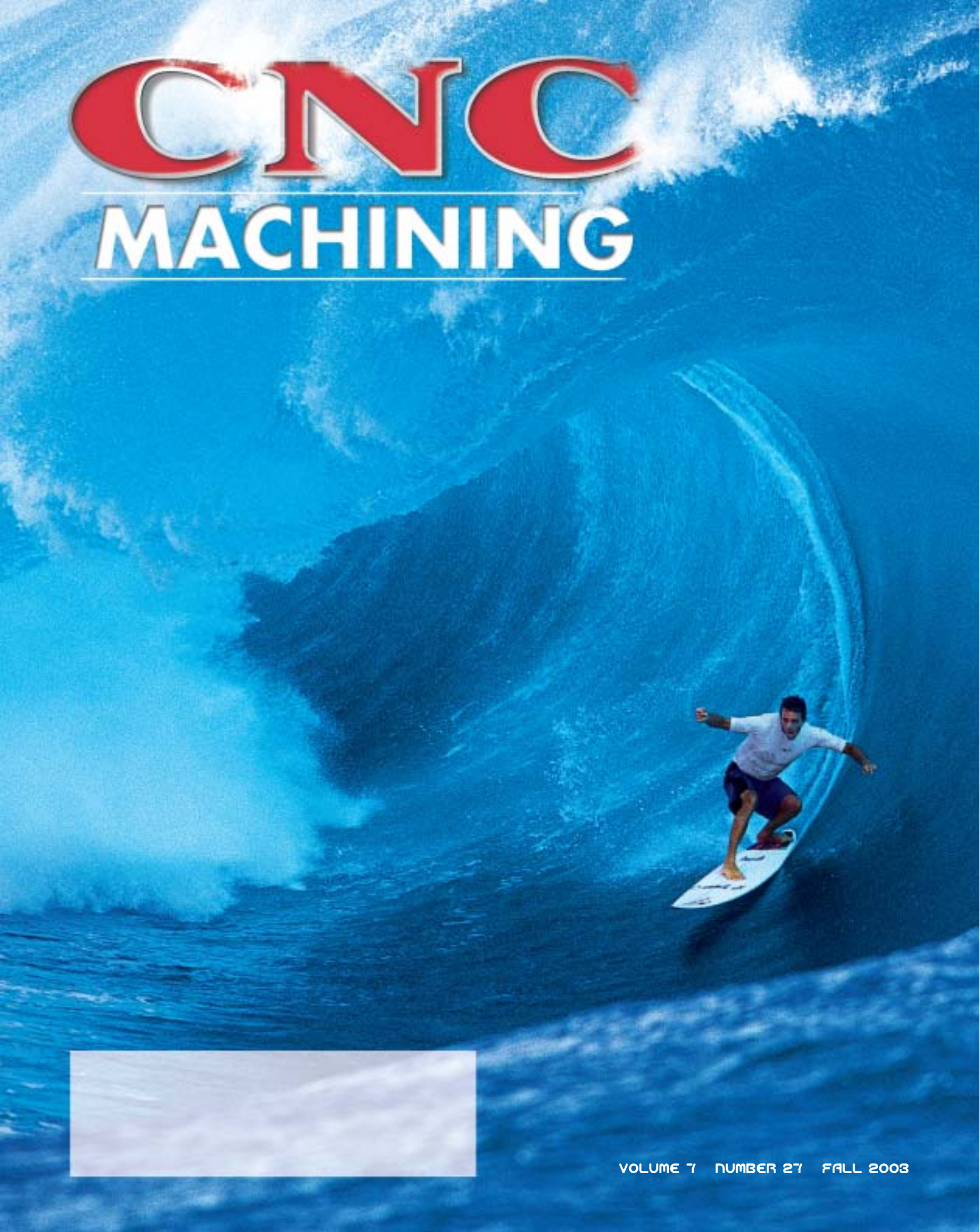
CNC MACHINING



VOLUME 7 NUMBER 27 FALL 2003

CNC MACHINING

Life's a beach, and then you . . .

. . . go offshore.

Whoa! Wait a minute. Them's fightin' words!

Mention the term "offshore" amidst a group of U.S. manufacturers these days and you're liable to get shot . . . or seriously roughed up. At the very least, you'll get a severe tongue-lashing. With more and more manufacturing jobs leaving this country every day, going offshore is a very touchy subject.

For Bobby Szabad, a long-time veteran of the surfing industry, going offshore is a good thing – as long as you're talking about grabbing a board and hitting the waves. But if you're talking about taking manufacturing to the shores of some foreign country to reap the benefits of low-cost labor, loose environmental regulations and lop-sided trade agreements, he wants nothing to do with it.

Szabad is the CEO of Szabad International, a company that manufactures surfboards, softboards and bodyboards. The current popularity of surfing among the masses has seriously increased the demand for his company's products, but he refuses to take production overseas. For our cover story this issue, we'll show you how Szabad teamed up with a local machine shop, Pacific CNC Machining, to increase production and automate their processes.

Much of surfing's growing popularity can be attributed to the image it portrays: a laid-back lifestyle free from the concerns of day-to-day life . . . and loaded with sun, sand and skin. A certain brewing company south of the border (the U.S. border, that is) has taken that lifestyle and put it into a bottle. At least that's their marketing strategy, and it seems to be working. Corona Extra has become synonymous with the sun, the sea and tropical relaxation, and that image has made it one of the best-selling beers in America. All that beer requires a lot of bottles. We took a trip to Mexico City to visit the Fabrica Nacional de Molduras, which produces the bottles for all that Corona, as well as for the other beers brewed by Grupo Modelo. We'll show you how they use Haas machines to make the molds.

If you happen to stay at a hotel while you're at the beach, you might run across the products of Griswold Controls, although you'd probably never know it. Griswold manufactures flow control valves for heating and air conditioning systems, and their products can be found in hotels and resorts around the country. The company recently purchased one of Haas Automation's Z4-500 laser cutting systems to speed production and increase accuracy on their products. Here's how they do it.

On the other end of the spectrum is the Willyard Company in Charlotte, North Carolina. Rather than head to the beach with the surfers, or move to the suburbs with the other machine shops, the owners of this unique contract-engineering firm have opted to remain in the heart of the city. Their dedication to solving customers' problems and adding value to their services is helping them compete with offshore companies.

Our education piece this issue also involves water, but of the chlorinated kind rather than salt water. Cape Fear Community College in Wilmington, North Carolina, recently participated in the second annual underwater ROV (remotely operated vehicle) competition sponsored by the Marine Advanced Technology Education (MATE) consortium of Monterey, Calif. Using a Haas Toolroom Mill, an SL-20 lathe and a vintage, plastic-bodied VF-1, students in CFCC's machining technology program designed and built an underwater ROVer that garnered top honors for design elegance.

As if this issue wasn't wet enough already, we've also got an informative piece about caring for your coolant. Our friends at *Metalworking Fluid Magazine* were kind enough to lend us their resident expert for a few tips on how to maintain and control the lifeblood of your machine tool.

Back on dry land, you'll also find the Race Report. It's been an interesting few months for the Haas CNC Racing team, and for NASCAR in general. We'll give you the latest.

But wait, there's more! Be sure to check out the latest application solutions from the Answer Man, and read up on the next Haas Demo Day.

It's another stellar issue, so grab a cold one, hit the beach and sit back, relax and enjoy!

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IN THIS ISSUE

ON THE COVER

Photo: Tom Servais/Surfer Magazine

Pro surfer Cory Lopez drops in on a monster wave in Tahiti.

It's everywhere, dude! It's on TV, it's in the movies, it's on the radio . . . it's even in this magazine. Check out the show on page 18.

THE MASTHEAD

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Living Beyond Our Means

The leaves are turning, the kids are back in school and the pennant races are in full swing. Football is already consuming every waking hour of the weekend, and the political ads are flying. Summer must be coming to a close, and fall must be rapidly approaching.

Wait, this is an odd-numbered year. We're generally spared the machinations of politicians every other year – there shouldn't be any political advertisements. But for those of us in California, no such luck.

The crux of the recall effort against California's governor is the huge deficit the state is struggling to extricate itself from. The current governor is telling us that he is sorry, and that he will listen to the people and take their concerns to heart. The two front runners vying to replace him both say they're going to solve our budget crisis – but in two very different ways. Will it really make a difference who is in the governor's office when all the campaigning is finished? I don't think so.

It seems we've gotten so used to the federal government spending more than it earns, and borrowing against our future, that it has become "normal." It's the same with almost every state in the Union. During a downturn in the economy, all governments suffer deficits as they try to fulfill the promises and programs they put into place when times were better.

I recently read an interesting article that compared government deficit spending to the spending of an individual family. While many economists have discussed this subject, I found the references of this writer thoughtful and persuasive. He compared the process that government uses – spending 5% to 6% more than it makes every year (GDP) and therefore having to go out and borrow the shortfall (the deficit) – to that of an individual household that spends 5% more than they earn, and borrows the difference by either refinancing their home, getting second mortgages, running up credit card balances, etc. He basically used the analogy to suggest that individuals can't continue doing this unchecked for too long, before the banks, credit holders, etc., stop lending them money or raise their rates, making the debt burden unaffordable. The same should hold true for our governments, he theorized.

While he made a good point, I feel he missed the boat. In actual fact, what he said "can't happen in individual households" is happening throughout the country today. The savings rate in the U.S. is the lowest of all industrialized nations, and individual debt is at an all-time high. The current low interest rates are giving people the incentive to refinance their homes, take out any equity they might have and spend it. Heck, the national economy counts on it: Consumer spending accounts for two-thirds of our economic turnover. Without it, we would be back in a recession (assuming the current one is over).

Other articles have suggested that economists are surprised that citizens are not voicing concern over the current deficits our governments (federal, state and local) are running. People aren't complaining because they're following our government's lead. As long as foreign investors are willing to carry our "paper," and lending institutions are willing to lend individuals money at reasonable rates, what incentive is there to stop going into debt? None. As Hollywood put it in a movie some years ago, it's *Other People's Money*.

I am not a doomsayer, but I do wonder how long it can continue before there are serious ramifications. I fear I show my age, but I remember my father preaching: "If you want something – save up and buy it. If you really want it, you will give up something else to save up faster." He borrowed money to pay for additional land and maybe some large pieces of farm equipment. That is all. We didn't have everything, but we had plenty of food, clothing and the things we needed. We lived pretty well and didn't really worry about how much the neighbors had. In retrospect, I think we were the better for it. Which leads to my closing question: What are we teaching our kids?

Haas Intuitive Turning System

Haas Automation's new TL-1 Toolroom Lathe has a functional range from manual operation to full CNC. The TL-1 features the Haas Intuitive Turning System, a proprietary conversational operating system that makes cutting parts and creating part programs nearly effortless. With an easy-to-read screen that uses full-color graphics on a liquid crystal display (LCD), the control guides the operator through the steps necessary to machine a part. The operator chooses an operation, touches off the X and Z surfaces, and is then prompted to enter basic dimension information. Default values for feed per revolution, spindle speed and depth of cut are automatically entered by the control, but these values may be changed by the operator. Once all necessary information is entered, a push of the

Please see TURNING on page 34

Haas Presents

"Affordable Solutions in Small Packages"

On November 19, 2003, Haas Factory Outlets throughout the United States and Canada will host Demo Day 5, where visitors will see first-hand how small machine tools can make a BIG difference to their business. The event will feature live demonstrations of parts being machined on the most affordable and compact machine tools in the Haas product line.

Demo Day 5 will showcase such models as the Toolroom Mill, the Mini Mill, the Super Mini Mill and the VF-1 – machines that don't take up much floor space, but make a lot of parts . Other affordable solutions on display will include the innovative Mini Lathe and the compact SL-10 turning center.

Visitors to Demo Day 5 will also have an opportunity to see and operate the brand-new Haas TL-1 Toolroom Lathe. The TL-1 combines the full functionality and simplicity of a manual lathe with the power and flexibility of the easy-to-use Haas CNC system – all in an American-made machine that is base-priced less than $20,000 (US). An innovative, conversational operating system makes the TL-1 the easiest to use Haas machine ever (see related article above).

And that's not all – attendees will also see the latest machine tool extras, including CAD/CAM software, cutting tools, workholding and other production-enhancing accessories. As always, Haas applications engineers will be available to answer questions and teach you what they know, and representatives from major

Please see DEMO DAY on page 35

For a complete 2003 Trade Show Calendar, head over to http://www.haascnc.com/news/trade_show.asp

Searching for the Right Combination

Success in racing requires the right combination of car, driver and crew chief. The setup of the car changes every week, according to the track and the weather. The crew chief oversees the car setup and makes constant changes according to input from the driver. The driver is responsible for telling the crew chief about any problems with the car. When things don't work out, a team usually replaces the crew chief first. If that doesn't seem to help, then it's time to look for a new driver.

Searching for better results after months of disappointment, the Haas CNC Racing team replaced crew chief Dennis Connor with Tony Furr back in April, but to no avail. So in July, the team relieved driver Jack Sprague of his duties, putting John Andretti behind the wheel of the No. 0 NetZero HiSpeed Pontiac. Andretti drove three races for the team, and then Jason Leffler took the wheel for a try-out. After some promising finishes, the Haas CNC Racing team decided to go with Leffler for the remainder of the 2003 Winston Cup schedule.

In a strange coincidence, Sprague and Leffler have actually switched places. Leffler has given up his duties as driver of the No. 2 truck in the NASCAR Craftsmen Truck Series to drive the Haas CNC Racing No. 0 car. Sprague has returned to the Truck Series and will drive the No. 2 truck for the rest of the year, once again teaming up with his former crew chief, Dennis Connor.

Leffler has one year of experience driving on the Winston Cup circuit. He drove for the Chip Ganassi race team in 2001, and then moved to trucks in 2002, where he finished fourth in the standings. He was in eighth position in the 2003 truck series standings and captured his first victory at Dover International Raceway back in May.

"I'm happy to be a part of the Haas CNC Racing team," said Leffler, 27. "It's a great team and a great opportunity for me to get back to the Winston Cup Series. Gene Haas, Joe Custer and Tony Furr have worked hard to get me here, and I'm looking forward to our future together."

Despite all of the changes this season, the Haas CNC Racing team has yet to find the right combination to capture a top-10 finish. While the team has managed to have a fast car in qualifying, the success has not carried over to race days. Andretti qualified in sixth position for the Pennsylvania 500 at Pocono Raceway, but then finished 33rd in the race. Leffler managed only a 33rd place finish in his debut for the team in the Brickyard 400 at Indianapolis Motor Speedway. Two weeks later, Leffler qualified sixth for the GFS Marketplace 400 at Michigan International Raceway, but then transmission problems left him in 35th place at the end of the race.

"I hate it that we had that problem with the transmission, because we were going to have a pretty good finish," said Leffler. "It's just a shame. We really had the total package until that problem. Even though the finish doesn't show it, we had a really good car, and I'm proud of this team."

In other news, the Haas CNC Racing team recently added the Earle M. Jorgensen Company as an associate sponsor of the No. 0 Pontiac. EMJ is one of the world's largest independently owned metal distributors, and will be supplying materials and technology support to the team.

Hendrick Motorsports

The Hendrick Motorsports teams have continued to post strong finishes over the summer, including another victory for the No. 48 car. It looks like Jimmie Johnson is having a better sophomore season than his rookie campaign last year. After winning back-to-back races in May, Johnson won his third race of the year when he captured the New England 300 in July.

The victory was a result of Johnson and crew chief Chad Knaus executing a solid fuel-mileage strategy. "I think some strategy played into it at the end, with us pitting at the last minute and gambling we had enough gas to finish it," said Johnson. "After I took the lead, I had to look in my mirror the rest of the way while I conserved fuel and kept an eye on whoever was second. But I was able to ride around and hold on for the win." Johnson is fourth in the series standings, with 11 races remaining.

Jeff Gordon had a run of bad luck over the summer, when he finished outside the top 30 in three out of four races. Gordon ran out of gas on the last lap at Watkins Glen, and was credited with a 33rd place finish. He was then involved in an accident at Bristol that left him in 28th place. Earlier in the summer, Gordon captured two fourth-place finishes – one in the Tropicana 400 at Chicagoland Speedway and the other in the Brickyard 400.

"It was a great birthday for me," said Gordon, who turned 32 the day after racing in Indianapolis. "I know we didn't get many points, but that's championship form as far as I'm concerned for this race team. I couldn't be more proud of them." With 11 races left, Gordon is fifth in the series standings, 591 points behind leader Matt Kenseth.

Hendrick Motorsports celebrated their fourth driver capturing a victory in 2003, when Terry Labonte won the Southern 500 at Darlington Raceway.

"It's really special for me," said Labonte, who won his first race at Darlington 23 years ago. "I was running there at the end with Bill Elliott, and I thought to myself, Man, I hope one of us wins it, because we appreciate this place maybe more than some of these young guys do."

Labonte began the last running of the Southern 500 in third place, and ran in the top 10 most of the afternoon. But it was the work of his pit crew, under the direction of crew chief Jim Long, that put Labonte in position to win. "I knew our last stop was going to be pretty fast," Labonte said. "They've been awesome on pit road, and the crew earned this win."

Labonte's strong finishes during the summer were just a precursor to what took place at Darlington. The two-time Winston Cup champion finished fourth in the Pepsi 400 at Daytona, and captured fifth place in the Pennsylvania 500. Labonte has moved all the way up to 11th place in the standings.

In other news, Nextel, a wireless phone service provider, will take over sponsorship of NASCAR's elite racing series in 2004, replacing R.J. Reynolds, which has sponsored the series since 1971. For the next 10 years, the series will be called the Nextel Cup.

Busch Series

A driver's first win is always the sweetest. For Brian Vickers, it always seemed he was getting just a sniff of victory. After being so close on several occasions this season, Vickers drove the No. 5 GMAC Chevrolet to his first career NASCAR Busch Series win at Indianapolis Raceway Park.

After qualifying a season-best third for the Kroger 200, it didn't take long for Vickers to assert himself as a contender in the race. It did take some careful driving, though, for the 19-year-old to earn his first victory. It was a hard-fought battle with Shane Hmiel.

"I just tried to be patient and wait until Shane's car started to fade away," said Vickers. "It was an awesome race. We made contact several times and leaned on one another, but it was clean, fun racing. It's unbelievable, and I'm not really sure when it's going to sink in that I've won my first race."

Vickers proved that his first win was not a fluke when he captured the Winn

Please see RACE REPORT on page 35

Coolant Control

(or How Can I Prevent Problems?)

Back in the late eighties and early nineties, I worked for a major formulating house. During my tenure, I was assigned to formulate a PAO*-based coolant for a major automobile manufacturer. This project was like manna from heaven for a number of reasons, but most importantly, it was my first really big project for this company – a real challenge. Of course, I was still new to this business then, and, like now, I had a lot to learn. **** PAO, or polyalphaolefin, is a synthetic hydrocarbon liquid (hydraulic oil).***

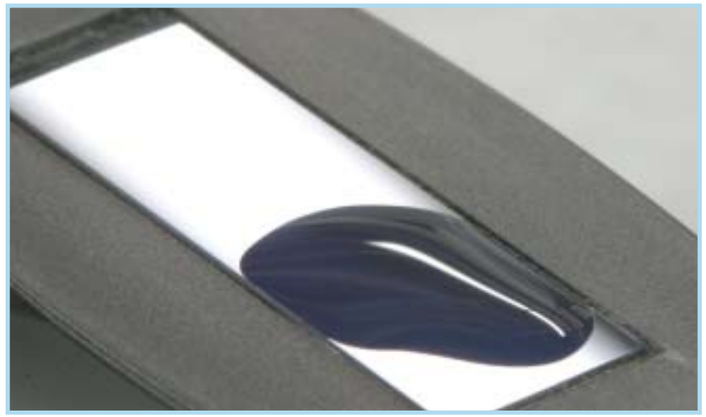
Story: Dom Ruggeri **Photos:** Scott Rathburn

The formulating work went smoothly and quickly. Soon I was ready to place my first project on the "completed" list. The product met all the customer's requirements, and passed their screening tests and our internal tests. We were ready for a customer trial. Or so I thought.

The director of research wanted the coolant to undergo one final round of testing in Tipp City, Ohio. This company manufactured inserts for machine tools and had designed a machine tool laboratory where they could test their products with scientific precision. Further, for a price, they would test anyone's coolants with this same precision.

My "masterpiece" tested well, and that should be the end of this story. However, during a lunchtime conversation with my hosts, the topic of machining problems arose. In their world, they explained, when something goes wrong, the customer always blames the tool. "What!" I exclaimed. "I thought they blamed the coolant!"

Your fluid supplier should be able to supply a graph for converting refractometer readings to concentration. Whether your fluid supplier is using a graph or an equation, be sure that both you and the supplier are using the same model refractometer, as different models yield different charts.



Oh well, different worlds, all working toward the same goal of helping the end user, and in so doing, helping ourselves grow.

In reality, though, no matter whose machines you have, which tooling you use or what types of operations you do, the coolant is the lifeblood of the system. Therefore, the coolant needs to be controlled and maintained. Here's how.

RECORD KEEPING

Whether you're managing a small shop of 5 to 20 machines, or a shop the size of an automotive plant, coolant records keep the systems running and downtime to a minimum. So how do we keep those records?

1. Keep your records in one place.

It can be anything from a simple notebook kept in the manager's office, to an Excel or other type of spreadsheet, to a prewritten program that does everything but add makeup coolant to the system – whatever works for your shop.

2. Use your Data.

Too many people will generate reams of control data and never use it to track system condition; this is a waste of time and effort. Most coolant-related problems can be avoided by using the data generated by daily control checks.

For example: A particular system has used 15 to 17 gallons of makeup coolant each day for the past 6 months. One day it spikes to 25 gallons of makeup coolant. A problem? Not yet. But suppose the increased coolant usage continues for two weeks. Now you better start looking for a reason; that increase has cost you at least 100 gallons of coolant. While that might be just a drop in the bucket for a large machining operation, it could be a real problem for a small shop – it's relative to the size of the shop. But by analyzing the data, potential coolant problems can be identified early, and corrected before they lead to unnecessary expense and downtime.

CONCENTRATION CONTROL

1. Refractometer. The hand-held refractometer uses light passing through a sample of coolant and a prism to measure the concentration of the coolant. The higher the concentration, the higher the refractometer reading. Your fluid supplier should be able to supply a graph for converting refractometer readings to concentration. Whether your fluid supplier is using a graph or an equation, be sure that both you and the supplier are using the same model refractometer, as different models yield different charts. Further, emulsified tramp oil in the coolant will interfere with the measurement and give you a high refractometer reading, resulting in lower concentrations of the other metalworking fluid components essential for optimum performance.

2. Total Alkalinity Titration. This technique uses the alkaline components of the coolant to determine the concentration. Acid is added (a drop at a time) to the coolant emulsion or solution until a pH of 4 is reached, thus neutralizing all alkaline components of the coolant. An indicator solution is added to let the operator know when the appropriate pH is reached. The two most common indicators are Congo red, which changes from red to purple at a pH of about 4.0, and bromophenol blue, which changes from dark blue to yellow at a pH of 3.6. Congo red is most commonly used for soluble oils, while bromophenol blue is used for semi-synthetics.

This technique can be used in all shops, both large and small. For small shops, your coolant supplier can provide a titration kit and a graph or equation to convert milliliters of acid to coolant concentration. Larger shops often have an on-site laboratory and the appropriate equipment to titrate the coolant and compute the concentration. Once again, rely on your coolant supplier to give you the correct procedures.

There are drawbacks to this procedure, however. Let's say, for instance, that the janitorial group accidentally dumps a huge slug of floor cleaner into the coolant tank. Well, the alkalinity will go up dramatically, rendering the titration inaccurate. Of course, there will be other coolant-related problems as well, should this scenario occur.

3. pH. The concept of pH is taught in all chemistry classes, so for the sake of brevity, this description will suffice: pH is a scale ranging from 1 to 14, where 1 is very acidic and 14 is very caustic. This concept applies to water solutions and emulsions only. The pH of the average water-extendable metalworking fluid solution/emulsion should be no lower than 8.5, and no higher than 9.5. Why? Because microorganisms will grow and proliferate in a metalworking fluid if the pH is below 8.5. If the pH is 8.5 or higher, the environment does not promote microbiological growth. Any higher than 9.5, though, and your operators run the risk of dermatitis. The ideal pH range for a fresh coolant charge is around 9.5; after recirculation for about a day, it should level off between 8.7 and 9.0.

4. Acid Split. The acid split measures the amount of lubricant in the coolant emulsion. This is an ASTM (American Society for Testing and Materials) procedure; thus, all the theory and procedures are well documented, so I won't review them here. Once again, your coolant supplier can provide the necessary graphs or factors so that you can convert milliliters of split to concentration. However, one word of caution with this procedure: You are handling concentrated sulfuric or nitric acid; either one will cause injury if mishandled. Hence, only trained personnel should handle these acids.

HOW OFTEN SHOULD YOU RUN EACH TEST?

1. pH: Every day – with the advent of inexpensive pH pens, there is no reason why you can't check the pH of the system each day.

2. Concentration by Refractive Index: Each shift change or every day, minimum.

3. Concentration by Total Alkalinity: If possible, once every day; minimum three times a week.

4: Concentration by Acid Split: If possible, three times per week; minimum once a week.

Take a look at the case study below. As you can see, this system is way out of control – probably loaded with tramp oil and needing makeup coolant badly. These problems did not happen overnight – they were a slow progression

that never would have occurred if the data generated had been analyzed and the system treated promptly. Can this system be saved? I am sure it could, but it would cost plenty in time and dollars.

So, in conclusion, remember these steps to maintaining your systems:

1. Follow the coolant supplier's recommendations, and check your concentrations regularly.

2. Record your data, and keep all your data in the same place.

3. Analyze your data to detect abnormal conditions or anomalies.

4. Act on your data before a minor problem becomes major downtime.

Case Study: Machine 11954

Date	pH	Conc. RI	Conc. TA	Conc. AS
Fresh charge	9.4	5.0	5.05	4.9
01/14/01				
01/15/01	9.0	5.1	x	x
01/16/01	9.0	5.3	5.25	x
01/17/01	8.7	5.0	x	x
01/18/01	8.5	4.9	5.0	x
01/19/01	8.6	5.0	5.0	4.8

As you can see, at least for the first five days, all is well. But how about a month later?

Date	pH	Conc. RI	Conc. TA	Conc. AS
Fresh charge	7.4	8.0	3.05	9.9
02/14/01				
02/15/01	7.0	8.5	x	x
01/16/01	6.8	8.3	3.25	x
01/17/01	6.8	8.3	x	x
01/18/01	6.5	8.9	3.0	x
01/19/01	6.6	9.0	3.0	9.8

Dom Ruggeri *is the technical expert at* Metalworking Fluid Magazine *(www.metalworkingfluid.com) A chemist by degree, he has more than 20 years of expertise in metalworking fluid formulation, including extensive lab work and unmatched hands-on experience solving application and maintenance problems at the manufacturing site. The chief chemist at Crystal Inc.-PMC, he is also an expert in anti-foams and defoamers.*

Crystal Inc.-PMC *is a leading manufacturer of performance chemicals for such industries as tire and rubber, metalworking, hydraulics, lubricants, coatings, cosmetics and cable. Crystal is also the leading manufacturer of anti-foams, and offers a wide range of custom manufacturing services for waxes, wax emulsions, oils and soap production.*

a time to *change*:

Bringing Laser Cutting Home

Story & Photos
Scott Weersing

There comes a time when even successful companies need to make some changes. While many businesses today continue to outsource their machining to job shops, others, like Griswold Controls of Irvine, California, are embracing new technology to reduce costs and control processes.

Griswold has manufactured flow control valves for heating and air conditioning systems for more than 40 years. In 1960, the company introduced a valve with a patented stainless steel cartridge that controls the flow of air or water to ±5% accuracy under any pressure. Today, their products can be found in office buildings and hotels all over the country.

About a year and a half ago, Griswold wanted to modernize their machine shop to bring more control to their own manufacturing and inventory. They decided it was time to bring their CNC machining and laser cutting in-house. Since many of their products contain complex turned parts, their first purchase was an easy decision – a Swiss turning center. But when it came time for a laser cutting system, they soon discovered there was very little available in their price range.

"My boss told me that he would like to bring laser cutting in-house," explains Hemant Shah, director of manufacturing. "But at that time, I had no clue what a laser machine was. So I started looking, and the lasers we saw were priced from three hundred thousand dollars to five hundred thousand dollars. And that's not the price we were looking for. But then, while we were looking for another CNC machine tool, we talked with the people at the Haas Factory Outlet in Anaheim (Calif.), and they told us that Haas was coming out with a laser machine."

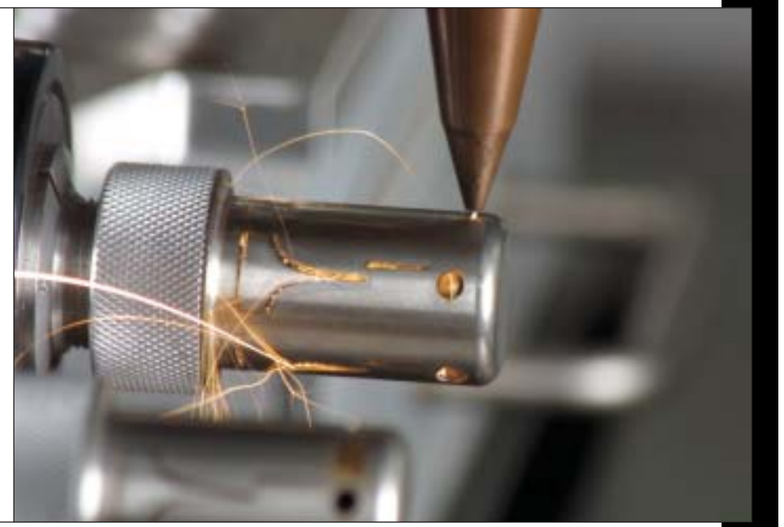
Haas Automation's Z Series laser cutting systems are based on the company's shop-proven vertical machining center platforms, and feature the user-friendly Haas control. A Coherent Diamond-Series CO_2 laser is then integrated into the machine in place of the spindle.

After looking at the possibilities, Griswold chose a Haas Z3-500 laser cutting system for their shop. The machine has travels of 40" x 20" x 25" (xyz) and provides positioning accuracy of ±0.0002". It comes equipped with a 500-watt (average power) Coherent Diamond Series pulsed-beam CO_2 laser that yields a peak power rating of 1,500 watts.

The key component of Griswold's flow-control valves is a stainless steel cartridge cup with parabolic openings cut into it. The parabolic openings maintain a constant flow rate within a broad pressure range. "The openings have to be precise," says Shah, "because we put a spring in the cup that controls the flow to plus or minus five percent. We are the only one in the industry who promises plus or minus five percent, and that's why our valves are so popular."

Depending on the size of the cartridge and its use, there can be up to 20 different profiles for the openings. "The profiles are all computer generated, and they're designed to meet flow and pressure specifications," explains programmer Jim McCulloch. "There are fifteen different configurations that come out of the same half-inch cup, depending on what type of flow and volume the valve has."

"There are fifteen different configurations that come out of the same half-inch cup, depending on what type of flow and volume the valve has."



In the past, Griswold sent the cups to outside suppliers to have the profiles cut using laser cutting systems or EDM, but it made more economic sense to bring the job in-house.

"We were spending approximately three hundred thousand dollars a year for outside processes," says Shah. "The price of the Haas laser system was more in line with what we were looking to spend, and it will only take us a year and a half to pay for the machine. We also liked that Haas was local. I knew we would get the support we needed to make it work."

Griswold's Z3-500 was installed in January 2003, and the first task was to design an effective fixturing system for the thirty-thousandths thick (0.030) cartridge cups. First, to increase throughput and take advantage of the machine's large travels, Griswold installed a Haas HA5C quad-spindle collet indexer, which provides simultaneous 4-axis machining and allows machining of four different cups in a single setup. Jim McCullough then worked with the engineering department to design a vacuum system to hold the cups in place. "All we have to do is screw in a different mandrel to hold a different size cup," McCulloch says. "Right now, we have the machine set up to do two three-quarter-inch cups, and two inch-and-a-half cups.

"We built it this way so I could run any size, at any profile, at any location," McCulloch continues. "It's programmed using macros, so I simply tell it what size cup is going where and what profile is going there – then press Start. Now that we've developed this system, we can do practically any part in our product line."

One of the difficulties Griswold had with outsourcing was inventory control. "We had to order one thousand of each size to get the price we wanted," says Shah. "We used to place an order and wait two weeks for delivery. Then the finished parts would sit on a shelf. Now, with the Haas laser, we are cutting cups when we need them."

And the accuracy is better as well, Shah adds. "Our quality is better in-house than from outside suppliers," he says. "And our assembly is faster, because we don't have to drill any holes or do anything extra. In the past, that wasn't always the case. But we wouldn't send the parts back. Instead, we'd have to drill a little hole in the cup to make sure the flow was correct, or add a shim to make sure the spring wouldn't compress too much. Now, every part is perfect."

McCulloch agrees, adding, "The cups we're making on the Haas laser are also more accurate because we have a better program to cut the profiles. The program that was developed in conjunction with engineering is completely adjustable, depending on what we need," he says. "The machine is extremely accurate, so if engineering develops a profile that is X size, then we get exactly that profile from the laser. We have mechanically inspected the profiles, and they're exactly what we've designed."

Bringing the laser processes in-house also allows Griswold to prototype new profiles easily, and respond to customers' demands quickly. "If someone from the assembly floor comes in with a hot order, we can react instantly," says McCulloch. "If someone says they need two of this and three of that, then that's what we'll run. All I have to do is call up the program and the machine cuts just what we need. And now, engineering is having us make prototypes for them rather than having to send those to outside suppliers."

Griswold's engineering group uses SolidWorks software to design new profiles. "Then they send it over to me and I take it into MasterCam to create the toolpaths for the laser," McCulloch says. The laser also engraves each cartridge cup with a number that describes the profile, which helps with part identification and inventory control.

It only takes the Haas laser about 45 seconds to cut the profiles and engrave the number on each cup. The vacuum fixturing system not only holds the cups in place, but also evacuates slag and small particles generated during machining. When each batch of four cups is done, the vacuum system automatically shuts off so the parts can be removed. At the end of the day, cleanup is easy. Any loose pieces of steel not already cleared are easily removed with a shop vacuum.

Although Griswold purchased the Haas Z3-500 laser primarily to cut the cartridge cups, they've found other uses for it as well. Cutting plastic inserts for the company's Griswold Optimizers is one example. This patented part goes inside a ball valve to control the flow of water. "We bought the laser for the cartridge cups, and then realized that we could use it for plastic parts," says Shah. "We used to have different molds for different inserts, but now we can buy just one size of material and use the laser to cut the insert. We don't have to pay for more molds, so we're saving on capital investments."

In the future, Griswold will be going to more just-in-time inventory. "Right now we're running one shift, but we'll probably go to two shifts as we use up our inventory of cups," says Shah. "And instead of having to order a thousand cups, we can make just what we need."

So while many companies continue with what works, Griswold Controls has taken advantage of new technology to bring laser cutting in-house. And with the change comes the benefits of reduced costs, increased accuracy and better control of processes and inventory.

"If someone says they need two of this and three of that, then that's what we'll run. All I have to do is call up the program and the machine cuts just what we need."

Vacation *in a* Bottle: Corona Extra

Story & Photos Scott Weersing

No other beer in the world is linked to its bottle like Corona Extra. Yet, when people think of Corona, they don't think of a bottle. They think of where they would like to be – relaxing on a warm beach, gazing out at picturesque azure seas. Years of effective marketing have convinced people that Corona Extra is an expression of lifestyle, not just a bottle of beer. People all over the world heartily agree, and choose to drink a Corona because it brings to mind relaxation and escape. Think of Corona as a vacation in a bottle.

The bottle itself is rather simple.

It stands just nine and a half inches tall and holds 12 fluid ounces of *cerveza* (that's Spanish for beer). However, Corona has several characteristics that make it different from any other beer and add to its unique image. For one, Corona Extra is not available fresh from a keg. It's known for being served in a clear glass bottle that has the label painted on. In fact, the Old English style lettering of the Corona Extra label is a registered trademark. Most other popular beers are bottled in brown glass bottles and adorned with paper labels. Corona bottles are sealed with an aluminum cap that can only be loosened with a bottle opener; the bottles have a rough feel that makes you think each one is unique.

Corona Extra is known as a beer imported from Mexico, but it has a long history. The light-yellow beer was first brewed in 1925 by Cervecería Modelo in Mexico City, and was first imported to the United States in 1979 by way of California and Texas. The beer can now be found nearly anywhere in the world. Corona recently became the best-selling imported beer in the United States, and is now the fifth-best selling beer in the world. Back in its birthplace, Corona still holds the crown of most popular beer.

Grupo Modelo, one of the largest companies in Mexico, now produces Corona. In addition to Corona, the company owns nine other brands of beer including Corona Light, Modelo Especial, Modelo Light, Victoria, Negra Modelo, Pacifico, Estrella, Leon and Montejo. The only bottle-making factory for the gigantic Grupo Modelo is the Fabrica Nacional de Molduras in Mexico City. The factory is automated to produce nearly four million bottles per day. That's 120 million bottles per month!

Inside the factory there are areas to produce and label the bottles before they are shipped by train to one of seven Grupo Modelo breweries. At one end of the enormous factory is the machine shop, which is responsible for creating the molds for all the brands of beer.

The machine shop was once a simple operation for a small factory. "We began with just eight people and one manual lathe in 1971," says machine shop manager Julian Fernandez Rodriguez. To keep up with the worldwide demand for Grupo Modelo beers, the machine shop realized they needed automation. "We now have 22 CNC machines, 39 manual machines and 172 employees working in our three-thousand-square-meter shop."

Haas machine tools have been part of the growth of Grupo Modelo and Corona Extra. In November 1996, Hi-Tec, the Haas distributor in Mexico, installed the first Haas in the machine shop – an HS-1RP horizontal machining center. That HMC was, in fact, the first Haas machine installed in all of Mexico.

The machine shop now has a total of five Haas machining centers – three VF-3s and two HS-1RPs. "We bought the Haas machines because of price, performance and service," says Rodriguez. "The president of the factory was very satisfied with the first Haas machine because the service was so good. So it was an easy decision to purchase other Haas machines."

The factory is automated to produce nearly four million bottles per day. That's 120 million bottles per month!

The molds to create a Corona bottle are complex and include 10 different parts. One set of molds creates the top and the neck of the bottle, while a second set forms the bottom half. "The top of the bottle and the mold that creates it are important for several reasons," explains Salvador Vazquez, assistant manager. "The rim of the bottle is where your mouth goes, so it has to be very smooth. Another reason is that the bottles require an opener – they're not twist-off – so the top has to be very strong."

The different parts of the mold are made from cast iron and brass. The cast iron comes from foundries in Indiana. Manual mills are used for roughing the B96 cast iron, and then Haas machines are used for the precision milling, drilling and tapping. It takes about seven hours to create a complete mold for a Corona bottle, with finishing and polishing taking the most time.

The Haas machining centers have helped the machine shop improve how well the two halves of a mold fit together. The shop uses a Haas VF-3 VMC to cut the grooves in the mold. "The different parts of the mold have to be machined to tight tolerances so that they fit together perfectly. We've had better repeatability and accuracy with the Haas machines," says Rodriguez.

The popularity of the Grupo Modelo brands keeps the factory running around the clock, and the machine shop knew it would need machines it could count on. "The service from Hi-Tec has continued to be outstanding," notes Rodriguez. "We have to have the machines up and running to keep up with the demand. We can call Hi-Tec and they are here in 20 minutes. Haas provides far and away the best service when compared to the other CNC manufacturers."

A mold is generally used to create 80,000 bottles before it has to be replaced because of heat and stress. The machine shop manufactures more than 600 molds per month to keep up with the worldwide demand for Corona. In addition to making molds for 12-ounce bottles, the shop also creates molds for 10-ounce bottles and small 8-ounce bottles, appropriately named Coronitas.

The machinists enjoy using the Haas machines because of the user-friendly control. "It was very easy to train employees how to use the Haas machines, because the control is so easy to use," says Rodriguez. "We also like how the control is the same on the vertical and horizontal machining centers. Once you learn how to use the control, then you can use either type of machining center."

In addition to making molds for beer bottles, the machine shop creates molds for bottles of Tequila Sauza. The tequila bottle features an intricate label on the neck of the bottle. The Haas machining centers have helped reduce the time it takes to create the label. "We have seen an improvement in cycle times using the Haas machines, especially on engraving," says Rodriguez. The engraving of the cast iron was once done by hand and took four days. It now takes only 40 minutes, using a Haas VF-3 VMC with an HRT-210 rotary indexer.

It takes about seven hours to create a complete mold for a Corona bottle, with finishing and polishing taking the most time.

The molds for the Corona bottles are used in an automated system that quickly produces thousand of bottles. Sand and limestone are heated in a furnace to 2,700 degrees Fahrenheit to create the glass. Then the molten glass drops into the bottom of the mold. The two halves of the mold quickly come together and then separate, to create the top and the neck of the bottle. A handle grabs the neck and flips it over into a second mold. Air is blown through the top of the bottle to create the middle and the base. The bottom of the bottle is still red hot when it emerges from the mold. All of this takes place in just two seconds.

The finished bottle moves to another unit, where flames burn off any excess material. The bottle then bounces along on conveyer belts to cool down before being placed in a box. The boxes are moved to another part of the factory, where the bottles come out of the box to have the labels painted on. The bottles go back into the box a second time, and then the boxes are wrapped up on a flat. The flat is loaded by forklift into a freight car and shipped by train to the brewery to be filled with the popular *cerveza.*

So when you are enjoying that bottle of Corona and dreaming of being on vacation, you might remember that Corona's unique bottle got its start on a Haas machining center. And while the popularity of Corona grows around the world, Haas will continue to help produce molds for that special bottle of beer.

RIDING THE WAVE:

MAKING A BETTER SURFBOARD

BY SCOTT WEERSING PHOTO: SCOTT AICHNER / SURFER MAGAZINE

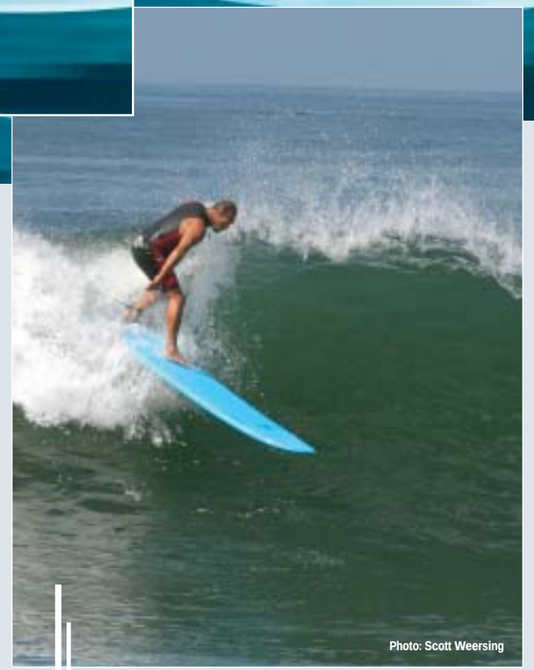


Photo: Scott Weersing

It seems like the influence of surfing is everywhere. You don't have to look far to see someone dressed like a surfer, or an image of someone surfing. And if you listen closely, you'll hear surfer lingo in everyday speech. Once upon a time, surfing was a minor subculture limited to California teenagers and twenty-somethings. Now, though, it's a hip culture on broad display in clothes, movies, music and television.

The call of "Surf's up!" has always been popular where there are waves, but these days surfing is trendy far from the coastal breaks of California and Hawaii. There are no waves in the Midwest, but there are numerous retail stores offering the next best thing – clothing. If you can't surf, at least you can look like you do. And there are lots of young people who want to look like surfers. People who ride snowboards, flip on wake boards, or glide on inline skates all want clothes that are hip. As these new extreme sports have gained popularity, traditional surfer-focused clothing companies such as Billabong, Quiksilver, O'Neill and Roxy have discovered new customers. People who have never touched a surfboard can now look like surfers – and they do.

"In the late seventies, people who liked a challenge went for new sports such as skateboarding, snowboarding, inline skating and wakeboarding. We have now come full circle. It started with surfing, went through all the other sports, and is now back at surfing. Surfing is everywhere you look," observes Bobby Szabad, veteran of the surfing industry and CEO of Szabad International of San Marcos, California. "All these people participating in extreme sports wore surf clothes and admired the surf lifestyle," says Szabad. "They just didn't have an easy way to learn to surf."

Hollywood has taken notice that surfing is "with it." The summer of 2002 saw Disney release *Lilo and Stitch*, an animated movie set in Hawaii and featuring surfing. Then Universal Pictures released the film *Blue Crush*, which was about girls surfing the big waves of Hawaii. The latest James Bond movie, *Die Another Day*, begins with the super spy surfing into a top-secret installation.

Television has also discovered surfing as a way to reach the right demographic – young people with money. There are now several programs which feature surfing. MTV recently aired a 12-week "reality" show about eight girls living the surfer lifestyle. The WB network is also airing a reality surf show called *Boarding House: North Shore*, which features male and female surfers competing in surf contests, while living in a beach house in Hawaii. Even the Nickelodeon channel airs an extreme sports cartoon for the very young set. *Rocket Power* features surfing, skateboarding and roller-skating, mixed with a dash of ethics and moral lessons, for the under-twelve crowd. Surfing has become so popular that the X Games, which feature the extreme sports, recently added surfing to its annual competition.

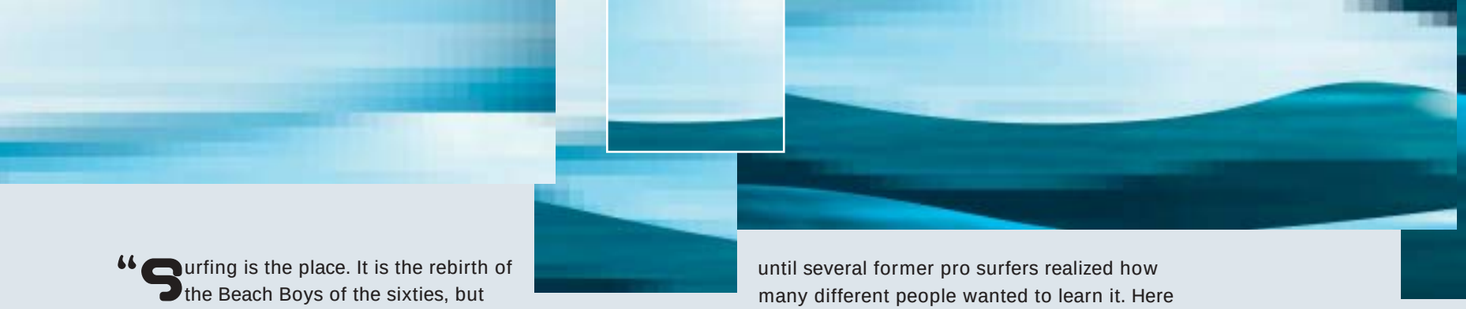
a Brief History of Surfing

by Scott Weersing

Some may argue that surfing has been around almost as long as there have been humans living by the edge of the sea. The natives of the South Pacific were probably riding waves long before explorers first observed surfing in 1779. In fact, there are petroglyphs of surfing that date to 1500 AD. >>

But history's first written record of surfing comes from Captain James King, who wrote about surfing in Hawaii. "Twenty or thirty of the natives, taking each a long narrow board, rounded at the ends, set out together from the shore. Their first object is to place themselves on the summit of the largest surge, by which they are driven along with amazing rapidity toward the shore." Surfing historian Les Drent notes that this journal entry of Captain King's is the first account of he'e nalu – the Hawaiian word for surfing – ever recorded by Western man.

Surfing was a large part of the ancient Hawaiian culture. The ali'i, or ruling class, and the maka ai nana, the common class, both appreciated surfing. Chiefs used surfing competitions to maintain their strength and agility, as well as their command over the people. The ruling class had the first choice on waves, and stealing a wave from a chief would mean a harsh penalty – even death. Hawaiians even had a word for being stoked about surfing: hopupu. >>



"Surfing is the place. It is the rebirth of the Beach Boys of the sixties, but with the girls, the kids and the seniors all invited," says Szabad.

Wherever you look you see surfing – and now people want to learn how to surf, not just wear the clothing. But opportunities to actually learn how to ride a wave have always been limited by who you knew or where you lived. If you did live near the waves – or went on vacation near them – then you had to find someone who could teach you. And if you were female, it was even harder to learn. You had to borrow a board from an older brother, or convince another surfer that you were athletically skilled enough to try it. Learning to surf can take days of trial and error before you figure out how to stand up and ride a wave.

Now, though, the escalating popularity of surfing has led to an explosion of surf schools. While most people learn a new sport by taking a class or joining a team, surfing didn't fit into this model. At least it didn't, until several former pro surfers realized how many different people wanted to learn it. Here was the perfect chance to make money while spending their days at the beach.

"The largest learn-to-surf movement is happening right now," notes Szabad. "Surfing has never seen this, not even back in the sixties. People have always wanted to learn how to surf, but there weren't enough schools to support everyone who wanted to learn," he continues. "We still don't know how many millions of people really want to know how to surf."

As the number of surf schools has expanded, so has the real need for a surfboard that is both safe to use and easy to learn on. In the early days of the sport, surfboards were made from wood (see sidebar), but since the 1960s they have been primarily made using foam and fiberglass. Traditionally, surfboards were always hand-made by shapers who could produce only limited quantities, splitting their time between building boards and riding the waves.

a Brief History of Surfing (continued)

As Puritan missionaries preached a work ethic in the 1820s, surfing slowly faded from the Hawaiian culture. Hawaiians no longer had the leisure time to surf, since they were kept busy attending school or working. But surfing had a renaissance at the start of the 20th century, when Hawaiian George Freeth wowed visitors on the waves of Waikiki. Freeth was also responsible for bringing surfing to California, when he surfed in an exhibition at Redondo Beach in 1907. Olympic swimmer Duke Kahanamoku took the sport to Australia when he was invited to surf in Sydney in 1912. The sport was truly international.

Surfboards were traditionally made from wood, but surfers were always looking for ways to make a better board. One key innovation was the addition of the fin by shaper Tom Blake in 1935. Surfboards had been difficult to maneuver and had a tendency to slip sideways at the most critical moments. Blake added a small fin to the rear end of the redwood surfboards, and the sport was changed forever. World War II then sped up the pace of technology, and before too long shapers were using fiberglass, styrofoam and resin to make surfboards that were both lighter and stronger.

Surfing saw its biggest growth in the U.S. during the 1950s, when people flocked to California and the surfing lifestyle became popular. People would throw a board on top of the station wagon and drive to their favorite surf spot, in search of the perfect wave. As clothing, music and movies advanced the surfing lifestyle, it soon became a favored way of life.

Far beyond the inability to get enough surfboards for students, there's a bigger problem with using fiberglass boards for surf schools: If one gets loose from an inexperienced student, it can easily hit and injure anyone in its path, sometimes seriously. Several companies tried to make boards out of other, softer materials, but students could not successfully ride waves using these boards. The solution was the performance softboard.

The performance softboard has its origins in the Morey Boogie board. Tom Morey of Hawaii invented the Boogie board in 1971, by pasting newspaper on a piece of polyethylene foam. Tom hired Bobby Szabad in 1973 to help him build the new creations, and by 1975, Tom and Bobby were joined by surfing legend Mike Doyle, who helped them bring the Boogie board to the masses. "The Boogie board was a rocket ship," says Szabad. "It was easy to make, and we made millions of them." Doyle thought the same foam used in Boogie boards would be perfect for a surfboard, but no one wanted to invest in a way to mass-produce softboards. "There were already high-performance fiberglass surfboards," continues Szabad. "Who needs a low-performance foam softboard? There were no surf schools back then, and the softboards were hard to make. Everyone saw the exponential growth in Boogie boards, and forgot about the softboards."

With the growth of surfing and surf schools, however, Szabad wanted to find a way to manufacture a softboard that would be safe for students and still have great performance. "By 1998, surf schools started blossoming," he says. "They were once seasonal, but then they started having classes year 'round. Then the operators of surf schools came to our factory and asked if we could make a performance softboard for them."

There were two ways to meet the demand for softboards – go offshore or automate production. Neither choice would be easy. Although surfboard builders have found ways to increase production, the process remains time-consuming and labor-intensive – in fact, it's a process that's ripe for export to nations with low labor costs. But Szabad didn't want to take it overseas.

"We're proud to be an American company. I have never understood why anyone would take something as American as the surfboard and take it overseas," Szabad states. And while other surfboard manufacturers have taken production to China, Thailand and Slovakia,

Szabad knew that surf schools wanted a board built in America. "I have had customers come up to me at trade shows and ask if our production is going overseas. They don't want to deal with a company making boards overseas. People will pay for surfboards that are made here and that will be delivered on time. Nobody has ever been sorry they bought the best."

So how does a company increase production and quality, while maintaining a unique product in a growing industry? While others have ventured offshore to reap the benefits of inexpensive labor, Szabad found a solution right in his own backyard. For Szabad International, the answer to producing more surfboards was right across the street at Pacific CNC Machining. It came in the form of a Haas GR-510 gantry router – a CNC machine with a 40-taper milling head and a 5-foot by 10-foot table that is well suited for making surfboards.

John McClain, owner of Pacific CNC Machining, explains how the relationship came about. "The surfboard company was just across the alley, and I saw them cutting away on band saws. I thought there might be a way to use our CNC machines to help them become automated," he says. "They were thinking the same thing, but unless you have the machining skills and are familiar with CNC, it's going to be a long, hard road."

Szabad agrees. "If it wasn't for John and Haas Automation, we wouldn't be able to meet the demand for our boards. CNC automation was the key."

With years of machining experience, McClain definitely had the skills and experience to make it happen. Before opening Pacific CNC in April 2002, he ran the machine shop at another company. "I had aspirations to do better, though," he says. "I wanted to have my own shop, so I left that company, started Pacific CNC with one Haas VF-4, and I haven't looked back."

To the benefit of his neighbors, however, McClain has looked forward. "I had just been to WESTEC 2002 and seen this new machine from Haas – the GR-510. It's designed for machining long parts," McClain says, "like surfboards. So I took the opportunity to get the GR-510, and then I contracted with Szabad to manufacture their surfboard components."

"When John said that Haas, an American company, had a machine that would be ideal for machining surfboard components, I thought it would be the perfect fit. An American surfboard made on an American machine," says Szabad.

Pacific CNC took delivery of the second GR-510 to roll off the Haas production line. It quickly proved to be as easy to use as other Haas VMCs. "I want to make parts," McClain says. "I don't want to learn how to use a new machine. I knew I could put the GR-510 on my floor and be running it that afternoon. No one out there offers a machine that is this size and this easy to use," he adds. "We think of it as a Super Mini Mill on a big gantry."

Pacific CNC quickly put the GR-510 to use making stringers for Szabad's performance softboards. Unlike traditional surfboards, which have a foam core and a hard outer skin of fiberglass and resin, softboards are constructed of soft foam, with a polyethylene bottom and rigid stringers down the center of the board. The stringers form the backbone of the softboard. Made of wood, they create the rocker, or curve, of the board, and provide the stiffness and high performance that surfers desire. Szabad laminates the stringers with fiberglass for additional strength.

McClain created a fixture out of particle board to hold the material in place on the GR-510. A vacuum system holds the fixture securely to the machine's table, and clamps hold the stringer material to the fixture. To cut the stringers, McClain uses a quarter-inch endmill specially designed for cutting wood. A great deal of sawdust is generated during the 1 minute and 30 second cycle, but a vacuum system mounted next to the endmill clears away most of the loose debris. With cutting speeds up to 833 ipm, it doesn't take long to work through a stack of boards.

"Before we started cutting their stringers, they were making them by hand," relates McClain. "They made some templates, and they would use a band saw to cut them. On a good day, they could make about 20 boards. By cutting parts for them on the gantry, they can now make up to 100 boards a day without too much trouble."

In addition to cutting the stringers, McClain uses the GR-510 to shape the foam for the surfboards. The foam blanks are set directly on the machine's table, and are cut to shape in four operations. Previously, workers at the surfboard company cut the foam by hand using routers and templates.

Not only has the GR-510 increased production for Szabad, it has brought higher quality and repeatability to the surfboard components. "We've been able to take their product from being a very rough, labor-intensive item to being a very repeatable part," says McClain. "With the GR-510, every part is the same. We've been able to eliminate seven operations from their assembly process by doing it with CNC. Just in the short time we've been making components for them, they've been able to double and triple their production."

For McClain, starting Pacific CNC with Haas machining centers was an easy decision. "We chose Haas machines at my last company because of price and the user-friendly control. We were kind of novices at CNC at the time," McClain says. "I have to laugh now, because it took me five years to build a decent machine shop there, and it only took me six months to do the same thing here."

McClain hopes to expand his capabilities further in the next year, and become a full-service machine shop. Versatility was the main criterion for his first vertical machining center, he says. "The VF-4 gives me an edge on the competition, because most people have a VF-3 size machine and they can't do the bigger pieces. Versatility is the key so that I can do parts of all sizes." McClain recently expanded his machine shop by adding a Haas SL-30 turning center. "I had been doing a lot of lathe-type jobs on my mill, but now I'm able to free up the VF-4 for more machining. The VF-4 is a workhorse for me," said McClain.

The final piece of the puzzle for Pacific CNC Machining is developing a quality control program. "My big challenge right now," says McClain, "is QC – quality control. A customer I do a lot of prototype work for is getting ready to go into production, but I need a QC system in place first. Once I have that, I can also bid on some government-type jobs. For a lot of vendors it's important to be quality certified. I think it will be one of the cornerstones of my business."

The future looks bright for Pacific CNC Machining, as more companies see the benefits of keeping manufacturing in the United States. Just as Pacific CNC was able to improve their neighbor's process for making surfboards, McClain knows that the flexibility of the GR-510 will provide more solutions in the future. "The GR-510 can do so many different types of things," he says. "It can cut anything from metal to stone, and I'm looking forward to finding new ways to machine parts with it."

Szabad International, meanwhile, is taking the growth of the surfboard business in stride, and is planning carefully to avoid the delivery problems that ruined past surfboard manufacturers. "We're careful not to take orders unless we know we can fill them," says Szabad. "We don't want to repeat the problems of the past, where people would order boards and then not get them."

To meet the growing demand and further automate their processes, Szabad plans to purchase two Haas GR-512 Gantry Routers (slightly larger than the GR-510) of their own to supplement the work being done by Pacific CNC Machining.

"The world has said, 'I want to learn how to surf,'" says Szabad. "And they're all going to start on our boards. We want kids to have a great first experience, because once they stand up, they are so stoked – and they stay in the sport."

Szabad International
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760-510-1360

Pacific CNC Machining
760-431-7558

Being • Different:

Staying in the City

Story & Photos: Scott Weersing

Many machine shops get their start in the heart of the city. They start out small, and spend their days solving customers' problems with a couple machines and a handful of employees. If all goes well, it's only a matter of time before the company grows and needs to expand. In many urban areas, however, space is at a premium, so most machine shops end up in the suburbs, often in some faceless industrial park.

The owners of Willyard Company, Inc., however, are a bit out of the ordinary. Lee and Carlson Willyard really like living and working in the city, so they've kept their machine shop in the center of Charlotte, North Carolina.

Charlotte is home to 1.4 million people, and could be considered the Queen City of the South. It is the headquarters of such Fortune 500 companies as Bank of America, Lowe's Home Improvement Stores and energy giant Duke Energy.

The Willyard Company began near downtown Charlotte in 1976, and still remains close to the center of the metropolis. "I thought about moving out to the suburbs when we needed a bigger building," explains Lee, "but I'm still a city boy, and I wanted to stay close to the heart of the city."

Willyard isn't crammed down some narrow city alley, though. Instead, the red brick building the company calls home sits on a tree-lined avenue, with open space all around. And while the international airport is only a few miles away, a herd of goats lives right across the street. "I came to work a couple of weeks ago and half the herd was in the middle of the boulevard," says Lee. "I called Animal Control and told them there were some goats out here blocking the road. They asked where, and when I told them, they didn't believe me."

The building itself is as unique as the location. Lee and his wife Carlson have always chosen unusual buildings to house their machine shop – including an old restaurant at one time. "We've always preferred older buildings," says Lee. "They have a certain ambience. Our current location was once a workshop where they made leather aprons." The wall of the lobby even sports an opening where customers, once upon a time, picked up their orders.

"I thought about moving out to the suburbs when we needed a bigger building," explains Lee, "but I'm still a city boy, and I wanted to stay close to the heart of the city."

Constructed before the advent of fluorescent lighting, the 6,200-square-foot building abounds with windows and skylights. Natural light streams in, making the place feel more like a museum or art gallery than a machine shop. "Our previous building was a dungeon," says Lee. "I really like natural light; it makes a difference from a mood perspective."

While the look and location of Willyard Company's machine shop may seem a bit out of the ordinary, their approach to business is not. Using Haas CNC machines, they provide machining services for engineering and industrial design groups, offering solutions for various industries, including automotive, computer components, telecommunications, consumer product development and other manufacturing.

Charlotte is in the heart of NASCAR country, with more than 30 race teams located within 60 miles of the Willyard shop. Before going out on his own, Lee worked in the engine-building programs for the Junior Johnson Racing team and the Holman & Moody Racing team. The experience he gained still helps him today. "I liked solving problems back when I worked for the race teams, and I still like

solving problems using the newest technology," says Lee. "I went into business because of my contacts in the race world. At one time, we made 10 different components that we sold to race teams. But that kind of got old. Then the racing business started to change. Instead of dealing with the people I used to work with, I was dealing with the purchasing department, so we looked for other ways to help people solve problems."

Rather than advertising and bidding for jobs, the Willyards prefer to let their work speak for itself. "We really like to reverse engineer things," says Lee. "People come to us with something they need made, and we find a way to make it faster and cheaper than they can do it themselves."

One example is a job they did for a consumer film manufacturer. "The client wasn't set up to make the part themselves," relates Lee. "We did some experimenting with different materials, and found a type of bronze that had three times the life of the original material. By doing that we were adding value to it. Our parts were at least as accurate as, if not better than, the parts they got out of Japan.

"That's the type of thing where we take something that exists and make it better," Lee continues. "We've gotten into a couple of things that I thought we couldn't do. But you don't know if you can do it until you try."

Willyard purchased its first Haas machining center in 1993 to offer better service to clients. "When I bought that first machine, people told me that I wouldn't be able to cut steel on it, and that it would be worn out in two years," says Lee. "I was a little concerned about the first Haas, but because of the support of Jeffreys (the local Haas distributor), my concern level was very low. If something happened down the road, I knew they would take care of it." Ten years later, that first VF-2 is still in operation.

After using the Haas VMC, Lee became more confident in its ability to machine any type of material, and in his ability to solve problems. "In any kind of business, you're looking for hard assets. For us, you've got to have something you can sell. With the Haas, I was able to go out and take on jobs and do them with confidence."

The Willyards soon found themselves with a backlog of work. They needed to add more machining centers to improve the flow of jobs and better meet their customers' needs. "Things were going well, but we had a huge logjam," Lee says. "We bought a VF-0, and then added a Haas lathe, so we could offer customers a much broader range of machining capabilities. We were then able to do a lot of parts that you could not do manually."

Willyard uses MasterCam and AutoCad software to create programs. The four machinists on staff like how easy it is to transfer programs from the PC to the Haas control using floppy disks. Lee likes the control because it's easy to use, and easy to train employees on. "We write a ton of programs," he explains, "because we do a lot of prototypes. One thing that has worked really well is the edit feature of the Haas control. We use all the power of the [CAD/CAM] software, but we use all the power of the control as well. You can do a lot with the editor on the control. The ability to manipulate programs and copy things over at the machine is great. Sometimes you make a mistake, but having all Haas controls means I only have one level of training."

Willyard has found success in the city, and the company's unique location allows Lee and Carlson Willyard to enjoy the best of both worlds. "We have a great garden out back where employees have their breaks, and yet, we're still close to everything we need," says Lee.

For the foreseeable future, Willyard will keep on helping customers solve problems while enjoying the city of Charlotte. "We've been able to commit ourselves to our customers, and our Haas equipment has helped along the way."

The Willyard Company
704-392-9495

Underwater Roving

It's obvious that Randy Johnson is a teacher. Ask him a question, and his answer is clear, concise and uncluttered. He explains things in order – A first, B second, C third. Lead instructor of machining technology at Cape Fear Community College (CFCC) in Wilmington, N.C., the guy is an interviewer's dream.

Story: Linda Dorr **Photos :** Courtesy CFCC

He's also extremely enthusiastic about his work – especially projects that require his students to practice hands-on design and manufacturing. Since CFCC is located on the banks of the Cape Fear River, and is almost literally a stone's throw from the Atlantic Ocean, those projects tend to center around watercraft – more specifically, underwater craft. In years past, CFCC's machining technology students have built many a human-powered submarine. "That competition has been going on for years," notes Randy. CFCC has won a few awards in that arena, and last year "we decided we had done all we could do with that particular craft, sort of a 'been there, done that' type thing, so we thought we'd look into something else."

The CFCC faculty looked around and found a brand-new competition for underwater remotely operated vehicles (ROVs). Sponsored by the Marine Advanced Technology Education (MATE) consortium of Monterey, Calif., the second annual ROV competition was held in June. The contest is open to high-school and post-secondary students across North America.

An ROV is "basically an underwater robot," explains Randy, "a tethered vehicle. When conditions are unsafe for divers, or the water's too deep, or the amount of underwater time required is too great, then you send an ROV down. Commercially, they range in size from about a two-foot cube up to as big as a Volkswagen. Some of them are huge, 200 horsepower – they lay pipelines and electrical cables. Of course ours isn't quite that big . . . ours fits inside a VF-1" [Haas VMC]. At least it did in the initial stages!

At the inaugural contest in 2002, competing teams built ROVs that had to recover various treasures from the "ocean" floor (the bottom of an 11-foot-deep swimming pool). CFCC's entry, says Randy, "looked almost exactly like R2D2 from Star Wars. And we won – we were the reigning champions the first year."

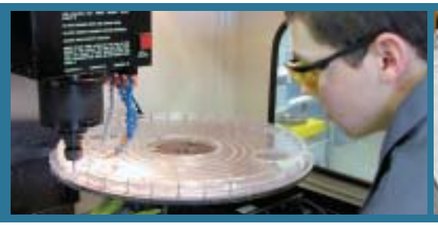
The theme this year was "Lost on the Titanic" – contestants had to design and build a vehicle able to rescue another, "disabled" research ROV that was wedged inside a shipwreck (set up at the bottom of a swimming pool). "There was a size restriction because it had to fit through a hole in the ship, and then it also had to have a lifting capacity of 10 pounds underwater. We had to pull out the disabled ROV and bring it to the surface." While accomplishing the designated feat in the least amount of time is (of course) the main goal, each team is also judged in such areas as ROV design, the team's presentation, and the efficiency and economics of the materials used.

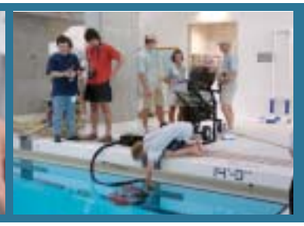
CFCC won the 2003 Design Elegance award, although overall the team didn't place as high as they'd hoped. "Our ROV was a little too big, and we got hung up getting out of the Titanic," Randy explained. "But, oh well, we'll get them the next time." Of 11 teams in the Open (post-secondary) Class, only two came in under the 20-minute time limit. "We still had the best machined and best engineered ROV, by far!"

The spherical shape of CFCC's Sea Devil is unique. "Usually they're cubic or rectangular, and they're constructed out of everything you can imagine." CFCC purchased the polycarbonate sphere that encloses their ROV, as well as the electric motors that propel it. The rest of it was machined – a few parts manually, and the vast majority on one of CFCC's three Haas machines. The ROVs need to be fairly lightweight for buoyancy, so, aside from the polycarbonate platform that bisects the sphere and that everything else is mounted on, Randy's students used aluminum for the rest of the components: the watertight tubes to hold the electric motors; the bracketry; and the pneumatically controlled robot arm for plucking the "disabled" ROV from the shipwreck.

"Every machined component on there has been on one of our Haas machines at one time or another," Randy noted. CFCC's Toolroom Mill is about a year old, the SL-20 lathe is a couple years old, and the VF-1 is vintage, hailing from 1991. "It's been great. We've put a lot of hours on it, and it's had a lot of crashes" – machining instructors say that a lot – "but it comes right back. We had a student drive a three-inch face mill into a vise one day, and it pulled one of the belts off, but we just purchased another belt and had it running again in a couple hours."

Live and learn, as they say. Which is the whole point of these competitions – to give students a taste of hands-on manufacturing. "They benefit tremendously from this. They've got an application for what they're learning, and they get excited about it. Competitions like this really stretch their imaginations." And hone their real-world skills as well.





TURNING continued from page 3

Cycle Start button performs the desired operation. A Recorder function allows multiple operations to be saved, so that the information can be retrieved and the part duplicated.

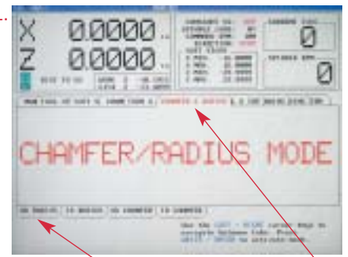
Operations that would be difficult or impossible on a manual machine, such as radii, tapers, profiles, grooving, ID and OD threading, and rigid tapping, are all possible on the TL-1 – without knowledge of G-code programming. Help menus are available directly on-screen, and a dry-run graphics feature allows operators to check their work before running a part.

For maximum versatility, the Toolroom Lathe operates in four modes. In all modes, the Haas control provides extremely accurate digital read-out (DRO) of position, displayed to 0.0005" when using the manual handwheels or to 0.0001" when using the electronic jog handle. Electronic soft stops may be set to limit the travel of the lathe. In manual mode, the X and Z axes are moved via standard handwheels. In semi-automatic mode, the TL-1 performs simultaneous linear interpolation for both axes using a single handwheel. ID/OD chamfers and tapers, for example, are easily cut in semi-automatic mode. In automatic mode, built-in machining cycles (both single- and multi-pass) are available for rough and finish profiling, chamfering, grooving, parting off, threading, drilling and tapping. In full CNC, the TL-1 is programmed using standard G code, and all axis motion is regulated by the Haas control via a G-code program. Programs can be input through MDI, created with the Haas Visual Quick Code (VQC) programming system, or downloaded from any CAM system. Programming with Haas VQC can be done at the control or, with VQC/PC software, downloaded from a PC.

From manual machinists who want a painless introduction to CNC, to experienced CNC machinists who do prototype work or R&D, the Haas Toolroom Lathe is a welcome addition to any shop.

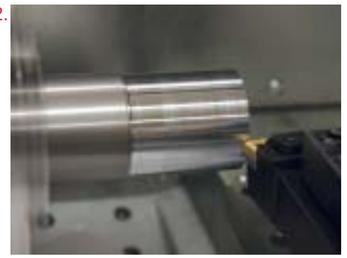
Intuitive Turning System Walk-Through

1.



Begin by selecting an operation from a library of templates. In this example we select the operation, Chamfer and Radius, from the templates. Of the four submenu choices for Chamfer and Radius we choose OD radius. The control then asks you to enter the required information to cut an OD radius.

2.



The first bit of data the control prompts you for is the X-axis endpoint. This is simple to measure by using the jog handles to move the tool to the outer edge of the part.

3.

Now press the X Diameter Measure button to enter the current position of the part into the control. Next, the control asks for the start point of the part, or the Z measure. Again use the jog handle to move the tool to the face of the part. With a touch of the Z Face Measure button, the control automatically enters the start point.

4.

The control then prompts you, in a step-by-step process, to enter the desired radius, depth of cut, feedrate, and spindle RPM. You can now cut an OD radius with a touch of the Cycle Start button.

RACE REPORT continued from page 5

Dixie 200 at Darlington Raceway over Labor Day weekend. Many thought a veteran driver would win the race, but Vickers' pit crew made the crucial difference. Vickers was trailing veteran Winston Cup driver Michael Waltrip late in the race, when Scott Wimmer's crash brought out the caution flag. All the lead cars pitted, and Vickers' crew got him back on the track just ahead of Waltrip, putting him in the lead with 17 laps remaining. Vickers then pulled away to snatch his second victory in just 50 starts.

"The guys did an awesome job. They've done an awesome job all year, but they really came through when they needed to today. They say it takes a veteran to win here, and as a team, I think we're a veteran team," said Vickers. "To be able to come here and win – it's awesome." Vickers moved up to third place in the Busch Series standings, only 67 points behind leader Scott Riggs.

Ilmor Racing Engines

Ilmor Racing, Inc. of Plymouth, Michigan has continued to form new partnerships with some the world's premier engine manufacturers. Ilmor is working with Honda to design, develop and produce the new Honda HI3R Indy V-8 engine. This engine will be for cars competing on the IRL IndyCar Series.

Ilmor is also working with Chrysler to take the company's V-10 engine out of the Viper sports car and modify it for use in high-speed watercraft. Ilmor's responsibility is to ensure the motor is capable of handling the added stress of marine use, while still delivering optimal performance.

J & B Motorsports

The J&B Motorsports Top Alcohol Funny Car made some strong showings in the NHRA Lucas Oil Drag Racing Series over the summer. Driver Paul Lee qualified second in the event at Bristol Dragway, and then edged out Bobby Martindale in the quarterfinals. But Lee couldn't keep up with eventual champion Jay Payne in the semifinals. Lee did get a rematch against Payne at Atlanta Dragway, but the results were the same, as Payne won the semifinal match-up once again.

Earlier in the summer, the J&B Motorsports Funny Car traveled to Hebron, Ohio, for the 39th Annual Pontiac Excitement National. Lee, who qualified eighth, overcame a slow start to defeat Todd Veney in the first round, but Frank Manzo then eliminated Lee in the quarterfinals. Lee is in fourth place in the NHRA Division 2 Top Alcohol Funny Car points standings after four events.

DEMO DAY continued from page 3

workholding, tooling and CAD/CAM manufacturers will be on hand as well.

As an added bonus, most HFOs will be giving away Haas promotional items and chances to win such in-demand sports memorabilia as autographed NFL footballs or helmets, and NASCAR or NHL collector's items. Each local HFO will offer different items, depending on the popularity of local sports teams. But one thing is for sure: You'll have to attend the event to have a chance of winning any of the signed collector's items. So be sure to mark November 19, 2003, on your calendar for Demo Day 5.

U.S. Manufacturers Holding Their Own?

By some accounts, America has lost more than two million manufacturing jobs in the past 36 months alone. Where did these jobs go? The answer is that they've gone to many places around the globe. Will those jobs come back to U.S. soil? Probably not.

There are many small to medium-sized manufacturing companies that want nothing more than to compete with the rest of the world – at least they would if the playing field were balanced and fair. Leveling that field and making global competition work for everyone is the focus of a new group of manufacturers in the United States.

The Manufacturing Coalition is a grass-roots organization bringing together businesses, professional associations and concerned individuals to promote America's manufacturing base. Whether you're a captain of industry, a plant manager or a CNC machine operator, the Coalition is seeking your participation.

If you'd like more information about the MC, call 888-258-8162, or contact them at: The Manufacturing Coalition, 734 Franklin Avenue, PMB 689, Garden City, NY 115390.

the answer man

Dear Applications:

We're using the tailstock on our SL-30 lathe for the first time. We can't get the tailstock to hold the part tight – it keeps backing off. It stays tight for about 1 minute or less. We've been using the soft key JOG button to move it. Is this the right way to do it? If we try to use the foot pedal, it alarms. What are we doing wrong? Any help on how to use the tailstock would be great.

Bryan Marshall

Dear Bryan,

The best way to use the tailstock in automatic operation is with the M21 (Tailstock Advance) and M22 (Tailstock Retract) commands. Also, Setting 107 (TS Hold Point) is crucial – you're getting an alarm when you use the foot pedal because there is either a positive value or the wrong value in Setting 107. You'll need to enter a negative value here that is about 0.500" past the hold point.

To find this value, press HANDLE JOG, then the B button, then HANDLE JOG again. Using the Jog Handle, manually move the B axis (tailstock) toward the workpiece that has already been center drilled. When you make contact with the center-drilled part, go to the POS-MACH display and find the negative number that is associated with the B axis. Subtract 0.500" more for this move into the part, and enter the resulting negative value in Setting 107. This will cause the tailstock to apply constant pressure on your workpiece when you call an M21. You should also use Settings 105 and 106 for tailstock retract / advance distances. Finally, note that the recommended hydraulic operating pressure is above 120 psi (tailstock pressure gauge is on the front of the machine).

The Haas Operator's Manual has a very good diagram and explanation of how this works. It's on pages 94-95 of the current (January 2003) version; if you have an older manual, check the table of contents for "Hydraulic Tailstock Settings."

Sincerely,
Haas Applications

• • •

Dear Applications:

I've been using G47 (Text Engraving) for sequential serial number engraving on my VF-4. What causes the machine to increase the number by 1? Is it the M30 at the end of the program? I ran 50 pieces several months ago and numbered them 1-50, and now I want to run another 50 pieces and start numbering them at 51. How do I do this? Do I need to change Macro #599 to 51?

Curt Olsen

Dear Curt:

The G47 cycle itself is what triggers the counter; after each engraving operation, the counter (macro #599) advances.

You are absolutely correct about setting Macro Variable 599 (in Current Commands) to the serial number you want to start with. The other option you have is to program the initial serial number: In MDI, enter G47 P1(51) to start at SN 51. The engraving section in the operator's manual has more details about this function.

Sincerely,
Haas Applications

• • •

Dear Applications:

I am trying to run a 3D program on my VF-3. It's too big to fit on a floppy, and we cannot send files from PC to Haas yet. Is there a way that I can take the three programs that actually make up one part and combine them on the Haas? I am looking for a way I can run this part overnight, without having to come in and call up another program.

Dave Bartlett

Dear Dave:

Yes, you can combine your three programs easily. Make a cover program like this:

O0001;
M98P101; *(first sub-program number is O101)*
M98P102; *(second sub-program)*
M98P103; *(third sub-program)*
M30;

Be sure to put an M99 instead of an M30 at the end of each sub-program, so that it will return to the cover program.

Sincerely,
Haas Applications

• • •

Dear Applications:

I'm cutting threads on my SL-20 turning center and would like to improve them. Is there an option in the G76 (threading, multiple pass) cycle to repeat the finish pass?

Gabriel Romero

Dear Gabriel:

There are a couple of ways to do this. You can change Setting 99, Thread Minimum Cut, to a smaller number so that the thread cycle will take spring passes. The factory setting is 0.001; try 0.0001 and see if that gets the results you're looking for.

The other thing you could do is write the spring pass into the program, using either G76 for two passes or G92 for one pass:

G76 X Z K F D (*make the D value large so it only takes two passes)*
G92 X Z F

Sincerely,
Haas Applications

• • •

Dear Applications:

Do you know of any PC-based G-code interpreters that closely match (or identically match) the Haas interpreter on the Mini Mills? We have many students learning to use the Haas machines. When they generate G-code (using Virtual Gibbs), the Mini Mill inevitably discovers errors with the code during screen pass. Rather than waste valuable machine time, it would be better to have students run a screen pass on the PC and make necessary changes. Does Haas offer such a utility? Do any exist elsewhere?

Adam Bowen

Dear Adam:

You have a couple of options. Haas offers low-cost CNC control simulators, which are popular items at a lot of schools that use Haas machines. In addition to proving out programs, simulators let students get familiar with the Haas control without taking up valuable machine time.

You can also use MetaCut Utilities, a very handy program for verifying toolpaths. On the Haas website, *www.HaasCNC.com*, go to the solutions/applications menu, click on Industry Links and look under CAD / CAM Utilities. MCU offers a free 30-day trial.

Sincerely,
Haas Applications

• • •

Dear Applications:

I have a VF-2 with an HRT-210 rotary table. I'm having a problem getting the X axis and the A axis in sync – unless I keep the feedrate low, they don't reach the endpoint at the same time. At higher feedrates, the X axis goes past its endpoint. Then, when the A axis reaches its endpoint, the X axis jumps back to the proper point. There are no alarms generated.

The only thing I could think to do was check the settings and parameters, but I can't find any problems there. Do you have any suggestions?

Mike Nevers

Dear Mike:

You pretty much answered your own question for us – when X and A don't reach the endpoint simultaneously, it's because you're exceeding the rotary's maximum feedrate.

According to the settings you sent

us, your fourth axis diameter (Setting 34) is only 0.92". With a feedrate of 35 ipm, that means you're trying to cut at 73 degrees / second – but the maximum feedrate on a standard HRT-210 is 60 deg / sec. For a part this small, you either have to slow down the feedrate or invest in a higher-speed model. The Haas super high-speed HRT-210SHS has a max feed of 270 deg / sec.

TIP: You might want to save the following formula for calculating a rotary feedrate.

The circumference of a circle equals the diameter times pi (3.14), so:

0.92 x 3.14 = 2.890 in.
(circumference of workpiece)
2.890 in. ÷ 360 deg = 0.008
(inches per degree on the rotary)
35.0 in. / min ÷ 0.008 in. / deg = 4,375 deg / min
4,375 deg / min ÷ 60 = 72.9 deg / sec

Sincerely,
Haas Applications

HAAS AUTOMATION INC. THE SHAPE OF THINGS TO COME.