FEBRUARY 2009

MetalForming

Serving Those Who Add Value to Sheetmetal
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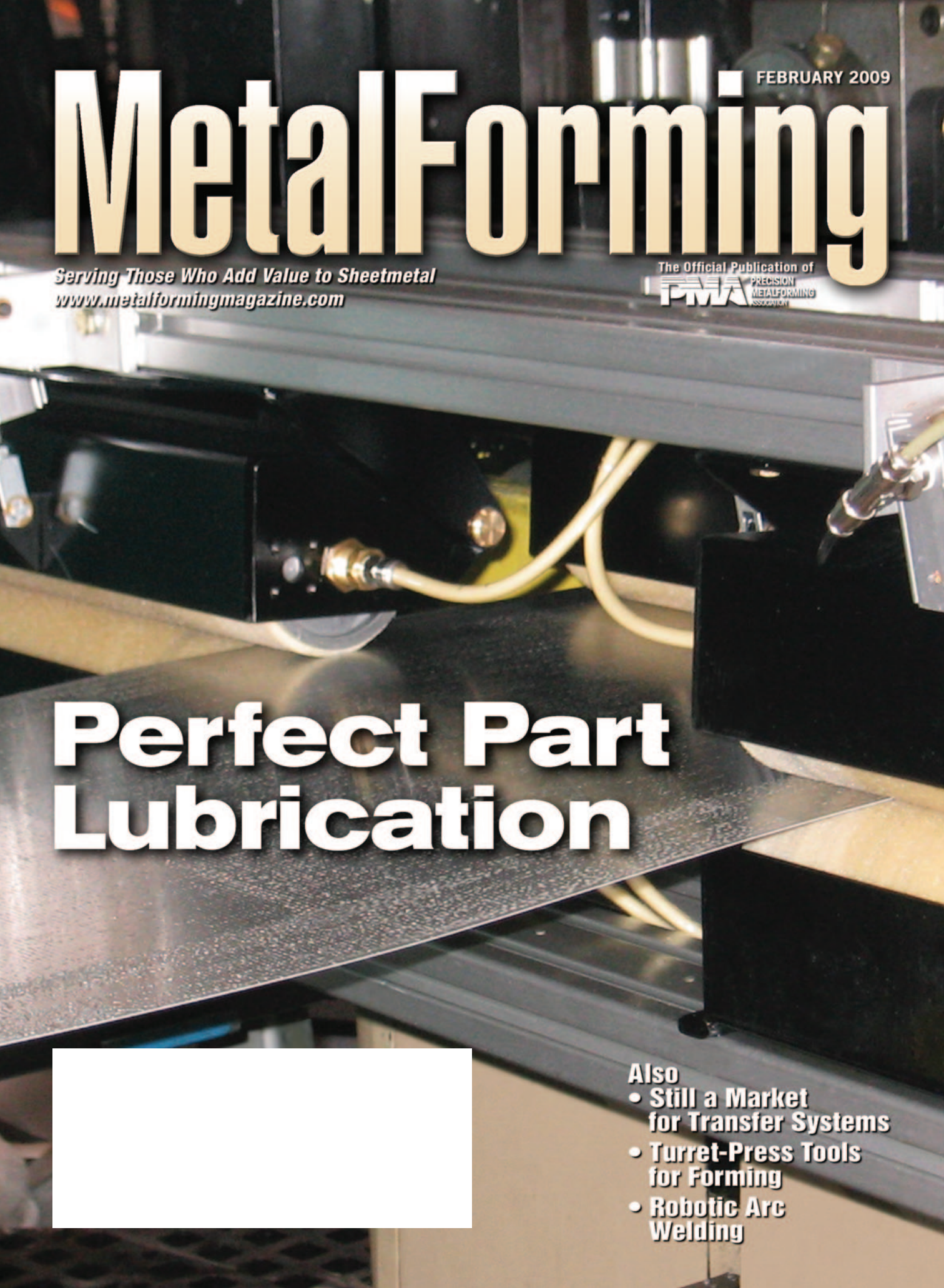
The Official Publication of PMA Precision Metalforming Association



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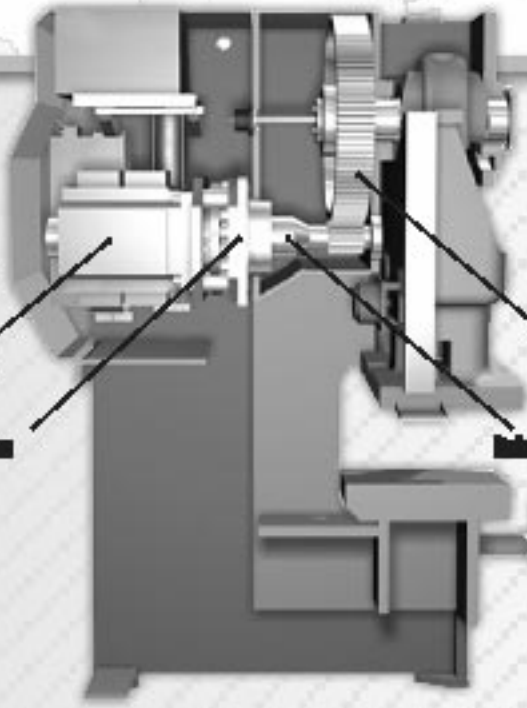

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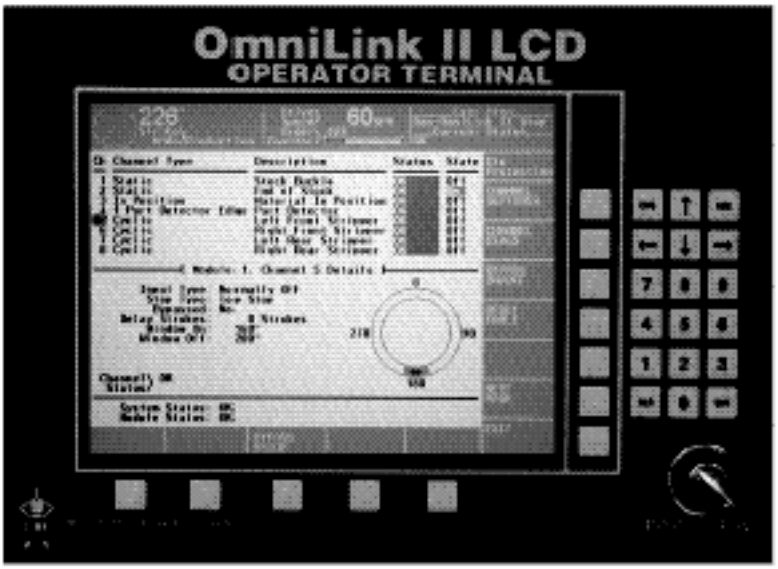

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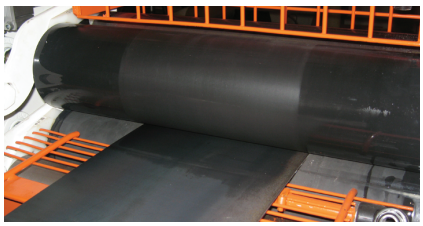
MetalForming

Serving those who create precision metal products using stamping, fabricating and other value-added processes.

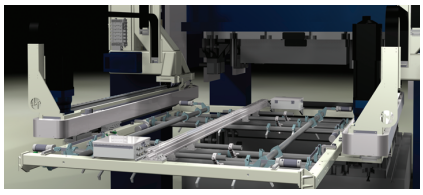
Contents

February 2009 — Volume 43 — Number 2

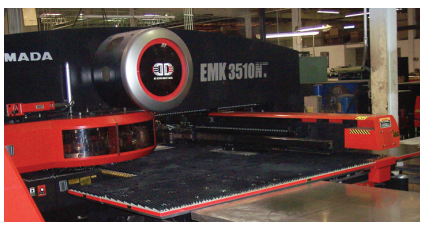
Cover Story



Features



Tooling Technology



Commentaries

Departments

ABOUT THE COVER: To address stock-lubrication concerns on its transfer and progressive-die presses, the MTD plant in Martin, TN, brought in roller-type lube equipment and controllers. The results have been impressive: less lube-system maintenance, less lube waste due to overspray, a cleaner pressroom and improved tool life. And did we mention better part quality? Read all about it beginning on page 12.

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Celebrating 70 Years Of Service

"Even through difficult times, customers must remain confident in your company's ability to deliver solid service and quality products on time."

EDITORIAL BRAD F. KUVIN

Keep Your Head

A little perspective: "Of the 100 largest industrial companies in 1912, by 1995, 29 had gone bankrupt, 48 disappeared (mergers, acquisitions and so on)… and 52 survived, but only 19 remained in the top 100," wrote Paul Ormerod in his book, *Why Most Things Fail: Evolution, Extinction and Economics*.

So, it seems, over time kingdoms crumble, leaders fall and markets retract. Call it what you will—reorganization and restructuring, overcapacity adjustment, thinning of the herd, survival of the fittest. Or, just random horrible circumstances—external shocks such as rising oil prices, hurricanes, credit crises and mortgage delinquencies. Whatever stacked the odds in favor of this record-setting recession, as Ormerod insists, we are not completely helpless in the face of failure. He writes:

"(Companies) fail because of the inherent uncertainties in any complex system. Despite our best intentions, outcomes often do not match desired effects. It is impossible to get around this simple fact, and no amount of intelligent analysis will change the situation. We are not completely helpless in the face of the Iron Law of Failure… Indeed, it is the dynamic of competition, innovation and experimentation that must be promoted."

How does a workforce remain focused, upbeat and confident that its company can continue to compete and innovate? As people leave, emotions run wild and people become easily distracted. I'm sure that for most of the readers of this magazine, uncertainty now has become the only constant. But even through difficult times, your company's customers must remain confident in your ability to deliver solid service and quality products on time.

To do this, human-resource consultants Claire Logan and Rhonda James, of PA Consulting Group, stress that companies must focus on delivery as usual. They recommend that company executives devise more manageable short-term strategic plans, and that these plans be well-communicated to teams so that the performance bar remains high. Coach your top leaders. They need to fully understand the situation so that they can communicate accurate messages and make decisions based on factual information. Engage your employees to develop and encourage two-way communication channels that you and your employees can rely on.

Now is probably not the best time to be focused on your long-term 3- to 5-yr. plan. Rather, set a course for three to six months, and develop a set of short-term objectives to steer that course. Make sure that the entire organization understands those objectives and is committed to pulling in the same direction. And, I suppose, be sure to account for the flexibility needed to navigate the twists and turns that even the short course will surely take. Here's where employee commitment becomes critical, as they must open their minds to new concepts that will help their company react quickly to these twists and turns.

Preparing this editorial, I took a long pause to consider the famous Kipling poem, "If." I paraphrase:

Leaders keep their heads when others around are losing theirs.

Trust yourself when others doubt you.

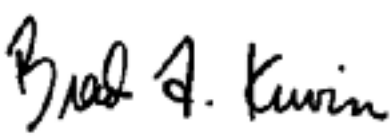
Treat triumph and disaster just the same.

And, when you must watch the things you gave your life to become broken, pledge to rebuild them with worn-out tools.

We will emerge from this crisis—consumer confidence will again rise, the auto industry will stabilize, housing construction will increase and unemployment will drop.

And as with past recessions, our manufacturing companies will reach new levels of productivity growth. This much I know for sure.

Hopefully, we'll also all become better at managing risk and credit.



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NewsFronts

Facilities

Rochester Welcomes Waterjet-Cutting Showroom

Millennium Machinery, Rochester, NY, a machine-tool distributor and supplier of service, training, parts and consumables, has opened a Mitsubishi waterjet-cutting showroom on behalf of its vendor, MC Machinery Systems, Inc., Wood Dale, IL.

The 7500-sq.-ft. showroom houses a new Mitsubishi 3000 Suprema waterjet-cutting machine that will allow the firm to perform product demonstrations and training sessions.

Taiwanese Fastener Company Opens Michigan Facility

The privately owned Lih-Ta group, a fastener-manufacturing company headquartered in Taiwan, has opened Pierce Fastener Products (PFP) Inc., in Manchester, MI, a manufacturer of pierce nuts. Expected to employ 30 people by the second quarter of 2009, PFP has an annual capacity of 250 million nuts and is currently tooled to manufacture three body styles—R205, S281 and S311.

The ISO 9001:2001-certified company offers online poka yoke with two camera systems for checking hole and thread presence.

ITW Rocol Expands Fluids-Mfg. Plant

After a recent move to a new, larger 43,000-sq.-ft. manufacturing plant in DeWitt, IA, ITW Rocol can expand production of metal-working fluids. The firm, based in Glenview, IL, manufactures under the brand names Accu-Lube, Rustlick, SafeTap, Metal Mates and Cedar Lubricants.

Wilson Tool Positioned to Expand in Latin America

Buenos Aires, Argentina, is home to the newly launched Wilson Tool Argentina, S.R. L., an office created by Wilson Tool Intl., White Bear Lake, MN. The office will serve customers in Argentina, Brazil and Chile. Jorge Martinez has been appointed general manager of the new office and will oversee operations.

Milwaukee Wire Products Gets New Name, New China Plant

Charter Automotive is the new name taken by Milwaukee Wire Products, Milwaukee, WI, to reflect its commitment to global automotive customers. The firm, a division of Charter Manufacturing Co., Mequon, WI, manufactures engine dipsticks, transaxle retaining rings, valve keys and valve-spring retainers.

To further its global reach, in February 2007 Charter Manufacturing acquired Valve Train Components Limited, Lichfield, England; and recently opened a manufacturing, warehouse and distribution facility in Wuhu, China.

Hobart Expanding Welding-Consumables Plant

Hobart Brothers Co., Troy, OH, announced plans to expand its manufacturing operations into a new 65,000-sq.-ft. facility in Troy. The facility will allow the firm to increase production capacity for its line of welding consumables.

And, when the new plant comes online next spring, Hobart expects to hire an additional 40 employees.

Agreements

Lincoln Electric Expands via Acquisition in Western Europe

Lincoln Electric Holdings, Inc., Cleveland, OH, acquired Electro-Arco, S.A., a privately held manufacturer of welding consumables based near Lisbon, Portugal. The firm exports to markets throughout Europe, with sales near $40 million.

Pepperl+Fuchs Acquires Maker of Industrial-Grade Monitors

Pepperl+Fuchs, Twinsburg, OH, a manufacturer of safety interfaces and industrial-control equipment for hazardous locations (monitors, PCs, etc.) has acquired Christensen Display Products, Preston, WA.

Christensen designs and manufactures ruggedized, industrial-grade flat-panel monitors.

Awards

Powder-Coating Equipment Manufacturer a "Fastest-Growing Company"

Inc. magazine has issued its second annual ranking of the 5000 fastest-growing

U.S. private companies, and ranked number 2185 is Powder-X Coating Systems, Smyrna, TN.

Powder-X Coating Systems manufactures ovens, spray booths and automated systems, as well as its own brand of powder, chemicals and other consumables used for powder coating.

Emerson Recognizes 38 Marquee Suppliers—Metalformer Among Them

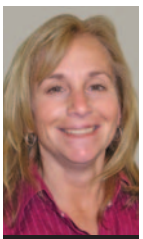
Emerson Electric Co., St. Louis, MO, has recognized 38 of its global suppliers by presenting them with Marquee Supplier awards. Among the winners: Brittany Stamping LLC, Cleveland, OH, a precision manufacturer of metal-stamped and wire-formed products. Brittany operates three subsidiary companies—Bettcher Manufacturing LLC, Duffy Tool & Stamping Ltd., and Meyer Stamping & Manufacturing.

Emerson's Marquee Supplier award recognizes superior quality and service, alignment with its strategic initiatives, ability to meet the needs of its multiple businesses from multiple locations around the world, willingness to integrate with its new-product development process, activity in support of lean supply-chain initiatives and senior-management involvement.

People

Roll-Kraft, Mentor, OH, has expanded its staff by adding two experienced machinists to its toolroom—**Norman VanHorn** and **Bruce Wolfe**. The firm manufactures tooling and equipment for manufacturing roll-formed products and tube and pipe.

MetoKote Corp., Lima, OH, a provider of protective-coating application services, hired **Michael Cooper** as director, Asia Pacific OE manufacturers. The firm operates electrocoating, powder-coating and liquid-paint facilities.


Gianatti


Griffing

TAK Enterprises, Bristol, CT, promoted **Patricia Gianatti** to vice president/executive manager, and **Sherwood Griffing** to vice president/business development. The firm supplies precision wire- and strip-processing equipment.

Formtek Metal Forming, Inc., Cleveland, OH, announced several personnel changes. **Jack Pennuto Jr.** has been promoted to sales manager for Formtek Metal Forming, responsible for selling strategies for the Yoder, Dahlstrom and Tishken forming and fabricating lines, B&K metal construction products and Winpro fenestration products. **Juan French** was appointed regional sales manager for the Formtek Group throughout Mexico. And, **Steve Friedman** was appointed regional sales manager for the Formtek Group throughout Canada.

TechUpdate

Right Abrasive Optimizes Belt Sanding of Weldments

Mike Walker, fabrication-shop supervisor for North Carolina-based Bartimaeus by Design, was willing to try a ceramic abrasive used on belt sanders. The salesman told him that it was a higher grade than the 40-grit zirconia belts Walker was using; and it would last longer. If the claims were true, the manufacturer of aluminum table and chair legs would save a lot of money.

Fortunately, Walker only bought one belt: The ceramic abrasive put a smooth finish on only 10 parts before it broke and had to be replaced. That's a far cry from the 35 to 40 parts his crew can finish with one zirconia belt from Klingspor, Hickory, NC, an abrasives manufacturer that Walker has favored for nearly 11 years.

Bartimaeus by Design demands that the abrasives it uses meet high standards: a consistent high-quality polished finish on all products, including stainless steel; and durability that allows uninterrupted production.

"Everything we do has to look good because very few parts that we make are hidden," explains Walker. "It's all out in the open. Since we do a lot of polishing of stainless steel and aluminum, we go through a lot of different sanding grits in order to get it ready to polish before we send it out the door. It's all about looks."

In addition, poor-quality abrasives that require constant changeouts slow productivity, dampen morale and take a significant bite out of profit. So the company is more than willing to pay a little more for abrasives that reduce downtime.

"It costs a little more but in the long run we save money," says Walker. "Klingspor products, such as quick-change flap discs, are designed to make rotations and changeouts speedy."

Walker supervises nine other employees who use a variety of abrasives, such as discs, wheels and nonwoven belts.

"We brush a lot of stainless steel—tubing or flat-stock sheets," Walker says. "People don't like to see welds, so we have to go in and make it look like it's grown together naturally. There's a lot of cutting off of welds and grinding. All of it is done by hand."

But despite the tough demands, Walker says his abrasives are always consistent and predictable.

"I know how many parts I can get out of each belt," Walker says. "The consistency is so good I can't tell where somebody has changed the belt in the middle of the run."

Each grit is rated during the manufacturing process, and tolerances are necessarily kept tight. For example, if the grade of 100-grit sandpaper varies slightly from one lot to the next, the user of that product may see significant differences when trying to polish a surface. Grit grades must be exact and predictable so that firms such as Bartimaeus can trust that

their products will meet quality standards.

Sizing is another important quality-control issue. Consider a 5-in.-dia. disc. If the abrasive is even ⅛ in. smaller or larger, supervisors like Walker will notice problems in production. If the disc is too small, the rubber backing from the disc sander may be exposed and leave streaks on the surface of the product. If the disc is too large, the abrasive may gather around the edges of the sander and gouge surfaces.

Clogging of abrasives can be a problem with some alloys such as brass, bronze and soft aluminum. Clogging may be due to static buildup during the sanding process. The Klingspor solution relies on antistatic strategies, including an "open coat" process: By maintaining space between grit clusters, resins from metal shavings and dust naturally fall away rather than adhere to the abrasive. This allows a shop's dust-collection system to easily remove particles from the environment. Also, a stearate, which acts like a dry lubricant, is applied to all abrasives to discourage clogging.

Klingspor: 800/645-5555; www.klingspor.com

Eddy-Current Clutch/ Brake Safety Controller

Cieco Inc., Clinton, PA, has released a press safety clutch/brake controller to interface with an eddy-current clutch/brake system. The Automator II eddy-current clutch/brake press-control module reportedly is the only dedicated system available to provide safety-compliant operation for presses using eddy-current clutch/brake controllers.

Most presses using eddy-current clutch/brake controllers have been operating outside of OSHA and ANSI safety regulations for power presses, according to Cieco officials. With the Automator II interface, users can comply with the latest safety standards and still maintain the speed regulation and features of their eddy-current controller.

Cieco Inc.: 412/262-5581; www.cieco-controls.com

Tips for Processing High-Strength-Steel Coils

For precision stampers that want to produce superior parts utilizing high-strength low-alloy (HSLA) steel from slit coil, the following tips will make the job easier, and more profitable.

The starting coil of HSLA steel is critical in producing quality parts. Therefore, stampers should include with their purchase orders the following specifications:

- Thickness tolerance
- Width tolerance
- Camber
- Edge condition
- Finish ID and OD
- Material shape.

Thickness tolerance—HSLA steel is used, in most cases, to minimize material thickness while maintaining part strength. Thickness consistency throughout a coil will improve the consistency of part quality and reduce the amount of time and cost required for adjusting tooling. It may be worth the extra cost to purchase half-standard thickness tolerance, if offered by the mill, as increased part yield may offset the cost penalty paid for the tighter tolerance.

Width tolerance will depend on the starting width and gauge of the coil, and should be discussed with the coil supplier as the part is being engineered to avoid tooling problems and minimize scrap loss.

Camber—HSLA steel can be difficult to slit, and the slitting process can create camber. Camber—the greatest deviation of side edge from a straight line over a specified measurement of strip—can make feeding the coil into the die very difficult, if not impossible. Slitter-induced camber often is caused by unequal clearance of the strip sides. Unbalanced clearance results in a different shear/fracture ratio on each side of the strip. The fracture tends to be stress-free, while the shear section tends to induce stress in the strip edge. Therefore, the edge with more shear will force curvature into the strip toward the edge with less shear. A setup that uses a combination of dull and sharp knives also can cause an uneven shear/fracture ratio, even if the clearance is balanced. Maintaining a set of sharp knives will help prevent camber from being induced into a coil. Also note that all slitting equipment is not designed the same—some pull-through slitting lines can induce camber into a coil of HSLA steel if the strands are not pulled evenly.

Edge condition of the starting strip is critical. If the strip has excess burrs caused by slitting, the burrs will build on the edge of the strip and cause it to take on a convex or concave shape. This shape can transfer to the part during stamping, causing rejections or rework. Edge cracking also can result, if there is a heavy burr created from slitting and the

requirements wind up changing more coils, which increases downtime and the time it takes to either end-weld coils or refeed coils into the press. This lost production time adds up to costly hours of downtime. Minimize these costs by working with your steel processor to consistently maximize coil size.

coil is tension-leveled to correct shape. If an edge crack does occur, the stamper would have to increase the scrap trim in the die to ensure removal of the cracking, causing additional scrap. Again, discuss edge condition required for the part with the coil processor before ordering, and specify it on your purchase order.

Finish ID and OD—The advantages of reducing the gauge of the steel may be minimized if attention is not paid to ID and OD specifications. Stampers that fail to order coils to meet maximum OD

Material shape—Some coil slitters use tension-leveling, after the stock is slit, to correct the shape created during slitting. If not performed correctly, this process can workharden the steel. While the steel properties may still fall within specification, the material may lack consistency, as some portions of the coil will have workhardened more than others and may form differently in the die.

Almetals, Wixom, MI, 248/348-7722; and Atlanta, GA, 770/745-7004; www.almetals.com

Ken-Mac Metals Orders New Multiblanking Line

Ken-Mac Metals, a division of ThyssenKrupp Materials NA, Inc., has ordered a precision multiblanking line from Red Bud Industries, Red Bud, IL. The new line will process stainless steel, aluminum and prepainted materials at the Ken-Mac service center in Kansas City, MO. It will include the Red Bud precision grip-feed system and a CNC programmable slitter, and will produce blanks with width and length tolerances of ±0.005 in. An automatic strip-divider positioning system will automatically set up the dividers in the strip stacker as the operator sets up the slitting head.

Ken-Mac will employ the line to process coils weighing as much as 50,000 lb. at widths to 72 in. and in sheet thickness to 0.135 in.

Red Bud Industries: 800/851-4612; www.redbudindustries.com

Lube-System Overhaul Dispenses Cost Savings on Every Front

A dramatic shift in stock-lubrication strategy for deep drawing and stamping at an MTD facility yielded improvements in press uptime and operator efficiency, and slashed lube consumption as well.

BY BRAD F. KUVIN, EDITOR

Deep-drawn mower side panels formed through a four-press cycle using multiple tools, ready to be washed and painted.

The huge 260,000-sq.-ft. MTD plant in Martin, TN, deep draws and stamps as much as 1 million lb. of steel per week to supply more than 250 different parts to its assembly lines, and to the lines of some of its nearby sister plants. Its bread-and-butter jobs—deep drawing mower decks and fenders—have become more critical with recent product redesigns, including a new, synchronized-blade system that requires tighter tolerances on the deep-drawn deck. The plant employs a 1600-ton transfer press to draw and trim decks at line speeds to 12 strokes/min., which can generate a lot of heat. Any lubrication failings can quickly lead to galling and other premature die-wear issues caused by overheating.

At the same time, in another area of the plant, more than a dozen progressive-die presses stamp a variety of smaller mower components—muffler guards, frame components and the like. Here, MTD operators change over press lines as often as seven times per shift. Each job has its own, unique lubricant requirements to avoid over-application and waste, while still ensuring consistent coverage to optimize part quality and die life.

New Programmable Roller-Coater Units

To address its lubrication concerns in both areas of the plant, early in 2006 MTD maintenance manager Trent Rutkowski began to replace the spray-lubrication equipment on the plant's presses with roller-type equipment. It started with a test unit from Unist, Grand Rapids, MI, a uni-Roller Type S equipped with Unist's SPR-2000 programmable controller, so that MTD could estimate the reduction in lubricant consumption due to eliminating overspray and therefore justify the investment needed to install the units on several of its presses. MTD then brought Unist personnel into the plant to train all of its press operators on the equipment, to ensure operator approval. Within two years, the plant had installed the uni-Roller and SPR-2000 on eight coil-fed presses. It also installed Unist powered uni-Rollers and SPR-2000s on a pair of blank-fed press lines.

"Upgrading our lubrication technology has been the most successful project we've implemented in recent years," says Trent Rutkowski. "With our previous oilers, we constantly fought maintenance battles with the pumps, filters, etc. We tried to implement TPM at

A roller unit sits ready to apply an even, think film of drawing compound top and bottom at the entry end of a press.

the cell level, but the work wasn't getting done. So we bypassed operator involvement to let them focus on other more important tasks around their press cells and decided to automate the lubrication process. I'd estimate that we've reduced press downtime due to lubrication issues throughout the plant by at least 20 percent."

Among the Unist installations, Trent says that the most noteworthy improvements came on the progressive-die presses, where he has installed the uni-Roller units on eight of 15 coil-fed presses. On these lines, where press size varies from 150 to 800 tons, the coil line feeds the stock through the uni-Roller, which applies lubricant to the top and bottom of the material. To set up a press for a new job, the operator only has to select a predetermined program on the SPR-2000 controller based on coil width.

"We used to run the same lube settings for every job, regardless of coil width," adds Trent. "This led to a lot of overspray and waste, and the subsequent cleanup time and associated costs. Also, running three shifts, without the programmable control, we might have operators on each shift run different lubricant settings for the same part. Now we get consistent, even coverage, top and bottom, with no need to spray lubricant in the die, with improved part quality to show for it. Our tools stay cool, which has saved us a significant amount of tool and die repair time." The plant last installed a uni-Roller and SPR-2000 setup in August 2008, on a 500-ton Verson, and Trent expects to continue to change over its presses well into 2009.

Deep drawing these mower decks at line speeds to 12 strokes/min. can generate a lot of heat. Any lubrication failings can quickly lead to galling and other premature die-wear issues caused by overheating.

Long-Lasting Application for Tandem Line

In addition to its coil-fed progressive-die stamping lines, the MTD team also installed new lubricant setups on a blank-fed five-press tandem line that stamps muffler guards and other parts with relatively smaller draws. Here the lubricant might have to last through as many as eight die stations, so Unist supplied its powered roller equipment and high-output rollers. The powered uni-Roller dispenses lubricant from a tube inside of the roller. The tube has holes spaced along its length and as the fluid controller injects lubricant into the tube, the lubricant is dispersed evenly across the inside of the roller. The setup features an array of 12-in. rollers staggered and overlapping to allow programming of custom application patterns onto the blanks.

"Before, applying enough lubricant to adequately coat the blanks on this tandem line required in-die spraying in addition to roll coating at the entry side of the first press," says Trent. "We could only position nozzles to spray

2009 Schedule

Seminars

Die Maintenance & Troubleshooting
2/12/09, Atlanta, GA

NEW Welding 101
2/19/09, Cleveland, OH

OSHA Compliance
2/25/09, Knoxville, TN

Sensors & Control Systems
3/5/09, Grand Rapids, MI

Punch & Die Technology
3/17/09, Brownsville, TX

Emerging Innovation in Press Technology
3/19/09, Nashville, TN

Higher-Strength Sheet Steel—Solving the Problems
4/15/09, Chicago, IL

Estimating Metal Stamping Dies
4/16/09, Milwaukee, WI

NEW Press Room Optimization
5/5/09, Cleveland, OH

Troubleshooting Formability Problems
5/7/09, Indianapolis, IN

Press Room Safety
5/27/09, Cleveland, OH

Operating Coil Fed Presses
6/9/09, Milwaukee, WI

Welding & Assembly
June 2009, TBD

Transfer Automation
7/14/09, Chicago, IL

Costing & Pricing
7/16/09, Cincinnati, OH

NEW Green Seminar
July 2009, Cleveland, OH

NEW Zero Defect Stamping
August 2009, Cleveland, OH

Designing & Building Metal Stamping Dies
8/19-8/20/09, Detroit, MI

Designing & Building for Higher Strength Steel Stamping
9/22/09, Chicago, IL

Die Maintenance
10/6/09, Cleveland, OH

Short-Run Metalforming
10/22/09, Minneapolis, MN

Forming Difficult Stampings
10/28-10/29/09, Detroit, MI

Roundtables

NEW Zero Defect Stamping Roundtable
2/5/09, Cleveland, OH

Tool & Die Roundtable
3/3-3/4/09, Nashville, TN

HR Roundtable
3/10/09, Cleveland, OH

Marketing & Sales Roundtable
5/13-5/14/09, Cleveland, OH

CFO Roundtable
8/11-8/12/09, Cleveland, OH

IT Roundtable
9/10/09, Cleveland, OH

Quality Roundtable
9/23-9/24/09, Cleveland, OH

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the top of the stock, not the bottom, and we also had overspray issues. Now we coat top and bottom once with no need to spray in the die."

Central Mix and Supply Stations

All of the MTD stamping presses run the same lubricant—a synthetic mixed with water in two different compositions—one mix handles the jobs at the tandem line and the 1600-ton transfer press that deep-draws mower decks; and one mix for the progressive-die press lines.

"We have two central mixing and supply stations to deliver premixed lubricant to all of our presses," adds Trent. "We're consuming about 350 gal. of the synthetic lube every two weeks."

Before installing the Unist equipment, press operators would have to fill reservoirs at each press, fed by the central supply stations. Now the supply stations feed directly to the presses, "yet one less procedure our operators must worry about," Trent says, which also helps ensure that the dies consistently receive well-lubricated parts and, therefore, won't prematurely wear.

Savings Keep Adding Up

Along with his conservative estimate of a 20 percent reduction in downtime due to lubrication-system issues, Trent also estimates (conservatively) that the plant's purchase of raw lubricant has been reduced by 11 percent since it began to install the Unist equipment some 30 months ago. This reduction is made more important since the price of its lubricant has continued to rise over the last few years.

"Overall, very little attention now is required of our operators to the lubrication process and equipment," he says. "Typically the operators would be involved with cleanup, refill and recycling activities—that's all been eliminated. We get an even coat of lubricant on the top and bottom of the material, and have eliminated the time-consuming mop-up and cleanup of the overspray from our previous lubrication systems." **MF**

Worried about Lube Delivery?

Just Roll With It

Roll coaters can apply wet or dry lubricant, in the right amount, to flat stock of any thickness and width, without overspray or other negatives typically associated with lubrication.

BY LOUIS A. KREN, SENIOR EDITOR

If the substrate is flat, roll coating is an ideal means to apply lubrication prior to stamping. That's the word from Walter Weiland, vice president of sales for Black Bros. Co., Mendota, IL, in business for more than 125 years providing roll-coating equipment for metalforming and other industries.

"We think the advantages of roll coating over other methods for lubricant delivery," he says, "relate to the precision and efficiency of the coating delivery system as opposed to spraying, curtain coating, misting, mopping or any of the other methods typically used to apply lube."

Roll coaters apply a broad range of lubricants, oils and drawing compounds to metallic stock prior to stamping or forming parts.

"Increased attention is being paid to the amount of emissions released into the factory environment," Weiland continues, "and here roll coating offers benefits. Roll coaters apply only to the substrate, negating overspray issues. Also, as lubricant and coating costs continue to increase, it becomes more important to precisely control lube delivery, and roll-coating machines do that."

Adjust to Material Thickness

Roll coaters have numbered settings that adjust to the thickness of the material being coated. That allows the use of

these machines on a variety of substrates, from thin flexible sheeting to rigid heavy material.

"For example, the feed-gap openings on the roll coaters we manufacture adjust from nearly 0 in. thick to 12 in. thick," Weiland says, also noting that roll coaters can handle nearly any coil or sheet width. "Stampers often tell us that their parts usually measure, say, 12 by 18 in., but they may have a job that calls for part widths to 68 in. wide. A roll coater does not care if the piece going through is 18 in. wide and the next is 40 in."

Black Bros., he notes, has built roll coaters for material widths from 14 in. to 14.5 ft.

Other settings control the amount of lubricant applied to the material surface, with Weiland noting that machines provided by his company have been required to apply coatings in thicknesses from 5 to nearly 80 wet mils.

Ideal for Deep Drawing

Roll coaters can be used to apply wet and dry lubricants, making roll coating a viable option in deep drawing, which often utilizes dry lube and where uniform coating to prevent scratching during the draw is a must.

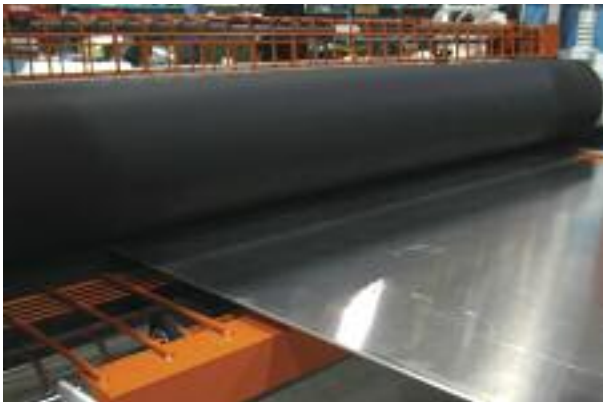
"We have installations in numerous deep-draw-forming facilities, everything from popsicle molds to kitchen sinks," Weiland says. "Uniformity, efficiency and speed are important to deep drawers, and roll coating addresses each of these issues."

The ability of roll coaters to consistently apply a set amount of lube removes guesswork, especially given that thickness measurements leave something to be desired. Even something like a weighstrip layout—placing a coupon on the processing line and measuring coating thickness—doesn't provide a continuous reading of the thickness across the entire coil.

Where stampers paint or mop to apply the coating, such application generally can't be controlled with much precision. That invites trouble in dry-lube applications, as excess lubricant can cause blanks to stick together or parts to stick to tooling, and compromise lubricant consistency during deep drawing. Other adverse results include reduced washability and accumulation of lube on tooling.

Function Inline or Off to the Side

A roll-coating machine can reside in the press line or off to the side. When applying a wet lubricant, the stamper typically would place the roll coater immediately in front of the press with coil or sheet feeding through the roll coater and onward through the forming operation. In dry-lubricant applications, the roll coater typically locates offline, perhaps in a nearby corner where personnel run sheet or coil through and stack it nearby. Then the coil or pallet of prelubed sheets is picked up and transported to the press for stamping.



Roll coaters work on a variety of substrates, including stainless steel, and can adjust for material and coating thickness.

Roll-coating machines most likely incorporate their own lube reservoirs, with several methods available for lube to be supplied to the machines. Some roll coaters incorporate a 10,000-gal. tank, 55-gal. drum or 250-gal. tote, depending on lube needs. And the machines can automatically request more lube from lube-storage tanks via sensors and controllers on the roll coaters or incorporated into press controls. That means no downtime for lube replacement.

Lube can be reclaimed as well, as some stampers create a fountain where lube pumps into a reservoir on top of the coater, and as the lube is used, excess is captured and pumped back into the reservoir.

Works Best with Proper Lubricant

Of course, a lubricant-application system functions best given the proper lube for a part run and for the method of application. With this in mind, a good application-equipment supplier should work with stampers to match the lube, job and application system.

"Our typical stamping customer will provide a part size, its lube supplier and a desired outcome," says Weiland. "If we have experience with that particular lubrication vendor, we can be confident that our equipment can apply that lube properly. For a new lubricant or for a formulation on which we don't have data, we process sample parts at our facility. Then we can go back to the customer and say, 'Based on your materials, your lube and our roll coater, these are the results you can expect.'"

More than Just Lube Application

Besides lube application, roll coaters can perform other functions in the pressroom, as metalformers also find use for roll coating after forming, according to Weiland.

"Again, roll coating responds best to flat surfaces," he says. "So preformed or nonflat surfaces usually aren't good candidates for applying lubricant via roll coating. But you can use roll coaters on formed parts if your intent is to apply a controlled amount of material to a raised surface.

"A good example is a stamped number that goes on a telephone pole," Weiland continues. "You can stamp it, paint it and then run it through a roll coater to coat the embossed areas, or the numbers. This often is performed in signage manufacture." **MF**

Interested in a Servo Transfer?

Then check out these pros and cons of two common types: through-the-window and front-and-back-mounted.

BY DOUG KNAPKE

One way metalformers can meet today's challenges is through process flexibility. And one type of pressroom automation offering such flexibility is the servo transfer system.

Servo transfers can be blank- or coil-fed. They often can be retrofit to an existing press while keeping within the existing press footprint, and progressive dies can still be run if required. Changeover simplicity enables smaller-lot production, and product design changes are handled via fully programmable operating parameters.

What Type is Best?

Okay, servo transfer is the answer you're looking for. So what type is best?

The decision typically boils down to two types of servo transfer systems: through-the-window and front-and-back-mounted.

With through-the-window servo transfer systems, the transfer assemblies mount on both ends of the press and the transfer-finger bars run through the press upright openings or window. This is a more traditional type of transfer-mounting scheme. Front-and-back-mounted transfer systems, on the other hand, mount on the front and back of the press, without bars running through the press window. What difference does that make? A lot, in terms of bar and tooling support needed for longer press beds and room required within the press window.

May Need Beefed-Up Transfer-Bar Support

First the transfer-bar-support issue. On through-the-window transfers, support is located only on the ends of the removable center bar. When spanning long distances, say 180, 240, 288 or even 300 in. with the transfer-finger bar, the bar profile must be increased to provide the required support and rigidity. Often times, instead of a typical extruded-aluminum finger bar, on longer spans steel may be used to beef up the bar to prevent sag, bar deflection and vibration. Increasing the bar profile means significantly increasing weight, so transfer-system drivetrain components must be upsized—larger motors and drives. This can be done, but cost becomes an issue—larger motors and drives as well as larger drivetrain components obviously are more expensive.

Front-and-back-mounted transfers support transfer-finger bars directly in the center of the bar, bringing more support along the entire length of the bar, allowing the bars to be smaller and lighter.

Account for Room in the Press Bed

Attention also must be paid to the amount of room needed within the press window to produce parts. Again, as through-the-window transfers require finger bars to run through the upright openings of the press, users are limited regarding the maximum width of coil or blanks running through the press since the transfer bars will take up some of the available room. The length of the press bed determines the size or girth of the finger bars used in through-the-window transfers. Suppose a press has a 50-in.-wide window opening with a bed length of 120 in. A common finger-bar size for this bed length would be 4 by 4 in., of extruded aluminum. So with the front and rear finger bars both measuring 4 by 4 in., you now have only 42 in. of available space in your 50-in. window. Bar clearance between the press columns, say 0.5 in. per side, takes away another inch from the window opening.

And we're just getting started. Specifiers of transfer systems also must account for the amount of travel required in the y, or clamp, axis. For example, say the bars are required to move 5 in. per side in that axis. That takes away another 10 in. of window opening. Now consider the length of the finger tooling. Let's assume for this example that the fingers would measure 5 in. With finger tools on both bars, another 10 in. of window opening disappears. The total? With a 50-in.-wide window opening, a through-the-window transfer could limit you to a maximum 21-in.-wide coil or blank in that press.

On a front-and-back transfer system, the bars do not travel within the upright openings of the press. With

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these transfer styles, the only limiting factor is the front-to-back press-upright opening itself. That is one of the big benefits of this style of transfer over a through-the-window unit.

Where's the Feed?

If the system is coil-fed, feed positioning also should be considered when deciding between a through-the-window transfer and its front-and-back-mounted counterpart. A through-the-window transfer has a permanent finger bar attached to each of the transfer assemblies mounted on each end of the press. Those bars travel outside of the press area, requiring the user to position feed equipment away from the press to provide bar clearance. Front-and-back-mounted transfers don't have this arrangement, enabling feed equipment to be positioned right at the press.

Besides occupying valuable floorspace, with a coil line positioned away from the press, actions such as tailing out the end of the coil can create more scrap. And suppose a stamper wants to retrofit an existing press and feed line with a servo transfer system. The feeder may already be mounted at the press, complete with a looping pit and other equipment. Installing a through-the-window transfer would require foundation work to accommodate a new pit location, let alone the work of relocating the entire feed arrangement. Doing so adds significant time and cost to the project.

Independent Bar Control a Plus

Front-and-back-mounted transfers have an additional advantage. These arrangements are comprised of essentially two transfer assemblies, operating independently of each other and not mechanically tied together, as is the case with through-the-window models. So they can be programmed for different move parameters in the x, y and z axes, making front-and-back-mounted transfers conducive to outside-the-box thinking in terms of die arrangements. This setup eases two-lane production, where two lanes of dies run within the press to simultaneously produce left- and right-hand parts, or double the production of the same part. Two-lane production is possible with a through-the-window transfer, but independent programming of each bar's movement makes it easier on front-and-back-mounted units.

Front-and-back-mounted servo transfer systems feature transfer assemblies placed in the front and back of the press, allowing the press upright window openings to be completely unobstructed, therefore, not limiting the material width of the coil or blank fed in through the window.

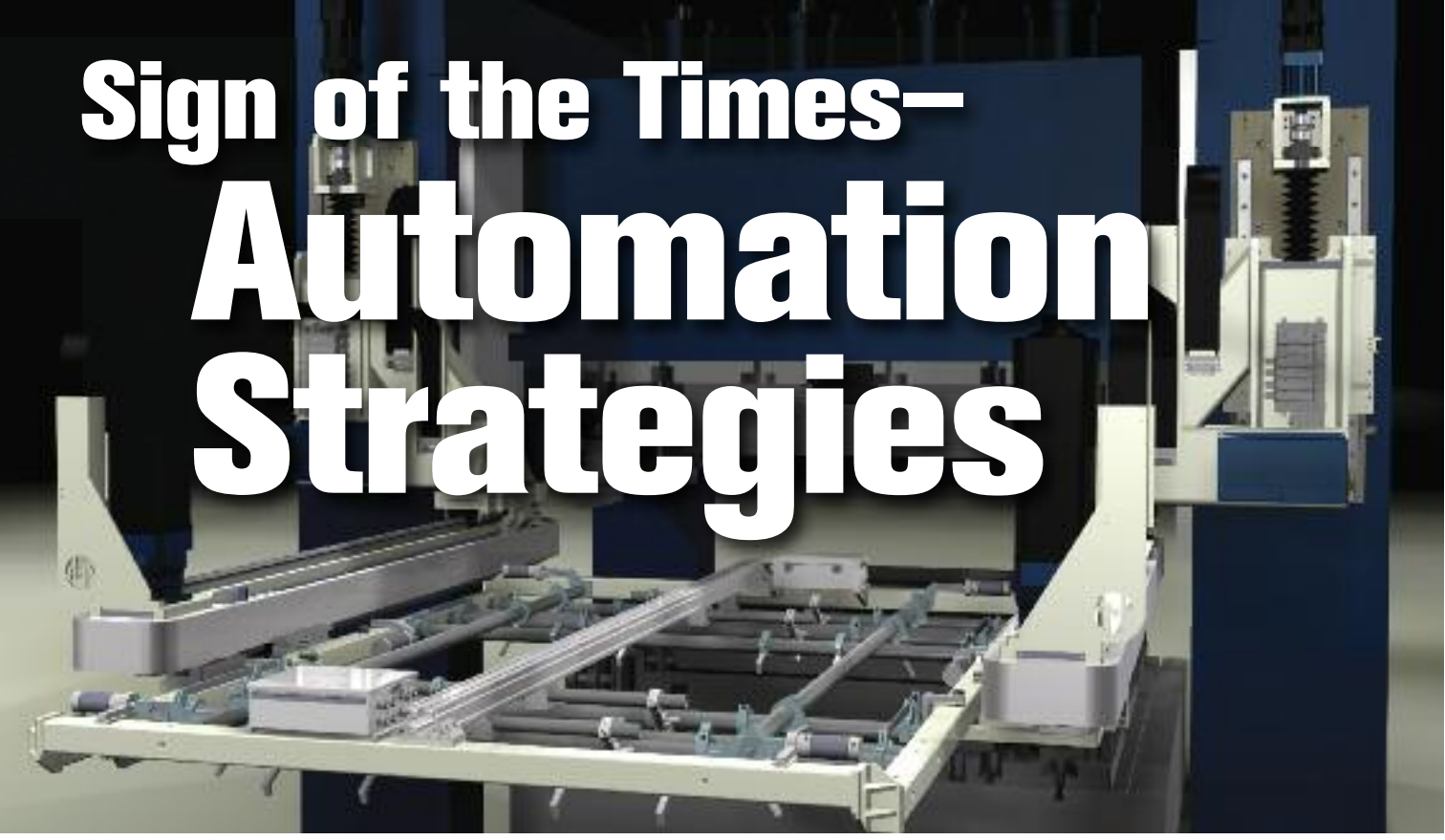
Another way of increasing press capacity is by configuring the die in a U-turn arrangement. In this scenario, the part is transferred through a series of dies in one direction, then shifted 90 deg. to a series of dies in which the part transfers in the opposite direction. The benefits of this arrangement are many. The press-bed-length capacity is doubled, the need for a secondary press operation can be eliminated and the possibility of utilizing an existing smaller bed press now is attainable. This type of die arrangement is typically better suited for a front-and-back transfer versus a through-the-window transfer because the part must be pitched in opposite directions simultaneously, requiring independent movement of each pitch-axis transfer assembly.

On larger presses, front-and-back-mounted transfers allow for multiple transfer assemblies, enabling different pitch, or x-axis, distances between die sections. That allows for closer die spacing, thus shortening the left-to-right bed-size requirement for a particular die. For example, in press beds more than 180 in. long where multiple transfer assemblies can be applied—say two on the front of the press and two on the rear—the modules can be programmed for different move parameters in their x axis between die sections. Given a 10-station die, the first five die stations can have a centerline pitch requirement of 30 in., but the pitch distances centerline to centerline of the last five stations can be shortened to, say, 25 in. This can allow for a shorter die design, thus requiring a shorter left-to-right press-bed dimension—or on an existing press, sufficient room to place one more die in the process if needed. This ability for closer die spacing enables a die previously considered too long for a press to fit into that bed.

Consider Press-Bed Access for Die Work

For all the benefits of front-and-back-mounted transfers, stampers should be aware of potential drawbacks. Presses with doors that enclose the press window during production require modification to accept these transfers; not the case with through-the-window units.

Die change also becomes more challenging with front-and-back-mounted transfers. The transfer assemblies occupy the areas most frequently accessed by towmotors to place or remove dies. Options are available to metalformers to raise the assemblies toward the crown or off to the side to open up press access. Through-the-window transfers provide clear and unobstructed access at the press front and rear openings. **MF**



Sign of the Times—Automation Strategies Change with the Economy

BY PATRICK CULLEN

It's no secret that difficult economic times have impacted the business plans and spending patterns of metalformers throughout North America, as well as the rest of the world. Many businesses must conserve cash and protect their solvency.

For the past several years, many contract stampers keenly focused on protecting all possible flexibility in their pressroom-automation purchasing patterns. For example, a typical press and transfer RFQ would entail a 1500- to 3000-ton press, left-to-right bed size in the 240 to 288-in. range, dual rolling bolsters, and a fully programmable press-mounted transfer system prepped with quick-die-change (QDC) automation, and tooling provisions to optimize flexibility.

As often as not, this same RFQ also would include a blank destacker configured to be continuous-run and to handle an array of blank sizes and shapes, different blank-material compositions, and perhaps even packaging within the same footprint as the coil-feed equipment.

Considering the logistics, commissioning, press-pit work and other incidental costs, this once-typical project can become a mammoth undertaking requiring a sizeable budget. Given the current financial issues among U.S. automakers and their tier suppliers, and the overall global economy, it's no surprise that business expansions, new facilities and large capital initiatives have all but dried up for the time being.

The good news? We still see RFQ activity at the two extreme ends of the press-automation spectrum. Unique "one-off" nontraditional applications still are out there, as are basic full-mechanical in-die transfer jobs.

Nontraditional Applications

The automation projects we see in the one-off realm involve hydroforming, hot stamping and general press-tending applications. These projects often feature specialized parts and tooling requirements, and the use of 3D design tools typically prove critical to their success, as this allows for a complete understanding and concurrent design by the entire team tasked with completing the project, including designers, controls and development engineers, software experts, and marketing and sales personnel. Design iterations can be pushed out to a secure website for collective review by the press-automation OEM, tooling providers, press manufacturers and end users. This collaboration occurs real time, and often in several geographic locations. Design reviews can be conducted more often, promoting better communication due to the elimination of travel time and expense. In recent years, this process has eliminated many surprises during equipment installations.

Advanced process simulations also allow the team to breathe life into

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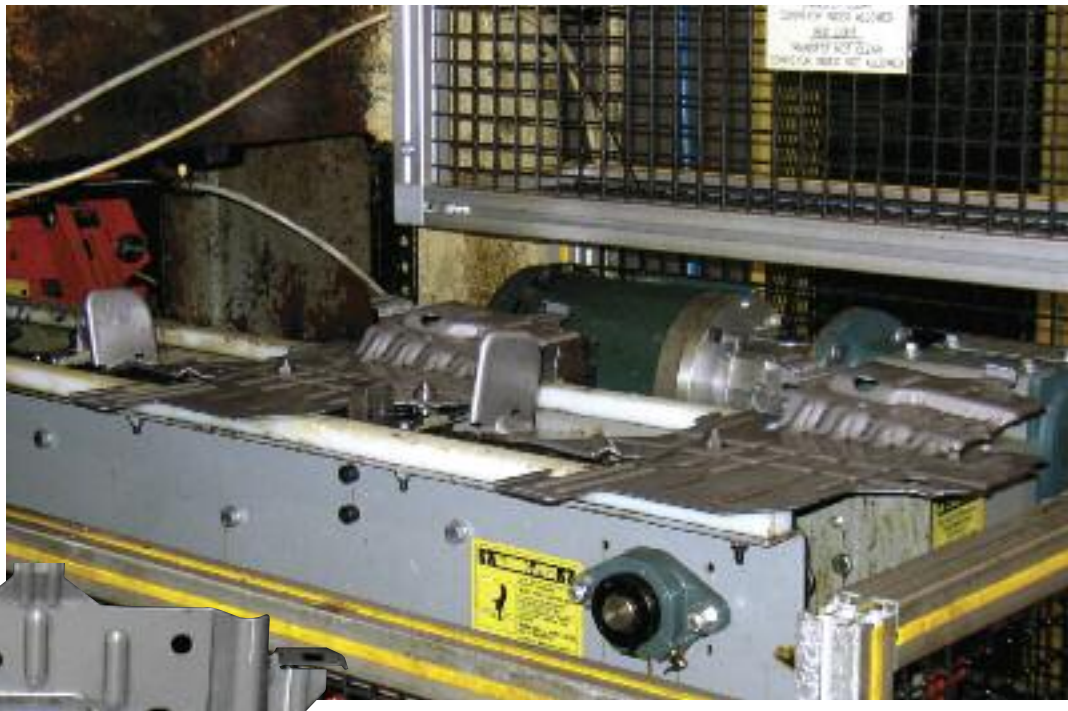
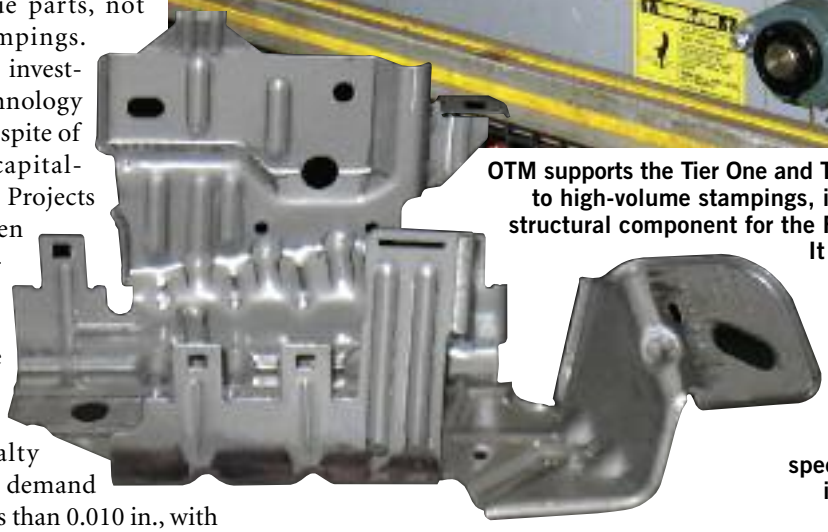
designs and quickly achieve complete clarity with all stakeholders. How do you introduce a part? What about the sequence for die changes? Guarding and press-attachment surfaces? Does the customer understand exactly how this solution works? If a picture is worth a thousand words, then an animation can save a full day of talking.

These nontraditional applications still are viable because they make unique parts, not commodity stampings. They still warrant investment in new technology and equipment in spite of the dried up capital-spending market. Projects in this arena often require heavy payloads and long—to 20-ft.—centerline-to-centerline reaches, with demanding accelerations. Specialty tooling tasks can demand repeatability of less than 0.010 in., with payloads exceeding 350 lb. Compound motions often are used to attain these travels with adequate structural support. Accelerations to satisfy cycle times can exceed 1.5 G. The solid design environment allows for complete finite-element analysis and motion kinematics to be performed inhouse and several times throughout the design cycle, as needed to verify group decisions and ensure that the application stays on the correct path.





OTM supports the Tier One and Tier Two markets with medium- to high-volume stampings, including stamping of this key structural component for the Ford F-250 and F-550 trucks. It sought to find an inexpensive method to apply transfer automation, and worked with its transfer supplier to install on an existing mechanical press a hand-loaded blank feeder and a mechanical transfer system, with part-specific engineered finger tooling integrated into the die design.

Application Specifics

Here is where collaboration between customer and supplier becomes critical. The customer knows the fine details of his challenges with part and process; the automation OEM understands very well what is required to create a machine that will cycle millions of times to handle a given task. But several critical questions might arise whose answers might not be immediately known, such as:

How does repeatability impact an automated hydroforming application?

How do you clear a press and tooling with automation to allow for QDC?

What precautions work well to protect cabling, sensors and lube lines in a high-heat application?

How do you position, reference and introduce a 1700 F part into dies accurately, and what end-of-arm tooling is needed to remove that part after its been struck?"

These comprise just the beginning of an entire series of meetings required to bridge the knowledge gap and successfully create a one-off machine that works properly—from the first cycle. HMS Products Co., Troy, MI, is seeing an uptick in plate-mounted all-mechanical equipment orders. At first this came as a bit of a surprise, but after taking a step back, the explanation makes perfect sense. There still are new parts that will require transfer because of material savings or process requirements—complex tooling or part rotation to do more work parallel to the bolster. The market seeks a low-cost and simple automation solution.

The Business Case

The business case for investing in a transfer-press line is difficult to make in this economic environment. There also is a disadvantage to running smaller parts in a larger-frame transfer press with high-end automation; thus the need for a plate-mounted in-die transfer or a press-mounted system on a smaller press. These fully mechanical solutions are simple and present lower risk than does moving to a low-cost country for production. Mechanical automation can accommodate the needs of a process for about 30 percent of the cost of a fully programmable electronic transfer system. A die-contained transfer may be quickly and inexpensively moved from press to press and plant to plant.

Typically, during conversations with customers relative to all-mechanical automation, the conventional thinking is that this solution can prove very restrictive. While such a setup may not offer the same level of flexibility as a fully programmable servo transfer system, some extra up-front consideration can allow processing of a nice array of parts in one mechanical-transfer stamping cell.

For Example: Oakland Tool and Manufacturing

Oakland Tool and Manufacturing (OTM), Fraser, MI, part of an umbrella group that also includes Madison Die and Engineering—a prototype and die-build company—and medium-volume stamper Gaylord Precision Tool, sits in the shadows of several now-closed automotive tier stampers. OTM remains viable because of several strategies, including paying attention to employing best practices in running production parts.

OTM supports the Tier One and Tier Two markets with medium- to high-volume stampings, including stamping of one key structural component for the Ford F-250 and F-550 trucks. OTM also performed prototyping and development work for the program.

Once prototyping activities were completed, OTM's customer was to market-test the part for production. In order to be competitive and secure the business, OTM evaluated material savings from nesting the blanks in an offline operation, hand loading the blanks into a blank feeder, and running the process with a mechanical transfer system. It already had a 300-ton mechanical press with an 84 by 48-in. bed and a 16-in. stroke. It sought an inexpensive method to apply transfer automation to the press and to present blanks to the automation. Working with HMS Products Co., OTM purchased a hand-loaded blank feeder and a Series 500 full-mechanical transfer system, with part-specific engineered finger tooling integrated into the die design.

Because of the limited press size, HMS faced a number of challenges in fitting the automation, dies and transfer finger tooling through the press uprights. Arial cam elements in the dies needed to be watched closely to avoid timing-curve interference in the 16 in. of press stroke.

Design collaborations between OTM and HMS overcame these challenges and resulted in a line that operates at 15 strokes/min., and which has produced 375,000 stampings/yr. for several years now.

Says Jim Tomlin, OTM engineering and tooling manager: "The transfer and loader unit have exceeded our expectations. Aside from lubrication and the most basic preventive maintenance, this system just runs. Other benefits include built-in error proofing of the finished parts, and less downtime than many of our progressive applications." **MF**

write no. 15

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A servo-controlled arc-welding robot and three-axis positioner form the heart of a new welding cell at D&S Manufacturing. Offline-programming software frees up the cell for production instead of programming and has improved accuracy.

Robotic-Welding Efficiency Improves with Offline Programming

New software lets this Wisconsin fabricator cut robot programming time and achieve a new level of welding accuracy.

D&S Manufacturing, a metal fabrication and manufacturing facility in Black River Falls, WI, is faced with the strains of a growing business. Since its founding in 1965, the company has supplied parts and assemblies for numerous OEM clients in the agricultural and construction industries. Known for producing large, heavy weldments in small quantities, D&S has 150 employees with more than 35 welders working two shifts.

Had to Automate Welding

Not content to maintain the status quo, company management knew it could not grow the business and increase productivity without finding solutions to two major challenges.

First, it had to increase productivity without hiring additional personnel, since finding skilled welders has become increasingly difficult. Second, while welding automation seemed to be the logical solution, the current programming method for the company's robotic-welding cell—using a joystick to manually lead the robot through its welding path and recording all of its stops and starts along the way—meant that the cell was being used more for programming than for production. It was clear that to expand production of large parts in such small quantities without more manpower, D&S needed a robotic-welding cell with offline programming.

Armed with a number of sample parts and CAD drawings, Joe Lane, manufacturing engineer and acquisition team leader for the welding-automation project at D&S, in 2006 contacted several robotic-welding companies. While all of the firms had comparable welding systems to perform actual welding, part programming was a challenge. Several offered offline software programs, but not all were capable of executing the same program on both the computer and the robot station.

RobotStudio software from Rimrock-Wolf Robotics (Fort Collins, CO) was the most accurate," says Lane, explaining the company's decision.

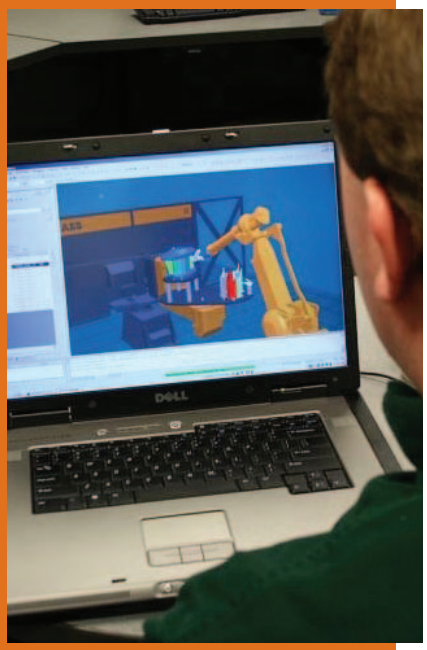
To get the system running as quickly as possible, D&S contracted Rimrock-Wolf Robotics to create a virtual test cell identical to the one it would build for D&S, and calibrate it to improve the accuracy of downloaded programs. Wolf Robotics engineers created the cell and programmed the initial parts for D&S.

"When we downloaded the program to the robot, it was off by less than 5 mm.," explains Lane.

Easier Programming Offline

Rimrock-Wolf Robotics officials attribute RobotStudio's accuracy to a virtual controller that runs the same software as that contained in the robot controller on the production floor. The offline-programming software also includes ArcWeld, a dedicated programming tool for generating arc-weld programs. Unlike traditional online robot programming performed directly on the robot, ArcWeld and RobotStudio utilize CAD geometry as the basis for all robotics programming. To create a weld, the user picks the start and end point of the weld and defines process parameters. ArcWeld automatically generates the weld path based on this input and creates approach and depart paths that will move the robot in and out of the weld location. Before downloading the final program to the real robot, the user can debug it by executing the entire program in RobotStudio. A built-in Collision Detector feature indicates any interference between the robot and the part, and provides a cycle-time estimate to help the user balance production.

Lane cites additional benefits of the offline programming software. For example, D&S can perform reach studies on new and existing weldments to verify that the robot can access all weld positions without exceeding its own capabilities, and that the parts are positioned for the best possible welding scenario to achieve proper penetration and weld strength. In addition, the tooling system's



A technician uses software to perform final debugging on a weld-path program prior to downloading it to a robotic arc-welding cell.

design-verification capability ensures that the robot has proper access to each weldment without interference from clamps and other components.

Delivered: A Robotic-Welding Workhorse

Along with the software, D&S Manufacturing purchased a complete robotic welding cell from Rimrock-Wolf Robotics, a LeanArc 500B, with components and capabilities key to the installation's success. For example, the cell features an ABB IRB 2400L robot with expanded reach capability; a servo-controlled, three-axis indexing IRBP 500B positioner that can rotate the weldment around its own axis and handle to 1100 lb.; a Wolf Cell Control that provides the operator with complete cell control from one location; and Advanced Weld Control seam tracking.

The robotic-welding cell at D&S operates two shifts per day, with one operator on each shift. The operator can load parts on one side of the cell while the robot welds on the other. Jobs that previous took 2 hr. to perform manually are now completed in 35 to 40 min.

"Our goal was to cut welding time in half and we have exceeded that projection," Lane says. He recently has completed first programming of a part with more than 50 paths and believes it has saved "more than a week of work" versus the old process of manually teaching the robot its paths.

Besides employing the offline programming software for more new projects, Lane is training a technician to use it and download to the machine as the need arises. The next step, Lane says, is to install a second system similar to the first and keep them both busy with offline part programming.

After its arrival, "we'll look at placing machine tools next to the robots for milling and drilling operations that will help improve production-floor processing," he explains. **MF**

Information for this article provided by Rimrock-Wolf Robotics, Fort Collins, CO. Tel. 970/225-7600; www.rimrockcorp.com.

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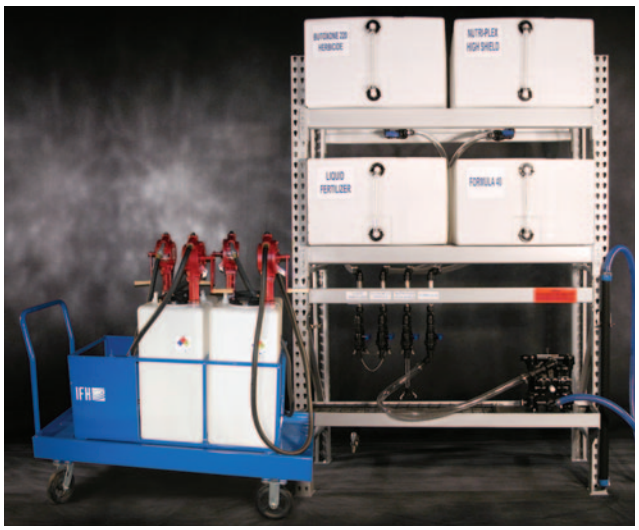
ToolingUpdate

Mobile Lubrication Carts

The Innovative Fluid Handling (IFH) Group, Rock Falls, IL, introduces custom storage and dispensing systems and mobile lubrication carts that use the firm's new, lightweight and economical polyethylene containers. The storage and dispensing system proves ideal for safe and clean handling of cutting and forming lubes, hydraulic fluids and engine oils. Users can specify the number of containers and a variety of options, including pumps, hoses, nozzles and a variety of drip-pan cart bases.



IFH Group: 800/435-7003; www.ifh-group.com

Brochure Details Nitrogen Manifold Systems

Hyson Products, Brecksville, OH, has issued a brochure on Nitro-Dyne nitrogen manifold systems, discussing 500- and 2000-psi systems and providing step-by-step instructions on how to design them for efficient and cost-effective operation.

The brochure reviews the benefits of such systems, including consistent force for consistent quality parts, balanced force for improved part quality and reduced scrap, more force in less space for lower die-construction costs, full force on contact for higher productivity, lower force increase for higher part quality and longer performance life, and simple force adjustment for reduced downtime and maintenance.

Hyson Products: 440/838-7684; www.hysonproducts.com

Synthetic, Concentrated Metalforming Lubricant

Pico Chemical Corp., Chicago Heights, IL, introduces Picodraw 4042 synthetic lubricant, which it says effectively replaces sulfurized straight-oil lubricants in the drawing and forming of carbon and stainless steels and aluminum alloys.

A concentrate, Picodraw 4042 may be mixed with water by as much as 90 percent, and can reduce lubrication consumption by 50 percent. The lube cleans easily, eliminating cumbersome, time-consuming and costly additional in-process or post-process steps. Its water-like consistency proves ideal for spray application, providing efficient coverage. And, it offers corrosion protection without staining parts, dies or machines.

Pico Chemical Corp.: 708/757-4910; www.picochemical.com

High-Pressure, High-Thrust Tube Groover

Manchester Tool & Die, Inc., North Manchester, IN, introduces the 24014 high-pressure, high-thrust groover for tube rolling or cutting operations. It offers simple tool changes and simple access to tooling. The groover features 5-sec. cycle time, machine capacity of ¾-in. dia. by 0.120-in. wall, jaw opening of 1¼ in. and a clamp force of 3 tons.

The groover operates by advancing and closing a spinning head containing rolling or cutting tools over a clamped tube. The depth of the rolled or machine cut grooves can be changed with a simple adjustment.

Manchester Tool & Die: 260/982-8524; www.manchestertoolanddie.com

Tooling/Workholding Star on New Website

Parlec, Inc., Rochester, NY, a manufacturer of tooling, workholding and presetting products, has launched its newly developed website at www.parlec.com. New content includes application articles describing its diverse customer base. The firm's product family comprises more than 8000 products for tool holding, boring, tapping and more.

Parlec, Inc.: 585/425-4400; www.parlec.com

Stuart Keeler (Keeler Technologies LLC) is best known worldwide for his discovery of forming limit diagrams, development of circle grid analysis and implementation of other press shop analysis tools. Stuart's sheetmetal forming experience includes 24 years at National Steel Corporation and 12 years at The Budd Company Technical Center, enabling him to bring a very diverse background to this column and the many seminars he teaches for PMA. His most recent project is technical editor of the AHSS Application Guidelines—Version 4, which will be available for free downloading from www.worldautosteel.org early this year.

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Fax: 734/671-2271
E-mail: keeltech@comcast.net

Stuart Keeler's next seminar is "Higher Strength Steels—Solving the Problems" scheduled for April 15 in Chicago, IL. Check www.metalforming.com for this and other seminars.

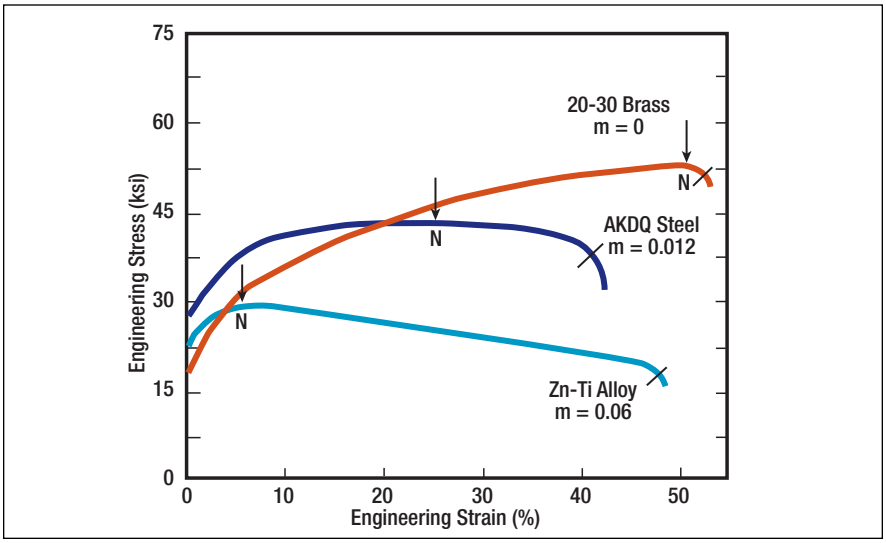
THE SCIENCE OF FORMING | STUART KEELER

Can Alloys Exhibit Superplastic Forming?

A year or two ago, print media praised the forming of a very complex automotive trunk lid with only a single die. The secret ingredient was a superplastic aluminum that stretched into very sharp features without necking or other failure modes. The aluminum stretched to strain levels way beyond any other material. Much superplastic forming research is not new but occurred during the 1960s at the Massachusetts Institute of Technology. Two laboratory demonstrations showed the fascinating capabilities of this very special aluminum alloy. In one demonstration, a standard round tensile test specimen (0.505-in. dia.) reached total elongations ranging from 2000 to 3000 percent before failure. In some tests, the specimen approached the diameter of a human hair without failure.

The other demonstration began with a box having 1-ft. square sides. The box contained one of the old spherical typewriter balls set in the center of the bottom of the box. This ball had raised letters and numbers around the surface. In the typewriter, the ball rotated to imprint each letter or number into the inked tape. The forming process began with clamping the sheet of superplastic aluminum over the top of the box to ensure a tight air seal. Then a vacuum pump removed the air from the sealed box. The aluminum sheet gradually sank into the box and took the shape of the inside of the box by forming all inside zero-radius edges and corners of the box. In the process, the aluminum sheet also wrapped itself around the type ball and embossed every letter and number through the sheet to create a duplicate of the original ball. Those two demonstrations made complete believers of everyone who witnessed the tests.

Why didn't the capability of this alloy immediately spread throughout the entire forming world? Mother Nature does not provide something for



Three stress-strain curves illustrate the increase in strain after the onset of a diffuse (width) neck, marked by downward arrow plus N. This additional strain is proportional to the m-value.

nothing. Almost all new capabilities come with a price. This time, creating the superplastic behavior incurs several different costs. First, the aluminum requires very special composition, microstructure and processing. Second, the sheet of aluminum is heated to a specific temperature. Third, the deformation must be very slow.

Once a new material capability is discovered, product designers immediately want to incorporate the new features into future part designs. Potential application by a huge industry (such as automotive) provides the driving force for additional research to further focus the material characteristics to end-user needs. In this case, elongations of 2000 to 3000 percent are far greater than target parts required. Therefore, metallurgists tweaked the chemistry and processing to reduce cost. New microstructures allowed an increase in forming speed. Ultimately, the total part cost equaled the value of the benefit received and the process went into production.

One fundamental measure of superplastic behavior is the strain-rate hardening exponent or m-value.

$$\sigma = K' \dot{\varepsilon}^m$$

The strain-rate hardening equation is similar to the strain hardening equation containing the n-value. When a strain gradient, local neck, or other localization of strain begins to terminate useful deformation in sheetmetal, the strain rate in the localization ($\dot{\varepsilon}$ in the equation) must increase relative to the surrounding material. A positive m-value means that the material becomes stronger as the local forming speed increases and resists or delays the localization. A zero m-value means that the strain rate has no effect. A negative m-value means that the material becomes weaker than surrounding material and accelerates the localization.

The m-value effect is shown in the illustration. For all three alloys, the onset of the diffuse or width neck occurs at the load maximum marked by the downward arrow and letter N. The zero m-value for the 20-30 brass means no change in strength and the neck forms rapidly (little additional strain) between the load maximum (arrow + N) and the forming limit curve (angular slash near the end of the curve). For aluminum-killed draw-quality (AKDQ) steel, the 0.012 m-value shows an additional 16 percent strain before reaching the forming limit curve (FLC). For the Zn-Ti (zinc-titanium) alloy, the 0.06 m-value adds 42 percent more stretch before the FLC terminates useful deformation.

In the illustration, the n-value is proportional to the amount of strain at the load maximum. Looking at the stress-strain curves, one may incorrectly conclude that the m-value increases as the n-value decreases. Instead, these three curves illustrate that the forming limit strains in the tensile test relate to the total effect of the n-value and the m-value. Why then are m-values generally ignored for steels? Additional research showed that the m- and n-values are proportional for steel. Therefore, the traditional n-value obtained automatically during computerized tensile testing provides sufficient information without additional tests utilizing speed changes.

Returning to superplastic forming, one can now understand why this process generates such tremendously high strains. The Zn-Ti alloy in the graph has an m-value of only 0.06. The early work at MIT required a minimum m-value of 0.5 for superplastic forming. Since the m-value is an exponent, the effect becomes even more powerful with increasing m-value.

The search for high positive m-values goes on. Recent work presented at the SAE International Congress in Detroit showed that warm forming of another aluminum alloy raised the m-value from negative to positive and thereby increased the total elongation from 25 to 125 percent. Competition among producers of different alloys continues to drive many improvements to target customer needs. **MF**

Say So Long to Secondary Processes

Metalformers operating CNC turret punch presses can apply tooling innovations to bend flanges, form spot-weld locating features, debur and hem. Finished parts emerge in one material handling, pushing productivity to new heights and putting a choke-hold on rising costs.

BY BRAD F. KUVIN, EDITOR

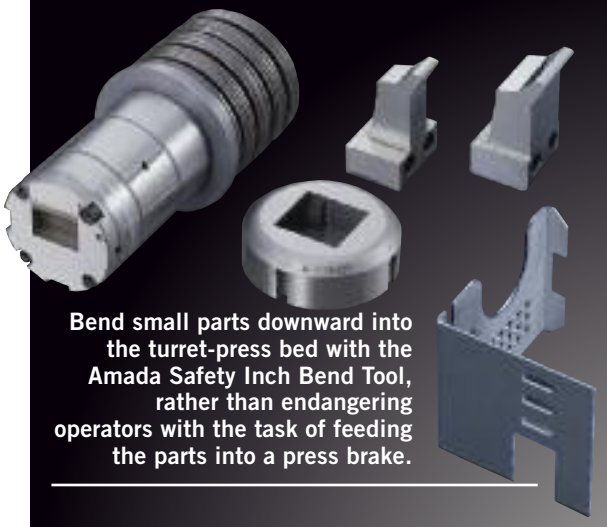
CNC turret punch presses process parts more quickly and precisely than ever before, with infinite control over stroke motion. Thanks to technology developments in drives and controls, these presses, when armed with tooling that boasts equally impressive design enhancements, often allow metalformers to remove completed parts from their turret punch presses that can route directly to a paint line or assembly cell—no secondary processes required.

New turret-press tools help metalformers hurdle real-life obstacles to improved productivity, by allowing presses to perform secondary processes and eliminate all of the associated material handling. Instead, fabricators can load a full sheet onto a turret-press bed and sit back while the machine employs tools to punch, bend, nibble, debur, mark and perform other processes. Eliminated from the production schedule are tasks such as secondary edge processing, press-brake bending and resistance-weld fixturing.

To gain insight into the products emanating from the creators of such tooling, we visited the brand-new home of Amada America in Schaumburg, IL, to speak with Amada Midwest tooling manager Scott Bowerman. We also visited nearby contract manufacturer Genesis Inc. to learn how the $30 million company leverages technology to continue its

Genesis fabricates this hinged door panel on its newest turret press (shown) to take advantage of the machine's infinitely adjustable stroke length that allows it to program a slightly wider opening on one of the knuckles. This allows for a slip fit of the dowel pin through the first knuckle and a press fit only through the second knuckle, making assembly easier and quicker.

Tooling Up for Success



Bend small parts downward into the turret-press bed with the Amada Safety Inch Bend Tool, rather than endangering operators with the task of feeding the parts into a press brake.

Nibble complex part contours at a pitch less than material thickness with this contouring tool, eliminating laser cutting or the need to develop a special tool.

To help operators of resistance-welding machines, metalformers can employ a flat-positioning tool designed to eliminate the need for weld-positioning jigs. The tool creates locating tabs without making a hole or uneven surface that requires additional finishing.

Eliminate nibble marks caused by common parting tools by upgrading to this slotting tool that avoids overlap marks and the secondary operation needed to clean them up.

Reduce the area of your sheet skeleton by as much as 50 percent by replacing a standard parting tool with a ¼-in. edge with this e-Fine tool, which comes in three blade widths from 1 to 3 mm, and 30 mm long.

Note: Amada's Scott Bowerman adds that these tools are designed specifically to take advantage of the features included in its newest turret punch presses—the AC and EM series of machines. For example, the e-Fine tool creates fine metallic slivers that without the Power Vacuum die system would result in these slivers working their way back up to the press bed and onto the workpiece.

Have a lot of marking to do, perhaps because you're nesting several different parts onto one common sheet? Then opt for a high-speed marking tool that creates dot-pattern marks at hit rates to 1800/min. Mark part numbers, dates, bend lines and weld locations with one tool, top or bottom, to varying depths.

impressive growth pattern even in difficult economic times.

30-yr. Customers, 30-yr. Pricing

"For some of our customers that we've maintained since our early days, back in the mid-1970s, we still make their parts for the same price we charged 30 years ago," shares Bill Stringfellow, owner and founder of Genesis Inc., Roselle, IL. Since founding the company in 1976, Stringfellow has led its consistent growth from sheetmetal fabricator and metalformer to the inclusion of powder coating, silk screening, CNC machining, welding and other processes, including wire-cable assembly and electromechanical assembly. Impressively, it's grown by at least 5 percent per year for the last several years by strictly following this Stringfellow directive:

"No one industry can comprise more than 20 percent of our business," he preaches. While Genesis manufactures parts and assemblies, and in some cases complete OEM products such as gaming machines and cooking appliances, for as many as 10 different markets, its busiest customers at the moment are those in the food-processing, communications and medical industries. Typical annual order sizes

average 3000 to 5000, which the firm manufactures in quarterly run sizes and warehouses for customers in a 30,000-sq.-ft. building near its 60,000-sq.-ft. main plant. The firm also inhabits four other buildings nearby, where it performs powder coating, machining and assembly operations. In all, 150 employees work over two 10-hr. shifts to meet customer demand for 2-week lead times.

Along with his commitment to diversification to immunize the company from a downturn in any one end-user industry, Stringfellow also insists that his sheetmetal-fabrication shop operate with 20-percent open machine time. To continue meeting that requirement, late in 2007 it purchased the latest-greatest CNC turret-punch press from Amada, an EMK 3510NT press. It boasts twin AC-servo direct-drive technology and adjustable control of ram motion—speed, stroke length, hover height and hold time.

To illustrate the diverse capabilities of CNC turret punch presses, check out this zinc-coated bracket nested 19 pieces per 36 by 40-in. sheet, 0.075 in. thick. Included on the bracket is a bridge lance cut and formed in one hit, and extruded holes each made in two hits.

New Tools, Better than the Old Tools

An important and innovative feature of its EM series of machines is what Amada calls Power Vacuum die technology, used on 0.5- and 1.25-in. tool stations. The press directs a continuous stream of air through the die to the slug chute, which effectively draws any slivers and slugs out of the die and away from the work surface. This allows die penetration to be reduced to just 1 mm, less than half of the typical die penetration required. Reduced penetration allows hit rates 30 to 50 percent faster, as well as reduced tool wear. It also, according to Amada's Bowerman, allows tool designers to develop tools for the press that otherwise could not be used in production. Hence the firm's introduction, a few years ago, of several new tools it calls Innovation Tools.

"New tooling concepts developed in recent years for the state-of-the-art CNC turret punch presses aim to reduce or, in many cases, completely eliminate the need for secondary operations," says Bowerman. Among the new tool offerings is the Safety Inch Bend Tool, in use at Genesis and which allows the 90-deg. forming of short flanges in the turret press. The tool proves perfect for forming very small parts that otherwise might prove difficult to safely and

efficiently form in a press brake.

"The tool bends the flange downward into the press bed," explains Bowerman, "in one or two strokes, or it can bump-form in a series of indexed hits to make radius bends. Then it separates the formed part from the sheet to exit through the slug chute." The tool runs in a 2-in. station and has a minimum flange length of three-times material thickness, up to 1.378 in. (See the sidebar for more information on new tooling for turret punch presses.)

Where the New Technology Pays Off

"Since we've had the new turret press, of course our employees want to run every job in the shop on it, since it's so much faster than our other equipment," says Stringfellow, thanks in part to its use of vacuum-die technology. "So we've analyzed our turret-press work to look for opportunities to improve productivity as well as quality by moving the work to the EM machine."

Citing one example of such a move, Genesis special-project engineer Gerry Luptak showed us a small hinged door panel fabricated on the EM to take advantage of the machine's infinitely adjustable stroke length.

"Dowel pins are used as hinge pins, and we can't swage them," explains Luptak. "In the past, forming the knuckles in the turret press all to the same dimension required our assemblers to pound the pins into place inside of the knuckles. Achieving a press-fit proved a timely and difficult manual operation as operators forced the pins through both knuckles. Now we run the parts on the EM, where we can program a slightly wider opening on one of the knuckles. This allows for a slip fit through the first knuckle and a press fit only through the second knuckle, which makes assembly much easier and quicker."

Luptak also showed us a new job being run on the EM press using a hemming tool. "Typically, we'd have to form the hem in a press brake. Now we can do it in the turret," he says, "eliminating the secondary operation and the required material handling."

Asked what's next for the firm's newest turret press, Luptak has his eyes on Amada's contouring tool, another of its Innovation Tools. This tool nibbles contours not achievable with standard tools, at pitches less than material thickness.

"It results in a near-laser-quality edge," says Bowerman. "And metalformers can avoid the purchase of special shapes."

"We think that tool will offer us opportunities to do more prototype work," adds Luptak, as the firm eyes opportunities to win more jobs from its 40 or so active customers. "And since it can run at nearly 800 strokes/min., we'll be able to use it in production runs as well." **MF**

Peter Ulintz has worked in the sheetmetal-forming industry since 1978. His background includes tool and die making, tool and process engineering, engineering management and product development. Peter also operates the website ToolingbyDesign.com, a source for the transfer of modern metalforming and tool-and-die technology, and which promotes the use of "Performance-Based Die Engineering Strategies."

Peter speaks at PMA seminars and roundtables focusing on tool and die design, die maintenance, deep drawing, stamping simulation, tooling for stamping high-strength steels and problem solving in the press shop.

Peter Ulintz

pete.ulintz@toolingbydesign.com

www.toolingbydesign.com

TOOLING BY DESIGN | PETER ULINTZ

Deep Drawing Stainless Steel

Metal-stamping companies and tool shops experienced with plain carbon steels often have problems making parts from stainless steel. Negative past experiences and poorly designed manufacturing processes often produce misconceptions and myths regarding these corrosion-resistant materials.

An example: All stainless steels have workhardening rates higher than plain carbon steels. This fact contributes to a long-standing myth that stainless steels are less formable than low-carbon steel because they workharden too rapidly. In reality, stainless steels are very formable. In fact, some grades have substantially higher ductility than plain carbon steels. Furthermore (another myth buster), stainless steel is frequently deep drawn into difficult shapes without intermediate annealing. Even the less formable ferritic grades have outstanding ductility and can be deep drawn easily. The Specialty Steel Industry of North America, a voluntary trade association representing virtually all the producers of specialty steel in North America, asserts that working with stainless steel is not difficult, it's just different.

With stainless steels, the combination of high forming pressures and surface friction results in significantly higher tool wear rates than those used to form carbon steels.

Stainless steels are iron-based alloys containing more than 10.5 percent chromium. The chromium in the steel reacts naturally with oxygen in the air to create a passive chromium-oxide (Cr_2O_3) film on the surface of the steel. In simple terms, passive means that the sheet surface no longer reacts chemically to its surrounding environment. It is this passive film to which stainless steels owe their corrosion resistance.

Essentially, two groups of stainless steels are commonly used to deep draw metal stampings; these steels are classified in the austenitic and ferritic groups. Type 200 and 300 series identify the austenitic group. Type 304 and 316 are nonmagnetic and are the most widely used grades in the austenetic group; type 304 being the most common. Some difficult deep drawing may require a special version of grade 304 having slightly higher nickel content. This grade is sometimes referred to as 304 DDQ. However, it would not be sound practice to use 304 DDQ by default as it is more expensive and not as readily available. Besides, most deep drawing can be readily achieved with standard grades materials such as 304 or 305.

Type 400 series identifies the ferritic group, although there are some martensitic stainless steels within the 400 series as well. Type 430 is the general-purpose stainless steel of the ferritic group. Its ductility is similar to carbon steel and this grade is magnetic.

Both ferritic and austenitic stainless

steels workharden at faster rates than carbon steels. Therefore, it requires higher pressures to form stainless steel than it does to form plain carbon steel of the same thickness and temper. In addition, the chromium-oxide surface film, even though it is a very thin layer, significantly increases the level of friction between the tool and the work piece. The combination of high forming pressures and surface friction results in significantly higher tool-wear rates than those used to form carbon steels. These higher wear rates increase tool maintenance, downtime and production costs. As a result, proper processing methods, tool coatings and lubricants must be employed in order to improve overall tool performance.

If your stamping operation or tool and die company is primarily experienced with plain carbon steels, but finds that it must occasionally produce parts from stainless steel, the following practical tips should prove helpful:

Due to the rapid workhardening rates of stainless steels, more press power and press energy is required. Frequently, a 100 percent increase compared to plain carbon steel of the same thickness is required.

Tooling material must be of sufficient hardness with a highly polished surface finish. D2, a high-chromium-alloy tool steel, is the most commonly used steel in stamping dies. Because stainless steel also contains high levels of chromium, it is best to avoid this type of tooling material in deep drawing and severe forming applications. Whenever sliding occurs between two materials, it is important to make sure that the materials in contact are dissimilar in order to avoid galling. The best deep-drawing performance often is achieved by using carbide draw rings or hard aluminum-bronze tooling inserts.

Extreme-pressure lubricants are essential for deep drawing stainless steel but soluble oil can be used with aluminum-bronze tooling. Common practice should include lubricating both sides of the blank to reduce galling tendency.

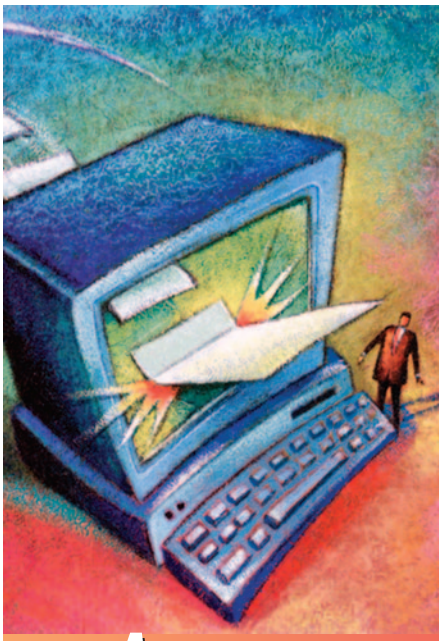
Polyethylene (PE) or polyvinylchloride (PVC) plastic films can be applied to the steel surface to aid drawing and to protect the surface finish. These films provide excellent lubrication with friction-coefficient values below that of oil. PE is usually adequate for most purposes but PVC may be required for severe draws and multiple forming operations. A word of caution: Both can be difficult to remove and should not be left on the stamped parts for extended periods of time. Exposure to the sun may make them impossible to remove.

Blankholder pressure is much higher than for carbon steel. The ferritic grades (430) require about 50 percent more pressure while the austenitic grades (304, 316) may require as much as three times the force of plain carbon steels. This is an important factor to consider when evaluating press energy and tonnage capacities during press selection.

Due to the high forming pressures and frictional heat, drawing speeds will be much slower than for plain carbon steel. A unique feature when cold forming stainless steels is that more severe deformation is possible when slower forming speeds are used. This is quite different from plain carbon steels, which form virtually the same regardless of the forming speed. In general, when forming stainless steel into difficult shapes, slow down.

The required clearances between the draw punch and die cavity wall are greater for stainless steels compared to plain carbon steels. In general, austenitic grades will require alloy thickness plus an additional 35 to 40 percent; most ferritic alloys require material thickness plus 10 to 15 percent additional clearance.

For more on stainless steels, visit The Specialty Steel Industry of North America at www.SSINA.com. **MF**



PMAEF Offers Web-Based Learning

The PMA Educational Foundation has partnered with KRM Information Services and CRK Interactive to offer new online-learning opportunities for metalforming companies to train their management staffs. PMA members receive significant discounts from both providers.

KRM's online courses are developed by such well-respected organizations as Kiplinger Washington Editors and Harvard Business School. Courses target topics that will enhance the skills and knowledge of senior management, customer service, sales and marketing, financial services, human resources and workforce-development staff. Several courses are available each month and can be accessed one of two ways: live with an interactive question-and-answer period, or through archived recordings. Access the KRM webinar schedule at www.krm.com/pma.

CRK Interactive provides online subscriptions to a leadership-training curriculum through a series of online courses. Designed for managers, team leaders, supervisors and trainers, courses focus on how to effectively coach and interact with staff to maximize performance, create a motivated workforce, discuss performance issues with employees, conduct effective interviews and learn successful negotiation skills.

For more information about these training opportunities, contact Michelle Underwood at 216/901-8800 or munderwood@pma.org.

Cleveland High School Earns Metalworking Skills Accreditation

On December 16, 2008, Max Hayes High School, Cleveland, OH, was recognized by the National Institute for Metalworking Skills (NIMS) as the first urban high school in the country to achieve NIMS educational training program accreditation. NIMS accreditation aims to improve the quality of training programs in order to build and maintain a globally competitive workforce, while providing workforce-development opportunities for potential and current employees. Accreditation involves a three-step process: registration of the program with NIMS, completion of a self-study analysis and an onsite audit. There also are credentialing requirements.

PMAEF executive director Dave Sansone, also a NIMS board and executive committee member, presented Max Hayes High School representatives with a plaque recognizing the school's CNC machining program. PMAEF supported the school's efforts with a small grant, along with many local companies who invested funds, time and equipment to assist its efforts.

For more information about NIMS or PMAEF, contact Dave Sansone at 216/901-8800 or dsansone@pma.org.

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Pushing the Limits with Metrolean

George Keremedjiev has been writing this column for more than 20 years. He regularly consults with metalforming companies worldwide and provides metalformers with training on the application and implementation of sensors for die protection. For more information on his seminars and consultancies, contact:

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I am offering a new word that would describe the marriage between lean-manufacturing practices and sensor-based mistake-proof manufacturing. The word that I am proposing is 'metrolean.' It derives from combining the words 'mechatronics' and 'lean.' A company or a process that encompasses the best practices of lean manufacturing while simultaneously integrating electronics within mechanical processes for mistake-proofing purposes (mechatronics) is a metrolean company.

In light of the current economic doldrums, I have decided to use this column throughout 2009 to showcase metrolean manufacturing companies and applications that push the limits of lean and mistake-proof manufacturing to achieve successful competitiveness. As we saw in January's column, Pridgeon & Clay Co., Grand Rapids, MI, exemplifies such stratospheric levels of modern manufacturing philosophies and techniques.

Metrolean metalforming and assembly occurs in companies that have two fundamental core competencies: a professionally implemented lean methodology coupled with a mistake-proofing laboratory. As you tour these practitioners of metrolean, you are constantly amazed at how efficient, productive and profitable processes can be when permeated with strategic and specific lean methods patrolled with electronic sensors and controllers.

Poka yoke, or mistake proofing, is vastly enhanced when mistake-proofing fixtures are imbued with electronic proximity or photoelectric sensors. Human errors are detected and logged via a nearby computer. Not only do the fixtures prevent a badly made part from exiting the process, but the specific causes of the subpar part are documented within the personal computer for further analysis. If the poka yoke fixtures have analog (or measuring) electronic sensors, then the mistake-proofing process is elevated several notches as now actual part-quality dimensional-measurement data and not just go/no go determinations are generated.

Mistake proofing is vastly enhanced when mistake-proofing fixtures are imbued with electronic proximity or photoelectric sensors.

I have seen first-hand companies that have maximized their lean-manufacturing cultures with advanced poka yoke fixtures. Production managers have at their disposal real-time data from the manufacturing floor reporting not only the number of good parts made per hour, but also the specific reasons for the generation of bad parts. Incorrectly assembled components as well as dimensional variations are detected, logged and reported. With such data, tweaking and fine adjustments of the lean processes can be scientifically made and justified.

Frederick Winslow Taylor (1856-1915), a Pennsylvania-born mechanical engineer and management consultant, is considered by many to be the father of

the manufacturing-efficiency movement. He advocated four basic principles for increasing the productivity of workers and processes:

1) The use of scientific methods for management of business and manufacturing-process improvements.

2) The direct tie-in between workers' performances and their paychecks.

3) The careful selection of new employees based on the testing of their aptitudes and skills and the importance of ongoing employee training.

4) The scientific and mathematically based study of shop-floor processes.

Taylor's influential work led to the time-motion studies that Henry Ford implemented in his factories to help eliminate inefficient manufacturing. Later, Japanese companies combined the time-motion studies with automation provided by robotics and other assembly-enhancing technologies into what became lean manufacturing.

Today, metrolean is practiced by only a handful of manufacturing companies in the metalforming and assembly sector. All metalforming companies need to reassess their current manufacturing processes via two scientific streams:

1) The time-motion analysis of current methodologies and what can be done to improve the efficiencies of these processes; and

2) The blending of electronic sensors within the lean-enhanced processes to assure correct repetitive quality of products on critical features and dimensions.

In other words, I am advocating metrolean: Lean manufacturing and poka yoke fixtures with full implementation of electronic sensors and controls in every aspect of the manufacturing process with real-time efficiency data from dies, molds, assemblies, paint and plating lines, etc., being reported and logged to be further analyzed for process improvements. Metrolean is the ship to sail during these extremely difficult times. **MF**

The Truth About How Income Tax Works

Irv Blackman, CPA and lawyer, is a retired founding partner of Blackman Kallick Bartelstein, LLP and chairman emeritus of the New Century Bank (both in Chicago). Want to consult? Need a second opinion? Contact Irv:

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This article first appeared in this column in October 2003. I was flooded with requests for copies, the last one —would you believe—only six months ago. I did not write it but wish I had. The source is T. Davies, Professor of Accounting at the University of South Dakota School of Business, who told me he received the article from a student. So, the real author remains unknown.

Let's put tax cuts in terms that everyone can understand. Suppose that every day, 10 men go out for dinner. The bill for all 10 comes to $100. If they paid their bill the way we pay our taxes, it would go something like this:

The first four men—the poorest—would pay nothing; the fifth would pay $1, the sixth $3, the seventh $7, the eighth $12, the ninth $18 and the tenth man—the richest—would pay $59. That's what they decided to do. The 10 men ate dinner in the restaurant every day and seemed quite happy with the arrangement, until one day the owner threw them a curve—in tax language, a tax cut.

"Since you are all such good customers," he said, "I'm going to reduce the cost of your daily meal by $20." So now dinner for the 10 only cost $80.

The group still wanted to pay their bill the way we pay our taxes. So the first four men were unaffected. They would still eat for free. But what about the other six—the paying customers? How could they divvy up the $20 windfall so that everyone would get his 'fair share?' The six men realized that $20 divided by six is $3.33. But if they subtracted that from everybody's share, then the fifth man and the sixth man would end up being paid to eat their meals.

So the restaurant owner suggested that it would be fair to reduce each man's bill by roughly the same amount, and he proceeded to work out the amounts each should pay. And so the fifth man now paid nothing, the sixth pitched in $2, the seventh paid $5, the eight paid $9, the ninth paid $12, leaving the tenth man with a bill of $52 instead of his earlier $59. Each of the six was better off than before. And the first four continued to eat for free.

But once outside the restaurant, the men began to compare their savings. "I only got a dollar out of the $20!" declared the sixth man, pointing to the tenth. "But he got $7!"

"Yeah, that's right!" exclaimed the fifth man. "I only saved a dollar, too. It's unfair that he got seven times more than me!" "That's true!" shouted the seventh man, "Why should he get $7 back when I got only $2? The wealthy get all the breaks!" "Wait a minute," yelled the first four men in unison. "We didn't get anything at all. The system exploits the poor!"

The nine men surrounded the tenth and beat him up. The next night he didn't show up for dinner—or, in our tax example, he took his business out of the country—so the nine sat down and ate without him. But when it came time to pay the bill, they discovered, a little late, what was very important. They were $52 short of paying the bill! Imagine that!

And that, boys and girls, journalists and college instructors, is how the tax system works. The people who pay the highest taxes get the most benefit from a tax reduction. Tax them too much, attack them for being wealthy, and they just may not show up at the table anymore. Where would that leave the rest? Unfortunately most taxing authorities anywhere cannot seem to grasp this rather straightforward logic. **MF**

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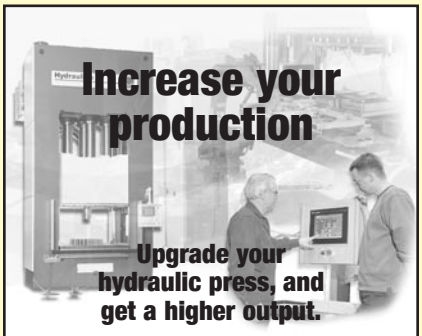

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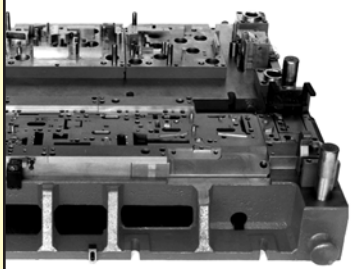

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"So the manufacturing base has eroded, and we are looking to our political leaders for help. But what have they given us?"

BACKTALK LOUIS A. KREN

Be Careful What You Ask For

News item: The government is coming to the rescue. It's opened its pocketbook and everyone is lining up.

A few days back a friend of mine offered her opinion on the economy, more specifically the local economy comprising Cleveland, OH, and its environs. Her somewhat optimistic opinion came in response to my assessment of the local economy. Given my background, I placed much emphasis on the declining manufacturing base and how that fact will challenge the Cleveland economy for years to come. I went on to lament the pitiful state of our local political and administrative leadership. It has no ideas and does nothing. Seemingly, our local government's only motivation to act is self-interest, often leaving incredible waste and corruption in its wake.

"Jobs. We need jobs." That's what our local leaders say. It's all lip service, though in all fairness, owing to local corruption, I think the district attorney's office and Cleveland FBI have had to hire on to handle the increased workload.

A new medical mart—where healthcare companies congregate to offer their wares to medical providers—was to be this region's savior, building off of this region's superior healthcare facilities. Instead our local brain trust misses deadline after deadline, unable to even choose a site for it. Meanwhile New York City announced plans to open its own medical mart and wants to act quickly. Let's see how quickly Gotham pulls this project from under our leaden feet. New York already is eyeing Cleveland's two major claims to international fame, the Rock n Roll Hall of Fame and LeBron James. That city gave us the hall but keeps its museum board along with the induction ceremony, and we hear rumblings that the whole museum may soon call New York home. And what NBA fan hasn't heard how New York area basketball teams are clearing money in an attempt to sign James when he becomes a free agent after next season? Now I can't specifically blame our government if LeBron leaves, but I'm sure our leaders would screw it up if they were part of the pro-basketball equation. As it is, here we can't even tie a gem like the Rock Hall to local development or events to spur growth—we are wasting an asset.

According to the U.S. Census Bureau, in 2006 Cleveland's population totaled 444,000, dropping 7 percent from 2000. Among major American cities, only New Orleans and Detroit suffered greater population losses in that time period. Congratulations, Cleveland, we did it without a hurricane!

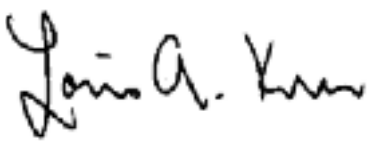
So why my whining about Cleveland? Because to me it is a microcosm of our nation's ills. So the manufacturing base has eroded, and we are looking to our political leaders for help. But what have they given us? Be careful what you ask for.

Dick Cheney, whatever you may think of him, during the 2000 vice presidential debate, had a memorable quote.

Said Lieberman, "I think if you asked most people in America today that famous question that Ronald Reagan asked, 'Are you better off today than you were eight years ago?' Most people would say yes. I'm pleased to see, Dick, from the newspapers that you're better off than you were eight years ago, too."

Candidate Cheney: "I can tell you, Joe, the government had absolutely nothing to do with it."

That brings me back to the news item at the top of this column. I don't think we should place all of our hopes in the government basket. I am optimistic about our future. I'm optimistic because this country, and this industry, have good, hard-working people that think, respond and adapt. The technology and knowhow available to us today is amazing, and placed in the hands of knowledgeable employees and forward-thinking employers, I have reason to see good times ahead. I'm banking on these people, not politicians, to lead the way.



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