Die sensoring trends | Automated scrap handling | Finding causes of stamping failures

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Second-gen stamper proves out mettle via prototyping

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STAMPING JOURNAL
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>> COVER STORY

On the cover: Cover photo courtesy of PTM Corp., Fair Haven, Mich.

>> DEPARTMENTS

>> FEATURES

Kate Bachman
Editor
kateb@thefabricator.com

Welcome the new *STAMPING Journal* Editorial Advisory Board

Hands-on, energetic, smart leaders to enrich content

You might wonder what the initials *PTM* stand for in the company name PTM Corp., located in Fair Haven, Mich. After meeting CEO/President Donna Russell-Kuhr, you'll suspect it is for Pedal to the Metal. Russell-Kuhr is an energetic dynamo who succeeded her father at the steering wheel of the company in 2016. Under her leadership, and with the help and support of her husband and her three sisters, the company has expanded and is more successful than ever.

You can find PTM's story on page 22.

Russell-Kuhr joins eight equally dynamic, smart, and keenly business-savvy stamping industry leaders on our newly formed *STAMPING Journal* Editorial Advisory Board. I've asked the board members to help direct and guide our editorial coverage going forward, to act as a sounding board for content, and to provide their in-the-trenches insights.

I've asked the board members to help direct and guide our editorial coverage going forward.

Their names may be familiar. Most have either been interviewed and featured in the pages of *STAMPING Journal* or have been authors and contributors.

•Paul Belanger, R&D director for Gestamp, co-wrote an award-winning article based on a Great Designs in Steel conference presentation, "How 2016 Car of the Year Honda Civic maneuvered around AHSS obstructions." Look for my "vidterview" with Paul in the next few weeks regarding Gestamp's technology in electric vehicle components manufacturing.

•Christopher Fagnant, president, Qualtek Manufacturing, was featured in "Colorado stamping manufacturer's solar array sees 5-year ROI," which details its solar energy array installations. Chris also penned a few funny and colorful blogs about his OOO experiences.

•With his deep technical knowledge and articulate explanations, Hale Foote, president of Scandic, has long been a technical resource for me. Scandic is the subject of not one but two articles: The award-winning "Silicon Valley stamper sizes up, down electronics" and "San Francisco stamper averts seismic event with servo press."

•Speaking of awards, Steve Peplin, CEO of Talan Products, Ohio, is no stranger to them, having the fullest trophy case of awards in a company's lobby anywhere. Peplin was selected for our Profiles in Stamping in 2017 not only for his profit-earning leadership, but for his unswerving commitment to safety in his workplace. Peplin shared his winning safety strategies in "How to gild your safety record."

•Ken Kaufmann, president, CEP Technologies, has been both an article contributor and the subject of a recent case study article. His contributions to "How will the electric vehicle evolution affect stamping manufacture?" were so good, I visited his new San Antonio plant, culminating in "Big-company thinking advances small electronics stamper." Ken will present at our June 1 Stamping in an EV World conference.

•Ramie Melvin is senior director of manufacturing operations for Kapco. The prominent company is a familiar name across the U.S., worldwide, and to supporters of Wisconsin professional sports teams. As both a stamper and fabricator, Kapco contributed to my article "How metalworking manufacturers decide whether to fabricate or stamp."

•Eric Nelson, director of engineering for Aranda Tooling, has already relayed helpful insider insights as a tier supplier to a major electric vehicles OEM. Readers will have an opportunity to learn more about the California stamping and tooling manufacturer in 2021.

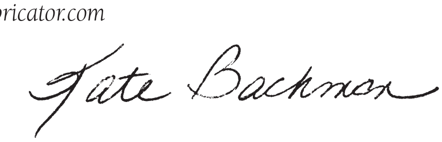
•With deep roots in tool- and diemaking, Fred Simonson, general manager of Victory Tool, Minnesota, knows a good deal about what makes a tool design manufacturable—and where the pitfalls lie. Look for his article on manufacturability in 2021.

In addition, our three wonderful columnists have also agreed to serve on the board:

•I cannot say enough about how valuable Die Science columnist Art Hedrick and Ask the Expert columnist Tom Vacca have been to me and to *STAMPING Journal* readers. Based on his excellent articles in our new column, Engineering Angle, I'm certain that Sergey Golavashchenko, PhD, will be too.

I want to thank this hardworking group of excellent industry leaders for their willingness to take the time to advise and guide our content. Considering the caliber of these board members, you can expect even better from *STAMPING Journal* next year.

Got thoughts? I'd love to hear from you. kateb@thefabricator.com



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NEWS & NOTES

GM transitions to EV production

General Motors Co., Warren, Mich., has announced that its Spring Hill, Tenn., assembly plant will begin the transition to manufacture electric vehicles, beginning with the Cadillac Lyriq.

The automaker also is continuing construction of the $2.3 billion Ultium Cells LLC manufacturing facility in Lordstown, Ohio.

ArcelorMittal selected as sole Gen 3 steel supplier for 2021 Ford Bronco

ArcelorMittal's Fortiform 980 GI has been selected as the sole source of third-generation AHSS for the 2021 Ford Bronco.

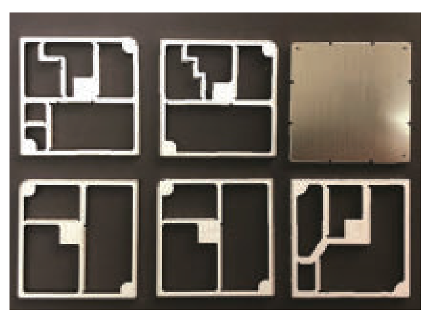
The high-strength steel is a lower gauge than the original DP800 and DP600 found in the earlier Bronco.

Boeing to move 787 production to South Carolina

Boeing will consolidate 787 jetliner production in South Carolina, shutting down the original assembly line in Everett, Wash., beginning in mid-2021.

Workers in Everett will continue making smaller models until the company cuts production to six 787s a month next year.

CEP Technologies expands operations in Texas



Precision metal stamper CEP Technologies, Yonkers, N.Y., is expanding its technical cleaning and tape-and-reel operations to its San Antonio, Texas facility.

The company produces its custom shielding components from copper-nickel-silver, cold-rolled steel, and 300 series stainless.

BTD Mfg. expands metal stamping capabilities in Georgia

BTD Mfg., based in Detroit Lakes, Minn., has expanded its stamping capacity at its Dawsonville, Ga., facility.

The expansion includes the addition of a 110-ton Komatsu press. It features a bolster size of 27.5 in. deep by 43.375 in. wide and feed line maximum thickness of 0.105 by 18 in. to 0.165 by 6 in.

AIDA-America installs servo press at Clips & Clamps

Metal stamping press manufacturer AIDA-America, Dayton, Ohio, has installed a 300-ton DSF-N2-3000 unitized-frame direct-drive servo press at Clips & Clamps Industries, Plymouth, Mich.

According to the manufacturer, Clips & Clamps has already increased production by 30% on a 5-mm-thick stainless steel spacer part.

Athader, Leveltek sign strategic agreement for stretch leveler cut-to-length lines

Athader, A Bradbury Group Company located in Spain, has signed a strategic agreement with Leveltek Intl., Benwood, W.Va., for the worldwide supply of stretch leveling cut-to-length lines.

Athader expands its equipment offering to include Athader roller mechanical levelers, Bradbury hydraulic e-drive levelers, and Leveltek stretch levelers.

Toledo Tool & Die purchases two Dallas Industries feed lines

Troy, Mich.-based Dallas Industries, a manufacturer of coil handling and press feeding equipment, has announced the purchase of two feed lines by Toledo Tool & Die, Toledo, Ohio.

The compact LoopSelect SpaceSaver feed lines are rated at 30,000 lbs. by 72 in. wide and 20,000 lbs. by 42 in. wide.

California governor announces state will phase out gas-powered engines

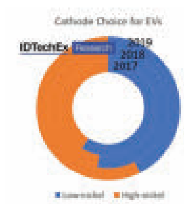
Gov. Gavin Newsom has issued an executive order requiring sales of all new passenger vehicles in California to be zero-emission by 2035.

Following the order, the California Air Resources Board will develop regulations to mandate that 100% of in-state sales of new passenger cars and trucks are zero-emission by 2035.

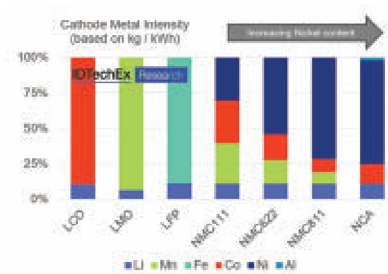
IDTechEx report reveals how nickel is replacing cobalt in electric vehicles

Electric vehicle (EV) powertrains are putting sudden strain on several raw materials industries, including nickel.

In 2019 more than 95% of new electric passenger cars sold used nickel-based batteries, as detailed in the new IDTechEx report, “Materials for Electric Vehicles 2020-2030,” at www.idtechex.com/evmat. IDTechEx expects the demand for nickel from EV batteries to increase tenfold by 2030 compared to 2019.



Historic data from IDTechEx shows a trend toward increasing amounts of high-nickel-content cathodes in electric vehicle batteries.



The electric vehicle market trend is toward NMC622, 811, and NCA chemistries.

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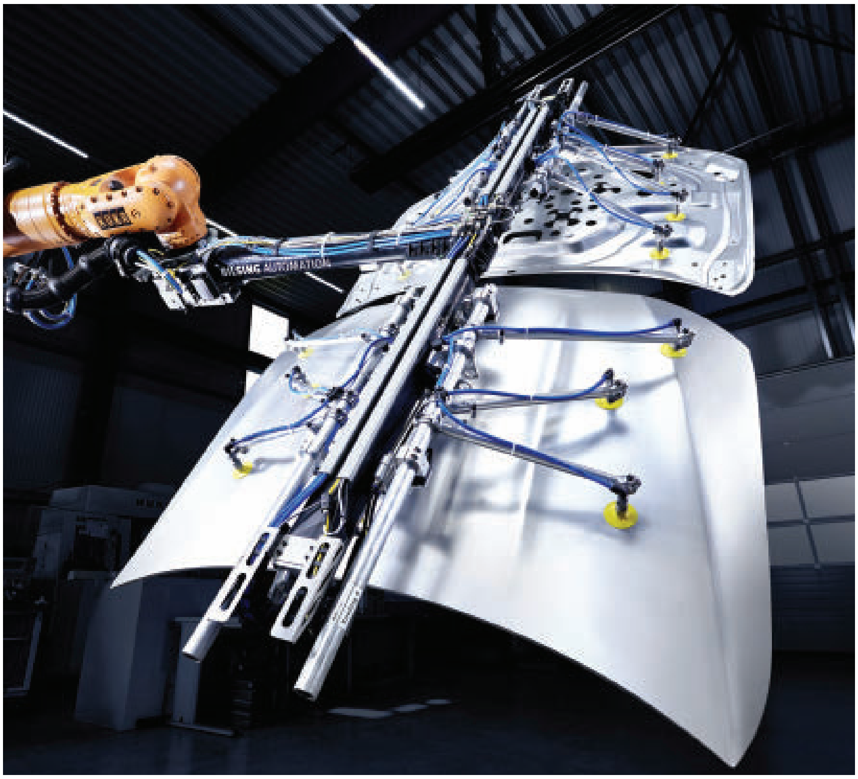
Servo-driven carbon fiber T-beam offers flexibility for varying production requirements



Bilsing Automation has announced the availability of its servo-controlled carbon fiber T-beams designed for high-speed tandem presses. Offering interchangeable tooling, the T-beams deliver speed and flexibility to the automotive stamping industry, where there is an increasing need to handle multiple parts produced from a single stamping die, the company reports.

The T-beams meet the dimensional specifications and requirements of General Motors World Tooling Standards and can adapt to any robotic application.

The T-beams are approximately 70% lighter than steel and 25% lighter than aluminum systems, as well as dimensionally smaller. The carbon fiber tooling provides 3.5 times the stiffness of steel, and its high elastic stiffness reduces vibration and deflection.

Bilsing • www.bilsing-automation.com/carbon-fiber-t-beam

Double-column machining center roughs, finishes press dies in one setup

Okuma America Corp. has introduced the MCR-S double-column machining center. It roughs and finishes press dies in one setup and is designed for heavy-duty machining of process-intensive press dies. Featuring full 5-face and 5-axis machining, the system is suitable for die repair work, handling hardened cast-iron, nonferrous, and exotic materials.

According to the company, the machine's one setup process achieves a 25% reduction in cycle time compared to similar models by using faster cutting feed rates and spindle speeds and eliminating manual die finishing.

The Hyper-Surface feature detects and automatically compensates for surface disturbances in the part program to eliminate streaks or stripes for a high-quality surface finish.

Okuma America Corp. • www.okuma.com

Biodegradable, corrosion-inhibiting film helps automaker cut plastic waste

Situation

Consumption and disposal of plastics is one of the biggest ecological problems globally, and many manufacturers worldwide are becoming more environmentally responsible in addressing the problem.

One of those manufacturers, a Czech Republic-based subsidiary of one of the world's three largest automakers, recently launched a new green logistics project aimed at decreasing plastic consumption. As part of that project, the company began looking for a biodegradable packaging substitute to reduce the amount of conventional plastic packaging it used.

Resolution

As part of a pilot project, the automaker tested Eco-Corr Film from Cortec Corp. to protect automotive engines during transport from the Czech manufacturing facility to the company's plant in Pune, India.

The biodegradable, corrosion-inhibiting film contains Cortec's proprietary VpCI technology to provide contact, barrier, and vapor-phase corrosion protection for ferrous and nonferrous metals. The film, which is shelf-stable, disintegrates within months when disposed in a commercial composting environment.

The film, which is shelf-stable, disintegrates within months when disposed in a commercial composting environment.

Several tests were conducted for compliance with strict conditions for transport in sea containers. Quality control in India did not show any damage or traces of corrosion of the wrapped components on arrival. To test if the film could be composted according to plan, the staff built compost bins near the plant. After six months, the foils had largely biodegraded in the bins.

The film successfully replaced conventional plastic films previously used by the car manufacturer while providing the same corrosion protection. Once composted, the organic packaging material is used as a soil improver in the logistics park in front of the Pune plant.

The successful trial opens the door for the automaker to cut its amount of conventional plastic packaging in half for shipments to Pune, eliminating up to 1,102 lbs. of plastic waste per month. In July 2020 the company launched a one-year pilot project to investigate the use of the film on a large scale.

Cortec Corp. • www.cortecvci.com

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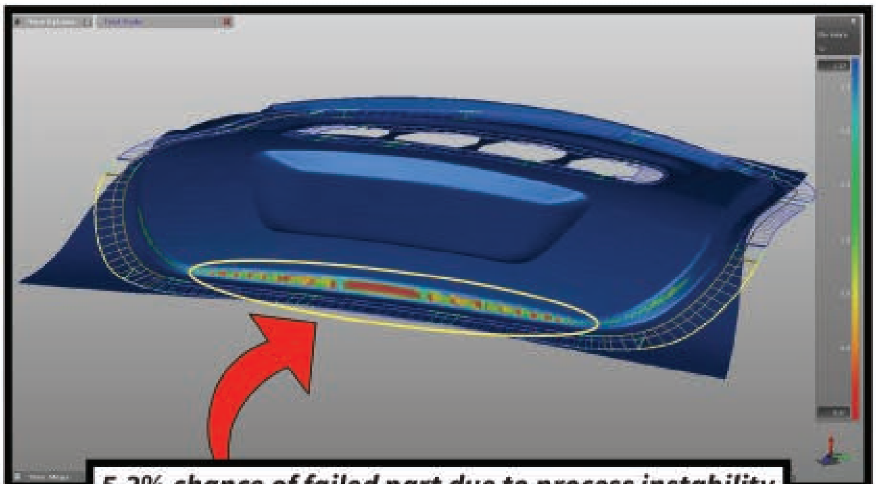
Use AutoForm Sigma to virtually simulate Cp/Cpk and resolve process issues prior to tool kick-off

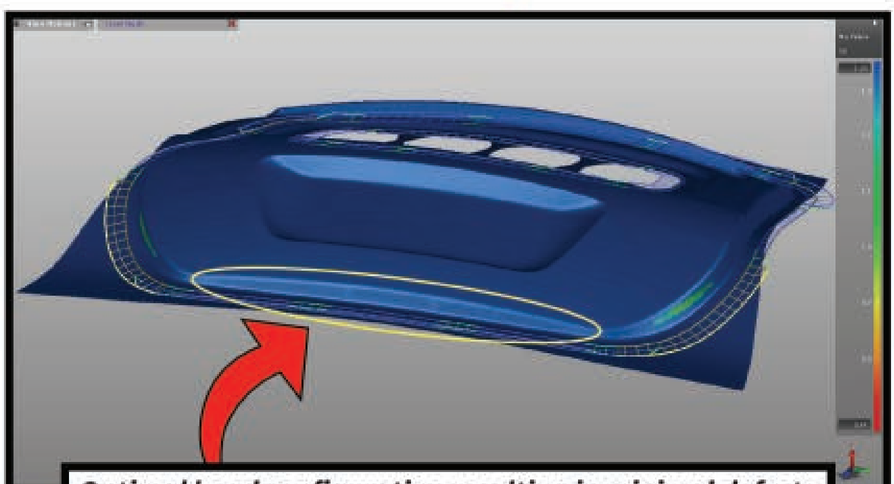


5.2% chance of failed part due to process instability

Most companies today simulate stamping formability, but don't consider analyzing the process capability (Cp/Cpk)

Compensating a tool without ensuring process robustness can result in costly re-cuts

Once Cp requirements are acheived, virtually compensate parts to meet Cpk with AutoForm Compensator



Optimal bead configuration resulting in minimal defects

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Finding the root cause of stamping failures

BY ART HEDRICK

"I just don't understand why we can't put this die in the press and make satisfactory parts without spending hours adjusting it. We paid good money for this die! They must have done something wrong when they designed or built it; otherwise we would be able to set it up and run it without making adjustments."

Sound familiar? If you work in a sheet metal stamping operation or in a die building shop, you probably hear this frequently. Yes, die design is critical, but it's only one element essential for manufacturing quality stamped parts. Variables such as the material's mechanical properties, press speed and accuracy, lubricant type and application method, tool temperature, drawing ratio, punch and blank shape, holding pressure, and number of stations all play a part. Discovering how all process variables interact can help you find the root cause of typical stamping failures.

Yes, die design is critical, but it's only one element essential for manufacturing quality stamped parts.

Failure 1: Parts Are Not Flat

When the material coming into the die isn't flat, the pressure pads holding it down and securing it may not have enough force to hold it flat during cutting and forming operations. This often results in excessive cutting burrs, bending in improper locations, and nonconforming geometries.

When part flatness is lost, stampers often focus on the die. Tool- and diemakers shim stations and grind stations to try to "reflatten" the problem area. But dies can only slightly improve the flatness of the incoming sheet. They can be designed and engineered to retain sheet flatness, but it's nearly impossible for the die to make a flat part out of incoming material—especially if the material has a very high tensile strength or is very thin.

In most of these cases, the problem is not the die, but the coil feeding and straightening equipment. The flatness and straightness of the incoming coil is a product of the straightener and leveler. Because the coil is wound tighter on the inside diameter than on the outside diameter, adjustments often need to be made to the coil feeder and straightener to compensate for coil set.

Failure 2: Parts Are Splitting or Wrinkling

Too much wrinkling can cause splitting in a stamping operation. For example, if the metal is allowed to wrinkle in the blank holder or draw pad area, it will be forced to unwrinkle before flowing into the draw die cavity. This will likely result in restricted metal flow, which in turn causes excessive stretching, thinning, and necking. Similarly, if the metal is allowed to wrinkle before flowing over a draw bead, the resulting restrictive force can cause excessive thinning or splitting. The diemaker must prevent wrinkling to stop the splitting by increasing blank holder force, adjusting the standoffs or equalizers, or changing the blank shape and/or size.

Conversely, splitting can result in wrinkling. If the metal is being overstretched and splits, sheet tension will decrease, allowing the sheet to wrinkle. It's much like poking a finger into a piece of plastic wrap: Once your finger pushes the wrap, it wrinkles. To eliminate splitting, the diemaker can try decreasing holding forces, changing or adding lubricant, polishing the tool, or making changes in the blank shape or geometry.

Failure 3: Part Features Are Not in the Right Location

If the pitch or progression on a progressive die is not set up correctly or the pilot release is not properly calibrated, the die will not be able to locate and register the parts correctly in their respective stations. This will result in holes being pierced out of location and other features formed out of location.

An inexperienced diemaker may attempt to move the holes physically or make changes in the cutting or forming die geometry when the real problem lies with the timing of the feed release. For the die to register the strip properly within the tool, the feed release must let go of the material.

The Interactivity Maze

These are only a few examples of the interactivity that happens within a stamping process. Literally thousands of variables affect the stamping process, and a solution to a problem might involve a combination of several working together.

To find the root cause of stamping failure, you need to understand these variables and how they interact and take a systematic, data-based approach to the problem. Defect prevention is much better than defect correction.

Until next time … best of luck!

Art Hedrick is president and senior consultant of Dieology, 10855 Simpson West Private, Greenville, MI 48838, 616-894-6855, dieology@pathwaynet.com, www.dieology.com.

Draw bead restraining forces in sheet metal drawing operations

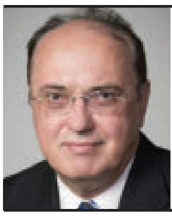
BY NATALIA REINBERG, ASHUTOSH MOKASHI, SAEID NASHERALAHKAMI, YURDAER DEMIRALP, AND SERGEY GOLOVASHCHENKO

In recent years automotive components increasingly have been produced from aluminum alloys and advanced and ultrahigh-strength steels for their excellent structural performance and reduced weight. However, these materials can have more constrained formability than commonly used mild steels.

When automotive stampers design sheet metal drawing processes, they must have accurate information on the distribution of restraining forces, typically provided by a series of draw beads located along the die cavity perimeter. Draw beads have become the most efficient method to provide restraining forces to draw complex-shape components from sheet material without wrinkles and splits.

The restraining forces created by draw beads are the result of bending/unbending the sheet under some level of stretching coupled with friction. The binder force needed to achieve the necessary restraining force is significantly lower when draw beads are used.

According to experimental data from H. Nine, the clamping force is about 80% to 90% of the restraining force with fixed beads. With a flat binder, when restraining force is created by friction only, the binder force needs to be five to seven times larger depending on coefficient of friction (COF). Without draw beads, a larger press size is required to provide sufficient restraining force.



The experimentally measured restraining force can help determine the bead penetration required in the die design.

Researchers at Oakland University's Center of Advanced Manufacturing and Materials (CAMM) analyzed how restraining force can be adjusted by changing the bead penetration. The experimental work was coupled with numerical simulation to demonstrate the applicability of commercial simulation software to predict the required adjustment of the material flow in stamping dies. The experimentally measured restraining force can help determine the bead penetration required in the die design to achieve the assigned line bead restraining force in the simulation.

Experimental Methodology

The draw bead simulator used in this experimental study was constructed around the idea of a sheet metal draw die: The sheet metal flows in between the male and female portions of the draw bead with some clearance, allowing sheet metal to flow outside the bead area (see **Figure 1**). For this study, the radii on both male and female beads were 4 mm; widths were 9 mm and 13 mm, respectively. The clearance was adjusted by the equalizer blocks, which included a set of calibrated shims separating the flanges of the tool. The hydraulic cylinder held the portions of the simulator clamped to each other. The draw bead simulator was built on a rigid die shoe system (see **Figure 2**). Clamping force was 34.2 kN.

The researchers used the following experimental procedure:

- Install the draw bead simulator in a 50-kN tensile frame, with the tool weight supported by a steel table bolted to the lower plate of the tensile frame.
- Install the draw bead inserts into the draw bead simulator with the targeted clearance and bead penetration, achieved with calibrated shims.
- Use a feeler gauge to check the clearance between the inserts.
- Lubricate a strip of aluminum alloy 6111-T4 sheet 0.9 mm thick and 50.8 mm wide, clamp its upper end with the upper grip of the tensile testing machine, and clamp the lower portion between the draw bead inserts with a hydraulic cylinder, leaving sufficient

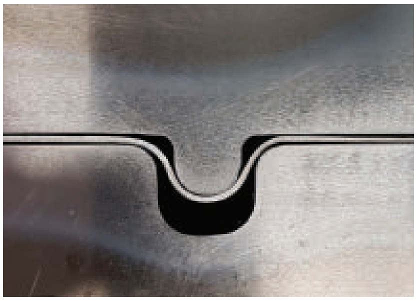


Figure 1

This experimental draw bead tool was used in the research.

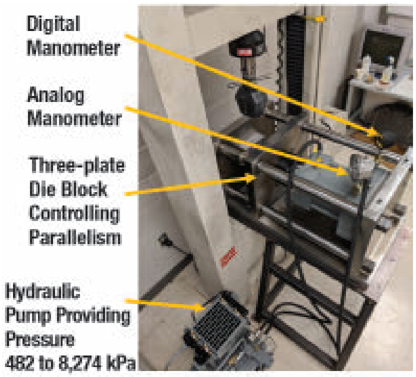


Figure 2

The draw bead simulator was built on a rigid die shoe system.

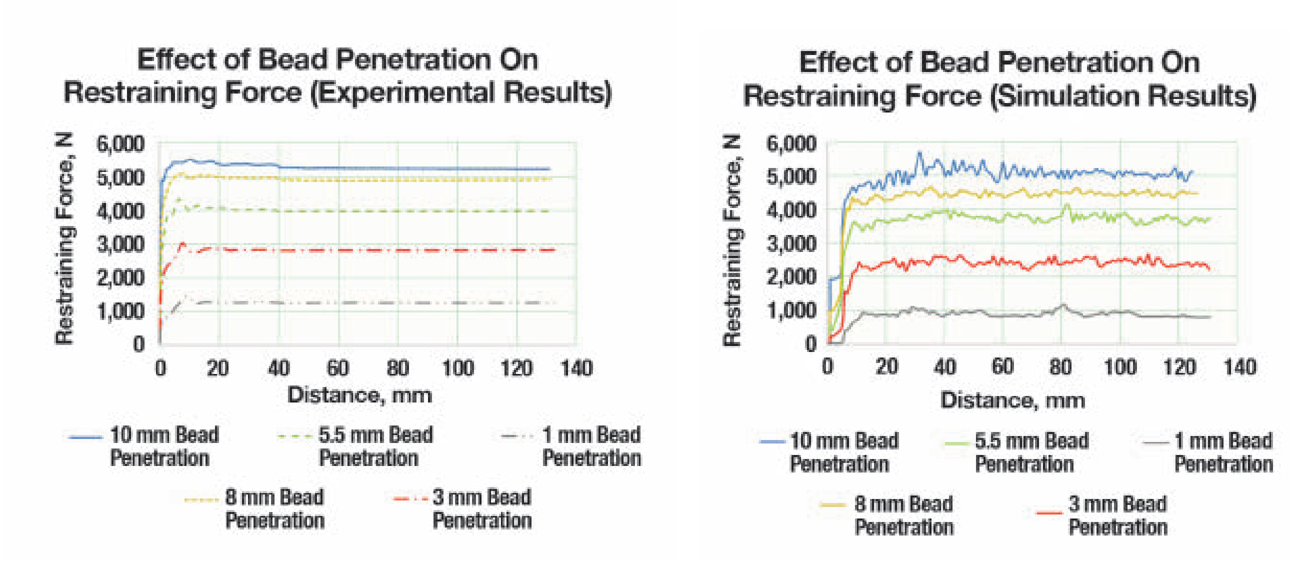


Figure 3

Restraining force was measured experimentally (left) and using simulation (right) for five different bead penetrations. Each curve is the average of five specimens.

material to be pulled through the beads.

• Pull the specimen through the draw beads at the speed of 200 mm/min. for 130 mm.

Numerical Simulation Methodology

Using the simulation software, the researchers developed a numerical model of sheet material flow through the draw bead. A comparison of numerical and experimental results showed that the simulation model, when calibrated, could be used to direct the tryout process of connecting draw bead geometry with splitting, wrinkling, and springback.

Material deformation in the draw beads was simulated in two steps:

1. Simulate the strip deformation while closing the beads.

2. Simulate the material flow through the beads.

In the model, after the strip was formed by the draw bead in step 1, the same draw bead moved horizontally to the left in step 2 while the sheet was restricted from one side. The results of in-plane force were used to evaluate the corresponding restraining force on the constrained side of the strip.

Results of Experiment and Numerical Simulation

The experimental study was carried out with an adjustable draw bead insert; the advancement of the male bead and the clearance between the flanges of the male and female portions of the tool could be independently changed. The male bead was fabricated as a separate insert with position adjusted by the first set of shims; the gap between the flanges of the draw bead inserts was adjusted by the second set of shims acting with equalizer blocks.

The results on draw bead restraining force for different male bead penetrations and 0.99-mm clearance between the flanges of the male and female beads (leaving 10% clearance of sheet metal thickness between the sheet and the inserts) showed that the restraining force can be varied by approximately a factor of four. This gives the die designer plenty of flexibility to perform a virtual tryout and achieve the desired distribution of restraining forces around the perimeter of the blank by selecting corresponding bead penetration. The material might not fully conform to the shape of the beads at smaller bead penetrations, and the wrapping angle where friction contributes to the restraining force varies significantly with the depth of bead penetration; therefore, an analysis is required for each bead geometry.

The numerical simulation with the software was targeted to define the COF that correlates the numerical restraining force to its experimental value. Results indicated that 0.14 provides the best correlation for all depths of penetration. **Figure 3** shows the experimental and simulation results with different bead penetrations from 1 mm to 10 mm.

Contact pressure varied in different locations of the draw bead surface. The positive and negative peaks shown in **Figure 4** indicate whether the pressure is applied to the female bead or the male bead. Pressure distribution depends on bead geometry and therefore is not uniform.

Conclusions

The experimental study and numerical simulations indicated that draw bead restraining force can be varied significantly by adjusting the bead penetration. Results demonstrated that numerical simulation can be successfully used to design the distribution of restraining forces if the COF is selected based on correlation with experimental data.

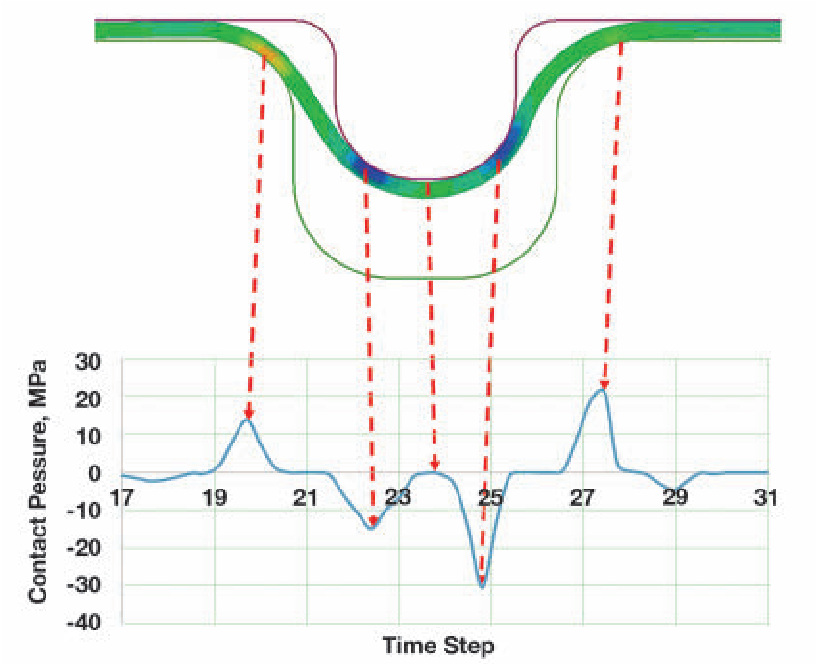


Figure 4

Shown here is the variation of contact pressure for a draw bead configuration with fixed central bead, 0.99-mm clearance, and 0.15 COF.

A simple set of tests performed with the draw bead tool can serve as a transition between the line bead simulation selecting the necessary restraining force and the design of the die.

These experimental and numerical studies illustrate a simple way to define the COF for small-radii areas of a stamping die with significant friction. ST

Dr. Sergey Golovashchenko is professor and director and Natalia Reinberg, Ashutosh Mokashi, Saeid Nasheralahkami, and Yurdaer Demiralp are graduate students at the Center of Advanced Manufacturing and Materials (CAMM), Oakland University, 115 Library Drive, Rochester, MI 48309, 248-370-4051, golovash@oakland.edu.

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PTM technician spot welds a large, complex assembly.

Second-gen Michigan stamper proves out her mettle through prototyping

Perfecting the part, perfecting the process

By Kate Bachman

Most stamping manufacturers conduct some prototyping in their operations. Usually, it is offered as a service but not necessarily a revenue source. Rarely does prototyping comprise 50% of a stamping manufacturer's business. Not only does prototyping sustain half of PTM's business, it is so sizable that it comprises two prototyping divisions.

"Fifty percent of our revenue is based on prototyping, R&D, and helping our customers with their problems," said PTM President/CEO Donna Russell-Kuhr.

"We try to become more involved

on the engineering side of prototyping because, at that point, we can help make sure it's manufacturable. That's the biggest distinction between prototyping and production. When we design or help our customer design a prototype, we do it so it can meet mass production requirements," Russell-Kuhr said.

That business strategy has helped the Fair Haven, Mich., stamper grow to a Tier 1 and 2 supplier, with multiple facilities occupying more than 300,000 square feet and nearly 300 employees. The stamping manufacturer recently invested $1.7 million in a plant expansion.

Objectives for Prototyping

There are many potential objectives for—and benefits of—prototyping.

Perfect the Part. One goal of prototyping is to prove out the part. PTM might stamp three or four versions of a part and before the customer's buyoff depending on size and complexity, Russell-Kuhr said.

"While you're creating prototypes, you learn a lot about that part. You learn about the metal, the properties, and the problems that you may have," she said. "We work with customers at the prototype stages to understand the part's purpose and function so we provide the customer a product that's repeatable in production."

A highly skilled fabricator qualifies a part to ensure that it meets customer specifications. The nature of prototyping is such that there are times when each part needs a craftsperson to fine-tune-shape it to specification by hand.

"It's costly to make engineering changes at the production stage," added Director of Business Development, Estimating, and Engineering Steve Kuhr.


Prototyping is such a major part of PTM's business—half—that the manufacturer has two prototyping divisions.

Perfect the Process. "In the prototype stage, you can make all the painful mistakes so that by the time you get to production, there are no surprises," Kuhr said. "At the end of the day, so much money can be saved."

"When we receive CAD part data that is not ready for production manufacturing, that is where our team comes into play to help ensure that the final part is manufacturable and at a feasible price point," Kuhr added.

One of the successful approaches PTM takes that may be unique is that when they make a prototype, it mirrors the final stamping processes closely.

"In prototyping, you can make anything. Everything in prototype is capable because you have time to shape it, to bend it, and you can use hand tools to put the part in specification. You can make things that would never be feasible to make in production," Kuhr said.

An associate final-inspects a prototype part.

Save Money. Another PTM goal for prototyping is to find ways to eke cost out of the part. "We work with the customer and their engineering and quality teams to determine what is acceptable while meeting specifications and building quality into the product," Kuhr said.

Russell-Kuhr offered an example. "A customer might want to prove out the same part in three different metal thicknesses to determine how thin the material can run and still meet design criteria. When you run 30 million production parts of a given part number, reducing your metal thickness saves a lot of money."

Develop Costing Models. Another prototyping objective is to develop costing models. This is especially relevant as more electric vehicles move into the mainstream, Russell-Kuhr said. "So many electric vehicle companies are going to be launching in the next few years, and there's no way on God's green earth they're all going to be winners. Most production volumes will be very low."

PTM is working with an electric vehicle OEM in the prototype stage to help it gear its costing model for low-volume production stampings and assemblies at an initial low-volume rollout so that it is mutually profitable, Russell-Kuhr said. "We're working out where they can make money and we can make money. Because no one knows exactly how well and how soon these electric vehicles and hybrids are going to sell."

Develop Prototype Tooling at Lower Cost Than Production Tooling. It's essential at the prototype stage to be able to design and build tooling to meet customer needs. At the same time, much is learned from the prototype tooling that can benefit the production tooling. Most cost avoidances can be made at this stage in prototype to develop lessons learned and carry over to production tooling and processes. The benefits of prototyping can outweigh high engineering costs of production tool changes.

"When a customer comes to us with a low-volume part, we can't be competitive with production tooling costs. Our advantage is that we know production and prototype and how to design and produce robust prototype tools at a lower cost," Kuhr said.

Quick Turnaround. Time constraints are an ever-present challenge for the prototype divisions. "With prototyping, you don't have a lot of time," Russell-Kuhr said. "Even in low volumes, making these parts is a slow process. It really comes down to tool design and how we manufacture and assemble the parts."

The Prototyping Process, Step by Step

The company divides its prototyping division into large parts and assemblies and small components. The company created two divisions because there are a few differences in the way they handle large and small prototypes—and in how far their customers want to take them.

The first step is the RFQ process for both large and small prototypes. "We look at the part, and evaluate it through engineering. We put an estimate togeth-

Large prototypes are formed in Kirksite tools.

A Faro scanner scans a part and verifies part quality with customer data.

er of how many forming stations there should be for the part," Kuhr said.

"If we get the program, we'll design the blank based on the overall parameters of the part."

From there the processes deviate, depending on whether they are large or small prototypes.

Large Prototypes. The job is run through Autoform simulation software. Based on that simulation, the engineers develop their first draw tool. There could be three- or four-piece tools. "Once that tool is completed, the engineering group provides a rough blank size, and we'll cut that on the shear or on the laser," Kuhr said.

The laser blanks are cut on PTM's 8,000-watt, 3-axis fiber laser cutting machine. "What's nice about using a laser machine to blank is that when there are design changes, we don't have to change a blank tool to blank the part out; we can just change a program," Russell-Kuhr said.

Once the blank is laser-cut, it heads to the forming and drawing processes.

Kuhr outlined the process steps. "We perform part tryout and prove out the blank dimensions are correct, the cutoffs are fine, and we're not wrinkling material during drawing. When we get close enough, we pull what's now the stamped part out of the press, and that's called a draw shell. We take the draw shell back to the laser department and trim the part.

"Then we take it back to the secondary form stations. We form the geometry characteristics into the part through a series of stamping stations."

The largest press is 2,000 tons. "We're forming fenders, doors, hoods, and Class A surfaces. We provide assemblies on closures as well as highly complex assemblies such as front-end and rear rails," he said.

Normally it takes only two or three hits to form a door or fender, with a couple of laser trims in between. But each part is unique, and the number of stations varies for each prototype process. One operation had 28 forming stations after it was laser-blanked to become a finalized part.

On occasion prototype parts need hand qualifying, but simulation software mitigates that to a minimum.

Small Prototypes. The small-proto-

A Kirksite tool is finished on the CNC.

Donna Russell-Kuhr succeeded her father as PTM Corp. president and CEO in 2015. Since then she, her husband Steve Kuhr, who is director of business development, estimating, and engineering, and her three sisters, who are co-owners, have grown the dynamic company. PTM recently added a $1.7 million facility expansion.

type process starts similarly to the large prototypes, with some significant differences.

"It's similar to our large-prototype process in that we create a developed blank which is laser-cut. Then we use a series of line dies to form the part. But we mirror our stamping production process more closely throughout our small-prototype process," Kuhr said.

"Think of a progressive die, and each station is pulled out and set in a series of small presses to form the part to its specifications," he explained. "We perform each of the operations in a number of small, single presses. This produces parts with characteristics similar to mass production."

Small Parts. The design, engineering, and manufacture of small prototypes is quite different from large prototypes, Kuhr said. "Prototyping brackets, clips, and metal fasteners is totally different than how we make a fender or a door.

"Our small-prototype shop stamps parts so small that you can literally put 50 of them in the palm of your hand. We make jewelry over there!" Russell-Kuhr added.

In the design stage, engineers always look for ways to consolidate parts, Kuhr said. At the same time, the forming of the small parts is simplified. The small-parts forming is limited to bend radiuses and angles, mainly. "A small bracket might have a 90-degree bend in it, while a large prototype has all kinds of forms that you could never do with the small-prototype process."

Although larger prototypes are trimmed before and throughout the forming process, small prototypes are formed from what PTM calls a developed blank. The small prototype parts are not laser trimmed at the end. "The part comes out just as it would in a prog die", Kuhr said.

Prototype to Production

Unsurprisingly, PTM welcomes running the prototype parts they developed in large-volume production runs. "We take on those low-volume jobs—a few hundred parts or more and before you know it, we're quoting large-volume production. That's kind of how we migrated prototyping into production and it made a natural fit for our business model growth," Russell-Kuhr said.

> **"When we design a prototype, we do it so it can meet mass production requirements."**

About half of the jobs for small-part prototype programs go into production tooling and production facilities; however, once the large prototypes are perfected, the OEMs usually perform the production. "We might prototype a door for an OEM, but their own production facility will run production and our work ends at the prototype stage. Automakers like to control their Class A process, especially outer skins," Kuhr said.

Russell-Kuhr remarked, "We feel that our competitive advantage is we offer both prototyping and mass production, which provides our customers a better result for their mass production process."

Finding a Way

Because so many unknowns accompany prototyping, inventiveness is required. "We always find a way," Russell-Kuhr said. Finding a way is rooted in the family-owned company's origins.

That family legacy story began with Donna's father, Charlie Russell, whose scrappy ingenuity transported him from a poor cotton-picking sharecropper in Mississippi to starting a small prototype shop in Michigan with one customer to help him start his new venture. Russell passed away in 2016; however, his legacy lives on as the shareholders and employees have continued to carry on that "can-do team spirit."

"Dad started with nothing and applied his wits and ingenuity to solving problems the best, quickest, and least expensive way—and just helping his customers," Russell-Kuhr said. "That was always at my dad's heart. Somebody has a problem, and we're going to find a solution for them. He would do whatever he needed to make them happy, and my mom would come in and help him.

"We have a code of honor at our company," she continued. "It's about how we want to conduct business with our customers, each other as employees, and our suppliers, no matter what the conditions are—if the economy isn't doing well, or there's a pandemic. Our No. 1 code of honor is 'deliver exceptional performance and peace of mind to our customers.'

"We trust that our corporate values will carry on in our next generation of family and those new people who succeed us. We believe that this is what keeps our company together through the good times and the not-so-good times."

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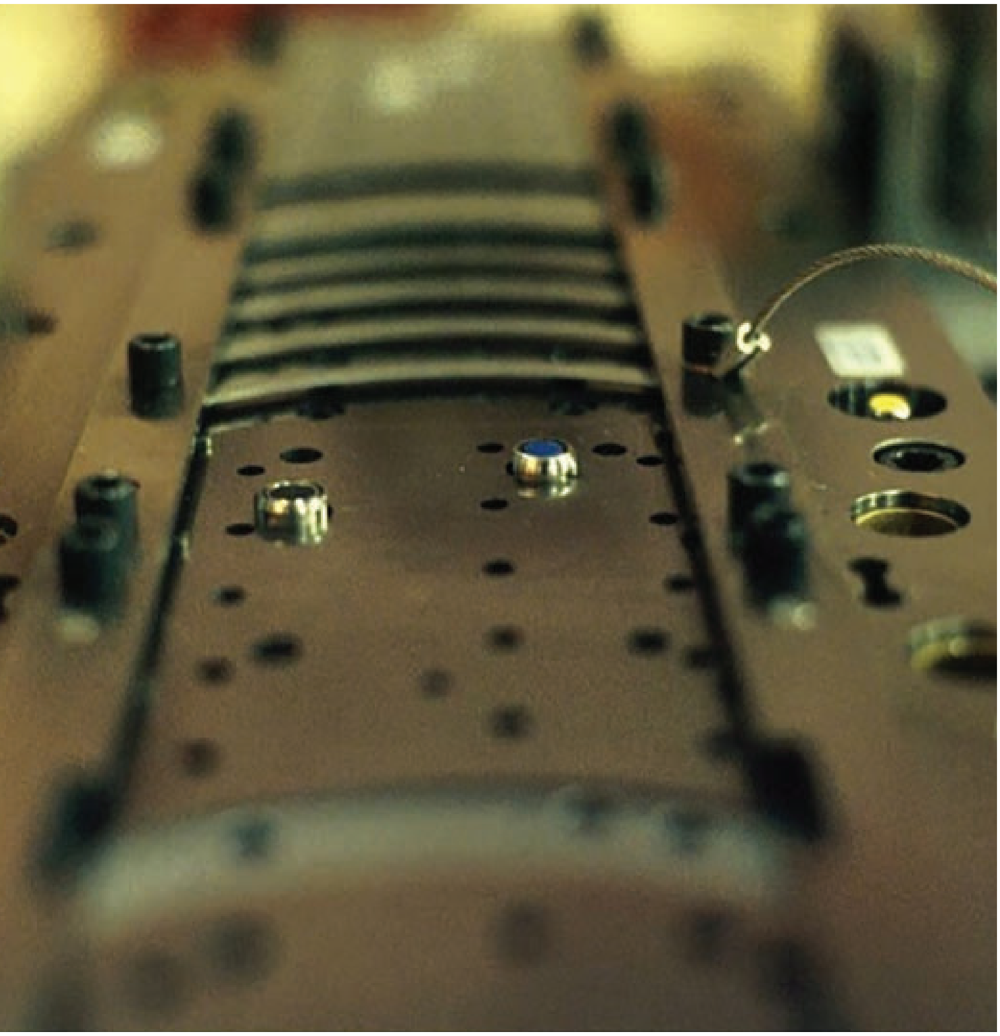
PTM Corp., www.ptmcorporation.com



Partial feed sensing early in the cycle enables the die protection system to detect misfeeds faster.

Q&A: How sensors and controls help stampers adapt to the new normal

Remote workforce can rely on controller's built-ins, monitoring logic, connectivity features

By Jim Finnerty

Challenges that stampers have been facing related to the skilled worker shortage have been exacerbated by the pandemic. Stampers are trying to do more with fewer people on-site, so many of them have turned their attention to mistake-proofing and sensoring their dies and operations more.

A big problem right now seems to be training. Technical people who have never installed sensors in dies before are tasked with doing so, and they need training to be able to do it right.

There is a learning curve associated with sensoring, and bumps in the road along the way are to be expected. However, many plants are not allowing visitors, which makes training challenging. Stampers are trying to implement "new-to-them" technology sans outside help.

1. How must sensor and control systems technologies evolve to help meet these challenges?

Controls must be easier to use. Common sensor monitoring logic must be built into the controls. Sensor monitoring has to be more forgiving while still protecting the dies. Everything should be well-documented, with the documentation readily accessible for the people who need it.

2. How are sensor and control technologies addressing these challenges?

Resolving these challenges can be handled in a number of different ways:

• First, die protection courses can be an invaluable industry resource for getting stampers started with in-die sensoring. They should entail proper installation techniques, programming tips, and wiring instructions. The classes should be structured so that they can be held on-site or delivered online in shorter sessions when they cannot be held on-site.

• New die protection features that can

either make the product easier to use or provide additional capability have been introduced to the market. For example, part-in-place sensors can now auto-reset when they are used for hand-fed applications. This speeds up the process because the operator doesn't have to reset an error every time a workpiece is removed and replaced.

•Timers can be added to the sensor inputs that enable the controller to ignore short false sensor actuations while detecting the real malfunctions. When enabled, the sensor inputs are more forgiving, which helps cover up rookie implementation mistakes while still protecting the dies.

•A new type of monitoring logic allows users to monitor complex events with a single sensor input. These are events that previously required multiple sensor inputs and external timing signals. They include sensors that require multiple actuations during a single cycle; sensors that must be on at a certain angle and off at others; and sensors for gagging operations that are required to actuate on some press cycles but not others.

•Context-sensitive help screens can be present for every function in the controller. When a new operator has a programming question, they can touch a single button and get help for whatever function is on the screen at that time.

•Product manuals are a dependable resource, as long as they are updated. They should include application examples, photos and diagrams, and thorough explanations for every feature and function in the controller. The manual should be accessible at the machine, and optimally as a PDF directly in the controller that can be viewed on-screen with the touch of a button.

•With so many people working remotely, it's become necessary to provide new tools for users' access to the controllers. To this end, full-functionality remote access features allow a company's subject matter experts to not only view the status of the controllers, but actually program them from a desktop computer or mobile device. That way, when an operator has a programming question or application problem, the person with the answer can fix it from wherever they are, instead of having to go to the machine or try to explain it over the phone.

With so many people working remotely, it's become necessary to provide new tools for users' access to the controllers.

3. What is the future of sensoring?

The remote workforce is here to stay. Stamping manufacturers are finding that workers can be productive—sometimes even more productive—working remotely. This increases the importance of connectivity features in a controller. Remote subject matter experts with full remote access to a machine's controls can quickly correct issues from anywhere.

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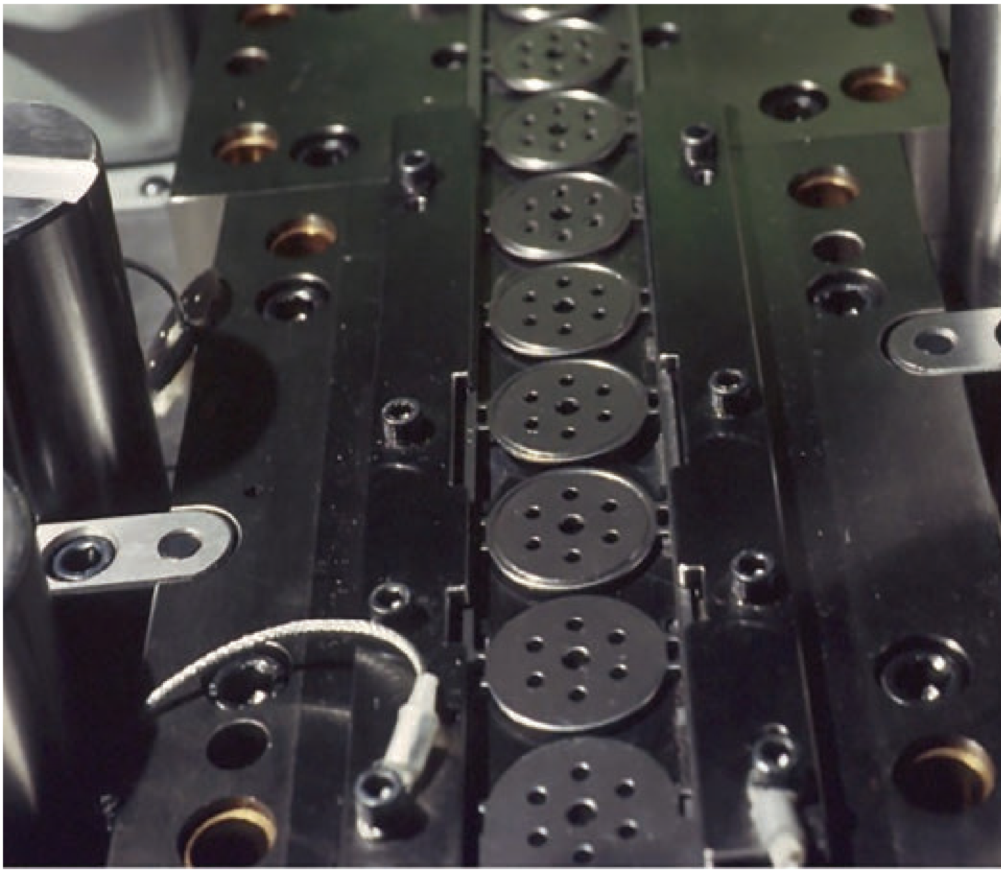

If possible, sensors should be installed so that they don't have to be removed during routine die maintenance.

Automating scrap handling brings efficiency, safety, and frees up labor capacity.

5 ways to handle stamping, die cutting waste streams automatically

Build operational resiliency by automating waste removal

By Mike Hook

As the manufacturing sector regroups from the disruption caused by COVID-19, one thing has become clear: Skilled worker shortages will continue to escalate, and stamping operations need to prepare and adapt to meet this challenge.

A recent survey by a major manufacturing technologies company reported that 21% of respondents said automation is an area in which COVID-19 revealed opportunities for innovation. With fewer human resources on the shop floor, metal forming operations that automate waste streams and leverage the Industrial Internet of Things (IIoT) will be more efficient for a more resilient future. Also, because automation supports physical distancing of employees and reduces contact with equipment and tools overall, it also enhances workplace safety.

Five areas in which adding automation to stamping and diemaking processes not only help mitigate the existing lack of skilled labor but position stamping manufacturers for growth down the road are related to scrap, fluid management, and monitoring.

1. Move Metal Scrap

Conveyors, hydraulic dumpers, and automated loadout systems eliminate some of the most laborious manual processes in metal scrap handling.

Conveyors. Conveyors remove stamping scrap and debris quickly and automatically from the point of production. When metal waste and spent cutting fluid are cleared from core operations automatically, forklift transfer is eliminated and production cycles are optimized.

Automatic dumpers. These accept chip carts or drums from die machining operations and elevate and invert them over a receiving hopper. Mechanical options are equipped for high-level transfers; hydraulic systems facilitate low-level metal scrap transfers. If a hand-held control is used for directing the operation, both systems empower efficient, one-person cart unloading.

Loadout systems. These systems automatically transfer metal scrap into distribution containers for transport to a metal recycler. A shuttle conveyor's continuous back-and-forth operation evenly distributes scrap in containers. Level sensors provide operators with an alert when the container is filled to capacity. Loadout automation can even send a signal to the scrap dealer using machine-to-machine communication that the container is ready for pickup. Integral scales track overall scrap output and help ensure that containers are full but do not exceed road weight limits as well. These systems significantly minimize the oversight needed for efficient loadouts.

Automating the transfer of metal scrap from one point of production to another minimizes employee intervention. Also, workplace safety is improved because these systems eliminate the dangers associated with moving metal scrap manually. This can help attract and retain quality employees, while enabling resource allocation for production-focused tasks in other areas of operation.

2. Modify Metal Scrap

Metal scrap processing equipment automates the task of reducing turnings and bushy wads of metal scrap into flowable, shovel-grade chips. Equipment with vertical feeds provides continuous positive feed operation to facilitate high-volume scrap reduction. Equipment with horizontal feeds can accommodate low volumes of stringy and bulky turnings.

These systems help keep shop floors free of hazardous materials and prepare the metal scrap for more efficient and effective processing down the line.

3. Monitor Machines

With older, experienced workers leaving the workforce, automated machine monitoring and IIoT capabilities present a way for stampers to succeed when that acute knowledge of facility equipment and maintenance resources are in short supply. Continuously monitoring

The die build milling and machining process creates combined metal scrap and fluid waste.

Loadout systems automatically transfer metal scrap into distribution containers for transport to a metal recycler. Level sensors alert operators and scrap dealers when the container is filled to capacity.

IIoT communication devices make equipment data accessible to any person or device, anywhere.

equipment performance and capturing that data, automated machine monitoring systems support predictive maintenance. That ultimately minimizes shutdowns, lowers maintenance through reduced labor overhead, increases productivity, and improves workplace safety over the entire operation.

Because IIoT communication devices gather equipment data and send it to the cloud, they make equipment data accessible to any person or device, anywhere. This can help a new operator review what has caused a machine to fail in the past and help make machine uptime more predictable. IIoT can even email vendors to order replacement parts automatically.

4. Separate Cutting Fluid

Post die-cutting operations, wringers and centrifuges separate cutting fluids from metal chips. Particularly when they are incorporated into a metal chip processing system, wringers and centrifuges facilitate automatic removal and recovery of cutting fluids to help speed up waste stream management. Wringers and centrifuges with self-cleaning designs and auto lube systems that automatically grease bearings help support continuous operation while reducing operator-led procedures.

5. Manage Cutting Fluid

For shops that lack automated fluid filtration systems, cutting fluid management demands repeated intervention from employees. Operations that use tramp-oil separators eliminate the need to vacuum oil from rinse tanks manually. By automatically removing free-floating and mechanically dispersed tramp oils, bacteria, slime, and inverted emulsions from individual machine sumps, central systems, and wash tanks, tramp-oil separators can reduce tramp oil to less than 1% in a single pass.

Turnkey centralized fluid filtration systems can take fluid management efficiency even further through automated coolant concentration control and continuous bacteria elimination via ozone injection. These centralized systems require minimal operator involvement and training, making fluid management effortless, seamless, and easy. Cutting fluid recycling equipment also reduces hazardous waste handling up to 90% and reduces new fluid purchases by as much as 75%.

Automation Not a Job-Killer

Although automation presents a path to future resiliency, it continues to be haunted by a stigma from the past. To fully leverage the level of innovation that automation offers, the North American manufacturing sector—including metal forming operations—must first extinguish the misconception that automation only eliminates jobs, when in fact is it shown to help create new jobs. A Deloitte study of automation in the U.K. indicated that although 800,000 low-skilled jobs were eliminated, 3.5 million higher-paying jobs were created.

Companies that deploy automated technologies in their operations tend to grow, while those that don't tend to wither. As such, automating waste streams is a pathway to progress for North American stamping companies and their employees, and to operational resiliency that will position plants for growth even in the most challenging economic conditions. ST

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Conveyors remove stamping scrap and debris quickly and automatically from the point of production, eliminating the need for forklift transfer for that operation.

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Machine Concepts

Machine Concepts Provides Custom Solution to Level High Strength Stamped Parts for ABM Tool & Die

Five Decades of Innovation and Steady Growth

ABM Tool & Die Co., Ltd. was founded in 1969 as a Tool & Die Shop in Brampton, Ontario, Canada by Armando Blagonic. Over the last 50 years the company has grown to employ over 250 people with two 100,000 sq. ft. manufacturing plants and is now a Tier 1 Automotive Parts Supplier of Stamped and Welded Assemblies. As the company grew it expanded operations internationally setting up a manufacturing plant in San Luis Potosi, Mexico. This move proved successful requiring an expansion of their advanced manufacturing capabilities there. However, the requirements for this expansion were twofold and not easy to achieve.


Armando Blagonic, founder of ABM Tool & Die (left) and current owners Terry Blagonic and Doriana Blagonic (right)

First, flat and stable parts were to be produced from Dual Phase Steel and other high strength materials for the manufacture of car seat track assemblies and other automotive components. Second, the new system would need to be fully integrated with an existing stamping press so the custom control system had to fully integrate all the equipment to perform as a seamless press production line. With these requirements in mind, ABM set out on a worldwide search to find a supplier with the engineering and manufacturing expertise to provide the specialized equipment required. Their search took them across Europe and the United States. Since ABM had little experience working with the high strength materials required they were looking for a knowledgeable partner as well as a supplier.


ABM Tool & Die corporate headquarters in Brampton, Ontario (top)
ABM Tool & Die manufacturing plant in San Luis Potosi, Mexico (bottom)

Strategic Partnership with Machine Concepts

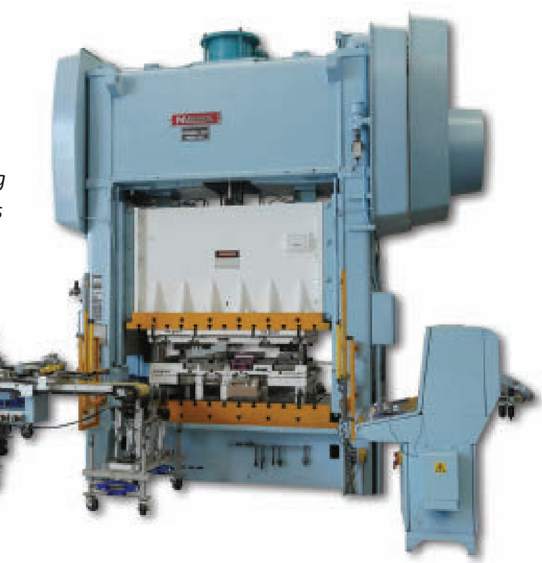
Their search brought them to Machine Concepts of Minster, OH, USA, a designer and builder of Press Auxiliary Equipment, Roller Leveling Systems and Coil Processing Equipment. "It did not take long to know our search was over," says Terry Blagonic son of ABM founder Armando Blagonic. "Machine Concepts' engineering expertise, in-house manufacturing capabilities and knowledge on working with difficult high strength materials along with their willingness to educate us set them apart from everyone else."

Producing the light weight, high strength automotive components meant developing a new approach for the stamping and manufacturing process. To produce flat, stable parts from the high strength materials Machine Concepts designed and built a Multi-Stage Leveling System. This multi-stage leveling system levels the material twice during the production process. Once as a coil prior to the stamping press and a second time as a part after the stamping press. This innovative production design addressed all the requirements.

The new stamping line can process Dual Phase Steel and other high strength materials from 0.070" to .250" thick at 24" wide and production speeds up to 150 parts per minute. The highly automated, push button operated system designed and built by Machine Concepts is comprised of a Coil Stand to Pre-Stage and Load Coils, a 25,000 lb. Traversing, Single Mandrel Uncoiler with Powered Coil Hold Down Arm, (1) H2 Cassette Style Precision Straightener with Hydraulic Entry Hammer Flattener Bar and Cassette Removal Kart, an Alligator Style Entry Guided Peeler Table, Loop System and (2) G2 Cassette Style Precision Straighteners with Part Conveyor Systems. The Machine Concepts supplied equipment utilizes an in-house designed custom control system which fully integrates the new coil processing equipment and multi-stage leveling system with ABM's pre-existing stamping press providing a seamless, push button, high performance press production line.

New high performance production line with advanced manufacturing capabilities produces high quality, reliable parts from difficult, high strength materials resulting in light weight, high strength automotive compenents.

"Producing flat, stable parts was key to our requirements. While other leveling systems may achieve a 30-50% yield in the thickness of the material our custom-engineered Multi-Stage Leveling System can achieve up to 85% yield within the thickness of the material. This produces a very stable and flat product even on high strength material like Dual Phase Steel. To date the system has produced over 70 million parts for a number of automotive manufacturers and everyone is happy with the results" says Terry Blagonic.



Multistage Leveling System levels parts before and after stamping

"As the drive for lighter, stronger parts grows in multiple industries the use of high strength materials will also increase. The need for innovative state-of-the-art manufacturing capabilities will also grow. Machine Concepts is dedicated to providing the technology and equipment needed to meet these challenges" states Randy May of Machine Concepts. "Advanced designing and custom building is what we are all about. We see our role as a partner to our customers as well as a supplier".

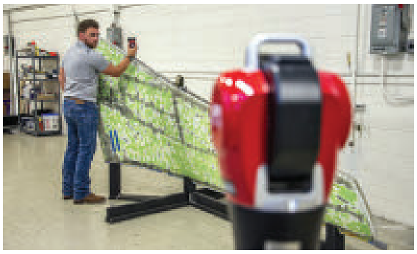
Future Growth

ABM sees huge growth potential in the use of high strength materials and plans to extend its operations in the future with similar projects. "Overall, we had the best of everything a local built system designed by a knowledgeable and helpful engineering team backed by extensive in-house manufacturing capabilities and an excellent service department. We are very pleased with Machine Concepts and the equipment. We will definitely work with them again in the future." says Doriana Blagonic daughter of the founder Armando Blagonic.

Addressing flexibility the Leveling System can be moved from press to press

For information contact Machine Concepts at 419-628-3498 or www.machineconcepts.com.

Sensor offers production floor CMM measurements



The API vProbe tactile measuring sensor provides the ability to perform CMM-style measurements directly on the production floor. Integrated with the company's Radian Laser Tracker series, the sensor enhances its measuring capabilities and functionalities.

The wireless, hand-held, lightweight tactile probe has an easy-hold grip that allows users to perform extended coordinate measuring functions by inspecting intricate internal and external features or part characteristics, providing fast and accurate dimensional measurements, the company states.

The sensor's RFID probe stylus recognition feature eliminates the need to select the probe stylus manually, ultimately removing potential for error. Additionally, Smart Buttons help minimize trips to the computer to select common functions that are integrated in the probe.

API • www.apimetrology.com

Interface improves speed, accuracy of lube system inspection

Generation Systems Inc., maker of the LUBE-IT lubrication management system, has released the SAP/Enterprise Asset Management (EAM) interface. This software enables the seamless transfer of inspection requests from maintenance technicians directly into the SAP Maintenance Notification Queue for approval by SAP work planning supervisors.

The interface enables the reliability engineers and supervisors responsible for maintaining daily essential care activities on the lubrication system to translate written notes and radio requests into SAP work requests for more vigorous inspections.

The lube system technician makes notes about issues of concern into a tablet during normal rounds and inspections. The notes, or trouble notice entries, are placed in a queue for the group manager to approve and auto-dispatch to the SAP Maintenance Notification Queue, where they are approved or rejected by planning managers. All relevant details are logged, checked, approved, and deployed with no paper generated.

Generation Systems Inc. • www.generationsystems.com

Control allows remote access to press production

Sutherland has introduced the I-PRESS press control. With software-based controls and touchscreen displays, the control allows operators to access their press production from anywhere in the world.

Built for automation and expandability, the intuitive control includes a full suite of safety features and is designed to integrate seamlessly with the Connected Enterprise.

The control is available in the I-PRESS, I-PRESS Hydro, and I-PRESS Forge models.

Sutherland • www.sutherlandpresses.com

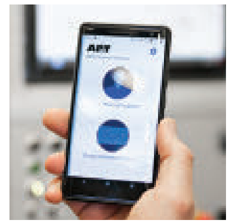
Coating doubles the gripping strength of jaws

Dillon Mfg. has introduced Carbinite, a wear-resistant, textured carbide coating that helps reduce or eliminate jaw slippage. According to the manufacturer, clamping tests have shown the coating to nearly double the gripping strength at equal clamping force.

The coating can be added by electro spark deposition to hard or soft jaws after they are milled to customer requirements. The wear-resistant carbide alloys display exceptional bond strength without annealing or distortion. The coating is suitable for hard or soft jaws, especially vise jaws and step jaws used for clamping applications.

Dillon Mfg. Inc. • www.dillonmfg.com

AP&T mobile app helps customers get press support quickly



AP&T has developed a mobile app, AP&T Aftermarket Services, to help customers get in touch with technical support when they experience problems with their metal forming presses.

The app provides phone numbers and email addresses to the closest AP&T support, as well as the user's agreement number, if any. It is available for download in App Store, Google Play, and Huawei AppGallery.

AP&T • www.aptgroup.com

PVD coating for cold press molds helps reduce maintenance

As industrial products are becoming highly accurate and have more complicated shapes, stress sometimes is concentrated locally because of the increase in deformation stress of the work material, and the mold life is shortened by wear and damage.

ZERO-I from Seavac is a PVD coating that imparts improved hardness and heat resistance to cold press molds to help reduce maintenance frequency and processing costs.

Seavac (USA) LLC • seavacusa.com

Metal stamping services brochure released

Tooling Tech Group has released a four-page brochure on the services offered by its Metal Stamping division. It provides an overview of the company's die design, manufacture, tryout, repair, and production services, along with color photos.

The brochure also includes detailed listings of the machine tools, stamping presses, and inspection equipment used in the manufacture of dies and production stampings.

The brochure is available for download at https://bit.ly/2EsPAXz.

Tooling Tech Group • www.toolingtechgroup.com

End-of-arm tooling designed for press tending

Piab offers end-of-arm tooling for robots in material handling in stamping applications. Fixed with the tooling, robots can lift, position, and separate heavy, contoured, and oily metal blanks during press unloading, destacking, and secondary operations such as bar code labeling or date stamping. Precise gripping components provide added designed flexibility to stack, crate-pack, or palletize finished parts.

The company also has developed systems including boom-type robotic applications with on-the-fly gripper adjustment and safety hold-down clamps for high-speed applications.

Piab • www.piab.com

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How do I start using tool coatings?

BY THOMAS VACCA

Q: I would like to experiment with applying coatings to extend my tool life. What is the best approach?

A: Good question! As with any improvement, when adding coatings, you have to be careful. You might think nothing will change, but the addition can cause unintended consequences.

The purpose for adding coatings and using tooling materials that exhibit greater resistance to wear is to improve the cycle time between consumables (cutting, forming, and camming components) changeout. This extends their life.

The continuous improvement process should include upgrading tool steels and trying coatings to improve tooling life.

New projects developed using tool coatings should be straightforward. Once development is complete, as long as all the tooling material and coatings remain the same moving forward, everything should proceed without problems. If you are trying coatings in an existing, ongoing production process, it's a different story. You must exercise due diligence.

New tooling may be built with standard, uncoated tool steel for two reasons:

1. Development of forms and trims will need to be changed as the tool is groomed for part to print. Special tool steels and carbide coatings can be three times costlier than standard tool steel, and so coatings at this stage could be very wasteful when making changes on-the-fly in development.

2. Development may result in grinding off the coatings or require new components to be made the same day. Coating costs and lead times make this infeasible.

When development is completed, the tool moves as is to the repair and maintenance tooling group, which in any best-in-class manufacturing operation is part of its long-term continuous improvement process. This should include upgrading tool steels and trying coatings to improve tooling life. And this process should never end. Its purpose is not to "put out fires" by fixing, sharpening, and repairing in reaction to unplanned tooling downtime.

Before moving to coated tooling, you need to establish a baseline of the current production process. This is done by setting up process control limits on data taken off key part parameters before making changes. Then you monitor the part data (in real time) to these predetermined control limits. This serves three purposes:

1. Ensures the process is stable. You can't improve a process that you can't control!

2. Identifies when uncoated tooling wear components must be replaced to ensure quality requirements are met continuously.

3. Establishes a baseline expected lifespan of the uncoated tooling.

Changes in the tooling materials and coatings are subject to the same controls as all replacement tooling, including verification that components meet all dimensional requirements on the component print.

After tooling wear components are replaced, either with or without upgrades in materials and coatings, standard good manufacturing practice applies. The part inspection data verifies that there have been no unassignable shifts. The maintenance cycle then repeats during production through the entire life of the program.

While pursuing continuous improvement, remember Tooling Law No. 10: "Grow and improve in steps," and Tooling Law No. 4: "If nothing changes, then nothing will change." Continuous improvement requires changes, so seek them out! If you don't innovate, the competition will pass you by. Every employee can be a leader in this process by being a proponent of change. Remember, one second saved in a minute of production yields almost a full workweek (35 hours).

Good luck, and happy stamping! ST

Stumped by a shop floor stamping or tool and die question? If so, send your questions to kateb@thefabricator.com to be answered by Thomas Vacca, director of engineering with Micro Co., www.micro-co.com.

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