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**Lloyd Graff** is a true lover of sports. A highlight of his sporting career was a tryout with the Chicago Cubs. Great photo opportunity, but it ended without a contract offer. Aside from baseball his favorite sport is table tennis. He met his wife, Risa, with a ping pong paddle in the pocket of his corduroy sport jacket. "Conversational ping pong" was a way of connecting with his children when all other approaches failed. Sadly, six eye surgeries for retina detachments have limited his ability to cover the backhand side.



**Bridget Mintz Testa** has been a full-time freelance writer for 17 years. She's written about telecommunications, the Internet, electronics, business strategy, human capital, information technology, residential construction, concrete and cement standards, engineered wood and a bunch of other things she can't remember any more. Before she was a freelance writer Bridget worked at NASA's Johnson Space Center for five years, first on lunar and planetary exploration and then on space station robotics. She has degrees in physics and psychology. Recently, she spent a week with her granddaughter, crafting crowns and tiaras from a kit for the three-year-old princess.



**Noah Graff** just turned 30 and has been working at *Today's Machining World* since 2005 (oy!). He is the features editor, videographer, and "the Web guy" for the magazine. Lately Noah has been planning a new Web site for the world's salsa dancing community called [Surfingsalsa.com](http://Surfingsalsa.com) (look for it in the next few months). Also occupying his mind at the moment is finding a new roommate on Craigslist for his apartment in Chicago before his lease is up at the end of the month (pray for him that he finds someone who he can "live with"). Latest quote on Noah's mind, "Looking good is feeling good." *His old barber.*



**Barbara Donohue** volunteers as a weekend puppy raiser for young dogs in training to assist deaf or disabled people. The pups live in a prison during the week, where they are trained and cared for by inmates. Volunteers like Barbara take the puppies out on the weekend so they can experience the outside world. Her latest weekend pup, Fenway, was born January 5. Barbara, who often writes the "How It Works" technology articles, is an MIT-educated mechanical engineer and has worked as a journalist for almost 20 years.



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# editor's note

## Unpolitic About Politics

I am fascinated by politics. I am also fascinated by baseball, business, psychology and a dozen other topics, all which help make me be a good writer—I hope. But it's my interest in politics that seems to bug a lot of readers.

Despite my love of politics I am not a strong partisan. I usually prefer gridlock because it makes life more predictable and easier to navigate financially. But sometimes you need movement, like during the latest financial crisis when the TARP money really helped stop the bleeding.

On health care legislation I waffled, because it seemed so ridiculously complicated. But to my own surprise I was happy something passed that would bring more people into the system, and eventually eliminate the blackballing because of pre-existing conditions. When I mentioned this in a blog it was taken by some readers like an admission I had been a member of the Khmer Rouge. Forty people wrote comments on the blog, which was cool, even if most of them skewered me.

I don't want *Today's Machining World* to be seen as my political soapbox, but I do think that politics are fair game occasionally because they affect our lives in so many ways. I don't like being vilified, but I do get a kick out of awakening readers' juices.

We reviewed the terrific book, *Game Change*, in the April issue, which gave an insiders' view of the 2008 election. I'm not afraid to say I gave money to John McCain but ended up voting for Barack Obama because McCain chose the hopelessly unprepared Sara Palin for his running partner.

I'm going to talk about politics once in a while because it's fun. Just ask Tina Fey.

Lloyd Graff  
Editor/Owner



## Today's Machining World

## forum

### Davenport Search Complete

*Lloyd Graff wrote a blog about Allan Bentsen's dream of finding a 70-year-old leg-type Davenport screw machine, restoring it and placing it in his living room as a parlor piece. The following is a response from Allan to the blog, which can be found at [www.todaysmachiningworld.com/swarflog](http://www.todaysmachiningworld.com/swarflog).*

My wife and I just took a look at the *Today's Machining World* Web site and were so surprised to see your piece about me that we were laughing out loud. It's awesome! I still can't believe that you did that, thanks so much! I've already had a couple of people e-mail me. One had Brown & Sharpes, which I requested pictures of, but the other had a Davenport serial number 243! With the history of that particular machine, I have already agreed to purchase it. It was most likely never used in production (as a Davenport is known to be used), because it was in a trade school. My wife and I will be driving to Ohio in June to pick it up. If you're interested I can keep you posted with my progress on the project, although I'm sure it will take me a couple of years at least to complete.

P.S. I will still accept free Davenports, as my wife will only let me buy one.

Allan Bentsen

Allan Bentsen can be reached at [pocketchrissy@yahoo.com](mailto:pocketchrissy@yahoo.com).

### Memories of Lititz, Pa.

(Hard) Hats off to Robert Strauss for his piece about Michael Tait and Tait Towers in Lititz, Pa. I had the good fortune of watching his crew in action back in 1982. As a senior at Franklin and Marshall College in nearby Lancaster, I received word that the new super group Asia was rehearsing for their upcoming American tour at the Tait Towers facility. Somehow me and a few pals managed to wangle our way into the back door of the staging and rehearsal building on a rainy afternoon. Our presence didn't seem to bother anyone, but the employees inside gave us a quick glance that screamed "sit-down, shut-up, and you can stick around." Spying a small stack of pallets

in a corner, we were happy to oblige! For a few music-loving undergrads the next two hours were nothing short of magic. One by one, the members of Asia appeared from what looked like an upstairs lounge. Steve Howe (guitarist for Yes), John Wetton (bassist for King Crimson), Carl Palmer (drummer for Emerson, Lake and Palmer), and Geoff Downes (keyboardist for both Yes and The Buggles) climbed the "stage-in-progress" and began pumping out "Heat of the Moment" from their penultimate debut album. It has been almost 30 years since that crazy afternoon in Lititz, but the memory of knowing we were watching something special remains.

Brian Adams

R.F. Mau Co.



### All We Sell is Time, Kid

I was surprised to read the "SAVE THE COMPANY YACHT" page on the cover of the April 2010 *Today's Machining World*. When my Dad retired in his 36' cutter rig in the 1980s he used an old line from a Dylan song, "Just drop me letters and send me checks." My two brothers and I are still running the company, started in 1954, and are focused on lean. We work on through-put, set-up reductions and visual help: "color glossy photos." Ideally we have enough (sometimes hard to

*Something on your mind? We'd love to hear it.*

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find) proper sized American stainless, and a decent variety of various aluminum. At least this inventory can only be taxed at cost. We try to stick with the old Japanese line, "Ah... inventory evil!" But just as you've said, we try to hold the safe amount. In the 1970s with our screw machines, the old way was to make the 3,000 pieces, ship them and receive the check. Now it's make the 3,000 pieces over four years and ship some every two weeks. My Dad's classic line "all we sell is time, kid" will forever be in my mind. Thanks for the great magazine; you seem to know your stuff.

Hunter Jamison  
VP. Millipart Inc.

### Times of Transition

Lloyd Graff's "Afterthought" title *Bread of Affliction?* is an inspiration to my wife and I, who own a small distributor in southern Ohio. I offered the article to my two sons who are currently transitioning into full ownership of the business. I think your comments say it all. Basically there's joy and sadness in life and freedom and captivity when owning a business. Thanks for your insights and the magazine, which we all here appreciate.

Bruce Mackintosh  
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BY LLOYD GRAFF

## House Rules

One person out of a hundred suffers from a form of autism, a brain dysfunction which robs a person of the ability to have normal social connections with the people around them. There is a wide range of behaviors covered by the term autism. The popular conception of an autistic person is the Raymond character portrayed by Dustin Hoffman in the classic film, *Rain Man*, but the autism spectrum is broad. The less severe but still devastating version is Asperger's syndrome—a diagnosis which Jodi Picoult masterfully brings into view in her brilliant new book *House Rules*.

*Today's Machining World* rarely reviews fictional books, but I felt that this work was extraordinarily valuable for me to understand people I know who suffer from this perplexing and devastating brain disorder and connect with the pain of the people who are a part of the texture of their lives.

The author takes the reader into the world of 18-year-old Jacob Hunt of Burlington, Vermont, his mother Emma and brother Theo. Jacob has Asperger's syndrome, is extremely smart, and is consumed by his interest in crime scene analysis. Routine is paramount for Jacob. He absolutely must watch the "Crimebusters" TV show everyday at 4:30 p.m. or he becomes distraught and acts out weirdly.

The plot of the book revolves around Jacob being accused and tried for the murder of his life skills coach, Jess Ogilvy. The narrative is absorbing but the interplay of the family and Picoult's ability to get in the head of Jacob Hunt is what makes this book so worthwhile for the layman. *House Rules* is not a medical or psychological tome, though there is a lot of such material artfully sprinkled into the book. It is more a family saga about how a dedicated single mother and a troubled teenaged sibling deal with a family member suffering with Asperger's and accused of murder.

One of the things I learned from this book is that an "Aspy's kid" may know a million facts but does not understand the emotions of other people. They take


everything literally, so subtlety and humor escape them. Their psyches demand routine—eating certain foods on certain days, watching the same show at the same time each week, wearing the same clothes on a given day. They lack affect in their language and tone and nothing about social behavior comes

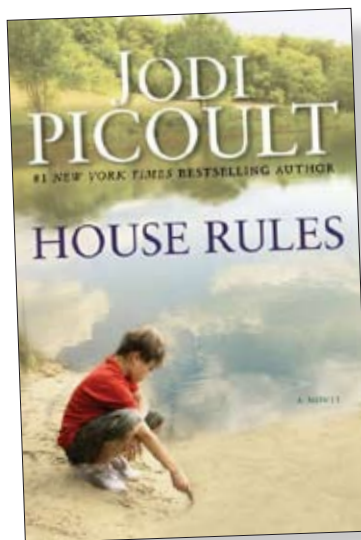
naturally for them. But behaviors can be taught to them by demonstration and practice.

Reading *House Rules* we realize that Jacob does have feelings. He likes his coach Jess and dislikes her boyfriend Mark. He depends on his mother for ordering his life, though he cannot discern her feelings. Jacob's relations with his brother Theo are intriguing, but Theo's rebelliousness about being ignored by his preoccupied mother Emma is the most interesting part of the book for me.

Jodi Picoult is a truly gifted writer. She took a topic, an Asperger's kid and his relationships, and wove it into a murder mystery that keeps the reader guessing to the last few pages. We like Emma for her devotion to her child, but we wish she would find the energy to help her "normal" son Theo, who must endure

one family crisis after another. That is the life of a family dealing with Asperger's. There is no vacation from the malady, it is exhausting and trying every day. I have seen it from a distance, but reading *House Rules* allowed me to get a little closer to what it is like to have Aspergers, or deal with somebody who has it, every day of your life.

You should read or listen to this book. 



Comments? You can email Lloyd Graff at [lloydgrafftmw@yahoo.com](mailto:lloydgrafftmw@yahoo.com)





## Hyundai Heresy

*I received impassioned letters (one is printed on page 13) about my "Swarf" piece in April recounting the purchase of new Hyundai cars by my two sons Noah and Ari. The letters were clearly heartfelt and probably representative of the feelings of many readers. They deserve an honest reply.*

I did not buy the cars. My sons bought them, and they were focused on the monthly payments. Like me, neither are car buffs, but they valued my opinion on the car buying process more than on which car to purchase. They both did some research, but the primary reason Hyundai was on their radar screen was that they had driven a Sonata on a family trip in February and found it to be a capable performer.

I think the letter writers believe I conspired to have my sons reject American cars. But the fact is that they were rather naïve car buyers and their driving

experience was mainly with Toyota and some GM.

They were probably biased toward Toyota, especially Noah, who loved his 1997 Lexus despite a bad siege of transmission problems, dead air conditioning and a messed up radio. Ari's strong bias was towards safety after working with badly injured patients in Chicago's famed Rehabilitation Institute.

I do confess I pushed them to look at the Prius, and if I were buying a car it would have been my choice because of the gas mileage.

The question of buying American never really came up in the conversation. I had been a "buy American only" guy until 1996, when I chose Toyota because my Buicks and Chevys had been mediocre vehicles. GM had entered its desperate years and Toyota seemed more committed to America than they did.

I knew that my bread was buttered by the Big Three, but they were asking me to buy apple pie, motherhood

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and crappy products, and I rejected them with sadness.

Personally, I regret that we did not give Ford and Chevy a better shot. But the reality is my sons did not care, and I probably did not nudge them as much as I should have.

We looked at Ford because it was gaining market share and I suggested they check it out. The fact that the salesman acted like he was doing us a favor to test-drive a Ford Fusion did have an effect on us. The attitude of a seller is important because it puts a human face on the brand.

In retrospect, I ask myself why we never even looked at the Chevy Malibu. It was probably because the Chevy dealer had shut its doors at the auto mall we visited. Both Ari and Noah were in a time crunch to buy because both of their cars were literally falling apart. They didn't have the inclination to shop the market for weeks or months.

For both sons, the last dealer we visited was Hyundai. (They never shopped together.)

Noah bought his car first. He wanted a vehicle with pizzazz, the lowest possible monthly payment and immediate availability.

Ari was more indecisive, but the fact that Noah bought the Hyundai probably affected his decision. He purchased his car a week after Noah, choosing a 2011 Sonata with a little less horsepower and smaller wheels. He really wanted a car that day, and buying a Hyundai offered the path of least resistance.

*Response Letter*

**As an avid reader** and financial supporter I was greatly saddened to see how your family makes major purchasing decisions. In your car shopping



"Swarf" piece, you and the boys go to the local mega dealer, spend a couple of hours walking around and end up buying two cars based primarily on the "energy" of the salesman and the music in the showroom?

Let me get this straight. Both boys had to have new cars that day? They wouldn't give the Ford guys enough time to check inventory at another lot and bring in the color or options they wanted? So some Koreans have good jobs because the Graff family is shallow and impulsive and won't even take the time to see how good the American offerings are?

Where do you sell machinery? Hopefully to Koreans and the like, because it is people just like you that cause the high unemployment and loss of quality jobs right here at home. No, I don't work for the Big Three. No, I am not a "union guy." But I am an American manufacturing employer that works hard every day to keep my 40 people employed. I do that by quoting against companies across the globe that have the distinct advantages of near slave labor wages, a lack of employee safety and environmental compliance and trade imbalances that I have no control over. All I can do is to fight hard every day and hope that there are enough Americans that care to give American products a fair look. Obviously you are not such an American, even in these economic times.

I guess next IMTS I will wander around and see who has the best music, maybe even get a free latte and see who has the prettiest clueless girl standing out front. I will buy their machines, and who cares who the maker is? Who cares what the features are? Who cares about the impact on jobs? Not me, just bring on the energetic salesman!

**Paul Kuyt**

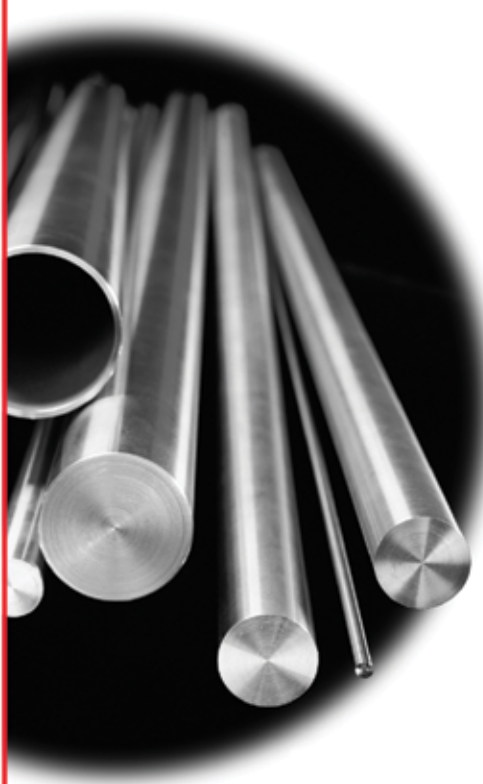
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# swarf

**Brian Capece** has a five person shop in rural Maryland. He does wire EDM and precision machining for aerospace, satellite, medical and commercial clients, often working 65 to 70 hours a week. His wife runs his office now that his two children are in school. He's been doing this for 10 years, since buying his first die sinker at an auction. It's been a rough year for Brian. He says he used up his cushion of money to keep the business afloat while not letting any of his people go, because those core employees are the key to his business and if he lost them he would be in the soup.

He is finally back in the black but wonders if the path he has taken for the last decade was the right one. "After going to the tax man this year and seeing how much I had to pay, I really think I would have been better off working for somebody else than having my own business," he said. His comment was not said out of anger or great regret, but I wonder how many people feel the same way—for the same money and less risk, they'd just as soon pull down a paycheck than sign all the checks.

**Brian Pendarvis of Anaheim** says he hasn't felt the recession. His company, Pendarvis Manufacturing grew despite the softening that battered almost everybody else in the machining game. He attributes his success to marketing his job shop on the Web. Brian says he spends about \$50,000 a year maintaining his Web site and spreading the word about his company's capabilities on Yahoo, Google, ThomasNet.com and MacRAE'S. He pays for Google ad words, but just to promote the company within a 100-mile radius of Orange County.

His niche is combining fabricating, welding and machining, a combination we don't see that often as firms reach for specialization. He says he tracks 5-8 calls per week directly from his Web prominence, which he says enables him to land one new customer per month on average. He lauds the work his Web designer has done for him—a firm that split off from ThomasNet—Creative Works.



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Jim Chanos is famous for identifying the Enron scam, shorting the company's stock and making a fortune. He runs a hedge fund named Kynikos Associates, which means "cynic" in Greek. He specializes in spotting emperors without clothes and is currently betting big that the Empire of China is a naked power. He compares China to Miami and Dubai of recent memory. The common thread is runaway condominium and office construction, huge real estate inflation and a shortage of able buyers. He says that today, all over China, high-rise buildings are rising, fueled by aggressive bank lending to developers. They are building 1,100 square foot shell apartments without floors, and selling them—or attempting to sell them, for around \$150,000. The problem is that even though half are going empty, they are still building.

Chanos sees the phenomenal growth numbers in China being fueled primarily by real estate speculation and construction. In his view it is unsustainable. State and local governments are being funded by real estate development, so they have an

interest in seeing it accelerate. They will suffer mightily when and if the bubble bursts. What happens if Chanos is right and the giant cranes go away like they did in Dubai and Miami? He feels that the raw materials companies who are supplying the steel, copper and cement will suffer immediately. Copper at \$3.60 a pound could plummet, as well as iron ore and scrap prices. Crane companies will get killed. He feels that the Chinese currency, which everybody including the Obama administration is hoping will rise when it is no longer pegged—will fall.

Incidentally, Gary Schilling, the noted bearish economist who predicted the American stock market collapse (not the rebound, however) also feels the Yuan will fall in value when it is allowed to float. Jim Chanos is a very smart guy. He sees the Chinese bubble bursting later this year or in 2011. The Chinese have enormous reserves in dollars to soften the blow and may tighten credit dramatically soon to try to avert a property crash. China bashers may be happy to see the country suffer and revel in lower raw material prices, but with an interconnected world, be careful what you hope for. 

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An example of in-process gaging: the WG2 gage head from Control Gaging Inc. measures the size of a workpiece during grinding, with repeatability of less than one-half micron (.000020").

Photo courtesy of Control Gaging Inc.

automated measurement



# Automated Measurement

Automatic part-measuring technologies can not only verify dimensions, but can collect the data for you and help improve quality.

**D**o certain features on certain parts cause you headaches or heartburn? If the answer is yes—and most folks in the machining business will probably answer yes—you might consider using automated measurement techniques to keep tabs on those challenging parts.

Many automated measurement options are available, measuring everything from a single critical dimension to an array of dimensions and forms on a workpiece. You can measure while a part is being machined, watch the dimensions of parts coming off a machine, or use a separate gaging station to measure dozens of dimensions on a finished part. Automated measurement systems come off-the-shelf or custom-made, and their abilities seem to be limited only by the imagination.

Various methods of automated measurement have been used for a long time. But over the last 30 years, innovations in sensors and improvements in computer technology have made automated measurement more and more applicable to different machining processes and machined parts. In addition to measuring parts and collecting the data, some measurement systems can even send information back to the machine.

## What, how and when to measure

David Hayes, president of Control Gaging, Inc., Ann Arbor, Mich., described three classifications of measurements, according to where and when they are made:

*In-process*—inside the machine during the machining process

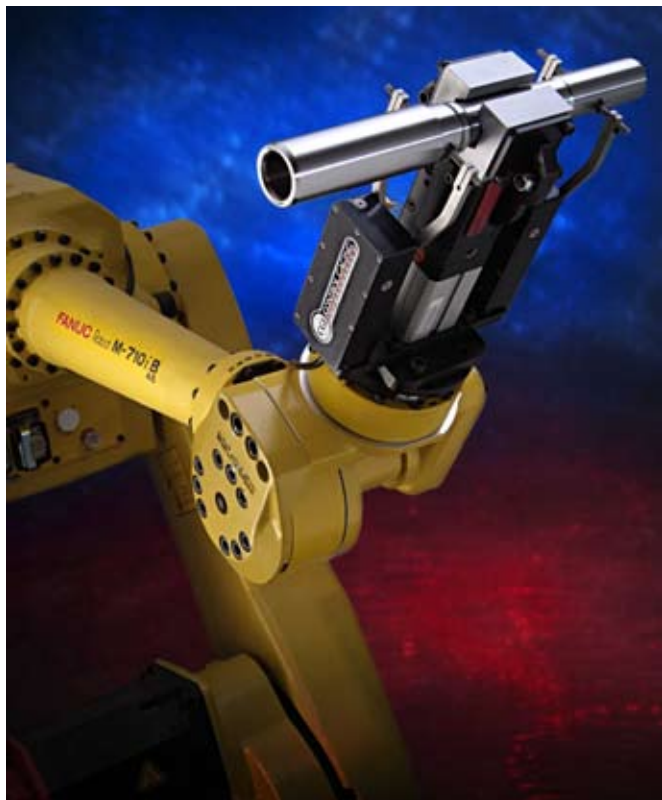
*In-line*—as soon as a part comes off the machine

*Post-process*—as a separate step, placing the part in a standalone gaging fixture, for example.

In-process measurement might include contact sensors within a grinder that measure the part while it is being ground. The WG2 gage head from Control Gaging Inc., is designed to withstand the hostile environment inside a machine. It protects the sensors within a small enclosure and contacts the part with fingers that are connected to the sensors.

Though you can mount a touch sensor on the spindle of a machining center and use that to measure parts on the table, ideally the measuring device should have no relation to the mechanism that created the part. You want independent verification of part dimensions and need to have any error in the machine show up in the measurement, according to Don Engles, manager of the automation group at Productivity Inc., Minneapolis, Minn.





# how it works

**Left:** In this example of a Grip-Gage-Go solution from Control Gaging Inc., two standard gages are attached to a robot gripper. They measure the part diameter in two places as the part is being handled. This takes the place of a separate gage station and saves the time that would be required to load/unload the part from a gage station.

Photo courtesy of Control Gaging Inc.

**Below:** The Keyence IM-6000 image dimension measuring system.

Photo courtesy of Keyence Corporation of America.

In-line gaging measures the parts immediately after a process is finished. For example, you might measure the outside diameter of individual parts as they come off a grinder.

In post-process gaging you measure the part outside the machine. You're "measuring in a world that is good for measurement," said Jack Gaughan, vice president of sales and marketing at Edmunds Gages, Farmington, Conn. In a dedicated fixture, you can accommodate any necessary measurement conditions or adjustments. If a part coming out of a lathe is hot, for example, the measurement system can incorporate temperature compensation to allow for thermal expansion.

You have many options for post-process gaging. Keyence offers an image dimension measuring instrument, the IM-6000, which uses light in a way somewhat similar to an optical comparator. However, instruments like the IM-6000 are programmable to automatically measure all the visible features and dimensions you want, at the press of a button. First you set up the desired measurements for a particular part. After that, you simply place a part on the stage, in any orientation, and press a button. In seconds the device makes the measurements and stores the data securely for your records and for later analysis. The IM-6000 can measure parts that fit in its 4-inch-diameter field of view, and costs in the same range as an optical comparator, said Michael Montgomery, technical marketing manager, Keyence Corporation of America, Itasca, Ill.

Where you're moving parts with a robot or gantry crane, you can make a diameter measurement automatically using

the Grip-Gage-Go concept from Control Gaging. Gage heads incorporated into the robot or gantry gripper make the measurement while transporting the part from one place to another. This approach is ideal for measuring one critical diameter, such as the end of a shaft destined for a press fit, said Karl Liskow, mechanical engineering manager at the company. Grip-Gage-Go may also be used to measure two diameters. Three or more diameters would require a stationary post-process measurement station, said Liskow. However, he said, if you gage the last feature machined or a dimension with tight tolerance, that one measurement can give you a good indication of the machine's accuracy.

## Preventing bad parts

To help keep parts within spec as tools wear or other drift occurs, some automated measurement systems can send measurement data to the machine control. In-machine measurement with feedback to the machine was used for grinding processes starting in the 1980s, Gaughan said. In the last decade, the technology has developed to provide this ability to feed dimensional information to other processes as well.

With the addition of a macro to the program for the part, the control can receive measurement data from the gaging system and calculate any necessary change in offset. Then it sends the offset adjustment to the machine. This way, adjustments are made before the dimension(s) go outside the tolerance band. This concept works with dimensions that can be changed with an offset adjustment, but not with others. Surprisingly, Engles said, shops sometimes forget this. A turned outside diameter is an ideal



**Top:** A robot-loaded railroad axle gage from Edmunds Gages measures 64 dynamic and static dimensional characteristics of a turned axle. The gage provides dimensional feedback to two lathes.

**Bottom:** Measuring the pin bore of a machined aluminum piston using a standard air gaging plug and column amplifier from Edmunds Gages.

Photos courtesy of Edmunds Gages.



candidate, but an inside diameter produced by a drill, reamer or boring bar, can't be corrected automatically.

### Types of sensors

Many different types of sensors are used for automated measurement. Here are a few examples.

*Linear variable differential transformer (LVDT):* This is a type of contact sensor that measures displacement and can be used for measuring linear dimensions. Basically, the LVDT is an electrical transformer that produces a voltage output that varies with the location of a magnetically permeable core attached to a measurement probe.

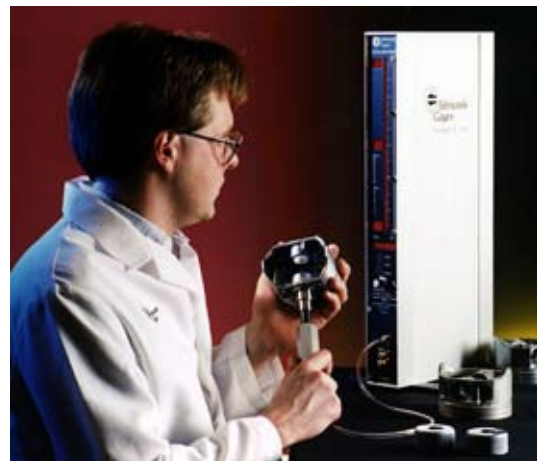
*Optical sensor:* Similar to a video camera, this type of sensor captures an image of the part and determines the dimensions from the image.

*Laser sensors:* Several different kinds of laser sensors make non-contact measurements of distance. The Keyence LK-G5000 laser displacement sensor, for example, uses a triangulation method. The relative positions of the laser emitter and the detector allow the position of the target to be calculated according to the location at which the reflected beam strikes the detector.

*Air gage:* Air pressure or air flow can be used to measure the clearance between a part and a fixture. As clearance increases, the flow goes up and the pressure goes down. Air gaging is suitable for checking tolerances up to 0.005", Gaughan said. This is an old technology and had fallen into disuse, he said, but it is ideal for many automated measurements.

### Application examples

Very large parts and very small parts can be measured using the appropriate sensor technology and any necessary fixturing, special lighting, or other setup. Vision systems can measure small or delicate parts without having to touch



and possibly damage or distort them. On the other extreme, Montgomery said that wind turbine blades are measured between grinding operations, using many sensors.

Sometimes measurements are used to control subsequent processes. Engles told about a particularly creative use of a measurement feedback system. For a small-engine manufacturer, Productivity Inc. provided a system for the CNC lathe that turned the pistons. The finished piston needed to weigh a certain amount. When machining was nearly complete, a robot removed the piston from the lathe and placed it on a scale. The scale sent the weight data to the machine control. A macro in the CNC program used the weight measurement to calculate the cutter compensation required to remove the correct amount of material to achieve the desired weight. The robot returned the part to the lathe and the turning process was completed.

Gaughan described the use of automated measurement in the process of making railroad wheel/axle sets. The axles were turned from 12-foot-long bar stock, holding tight tolerances at the ends to allow for a press fit into the

# how it works



**Above:** Measuring the inside diameter of a bushing after the first machining operation. A robot arm has placed the workpiece in the gaging fixture (the blue box). The gage amplifier in the foreground shows the ID measurement.

Photo courtesy of Productivity Inc.

wheels. The measurement system from Edmunds Gages measured more than 60 features on the axles and sent the data to three different machines, including the wheel-making machine. At the wheel machine, the wheel bore was measured. The wheels and axle for each set were delivered together to the automated assembly equipment. In this case, automated measurement was being used in a low-volume application—the normal production rate of wheel/axle sets was four per day.

## Bringing automated measurement on board

If you have a part that is giving you headaches and you think it would benefit from automated measurement, contact a company that provides this type of equipment. Be prepared to discuss the print, the tolerance problems it presents and how you machine the part, plus lot size and other relevant information. Is there a regulatory requirement to retain measurement data, for example?


The good news about automated measurement is “this kind of technology has gotten down to where small, non-automotive shops can implement it and get a good return on investment,” Engles said. “You could hardly even do this 10 years ago. Now, it’s becoming more popular, and the price is coming down. What you could do for \$100,000 10 years ago costs much less now.” Metrology equipment has become more affordable and machine tool control technology is more flexible and open than it has been in the past, making it easier to implement measurement feedback.

The cost of an automated measurement system or device varies greatly. A manual-load fixture measuring one dimension and feeding the data back to the machine might start at \$3000, Gaughan said, and you could spend millions

on a complex measurement station that checks a great many dimensions. From another company, a rough estimate for a simple, manually loaded gaging system with feedback was “no less than \$15,000.”

At Keyence, Montgomery has seen growing interest in automated measurement, including the higher-end systems—despite the state of the economy.

The opportunities for automated measurement and the benefits of using the measurement data are only going to increase. “The technology is changing,” said Gaughan. “More and more, you’ll be able to communicate with the equipment on your floor,” and the different types of equipment—machine tools, measurement systems, robots, gantry cranes, marking systems, etc.—will be able to communicate with each other.

When you encounter one of those headache-producing parts, check out your options for automatic measurement. You can start small with a simple gaging fixture, and over time, as costs go down and measurement capabilities improve, you may find that automated measurement can help you get a handle on more and more of those troublesome parts. 

## For more information:

Control Gaging Inc.: [www.controlgaging.com](http://www.controlgaging.com)

Edmunds Gages: [www.edmundsgages.com](http://www.edmundsgages.com)

Keyence Corporation of America: [www.keyence.com](http://www.keyence.com)

Keyence IM-6000: [keyence.com/IM6TMW](http://keyence.com/IM6TMW)

Keyence LK-G5000 laser displacement sensor:

[www.keyence.com/LKG5TMW](http://www.keyence.com/LKG5TMW)

Macro Sensors: [www.macrosensors.com](http://www.macrosensors.com)

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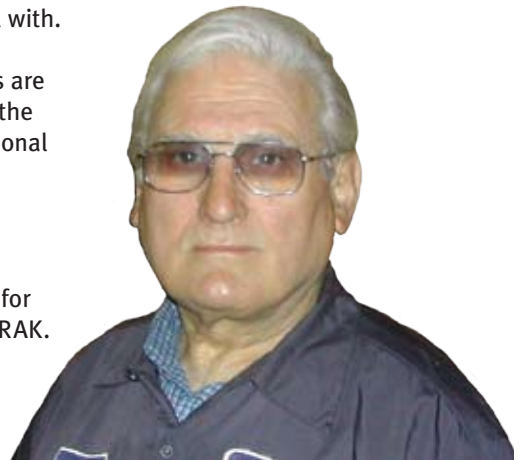
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## ◀ ALMCO Inc.

### BOOTH #2022

Almco Inc. will feature a spiral-bottom round-bowl finishing machine with a unique full-circle baffle that keeps parts in the media mass constantly for faster, more precise processing. The Model SBB-12 has a 12-cubic-foot, urethane-lined tub for parts protection. Other standard and custom spiral-bottom models that are available from the manufacturer can have tub capacities up to 100 cubic feet.

For more information, please visit ALMCO Inc. at [www.almcoinc.com](http://www.almcoinc.com).

## ▶ BIG Kaiser Precision Tooling Inc.

### BOOTH #5244

BIG Kaiser's new KKN modular connection for large boring tools features a three-screw interface, providing high clamping forces for maximum torque transmission. The new system utilizes both steel and aluminum components to offer weight reductions up to 50 percent. This allows for better machine performance, easier handling and eliminates manual tool changes in many instances.

For more information, please visit BIG Kaiser Precision Tooling [www.bigkaiser.com](http://www.bigkaiser.com).

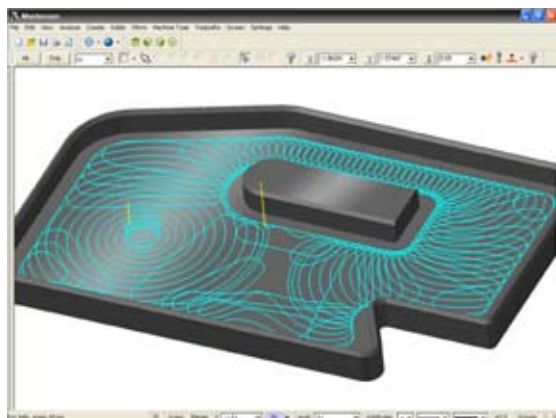


## ◀ CNC Software Inc.

### BOOTH #5245

CNC Software, Inc., will spotlight the latest in their line of Mastercam machining software, with the most notable being Dynamic Machining. Dynamic Machining creates a constantly adapting toolpath that delivers more consistent cutting conditions and allows use of the entire tool flute length, often eliminating the need for multiple depth cuts. This allows dramatic savings, with some Mastercam users reporting more than 50 percent reduction in cutting time, and longer tool life.

For more information, please visit CNC Software Inc. at [www.mastercam.com](http://www.mastercam.com).



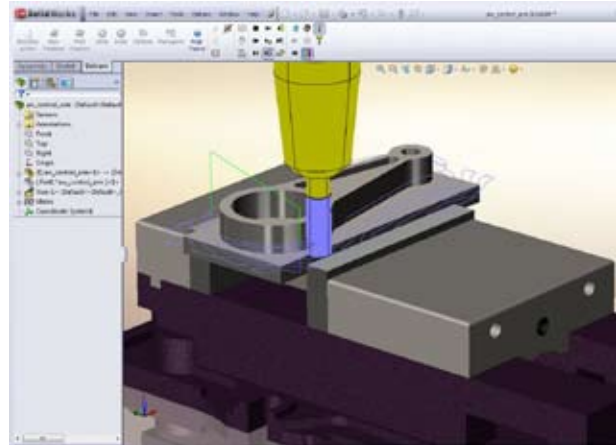
# fresh stuff

## ► Delcam

### BOOTH #5322

Programs on display at EASTEC will include the new Delcam for SolidWorks software, plus the 2010 releases of PowerMILL for high-speed and five-axis machining, FeatureCAM for feature-based programming, PartMaker for Swiss-type lathes and turn-mill equipment and ArtCAM for engraving and routing. Delcam for SolidWorks marks a new direction for Delcam. Previously, the company has supplied all of its machining software as stand-alone systems that can be linked to any CAD program. The software offers PowerMILL's exceptional speed of toolpath calculation, plus all of advanced strategies to increase productivity, maximize tool life and give immaculate surface finish, even when cutting the hardest, most challenging materials.

For more information, please visit Delcam at [www.delcam.com](http://www.delcam.com).

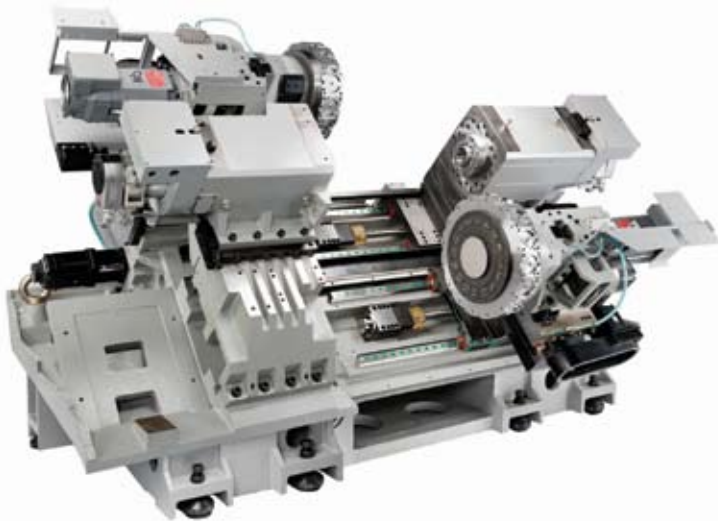


## ◀ Ganesh

### BOOTH #1304

The Cyclone 52-TTMY CNC Mill/Turn center comes with 32 tools and a Mitsubishi control. It features full bar, chuck and shaft machining capability with 2" bar capacity and 6" chucks. The integral main and integral sub-spindle spindles both feature 6,000 rpm capability for fine surface finishes, as well as a C-axis so that milling and drilling operations can be completed all in one operation on the front and back-side of the workpiece. The Y-axis features  $\pm 40$  mm of off center movement to allow the completion of off center work in the same chucking.

For more information, please visit Ganesh at [www.ganeshmachinery.com](http://www.ganeshmachinery.com).



## ► Genevieve Swiss Industries

### BOOTH #5337

Genevieve Swiss Industries will show the new UTILIS® Multidec 1600 series thin grooving and micro turning tools capable of work under .125" in diameter utilizing insert widths from the thickness of human hair (.0019") up to .108" with cutting edge repeatability within .0004", and available with a variety of coatings. Also featured will be high speed live tooling attachments (15,000 max. rpm) available as a direct replacement for many Swiss machines with no retrofitting required, providing increased speed, feeds, faster cycle times and enhanced micro tool life.

For more information, please visit Genevieve Swiss Industries at [www.genswiss.com](http://www.genswiss.com).







## ◀ Kinefac Group

### BOOTH #3010

The Kinefac® Group processes, powers and controls fluids for a wide range of ecology focused applications. KinePower Division will be showing equipment that provides fluid power for the precise positioning of devices ranging from optical turning equipment to solar electric power generating units. For nano applications, the Kine-Spin/Barrett Division will be demonstrating the 601 Versafuge with integral heating, used for separating fluids from very fine powders and washing and drying of complex electronic and medical parts with minimal fluid use. Kinefac will also show the latest generation of Parker Origa rodless pneumatic actuation cylinders and electromechanical positioning devices.

For more information, please visit the Kinefac Group at [www.kinefac.com](http://www.kinefac.com).

## ▶ Marubeni Citizen-Cincom

### BOOTH #1525

Marubeni Citizen-Cincom (MCC) is excited to introduce four new models for the spring of 2010 at EASTEC. They include the newest versions of the L20 and K16 Swiss type lathes—the L20E Type IX and the new K12/16E. MCC will also introduce two new Miyano machines. The BNA-34/42S provides the same efficiency as the BND series in the footprint and price range of the BNC series. Half indexing turret provides greater tooling capability as well as tool change speed. This, as well as new control technology, reduces idle time by 27 percent and cycle time by 13 percent when compared to BND models.

For more information, please visit Marubeni Citizen-Cincom at [www.marucit.com](http://www.marucit.com).



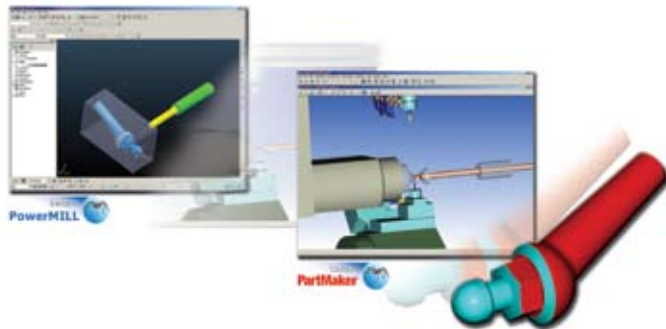
## ◀ The Robert E. Morris Co.

### BOOTH #1305

The Robert E. Morris Company will unveil the new Okuma M460-VE vertical machining center, which adopts a powerful new double column structure to deliver the most machining in the least floor space. Total travel measures 30" (x), 18.11" (y) and 18.11" (z) with a rapid traverse rate of 1574 ipm. Standard features include a high power 40 Taper 12,000 rpm spindle with a 30/25 HP VAC liquid cooled integral motor and a 32-position ATC. Thermal deformation is minimized with Okuma's industry-leading TAS-C/TAS-S compensation system.

For more information, please visit Robert E. Morris Co. at [www.robertemorris.com](http://www.robertemorris.com).

# fresh stuff



## ◀ Partmaker Inc.

### BOOTH #5322

PartMaker Inc., a division of Delcam Plc., will demonstrate its latest release, Version 2010 of its PartMaker® CAD/CAM software for CNC Mills, Lathes, WireEDM, Turn-Mill Centers and Swiss-type lathes. Major highlights of PartMaker Version 2010 include the ability to perform 5-axis simultaneous milling on multi-axis lathes, more powerful milling functionality, enhanced grooving routines, faster tool path creation, improved solid model-based programming tools and the ability to better visualize thread whirling. A host of additional productivity and user-driven enhancements has also been included in PartMaker Version 2010.

For more information, please visit PartMaker Inc. at [www.partmaker.com](http://www.partmaker.com).

## ▶ Slater Tools Inc.

### BOOTH #5518

The latest Slater Tools Rotary Broach Holder eliminates secondary operations and upgrades machine capacity to produce larger internal forms. Slater Tools 3700 Series Adjustment Free Rotary Broaching Tool Holder is the largest holder of its type produced by the company. Unlike the first two series of adjustment free holders, which were produced for Swiss-type machines, the 3700 series features a larger bearing capacity capable of producing larger forms. Rotary broaching tools are popular in turning and milling machines for creating internal and external forms on the machine while eliminating secondary operations.

For more information, please visit Slater Tools Inc. at [www.slatertools.com](http://www.slatertools.com).



## ◀ Star CNC Machine Tool

### BOOTH #1333

The user-friendly ECAS-20T is the first 12-axis machine of its kind with a completely independent three turret-design that allows three tools to be used simultaneously. It provides fully independent front/back machining with an extensive variety of tools that make complicated parts in a single operation. The ECAS-20T provides fast rapids, a quick tool change and great accuracies. It is suitable for traditionally difficult and complex parts.

For more information, please visit Star CNC at [www.starcnc.com](http://www.starcnc.com).

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## WICKMAN

5/8" 6-spindle, thdg., pickoff, 1981  
1" 6-spindle, 1985 (10)  
1" 8-spindle, 1980  
1-3/8" 6-spindle, 1967-1978 (5)  
1-3/4" 6-spindle, 1965, 1984 (4)  
1-3/4" 8-spindle, 1970  
2-1/4" 6-spindle, 1962, 1973-79 (3)  
3-1/4" 6-spindle, 1978

## ACME

1" RAN6 1970  
1-1/4" RA6 1978-61 (9) - some  
w/threading pickoff  
7/16" RA6, 1975 (2)  
1-1/4" RB8, 1981, thdg., pickoff (2)  
1-5/8" RBN8, 1979, thdg., pickoff (3)  
1-5/8" RB8 thdg., pickup '68-72 (5)  
2" RB6, 1967  
2" RB8, 1966 (2)

## CNC MACHINING CENTER

Haas EC400, 2004  
Miltronic RH33 2007  
Doosan 3016LD 2007

## INDEX

G200, 1997, Index  
G300, 1997, Index  
ABC 60mm Index 1996  
B60, 1985  
C-29 1980 (3)  
C-19 1970

## SCHUTTE & GILDEMEISTER

SF51, 1985-79 (3)

## SWISS

Star SR20, 1999  
Tornos R25

## HYDROMATS & ROTARY TRANSFER

V8 Trunion (1990)  
HW 25-12, 1985, 1994, 1997  
HB45-16, 1989 - '97 chucker  
HS16, 2001  
Rismat 154-16 1990  
36-100 Units (3)  
36-100 Recess unit  
Gnutti FMF 15/100 28.1305, 1997  
Gnutti FMF 15 UA/100, 1991  
Gnutti FM 15/100-op sp, 1984  
Govro Nelson, 1970

## EUBAMA

S-12 1998 (2)

## ESCOMATICS

D9 (2), 1995  
D6SR (2)  
D-2, D-4, 1975

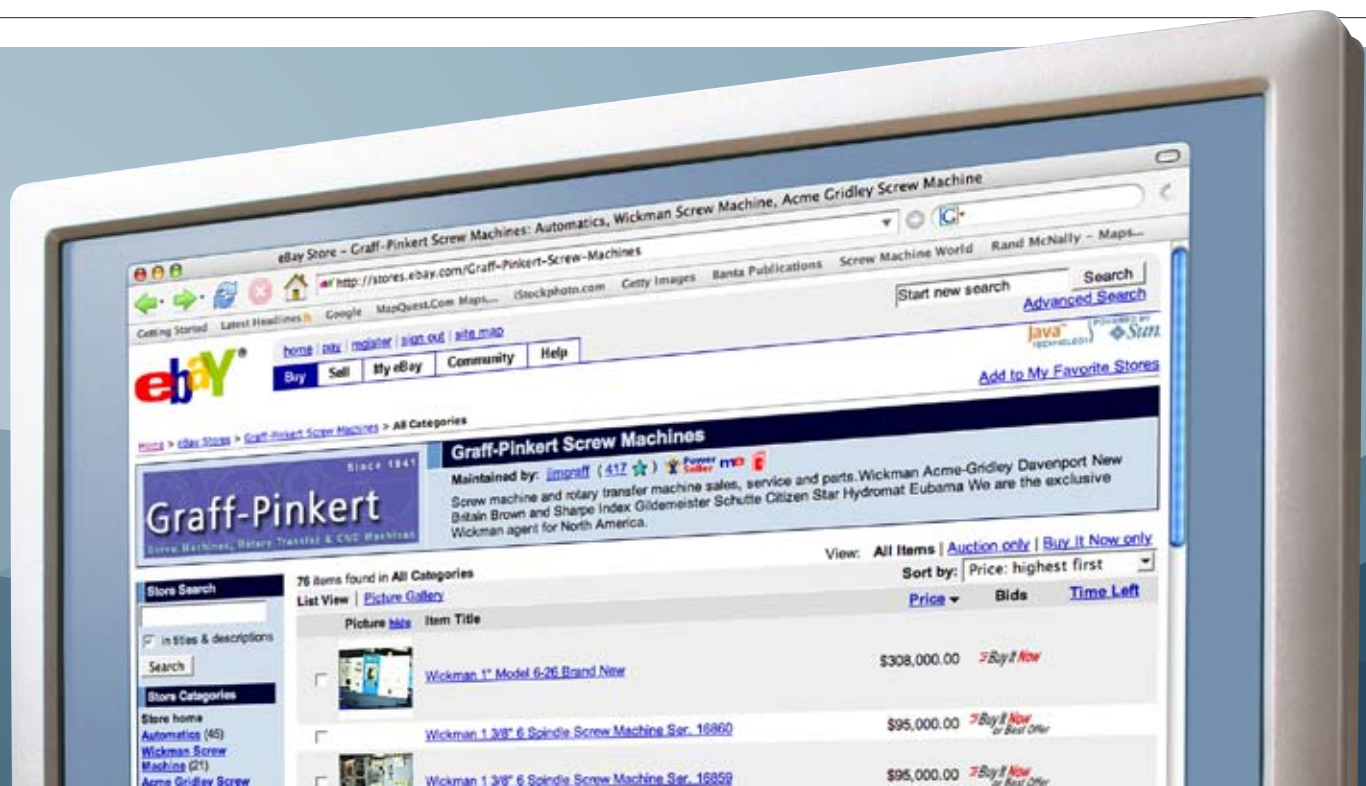
## MISCELLANEOUS

Cincinnati 107-4 centerless  
2 5/8" RB6 spindle bearings  
C-29 Index long turning  
3-1/2 RB6 thdg. attachment  
IMG recess 1-5/8" RB6 (2)  
Hydromat recess unit and flange 36-100  
Siemens varispeed motor off Wickman  
Wickman thread chasing 5/8" - 3 1/4"  
Smog hog air cleaner SG-4S-H  
Every Wickman spare part  
Mayfran chip system  
Crystal Lake Grinders  
Telhurst 48" spinner  
Goss 1-2-3 brass 1980

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# Horizontal Drilling

# SHALE

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“Unconventional” natural gas is the source of this new abundance. Conventional natural gas is typically found along with oil. Just as the easiest oil is gone, so is the associated natural gas. Shale gas is the main source of the enormous increase in reserves.

Shale gas lies in deep high-pressure and high-temperature formations 10,000 to 25,000 feet (or more) beneath the Earth’s surface. Shale is impermeable, and it must be fractured repeatedly to create pathways for the gas to flow back to a wellhole.

Without a wide variety of precision-machined products that follow the American Petroleum Institute’s specifications, like tubular steel, couplings, valves, wellheads, drilling bits, bridge plugs, perforating guns and packers, unconventional natural gas extraction and production would not be possible. Any good machine shop can make oil and gas products, but getting a foothold in the industry involves much more than cutting steel.

By Bridget Mintz Testa

horizontal drilling

Devon’s Bridgeport natural gas processing plant is one of the largest in the country, serving hundreds of gas wells in the rapidly expanding Barnett Shale field in north Texas.  
Photo courtesy of Devon Energy

## The Long Road To Exploiting Shale Gas

"The oil and gas industry has known for decades that shale is a source rock for hydrocarbons," says Chip Minty, a spokesperson for Devon Energy, a major player in unconventional gas. "Shale has produced the reservoirs we've used for about 100 years."

Over geological time periods, oil and gas from shale formations moved into permeable sandstone reservoirs. Those sandstone reservoirs were reached by drilling vertical wells through the shale.

Attempts were made to extract the hydrocarbons in shale, but they weren't very successful. "The old literature said that the typical shale gas well would produce about 500,000 cubic feet per day in its first year and then drop off to a very low level (unprofitable) for the next 30 years," says Rick Smead, a director of the natural gas practice at Navigant Consulting in Houston.

"In 1981, George Mitchell of Mitchell Energy directed his engineers to look into tapping the Barnett Shale north and west of Fort Worth," Minty says. Mitchell had leased about a half million acres of land above the Barnett Shale, where he'd been producing oil and gas from conventional sandstone reservoirs associated with the formation. Mitchell knew, however, that the shale held far more hydrocarbons. He drilled more than 100 vertical wells into the Barnett Shale to learn how to get the gas so it could be produced, according to Steven Holditch, head of the petroleum engineering department at Texas A&M University in College Station.

"Mitchell's people started experimenting with fracturing the shales," Minty says. "They tried a number of methods and started seeing progress in the late 1990s. That was when they started honing in on hydraulic fracturing, which is injecting water under high pressures into the well. This created enormous pressure on the rock, which shattered the shale. That creates the porosity necessary for the gas to move to the well borehole."

Only some 150,000 acres of the lease could be reached this way. In the other roughly 350,000 acres, the shale lay above the Ellenberger Aquifer. When hydraulic fractures penetrate through shale into water, the water seeps into the wells, which "kills" them. In the 150,000 acres Mitchell was drilling, tough layers of limestone encased the shale, both top and bottom. There was no possibility of seepage.

Devon Energy bought Mitchell Energy in 2002. The company wanted to exploit those other 350,000 acres of the Barnett Shale. It applied a familiar industry technology, horizontal drilling, to the Barnett Shale and also figured out how to use the shale itself as a barrier against the Ellenberger Aquifer.

"We drilled down into the Barnett, but took the well laterally through the top half of the shale, using the bottom half as the fracture barrier," Minty says. "This let us get to the other 350,000 acres. We also discovered that by drilling horizontally, we could make the well even more productive than vertical wells because we were exposing the well to a much greater area of the shale."

Since 1981, seven more major North American shale gas basins have been developed. "We produce 20 trillion cubic feet per year of natural gas in the United States and import three trillion cubic feet from Canada," Smead says. Including all natural gas sources, "the total recoverable resource in 2008 was 2247 Tcf," he says. "At 23 Tcf per year, that's about a century of low-greenhouse-gas-emitting fuel for the United States."

Can't quite visualize those volumes? Try this. Lake Superior, the biggest of the Great Lakes, is 350 miles long, 160 miles wide and an average 483 feet deep. It contains 2900 cubic miles of water (more than all the other Great Lakes combined). The total volume of recoverable natural gas Smead cites, at 2247 Tcf, would fill about 5.26 Lake Superiors. The volume of natural gas the U.S. uses in one year, 23 Tcf, is about 5 percent of Lake Superior.

## Hydraulic Fracturing

"To produce natural gas at commercial flow rates and recover enough volume to make a profit, the horizontal wellbore must be treated to create cracks or fractures in the shale," says Holditch. This is done through a "fracture treatment," which means applying high-pressure hydraulic fluid at specific locations along the wellbore. "The cracks provide the paths for the gas to flow to the wellbore," he says.

Before hydraulic fracturing ever begins, a vertical well, or "hole," as it's called in the industry, is first drilled to assess the quality of the shale formation. If the quality is good, data

**Below:** No cement lines the wellbore of this "open hole" horizontal well. Open-hole fracturing uses packers such as the Baker Hughes FracPoint packers shown here, instead of bridge plugs, to separate shale sections. Also with open holes, high-pressure fracture fluid, not explosives, fractures the shale.

Image courtesy of Baker Hughes







**Top:** High-pressure fracture fluid has been pumped into this Packers Plus packer. The packer mechanism slides under pressure, forcing the elastomer section in the center to expand radially.

**Middle:** High-pressure fluid sprays out of the open “ports” in this Packers Plus packer. In an open hole, this high-pressure fluid would crack the shale.

**Bottom:** An undeployed Packers Plus packer’s ports are not visible, and the elastomer element has not expanded.

Photos courtesy of of Bridget Mintz Testa; Image courtesy of Packers Plus

about the formation from the original vertical hole is used to gradually turn the well horizontally. The point where the well becomes horizontal is its heel and the point furthest from the surface is called the toe.

A horizontal hole is typically 2000 to 6000 feet long and 8 to 12 inches in diameter, according to Holditch. Once this hole is drilled, the operator must decide whether to leave the hole open or cased and cemented. Most commonly, the second method is chosen: steel casing is run into the well and cement is pumped down and around the casing to anchor it in place.

To fracture shale in stages by the conventional method, sections of the horizontal hole are isolated with bridge plugs. These devices completely plug the hole from the casing to the cemented wall of the formation to isolate sections of the wellbore. Bridge plugs can be made of steel or steel alloys but are usually made of composites that can be drilled easily. Once a section is isolated, the hydraulic treatment must

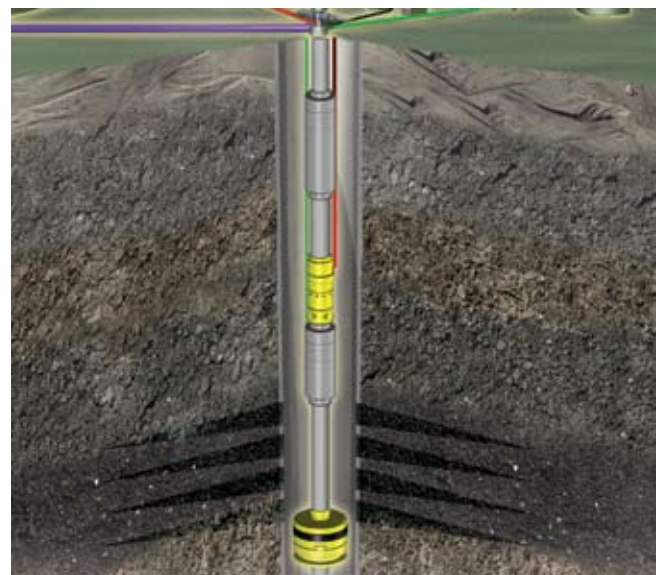
be applied, and for this, the casing, cement and shale must be opened up in some way. Perforating guns, which are tools that contain shaped charges, create entry cracks in the shale. The perforating gun shoots high-pressure jets of gas and particles out in 360 degrees, all around the gun.

Next, “fracture fluid” is pumped at high pressure down the casing through the perforations in the formation. Mainly composed of water with small amounts of bacteriacide, a friction-reducing agent, and a polymer to increase viscosity, fracture fluid also contains large quantities of sand. When this high-pressure fluid is pumped in, the entry cracks expand and penetrate further into the shale. Pressure forces the sand into the fractures, where it remains, propping them open. The industry refers to the sand as a “proppant.”

Fracture treatments start at the toe of the well. Each stage requires setting bridge plugs and perforating. Subsequent stages are pumped by moving closer to the heel of the well, until the entire horizontal hole has been “stimulated” to allow the gas to flow.

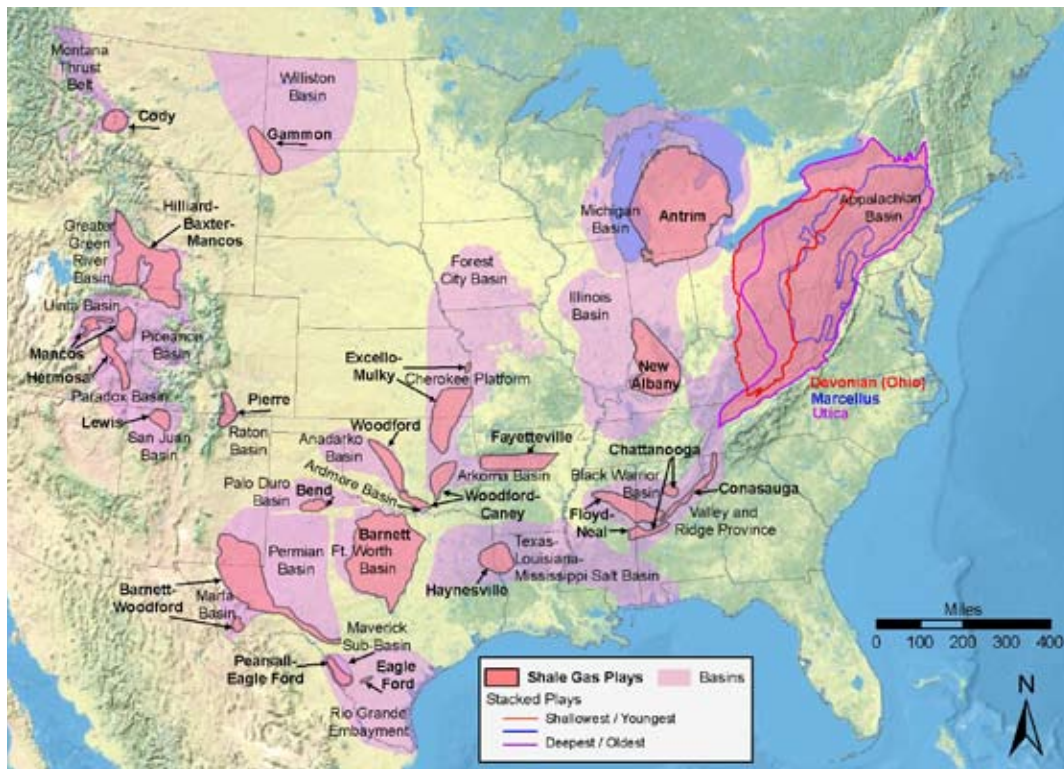
“Each stage of the treatment can take a day or more to complete, although two stages can sometimes be pumped in a single day,” Holditch says. “If an operator pumps 10 or more fracture stages in a single well, it can take days to completely fracture-treat the shale formation along the entire length of the wellbore.”

Once all the treatments are complete, the shale is laced with fractures, most of which will be propped open with sand. In the first few days after fracturing is complete, fracture fluid flows back along with small amounts of gas. Before the gas can be produced in significant quantities, the bridge plugs must be removed by milling. All this debris must be cleaned out and removed with water or brine before real production can begin.



**Above:** This Image of a cemented vertical wellhole shows a cutaway view of the string of tubular equipment sent down into the hole.

Image courtesy of Baker Hughes



**Left:** Oil and gas companies are drilling for unconventional natural gas in these North American shale gas plays. Basins contain the shale formations that hold the gas.

Image courtesy of the Energy Information Administration, Department of Energy

## Machining for the Oil Bidness

If you'd like to make bridge plugs, perforating guns, packers, tubing or any other oil and gas products, the good news is that you don't need any special or exotic machining skills. The bad news is that getting into the oil and gas "bidness" isn't easy. And due to the boom-bust nature of the industry, a conservative business owner should think twice about relying solely on oil and gas for a living. Nevertheless, a good shop with the right attitude and capabilities can do it.

Mike Bowman, president and owner of Hunt and Hunt, a contract machine shop in Houston that specializes in perforating tools, identified a couple of barriers to entry. The industry is now "chasing low-cost overseas manufacturing," Bowman says. He says these are "just low-quality, low-tolerance parts. High-quality, intricate parts are still made in the United States, but [the overseas manufacturing] makes it very difficult to compete as a domestic manufacturer."

Another barrier is the face-to-face nature of the business. "The oil field likes you to come down and discuss a project, so being close to your customer is important," Bowman says. "It's all about in-person relationships." The headquarters of the Big Four oil services companies—Baker Hughes, Halliburton, Schlumberger and Weatherford—are in Houston, which has more than 4,000 machine shops. If you're not in or near Houston, Bowman believes your shop faces a disadvantage.

These barriers can be penetrated. If your shop is far from Houston, but has special capabilities, like the ability to work with exotic materials such as inconel or hastalloy or handle large-diameter tubular goods of 40 inches in diameter or more, that may trump the distance issue.

"Machine shops that want to get into oil and gas need to have capacity, good prices and quality," says Mark Adamson, owner and founder of Tech-Seal International, a 40,000-square foot facility in Houston. Adamson makes flow-back equipment and a solar-powered pump for the oil field. By capacity, he means knowing how to work with large tubular goods and how to provide fast product delivery. Because so many of the products in oil and gas are tubular, Adamson says that knowing how to work with those goods is very helpful.

He also stresses the value of certification by ISO or the American Petroleum Institute. "Certification by either of these shortens the time to become an approved vendor for the major oil and gas service companies," he says. "They won't even send out an audit team otherwise."

Dan Themig, CEO and co-founder of Packers Plus, a Canadian oil service company, advises machine shops to develop relationships with the large oil services companies. "That usually starts with small jobs," he says. "Develop the expertise to machine oil-field products. Pick specific products. A starting point would be to meet with companies that purchase downhole tools, learn their requirements and then start developing the expertise to



**Top:** These steel tubular goods form the outer casing for perforating guns. Inside are the charge carriers that contain shaped explosives that fracture shale in wells lined with cement (cased hole).

**Bottom:** A view down the center of a perforating gun charge carrier that holds shaped explosives for cased-hole hydraulic fracturing.

Photos courtesy of Hunt and Hunt Limited

## Typical Tolerances and Material Grades In Oil and Gas Industry

Along with the standards the American Petroleum Institute maintains, it also specifies tolerances and material grades. Typical materials meet ASTM methods and are of steel grades made from fine-grain practices, typically following ASTM grades. The materials have limits on how much of certain elements can go into the process, as well as mechanical test requirements.

Here are some examples of oil and gas industry tolerances.

Item	Tolerances
Taper	Per ft. on diameter, 0.750 in. +0.0625 in./-0.0312 in. Per in. on diameter, 0.0625 in. +0.0052 in./-0.0026 in.
Lead	Per in. $\pm 0.003$ in. Cumulative $\pm 0.006$ in.
Height, $h_s$ and $h_n$	+0.002 in./-0.006 in. (-).005 in where round casing/tubing and line pipe thread tolerances diverge.
Angle, included	$\pm 1.5$ degree
Length, $L_4$ (external thread)	$\pm 1 p$
Chamfer	$\pm 5$ degrees
Rotary Shouldered Connection	$\pm 0.0015$ in/ft. between first and last full depth thread
Pin taper	$\pm 0.030$ in/ft. to 0 in/ft., average
Boxes	0 in/ft. to -0.030 in/ft., average

do that work. The larger service companies have the staff to set up inspection and quality standards. Then transition to some of the smaller services companies."

Besides providing certification, The American Petroleum Institute is helpful in other ways. "The API


publishes about 500 standards," says Dave Miller, API's standards director. "But if you winnow those down to the specs that facilitate discussion between buyers and sellers, it's about 60 standards."

API's Web site, [www.api.org](http://www.api.org), features a list of API-licensed manufacturers, along with the products they make categorized by standard. Machine shop owners and managers can study this list to identify products they'd like to make. "Then they can go to the publications part of the site and search for the specs they want," Miller says.

API holds regular standards meetings around the country. "The meetings draw 300 to 500 people, including owner-operators, oil companies, oil services companies, manufacturers, consulting engineers and government representatives," Miller says. It's an opportunity to network face-to-face with people in the industry, discover their needs and where you and your shop might fit in. Registration fees

are \$400 to \$500 for the week-long meetings.

"Look at the site and the composite list," Miller says. "Zero in on a particular area and maybe buy one or two of the standards. Then maybe go to a meeting to find out about the needs in the industry or if a standard is going to change." (To go directly to the list, go to [www.API.org](http://www.API.org), click on "certification program," then "monogram program," then "composite list.")

Taking this advice can help a machine shop overcome distance from Houston and build its own network of oil and gas customers. Packers Plus started out in Canada and didn't start working with the oil and gas industry in Houston until several years after its founding. Despite its small size of 300-400 people, it's now a major player in the industry, and its technology is so highly sought-after that in 2005, Schlumberger bought an undisclosed minority share of the company. It also entered into a partnership where Schlumberger would internationally promote several Packers Plus technologies. Themig won't cede any more control, however. He wants to keep the company closely-held and focused on being world-class. It took Packers Plus a few years to find its niche, as it did for Bowman and Adamson. The two Houstonians each did job-shop work initially, but then they found specialties that set them apart. That's the path to success for machine shops in oil and gas. 





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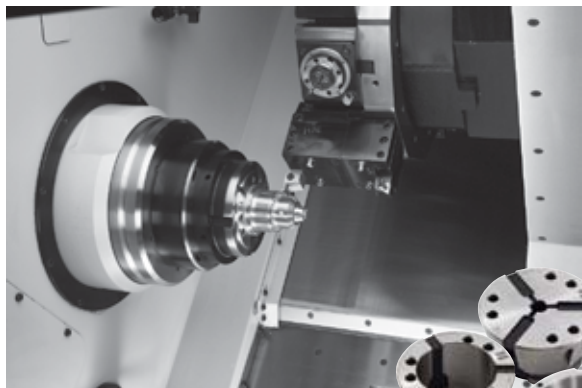
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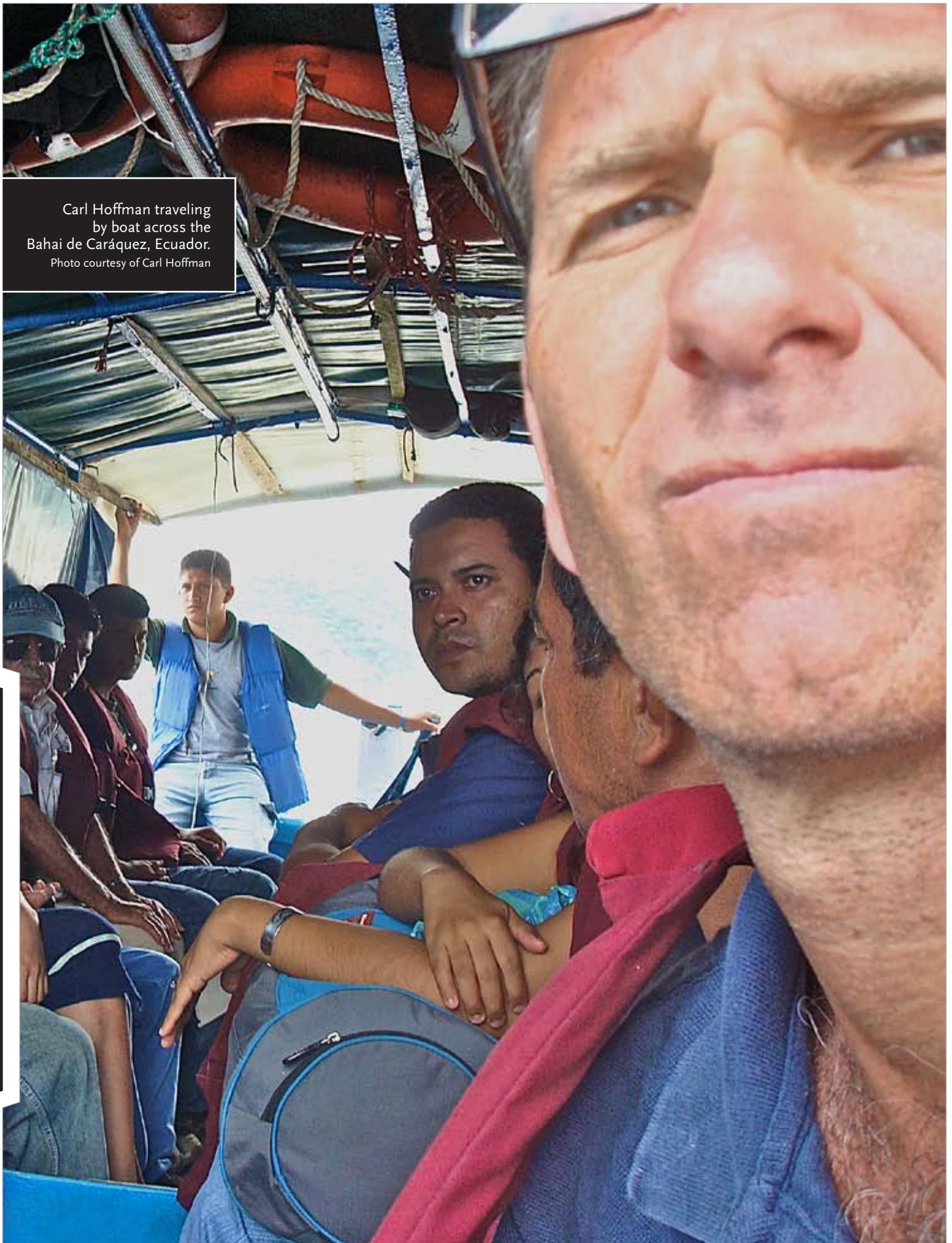
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Carl Hoffman traveling  
by boat across the  
Bahai de Caráquez, Ecuador.  
Photo courtesy of Carl Hoffman

one on one



**Carl Hoffman's** new book, *The Lunatic Express*, chronicles his travels throughout Asia, Africa, South America and the U.S., where he attempted to travel by modes of transportation commonly used by the natives, which were notorious for discomfort, tardiness and poor safety.

**How did you get the idea for the book?**

**CH:** I'd been traveling a lot for work over the last decade in places like the Congo, Sudan and South America. I saw minivans and trains just packed with people, and people riding on the roofs of trains. My journalist sensibility was asking me, "who are these people, where are they going and why are they moving around?"

**How did these people look at you, as they were traveling out of necessity for work and you were this American traveling alone to document an adventure?**

**CH:** They looked at me with incredible curiosity and openness. Most of these people don't travel alone. They travel with family members. Most people spend very little time in their whole lives alone. They sleep in big piles in a one-room apartment or a shack somewhere, and then they have this incredibly long commute in a crowded minivan or matatu or train, and they have a job that's full of people. They kept asking me, "Are you alone? Why are you alone? Where's your family? Why are you here? Why aren't you traveling in first class, or why aren't you flying?"

**Tell me about some of the ways you traveled. Which ones were the most dangerous?**

**CH:** The Cuban airline, Cubana, statistically has one of the worst safety records. The plane from Toronto to Havana was a marquee flight, so it was a brand new shiny airplane and the stewardesses were all beautiful. But the flight from Havana to Bogota was a different beast. It was an old Russian Ilyushin, and the seat backs didn't work, people were smoking and stuff was flying out of the overhead bins. I also traveled on busses, auto rickshaws, bicycle rickshaws and ferries, which are ubiquitous in certain places like Bangladesh and Indonesia. They get incredibly packed with people and they have no life vests and often no lifeboats.

**When did you feel most in danger?**

**CH:** The scariest thing probably was when our bus broke down in Afghanistan in the middle of nowhere. Everybody got off to stretch their legs and I got up too. As I was going to go outside an Afghan guy I was traveling with said, "No, don't get

out. This is a really bad area." That was when I realized that I was really treading a narrow line. Of course, 10 minutes later they got the bus going and off we went.

**At the end of your journey you took a Greyhound bus from Los Angeles to D.C. How did that experience compare to the rest of your travels?**

**CH:** In some ways that was the worst leg of my trip, not because the Greyhound buses were particularly dirty, they weren't, or late, they were wealthily on time. America just looked like a very grim place. The luggage of choice for Greyhound passengers was a plastic garbage bag, quickly stuffed with a few clothing items. But when you're on an India train or your on an Indonesia ferry in steerage, they're eating such good food and they're praying and they're dancing. But I think one has to be careful about over romanticizing the lives of the Third World. They're not lonely, but they live very difficult lives.

**Did you see much manufacturing going on during your travels?**

**CH:** Well, one really cool thing throughout the Third World is the amount of small scale manufacturing and small scale human enterprise. In Bangladesh, you can walk down the street and there's nothing but bicycle rickshaw shops, and guys are welding and banging and doing it in bare feet without shirts. It's hot, and they're building things.

I had a bicycle messenger bag and its zipper was broken. One day I was just sitting around having tea in the park with some shoe shiners and an ear cleaner that had I buddied up with. One of them suddenly pointed at my zipper and he grabbed my bag and went at it with a little wax from his kit and a razor blade. And with incredible care, he fixed my zipper. It's the sort of thing that only a poor Indian in a park would do. We don't fix a zipper. We take it in and send it away, and maybe they send back a new one or they rip the whole zipper out and sew a new one in. This guy fixed it. They have a whole mentality and culture of fixing things and building things, and it's kind of been lost here.

Find out more about Carl Hoffman's new book and travels at [www.lunaticexpress.com](http://www.lunaticexpress.com).



WITH NOAH GRAFF

# shop doc

Today's Machining World's "Shop Doc" column taps into our 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 can also check out the Shop Doc Blog at [www.todaysmachiningworld.com](http://www.todaysmachiningworld.com).

Dear Shop Doc,

I recently decided to shop around for quotes to rebuild my 1-1/4" RB8 Acme-Gridley. I sent the RFQ out to three different rebuilders and received three very different prices. Why is there such a big difference in price from one rebuilding company to the next?

Confused in Cleveland

Dear Confused,

This is a very common situation in our industry today, but a little knowledge can go a long way towards helping you evaluate quotes for your rebuild projects.

Many companies mistakenly assume that the term "rebuild" means the same thing to every supplier. This is not the case, and there can be a great deal of difference between machine tool rebuilders as to what constitutes a machine rebuild. These differences have a substantial impact on what it will cost a rebuilder to do the job, what will actually be done to your machine and what condition your machine will be in when you get it back. For Rebuilder A, it may be standard practice to replace every bearing in the machine, and just about every part with a new part, while Rebuilder B might have the practice of evaluating all of the current parts in the machine and then reusing the ones that pass inspection. One rebuilder may always strip the machine completely down to the castings, inspect them carefully for damage or needed repairs, then repaint the machine inside and out, while another rebuilder may consider that to be more work than necessary.

The differences in opinion about what work must be done when "rebuilding" a machine is the main cause of the wide range of price quotes. Some of the better rebuilding companies offer a written procedure detailing what they

do when they rebuild a machine. Many also offer what is commonly called a machine "re-condition," basically a mini-rebuild, which is also subject to discrepancies from company to company regarding what work is included. A written procedure for machine re-conditioning may also be available.

A great way for a customer to deal with these discrepancies is to write their own detailed outline for what work they want to be performed, and use that as the platform for every rebuilder to bid on. Be sure to include as much detail as possible and outline what is acceptable to you with regard to reusing any current parts on the machine. Also, consider if you want the electrical system to be addressed, if there are attachments that will need to be rebuilt or added, and if there are any other upgrades such as adding a PLC, that need to be outlined. The more detail you have going into the quoting process the more accurate your quotes will be, and the fewer surprises you will have down the road.

David Johnson

Champion Screw Machine Engineering, Inc.

*David Johnson is the Rebuild Manager for  
Champion Screw Machine Engineering, Inc. in Wixom, Mich.  
He can be reached at [djohnson@championscrew.com](mailto:djohnson@championscrew.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.

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THE FOLLOWING COMPANIES HAVE PROVIDED  
INFORMATION ON MACHINE TOOL AUTOMATION

# product focus

In today's competitive world, saving minutes on a machining process can be crucial to your bottom line and your customer's satisfaction. As automation processes grow in availability and technologically they are becoming more commonplace and necessary to compete in a shrinking marketplace. The following companies have provided information on their latest machine tool automation-related offerings and successful processes.



## ◀ API Automation

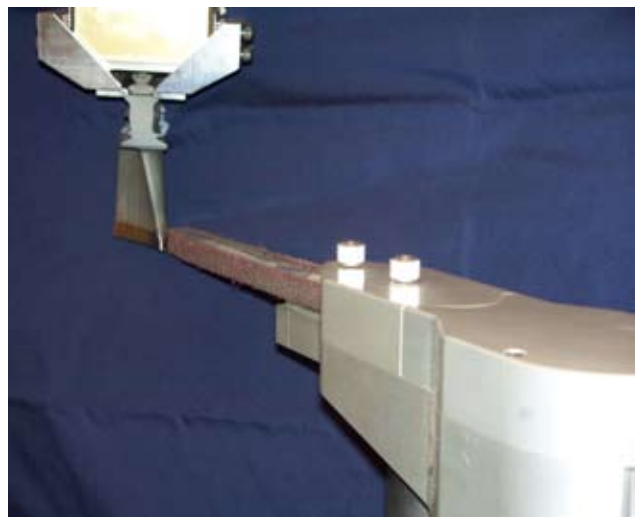
API Automation has created the pictured machine tool robot loading and unloading system, which can be cabinet mounted or pivot arm mounted. Both mounting systems incorporate a linear rail system, making it easy to use in manual, semi-automatic or fully automatic operations. The robot can pick up the parts from any style API parts handling system. Parts are then loaded into the machine tool utilizing the robot's two sets of offset grippers, allowing for fast and easy loading and unloading of parts. When the machine is finished with the part, the robot takes the finished part to any desired location API can integrate into your system.

For more information, please call API Automation at 815-577-1600.

## ▶ Applied Robotics Inc.

Applied Robotics Inc. recently announced the debut of their new Reversible Belt Tool, adding a new line of metal finishing tools to their arsenal of products and solutions. The Belt Tool is a precision tool assembly designed to be mounted on a robotic tool changer or directly on a robotic arm or in a stationary manner. It enables fine finishing of high value parts that have many contours with complex geometry. The tool offers a quick change of belt media, from grinding to polishing, for example, by the simple replacement of the reversible belt.

For more information, please visit Applied Robotics Inc. at [www.appliedrobotics.com](http://www.appliedrobotics.com).





## ► ATI Industrial Automation

VersaFinish™ is an axially compliant finishing tool ideal for robotic and automated material finishing operations on aluminum, plastic, steel and more. Therobust, a low-speed, high-torque finishing tool, has a unique “floating” motor and spindle arrangement that provides the finishing tip’s axial compliance to perform consistently on irregular part patterns. The VersaFinish™ is mounted to a robot or CNC machine and has a vane-type air motor with gear reduction, providing a long service life.

For more information, please visit ATI Industrial Automation at [www.ati-ia.com](http://www.ati-ia.com).



## ◀ CNC Solutions

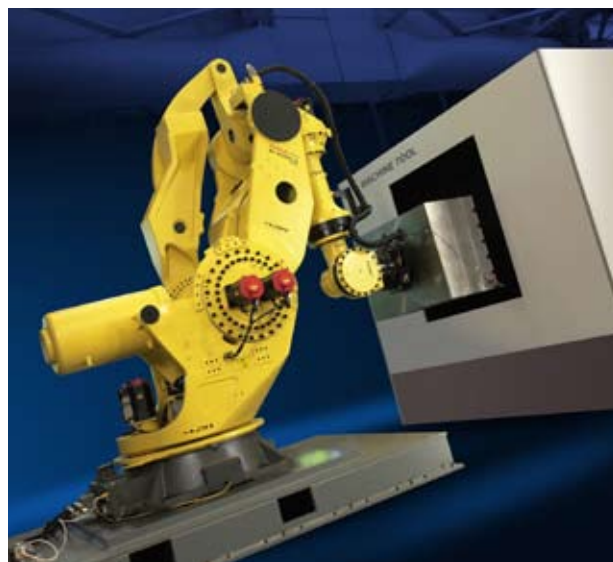
CNC Solutions uses system integration technology to provide quality plant automation solutions for both machine and process controls. Pictured is an example of a system created by CNC Solutions for a customer who was having material handling issues due to the size and weight of their sheet metal blanks. Each operation required two people to handle the product, which created safety hazards, numerous workman’s comp claims and was labor intensive. A robotic system with various stations now processes the parts as needed and stacks them for use in the next operation, which reduces the number of times the product is physically touched from eight times to zero.

For more information, please visit CNC Solutions LLC at [www.cncsolutionsllc.com](http://www.cncsolutionsllc.com).

## ► FANUC Robotics America Inc.

FANUC Robotics America Inc. recently introduced the new M-2000iA/1200 super heavy-duty robot, able to lift parts weighing up to 1350 kg (3,000 lbs or 1.5 tons). The M-2000iA/1200 has the highest payload and the strongest wrist when compared to all other electric six-axis robots available. It has a 0.6 m offset from the faceplate and full-articulated motion at the wrist. One M-2000iA/1200 robot can handle a super heavy part, which previously required dual robots, conveyors, lifts or other fixed automation.

For more information, please visit FANUC Robotics America Inc. at [www.fanurobotics.com](http://www.fanurobotics.com).



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## product focus



### ▲ Gosiger Automation

In response to a customer's need for more time and less labor-intensive processes, Gosiger recently designed a machining system that includes an Okuma LU-400, 4-axis lathe, an Okuma LB-3000EX, 2-axis lathe and a Fanuc R-200 iB/165 robot for a company that makes a line of well fracturing pumps for the oil and gas industry. The system is designed for maximum flexibility to accommodate a wide range of parts but is primarily used to make pump valves and seats. These parts are made from castings and forgings and have cycle times of 30 seconds to 1.5 minutes. Initial operations are performed in the LU-400 machine and secondary operations in the LB-3000. The robot tends both machines, flipping over the part between operations.

For more information, please visit Gosiger Automation  
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### ▲ Motoman Inc.

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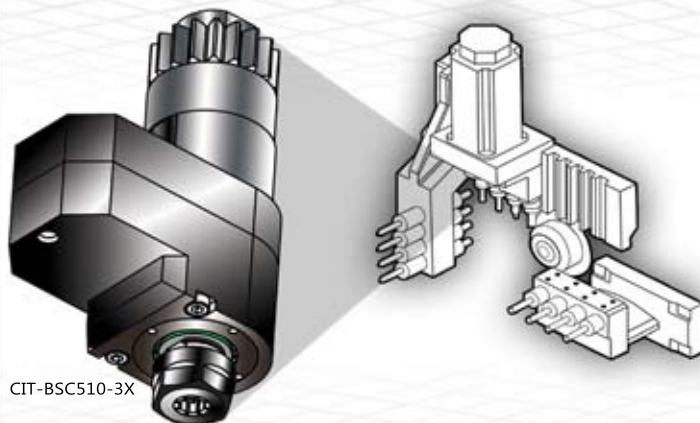


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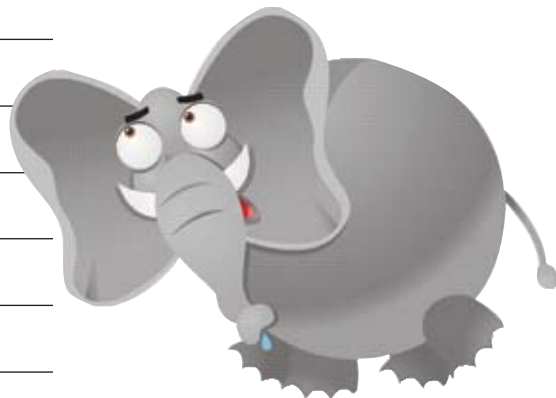
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# think tank

## Commonym

A Commonym is a group of three words that have a common trait. For example, the words car, tree and elephant all have trunks. What word ties each of the following groups of words together?

1. Brain - Lung - Ear\_\_\_\_\_
2. Spider - Fiddler - Hermit\_\_\_\_\_
3. Back - Butterfly - Side\_\_\_\_\_
4. Car - Tree - Elephant\_\_\_\_\_
5. Bear - Hammer - Lobster\_\_\_\_\_
6. Finish - Fishing - Dotted\_\_\_\_\_
7. Metal - Radar - Lie\_\_\_\_\_
8. Stop - Spot - Strobe\_\_\_\_\_
9. Trap - French - Glass\_\_\_\_\_
10. State - Sales - Income\_\_\_\_\_



## Who found their numbers?

**Wendy Bowman** of A&A Machine Co. in Rocky Mountain, Va.; **Rick Stein** of Key Products in Milwaukee, Wis.; **Greg Toellner** of Custom Components & Assemblies in Houston, Texas; **Steve Richards** of Yamazen Inc.; **Steve Taylor** of Global Shop Solutions in The Woodlands, Texas; **Bill Hopcraft** of Precision Design Craft in Millington, N.J.; **Randy Settles** of Nutex Automatic Products, Inc. in Fredericksburg, Texas; **Ram Chandran** of Muller Martini Mfg. Corp. in Newport News, Va.; **Chris Hoeker** of International Tool and Machine in Hillside, N.J.; **Bill Middleton** of Econotool Inc. in Huntingdon Valley, Pa.

Puzzle found in the April 2010 issue.

6	0	3	8	3	6	8	4	7	41
0	1	5	2	6	3	3	1	3	45
4	5	7	4	0	8	8	7	5	24
8	8	2	5	1	0	2	7	2	48
8	4	6	4	7	2	8	6	1	35
8	8	0	5	1	8	4	1	4	46
8	6	8	5	1	2	0	7	4	39
7	4	1	0	4	6	5	5	0	41
1	7	4	4	5	8	1	7	5	32
50	43	36	37	28	43	39	45	31	42
									44

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### Amish Precision Machining

*Lloyd Graff blogged about Eli L., an Amish machinist in Northwest Indiana who runs three 1-1/4" RA6 National Acme screw machines without conventional electric motors. Lloyd asked readers, "Would you do business with a company that was off the power grid?"*

**Allen Robinson** April 1, 2010 at 1:01 p.m.

I'm a moldmaker of 25+ years and have done business in the past with the Amish and Mennonites and would again in the future. They're the hardest working people I have ever worked with. Honesty and integrity are how they live and do business. I think if we can get more Amish into this trade we will give China a run for their money. I wish them all the best and would help any of them that wanted to venture into machining.

**Dave Inners** April 1, 2010 at 1:52 p.m.

I own a machining, welding, and fabrication job shop in south central Pennsylvania. The Amish of Lancaster County are my competitors. They operate their welding, fabrication and machine shops on their farms taxed as agricultural, not manufacturing. They use their children and grandchildren as machinists. Do they obey the OSHA and safety laws? Do they pay unemployment compensation? Do they pay for health insurance? Are their employees of age to operate machinery? Do they pay their fair share of taxes? Do they adhere to state laws regarding hours of work and overtime pay?

**James** April 6, 2010 at 12:00 p.m.

As Americans [the Amish] have found a way that works for them. If the Indians got into manufacturing on their reservations instead of building casinos to earn a living, would we complain about them too? Just because our government has a choke hold on most of us doesn't mean we should knock how others choose to live and run their businesses. I'd rather have my kids working for the family business at age 10 or 12. I consider that 1000 times better than the kids today texting and twittering,

bullying classmates and playing X-box until they develop carpal tunnel syndrome. Then when they finally have to get a job they expect to start out at the top. Working on farms is something this country should get back into. We should learn how to take care of our own and support ourselves!

### Are Machinery Trade Shows Becoming Obsolete?

*Lloyd Graff blogged about SME canceling the WESTEC show in 2011. He asked readers if they thought machinery trade shows were becoming obsolete.*

**Steve W** March 30, 2010 at 11:10 a.m.

The last few times I have been to WESTEC it was more or less a social thing. I have never really made a decision at the show. We knew going into the show what we were buying. For the upcoming IMTS I don't intend to go or send anybody. It is just not worth the cost. I would rather go to the builders and view the machine tools/equipment in operation. When I do that I also get more time to see the processes/equipment and don't have a schedule that I have to keep to. At a trade show I can only spend 10 or 15 minutes talking to somebody. I did use it one year as a great way to meet engineers for job interviews since their employers thought they were at the show to see something.

**Tim Daro** March 31, 2010 at 7:39 a.m.

As a 35-year veteran of industrial ad/PR work mostly in the machine tool market, I will state without hesitation that trade shows are still viable, particularly for machine builders. I attend perhaps 25 shows a year and the attendance is down at all of them, but the quality is still there. One client sold three lasers off the floor at FABTECH, last fall. Folks will come to IMTS or PMTS and not stay as long, but they'll find what want to see and they want to see it in action. The mindset of a shop owner looking to buy a machine tool, molding press or other capital equipment is fundamentally different from the purchasing agent at a mega-corporation doing program buying online.



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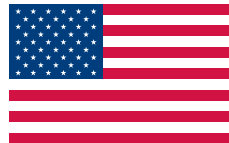
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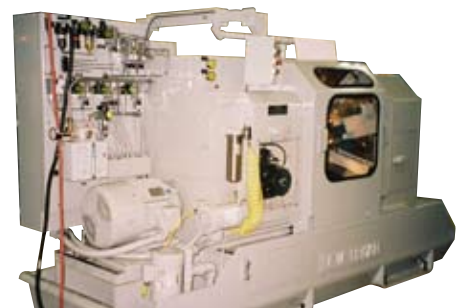
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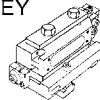
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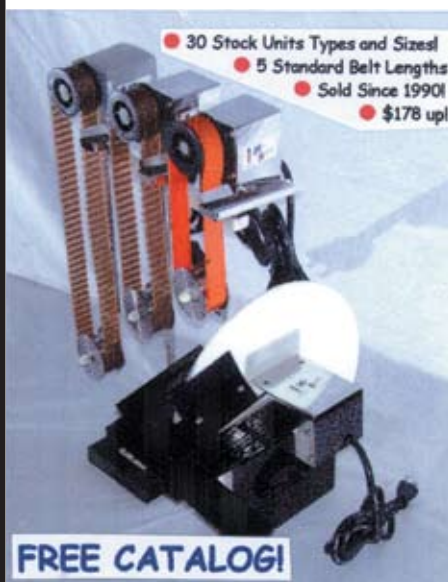


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# afterthought

## Making the Call

**F**or almost 10 years I've lived the schizoid life of a machinery dealer and writer/publisher. Both jobs stoke my intellectual furnace with firewood. I feel like I'm usually on top of my game in my writing because the more I do the sharper the prose gets. As a dealmaker, I sometimes feel like I'm half a lap behind.

The skills of dealmaking resemble those of writing a journalistic piece. Both require research—acquiring the facts from disparate sources. On the machinery side I am constantly looking for sources to provide me with solid comparisons of values. Is a four-year-old Mazak 30" x 16" vertical machining center worth \$25,000

or \$45,000? The difference in value may hinge on a change of controls, a choice of options or the hours on the spindle. Another variable affecting the price is the quality of Mazak service, availability of spares or whether the dealers are discounting at the moment.

This kind of exercise is almost second nature to me now because I've been doing it since I was young. I knew my father was in the buy low sell higher business, and I was always curious how he knew what low was.

My abiding interest in discerning the meaning of low continues to keep me engaged in the machinery business. One thing I have learned at heavy cost is that low isn't always low, because if you have to hold an item for years and years it isn't cheap at any price. There have been many years in the machinery business when the buy low philosophy had to be replaced by the buy high and sell higher approach because rolling inflation almost eliminated the buy low method. During an asset appreciation period, if you don't chase the rising prices you can miss the big opportunity that the rising tide presents.

The stock market offers an interesting comparison. Warren Buffett is the consummate "value" investor, strictly adhering to his principle of buying "cheap" assets. He loves

recessions because they afford him more opportunities to buy depressed stocks and companies.

But other investors have been successful at buying "momentum." They spot a trend and ride it up and up. It mimics the buy high and sell higher approach that often works well in the used machinery business.

I think the reason I feel like I am half a lap behind in the dealmaking world today is that I can't make up my mind if we are still in a buy low sell high period or if we are transitioning

**“My father was in the buy low sell higher business, and I was always curious how he knew what low was.”**

to a buy high sell higher world. The high production multi-spindle screw machine, rotary transfer and stamping press arena has been in a deflation rut for several years. But in the last couple of months the market has started to reinflate. Used Hydromats, which were abundant last year, are now scarce.

I think a lot of people in business live with one foot on the treadmill. Do you start hiring, build an addition or look for an acquisition when business starts getting better, or do you play it safer, fattening the margins, socking away the profits, paying down the debt?

Lloyd the journalist can sit here and observe, but Lloyd the dealer, the speculator, the buy and sell guy, has to make a call. Doing nothing is a decision. You and I are at or close to an inflection point in the market. Do we double down to maximize the opportunity, or dance and jab, keeping our guard up at all times?

As a commentator I can comfortably opine on both sides, but my other half time job demands a call, and at the moment I feel at a loss to make it.

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## **SMQ™ Screw Machine Quality** **Stainless Steel Bar**

At SCHMOLZ+BICKENBACH we pride ourselves on providing precision products that improve productivity while increasing profitability for our customers. Our Screw Machine Quality SMQ™ provides precision ground qualities at cold drawn prices.

Our products feature precision tolerances for straightness, out-of-round, surface finish, diameter tolerances, and overall consistency. Combined with our latest generation of Ugima® high machinability grades—we are able to offer you a product that will allow for excellent performance across a wider range of operations and cutting conditions. Additional benefits include improved chip breakability, superior surface finish, and increased tool life.

SCHMOLZ+BICKENBACH is the world's leading producer of stainless and tool steel long products offering directly integrated service from the mill to your door. Our owned production facilities include such names as Ugitech (France), DEW (Germany), SteelTec (Switzerland), and A. Finkl & Sons Co (USA)—offering over 100 years of experience serving innovation.

In North America, we are able to service your needs from one of our 8 service facilities—including our Chicago production facility which offers a full line of stainless bars manufactured in America. Because we own our own distribution as well, you are dealing directly from the source. Our services include immediate product availability, custom orders, customer-dedicated inventory programs, and strong technical support with both in house metallurgical and mechanical engineering support.

*Please inquire about our entire range of products, sizes and grade capabilities. SCHMOLZ+BICKENBACH Bar Mills are DFARS compliant. SCHMOLZ+BICKENBACH meets all North America and European compliance standards.*

**SCHMOLZ + BICKENBACH**  
**Stainless Steel Materials Division**

**SCHMOLZ + BICKENBACH**

Providing special steel solutions





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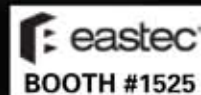
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