

CNC

MACHINING

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coverstory

PacWest Ahead of the Curve for '99

features

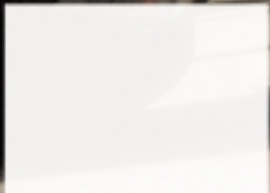
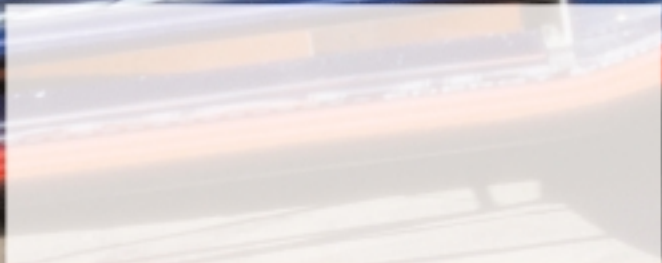
Morgan Motor Company's Switch to CNC

Innovative Metal Designs:

Crash-Test Dummies to Race Cars

Haas Beats Hurco Lawsuit

New SL-Series Lathes Unveiled



Denis Dupuis General Manager, Haas Automation

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Coverstory



Photo: Scott Rathburn

PacWest Racing Group is way ahead of the development curve as they head into the 1999 season. A new outlook and a shop full of Haas CNCs are expected to put them at the head of the pack.

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Mauricio "Big Mo" Gugelmin attacks a corner during the Toronto Molson Indy in July.

Cover Photo: Dan R. Boyd



Measuring The Year's Results

The fourth and final installment in the series of articles on managing your business is finally here. A year ago, we began this process by making a plan and we've since discussed implementation strategies.

Now we want to know how we did. This editorial raps up the final steps of the business management cycle. Measurement. You know, the paperwork part of the business – that stuff we relegate to the wife, or niece or someone in the office. We make parts, and they tell us if we made any money at it or not.

The measurement process I'm going to talk about is relatively simple. We start again with the plan we made last January.

Step 1 is to establish the standards and methods for measuring our performance. This task is dependent on how detailed our original plan was. If we just wrote down a total sales number, our measurement is going to be easy. We will simply add up the total sales for the business. If our plan was more complicated, we have to sort our records according to what it is we planned and what we now need to measure.

Step 2 is to actually measure our performance. This is where we get those office people to add up the numbers in the categories we want to check.

Step 3 is to compare our actual numbers with our planned numbers and determine the variance. If it is just sales numbers we were working on, then the question is: Did we meet our

should also be measured and compared to our plan. We need to know how much it cost us per dollar of sales in expenses. We should compare if we invested our money wisely or merely spent with no return. Our analysis should also include short-term and anticipated, long-term benefits from our spending. Are we willing to give up some short term gain to get greater gain in the future?

Step 4. Now that we know how we did in all of these categories, we can begin to take corrective action in areas where we under performed. This, of course, goes back to the problem solving model we discussed a few articles ago. This is where we figured out what went wrong so we could come up with some better ways to do things next year. This exercise won't fix last year's results, but even if done simply, it will help



plan? If yes, great, let's go celebrate. If not, hmmm, what to do? What to do?

For most of us, at the very least, we plan the subsections of an income statement, so our comparison is going to be more difficult. Did we meet sales numbers? Did we meet our expected cost of goods sold? If we sold what we wanted, but our costs were higher than planned, maybe we didn't make any money. Our general and administrative expenses

prepare us for our new plan for 1999. As Charles F. Kettering said, "My interest is in the future because I am going to spend the rest of my life there." How much are we willing to invest?

Just when you thought you were done – yes, the whole cycle starts over again. This time, however, we have the advantage that by having done this in 1998, our future plans will be even better. ☐

THE MASTHEAD

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Haas Wins \$270 Million Hurco Lawsuit

Since July 1997, Haas Automation, Inc., has been on the receiving end of a lawsuit brought by IMS Technology, Inc. (IMS), a wholly owned subsidiary of Hurco Companies, Inc., alleging infringement of U.S. Patent No. B1 4,477,754 (the Patent) for an "Interactive Machining System." Gene Haas, president and owner of the company, was personally brought into the lawsuit as an additional defendant in March 1998.

IMS claimed that the Patent broadly covered all interactive parts programming, and demanded a license fee from Haas Automation. When Gene Haas refused to pay, IMS sued.

"They wanted \$90 million from us unless we agreed to pay them a \$2 million license fee," says Gene Haas. According to Haas' lawyer, Theodore Pianko, IMS lawyers threatened triple damages for "willful infringement," bringing the total to \$270 million. "We just brought it all the way to the court and let the court decide what the Patent meant," Haas says.

On October 2, 1998, the United States District Court for the Eastern

District of Virginia dismissed the lawsuit on the grounds that all models of Haas CNC machine tools, including those with Quick Code and Conversational Quick Code programming options, did not infringe the Patent. The court, presided over by U.S. District Judge Leonie M. Brinkema, granted summary judgment in favor of Haas based on its interpretation of the claims of the Patent. The ruling came a week before trial was scheduled to begin.

Haas Automation was just one of a long list of defendants IMS chose to sue for allegedly infringing the Patent. In all, at least nine different lawsuits have been filed against more than 60 defendants. The list reads like a Who's Who of machine tool manufacturers: Fanuc, G&L, Okuma, Bridgeport, Vickers, Mitsubishi Electric, Yamazaki Mazak. One by one, every major manufacturer opted to take the easy way out and settle, negotiating either a one-time payment or ongoing royalties. Gene Haas was the only defendant who refused to buckle under the pressure of a protracted legal battle and stand up for what is right.

The Hurco Patent has quite an interesting history. The original application was filed with the U.S. Patent and Trade Office (PTO) in July 1976 by Gerald V. Roch, the president of Hurco from 1968 to 1985, and two consultants. The application was assigned to Hurco before the original patent issued. The actual Patent was not granted until September of 1984, after eight years of clarification and refinement.

The PTO originally rejected the patent application on the grounds that the claims were too broad and were "anticipated" by existing patents or were "unpatentable."

During the next several years, after subsequent amendments, the application again was rejected on the grounds that, "The specification inadequately describes interactive machining . . ." The PTO went on to say, "At best these features have been described in terms of desired results with little or no disclosure of any

Please see page 30

Haas 1999 Trade Show Calendar

| Show | Dates | Info |
|--------------------------------------|---------------|--|
| Orlando APEX Orlando, FL | January 19-21 | Held at Orange County Convention Center. More than 4,500 visitors are expected. Haas Booth #301 |
| Nashville APEX Nashville, TN | March 2-4 | Nashville Convention Center location for more than 4,000 buyers. Haas Booth #701 |
| WESTEC Los Angeles, CA | March 22-25 | North America's largest annual metalworking and manufacturing exposition. More than 30,000 attendees expected. Haas Booth #3229 |
| Twin Cities, APEX Minneapolis, MN | May 4-6 | More than 8,000 buyers are expected at the Minneapolis Convention Center. Haas Booth #301 |
| Eastec West Springfield, MA | May 25-27 | The East Coast's largest annual manufacturing systems trade fair. Expected to attract more than 20,000 attendees. Haas Booth #2448 |

As the checkered flag dropped on the 1998 racing season, teams carrying the Haas logo were already rolling out their new chassis for early testing. All across the United States, fresh tubing wrapped in raw carbon fiber body panels has been screaming around test tracks in search of that extra edge over the competition.

PacWest Racing Group

FEDEx CHAMPIONSHIP SERIES

PacWest Racing Group has been testing chassis #001 of the Reynard 99I Champ car since November. They've been running the car deep into the corners and flat out down the straights at various tracks, looking for the perfect suspension setups to stick drivers Mauricio Gugelmin (#17) and Mark Blundell (#18) in the winner's circle for the '99 CART FedEx Championship Series.



John Anderson, PacWest's vice president of race operations, said being the first team to get a '99 car will be a great competitive advantage, and will allow them to get in a lot more pre-season testing. "It's earlier than we've ever had a car before," he said.

"From the outside, a lot doesn't appear to have been changed," commented team manager Russell Cameron about the new car. "But Reynard has done a lot of detail work under the skin that will make the car easier to work on and more comfortable to drive. The 99I also features a new aerodynamic package."

PacWest endured a difficult '98 season in the Champ car series with Mauricio Gugelmin earning a top finish

of 4th and teammate Mark Blundell a 6th. However, Gugelmin led the pack for 40 laps during the last race of the '98 season at Fontana's California Speedway where he holds the track's average qualifying lap record at 240.942 mph.

CART Spring Training, February 3-4 at Homestead, will provide the ultimate side-by-side comparison of the team's new entries. Of course, not everybody is willing to show their complete hand at this pre-season shakedown fest!

PPG-DAYTON INDY LIGHTS

PacWest's efforts in the Indy Lights series found Didier André racking up enough top-five finishes to earn a place on the podium at the end of the season with 2nd place overall in the points race. His efforts included his first win at Laguna Seca Raceway near Monterey, Calif. Paul "Ziggy" Harcus, PacWest Indy Lights team manager, says, "We're the top team in Indy Lights right now. The team has been great all year. Didier has done a great job for us, and I can't say enough about the group of guys we've got."

Hendrick Motorsports

WINSTON CUP SERIES

Third time's a charm, right? Then pass the champagne to Jeff Gordon, the 27-year-old Hendrick Motor Sports driver has once again put his name at the top of the points race at the end of the hotly contested NASCAR Winston Cup Series championship. This puts the Hendrick team in the win column for the fourth straight year in this, the 50th anniversary of the series.

Clinching the championship at Rockingham, Gordon pushed the limits of his professional envelope and went



on to win his 13th race of the season, equaling a record for the most wins during a season held for the last 23 years by "The King" - Richard Petty.

Finishing 364 points ahead of Mark Martin, Gordon (#24) posted 26 top-five finishes in the official 33 race season with winnings in excess of \$6 million. Jeff received an additional \$2 million at the NASCAR awards ceremony. Fellow Hendrick teammate Terry Labonte (#5) finished 9th in the points race with one win and 15 top-ten finishes.

CRAFTSMAN TRUCK SERIES

Jack Sprague had a rough go of it this third year of the NASCAR



Craftsman Truck Series. He won the last race of the season only to finish three points behind rival Ron Hornaday.

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Dramatic Evolution at Morgan

Story
Mike
Excell

Photos
Richard
Surman

How many British-owned motor car manufacturers can you name? Mike Excell of Metalworking Production Magazine in the U.K. visits a famous survivor, and finds that the secret of success is managing change, while maintaining the core values which have made it one of the most enduring names in motoring.

Morgan Motor Company (the last genuine sports car builder?) moved to its present Malvern Link site in 1918. Externally, things probably haven't changed much. Glimpses of ash frames and gleaming chrome through open workshop doors, and hill climb posters in the lobby, evoke an England which perhaps never really existed, but ought to have done: a comfort zone where the roads are always open, and the soundtrack is forever Elgar.

But Morgan, inseparable from its sepia-tinted imagery, is also the model of a modern, market-oriented company. It provides customers with what they want – including the exclusivity of a car for which the wait is part of the deal. Market awareness also means responding to external market conditions, like changes in legislation. Adapting to circumstances without losing core values is never easy; Morgan appears to have mastered the trick.

The company was founded by "HFS" Morgan in 1911; by the 1920s it was one of Britain's largest manufacturers, building fifty three-wheelers a week to meet growing demand for inexpensive transport. The 1930s introduced mass production to the car industry, and the "light car" market contracted. Morgan responded by building on the sporting heritage which underpins the current range. Nowadays, it's a niche manufacturer, producing 500 cars a year under the helm of Peter and Charles Morgan.



Relative new boy John Curtis (9 years service) is responsible for programming, setting and operating the Haas VF-0E. Morgan routinely recruits local apprentices such as John who happily spend their entire working lives with the organisation.

PLANT AND WORKFLOW IMPROVEMENTS

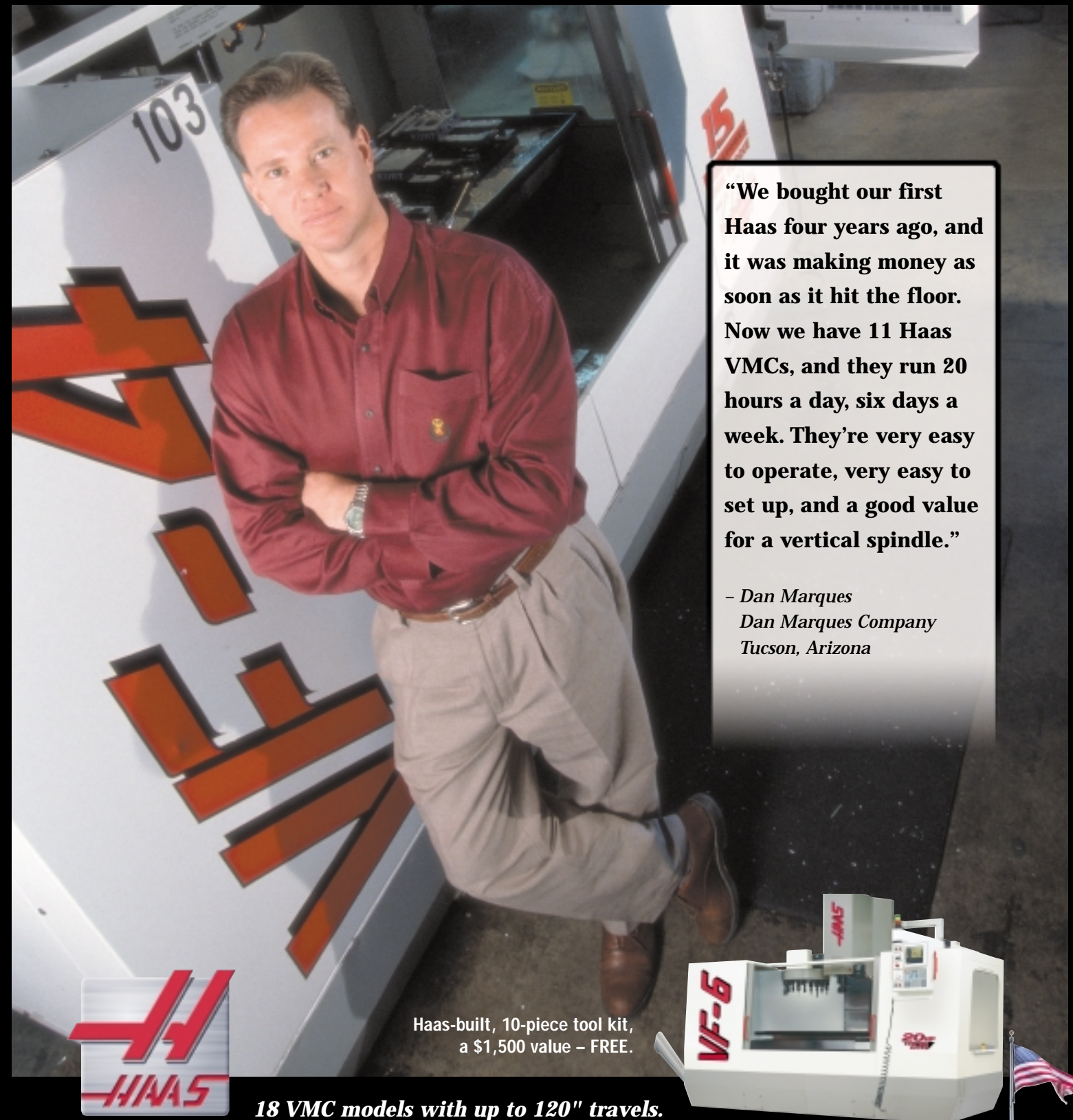
In late 1997 Morgan invested in its first two CNC machines. Assistant managing director Mark Aston puts this in context. "We had a very set production system, but a few years ago we made a big change, partly driven by Environmental Protection Agency regulations. We were going to have to spend a lot of money on our paint shop to upgrade it. We decided to spend £100,000 on building a new paint shop on space created by knocking down some older buildings. This freed a complete building."

Compulsory purchase of land surrounding the factory by the Royal Signals Radar Establishment in the 1940s had left no room for expansion. Now, clearing one workshop and freeing space in others created the floor space needed to produce extra cars, and allowed work flow to be rationalised. "The process we use for

Please see page 6

Working Class Heroes.

Dan Marques and Haas VMCs



"We bought our first Haas four years ago, and it was making money as soon as it hit the floor. Now we have 11 Haas VMCs, and they run 20 hours a day, six days a week. They're very easy to operate, very easy to set up, and a good value for a vertical spindle."

*- Dan Marques
Dan Marques Company
Tucson, Arizona*

Haas-built, 10-piece tool kit,
a \$1,500 value – FREE.



18 VMC models with up to 120" travels.

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making the cars is exactly the same as we've always used; we've just changed the order we do it in." Each car is built to a specification defined by the customer around one of three basic model types. It starts in the chassis shop where the engine (from Ford or Rover), gearbox and back axle are fitted to a chassis from Hay on Wye-based ABT. The rolling chassis then travels through the factory – first to the body fitting department next door, where the ash body frames and steel or aluminium panels, manufactured on site, are fitted. Later stages include painting, fitting instruments and assemblies, finishing and trimming.



Peter Morgan, seated, company chairman and son of founder HSF Morgan, and his son Charles, managing director, with a 1935 Y type Morgan three wheeler.

The popular notion that the cars never change is false. For example, air bags are now fitted on some cars. "Not as standard; it's a very expensive option, developed for our America dealers and tested to full Federal standards. We still manage to make wish changes – things that we think we can make better – but these days it's driven mainly by legislation. European requirements for emissions, noise, radio suppression and so on, are continuously changing. It's a moving target, and a

single change of phrase from first to final draft of a piece of legislation can change the whole emphasis. The beauty of our operation is that we are very responsive."

The machine shop changes aim to reinforce this philosophy. "We'd been running with the same machine shop since the Second World War, using Ward lathes on the more complicated jobs, which have been fine. We looked at CNC some years ago, but at the time the flexibility was limited and it didn't really fit. We're doing relatively small batches; a run of 500 parts is a year's worth."

Morgan shelved the idea and revamped the Wards, but since 1992 legislation has driven up the volume of

components needed. The time came when the Wards were working flat out on parts for production and a spares demand rising by 10 to 15% a year. "We were running them forty weeks in the year just on hub production." A minor breakdown could mean several weeks delay waiting for components for these old machines.

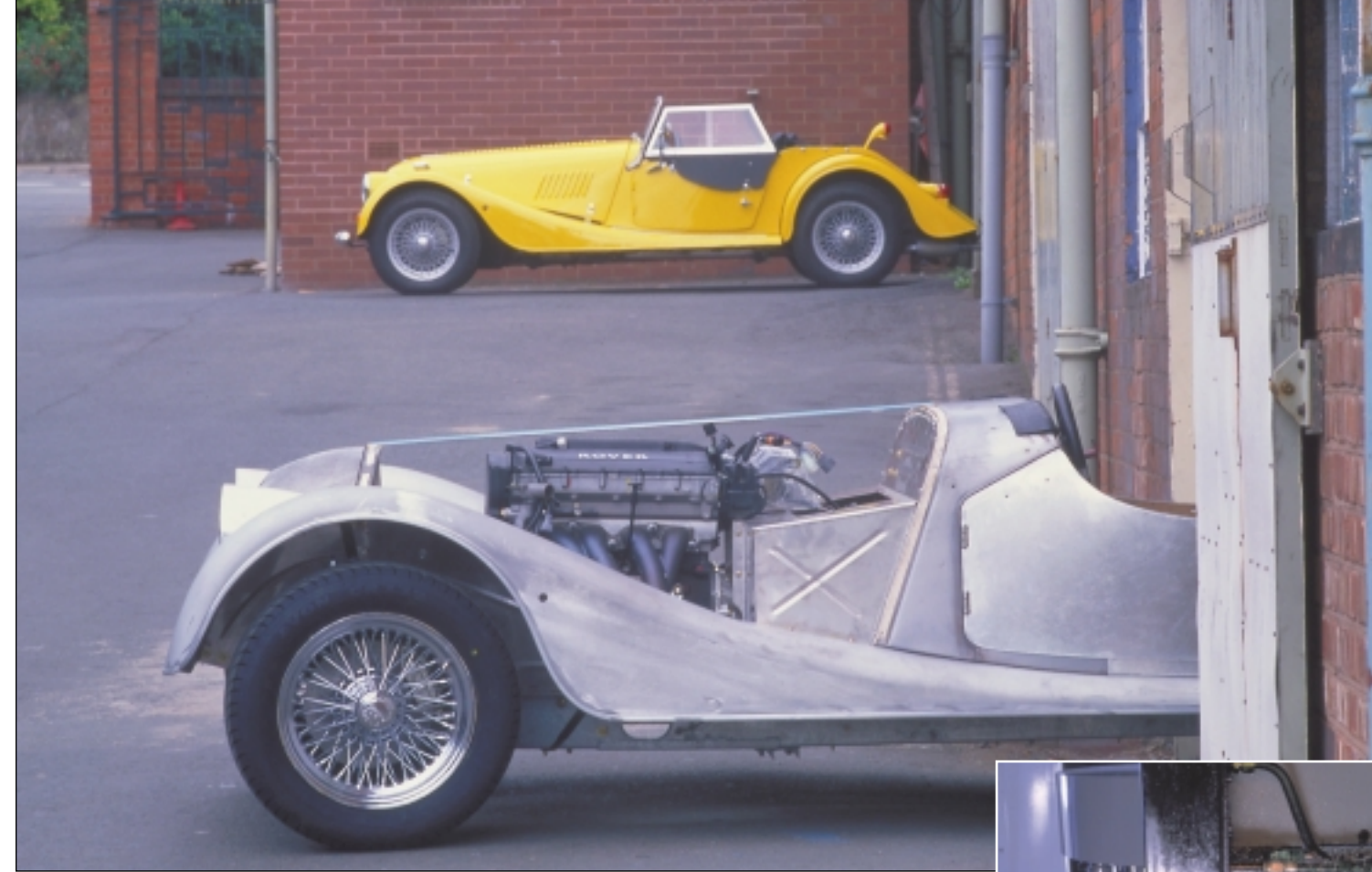
Subcontracting was considered, but Morgan prefers to keep in-house work on brackets, fittings, hubs, suspension components, brake drums etc. It seemed logical to invest in machinery to the level used by the best subcontractors. Enter the machine tools: a Haas VF-OE vertical machining centre with HRT 210 rotary table, and a Haas HL-4 turning

centre, supported by a Licom Advanced Mill "One Post" CAM system. Why Haas? "The overall package won it," says Aston – not least the enthusiasm of Haas understanding the needs of people with no CNC experience. "This was completely new to us; so we needed a total package starting from scratch, including programming, operation, setting up, tooling. We literally gave a pile of bits and some drawings to Haas and said – these are what we want to make."

Flexibility was also critical, plus capacity, within a realistic cost band. "We don't borrow money to buy machinery – we'll only buy what we can afford." £120-130k is high for Morgan. "But we'd rather have the right machine than the cheapest machine. Initially, we were just talking about a milling machine; the lathe came in halfway through the process when we thought that if we were going to reorganise the machine shop, we might as well do it once rather than twice." In fact, Haas had to respond to a late size change – to a larger lathe – requested by Morgan to meet foreseeable future demand.

Currently the machines are occupied partly on production work, partly on development – for example, examining their potential in conjunction with the offerings of tooling suppliers. With some production jobs established, Morgan is looking at how best to use spare capacity; and time freed up on the older machines in allowing subcontracted work to come back in-house.

Components on the Haas machines include caliper mounting brackets, stub axles, engine plates, steering column brackets and brake drums. All operations on the caliper brackets (20 a week) are completed on the machining centre. Two castings are loaded at a time on a dual Chick fixture for first (face, drill, tap) and second (bore, face) op sequences respectively. A component comes off after each six-minute cycle, and is replaced by a new casting; the other is turned over so that it in turn can



Above: The Morgan production line proceeds up the hill, crossing the site once en route to the paint shop and finishing at the dispatch shop. For more than 90 years the line proceeded in the opposite direction (downhill) with the car having to be pushed back up the hill to the paint shop and the dispatch shop. Right: The eye-level brake light bracket of cast aluminium is a recent modification necessary to meet global safety requirements. Designed on the company's Licom CAD/CAM system, the program is downloaded directly to the VF-OE



undergo the second op sequence – and so on. Previously, the sequence used a series of machines – with a net output of two per hour. Engine plates simply require a series of drilled holes, bores and taps, but each one used to take about two hours; now it's 15 minutes.

On the lathe, front hubs now take 18 minutes for a two stage process (rechucking to get at each end of the component) which includes drilling, boring, turning inside and outside diameters and threading. Previously, one operation alone could take around 25 minutes. Brake drums – for which roundness is especially critical as these have to be fitted to the hubs – are also done in two stages: face, rough bore, chamfer and turn OD features; face inside, turn ID. Total cycle time is 16 minutes.

This may not be rocket science, but the machine shop team is gradually

learning to exploit the full potential of its equipment – a claim not every company buying new machine tools can make. Simplicity usually pays off, and Morgan has simply bought in the technology to match its needs – and in turn, those of its customers.

If you order a Morgan today you'll have to wait five years (a "basic" 4/4 model costs around £20k, which seems very reasonable, and maintains the premise of a realistically priced product, on which HFS established the business). With the improvements in production equipment and workflow the waiting list may come down – but it will never be eliminated, because it's part of the fun; part of a whole ethos based on "producing a car in traditional coach-built fashion with a separate rolling chassis and a wooden body frame; hand paneled, hand-painted. We are building

cars as Rolls and Bentley – and even Ford and Austin – did in the early days."

A productivity revolution would be inappropriate here – stability, continuity and evolution are the cornerstones. But by talking to customers and dealers – Morgan Motor Company probably wouldn't describe this as market research – the company has established that there's sustainable demand to justify an increase in production to 600 cars a year – which is, after all, as Aston points out, a 20% increase – dramatic by any standards. 📺

From Crash-Test Dummies to 220 MPH Driving Machines, IMD Sets the Pace and Delivers

Story
and
Photos
Preston
Gratiot

Looking ahead, you compare your abilities to your limitations as you start setting up for the corner. Attack too aggressively and you end up on the sidelines as everyone else goes flying by. Enter with too much caution and trepidation and your competitors will bump you aside and leave you in the dust as they race on to the winner's circle.

Yes, driving a high-performance race car is actually quite similar to running a competitive machine shop: If you're too fast and aggressive, you fly off track and you're out of the running. Go too slow and you're just another cautious loser.

Innovative Metal Designs (IMD) is a family run business. In fact, it got its start back in 1982 when Carlos Danze, a veteran tool and die maker working for a company manufacturing crash-test dummies, took a chance and stuck an old Kent milling machine out in the family garage.

Carlos, who had operated machine tools since he was 13 years old, realized it was time to become his own boss and start setting his own hours. Good business sense and a 15-year relationship with his previous employer, First Technology Safety Systems, allowed him to continue making those same crash-test dummy parts at home as an outside supplier. His son Alex, who started his machining career in his father's garage machine shop – also at the age of 13 – says that same company is still a customer – a testament to the quality work that has become the trademark of IMD.

STILL A FAMILY SHOP

It didn't take long for the company to outgrow the family garage and relocate to a new 700-square-foot shop. This move allowed for the purchase of a new lathe. The customer base, and IMD, continued to grow.

Today, 17 years later, Alex Danze manages the family-owned business and its 22 employees with help



High-tech frame components for GT Bicycles Inc., helped IMD make the change from manual to CNC mills. Here, a Haas VF-0E is used to cut a rear axle bracket for the STS 1000-series bike. With carbon-fiber frames and fully-articulated suspensions, these bikes are the flagships of the competitive GT Bicycles line.

from his father, now company president, and his brother Marcelo, the company's senior programmer. Located in Huntington Beach, California, IMD runs three shifts per day in a 6,500-square-foot building loaded with CNC equipment. They currently book more than \$2.5 million in annual sales.

But, like most success stories, the road was paved with a few rough spots. "We were doing fairly well back in the early 1990s, with annual sales in the \$200,000 area," says Alex, "when things suddenly went downhill, sending us looking for new customers in new markets." One of the new clients IMD hooked up with during these reformatory years was GT Bicycles Inc., a company building high-tech performance bikes for

both adults and children.

"When we first got GT, back in 1995, they ordered 1,200 clevises and gave us a really short deadline so they could beat the arrival of the Christmas buying season. It was our first experience with large-volume production, and we weren't really equipped to handle that much work, but we worked night and day and delivered on time. They were happy, and they've been with us ever since."

NEW DEMANDS LEAD TO CNCs

The Danzes say it was their association with GT Bicycles that really made them change direction and look into automation. In order to keep pace with these new demands, IMD had to modernize and gear up for production of large orders. They had to get into CNC machines fast.

"Our first CNC machine was a Haas VF-3," says Alex. "We bought it through Machining Time Savers (MTS) of Anaheim (Calif.) back in May 1995.

That VF-3 gave us the ability to accept more high-volume, multi-part runs. Our production capability and sales have been growing ever since.

"We picked the VF-3 because we felt the Haas VF-series machines were the best machines for the money," explains Alex. "And because we felt the VF-3 gave us a lot of capability for the money compared to the other machining centers we looked at. The Haas also delivers reliability and incredible accuracy. We've never had an issue; our accuracy level has been as close as two-tenths."

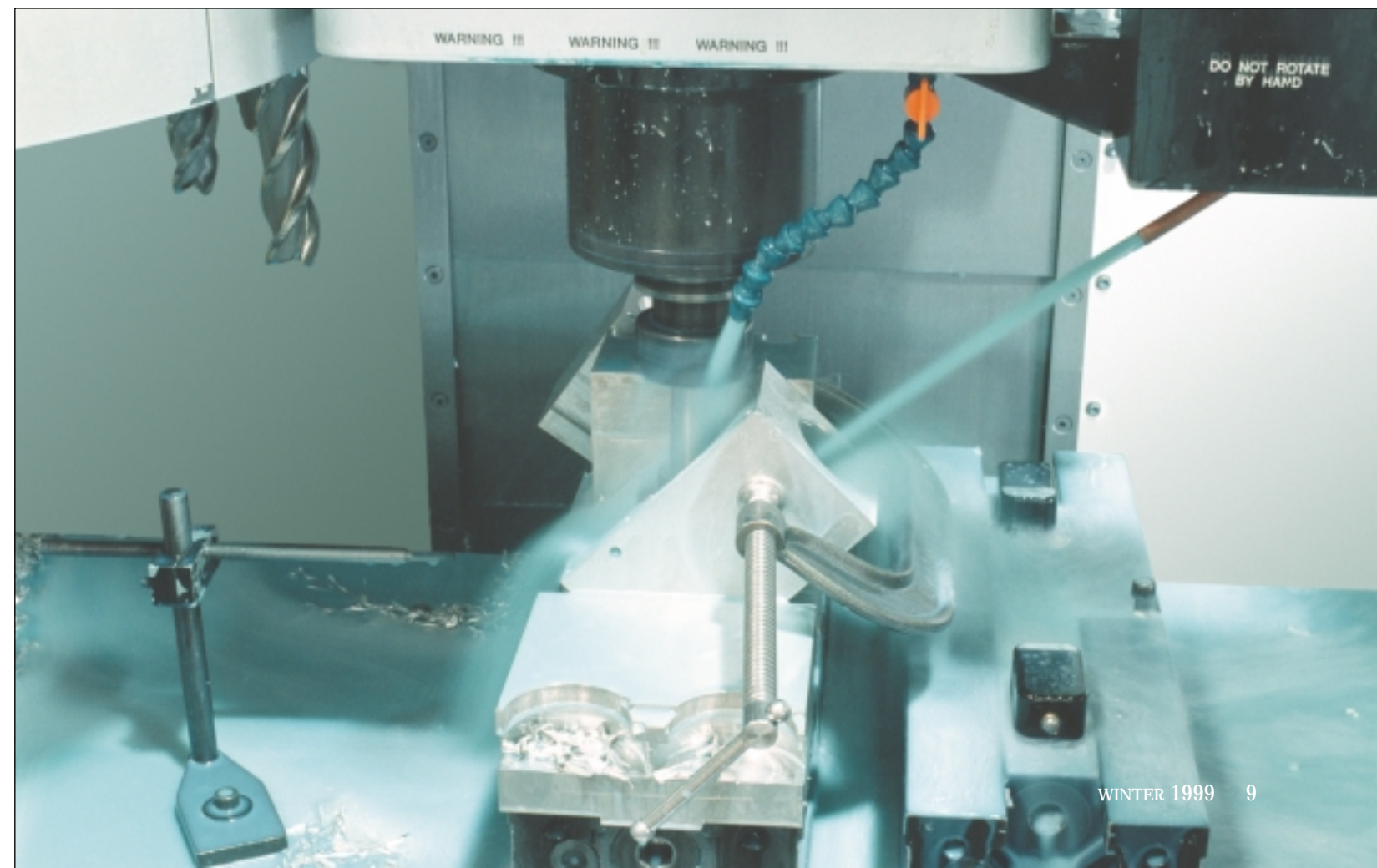
By shifting from short-run parts to continuing part runs in the thousands, IMD was able to increase both their profit margin and contract-bargaining power by reducing the percentage of setup time charged to each completed piece. In addition, the repeatability of

the CNC machines cut down on other cost-incurring aspects of metalworking production.

Their stable of Haas CNCs continued to grow with the delivery of seven more Haas VF-series machines over the next few years. Included in the gray garrison of vertical machining centers are a VF-0, VF-0E, three VF-2s, the original VF-3 and a VF-4. "We run a lot of suspension components for GT Bicycles, and on one particular part, the top link, we have been able to cut down the cycle time considerably with the newer Haas VF machines," says Alex. "In fact, we have realized a 35-percent decrease in cycle time."

Working in conjunction with these machines are four Pentium Pro 200 MHz personal computers linked to the CNCs through dual DNC switches. Machine programming is entered on

IMD keeps their machines running by taking on a wide variety of milling challenges. Here, a gas-flow shutoff valve, used to protect residences and businesses in the event of earthquake damage, is machined on a Haas VF-2 equipped with the optional programmable coolant nozzle.



Danze brothers Marcelo, left, and Alex check the finish on an earthquake shutoff valve body. Machined on the VF-2, the safety device is required in many communities to guard against tremor-induced gas leaks and fires.

three Teksoft 3D CAD/CAM systems by Alex and his brother Marcelo.

PROGRAMMING FOR SUCCESS

However, when the first VF-3 arrived on his shop floor, Alex didn't know how to run the accompanying Teksoft software. "So I went to the Teksoft three-day school at MTS, and I was making parts the day after my classes.

"Haas machines are very easy to set up because of their user-friendly control," says Alex. "We love the way the Haas control touches off tools and sets work coordinates. Other features we depend on include the rigid tapping, Quick Code, P-Cool, easy editing, the ability to copy and paste and the faster tool changes."

Previously, a typical order at IMD was for 10 to 50 pieces, but now orders run into the 10,000-20,000 piece range without taxing the company's ability to deliver on time and to spec. As a result of shifting to CNC production, IMD is now more marketable and profitable than ever before.

OPTING FOR VERSATILITY

"We order all of our Haas machines equipped with the chip auger system; P-Cool; 1 MB program memory; the Quick Code programming system; a 3.5" floppy disk drive; rigid tapping; 4th axis drive; custom macros; remote jog handle and the coordinate rotation & scaling feature," says Alex. "We also do all of our own fixturing using Chick vises, and run two Haas 8-inch, high-speed rotary tables (HRT 210) for multiple-axis versatility.

"We've stayed with Haas because of the reliability, good local service, and the commonality of parts in the product line. All Haas machines have virtually



identical controls that are easy to learn. If you learn one, you can find your way around the control on most any other Haas, so we don't need to look for operators who are versed on a number of different manufacturers' machines."

Familiarity with the machines also cuts down on waste. "We inspect all of the parts we make here before we release the order," he says. "We haven't had a rejection in more than a year. We're pretty pleased."

FULL SPEED AHEAD

While looking for new markets back in the early 1990s, Alex started Danze Racing. The small company was originally formed to keep one of his Pro Formula 2000 race cars outfitted with

special custom-built parts. "While doing that, I found a new market for us making custom pieces for other racers," says Alex. As this new market grew, so did Alex's interest in open-wheeled formula car racing.

Alex now campaigns an American Indycar Series (AIS) racer - a Buick V-6 powered Lola - that was previously driven by John Andretti. Andretti raced it in the 1991 Indy 500 as the "Pennzoil Special" (car number 4) with a qualifying speed of 219.059 miles per hour. (The car finished first in both the Vancouver and Australia CART races in 1991.)

The AIS series allows ex-CART/USAC cars to compete in this international series at a cost much

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Working Class Heroes.

Charles Wieland and Haas HMCs

"We run 24 hours a day, and if we don't have the reliability or service to keep running, we lose the equivalent of two if not three working days. Our Haas horizontal hasn't stopped since we got it. It never gets a chance to cool down."

- Charles Wieland
Wieland Precision Machine, Inc.
Lake Elsinore, California

Haas-built, 10-piece tool kit,
a \$1,500 value - FREE.

7 HMC models with up to 150" travels.

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Engine Project Sparks Students' Interest

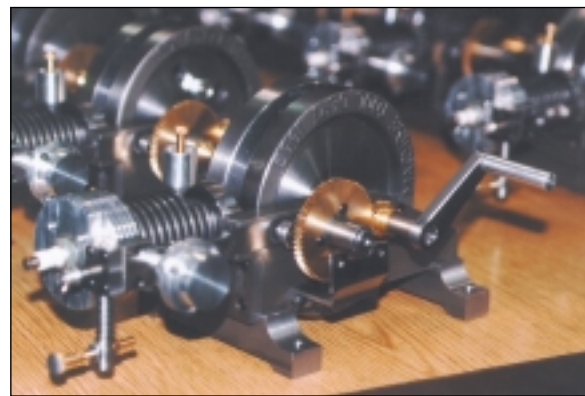
Story
Preston
Gratiot

Planting the seeds needed to replenish the rapidly dwindling supply of qualified machinists is the goal of numerous trade schools and manufacturing arts classes throughout the United States. But how do you get students interested in the machining arts?

The search for meaningful projects that not only test the skills of the budding metalworkers, but keep them interested, is a quest facing many an instructor. Here's how one teacher at North Dakota State College of Science (NDSCS) started a tradition that has kept students interested and challenged year after year.

"For the past six years, the final group project has been to manufacture a small gasoline, steam or forced-air engine," says Dave Chase. "I started the engine project because, up until then, all of the projects had been trinkets or throwaways. This project was developed to tie everything together in a form that would mean something to my students."

Located in Wahpeton, NDSCS is a comprehensive two-year associate-degree college. In continuous operation since 1903, it offers more than 70 programs in



This engine is one of 53 manufactured by NDSCS students between February and May of 1998. It is known as the "Six-Cycle Oddball" engine and runs on gasoline. This particular engine was given to Haas Automation as a token of appreciation for their continued support of higher education.

the trade/tech and arts/science divisions.

The motto at NDSCS is: "Where Students Learn by Doing," a philosophy put to practice by the Machine Tooling department. Each year, second-year students get to use the skills they have acquired at NDSCS to build a working engine. These skills include:

- Project planning/order of operations
- Machine and work scheduling
- Design, and in-process design changes
- Designing and building jigs and fixtures
- CNC setup, programming and operation
- Quality control/assurance
- Problem-solving skills
- Assembly/sub-assembly process

The project may involve several departments, just like in the real world. Mechanical Drafting students draw the prints and work closely with the machinists throughout the entire process. Welding students may also be involved in material prep and an occasional welded sub-assembly. An overall team environment is stressed throughout the entire process, so that students realize that no single manufacturing arm can do it all.

The nice thing about an engine project is, if the parts aren't correct, they will not fit. And if the fit isn't perfect, the engine will not run. And keep in mind, these projects do not start as kits – they start as raw stock. With more than 50 parts in the typical engine – some very complex – it really challenges the problem-solving ability of the students.

Key ingredients in this entire project are a pair of Haas CNC vertical machining centers owned by NDSCS – a VF-1 and a VF-2. "Without them, it would not be possible to complete this project in the time we have," Chase says.

"Approximately 70 percent of the parts for this engine were cut on a Haas. And without the support and special pricing Haas gives to institutions of higher learning, we would not be able to afford machines of this quality." Another reason Haas was the logical choice for NDSCS was that they are easy to teach as well as understand. "It allows us to do a lot of work with a lot of students in a very short period of time. After all . . . we pride ourselves on learning by doing." 📷

Gene Haas Donates Equipment to Alma Mater

Story
and
Photos
Scott
Rathburn

It's not uncommon for university graduates to return to their alma mater later in life and present some sort of gift in appreciation for the education they received years ago.

Usually that gift – in the form of money, equipment, land, etc. – goes to benefit the particular field of study from which the student received his degree. But Gene Haas, who graduated from California State University Northridge (CSUN) with a Bachelor of Science degree in business and finance, broke with tradition when he entrusted nearly \$200,000 worth of Haas CNC equipment to CSUN's college of engineering and computer science.

In appreciation for his generous gift, CSUN has dedicated a new laboratory in honor of Mr. Haas. Unveiled October 6, 1998, before a crowd of students, faculty and Haas representatives, the Gene Haas Engineering Laboratory houses an HL-2 lathe and VF-2 vertical machining center, as well as several workstations for computer-aided design and manufacturing. The dedication ceremony included demonstrations of the two Haas machines by students enrolled in the college of engineering and computer science.

These same students will put the Haas equipment to immediate use working on their senior



Above: CSUN President Blenda J. Wilson presents Gene Haas with a token of appreciation during the dedication of the Gene Haas Engineering Laboratory. Below: Students, faculty and Haas representatives look on as students demonstrate the school's new Haas machines.

class project: building a miniature formula race car from scratch. The race car will then compete with those built by other engineering schools in the Formula SAE (Society of American Engineers) competition held in Detroit in May.

Using the new equipment, the students will be able to make the necessary components, and complete the race car itself, more quickly.

"It's state-of-the-art, as good as you can get for the money," said engineering professor Stewart Prince, who serves as the students' advisor. "It's exactly what we need, and it fits perfectly into our curriculum."

But the donation is not just good for the school, it's good for the industry, as well. "The equipment will help the students gain more hands-on knowledge of what is being used in the industry today," said Gene Haas, "which will make them more attractive to companies after they graduate."

And Mr. Haas is happy to do it, as some of these students may eventually end up working for him. "It's nice to return something to the school I went to." 📷



*gettin' back
on that*

HORSE POWER



did you ever have one of those days where nothing goes right? Where the cosmos is aligned against you, and no matter what you do, the results are less than favorable? Well, that's the kind of season PacWest Racing Group had last year.

Story and Photos by Scott Rathburn

Things looked so promising as they geared up for 1998. Coming off their best season ever in 1997 – drivers Mauricio “Big Mo” Gugelmin and Mark Blundell combined for four race wins, three pole positions and finished fourth and sixth respectively in the PPG Cup points standings – they were ready to take things to the next level. Early predictions pegged PacWest as one of the teams to beat, with Blundell and Big Mo not only expected to be in the hunt for 1998, but at the head of the pack.

Unfortunately, the cosmos had other plans. Setbacks plagued the team at every turn: a new engine/chassis combo arrived too late for thorough testing, practice and testing sessions were hindered by weather, untimely crashes destroyed cars. What started out as a promising year ended with both drivers playing follow the leaders. With all points tallied, Gugelmin closed out the season in 14th place, and Blundell rolled across the line three places later in 17th.

What happened?

“In ‘97 we ended on a high note,” explained John Anderson, PacWest’s vice president of race operations. “In ‘98 we fell in a big hole. There’s not one thing you can point to and say: ‘Look at the size of that! There it is. That’s it.’ There were a lot of little things.”

Bruce McCaw, PacWest’s president, expressed a similar view. “Fundamentally, we just got a late start on the season, with our cars coming late, and of course a new engine being developed by Mercedes.”

The introduction of the new Mercedes engine, and the corresponding new chassis from Reynard, posed several challenges for PacWest, as well as other teams. The new lump was drastically smaller and lighter than its predecessor, the electronic fuel injection package from Magneti Marelli wasn’t yet reliable, and the new chassis had some major aerodynamic differences. It was like starting over.

“They were behind the development curve,” Anderson said, referring to the new engine, “which

meant there were parts arriving late to us; and the electronics system wasn’t to the point where they could put it on an engine and use it reliably.”

Faced with a new Reynard-Mercedes that had major teething problems, PacWest chose to start the new season with their ‘97 Reynards: a known combination with proven speed and reliability.

“We had ended up with a good package,” Anderson said, “we had a competitive engine and chassis, why not use it? We could take delivery of the ‘98s, and slowly get to know those cars while starting the season with a known quantity. We knew the ‘97 engine, we knew what its capabilities were, we knew how much mileage we could get. We thought we could take advantage of those things to put us a step up with early points. The points you miss at the start of the year you never regain. They can win or lose a championship.”

Other teams opted to use the ‘98 cars despite the early problems. But, according to Anderson, they had to run the new engines conservatively at first, which meant they would use more gas. For this reason, PacWest chose a strategy of fuel conservation for the first race.

“If we could go further than the next guy,” Anderson explained, “the chances of getting a yellow flag to pit under were going to be greater. Unfortunately, the first two races, the yellows came when we didn’t want them – early. And the guys who were running the new stuff, it fell right into their hands.”

PacWest ran the ‘97 chassis through the first three races of the season: Miami; Motegi, Japan; and Long Beach. Bad weather plagued both Motegi and Long Beach, dampening practices and making it difficult to find a competitive setup for race day.

“Those first three races with the ‘97s didn’t pan out the way we thought they would,” Anderson stated. “Coupled with that, we made some setup changes that shot us in the foot.”

McCaw added, “I think there were probably some mistakes we made. One was probably trying to develop the ‘97 car some, instead of just running it the way we had it.”

Even so, both Gugelmin and Blundell logged top-ten finishes in two out of three of those races. Clearly they were still in the hunt.

PacWest finally brought out their ‘98 cars for the fourth race of the season, which was Nazareth, a short oval. “Both drivers were involved in major accidents there,” Anderson said, “and we basically wrote off two cars. We were struggling to come to grips with the new ‘98 car, and the first race we get to, we have a problem with both of them, and we’re scratching again. We kept running the ‘98s, but we took the ‘97s as backups, because we didn’t have the parts finished or ready to support a whole ‘98 program.”

PacWest struggled with the ‘98 cars throughout the remainder of the season, trying to find a winning setup. “The series is so competitive,” Anderson commented, “that if you get behind the development curve, it’s very difficult to catch back up again. It’s a game of numbers, really. You make fewer mistakes than the next guy, or you make better choices than the next guy, it will all add up to a better result, usually. It’s a gamble. You can go from hero to zero pretty quickly. And we had zero.”

Yet, in CART racing, zero is a relative term; and the

difference between hero and zero is often measured in fractions of a second. Even though PacWest didn’t win any races in ‘98, they still amassed 13 top-ten finishes and two top-five finishes. Both Gugelmin and Blundell showed tremendous determination and commitment throughout the season, and it all seemed to come together for the final race in Fontana. Aided by the dedicated and consistently fast efforts of their pit crews, both drivers finished in the top six at California Speedway, with Mo leading the race for 40 laps and Mark leading for one. ■▶

PacWest Racing weathered a storm of adversity during the 1998 CART racing season. Rain at several venues hindered testing and practice, making it difficult to dial in the cars for race day. Below, Mark Blundell navigates the wet streets of Long Beach during practice for the Long Beach Grand Prix.





Chris Jaynes works up a machining program on a computer work station in PacWest's machine shop. The machinists share space with PacWest's two-car PPG-Dayton Indy Lights race team. Plans are already in the works to expand the facility

"Fontana was a nice way to finish the season," McCaw stated. "The whole organization ran well, and we were fast all weekend. We probably had the best pit stops in the race. So, we were very much there, and I think everybody knew we were there. It's nice to go into the off season feeling good about the organization and where we are and what we're doing."

With a disappointing season behind them, PacWest had no time, nor the inclination, to sit around and lick their wounds. They had survived the battle, and it was time to move forward and prepare for the next round.

As the old saying goes, when you fall off the horse, the best thing to do is get back on; and PacWest is ready to ride this horse for all it's worth in 1999.

Unlike in 1998, the team is ahead of the development curve this year. They've had a season to dial in the '98 cars, and they're working with basically the same Reynard-Mercedes platform for '99. The Ilmor/Mercedes IC 108E engine has pretty much matured out of the teething stage, and reliability is no longer an issue with the Magneti Marelli fuel injection system. "That engine will be in the new '99 car with a season's development under its belt," commented Anderson. Things are looking good.

The team has been working with scale models of the '99 car since about mid season last year, making modifications to the aerodynamic package and testing the results in the new Reynard wind tunnel conveniently located next door to PacWest's Indianapolis facility.

"We think having the aero program next door, as opposed to in the UK where we did it last year, will be a big help to us," McCaw said. "We have some ideas about how to use the program more effectively."

Reynard's new facility, known as the Auto Research Center, also houses a computerized seven-post "shaker" rig for testing suspension setups. Using information gathered during races from sensors located throughout the cars, the "shaker" simulates the actual conditions encountered at a specific track, allowing engineers to see first-hand how the suspension is reacting, and develop optimal setups without having to go to the track.

"As long as you have the data from the track," said Julian Karras, PacWest's drawing office manager, "you can simulate a lap." The advantage of the seven-post rig is that it can fire forces not only into the four corners of the car (wheels and suspension), but into the chassis as well to simulate the effect of aerodynamic forces on the car.

"You're able to simulate other forces being exerted on the car, such as pitch and roll and rake," Karras said. "If you can do that at tracks like Cleveland and Long Beach, where you can't go and test because it's a street course, then you're going to get some useful data that you normally couldn't get."

Having the new Reynard facility right next door obviously is an advantage for PacWest; but the relationship goes both ways. PacWest has been instrumental in helping Reynard set up and test their new facility. In fact, one of the team's '97 race cars was used to calibrate the seven-poster.

"They took a '97 car and loaded it with accelerometers and strain gauges, and ran it around Putnam with a set of tires on it," explained Karras. "Then they pretty much wrapped it up in brown paper and packed it off to England. They calibrated the data against their four-poster rig over there, and using that information, they were able to bring the car back over here and dial-in the seven-poster."

All of PacWest's early aero work came to fruition when the first Reynard Champ Car for '99, chassis number 001, arrived at PacWest's racing shop Sunday, November 8 – a mere seven days after the close of the '98 season, and six weeks earlier than they received last year's car.

"It's earlier than we've ever had a car before," Anderson said when the chassis was delivered. "It's going to be a great competitive advantage. If you look at where we were last year and where we are now, we're



PacWest's build shop, above, is where the CART cars of Mauricio Gugelmin and Mark Blundell are brought to life. Although new cars are received fully assembled from Reynard, PacWest immediately takes them apart and rebuilds them to their own specification.

At right, mechanic Charlie Guilinger works on the bulkhead of one of Mark Blundell's Motorola cars. The aluminum bulkhead, which joins the front of the chassis to the engine, is machined on a Haas VF-4 at Reynard Racing Cars in Oxfordshire, England.





At left, Brian Williams, Julian Karras and Chris Jaynes check a prototype throttle linkage component coming off the Haas VF-4. Haas CNCs have allowed PacWest to bring their machining and R&D programs in-house, reducing lead times and giving them more flexibility to build and modify components.

Charlie Crockett, below, works on one of Mark Blundell's Motorola cars. On the wall behind is a Gerhard Berger F187 Ferrari Formula One car which recorded three F1 wins. The Ferrari is part of team owner Bruce McCaw's personal collection of vintage race cars.

already months ahead of the game.”

The new car got its first shake down in the hands of Mauricio Gugelmin at Sebring International Raceway in Florida in mid November. Following three successful days of testing, Gugelmin came away very optimistic.

“It’s very encouraging to have such a successful first test,” he said. “We did around 600 miles overall and had no problems whatsoever. The car was really reliable.

“We’re basically learning all we can about the new car,” he continued. “We kept it simple, but looked at a lot of things. I’m very optimistic; there’s potentially a lot more to come. At least I know I have a car in which I can use the brakes to attack corners rather than a car that wants to attack me!

“One of the keys to our success in 1997 was getting the new car early and putting in a lot of miles to learn what it liked and didn’t like,” Gugelmin said. “It’s a tremendous advantage for us to be the first team out testing our ‘99 package.”

Such testing will be a crucial part of PacWest’s program for ‘99. “We’ve established an autonomous test team this year,” Anderson said, “so we have five cars. We’ll use the fifth car for testing. The test team will be equipped with its own gear, its own equipment and its own transporter, so we can take the test team and not interrupt the preparation of the cars for a particular race.” This will free the race cars from testing duty, allowing more freedom to test new components and modifications throughout the season.

“Clearly, having a fifth car will help our testing,” McCaw added. “It primarily gives us an opportunity to have a car ready to set up and go testing maybe the day after a race, instead of having to take a race car back and repair it and rebuild it. It makes our people a lot more effective; and, of course, if we have a problem, it becomes a fairly instant source of spare parts.”

In addition to bringing their aerodynamic division in-house, PacWest also has brought their research & development division on board. “In the past, we’ve had a relationship with a company in England called Galmer Engineering,” Anderson explained. “But with the location of the two entities, it got unwieldy sometimes:



different time zones, the logistics of getting parts made over there and sent over here to fit cars they don’t see. The name of the game, especially with 20 races, is time. So if you can do the job faster, that’s the key to it.”

Getting the job done faster meant bringing in the equipment to do it. To this end, PacWest has set up a full machine shop outfitted with two CNC machining centers (VF-2 and VF-4) and two CNC lathes (HL-2 and HL-4) from Haas Automation. They also have HP Kayak workstations running AutoCAD for the design work, and Mastercam software for developing the machining programs.

The new equipment is a vast improvement over what they used to have. Previously, any in-house machining was done on a manual knee mill with a digital read out and a small manual lathe.

“Those machines have performed several miracles,” Karras said, referring to the manual machines. “We’ve made stuff on there that you wouldn’t believe. Back in the old days, that was how it was done: one at a time, manually, and every part was different.”

But when you’re building five separate race cars and running 20 races a season, not to mention all the testing,

you can’t afford to make parts one at a time. And if you’re trying to make a batch of identical parts, you definitely don’t want every one to be different.

According to Karras, PacWest used to send out at least 75 percent of their work, which required a lot of lead time. “We’d have to get parts drawn up and ready a couple weeks in advance. We’d have to have it quoted by a couple of subcontractors and find one who could make it on time. Then we’d get a P.O. written up and fax it to him, and then he’d make the parts and ship them back. That all takes a bunch of time. Whereas now, if we need ten of something, we’ll make them in two days. The story’s completely different now that we have this equipment here.”

With the manual machines, the parts had to be fairly simple. “We were a little constricted as to what we drew,” Karras said. “If we knew we had a short time to make it, we drew it with that in mind. Now, even though it still has to be done in a short time, we can be more ambitious with what we draw, because we have the CNC power.

“Something else which is very important,” Karras continues, “is the control over that piece. If the guys are halfway through making a piece and suddenly you find you need to modify a certain part of it, they’re able to do that. You can run out into the shop and say, ‘Stop.’ But when some guy in Colorado or England is making it for you, you can’t do that. You wait for the bits to come in, then you try to modify them. Or you try to ring him with the change, and if you’re too late, then you’ve got to pay for them. That’s been a problem, sometimes. You have to have them redone, so you’re paying for them twice, effectively.”

“The old enemy is time,” stresses Anderson. “There are a lot of good machine shops around, and they’re there to make money. They’ve got other customers, and if you’re the second, or third, or fourth on the list to get a job done, your parts are going to take more time than if you do them yourself. We didn’t have the capability, and we couldn’t compete with just a manual lathe and mill.”

The CNC power, as Karras puts it, gives PacWest the capability to compete, and speeds up the development process.

“This is a just-in-time business,” McCaw remarked, “and you have to be able to do things on your own schedule, not somebody else’s.”

PacWest’s machinists, Brian Williams and Chris Jaynes, are thrilled to have the new equipment. Both had been pushing for quite some time to make the move to CNC.

“We went from having VW Microbuses to having Porsche 911 Carreras,” exclaimed Williams. “It was a huge difference. Now the engineers are thinking, ‘Yeah,



One of the high points of PacWest's '98 season was the success of driver Didier André in the PPG-Dayton Indy Lights series. Racking up numerous top-five finishes and a win at Laguna Seca, André earned enough points to end the season with 2nd place overall in the series.

Mauricio "Big Mo" Gugelmin



Mark Blundell



they can do this, and they can do this and . . . They'll be designing parts for us to build, instead of having somebody else do it."

"The engineers used to have to consider whether or not we could actually make the part in-house," Jaynes explained. "And then if we couldn't, we would send it out to a local machine shop and pay a lot of money to get it done, because everything we do has got to be done in a short period of time."

Now, with the CNCs, the process is different. "On Monday they figure out what they want. On Tuesday the part's drawn. By Wednesday we're machining it, and hopefully, by Friday the part's on the car and on its way to the race track," Jaynes said.

"A lot of times it's drawn, designed, built, anodized, almost in the same day," said Williams.

And there's been no shortage of work for PacWest's new machine shop. "We haven't sent any work out for a long time," said Karras. "We've even modified a few Reynard pieces ourselves. We've changed stuff around and made it to our own liking. We're going to make as much as physically possible, and the guys are pretty stacked up right now. We've got things like front-upright tooling to make – so you can put the bearings in properly – and this kind of stuff. It's not just parts that go on the car, it's the backup pieces, as well."

One group of parts in particular, the skid plates, has really benefitted from the CNCs. These thin aluminum or brass plates bolt to the bottom of the cars to prevent the carbon fiber chassis from wearing away when the car bottoms out. Although they're not the most complicated part, they are crucial to the race car.

"They're such a throwaway item," Karras explained. "We get through hundreds of them a year with four cars beating them on the ground. They don't last that long, and we have to change them and put brand-new ones on. So for that reason, we make our own. The CNCs have been churning those out."

"The way it used to work was," he continued, "we would take the first ones that came with the car and make a pattern off them, then sort of cut them out on the bandsaw and mark off where the holes were supposed to go. That's so unreliable, with human error involved there, you know."

"Now," said Jaynes, "we just sheer the plate square, stick it in the machine, and it cuts the profile, drills the holes and countersinks them in three minutes. So, the job that was taking a guy probably two hours to do, is taking us three minutes to do now." Because they are pulled directly off the drawings from Reynard, the profiles and hole locations for the plates are exact.

Such time savings are crucial when you're racing or testing nearly every weekend. But cost is another consideration. After all, race cars are expensive. A Reynard chassis will set you back about \$450,000, and that's without an engine, or any spares. Multiply that by five – two race cars, two back ups and a test car – and you're talking major bucks.

If you break something and need a replacement, or just want to have a couple spares around, you have two options: buy them direct from Reynard, or make your own. Obviously, Reynard is going to charge a premium. They've got it, and you need it – it's simple supply and

demand. But if you have the capability and can make it yourself, well, you're that much further ahead of the game. Not only have you saved a lot of time, but a bunch of money, to boot.

Another reason to bring things in-house is security. Every race team has their own speed secrets, and they don't want them to get out.

"Any race team will tell you," Karras said,

"that the best speed secret they have is keeping their speed secret. And that applies to us, obviously, as well. I would say about a third of the stuff we do is strictly PacWest related."

By manufacturing and modifying their components in-house, they eliminate the chance that another team working with the same supplier – be it Reynard or a local machine shop – could find out their secrets.

Summing up their reasons for bringing the processes in-house, Anderson put it this way: "You are master of your own destiny. You can react far quicker than if you're doing stuff outside, you have the security, and then there's the financial consideration. When you farm stuff out to an outside contractor, you're obviously paying for his profit and his overhead. To bring that in-house, it's a major advantage to us. It's money saved. What you save there you can spend somewhere else to make that car go quicker."



Mauricio "Big Mo" Gugelmin gives the first Reynard Champ car, number 001, a successful shakedown at Sebring in November.



PacWest's machine shop, above, now houses a pair of Haas VMCs and a pair of Haas lathes. The two manual machines in the corner still see some use, but it's the Haas CNCs that allowed PacWest to bring their R&D and aerodynamics programs in-house.

Below is just a small sampling of components and tooling PacWest has made with the Haas machines. Many more are planned for the '99 season.



And, after all, that's what racing's all about.

Since they got the CNC machines, PacWest has jumped in with both feet, making just about anything they can think of. "We make all kinds of bobbins or washers or pieces that get lost or broken easily," Karras explained. "For example, if you have a crash and you lose a side pod- which generally you do, that's the first thing that makes contact with the wall after the wheel - in that side pod there's all kinds of clevises and washers and stuff that hold it down. That's all gone, because it's broken or cracked, so they all get replaced.

"I think we're going to be playing around with the suspension mounts just to experiment with geometry," he continued. "That's going to require some full-blown CNC power to produce those. We have no requirement at the moment to get into making our own suspension, simply because the parts, everything we need, come with the car. But when we start stuffing them into the walls, we have to think about where to get the spares."

Rather than buy the spares from Reynard, they will probably make their own. "We make anything we can, at any point, because Reynard makes a pretty decent mark-up. When you have the kind of hardware sitting on the floor that we have [the Haas CNCs], you make use of it," Karras said.

The list of bits they'll be making is endless: anti-roll-bar pieces, weight jackers, suspension components, skid plates, shock parts, quick jacks, underwing supports, rear wing pillars, pit equipment, fasteners, bushings, spacers. And they'll be working with a multitude of different materials: 6061 and 7075 aluminum, 17-4 stainless, a little bit of steel, and even some exotic materials like Zymaxx, a NASA-grade carbon-based polymer.

The move to CNCs and bringing everything in-house, while being very beneficial, also has been a learning process for PacWest. Neither Brian Williams or Chris Jaynes had much experience with CNC equipment prior to the Haas machines. In fact, both machinists originally were hired as mechanics for the team. When the decision was made to acquire CNC equipment, they were asked to put together a wish list.

After pouring over brochures and literature, and talking with some other manufacturers, the decision was



made to go with Haas, which was Williams' first choice.

"From what I'd read and the people I talked to, it just seemed to be the best package all around for what we're doing here," he said. "I'd never actually seen one run until we went down and looked at one at the local distributor, Technical Equipment."

"We went down to the local distributor and saw the machines in operation," Anderson said. "It was a feeling, really, from those guys: the enthusiasm was there. These guys followed up, they were enthusiastic, they wanted to see us involved, and it just made the difference. We went down there a couple of times. We had a look at the machines; we measured them up. They made parts for us while we stood there and watched."

Once the machines were delivered, it was time for the machinists to go to school, as there's a little bit of difference between running a manual machine and programming a CNC.

"Chris, myself and Chris Griffis (PacWest's machine shop manager) went to Technical Equipment in Cincinnati for the training," Williams said, "and the week after we

suspension components like these Ohlins shock absorbers are one area where PacWest uses Haas CNCs to make and modify parts. Although they successfully used a shock of their own design in 1997, it didn't work as well as expected on the '98 cars, so they went back to the Ohlins for the '98 and '99 cars. PacWest's shock program is currently on hold pending further development of the design.

got back the guy from Technical Equipment came in and initialized the machines and did all the setup and got us going. About a week later we were making chips."

They've been making chips ever since, and having a great time doing it.

"I love coming to work every day," Williams enthused. "That's the reason I wake up every morning, so I can come in and be building parts. If I didn't like what I was doing, I wouldn't be here." And things are even better now with the Haas equipment, he said. "It's definitely better now. When you get a part out and it looks extremely nice, and everything is exactly the numbers that you punched in, it's a good feeling. Whatever work you put into it has paid off, because

the parts you get out are perfect."

And the more complicated the part, the better. "That's the type of stuff that Brian and I look forward to doing," Jaynes commented, "the really challenging stuff that we have to actually sit down and think about."

Both machinists tout the Haas control as one of the best things about the machines, emphasizing the fact that it's the same on both the lathe and the mill. "Once you learn one, you're able to really run them both," Jaynes said.

Since many of the parts they make are similar, the machinists also really like the word-processor-style editing. "You can take a chunk of your program out here and stick it over on the clipboard, then write another program that you know is going to have the same operation, and slide it right back in," Jaynes said.

Other features of the Haas control they rely on are the built-in calculator and graphic dry-run function. "I use the calculator quite a bit," Williams said, "especially with angles and whatnot on the lathe. You can transfer the numbers right from the calculator into the program."

And they use the graphic dry-run every time they run the machine, according to Jaynes. "It's a life saver," he said.

Williams agreed, "The graphics are definitely good, even for debugging programs. If you've got something in there that you accidentally put in, you can see that on the graphics, instead of wasting a piece. I don't know how you'd live without it, really."

Now that they've had a taste of CNC power,

PacWest probably is wondering how they ever lived without it. The Haas machines have definitely become vital members of the PacWest team.

"When you talk to the guys who are running them," explained McCaw, "man, they just love the equipment; they love working with it. That speaks volumes, because at the end of the day the guys who use the equipment are the ones who really know if you've got the right thing or not. And I know our people are thrilled with it."

"The main role of the Haas machines, obviously, is to produce parts in less time, and more of them," Anderson said. "You've got to be able to take advantage of what modern technology can do for you. The ones who can are the ones who are going to get a leg up on the competition. The name of the game is to beat the other guy. If we can do it faster, better and more cost effectively, that's our advantage over the competition who hasn't got that capability."

"You're only as good as your last results," Anderson continued. "For the '99 season we want to be competing for the championship. From the time that bloody green flag drops at the start of the first race, we want to be running with the lead bunch."


"We've got a lot of confidence in our organization, and I think we have two of the finest drivers in the series," concluded McCaw. "You have to get better to stay in the game, and if you want to get really good, you've got to get a lot better. We feel we've got a combination that can win, and we expect to be right at the top all year." 

photo: Dan R. Boyd

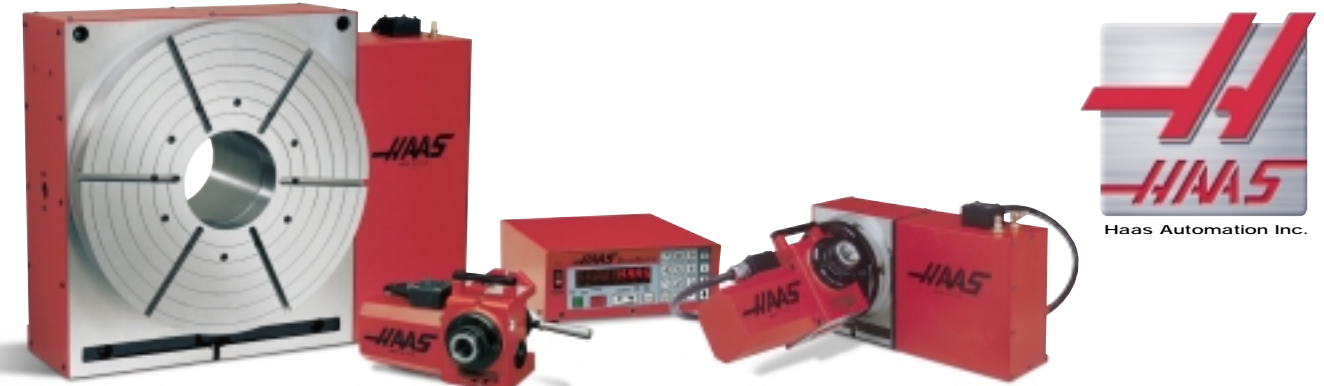


Built to Last.



At Haas, we know dependable, high-accuracy motion must be built into the design. Reduce deflection, increase rigidity, and you increase accuracy. One example of how Haas builds the most accurate rotary tables in the industry is our worm-gear design. Many of our competitors use a thin-wall design – placing the bearings inside the worm gear. Haas employs a solid worm-gear design, with extra-heavy-duty bearings mounted on each side of a solid worm gear. Hobbled from aluminum-bronze alloy, the Haas worm gear offers superior rigidity compared to the hat-shaped worm gear used by our competitors.

Does Haas design and manufacture heavy-duty rotary tables built to last? We'll let the parts speak for themselves.



Haas Automation, Inc., 2800 Sturgis Rd., Oxnard, CA 93030 • 800-331-6746 • www.HaasCNC.com



Haas Automation Inc.

Machine Options:

- Fully-programmable hydraulic tailstock
- Big Bore with enhanced bar capacity and spindle hp
- Live tooling
- VDI tool disk
- High-productivity barfeeder (SL-20/30 only)
- Automatic parts catcher (SL-20/30 only)
- High-discharge chip auger
- Rigid tapping
- High-torque gearbox (SL-30 only)
- Tool presetter
- 5,000 rpm w/30-hp spindle (SL-20 only)

Control Options:

- Quick Code programming system
- User definable macros
- Zip drive with interface
- 3.5" floppy drive
- Remote jog handle
- 8-spare M functions
- Expanded memory to 16 MB



Haas Raises the Bar for 1999 All-New SL-Series CNC Lathes Unveiled

For Haas Automation, no product is ever "good enough." It can always be better.

Constant improvement is what drives Haas Automation. Every day, engineers strive to make every machine better, while getting better at making the machines. Haas products are always evolving.

The new Haas SL-Series CNC lathes are the culmination of months of design and real-world testing aimed at making Haas lathes the finest available. By taking the best features of their HL-Series lathes and adding a host of new innovations, features and options, Haas has raised CNC turning to a new level of ease and productivity.

The SL-Series line consists of three basic models according to swing diameter. The SL-20 features a 20" swing, the SL-30 features a 30" swing and the SL-40 features a 40" swing. Maximum cutting capacities range from 10" x 20" for the SL-20 up to 25" x 44" for the SL-40.

To simplify the ordering process, the customer first determines the size of lathe needed to meet his job requirements, then selects the options he wants, such as a hydraulic tailstock, versatile live tooling, the automated Servo Bar 300 bar feeder or, for larger bar capacity in a smaller footprint, the Big Bore option. Options may be ordered in pre-packaged groups, or selected individually for a custom configuration.

New SL-Series innovations include massive headstock castings with symmetric ribs for rigidity and stability; all-new, large tailstock castings with adjustable heads for easy alignment; embedded chip trays and increased-volume roll-out coolant tanks for improved sealing and chip removal; and a new double-wall door riding on precision bearings for smooth, reliable operation.

A new viewing window design with thicker (1/2-inch) polycarbonate provides extra protection for the operator, and has been moved out of the path of the coolant sling for improved visibility and resistance to scratching. Precision-fit seals and wipers on the inner doors contain coolant sling and resist swarf buildup.

All in all, the new Haas SL-Series turning centers present a new level of manufacturing excellence for 1999. And the best part is, they're more affordable than previous models!



SL-Series Innovations

1. Primary Castings

a) Headstock

- i. Enhanced Thermal Stability
- ii. Massive Ribbed Castings
- iii. Symmetric Design for Rigidity and Stability

b) Tailstock

- i. All-New, Large Casting
- ii. Adjustable Head.

2. Coolant Supply and Chip Enclosure

a) Embedded Collection Tray

- i. Based on Proven VMC Design
- ii. Improved Sealing / No Leak Design

b) Roll-Out Coolant Tank

- i. Easier Cleaning Access
- ii. Increased Coolant Capacity
- iii. Coolant Pump Hook for Ease of Cleanout

3. SL-30

a) Improved Swing Clearance

- i. Raised Spindle Saddle for Increased Swing
 - New swing is 14.5 inches over the slide and 30 inches over the bed.

4. Sheetmetal

a) Clean, Rounded Modern Look

- i. 14-gauge Steel Construction

b) Operator's Door

- i. 10-gauge Steel Construction
- ii. Double-wall Safety Door Design
- iii. Large Operator's Window
 - 1/2-inch thick polycarbonate
 - Window moved out of "sling path"
- iv. Improved Inner Door Wiping and Sealing
 - Precision-fit wiper/seals to resist swarf buildup and contain coolant sling

5. Live Tooling

a) Improved Tool Clearance

- i. Longer, Larger Tool Capacities

RACE REPORT Continued from page 3

Losing his main sponsor halfway through the year didn't help Sprague's outlook, but GMAC Financial Services jumped right in and kept "Mile Track Jack" in the running. Despite being edged out for the championship, Sprague once again turned in more top-ten finishes (23) and earned more money in race winnings than any other driver in the series.



"Baja 1000" more than five hours ahead of the nearest class competitor, the team passed more than 130 of the 160 cars that started the timed course ahead of them. Drivers Joe Custer, Troy Cline and Steve Pixley took 25 hours 46 minutes to secure the truck's second class win.

SCRA

Troy Cline also wrapped up the SCRA sprint car season with a 5th in points. The team is happy to have finished so high in a field of more than 90 competitors, but is looking to next year to realize their full potential.

court ruled the Patent does not apply.

For Gene Haas and Haas Automation the court's decision is clearly a victory, as well as a great relief. Preparing for trial has been an expensive proposition. Gene Haas has spent more than \$1.5 million in fees and expenses for lawyers, expert witnesses and fact-finders. "We were fully prepared on all aspects to take the case right through to trial," says Haas attorney Pianko.

It may not be the end, however, since Hurco has vowed to appeal the decision. But that's okay with Gene Haas. "We're ready to show that interactive programming was around a long time before Hurco first approached the Patent Office in 1976," he says. "The claim that Hurco invented shop-floor programming is ridiculous. The patent should never have been granted. It summarizes what had been done in the industry already. It's clear to me that these cases aren't about patent infringement at all. They're about money."

And in an industry starved for R&D money, and facing a rapidly dwindling workforce, the money and time wasted on these infringement cases could be better spent elsewhere.

C&C Motorsports

SCORE

Speaking of success, in November, the C&C Motorsports team

returned from La Paz, Mexico, with another win under their belt. Just a few months after snatching a first-in-class victory in the "Baja 500" on their inaugural run, their SCORE mini truck served up yet another defeat to the competition. Finishing the famed

lawyers, Hurco has grossed more than \$32 million in licensing fees in 32 separate settlement agreements.

The narrow claims of the Patent confirmed by the PTO in 1995 are what IMS has used as the basis for lawsuits against nearly every machine tool builder in the world. Nevertheless, IMS asserted that the claims should be broadly interpreted to cover all types of interactive programming.

On October 2, after carefully examining the claims of the Patent as confirmed in 1995, the court determined that Haas Automation does not infringe.

Judge Brinkema determined that the IMS patent covers interactive programming when it is done through a Hurco data block, which is described by the Patent as following the sequence: "data block number, machine mode, control mode, X, Y, and Z dimensions, feed rate, peck rate and tool number." The court also restricted the method of data storage covered by the Patent to a tape cassette.

Since the Haas control uses G- and M-code programming, not specialized data blocks, and stores data via floppy disk drives and/or RS-232 data ports, the

HURCO SUIT Continued from page 2

structure required to realize these desired results. . . . Some of the desired results have been described in such vague terms as to make it difficult to ascertain just what they are or what is to be accomplished."

Only after narrowing their claims drastically to represent the specific application of the "interactive machining system" as it pertains to Hurco machine tools - i.e., data storage via tape cassette and the use of Hurco "data blocks" - was the Patent finally granted. And even then, arguments continued for more than a decade over exactly what was patented. As late as 1994 the PTO continued to reexamine the Patent and reject Hurco's claims based on "prior art."

In January 1995 the PTO finally confirmed certain specific claims of the Patent and determined that other claims were patentable as amended. Coincidentally, it was at roughly this same time that IMS Technology, Inc., was formed, apparently for the sole purpose of trying to enforce the Patent. And it has been a profitable endeavor. According to the company's own

Heavyweight Horizontal Rolls off the Line



The 40-horsepower, 50-taper spindle provides 450 ft-lb of low-speed cutting torque through an oil-cooled, two-speed gearbox. And a vector spindle drive yields peak performance and delivers precise speed control under heavy cutting loads. To provide the rigidity and holding power needed for 50-taper cuts, large-diameter ballscrews and high-thrust brushless motors are used on all axes.

The 28-pocket shuttle-style tool changer moves out of the work envelope for unobstructed machining, while offering ample tool selection for most applications.

The new Haas HS-3R is a 50-taper horizontal brute offering travels of 150" x 50" x 60" (xyz) - something other conventional T-shaped HMCs can't match. These behemoths will be rolling off the line and ready for delivery by the first quarter of 1999.

Big jobs and heavy cutting are what the HS-3R is all about, so its massive 126" x 40" table is designed to hold large parts and fixtures with ease. The built-in 4th-axis rotary table (37" diameter) features a 50" swing radius, and allows machining of all four sides of a part in a single setup for greater accuracy.

Haas Servo Bar 300

Designed to boost productivity and streamline turn operations, the new Haas Servo Bar 300 automatic bar feeder is now available for all Haas SL-20 and SL-30 CNC lathes.

The only "smart" bar feeder on the market, the Servo Bar 300 is designed and built by Haas - exclusively for Haas lathes.



New Bridge Mill Reaches Production

Five-axis machining has become popular these days as a means to speed manufacturing and increase accuracy. But when excess size or weight make it impractical to rotate the

part around the spindle, it becomes necessary to rotate the spindle around the part, instead.

To address this need, Haas Automation introduces the new VB-1 five-axis vertical bridge mill. This extended-travel machine, which debuted at IMTS '98 in Chicago, is scheduled for production during the first quarter of 1999.

Featuring travels of 200" x 84" x 40" and full five-axis capabilities, the new Haas VB-1 bridges the gap between large parts and complex, multi-sided machining. Travels for the 5-axis head are ±120° on the B axis and ±200° on the C axis. The 126" x 59.5" table allows machining off the ends of the table; or a large subplate can be mounted to machine larger workpieces. The 30-hp spindle employs an integrated-motor design and features a vector spindle drive. The spindle is water-cooled for thermal stability and provides speeds to 15,000 rpm for high-speed milling.





IMD team members Lloyd Butfoy and Bryan Dee, from left, man the pit bikes while owner/driver Alex Danze sits on the left front tire. Testing at Willow Springs Raceway yielded lap times just .03 seconds off the class record. Not bad for 100-degree heat and a fresh car!

lower than fielding a team in the current CART/IRL series competition. The car is sponsored by GT Bicycles, Innovative Metal Designs, Haas Automation, Machining Time Savers (MTS, the Haas dealer that services IMD), Classy Cars and RSD, USA.

While conducting the first pre-season testing at Willow Springs Raceway – a nine-turn road course that runs up and down the side of an upper desert mountain in Southern California – Alex was able to push the freshly painted car (#17) to lap times more than a second faster than his old best time at the track, and within .03-second of the track record for AIS cars. Not bad, considering the mid-July mercury was hovering at the 100-degree mark, making the Goodyear Eagle racing tires

lose adhesion because of the excessive track temperatures.

The international AIS schedule will find the Danze Racing team competing in races in Canada and Mexico along with a number of races here in the United States. Support vehicles include a fully enclosed tractor-trailer transport with air-conditioned crew quarters behind the cab, a Daihatsu mini-mini van (painted Haas red and running Haas Automation lettering) that rides in the trailer, a flat-top tire-carrying golf cart and four high-tech mountain bikes from GT Bicycles.

Alex hopes to continue advancing his racing career with the ultimate goal of racing in the Indianapolis 500. Of course, that not only takes driving skill,

but skill in lining up sponsors to finance such an expensive form of competition.

But the Danze family understands the value of investing for a profitable future. “We have been able to increase production from \$200,000 a year to more than \$2.5 million annually with the addition of the Haas machines,” says Alex. “We only buy Haas, and the reasons are obvious: more production, more profit and less stress!”

Innovative Metal Designs, Inc.
18421 Gothard Street, Ste. #400
Huntington Beach, CA 92647
714-847-3197

From The Solutions Department

This new column is designed to help you and your business perform better. It will be a standard feature in future issues of *CNC Machining*. Each of our readers is welcome to submit machining and programming questions to the Haas Applications Department. Haas applications engineers will answer each of your questions promptly, and the best questions will be published with answers in this column.

Dear Applications,

I am currently running a job that requires serialization of paired parts. Each pair must have the same serial number engraved on them. I am using G47 with your sequential serial numbering function. I have set the macro variable #599 to 0001 for my first set of parts. But when I engrave the second half of the set, the counter automatically advances to 0002. Is there a way I can make this automatic function work for me or do I have to manually reset the counter for the second part of each pair?

Signed,
Allen Parker

Dear Allen,

If your machine is equipped with the macros option, you may suppress the advancement of the counter with a #599=#599-1 macros statement. This statement can be used repeatedly (use the copy-and-paste function to save excess key-strokes) to engrave the same serial number on as many parts as you wish. Please refer to the programming example below:

```
%
O00003;
T1 M6;
G00 G90 X0 Y0 G54;
G43 H01 Z1.;
S7500 M03;
Z0.1;
G47 Z-0.01 E5. F10. J0.15 P1 R0.1 X0 Y0
(###) (ENGRAVE AT X0 Y0);
#599=#599-1 (THIS STATEMENT WILL SUPPRESS
THE INCREMENTING OF THE COUNTER);
X2.;
G47 Z-0.01 E5. F10. J0.15 P1 R0.1 X4. Y0
(###) (ENGRAVE AT X4.00 Y0);
(THE COUNTER WILL BE ALLOWED TO ADVANCE BY ONE
AFTER THIS G47 IS FINISHED);
G28 G91 Z0;
G28 Y0;
M30;
M30;
%
```

Sincerely,
Haas Applications

Dear Applications,

We recently purchased a Haas HS-1RP horizontal machining center. Everything is going along just fine, we have been making lots and lots of parts (and money!). But recently, we ran into a little hiccup. We manufacture a family of parts and often we machine dissimilar parts, one on each pallet of the HS-1RP. Well, my operator wasn't paying attention and ran the wrong program for the pallet that was in the machine at the time. He crashed the machine and destroyed valuable tooling, fixtures and the part. Is there anything I can do to ensure that the machine will always run the correct program for the pallet in the machine at the time?

Sincerely,
Dan Foster

Dear Dan,

There is a simple way to eliminate such operator errors. The pallet changer position status is written to discrete inputs #1022 and #1023. If you insert the following simple lines of code in the very beginning of the appropriate programs, your machine will simply stop if the wrong program is selected for the pallet that is in the machine.

```
For pallet "A"
M96 P999 Q22 (JUMP TO BLOCK N999 IF PALLET A IS
IN THE MACHINE);
M00 (WRONG PALLET IN THE MACHINE);
M30;
N999;
```

```
For pallet "B"
M96 P999 Q23 (JUMP TO BLOCK N999 IF B IS IN THE
MACHINE);
M00 (WRONG PALLET IN THE MACHINE);
M30;
N999;
```

Sincerely,
Haas Applications

Dear Applications,

I have a '97 model VF-3 vertical machining center with the fourth-axis option and an HRT 310 rotary table. Up until now I have only used the rotary table for indexing operations on simple parts. I recently bid on a job that will require full four-axis motion. My CAD/CAM system will support both feed-per-minute and inverse-time-feed modes but I am not familiar with inverse-time feed. Should I use inverse-time feed on full fourth-axis parts? What exactly is inverse-time-feed mode?

Sincerely,
Mark Curry

Dear Mark,

Inverse-time feed is not as complicated as it sounds. Inverse-time-feed rates simply dictate the amount of time a particular stroke will take to complete. To calculate the time for a stroke, divide the inverse-time-feed rate into 60. For example, an inverse-time-feed rate of F1000 dictates that the commanded motion of that line will take .06 seconds. This method of feed-rate command allows for more precise control of the feed rate when combining rotary and linear axes. With the Haas control you have the option of running in either inverse-time-feed mode or feed-per-minute. The Haas control can convert linear-feed-per-minute rates to approximated angular-feed-rates based on the user-definable part diameter stored in the 4th- and/or 5th-axis diameter setting(s). This feature allows the user to program a combination of linear and rotary axis motions in feed-per-minute mode, but the rotary feed rate will only be exactly correct at the diameter set by the user. Therefore, inverse-time feed is preferred when mixing linear and rotary axes because it is not a linear-feed-rate command, but rather a time-based feed command.

Sincerely,
Haas Applications

If you have a question regarding the operation of your Haas machine or the running of a program (including rotary tables), please fax your request to 805-278-0861, att: applications, and a Haas applications engineer will follow up and get back to you. If we feel your problem would help others, we will publish it in the following issue of *CNC Machining*. Or you can send your questions to 2800 Sturgis Road, Oxnard, CA 93030 • Att: Applications Dept. You can also e-mail your questions to: askhaas@hotmail.com

Turning the industry upside down – again.



All-New Haas Turning Centers

- Newly Designed Inside
- Newly Designed Outside
- Lower Overall Prices



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SL-SERIES LATHES

SL-20 • SL-30 • SL-40
20" swing 30" swing 40" swing