CNC MACHINING

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If you want something done right, you have to do it yourself.

How often have you heard that phrase?
How often have you used that phrase?
How often has that phrase been right on the money?

We've all been there. You ask someone to do something for you – or worse, pay them to do something for you – and the end result just doesn't live up to your standards or expectations: It's not done right. The quality is below par. It's not done on time. The final cost is more than you were quoted . . . . You now have to redo the job, live with poor quality, wait longer than expected or pay more than you wanted.

If you had just done the job yourself, you wouldn't have these problems. It seems you can't rely on anyone these days.

But sometimes you can . . .
. . . and sometimes you have to.

Take Formula One drivers, for example. Every time they climb into that racecar and head onto the track, they're putting their faith in the belief that everyone who worked on that car did their job right. In fact, they're trusting their lives on it! At 200 mph, even the slightest hint of complacency or "that's good enough" could spell disaster.

"Sure," you say, "but they've got the very best – people, materials, software, machines, equipment – that money can buy."

You're right. But it's not about the money. Or at least it shouldn't be. It's about doing the job right because it's the right thing to do. It's about taking pride in your work and honoring your commitments to others. It's about doing things the best you can rather than just good enough.

In this issue of *CNC Machining* we'll introduce you to some people and companies who are going well beyond just getting the job done: They're doing the right things, and doing them right. By providing quality, service and value that are above and beyond what their customers expect, they are creating relationships that are mutually beneficial to all parties.

For our cover story this issue, we visited the operations center of B·A·R, a Formula One race team based in the UK. B·A·R is currently one of the top three teams on the F1 circuit, and they got there by doing things right. By investing heavily in high-quality people and equipment, and forming synergistic relationships with suppliers and partners, the team has brought itself from start-up to serious contender in just a few years. We take a look at the inner workings of their state-of-the-art facility.

Racing is all about speed, consistency and, above all, reliability: You can't win if you don't finish the race. Race teams need parts they can rely on, so they go to suppliers they can trust. When it comes to custom pistons, wrist pins and connecting rods for NASCAR and NHRA racing, many of the top teams rely on components from Bill Miller Engineering. The company's owner, Bill Miller, is passionate about what he does – "I love making parts for racecars," he says – and that passion shows through in the quality of his products. The company has become successful by focusing on building the best products rather than on becoming the biggest.

On the international side of things, our jet-lagged roving reporter Matt Bailey found time – between trips to China, New Zealand, Brussels and Sweden – to visit some of South Africa's leading engineering workshops. In this issue, you'll find his report about NorGrip, a company that manufactures components for heavy-vehicle pneumatic systems. It seems they were having difficulty getting their machining work done "right" by outside suppliers, so they brought the process in-house. Now they're able to provide their own customers with better products in less time, while simplifying and improving their designs.

For our education piece this issue, we visited a technical college in Kansas that is doing things right by providing local industries with the type of employees they actually want to hire. Wichita Area Technical College has created a new program that combines training in product design and engineering with manufacturing systems and manufacturing applications. Since students graduate with both engineering and machining skills, their options for employment or further education are greater.

As usual, you'll also find the Race Report and the Answer Man, as well as an IMTS preview and news about Haas Automation's latest international facilities. So sit back, relax and enjoy!

Oh, one last thing. Remember that phrase at the top of the page? The one that said: If you want something done right, you have to do it yourself? Here's something to think about: Are others speaking that phrase about you, or the company you work for?

Just a thought.

IN THIS ISSUE

ONTHECOVER

Jenson Button of Great Britian and B·A·R in action during the 2004 Malaysian F1 Grand Prix on March 21, 2004, at the Sepang Circuit in Kuala Lumpur, Malaysia.

Photo by Clive Rose/Getty Images

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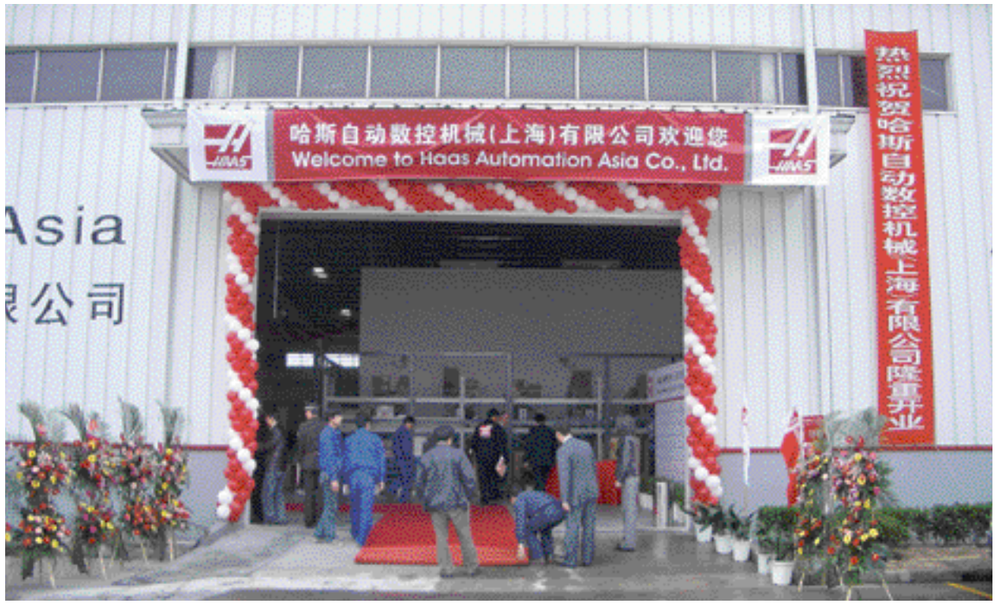
Haas Asia Opens for Business



Haas Automation, Inc., the largest CNC machine tool builder in the U.S., has again expanded its international presence, opening headquarters in the free trade zone of China. Located in Shanghai, the Haas Asia facility covers 2787 square meters (30,000 sq ft) and houses administrative offices, an extensive inventory area, Service and Applications departments, a showroom and a Training department. Managing Director Fischer Mou, a native of Taiwan, has been with Haas Automation for more than 12 years, moving to his current post from a position as machine shop manager at the Haas factory.

"Haas Automation Asia was established to better support customers in the region," stated Bob Murray, Haas Operations Manager. "We want to provide our customers in Asia with the same level of service that our domestic customers are used to." Currently there are 17 Haas distributor offices throughout Asia, including six in China, with plans to steadily increase these numbers. Mr. Murray noted further that "Fischer Mou has experience as a CNC programmer and machinist, he has in-depth knowledge of the company, and he speaks the language and is familiar with the culture. We feel that our business in Asia will expand very quickly."

With a substantial spare parts inventory and factory-certified support personnel, Haas Asia will provide fast, efficient sales and service assistance. Base-model machines shipped from the U.S. factory can be reconfigured to customer specifications on-site, and customers who need spare parts will have them overnight instead of waiting days for shipment from the U.S. Customers unsure of which machine best suits their needs will be able to visit the showroom, see the complete line of Haas CNC machine tools in action and seek advice from Haas-certified applications engineers.

The Training department will serve new Haas personnel as well as customers. Instruction on Haas control simulators in the classroom will be backed up by hands-on experience with the six Haas CNC machines in the training lab. Haas-certified instructors will offer programming classes for customers, as well as training new Service and Applications staff for certification.

Veteran Machine Tool Salesman

Comyn "Tubby" Berkley is the Haas CNC machine tool representative in Cape Town, South Africa. At 78 years old, he's the oldest working Haas sales engineer in the world – probably.

Tubby has been selling machine tools since 1957, and in the year and a half he's been selling Haas machine tools, he's sold an average of one a month. That may not sound like much to those working in Northern Europe or some parts of the USA, but in the rolling hills of the wine country surrounding Cape Town, 18 is a lot of machines. It also happens to be – according to a justifiably proud Tubby – at least three times more than his predecessor managed in 7 years!

So, why is Tubby still selling machines when, by rights, he should be relaxing on one of the Western Cape's beautiful, wide beaches?

"Because I enjoy it," is his characteristically to-the-point answer. "Even after all these years, I still find it fascinating and I still enjoy getting involved in finding solutions to customers' manufacturing problems."

Arguably, a man of Tubby's years and experience doesn't trade in physical goods; his commodity is knowledge, which he collects and administers to those who ask for his help. He has an insatiable appetite for new applications.

"I don't try to sell a customer a machine," he says. "I help them find a better way to manufacture their product."

US-built Haas CNC machine tools are distributed and supported in South Africa by Johannesburg-based Johan Pieterse and his team at Haas CNC Services. Before he "retired," Tubby was managing director of Forest Engineering, where Pieterse worked as an electrical specialist in the service department.

"Johan is the best CNC machine engineer in the whole of South Africa," claims Tubby. "He's worked all over the world on all sorts of machines and all kinds of applications."

Pieterse left Forest in 1988, to set up his own company. The rest, as they say, is history.

For a complete 2004 Trade Show Calendar, head over to http://www.haascnc.com/news/trade_show.asp

New Facility
for Haas Automation Europe

During the first two weeks of May, Haas Automation Europe relocated to its new, 3,500-square-meter (37,660 sq ft) headquarters and showroom in Zavantem, Belgium, just 10 minutes from Brussels airport.

The move comes just three years after the company first opened its European operations at the city's Paespsem Business Park. In that time, Haas' business in Europe has increased dramatically and the company has outgrown its original location.

As well as providing vital additional office space, the new building incorporates a 750-square-meter (8,070 sq ft) showroom. This allows some 25 Haas machines from the company's extensive and growing range of affordable CNC machine tools to be exhibited and demonstrated simultaneously.

According to Haas Europe Managing Director Peter Hall, the relocation marks an important milestone for the company. "Since establishing Haas Europe we've exceeded our annual sales targets in all of the key European markets. In the past year alone, we've experienced a sales increase of more than 80%. This is in line with the growth Haas has enjoyed in other markets around the world, and reflects the universal appeal of low-cost, high-quality CNC machines."

The new headquarters also includes a massive and comprehensive spare parts warehouse. Run by factory-certified support personnel, it will provide same-day dispatch for more than 90% of requisitions, and dispatch 100% of requisitions within 24 hours.

In addition, the new facility includes a modern, fully equipped training area and classroom where Haas personnel will instruct Haas service engineers and customers from all over the Continent.

"As both our European customer base and our distributor network increase, we intend to offer the best service and support in the industry," adds Mr. Hall. "Our investment in the new office and showroom will help ensure we do just that."

Haas Leads Unit Sales in Canada

Haas Automation led the way – again – in 2003 machine tool sales across Canada, according to a recent market analysis by *Canadian Machinery and Metalworking*. For the third consecutive year, Haas held the top position in the magazine's annual "CNC Census," which is based on unit sales. According to the Census, Haas made 29% of all metalcutting machine tools reported sold in Canada last year.

For CNC machining centers, Haas achieved a 43% market share – nearly double that of the closest competitor. The report noted that "Haas again . . . owns the number one spot, having installed almost half of all the machining centers reported" in the survey. The company has dominated this market sector in Canada for 5 years now.

Haas also topped the ranks in the CNC lathe/turning machine category with a market share of 25%, the report says. The company's lathe installations in Canada have increased steadily over the past few years. In 2001, Haas weighed in with 12% of the Canadian market share, and that number rose to 15.3% in 2002. In 2003, one in every four new lathe installations in Canada was a Haas, the Census shows.

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The Highs and Lows of Racing

By Scott Weersing

The Haas CNC Racing team has seen its share of highs and lows during their second season in the NASCAR Nextel Cup Series. But despite some bad luck, misfortunes and simple mistakes, the team is happy to see their hard work pay off with top-10 finishes.

Ward Burton and the No. 0 NetZero Chevy began the year with four top-20 finishes, but recent results seem to prove that once you start admiring how well things are going, luck has a way of turning against you. After an 18th-place finish at Darlington, Burton finished 28th at Bristol, and then followed that with a disappointing 32nd-place finish at Texas. Things got even worse when an engine failed at Talladega, leaving the team in 40th place – by far the worst finish of the year.

In May, however, the hard work on and off the track began to pay off once again. The team traveled west to California Speedway, where they were greeted by 100-degree heat for the Auto Club 500. Burton began the race in 15th position, but fell back to 35th after spinning out on the infield grass on lap 61. At first, it looked like it would be another poor finish for the team, but Burton slowly fought back. With 52 laps to go the team was in 14th position, when crew chief Tony Furr called Burton in for a final pit stop. It turned out to be the right call, as Burton was able to finish the race without refueling. Others were not so fortunate, as four cars ran out of gas before the finish. Burton zoomed past the slowed cars and into a 10th-place finish – the team's second top-10 finish of the year.

"That was a good run for us," said Burton following the event. "We needed that. We overcame a lot of adversity there after we spun on the front stretch. Tony made great adjustments to the NetZero Chevrolet all day, and we're pretty happy with that finish. Our Hendrick motor ran great all day and I'm proud of this team for not giving up."

In the Busch Series, Jason Leffler and the No. 00 Haas Automation Chevy won their first pole ever, and continue to build consistency with high finishes. Leffler won the Busch Pole Award for the Stater Brothers 300 at California Speedway in May. The No. 00 Chevrolet Monte Carlo was the fastest car during qualifying, at 182.223 mph, and had a top lap time of 39.512 seconds on the 2-mile oval. "It's great to come home and win the pole," said Leffler, who is from nearby Long Beach. "I like this track here, because it's a lot like

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"We're very pleased with the results of this survey," says Haas Managing Director Denis Dupuis. "Canada is an important market for us, and our increasing market share shows that we're providing customers with the right machines – at the right prices – to meet their needs."

Indeed, 2003 was a banner year for Haas Automation in all regions of the globe. Sales increases over the previous year ranged from 4.25% in the USA to nearly 400% in Latin America; worldwide, total sales were up by more than 10%. "Haas is a forward-looking company," says Dupuis. "Our ability to increase our sales volume is a reflection of the tremendous value our products provide for machines shops and manufacturers of all sizes." Haas also provides immediate, efficient customer service through a worldwide network of Haas Factory Outlets and Haas Technical Centers – a rare commodity that customers really appreciate.

Known for innovation as well as reliability and value, Haas Automation offers a complete range of CNC vertical and horizontal machining centers, turning centers and rotary products. The company introduced a line of toolroom machines in 2002 and 2003 that have proved to be immensely popular. With a functional range from manual machining to full CNC, Haas toolroom lathes and mills are powered by a proprietary software system that allows operators to perform complex operations without knowing G code. The Haas Intuitive Turning System and Intuitive Milling System use an interactive, conversational approach to guide the operator through the steps necessary to machine a part. A touch of the Cycle Start button then generates the G-code program and executes the operation.

A new series of horizontal machining centers and an expanding line of gantry machines have also generated a great deal of interest. Other recent innovations include the Office Lathe and Office Mill, machines with full CNC capability and a footprint that fits into an office, laboratory or jewelry shop.

For more information on Haas Automation and Haas products, call 800-331-6746 or visit www. HaasCNC.com on the Internet.

HFO From the Ground Up

Not long ago, an area of high desert scrub in northern Mexico sat undeveloped. Quietly, the area began to sprout manufacturing facilities for some of the world's best-known corporations. This area of Mexico, due south of Texas, is now home to many multi-national enterprises. And what once was an empty lot is now a showcase for Haas machine tools.

The newest Haas Factory Outlet (HFO) in Latin America recently opened its doors in Monterrey, Mexico. It is the first HFO to be built from the ground up.

"Monterrey is the second largest industrial area in Mexico," explained Bill Conde, general manager of HFO Monterrey, "so it was an obvious place to have an HFO. We are especially proud of how this facility was built from the ground up in just under seven months."

The 10,300-square-foot facility is located across the street from the Monterey International Airport, and has a 4,000-square-foot showroom with 12 Haas machines, including several newly released models.

In April, Haas Automation, Inc., and Hi-Tec de Mexico celebrated the grand opening of the new HFO. More than 200 people representing nearly 100 companies were on hand to tour the facility and look over the Haas product line. Attendees included such dignitaries as Mr. Pedro Pablo Treviño, Undersecretary of the Governor of the State of Nuevo Leon, and Mr. John Ritchie, United States Consul in Monterrey.

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Also at the event was Haas Managing Director Denis Dupuis, who 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 facility will help Haas continue to expand in Mexico, and will show people the diversity of machine tools that Haas offers."

"This new facility ranks among the top HFOs in North America," added Byron Jacomo, Haas regional business manager. "This new HFO will further establish Haas as a worldwide leader in machining centers and rotary products."

Hi-Tec has represented the complete line of Haas products since 1996. In addition to the new Monterrey HFO, the company operates an HFO in Mexico City, along with offices in Guadalajara and Querétaro.

IMTS '04: "The New Manufacturing Age"

With a new front-row location in South Hall, booth space totaling 17,000 square feet and 40 CNC machines making chips, Haas Automation is planning to attract even more attention than usual at IMTS this fall. As always, Haas will be showing off several brand-new machines – in addition to a complete line of production models – in South Hall's booth A8000. There will be another dozen or so Haas machines throughout the show as well, including a Haas laser system in the Coherent Inc. booth.

Among the latest products on display will be the smallest CNC machines Haas has ever offered: the Office Mill and Office Lathe. Designed to fit into spaces where ordinary CNC machines can only dream of going – they'll roll through a standard 36" door – these portable wonders boast full CNC capabilities, 8" x 8" travels and the famously easy Haas control.

The brand-new TL-3 lathe, with a functional range from manual to full CNC and a max part capacity of 20" x 60", has already generated its share of interest. The entire Toolroom Lathe series will be on display, demonstrating that the user-friendly Haas control has gotten even friendlier. With the Haas Intuitive Turning System (ITS) – standard on all Toolroom Lathes – machine operators can generate parts programs even if they don't know G code. Choose an operation, enter basic machining information as prompted, push the Cycle Start button – and the Haas ITS generates the G-code program and executes the desired operation. The Haas TM-2 Toolroom Mill features corresponding mill software.

Another completely new model is the PC-305, a gantry-style machine featuring a Hypertherm plasma cutter, 3' x 5' table, rapids to 2,000 ipm and an open-platform design for easy access to large parts.

And there's more: The Haas VM-3 Mold Maker (40" x 26" x 25"); the Mill Drill Center (20" x 14" x 20") with dual work stations; the latest addition to the Haas Gantry Router series, the GR-712 (145" x 85" x 11"); and a completely new line of horizontal machining centers – in both 40- and 50-taper configurations – will all be making chips. Come by the Haas booth to see the '04 IMTS theme, "The New Manufacturing Age," come to life.

Efficiency on the Assembly Line

Installment Two:

Story Alex Loyd **Photos** Scott Weersing

In the last issue, we introduced the first in a series of articles detailing how Haas Automation is able to deliver high-value machine tools at such reasonable prices. You may recall that we asked, "What, exactly, does 'value' mean?" In the case of a Haas, the answer is: "Performance exceeds customer expectations." Once someone owns and operates a Haas machine, and interacts with both the company and their local distributor, they realize that they're getting a lot more for their money than they expected.

But what about people who don't have experience with Haas machines? Well, that's the point of this series. We want to clear up some of the industry-wide misconceptions, and refocus attention on the things that matter – like your bottom line. Making chips pile up and parts move out the door is how you stay in business and prosper.

In the last issue, we detailed how Haas uses common components – specifically, in the Haas control. (You can read it on-line at www.cncmagazine.com.) And Haas doesn't just build its own computer numerical control – they also design and build the axis drives and spindle drives, for a complete, integrated package. Compatibility between the control and the machine is simply a non-issue, so you'll never get finger-pointing from Haas. It's one company that takes responsibility for the entire machine.

So let's take a look at another important element of the Haas formula for keeping machine quality high and prices low: efficiency on the assembly line. Henry Ford was the first industrialist to really utilize the moving assembly line, and his invention revolutionized manufacturing and changed the world. While the Haas version is not a true moving line – where product assemblies move along while workers add things to the assembly as it passes by – it's as much of an assembly line as it can be, given components made of cast iron or steel, weighing up to thousands of pounds.

In the Haas CNC version of the assembly line, the goal is the same as Henry Ford's, but the methods have been modified to suit the product. Instead of one moving line, specialized Haas teams build machine sub-assemblies that feed the main assembly line. Using very efficient processes, major components – such as the spindle and motor unit, gearbox, tool changer or turret, saddle and table, sheet metal enclosures and computer controls – are delivered to the main line completed, tested and ready to fit.

Rather than the moving line of Ford fame, the final assembly line at Haas employs teams of roving assembly specialists – people move instead of product. While a typical Haas machining center is relocated only three times between initial build-up and load-out, more than six different teams will trade places during the assembly process. While these assembly teams specialize in particular tasks, they are also eventually cross-trained in every aspect of the assembly process – many Haas assembly specialists are certified to complete any task for every product line.

It's one thing to develop assembly teams and refine their processes, but without highly organized scheduling and delivery, all you'd really have is chaos. Hence, another part of the Haas strategy is a sophisticated ERP (enterprise resource planning) system, specialized scheduling software that links purchasing and materials handling. It's something of an intricate, choreographed dance, executed with massive components and flowing gracefully over more than 820,000 square feet of factory floor space.

So, efficiency is planned and controlled through good organization and timing, and the use of sophisticated computer tools designed for lean manufacturing. This all sounds very

modern and cutting edge, but how does it translate into your ability to buy a high-quality Haas machine at a really affordable price?

Well, the best analogy might be the "some assembly required" story. Consider your own experience: the all-day-Saturday barbecue build; the Christmas bicycle; a model of your favorite muscle car; or just about any complex kid's toy. Some of us read the instructions and try to follow them, and some of us just go at it cold. Either way, we often learn a lot by the time the project is complete. The most useful lessons usually occur at the stage where we have to disassemble something because we missed a part or a step, and end up doing some task twice – or (for some of us) more than twice.

Now consider assembling ten of them – what would be the difference in time required between the first and the tenth assembly? By the tenth time around, you'd know which components to pre-assemble, which tasks could be combined to eliminate wasted movement, and you'd have all the tools required for the job right in front of you. You'd be really, really efficient at putting that banana bike together in about, say, five minutes.

All the same principles apply on the Haas assembly floor. It's all about organization, teamwork, planning, being smart about even the little things – all this keeps costs under control. But what happens when things change? What if the product design is modified, different parts come into play and the assembly changes?

Dealing with change may be the one thing that really separates Haas from the competition. Most smart people can figure out the most efficient way to assemble a complex machine. But effectively absorbing change into the process, and keeping the system

running smoothly – now that's not such an easy task. At Haas, the focus seems to be in three key areas. And like everything else at the company, these work in harmony and are intricately interconnected.

For starters, Haas Automation embraces change – you might even say the company is passionate about it. Second, a continually refined, high-resolution measurement system keeps track of every step in the assembly process. The human element is defined and measured – as people work toward a goal, data on performance and processes piles up. Finally, the data is analyzed to discover areas where improvement is needed, and what the best way to implement it is.

Being an ISO-certified company means there is a process in place to deal with change. Everything is documented, and any change happens first to the documentation. Change moves from its source – whether that's the engineering department or a suggestion from the production floor – to supervisors to assembly team members, through education and training.

All told, these things add up to a company-wide philosophy that encourages and promotes ongoing refinement. At Haas, everyone – at every level – works with and understands the process of constant re-evaluation. The goal is to continuously reinvent and improve the process and the product.

And controlling all the processes is the key to maintaining the kind of efficiency that affects the bottom line – and the savings that can be passed on to customers. Your high-quality Haas machine tool can be purchased for a very affordable price because of the systems Haas has developed that offer real control over process refinement – including their 21st-century assembly line.

Most smart people can figure out the most efficient way to assemble a complex machine. But effectively absorbing change into the process, and keeping the system running smoothly– now that's not such an easy task.

BME's *Passion* leads to SUCCESS

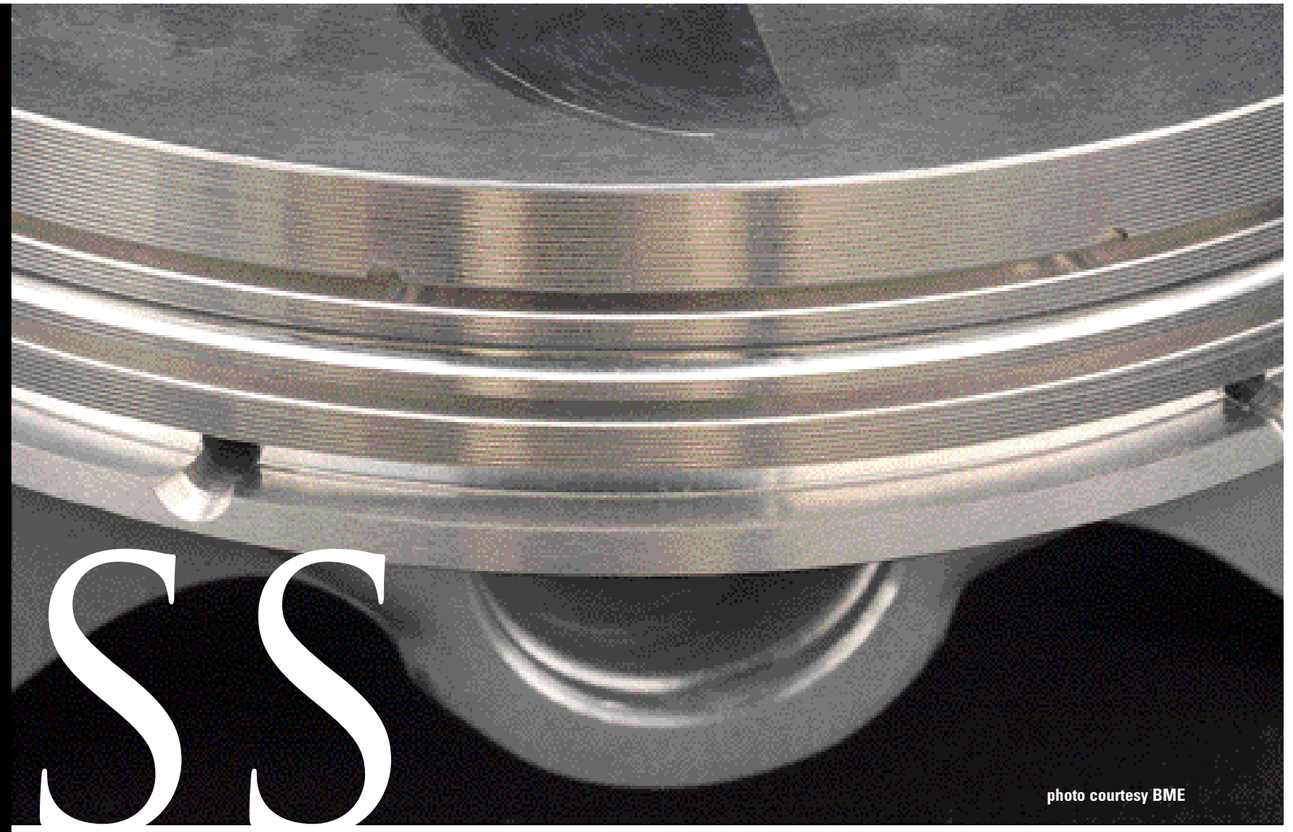


photo courtesy BME

Every weekend millions of race fans tune in to watch the speed and excitement of NASCAR. Among those fans are the employees of Bill Miller Engineering. They're not just watching for the fun of it, though, hoping to see their favorite driver win. They've got an ulterior motive. They want to see if the parts they build, and the cars that use them, end up in Victory Lane.

Story & Photos **Scott Weersing**

Founded in 1975, Bill Miller Engineering (BME) "manufactures premium-quality engine parts for the hard-core racing community." The company specializes in custom pistons, wrist pins and connecting rods for race teams. They may not be the largest piston manufacturer in the country, but they're arguably one of the best – and they've got the track results to prove it.

Today, the company builds pistons and wrist pins for some of NASCAR's top race teams, including Richard Childress Racing, Joe Gibbs Racing, Bill Davis Racing and Evernham Racing. Such NASCAR champions as Tony Stewart, Bobby Labonte, Jeff Gordon and the late Dale Earnhardt have all driven cars with BME pistons. As if to drive the point home, the walls of the BME machine shop are covered with pictures of NASCAR vehicles that have run with BME pistons.

"My passion is racecars," says Bill Miller, president and owner. "I love racecars. I love making parts for racecars. It's the passion of making a racecar part and seeing your part win on Sunday – it's really cool. I just can't express it to you."

BME's success, says Miller, comes from focusing on building the best, rather than on being the biggest. To illustrate his point, he invokes the words of Clint Eastwood in the classic Dirty Harry flick *Magnum Force:* "A man has got to know his limitations."

It's a point Miller takes to heart. "If you want to be all things to all people, and make all sorts of products, then the products are going to suffer," he says. "If you want to make a substandard part and make tons of them, then that's pretty easy to do. If you want to make real quality parts, then you can command more money. The idea here is to make a million-dollar piston, not make a million pistons.

"What we're doing here works so well that we don't have to be greedy. If you get greedy," Miller says, "then you will have problems. You can go for the money, but the passion of making racecar parts that are NASCAR championship quality is our reward of manufacturing."

Bill Miller Engineering began making connecting rods in a tiny 1,200-square-foot factory in Long Beach, California, in June 1975. It wasn't long before the company's forged aluminum connecting rods became well-known in drag racing circles, with racers like Bill


photo courtesy BME

"Grumpy" Jenkins, Bob Glidden and Warren Johnson becoming staunch supporters and devoted customers. In 1981, BME fielded its first Top Fuel dragster.

BME got into the piston business when it purchased ForgedTrue Pistons in 1982, and began concentrating mainly on the piston needs of hard-core drag racers. By 1995, the BME Forged Racing Piston was so highly regarded that Richard Childress Racing and Hendrick Motorsports, two of the top teams in NASCAR Cup racing, switched to BME pistons. It wasn't long before other NASCAR teams were ordering custom pistons from the company.

Although most of their customers are on the East Coast, BME is currently located in Carson City – Nevada's state capital. "We moved up here because Los Angeles had worn me out," says Miller. "I was born in the Los Angeles area and spent a lot of years there. But you get tired of the graffiti. You get tired of reading about the killings and the car jackings every day."

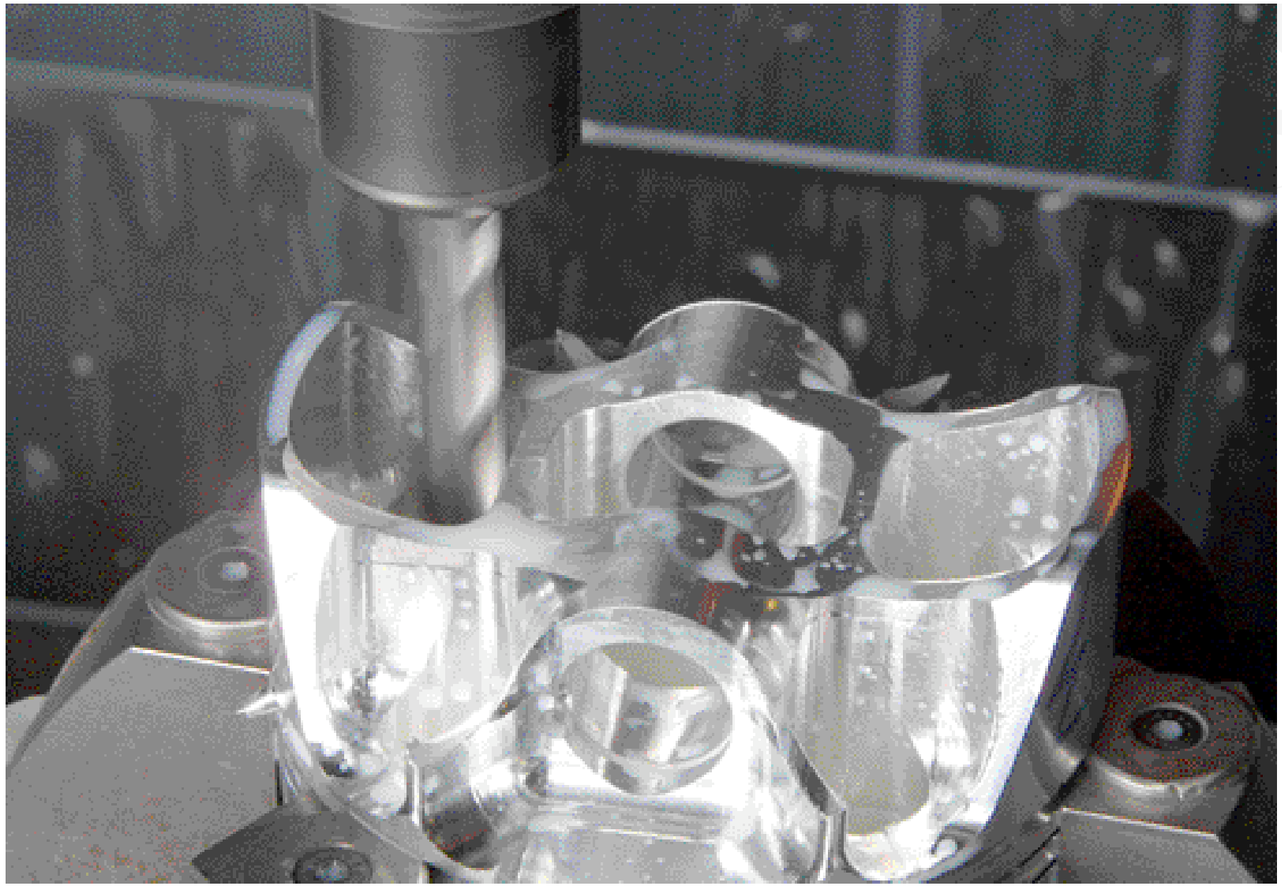
Miller chose Carson City because it is relatively crime-free, and it's affordable. As an extra benefit, the airport is just down the street, so Miller can easily fly off to race his Top Fuel dragster. "As long as you can manufacture parts and the UPS brown truck shows up every day, everyone wins," says Miller.

Another advantage of moving to Nevada, adds Miller, was the cost of doing business. "This building is 18,000 square feet, and it costs me the same per month as it would cost for a 6,000-square-foot building in California. This one I own; the other one I was leasing. It wasn't a hard call."

For efficiency, the BME facility is arranged in three production lines – one for each product. The company began manufacturing its products with manual machines, but has added more than 25 CNC machine tools to improve quality and productivity.

"I have the same six guys in the rod shop," says Miller, "and we're producing twenty thousand rods a year now, where we used to produce fifteen thousand with the same number of guys. Not only that, but the quality of the part with a CNC machine is ten times better," he says.

One particular machine that has helped BME increase production is the Mini Mill from Haas Automation – four of them, in fact. Shop foreman Craig Whitener explains: "These Mini Mills are cool. We used to have to do all these different operations on manual machines. We had three different mills with ten different fixtures. Now we have one mill, one fixture. We're doing all the operations at once, instead of having to load and unload the part."



The company has realized several other benefits with the Mini Mills, as well. “They’re cleaner than manual mills, because they’re self-contained,” says Whitener. “It’s a much neater package. When we had the manual mills, we’d have big piles of chips. Now, we just scoop out the chips. We can run full coolant, while before we could only run sprays.”

According to Whitener, the 500-ipm cutting feeds of the diminutive machines have also improved the quality of parts. “We’ve been able to increase the speeds and feeds,” he explains. “You don’t have the same rpm control on a manual machine, so we get a better finish with the Mini Mills.”

“The Mini Mill is a cool deal,” agrees Miller, “because it allows you to have a machine that has a very small footprint, does a very specific operation, and you don’t have to spend a hundred thousand dollars on it.”

In addition to the Mini Mills, BME also uses Haas turning centers to manufacture wrist pins – a product that is widely admired throughout the racing industry. The wrist pin joins a piston to the connecting rod. “We make a wrist pin now that is, hands down, the finest wrist pin manufactured,” states Miller. “It’s because we take the time and the trouble to do the best job we can. We compete with companies that manufacture wrist pins over in Europe and import them. They [wrist pins] all go to one place to get diamond-like carbon coating. That company has told us that our pins are double the quality of anyone else’s. You can compare a BME pin with everyone else’s pin and it stands out.”

BME currently boasts a total of 23 Haas CNC machines. They purchased the first – a VF-0 – 12 years ago, and it’s still running in the shop. “It’s a great little machine for doing what you want it to do,” Miller says. “It’s been plugging along for a long time. That’s why there are a whole bunch of Haas machines in here. No one here has any problems running Haas machines, because the controls are the same on all the machines.”

“The control is very user-friendly,” adds Whitener. “I’ve been able to quickly train people [on a Haas] who have never used a CNC machine in their life.”

To maintain and service the machines, BME is fortunate to have a Haas-certified service technician on staff. And getting spare parts couldn’t be easier. “When you have a problem with a Haas machine, you can call the factory and the part will be here tomorrow,” says Miller. “You don’t have to go to Japan to get the part. You don’t have to go to Korea to get the part. And that’s a big, big plus. With imports, you’re going to have problems – maybe not today, maybe not tomorrow, but sometime.”

Unlike most companies, BME doesn’t employ a sales staff to sell their products. Instead, the engineering staff and Miller himself handle everything. “When a customer calls here they get to talk to the guy who owns the place,” Miller says. “It gives the customer a lot of power to be able to talk to the boss. If there is a problem, they can talk to me and we’ll fix it very quickly.

“Rarely do you get a call thanking you for making a nice part, but boy, they can be on your tail when something breaks,” Miller continues. “And if there is a problem, then I’ll be out in the shop in five minutes asking, ‘What are you trying to do here, kill me?’ We’re all on the same team working together, and it bonds everyone together.”

A little bonding is great, but when all is said and done, it still comes down to knowing that the part you make is in a car that’s seen by millions of race fans. “It’s fun to see it on TV when we win,” says Whitener. “Often times a machine shop is making parts and you never hear anything about them. But at BME, we make parts and get see how they’re doing. It’s very satisfying.”

Bill Miller Engineering
775-887-1299

"The perfect racing car crosses the finish line first . . . and subsequently falls into its component parts."

– Ferdinand Porsche

Formula 4 Success

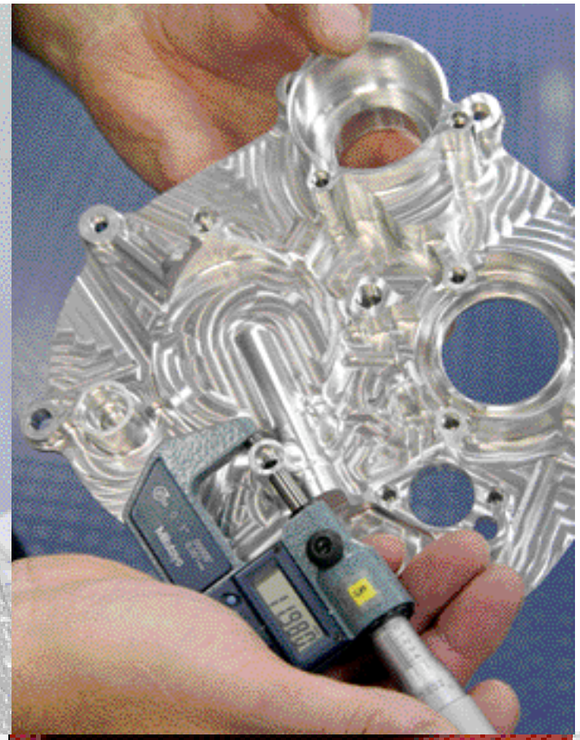
Formula One racing is the most watched motor sport in the world, with more than 150 million people seeing each race. It's also the most expensive form of motor racing on the planet: Collect a dollar from each of the 150 million fans and you'd still be $250 million shy of Ferrari's estimated budget for its two-car team this year.

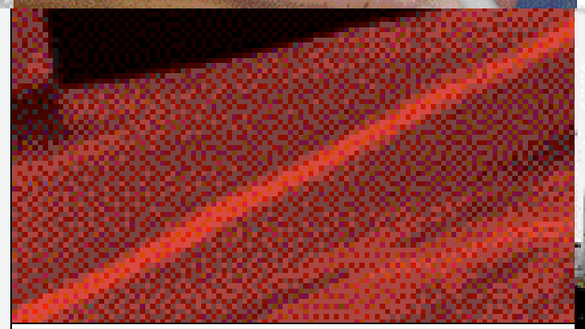
Granted, Ferrari is the exception rather than the rule, outspending all others in its (very successful) quest to dominate the sport. But the median annual budget for each of the remaining nine F1 teams still hovers at, or above, the $300 million mark. That's roughly ten times the $30 million or so required to field a competitive two-car NASCAR Nextel Cup team.

Ah, but look at the cars. They're masterpieces of mechanical design and technological wizardry: Sleek bodies formed of carbon-fiber and aluminum-honeycomb composite; intricate components sculpted from titanium and aerospace alloys; advanced computerized electronics controlling sophisticated feedback systems – in many ways, they're as advanced as any modern fighter plane. It's no wonder the sport has such a voracious appetite for funds.

Every component, system and surface of a Formula One car has been thoroughly engineered, analyzed and manufactured to conform to Herr Porsche's driving dictum. Aerodynamics, suspension, brakes, engines, gearboxes, tires – all are at or beyond the cutting edge of modern technology, be it automotive or otherwise.

But the cutting edge is always moving. F1 teams must constantly push the technological envelope to eke out every last ounce of performance from their cars, or risk being overtaken – on and off the track – by the competition. At the same time, they must adhere scrupulously to a stringent set of technical guidelines prescribed by Formula One's governing body, the FIA (Federation Internationale de l'Automobile). Those guidelines are, in essence, the "formula" for Formula One.





Back in the early years of F1, the "formula" was pretty simple: Engines were limited in size to 4.5 liters if they were normally aspirated, and 1.5 liters for supercharged. The rest was pretty much a clean slate.

On its face, today's formula may appear just as simple – engines must be naturally aspirated, the cylinder capacity must not exceed 3.0 liters, and the cars (including the driver) must weigh at least 600 kg at all times – but in reality, it's much more complex. The FIA Formula One Technical Regulations document spans 45 pages, and covers every aspect of the car – bodywork, transmission, steering, electrical systems, wheels – right down to the types of materials used and the composition of the fuel.

Because the regulations are so extensive and specific, F1 cars in the current crop are quite similar to each other in design and performance – lap times are often separated by mere tenths of a second. Gaining any advantage on the racetrack requires serious engineering efforts, as well as considerable skill on the driver's part.

Out of necessity, today's Formula One teams are some of the most advanced manufacturing concerns in existence. For a look inside this high-octane world of fast cars and high-end manufacturing, we visited the operations center of UK-based B·A·R.

Located in Brackley, a few miles from Silverstone – home of the British Grand Prix – B·A·R is a relative newcomer to Formula One. Formed in 1998, the team dedicated its first year to building its factory and developing its first car, which was powered by a Mecachrome engine (B·A·R Barrell – using a modified Tyrell chassis). In August 1998 they concentrated their efforts on designing the B·A·R 199, for entry into the Formula One World Championship for the following season. They enlisted the talents of Formula One and Indy Car world champion Jacques Villeneuve as lead driver.

Unfortunately, the team's inaugural season proved rather disappointing, with Villeneuve retiring from 11 races and failing to score a single point. Results improved considerably, however, in 2000 – thanks in part to new engines from Honda – with B·A·R scoring 20 points and finishing fifth in the Constructors' Championship. The team's first podium finishes came in 2001, with Villeneuve placing third in both Spain and Germany, but the season only yielded 17 points, leaving B·A·R in sixth place in the Constructors' Championship.

B·A·R's founder, Craig Pollock, stepped down in 2002, and was replaced by former World Rally champion and WRC guru David Richards. As new Team Principal, Richards spent the year restructuring and preparing for 2003, focusing on long-term success rather than short-term results. The team finished the season eighth in the Constructors' Championship, with only seven points.

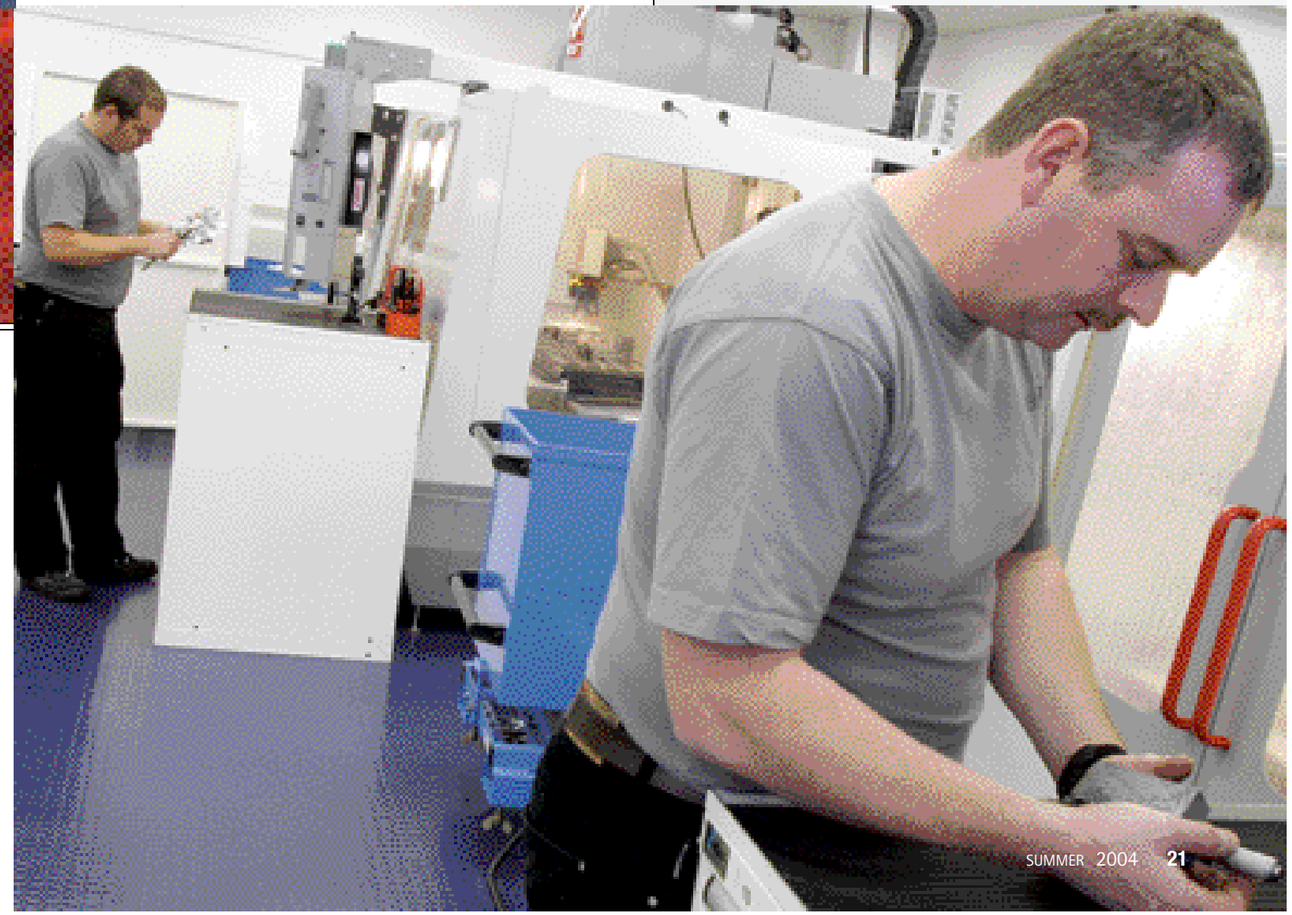
In 2003, B·A·R fielded what many thought was one of the best cars on the grid. Jenson Button, an up-and-coming young Briton who joined B·A·R in 2003, consistently outperformed his more experienced teammate.

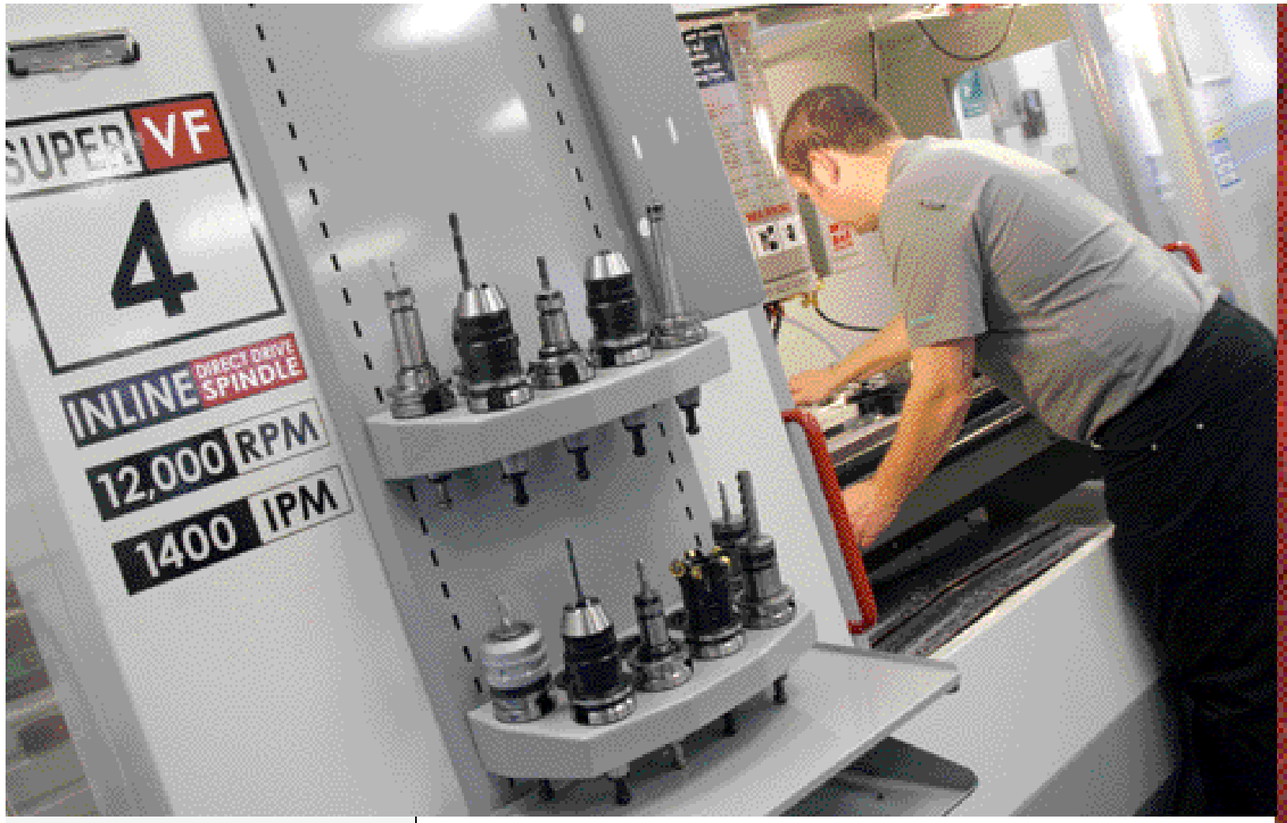
After learning he would be replaced by Takuma Sato for 2004, Villeneuve left B·A·R prior to the 2003 season finale in Japan. Button finished fourth in the Japanese Grand Prix, while Takuma Sato, hastily moved up from testing duties, finished sixth. Their combined eight points from the race boosted B·A·R to fifth place in the Constructors' Championship. By the end of 2003, things were looking up.

Of course, it wasn't just good drivers that made the difference. According to Team Principal David Richards, the success of the 2003 car [the B·A·R Honda 005] was the result of "a dramatic improvement in engineering standards."

B·A·R's Technical Director, Geoffrey Willis, agrees: "Our main objective in 2003 was to establish a credible engineering base, and 2004 provides us with the opportunity to use that credibility and be innovative in design."

B·A·R debuted their 2004 racecar in Barcelona, Spain, on February 1. At the unveiling, Richards commented that the B·A·R Honda 006 "is a significant evolution of the 005, and a further step forward in design and build quality. It is the product of a more challenging and innovative approach."





A significant part of that approach is B·A·R's close working relationship with Honda. "Our relationship with Honda has developed immeasurably, to the point where we now have a totally integrated engineering team," says Richards, "and the B·A·R Honda 006 is testament to the strength of our partnership."

"We now have the extra resource of Honda engineers recruited into the B·A·R design team," adds Willis, "and we are seeing the benefits of an integrated, stable engineering base."

B·A·R's design department consists of some 130 people working under the direction of Willis. They work closely with Honda's chassis and engine design teams to ensure seamless integration of all the components.

The 006 car was designed, refined and even tested in the virtual world of computer modeling, long before the first panel of carbon fiber was formed or piece of titanium was machined. Ideas were transformed from concept to reality using computer-aided design (CAD), computer-aided engineering (CAE), computational fluid dynamics (CFD) and computer-aided manufacturing (CAM).

The process works something like this: A three-dimensional version of every component is created and assembled in virtual space. Every detail is specified, down to the weight of each component and the material it is made of. Once the car is designed and tested in the CAD system, and the structural analysis is completed using CAE, a half-scale model is constructed and sent to B·A·R's on-site wind tunnel for aerodynamic testing. At the same time, the

"We're not just cutting any old material – the materials are expensive before we start, and the components are expensive afterward."

– Stuart Lain, CNC machinist, B·A·R

virtual model of the car is run through CFD – the fluid in this case being air – to ensure there are no unforeseen problems.

Based on the results of the wind tunnel and CFD testing, design changes are fed back into the CAD system and the process is repeated, until a perfect virtual model of the car has been created. This process has nearly eliminated the need to manufacture all but a final working prototype of each component, resulting in tremendous savings of time and money.

Of course, this state-of-the-art design process would be next to worthless without cutting-edge machining equipment to turn the designs into reality. B·A·R has invested heavily in the latest CNC equipment for their machine shop, and the team's Unigraphics NX design suite (CAD, CAM and CAE) allows the engineers to move seamlessly from CAD to CAM to generate the toolpaths for machining components. Programs are fed to the machines via RS-232.

"Formula One is at the forefront of technology," explains Dave Gibbons, team leader in charge of B·A·R's machine shop, "so we have to use all the modern technology available to make our product better."

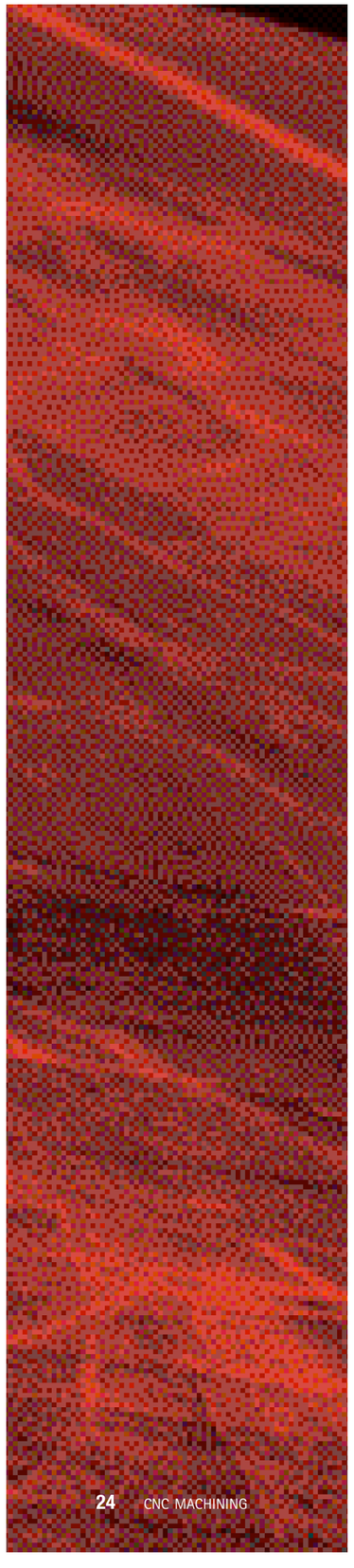
The newest additions to B·A·R's arsenal of modern technology are two Haas Super Speed VMCs – a VF-2SS and a VF-4SS – the latest high-speed machining centers from U.S. builder Haas Automation. The VF-4SS provides a 50"x20"x25" work cube and the VF-2SS has a 30"x16"x20" work cube. Both feature a 12,000-rpm spindle, high-speed side-mount tool changer and 1400-ipm rapids. B·A·R has two other Haas machines as well – a VF-3 housed in the R&D department above the on-site wind tunnel, and another VF-3 in the pattern shop.

According to Willis, the new Haas machines "increase our on-site capabilities by around 25 percent," and "reduce our downtime and increase our rate of development, which in turn will lead to performance gain."

"We now have the capability to produce a greater range of components in a quicker lead time than previously," adds Richard Smith, B·A·R's machining and fabrication manager. "This increase in capability and capacity allows us to support the team using internal resources, and therefore helps reduce the external cost burden."

The machines are a good match for B·A·R, says Andrew Stevens, Managing Director of Haas Automation UK, who brokered the deal. "The technically demanding and competitive environment of Formula One is a perfect arena for Haas Automation to demonstrate the high-performance characteristics of their CNC machine tools. Speed, accuracy and reliability are all requisite components of a high-quality machine tool, and each is used to the full in machining components for a Formula One car."

The SS machines were installed at B·A·R just as the design of the new B·A·R Honda 006 car was coming to fruition and the build cycle was about to begin.



The build cycle of a Formula One car has two distinct manufacturing phases: the initial build stage, and the testing and race stage. During the build stage, components are released by engineering to the machine shop at a steady, but not frenetic, pace. Parts are machined and sent off to their respective divisions for assembly.

Steve Martin, one of B·A·R's CNC machinists, explains: "In the early part of the build cycle, say from October on, when the drawings are released, the shop goes to a 24/7 schedule and we get a fair amount of lead time for new parts. There's plenty of time for modifications if we need to fit them in."

"We also do a lot of jigs and fixtures," adds CNC machinist Stuart Lain, "for fabrication, for the guys who make radiators, stuff like that. And we manufacture molds for the composite manufacture."

Once the car is complete and testing begins, however, the pace quickens. That's when the engineering change notices (ECNs) start rolling in.

"We do a lot of ECNs," says Lain. "We'll get something that's come back from the track that needs a change on it. You can imagine the scenario: The guy's outside in the van with the engine running, and he's waiting for me to finish that component so he can take it back to the track, put it back on the car and get the car running again. We've had instances where a guy's waiting in a helicopter for a part – we'll work through the night to get it done. That's Formula One – you learn to deal with it."

This type of work is where the two Haas SS machines really shine. The 12K spindles and fast rapids keep cycle times to a minimum, allowing the team to react quickly. B·A·R's machinists are quite pleased with the results.

"Originally we were going to be a fast-track section, which dealt with ECNs and changes to jobs and second ops," says Lain. "But the Haas machines have enabled us to bring in main components as well, so now we're more flexible. The speed is great; the machine's very sturdy, as well. We're cutting Ti [tanium] on it, which is quite important in this environment. Because we're looking for strength and lightness, things tend to be aluminum and titanium. That's really the bread and butter of our machining.

"The Ti is aircraft spec," Lain continues. "It's really quite expensive and good-quality stuff. We're not just cutting any old material – the materials are expensive before we start, and the components are expensive afterward."

Both Lain and Martin agree that the SS machines are more than up to the task, handling everything that has been thrown at them. The extensive travels of the machines have been a benefit, as well.

"The capability provided by the size of the machines is a major benefit, allowing us to support larger-size components," says Smith. "Whilst the machines are loaded with both development and stock-replacement components, the VF-4SS has been a major benefit in the machining of the lower rear wings."

He cites Monaco – a tight, slow circuit that requires a much more aggressive wing profile – as an example. "The aerodynamic development for Monaco was an ideal example of the quick reaction necessary in Formula One. Previously, this would not have been possible to support internally, and therefore would have had to be outsourced."

When asked if the Haas machines are contributing to B·A·R's current success, Smith responds: "Most definitely. The additional capacity and capability allows us to support the needs of the team internally, which has the benefits of greater control with quicker reaction, as well as reducing the external spend. This savings financially can then be focused towards the development of the car."

It's an approach that's definitely working. Jenson Button started off the year immediately in the points, with a sixth-place finish at the season opener in Australia. He followed that with back-to-back third-place finishes in Malaysia and Bahrain – his first visits to the F1 podium. Button then gave Ferrari a serious run for their money in the Italian firm's backyard in San Marino. After snagging the pole during qualifying, he went on to finish second behind the seemingly unbeatable Michael Schumacher.

After his brilliant performance in Italy, the Spanish Grand Prix was a bit disappointing, but Button still finished eighth to add another point to his total. He followed that with a stunning second-place finish in Monaco, just 0.4 seconds behind the Renault of Jarno Trulli. The European Grand Prix yielded yet another spot on the podium, with a third-place finish at the Nurburgring.

Teammate Takuma Sato, while not showing the consistency of Button, has turned in several strong performances himself, earning strong grid positions and recording blazing lap times at several venues. Fifth-place finishes in the Bahrain and Spanish Grands Prix have further contributed to B·A·R's standing in the Constructors' Championship. Unfortunately, mechanical failures have forced the young driver to retire from several races.

Also contributing to B·A·R's impressive showing this season is test driver Anthony Davidson, whose performances during free practice have been nothing short of brilliant. At nearly every track, he has kept pace with, and even bettered, the Ferraris of Michael Schumacher and Rubens Barrichello, demonstrating just how good the B·A·R Honda 006 really is.

With seven of 18 races completed, Button sits in third place in the Drivers' Championship and B·A·R is third in the Constructors' Championship. As the team heads to Montreal, a new engine from Honda and further refinements to the car's aero package are in the works. Look out for B·A·R becoming even more competitive for the remainder of the season as a result of these improvements. If all goes well, a World Championship could very well be in B·A·R's near future.

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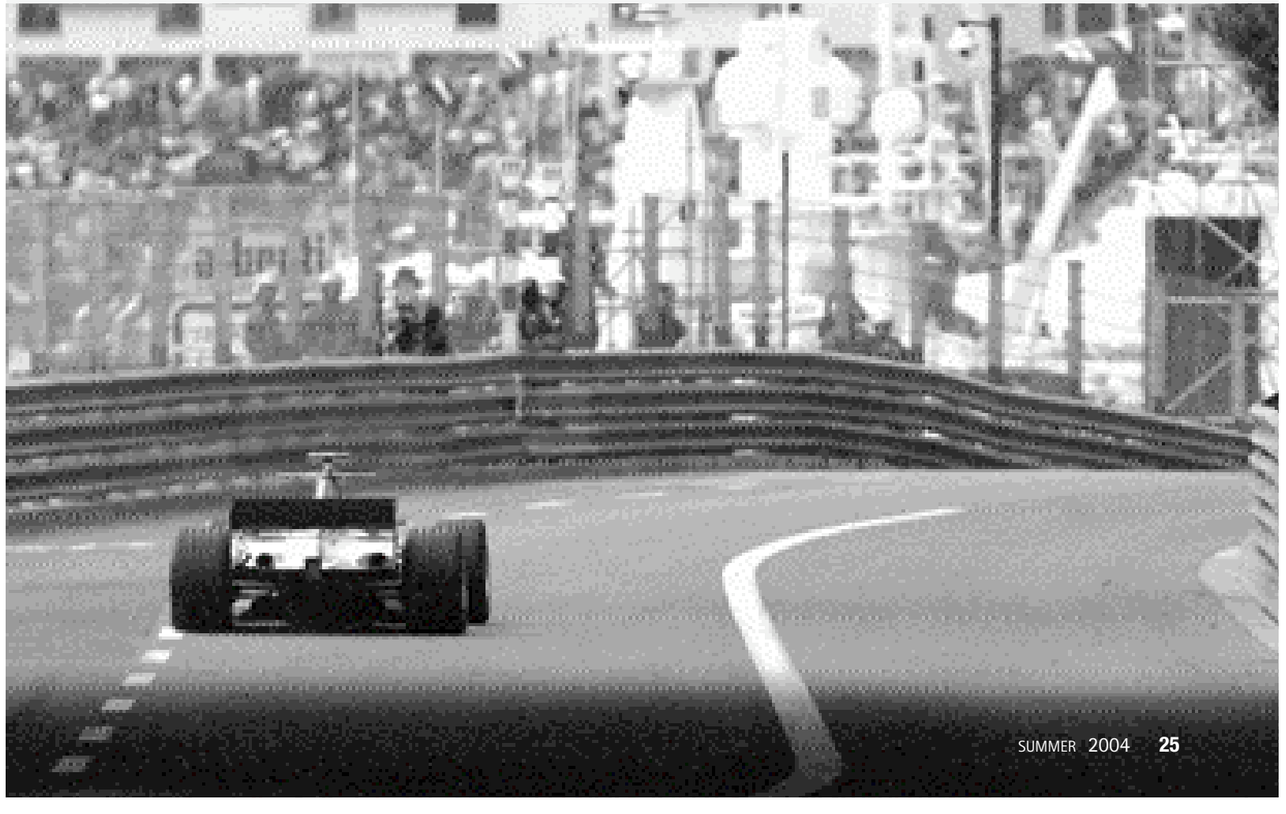


The penultimate day of my recent week-long trip to visit some of South Africa's leading engineering workshops, and I'm struck down by one of those indiscriminate, 24-hour bugs that all travellers dread – itinerant business people and holiday makers alike.

Mind you, it could have been worse. This final visit was to the premises of Centurion-based NorGrip Engineering, a pristine, almost clinical engineering environment that most Formula 1 teams would be proud of. It wasn't a cure for the pounding in my head, but it was as much as I could have hoped for.

HEAVY-DUTY PARTNERSHIP

photo courtesy Bell Equipment

Story & Photos **Matt Bailey**

NorGrip is owned and run by Managing Director Otto Seyfarth – a production engineer by profession and a tenacious and driven entrepreneur by nature.

Seyfarth's company is the exclusive South African distributor of FleetFit fittings and vehicle pneumatics for global engineering concern IMI Norgren. One of NorGrip's biggest customers is Bell Equipment, the South African-based earth-moving and construction-equipment manufacturer partly owned by U.S. company John Deere.

Towards the end of 2001, Bell launched the D-series range of articulated dump trucks (ADTs): huge, state-of-the-art, earth-moving vehicles of the type used in large-scale mining and civil engineering operations.

During the development phase of the D-series, NorGrip worked closely with Bell to configure and adapt NorGrip's patented IPM (integrated pneumatic manifold) concept to dramatically reduce the quantity of fittings and tubing required to run the Bell truck's pneumatic systems. On previous models, the brackets to mount pressure switches and solenoid valves were located in the truck's engine bay, and were controlled by the operator via pipes and cables routed through the cab walls. Being located in such a hostile environment, these critical components were especially susceptible to damage.

"For some time I'd been looking at the possibility of putting all the pneumatics on a single block," says Seyfarth. "The IPM is exactly that: a manifold acting as a transfer port between the engine and the driver's control."

The basic premise was that a simpler system would be easier to manufacture, assemble and pre-test in the factory. The modular arrangement would also be more reliable and allow more efficient maintenance. The concept involved moving vital components from the hot, dirty engine bay to the inside of the cab.

"Because the cab is normally air conditioned or heated, the solution effectively took those components from the worst environment and re-housed them in the best environment," Seyfarth says.

After $2^1/_2$ years of development, Seyfarth and Bell finally had a good, reliable system both parties were happy with.

DEVELOPMENT TO MANUFACTURE

NorGrip maintains an inventory of all the pneumatic components it needs for the seven different configurations of IPM. When Bell places an order, the company machines the block and assembles and dispatches the finished product.

"We don't keep a large stock of finished products, because once components are fitted to a block, they're committed," says Seyfarth. "Generally, the objective is to hold minimum stock but have maximum flexibility and rapid delivery. That places a lot of emphasis on the machining."

For a short time, Seyfarth had been using subcontract companies for his metal cutting. Once the product moved from the development phase to manufacturing, however, it soon became clear that external suppliers wouldn't be sufficiently flexible or reliable.

"We could never give accurate delivery dates for the finished blocks, because we couldn't predict how long it would take for a subcontractor to finish the machining," Seyfarth says. "Often, if they had a better paying or more interesting job arrive, ours would be put to the back of the queue." With Bell's world-class manufacturing standards,

the complete quality aspect also demanded that NorGrip be responsible for the critical machining phase.

To Seyfarth, the solution was obvious; he'd have to invest in the necessary equipment and take full responsibility for the machining. In 2001, he purchased a Haas VF-5 CNC vertical machining centre, supplied by Johannesburg-based Haas CNC Services.

"We're milling quite deep holes in aluminium," he says, "from 2 mm diameter holes 23 mm deep to 6 mm diameter holes 200 mm deep. Amazingly, none of our local suppliers had machines with through-spindle coolant! When we bought the Haas VF-5, it was one of the very first machines locally to have TSC."

The VF-5 came equipped with a 4th-axis drive and software as well, so fitting a Haas 4th-axis rotary table or collet indexer was quick and simple. The combination provides full, simultaneous 4th-axis machining capability.

"Using a Haas HRT 310 rotary table on the VF-5, we can machine all five sides of a block in three set-ups," adds Seyfarth.

The interfaces for valves and pressure switches are machined directly onto a single manifold block, eliminating the need for sub-bases, fittings and hoses. Each block carries several ancillary components, including throttle assemblies and shuttle valves.

Suitably impressed with the VF-5 – and always with his eye on providing a better service – Seyfarth decided to take his modular manufacturing approach one step further.

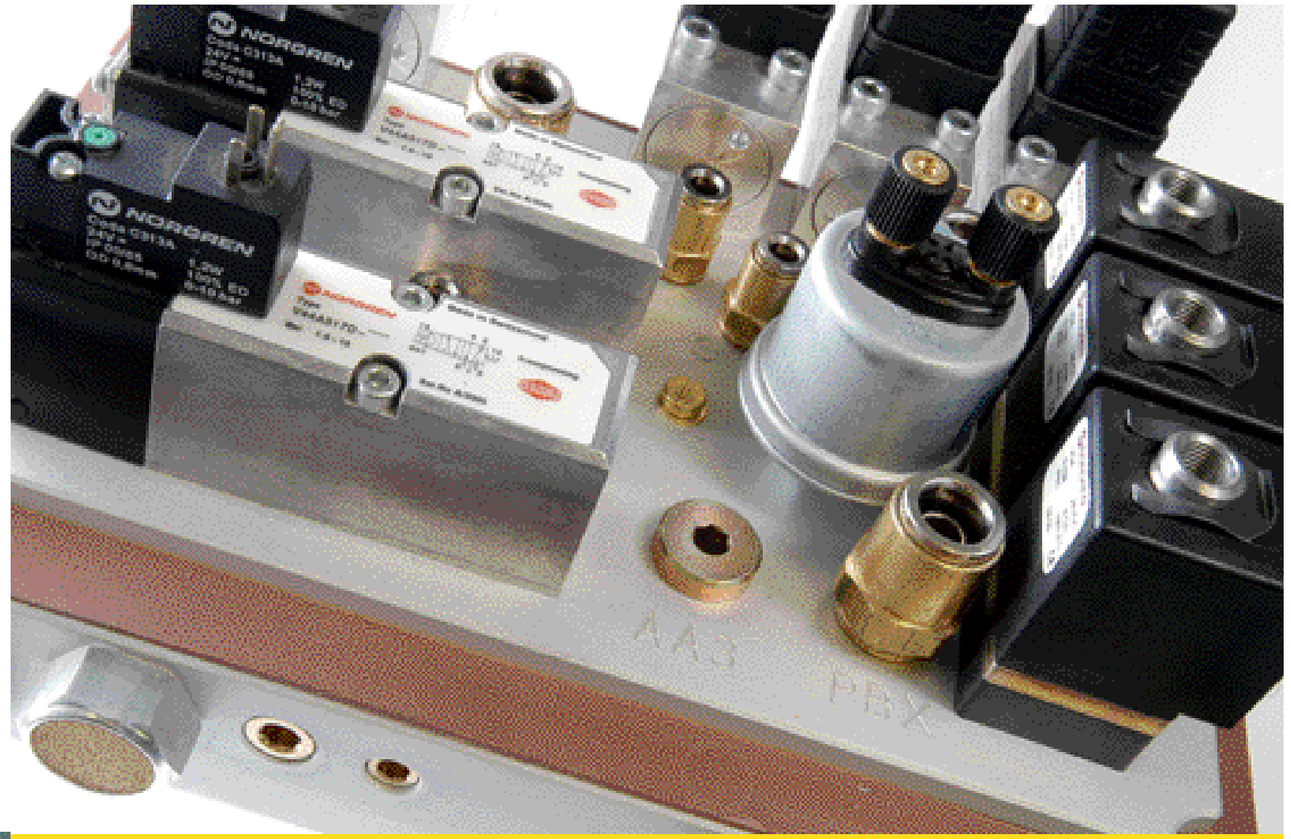
"The reverse side of all of the blocks is standard," he says. "That is, they all require exactly the same preparation before they're customised for the model of truck they'll be used on. To reduce the order-to-delivery time even further, we wanted to stock prepared blocks."

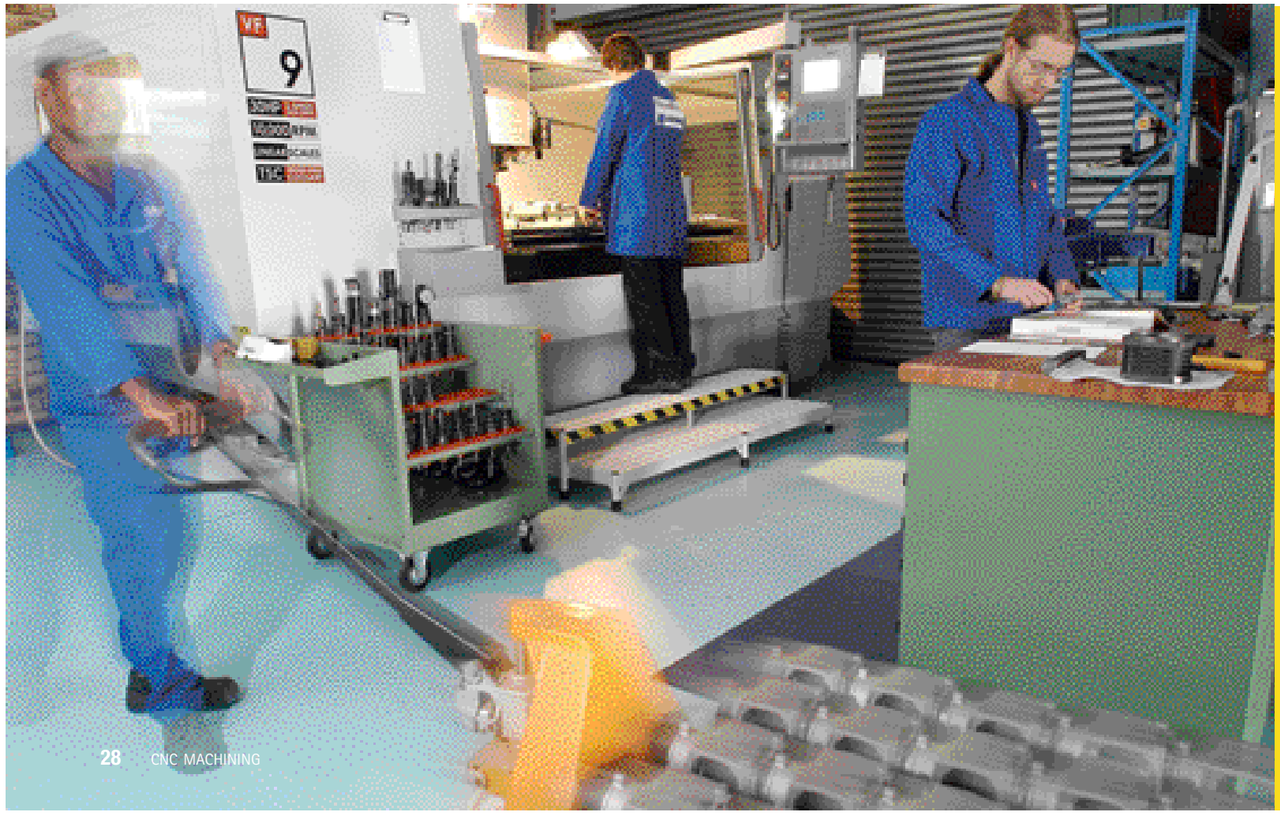
Again, Seyfarth called Haas CNC Services. Just three weeks later, the Haas factory had built a custom spec' Haas VF-9 vertical machining centre.

"The VF-9 is a big machine by anyone's standards," Seyfarth says. "I ordered it with a number of options – including a 30-hp, 10,000-rpm spindle with TSC and glass scales for optimum accuracy. And yet, it was just six weeks – including three weeks sea freight – between placing the order and having the machine cutting metal in our workshop. I was truly amazed!"

Seyfarth also purchased a Haas HRT 450 rotary table with the VF-9, as well as – in his words – the "ultra-flexible" Haas QuikCube and QuikPlate workholding systems mounted on an HRT 210 A6 rotary table.

Seyfarth claims that there were a number of reasons why the VF-9 was suitable, not least the capacious 2.1 x 1 meter table and the familiarity of the control. Like the VF-5, the VF-9 has also been fitted with a 40-tool side-mount tool magazine to allow for the large





number of different threads and holes to be machined without additional tooling substitutes.

"The VF-9 has space to machine 27 blocks in one setup," Seyfarth explains. "It also uses exactly the same control as the VF-5. Even though I had very little prior CNC experience, I was able to program the machine manually and have it making parts in no time at all. Johan at CNC Services was here for a couple of days, to make sure I got it right. After that, it was easy."

In fact, the proprietary Haas CNC is widely recognised as one of the most simple and user-friendly controls available, and it is almost identical on all machines in the Haas range, including CNC lathes, CNC horizontal machining centres and a number of specialist products. Like the machines themselves, it also has a reputation for being one of the most reliable.

"We work the machines 16 hours a day," says Seyfarth. "Although the VF-5 is only 2 years old, it's probably done more like 4 years work. Apart from a couple of minor adjustments and a scheduled major service, both machines have behaved impeccably."

PARTNER

As a result of its investments, NorGrip has forged a long-lasting relationship with Bell Equipment.

"We went from being a regular supplier to being a development partner," says a justifiably happy Seyfarth. "That was a real breakthrough. Bell stopped telling us how to do things and simply advised us what functionality they needed, leaving us to engineer a solution and a manufacturing process to best meet their operational requirements."

The results are impressive. Putting all of the components on a single block has reduced the total number of parts needed from 159 fittings to just 29. Breakdowns due to pneumatic failures have been reduced just as dramatically, as has the time it takes a Bell engineer to fit a truck's pneumatic system.

"The rejection rate for the finished Bell IPM is zero," claims Seyfarth. As a result, NorGrip consistently ranks amongst the company's top suppliers, and has recently been named runner-up in Bell's Supplier of the Year award for 2003.

Meeting the Needs of INDUSTRY

Story Scott Weersing Photos Courtesy WATC

Career options in manufacturing can sometimes be limited by conventional views of what a particular job requires. For instance, while manufacturers can hire both qualified machinists and engineers, they would often prefer to hire people who have skills in both areas. While "engineers" design a product and "machinists" make it, these two job titles don't necessarily require different skill sets. Both call for a mathematical, mechanical mindset, as well as the willingness to tinker with one's project until a good result is achieved. In the best of all two-tiered worlds, good communication and collaboration between the engineer and the machinist will ensure the best end product.

By the same token, students generally must choose between a trade school program for machinists or attending a university to become a manufacturing engineer. For many 18- to 21-year-olds, this is a tough choice – they may know where their interests lie, but they don't always know which option will give them the most career satisfaction.

To bridge this gap, the Wichita Area Technical College (WATC) in Kansas is starting a program in which students will learn the practical skills of both a machinist and an engineer. "The new MET program will combine training in product design and engineering with manufacturing systems and manufacturing applications," says George D. Gray, WATC director of Applied and Engineering Technologies. "So, effectively, graduates can work in either realm – product design or manufacturing processes."

The stimulus for the MET program came from Gray's previous experience in Texas, plus feedback from local Kansas manufacturers. "When we had our first advisory meeting, the people from industry told us that students from this type of combined program would really enhance their employability by having knowledge of both manufacturing and product design.

"There were machining programs and high-end engineering programs available, but students did not have anything in between," Gray continues. "Industry representatives, meanwhile, told us they had plenty of engineers to draw upon, but they did not have a technician base."

Gray recently came to WATC after 19 years at Texas State Technical College in Waco, where he was in charge of a similar program. "When I started here last year, this type of program really wasn't available," he says, "but I saw all these diverse manufacturing companies in our region of Kansas. I felt there was something missing. So I thought the MET program would work as well here as it had worked in Texas, because those students can fit into so many different areas."

Gray and the advisory board knew they were on the right track after they sent out a survey to local industries asking where MET students could expect to work. "The survey," says Gray, "came back showing many different areas within one company where our students could work, because they will have this unique diversity in product design and manufacturing procedures. It was encouraging to see that."

Upon completing the MET program, Gray continues, "The students will have workable and deliverable skills to take into the workforce. Or they can continue their educations – at Wichita State University, in the Mechanical Engineering program, or at Kansas State, in Mechanical Engineering Technology. It is a win-win for the students."

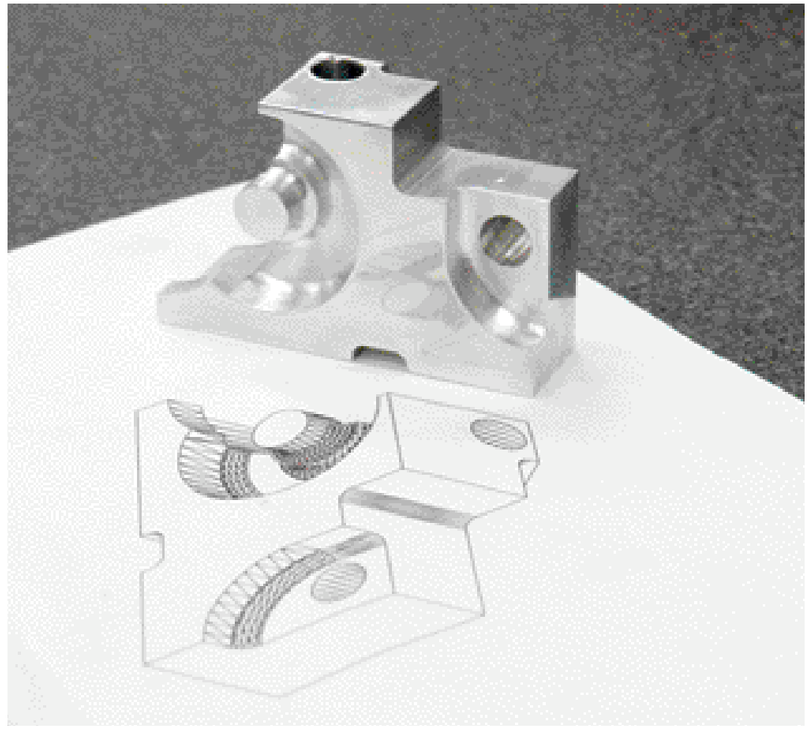
A scenario, says Gray, that attracts a variety of students to WATC. "We have students coming out of high school, and we also have people wanting to upgrade their training. Some people have experience in machining, or in quality control, but they don't necessarily have an associate's degree and would like to gain that accomplishment. Older students in particular realize this new program will help them get more job opportunities."

Judging by the number of students who have signed up, the new program has already proved to be popular. "We just got approval for the program in April, and we've already had several students register," says Gray. "I don't know how they heard about it, because we haven't really started advertising it." WATC plans to enroll 20 students in the MET program when it starts in September, and hopes to have another group of students start in January 2005, if interest continues to grow.

Fall 2004 classes will be held in existing facilities at the WATC Grove Campus, but a new 17,000-square-foot building is planned and should be ready for students in summer 2005. "We will begin construction this summer on a two-million dollar building that will house our new Applied Engineering and Technology Center," says Gray, "of which 3,000 square feet will be dedicated to the Haas Technical Education Center lab (currently located elsewhere). It will be a state-of-the-art building with a dynamic exterior. The Haas lab itself will have high ceilings with lots of windows, because we want to show off our Haas machines.

"We are located on a road that gets a lot of exposure, so people driving by are going to see the new building. It will have a high-tech look, which I think will make people stop and check out what is going on inside," Gray adds.

The Haas Technical Education Center at WATC currently has six Haas CNC machines: three VF-0s, a Toolroom Mill, and SL-10 and SL-20 turning centers. "The HTEC is a tremendous selling point in terms of recruitment, and also from a placement standpoint for these students, because we have industry-standard machines with so many capabilities," says Gray. "We are integrating the machining aspect into this new program so the students can understand and communicate the requirements of CNC prototyping and production."



The HTEC, of course, plays an integral part in the preparation and training of students for careers in manufacturing. "Haas machines have a big role here," says Gray. "We've been able to create many prototype components and assemblies that we could not have produced without the Haas equipment. Haas also continues to make improvements and keep on the leading edge."

While the CNC machines play a key role in the MET program, Gray is especially proud of the faculty at WATC. "I think the key here is that our faculty members are committed to our students, and to staying up to date with current trends in technology. In fact, some of them are working on professional development opportunities with local industries, to stay abreast of what is going on in manufacturing."

For students who are interested in engineering design as well as manufacturing processes – and the employers who await them – the best of both worlds is now available. The educational opportunities at WATC, including the technology of the Haas Technical Education Center, will offer MET program graduates promising careers in manufacturing.

Wichita Area Technical College
301 S. Grove, Wichita, KS 67211-2099
316-677-9282
www.wichitatech.com
www.wichitatech.edu
info@wichitatech.edu

> RACE REPORT (continued from page 5)

Michigan Speedway, where I have run well." Unfortunately, the car did not respond well to race conditions, and Leffler finished a disappointing 34th – the team's worst finish of the year.

The result in California was an anomaly, however, as the team had five top-10 finishes in the first 11 races of the year, including a 5th-place finish at Talladega in April. Leffler is in tenth place in the Busch Series standings after 11 races.

Hendrick Motorsports

Hendrick Motorsports continues to show why they're one of the dominant race teams in the Nextel Cup Series: Drivers Jeff Gordon, Jimmie Johnson, Terry Labonte and Brian Vickers have all collected top-10 finishes in the first 11 races of the year. In the meantime, rookie driver Kyle Busch, who is all of 19 years old, won his first Busch Series race at Richmond in May.

Gordon retains his status as one of the top drivers on the circuit, leading the No. 24 to Victory Lane in back-to-back races at Talladega and California Speedway. At Talladega, Gordon and Dale Earnhardt Jr. were battling for the lead with four laps left, when Vickers spun out behind them, bringing out the yellow flag. It took NASCAR officials several minutes to declare Gordon the winner – much to the dismay of the crowd, who littered the track with trash as Gordon took his victory lap. "Neither of us really knew who was leading," said Gordon, after visiting Victory Lane for the 65th time in his Cup career.

The next week at California Speedway, Gordon was way out in front at the end, but worried that he might not have enough fuel to finish. He wasn't alone in his worries – four of his competitors did run out of gas on the final lap, as Gordon held on to win the race. Since crashing and finishing 41st in Darlington in March, Gordon has finished ninth, third and sixth to go with his two wins. "A couple weeks ago everybody was down on us," said crew chief Robbie Loomis. "Jeff Gordon pushed me to believe in our team. We always support each other in difficult times, and now we're rolling." After 11 races, Gordon is in third place in the Nextel Cup standings.

Jimmie Johnson is having another spectacular year in the No. 48 car, with seven top-5 finishes, including a victory at Darlington and two runner-up finishes. "I can't believe I've won Darlington," said Johnson after winning the Carolina Dodge Dealers 400 in March.

Johnson credited his pit crew, whose quick work during the event's final round of stops put the Lowe's Chevy in the lead coming off pit road, just inches in front of Bobby Labonte, who finished second. "It was show time, and they really stepped up to the plate and hit a home run," said Johnson. After 11 races, Johnson is in second place in the Nextel Cup standings.

Rookie Brian Vickers became the youngest driver ever to earn the pole position when he qualified with the top speed at Richmond. He then went on to capture his best finish of the year by placing eighth. Terry Labonte, who is in his 25th year of Cup racing, had his best finish of the year with seventh place in the Auto Club 500 at California Speedway.

Kyle Busch won his first Busch Series race, dominating the track as he led 236 of 250 laps in the Funai 250. "It was an awesome race," said Busch. "I had a phenomenal car out there, and the team did an awesome job in preparing that. We qualified on the pole, led the most laps and won the race. "

NHRA

The J&B Motorsports Top Alcohol Funny Car team won their first title ever at the NHRA Southern Nationals in Atlanta. Despite difficult weather conditions and hotter-than-normal race track temperatures, team owner Jeff McGaffic and crew chief Jeff Sommer were able to provide driver Paul Lee with a remarkably consistent racecar all weekend to win their first NHRA national event.

"Consistency was the key to winning," said McGaffic. "We studied the computer results of the qualifying runs and tried to tune the car the best we could, considering we had track temperatures of over 125 degrees."

The dream weekend for driver Paul Lee and the rest of the team began with first qualifying runs. The third qualifying run was the best, and resulted in a stout 5.70 seconds at nearly 253 mph, which placed the J&B Funny Car in the number 6 position going into eliminations.

In the first round of eliminations, Lee defeated Mick Snyder, and then knocked off Paul Gill in the quarterfinals. In the semifinal round, the J&B Motorsports team faced an always-tough Bob Newberry. "To beat Bob Newberry, one of the true legends of the sport, is a great achievement and a big feather in our team cap," said Lee.

That set up a final round match-up with 25-time NHRA National event winner Jay Payne. Since the J&B Motorsports team ran a faster time in the semifinals, they chose the right lane. Lee took off right from the start and defeated Payne for the title. "When we made it to the finals, I thought to myself that there was no way I was going to let my team down by not doing my job. I just kept my focus, and when the green light flashed, I mashed the gas pedal and hung on," said Lee.

After the win in Atlanta, the team went two for two with another title in Topeka, Kansas. Lee passed Kevin Richardson to win the title at the 16th annual O'Reilly NHRA Summer National for back-to-back victories.

Dear Applications:

I have a question about one of the programming examples in my SL-20 lathe operator's manual. Here's the example in question:

T200 B-2.0
G50 S2500
G97 S1042 M03
G00 G99 X2.0 Z0.01
T232 M08
G96 S600
G01 Z0 F.01

What is the purpose of the program line that has G97 S1042 M03 in it? I ask because of the G96 S600 code that follows two lines down in the program. This just doesn't make sense to me. Thanks.

Joe Killeen

Dear Joe:

When you invoke G96, Constant Surface Speed (CSS), the machine will automatically increase or decrease spindle speed according to the radius being cut (distance from tool tip to spindle centerline). This is an excellent way to ensure the proper cutting speed for the material being used. The common practice is to program with G97 (turn off CSS) when rpm adjustment is not necessary, such as during any rapid moves to approach the part or during drilling. A G96, with its increasing or decreasing speed, can sometimes be inconvenient during non-cutting moves. For example, if your programmed feed is in inches per rev and the tool tip moves outward, everything will slow down – and your cycle time will increase. In conclusion: Use G96 only during cutting, and cancel it as soon as possible with a G97 command.

Please feel free to contact us for further assistance.

Sincerely,
Haas Applications

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Dear Applications:

On the VF-0, I can zero the A (rotary) axis and it will zero out in less than one revolution. This is useful for a restart after doing multiple rotations in one direction. When I attempt the same thing on the Super Mini Mill, it seems to go all the way through several revolutions. Can the Super Mini Mill Zero Single Axis perform the same function as on the VF-0?

Gil Stein

Dear Gil:

Sure it can. Your Super Mini Mill probably does not have Setting 108 (Quick Rotary G28) turned on. With this setting on, the G28 command (Zero Return thru Ref Point) will cause the machine to unwind from 361 degrees to 0 degrees by unwinding 1 degree. Note that if the rotary is at less than 360 degrees, it will unwind the entire amount – if it's at 359 degrees, it will unwind 359 degrees to go to A0. Also, if the rotary is at 630 degrees, it will zero out by unwinding 270 degrees, not by moving forward 90 degrees. This feature eliminates the need to unwind more than 1 revolution.

Finally, with Haas mill software versions 12.03 and later, turning on Setting 108 also requires a parameter change. Most parameters can only be changed by Haas Service personnel, but you should be able to turn on Parameter 43, bit 11, Circ Wrap, by changing its value from 0 to 1. Call your local dealer or the Haas Service department if you need help with this.

Sincerely,
Haas Applications

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Dear Applications:

When I power up my older VF-0 , my 5C Haas rotary only goes about 7 degrees to find home. I have a new HA5C that always goes to home, no matter where it had stopped. What is the difference?

Rick Connelly

Dear Rick:

Older 5C rotary products did not have a home switch; they only used the "per rev" signal from the motor (about 5 degrees, actually). New HA5Cs and other rotary products all have a home switch.

Sincerely,
Haas Applications

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Dear Applications:

I am not sure what software I need to download onto our computer so that I can store, read and change CNC programs while I'm not at the machine. Please advise what – and where to get it – if you could, please. Thanks.

Curt Fredericks

Dear Curt:

You can use the Note Pad accessory, which is supplied with most computers, to store and edit programs. This application is the intellectual property of the Microsoft Corporation, and is installed on most Windows-compatible computers. (You should not use Word Pad or any word processing program to edit CNC programs, as they can introduce text-formatting commands that are incompatible with the Haas control. If you do use these, you must save the file in ASCII format – that is, as a text-only file with a .txt extension.) You might also be interested in ESPRIT Machinist editor, a program that is specifically designed for Quick Code programming on a PC – and also specifically designed for use with the Haas control. Download it for free from the Haas website: Go to www.HaasCNC.com/training and scroll down the page to the red box.

Sincerely,
Haas Applications

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Dear Applications:

Are there recommended time limits for running at 10,000 rpm? We are running our VF-3, which has a gearbox, for 6-hour cycles three times a day.

David O'Dwyer

Dear David:

There are no time limits for running the spindle at 10,000 rpm – even at 100% spindle load, you can easily run it for 6-hour increments three times a day.

The main consideration when you run the spindle continuously for long periods of time is letting it warm up and cool down. While the machine will warn you about spindle warm-up, you should also allow a cool-down period. Best-case scenario is to run the spindle at low speed (500 to 1,000 rpm) for a maximum of 20 minutes after completing the job. At the very least, the spindle fan should be allowed to run for 20 minutes before the machine is powered off, which can be done automatically. Setting 1, Auto Power Off Timer, lets you set the number of minutes that the machine will sit idle before it turns itself off.

Sincerely,
Haas Applications

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Dear Applications:

I have access to a Haas HL-2 lathe at the university where I teach, and want to know if the machine is recommended for hard turning applications. We want to hard turn some samples and then run ball burnishing experiments on the machine.

Conrad Morton

Dear Conrad:

Haas HL and SL series lathes are very capable of, and well suited for, hard turning applications. Process and tooling may be areas of concern, but the Haas lathe won't be. Issues that could potentially require special attention – i.e., these could be the source of a problem – include depth of cut, advance per revolution, surface feet (or meters) per minute, insert grade, and programmed path. It's a good idea to work closely with your tooling supplier to determine the best insert grade and programming path for your part.

Sincerely,
Haas Applications

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Dear Applications:

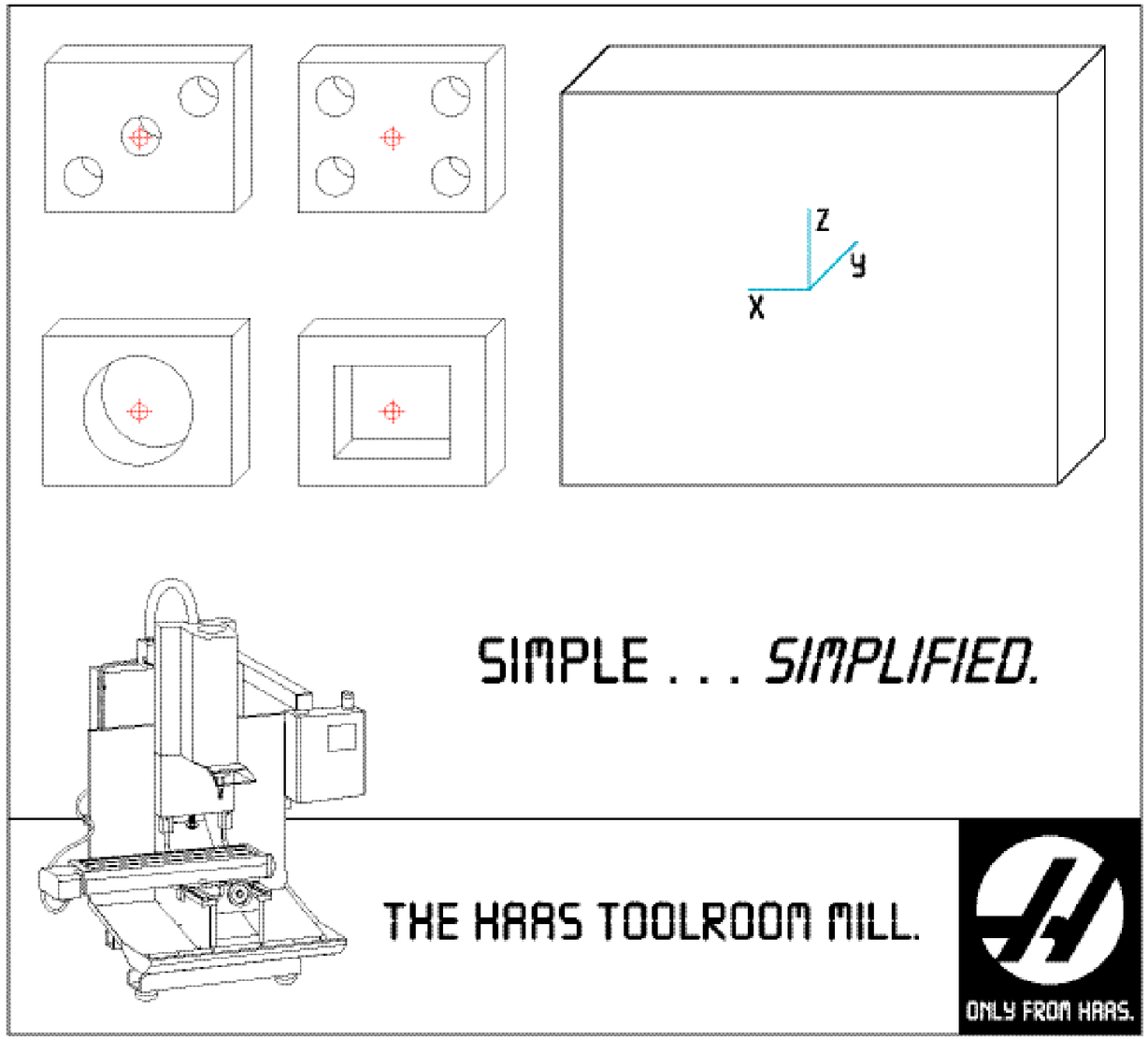
We need to know about your bar feeder. Can it make two different, alternating pushes? I need to turn 2-inch–long and 3-inch–long pieces from the same bar stock. Can I alternate them?

Clark Crenshaw

Dear Clark:

Yes, you can do multiple bar pushes with the Haas Servo Bar 300. The I, J, and K commands will override the macro variables for the program line in which they occur (the macro values in Current Commands will not change). The J code is for part length plus cut-off, so to feed 2.0 inches of bar stock would require the line G105 J2.0.

Sincerely,
Haas Applications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