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august 2007 volume 3 issue 8

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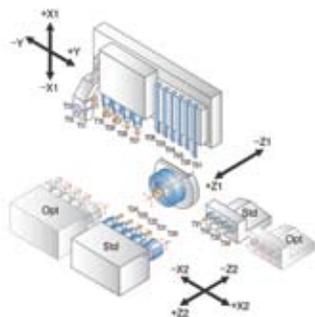
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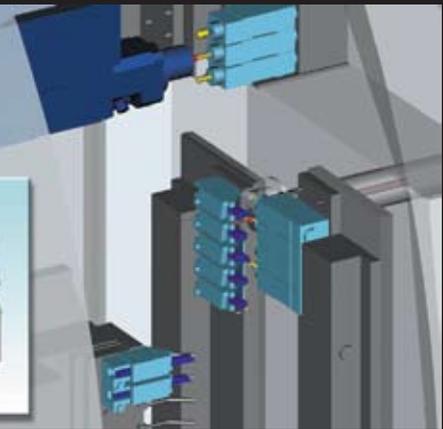
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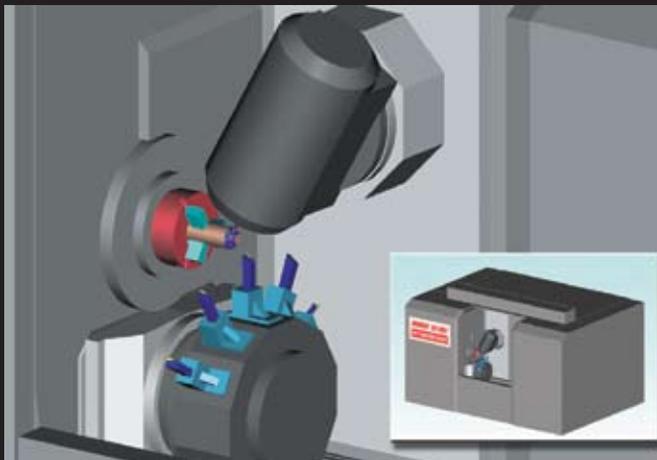
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## editor's note

### Recipe for Success

In late June, Noah and I journeyed to Latrobe, Pennsylvania, to interview the CEO of Kennametal, Carlos Cardoso.

Kennametal has been on a roll since Cardoso arrived, with its stock up 70 percent in the past year. Our interview with him will appear in a future issue. We got the tour of the technology center where they concoct the recipes of their world-famous cutting tools. Douglas Moore, who has been with the company for 45 years, simplified the process of developing a new tool by using the analogy of the kid's favorite, the Rice Krispy square, to explain the construction of a carbide insert.

A cutting tool is built with metal powders which are compacted by big presses into the cutting squares that remove softer material in a consistent fashion. Cobalt mixed into the basic tungsten carbide powder recipe is like the marshmallow in the Rice Krispy square. By varying the amount of cobalt in the mixture, the metallurgists can make the tool stiffen or soften. The cutting tool goes to the furnace after being pressed, where it shrinks and solidifies. The length of time in the oven imparts desired qualities to the insert and burns off the paraffin substrate that holds the pressed powders together. The tool is then inspected and coated to the customer's specs.

I've been around machine tools my entire working life, yet I never knew how a carbide cutting tool was made. My belief is that a lot of you who use inserts every day do not know where they come from. We take a lot of knowledge for granted in our daily tasks. But we all need to go back to the basics from time to time to know what we don't know.

Lloyd Graff  
Editor/Owner

editors note



**Barbara Donohue** received her mechanical engineering degree from MIT. She worked in design, heat transfer and manufacturing for several years before changing careers to become a journalist. Now she writes about technology and business from her home office in Acton, Massachusetts. When not writing, she sings in a choir, volunteers as a literacy tutor, and is weekend “foster mom” to a yellow Lab puppy named Tikva who is training to become a wheelchair assistance dog.



**Jerry Levine** was the Director of Corporate Studies in his 35-year career with Amoco Oil Company. He was mainly involved with business planning and strategy as well as energy and environmental legislation and regulation before retiring in 1998. Mr. Levine was chairman of the American Petroleum Institute's Motor Fuels Committee and chaired the industry's representation at various state and federal regulatory negotiations. In 1997 he represented the oil industry at global warming negotiations at the White House. He also helped negotiate gasoline regulations for the Clean Air Act. A Chicago native, Jerry holds chemical engineering degrees from Purdue and Michigan.



**Chad Waldo** has been working in the manufacturing and mechanical design sector for over 10 years. He started with R&D Tool and Engineering in Lees Summit, MO as a design engineer, then moved into the research and development team. In 2003 he took on the role of Vice President of Operations at Granco Industries in Grandview MO. Granco manufactures its own line of hand tools as well as several defense related items. Chad recently started his own company, Nu-Forge Tool, making components for weapons platforms and other military parts.



**Robert Strauss** was formerly a reporter for *Sports Illustrated* and the *Philadelphia Daily News*, and a news producer at KYW-TV in Philadelphia. Now a freelance writer based in Haddonfield, N.J., where he revels in his two daughters' basketball prowess and their eye-rolling at his bad puns, his work appears most often in the *New York Times*, the *Washington Post*, the *Los Angeles Times* and *Today's Machining World*.

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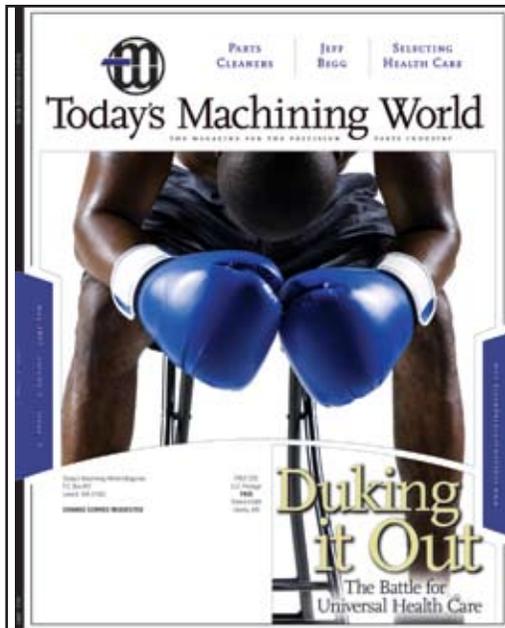
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### Healthy Dose

Phenomenal job on the Health Care issue (May, 2007). It has more in it on the health care debate than journals that are supposed to be discussing it. The articles are well informed and well written. Congrats!

Martin S. Levine, D.O., MPH, FACOFP  
Associate Dean

Touro College of Osteopathic Medicine, NYC, NY

### Resurrected

I went back and read the article "It Happened Here" from the June/July 2005 issue of *Today's Machining World*. I want to tell you that the plant never actually did die. I own and operate a steel fabrication shop that now calls the old JH Horne plant home. I started Diamond Iron Works in Lawrence in 1994, originally a couple of blocks away from the Horne plant. As business grew for me, I developed a pretty close relationship with Byron Cleveland Jr. at Horne. For many years I sublet large steel fabrication projects over to Horne that my shop was too small to handle. It was a good fit for both companies. In August of 2006 I purchased all the property here and moved my business in. We were able to breath new life into the buildings, and today we have nearly 30 people working in the plant, albeit in a different trade. I kept eight of the Horne employees on, and they are still working today. Byron Cleveland Jr. still maintains an office here, and I talk to him every day, often about the history of the buildings here.

It was a sad story to watch a 142-year old business close its doors. But as the saying goes, "when one door closes another one opens." The plant lives on.

Steve Doherty  
Diamond Iron Works  
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## The Scorpion On the Back of the Frog

The recent ratification of a 50 percent cut in wages and benefits by Delphi workers shows that Ron Gettelfinger of the UAW is an able leader and the workers are realistic about their situation.

I was one of the pessimists two years ago when Delphi moved into Chapter 11 bankruptcy, when Robert Miller took over and the bottom-fishing hedge funds bought up the stock for between 59 cents and a buck a share.

Delphi has been the point company in working out a deal with the UAW. With the Big Three in negotiations now the precedent has been set for a groundbreaking labor agreement. This is really huge news for everybody involved even tangentially with American automotive. The negativists have seen the UAW and its workers as the scorpion on the back of the frog crossing the lake. The scorpion bites the frog which dooms them both, because that's what scorpions do.



The stocks of GM and Ford have been moving up despite dreadful sales. General Motors May sales figures were down 21 percent from the previous year. Their trucks, despite being in the middle of a new product cycle, are stuck in the tar. Ford isn't doing much better. But hopes for an enlightened contract are lifting spirits in Detroit.

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## I talked to a client whose factory

is out in the steppes of North Dakota. How things have changed in the last couple of years. Those of us cloistered in cities living in the old, tired world of domestic auto, Microsoft and pulp newspapers may be missing the fabulous bull market in agriculture, infrastructure and machinery for export.

Jim Flaherty, who has a job shop in Fargo, says business is great. His customers make giant wind towers to harvest electricity and a variety of agricultural equipment, much of which is exported.

The ethanol boom (boondoggle?) is promoting a corn growing frenzy, which means more tractors and everything else needed for cultivation.

A richer advancing world in Asia and virtually everywhere else except AIDS-besotted Africa means a fabulous gold rush for protein and potable water.

The raw material rush, which has doubled the price of copper and lead in the last couple of years, means more conveyors and mining machinery.

A look at the Investor's Business Daily top 100 stocks shows Hardinge and Hurco as favored firms.

Aerospace is in a ten-year up cycle as commercial airlines replenish their planes and the military keeps buying stuff to fight the last three wars.

Cummins, Caterpillar, Terex and Deere are today's IBM, as the world rushes to dig, grow and build.

The opportunities for companies with manufacturing and machining skills abound in this climate. If we are not blinded by the problems of the old economy and focus on the new economy (which just a couple of years ago was considered the ancient economy) we can take advantage of the hot opportunities that beg for our attention.

## I was talking with an old friend

in the screw machine business recently and he talked about a vexing decision that he is confronted with.

Last year was tough for him because he got whiplash from the spate of bankruptcies in automotive-land. He runs Davenport and Wickmans plus several Citizen CNC Swiss lathes. Business is stable this year with some nice opportunities in traditional high-volume work.

His dilemma is that return on investment on his old multi-spindles surpasses that on his CNC machines, but he sees his bank of screw machine skills eroding every year. Which way do you go?

It is difficult to build a Davenport crew, but, if you can, there could be big rewards in a CNC-oriented world. As the

# swarf

problems in buying everything from China are highlighted in new permutations almost every day, it is becoming clearer that there will continue to be a screw machine industry presence in North America.

## I had a long talk recently with

Joe Merchant, who runs the Advanced Manufacturing program at Vincennes University in Vincennes, Ind.

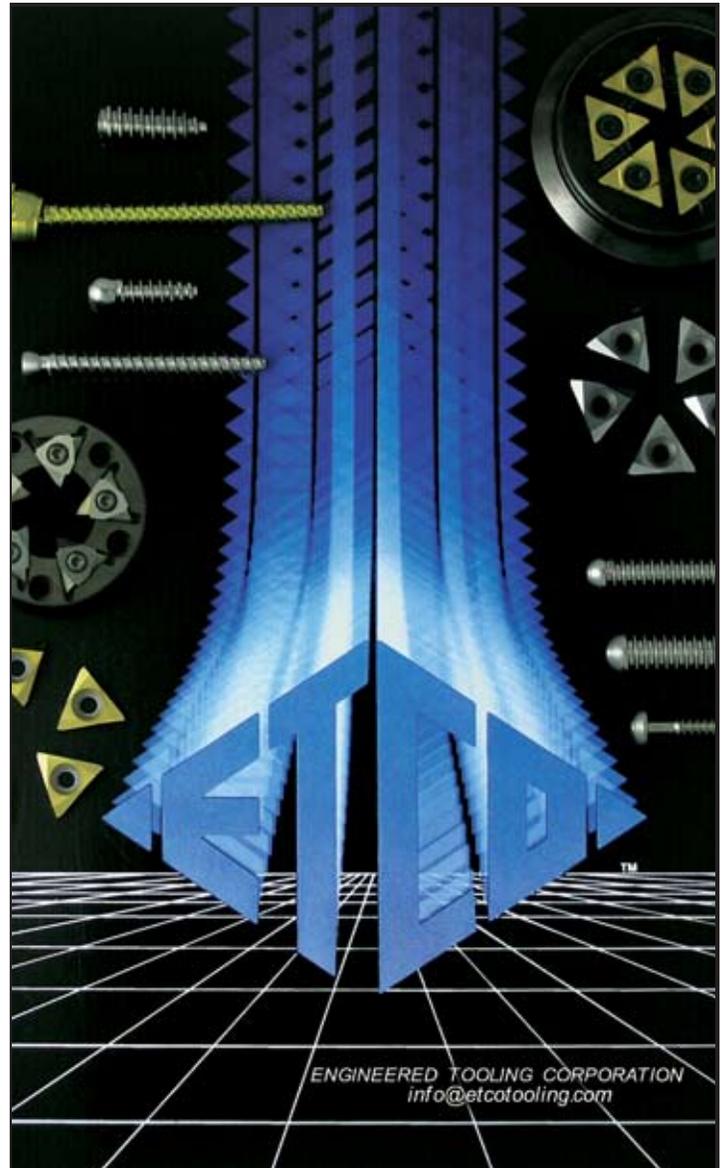
Vincennes is halfway between Terre Haute and Evansville in Southern Indiana. The school has 5,000 students and has long been considered a top junior college. It is now incorporating a four-year undergraduate degree to compliment its Associate degree program. But I was intrigued by the three year Advanced Manufacturing program, which has partners like Toyota, Haas, Mastercam, and Kennametal.

Students who complete a 2-year Tool and Die or Injection Molding program are eligible for the third year course, which comes with an additional Associate's degree upon successful completion.

The Vincennes program has 12 pieces of Haas CNC machinery, five of which they own thanks to an Eli Lilly Foundation grant, and seven machines donated by Haas. The equipment is four years old, so they have a beautiful setup.

There are 16 slots open for this program, and late in the summer Mr. Merchant still has two openings. He says that the demand for their grads is so overwhelming that he hasn't filled the requests from two years ago. Average starting salary is \$40,000 for his CAD/CAM graduates. He says that some of his recent students are making \$120,000 a year now at the Georgetown, Kentucky, Toyota plant.

Merchant laments the parochial view of guidance counselors who still look at manufacturing as grimy grunt work. I asked him if he thought this was changing, but unfortunately, he hasn't seen a shift yet. I asked him if the interest



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in Robotics competitions has kindled interest in manufacturing. He said he thought it was a parallel track, but wasn't seeing robot enthusiasts in his Vincennes classes.

Joe Merchant sees the workforce at Toyota and Zimmer in Warsaw and Cummins in Columbus reaching retirement age in the decade ahead. Their businesses are booming and he struggles to fill his 16 slots.

Meanwhile, as I write this piece at Starbucks, the coffee chain is interviewing for possible future openings. They have a line of applicants, and four women from the coffee chain are interviewing. If you make it to supervisor, the wage is \$10.45 an hour, and 40 hours a week is not guaranteed.

He spent some time in Portugal, but the bulk of his childhood was spent in the dirt poor, oil-rich African colony run from Lisbon.

At the age of 17, the slightly built young man flew to New York, alone, to enroll at Fairfield University, a small liberal arts college in Connecticut. He came to Fairfield to play soccer, he told us – a sport he still loves and says he's started to play again in his early fifties.

Now ensconced in Pittsburgh, he has embraced the Pirates and gallantly entertains 600 people at Kennametal's annual baseball outing, but soccer, the world's game, is his first love. Look for the interview with Mr. Cardoso in September's *TMW*.

## Noah and I interviewed Carlos

Cardoso, the CEO of Kennametal at company headquarters in Latrobe, Pa., in late June.

Carlos told us quite a bit about his life story, which gave us an insight into his strong push to make Kennametal a global company. Today more than 50 percent of its revenues come from outside the U.S.

Carlos grew up primarily in Africa. His father worked for the colonial Portuguese government in Angola, pre-civil war.

## The Gene Haas tax evasion trial

is coming up in September. It has been stalled by continuances, but both sides evidently want it to happen now.

Denis Dupuis, who was Gene's top deputy, was indicted with him. Dupuis has made a deal with the Feds to testify for the prosecution.

The Haas Automation company has attempted to distance itself from Gene's travail and appears to be going

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operating and servicing Index machines. One piece of new technology showcased was the Index C100, a space-saving turn-mill for production of medium complexity parts from 30-42mm diameter bar stock. "We noticed that 80 percent of the so-called Swiss machines working today are actually making fixed headstock-type parts in the 1-1/4" range," said Olaf Tessarzyk, INDEX Corporation CEO. "Although the Swiss-style machines are built to handle this bar size range, it is a misapplication of the Swiss-style sliding headstock technology," he continued. Index is expecting this machine to fill the gap. Also featured was the MS22 full CNC multi-spindle for turning and milling small work-pieces from bar up to 22mm diameter. With a price tag of less than \$1 million, Index says they have sold 60 of these machines since the 2006 IMTS show.

## Congratulations to UNIST, Inc.

on their 50th anniversary in the lubrication technology business for metalworking, metalforming, and related industries. UNIST specializes in eliminating excess fluid and lubricant usage by improving the processes used to apply them.

Wally Boelkins, his managers and engineering staff continue to pursue growth among traditional stamping and turning operations. The company is a unique mix of family atmosphere and professional image where good people are allowed to do what they do best. At age 74, Boelkins continues as President and sole owner. He remains actively involved in the company's daily business, designing products, improving manufacturing and traveling to customer sites in the U.S. and abroad to maximize system applications – sometimes teaching, always learning.

## The Boston Red Sox paid

**\$51 million just to get the rights to negotiate a \$50 million contract with the young, Japanese, hotshot pitcher Daisuke Matsuzaka, and he's done nicely in his first season with a great team.**

**But the Baltimore Orioles found Jeremy Guthrie for**

**\$20,000 in the conditional free agent draft after everybody passed on him. Guthrie may be the better rookie pitcher this year.**

His story is intriguing. He pitched high school ball in rural Ashland, Oregon, enrolled at Brigham Young University and pitched varsity ball with mediocre results. After freshman year he embarked on a Mormon mission to Spain where he proselytized in newly-learned Spanish for two years. He came back home after not touching a baseball or lifting a weight. He and his dad decided to play some catch, like fathers and sons often do, and Jeremy discovered a pop in his fastball that must have seemed heaven sent. The kid whose best pitch used to top out in the high 80's was now throwing 96 mph, with movement, to Dad.

Jeremy called the baseball coach at Stanford, a perennial college baseball power, and was invited to walk on after being accepted at the prestigious Palo Alto, California school.

After two exceptional seasons pitching for the Cardinal, Guthrie was picked in the first round of the amateur draft by the Cleveland Indians and paid a \$4 million signing bonus.

But then the cruelty of baseball's minor leagues hit him. The hotshot college pitcher couldn't get the hungry kids from the Dominican out, and the Indians finally gave up on him. At 28 years old, Guthrie looked like another washed-out pitcher, but Dave Tremblay, then a Baltimore coach and now the Orioles manager, had seen Jeremy pitch in the Minors and liked his attitude and stuff. This season Guthrie has thrived working with the storied former Atlanta Braves pitching coach, Leo Mazzone, now with the Orioles.

## Robert Kretchman was hawking

his invention at the Hurco Open House on July 27, 2007 in Indianapolis. His one-year-old company NexJen Technologies makes a transparent plastic coolant filtration device that can be easily attached to a machine tool. It's value-added proposition is that it efficiently cleans machine oil in a visible process which can be easily monitored by a machine operator.

Kretchman is a chemical engineer who saw an opening for a product that would illuminate the filtration process in the machining setting. The beauty of his product is in exposing the process as it is happening. It is akin to cooking with a transparent pot. If your chips are infiltrating the

coolant, you will know it almost immediately and you can see if the filter is taking care of the problem.

The inventor, owner, marketer and floor sweeper, Kretchman has just moved to Cleveland from Waltham, Mass., to be closer to family with a 1-year-old baby – his company.

He is struggling with the good problems of growth – should he take a partner, should he sell out, should he have one company make it for him or tool up and make it himself?

A big issue for him is how does he manage the intellectual property. He has patent protection, but he knows the imperfections of that buffer.

Kretchman understands that with a product like his, as clean and elegant as it is, he is in a race to get it into the field before a competitor develops a “me too” incarnation and throws a lot of marketing muscle behind it.

Hurco offers his product as an option on its machining centers. Haas and others have also shown interest.

I think he'll need to develop his brand as an aftermarket option, like high-pressure coolant pump companies have attempted. His product sells for around \$1,300, which he says puts him in the mid-range of such filtration devices.

It is always refreshing to see guys like Robert Kretchman thinking up better mousetraps, and then going at it alone to try to make it into a viable business.

far ranging.

I wanted to give Phil more authority in the cleaning and painting area, but he declined every opportunity to lead. He said he didn't want the pressure. He never wanted to tell people what to do.

Over the years Phil also became our company chauffeur. He picked up clients and sometimes drove them around the city. He had been a Chicago cab driver for many years before he found his way to Graff-Pinkert.

About the time Phil hit 60, three years ago, his health began to falter. The demands of the dirty cleaning area began to be too much for him. My brother Jim and I pondered over what to do about Phil. We were ambivalent about him. He could still fill some nice holes for us in the plant and the office. We moved him into the spare parts business to help Cathy Heller. He picked and packed parts, chauffeured, cleaned up, watered the garden and made coffee.

Jim and I wanted to let him go but couldn't bring ourselves to do it. Phil ultimately relieved us of our problem.

On that Monday when we heard about Phil's suicide, the whole company was in shock. The women cried and talked. The men just talked and walked around dazed.

I called a meeting. In lieu of a funeral we held our own group mourning session. We held it outside in our picnic area and everybody shared remembrances of Phil. We cried a little, laughed a little, spent an hour not doing business – just recalling our Phil, who suddenly ended his life without saying goodbye to us. We all really cared about him. I don't know if he ever knew.

## Phil Piazza worked for



Graff-Pinkert for 13 years. On July 14, he ended his own life. He was 63.

The Graff-Pinkert family heard about it on Monday morning. He left a note that explained nothing. He just said he wanted no funeral.

Phil started as a day laborer in our cleaning department. He was meticulous. He taped the screw machines with persnickety attention to detail before painting. In a dirty job, surrounded by the filth of

40-year-old Acmes and New Britains, Phil brought a piece of perfectionism.

On every work break, Phil removed himself to a quiet spot and read. He read mostly books. His taste was eclectic and



BY JERRY LEVINE

## *Born On A Blue Day*

Across the world, people are suffering from an autism epidemic called Spectrum Disorder, which does not manifest itself with a single set of symptoms, but covers a range of behaviors.

At its worst, victims of spectrum disorder are non-communicative and may be violent to themselves and others. At best are those diagnosed with Aspergers Syndrome, characterized by above average intelligence but limited social skills. The common thread is an inability to relate to others and express feelings. Severely autistic people have limited ability to function independently in the world. Even uniquely skilled “savants” with special gifts are severely socially challenged.

I have an autistic nine-year-old grandson Sam. My daughter and her husband struggle day to day and wonder what the future holds for them. My grandson was recently invited to his first, and to date, only birthday party this year, even though all 17 of his classmates came to his party earlier this year. Sam is oblivious to the snub, but it pains my daughter greatly.

*Born on a Blue Day* by Daniel Tammet is a beautiful story of a very high functioning savant autistic person. He has unique mental abilities, such as remembering his early childhood and relating his fears and difficulties growing up.

He grew up with warm, caring parents and many siblings, but had no relationship with them. He was the first one taunted and the last one picked on the schoolyard, and was almost never asked to someone’s house to play. He recognized that he was different as a child and wanted to be accepted, but was totally unable to do so. Numbers were his friends, and they came in various shapes, sizes and colors.

For Tammet there was hope, but his case is very unusual. As he points out near the end of the book, “It was the strangest thing: the very same abilities that set me apart from my peers as a child and adolescent, isolated me from them, actually helped me connect with other people in adulthood.” *Born on a Blue Day* opens, “I was born on

January 31, 1979 – a Wednesday.” I recently asked Sam what day January 31, 1979 was, and he quickly responded “Wednesday,” the correct answer. This calendarization is one trait Sam shares with Tammet. Tammet relates dates to colors. Sam has no explanation for his ability.

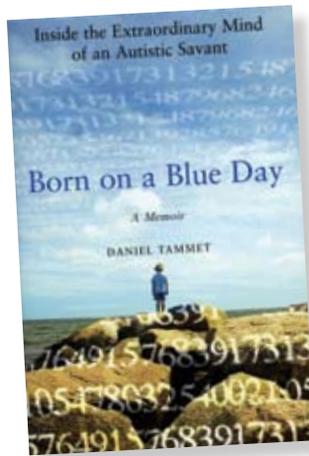
Tammet, who is British, writes of his coming of age and his difficult transition into independent living. After high school he volunteered to teach English in Lithuania and lived for a year on his own. In spite of being a loner, he made a few friends and learned to speak fluent Lithuanian.

After returning to the U.K., Tammet realized his gift for languages and numbers. He gained notoriety by memorizing the first 22,500 digits of Pi and made a public recitation for a charitable fundraiser.

This led to a TV offer from a major U.K. channel to do a one-hour documentary on his life. He met Kim Peek, the inspiration for the movie *Rain Man*, and made an appearance on David Letterman. The TV producers challenged Tammet to learn a new language from scratch in one week in front of their cameras. They chose the extraordinarily complex language Icelandic, and Tammet became fluent and comfortable enough to appear on several interviews on Icelandic TV.

Tammet eventually fell in love, converted to Christianity, and learned to appreciate his love for his family and their love for him. The book closes with the beautiful passage from I Corinthians: “Love is patient, love is kind... Love believes all things, hopes all things, and endures all things. So faith, hope and love abide... but the greatest of these is love.”

Tammet proved that it is possible for an autistic child to become a feeling human being with the ability to love and be loved. His story gives this grandfather hope.



Comments? You can email Jerry at [jerroldlevine@yahoo.com](mailto:jerroldlevine@yahoo.com)

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## Mr. Roboto

Bardons & Oliver has introduced a new automated robot for the unloading process on CNC machines. This robot unloader increases the efficiency of the unloading process. After the part is cut off and discharged, a lifting mechanism singulates and positions the part so that it can be unloaded by the robot arm. The robot utilizes a strong magnet to lift parts and can be programmed to tilt the part to dump any coolant prior to stacking. The robot can then stack the part in a bundle frame or move the part to the next operation. With the ability to swing 180 degrees, the robot can even service two machines by swinging back and forth.

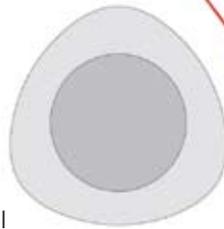
To see a video showing how the robot works, contact Bardons & Oliver at 440-498-5800 or visit [www.bardonsoliver.com](http://www.bardonsoliver.com).

## Capto-Vating

BIG Kaiser Precision Tooling Inc. announces that Speroni has developed Integrated Automatic Mechanical Clamping Capto Spindles for all models of Speroni Tool Presetters. The new system applies a tool clamping force of more than 550 pounds to seat Capto tooling into the tool presetter spindle. The integral spindle design can be specified in Capto sizes C3, C4, C5, C6 or C8. The spindles are completely field retrofittable to existing Speroni tool presetter machines.

Speroni Tool Presetters are available with preventative maintenance programs and service contracts, which includes cleaning, inspection and lubrication, verification of repeatability and zero point calibration, plus performance evaluation and verification of all functions.

For more information about Speroni Tool Presetters, contact BIG Kaiser, at 888-TOOL-or visit [www.bigkaiser.com](http://www.bigkaiser.com) or [www.toolpresetters.com](http://www.toolpresetters.com).



# fresh stuff

## To the Point

Kennametal Inc. has introduced the Split-Point Fiber (SPF) Drill. By offering improved hole quality over the entire length of the tool's life, the SPF Drill is said to help reduce the cost-per-hole by at least 50 percent.

The high cutting forces required to machine layer carbon fiber with expensive polycrystalline diamond (PCD) drills cause the material to delaminate, shortens tool life, and contributes to lower productivity.

The drill has a CVD multi-layer diamond coating. Special point thinning increases centering capability and allows reduced thrust, which improves hole quality. The new SPF Drill is available in 24 different standard diameters, in inches from 0.1719"-0.5010", and metric from 3,20-6,50, with standard lengths equal to 3x and 5x diameter.

For more information, please contact Kennametal Inc. at 800-446-7738 or visit [www.kennametal.com](http://www.kennametal.com).



## Maxis Axes

With seven CNC-controlled axes, the new CHIRON FZ 12K S Swivelhead is equipped with a swivel head, full turning spindle with a 65 mm bar diameter capacity as well as a bar feeder and a workpiece turning unit. By means of synchronous technology, the axes accelerate with up to 1.5 g to a maximum speed of 75 m/min. The motor spindle accelerates up to 24,000 rpm in 1.2 seconds. The chain magazine is available with 24, 48, or 64 tool places. Tool change takes only 0.9 seconds, reducing the chip-to-chip time to 2.4 seconds.

The FZ12K S Swivelhead vertical machining center incorporates a swivel head spindle for single setup machining of complex parts. It has a swiveling range of -10 degrees to +100 degrees and only takes 0.5 seconds to swivel for 0 degrees to 90 degrees.

For more information, please contact Chiron America at 704-587-9526 or visit [www.chironeamerica.com](http://www.chironeamerica.com).



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## It's Electric

Mitsubishi EDM has introduced its newest die-sinking EDM, the EA28V. The EA28V's new three-sided drop tank design provides many benefits, including the fast fill/drain system, which keeps the tank height and fluid levels constant; the new drive system, which makes tank operation easier and quicker; and programmable fluid circulation, which can be used at zero tank height for improved thermal stability during job setup and removal.

A new, easy-access, triple-filter system is now located at the back of the machine. Its configuration allows for each filter to be changed without interruption to the machining process. Two pumps are provided to maintain rapid tank fill and proper work-tank circulation. The EA28V is automation ready – compatible with an external setup procedure using a 3D measuring instrument.

For more information, contact MC Machinery Systems, Inc. at 630-616-5920 or visit [www.mitsubishi-world.com](http://www.mitsubishi-world.com).

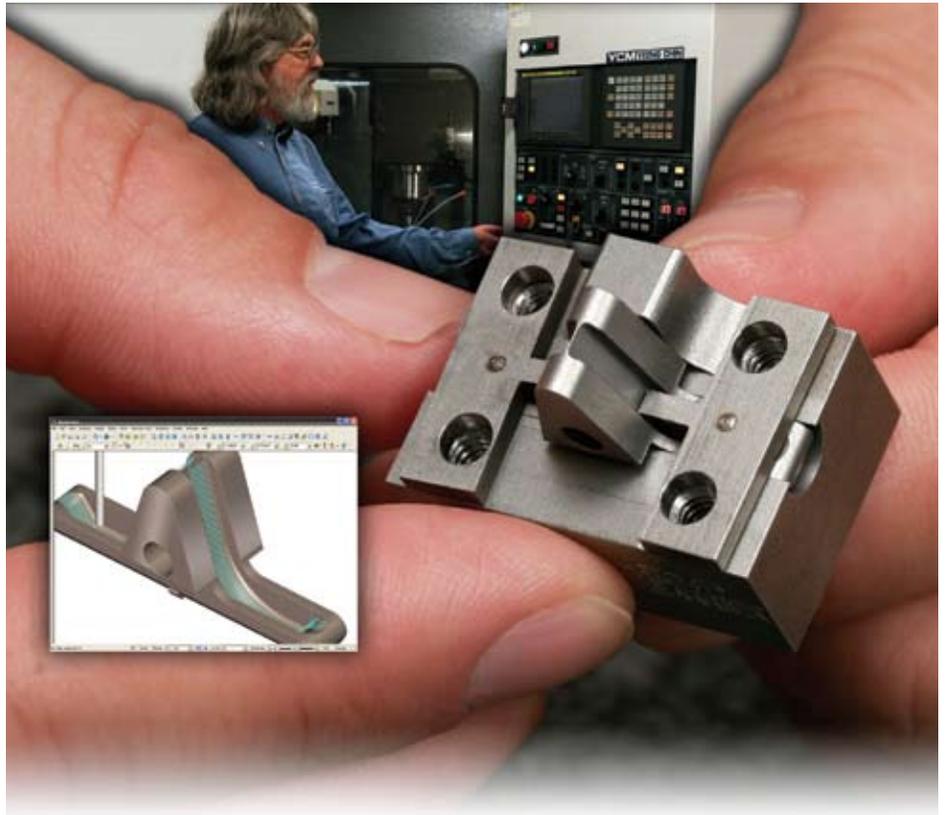
# fresh stuff

## Cut it Out

Morris Welding & Machine designed and developed MorrisKeyseater, a unit that fits onto any manual or CNC mill. MorrisKeyseater can be programmed by any CNC control and follows a CNC path by way of linear bearings. It cuts internal and external keys, splines, tapered keys, internal grooves, blind keys, and helicols. The machine is driven by the mill's spindle, and the base is clamped directly to the mill's table. The machine moves following a pattern using X and Z movements only.

MorrisKeyseater cuts material using live tooling. The tooling is water cooled and does not harden the material. Tooling can be changed in less than 30 seconds with a quick turn of an Allen wrench. The MorrisKeyseater does not require different size spindles for each internal diameter, and keys can be cut without cutting the full length of the part.

For more information, please contact Morris Welding & Machine at 352-748-1875 or visit [www.MorrisKeyseater.com](http://www.MorrisKeyseater.com).



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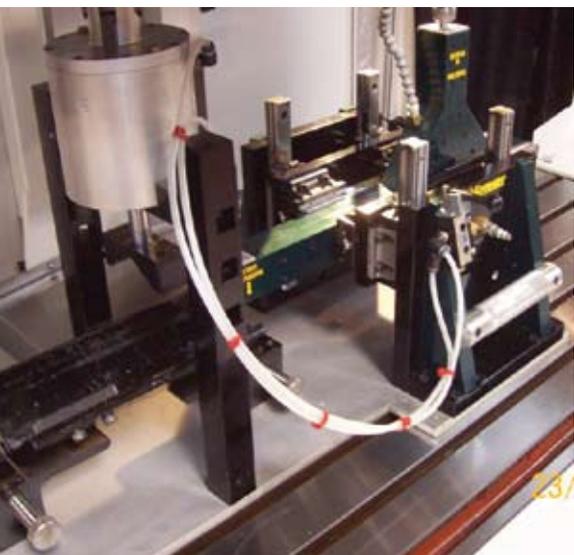


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## Spic 'N Span

A high-frequency ultrasonic cleaning machine with an agitated immersion feature has been introduced by ALMCO, Inc. Two models of the new machine move a load of parts through 60 vertical 4-inch strokes per minute, while ultrasonic energy and surging action of the cleaning fluid removes dirt from cracks and crevices with ultimate efficiency. A third, bench-top model offers ALMCO's ultrasonic technology but not the agitation feature.

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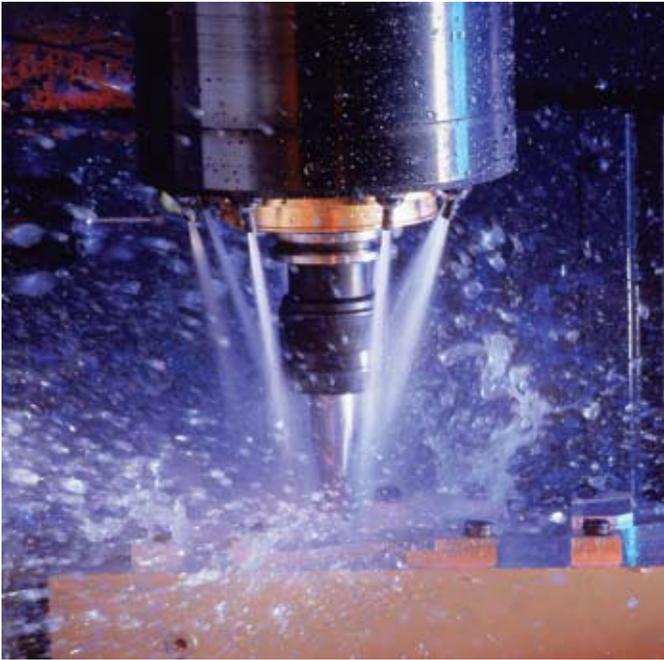
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## Easy Being Green

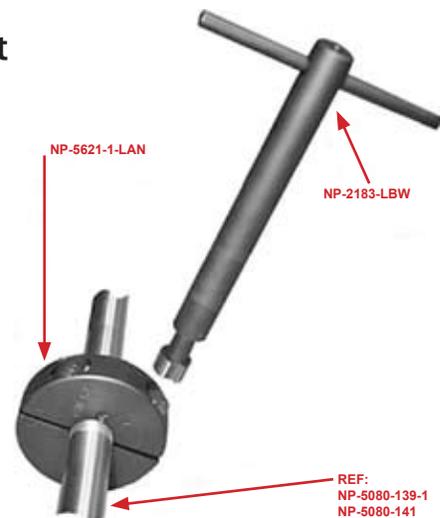
Wallover Oil Company announced a new, chlorine-free micro-emulsion for heavy-duty machining of ferrous and non-ferrous metals. Using the most advanced bio-resistant technology, WS6610 provides a high level of performance in controlling biological growth and eliminating odors. This micro-emulsion chemistry is said to extend sump life and reduce waste disposal and change out costs.

For more information about WS6610, contact Wallover at 800-255-9626 or visit [www.wallovermwf.com](http://www.wallovermwf.com).

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## Mini-G

Ganesh has introduced the CNC Miniturn, a small CNC turning center. The machine comes standard with a 5 inch hydraulic or a 5C Collet chuck, a fast servo-driven 8 station turret, a Fanuc CNC Control, and 4 ID Holders. Options include a C axis, live tools, parts catcher, auto loaders and bar feeder. Price on this machine starts at \$37,995.00.

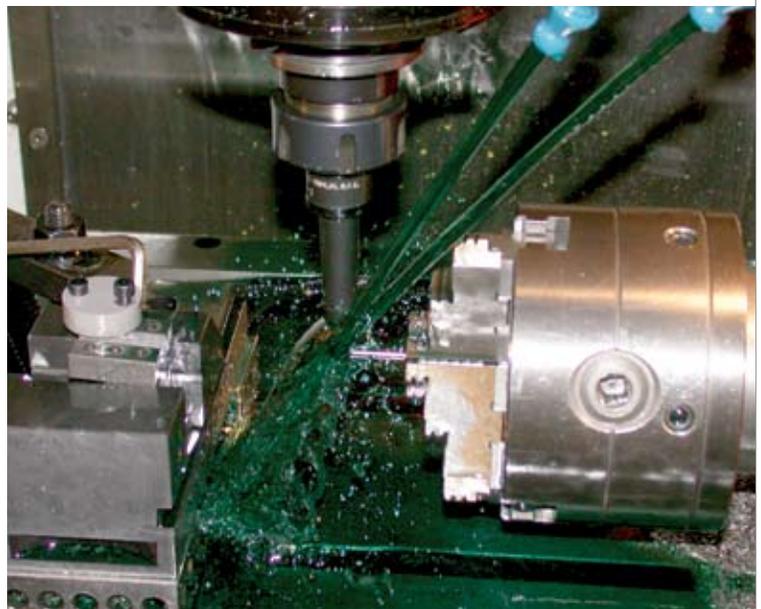
For more information, please contact Ganesh at 888-542-6374 or visit [www.ganeshmachinery.com](http://www.ganeshmachinery.com).

## Blue By You

PICO Chemical Corporation has announced a new technology chlorine-free and blue-colored cutting oil for stainless and titanium alloys. PICOCUT CODE BLUE was developed primarily to meet the growing demand for oils without the environmental, cleaning and corrosion issues often associated with chlorinated paraffins.

PICOCUT CODE BLUE is a formulation said to improve tool life, reduce smoke, be non-foaming, exhibit high oxidation resistance and is able to replace both older technology cutting oils and water soluble fluids. This oil offers improved lubricity, extreme pressure anti-weld performance, and anti-oxidation protection without the need for any tank side additives. It is clear in appearance, low misting, operator-friendly with low odor properties, and formulated for elastomer compatibility.

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Cross Tool(Driven)	4(4)
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BY ROBERT STRAUSS

# The Intersection Of Art &



Connecting mechanics, technology and art

**F**ernando Orellana's father was a civil engineer and Fernando, when he was growing up, liked art. There seemed little to connect them.

"But I saw my father tinkering when he came home, doing this and that. I watched, but with no particular interest," said Orellana. "Then someone connected the dots for me. What my dad was doing was no less art than what I did. The idea is that he was being creative and trying to figure things out. That is art."

What finally dawned on Orellana is what has become an exciting mini-trend in modern art, the connection of mechanics, technology and art, primarily sculpture. Since it is primarily robotics-based, it is called ArtBots, and its advocates are positively evangelical about it.

(Continued on page 34)

Photo above taken at Real Art Ways in Hartford Connecticut 2006



Iona (left) & Neil (right) will be exhibited at the Manchester Craftsman's Guild in Pittsburgh, Pa. October 12, 3007 - January 6th, 2008

# Machining

Photos: A. Retrospectrum by Yoav Bergner and LoVid.  
B. Drawing Machine 3.1415926 v. 2 by Fernando Orellana.  
C. Wildflower Meadow Glacier (autonomous robotic sculpture that plants flowers & monitors local climate change) by James Powderly.



“The definition of robotics is not firm and, frankly, the definition of art isn’t firm either,” said Douglas Irving Repetto, whose day job is as the Director of Research at the Columbia University Computer Music Center, but whose lifeblood is as the guru of the ArtBot movement. He has been the curator of several significant ArtBot exhibitions, the most recent one this summer at the Klein Art Gallery in the University City Science Center, a research facility just off the campuses of the University of Pennsylvania and Drexel University. “It is a diverse and wide open field and full of open questions. The primary one is, ‘What does it mean for a non-human system to be creative?’ Each artist is asking different questions when he or she enters the world of robotics. There is a sense now that there is a lot here, and that we don’t really know the answers yet.”

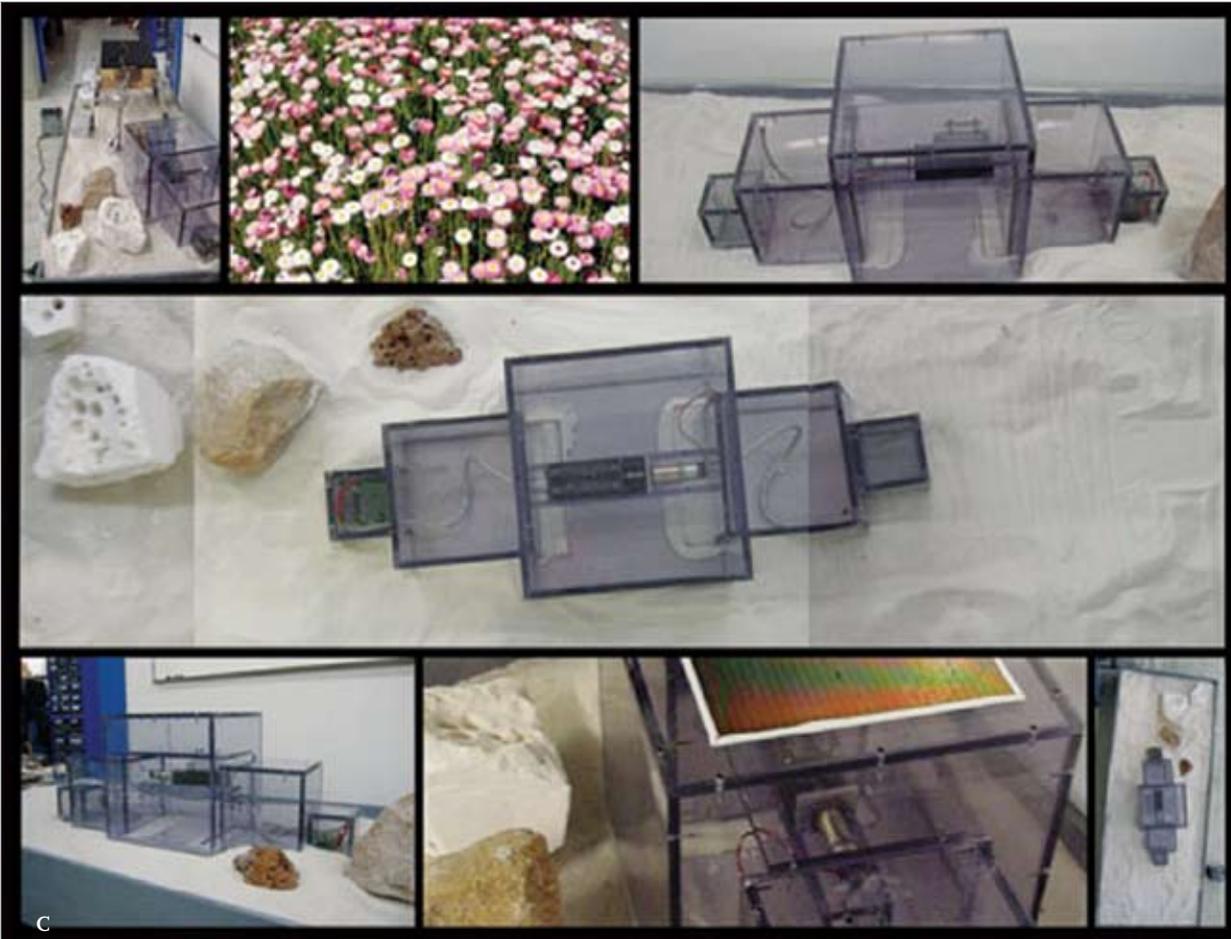
Repetto curated the Klein Art Gallery exhibit, of which Orellana’s “Drawing Machine 2.1415926 v.2” was a part. Orellana, who is 33, has been tinkering, not unlike his civil engineer father, with the idea of a robot that can make its own art ever since he was an undergraduate at the Art Institute of Chicago.

“I enrolled with a painting and drawing focus, but by chance I took a couple of computer classes that related to art,” he said. The Art Institute of Chicago was at the forefront, he said, of the connection of technology to art. During his undergraduate years, Orellana produced what

“The definition of robotics is not firm and, frankly, the definition of art isn’t either.”

he called a “clunky” machine that he could program to make a small amount of randomly produced paintings. Then for his bachelor of fine arts show, he modified it so that certain sounds or movements around the machine would cause it to draw one way or another with its appendages, to which brushes were attached.

He heard about ArtBots in 2002 and got to show the drawing machine to Repetto. Soon, Orellana – almost now more like an agent for his robot than the artist himself – sold four of the drawing machine’s drawings



through Sotheby's ArtLink auction house, which emphasizes emerging modes of art from young artists. The Drawing Machine, under 10 years of age even then, was about as young an artist as there could be.

The Drawing Machine Orellana showed at the Philadelphia show was a more sophisticated version than that of his collegiate days. He is now a professor at Union College in Schenectady, New York, where for the last two years, he has been setting up a new electronic arts program in the computer science department. He is trying to get students to integrate all sorts of electronic and mechanical materials into their art.

He does just that with the Drawing Machine. As it sits ready to draw, the spectators can yell, hum, sing, whisper or otherwise create sounds that will affect the computerized system within the machine, changing its movements randomly.

"Once it does not hear anything interesting," Orellana writes in his description of the piece, "it goes back to automatic drawing, slightly changing its programming by incorporating the data from the last sound it heard." The drawings are usually a bit chaotic, not at all

representational. So it isn't a tree or a scene of bathers or a self-portrait with a damaged ear, but it is art, according to Orellana.

"Each piece it creates is different in that there is no way it can produce the same thing again. It isn't a human being after all," he said. "But they are also the same, like snowflakes. All are alike in that they are essentially the same shape, but different in the micro sense."

Artist Jason Van Anden grew up in an IBM-employee-infested neighborhood in Yorktown Heights, outside of New York City.

"My parents weren't IBMers, but there were so many around there that there was a computer lab in my middle school in 1977," he said. He learned Basic by the time he was in grade school and even though he studied art, "I hung out with bigger computer nerds than I was, so it was natural to incorporate it in my art."

Now, Van Anden said, he lives in what might be the first ArtBot community in the country, near Prospect Park in Brooklyn.

"There is a ragtag group of us here," he said. "It's the do-it-yourself crowd." Van Anden's signature ArtBot



piece is Neil and Iona, two robots in the quasi-R2D2 mode that interact with people viewing them, and with each other. To Van Anden, they are the first step in finding out whether robots can have feelings.

Neil and Iona are about life-sized, though with television-like heads and pear-shaped bodies on a swivel at the base.

“They have a magical kind of feel to them,” said Dan Schimmel, the curator of the Klein Gallery in Philadelphia, where Neil and Iona took up residence during that Gallery’s ArtBot spring show. “They were definitely engaged with each other. They made sounds like the underwater noises during the mating rituals of whales. It was definitely more mysterious than grunting. It was definitely a happy kind of thing.”

Van Anden developed a software system that allows Neil and Iona to act out improvisational phases. There is a Mac Mini in each head with the monitor and an Ethernet connection in the neck that helps control the motion sensors inside each sculpture.

Neil and Iona have animated facial expressions that change when people – or the other sculpture – passes by cameras underneath their chins.

“When they see someone, it changes the weight for the computer system. It causes a radical shift in the behavior [of the sculpture],” Van Anden said. “Each time the robots interact, they pass information between each other and weigh the probability toward the other one. In other words, if one is ‘happy,’ it will get sadder as the

Photo: Misericordiam by Ranjit Bhatnagar. This piece is a floating robot accordion that makes sound and movement at will.

other one gets happier, until they reach parity.”

With all this going on, Neil and Iona appear, with gallery-goers around them, to be living creatures, according to Van Anden, “living puppets capable of pulling their own strings.”

The Klein Gallery show also had a young student component. Schimmel discovered that schools in both the city and suburbs of Philadelphia were interested in enhancing their technology programs with an artistic component. One school had a robot that worked under water. It floated around a 100-gallon tub and with its underwater camera, visitors could see what it was looking at through a monitor attached above the surface.

“Another had a robot that you could fasten a brush to, with a remote control like with toy cars,” said Schimmel. “It was engineered to dip into different colors of paint and then swivel around to paint a picture. It was crude, but it was art.

“ArtBots, in this way, can excite kids not only about art, but about the practical applications of robotics and engineering,” he said. “What seems like diametrically opposed things are actually quite complementary.”

Van Anden and Orellana are already on to their next projects. Orellana is looking for ways to anthropomorphize inanimate objects. For a show in Saratoga Springs, New York, he embedded four robots in the ceiling of an elevator. Each time a person got in the elevator, the robots became curious, and that caused the dynamics of the elevator, and the people in it, to change. He embedded a couch with a robot in a living room in another piece.

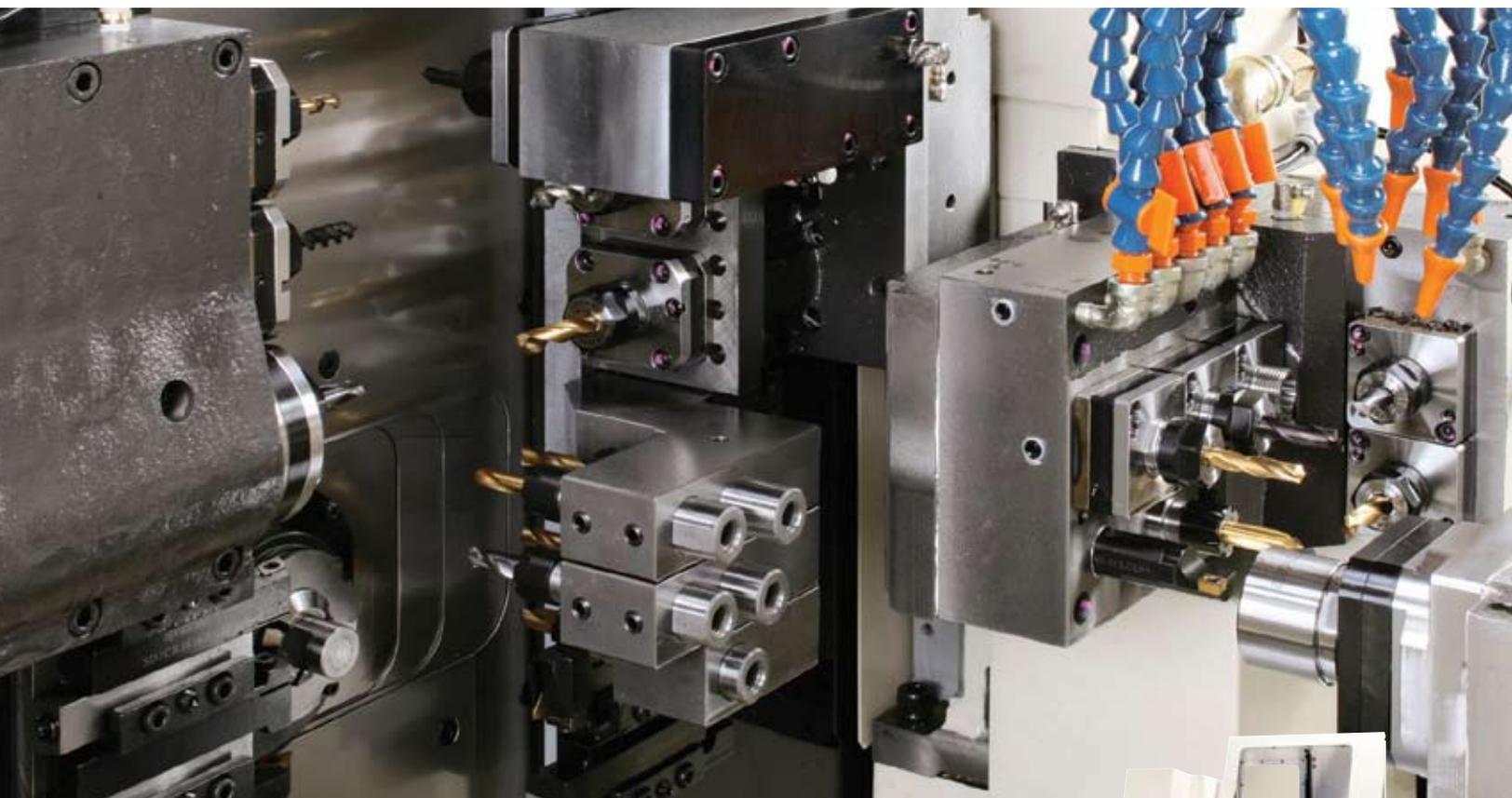
“Pun intended, the room then became living – alive. I wanted to see what it would be like if a couch was sentient,” he said.

For Van Anden, his own future work may not look exactly robotic, but it will definitely be of the ArtBot genre.

“It is about the motion and the gesture, that is what ArtBots is about,” he said. “As a film is to a painting, a robot – an ArtBot – is to a painting.”



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1-3/4" 8-spindle, 1970  
2-1/4" 6-spindle, 1962, 1973-79 (3)  
3-1/4" 6-spindle, 1982  
5-5/8" 6-spindle, 1979  
6-5/8" 6-spindle, 1979

## ACMES

1-1/4" RA6, , 1994, thdg., pickoff  
1-5/8" RBN8 - 1994 (2)  
1-5/8" RBN8 '81 (2)  
1-5/8" RB8, 1980, rebuilt 1996. pickoff  
2" RB6, 1979, Direct Drive Rebuild (2)  
2" RB6 collet chucker, 1980  
2-5/8" RB6- pickoff4" RB6, 1975

## GILDEMEISTER

GM-16 AC '97-2000 (4) w/lemca  
GM-20, 1993

## INDEX

42 mm ABC Index 1997 (3)

## INDEX CNC MACHINES

Index 42mm ABC, '97 (3)  
Index GFG, 1987 (3)

## SCHUTTE

SF 51, 1979  
SF 67, 1973

## SWISS-CNC SLIDING HEADSTOCK

Citizen M-20, 1996 (2)  
Citizen L-32, 1999

## NEW BRITAIN

Model 62 2-1/4" 6sp., 1975, heavy thdg.  
Model 62 2-1/4" 1967

## DAVENPORT

3/4 Davenport, 2006  
3/4" thdg., pickoff, longbed (4)  
3/4" chucker, 1991 (4) Tamer  
3/4" with Tamer & Logan clutches,  
'91, long bed  
3/4" thdg., pickup, 1977-66 (8)

## MISCELLANEOUS

Goss DeLeeuw 7-spindle, 1-2-3  
Davenport slotting, 1950

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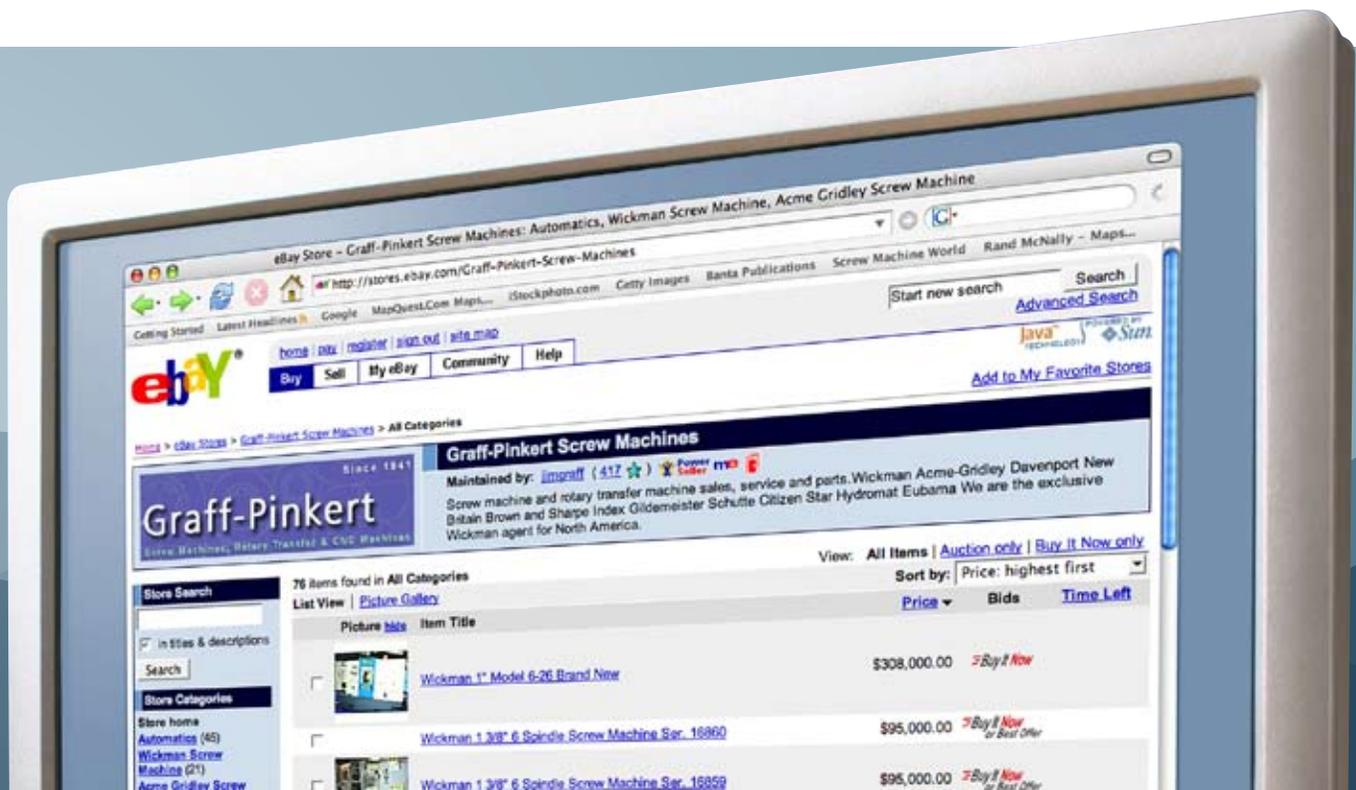
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# Bringing Heat Treat



heat treating

## In House

BY CHAD WALDO

## One company's induction into the world of heat treating

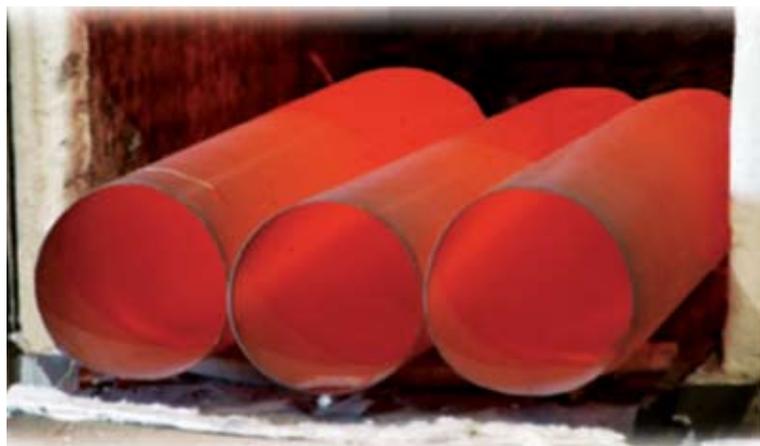
**T**he story is almost a cliché these days; the customer needs parts yesterday and you have a week's worth of production left.

It was a typical Monday morning when we got the call from the Norfolk Naval shipyard. There was a container ship leaving 10 days from Monday, and our parts needed to be on that ship. Production was still in process and would be finished Thursday afternoon. With that in mind, we told the procurement officer that there shouldn't be a problem and hung up the phone. But upon checking the parts list for that order, we quickly discovered that there were two parts which required heat treating. It wasn't until we called our outside heat treating service

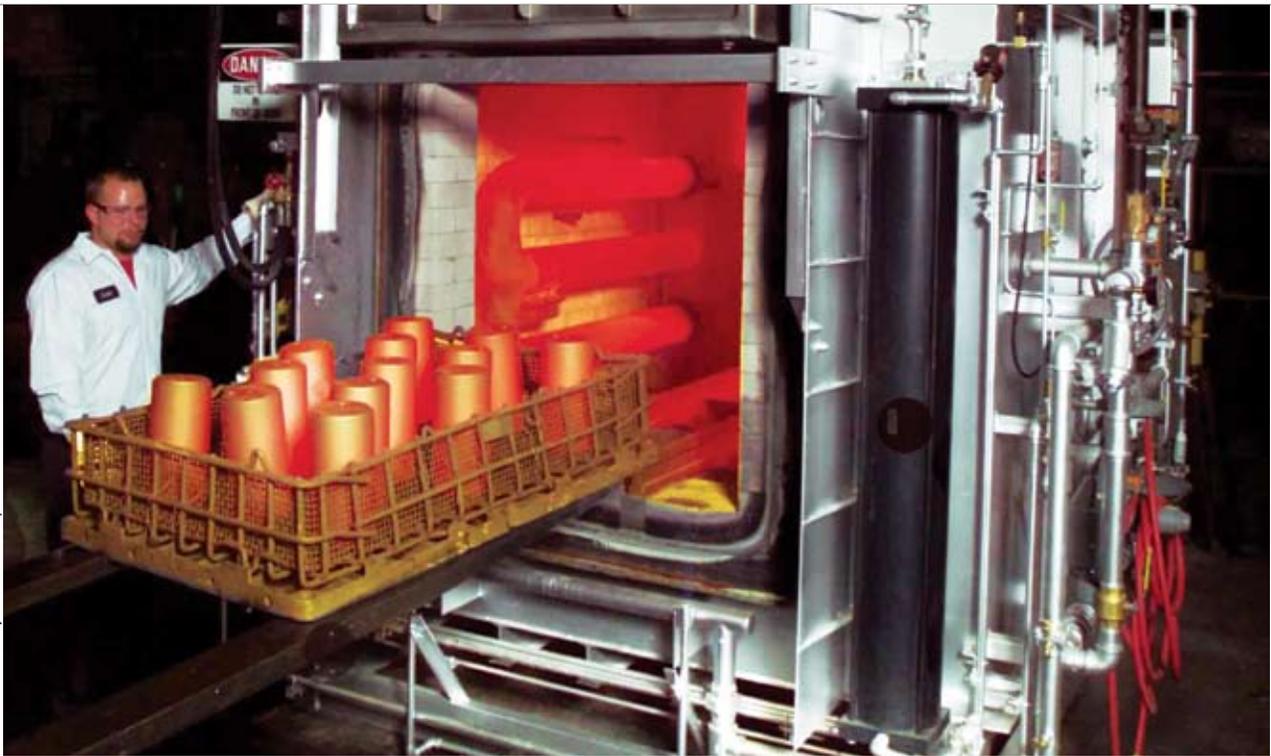
company that we realized we had a big problem. Their current backlog was one week. There was no way to make the boat unless the parts were completed and out by Tuesday. We were at least two days short of time.

One constant truth about manufacturing I have found is that you always have options. Ours were to either ship the parts late and lose the contract, speed up the manufacturing process or heat treat the parts in house. With a limited window of only a few hours to make this decision, we dissected the choices, one at a time. Option one was out of the question; we simply could not afford to lose the contract. We quickly discovered that speeding up manufacturing wasn't possible without shutting down

Left Photo Courtesy of Ferris State University, Photo Below (left) Courtesy of Paulo, Inc., Photo Below (right) Courtesy of S & T International



heat treating



several other jobs that were just as hot. In the end, the only option that made sense was heat treating the components in-house quickly.

We already had some of the equipment in place to make heat treating feasible, but we had no idea if it would work right. For our socket production line, we had installed a furnace next one of our punch presses. This setup was used to heat blanks up to 1800 degrees Fahrenheit. There was a large hood over the furnace to pull out heat and gas. We had access to several air lines, and one gas line could be tapped into if needed. With that layout in mind, we had the rest of the afternoon to figure out the best method to finish the parts in-house.

We referenced the every handy Earle M. Jorgensen steel catalog and looked up the heat treating specifications for 1045 CR steel. There were two methods we could use. We could heat it to 1575 degrees Fahrenheit and water quench it, or heat it to 1625 degrees Fahrenheit and oil quench it. We fetched a five-gallon steel pail of water before our furnace was up to 1575 degrees. We stuck a few scrap pieces of 1045 CR into the furnace and waited for it heat up. Once the parts were the same color as the inside of the oven, we pulled them out one at a time with a long pair of tongs. The operator plunged them into the water as fast as possible, to lessen the exposure to the air.

Our testing indicated that the hardness was 49 to 50 Rockwell on all of the parts. The next step was to temper

**“In the end, the only option was heat-treating the components in house.”**

the parts and get the Rockwell back down around 38 to 40. We had a large oven that was used to process plastisol parts after dipping and was capable of reaching 800 degrees Fahrenheit. After checking again with the Jorgensen book, we found that 1045 should never be tempered below 750 degrees, but there was no reference as to how long you should leave the parts at that temperature. After an hour of tempering we decided to pull out the parts and check their hardness. We thought we had everything solved all in that one afternoon; the parts were at 41 Rockwell. The inspector stood behind me examining one of the pieces I had just hardness-tested and she found a crack in the part. After looking at them all carefully under magnification we discovered they were all cracked. Although the crack was tiny, it was quite a buzz kill. No crash is minor. Quenching with water failed, so we had to find another method.

Our second option was to search for quenching oils. We called a company called Heatbath Corporation that offered several types of quenchant. After they got over their shock about our attempts to quench with water,



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Photo: Aberfoyle Metal Treaters courtesy of spinlab.ca

“Even with our process being manually intensive, we finished ahead of schedule.”

they suggested AAA quench oil. We ordered a 55 gallon drum, which shipped out the following day. They explained to us why the water method did not work. It was simply too fast. The AAA oil slowed the cooling rate down enough to keep the part from cracking, yet still allowed it to be hardened. Heatbath’s technician was not alarmed by bringing the parts into the open air prior to submerging the parts in the quenching oil. Unfortunately, this process would leave the parts with an oily coating, which was not what we wanted. We would need to clean the oil off the parts before they entered the tempering process.

The AAA oil arrived on Thursday and we moved quickly. Instead of putting oil into another five-gallon bucket, we just cut the top off the barrel and stuck it next to the furnace. There were several ways we could have approached the next step in the process, but we got ahead of ourselves and just started heat treating the actual parts. Six pieces were sent to inspection and the results were a disappointment. None of the parts had the same

hardness. We had to stop production immediately. Another round of talks with Heatbath enabled us to discover that our problem was lack of uniformity of the bath. We would need to agitate the bath and keep the oil temperature consistent. They sent us a quick sketch illustrating the best approach for our setup. We needed to run steel airlines down the sides of the drum and along the bottom, drilling holes in one side of the pipe to bubble air towards the center of the bath.

We started putting the airlines together and welding pipe on Friday morning. The agitation worked well and the parts were coming out at around 42 Rockwell. The cleaning phase of our process was carried out by using an aggressive chemical in a tumbling operation. Once clean, the components were moved to the tempering process. Inspection readied a series of tests for our first batch and found that the hardness was dropping too low after tempering. Talking to our local heat treater led us to the conclusion that tempering will not always lower the hardness of the part, and in fact, it is not intended to lower it more than a few points. Our times for baking would have to be judged one part at a time until we understood how our items would be affected. But by the end of the day, we had built a set of racks that would allow us to temper all of the parts in one large load. We had cracked the heat treat code for at least one group of pieces.

By becoming in-house heat treaters, we discovered several benefits. The most important was lead time. Even with our process being extremely manually intensive, we were beginning to finish our production runs ahead of schedule. When we added up our time and labor for taking the parts to an outside service for heat treating, we realized how much time and money was being wasted. Our costs went from .40 to .50 cents per pound down to .05 and .10 cents per pound. We also developed the ability to maintain more consistent part hardness with in process inspection.

Heat treating is not for everyone. It’s smelly, dirty and extremely hot. But the parts were finished and shipped out by Monday morning, one day early. There is nothing more satisfying for a man than to actually fix something or make it better. We improvised our way through a real mess, and I learned a valuable new skill.



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A continuing column in which we ask smart people to discuss their views on topics related to the future of manufacturing

next

BY NOAH GRAFF

## In 10 years will defined benefit plans be extinct?

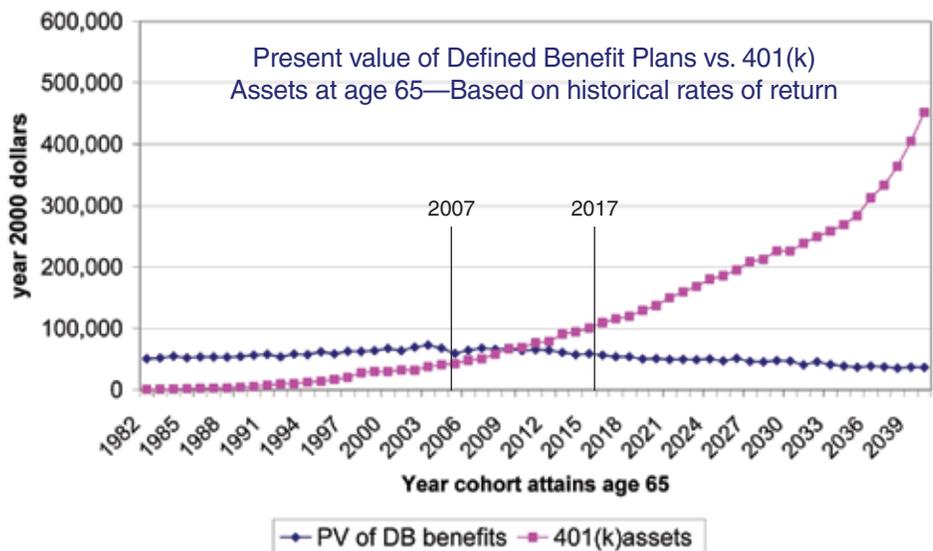
*In recent years, traditional pension plans, officially classified as “defined benefit plans,” are rapidly being replaced by 401(k) plans.*

I definitely believe that the old defined benefit plans will be much less prevalent. Employers are looking both to reduce cost and have employees take more ownership in providing for their own retirement. The traditional pension plan is being replaced with 401(k) plans that provide an incentive matching contribution to encourage the employees to save for the future. Some employers will provide both a match and a profit sharing feature in their plans. With the passage of the Pension Protection Act in 2006, and guidance from the Department of Labor, we will see more and more plans also adding automatic enrollment and automatic increase features to improve savings rates.

Howard A. Simon, CPA  
Howard Simon & Associates, Inc.

Defined benefit plans will not be extinct in 10 years, but there will be a smaller portion of manufacturing jobs covered by these plans. The costs per UAW employee is some \$30,000 higher than the costs for competitors, with much of these additional costs associated with generous retirement income and medical benefits. I anticipate that high-cost U.S. manufacturers will continue to lose jobs to lower-cost manufacturers employing American workers making so-called “foreign cars.” In contrast, I anticipate that the most profitable firms such as Exxon Mobil that have costs under control will maintain their defined benefit plans. Defined benefit plans tend to be eliminated during tough economic times.

Dr. William Reichenstein, CFA  
Baylor University



National Bureau of Economic Research (NBER) 2006  
[http://econ-www.mit.edu/faculty/download\\_pdf.php?id=1455](http://econ-www.mit.edu/faculty/download_pdf.php?id=1455)

next

## the facts:

While it is unlikely that defined benefit plans as we know them will be completely extinct, I believe their impact on the lives of retirees will certainly diminish. It is less that this old-style pension plan is necessarily bad, but rather that the already popular defined contribution vehicle has managed to steal a couple of the defined benefit plan's best features!

It is probably by design that certain aspects of the Pension Protection Act, when fully implemented, orient participant behavior in a manner that almost mirrors a defined benefit plan's intended outcome. The use of auto-enrollment, auto-escalation and target date funds creates a fully functioning retirement plan for employees without their conscious decision (or approval) and if left undisturbed should serve them very well as they get older.

Paul D. Murray, Financial Advisor  
Morgan Stanley

### The Pension Protection Act:

Passed by Congress in 2006, to grant safe harbor to employers (protecting them from lawsuits) who encourage their employees to adopt 401(k) plans. **Two of the most important issues of the act are the policies of "auto-enrollment" and providing the investment option of "life cycle funds."** An auto-enrollment policy means that when employees are hired, they are automatically enrolled in 401(k) plans. They still have the right to opt out of the 401(k) plan if they desire, but the policy generally causes more people to adopt 401(k) plans. "Life cycle funds" provided by the employer give employees more choices of investment portfolios than the conservative investment plans traditionally advised by employers. U.S. Department of Labor

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"Corporate America, which boasted more than 112,000 pension plans in 1985, has since terminated about 80,000 of them. As a result, the share of working Americans earning a pension has dropped from more than 35 percent in 1980 to less than 20 percent today." U.S. News and World Report, Jan.16, 2005 <http://www.usnews.com/usnews/biztech/articles/050124/24pension.htm>

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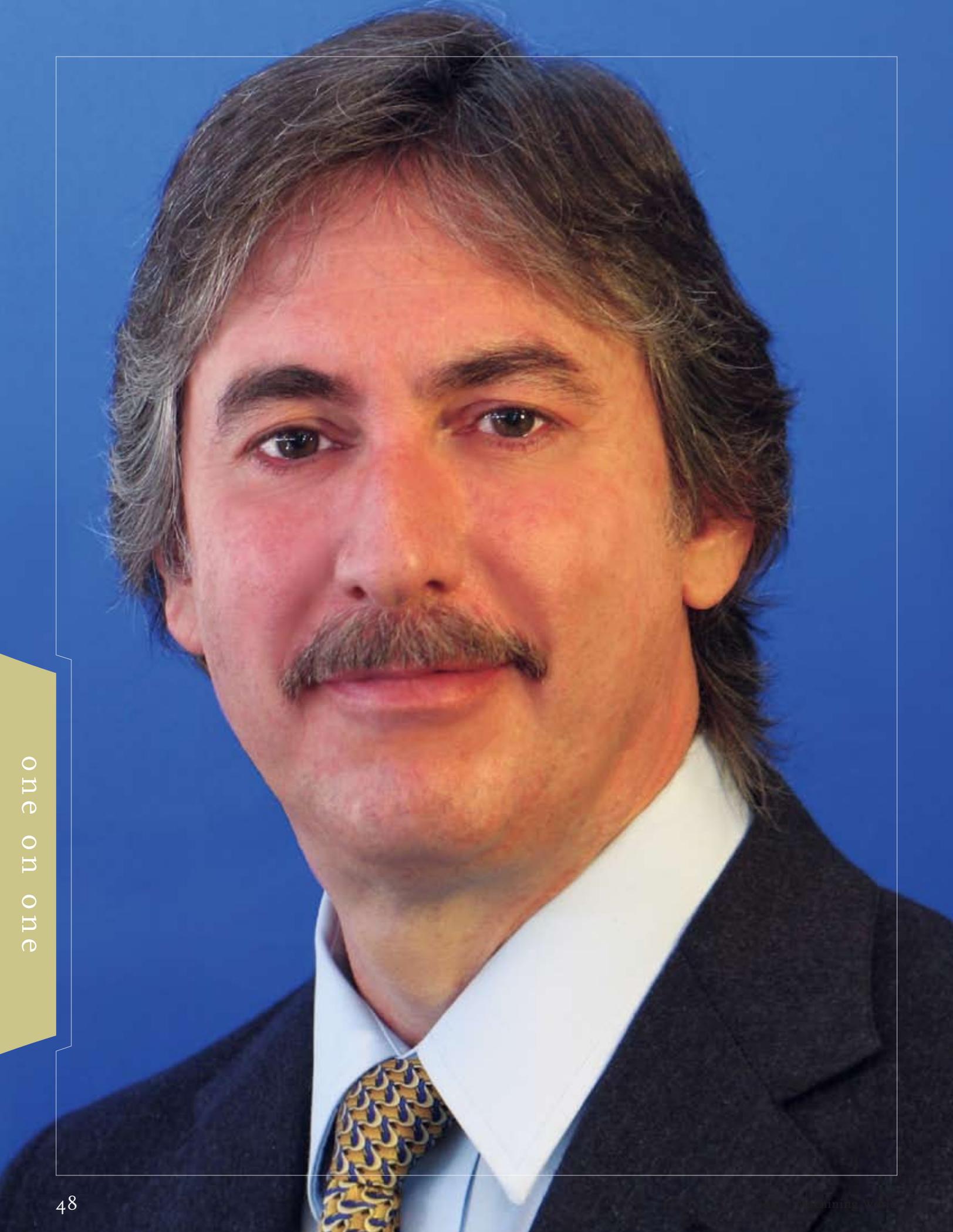
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one on one

**Daniel Rosen** ran for representative in the Second Congressional District in Nevada in 2006 on a platform to implement Direct Democracy via Internet voting. He pledged to the citizens of his district that if he were elected, his constituents could directly vote on how he should cast his vote on bills in Congress. Although Rosen received only two percent of the popular vote, his present goal is to have a congressional candidate run on the direct democracy platform in every state in the next two to four years.

**NG:** Explain your agenda when you ran for Congress, and what you're trying to do now.

**DR:** My agenda is to eliminate corruption in the political process by applying the technology that we have at our disposal today, so that citizens are given actual and direct control over their representatives in government.

**NG:** Is there a precedent for direct democracy in other societies?

**DR:** Many New England towns have operated according to the principles of direct democracy since colonial days and still do. Of course, they have always been bound and limited by the technology available, so they could only do it in small towns.

**NG:** How does the average Nevada citizen understand complicated bills? I would think congressmen don't even understand some of them.

**DR:** When you say even Congress doesn't understand it, I think that's the central point. They don't understand it any better than citizens. We expect our representatives today to study the issues, inform themselves and make proper judgment. In a direct democracy, I would expect the citizens to inform themselves and make proper judgment – and I trust people to do that. But in our present day situation, the reality is that our representatives vote in Congress as they are told to vote by lobbyists. As the representative, I would organize a team of experts, including legal experts who could advise my constituents exactly what the legal language a bill provides. So there's no confusion about what the arcane language of legislation really means.

**NG:** How would you prevent fraud and hackers with Internet voting?

**DR:** All of the study of security in electronic voting and all of

the fears that are associated with it relate to the system that we currently have for electronic voting in which people vote one day a year or one day every two years. Our voting would be continuous 24 hours a day, seven days a week, and most legislation is pending in Congress sometimes for years at a time; if the system is hacked, we can then restore the totals to the day before. We can make sure it cannot be hacked in that way again, then inform anybody who voted on that particular day that their vote was lost, and they'd have to vote again.

**NG:** When you ran for Congress, did you think you could win?

**DR:** Running as an independent, I had to do a petition drive. So I went out on the street with a few other supporters and gathered signatures, and I discovered, to my surprise and amazement, that seven or eight out of 10 people said, "What a great idea." So I began to think at that point, maybe I can win. And I ran the whole the year, the entire campaign, intending to win. I think I would've won if I had had enough money just to inform sufficient numbers of voters about this option.

**NG:** What did you do before politics?

**DR:** I was a musician. I play violin and viola, and I compose music.

**NG:** Do you see any similarities between direct democracy and reality shows like *American Idol* where viewers get to directly vote for their favorite contestant?

**DR:** Until you mentioned it, I hadn't thought about in that way, but I do agree. It's the same idea – that our judgments are just as good as the next guy's. The real question is this: Do we want experts deciding, or do we want to make our own judgment?

# how it works

BY BARBARA DONOHUE



Photo: Parts before sintering (back) and after sintering (front).

Photo courtesy of PCC Advanced

Can manufacturing complex metal parts in high volume really be as easy as filling a mold? Read on.

# Metal injection molding

how it works

To make a complex part in metal, you can cast it, or machine it — or injection mold it. Injection mold it? Yes. Injection molding by mixing metal powder with plastic, molding it and then removing the plastic and sintering the part.

The process is called metal injection molding (MIM), or sometimes powder injection molding (PIM), and it can produce intricate parts in a wide range of metals, including steel, stainless steel, and even high-temperature alloys. MIM has been around for decades, but only in the last twenty years has found widespread commercial application.

Industries that now use MIM parts include aerospace, medical, electronics, firearms and consumer products.

You may be familiar with powdered metal, or PM, parts, especially as bearings, bushings and small gears. PM parts are formed of metal powder compressed in a die and then sintered. There are several related processes that also use metal particles. MIM uses much finer powder than PM, and a completely different manufacturing process.

The worldwide market for custom MIM parts is more than \$500 million, according to James Dale, vice president of member and industry relations, Metal Powder Industries Federation (MPIF), Princeton, N.J. This does not include parts companies manufacture for their own in-house use.

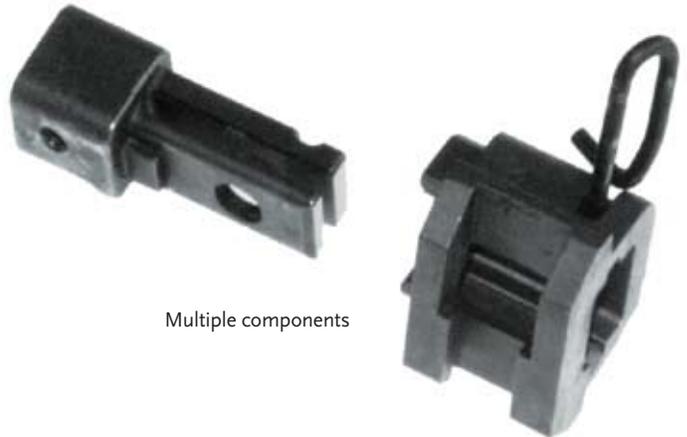
Since MIM can be used to fabricate complex parts economically in structural metals, it can provide significant cost savings to the savvy manufacturer. MIM can reduce part cost in many cases. MIM can also make it possible to replace an assembly of two or more parts with a single MIM part, eliminating the cost of assembling those parts.

### From powder to part

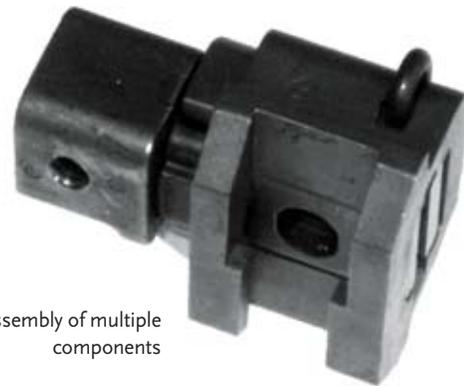
MIM metal powder is very fine, with particles 20 microns (about 0.0008") in size or smaller. "It feels like talcum powder," said David Smith, senior sales manager at PCC Advanced Forming Technology (AFT), Longmont, Colo. These very fine powders are made by a number of processes, including atomizing molten metal with a high-velocity stream of gas.

The MIM process starts with mixing the feedstock, a combination of metal powder and binder. The binder is a mixture of materials such as plastic and wax materials that melt and hold the metal particles in suspension while the stock flows into the mold cavities. A typical feedstock might be 60 percent metal powder and 40 percent binder by volume.

The feedstock is heated and forced into the mold cavities. The parts are removed from the mold. The newly molded parts are the shape of the final part, but larger. At this stage they are called "green" parts.



Multiple components



Assembly of multiple components



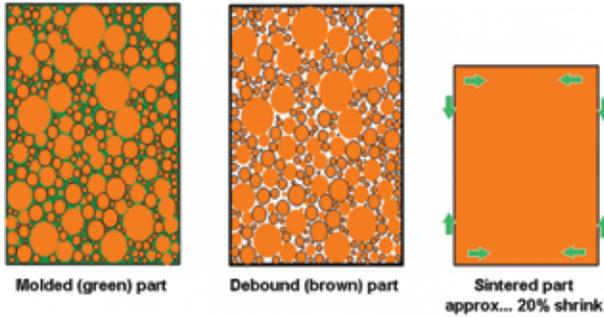
Single MIM component

Photos Above: Blade clamp for a power tool: Replacing a multiple-component assembly with a metal injection molded part. Photo courtesy of Kinetics Inc.

# how it works



Photo Above: Reciprocating saw that uses the blade clamp. Photo courtesy of Kinetics Inc.



Photos Above: Molded (green) part, debound (brown) part and sintered part. Note part shrinkage of approximately 20 percent during sintering. Illustration courtesy of PCC Advanced Forming Technology.

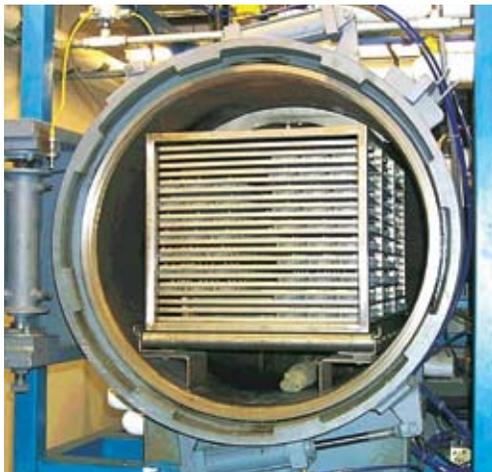


Photo: Debinding furnace. Photo courtesy of PCC Advanced Forming Technology.

The next step is called first stage debinding. This removes most, but not all, of the binder from the part. Debinding can be done with heat (thermally) or by a chemical process, either with solvents or with chemicals that react with the binder.

After first stage debinding, a small amount of binder remains to help the part hold its shape. The part is now a “brown” part and is about 40 percent porous.

Finally, the parts are set on ceramic trays, supported by fixtures if necessary, and placed in a furnace to remove the last of the binder and sinter the parts. Sintering may be done in a vacuum or in a hydrogen or other gaseous atmosphere, depending on the requirements of the metals. For example, metals that form oxide on the surface of the particles might be sintered in a hydrogen atmosphere to remove the oxide layer.

In the sintering furnace, the temperature rises until the remaining binder is gone and the metal particles approach 90 percent of their melting temperature, at which point they join together. After sintering, most MIM parts end up at 95 to 98 percent of full density; they contain 2 to 5 percent of equally dispersed voids (pores). They have a smooth surface finish, typically around 32 RMS (root mean square roughness).

MIM parts are often used as-sintered, but machining, heat treating, plating and other processes can be applied to the sintered part. Parts that distort during sintering can be coined or otherwise straightened afterward. In special applications where 100 percent density is required, a hot isostatic pressing (HIP) process is used.

## Economical for small, complex parts in high volumes

Since MIM parts are made in precision injection molds, similar to those used with plastic, the tooling can be quite expensive. A MIM mold will cost about 20 percent more than an equivalent plastic mold, according to Tim McCabe, technology development manager, Kinetics Inc., Wilsonville, Ore. The MIM molds need to fit together more tightly because of the properties of the binder compounds. Also, said McCabe, in general, part tolerances tend to be tighter for MIM parts. The cost of making injection molds varies tremendously and depends on many factors, but tens of thousands of dollars would not be unusual for a multiple-cavity mold for small precision parts.

To make MIM economical, a company would need to amortize the tooling cost over all the parts made. So MIM is usually used only for higher-volume parts. At his company, “low volume” is less than 10,000,” said McCabe, and typical quantities can run to



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# how it works



Photo: Sintering furnace.

Photo courtesy of PCC Advanced Forming Technology.

the hundreds of thousands, or even millions.

The MIM process works best with smaller parts. Some typical maximum sizes listed by different MIM shops are 100 to 200 grams (3.5 to 7 ounces), with a recommended size of 50 grams or less. One MIM manufacturer mentions its “rule of thumb” on its web site: you can make MIM parts about the size of your thumb.

The mold is designed over-sized to allow for the expected shrinkage of the part. Tolerances on completed parts normally run in the 0.003”/inch range, with closer tolerances possible. On longer parts, feature-to-feature tolerances can be challenging. In this case, “you could mold in one hole and drill the other one,” said McCabe.

MIM’s niche in the manufacturing world is small, complicated, high volume parts. Some parts may not be economically viable without MIM. “MIM does not compete with pure manufacturing,” said Smith. If a customer needs a part that could be a “straight screw machine part, a stamping, or a powdered metal part, we’re not going to compete.”

## Material mystery

The mechanical properties of MIM materials can be close to those of wrought materials on ultimate tensile strength. The small amount of porosity remaining in completed MIM parts may impair dynamic properties such as impact and fatigue strength, as compared with forged or wrought parts of the same alloy. However, the overall uniformity and fine microstructure of the material can make for improved or more consistent properties.

“One advantage that MIM material has versus forged

## For more information:

### Contributors to this article:

**Kinetics Inc.:** [www.kinetics.com](http://www.kinetics.com)

**Metal Powder Industries Federation (MPIF):** [www.mpif.org](http://www.mpif.org)

**PCC Advanced Forming Technology:** [www.pcc-aft.com](http://www.pcc-aft.com)

**Remington Arms Company, Powder Metal Products Division:**  
[www.remingtonpmpd.com](http://www.remingtonpmpd.com)

### Design guides:

[www.kinetics.com/guide/](http://www.kinetics.com/guide/)

[www.remingtonpmpd.com/design/design\\_man.asp](http://www.remingtonpmpd.com/design/design_man.asp)

[www.parmatech.com/parmatech/downloads.html](http://www.parmatech.com/parmatech/downloads.html)

[www.epma.com/about\\_pm/web\\_pages/nma\\_mim\\_design.htm](http://www.epma.com/about_pm/web_pages/nma_mim_design.htm)

### Examples of MIM parts:

[www.pickpm.com](http://www.pickpm.com), click on “Award-Winning Parts Gallery”

<http://www.ssisintered.com/mim.htm>, click on “More Case Studies”  
(in box showing MIM part)

[http://www.mpif.org/DesignCenter/case\\_study.asp?linkid=65](http://www.mpif.org/DesignCenter/case_study.asp?linkid=65),  
some of these are MIM parts

<http://www.mpif.org/DesignCenter/awardparts.asp?linkid=66>,  
search all years, all segments; some MIM parts shown

### Materials:

**Global PM Property Database:** [www.pmdatabase.com](http://www.pmdatabase.com)

**Materials and properties:** <http://www.kinetics.com/materials/>

**Materials and their characteristics:** [http://www.parmatech.com/parmatech/metalinj\\_materials.html](http://www.parmatech.com/parmatech/metalinj_materials.html)

### Other injection molding processes:

#### Ceramic injection molding:

[www.morganadvancedceramics.com](http://www.morganadvancedceramics.com)

[www.smallprecisiontools.com/index.cfm?parents\\_id=438](http://www.smallprecisiontools.com/index.cfm?parents_id=438)

<http://www.azom.com/Details.asp?ArticleID=3618>

Magnesium injection molding:

[www.phillipsplastics.com](http://www.phillipsplastics.com)

<http://www.pcc-aft.com/thixo.htm>



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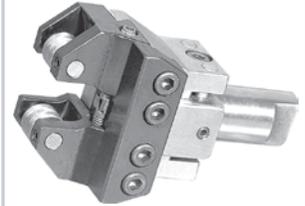
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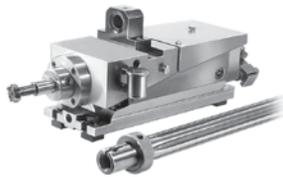
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# how it works

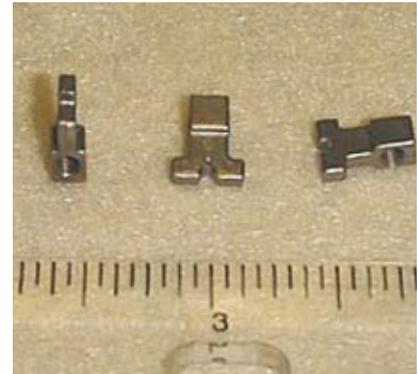
Remington-fire control components



Remington-M-700 trigger



Remington-M-597 front sight



Remington-M-597 aperture

Photos Above: MIM parts used on firearms triggers, trigger guard, front sight.  
All photos on this page courtesy of Remington Arms Company.

material is the lack of texture or directionality of properties,” said Maryann Wright, engineering supervisor at the Powder Metal Products Division of Remington Arms Company, Ilion, NY in an e-mail interview. For wrought metals, the mechanical properties in the direction of rolling can be different from the same properties in the transverse direction. MIM parts are usually quite uniform in all directions.

MIM can also have performance advantages over cast metals, which may have larger, irregular pores and a non-uniform chemical composition due to the melting/solidification process.

“Because pre-alloyed, fine powders are used in MIM, diffusion distances tend to be small, and the microstructure has a uniform distribution of elements,” Wright said.

## Learning to MIM

Most of the design guidelines for MIM parts are the same as for injection-molded plastic parts. The same recommendations apply for uniform wall thicknesses and ribs for strengthening. For MIM parts, you also need to think about how the part will behave during sintering, and include design features to prevent sagging or other deformation. Special fixturing can support the part during sintering, or the part can be straightened afterward, but ideally it should support itself and not deform in the sintering furnace.

Material selection offers its own challenges. When working with a MIM house, you should specify the mechanical properties the part needs to have, and let your MIM supplier

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S/U time [hr]	8	8
Parts per S/U	200,000	200,000
Cycle time [seconds]	6	6.00
#parts/year	800,000	800,000
<b>Cost/part</b>	<b>\$0.18240</b>	<b>\$0.18240</b>
Selling Price / part	\$0.26050	\$0.26050
<b>Total cost</b>	<b>\$145,920.00</b>	<b>\$145,920.00</b>
<b>Revenue</b>	<b>\$208,400.00</b>	<b>\$208,400.00</b>
<b>GP</b>	<b>\$62,480.00</b>	<b>\$62,480.00</b>
<b>ROI Realized in:</b>	<b>35 Months</b>	<b>79 Months</b>

\*Davenport machine cost includes tooling.

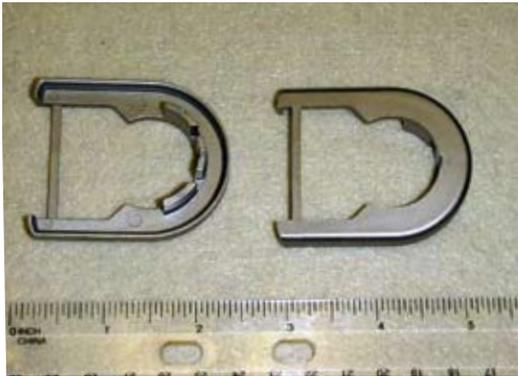
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Experienced MIM engineers can help fine tune a new design and select the right material. Also, if you're changing from a cast or machined part to a MIM part, or if you're creating a single molded part to replace an assembly, seek out the engineering expertise at the MIM house. "The sooner you get the MIM designers involved, [the better]. They may come up with solutions you may not have considered," said Dale. "[. . .] A MIM engineer sees problems every day that the design engineer has never had to consider."

A lot of design engineers aren't very familiar with MIM, said Dale. They may have heard something about it in school, but may not have gone into any depth on the subject.

To help remedy this lack of exposure, Advanced Forming Technology conducts a "hands-on MIM school" four times a year. Interested engineers, and a few purchasing people, come to the plant and spend two days learning about MIM. They experience first-hand how to mold, debind and sinter parts, and come away with a deeper understanding of what MIM can do.

Though metal injection molding is a powerful parts-making technique, it is not the ideal method for making every part in every application. For some high-volume products, however, MIM can solve design problems or save assembly costs in ways not possible with other manufacturing technologies.



Remington-M-SP10 collar

help you select the material on that basis. The alloy you end up using for a MIM part may not be the same one you might specify for a cast or machined part.



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Companies constantly strive to use innovative methods and materials, which can result in accelerated production for users. The following companies have provided “cutting edge” information:



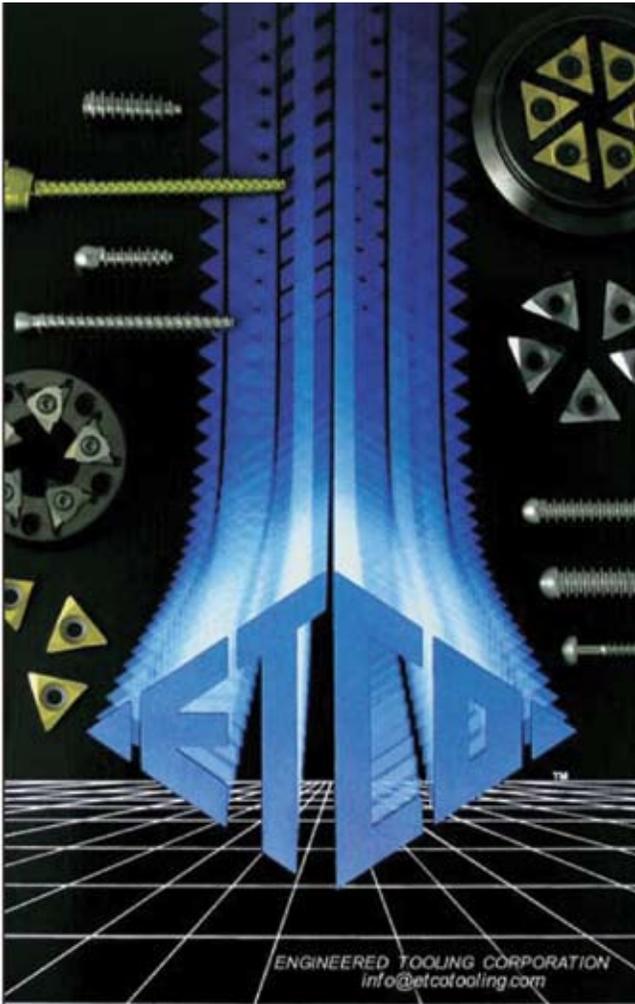
## Kennametal

New to Kennametal's small-parts tooling product line include new inserts offered in PVD-coated carbide and PVD-coated cermet; new products for traditional turning, backturning, grooving, threading, and cutoff; and new toolholders in inch and metric shank dimensions.

Kennametal's Quadralock ultra-precision system provides tool repeatability within 0.0005 inches (0.0127 mm) through a system that allows the insert's cutting tip to be locked into four different positions. As a result, profiles are possible in diameters as small as 0.062 inches (1.57 mm) or bored holes as small as 0.010 inches.

For turning, grooving, finishing, copy turning, and part cutoff applications, the new Kenna Precision (tm) O.D. indexable tooling comes in J-type inserts and toolholders for axial turning and K-type inserts and toolholders for radial turning. Grooving widths from 0.1 to 3 inches (2.54 to 76.2 mm) and part-off widths starting at 0.028 inches (0.71 mm) are possible.

For more information, please contact Kennametal Inc. at 800-446-7738 or visit [www.kennametal.com](http://www.kennametal.com).



## ETCO (left)

Founded in 1987, Engineered Tooling Corporation (ETCO) designs, manufactures and markets Swiss-style mini-shank tooling, and indexable inserts for Swiss-style screw machines. They stock a complete line of qualified inserts and shank sizes for Tornos, Citizen, Star, Nomura, Tsugami, and Hardinge, ready for immediate delivery. They also feature a 7 and 8 mm "Tornos Series" line of tooling designed for Tornos, Peterman, Strohm and Star machines.

For more information, please contact Engineered Tooling Corporation at 781-788-8888 or visit the company website at [www.etcotooling.com](http://www.etcotooling.com).



## Somma Tool (above)

Somma Tool Company has announced the availability of the Somma Air Speeder. This compact and powerful tool was designed to help eliminate secondary operations, optimize drill speed, and perform many milling, drilling, and slotting operations.

This unit easily mounts to a cross slide or a 2" diameter tool holder, is 16" long overall and requires only 7.5" of clearance behind the quill. It can be used on New Britains, Acmes, Wickmans, and other multi-spindle machines as well as various single spindle machines on the cross slide. There are four different units available, for 2000 RPM, 3300 RPM, 4500 RPM, and 6000 RPM. They have a 2" diameter quill, require a 1/4" MNPT air connection, 90 psi, and use 200DA double angle style collets, from 0-3/8" capacity.

For more information, contact Somma Tool Company at 203-753-2114 or visit the company website at [www.sommatool.com](http://www.sommatool.com).

## NTK Cutting Tool

NTK Cutting Tools product line includes ceramic, cermet, silicon nitride, CBN and PCD cutting tool inserts. They sell a complete line of SS tooling for CNC Swiss screw machines including products such as Y-axis toolholders and drill sleeve toolholders. NTK Cutting Tools is a division of NGK Spark Plugs (U.S.A.), Inc. NTK Cutting Tools develops and provides high quality cutting tools for a variety of industries including automotive part manufacturers, steel mills, and aircraft part manufacturers.

For more information about NTK Cutting Tools, please call 248-668-0100 or visit [www.ntkcuttingtools.com](http://www.ntkcuttingtools.com).



## American Q.C. Systems

The “Q-Switch” tooling system can now be preset offline while the machines are running. By eliminating jogging the machine around, touching off, and entering numbers into the control screen the down time for tool changes decrease. The ER to ER adaptor has a male back end that is shaped exactly like an ER collet and will fit in any ER style holder. The front end of this adaptor has an ER style female end for holding ER collets one size smaller than the back end. It is held into the holder with a standard nut that fits the ER style holder.

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# product focus

## Iscar Tool

The BAYO T-REAM from Iscar is a new reamer with interchangeable carbide heads. This system allows for quick setup and indexing times. The BAYO T-REAM is most advantageous in mass production industries when large quantities of workpieces are involved. The BAYO T-REAM's interchangeable head design consists of a unique patent-pending quick-change bayonet mechanism suitable for reaming applications of H7 hole tolerance range. A special key is used to clamp and release the bayonet screw mounting the carbide head to the steel shank. The reamer is designed with internal coolant holes to guide coolant directly to the cutting zone. This new reaming system can be used for blind and through holes as well as for applications with cross holes or keyways. The interchangeable design allows one shank to be used for a number of hole diameters and materials.

For more information, please contact Iscar at 817-258-3200 or visit [www.iscar.com](http://www.iscar.com).



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# product focus

To assist users, Genevieve Swiss has developed a "Guide to Thread Whirling" featuring valuable machining information including speeds and feeds, cutting principles, and troubleshooting tips for whirling applications. A copy is furnished with any PCM® Thread Whirling Attachment purchased from Genevieve Swiss.

For more information, please contact Genevieve Swiss at 413-562-4800 or visit the company website at [www.genswiss.com](http://www.genswiss.com).



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## Sandvik Coromant (below)

Sandvik Coromant is broadening its variety of hard part turning inserts with CB7025, a strong grade optimized for interrupted cuts in case hardened steel.

The key to CB7025's performance lies in the fine grain CBN, which controls wear and mechanically interlocks insert corners to provide strength and security. Sandvik Coromant's CB7025 comes in two patented, radius wiper geometries. The grade's -WH geometry provides high surface quality with reduced cutting forces, while its -WG geometry offers the best preparation for finishing cuts while running at high feed rates.

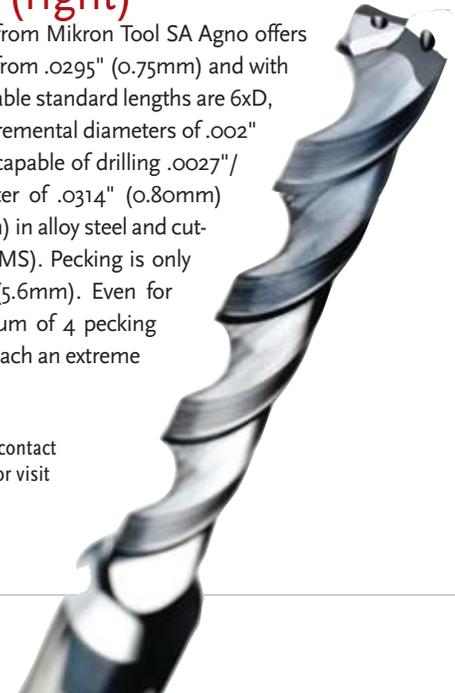
For more information, please contact Sandvik Coromant at 201-794-5000 or visit [www.coromant.sandvik.com](http://www.coromant.sandvik.com).



## Mikron Tool (right)

The CrazyDrill small drill from Mikron Tool SA Agno offers small diameters, starting from .0295" (0.75mm) and with internal cooling. The available standard lengths are 6xD, 10xD and 15xD; and in incremental diameters of .002" (0.05mm). The drills are capable of drilling .0027"/revolution, with a diameter of .0314" (0.80mm) and a length of .315" (8mm) in alloy steel and cutting at 164 SFM (2125 RPMS). Pecking is only needed after 7xD .220" (5.6mm). Even for longer versions a maximum of 4 pecking operations is enough to reach an extreme depth of 15xD.

For more information, please contact  
 Mikron Corp at 203-261-3100 or visit  
[www.mikron.com](http://www.mikron.com).



# product focus



## BIG Kaiser (above)

BIG Kaiser Precision Tooling Inc. has introduced a new series of Kaiser boring tools. These heads offer easy-to-read dials and backlash-free tool carriers for direct diameter adjustment. The series' six boring heads allow users to bore a range of 20-100mm (.787"-3.94"). The flexibility of the Kaiser KA connection permits a wide range of spindle interface options. All bore ranges and tool lengths are identical to existing Kaiser tools. The integrated counterweight can be adjusted to any bore diameter by a separate scale to permit high speed operation.

For more information, contact BIG Kaiser at 888-TOOL-PRO, or visit [www.bigkaiser.com](http://www.bigkaiser.com).

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Today's Machining World's "Shop Doc" column taps into our vast contact base of machining experts to help you find solutions to your problems. We invite our readers to contribute suggestions and comments on the Shop Doc's advice. If you consider yourself a Shop Doc or know a potential Shop Doc, please let us know. You should also check out the TMW online forum at [www.todaysmachiningworld.com](http://www.todaysmachiningworld.com).

**Have a technical issue you'd like addressed? Please email [noah@todaysmachiningworld.com](mailto:noah@todaysmachiningworld.com). We'll help solve your problem, then publish both the problem and solution in the next issue of the magazine.**

Dear Shop Doc,

We are trying to saw cut small, delicate parts but we are damaging the parts in the process. The dimensions of the component are 0.044" OD x 0.031 ID x 0.100 long. The material is beryllium copper. We are cutting along the longitudinal axis, essentially bisecting the front of the part, which is creating equal tines. We are utilizing a CNC Swiss-type lathe that has an X/Y tool plate for the turning- and live-tools. We've tried different types of saws with various geometries but we are still failing. At closer inspection, the surface finish of the slit looks fine but somehow the part is still getting damaged.

### Saw Cutter

Dear Cutter,

What you're encountering is fairly common when you perform any kind of live-tooling operation on delicate parts. The component itself does not have the rigidity to withstand certain types of tool pressure. If you do the math, you will see that the wall thickness of the component is only 0.0065", which is why you are having this problem. There's a couple of ways to attack your problem, but before we get into those, let's discuss your tooling. You should get the thinnest carbide saw with as many teeth as possible. This will allow the most amount of material to remain on the component, which will help in rigidity. Next, you need to have a high quality arbor. A lot of machinists overlook this tool as if it's a door stop. They may be thinking "Well, this arbor has worked for so many other parts." But this is a huge assumption that is false when dealing with miniature components. You should get a "precision ground" arbor. Most likely the same source where you purchased your carbide slitting saws can provide one. Lastly, get a precision collet to hold the arbor. This trifecta of ultra precision slitting saws, arbors and collets is what you must have in order to be successful.

Now that you have the proper tools, let's talk about the methodology. There are two methods that can help you be successful in this cutting process. Assume there is a 0.500" saw diameter and 0.020" safety distance. The first method is to first position the component in its final Z-axis position to give you the desired dimension. Then, position the live tool at X = 0 and position the Y-axis using the following equation: Part diameter + saw diameter + safety distance (0.044" + 0.500" + 0.020" = 0.564"). Then, feed the Y-axis across the component at a distance of -0.586", which will put the center of the slitting saw at the opposite of the part diameter. Then, stop the live-tool spindle and back-out the Z-axis. The second method is to retract the Z-axis, index the live-tool to X = 0 and then feed the component in the Z-axis into the slitting saw, stopping the live-tool spindle and backing out the Z-axis. The key to both methods is to stop the live-tool spindle when it's finished cutting before you retract the component or tool. I hope this works for you. Happy machining!

**David Cogswell**  
Director, Precision Machining Operations  
Bal Seal Engineering, Medical Products Group



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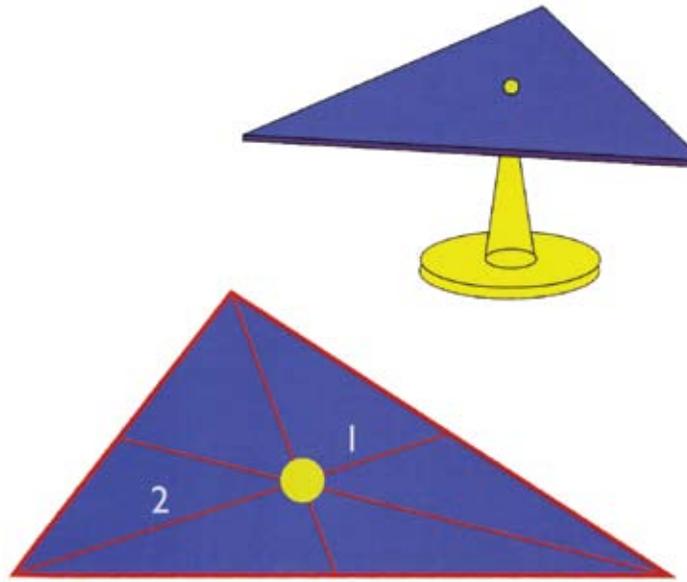
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## Medians of a Triangle



A median joins a vertex of a triangle to the midpoint of the opposite side. The point where all three medians meet is called the centroid and divides each median in a 2:1 ratio.

The centroid is the center of gravity of the triangle; it's the point at which it can be balanced.

A line from a vertex that bisects the median will divide the opposite side of the triangle a certain proportion. What's the proportion?

## Mathemagic HoneyCombs

Who combed their brains looking for the answer?



**Abdul Khatri** of Kamet Manufacturing Solutions in Sunnyvale, CA; **Greg Roan** of BLP Products in Orlando, FL; and **John M. Weber Sr.** of Weber Systems, Inc. in Menomonee Falls, WI.

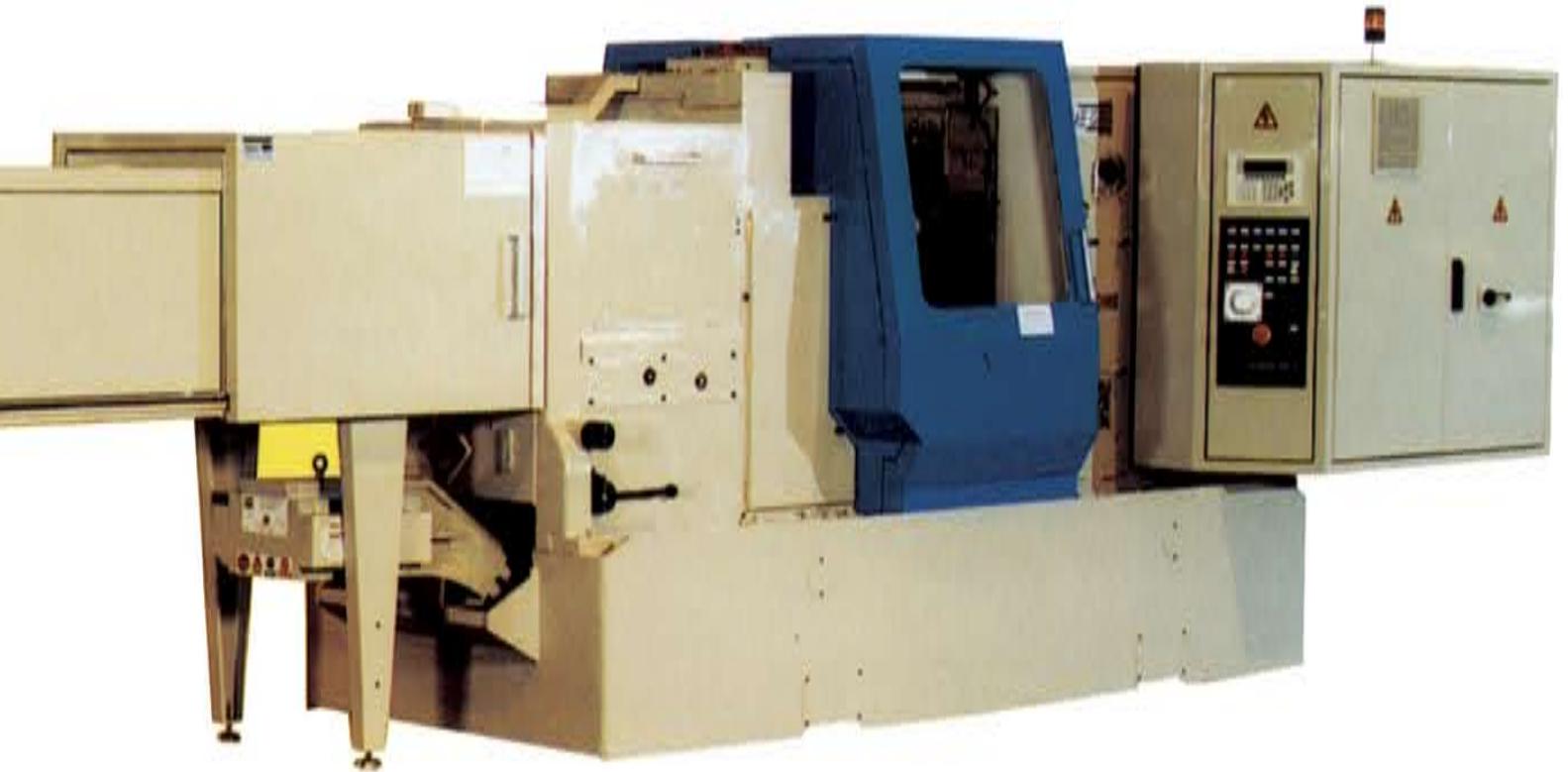
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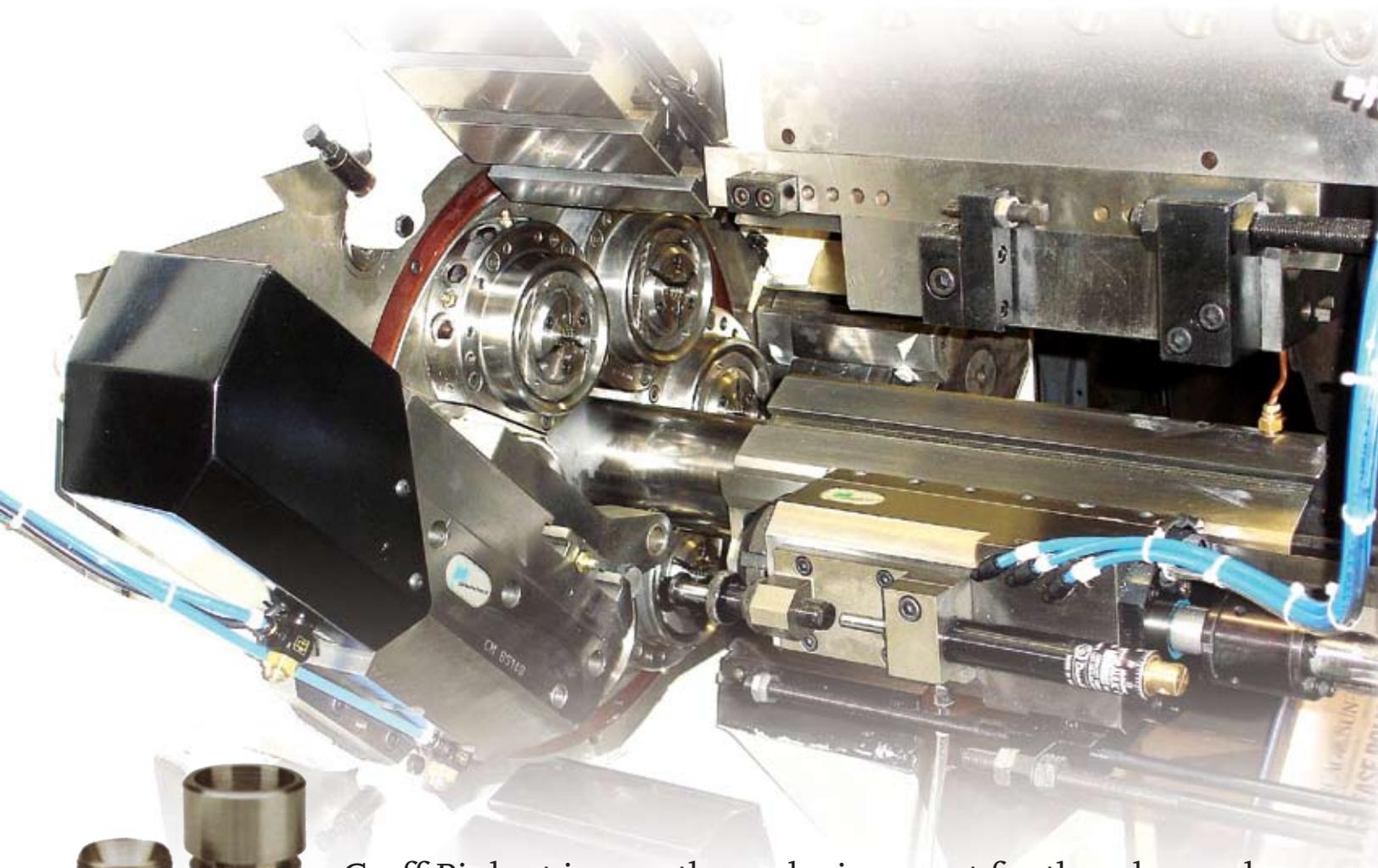


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# postings



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Sept. 18 - 20

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[www.sme.org](http://www.sme.org)

Sept. 11th  
thru  
Sept. 13th

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Manufacturing  
Week  
2007

Exposition &  
Conference

Rosemont, IL

Sept. 24  
thru Sept. 27

[manufacturingweek.com](http://manufacturingweek.com)

North American  
Hydroforming  
Conference &  
Exhibition

Nashville, TN

Sept. 19-21

[www.sme.org](http://www.sme.org)

ISAAT2007  
at SME  
International  
Grinding  
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Sept. 26-28

Dearborn, MI

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Hannover

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metalworking

Sept. 17-22

<http://www.emo-hannover.de>

ESPN  
premiered  
Sept. 7, 1979

[www.wikipedia.org](http://www.wikipedia.org)

Talk Like  
A Pirate  
Day

Sept. 19th

[www.talklikeapirate.com](http://www.talklikeapirate.com)

Birthday

Peter  
Sellers (actor)

Sept. 8,  
1925-1980

[www.wikipedia.org](http://www.wikipedia.org)

## Bye-Bye PAG

Now comes word that Ford Motor Co. may be ready to put Volvo on the market. The struggling Detroit automaker has already auctioned off its high-line British luxury brand Aston Martin, and recently revealed it was considering the sale of two more European-based subsidiaries, Jaguar and Land Rover.

The four marques collectively comprised the Premier Automotive Group, or PAG, which was a central element in the grand vision of former Ford CEO Jacques Nasser. Barely a decade ago, Nasser engaged in one of the largest spending sprees in automotive history, snapping up everything from recycling firms to struggling British car brands, in a seeming bid to push his company past long-time rival General Motors.

It was a bold and audacious move and, at one point, not all that long ago, the PAG was expected to yield a whopping one-third of all Ford profits by permitting it to enter a variety of new, high-profit market segments.

What profits, you might ask? Well, at least the Premier Automotive Group did rack up some earnings over the last year, despite the continuing problems at its most well-known brand, Jaguar Cars. But as with the rest of Nasser's legacy, it has failed to live up to expectations and is now being dismantled by successor Alan Mulally, the long-time Boeing executive who is now racing against the clock to turn things around at Ford.

Aston's sell-off, earlier this year, seemed a no-brainer. The ultra-luxury operation never really fit into the Ford empire. Indeed, it was acquired almost as a favor by the late Henry Ford II, a long-time Anglophile who stepped in, 20 years back, to keep Aston from going bankrupt. On its own, the U.K. operation is likely to do things that it simply couldn't under Ford's stewardship. The American automaker, with its rigid controls, simply stifled the creativity of the now profitable Aston, grumbles Ulrich "Uli" Bez, the strong-willed

German who steered the brand's remarkable turnaround.

Jaguar, which was also purchased before Nasser came aboard as Ford chairman, is an especially sad story. Like Aston, it was in desperate shape when purchased. Ford came in with some much needed capital and equally critical management resources. But instead of promoting those unique attributes that defined Jaguar, including its exclusiveness and elegant design history, Ford forced the maker into market segments where it didn't belong, notably with the "entry-luxury" X-Type. Even when Jaguar turned to what it did best, Ford's innate conservativeness led to products like the same-as-the-old flagship XJ sedan, which looked identical to the car it replaced. Sadly, the product that could finally revive the brand, the upcoming midsize XF, may hit market just as Jaguar is sold to someone else.

Land Rover is another misfit, a brand that never really slid into the Ford system. But Volvo's story is different than those of mavericks Land Rover and Jaguar. It seemed well-placed to become an essential cog in the Ford system. Indeed, it offered much-needed safety technology, as well as the underlying platforms Ford began using for American-made products – the Volvo S80 chassis resurfaced under the skin of the Ford Five Hundred, for example.

Ford's continuing cash crunch now leaves it little room but to keep selling off assets to keep itself going. By next year, Mulally has promised the bankers, Ford will once again be profitable. Perhaps it will be, but Ford's grand global expansion will not be part of bottom line.



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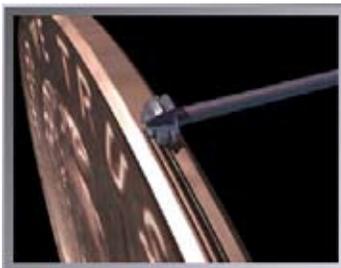
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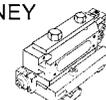
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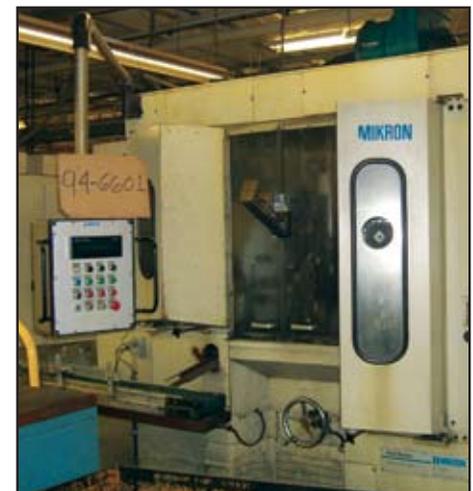
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## Remembering Beverly Sills

**B**everly Sills died July 2. She was a marvelous singer and humanitarian, but I will always remember a story attributed to her that has had a major impact on my life.

Beverly was on one of those “If this is Sunday I must be in Salt Lake City” kind of concert tours. The physical grind of moving yourself and your entourage on one of those marathon tours was exhausting. Not only did she have to travel, rehearse, and perform demanding operatic vocals, she also did promotional interviews with the local press.

At the end of the tour, she was in San Francisco for a matinee and a Sunday night performance. Herb Caen was the most important local columnist and he called on Beverly for an interview. She obliged with her usual graciousness.

“The tiny shift of the words ‘have to’ to ‘get to’ can change a life from drudgery into grateful appreciation.”

After the chit chat Caen asked her about the marathon tour. He said, “Beverly, you have to do an afternoon performance, then a few hours later you have an 8 o’clock performance you have to do. How can you do it?”

She answered, “Herb, I don’t have to do it – I get to do it.”

I can’t remember how many times I have repeated that line to myself, to my wife, to my children. The tiny shift of the words “have to” to “get to” can change a life from drudgery into grateful appreciation.

When I began a writing day today, thinking of the columns and Swarf I need to create I was tilting toward the “have to” mode. But then I remembered the Beverly Sills story, knowing that I wanted to write this ode to her after reading her obituary.

Perhaps it sounds corny or saccharine for a wrinkled used machinery peddler to be so stupidly upbeat, but I work on my sense of gratitude every day. I have a profound sense of “get to” when I start writing because I genuinely believe I am getting to use the gift of language and expression that is uniquely mine. As I get older and endure the infirmities that

nick me, I am acutely conscious of the window I have to use my unique talents.

When I write this I am not feeling grandiose. I feel every person has a talent. The pity is that so often they never find it or lose the key to fulfilling it. My gift is using verbal intelligence. For Beverly Sills it was singing and interpreting music. My wife’s unique ability is to help children learn and connect with their special smarts. Jerry Levine writes in his book review about an autistic savant who can memorize 22,000 numbers and pick up a new language in a week.

Even for a practicing optimist, life throws boulders and explosives in one’s path. For me, approaching the day with a concrete image of personal gratitude for a grandchild’s giggle or a loving wife’s kiss can correct a maudlin drift toward despair or overwhelmedness. But it does take a conscious effort to pull myself away from the dark side.

My yoga instructor, Karen Nielson, advocates beginning the day with an “intention.” I believe this is another way to steer my reluctant butt toward happiness and fulfillment.

I hope you indulge my Tony Robbins moment, but I actually believe this stuff. I spent a weekend many years ago with Tony – an egotist and showman, but you can learn from him.

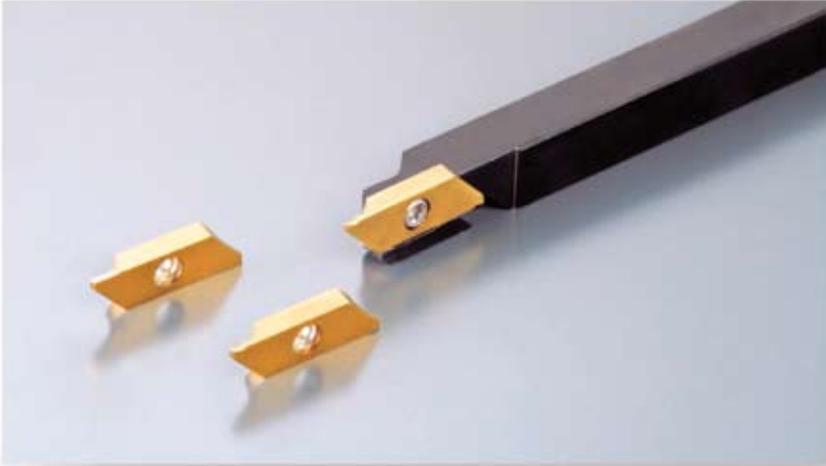
Every single day I observe people who live the “I have to” life. They complain their way through the day as they cynically tear down others.

I get to remember Beverly Sills today, and I am grateful.

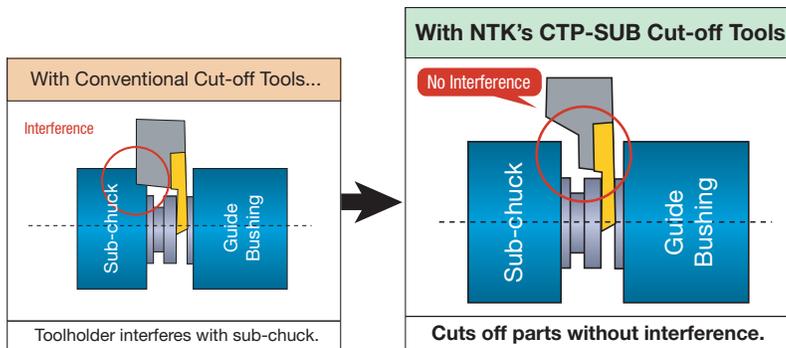
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