico is worth keeping an eye on for opportunities that market could bring to U.S. and Canadian mold manufacturers.

And if expanding into Mexico is not the growth option for your company, then a strong focus on improving efficiency, cutting costs, and increasing productivity with the

right people, processes, and technology will be required for you to stay competitive, and *MMT* can help you with that, too.

short.moldmakingtechnology.com/Queretaro

What's in Querétaro, You Ask?

By Christina M. Fuges



The mold, tool and die sector in Mexico has a promising future, as seen by Meximold's recent success in acknowledging and legitimizing this niche industry by bringing together its important players.

Moldmaking Community Keeps iWarriors Going Strong

By Christina M. Fuges

iWarriors was not only the brainchild of Kim and Tim Bartz of Mold Craft back in 2011, but it was also a love project. This program provides tablet computer gift packages to combat wounded service members for use as a rehabilitation and recovery tool. To date, it has outfitted more than 900 service members with fully loaded and customized devices. Kim and Tim are now retiring but iWarriors will live on thanks to this wonderful moldmaking community. The iWarriors iPad program has changed hands, transferring to STAR Charities, a registered 501C-3 non-profit entity, which took over operations on December 1, 2019.

With retirement approaching, the Bartzs were thrilled when approached by Don and Glenn Starkey of Progressive Components and STAR Charities, with interest in carrying on the program.



Tim and Kim Bartz (center) react to a gift entitled "Happy Trails" from Don Starkey (left) and Glenn Starkey (right), marking the transfer of the iWarriors program to Star Charities.



"We are confident STAR Charities will carry on what we started in 2011," Kim says. Don and Glenn not only understand what this program means to Tim and me, but also what these men and women mean to us. These warriors have sacrificed so much, including their health, so that we may enjoy our many freedoms every day. As our motto states, 'They gave their all, let's give some back.' We owe our wounded heroes a helping hand, an essential tool in the treatment of traumatic brain injuries and posttraumatic stress, as well as a means to communicate with loved ones and battle buddies".

"None of this would have been possible without the tremendous support of members and partners

of the American Mold Builders Association," Kim adds. "This group has such a huge heart, and they have the utmost respect and gratitude for our military. Many have gone above and beyond to raise funds for the program by holding events, and for that, we are grateful. I have no doubt this support will continue with the new team at the helm and being so active in the AMBA".

"We've seen the Bartzs' dedication firsthand, not only through AMBA activities but also through our i-Sledders charity snowmobile ride that we organized in 2015," Don Starkey says. Assisted with the transition by industry colleagues Jacob Niggemann and Erick Robins, Starkey adds "our team is honored to help our heroes in need by taking up the torch that the Bartzs initiated." short.moldmakingtechnology.com/iWarriors

K Show Report: Next-Level Efficiency and Control

By Christina M. Fuges

After my week in Dusseldorf Germany attending the "World's No. 1 Trade Fair for Plastics and Rubber" along with more than 200,000 other visitors from 165 countries, I walked away with plenty of information, contacts, leads and ideas. However, the most important takeaway was that plastic continues to be an essential and innovative material to consumers, brand owners and manufacturers and that includes mold builders.

With that being said, a prevalent tagline across the walls and backdrops of many booths was circular economy—meaning an economic system aimed at eliminating waste and the continual use of resources. At first, I wasn't so sure what this had to do with my little neck of the plastics woods (moldmaking), but after several discussions, it became clear. Recycling, sustainability and waste reduction are not just OEM and molding facility concerns, challenges and opportunities, they impact the mold manufacturer as well. Mold builders need to ask themselves where they fit into the circular economy. For example, are you considering how to design molds for recycled material, how to design or spec hot runner systems to process bio-resins, how to implement systems and components in your molds to make them more efficient?

It is time to be proactive and to be part of the solution by getting involved early and often to offer your expertise on how to optimize a mold to be more efficient and/ or to handle recycled materials. Technology plays a vital role in achieving both of these goals, and K 2019 did not disappoint on that front.

Exhibitors offered plenty of options, which you can see in the video recap online. short.moldmakingtechnology.com/KShow2019

When you think about unattended machining in your shop, you most likely think just the amount of time a machine runs without an operator. While technically correct, this way of thinking can be misleading in many cases as it doesn't factor in labor costs for running a machine.

The true question that needs to be asked and answered is: Are we running our machines more with the same amount of labor, regardless of in-shift or out-of-shift?

- Let's look at two hypothetical weeks at a mold shop. Week 1:
- 400 attended machining hours (machines ran for 350 hours)
- 100 unattended machining hours
- Week 2: 400 attended machining hours (machines ran for 250 hours)
 - •130 unattended machining hours

The conventional method of calculations currently employed by most shops would lead to the conclusion that week two was better than week one (more unattended machining hours). However, this overlooks the amount of time the machines ran relative to labor hours. Now, let's look at this same example, but employ an algorithm that correlates total machine runtime with total labor hours.

- Week 1:
 - 450 total machining hours (350 attended + 100 unattended)
 - 400 total labor hours
 - Ratio of Total Machine Runtime

to Total Labor Hours = 1.125 (for every one hour of labor, 1.125 hours of machining time was produced)

• Week 2:

380 total machining hours (250 attended + 130 unattended) 400 total labor hours

• Ratio of Total Machine Runtime to Total Labor Hours = 0.95 (for every one hour of labor, 0.95 hours of machining time was produced)

Using this calculation where machining time and labor time are viewed as two distinct values, we can more clearly see the reality of the matter: Week one was, in fact, better than week two.

short.moldmakingtechnology.com/rer

Rethink How You Track Unattended Machining

At K Show 2019, the two words that came

to mind were efficiency and control.

By Roger Bassous



Screen shot demonstrating real-time machine and job tracking.

Index Contracts in Business Activity

November 2019 - 44.9

The Gardner Business Index (GBI): Moldmaking reported a sharp acceleration in contracting business activity as the Index fell over three points to 44.9. Index readings above 50 indicate expanding activity while values below 50 indicate contracting activity. The further away a reading is from 50, the greater the magnitude of change in business activity. The latest reading came as a result of both new orders and production transitioning from expanding in October to contracting in November. All components of the Index contracted in the latest period. The Index, calculated as an average of six components, was pulled lower chiefly by the month's strong contraction in production and backlogs.

November's production activity reading fell 10 points from October's—the fifth lowest reading in recorded history—and set a four-year low. The loss of support from both production and new orders activity saw the Index abruptly contract. November's contracting activity readings for employment, supplier deliveries and exports were in line with readings from recent months.



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



November's Moldmaking Index reported a quickening contraction in business activity due to a sharp change in activity levels for new orders and production. The loss of support from these components sent the Index into deeply contractionary territory.



The loss of support from new orders and production activity resulted in a sharp decline in the Moldmaking Index. November's production reading pushed the 3-month moving average below 50 and into contractionary territory.

Products

Linear Five-Axis Machining Center Minimizes Crossbeam Deformation

The Linmax B-3040 linear five-axis machining center sold by **Dynamic International** offers a box in box, symmetrical design to drive at the center of gravity, minimizing crossbeam deformation after long periods of usage. The machining center provides advanced FEM analysis and design to optimize higher rigidity, response and stability of high speed cutting. The center's structural design minimizes the environment temperature affection, ensuring high precision during machining, and the Z axis equipped with four linear guideways enables each side to undertake the same cutting force, enhancing machine lifetime and accuracy.

Dynamic International / 262-521-1100 / dynamicint1.com

Software Improves Five Axis Movements for High Accuracy Parts

MAX

CAM-TOOL by **CGS North America, Inc.** has improved its simultaneous five-axis conversion (auto) function. The process has been updated to decrease movement of unnecessary axis when unnecessary. This reduced movement in the machine resulting in smoother more accurate tool paths. Having less axis to control makes the tool paths easier for the user to create.

With the ongoing movement towards the barrel cutters, CAM-TOOL has expanded its functionality of barrel cutters by adding "3D Offset Cutting" and "Curve Control Along Surface" to the list of many other tool paths that support barrel and lens cutters. When it is combined with simultaneous five-axis machining, this can show large reductions in cycle times all while increasing surface finish.

Component point (control point) rearrangement has been implemented to achieve the smooth movement of the machine tool and obtain the best surface finish possible. It arranges component points at equal intervals to ensure perfect tool paths at the machine. Rearrangement type is "Aligned" and "Alternate", enabling the user to control points even more than before.

Improving the drilling functions in CAM-TOOL has been updated with the addition of G01 cross hole drilling. G01 cross hole drilling controls the feed rate when crossing holes. It recognizes the crossing section of previous processes and changes the feed rates accordingly. This is all done automatically by using the stock model to understand where to apply this strategy. This improves deep hole drilling by reducing the feed rate only at the crossing section, while improving tool life by avoiding chipping when breaking through cross holes.

To help with ease of use, CAM-TOOL has added Show tool shape for preparation of five-axis machining. Users can display the tool shape on the screen and use the mouse cursor to move the tool on the screen to visually see it against their model. The tool axis direction changes the tilt and rotation angle for 3+2 machining, therefore, the direction makes work a smooth process.

CAM-TOOL by CGS North America, Inc. / 844-737-6009 / camtool.com

Rhino Feet Support Massive Weight Loads

Rhino Feet from **Rhino Products**, and offered by **Molders Choice**, are support pads that stick to a wide variety of items and keep them elevated like large molds. The compact size enables users to place them where they are always within reach. The magnet keeps the Feet out of the way so they don't get in the way, and users can stick them to I-beams, toolboxes, machines, benches, cabinets, tables, etc. Rhino Feet can support massive weight loads and have magnetic inserts molded directly into the mold or part. These magnets enable the Rhino Feet to travel with the item they are supporting. It makes transporting and working on heavy metal items faster and easier. The top of each Rhino Foot has a rare-earth magnet molded directly into the part to provide strong holding power on metal surfaces. The bottom has a steel insert so the Feet can be stacked together for storage purposes. Rhino Feet have a patentpending webbed geometry that supports incredible weight loads, available in four sizes.

Rhino Products, LLC / 636-734-3612 / rhinoproducts/lc.com



Spotting Press Matches Mold Parts from an Ergonomic Position

The SXKH spotting press from **Dynamic International** enables users to match all the parts of a mold in a more comfortable, ergonomic position. The high standard of configuration ensures high performance, and all the main components for mechanical processing are manufactured by imported machining center to ensure machining precision. The spotting press's shift-out rail of the lower mold plate adopts wear resistant rail with intensified handle and large-scale dust-proof device. Hydraulic system adopts optimal combination of imported high performance hydraulic elements.

The press uses a high tensile rod to provide higher accuracy, making it convenient for platen parallelism adjustment. Four molding clamps distribute stress when the mold is closed with high pressure. Using a quick cylinder device, the press speeds up strokes without the mold closing, creating lower energy consumption and more energy conservation. Parameters are displayed on a touch screen, and it provides practical failure detection alarm and low-pressure mold protection functions. The press is marked with a Certificate of Conformity.

Dynamic International / 262-521-1100 / dynamicintl.com

Software Update Gives Users Sharper View of the Machining Process

CGTech announces the latest release of VERICUT software, Version 9.0. Vericut CNC machine simulation, verification and optimization software simulates all types of CNC machining, additive and hybrid manufacturing processes. The software operates independently but can also be integrated with leading CAM systems. Version 9.0 features several enhancements designed to increase power and improve efficiency, including a new graphics engine. Users will experience sharper, clearer and more realistic views of machines and the machining process. Hundreds of customer-driven enhancements and software change requests were also completed.

The software's enhanced image quality makes it easier to spot problems and imperfections in machined parts. Switch seamlessly between Workpiece, Machine or Profile views, or combine them in a variety of view layouts. Any of the software's major functions can be used in any view, which streamlines the verification effort and increases productivity. X-Caliper has several new measurements and features that provide greater control over how measurements (dimensions) are shown. Images with dimensions can be printed, saved to an image file, or utilized in Setup Plans. A new Setup Plan capability can create images from the simulation with dimensions or notes that help others understand the manufacturing process. Setup Plans are easily incorporated in VERICUT's reports to document operation setups, or how machined parts should look at various stages. The new Multi Tool Station tool component has been added in Tool Manager, enabling users to setup an apparatus that holds multiple tools, attached to a single turret station. Tool Change List panel is enhanced with capabilities to graphically setup tools on turrets, in tool chains, define orientations for "Flash" multi-function tools and more. The Reviewer application is powered by the same enhanced graphics engine featured in Vericut Verification. The Section window is easier to use with dynamic section plane locations and angle adjustments.

in the second second

CGTech / 949-753-1050 / cgtech.com

Use Force "Analyze", without any prior configuration, to spot potentially dangerous machining conditions or identify underutilized tools. Force Charts has a new "Fill Comparison" option to help visualize the changes made by Force optimization to feedrates and chip loads. Appearance settings accompany the "Color" option for components and models, and can be used to add realism to objects in simulations. Machined parts look more lifelike and identification of errors or incorrect cuts has become easier. New features are available to display the Design part embedded in translucent Stock, and show AUTO-DIFF Gouge or Excess errors in relation to the Design part or cut stock model.





Cavity Pressure Sensor Ideal for Tightly Packed Ejector Pins

RJG releases a 250 lb 6 mm cavity pressure sensor ideal for high cavitation molds with small, tightly packed ejector pins so users can measure cavity pressure in order to improve quality and reduce costs. There are now two models available, one rated to 50 pounds for use with the ejector pins up to 3 mm diameter, and the newest one is rated to 250 pounds for pins up to 6 mm diameter.

The 6 mm sensor is a robust, indirect (under the pin) pressure sensor that works in conjunction with the eDart System to assist molders in diagnosing processes and automatically sorting suspect parts. The 6 mm sensor head is the smallest strain gage sensor available, permitting the use in molds that may have tight clusters of pins with limited room. The new model is designed with a sensor head that matches the dimension and installation pocket of the Piezoelectric 9211 6 mm button. The connector cables can be bent and folded without damage, making them more flexible and easier to maneuver around obstacles. Features of the 6 mm sensor include a 6 mm diameter and height, flexible, robust, order-to-length cables and it is not susceptible to moisture or contamination. The 6 mm sensor is part of the company's Multi-Channel Strain Gage sensor line, which was designed to simplify in-mold installations for molds with four or more sensors and save real estate in the mold. **RJG, Inc. / 231-947-3111 / rjginc.com**

Solid Carbide Milling Cutters Feature Corner Radius

Walter introduces the MC232 Perform line of solid carbide milling cutters. These milling cutters feature a corner radius and reduced neck. Solid



carbide milling cutters with corner radii enable improved approaches to individual component geometries. It also improves the tool life of the milling cutter, as the edge stability is increased. The reduced neck in turn makes the milling cutter

more flexible, as it can be used with an even wider variety of cutting depths. Diameter sizes range from ½ to ¾-inch and 2-20 mm metric, which can be used for typical milling applications and are suitable for a variety of materials. Walter USA, LLC / 800-945-5554 / walter-tools.com/us



Machine Series Features Direct Drive Spindle

Hurco launches the latest iteration of the VMXDi series, which features a direct drive spindle. This series includes the VMX24Di, VMX30Di and the VMX42Di. With the direct drive spindle, the VMXDi series boasts a better surface finish, quieter spindle and less head growth. It also includes a 15,000-rpm spindle, improved chip to chip time, faster spindle acceleration and deceleration.

The VMX42Di will use the Hurco control powered by WinMax software and the patented motion system called UltiMotion, which determines the optimal trajectory to run the tool, provides consistent programmed feed rates and reduces cycle time. The control helps machinists and job shops be more productive and profitable by supporting many programming methods: conversational programming; NC programming; and a feature called NC/Conversational Merge that optimizes efficiency even further.

Hurco Companies Inc. / 800-634-2416 / hurco.com



Expanded Indexable Threading Tools Ensure Minimum Interference

Tungaloy expands its TungThread line of indexable threading tools to include 11ER external threading inserts as well as 8 by 8 mm and 10 by 10 mm square shank holders to accommodate the new inserts. These new 11ER threading inserts and two square shank holders are specifically designed with users of Swiss-type automatic lathes in mind. The 11ER insert is smaller than conventional 16ER inserts, and the insert holders are designed to ensure a minimum interference when machined towards the sub-spindle, which is an issue with a 16ER insert holder. This expansion will enhance the TungThread series to meet the needs of various threading applications on Swiss type automatic lathes and other small-parts manufacturing equipment.

Tungaloy America, Inc. / 888-554-8394 / tungaloy.com/us

CNC Coordinate Measuring Machine Operates Without Compressed Air

Mitutoyo America Corporation releases the MiSTAR 555 CNC shop floor coordinate measuring machine (CMM) to its CMM product line that operates without compressed air and on conventional 120V 20 AMP electrical service with movement speeds of 606 mm/s and acceleration of 2,695 mm/s² (3D). The CMM is a compact, space-saving in-line or near-line CNC coordinate measuring machine designed for high-speed measurements with accuracy assurance from 10°C to 40°C. It features an open-structure design with a single support moving bridge, enabling users to mount workpieces from the front, rear and right for installation and a walk-up inspection station for easier operability. The MiSTAR also uses a Mitutoyo-designed and manufactured robust scale detection system with a high resistance to airborne contaminants, eliminating the need for costly environmental controlled enclosures.

The CMM also features several Industry 4.0 integrations, including the Smart Measuring System, which enables monitoring the operation state required by smart factories and a status monitor that retrieves current CMM status features using the MTConnect protocol. Condition monitor provides a system that collects and evaluates different operational information for long-term preventative maintenance and machine use statistics.

Mitutoyo America Corporation / 888-648-8869 / mitutoyo.com



CAM Software Provides Expert CNC Programming Strategies

PowerMill five-axis CAM software from **Autodesk**, **Inc.** provides expert CNC programming strategies for complex three- and five-axis subtractive, high-rate additive and hybrid machining. Features in the latest software release enable easier three- and five-axis programming, simulation and verification, including accessing a vast library of CNC strategies to reduce programming times with rapid toolpath calculation. The software release offers shortening machining times, improving control with advanced toolpath editing and automating programming with customizable templates and macros. It prolongs tool life and reduces maintenance costs with interactive tools to help identify and repair toolpath motion that can cause collisions or near misses. The Dynamic ViewMill also provides improved image quality and new options to detect and display collisions.

Autodesk, Inc. / 877-335-2261 / autodesk.com/solutions/ manufacturing

3D Printer Offers Latest in Digital Light Processing Technology

Gesswein introduces the Everes desktop 3D printers, which use the latest in digital light processing technology. An intuitive user interface and selfcalibration enables users to take designs from ideation to creation. Designed are printed layer by layer, from 25 to 200 micron depending upon which Sisma refillable resin used. Zero tilting technology (ZTT) ensures that parts are not pulled away from the vat when printing. In ZTT, the glass affixed to the vat tilts gradually between layers, separating the first printed layer from the bed. This avoids suction between the object and the print bed, reducing the amount of process-related mechanical stresses on the model, and promoting better layer adhesion throughout the part. Smart building platform provides self-alignment

and self-zeroing of the build platform at every printing cycle, eliminating any human calibration intervention. The automatic detachment function also eliminates the risk of breaking the newly printed objects. The use of PTFE in the bottom of the vat, an inert material in the exothermic photo-curing process, allows for a nondegenerative printing, granting a very high dimensional precision, together with a high repeatability of the process. The alignment and zeroing of the building platform take place automatically for every print job, without the need for any manual intervention, thus limiting any possible human error. Resin cartridge types are automatically recognized by Tag RFID; the resin loading/ unloading operations are automatically managed at the start and at the end of every single printing process. Available in 0.5L cartridges. Available in two models (Zero and Uno) which have different platform sizes. Made in Italy. Gesswein & Company / 800-243-4466 / gesswein.com



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Participants of the MoldTrax Hot Runner Extravaganza workshop share takeaways from not only leading hot runner technology suppliers but also hands-on learning about proper hot runner preventive maintenance. youtube.com/c/moldmakingtechnology

f Popular Posts

The American Mold Builders Association Chicago Chapter meeting announced Rogelio Estrada as the recipient of the Mold Your Career Award! Estrada was cited as being a team player that pitches in whenever there is a need. facebook com/moldmakington



facebook.com/moldmakingtechnology

▶ @MMTMag Hot Tweets

At the MADE IN AMERICA 2019 event held at the Indiana Convention Center in Indianapolis, IN, Harry Moser and the Reshoring Initiative team received the MADE IN AMERICA 2019 Reshoring Award. Congrats! Twitter.com/MMTMag

in Conversations

Ongoing advances enable humans and machines to better communicate, so if your shop hasn't looked into upping its automation game yet, here are five reasons why you should. Linkedin.com/company.moldmakingtechnology

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@meximold19 rocked!! So glad @moldmakingtechnology was able to attend the premier event. Instagram.com/moldmaking technology





MOLD MATERIAL

Steel Choice Matters for Corrosion Resistance

By Daniel Kipp and John Stocker

Tool steel resists condensation, and waterline corrosion, which is especially important as the use of corrosive materials like fire-retardant additives, PVC and aminoplast increases. However, with every positive there is typically a negative. For example, corrosion-resistant plastic injection mold steels require additional machining time that increases wear, and more complex mold bases cause 60% of the steel to become chips.

In general, manufacturers do not consider plastics chemically aggressive. However, the molding process can subject a mold to highly corrosive stresses under operating conditions. These conditions can range from extreme climatic influences to the use of PVC, which can release hydrogen chloride if exposed to temperatures of 170°C for a long time. Also, the humidity in the air can help to form hydrochloric acid during PVC production. Other influencing factors are a result of the physical mold design, such as by complex engraving or cooling channels.

To address these challenges, steel suppliers continue to develop specialty steels to combat the extremely corrosive injection molding environment while improving steel's machinability and stability. For example, a free-machining

| С | Si | Mn | S | Cr | Additions |
|------|------|------|------|-------|-----------|
| 0.05 | 0.40 | 1.30 | 0.15 | 12.50 | + |

TABLE 1. Chemical composition in weight-%.

stainless steel that offers a balance between machinability and corrosion resistance by combining a special chemical composition with a special heat-treatment process.

Low-carbon content and alloying elements such as chromium, manganese and other additions play an important role in this free-machining stainless steel. The alloying elements are

| Tool | Ø 25 mm | Ø 120 mm | Round plate | Drilling |
|--|---------|-------------|-------------|---------------|
| Cutting material | K 15 | P 40 coated | P 40 coated | Solid carbide |
| Cutting speed v_c in m/min | 80 | 140 | 140 | 60 |
| Feed per tooth f ₂ in mm | 0.3 | 0.7 | 0.6 | 0.2 |
| Depth of cut a _p in mm | 5.0 | 2.0 | 2.0 | 55.0 |
| Width of cut \mathbf{a}_{e} in mm | 15.0 | 100.0 | 45.0 | 17.5 |
| Stability of the machine
clamping + workpiece | | ••• | *** | ••• |

TABLE 2. Machining values for free-machining stainless steel (hardness 290 - 332 HB).



FIGURE 1. Comparing machinability in % (sulfur-alloyed steel 325 HB, free-machining stainless steel 370 HB).

added during production and combine to yield optimal hardness, machinability and corrosion resistance (**see Table 1**).

The heat treatment process further refines the steel at the final production process. The material is heated to a temperature of 1,475°F under controlled conditions and quenched in water or a polymer, which promotes the characteristic of a homogenous microstructure yielding material that is consistent throughout and extremely stable.

To assess corrosion resistance and determine the appropriate testing method, the mold builder must understand the type of corrosion that may occur. The corrosion behavior is a system property. The corresponding tests only reveal the classification of the steels in the same testing structure. Several tests were conducted on this free-machining stainless steel in laboratory conditions with media containing chloride, condensation and in slightly acidic conditions. A sulfur-alloyed steel was tested for comparison. The results indicated that the freemachining steel and the sulfur-alloyed steel are nearly identical in corrosion resistance. The free-machining steel also offers an increase in cost-effectiveness and productivity by decreasing machining cost and lead times (**see Figure 1**).

To optimize machining efficiencies and lead times, refer to the process recommendations in **Table 2**.

Mold material choice is one of the key variables influencing plastic part production profitability, so it may be time to consider the machinability, dimensional stability and weldability benefits of a free-machining stainless steel, which can also enhance mold performance with its toughness, minimal residual stresses and good corrosion resistance.

FOR MORE INFORMATION

Schmolz + Bickenbach USA / 800-323-1233 / schmolz-bickenbach.us Daniel Kipp, Technical Sales & Marketing USA and John Stocker, Director of Sales USA





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