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editor's note

Born to Blog

In the unlikely case that 2500 words of “Swarf,” plus “Afterthought,” and “Editor’s Note” are an insufficient diet of my dubious dabbling in just about everything I have ignorance about, you can now read my blog – swarfblog.com on the web.

This new exercise in journalistic vanity begins during IMTS, because the show will offer a lot to talk about. I figure a few people will want to read about IMTS and maybe see some photos and video without a ridiculously long lag period. One thing I’ll be checking on is the mood of the folks visiting the Haas Automation exhibition. It will be an indicator of whether Gene Haas’s indictment on tax charges will have a spillover to machine tool sales at Haas.

I will be offering my reaction to new products and recounting conversations. If swarfblog.com gets some traction quickly the blog will be a conduit for the other show visitors and exhibitors to post their observations and opinions.

Blogs are revolutionizing journalism and politics at an astonishing pace. Ned Lamont’s victory over Joe Lieberman in the Democratic Senate Primary in Connecticut is a testament to the bloggers’ reach, particularly Daily Kos (dailykos.com), voice of the Democrats’ Maoist wing.

The blog which inspires me most is Mark Cuban’s Blog Maverick (blogmaverick.com), which is funny, astute, and honest.

I brought in Paul Conley from Brooklyn to coach me on blogging. Paul writes an incisive blog and is one of the top consultants on the topic. He thinks I was born to blog.

Hopefully, you will too.

Lloyd Graff
Editor/Owner

editors note

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Reading Material

About three months ago, I found your magazine in the bathroom under several issues of *Modern Machine Shop*, which were under several issues of *Hustler* magazine and the like. So I picked it up and thumbed through it. What happened next is that I liked the articles, actually read most of them, and that is a departure from what I do with the others. I go through those quickly, look at the machine and/or software ads, then put it at the bottom of the pile, back under the *Hustler* magazines. That's all. Good job.

David Shaby
Compumachine Inc., Wilmington, MA

Short Sighted

Lloyd was off base on the GM SS Nazi thing (Swarf, March 2006). SS stands for Super Sport and has for over 40 years. People still rave about 60s era SS 396s, etc. Your reaction re-

minded me of a scene in *Annie Hall* where Woody Allen says to his friend that everyone is against Jews and uses as an example a conversation he overhears (while Woody and his friend are walking down the street) where a guy asks someone: "Have you eaten?" and the other guy replies, "No. D'jou?"

I suspect real car guys were taken aback by your bashing of GM for using the SS label, a label with a 40+ year performance car history.

Russ Ethridge
St. Clair Shores, MI

Trade Deficit

Don't be too hard on the lady who writes for clients but doesn't know anything about the business or the trade magazines (Editor's Note, July 2006 issue). Those people create a lot of writing gigs for me. One of my best came when the client stated to his contracted writer that he wanted a piece written about the manufacturing of high performance pistons. Her response was, "What's a piston?" It's a crime that people can get away with such mindlessness.

Dennis Myers
Laguna Beach, CA

Down Under

I suspect you have mixed up the Australian geography with their economy (Swarf, July 2006). You mentioned mining being very active in western Australia and the market being hot in Brisbane. For the record, there is precious little mining going on in Brisbane or surrounding areas, and you may play hell trying to find more than a couple of CNC shops.

However, congratulations on having the courage to comment on the Gene Haas issue. Since all the other magazines fear the loss of the mighty advertising dollar, they have not addressed the biggest headline ever in the machining industry.

Uli Kuster
Blaser Swisslube Inc., Goshen, NY

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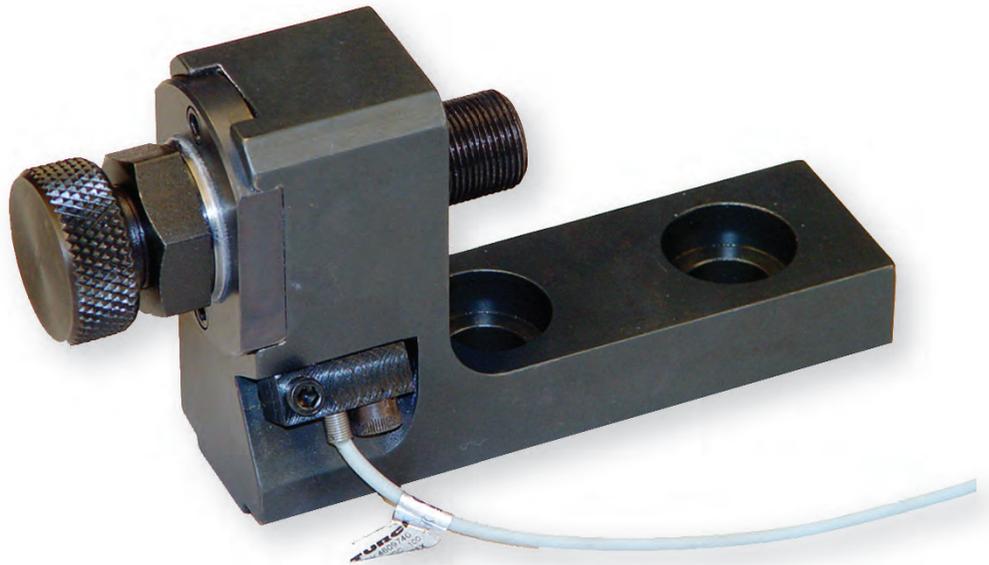
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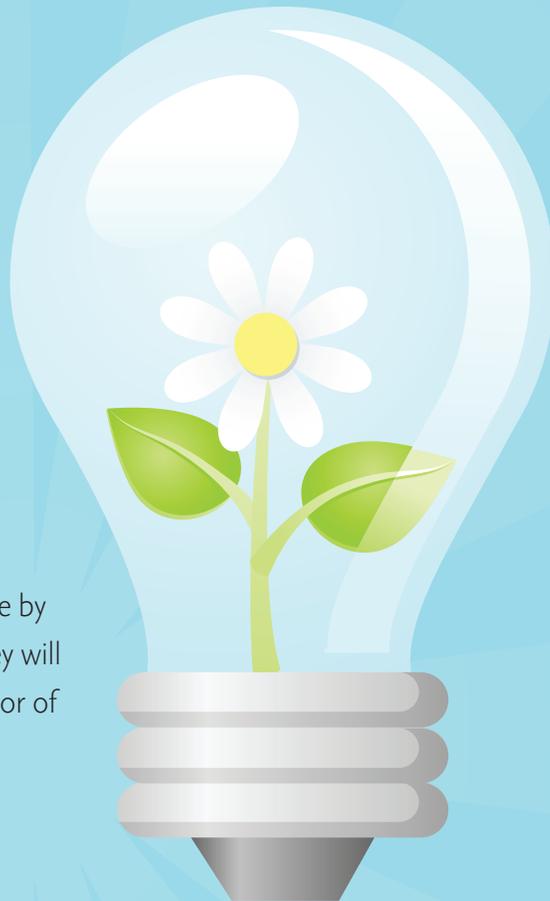
Here Comes

We all tend to make judgments about the way the world will be by looking backwards. Oil prices have been rising so we think they will be going higher. I am not so sure. And if we look at the behavior of Big Oil, I think they are not so sure either.

Exxon Mobil made \$10 billion last quarter, but they are not drilling new holes like crazy as one might expect. Money is starting to pour into alternative energy companies from venture capitalists. Clean coal and solar are red-hot places for investment.

The potential for solar energy is huge. Photovoltaic panels keep getting more efficient, but one of the most promising developments is the coupling of solar and the Stirling engine, that interesting relic of the 18th century. A company called Stirling Energy Systems, Inc. of Phoenix, Arizona has developed a system of converting solar energy to electricity using the Stirling engine, which is almost three times more efficient than panels. They have a demonstration plant developed with the Federal Government's Sandia Labs in New Mexico. They have long-term contracts from San Diego Gas & Electric and Southern California Edison and are building a \$2 billion dollar sun farm in the Mohave desert, which will provide enough clean power to serve 278,000 homes by 2011. If the Mojave project is successful the path is clear for mass production of the company's proprietary solar mirrors, which will bring down the price significantly per dish.

Theoretically, enough electricity could be produced in the Mohave and Sonoran deserts to produce most of our electricity needs in 15 years. Combine this with hybrids or fully electric cars and oil dependency is over, greenhouse gases are a memory, and Al Gore is an inconvenient tool.



We have a lot of desert in North America and a huge amount of coal. If we use sun power during the day and clean coal, natural gas and nuclear at night, the world will quickly be a different place. Perhaps this explains why refiners are not lusting for more capacity and Exxon and BP are slow to drill more holes in the Gulf of Mexico.

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Chris Anderson has written an important book for understanding market trends, *The Long Tail*. The book focuses on consumer products and tastes, but the ramifications for industrial products are equally significant.

Anderson's thesis is that the blockbuster hit is dwindling in importance as a vast array of niche products takes its place. You see the trend in music, magazines, foods, even cars. He points out that there are a few huge hits on I-Tunes and Rhapsody online music, but the market has gravitated to the obscure titles. Amazon has found the real growth market for the company is not Danielle Steel's newest novel but her old books being rediscovered. The action is in small buys among an almost infinite number of sources, which is possible with online distribution, but much more difficult in physical stores.

Starbucks has skillfully exploited this trend by offering thousands of variations on its basic drink menu. You want a venti mocha decaf Frappuccino double blended with half a dollop of whipped cream? No problem.

If this customer preference continues to filter down through the masses you will see dramatic shifts in products, which will mean manufacturing will have to change with it.

I was talking to a client recently who has a traditional high volume screw machine business. He is boot-strapping a niche product business aimed at car and motorcycle enthusiasts. The market is for individualized products. He has hired a graphic designer to give form to his customers' desires. His goal is to be the Gauguin of tire rims, not the Goodyear.

I have another client who has made a living in the machining business for thirty years, but in recent years he has found niches in the ammunition testing business. He makes the test bullets, usually in the hundreds of pieces, but now is selling the testing facilities also. When you are making military armor today, price is not a big issue.

I have long believed that the future of the footwear business is in custom orthotic inserts. Who doesn't have a foot problem? CAD/CAM software and same-day orthotics at low prices will remake the shoe industry in the next few years.

The prototype business is changing quickly. New "printers" are capable of making prototypes in minutes that used to take weeks or months. We are entering the age of instant manufacturing. This is changing battlefield repairs to vehicles and helicopters.

The customized cell phone ring-tone is hot. Everybody wants something special. This is a big trend that we must all adapt to if we are going to be successful.

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I had a good talk with Hanan Fishman of

Partmaker about its merger with Delcam Software. He sees the combination as a great fit for both companies because Partmaker gets access to the powerful distribution network of the much larger European parent company and Delcam gets Partmaker's fast-growing products aimed primarily at the CNC Swiss lathe market.

Delcam is publicly traded, doing around \$50 million in sales, with a focus on milling and mold making. The mold industry has been moving to China where software piracy is rampant, which is another argument for the deal.

Partmaker is a dynamic small company with great reach for its size. This combination gives it extraordinary extension in Europe and Asia that would have taken a long time to develop. It also gives the Fishman family the liquidity that a small intellectual property company owner often covets.

Mergers are always risky because the personalities may ultimately fail to click. Hanan sounds very happy and confident about this one. I wish he and his mother Lena only the best with it.

We have recently seen a sad and comical

farce played out in the Chicago City Council, which passed a bill

which would force big box retailers like Wal-Mart and Home Depot to pay a "living wage" to its employees. Wal-Mart vows to build no stores in Chicago if this ordinance passes legal testing.

An artificial local minimum wage law is a political sop. It is probably illegal and certainly not economically viable, but it highlights the plight of the poor people it purports to help. A couple years ago Jerry Levine reviewed Barbara Ehrenreich's book *Nickel and Dimed in America*. The book made Ehrenreich a lot of money (meaning she got a big advance for her next book and her speaking fee went up) but really didn't change anything. What may change Wal-Mart's hiring practices is its languishing sales and dead stock price. It continues to lose out to specialty retailers who hire smart people, train them well, retain them, and provide an appealing customer experience. Wal-Mart has been failing at this for years, partly because their focus has been more on the cost of sales than on the customer buying experience.

The \$9.25 per hour starting wage mandated in Chicago would work for Wal-Mart if it would bring a higher quality employee to the huge chain. But in the real world Wal-Mart will react by buying high-priced legal and lobbying talent to beat the law, and if that fails, build their stores just outside the city – an elegant no-win solution typical of Wal-Mart and the politicians.

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Gary Smith's brilliant biographical story about André Agassi in the July 17th issue of *Sports Illustrated* is a must-read.

I have followed Agassi's career for 20 years – from the flashy teenager with the flowing locks and denim shorts to the shaved-headed veteran winning matches more with guile than smashes. Smith reveals a tormented son of a tennis-obsessed Iranian immigrant father who pushed Andre to fulfill his own dreams of fame and riches. Agassi had a racquet in his hand virtually from birth. His father put a ping pong paddle in his stroller and crib with a ball instead of a mobile. Agassi hit thousands of balls a day as a kid from fourteen different ball machines his father set up.

The family lived in Las Vegas where his dad worked as a maître d' at a casino. His two older siblings were also mainlined into tennis but his sister got romantically involved with her pro – Pancho Gonzalez – and his older brother lacked the foot speed of a champion. But André had the passion, the athleticism and the guts to reach the stardom his father lived for.

His father sent André alone to the tennis boot camp of Nick Bolletieri in Bradenton, Florida when he was thirteen. André hated the camp, the loneliness, the maniacal intensity of Bolletieri, but he eventually embraced the dream himself.

Smith writes about Agassi's lurking self-doubt that sent him into psycho therapy at critical junctures in his career. He describes the hate/love relationship with his father, who had boxed for Iran in the 1948 and 1952 Olympics. One of the themes of the article is André's ability to remake his career after burning out and losing confidence at several times. It's an inspiring story.

No career is without crisis. Even an Agassi, a Federer, a Sampras has major setbacks. The great ones regroup – they make peace with their dreams and the dreams of others for them.

Robert Mushtare is a big fat problem for bowling.

He is a chubby 17-year old recreational bowler in Fort Drum, New York, who has bowled three 900 series in the last year – he claims. A 300 game is bowling perfection – 12 straight strikes. Bowling three straight perfect games is the holy grail of the sport. It is an incredible, virtually impossible feat. Doing it three times would be like shooting a 59 in golf ten times or getting three holes-in-one on par fours in consecutive rounds.

Nevertheless, the kid is believable and he has many witnesses who vouch for him. The professional bowling tour is trying to



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discredit Mushtare. If he did it even once they think it diminishes the pros who rarely roll one 300 game. And they can't blame it on steroids or human growth hormone injections.

Mushtare is a good amateur bowler, but he has not done spectacularly well in the big tournaments. Logic says he is a fraud – that he rigged the computerized scoring and paid off the witnesses – but I saw the guy interviewed on ESPN's "Outside the Lines" show and found him innocently believable.

It reminds me of Lance Armstrong in the Tour de France. His story was implausible. To come back from near death from testicular cancer to win several straight Tours is so incredible that most of the European biking press sought to undermine him. Are Mushtare's 900 series any more bizarre?

Most humans crave order and predictability. But sometimes miracles happen, like recovering from a terminal illness or Bob Beaman's 29-foot long jump in the Mexico City Olympics.

Remember the song from the 1960s- "when you're hot, you're hot." Bowling is a momentum sport. When you get into a groove you can score. I choose to believe the kid partly because the accomplishment is totally preposterous.

I'm going back to the lanes to perfect my hook.

What do you do if you are feeling stale? How do you get fresh again?

The common antidote is said to be "take a vacation," but this does not work for me. I often return from a vacation more tired than before I left. If the mental conditioning that caused the staleness before the holiday has not changed, I find my mood as negative as when I left.

For me the stale-to-fresh shift is not about fatigue or rest. It is about changing my mental and emotional axis. An upbeat conversation with a friend or family member may help. A gratitude talk with myself in which I enumerate five things I'm most grateful for may shake me. Doing something completely different than my norm, like bird-watching or fasting, can jump start me.

These are all conscious efforts at mood altering. I think that is mandatory. I need the intention to shift. Waiting for something to happen does not work for me. I need to consciously whack myself off the stale axis.

How about you?



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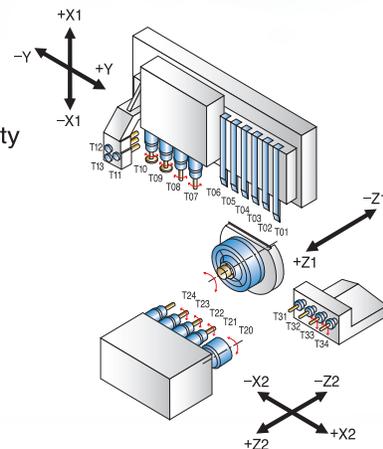
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The Foreigner's Gift

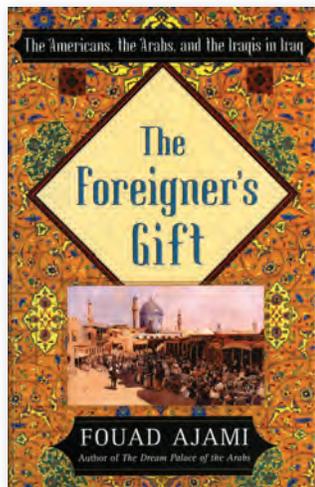
Whether we like it or not – or even realize it – the West has been at war with radical Islam for over a decade. The most recent confrontation was last month's foiled terror attack on British and U.S. passenger planes over the Atlantic. There was a similar attempt over the Pacific 10 years ago, and there have been numerous attacks since then, most notably September 11th, when more Americans died than at Pearl Harbor. The U.S. finally responded in Afghanistan and Iraq; but through it all, we Americans never quite understood why we were subjected to this war. What kind of history and belief system motivates a suicide bomber?

The Foreigner's Gift, by Fouad Ajami, attempts to step into the breach to explain the enormous gulf between Islam and the West, and explain why Iraq, in particular, has turned out so badly. Ajami is one of the foremost authorities on Middle East politics. He is a non-practicing Shiite from Lebanon who is currently a distinguished professor of Middle East studies at Johns Hopkins and is a frequent journalistic contributor.

The war in Iraq will be one of the central issues in the 2006 and 2008 elections. Both parties will spin simplistic depictions of the Middle East. *The Foreigner's Gift* is one book that presents the Middle East in all its complexity, giving the reader guidance to the dilemmas and contradictions of that troubled region. It would be wonderful for us to walk away from its problems – if only the U.S. economy wasn't riding on their major export.

Ajami gives great insight into the complex world of Arab political and religious factions. For instance, Ajami writes that Ayatollah al-Sistani of Iraq used to respect Hassan Nasrallah, leader of Hezbollah, for his resistance to Israel, but now prays for his undoing and eternal damnation. Conversely, although Hezbollah is Shiite, it doesn't support the Iraqi Shiites because the Iranian hardliners who bankroll Hezbollah want it that way.

The Foreigner's Gift specifically looks at Iraq and discusses why a solution to its strife is so intractable. Ajami says that the "foreigner's gift" represents our innate optimism – the American "can do" spirit. We brought the Iraqi people their first chance at independence, freed them of one of the cruelest despots in the history of the world. But instead of jubilation or even acceptance, Iraq is exploding with sectarian violence and is mired in pessimism and fear.



This is a microcosm of the ongoing Middle East dilemma – optimistic America is stuck in a land steeped in sorrow, something Ajami calls "the grief" – the deep sense of victimology at the heart of Arab life. There are two aspects of the victimology: The Arab world vis-à-vis the West, and the Shiites (the stepchildren of the Arab world) relative to the Sunnis. No good deed will be accepted, and the rejection will be framed in whatever illogic is needed to emphasize the victimology.

The exception is the Kurds, a group that originally didn't want to be part of Iraq but was forced to be in order to provide a balance against the Shiites, so that the Sunnis could rule. On the other hand,

the Kurds found Baghdad and even Saddam useful as a counterweight to their traditional enemies, Turkey and Iran. This is one more example of the ever-shifting contradictory sands of Middle East politics and loyalties.

Finally, Ajami is quite negative of both father and son Assad of Syria, and the problems they foment. He strongly condemns Syria's murder of Lebanon's Prime Minister Rafiq Hariri. Hariri had risen from poverty to the upper reaches of Arab and Lebanese society. He was a businessman and philanthropist who commanded no militia. He had no blood on his hands and believed that business and trade (traditional Lebanese strengths) could rebuild the country. His break with Syria a year ago was his death sentence. The "Cedar Revolution," following his death, drove Syria out, but it's clear Syria helped instigate the recent Lebanese-Israeli war as a way back in.



Comments? You can email Jerry at jerroldlevine@yahoo.com.

fresh stuff

DecO'd-Out

Tornos Technologies U.S. Corporation is now offering the new "DECO 8sp" single-spindle Swiss-type multi-axis, multi-function machine, which accommodates moderately complex parts up to 8mm. This machine boasts accuracies of $\pm 1\mu$.



Key specifications of the new DECO 8sp include spindle rpm up to 15,000 powered by a 3.7 KW motor. Four tools serve the main spindle; up to six for the subspindle with up to seven "live" tools – five for the main, two for the subspindle. Programming can be accomplished with traditional ISO G-code or via Tornos' dedicated TB-DECO ADV program, which takes full advantage of the DECO's unique kinematics designed for speedy processing, which eliminates almost all non-productive time.

For more information, contact Tornos at 203-775-4310 or visit the company website at www.tornos.com.

Water World

Mitsubishi has introduced the first waterjet line designed specifically to work hand-in-hand with EDM technology. The Waterjet line is powered by Mitsubishi Electric, and dedicated Nano control helps achieve high-precision machining. The 2-3 axis Classica features 2D CAD-CAM software with nesting capabilities, and accuracy and repeatability of ± 0.004 ".

The 4-axis Suprema's software features (ITC) Intelligent Tapering Control, which corrects tapering of the cut automatically. The CNC tilts the high-pressure water jet ± 2 degrees which allows for increased cutting speeds in a contour. The ITC system can achieve ± 0.001 " wall straightness in half inch thick steel.

For more information, contact MC Machinery Systems, Inc at 630-616-5920 or visit the company website at www.mitsubishi-world.com.



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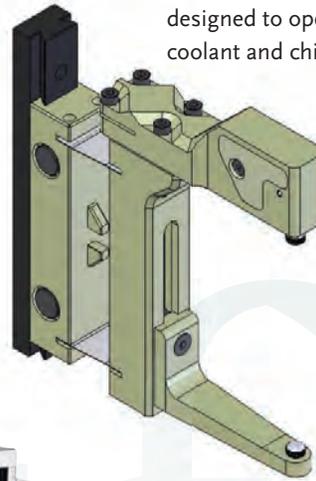
The new Hydrobar Sprint 555 from LNS America, Inc. permits users to cut up to 12' bar stock at maximum spindle speeds without dangerous vibrations. The Hydrodynamic principle allows for a range of bar stock diameters in one setup, fewer guide channels and 2 – 8-minute changeovers. The bar feed's Hydrostatic feature uses a self-opening bearing block design that permits users to run round bar stock at a lathe's maximum spindle speed with or without remnant retract. Sprint 555 reduces the number of guide channels necessary to accommodate the 1/4" – 2-1/8" (5mm – 55mm) range of bar stock diameters.

For more information, please contact LNS America at 513-528-5674 or visit the company website at www.lnsamerica.com.

Detector Work

SPC Innovations, Inc. has announced a new DETECTOR™ in-machine gauge probe for measuring outside diameters from 1.375" to 2.750" (35 to 70 mm).

The new probe is fully plug-in compatible with existing DETECTOR Gauge Controller/Amplifiers such as the PC2003M/B and the PC300. The new probe may be used to measure diameters "on the fly" during indexing in many applications. The probe is self-centering to account for indexing errors on multi-spindle automatics. The probe is designed to operate inside the machine with coolant and chips.



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Ask about a free trial!

Slater Tools Inc. has announced the release of a new Adjustment Free Rotary Broaching Tool Holder designed for Swiss-type machines. Slater's new adjustment free design allows the operator to use the tool holder without the need for centering. The new rotary broaching tool holder's design eliminates interference and clearance problems and provides easy access to the grease fitting for maintenance. Slater's new tool holder uses the standard 1.25" length rotary broaches, available from stock. The Adjustment Free Rotary Broaching Tool Holder is used for any type CNC, Swiss or manual turning, milling, drilling or screw machine.

Rotary Broaching uses a precision tool to produce an internal form inside a pre-drilled hole. The result is a polygon form which matches the shape of the broach. Broaches are available as squares, hexagons, splines, serrations and other polygon forms.

For more information, please contact Slater Tools at 586-465-5000 or visit the company website at www.slatertools.com.

Insert Here

Genevieve Swiss Industries, Inc. is now offering Swiss-Made tooling from UTILIS A.G. of Müllheim, Switzerland. UTILIS is a manufacturer of premium OD turning Inserts & Holders. The MULTIDEC® turning line features increased rigidity, better repeatability and large TNR selection. Some specialty inserts they feature are extra-rigid cutoff inserts for use on up to 32mm bar stock. They also specialize in enhanced cutting geometries that are ideal when working with 300 series Stainless, Titanium and other exotic alloys. Advanced inserts for operations such as front turning, back turning, threading, and grooving are also available.



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Kennametal's new A4 groove & turn inserts for grooving, face grooving and cutoff across a variety of materials are available in narrow groove widths of 1.5, 2.0, and 2.5 mm, bringing the complete range of A4 sizes from 1.5 to 10 mm (3/32" to 3/8"). Together with a complete range of A4 toolholders and boring bars, multiple operations are possible from a single toolholder.



Kennametal's A4 inserts also benefit from a unique double-ended design available in full radius and rectangular types as well as precision-ground and molded-utility styles. The A4 insert features a distinct guide rail on the top and a 120-degree v-prism on the bottom that seat it more securely in the toolholder.

Also Available from UTILIS is their MULTIDEC® - MICROBORE system that features Thru-Coolant Micro Boring Bars and easy-locating holders. Boring Bars are solid carbide and have the option of coating. Min Bore Sizes range from .032" to .280". Boring Bar holder shanks are available in sizes to fit any Swiss-Type CNC Machine.

For more information, please contact Genevieve Swiss Industries Inc. at 413-562-4800 or visit the company website at www.genswiss.com.

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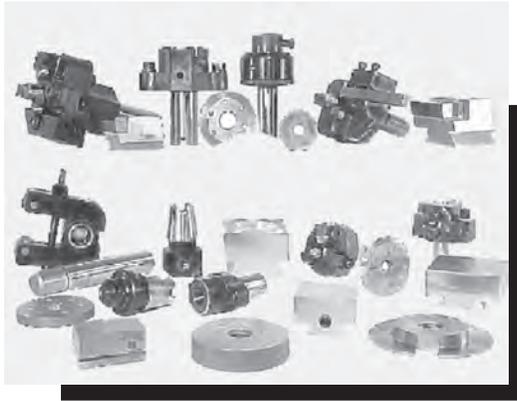
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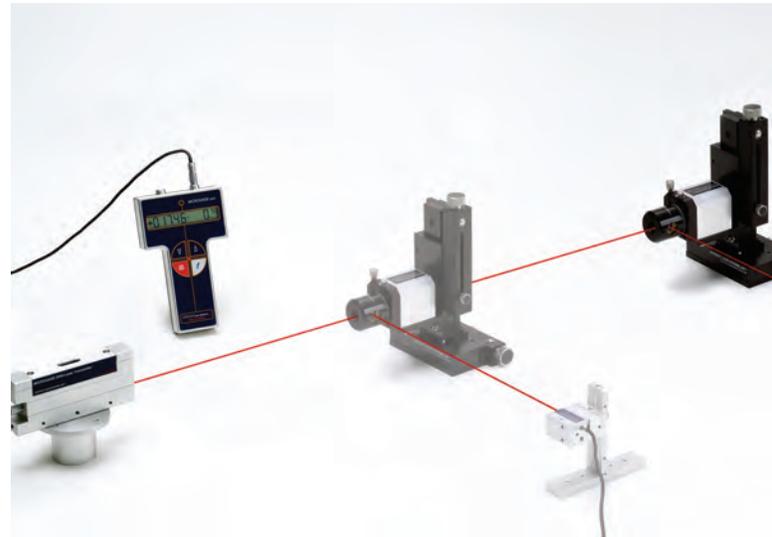
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Beam Bender



Pinpoint Laser Systems®, Inc. has introduced the 90-Line, a new right angle beam bender. The 90-Line takes the Microgage 2000's reference laser beam and turns it precisely 90 degrees. The 90-Line can square machinery and equipment, set and adjust parallel tracks and rails, align web rollers, idlers and reels, check gantry travel and position, monitor and adjust machine tools and assist in geometric alignment.

The 90-Line's housing holds precision optical elements that redirect the laser beam. The exiting laser is square to the incoming beam within 0.0006 degrees, or equivalent to 0.001" over a distance of eight feet. The housing has several adjustments, allowing the square exiting beam to rotate through a full plane. The 90-Line is machined from solid, aluminum block and is protected with a hard, anodized coating.

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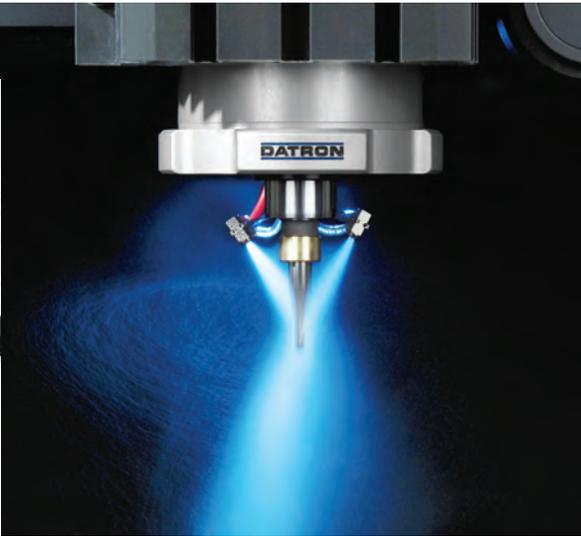
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Ethanol Advantage



"The Science Behind The Solution" study from Datron Dynamics, Inc. has been released which enumerates the economic and environmental benefits of using ethanol coolant in high-speed (60,000 rpm) micromachining of nonferrous materials.

Ethanol is a form of alcohol that results naturally through the sugar fermentation process and is environmentally friendly. For high-speed, micro machining a thinner-than-water viscosity allows the ethanol to quickly cover and cool more surface area on fast-moving micro tooling. The low evaporation point of ethanol eliminates the need for disposal and recycling. Ethanol coolants leave no residue on machined parts. When micro-tooling and nonferrous metals are involved, ethanol is capable of quickly covering tiny tools and cooling them while only using miniscule volumes. Ethanol is misted onto the part only during actual cutting cycles.

For a free copy of the paper contact Datron Dynamics at 888-262-2833 or visit the company website at www.DatronDynamics.com.

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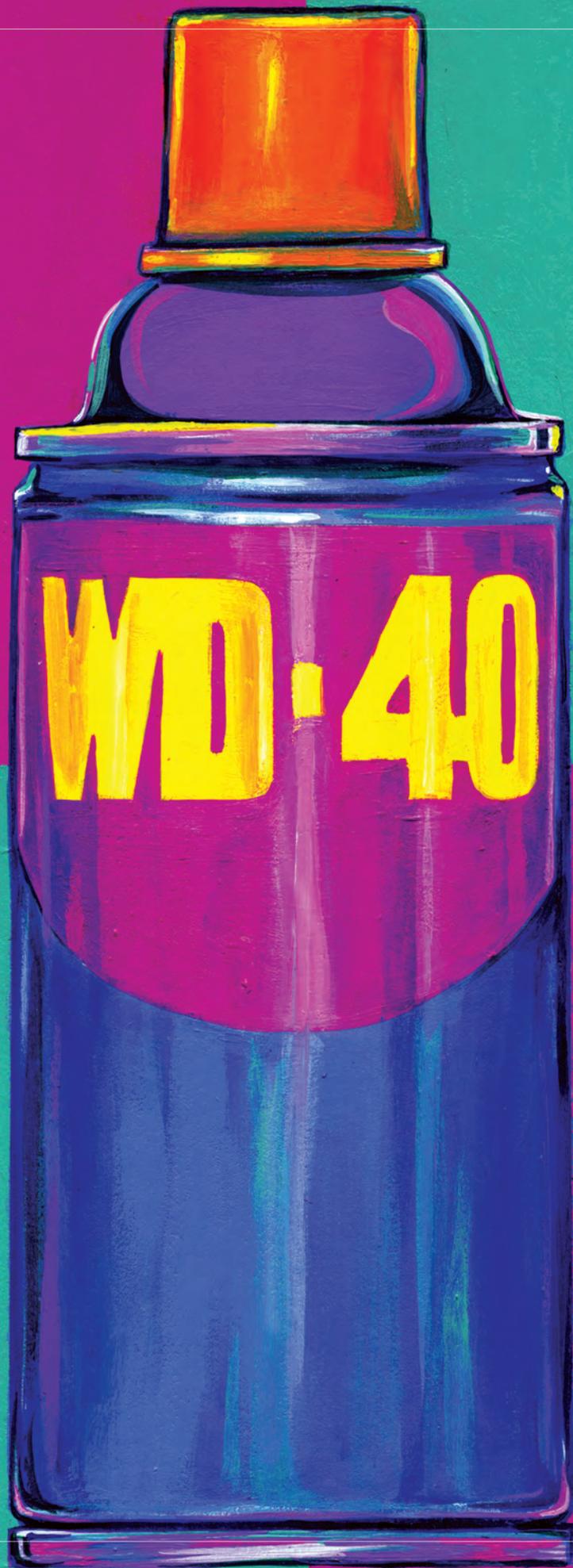
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The Story of WD-40

Birth of an Icon:

THE STORY OF WD-40

As testimonials go, it is hardly the usual.

“I spray WD-40 on the hinges of my cooler so I can sneak a beer in the middle of the night,” claims Kevin Meany, identified as a “school district mechanic/volunteer fire chief.”

Even in these days of “Dr. Z,” the voice of the Daimler-Chrysler chief touting his cars somewhat humorously and the return of the “speecy-spicy meatball” commercials for Alka-Seltzer, the website for the WD-40 Fan Club is a bit goofy. There you find not only the above Mr. Meany, but also six other folks who comprise the alleged “WD-40 Fan Club Board of Directors.”

“It’s not like they ever meet or anything. It is just for fun. They don’t talk to the press,” said Jesse Lovejoy, a spokesman for the company. “We just like to have fun here.”

What is not to be fun when you have a product with an odd name and, so the company claims, an 80% penetration rate.

“That means that 80% of homes have around or have used WD-40,” said Tim Lesmeister, the WD-40 vice president for marketing. “We have got to believe that even Coca Cola doesn’t have that kind of penetration. There are at least other colas. When you think of the kinds of things this product does, WD-40 is what you think of.”

The legend of WD-40 is somewhat similar to that of Tang, which allegedly was developed so those early astronauts like Scott Carpenter and John Glenn had something to drink while orbiting the Earth while Walter Cronkite sang their praises. It is one of those post-World War II sagas worthy of a Norman Rockwell cover and a “*Saturday Evening Post*” story.

BY ROBERT STRAUSS

The aerospace industry was centered in Southern California in the late 1940s and early 1950s for many of the same reasons the movie business nested there a generation before. There was a lot of room to build big plants for what were presumed to be huge planes and missiles and, frankly, the weather was good year-round to attract employees. It is true that there were a bunch of naval bases, Army camps and Air Force installations in California, but the real attraction was land and weather – presumably aircraft performed better in a long dry summer season. And, workers might perform better if they knew in their off-hours they could easily get to the luscious Pacific Ocean waters.

The problem was that when aerospace companies built their plants too close to the ocean, the damp air started to corrode the parts of the new planes and missiles.

Still, the new industry not only attracted pilots, factory

workers and marketing folks, but also dreamers and inventors willing to solve these kinds of problems. Three of those research types at the San Diego Rocket Chemical Company came up with a formula in 1953 that they thought would inhibit such corrosion. They had tried 39 times to find a solvent that would both degrease those parts and then provide a rust inhibitor that would stand up to that damp ocean air.

On the 40th time, though, the water displacement solvent did what it was supposed to do: ergo, W D, as in “water displacement,” and 40, as in “the 40th try.” It was like Chanel’s famous No. 5. No one cares what the first 4 were, just like no one in the machine industry – or in any of those 80% of American households – gives a hoot about the first 39 formulas.

“Everyone, I think, is just happy the researchers didn’t give up at, say, 25,” said company marketing guru Les-

Uses for WD-40 from

WD-40 marketing vice president Tim Lesmeister said that people write the company with new and sometimes odd uses for the product constantly. The company puts those that are not salacious or violent up on its website.

Use for science project on rust prevention

- Keeps dog collars squeak-free
- Removes gum from bottom of shoes
- Removes crusted gunk from bird cages
- Cleans and protects handcuffs
- Protects combination locks
- Cleans power steering fluid from driveway
- Dissolves glues
- Protects and polishes bronze grave markers
- Lubricates hinges of eyeglasses
- Cleans mud from



meister. "It is one of the world's great products."

The first big contractor to use the product was Convair (later a division of General Dynamics Corp.), which was making the Atlas missile, which soon became the most important missile in the United States arsenal. With its inflated steel tank style, the Atlas had, and still has, the lowest empty weight ratio of any missile without a reliability penalty.

Eventually, Convair's employees discovered the wonders of WD-40 for personal use. They started spiriting the cans home from the plant. They found out it could do, well, most anything. They could clean and protect their tools with it; lubricate their lawnmowers and their new suburban kitchen items, too. It loosened bolts and nuts and degreased the kids' bicycles. Heck, it sometimes even degreased the kids.

In 1958, the bosses at Rocket found out about the in-

house smuggling at Convair and decided to make lemonade out of lemons. They put WD-40 in aerosol cans and hired a few salesmen to get it into local hardware stores. According to a company history, by 1960, they were selling 45 cases of the stuff a day.

Then Hurricane Carla hit the coast of the Gulf of Mexico. In order to help rebuild, contractors from Texas to the Florida Panhandle needed all sorts of everything. They had heard of this semi-miracle product from San Diego and got a truckload sent out. The cult had finally spread east, and through the 1960s, the aerosol can with the funny name became ubiquitous in carpentry and machine shops and on construction sites. By 1969, with only one product, albeit a good one, in its line, the Rocket Chemical Company officially became the WD-40 Company, four years later going public.



the company website

shoes • Restores transparency of plastic shoes • Removes stickers on CD cases • Clean and polish Alaskan Oil Pipeline at visitor viewing • Cleans and protects shoe-lace eyelets • Cleans and protects ammunition • Removes ink from hands • Shines diamonds • Removes tar from feet • Lubricates garbage disposal blades • Quiets squeaky piano pedals • Rejuvenates gears on old clocks

"The warning is that we don't test these, so we don't necessarily vouch for them," he said. "Still, I would guess that most of them really do work."

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Now more than one million cans of WD-40 are sold each year, and annual revenues top \$150 million.

Adding to its mystique, like with Coke and Pepsi colas, is the secret nature of WD-40's formula. Company officials say there are only four people who really know the formula and only a couple who deal with it day to day.

"There is one guy who is part of WD-40 who gets up every morning and makes the brew," said marketing chief Lesmeister. "We have three locations (in Sydney, London and San Diego) that make the secret sauce, but primarily it is made in the same warehouse in San Diego that has been there for many years. He does have a back-up or two, but even the CEO doesn't have anything to do with making it. In fact, almost no one here knows whether it is something really complicated or really simple."

Garry Ridge, who has been CEO of WD-40 since 1997, plays along with cult status. On the fiftieth anniversary of the company, he rode into Times Square in a suit of armor, carrying the secret formula. On the other hand, he doesn't want the company to stand too pat. He told the *Wall Street Journal* earlier this year that more people used WD-40 in a year than used dental floss, but worried that the future wouldn't always look like the present.

"We decided we were going to be in the squeak, smell and dirt business," he told *The Journal*. "I felt that there would always be squeaks. There will always be smells. And there would always be dirt. That was the strategy as we started looking for brands that we could acquire."

So now the company owns products like 2000 Flushes®, the X-14® cleaner line, the Lava® line and 3-In-One® dry lube.

Still, the bulk of the business, and the fun, comes from WD-40. Even Consumers Union, that tough-minded find-fault-with-most-anything group, touts WD-40 on its Consumer Reports 4 Kids recommendation page, saying it is marvelous for removing decals and stickers.

The WD-40 Fan Club came about, according to Lesmeister, after people started emailing oddball uses for the product. Now the company website lists more than 2,000 uses for WD-40 (SEE SIDEBAR), from the mundane and predictable ("Keeps garden tools rust-free"), to the sensual ("Loosens crud around stoppers on antique perfume bottles") to the just plain nutty ("Removes stains left from Silly String").

The company even did a poll to ask residents of each state what the best use for WD-40 would be for their states. In Pennsylvania, for instance, it was to keep the Liberty Bell from squeaking, while in Kansas, it was "lubricates break-away rims for easier slam-dunking by the Jayhawks."

What is even more amazing is that competitors rarely speak ill of the product.

"We're a good lubricant and at least its [WD-40's] equal in corrosion protection," said Gary Nieberle, the product manager for 3-36, the top-line similar product for CRC, the Warminster, PA-based company. "But I would never knock WD-40. We like our product better, but theirs is also good."

About the only thing consumer watch groups do criticize WD-40 for is its flammability, which the company certainly acknowledges.

"But I think people are careful of that. Every product has to have some minor downside, but we have never had any problems with that," said Lesmeister.

Lesmeister even gets a good chuckle when oddball stories, even seemingly negative ones, come out about WD-40.

Last year, for instance, police in England started to use WD-40 to thwart cocaine users. In Avon, Somerset and Bristol, cops started spraying toilet seats in pubs with WD-40 after figuring out that, first, lots of coke was being snorted there, and, second, the WD-40 made the stuff

congeal. Then, when people would try to snort it, the mixture of WD-40 and cocaine would inevitably cause nosebleeds, and the subjects would be caught, if not red-handed, at least red-nostriled.

Recently, the company has decided to branch out just a little bit in getting WD-40 in cracks and crevices that had eluded it. There is a new super-sized can, the 18-ounce Big Blast, mostly for big machine-shop or automotive bay use. On the other end, there is the WD-40 No-Mess Pen, a felt-tip marker-like dispenser for tight applications.

"We got it out this way to people who hadn't used it before, specifically women, and into crafts and hobby shops, and places like Office Depot, another vehicle for distribution," said Lesmeister.

"I guess the motto here is we won't rest until everyone is using WD-40, for something, all at once," he said with a chuckle. "It may not be so far-fetched."





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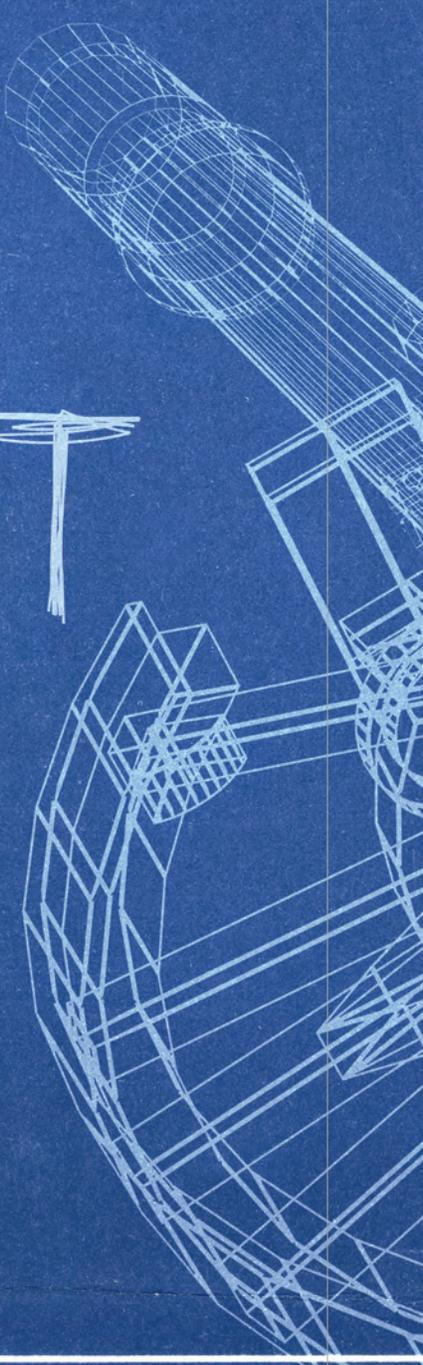
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REINVENTING A COMPANY THROUGH INNOVATION

FROM PASSION TO PRODUCT



The machining community is filled with ideas about making better products. The challenge is to take the imagined product, then the tinkered prototype, and finally, the working model into the marketplace. And if the market embraces the new product, how do you take it from product to business to brand?

For dreamers and contract machine shop owners, Corsa Products of Berea, Ohio, and Manth-Brownell of Kirksville, New York, are working examples of companies in the process of turning their ideas into viable market winners.

By Gary Wollenhaupt



ENTREPRENEURIAL BENT

Jim Browning Sr., president of Corsa Performance, started out making exhaust components for the marine industry in his garage in 1989, after leaving his senior management job at an automotive components group.

Building on his love of boats—he has built three himself—Browning went to two nearby boat manufacturers and asked what their biggest problem was. They told him it was water surging down the exhaust system into the engine. Engines at that time were equipped with valves to stop the water, but the ones on the market failed frequently, causing major headaches for boat owners and the manufacturers.

Browning set out to solve the problem, and with the help of a former NASA engineer, developed a new anti-surge valve that's now found on the majority of boats with inboard engines. Browning and his two sons started making the valves themselves, hand mixing the batches of silicone that form the water seal.

His next problem was developing a new exhaust diverter valve to direct the exhaust path through the propeller for quiet operation or through the hull above the waterline for maximum performance.

A major marine engine manufacturer had a complicated pneumatically operated diverter valve that was heavy, expensive and prone to failure. Browning devised a much simpler mechanism driven by a proprietary high-power solenoid. That product was so successful the engine manufacturer dropped its product altogether.

From there, Browning developed exhaust systems that are now found in nearly 80% of boats on the market. The company grew to 115 people, selling high performance exhausts around the world to the marine and automotive markets.

Browning was satisfied making marine exhausts, until the automotive world came calling.

John Lingenfelter, a renowned builder of high-powered Corvettes, asked Browning to build an exhaust system for a new Corvette package. Of course, he needed it in two days so the car could be tested by writers for *Car & Driver* and *Motor Trend* magazines. During the tests, the car suffered from droning, a low-frequency hum that's annoying and fatiguing for those inside the vehicle. Browning wasn't satisfied, so he went back to his engineers for a solution.

Nine months and eight iterations later, Corsa's patented Reflective Sound Cancellation technology was born. Browning got an early publicity boost when the exhaust

"BROWNING WAS
SATISFIED MAKING
MARINE EXHAUSTS,
UNTIL THE AUTOMOTIVE
WORLD CAME
CALLING."

was fitted to the Corvette pace car for the May 1998 Indianapolis 500. He started shipping product in June 1998.

The RSC technology uses the sound waves themselves to cancel out certain frequencies, much like waves from pebbles dropped in a pond collide and subside. Inside a car or truck equipped with a Corsa exhaust, the bothersome low-frequency noise is banished, making normal conversation possible, even in a diesel pickup truck under full acceleration. Outside, the roar and rumble that enthusiasts crave is still impressive.

The first Corsa exhausts were aimed at the Corvette enthusiast market, but have since expanded to include many GM models and vehicles from other manufacturers, including Dodge, Ford and BMW.

PATENTLY PROTECTED

Browning was quick to patent his technology, even though there was little danger of anyone stealing it at the time.

"Sometimes you have an idea, and people look at it and don't think anything of it, like our car muffler," Browning said. "It's taken a while for people to appreciate the value of it, but they certainly do now."

He regrets not securing a patent on the shape of the exhaust tips, the showy chrome that lets observers know the exhaust system is something special. That shape is starting to show up on competitors' products.

"The next time I come up with some new exhaust tips, there's going to be as much patent protection as I can possibly get on it so we that we don't have people stealing from us," Browning said.

GROWTH MODE

Corsa recently adopted a new distribution model, leaving behind a relationship with General Motors and placing its products with major distributors and wholesalers for mail order, specialty shops and warehouses that reach about 46 % of the marketplace.

The company is also spending more on promotions, becoming a corporate sponsor at the Mid-Ohio Sports Car Course and increasing its marketing outreach as it adds more vehicles to the lineup.

"We've elected to spend money on product development instead of advertising," Browning said. "Everybody that has a Corvette knows about Corsa, but for a Chevy pickup truck, maybe not."

With the new distribution model fueling growth, Browning is considering building a new factory and research center because the current facility is running three shifts a day and there's no more room. It's not the first time Browning has been in this situation, as his previous employer went through a similar expansion. The lessons he learned there enabled him to lead Corsa into its next phase, including bringing on board qualified people with experience at the auto manufacturers.

" OUR THEORY IS
TO GO INTO SOMETHING
WHERE THERE'S A
LOT MORE ENERGY
AND EXCITEMENT,
AND POSITION
OURSELVES USING
CUSTOMIZATION."

CHOPPER CHALLENGE

Management at Manth-Brownell, a \$24-million manufacturer of turned parts in Western New York, is looking to bring new energy and hopefully a new line of business to the company by making custom parts for the motorcycle industry.

Wes Skinner, president of Manth-Brownell, said the idea germinated in a strategic planning session.

"We said we need to be getting into higher complexity work, and we kicked around a lot of ideas," Skinner said. "The energy in the room began to come up when we got around to things where we're doing our own products."

The group considered products such as jewelry and hardware, but a shared passion for motorcycles won the day. The team decided to enter the custom chopper arena by marketing to bike builders who need a steady stream of unique, high-quality bling bling for their projects.

"We are customizing anything that you can do on a motorcycle that would be unique," Skinner said. "Our theory is to go into something where there's a lot more energy and excitement, and position ourselves using customization. We are looking for products that flow out of that."

After only four months on the project, TV cameras have been in the plant twice, as the Fox Network taped segments for a biker build-off program featuring custom parts turned at Manth-Brownell.

Skinner had found that building relationships with bike builders and generating publicity may be more important than machining skills.

"It's all based on connecting with people and getting them to like you," he said. "There's a whole motorcycle culture, and you have to join that culture."

Skinner and his team set aside a budget for developing the business and hired a designer. The goal is to develop a business before the budget is exhausted. Being a part of the TV shows is a step in the right direction for the fledgling effort.

"Notoriety is what we're looking for," Skinner said. "This is high energy, and it's a break from screw machining. It's something where our people get to see the end product."

Skinner has added a graphic designer to his staff. His traditional screw machine business of Wickmans and Davenport's did not prepare him for his one-of-a-kind designs for choppers. But he and his staff are learning on the fly.



Gary Wollenhaupt is a freelance writer specializing in automotive and business topics.

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1" 6-spindle, 1960-1992 (9)
1" 8-spindle, 1979
1-3/8" 6-spindle, 1980, 1967
1-3/4" 6-spindle, 1965, 1993 (7)
1-3/4" 6-spindle, factory rebuild
1-3/4" 6-spindle, thdg., 1969
1-3/4" 8-spindle, 1970
2-1/4" 6-spindle, 1973-79
2-1/4" 6-spindle ACW 2004
3-1/4" 6-spindle, 1982
5-5/8" 6-spindle, 1979
6-5/8" 6-spindle, 1979

ACMES

1-1/4" RB8, 1956-1979 (3)
1-5/8" RBN8, 1968-thdg
1-5/8" RB8, 1980, rebuilt 1996. pickup
1-5/8" RBN8, 1975, rebuilt 2002
2" RB6, 1979-1985
2-5/8" RB6-1977
3-1/2" RB6, thdg
2-5/8" RB8, 1975 (4), thdg
6" RPA8, Gov't Storage

GILDEMEISTER & SCHÜTTE

GM16 AC 1997 w/ lemca loader
SF51 6sp. Schütte, 1981
AF26 8sp. Schütte, 1981 (2)

SWISS-CNC SLIDING HEADSTOCK

Citizen L20, Type VII, 1998
Citizen L25, Type VII, 1998
Citizen M-12, 1999
Star SA 12, 1998

BROWN & SHARPE

#2 1-1/4" Ultramatic, 1970
#00 1/2" Ultramatic, 1982

NEW BRITAIN

Model 52, 1-1/4" 6sp., 1979
Model 62 2-1/4" 6sp., 1975

INDEX

MS 25E, 1996
MS 36E, 1993

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HS-16 2000

ASK FOR OUR IN-HOUSE PARTS EXPERT

Cathy Heller

Wickman and Index Parts manager



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

BY NOAH GRAFF

The majority of the scientific community has concluded that greenhouse gasses produced from fossil fuels are causing harmful pollution and climate change. This trend, coupled with rising oil and natural gas prices, further assures the need to acquire energy through cleaner, cheaper methods. Nuclear energy and clean-coal appear to be the probable energy sources for the U.S. in the future.

In the next 25 years what will be the dominant source for electricity generation in the United States?

There is no easy answer to this question. To a large extent, the answer will depend upon the price society places on CO2. If high, coal will obviously be less attractive than it is today, and the alternatives (nuclear, gas, renewables, conservation, etc.) will become more attractive. In such a world, the only way for coal to maintain its market share will be through the successful development of carbon capture and storage technology.

Richard Richels, Technical Executive
Electric Power Research Institute, Washington, DC

the facts:

Clean coal is the name attributed to coal chemically washed of minerals and impurities, sometimes gasified, burned and the resulting flue gases treated with steam, with the purpose of almost completely eradicating sulfur dioxide and reburned so as to make the carbon dioxide in the flue gas economically recoverable.

www.wikipedia.org

After the impurities from the coal have been washed away, and the carbon dioxide has been released, the CO2 must then be captured and stored to prevent it from going into the atmosphere. **Presently, storing CO2 is extremely expensive, and, similar to storing nuclear waste**, people still can't be positive that it is safely contained.

www.wikipedia.org

A pound (slightly smaller than a baseball) of highly enriched uranium as used to power a nuclear submarine or nuclear aircraft carrier is equal to something on the order of a million gallons of gasoline.

www.howstuffworks.com

In France 59 nuclear plants produce 78% of the entire country's electricity.

www.ambafrance-us.org

Coal will remain the dominant fuel source for electricity in the U.S. for at least the next 25 years. Before nuclear can grow, public attitudes must change towards this technology. I think this will eventually happen (in part due to climate change concerns), but not in the next 25 years. The total amount of electricity from nuclear plants may actually decrease in this timeframe due to retirement of old plants. Natural gas is too expensive to grow significantly in the electric power sector (even with new supplies of liquified natural gas). Renewables (besides hydro) will grow significantly, but because they start at a very low level, they will still be a small contributor compared to coal, nuclear and natural gas. Concerns about climate change and CO2 emissions will change the longer term outlook by making nuclear and renewables more cost competitive and requiring CO2 capture and storage technology for coal. However, most of these effects will occur beyond the 25-year outlook.

**Howard Herzog, Principal Research Engineer
MIT Lab for Energy and the Environment, Cambridge, MA**

Over the next 25 years, I think there will be a real competition between nuclear and coal for new baseload generation sited in the United States. Right now, most new capacity continues to be gas — a legacy of historically low natural gas prices and considerable difficulty siting new coal and nuclear plants. Nonetheless, given the likelihood that natural gas supplies will remain constrained and prices high for the foreseeable future, and the relatively limited role for renewables, especially for baseload, that means coal and nuclear. And, given the problems with each — carbon dioxide emissions from coal and radioactive waste from nuclear — it seems unlikely that either will dominate.

**William Pizer, Senior Fellow
Resources for the Future, Washington DC**



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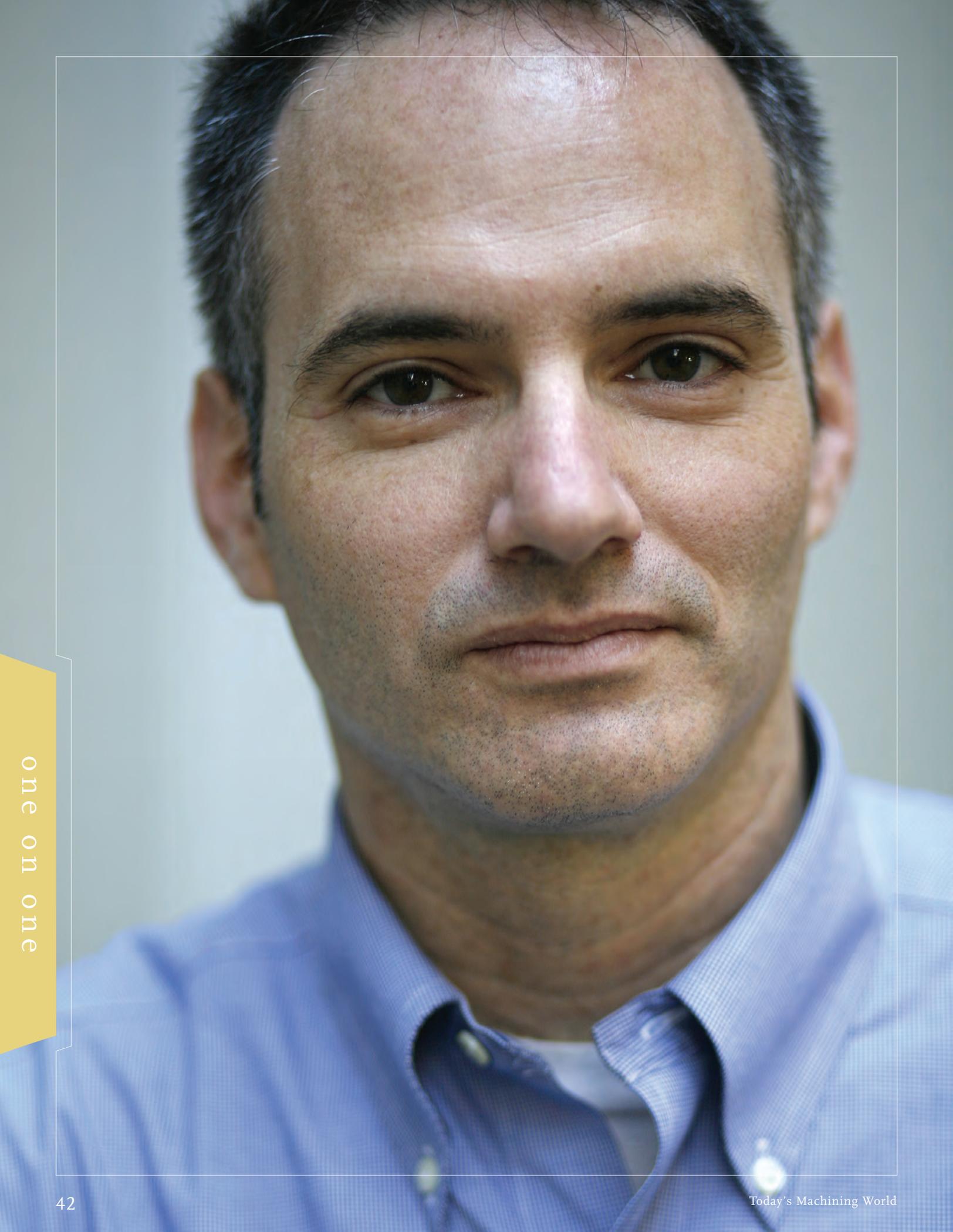
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one on one

William Pizer

is a highly regarded economist.

He is Senior Fellow at Resources for the Future, a think-tank in Washington D.C., which does research on environmental, energy and natural resource issues. From 2001-2002, he served as Senior Economist on President Bush's Council of Economic Advisers where he worked on environmental and climate change issues.

What is a think-tank?

A think-tank is a place where people come up with ideas and then try to explain them to people.

How do think-tanks differ from one another?

Different think-tanks can have different ideology associated with them – like free markets, or protecting land, or education. They also differ to the extent to which they are in the research and educate mode. Some think-tanks come with a real agenda and they try to fit research into their agenda. And some think-tanks do research and use the research to create an agenda. I think of Resources for the Future as being more of the latter.

When you worked for the Bush Administration did you agree with its environmental policy?

I wasn't doing broad based policy work for the administration. I was very narrowly focused on energy and the environment. I got to be involved with a lot of the decisions they were making. The ideas that I came into the room with may not have been the ideas that won the day. They made the decisions that I think were consistent with their view of what was best for the country.

What did you think of the Kyoto Protocol?

The Kyoto Protocol was, is, on the one hand, a miraculous first step towards dealing with climate change. It's amazing that as many countries were able to agree to it and that it's been ratified by as many as it has been. It was also in a lot of ways a very poorly designed agreement – particularly from the U.S. perspective. The requirements on the U.S. were more onerous than they were on any other country because the U.S. simply grows a lot more than other countries.

What is the difference between global warming and climate change?

Global warming suggests that the whole earth is going to heat up. Climate change suggests that there are going to be general changes in the climatic patterns, some of which may be a

global warming phenomena. Some of it may be regional warming. Some of it may be changes in precipitation or storms – weather patterns or things like that.

Is climate change irreversible? Is it permanent?

It's not necessarily permanent, but it's pretty damn hard to change because the gasses that we're talking about – once you emit them, they stay in the atmosphere for 100 years or more.

What are you most optimistic about for the future of the environment?

I'm generally optimistic about the environment as a whole just because as we get richer as a country and as the world gets richer as a place, we're able to afford a lot more environmental amenities. And people generally want a cleaner environment as they deal with the basic necessities of food and clothing and shelter.

What are you most afraid of happening to the environment in the future?

It clearly is battling against other forces, mainly our continued thirst for natural resources. So there's kind of a question about whether both the global population expansion and poor people's pursuit of the basic necessities will erode the environment faster than the wealth accumulation allows people to purchase environmental things.

What is one thing you really love about your job?

I really like helping people understand stuff – whether it's an environmental problem, an energy problem, a political problem, whatever. You're helping them think creatively about something and hopefully in the process making better public policies.

If you could be a machine, what would you be?

Probably an airplane or a spaceship. The idea of traveling long distances and being a fairly sophisticated piece of machinery – that's kind of nifty.

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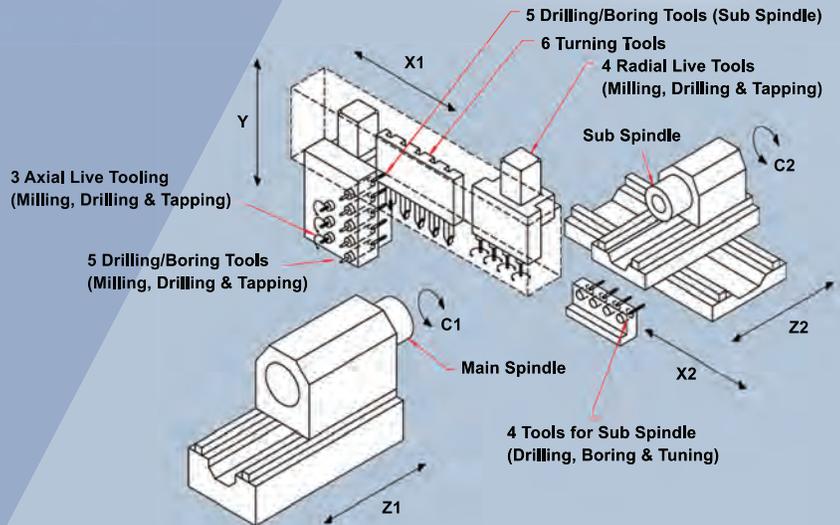
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Keeping the Spindles Turning

Everything wears out eventually, and the spindles in machine tools are no exception. Though many shops could theoretically rebuild or repair their own spindles, many choose to send them out—back to the manufacturer, or to a company that specializes in rebuilding and repairing them.

One such company is GTI Spindle Technology, Inc., in Manchester, NH (see sidebar). GTI Spindle repairs and rebuilds a wide variety of spindles from over 300 manufacturers. They rebuild tiny spindles used in machines that wind light bulb filaments; large spindles used in enormous machining centers; spindles in machines that grind the titanium parts for artificial hip joints, cut and polish granite countertops, saw and rout wood for assemble-it-yourself furniture, hone razor blades and even curl the hair on dolls.



Above: Lisa Bailey-Beavers, national sales manager of GTI Spindle, inspects a Heald grinder dressing spindle.

First look

At GTI Spindle, when a spindle arrives at the plant, it is logged into the tracking system. Information about each spindle is available online for customers to track their spindles through the process.

Next, the spindle is evaluated. If it isn't broken in any obvious way, it is run on a test stand and a vibration profile is taken. A sensor (an accelerometer) is attached to the spindle housing. As the spindle rotates at different speeds, the sensor detects how much it is vibrating. A vibration analyzer takes in the signal from the sensor and prints out a graph showing how severely the spindle vibrates at different frequencies. The vibration signature can help diagnose problems, including out-of-balance conditions and bearings that are failing.



Right: Lead technician Barry Beavers, assesses spindle vibration in the lab.

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Vibration testing can also help determine there is no problem. Quite often, GTI Spindle receives perfectly good spindles that have been sent out for rebuilding. "One in twenty doesn't need repair," according to GTI Spindle president Thomas Hoenig. In these cases, sometimes a little detective work is needed to diagnose the trouble.

Hoenig recalled the case where every fourth part from a customer's machine was bad. The spindle came in for repair, but there was nothing wrong with it. The customer, helped on-site by a GTI Spindle technician, eventually discovered that the problem was a hydraulic pump mounted to the bed of the machine without benefit of an isolation pad. When the pump turned on, the vibration disturbed the machining process. In another case, vibration from a compressor in the next room actually interfered with machining.

Looking inside

After vibration analysis, the spindle is carefully measured for runout and other parameters. Then, the technician disassembles it, looking for signs of wear, fracture or other modes of failure.



Above: Richard Bourgeois, breakdown technician, performs runout measurements before disassembling a spindle.

"Eighty percent [of spindles] fail from contamination in the bearings," Hoenig says. "Contaminants migrate from the coolant or from air/oil lubrication."

As the disassembly process continues, the parts are cleaned, examined, measured and sometimes photographed. By the time disassembly is complete, the technician has a pretty good idea what is wrong with the spindle. Each spindle's components and paperwork are stored in a plastic bin. At this point, the customer receives a diagnosis and a quote for the repair.

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how it works

Putting it back together

When GTI Spindle gets the go-ahead from the customer, the repair process commences. Parts are repaired or replaced, as appropriate. Parts damaged in a crash might be resurfaced, welded back together or replaced with new parts machined in GTI Spindle's machine shop, says Hoenig. Bearings are replaced. Tapers and other surfaces might be reground or could be resurfaced through a process called grind-plate-grind, in which they are ground, sent out for replating and then ground to resize.



Above: A display of spindle components made in GTI's machine shop: (Front, from left) a shaft, a rear housing cap, two labyrinth rings and two spindle housings. (Rear, from left) a stator housing, a shaft, two rear shaft nuts and a front shaft nut.

A well-balanced spindle



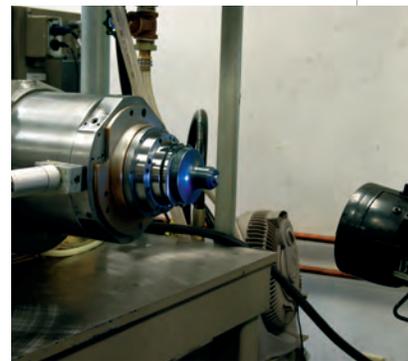
Above: Running a shaft on the balancing machine.

the entire spindle assembly is balanced.

The balancing operation is similar to dynamically balancing an automobile wheel with a tire mounted on it. The part is rotated on a balancing machine that indicates where the imbalance is. On a car wheel, weights are added to offset heavy spots.

On most spindles, material is removed opposite lighter spots that could be due to voids in a casting or other causes. An occasional spindle will allow for adding material, such as the large Makino spindle (see below), to which you might add weight by installing setscrews into threaded holes in the shaft, provided for this purpose. Large spindles that are too big to fit on a balancing machine can be balanced using a vibration sensor and a strobe lamp.

After the spindles are rebuilt, GTI Spindle operates them for at least eight hours to run in the bearings and make sure everything is working properly. Specially designed test stands hold the spindles, power or drive them, provide lubrication, compressed air for air bearings; whatever the spindle needs to run properly.



Above: Applying the strobe to a Makino spindle.

Special stand

Some spindles are especially demanding in what they need to run properly. Makino spindles, such as the one shown above, which is from a vertical machining center, contain passages through the shaft and bearings for oil that lubricates and also cools. This type of spindle cannot be run at speed "on the bench" without its oil supply.

GTI Spindle spent a year and a half and footed the considerable expense to develop a special Makino spindle run-in stand that includes pumps, coolers, vacuum oil recovery and other features. Now, at GTI Spindle, these units can be properly exercised and tested before being shipped back to their owners.

Sending them home

Finally, after the reassembled spindles have been run in, measured, tested and found good, they are painted, if appropriate, and packed in wooden crates for shipping, cushioned by conforming foam. Along with the spindle, GTI Spindle sends the customer the spindle's records, failure analysis report, if any, and all parts that were replaced.

Spindle maintenance, repair and rebuilding can represent a large expense for even a moderately-sized plant. "Customers who spend \$50,000 to \$ 1 million a year can save 30, 40 or 50 percent, of new replacement cost" says Hoenig. Significant savings can come from maximizing spindle life through proper maintenance and correcting the problems that cause failures. Preventive maintenance, including scheduled rebuilds, can also keep unexpected downtime to a minimum, keeping machine hours and revenue up.

Even though you can depend on spindles to fail eventually, there are ways to plan for failure and minimize its effect on your business.

how it works



GTI Spindle Technology: Not your father's spindle rebuilder

"We're the new kids on the block," says Lisa Bailey-Beavers, national sales manager for GTI Spindle Technology, Inc., a spindle repair and rebuilding company in Manchester, NH. GTI Spindle opened in 1997 with a handful of employees. It now employs more than 50 people in four locations, and since 2002, has doubled revenue and then doubled it again, according to company president Thomas Hoenic.

You might not think of spindle rebuilding as a likely business for a successful startup these days. But GTI's founders saw a need that was going unfulfilled. And they filled it.

"Everybody offered to repair spindles, but nobody offered to partner with the customer to figure out why they were breaking in the first place," says Bailey-Beavers. GTI Spindle includes failure analysis as part of the rebuild process and even tells the customer the diagnosis—right away if it's a problem like lack of lubrication that could cause the replacement spindle to fail. Then, GTI Spindle works with the customer to solve the problem and prevent future failures. And the customers really appreciate this level of technical support. It saves downtime, and that saves them money.

In addition to repairing spindles, GTI Spindle also works with customers to re-engineer their spindles. For example, GTI has designed custom labyrinth rings to prevent contamination, and the company often recommends using ball bearings with lightweight, rigid, long-lived ceramic balls instead of steel. Hoenic says about 70 % of customers have made the switch.



Above: High precision ball bearings.

A different spin

Besides sharing information and engineering aid, the company goes even further. "We're training our competitors," says Hoenic with a bit of a smile. Indeed, if a customer decides to do its own repairs, GTI Spindle would lose that business. But, if that customer wants training on how to repair spindles, GTI Spindle will happily provide training. Of course, once a customer finds out what is involved in rebuilding spindles, he or she may decide to continue letting GTI Spindle do the job.

On one Thursday in July, representatives of two major corporations were visiting the Manchester plant. The head of the spindle repair lab at a well known aerospace company was training on how to rebuild Makino spindles.

Two plant engineering staff from the state of the art Hyundai factory in Montgomery, AL, watched as GTI technicians rebuilt spindles from their plant. Hyundai engineer Nick Harsanyi said he and maintenance technician Ricky Speaks were "training, learning and evaluating [GTI's] services." Their department is responsible for over 150 spindles in the CNC cell that manufactures heads and engines for the Sonata and Santa Fe vehicles, Harsanyi said.

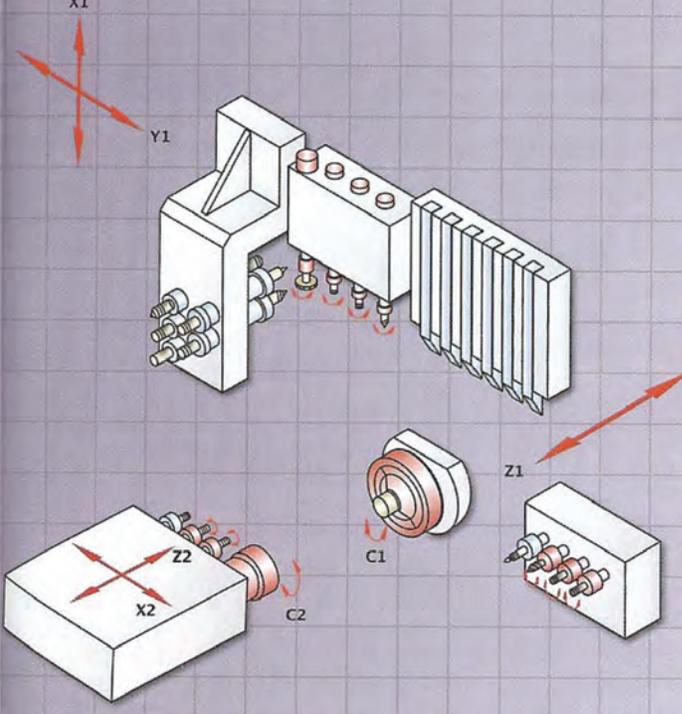
Besides GTI Spindle's headquarters in New Hampshire, the company has facilities in Bloomington, IL, Romulus, MI, and a spindle and machine tool repair shop on-site at Caterpillar Fuel Systems in Pontiac, IL. For more information, visit the company's web site, www.gtispindle.com.



Above: GTI technical director Raymond St. Onge checks runoff on a spindle shaft.



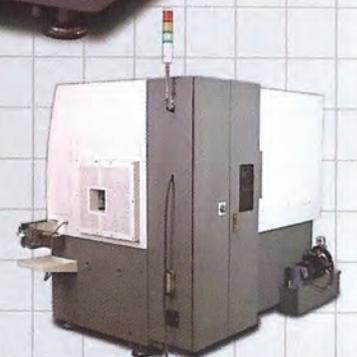
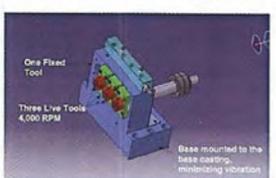
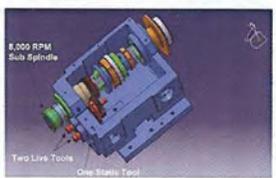
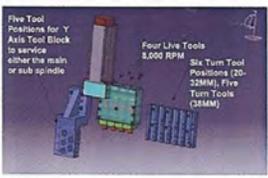
Above: Tom Hoenic, left, gives visitors a close-up look at spindle repair; maintenance technician Ricky Speaks and engineer Nick Harsanyi are from Hyundai Motor Manufacturing Alabama.



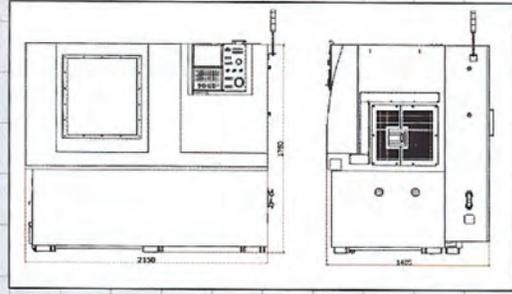
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SV-12/20/32-32JII
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ECAS-12/20
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product focus

THE FOLLOWING ARE COMPANIES WHO HAVE SPUN US INFORMATION ON SPINDLES:

Each month, Today's Machining World works to help you understand how the precision parts marketplace works, what's available in the industry, and how you can use available resources, as well as knowledge, to run a more efficient and effective shop. In every issue, we'll feature a product category and focus on equipment key to remaining competitive in our marketplace.

Spindles – tool rotating devices, typically for holding drills, mills, boring bars or grinding wheels – are a critical part of a machine's speed, with speeds up to 150,000 rpm. Spindles are either air, belt or servo-driven. And when these spindles wear down, replacing the spindle is the most cost-effective decision to recharge your machine. The following are a list of companies who have speedily brought us spindle information:

NSK America

To complement the current line of electric spindle systems, NSK America is now introducing the new E3000 series. These spindles are available with outside diameters of $\varnothing 20\text{mm}$, $\varnothing 25\text{mm}$, and $\varnothing 30\text{mm}$ and have a speed range of 5,000 up to 60,000 rpm. They are designed for high speed milling and drilling on CNC lathes and special purpose machines.

Maximum power output for the 30mm spindle is 350W and maximum power output for the 20mm and 25mm spindles is 250W. The use of a brushless DC motor, ceramic bearings and an air-cooling system allows for continuous operation. Total Indicator Run-out of each spindle is less than $1\mu\text{m}$. Maximum torque output of each spindle is 8.75cN·m while the continuous duty rating for torque is 4.0cN·m. The use of a selector unit with the E3000C control unit allows for the sequential operation of up to 4 spindles on one machine.



NSK also offers a complete line of High Speed Spindles that can be mounted into the taper of the main spindle on a vertical or horizontal CNC machine. With speeds up to 150,000 rpm, this allows the operator to achieve the necessary SFM when using small diameter tools.

For more information, please contact NSK America Corp. at 800-585-4675 or visit the company website at www.nskamericacorp.com.

product focus



Fischer Precise USA

Fischer Precise USA is now presenting a new option for its Type Super 65 universal spindle motors, used in high precision light milling and grinding applications. The new option is the 3-phase AC induction motor Type SC 65 spindle package. This upgrade package provides the user greater speed up to 54,000 rpm and greater power in the same physical size; an ability to sustain rpm under load; a new high frequency converter; and updated electrical connectors and cabling for worldwide EMC compliance. In addition, Fischer Precise can provide a wide range of other replacement spindles in milling, drilling, and grinding applications.

Fischer Precise USA has been created from the recent union of two companies, Fischer AG and The Precise Corporation, to create a company offering high performance spindles used in machine tools. The company strives to provide the customer the benefit of the widest range of technology-driven spindle solutions from a single source, not only in engineered products but also in worldwide service and support programs.

For more information, please contact Fischer Precise USA at 800-333-6173 or visit the company website at www.fischerprecise.com.

SKF Precision Technologies



SKF Precision Technologies, (formerly Russell T. Gilman, Inc.), a unit of SKF USA, Inc., in Grafton, Wisconsin offers a complete line of externally driven cartridge and block spindles. SKF Precision Technologies' belt-driven spindles can be used for milling, drilling, boring and other rotational processes.

SKF Precision Technologies' machine tool and automation components are precision manufactured with boring and grinding equipment to millionth-of-inch tolerances before being assembled in a Class 10,000 clean room. The company is ISO 9001, 14001 and 18000 certified for quality systems and environmentally friendly processes.

For more information, please contact SKF Precision Technologies at 800-445-6267 or visit the company website at skfpt.com

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Precision Balancing & Analyzing has introduced a line of new spindles for the machine rebuilder and end user looking to upgrade their machine tools with higher speed spindles and more power over a wide speed range. The spindles are available from a 40 HP 10,000 RPM spindle to a 120,000 RPM with 0.5 Kw of power for grinding precision bearing and automotive parts. Spindles are available in foot mounted, flanged mounting and cartridge style spindles.

The speed ranges of the available spindles is determined by the application. Three ranges have shown to be very popular. The model HXC-140-33 has a speed range from 12,000 to 33,000 RPM with 10Kw of power at maximum speed, while the model HXC-140-45 has a higher speed of 45,000 RPM with 6.5Kw at the maximum speed. The third model HXC-150-70 is actually a 150mm cartridge with a speed range of 30,000 to 70,000 RPM and 4.4Kw from 50,000 to 70,000 RPM.

For more information please contact Precision Balancing & Analyzing at 603-826-5102 or visit the company website at www.pbaspindles.com.

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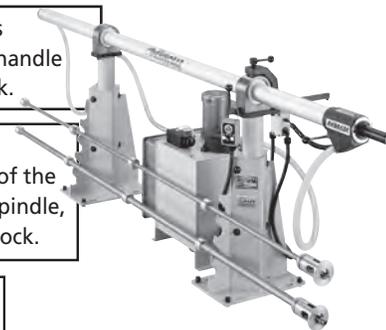
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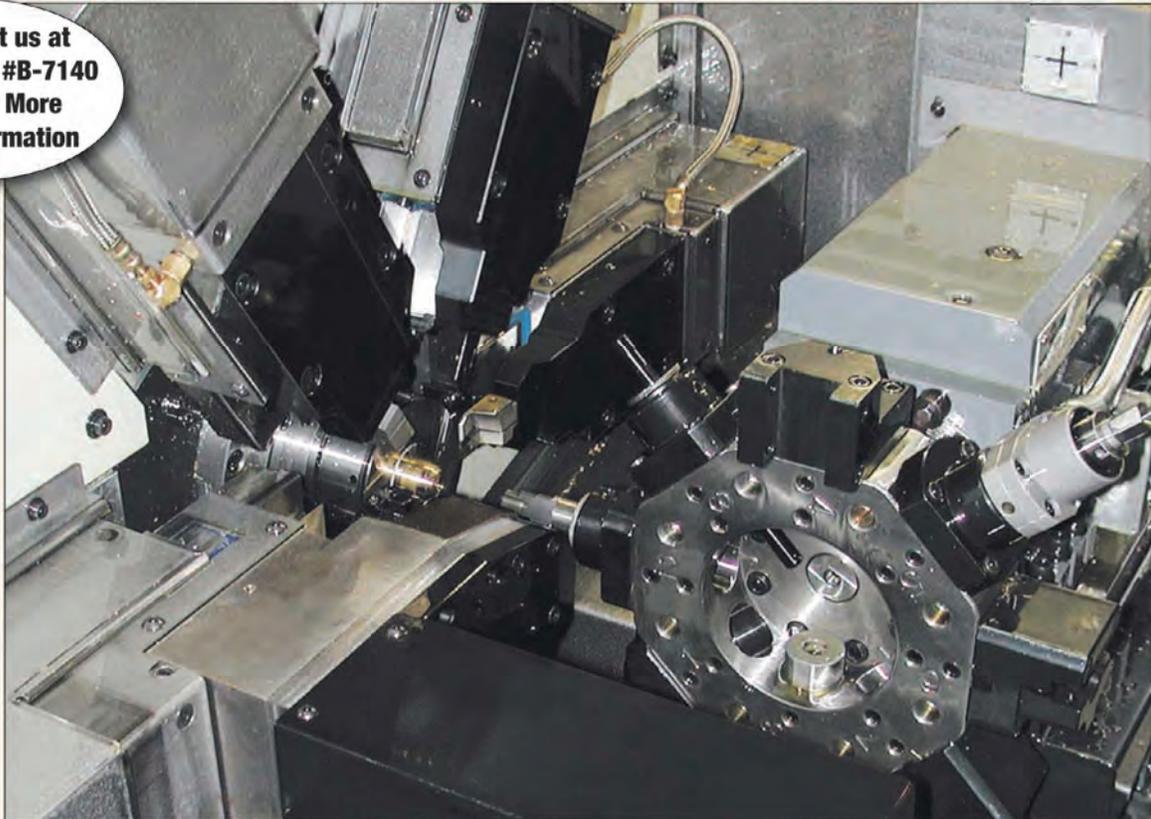


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To test or not to test

Among many hats I wear, I handle human resources for a transmission remanufacturing facility with around 35 employees, including office staff. Our management asked me to develop a drug testing policy. I checked with our lawyers, who said we could do whatever we wanted since we're a private company and there are no laws on the topic in our state. I don't support drug use or any illegal conduct, but I'm wondering how to develop a policy that doesn't seem overbearing. I'm also sure a few great employees will have problems with this because I've heard innuendo about what goes on during their garage band practices after work and on weekends. We haven't had any problems on the floor or in the office that I can see. Where do I start?

Like the compass that identifies north but shows all 360 degrees, the answer depends on where you want to go. If the object is to root out drug use without regard to whether it affects performance, then test frequently, randomly and, of course, before employment. But drugs vary in their ability to be detected, and you may catch 100% of the casual marijuana users and few of the users of hard drugs such as cocaine. The reasons are chemical. The evidence of marijuana use stays in the body for weeks, well after the effects have worn off. Cocaine, however, leaves the body in days. The result could be that a random test on Tuesday catches your star employee who smoked marijuana three weeks ago in the privacy of his basement, but misses the cocaine user who put his paycheck up his nose at the bar Friday night and was planning on selling the tool holder he stole from the floor Monday.

Your question raises broader concerns about the involvement of employers in the private affairs of their employees. Drug testing is common because it is easy and convenient. (If only identifying terrorists was so easy.) But drug testing may not reveal much about employee performance in the workplace. Spouse abuse and drunk driving are also criminal acts, which many would say are much more harmful, at least to others. At a minimum, both demonstrate respectively poor judgment and lousy impulse control, not qualities one wants in a working environment. But you probably aren't considering putting breathalyzers in employee cars or asking spouses to certify workers as non-abusive. That would cross the line for most people.

The inquiry, then, should be if conduct outside of work affects the performance and safety of your workforce. Then

it is your issue. An employer in Michigan made national news last year when he decided he did not want to employ smokers, not just prohibit smoking on the property. The courts upheld his decision. His rationale was that smoking hurt his bottom line through increased health care costs. It affected his workplace. He gave people time to quit and offered smoking cessation assistance. Some smokers quit smoking and some quit the job.

Do you really need to test if there are no issues affecting your workplace? Love him or hate him, Bill Clinton may have been on to something with "don't ask; don't tell". If it doesn't affect you, do you really want to know? Once you know, are you willing to face the consequences of losing the great employee who might test positive but would never come to work impaired and never misses a day?

In the private sector, aside from obvious legal issues like age discrimination, you are free to decide where on the compass you want to go, and you must weigh your objectives against the costs and consequences of the course you choose.

Russell Ethridge is a part-time judge and an attorney in private practice in Southeast Michigan. The material provided in this article is for information purposes only and does not constitute legal advice.

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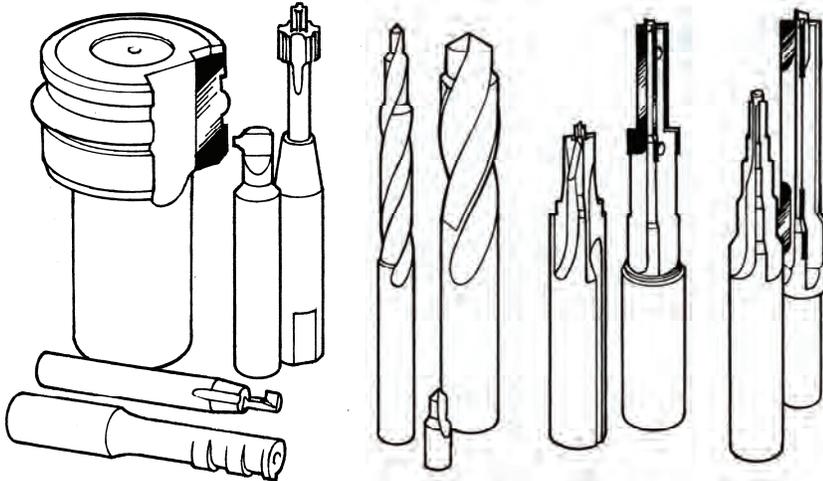
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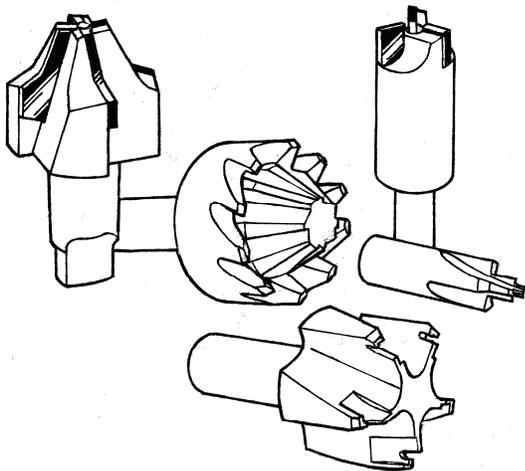
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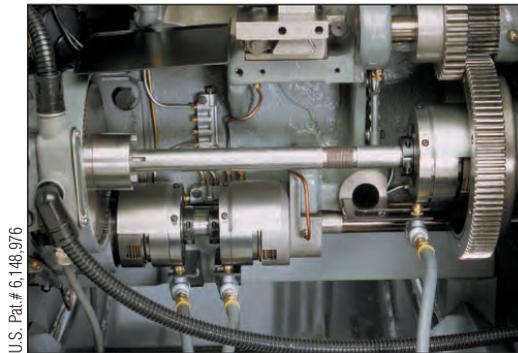
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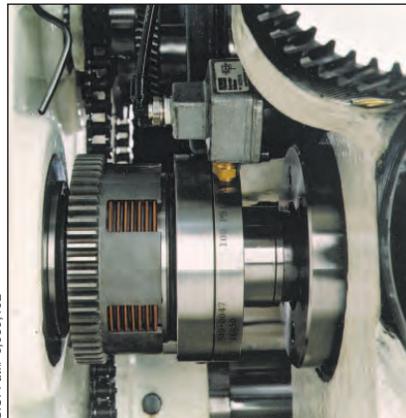
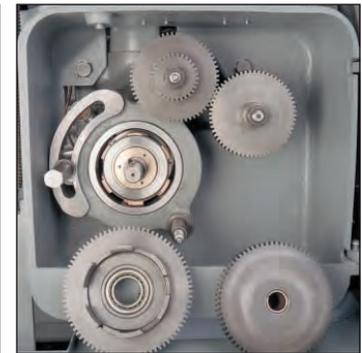
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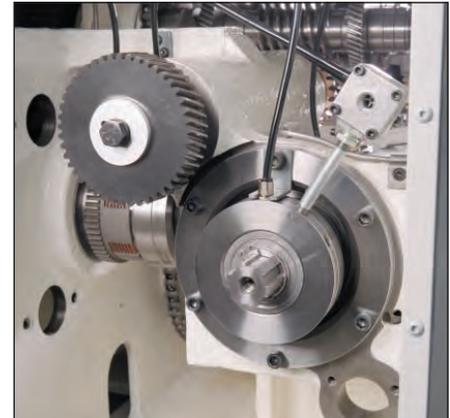
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BY NOAH GRAFF

Camel Driving

In July, my friend Justin and I traveled to the Sahara desert in Southern Morocco. We camped out in the wilderness twice, the first time in Zagora, the second time in Merzouga. Both times, we traveled by camel to reach our campsites. Our camels in Zagora were some of the smallest, mangiest looking camels we had ever seen, yet they got us to our destination generally unscathed.

On our desert treks, we had little control of our camels because our nomad guide Muhammad pulled us the entire way. Camels provide an interesting travel experience, but not the most comfortable journey. While riding, our legs straddled our camels' wide saddles, which were poorly cushioned by coarse blankets. Our legs dangled to the sides and constantly rubbed up against the blankets because the saddle had no stirrups. When we finally reached our campsite, the skin on our calves was chafed from all the rubbing and scratching. A bigger discomfort when camel riding is that the rider bounces every time the animal takes a step. As we rode back to town on our second day in the desert, our butts were so sore we actually got off the camels and walked most of the way.

In Merzouga, our camels were in slightly better shape than in Zagora, probably to traverse its overwhelming dunes. Some of the dunes were so high that you could rent skies or a snowboard to slide down. As we trekked into Merzouga's tumbling ocean of sand, we felt we had finally reached the promised land. It was the desert we had fantasized about from watching films like "Lawrence of Arabia" and "The English Patient"; blazing hot, sandy, infinite. Usually, our travel

strategy in Merzouga was to navigate around the sand valleys, staying on top of the dune bluffs, but sometimes, we were forced to ride down into the sand pits. Every time we descended, our stomachs churned. Imagine a sharp drop on a rollercoaster lasting about two seconds where you bounce up and down on a camel hump rather than rolling on wheels.

When we reached camp, the nomads who looked after us talked about the importance of the camels in their lives. The nomads see camels not just as a means of transportation, but as status symbols. They spend a lot of money acquiring them. One top of the line camel can cost the equivalent of several hundred dollars. That's extravagance in a country where the average income is a little more than 200 dollars a month. The nomads brand their camels to display ownership, but curiously, during certain seasons, they release the camels to roam freely in the desert. They claim to have amazing tracking skills that enable them to recover their camels even in the vast Sahara.

No doubt, our camels were small and unimpressive compared to many of the other camels we saw on our travels, but we felt majestic as we sat high upon our camel nags, decked out in our white gandoras (robes) and blue turbans (traditional of the Berber nomads). Our trip through the Sahara was truly a ride we'd never forget.



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shop doc

WITH NOAH GRAFF

Dear Shop Doc,

I have problems at times with indexable boring bars when boring holes on my lathe. It seems the diameter or surface finish isn't as good as I expect it to be, and for this job, I need to have consistent diameters due to some very close tolerances. I have tried cutting at the speed and feed parameters recommended in the tool catalogs, but most of the time the tool chatters until I slow it down. I have checked the centerline for proper alignment and believe it is set correctly. Shop Doc, I need some help quick !!!

Dear Bore-Dumb,

I believe we can steer you toward a solution rather quickly. The two topics that we will focus on are length to diameter ratio and tool nose radius. These topics contribute to the majority of problems in boring applications.

Indexable type boring bars are made of basically three materials—steel, heavy metal and carbide. Some manufacturers are getting quite sophisticated with these tools with dampening features and special designs, but let's keep this simple. A 1" diameter bar hanging out of a holder 4" in length is considered to be a 4 to 1 length to diameter ratio.

Steel bars can be used in relatively shallow depth bores such as 4 to 1 ratios. Heavy metal bars can be used in bores up to a 6 to 1 ratio. Carbide bars are used for bores up to an 8 to 1 ratio. The stiffness of the bar is the key factor. The bar must be capable of hanging out that far and still be sturdy enough to not have the cutting forces affect the tool adversely while in the cut. There is a cost involved—steel is cheapest, heavy metal is slightly more expensive and carbide is the most expensive.

Tool nose radius selection is crucial regardless of what bar you use. You need to know how much material you will leave for the tool nose radius on the insert you wish to use. The correct amount of material per side will be equal

Signed, "Stop The Bore-Dumb"

to or greater than the radius of the tool. This enables the material to be engaged completely around the radius of the tool. Always try to leave more material in the hole per side than what the selected tool nose radius is. If you need to use a larger radius, leave more stock per side. This engagement stabilizes the cutting forces of the tool and provides a smooth, consistent cutting action resulting in consistent diameters and tolerances.

Also, you might want to try out the wiper insert technology available today. It allows faster feed rates and better surface finish due to the design of the tool nose radius and clearances following the cutting tip.

One last thing to remember—Because the tip of the tool plays a huge role in creating successful bores, the centerline of the tool must be as close to the machine centerline as possible. If it's not close, some really weird pressures can occur, giving you negative results. Good Luck.

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

Have a technical issue you'd like addressed? Please email noah@todaysmachiningworld.com.

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Jim Rowe

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Magic Primes Square

31	13	67
73	37	1
7	61	43

Can a magic square be made up of only prime numbers and 1? (A magic square is an arrangement of the numbers from 1 to n^2 (n -squared) in an $n \times n$ matrix, with each number occurring exactly once, and such that the sum of the entries of any row, any column, or any main diagonal is the same)

Who worked their magic?

Gary Sewell and **Lynne Weixel** of GS Design and Machine in Tallassee, AL,
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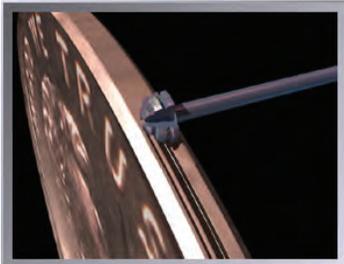
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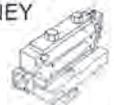
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As a machinery dealer, I boldly step into the maw of cataclysmic company change. Plant closings, bankruptcies, relocations, start-ups, expansions, fires, hanging-it-ups – I'm all over them. Lately, our company has been doing consulting work for machining firms looking for globalism ghostbusters. Our plant manager Jim Barnette, is a machining maestro, and more and more people are asking him to help them fight off manufacturing ghouls.

I find myself often reveling in the daily chaos because it brings me financial opportunity and story possibilities, but I'm saddened by the struggles of the people left to flail in the undertow of uncertainty.

I was in Oklahoma recently, evaluating the screw machines and Hydromats of a brass fittings company which was euthanizing a big machining plant. The factory was in a small town, barely worthy of a McDonald's and a Pizza Hut. I was escorted around by Alan, a key man who knew every machine like it was a drinking buddy. He was highly skilled in programming and engineering. I could place him in ten factories with a couple hours of phone calls. But Alan doesn't want to leave this corner of the Sooner State because his wife positively will not move, because her aged mother won't move. In a roiling business world Alan is staying put, even if it means less money and opportunity for personal growth.

For the Fortune 100 company, guillotining this factory is sound corporate pruning. They will be outsourcing the brass products in North America with hand assembly in Mexico. Sharp job shops – good customers of ours – are going to get the work. We might buy the residual equipment. Hundreds of people will be plunged into life-changing economic chaos. It's sunrise in America 2006.

This is no bleeding heart rant about the cruelty of corporate Eichmanns who just do what they are told. Those guys are bobbing almost as helplessly in the whitecaps as the Oklahoma Acme operators. My interest is in the coping skills of these economic earthquake victims. Do they stay in the depressed, demoralized dirt of rural Oklahoma because it's

home, it's family, it's what they know – or head for Houston and Austin – towns that beckon with opportunity and fistfuls of money?

I have worked for one company and lived in the same house for 30 years. I have the same wife and use the same prayer book I've had for 36 years. I hold on and savor sameness. In an economic world of ruthless change, I continue to eat Grape-Nuts for breakfast and die with the Chicago Cubs. I listen to Sam Cooke while driving to work. He died 40 years ago.

The desperate challenge we all face today is accommodating daily economic uncertainty with our chromosomal longing for the comfortable and permanent.

For me, a tight family enables me to compete in an uptight world. Sitting in the same seat in the same coffee shop for years frees me up to create Swarf from chaff. I understand why Katrina's refugees are returning to the low life of New Orleans early into a 20-year hurricane cycle. I hear it's the hottest real estate market in the country.

Tom Friedman has sold two million copies of his book *The World is Flat*. In it, he extols the global competition of Indian radiologists, trained in America, reading my CAT Scan in Bangalore at 3:00 a.m. Chicago-time for half the money of the local Doc sleeping in her penthouse at that happy hour. This is the global warming of competition. I accept it. I don't have to like it.

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