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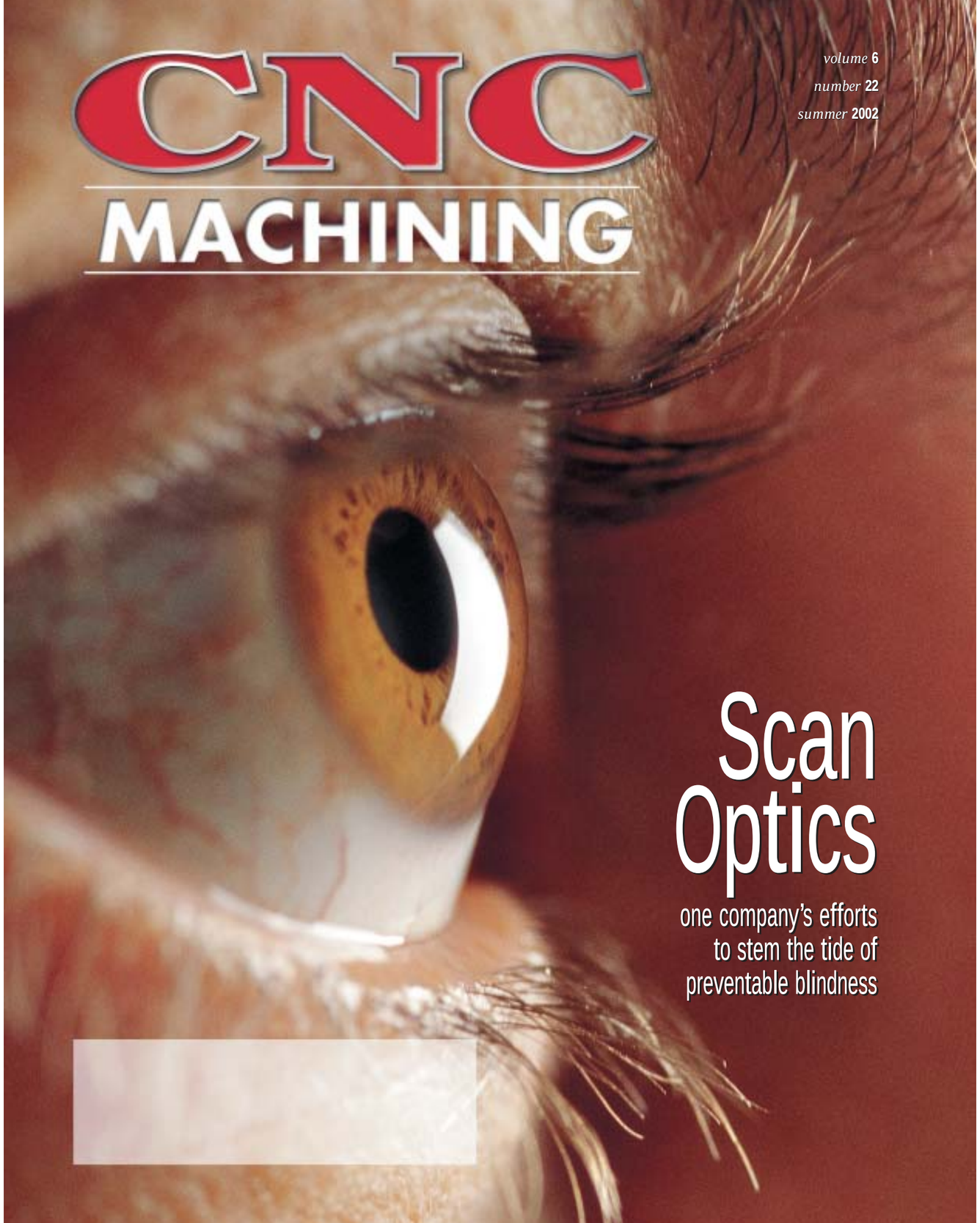
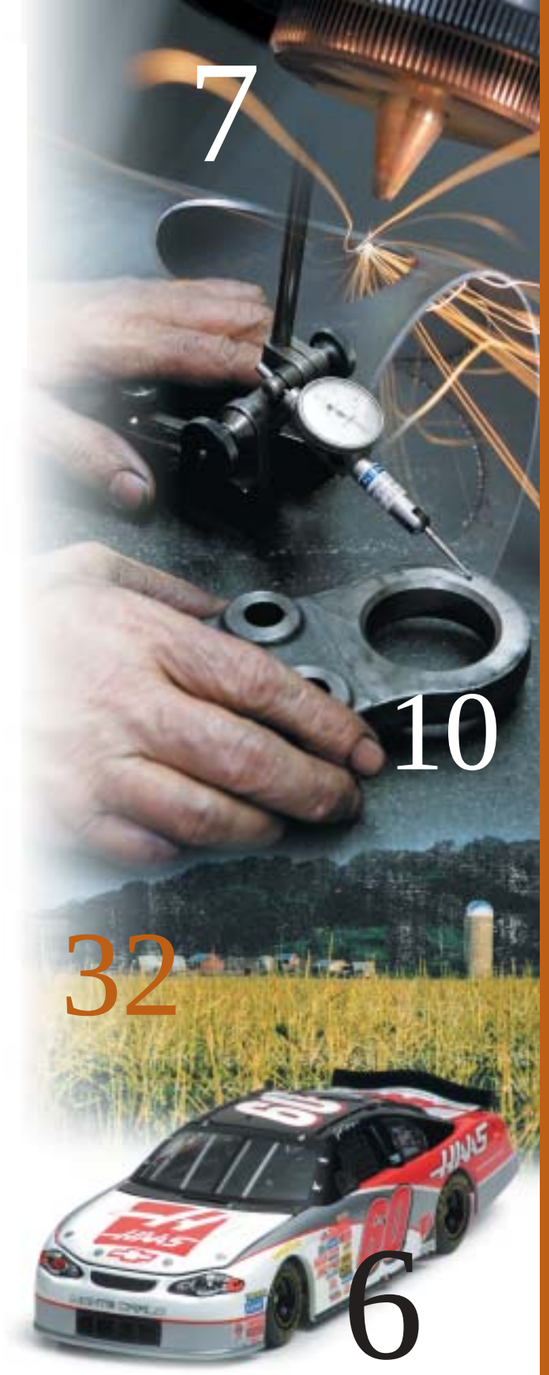
CNC MACHINING



Scan Optics

one company's efforts to stem the tide of preventable blindness

CNC MACHINING



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Out of sight, out of mind.

It may sound trite, but this age-old adage is, unfortunately, usually quite true. When something is not directly in front of us, constantly reminding us of its presence, we tend to forget about it. Out of sight, out of mind.

Most of us live in our own little worlds – oblivious, for the most part, to what's going on around us. We do the same old thing the same old way, because it's familiar, comfortable and the way we've always done it. We go about our daily business blind to the ever-changing environment around us . . . and to the plight of others. Only when something affects us directly – or is of such magnitude that it cannot be ignored – do we react, or look at things differently.

With the current state of the manufacturing industry, especially in the United States, and the post-9/11 geopolitical atmosphere, maybe it's time to open our eyes.

In this issue of *CNC Machining*, we try to shed some light on some things you may not have known, and take a different look at some things that are familiar. Strap in and hold on, it's going to be a bumpy ride. From third-world countries to Midwestern cornfields to garages and construction sites across America, we'll show you how the world of CNC affects us all.

For our cover story this issue, our roving reporter Matt Bailey ventured Down Under for an eye-opening look at one company's efforts to stem the tide of preventable blindness. Scan Optics of Adelaide, Australia, manufactures portable microscopes that are used for ophthalmic surgery. Their products are helping international aid organizations fight blindness in the world's poorest and most remote countries.

Since he was already out of the office, we also sent Mr. Bailey to rural Illinois (he doesn't seem to mind the flying) to visit a small (51 Haas machining centers, 30 rotary tables, 27 robots, 31 cells) family business founded on the philosophy of: "Work hard, and never let quality take second place to cost." Mennie Machine Company is a high-volume production shop that employs extensive automation to keep parts flowing for the likes of GM, Caterpillar, Ford and TRW.

Since we're dropping names, Black & Decker is another one that most people know. Whether it's a drill, a sander, a saw – or even a steam iron – the company's products can be found in just about every household. What many don't know, however, is that the familiar pistol shape of modern portable drills is a B & D invention, or that the company also manufactures DeWALT power tools. Or that they use Haas machines to shorten their design-to-market process.

From our friends at Coherent Laser, there's a piece about cutting metal with carbon dioxide lasers. This primer on laser basics provides insight into such things as flying optics, beam quality, assist gas, kerf widths and power ratings.

On the education front, we travel to America's heartland, where, amidst the cornfields of Iowa, there exists a thriving manufacturing industry. And where there's manufacturing, there's a need for training. You'll hear from four Iowa schools that are providing cutting-edge training to keep the industry alive. Who'd a thunk it?

And who'd have thought that not one, but several Haas-sponsored drivers would be vying for top spots in several race series? Check out the race report for a complete update.

Of course, there's more: an IMTS preview (be sure to check out the details of the Toolroom Mill giveaway), some new product information and two pages of applications solutions.

So sit back, relax and enjoy!

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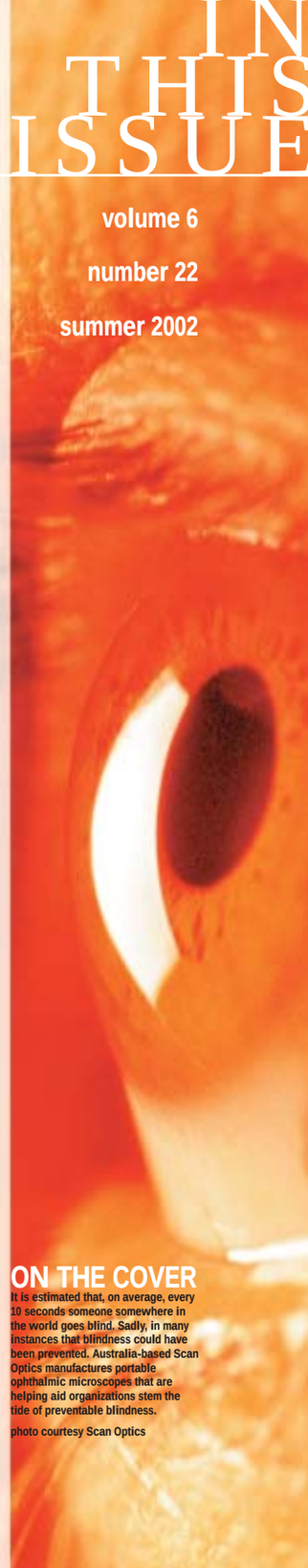

ON THE COVER

It is estimated that, on average, every 10 seconds someone somewhere in the world goes blind. Sadly, in many instances that blindness could have been prevented. Australia-based Scan Optics manufactures portable ophthalmic microscopes that are helping aid organizations stem the tide of preventable blindness.

photo courtesy Scan Optics

THE MASTHEAD

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by Denis Dupuis

Innovation – the step that follows ingenuity

In the last issue, I wrote about ingenuity – about the quantum leaps throughout history that have made the world a smaller place. About air travel and the ability to construct buildings in a fraction of the time it took only a century ago. Each of these remarkable achievements began with ingenuity – with a quantum leap that triggered further innovation and brought us to where we are today.

Likewise, the technology boom of the past 20 years began with a major change: a new science (the computer microchip age) from which grew a network of innovations that furthered, and continue to improve, productivity.

While we continuously hear about the 'bust in the tech sector' in every form of media these days, I'm not sure there actually is a bust, as opposed to simply a digestion period. The computer age moved quickly: new technologies spread like wildfire, consuming huge amounts of resources, both human and capital. Now that it has reached a plateau, the media would have you believe it has fizzled like a shooting star. On the contrary, I believe that we have moved into the period of innovation that always follows the flash of ingenuity.

There has been so much change in the past two decades that I believe the world needs to step back from its furious pace and absorb the technological changes. We will continue to apply innovation within the new technologies, to improve productivity, quality and ultimately our lives, but at a more controlled speed. Being what we are – only human, after all – I think the world has accepted the phenomenal changes thrust upon it, and is now taking a collective moment to catch its breath and determine how best to utilize these new technologies . . . how best to maximize the benefits of what we have discovered.

This is the part I call innovation – where we build upon the ingenuity to bring new products to market, improve the quality of existing products and enhance the things we use every day to make them bigger, better, faster and less expensive. It's what we at Haas call BBFLE (pronounced biffle).

For example, today's desktop computers have more power than the average human can keep up with or fully utilize. Add to that the Internet, which provides more information than we can possibly absorb, and we now have the time and resources to develop more innovative uses for our desktop companions. New PCs will continue to come on the market with new software applications, hardware applications and features that are small improvements over the previous version. While not earth-shattering, these innovations will be useful nevertheless. We need to take the time to put the Internet to its best use – to filter out the reams of data available, find those items that are of the most use to us and build upon them.

The revolution of the cellular phone industry – in which every person on earth was going to have a phone in their pocket – is another example. Well, almost everyone in the industrialized nations does have one, and while they are useful tools, they are just that – tools. While they have improved productivity, they have moved from prodigious to commonplace status in a short period of time. Their overuse has even led to contempt in some quarters. So, during this innovation stage, they will continue to become smaller (instead of bigger), better, faster and less expensive, but their overall use will remain relatively constant.

Being humans, we need to absorb all these radical changes of the past decade or so, put them into perspective and make them a part of our everyday lives. Once we reach a certain comfort zone, we'll be ready for the next level of ingenuity: the next round of earth-shattering, world-shaking events that will launch another technological revolution.

In the meantime, I don't know about you, but I'm pooped from all this travel, technology and productivity improvement. I need a rest . . . so don't be surprised if my next column comes to you from an island somewhere in the South Seas, where it's okay to turn off the cell phone, relax and live life simply.

¿Habla HFO?

The first Haas Factory Outlet (HFO) south of the border is now open for business. Haas Automation, Inc., and Hi-Tec de Mexico recently celebrated the grand opening of the new HFO in Mexico City. More than 200 people representing nearly 100 companies were on hand to tour the facility and look over the Haas product line. Haas General Manager Denis Dupuis, who attended the event, said he was impressed with the facility and the number of people in attendance. "Hi-Tec has created an impressive showcase for Haas," he said. "This event shows the impact Haas is having in Mexico."

Hi-Tec has represented the complete line of Haas products since 1996. In addition to the HFO in Mexico City, the company has offices in Monterrey, Guadalajara and Querétaro. The Mexico City grand opening featured demonstrations of Haas machining centers, product training by Haas personnel, technical seminars, food, beverages and entertainment by a mariachi band. The event also marked the celebration of Hi-Tec's receipt of the HFO Dealer of the Year award for 2001, which was presented by Gene Haas at the annual Haas distributor meeting in March.

"This new facility ranks among the top HFOs in North America," said Bob Moraga, Haas regional business manager. "This showroom, and our partnership with Hi-Tec, will further establish Haas as a worldwide leader in machining centers and rotary products."

Demo Day – Round 2: 1 Day, 5 Applications, 50 Locations

June 19 was a busy day for Haas Factory Outlets throughout the U.S. and Canada. To mark Haas Automation's 2nd Annual Demo Day, each HFO hosted a one-day high-speed machining event to demonstrate the latest advances in high-speed machining equipment, tooling and CAD/CAM software.

Haas developed five basic applications for the event that showcased various aspects of HSM. Each HFO picked the applications that best suited the industries in their geographic area, and presented live demonstrations on Haas machines. Customers could also view video demonstrations of the remaining applications.

The five applications presented were:

• A water bottle mold in hardened tool steel – cut using a Haas VF-2 VMC with 15,000-rpm spindle, 1200-ipm

Please see DEMO on page 37

The Elusive Number 59

When you're the defending Winston Cup champion and you haven't won a race in your last 22 attempts, many would say you're in a slump.

With 58 career victories in 10 seasons, Jeff Gordon is known as a consistent winner. But being a consistent finisher over the long run is even more important, and despite the absence of a win, the defending champ is still in contention for the crown. With 15 races down, Gordon has five top-5 finishes and ten top-10s. Going into Sears Point, he's tied for second with teammate Jimmie Johnson – just 110 points behind leader Sterling Marlin.

"I'm certainly in a race-winning slump," said Gordon. "But, we're in a top-10 streak of late, and it's just a matter of time before we win again. I'd be concerned if we weren't running well, but we're doing good in the points and leading laps."

Although he hasn't won a race this season, Gordon has still been to the winner's circle – as an owner. He was a proud co-owner when rookie sensation Jimmie Johnson took the checkered flag at the Napa 500 in California.

"It feels awkward," Gordon said. "I feel like I don't belong in victory lane. But Rick Hendrick and I worked hard to get the sponsorship, and Hendrick Motorsports worked hard to put this team together. The chemistry has been right there from the beginning. Jimmie, crew chief Chad Knaus and the team have just clicked. I told Jimmie that we'd put him in top-notch equipment, and he's really making it work by getting into victory lane."

Gordon joined Johnson again after the 26-year-old won the MBNA 400 at Dover, Delaware, in June. Propelled by the two victories, Johnson is tied for second in the points going into Sears Point, and running away with the rookie-of-the-year award.

Johnson also nearly clinched the Coca-Cola 600, the longest race of the year. After winning the pole, he led for 263 of the race's 400 laps. On his final pit stop, however, he overran his pit box and lost valuable time. "I had my fork

Scott Weersing

dug into the cake and was ready to take a big ol' bite out of it," Johnson said. "Well, that cake fell off my fork right onto the floor. That tells the tale. I can't blame it on anyone but myself. You're a hero one lap, and a zero the next."

Johnson wasn't quite a zero, as he ended the race in seventh place. Gordon took advantage of Johnson's miscue to maneuver his way up from 16th position to finish 5th.

In other Hendrick Motorsports (HMS) news, Jerry Nadeau and the organization have mutually parted ways after realizing they were not an effective combination. "Jerry has made a tremendous effort, but sometimes these things just don't work out," said Rick Hendrick. "We wish him well, and have no doubt that he will be successful."

"Driving for Hendrick Motorsports was a great experience for me," said Nadeau, who began racing Winston Cup in 1997. "At the end of my first season with the team, I really felt we were on our way, but the results just weren't there. I wish everyone at Hendrick Motorsports the best of luck, and look forward to future opportunities."

HMS president John Hendrick has since named Joe Nemechek as the interim driver of the No. 25 UAW-Delphi Chevrolet. "We're pleased to put a talented veteran like Joe behind the wheel," said John Hendrick. "He's a proven winner, and we're confident that he'll compete at a high level for the remainder of the 2002 season."

Winston Cup veteran and fellow

Scott Weersing

HMS driver Terry Labonte currently sits at 19th position after a DNF at Pocono and a 31st-place finish in Michigan. He has logged only one top-10 finish this season.

Busch Series

The sound of a racing engine is music to Jack Sprague's ears, especially after winning his first Busch Series race – the Inside Traxx 300 – at Nashville Superspeedway in the Music City.

"It was awesome," said Sprague, who earned the traditional Gibson guitar trophy for his effort. "When I saw that guitar in the driver's meeting, I knew I wanted it real bad. I can't believe I've got it. During the last caution, my crew chief Dennis Connor told me he'd pay for guitar lessons for a whole year if I won the race. I guess he's got some paying-up to do now." It was Sprague's first win in 90 starts in the Busch Series.

"I'm surprised it took us so long to win; we've been close so many times this year." Sprague said. "Now I've got that monkey off my back." Sprague started the race in 5th, and took the lead for the first time on lap 24. Overall, he led a race-high 144 laps, including the final 22 laps.

All season, Sprague has been battling Jason Keller for the points lead, but the team Net-Zero No. 24 car has been the most consistent on the track. Sprague recaptured the lead from Keller in early June with a 5th-place finish in the MBNA 200 at Dover, Delaware. Keller's inconsistency (and Sprague's win in Nashville) dropped him into 3rd place, 110 points behind Sprague after 16 races, with rookie Scott Riggs in second.

Sprague's previous best finish of the year was in the Pepsi 300 in Tennessee, where he captured 2nd place behind Riggs. Sprague also finished 2nd in the O'Reilly 300 in Texas, and now has six top-5 finishes and 11 top-10s.

Ricky Hendrick and his GMAC Financial Services No. 5 Chevy are having a tough rookie season on the Busch circuit. After a promising start, Hendrick damaged his shoulder in a crash in Las Vegas. His comeback from the injury has been rough. "Right now, we're in a slump," Hendrick said. "We've had some problems, but we'll eventually pull through and get running well again." With 16 races down, Hendrick is 28th in the points, with his best finish being 8th place in the Kroger 300.

Ilmor Racing Engines

Ilmor-built Chevrolet engines continue to dominate the Indy Racing League, and the proof is in the points: With seven races down, drivers running Ilmor engines – Helio Castroneves, Gil de Ferran, Felipe Giaffone and Al Unser Jr. – hold four of the top five positions.

Castroneves also became the first driver in three decades to win a second consecutive Indy 500, which brings the total number of Ilmor-powered wins at Indy to nine in 12 attempts. The Brazilian took the lead late in the race when the leaders pitted during a caution. When green-flag racing resumed, he was in 1st place, until Paul Tracy passed him on lap 198 – just as another yellow was thrown. Race officials ruled that Tracy made an illegal pass during the caution and named Castroneves the winner.

But it's not over 'til it's over. Tracy has appealed, and is awaiting a final decision from IRL president Tony George. Castroneves leads the points after a 2nd-place finish at Pike's Peak, with teammate de Ferran running a close second.

NHRA

In the Top Alcohol Funny Car division of the NHRA Lucas Oil Drag Racing Series, Todd Veney of J&B Motorsports is making great showings. In the first event of the year in Orlando, Florida, Veney finished 2nd behind Von Smith. Veney then defeated Jeff Payne, and advanced to the finals with a victory over Jeff Craig.

At the GatorNationals, Veney sped by Craig again in round one and Jeff McCulloch in round two, before getting edged out in the final by Frank Manzo. It was Veney's second runner-up finish of the season in two races.

Craig got his revenge in Atlanta, though, by defeating Veney in the first round. Through four events, Veney stands in 2nd place in the Division 3 standings. The J&B Motorsports team has a busy summer ahead, as they travel to Columbus, Ohio, in July and Cincinnati in August.

CART

PWR Championship Racing is in stand-down mode as they try to find sponsorship. The team last took to the track in Japan, where Scott Dixon finished 9th. Dixon has since left the team to race for Target and Chip Ganassi Racing, leaving Oriol Servia of Spain waiting in the wings to drive once PWR secures a sponsorship for the rest of the year.

In other CART news, the Mexico City race has been rescheduled from October 13 to November 17 to give race promoters more time to complete facilities for the event. The Mexico Gran Premio 2002 will serve as CART's season finale this year.

Haas & Sprague Take on Winston Cup

Haas Automation, Inc., recently announced the formation of a NASCAR Winston Cup Team – Haas CNC Racing – that will run select events this season with driver Jack Sprague behind the wheel. Sprague and the team will then enter the Winston Cup ranks on a full-time basis in 2003, beginning with the Daytona 500 at Daytona Beach, Forida. Haas is a long-time associate sponsor of Hendrick Motorsports, and is receiving assistance from the five-time NASCAR Winston Cup championship organization to make this new team possible.

"I've been waiting a long time to get the right opportunity to go Winston Cup racing," said Sprague, the three-time NASCAR Craftsman Truck Series champion who is now racing at the top of the NASCAR Busch Series. "I've had opportunities in the past, but they just weren't structured in a way that would give me and the team all the ingredients we needed for success. This new association with Haas Automation has everything we need to make the deal go, both on and off the track. This deal was worth the wait."

Haas is fielding the Winston Cup effort out of the 40,000-square-foot Haas CNC Racing headquarters in Harrisburg, NC, which currently hosts the Hendrick Motorsports Busch Series team. Haas is a major associate sponsor of Jack Sprague's No. 24 NetZero Chevrolet NASCAR Busch Series entry, and Ricky Hendrick's No. 5 GMAC Chevy Busch entry. The team's general manager is Joe Custer, and Jack Sprague's current and long-time crew chief, Dennis Connor, will also serve in that capacity for the new Winston Cup team.

The Haas CNC Racing team is being mentored by Hendrick Motorsports, which has years of experience running Winston Cup cars, including those driven by four-time Winston Cup champion Jeff Gordon. As partners, Hendrick Motorsports is providing cars, engines and technical assistance for the Haas team in 2002. "The biggest help is having Hendrick as a source for technical and engineering support," said Custer. "Match that with Haas' engineering capabilities, and there is nothing but optimism."

Sprague was initially set to debut the No. 60 Haas Automation Chevrolet Winston Cup car in the Coca-Cola Racing Family 600 at Lowe's Motor Speedway in May, but testing at the 1.5-mile oval prior to the race led the team to withdraw the entry.

"We just didn't feel we were prepared enough and quick enough to go there and do it," Sprague said. "So we're going to hold off and get our stuff better prepared and go test again."

Sprague tested two cars prior to the race – the brand-new car built by Hendrick for the Winston Cup program and another car acquired from Hendrick's No. 25 team; he was disappointed with the performance of both.

According to Connor, there was no quick fix for the team's planned first outing. "The characteristics of the two cars were totally opposite. One was very, very tight and the other was scary loose. Instead of making a bad decision on which car to take and getting a big surprise, we elected to try to get some answers to our questions by doing more testing.

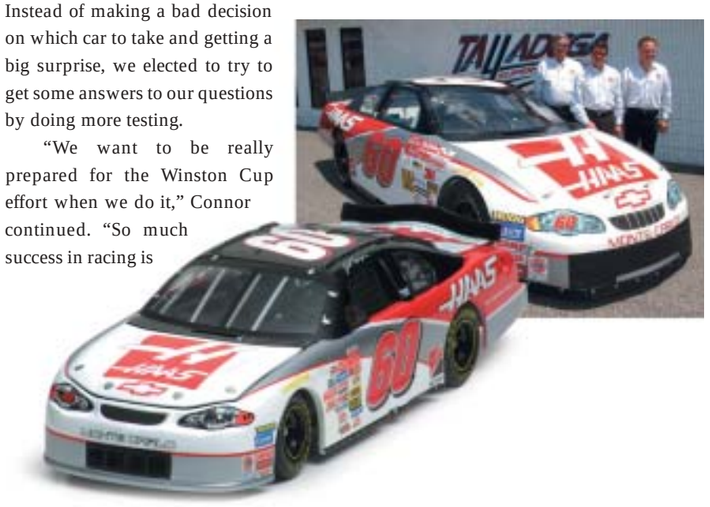
"We want to be really prepared for the Winston Cup effort when we do it," Connor continued. "So much success in racing is psychological, and so much of it is team effort, that we were concerned that going to Charlotte and putting on a poor performance would really do a lot of damage to the team from a morale standpoint."

Both cars have since been to the wind tunnel for testing, and, according to Joe Custer, some pretty significant differences were found in their aero packages. "We were able to gather a lot of information that will help us build a better car," Custer said. Further track testing is planned for July.

This will be a learning year for the Haas CNC Racing Team, as they build and test cars for the Winston Cup racing series. "This is a new deal for everyone, but we are starting with a blank sheet and we can do things right," said Custer. "It's extremely important to learn from the Busch Series as we get ready for the Winston Cup races."

If Jack Sprague continues to dominate the Busch Series like he has been, he'll be a major force to contend with in Winston Cup. Stay tuned.

For more information about Jack Sprague and the Haas CNC Racing team, visit www.HaasCNCracing.com on the Internet.



Cutting Metal with Carbon Dioxide LASERS

Story Stephen Lee **Photos** Scott Rathburn

The flexibility, precision and capability of a carbon dioxide laser-cutting system complements other machine tools and lets end users respond quickly to the ever-changing requirements of customers.

A typical laser cutting system consists of the following:

- A laser
- A motion-control system, consisting of motorized, computer-controlled stages that allow the work table to move freely in almost any direction
- A beam-delivery system, including mirrors and a lens to deliver and focus the laser beam onto the work surface
- A gas-and-vacuum system to supply gas to the laser, assist in the cutting process and remove cutting waste

There are two main types of CO_2 laser cutting systems: flatbed/gantry and robotic. Flatbed lasers are excellent for cutting metal plates and sheets, as well as simple 3-D parts. Conversely, robotic lasers are ideal for cutting complex and irregular 3-D parts.

Flatbed/gantry-type systems have two beam configurations: fixed and moving. In a fixed-beam configuration, the part moves beneath the laser beam that is fixed in a specific location. For the moving-beam system, the laser is mounted on one of the moving axes of the system (mounted on a gantry) or fixed in one location (for example, mounted to the side of the machine), and the laser beam is moved with a set of moving mirrors and a focusing assembly (called a flying optic) to direct the beam over the workpiece that is fixed in place.

CO_2 lasers use a mixture of gases – typically carbon dioxide, nitrogen and helium – inside a chamber where electrical energy is delivered. The gas converts the electrical energy into light, and mirrors direct the light beam to perform the cutting.

CO_2 lasers emit light in the mid-infrared region, which has a wavelength of 10 microns (µm) and is not visible to the human eye (the human eye is sensitive to a wavelength range from 0.4 µm to 0.7 µm).

Lasers for metalcutting are available in a range of power ratings. Low-power lasers with an average power output from 10 to 500 watts are primarily sealed systems. Here, gas is sealed in a tube and the laser beam is emitted from one end of the tube. The gas is effective for about 15,000 hours of operation before the tube requires reprocessing. These systems require little maintenance, are compact in size, need no additional gas supply and are quite efficient. However, their initial cost can be higher than flow-type systems, and they are limited to 500 watts of maximum power.

Laser-cutting systems above 500 watts to over 10,000 watts are mainly flowing-gas types, which includes axial-flow and transverse-flow systems. In axial-flow systems, the gas moves down the tube in the same direction as the laser beam, whereas the gas moves across the tube and orthogonal to the beam in transverse-flow lasers. In all flowing-gas systems, a portion of the gas needs to be replaced periodically.

The main performance requirements in any laser system are the beam, or "mode," quality and the laser power (in terms of average or peak-power wattage). The mode quality is determined by the distribution of the light's intensity across

In axial-flow systems, the gas moves down the tube in the same direction as the laser beam, whereas the gas moves across the tube and orthogonal to the beam in transverse-flow lasers.

the laser beam. A "perfect" laser beam is round with a bell-shaped intensity distribution, which is called a Gaussian beam. The value M^2 describes an actual laser beam relative to a perfect Gaussian beam. An M^2 of 1.00 means that the beam is a perfect Gaussian profile. The higher the beam quality, the more cutting can be performed with less power.

However, a minimum threshold of power is required to start any process. This power threshold varies according to the material being cut. For example, more power is required to cut steel than acrylic. Above this power threshold, any extra power increases the speed of the process.

Metalcutting with a CO_2 laser is a thermal process. Using a single lens, the laser beam is focused to a spot measuring from 50 µm to 250 µm in diameter. For example, the beam intensity, measured as irradiance, for a 500 W laser beam focused to a 250 µm spot is 1 mW/cm^2. This spot heats the material, while the assist gas, typically compressed air, oxygen, nitrogen or argon, burns and blows the molten metal away to produce the cut. The width of cut is called the kerf width. Typical kerf widths are less than 0.5 mm.

In addition to steels, CO_2 lasers can cut plastics, paper and ceramics; many different industries incorporate lasers to manufacture a host of products. The versatility of CO_2 laser cutting systems, working in conjunction with traditional machine tools, allows manufacturers to have greater flexibility, and to respond faster to customer needs.

Coherent Laser Division
Santa Clara, Calif.
408-764-4000
www.coherentinc.com

Big Ideas

Story & Photos
Matt Bailey

So you find yourself two hours south of Chicago, rolling along Route 71 through low hills of Illinois farmland. You slow as you approach the town of Mark, population 450. Passing through, nothing outside the car is sufficiently interesting to draw your attention from the conversation inside the car.

Then, just as you crest the summit of the last small hill of the sleepy town, the conversation stops. There it is. Nestled in a shallow valley of green and brown, flags billowing in the stiff breeze, incongruous, grand and pristine: Mennie Machine Company, a neo-classical monument to one man's vision. White, stuccoed, crowned by rooftop alabaster replicas of Greek and Italian statuettes. Proof, if ever proof were needed, that big ideas are not exclusive to the big cities.

In the late 1960s, Mark (IL) native Hubert J. Mennie took the advice of the pioneers and, like many a small-town boy before him, headed west to California, the land of milk and honey. Whatever the motivation behind his migration, Mennie, a graduate of local company Westclox's tool & die program, probably didn't anticipate cleaning people's swimming pools to earn a living. For him, California meant swallowing pride: not much milk, not much honey.

But Mennie was a quick learner. During his time in California he saw that people owning and running their

own companies were doing rather well. The idea of doing likewise, in his own inimitable style as it turned out, appealed to the young pioneer. Mennie took action; he went home to rural Illinois and in March 1970 he started Mennie Machine Company (MMC).

Hubert Mennie's first steps, though tentative, were guided by a strong commercial and engineering nous *(mind or intellect; we had to look it up, too)*. By the late 1970s, with the support of his wife Cheryl, Mennie had turned his vision into a modest but ambitious reality as a respected tool and die contractor for the U.S. military.

A decade of hard work saw the company expand its activities to designing and producing automated computer-controlled equipment and custom automated manufacturing solutions – skills that were to become the cornerstone of the company's present-day high-volume production machining activities.

By this time, Hubert and Cheryl's family was taking a very active part in the proceedings. Sons Bill and David started out on the shop floor and soon graduated to leading roles as the company grew and looked to the future. A little later, the Mennie daughters followed their brothers into the business – Jennifer got involved with the company's financials, and Amy, the youngest Mennie, was to be instrumental in the company achieving its ISO-9002/QS-9000 certification in 1998.

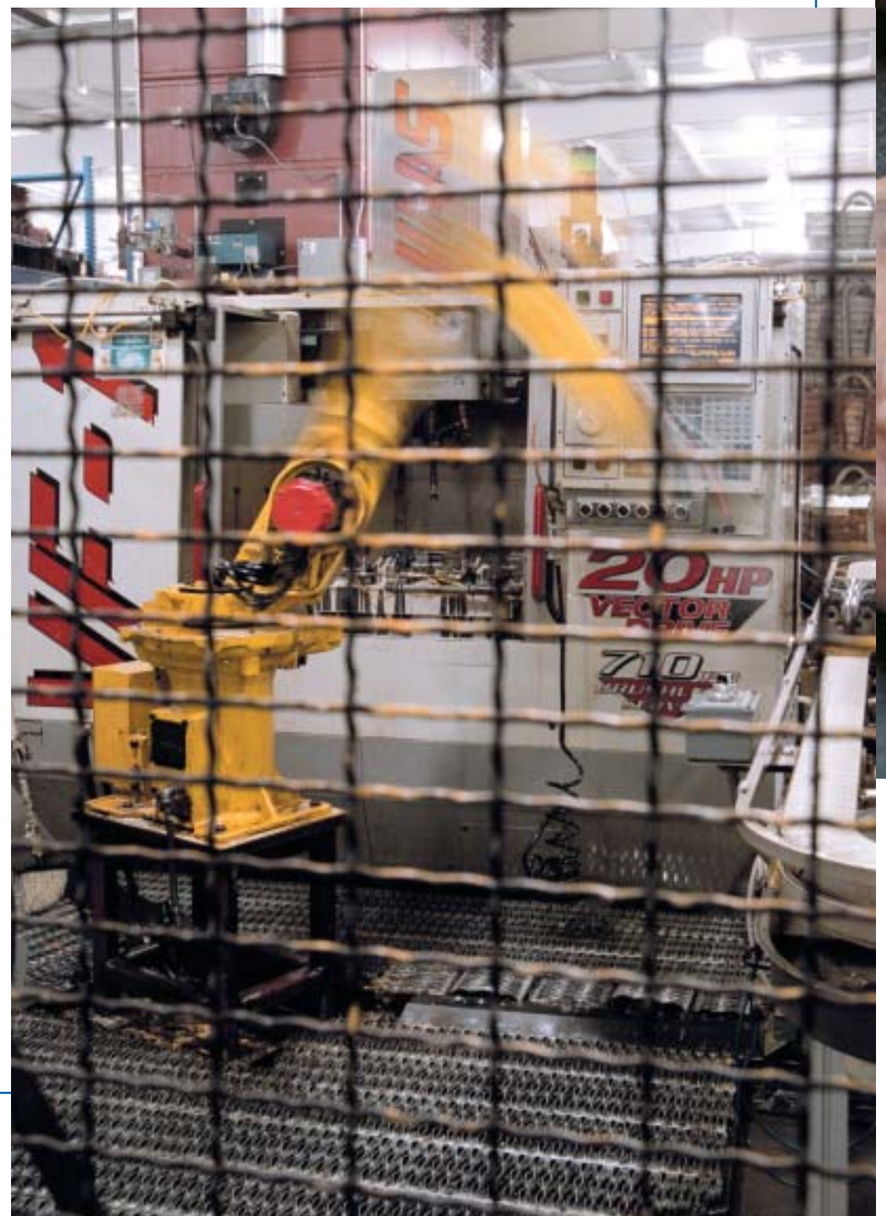
So MMC finally had a full complement. Where one Mennie was good, imagine what six could do!

STRENGTH IN NUMBERS

These days, Hubert Mennie is still at the helm; his wife Cheryl, as CFO, keeps a close eye on the company's finances; Bill and David are both vice presidents of the organization; and daughters Amy (QS-9000 management representative) and Jennifer (finance), hold key management positions. Jennifer's husband, Joe Smoode, holds the plant manager position. David's wife, Annette, is responsible for accounts payable/receivable, and Amy's husband, Jake Cimei, is responsible for purchasing.

What started out as a small tool and die job shop has, thanks to a solid foundation, bright successors and a dedicated workforce, become a model business with more than 170 employees and a turnover of more than $30 million.

The company's customer base reflects the aspirations of its management: MMC currently serves several high-profile agricultural, off-road and automotive manufacturers, including Eaton, General Motors, American Axle & Manufacturing Caterpillar, Chrysler, Sauer-Danfoss, Ford and TRW.



Joe Smoode, plant manager, explains how the company came by such prestigious clients. "To start with, we knocked on a few doors," he says. "Sometimes we'd do some work for someone because they had a machine failure or they were moving a line and needed some temporary help. Often we'd be helping for anything from two months to a year, and that got us in the door."

In 1992, a division of GM launched a new program that required complete, machined parts in a two-week lead time. MMC was selected as the machining contractor because of its ability to meet the unusually tight deadlines. As a result, MMC was put on GM's bid list, opening the door to more automotive work later on.

Roger Abbott, head of process improvement, shares the all-pervasive can-do feeling at the company. "Part of the reason for our success is that, as an organization, we don't let opportunities slip away. As Joe says, if a company is running into trouble or needs help over a difficult period, that's an opportunity for us. We usually grab it and run with it. There's a lot of hard work from some very dedicated workers – they make it work – but the main thing is we don't let opportunities slip away."

And we're talking serious opportunities! "We ship between 80 and 250,000 parts a week, according to our customer's demand," says Smoode. "Roughly 300 different part numbers – some parts just 10 a year, some up to 20,000 a week. Most are sent directly to the customer's line 'assembly clean.' We also perform sub-assembly operations per our customer's request."

Needless to say, the Mennie shop floor is a blur of activity. $18 million worth of machining cells dominate the 130,000-square-foot space, semi-hidden behind tall, black-and-yellow fencing through which the occasional flash of a yellow Fanuc robot arm can be seen. Conveyor systems continuously feed raw material in one side of a cell and remove finished components from the other. Marposs gauging and vision systems on the lines check for quality, and parts are removed and packed for delivery. At eye level it's difficult to see exactly what's going on, but find a vantage point high above the hustle and bustle and, suddenly, it all makes sense.

"We currently have 27 robots loading various machining cells, turning out a variety of parts, including transmission, steering and suspension components, drive segments, hubs, bearing adjusters, etc., all to production

quantities," says Smoode. "Across the 31 cells we have 51 Haas machining centers and 30 Haas rotary tables and indexers. Just six are dedicated cells," he states. "Flexibility is the key to what we do."

Included in Mennie's armory of Haas vertical machining centers are 19 VF-1s, 10 VF-2s, 9 VF-3s, 5 VF-4s and 4 VF-5s. The company also has 4 HS-1RP horizontal machining centers, 28 HRT 210 rotary tables and 2 HRT 310 rotary tables.

TOP 20

Mennie Machine Company's experience with manufacturing systems means that most of the engineering for a new cell is done in-house by its engineering department. For example, a Haas machine going into a low-volume cell is installed and running within just two days. A higher-volume cell can take 2 to 8 weeks, depending upon the complexity of the machining process. Drawing on the same skills, the company adds value to its services by engineering everything from the customer's part to the machine fixtures. "Our customers send us the drawings and we do the rest," says Smoode. "We have seven full-time engineers, and we decide what we're going to do, how we're going to fixture it, machine it, etc. As with the cell engineering, all of our fixtures are designed and made in-house. We try to make everything as user friendly as possible, so all the operator has to do is hit a button."

MMC's investment in Haas machines makes it, in terms of number of machines, one of the top 20 users in the world, and one of the top two in Illinois. The machines are supplied and serviced by the Haas Factory Outlet (a division of Arthur Machinery) in Elk Grove Village, near Chicago.

According to Bill Mennie, quality and delivery are among the key reasons why MMC chooses Haas. "The simplicity of the design of a Haas, and the ease of integration with auto-loaders, hydraulic clamping systems and robotics, make Haas machines suitable for this kind of high-volume production work," he says.

"I have to say, we're very happy with the Haas machines," adds Abbott. "They're very operator friendly, easy to work with; and to produce the volumes that we do, we have to run them hard."

In fact, Mennie runs the Haas cells for 24 hours a day, 6-7 days a week, sometimes turning out up to 95 parts an hour. Clearly, if you're asking this much of your plant, maintenance should be a primary consideration: MMC has a comprehensive preventive maintenance program.

"We have a dedicated maintenance crew, many of whom attended the school at the Haas plant in Oxnard," says Abbott.

"Equally importantly, we have a great relationship with the Elk Grove HFO. We currently have a meeting once a month with a senior maintenance engineer, and we keep a consignment of all standard wear items on-site, just in case. Having said that, since we took delivery of the first machines back in 1994, we've had nothing other than the usual maintenance issues."

Mennie's preventive maintenance program also includes a replacement policy that upgrades the Haas machines every 5 to 7 years.

PHILOSOPHY

"Work hard, and never let quality take second place to cost." Hubert J. Mennie's founding philosophy for running and growing MMC has stood the test of time.

He believes that it's not always the fastest or the cheapest company that wins the contract. "It's the company that the customer can trust to do the work correctly that will win out in the end," he states. It's this kind of thinking that's behind MMC's quest for excellence in everything it does. Or, in Hubert Mennie's words, "If you work hard toward your goals, and strive to make the best possible product, you will never have a lack of customers."

In practice, Mennie genuinely believes that teamwork is what makes it possible for the company to do what it does. "Teamwork goes hand in hand with trust, and together they're the key to building and running a large, successful company. Teamwork is also what makes implementation of large automotive contracts possible." Watching the well-coordinated activity on the MMC shop floor, the truth in Hubert Mennie's words is obvious.

Mennie Machine Company, Inc.
815-339-2226

"We usually grab it and run with it. There's a lot of hard work from some very dedicated workers – they make it work – but the main thing is we don't let opportunities slip away."

POWER TOOLS of the trade

Story & Photos
Scott Weersing

product photo courtesy DeWALT

Look in any garage and there's a good chance you'll find a Black & Decker power tool. Visit any construction site and you'll likely find drills, saws, sanders, nailers and other power tools with the DeWALT moniker.

In fact, pick just about any project requiring power tools, and these brands find common use. But before they reach the hands of people across America, these popular power tools get their start on another tool . . . a Haas machining center.

Many successful businesses got their start in the founder's garage . . . but Black & Decker got its start on a kitchen table. It was 1917 when company founders S. Duncan Black and Alonzo B. Decker sat down and conceived the first portable drill. Designed with a previously unheard-of pistol shape and convenient trigger power switch, the Black & Decker portable drill quickly became the industry standard, replacing the 50-pound monstronsities of yore that required several people to operate them.

This innovation was just the beginning for Black & Decker, a company that is now a $5 billion global corporation, and the world's largest producer of power tools and accessories.

Well known for its orange and black color scheme, the name Black & Decker understandably brings to mind power tools, but the company also owns concerns that manufacture faucets (Price Pfister), locks (Kwikset) and fasteners (Emhart Fastenings). The company acquired DeWALT in 1960, and established the brand as a division of Black & Decker a decade later. An innovative company in its own right, DeWALT revolutionized the woodworking industry in 1922 with the invention of the first radial arm saw.

Another revolution occurred in 1992, when Black & Decker introduced the DeWALT line of portable electric power tools for residential contractors, remodelers and professional woodworkers. Powered by rechargeable batteries, these versatile devices freed operators from the restrictive tethers of extension cords and electrical outlets. In just two years, sales of the bright yellow tools soared from zero to $300 million.

The popularity of DeWALT and Black & Decker power tools has led to constant development of new products. The company's industrial design department, located in Towson, Maryland, uses Haas machining centers to quickly deliver prototypes of new models.

At first glance, Black & Decker's 3,000-square-foot industrial design department looks more like a laboratory than a machine shop. Then you notice several older milling machines and a pair of new Haas machining centers: a VF-3 and a Mini Mill. The Haas machines are used to produce models of new products prior to manufacturing in order to test their look and feel. Models are usually made from foam or modeling board (such as Ren Shape®), and can vary dramatically in size. As the DeWALT line has expanded to include such tools as air compressors and generators, the corresponding models have gotten much larger.

"The biggest reason for getting the VF-3 was the capacity," says John Reed, master prototype specialist. "We were running into more and more large parts, so we needed a bigger machine."

Initially attracted to the large travels of the VF-3, they enhanced the machine's capabilities further by adding a high-speed spindle and the High-Speed Machining option to help them better meet deadlines. Since Black & Decker introduces new products continuously, they wanted to shorten the time between development and bringing the product to market.

"The Haas machines help us meet our deadlines," Reed explains. "There's pressure to get models out. Every day the product is delayed from being on the market is one day of sales we're losing. So it's important to speed up product development."

New products are designed using the Catia CAD system, and then Reed and his team convert the program into G code for the Haas machines. Dean Torantore, the department programming and machining champion, loves the speed of the VF-3. "I can get the information, program the machine and then the designer can see the part before he leaves for the day," Torantore says.

"I like the size and speed of the Haas," he continues. "I can turn over a

lot of models in a short amount of time. I can crank up the rpm and let it fly. With the high rpm, I can get away with running really high feedrates."

The industrial design department almost didn't buy the VF-3 back in March 2000. What changed their minds was another shop's ability to meet deadlines. "We had a job that had to be done really quickly, so we sent it out to another shop," relates Reed. "They got the job on a Friday and got it back to us on Monday. We asked them, How did you turn this around so fast? They had a Haas machine with a high-speed spindle and High-Speed Machining on it. That switched our thinking about buying a CNC machine from another manufacturer, and we went with the Haas machines."

Price was another consideration, says Reed. "We're always looking to spend the least possible, so price was important. But with Haas, you get the most features for the price."

To mill parts such as the pistol grip of a power drill, Black & Decker's industrial design department created a unique fixturing system that allows accurate positioning of parts for initial machining, or for remachining if changes are required. "First, we drill and tap holes in the back of the part so we can attach dowel pins and spacers," says Reed. "Then, we attach the part to a subplate on the machine's table that is drilled with a series of holes for the pins. The 10 mm spacers allow the part to sit up in the air for machining. Using the G52 offset, we always know where we are when we put something on the machine. It saves us a lot of time."

The special fixturing and the high-speed capability of the machine have helped the department increase production and beat deadlines. "The designers can have a good visual of the product right away, which is something they haven't seen from this shop before," says Torantore. "I love using the Haas mills. I wish I could afford one for my garage."

Just north of Baltimore, Black & Decker's world headquarters houses a second model shop that also uses Haas machining centers. Dubbed the Prototype Model Shop – a 4,000-square-foot shop where 18 machinists make parts for working prototypes – it acquired its first Haas in 1998.

"The reason we went with Haas was because we needed to have more accurate CNC equipment," explains Sidney Pritchett, model maker. "We have some other machines, and we had problems with those. The Haas machines are more accurate and reliable." The shop has four Haas machines: two VF-2s, one VF-0E and one Mini Mill.

While the shop has a collection of other machining centers, there is no doubt which ones the model makers like best. "I think the Haas machines are the best in the shop," says Pritchett. Model maker Mike Cochran is quick to agree. "It's like lightning to switch from one job to the next. I can do five to six different jobs a day, and that includes programming. I can work faster on a Haas than a manual machine, no matter how easy or hard the job is. I can bust through a lot of jobs with the Haas machines."

Getting new products to market keeps Black & Decker's model makers busy making molds and machining other parts. To meet tight deadlines, they often set up parts on the Haas machines to run unattended at night. "Our older machines had problems handling large programs, so it was impractical to run unattended. The Haas machines can handle complex programs with multiple fixtures," says Pritchett. "I can run one program to do multiple pieces in multiple vises."

Right from the start, the model makers liked the Haas control. "A lot of the guys who hadn't worked with the Haas machines before were able to use the control with a minimal amount of supervision," notes Pritchett. "The control is very easy to use, and it's great being able to set fixture offsets with one push of a button."

Parts for new working prototypes are designed by Black & Decker's engineering department using Catia. The model makers, who do both the machining and programming, then take the solid models and convert them to G code. The programs are then downloaded to the Haas machines via the RS-232 port.

The Haas machining centers were chosen for their speed and ease of use after looking at other machining centers. "We are self-directed teams here, so the guys who run the machines helped picked them out, rather than a manager up in an office choosing the machines," Pritchett says.

Another key selling point, Pritchett adds, was the level of service. With other machining centers, the model shop has had problems getting service, but the downtime on the Haas machines has been minimal. "When we've had a problem," he explains, "there is a service guy from Haas here to fix it the next day." Service is provided by the Haas Factory Outlet in Philadelphia, which has a fleet of vans stocked with replacement parts in order to respond quickly to any repair needs.

With Black & Decker creating larger products, such as generators and compressors, Pritchett says the model shop will probably need to expand its capabilities further. He already has his sights on a bigger machine. "I hope in the future that we will be getting a larger Haas," he said.

So when you're looking to buy a new tool from DeWALT or Black & Decker, you now know that tool probably began as a prototype on a Haas machine.

life through a lens.

It's estimated that humans receive 90% of their sensory information visually.
If you've ever wondered what your life would be like without this information,
imagine never seeing the faces of your loved ones, never seeing the sun set or rise,
never seeing what you eat or what you're wearing, never seeing a movie,
a work of art, your favourite beach or mountain or the view from an aeroplane window.
If deprivation of these privileges isn't bad enough, think of the sheer, disabling
inconvenience, impracticality and frustration of trying to make your way in a world
designed by and for sighted people.

Story and shop photos by Matt Bailey

Scan Optics

For the blind living in the developed world, this is the hard, no-frills reality of everyday life – a life that no seeing person can easily comprehend. But for blind people in developing countries, the reality presents a more fundamental and immediate challenge: survival. In fact, aid agencies dedicated to helping the blind in such countries estimate that in some regions survival expectancy of a newly blind person is just three years. Blindness in these hostile environments is, effectively, nothing short of a death sentence.

According to the World Health Organization, on average, every 10 seconds someone somewhere in the world goes blind. That's two to three newly blind people in the time it has taken you to read this paragraph.

In Nepal there are already 400,000 people living in darkness. In India there are some 9 million. Africa: another 7 million. In fact, conservative estimates suggest that approximately 40 million people around the world are needlessly blind, and of these, 17 million could be cured with a simple 20-minute operation. That's more than the population of London and Los Angeles combined.

Just in case you're having trouble comprehending the humanitarian cost of this blindness, consider the economic cost. The U.S.-based One World Sight Project estimates that in the U.S. alone, blindness costs some $16 billion a year. And the U.S. has one of the lowest per-capita rates of blindness of all nations.

So what are the causes of preventable blindness?

Cataract: Opacity, cloudiness and, ultimately, loss of sight caused by water droplets forming in the eye's lens. In developed countries, cataracts are normally associated with old age. In developing countries, especially where environmental conditions are harsh, they mostly affect people over 40 years of age.

Trachoma: Corneal clouding caused by a severe and particularly nasty, contagious conjunctival viral infection.

Glaucoma: An easily preventable progressive condition that results in irreversible damage to the optic nerve and the retina.

Xerophthalmia: Blindness caused by a lack of vitamin A in a person's diet. It affects mostly children, and is preventable with nothing more technologically advanced than vitamin supplements.

Onchocerciasis: Severe ocular inflammation caused by infestation by a parasitic worm. In Africa and Latin America, 20 million people are infected with the parasite, some 350,000 of whom are blind.

Leprosy: Communicable disease most people in the developed world have only heard about in the Bible. Can cause severe corneal and intraocular inflammation, with sadly predictable results.

The list of causes of preventable blindness makes for miserable reading. But for one small, privately owned Australian organisation, the list reads as a call to action.

SCAN OPTICS

Adelaide-based Scan Optics was founded in 1987 to manufacture portable microscopes for use in ophthalmic surgery in the world's poorest and most remote regions.

The inspiration behind the company is Rod Watkins, optical scientist, graduate of Imperial College London, businessman and an individual with a mission: to help reduce preventable suffering throughout the world. But let's not rush to canonize. What Rod Watkins also saw when he started the company was a niche, a business opportunity in an already huge and growing market. It's a combination of his compassionate pragmatism and business acumen that forms the foundation of this successful and profitable company.

"Most forms of blindness can be treated and cured," says Watkins. "The issue with developing countries is that 80% of the population lives in rural locations without easy access to doctors, medical facilities, power supplies, etc."

It figures that if such a high percentage of the population of these countries lives in rural areas, it's also where most of those needing medical help are likely to live. To reach them means having robust, portable medical equipment.

"Scan Optics builds ophthalmic microscopes that are designed to be easily portable, are protected against corrosion and mold, can be operated from a range of main or battery power supplies, are robust and are reliable in extreme environmental conditions," says Watkins.

"We make four models of microscope, from a very simple device through to a foot-operated system that is designed to leave the surgeon's hands completely free during an operation. Using the same expertise and applying the same principals, we also make microscopes for ear, nose and throat surgery, as well as the optical inspection instruments used during eye examinations."

It took Scan Optics two and a half years to make the first prototype portable microscope and get it into production, a period funded in part by investors and in part by government grants.

The time and financial investment paid off. The company is now a major supplier throughout the world to prevention-of-blindness programmes such as Christoffel Blindenmission, the Fred Hollows Foundation, Sight Savers International, Surgical Eye Expeditions, the Lions SightFirst Project and the International Eye Foundation.

The Australian government is evidently pleased with the faith it placed in the fledgling organisation, recently presenting Scan Optics with a certificate of achievement for technical innovation.

"Since we built and sold our first finished product in 1990 we've shipped equipment to 104 countries," states Watkins with typical, quiet modesty. "In fact," he continues, "more cataract surgery, in particular, is carried out using our equipment than any other make, anywhere in the world. That's very gratifying."

The challenge for the world's aid agencies fighting blindness is the sheer volume of those needing treatment. Because Scan Optics' products are portable, medical teams are able to move quickly from region to region, offering much needed help to the vast numbers of those affected.

"The most common cause of preventable blindness is cataracts," says Watkins. "Overall, more than half of the world's curable blind suffer with them, but in some developing countries, the condition accounts for 90% of those needing help."

In 1997 alone, more than 600,000 cataract operations were carried out using Scan Optics ophthalmic microscopes. From a total of some 10

Scan Optics

million operations performed worldwide that same year, it's clear that Scan Optics is making equipment that makes a difference.

MANUFACTURING VISION

Ever since the company was set up, the research and development process has driven it to produce better products. This philosophy is still strong, explains Brian Staples, Scan Optics' general manager:

"R&D has always accounted for a large percentage of the company's resources, and continues to be today. We currently have 21 employees and, at any one time, at least four or five of them are working on developing new products."

Staples is from a technical background in consumer ophthalmology: spectacle manufacturing. He's largely responsible for Scan Optics' investment in the latest manufacturing technology.

"This year was a watershed for Scan Optics," says Staples. "We've made a pretty big investment in manufacturing and design technology. To reduce product development times, we wanted to move to using CAD/CAM and CNC. The objective was to dramatically change and improve the way we have been developing our products. We've pretty much achieved what we set out to do."

"Our new-product development has certainly changed," interjects Watkins. "Ten years ago, in fact even five years ago, we had a normal prototype procedure where we built and tested a model, then we built an improved version, and so on. It was very time and resource intensive. Now, we have a small team of mechanical and industrial designers using Mechanical Desktop to draw components and design finished products.

"In fact," he adds, "we have a mixture of people in our R&D department: industrial designer, computer programmer, mechanical engineer and an electronics engineer." Such is the nature of the Scan Optics product.

"The latest and most complex Scan Optics development is a microscope we designed entirely in the virtual space," says Staples. "The very first example we made was a fully functioning product that we took to a show in China to demonstrate."

Using the same new technology, Scan Optics is also currently developing a Fundus imaging system that digitally photographs the back of the eye. Yet another new product has also been developed "virtually" over a period of almost 3 years – the first metal being cut just recently.

"To improve the development process, streamlining the design of the product was the first step," says Staples. "Once this was taken care of, we needed to make the parts in the kind of batch numbers we wanted. We decided that we needed to make the investment in CNC.

"We'd been using manual milling machines and lathes for some time, outsourcing some of the more complex work to subcontractors. Part of the problem with outsourcing machining is that the batch sizes often had to be bigger than what we wanted. Consequently, if we made any updates or improvements to our microscopes, we'd have to exhaust current stocks before redesigning and remachining the part."

"We'd also had one, small CNC lathe for about a year – a very simple one that we were using continuously. So, we already had some in-house expertise of CNC, although not much of CAD/CAM," adds Watkins.

"We were looking at a variety of suitable CNC lathes and vertical machining centres when we decided to take a look at what the local Haas distributor could offer," continues Staples. "Not just the machines, but also the support, the training, the response, etc. I'll be honest. We were very impressed with the package that they put together. Also, Brian Harding, the local Haas sales and applications engineer, was able to offer very valuable advice and support for the machines, as well as the entire design-to-manufacture process.

"As an example, Patrick Walsh, our CNC specialist, had some useful knowledge and adapted very quickly to the machines. However, there's always a learning period, and if he ever needs help with running the machines, or if he has a manufacturing problem, he can call Brian on his mobile phone and, nine times out of 10, Brian can resolve the problem over the phone."

Once Scan Optics has designed its parts in Mechanical Desktop, it sends them to its Surfcam installation, where it generates the NC code for the Haas machine.

"Some of the parts we make are quite complex, so the programs are drip-fed to the machine," says Staples. "Generally, we're machining non-ferrous materials such as brass, stainless, aluminium and plastic, so our microscopes remain corrosion resistant.

"Our run sizes are small, typically 100 to 200 parts," he adds. "So the setup time for the machines is important in the costings. We store some 300 to 400 programs for different parts on the Haas controls. When it comes to changing parts, we just swap fixtures or chuck jaws and open the correct program. The simplicity and speed of changing from one part to the next has made such a difference that the setup times are no longer such a significant factor."

Watkins adds: "The Haas SL-20 lathe went in in March 2001. The VF-0E was installed in May. Each machine took just three days from installation to training to cutting metal. We were very impressed."

"The machines have performed very well and the support has been excellent," says Staples. "We make approximately 25 to 30 microscopes a month, so we're currently only running one shift, but we will need more capacity if we are to meet our very conservative demand estimates. And, we never have any downtime, which is great."

WORLDWIDE SUPPORT

With such a huge and growing number of blind people needing urgent assistance – in the words of One World Sight, the world is slowly going blind – it would seem that Scan Optics needs all the help it can get.

The company's almost surgically clean and tidy facility is based on land owned by the University of Adelaide. This gives it very good access to the university's various faculties, including the teaching hospital. Doctors are frequently invited to the Scan Optics office to help with product development, and university undergraduates occasionally join as interns.

The company also works with a local outpost of British Aerospace – a protagonist in Adelaide's thriving defence industry – to help develop the optical systems used in its products.

But the main problem for Scan Optics is not one of finding the local talent to develop the products, it's supporting a growing user base in such out-of-reach and remote countries.

"In the last fiscal year we shipped equipment to 54 countries," says Watkins. "The main market was China. But all of Asia, Africa and India have huge populations with many people awaiting surgery. Virtually none of our business came from Australia.

"To be able to support these countries, and the Scan Optics products already in the field, we have to travel a lot. We currently have an office in Shanghai, and we're slowly developing a support network. Thankfully, Scan Optics microscopes are built to last in tough environments, so we don't often hear of equipment failures. We frequently solve problems with technical support provided by e-mail, shipping new parts whenever necessary."

"There's an enormous variation in the conditions where our products are used," says Staples. "In developed nations, the surgical operating rooms are sterile and have good air-conditioning systems. In other countries, surgical operating rooms may not even have glass in the windows. Some microscopes travel around, some of them stay in one place all of their serviceable lives.

"We have several large microscopes with aid agencies based in the U.S., and these units travel around the world some four to six times a year. They're constantly on the move. On the other hand, one of our latest products, weighing 120 kg, is designed to be installed permanently in an operating room. So you can see, the level of support a user requires varies considerably. We have to be flexible."

WHERE PREVENTION FAILS . . .

For admirers of socially aware business organisations, Scan Optics is certainly an interesting study – not just a good example of 21st-century social entrepreneurism, but a company growing and thriving on the cusp of the profit/not-for-profit motive. That's not to say that the Scan Optics profit motive is in any way compromised. It isn't. It co-exists with the management's genuine empathy with the not-for-profit aid agencies that its products serve, and for the ills that they are helping to eradicate. It wears two hats.

In the company's meeting room, where this interview with Rod Watkins and Brian Staples took place, the bookshelves house manuals on optical physics and medical ophthalmology, as well as some of the classics of business best practice and management theory. But the motivation and success of companies such as Scan Optics can't be found and copied from the pages of academic tomes. It comes from passion and intellect and, just as importantly, from taking entrepreneurial risk to help overcome some of the world's most daunting and pressing problems. Scan Optics shows that free enterprise can make a difference and still make a profit.

"There are an additional two million people who become blind every year," says Watkins. "Ideally, prevention is better than cure, so the more we can understand about the causes of blindness, the more we do to help prevent it. In the meantime, we will continue to ship Scan Optics' products around the world."

CNC on the Range

Story **Linda Dorr** Photos Courtesy **Hawkeye, Kirkwood, NIACC and MTC**

Iowa. The heartland. The middle of the Midwest. Makes you think of corn, cows and hogs, right? Think again. Think manufacturing. In fact, think more than a quarter of a million manufacturing jobs, in a state with a population of just under 3 million.

Iowa is definitely a rural state – 91% of its land area is in agricultural use, and its 95,000 farms generate nearly $11 billion in cash receipts annually. And while cows, hogs and sheep are the livestock majority, you'll also find such exotic species as ostriches and alpacas. Still, there's plenty of room on those plains for the manufacturing industry.

Mike Turner, tool & die instructor and Machine Trades program chair at Hawkeye Community College in Waterloo, thinks part of the reason there's such a good manufacturing base "is because of the work ethic of the people around here. Kids who grow up on a farm know what a day's work is, and they're not afraid of it." Another reason is probably the state's commitment to employers. For companies creating jobs in manufacturing, product assembly, R & D or interstate services, the state Department of Economic Development works with educational institutions to provide customized employee training. For four community college programs in eastern Iowa – Kirkwood Community College in Cedar Rapids, Hawkeye in Waterloo, North Iowa Area Community College (NIACC) in Mason City, and the Manufacturing Technology Center in Davenport, which is part of the Eastern Iowa Community College District (EICCD) – that means training people to be CNC operators, machinists and tool & die / mold makers. Need we add that all four programs use Haas machines?

Kirkwood and Hawkeye have both had machining programs since 1966, when the Area 10 Vocational School became Kirkwood Community College, and the Waterloo Area Vocational School became Hawkeye Institute of Technology. Kirkwood's Dave Stotelmyre, Professor of CNC Machining Technology – "That's a fancy title for instructor," he says, laughing – was a student in one of the first machining classes at Kirkwood. Like every machining instructor in the Iowa community college system, he had to spend some time (10 years, in his case) working in industry before he began teaching. A CNC shop foreman for several years, he's been teaching for more than 20.

Manual machines outnumber CNCs by about 4 to 1 in the schools' shops, evidence that students are first required to get an excellent grounding in the fundamentals of machining. Once that's accomplished, they're enthusiastic about learning CNC – especially on a Haas. "Haas machines all have the same control, so that shortens the learning curve by a gob," notes Mike Turner. "And it's so user-friendly – we have to force them to use the other machines." Gary Forbess, head of the Industrial Division and a tool & die and CNC instructor at NIACC, echoes these sentiments. "Our students have learned how much easier the Haas machines are compared to others. There may be faster machines, but you have to look at the total time – setup time and programming time. People who come in from industry find them extremely easy to use."

Size-wise, Kirkwood is the fourth largest college in the state (including the state universities), and Dave thinks it probably has the biggest machine shop. In addition to four Haas vertical mills, two Haas lathes and several simulators, Kirkwood has about ten other CNC machines. "Every comment we've ever heard from students about a Haas has been positive," he notes. "One of the local shops is planning to change over to Haas machines because the owner has been to school here."

The machine shop programs at NIACC and the Manufacturing Technology Center (MTC) are new, both having come about in response to the needs of local industry. NIACC has had CNC machining and tool & die programs since 1997, when its Murphy Manufacturing Technology Center opened. NIACC alumnus and local entrepreneur David Murphy saw the need for a manufacturing curriculum at

the school, and donated start-up money for the Center. Local industry also contributed. A similar need fueled the opening of the MTC in Davenport, which has been in operation for not quite a year – classes began in the fall of 2001, following a 1999 study by the EICCD that found industry in eastern Iowa was in need of almost 60,000 people with manufacturing technology skills. The MTC is funded by a joint effort of the EICCD and several local manufacturers.

"NIACC has Haas machines for two reasons," says Gary Forbess. "They're pretty straightforward in terms of programming – and the simulators are the crowning glory. They allow us to have more students actively learning the control, learning to program, without standing in line at a machine." Another plus for educational purposes, he notes, is "the documentation. The books are well organized, and the operator's manuals have good pictures and lots of examples, broken down into the logical steps. It's great, especially for us – most of our high-school students have never been introduced to a machine before."

Students at the Davenport MTC are still on simulators, since the CNC program there is so new. The CNC lathe in the machine shop is a Haas SL-20.

“They start studying programs on day one,” says Mike Turner, “and if they don’t have the math background it can grind them up fast.”

“The instructors are using the Haas for curriculum development,” according to CNC instructor and program coordinator Teresa Brockhage, who was a journeyman tool & die maker before she began teaching. “We look at the CNC machines as the end of the road, not the beginning,” adds instructor Kurt Putnam. “First they learned manual machines, then table-top CNC, and now they’re on the simulators. Then we’ll take them through their paces on the real CNCs.” When it came to choosing CNC machines, Teresa notes, “We put out bids, looked at various machines, and we liked Haas. Also, local industry has a lot of Haas machines,” so it made sense to have a Haas in the school’s lab.

All four schools work closely with regional manufacturers, offering flexible class schedules so that part-time students with full-time jobs can acquire the skills they need or update the training they already have. According to Dave Stotelmyre, “Kirkwood will work with companies and individuals to provide whatever’s needed” – an attitude echoed by NIACC, the MTC and Hawkeye. The same certification options open to industry are available in the full-time programs, which are mostly filled with recent high-school graduates. In general, the equivalent of a semester of full-time classes earns students a certificate in general machining or manufacturing production, which qualifies them to work as a CNC operator. A year of full-time classes yields a CNC machinist diploma, and two years earns students an associate degree – in tool & die / mold making at NIACC and Hawkeye, in machining technology at Kirkwood, and in industrial engineering technology at the MTC. All of these associate’s programs are transferrable to the state universities. At Kirkwood, the pre-engineering program – designed for those who plan to transfer to a 4-year school – requires students to take a Manufacturing Processes class that includes a stint in the machine shop.

Like the Davenport MTC, other schools bought Haas machines because they did comparison shopping. “For the money, you can’t beat them,” says Dave Stotelmyre. Mike Turner notes, “They’re sturdy. Whatever we get has to be pretty durable, because students crash. Our Haas lathe has taken its lickings, but it hammers. That thing works all the time.” The local Haas Factory Outlets (HFOs) are another factor. “The dealer is always willing to help us out,” according to Dave. “They always go to bat for us – plus they help keep me up to speed on the newest technology.”

Like all teachers, the instructors in these programs are not motivated mainly by material rewards. Mike Turner was a journeyman tool maker before he embarked on his 18-year (so far) teaching career. Gary Forbess, after two decades of making medical and scientific instruments, has been at the Murphy Center since it opened in ’97. He had been teaching part-time for a few years before that. “I love it when the light bulb goes on,” he says. “That’s exciting! The rest of it is the challenge of how to turn on the light bulb.”

Most of the recent high-school grads who enter full-time programs are prepared for the coursework. They’d better be: “They start studying programs on day one,” says Mike Turner, “and if they don’t have the math background it can grind them up fast.” Hawkeye has a tech prep class for students who need some catch-up before tackling CNC classes; only one or two of every 10 students needs it. And at NIACC, local high-schoolers can attend the Murphy Center’s first-year program for free. Student English skills need to be up to par as well; the second year of the associate degree programs includes classes in communication skills. “Industry really says, ‘You’re going to work in teams, so you’d better be able to communicate with each other,’” says Gary Forbess. Kids who are interested in the program but lack math or English skills “now have a carrot, so they dig in and do it,” he notes.

That carrot is important. “That always frustrated me when I was a kid,” Mike remembers. “I hated algebra – what was I ever going to do with it? Now I use it every day. And,” he adds, “you end up with a product, something you can hold in your hand. It’s not just a bunch of numbers on a piece of paper.” The MTC in Davenport also does outreach with high-school juniors and seniors, averaging eight or ten facility tours a month.

A lot of high-school students are interested once they’re exposed to CNC machining programs. The problem, of course, is getting parents and high-school counselors to help with exposure. As Dave Stotelmyre notes,

“You just have to have a brain in your head. I think if women knew what this job was, more of them would do it. The ones who have made it through here have always been successful.”

“A lot has changed out there, but our image hasn’t. Parents and counselors still think of manufacturing jobs as low-paying and unskilled.” Kirkwood tailors class schedules for local high schools as well as for industry. “We want these kids to find out what machinists really do,” adds Dave. At Hawkeye, one approach to remedying the situation is EMC² (Exploring Manufacturing Careers Consortium), a school-to-work program that introduces students to the high-tech side of manufacturing. Attracting female students is a huge challenge: About 5% of students at the MTC are women, and the numbers are even smaller at the other three schools. “I tell the high-school kids [in EMC²] that you don’t have to be a big moose to do this,” reports Mike Turner. “You just have to have a brain in your head. I think if women knew what this job was, more of them would do it. The ones who have made it through here have always been successful.” Older students, who often have full-time jobs and take classes part-time, naturally tend to be more motivated. “I have a student signed up for the fall,” says Dave, “who is 70-something and has decided that he’s always wanted to do this – and now is the time.”

Every community college technical program in the state of Iowa has an industry advisory board, and the program instructors are required to meet with the board on a regular basis. This is one way instructors keep up with what’s new in CNC manufacturing. Trade shows, of course, are another – “We’ll be cruising the Haas booth [at IMTS] in September” – and occasionally instructors even go back to work in industry. Dave Stotelmyre took a 1-year leave of absence a while back and worked as head programmer for the Industrial Engineering department of an area manufacturing company. “I worked on prototypes – it was great! I almost stayed there,” he says. Advisory board members come from both the shop floor and management, and CNC instructors find that invariably there’s one or two of their former students on the local advisory board.

Even in a slow economy, graduates of machining programs don’t have much trouble finding work – most students land jobs before they graduate. “It was 100% for years,” says Mike Turner. “In two weeks I’m graduating sixteen students, and twelve of them already have jobs. The rest are going to get jobs; they just might not be quite as lucrative as they could have been before September 11. That was disastrous for manufacturing. It’s really been beating us up.” Geography also plays a role. Cedar Rapids is one of the bigger towns in Iowa, and Dave Stotelmyre says most of his graduates are hired within about a 50-mile radius. “We have a population of about 120,000,” he notes, “and lots of industry for a city that size. Much of it, of course, is farm industry.” (The John Deere company alone employs more than 10,000 people in the state, and is one of the businesses that fills up part-time classes with its employees.) Gary Forbess says his graduates “are not having trouble with employment at this point. They only have problems if they really want to stay right where they are.” Mason City has less than a quarter the population of Cedar Rapids, and there aren’t any big towns within about 75 miles. For many 20-somethings, of course, moving elsewhere is no problem – Gary’s students may stay in Iowa, or they may go to New York or the West Coast or anywhere in between.

Wherever a CNC machinist or tool & die apprentice with a newly-minted diploma or degree ends up, staying busy is rarely a problem. Getting the manufacturing sector revved up is key to a healthy economy, and the graduates of these programs hold that key.

> CONTINUED FROM . . .

Technical Education Council Addresses Industry Needs

To better serve the needs of the manufacturing industry and address the ongoing shortage of skilled labor, Haas Automation recently established the Haas Technical Education Council (HTEC) to oversee its growing network of Haas Technical Centers (HTCs). Comprising instructors and administrators from the various learning institutions around the country that house the HTCs, the Council’s mission is to promote and advance manufacturing productivity through excellence in manufacturing education. The Council met for the first time in March.


HTEC Chairman Chris Brown

Scott Weersing

“The Council brings together a fantastically diverse group of world-class educators, all with a common goal – to serve our students and the CNC machining community,” said Chris Brown, chairman of the HTEC and the Saint-Gobain professor of mechanical engineering at Worcester Polytechnic Institute (WPI) in Massachusetts. “We want to work together to meet a wide variety of industry needs relating to CNC machining. There has never been a group like this before, and the potential is incredible.”

Through this unique alliance, Haas Automation and the national network of Haas Factory Outlets are able to partner with industry, learning institutions and professional societies to provide students with the tools they need to succeed. “Together we can speed the evolution of CNC machining education to promote healthy, sustainable industrial growth,” said Brown, who directs the Manufacturing Engineering program at WPI.

The Haas Technical Centers and the Council are dedicated to the future of the manufacturing industry, and they continue Haas Automation’s long-standing pledge to deliver quality education to the machinists and engineers of tomorrow.

DEMO continued from page 3

rapids, HSM software with full look-ahead and 16 MB expanded memory.

• A graphite EDM electrode for a small automotive part – cut using a Haas VF-2 with 30,000-rpm spindle, vacuum dust-extraction system, 1200-ipm rapids, HSM software with full look-ahead and System 3R workholding.

• An aerospace spar out of 6061 aluminum – cut using a Haas VF-2 with 15,000-rpm spindle, 1200-ipm rapids and HSM software with full look-ahead.

• A comparison of two identical complex geometric parts in 7075-T6 aluminum – cut using a Haas Super Mini Mill with 15,000-rpm spindle, 1200-ipm rapids, HSM software with full look-ahead and 16 MB expanded memory. One part was machined using optimized HSM techniques, tooling and CAD/CAM settings; the other was machined using standard machining techniques, tooling and default CAD/CAM settings.

• A five-axis impeller out of 1018 steel – cut on a Haas VF-4 VMC with a high-torque 10,000-rpm spindle and HSM software with full look-ahead, and using a Haas TR 210 trunnion rotary table or TRT 210 tilting rotary table for fully interpolated 4th- and 5th-axis motion.

Each HFO also presented educational seminars detailing the benefits of high-speed machining, as well as illustrating the importance of proper tooling, balanced tools, proper speeds and feeds and optimized part programs. Haas applications engineers, as well as representatives from major tooling and CAD/CAM manufacturers, were on hand to share their insights and answer questions.

Looking for what's new at IMTS 2002?

EXPECTING to see the same old machines shadow-cutting the same old imaginary parts? Or are you looking for something new and innovative? Prepare to have your expectations blown away!

Since IMTS 2000, Haas Automation has introduced 20 totally new machines, 18 new standard features and 16 productivity-enhancing options. And you can see them all in action at this year's show. Haas will have 28 machines in its 10,000-square-foot booth, and more than 25 other Haas machines will be on display in vendor booths throughout the show.

And the chips will be flying. Throughout the show, Haas machines will power through more than 65,000 pounds of raw material. Aluminum, 1018 steel, brass, pre-hardened 4140, NAK 55 hardened-tool steel, graphite and stainless – you'll see it all.

As if that isn't enough, visitors to the Haas booth can pick up a pack of limited-edition CNC trading cards, which could contain a chance to win a Haas Toolroom Mill (see sidebar at right). Chicago's State Street may be the place to be for after-hours entertainment, but the Haas booth at IMTS is the place to be for the latest genuine American ingenuity.

Pictured here are just a few of the innovative new machines that will be in the Haas booth at IMTS. Clockwise from upper left are the GR-510 Gantry Router with 120" x 60" x 10" travels and a 5' x 10' fixed table; the Z4-500 Laser Cutting System with 50" x 20" x 25" travels and a 500-watt CO_2 laser cutting head; the high-speed Mill Drill Center with 12" x 10" x 12" work cube, dual fixture stations and 2000-ipm rapids; and the VF-3APCQ Mini FMS with 40" x 20" x 25" travels, dual automatic pallet changers, 4 pallets and a 40-tool side-mount tool changer. Each of these machines will be hard at work cutting parts and making chips – all day, every day, for the duration of the show.

Register to Win a Haas Toolroom Mill at IMTS – and Receive a Pack of Collectible CNC Trading Cards

Visitors to Haas Automation's booth at IMTS 2002 can register to win a fully loaded Haas Toolroom Mill valued at more than (US) $35,000. Show attendees are automatically entered in the giveaway when they have their magnetic IMTS registration cards scanned at the Haas booth.

The winner will be selected at random after the close of the show.

Attendees who have their cards scanned at the Haas booth will also receive a pack of 12 limited-edition CNC trading cards, which could contain an "Instant Win" card redeemable for select merchandise promoting the all-new Haas CNC Racing Winston Cup team. Hats, T-shirts and scale models of the No. 60 Haas CNC Racing Chevy are among the items that will be given away.

The popular Toolroom Mill combines the simplicity of a manual mill with the power and flexibility of the easy-to-use Haas CNC control. The lucky winner will receive a Haas Toolroom Mill that's equipped with a 7.5 hp (peak) spindle that uses standard 40-taper tooling and spins to 4,000 rpm. The machine will also include a 10-pocket automatic tool changer, a floppy disk drive, Haas' Visual Quick Code programming system, 4th-axis drive capabilities, rigid tapping, a table guard and a coolant pump package.

For your chance to win a Haas Toolroom Mill at IMTS – and to pick up a set of limited-edition CNC trading cards – come to the Haas booth (#8232) in the South Hall of McCormick Place, September 4 through 11.

To learn more about all the machines that will be featured in the Haas booth at IMTS, visit the Haas website at www.HaasCNC.com.

Dear Applications:

Can I use the Mini Mill to machine $^1/_8$" to $^3/_{16}$" stainless? Would it require more than one pass?

Thanks,
Robert

Dear Robert,

The Mini Mill is more than capable of cutting stainless, as long as you stay within the torque and horsepower range of the machine. The Mini Mill's spindle provides 33 ft-lb of torque up to 1200 rpm, and is rated at 7.5 peak horsepower. For best results, select tooling that allows you to run speeds and feeds that fall within the peak torque band of the machine.

As with any machine, the number of passes required depends on the type of tooling being used, the material being cut and the amount of material being removed.

Regards,
Haas Applications

• • •

Dear Applications:

We're currently making small numbers of a fairly simple part on a three-axis vertical mill. We'd like to increase production to at least 2,000 parts a month, but we're not sure what kind of equipment and process planning we need. Ditto for a more intricate part: a multi-faced piece that we need to turn out in batches of 20.

Lynne Little

Dear Lynne:

To increase the production level of your current machine, first look at how many operations each part requires, and then try to consolidate the operations into a single setup. Depending on the size and configuration of the part – and the size of the machine – you may be able to use multiple vises/fixtures, or a rotary table with a multi-sided tooling block, to increase the number of parts machined per load cycle. This will also reduce the number of tool changes considerably (more parts are machined per tool change), and thus shorten your cycle times.

For the multi-faced part, again, you should try to consolidate the operations into the least number of setups. A 4th-axis rotary table will allow you to position the parts for machining on up to four sides in a single setup, which will reduce part handling, cut the number of tool changes and eliminate the tolerance stack-up associated with refixturing.

You should also think about potential bottlenecks in the production flow. Can the part be completed in one setup, or will it require additional work? Establish batch-size and part-transit flow charts that list all of the processes needed to complete the part. Consider part weight and size, the number of parts that can be processed at the same time (including processes such as heat treatment or black oxide) and how many parts can be loaded at a time.

If these jobs will be ongoing, consider investing in a machine designed for higher production, such as a Haas VF-3APCQ Mini FMS with dual automatic pallet changers, or a Haas HS-1RP horizontal machining center with built-in 4th axis and pallet changer. A machine with a 10,000-rpm spindle and programmable coolant nozzle will also speed things up.

Sincerely,
Haas Applications

• • •

Dear Applications:

Why do CNC machines need to be calibrated?

Dan MacMedam

Dear Dan:

All Haas machines are fully inspected for linear accuracy and three-dimensional squareness prior to shipping.

CNC machines, like all types of equipment, are subject to change over time. The thing most likely to change with a machine tool, and most likely to affect accuracy, is the machine's level. The quality of a machine's level is crucial to the quality of the parts produced.

For this reason, checking a machine's level should be part of a regularly scheduled preventive maintenance program that is appropriate to the machine and its operating environment.

Sincerely,
Haas Applications

• • •

Dear Applications:

We build plastic injection molds, using a new VF-2 mill with 8 megabytes of memory and the Ethernet option for communication. We use MasterCam as our CAM system.

We are having problems downloading files due to their size. Small programs are transferred almost instantaneously, but recently it took 10 minutes to download a 2 MB program at the VF-2 control. The machine would not even accept a 5 MB file.

We need the ability to download large files. What's the best way to implement a drip-feed system? Do we scrap the Ethernet card and revert to an RS-232 system, or go to a third-party drip-feed system?

Joe Colburn

Dear Joe:

We were able to download a 7.5 MB file in 9 minutes via Ethernet, so you should be able to get similar results.

There are several things that may be causing or contributing to your long download times. If your company's computer network is busy or overloaded, it can increase your download time considerably. Also, there must be sufficient memory available in the Haas control to accept the program, and provide buffer space for the download. It's possible that the 5 MB file was larger than the amount of memory you had available.

The Ethernet option is about 10 times faster than a serial port, so you don't want to go back to RS-232. Please keep in mind that DNC from a PC to a CNC machine via Ethernet is not the same as transferring a file from one PC to another.

To free up additional memory, you can delete old programs, or save them off the machine. And remember, it's not how many programs, but how large they are that matters (ten 200K files take up the same amount of memory as one 2 MB file).

Sincerely,
Haas Applications

• • •

Dear Applications:

A couple of years ago we bought a Haas VF-1 vertical machining center. We have been using the disk drive to load programs, but would like to connect the machine directly to a PC instead. Is it possible to hook up the Haas directly to a standalone PC (Pentium) through the RS-232 port in order to send and receive programs? If so, do we need special software or hardware (i.e., modem or network)? Is there a specific computer program/application that must be used, or can we save the G-code programs in something like Microsoft Word?

Thank you,
Pam Treige

Dear Pam:

Yes, you can connect your Haas machine to a standalone PC.

You will need an RS-232 cable with a 9-pin connector on one end and a 25-pin connector on the other. The cable will be configured as a null modem cable. These cables can be purchased at almost any electronics store, such as Radio Shack. They are also available off the shelf from Black Box Corp. (724-746-5500); the part number is BC00803.

No special hardware is needed, but you will need some form of communication software. An easy-to-use and affordable communications program, as well as general information about machine tool communication, is available online at www.dncsoftware.com. A quick search of the Internet will yield several others as well, such as eXtreme DNC and Predator. If you have a CAM system (Mastercam, Surfcam, GibbsCAM, etc.), you probably already have the program you need to communicate.

The only other thing you have to be aware of is that the communications settings in the Haas control and the PC must correspond. Settings 11, 12, 13, 14 and 37 in the Haas are important; they must match the PC software.

Sincerely,
Haas Applications

• • •

Do you have a question or comment concerning the operation of your Haas machine? Do you need help with a tough programming task, or want to know a better way of producing your parts? Maybe you have a better way of doing something and want to share it? Why not e-mail our applications personnel and let them do a little research for you? Be certain to fill in the contact information so we can get back to you.

http://www.haascnc.com/solutions/question.html

A Template for Making Money

By now, most people are familiar with Haas Automation's Visual Quick Code (VQC), a conversational programming system that uses a graphical interface – a series of templates – to help users create part programs. What might *not* be familiar is the fact that users can customize VQC to suit their individual needs and programming styles.

Since Visual Quick Code is stored in the Haas control's program memory, it can be modified: users can edit existing templates, or create their own templates for common operations or families of parts. As a result, Haas users around the world are continually upgrading their VQC templates.

This last part is where Haas needs your help. As they say, two heads are better than one, and with more than 7,500 copies of Visual Quick Code in the field, that's a lot of heads. Haas is looking for new, innovative and unique templates to add to its VQC database. And that's where the money comes in: Submit your best VQC templates (mill and lathe) to the Haas Applications Department for review, and if your template is chosen for inclusion in future VQC releases, Haas will pay you $100!

This is a limited time offer, so act now. Templates should be sent as e-mail attachments to Frank Ramirez at framirez@haascnc.com. Be sure to include your name, phone number, e-mail address and the name of the company you work for with your submission. Good luck!

Who says collecting trading cards is just for kids?

Stop by our booth at IMTS and get your card scanned and you're automatically entered to win a fully loaded Haas Toolroom Mill.

You'll also receive a pack of limited-edition Haas CNC trading cards.

Collect the right one of these cards and you'll be an instant winner of select Haas CNC Racing Winston Cup team merchandise.

For your free pack of limited-edition CNC trading cards — and a chance to win a Toolroom Mill — come by and register at the Haas booth, #8232 in the South Hall, September 4 – 11.

IMTS 2002 The New Manufacturing Age

VF-4

VR-Series

VTC-4R Mini Mill

Z3-500 Laser

HAAS

BOOTH #8232