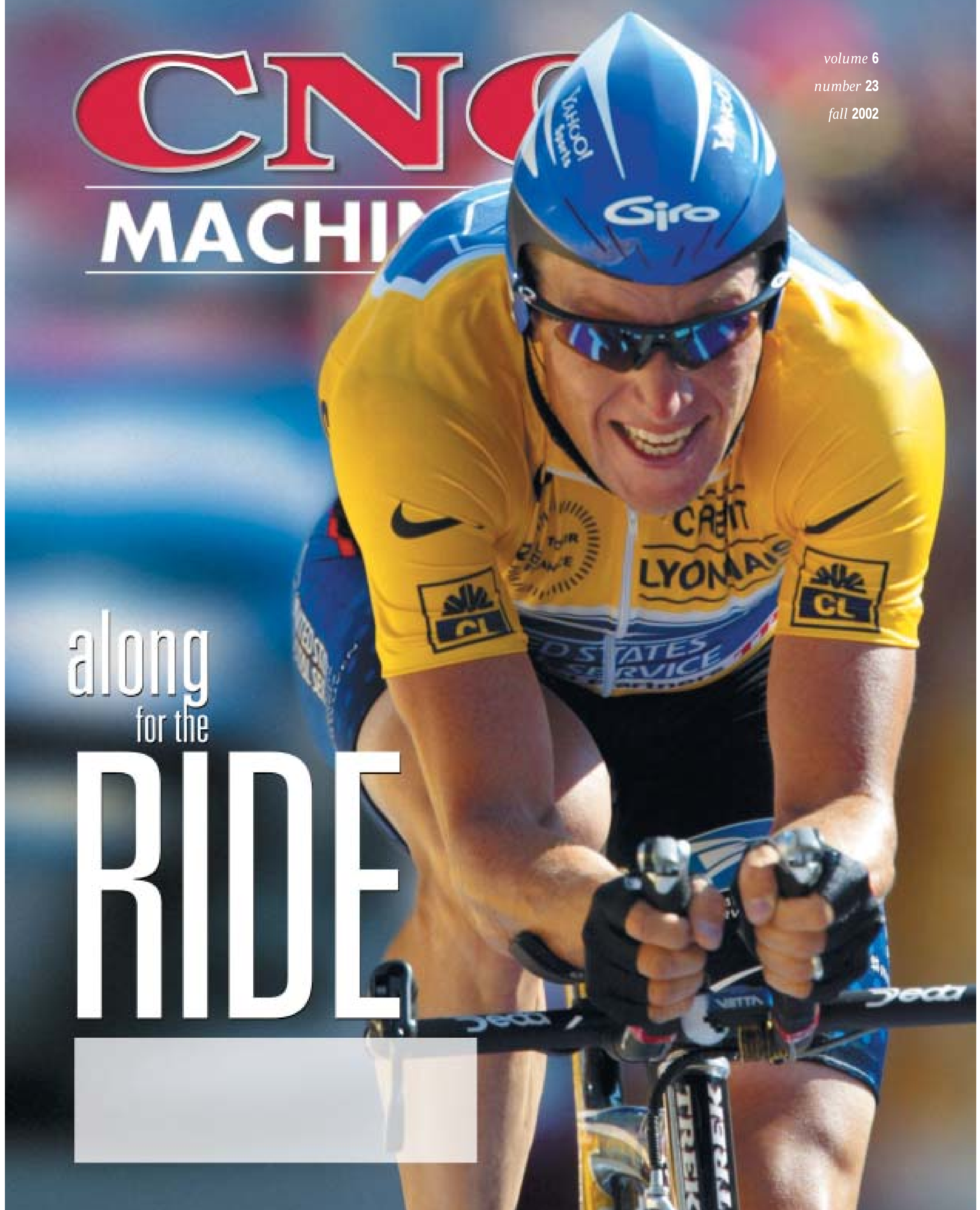

CNC MACHI

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fall **2002**

along for the RIDE

FALL 2002 VOLUME 6 ISSUE 23

CNC MACHINING

Imagine a successful company that's at the top of its industry. Business is booming, profits are soaring and, by all accounts, there's no place to go but up.

Imagine suddenly discovering that, despite the apparent success, something terrible has been festering just below the surface. Something so malignant that the prognosis for the company's mere survival, let alone continued success, is less than 40%.

Now imagine the same scenario on a much more personal level: You're a world-class athlete who's rapidly rising to the very top of your sport. You live in a beautiful custom-built home, you drive an expensive sports car and you've just signed a $2.5 million contract for the new season. By all accounts, there's no place to go but up.

Imagine suddenly discovering that the terrible thing festering just below the surface is cancer – cancer so malignant that it has already spread to your lungs and brain. The prognosis for your mere survival, let alone your ability to compete again, is less than 40% . . . and that's being optimistic.

They say that what doesn't kill you makes you stronger. Of course, *they* usually aren't the ones undergoing the ordeal in question. It's easy to have a positive view when looking at a situation from the outside. But when deep in the midst of an event that threatens to irrevocably change your entire life – or perhaps even bring it to a premature end – I'd wager that many, this writer included, would find optimism in very short supply.

But maybe it's time to change that. Maybe looking at things with a more positive view can make all the difference in the world.

In this issue of *CNC Machining,* you'll meet optimism head-on in its highest form, and you'll discover just what's possible with a positive outlook. For our cover story we visited Trek Bicycles in Wisconsin. And while they do a bit of machining at Trek, that's not the real story. The real story is about a man rather than a machine. A man who not only survived cancer, but came back stronger than ever. Lance Armstrong beat all the odds, and recently won his fourth consecutive Tour de France, the greatest bike race in the world. Determined to continue living life at top speed, he has his eyes set on number five. We take a look at the man, the race and the bikes.

Also in this issue is a story of another man living life at top speed . . . a few seconds at a time. Drag racer Todd Veney gives us a first-person account of what it's like to blast down the strip at 250 miles per hour, and how being able to see where you're going is a good thing.

We also visited two shops that are taking advantage of the latest advances in machine tools, tooling and design software to stay ahead of the curve and remain competitive. Viking Tooling is a family-owned business in Australia that manufactures tools and dies for the automotive industry, and C&R Molds is a SoCal shop that produces complex molds for a variety of industries.

For our education piece this issue, we present another example of positive thinking, and success arising from adversity. You'll meet a gentleman who turned the loss of his job into an opportunity to change directions and do what he always wanted to do.

You'll also find an IMTS wrap-up, the race report and a first look at an innovative new probing system that is easy to use and affordable.

So sit back, relax and enjoy . . . and remember, keep a positive attitude!

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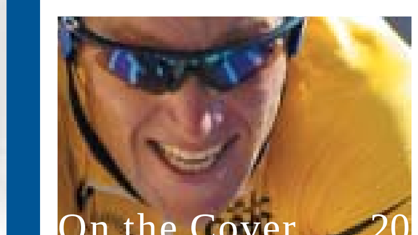

On the Cover 20

Lance Armstrong on his way to winning stage 19 of the 2002 Tour de France, and clinching his fourth straight title in the greatest bike race on Earth.

photo courtesy AP/Wide World Photos

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America . . . At Your Service

After the doors closed on IMTS in Chicago, I had an opportunity to reflect on the show as I headed back to California. With the smaller crowds at this year's event, I had more of a chance to wander the halls and see all of the products being offered. Even though the show had similar square footage to previous shows – most of the same players were there, with booths in the same places and of the same size – the halls did not appear as crowded, from the standpoint of both the attendees and the number of machines being shown.

Although a few manufacturers filled their stands with new and redesigned products, overall, I got the sense that there wasn't much that was new at this show. Not like in the past. And it felt like there was less differentiation between products this time around. That's not to say that every product was alike, but for the most part, the technology was similar within individual product categories.

Thinking about this later, I started to review what makes a potential customer select one product over another. In my wanderings and discussions at IMTS, it became apparent that there are as many ways to make a part as there are machines. If a number of different machines can make the same part, how does a customer decide which machine to buy? If the technology is the same – the axis speeds, tool change times, spindle speeds, etc., are within a similar range – then why select machine A over machine B? Can there be more to this than random selection or a feel-good decision?

Since the Haas Automation manufacturing facility in California houses more than 200 machines in the machine shop, I thought back over what we, ourselves, focus on when deciding what to buy. It dawned on me that it all boiled down to one thing: throughput for a particular part or series of parts. Simply put, it was the number of good parts a machine could produce in a week.

When business conditions are most difficult, and the competition is fierce, it's necessary to take time and examine what, where, why and how we do what we do.

We found that most of the machines we looked at could produce the number of parts we needed per week – mind you, varying setups, tooling, etc., were required to take advantage of an individual machine's strengths. Since several different machines could meet our throughput needs, we next had to look at the cost per part, including the amortization of the machine. The net effect of throughput, after all, is money moving one direction or another.

It's what customers ask for every day, isn't it? They want the right quantity of parts for the best price. If you, as a manufacturer or supplier, can't deliver all of this, the customer will find someone who can, whether it's your neighbor, someone in another state or even someone in another country.

So, how do you keep your customer happy, especially when someone else in a lower-cost labor market can make the part or provide the product for a few pennies less?

You do it with the service you provide, and with your ability to quickly respond to any increases or decreases in the quantities the customer needs. In their efforts for continuous improvement, customers want to tweak their designs regularly, and your ability to quickly respond to design changes is a great service – much more desirable than having months of supply in transit from overseas. Providing service can be as simple as the ability to communicate clearly, because there are no language barriers.

"So what," you say, "it still all comes down to price." True, but you can put a value on these services, because they all affect throughput. And throughput affects the cost per part.

So how do machine tool builders differentiate their product to you? Well, the best way is through the services they provide to ensure your throughput. Here are a few examples:

- **Factory-trained service people and a ready supply of parts in your local area, to ensure that your machine is back up and running immediately should downtime occur.**
- **Factory measured response time and first call completions.**
- **Applications assistance to help with programming problems, using the Internet for immediate response.**

We take most of these services for granted, but they affect our throughput and therefore have value. Machines that aren't running aren't making money. Downtime goes directly into the manufacturing cost, and ultimately into the price of the part.

It might seem a stretch to realize that a week in Chicago can take you from visiting a machine tool show to analyzing how much it costs to make a part. But somehow, I got there. When business conditions are most difficult, and the competition is fierce, it's necessary to take time and examine what, where, why and how we do what we do. In the end, the examination will ensure that we're taking care of business.

Quantity Vs. Quality:
IMTS 2002 Deemed a Success, Despite Slow Start

Chicago. Day one. South Hall, McCormick Place. It's 10 a.m. The doors have just opened on the largest machine tool show in North and South America. At every booth, company representatives stand at the ready, prepared to hawk their wares to the anticipated – and greatly hoped for – onslaught of attendees.

But where are they? Where are the throngs of machinists pushing and shoving their way down the aisles to see the latest machine tools? Where are the mobs of shop owners dashing from booth to booth comparing specs and features? Where are the hordes of engineers scouring the halls in search of cutting-edge technology and applications?

Apparently, at least for the first few hours of IMTS 2002, they were someplace else. Granted, opening day of IMTS usually is a

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Canadian Students Set to Prove Skills in Switzerland

Pierre Luc Turner and Kirk Quast, first and third from left respectively, will travel to Switzerland in 2003 to compete in the 37th WorldSkills Competition. They're shown here with their fellow competitors in the CNC Machining Integrated Division of the Canadian Skills Competition.

You could call it the Olympics of vocational training. Every odd-numbered year, participants from around the world gather to prove their skills and compete for gold, silver and bronze medals in each of 40 recognized trades. Every vocation you could think of – and many you never would – is represented in the competition. Bricklaying, auto body repair, carpentry, welding, hairdressing, jewelry, cooking, dressmaking – they're all there, including CNC milling and turning.

It's these last two categories that have a pair of Canadian machining students set to travel to St. Gallen, Switzerland, for the 37th WorldSkills Competition in 2003. Kirk Quast of Alberta (CNC milling) and Pierre Luc Turner of Quebec (CNC turning) were chosen to represent Canada in the worldwide competition after taking top honors in their respective categories at the local, provincial and national levels.

The national event, known as the Canadian Skills Competition, took place May 31st and June 1st, 2002, at BC Place Stadium in Vancouver, BC. Held under the supervision of the National Office of Skills Canada, the competition brought together students from across Canada to show off their skills and challenge themselves to become the best in their discipline. Skills Canada is a not-for-profit organization that works with employers, educators, labor groups and the government to present trade and technical careers as a first-choice option for Canadian youth. The

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It's a race to the finish – the title is up for grabs

The race for the Winston Cup series championship is getting very tight, and just about anyone could win the crown. There are only 227 points separating the leader, Mark Martin, from the driver in tenth position, Ricky Rudd, with nine races left. Martin took over the lead from Sterling Marlin after the New Hampshire 300 in mid-September.

photos by Scott Weersing

After a summer of top-10 finishes, Jeff Gordon is back to his winning ways and threatening to win the Winston Cup championship for a second straight year. Gordon recently won back-to-back races in Bristol and Darlington. His first victory of the year ended a 31-race winless streak, while the second was Gordon's 60th of his career. But the two wins weren't enough to catch the leader, and Gordon sits in fifth place – just 67 points behind.

"Jeff looks like he's getting on a roll. We'll have to keep an eye on him," said Marlin, who was the points leader for 24 races until a 16th-place finish in the New Hampshire 300 dropped him to second place.

Gordon's win at Darlington wasn't a complete surprise, as the South Carolina track is one of his favorites. Gordon has now won the Southern 500 five times, tying the record set by Cale Yarborough.

"What fun we're having right now," Gordon said following the race. "We didn't capitalize on Bristol or Darlington the first time around, but we sure are making up for it now. We're in the position of the hunter. I love it, because you have nothing to lose. When you're the team needing points and wins, you go for broke and take risks, which can either pay off or bite you. Right now, it's definitely paying off."

Gordon's first win of the year in the Sharpie 500 came when he bumped Rusty Wallace out of the way and then sped on to the finish line. The DuPont No. 24 car was behind Wallace with less than three laps to go when Gordon tapped Wallace, causing his car to turn sideways. But it was the break Gordon needed to take the checkered flag and end a losing streak that dated back to September 2001.

"He [Wallace] got bottled up in some traffic and I knew if I could get to him, I could make a pass," Gordon said of his win. "I got into him a little bit and he got loose. I hope he'll understand tomorrow."

"It's just racing, I guess. I tried real hard," responded Wallace. "To get nailed in the rear end and turned sideways, I didn't expect it. I lost the air to the front and it allowed Jeff to get up on me and he just got to me where he could hit me."

After the long absence from Victory Lane, Gordon felt like a first-time winner. "It feels like the first one all over again. I can tell you we do not take wins for granted," said Gordon. "These things are hard to come by and we appreciate them. I just wanted to burn that moment there in Victory Lane into my memory forever, because it's just such an awesome, awesome feeling.

"As far as the championship," he continued, "I think it just kind of serves notice to a lot of people that we're not

out of it; don't count us out. When things go our way, we are going to be able to stay on top of things and get to Victory Lane."

Rookie driver Jimmie Johnson has shown his competitive ways all summer, but then joined a list of drivers who display their anger in poor ways. After getting bumped by Robby Gordon in the Sharpie 500 and knocked out of the race, Johnson responded by giving Gordon the proverbial one-finger salute. Johnson had good reason to be angry – NASCAR penalized Gordon two laps for rough driving after the wreck – but was remorseful after the race, and felt stupid for showing his immaturity.

"I don't need to be out there acting the way I did, and I'm ashamed it happened," said Johnson. "I was very animated, and I'm disappointed in myself for handling things the way I did. It's something I won't do again in the future – I'm a professional and need to be acting like a professional, and not out there making obscene gestures."

Johnson was angry because he knew the poor finish would cause a drop in the series points standings. Johnson has bounced around the standings, but is in third place, 40 points behind the leader, with nine races remaining.

Terry Labonte captured his best finish of the year when he finished third in the Dodge / Save Mart 350. He scored another top-10 finish when he took ninth in the Pennsylvania 500 later in the summer. Labonte sits in 22nd place in the series points standings through the New Hampshire 300.

Busch Series

Jack Sprague has had a consistent summer in the Busch Series, but not the type of consistency anyone would want. Rather, it has been nothing but consistent problems and poor finishes.

Some of his problems have included a blown engine in Chicago and an "evil" car in Colorado. But despite all the difficulties, Sprague managed two top-10 finishes over the summer. His fourth-place finish in the Charter Pipeline 250 at St. Louis' Gateway Raceway kept him in the running for the points title. But he will need to win some races in the final months to catch the leader, Greg Biffle, who has a 398-point lead over Sprague with eight races remaining. Biffle has won three races over the summer, including wins in Milwaukee and Indianapolis.

"I said this car was extremely evil when I had it at Chicago," said Sprague. "I just didn't have the chance to race it, because the engine blew up on lap 14. I quickly remembered how much I hated it when we got to Pikes Peak Raceway. I thought we'd end up with a top-10, not a 14th-place finish. We're still third in the points race, but we're losing ground each week. We need some really great finishes in the next few weeks to catch back up."

"I am sick of these bad finishes lately," said a frustrated Sprague. "Thank goodness for our fourth-place finish at Gateway a few weeks back, because that's the only decent finish we've had for quite a while. I don't even know what to say, because I know I'm not the only one upset by it."

In August, the team took a new car to Michigan and managed a 15th-place finish in the Cabela's 250. "I'm happy with today's results," said Sprague after the race. "We brought a brand-new car here. It went to the wind tunnel on the way to the track and we thought we'd have a really good car. We never expected it to practice and qualify as terrible as it did. I was doing a lot of praying this morning, because I didn't think we had a prayer to salvage a decent finish, but we definitely pulled it off."

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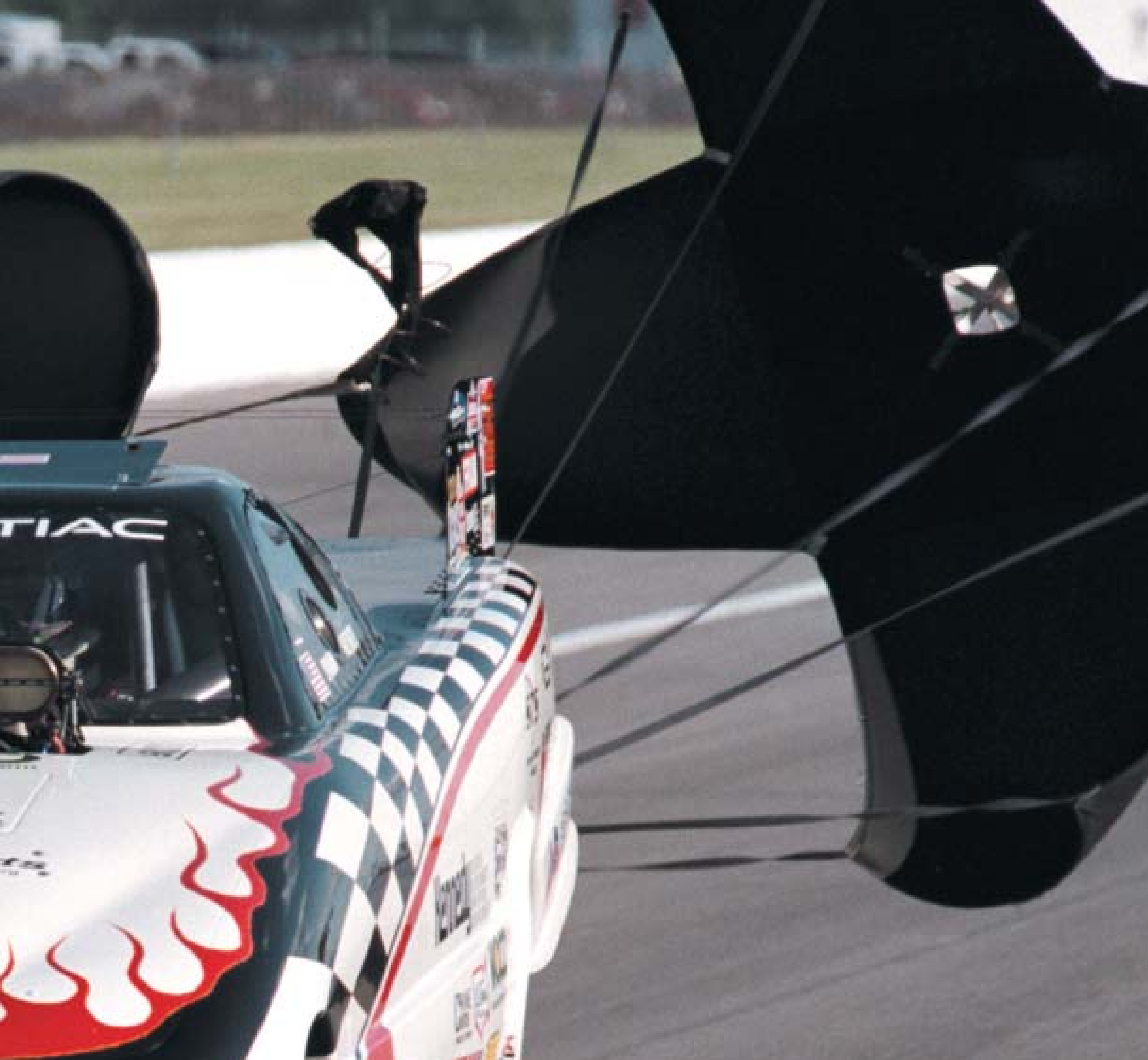


A Different Kind of High-Speed Machining

STORY Todd Veney PHOTOS Bob Hesser

When you're rocketing down a dragstrip at 250 mph, it's always nice to see where you're going. In a dragster, that's no problem – the engine is behind you, and there's nothing to block your vision except the visor you flip down just before you leave the starting line.

In a Funny Car, though, the engine's right in your face. When the body is up and you're strapped in, waiting for them to fire up the car and lower the body, the engine commands your attention. You can just see over the top of it . . . usually.

If it weren't for our Haas Mini Mill, I'd still be driving blind, strapped in behind a too-tall engine, frantically looking side to side as I blast down the track, trying to keep the car halfway between the guardrail and the centerline until I cross the finish line.

I've only had to drive that way once, and it's something I never want to do again. It was the first race of the 2001 season, in Orlando, Florida. Jeff McGaffic, the owner of our Firebird Alcohol Funny Car, and a full-time CNC machine shop owner, had built a brand-new engine in the off-season, one with not only new but completely different cylinder heads, a much taller manifold and a new supercharger that didn't incorporate the injector scoop into the blower case.

With the PSI supercharger (as with all blowers, except the Whipplecharger brand, which we ran the year before), the injector is a separate component that is bolted atop the supercharger and sticks up through the hood.

You can't get a good feel for how all the changes are going to affect your forward vision until you're on a completely flat surface, strapped into the car, with the body down – the kind of environment I found myself in when our all-new engine was fired up for the first run of the new season.

The first run is always a little nerve-wracking. "What am I doing trying to drive this car?" you think. "Can I really do this?" It's like that every year (and sometimes in the middle of the year, if you've had a month or more off between races), but it goes away. This time, I didn't even want to get back in the seat for the next run.

Fortunately, the Orlando race also was our first event with a Haas Mini Mill – and the place where Jeff's plan to have the first drag racing team with its own CNC milling machine at the track began paying dividends.

We're not the only Alcohol Funny Car team with a well-appointed transporter. Just about everyone at this level has a tractor-trailer rig – you almost have to have one to carry the car, the thousands of necessary tools, at least one spare engine, bin after bin of spare parts, and the support equipment

The first run is always a little nerve-wracking. "What am I doing trying to drive this car?" you think. "Can I really do this?" – Todd Veney

essential to service and maintain such an operation.

Everybody has hydraulic lifts that double as jack stands, spotless stainless-steel workbenches, computers for analyzing data between runs, and stacks and stacks of spare parts. Top teams – especially Top Fuel and Funny Car teams – have drill presses and lathes. Nitro teams, like those of John Force and Don Prudhomme, even have entire rigs called “technology centers” that are separate from the rigs that haul their race cars. But they don’t have Haas Mini Mills.

Out on the road, more than 1,000 miles from his Vista Manufacturing facility in Midland, PA, just outside Pittsburgh, Jeff was able to do himself what would have cost the team who-knows-how-much money and consumed most of the little time we had between back-to-back events.

Before we left Orlando and headed north to Gainesville, FL, for a bigger race that was to begin four days later, Jeff took apart the top of the engine, carefully disassembled the intricate fuel system and removed the port nozzles from the manifold. In no time at all, he was making chips in the front of the trailer.

It doesn’t sound like much, but machining 0.220 inch off the top of the manifold and another 0.100 inch or so from the supercharger made all the difference in the world. By the time we got to Gainesville for the Gatornationals, I could actually see where I was going when I left the starting line.

That’s not the only time our Haas Mini Mill has proven invaluable. Run after run, the discs and floaters in our three-disc clutch (and that of every Alcohol Funny Car) take a pounding that no component should be expected to withstand. Sliding the clutch in the first few hundred feet of the run, as 2,800 horsepower propels our 2,250-pound car to 200 mph by half-track (the eighth-mile mark, or 220 yards from both the starting line and the finish line), and 250 mph by the end of the quarter-mile, abuses everything inside the bell housing.

When we take the discs and floaters out of the car minutes after returning to the pits from a run, they’ve turned blue from the excessive heat of metal-on-metal contact. Even half an hour after we’ve pulled the clutch apart with gloved hands and set it aside to examine later, the sweat that rolls off our foreheads jumps around like grease bubbles on a skillet, vanishing in seconds, when it hits the discs and floaters.

Every part of the clutch looks like it’s destined for the junk pile when it comes out, but these expensive pieces are not only salvageable – after a little time in our mobile machining center, they are as good as they ever were. Making another run on the same hot clutch is guaranteeing yourself a loss in the next round; making a run later without completely resurfacing it would be just as bad.

Gary Hanshe, the team’s clutch technician, and I install a fresh clutch pack – a new set of three discs and two floaters arranged in a disc-floater-disc-floater-disc configuration – for each run. When he has time, Gary machines both sides of the floaters and discs, removing the smallest possible amount of material from each; we continue to use them until they’re down to about 0.270 inch. At that point, they really are ready for the scrap heap.

Aside from the day-to-day miracles it performs for our clutch program, having a Haas Mini Mill has given us the peace of mind that comes with knowing that, for almost any crisis that arises in the always unpredictable world of racing, we can solve the problem ourselves. In our sport alone, it has countless applications.

It is compact and rigid, and Jeff has no trouble maintaining exacting tolerances, even when we’re assigned an unlevel pit space and the machine is not perfectly level in the trailer. With just a 5,000-lb fork lift, the machine can be moved easily from the trailer to the shop. At the track, Jeff has used it to custom-machine pistons for other racers who are desperate to raise or lower the compression in just a single cylinder. He’s even used it to make the Haas key chains and other giveaways that we’ve handed out at tracks across the country, and at machine and trade shows.

Being affiliated with Haas also has opened the doors to other sponsors who back the team, including our current alliances with U.S. Tool, a leading supplier of specialized cutting tools, and WOCO, the Wallover Oil Company, which produces coolants and oils for the machining industry.

Plus, we never get tired of seeing those you’ve-got-to-be-kidding-me looks on the faces of other drag racers when we tell them where all this machine work was done: right up in the front of our trailer – where they have their lounges. But, to me, the Haas Mini Mill will never be more valuable than it was that day it allowed me to see where I was going again.

When time permits, clutch plates are surfaced and reused. This process is repeated until there is about 0.270 inch of material left. The ability to do this in the pits gives a certain peace of mind and self confidence.

High-Speed Spindle Helps Moldmaker Stay Ahead

Story & Photos Scott Weersing

The constant need to do things faster is one of the driving forces behind advancing technology. Innovation comes from trying to solve problems, save time or improve processes. If a company isn't using the latest technology, there's a good chance they will fall behind – or worse, go out of business.

In the competitive arena of moldmaking, shops must produce molds quickly and within tolerance to remain profitable and attract new business. The latest technological advances in high-speed spindles, sophisticated programming methods and high-performance cutting tools allow shops to save time and improve accuracy.

While advancing technology has facilitated moldmaking, it has also had an unexpected side effect: Today's molded parts are more complicated than ever before. Designers are using the latest CAD (computer-aided design) programs to create parts that would have been unthinkable five years ago. This makes the moldmaker's job even more difficult.

"People say the computer is making things easier," says Randall Ohnemus, president of C&R Molds, Inc. (Ventura, California), "but computers are making things harder for us. Parts have more details these days, because designers can put in all these radiuses and blends. When parts were drawn by hand, they weren't as complicated, because they were hard to draw. Things have gotten a lot more complex with computers."

Fortunately, C&R is taking advantage of the latest advances from machine tool manufacturers, tooling companies and software providers to simplify the task of producing these detailed parts quickly and accurately.

Since February 2002, C&R has used a Haas VF-2 vertical machining center equipped with a Haas-built 30,000-rpm spindle to perform finish operations on molds. "We're getting some really nice finishes from this new machine," Ohnemus says. Finish cuts are taken with stepovers of 0.002" and depths of 0.002"; the high spindle speed allows them to maintain proper chip loads and high surface feedrates.

In addition to yielding great finishes, the 30,000-rpm spindle also reduces cutting time and allows faster job completion. "With the new spindle, we are able to increase our feedrates and rpm. We're saving thirty to forty percent on cutting time," Ohnemus remarks. "We're seeing a lot of difference with the small cutters from what we had before. The same programs we were

Randall Ohnemus, president of C&R Molds, looks over a blueprint before machining a part on the VF-2 with the new 30,000 rpm spindle.

"When parts were drawn by hand, they weren't as complicated, because they were hard to draw. Things have gotten a lot more complex with computers."

running on a 15K [15,000-rpm] spindle, we now run at double the speeds and feeds on the 30K spindle."

C&R Molds has always embraced new technology, and continues to look for ways to improve production. The company employs 40 people and runs three shifts per day to provide full service – from design to production. Backed by 10 injection molding presses, new products can go from concept to reality, all under one roof. The 12,000-square-foot shop produces molds for a variety of products – from dental tools to water cooler components. Some of the materials used include H13 steel, P20 pre-hardened tool steel and 7075 aluminum. Molds are first roughed out on a Haas VF-0, then finished on C&R's VF-2 with the new high-speed spindle.

Proper tooling is another ingredient in C&R's recipe for success. Recent changes in part design, combined with increasing part complexity, have led them to change their tool selection. "We used to be able to cut things with tapered endmills," explains Ohnemus. "But nothing is flat anymore. Everything is now blending radiuses into other surfaces, and that's why we've had to adapt and use ball endmills."

C&R uses ball endmills as small as 0.010" diameter to make the finish passes on cavities and mold surfaces. Improvements in cutting tools have helped them fully utilize the capabilities of the Haas 30K spindle. "The endmills are making the machine work," says Ohnemus. "The new coatings allow high rpm, so now we can get through an entire part, where before we would have burned the tool up."

Programming and software have made it possible to machine complicated molds. C&R uses the latest version of MasterCAM to program tool paths. "We have taken certain jobs from days down to hours," remarks Ohnemus. "It's in the way you program, and the programming is getting better and better all the time."

In the past, C&R relied on electrical discharge machining (EDM) for some of the more complex jobs, but now, the speed and accuracy of the Haas 30K spindle allows them to machine cavities that were once the sole domain of EDM machines. "We probably have eliminated half of our EDM work," Ohnemus says. "Previously, we would have burned the thread on this one mold, but we were able to machine it with the high-speed spindle. We now can machine areas of a mold faster than using an EDM machine to do it – and with the same accuracy." Not having to create electrodes provides additional time savings.

Electrodes haven't been eliminated completely, however; C&R still uses EDM for certain molds. But that doesn't mean the 30K spindle sits idle. Rather, it's put to work machining electrodes, which has allowed C&R to boost electrode production considerably. "We've been using it to cut graphite and copper," says Ohnemus. "We've been really happy with how the machine cuts electrodes."

The Haas VF-2 with 30K spindle has netted additional gains for C&R by reducing the time spent hand finishing and polishing molds. "Sometimes the hand finishing takes days," says Ohnemus, "but we have taken out 80 percent of the hand finishing with the new machine. By taking light passes at very high feedrates with small cutters, the part gets a very smooth finish. With some of the small endmills, we have pretty much eliminated the hand finishing." More importantly, CAD-defined geometry and accuracy are maintained when hand finishing is eliminated.

So, as computer technology makes products better, the same technology is helping C&R Molds create molds faster – and more accurately than ever before.

C&R Molds, Inc. – 805-658-7093

"It's in the way you program, and the programming is getting better and better all the time."

Viking Tooling— A *family* Concern

Story & Photos
Matt Bailey

In a small, inconspicuous-looking machine shop in Dandenong, near Melbourne, Australia, a family business is successfully applying the latest machine tool and design technology to the manufacture of tools and dies for the automotive industry.

Although Stephen Hansen is of Danish stock, he was born in Australia in 1957, spending just $7^{1}/_{2}$ years of his boyhood in the family's ancestral homeland before returning to Australia for good.

In 1981, together with his father and brother, Hansen started a small but successful tooling machine shop called Scandia. The company is still going strong today, having provided Steve with the practical and business foundation for his next venture.

In response to what Hansen perceived as a growing demand, he and his wife, Yvonne, broke away from Scandia just over two years ago to form a completely new company: Viking Tooling. Steve explains why he decided to leave the family business. "Between us, our interest in manufacturing was diversifying. Personally, I was getting more into the manufacturing technology: CNC and CAD/CAM, for example. I felt that I could use new technology to great effect, and market my services to a particular niche of the industry."

At the heart of this new, technology-driven approach, Viking can boast some pretty impressive kit. "We use the high-level Unigraphics CAD system commonly used in automotive design," says Hansen. "It was a very big investment for us, but of central importance to what we do.

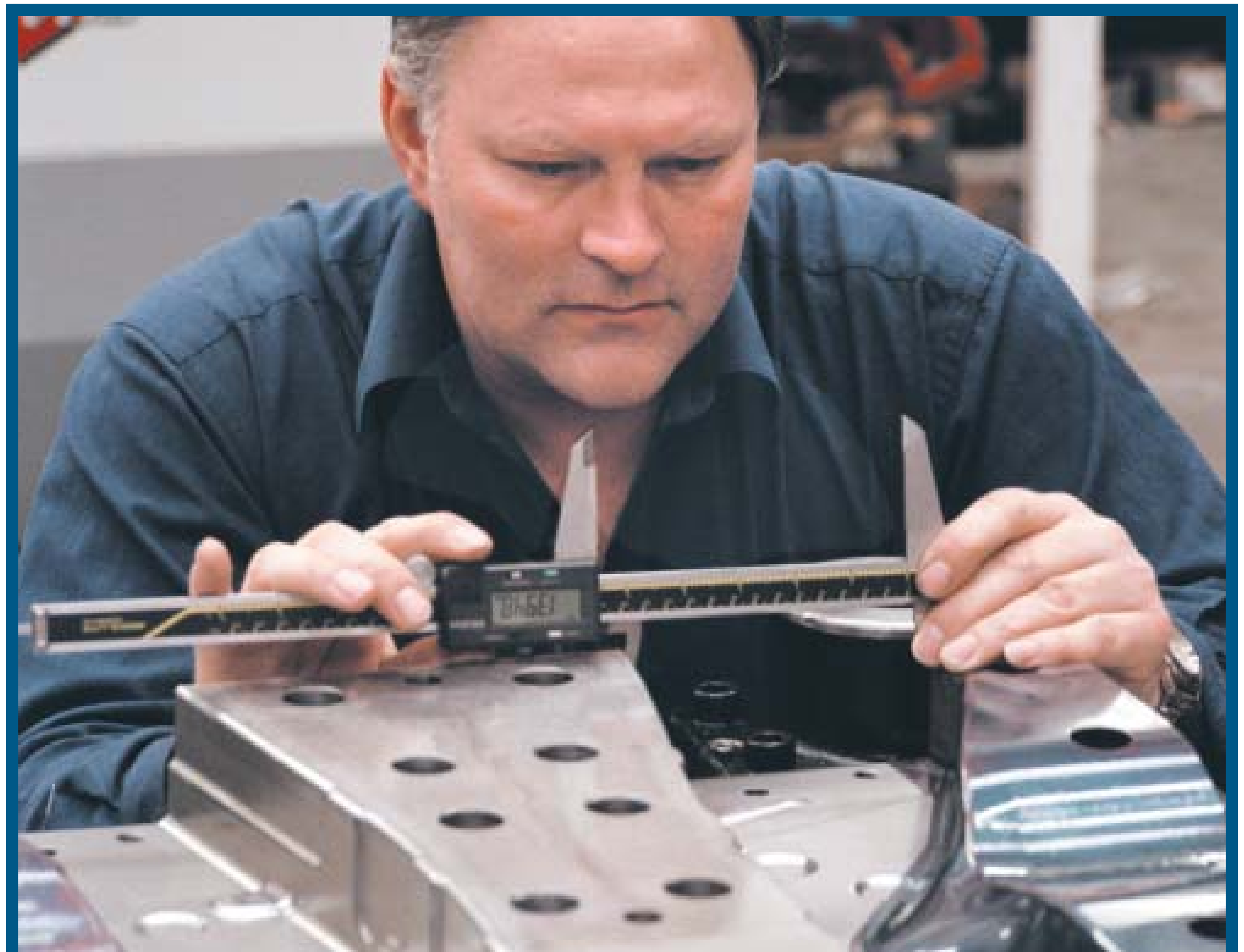
"The only thing the customer sends us is the basic part file for a new project. Then, all of the tooling has to be designed around it."

Turning the CAD files into precision tools is the job of three Haas vertical machining centres. Hansen: "We installed the first Haas machining centre, a VF-3D, in June 2000. The second VF-3 came in March 2001, and the third in May 2001.

"I first came across Haas products at a show in Melbourne, about nine or ten years ago. I asked the guy on the booth if I could run the machine manually, and he tried not to laugh."

In an industry where manual labour was traditionally the main means of manufacture, Hansen encountered more than a little skepticism when he first showed customers the new technology.

Like many before him, Hansen praises the Haas CNC for helping him to quickly get to grips with his investments. "I taught myself to program," he says. "The Haas CNC is extremely simple, and there are lots of nice features, like one-button programming, work-offset probing and engraving. Mind you, the programs we produce these days are so complicated that we generate them on the Unigraphics



system and drip-feed them to the Haas machines."

In an industry where manual labour was traditionally the main means of manufacture, Hansen encountered more than a little skepticism when he first showed customers the new technology. "A lot of people were pretty unsure about the technology," he says. "Then they saw first hand, realized what we could do and were pretty impressed."

"A lot of machines round off corners, gouge, etc. It can get pretty messy. But the finish quality on the Haas is so good we don't even have to polish to achieve the surface finish."

HIGH-SPEED FORTE

In keeping with his original intention, Hansen wanted to maximize use of technology to produce his tools and dies. High-speed machining was to become a vital part of his new approach.

"When I was looking at the first Haas machine, the local agent – Alfex CNC – recommended that I should purchase the HSM (high-speed machining) option for our application. This was all new to me then," he says, "but now I realize it was a wise move, and I'm grateful the Haas sales engineer persisted with this point."

High-speed machining is now one of Viking's fortes, and one that Hansen is particularly keen to discuss. "High-speed machining is not just about high spindle speeds. Having the high spindle speed is great, but it's also about feeding at a sustainable, fast rate and keeping it under control, particularly in the Z axis. A lot of machines have problems tracking in Z. HSM on the Haas is great. A lot of machines round off corners, gouge, etc. It can get pretty messy. But the finish quality on the Haas is so good we don't even have to polish to achieve the surface finish.

"Just recently we had a visit by overseas tooling engineers from a major car manufacturer. They were very impressed and quite surprised by our capabilities and the quality of work coming off the Haas machines."

Making sure that the cutting tool feeds at the optimum speed is the look-ahead algorithm, which is part of the Haas HSM option. “The Haas brochure is exactly right,” says Hansen. “If you try to drive quickly around a mountain road that you’ve never driven before, you’re going to be a lot slower than if you know what’s ahead. The Haas control does exactly that, it looks ahead and determines the fastest possible feedrate.”

For many in tool and die making, HSM is a vital and important investment. To Viking, the investment was also common sense. “The machines we were using previously were too slow and too small,” says Hansen. “They were costing us a lot of money in downtime.

“In the first year of using the Haas HSM it saved us at least two times the investment cost. Also, by reducing the time to produce the components to the required standard, it effectively increased the capacity of the machines.”

“The machines are extremely accurate. It’s almost harder to make a bad job than it is to make a good one!”

Hansen says that he knows Viking’s investment was a shrewd move when he sees the looks on the faces of visiting customers. “Customers come in here and see the Haas machines zapping around at high speed and they’re pretty impressed. We can’t keep them away.”

The Viking machine shop is open 7 days a week, with the Haas machines running 24 hours a day. “I reckon the first VF-3 we bought did two years work in the first 12 months,” says Hansen, without a hint of exaggeration. “Once we’ve finished a program, the machine will just run ’til the job is done. Often up to 30 hours!

“The trend in HSM these days is to do a lot of lighter cuts very quickly. In the old days we used to do lots of big, heavy, roughing cuts. That’s gone by the wayside. If the tools break, you can have a disaster on your hands. We’d rather leave the machine running overnight and come back to find the job finished in the morning. These are very tough tool steels we’re machining. Mind you,” he adds, “on occasions when we’ve machined a big tool or die, the HSM has proved to be up to three times faster than conventional machining.”

Asked to identify the fundamental difference between doing things the high-tech way versus the traditional method, Hansen is quick to reply. “The machines are extremely accurate. It’s almost harder to make a bad job than it is to make a good one!” he says.

“Tooling budgets around the world are pretty tight. If you’re doing it by hand and you want to make a particularly good job, the extra time can cost a lot more. If you’re using a Haas and you have to run the machine some additional hours, it’s no big deal.”


photo by Mike Powell/Getty Images

On a TREK

About Lance. Tests show that he doesn't feel pain. At least, not like the rest of us. They also show that his lung capacity is way greater than your average athlete, and that his resting heart rate is a preternaturally low 32 to 34 beats per minute. What's more, he's beaten testicular cancer, he's written a book, he's started a non-profit foundation, he's raising a family and he inspires millions. But if you happen to find yourself behind him on the L'Alp d'Huez mountain stage of the Tour de France, none of this is important. >>

The only thing you'll care about is the legendary cadence, the killer rpm, the smooth, unwavering rhythm that never falters. His legs are pistons, forcing a pace that no one else can live with. And if you think the gradient will slow him, just watch him apply more power and more determination. More than anyone, even more than his closest competitors can comprehend. And if you think you're getting his measure, Lance Armstrong gets serious. He flattens Alps and he raises the game, confounding those who thought that he'd never see the ripe old age of 26, let alone the Champs Élysées from the 1999, 2000, 2001 and 2002 winner's rostrum. And if you think that four first places in the meanest bike race on Earth is enough for one man, think again – he hasn't come this far to roll over and retire gracefully. He now has his sights firmly set on a fifth win to match the achievements of just four other riders, and to equal Spain's Miguel Indurain as the only rider to have scored five consecutive victories. In his autobiography – *It's Not About The Bike* – he candidly hopes that his eventual departure from this life will be as glorious as his tenure: happy, loved and living life at top speed. But most of all he wants to be old. An ambition that once seemed an impossible dream. Lance Armstrong is a living legend, a walking, cycling miracle. One of the greatest bike racers of all time and a cancer survivor extraordinaire. >>

story and shop photos MATT BAILEY

photo by Ezra Shaw/Getty Images

About TREK

That American bike builder TREK should arm the U.S. Postal Service (USPS) cycling team with the best machines that technology could create was never in question. The surprise was that the team would be built around a man whom other sponsors were quite literally leaving for dead. They just couldn't believe that anyone could make a comeback from such a savage disease and its brutal course of treatment. The cancer's progress was rapacious (spreading to his lungs and brain), so much so that his doctors gave the 25-year-old just a 40% chance of survival. But Armstrong didn't just survive, he came back stronger than ever: fitter, leaner, more determined and claiming that cancer was the best thing that ever happened to him. And TREK's faith might well be regarded as the most important investment that the company ever made – it's never been shy of backing talent, but the 9 members of USPS team have turned out to be the best salesmen that any bike company could wish for.

In 30 years, TREK Bicycles has never stopped growing, thanks in part to the global resurgence of two-wheeled recreation, but also, at least in the past 4 or 5 years, as a result of the achievements of Armstrong and his team.

Based in Waterloo, Wisconsin, a small, unassuming town in America's Midwest, not far from the western shores of Lake Michigan, TREK is just a short car ride from Milwaukee, home of America's most notorious two-wheeled icon: Harley Davidson.

The company was founded in 1976 by a team of 5 employees. It was one of the first to build aluminum alloy frames and, with the introduction of the world's lightest road frame in 1992, was a pioneer in the use and development of carbon fiber as a bike material. These days, TREK designs, engineers and manufactures high-quality, technologically sophisticated road and mountain bikes, exporting them worldwide via the industry's most extensive distributor network.

Growth has been both impressive and consistent, partly through a global expansion of sales, and partly through acquiring some of the biggest and most successful names in the industry. In 1993 TREK bought the Gary Fisher Mountain Bike Company from the widely acknowledged founder of mountain biking. Within just a year of ownership, sales of Fisher bikes increased from $2 million to $20 million. Two years later, in the spring of 1995, the company also acquired Klein bicycles, a top-end American-built bike born in Washington state. Later that same year, TREK brought the Keith Bontrager line of American-built componentry into the fold. If you ever find yourself on a walking tour of the company's frame-building plant, you'll see all products being painstakingly hand-built by the same technicians and engineers.

About Carbon Fiber

Next time you're struggling up a 10% gradient against a 15 mph headwind, remember that a bicycle is still the most efficient form of human-powered locomotion known. If you're riding a TREK, particularly a carbon fiber TREK, you can find additional comfort in the fact that bikes probably don't come any lighter or any more efficient. The hardworking folk in Waterloo make sure of that.

TREK introduced the OCLV (optimum compact low void) carbon fiber frame in road bike form in 1992. Weighing in at a svelte 2.44 lb, it was the lightest frame in the industry and marked the beginning of the company's leadership in carbon frame technology. It was followed by the 2.84 lb mountain bike frame just a year later – an even more remarkable feat of materials science when one considers that mountain bike frames have to be that much more robust.

Carbon fiber is a composite. Composites, by definition, are two or more separate components combined to give a material with properties superior to either of the two ingredients in isolation. Nature has been making composites even longer than TREK. Take wood, bone and muscle, for example. Early civilizations combined mud and straw to produce basic building composites, and the idea has developed over the ages to the point that almost everything we use to carry loads and provide structure (concrete, plywood and chipboard, for example) are, technically, composites.

Today's advanced, carbon-based composite materials are everywhere. In fact, aerospace, transport, sport and building technology have all made quantum leaps in performance thanks to what is rapidly becoming the most revolutionary material of the late 20th and early 21st centuries.

But, although glass, carbon and Kevlar (the main materials used in modern composites) have desirable tensile and compressive strength, they're brittle and prone to failure in their solid, non-composite forms. To overcome this fundamental problem, the material is produced as fibers and arranged directionally to counter loads and forces. By setting the fibers with a resin matrix bond, loads are distributed evenly throughout the structure, even when small structural flaws are present.

Despite the relatively high cost, there are several advantages to using carbon fiber in the construction of competition and high-performance bicycles:

Less Weight

Less weight means less rider fatigue and higher speeds. A rider in the Tour de France can burn between 6000 and 9000 calories a day – that's a possible total of 125,000 calories for the race! Reducing the weight of the bike simply means that those calories can be used to haul the rider, not the machinery.

Long life

Weight for weight, carbon fiber has better impact resistance and superior longevity when compared to aluminum. Also, the honeycomb construction provides excellent energy-absorbing properties. When you're hurtling down the side of a mountain at 60 mph, it's nice to know that nothing's going to break.

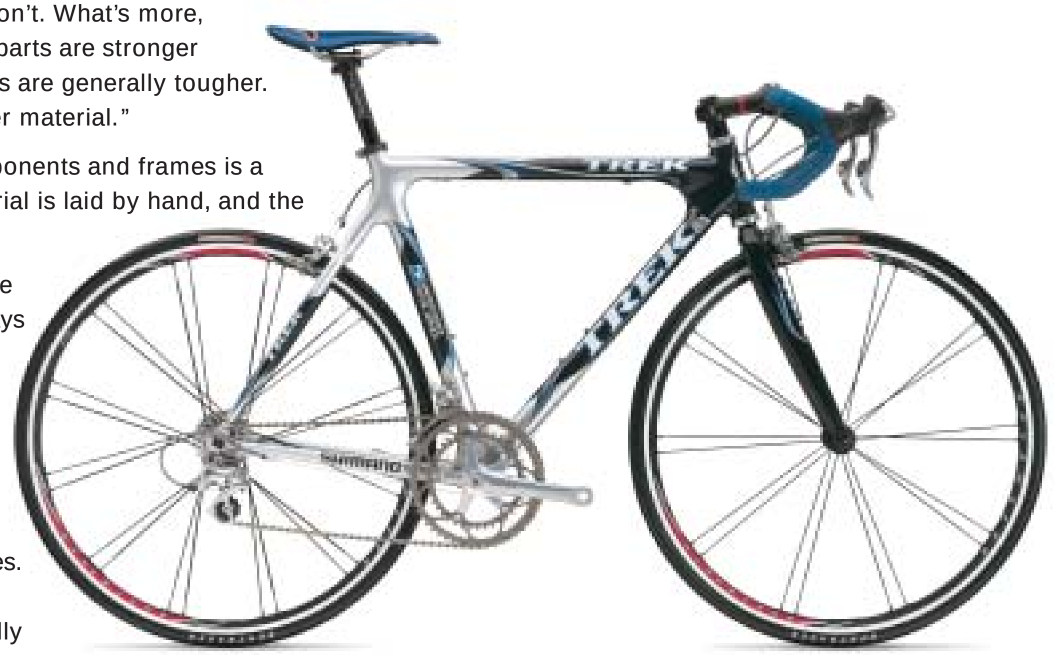
Stiffness

A flexing frame is a waste of energy. The stiffer the bike, the more that energy can be used for forward motion. Simple as that!

About the Bikes

“TREK has been building carbon fiber bikes for over ten years,” says Waterloo-based Brian Moe, manufacturing engineer specializing in composites. “We developed and we patented many of the processes we still use today, in particular the molding process. It’s pretty sophisticated.

“We make all sorts of components in carbon fiber: seat tubes, forks and even entire frames. It’s very lightweight and very strong, even compared with aluminum. It also has a memory, so if it gets knocked or twisted, it knows where it came from and it’ll return to its original shape. Aluminum won’t. What’s more, the bonds that we use for joining parts are stronger than aluminum welds, so the joints are generally tougher. Basically, it’s just a lighter, stronger material.”



But making carbon fiber components and frames is a labor-intensive process. The material is laid by hand, and the curing process can’t be rushed.

“Making a carbon bike or a bike with carbon parts is expensive,” says Moe. “All of our bike frames are built by hand, even the aluminum ones, but carbon fiber is even more labor intensive. For example, a time trial frame can cost up to $4000, even though we’re building around 200 examples. The high-end road bike frames are upwards of $2000, and we’d typically make something like 20,000 of them a year.”

As the material and the technology have proved their worth in the cost-is-no-object race environment, so they’ve caught the imagination of the serious amateur.

“These bikes are pretty high-end machines,” says Moe. “Lance and many of the other professional riders come here, and we custom design and build a bike to fit each of them. We conduct wind tunnel tests to get the best possible fit, then we use the same design to build a frame for the public. So anyone, if they’re willing to spend the money, can go along to their local TREK dealer and buy a top-of-the-range road bike knowing that it’s exactly the same as the bike Lance would ride in the Tour de France.

“At Waterloo, we’re tending to concentrate on the high-end machines,” he says. “We import a lot of the lower-end frames, but all of the assembly is done at our Whitewater, Wisconsin, plant, or at our Ireland plant. I guess we currently make around 25 to 30,000 carbon bikes a year here in Wisconsin. The rest are mostly aluminum.”

About the Haas

“You know,” says Moe, “the more Armstrong wins, the more bikes we make and sell. We’re never quite sure how or when his latest success will impact us, but it invariably does. We have to make sure we have the capacity to meet the demand when it occurs. A big part of what we do here in Waterloo is try to find ways to speed up the whole manufacturing process.”

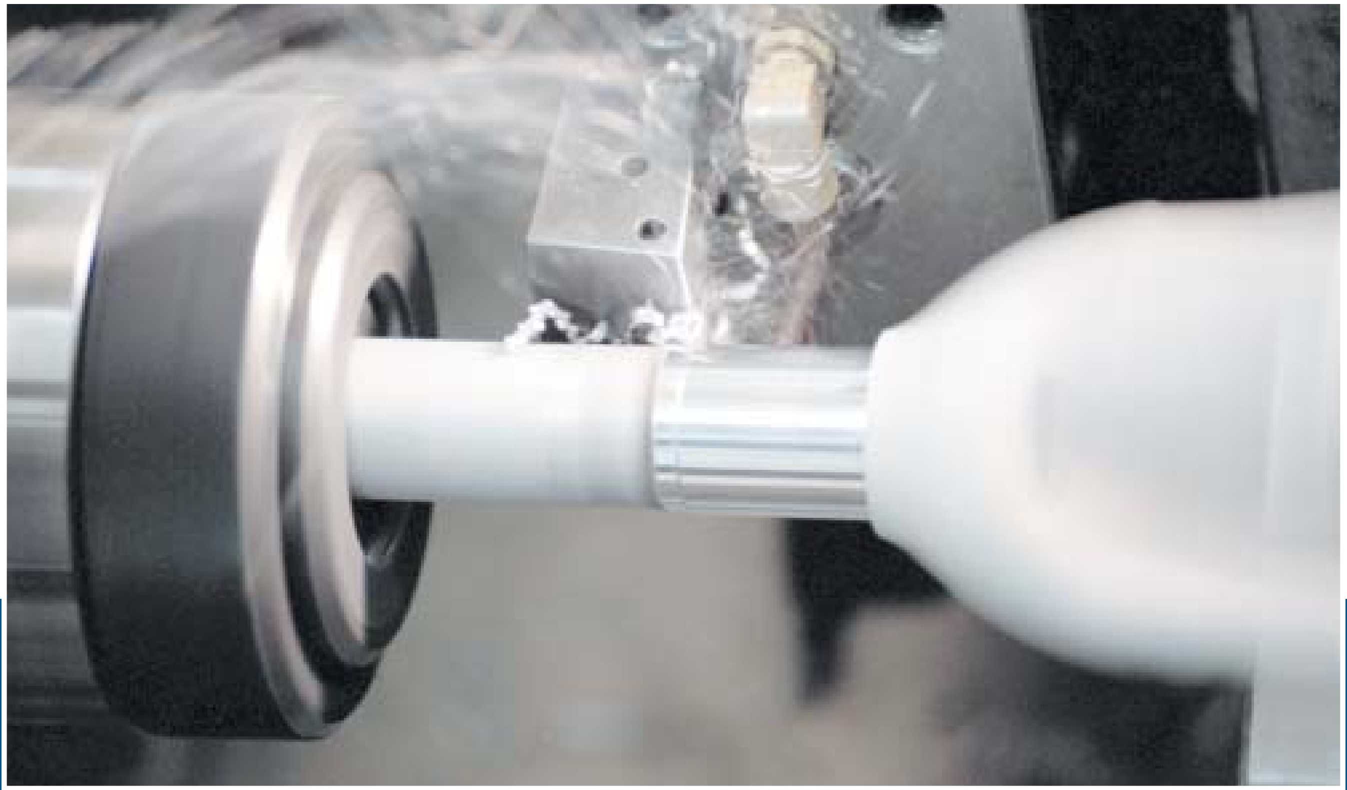
Just about the only machining on the high-end bike frames is the bearing surface on the steering tube. In the past, TREK used a manual lathe to turn the surface, struggling to maintain the desired accuracy and keep up with ever-increasing demand. There had to be a better, faster, more efficient way.

“For the high-end bikes,” says Moe, “the main part of the fork is aluminum and the fork legs are carbon fiber. We’re machining the bearing surface to plus or minus one-thousandth tolerance. It’s a simple part, but it needs to be very accurate.

“The steering tube itself is aluminum. It’s bonded into a crown and, before we fit the carbon fiber blades [the fork legs], we machine the bearing surface on the Haas. We’re making 300 of these every day! That’s 6000 bikes a month, and they’re all high-end bikes.”

Moe was a key player in TREK’s decision to purchase a Haas SL-10 CNC turning center.

“We needed the Haas turning center because we needed a fast machine with excellent, repeatable



accuracy – something reliable. It didn't have to be very big, because it's really just the one small part we're machining on it.

"The cycle time is less than one minute per part. It's a simple operation, but it has made all the difference to what we're doing. In fact, the Haas has made us look very critically at other stages of the manufacturing process, to see if we can speed things up and make things more efficient. We're currently machining parts quicker than other operations, so we only machine for one shift a day. The molding operation is three shifts a day.

"The Haas machine is set up in a cell," continues Moe, "and we move parts in batches. We start by drilling and deburring the brake hole before loading the part in the machine. As it's machining, we drill and debur the next part ready to load. Finally, the forks are bonded to the crown and the batch is moved into an adjacent oven for curing."

TREK'S SL-10 was one of the very first of the new generation turning centers from Haas.

"We narrowed our search down to three makes of machine based on price, service and specifications," says Moe. "Service was a particularly important factor. When we had our short list, it was a clear-cut choice: We wanted the Haas.

"The Milwaukee Haas Factory Outlet (HFO) had the machine in and up and running in just a day. We were very impressed. And, because it was one of the first of the new machines, the Haas factory in California was extremely supportive. We had regular contact from engineers at the Oxnard plant making sure everything was fine."

Once Moe and his team had the chance to put the SL-10 through its paces, their choice was vindicated.

"The controller in particular is very easy to use," Moe claims. "Personally, I'd had some CNC milling machine experience, but not lathes. For the production part, we program at the control. For other parts, the prototype parts, for example, we program using a Mastercam package. The programming is very simple. We've only had it a year and a half, and now I'm the main programmer.

"Now that everyone is very familiar with the machine, we just keep finding additional uses for it. Aside from everyday production, we also do tooling, research and development, etc. We're making aluminum head tubes for prototype bikes on the machine, as well as specially designed rolling dies for our wheel rims. We get a straight extrusion and roll it. We make what we call rolling pins for rolling carbon fiber. You roll the carbon fiber sheet around the pin, then take the pin out. It's a very versatile machine. When I think back, I just can't believe we used to try and do all of the same on a manual machine."

About the Race

Not only is the Tour de France widely acclaimed as the world's greatest bike race, it's also one of the most grueling physical challenges any professional athlete can undertake – anywhere.

For three weeks in July 2002, 21 teams of 9 riders raced a total of 2036 miles, the length and breadth of France, across 20 stages to the finish line in Paris. Along the way, hopes were shattered, spirits were broken and a billion people tuned in every day to watch one man rewrite cycling history.

In essence, the Tour consists of 21 individual races (20 stages plus the Prologue) that take place over a period of 23 days. The stages, or races, fall into three major categories: flat stages, which have only minor climbs and favor sprinters; time trials, which pit the riders directly against the clock; and mountain stages, which are the most difficult and dangerous, incorporating long, steep ascents and fast, treacherous descents.

Stages 1 through 9 and 20 are considered flat stages. The Prologue, stage 4 and stage 19 are time trial events, and stages 11 through 18 are mountain stages.

To win the Tour de France, a rider must complete every stage, and must have the lowest cumulative time at the end of the race. Often, simply finishing an individual stage without losing time against the leaders is more important than winning it.

The Tour is also very much a team event. Each member of the team brings different strengths that can be utilized during different stages. Some are sprinters, some are climbers and some are just all-around good riders, but they all have one common goal: to assist and protect their team's primary rider. In the case of the USPS team, that rider was Lance Armstrong.

Lance kicked off the 2002 Tour in typical Armstrong style by winning the Prologue – a 6.5 kilometer (4 mile) individual time trial – to grab the yellow leader's jersey right from the start.

That statement made, Armstrong soon ceded the yellow jersey to other riders, but remained strongly in the hunt during stages 1 through 10, always staying within striking distance of the leaders.

Next came the mountain stages, which some say are where the Tour de France actually begins. Each day, riders tackle climb after grueling climb, with little rest in between, as they face first the Pyrenees and then the Alps. Summits rise from 4,300 feet to nearly 8,700 feet, with gradients ranging from 4.9% to 9.6%. Fatigued riders then reach speeds of 70 mph on the treacherous descents. This is where Armstrong reclaimed the yellow jersey by winning stage 11, and solidified his lead by winning stage 12. Third-place finishes in stages 14 and 16 kept him in the lead, and winning the stage 19 time trial was just icing on the cake.

When all was said and done, Armstrong's margin over the next placed rider as he rode into Paris was a staggering 7 minutes and 17 seconds. Helping him achieve this incredible feat was the USPS team – nurturing him, sheltering him and systematically breaking down the morale and the resolve of the other riders. The blue-liveried, TREK-equipped team has become so proficient in its duty that it's been dubbed the Train Blu – a relentless locomotive with Armstrong as its powerhouse.

The 2003 Tour de France, Armstrong's bid for his fifth consecutive win, and the 100th anniversary of the race, will start at the traditional finish line – on the Champs Élysées in the French capital. No one doubts that Armstrong can achieve his dream, least of all the competition. To paraphrase Tour organizer Jean-Marie Leblanc after the 2002 race, Armstrong is too much of a master of his sport to have rivals of his worth.

Lance and TREK: an all-American success story that keeps getting better and better.

photo by Graham Watson

IMAGE IS EVERYTHING

Vintage photos courtesy American Machinist

The manufacturing industry has a problem. Over and over, companies complain they can't find the skilled workers necessary to take on larger jobs or expand. But this is only a symptom. Lurking just below the surface is a larger problem – one that is directly responsible for the lack of skilled workers.

MANUFACTURING HAS AN IMAGE PROBLEM!

STORY BY SCOTT WEERSING

"ANYTHING THAT REQUIRES A PERSON TO GET DIRTY OR SWEAT OR WEAR A UNIFORM SEEMS TO BE HELD IN LOW REGARD, WHILE JOBS REQUIRING A BUSINESS SUIT AND SITTING BEHIND A DESK ARE VIEWED AS GOOD."

In today's high-tech world of modern conveniences and instant gratification, most people don't even know what the manufacturing industry does, even though they use its products every day. If, by chance, manufacturing does receive an errant thought, the image that comes to most people's minds is not a 21st century image.

"When people think of manufacturing, too often they think smokestacks, dirty, hot, unskilled workers, assembly lines," says Melissa DeBilzan of Manufacturing Technology of Minnesota (MTM), an organization working to change this perception. "That's the image that parents have, and parents are the number-one influence. It's no wonder students aren't going into manufacturing."

There are social aspects to this outdated stereotype as well, says Larry Wohl, professor of economics and management at Gustavus Adolphus College in St. Peter, Minnesota. "The American dream of each generation doing better than the last plays a significant role. Historically, this meant better economically, but it seems to be evolving into more of a concern about social status. Anything that requires a person to get dirty or sweat or wear a uniform seems to be held in low regard, while jobs requiring a business suit and sitting behind a desk are viewed as good."

Not only is this view prevalent among the general public, but also among those working in manufacturing. "I'm surprised at the number of parents who, despite their own blue-collar backgrounds, insist that their children aim 'higher.' There are great opportunities available in manufacturing," says Wohl, "but parents often use the 'not for my kid' line. It's considered a step backward to go into manufacturing instead of the professional world."

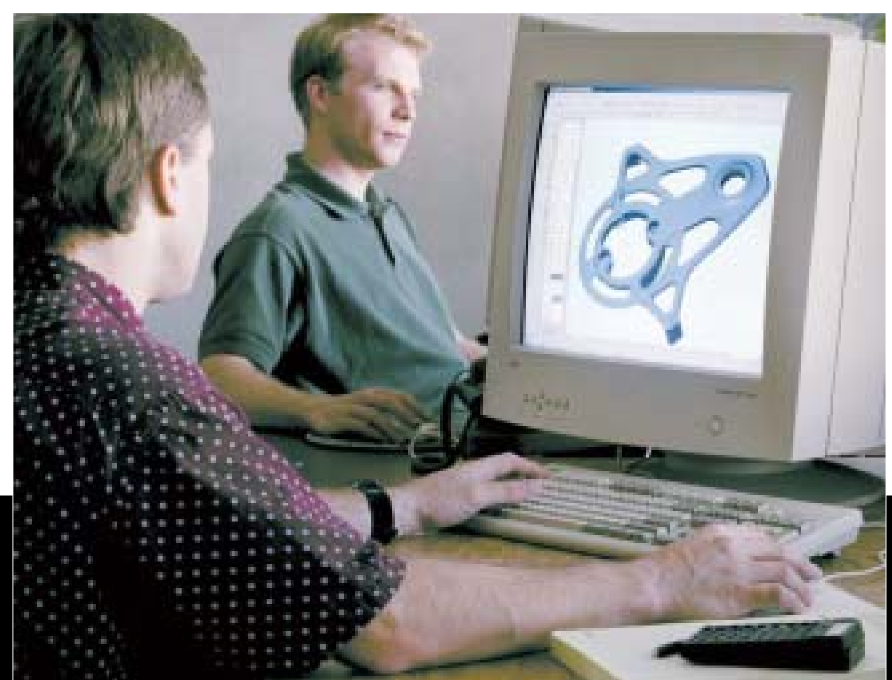
Parents also remember the instability and layoffs of 20 years ago,

explains Dave Horn, Continuous Improvement Director for the Association for Manufacturing Technology (AMT). "Many of the people who were laid off in the 1980s are now the parents of today's students. So they have a bad taste in their mouths about manufacturing, and typically steer their kids away from these types of careers."

JOBS – AND TRAINING – ARE OUT THERE

On the upside, manufacturing has undergone tremendous growth in recent years, which, in turn, has created a tremendous number of career opportunities – many of which are quite lucrative. Unfortunately, much of the growth has been – and still is – taking place in faceless industrial parks around the country. As a result, both the growth of the industry and the resultant job opportunities have gone largely unnoticed.

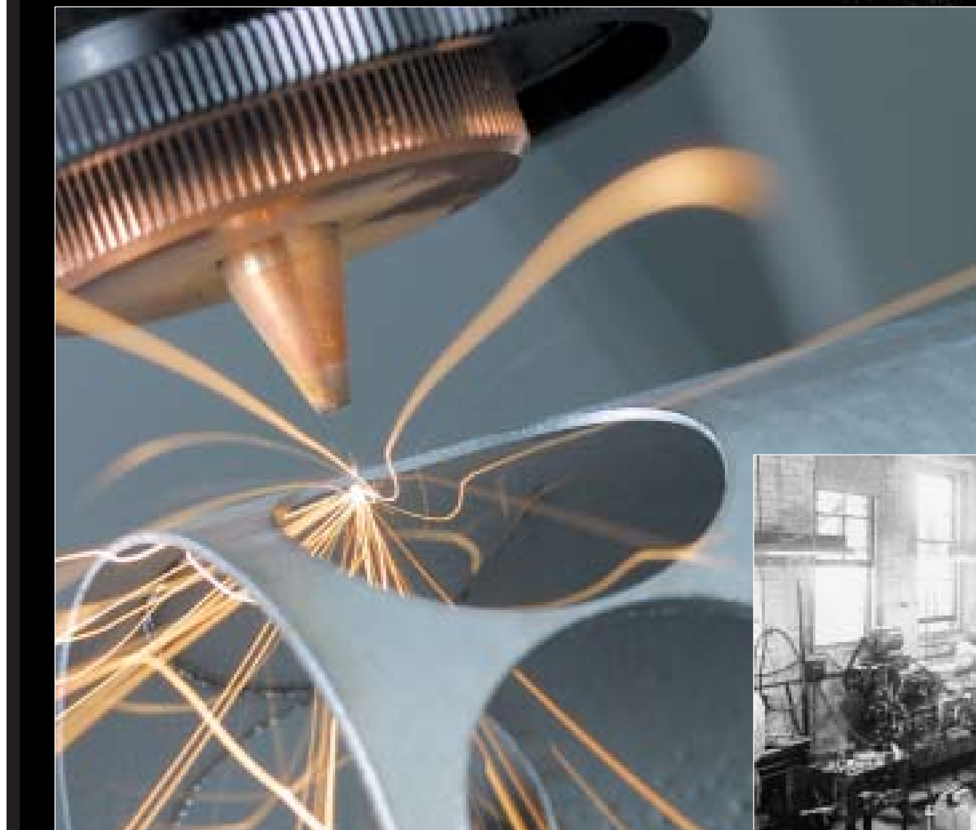
But the jobs are out there, and the manufacturing industry is doing a great deal to support the training of needed workers. There are hundreds of technical schools and training centers around the country that are preparing machinists and engineers for future job openings. But recruiting qualified and interested candidates for these programs is still difficult.



AGAIN: IT'S AN IMAGE PROBLEM

Attracting people is easy with the right image. Students and future workers are attracted to high-tech industries because of the image they project. The dot-com revolution saw companies spending millions on flashy ads to promote themselves to a society with 30-second attention spans. Students in search of a career naturally gravitate toward such industries, because they perceive them as glamorous and lucrative.

Parents see their children's high interest in computers and the Internet and encourage them to pursue these high-tech careers. Yet, few realize just how much technology, computers and cutting-edge software are involved in today's manufacturing. Nor do they realize that most so-called "high-tech" careers wouldn't even exist if it weren't for manufacturing.



THE JOBS ARE OUT THERE, AND THE MANUFACTURING INDUSTRY IS DOING A GREAT DEAL TO SUPPORT THE TRAINING OF NEEDED WORKERS.

WHAT CAN MANUFACTURERS DO?

Manufacturers must work together, work with their local communities and work with learning institutions to create a better image for the industry and build positive awareness of career opportunities. Only then will they be able to attract the skilled people necessary to achieve healthy, sustainable industrial growth.

Here are just a few things that can help:

- ***Start early! Visit local elementary schools, middle schools and high schools to talk about manufacturing – instill a positive image before it's too late.***
- ***Get students involved through plant tours, internships and product demonstrations – show them how "high-tech" manufacturing can be.***
- ***Work with local learning institutions to develop curricula that are interesting to the students, and beneficial to both the schools and to local industry.***
- ***Promote manufacturing as a positive career choice by participating in job fairs and career days.***
- ***Urge your own kids to consider a career in manufacturing – it just might be their American Dream.***
- ***Stop finger pointing! Take an active role to improve the situation.***

Opportunities to train the workforce of tomorrow are expanding every day. And every day presents another opportunity to improve the manufacturing industry's "image." It's time to quit whining and take advantage of them.

From Unemployed . . . to Machinist . . . to Businessman

A Training Success Story

Story & Photos Scott Weersing

When Shawn Gorman was laid off from his last job, he saw it as an opportunity to reflect upon what he really wanted to do with his life.

Although he'd spent much of his career in sales, he soon realized he'd always liked working with his hands. He had taken classes in auto mechanics while in high school, but had always wanted to take a metalworking class. So, finding himself with free time on his hands, Shawn enrolled in a training program at the National Tool and Machining Association (NTMA) Training Center in Fremont, California.

"The program sounded too good to be true," says Shawn, who lives in Livermore. "To go from knowing nothing about machining to being a machinist and getting a job, I wasn't so sure. But the school is very efficient at teaching you quickly."

In August 2001, Shawn joined a class with 19 other students, and together they learned the fundamentals of machining on manual mills and lathes. After learning the basics on manual machines, Shawn was prepared for the automated controls of CNC machines. "It was a very easy transition," he says. "Once you have an idea how to machine manually, then all you're doing is transferring that knowledge to an automated system, and you better understand what the machine is doing."

Shawn graduated from the program in December 2001, and in just a few months he became a full-time CNC machinist, and a part-time businessman making his own parts. He was employed by a fellow graduate of the NTMA training center shortly after completing the 13-week program.

"I made 12 calls to machine shops in the area," explains Shawn. "I went to two interviews, and at the second one, the guy hired me. He was a graduate of NTMA and he knew the kind of education I had gotten there."

The NTMA training center offers classes in entry-level machining, as well as advanced courses in CNC machining, programming and inspection. The modern, 20,000-square-foot facility includes four classrooms, two computer labs and a machine shop equipped with manual machines as well as Haas CNC machines. "We are known for intensive, relevant training," says Tony Tammer, director of training. "If we don't do our job here, then our graduates don't get hired. But we've been successful, and have hundreds of our graduates working in machine shops around the Bay Area."

The NTMA training center in Northern California was established 13 years ago by members of the local NTMA branch as a means to train people as machinists. The training center takes people who are unemployed and, if they qualify, trains them free of charge. The training center is then reimbursed by the state of California, but only after a student has been on the job for 90 days. This makes the goal of the program simple – train people to become employable machinists.

Shawn wasn't even sure what a machinist did when he discovered the training center on the Internet. "The perception I had of a machinist was kind of the one you would see in an old textbook. You open up a book and see an old guy with glasses, a long shop coat and old equipment," says Shawn. "But when I got into the course, I realized there's a lot of technology behind it. It's a completely different world than I imagined. This is really high-tech stuff."

The training center offers extensive hands-on training using Haas vertical machining centers and turning centers, as well as Haas control simulators. "We have ten simulators for students to practice programming, along with two vertical machining centers, a Haas HS-1 horizontal mill and an SL-20 lathe," says Tony. "We wouldn't have any CNC equipment without Haas."

The NTMA training center in Fremont is also a Haas Technical Center (HTC), meaning it has an official partnership with the local Haas Factory Outlet. There are more than 25 HTCs at training centers, technical schools, community colleges and universities throughout the United States and Canada. The goal of the HTCs is for students to take theory out of the classroom and apply it in a manufacturing environment. The NTMA training center works closely with the Haas training department to improve instructional materials, so that students are prepared to enter the workforce. "It has been great to work with Haas to make sure the students are getting the best training available," says Tony.

Shawn feels the training was just what he needed. "I use another brand of machine where I work now, but when I started the job, I didn't know anything about them," Shawn says. "I wish I could have stayed on Haas machines, but the training prepared me for any type of CNC machine."

Shawn now works at Omega Precision in Tracy; he loves working in a job shop. "I love being a machinist," he says, "and it took me all of about two months to get into my own enterprise through the shop. I'm working at the shop, but I'm also designing and making my own aftermarket automotive parts."

The training center prepared Shawn to be a machinist, and from there he has been able to apply the skills to his own interests. Shawn had prior experience designing aftermarket automotive products, and now he is able to make what he designs. "If it wasn't for all the G-code work and programming work I had here," Shawn says, "I wouldn't be able to do what I'm doing now. "

So far, Shawn has designed five types of gearshift knobs that he machines out of 304 stainless steel. "They [his employer] let me come in on my own time to use the machines," he says. "I'm becoming a better designer, because I know what it takes to machine the parts. When you're making your own things without any help, you learn a lot through trial and error."

For Shawn, the NTMA training center was the perfect fit of technology and hands-on application. With his new love for machining, he hopes to expand his own business of aftermarket auto parts. "If things keep going the way they are," Shawn says, "maybe someday I'll have my own shop and Haas machines."

RACE continued from page 5

The NetZero No. 24 Chevrolet continued to improve as the summer ended, including a fifth-place finish at Darlington. It was Sprague's eighth top-5 finish, but he failed to make up ground in the points race, as leader Greg Biffle finished fourth.

Teammate Ricky Hendrick had his best finish of the year when he took seventh place in the Kroger 200 at Indianapolis Raceway Park.

NHRA

In the Top Alcohol Funny Car division of the NHRA Lucas Oil Drag Racing Series, Todd Veney of J&B Motorsports advanced to the quarterfinals of the Pontiac Excitement Nationals in Hebron, Ohio, this past June. In the first elimination round, Veney led from the start to defeat Chuck Cheeseman and advance to the quarterfinals. But Veney then lost to eventual runner-up Frank Manzo.

In September, at the 48th annual Mac Tools U.S. Nationals, Veney faced a competitive field and qualified 14th after three runs. In the elimination round, Veney took on three-time winner Bucky Austin. Veney took a small advantage at the start, but Austin erased Veney's lead before the halfway point, and then pulled away to win by a couple of car lengths.

Ilmor Racing Engines

Ilmor-built Chevrolet engines weren't quite enough for Helio Castroneves to capture the Indy Racing League points title. But it sure was close.

Sam Hornish Jr. beat Castroneves by just inches in the last race of the year at Texas Motor Speedway. The win gave Hornish his second straight IRL crown.

Hornish and Castroneves traded the lead six times in the closing laps of the race, and 10 times overall. Racing side by side, they kept jockeying back and forth – even rubbed tires more than once at 220 mph. But in the end, Hornish took the checkered flag by 0.0096 second, the second smallest margin of victory in IRL history.

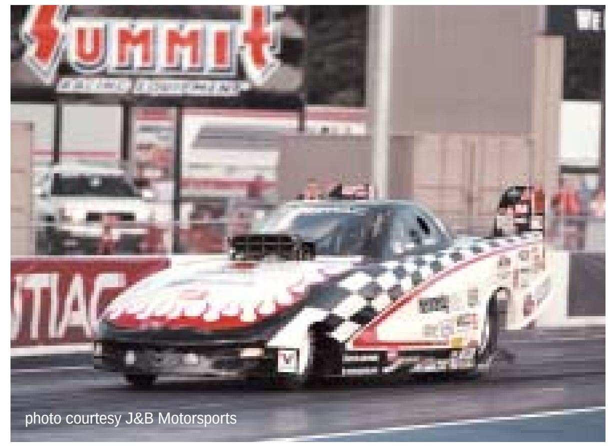


photo courtesy J&B Motorsports

In the final point standings, cars with Ilmor-built Chevrolet engines took three of the top four spots, as Gil de Ferran finished in third place while Felipe Giaffone was in fourth place.

Falcon Cars

Falcon Cars of Concord, North Carolina, will be using Haas machining centers to create 2003-2005 Indy Racing League chassis out of carbon fiber and other composite materials. Owned by Michael Kranefuss and Ken Anderson, Falcon Cars was selected by IRL to be one of the three manufacturers for the new generation of chassis.

"Falcon Cars' technical partners have been critical in helping build a state-of-the-art facility from the ground up," Anderson said. "Without their enthusiastic support, meeting our objectives and deadlines would have been much more difficult. Industry-leading companies in the fields of CAD software, CAM software, CFD analysis, computer hardware, CNC machines, composite manufacturing and rapid prototyping have all come through for us. What we are building is truly world class – the premier race car engineering facility in the United States."

STUDENTS continued from page 3

competition is designed to reward students for their excellence, to directly involve industry in the training process and to keep training relevant to employers' needs.

Furthering the education of skilled labor is vital to the success of the metalworking and manufacturing industries – not only in Canada, but throughout the world. For this reason, the Western Canadian Haas Factory Outlet, a Division of Thomas Skinner & Son Ltd., actively supports the Canadian Skills Competition. For this year's event, the company donated the use of three Haas Mini Mills and three Haas SL-10 Lathes for the CNC Machining Integrated Division competition. All tooling was donated by Sandvik Coromant.

Also supporting the Skills Canada competitors were Rob Ataman of Red River College, David Grabski and Steve Moores of NAIT, Peter Brown of Murdock McKay College, Greg Wahl of BCIT, Bob Wagstaff and Gary Mueller of Mitutoyo, and many others, who donated time to serve as judges and volunteers throughout the competition. For further information about Skills Canada, contact Rob Chioccarello, Executive Director of Skills Canada, BC, at 604-430-2204, or visit www.skillscanada.com on the Internet.

IMTS continued from page 3

bit slow, but those early hours had many exhibitors asking the question: What if we had a machine tool show and nobody showed up?

Thankfully, that was not the case. By midday, traffic had picked up considerably, with a steady flow of visitors streaming through the halls. By day two, things looked more like normal, with steady booth traffic right from the opening bell. For the remainder of the eight-day show, the crowds continued, albeit somewhat diminished from the record-setting numbers seen in 2000.

Seat-of-the-pants estimates from the show floor had attendance down by 25 to 30%, which proved surprisingly accurate. Based on actual registrations, the numbers were off by slightly more than 25% from IMTS 2000 (85,030 registrants versus 114,675).

While no one can argue that the sheer quantity of visitors was less this year, the general consensus among exhibitors was that the "quality" of attendees was up: Those who showed up at McCormick Place were serious about looking at, comparing, and even buying equipment, accessories and software, while the tire kickers and looky-loos opted to stay home.

Today's customers want to get the most value for their machine-tool dollar, and they want to see what a machine can do before they sign on the dotted line. IMTS provides an opportunity to compare machines and manufacturers head-to-head.

As usual, some booths at IMTS drew more visitors than others, and the Haas Automation booth was one of the busiest at the show. With 29 machines all cutting chips, it's no wonder. In addition to a wide selection of standard machines from each product line, Haas also showed a number of brand-new production machines, as well as several never-before-seen prototypes.

A few of the machines that drew the most attention in the Haas booth were the Super VF-2 high-speed VMC, the Z4-500 Laser Cutting System, the GR-510 Gantry Router and the prototype Mini HMC.

The Super VF-2 is essentially a Haas VF-2 vertical machining center that has been seriously hot-rodded. It features a 12,000-rpm inline direct-drive spindle, a 30-hp vector drive system, 1400-ipm rapids and an ultra-fast tool changer that swaps tools in less than 1.5 seconds. The kicker is that these high-performance features don't come at a premium: The Super VF-2 retails for just (US) $56,900.

The Z4-500 Laser Cutting System combines the rigidity and accuracy of the Haas VF-4 platform with the versatility and reliability of a 500-watt Coherent Diamond Series CO_2 laser. The system is fully integrated and easy to use, and all laser variables may be controlled via the full-function Haas control. Base price for this versatile machine is set at (US) $184,900.

The GR-510 is a gantry-style router with full milling capabilities. It features a 10,000-rpm spindle standard, but may be ordered with optional 15K or 30K spindles for high-speed work, or a high-torque 5K spindle for heavier milling. The GR-510 features travels of 121" x 61"x 11" and is base priced at just (US) $79,900.

In 2000, IMTS attracted 114,675 visitors (17,544 among them from foreign countries).

In 2002, attendance peaked at just over 85,000 registrations.

Haas' prototype Mini HMC expands the company's successful mini machine concept to the HMC line. The Mini HMC is a twin-pallet machine with 300 mm pallets and built-in 4th axis rotaries. It features a 12,000-rpm inline direct-drive spindle, 30-hp vector drive system, 2000-ipm rapids and a 24-pocket tool changer. Pallet change time is around the 2-second mark. Sporting high capabilities and a compact footprint, this machine is expected to hit the market with a target price less than (US) $100,000.

At a time when many manufacturers are struggling just to survive, it's encouraging to see an American company that continues to develop new products and innovations.

Easy-to-Use and Affordable Probing System from Haas

Few machinists will dispute the merits of probing for speeding up part setup, setting tool offsets and performing in-process inspection . . . at least in theory. In practice, however, probe systems traditionally have been viewed as difficult to use and expensive to buy. As a result, they've become tools used primarily by experienced programmers in high-production environments.

The Haas Visual Quick Code Probing System includes both a high-resolution spindle probe and a contact tool setting probe.

The new Visual Quick Code Probing System from Haas Automation, Inc., changes all that. Working in conjunction with Renishaw, a world leader in probe systems, Haas has developed an affordable, easy-to-use system that puts probing technology into the hands of the machinist.

Available as an option on new Haas vertical machining centers, the VQC Probing System consists of a spindle probe, a contact tool setting probe, an optical receiver and Renishaw's Inspection Plus software. The entire system is installed and calibrated at the Haas factory.

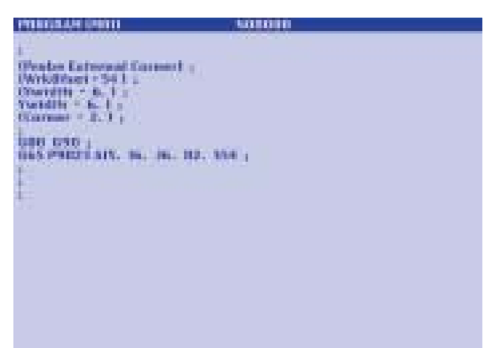
The key to the system's ease of use is Haas' Visual Quick Code, a conversational programming system that uses a graphical interface and a question / answer format to create G-code programs. Unlike other systems, using the Haas VQC Probing System does not require knowledge of macro programming. Rather, the machinist quickly and easily creates probe routines for tool setting and part setup simply by entering basic information into the Haas control through Visual Quick Code.

For example, to probe the external corner of a workpiece and establish a work offset, the machinist simply selects the appropriate graphical template from Visual Quick Code, jogs the spindle probe to within 0.400" of the selected corner and enters the following information: work offset number (e.g., G54), approximate X width of the material, approximate Y width of the material and which corner to probe. Once this information is entered, a pop-up dialogue box prompts the machinist to choose where to output the G code: to a new program, to an existing program or directly to MDI. Once a destination is selected, the G code is generated automatically for the probe routine.

Select the Visual Quick Code template that represents the probing operation you want to perform. In this case, probe an external corner.

Fill in the basic information requested by Visual Quick Code: offset number (e.g., G54), approximate X part width, approximate Y part width and which corner to probe.

Once the information has been input, a pop-up menu prompts the user to select a location for the G-code output. In this case, MDI is selected.



This is the G code generated by Visual Quick Code to probe the left-rear corner of the part. Pressing CYCLE START at this point will run the probe routine to automatically probe the part and record the offsets in the Haas control.

Once a probe routine to measure a tool is created using Visual Quick Code, tool length and diameter are measured automatically and the offsets are recorded in the Haas control.

If the G code output goes directly to MDI, the machinist simply hits CYCLE START to probe the workpiece and automatically enter the correct offsets into the control. If the machinist chooses to create a new program, the program can be called up immediately to start the probe routine, or saved for later use. If the G code is inserted into an existing part program, it can be used to probe each workpiece and update the offsets prior to machining.

The Haas VQC Probing System also has templates for finding the center of a workpiece, probing a bore or boss, measuring bore-to-bore or boss-to-boss and probing a web or pocket.

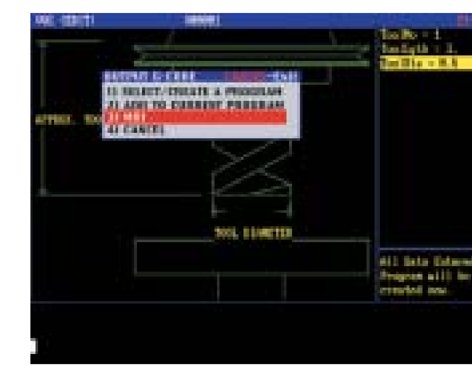
The procedure for setting tool offsets is just as simple as setting work offsets, with VQC templates for automatically measuring tool length, tool diameter or both. The machinist can measure tools individually, or quickly create a probe routine to check an entire carousel of tools.

The advantages of probing are undeniable, and now they're easily within reach of the average job shop. The new Visual Quick Code Probing System from Haas is an all-in-one package that is not only easy to use, but extremely affordable. Priced at just $4,995 (US), it is less than half the cost of comparable systems.

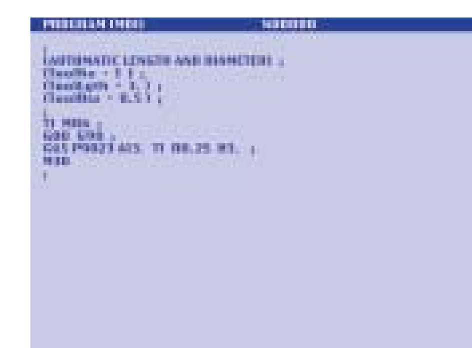
But don't let the low price fool you. This Haas-exclusive system is a full-featured, high-resolution probe system that's fully capable of much more than just tool and part setting. Using macros (included) and advanced programming methods, it can perform such operations as in-process tool and part inspection, first-off part measurement, automatic compensation for thermal changes and even check for worn or broken tools. This greatly reduces operator-induced variations in the process, and guarantees confidence in unattended machining processes for lights-out manufacturing.

Select the Visual Quick Code template that represents the probing operation you want to perform. In this case, it's automatic length and diameter measurement.

Fill in the basic information requested by Visual Quick Code: tool number, approximate tool length and approximate tool diameter.



Once the information has been input, a pop-up menu prompts the user to select a location for the G-code output. In this case, MDI is selected.



This is the G code generated by Visual Quick Code to measure tool length and diameter of the selected tool. Pressing CYCLE START at this point will run the probe routine to automatically measure the tool and record the offsets in the Haas control.

HAAS DEMO DAY 3

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