# CNC MACHINING

EUROPE

NUMBER 07 EN

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## FEATURES



## CYCLE TIME



## THE ANSWER MAN







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# In This Issue

## Polymaths Needed. Apply Everywhere.

Should anyone need reminding of the increase in speed of technological change, consider this: remnants of chipped flint tools found in the paleo-anthropological sites of East Africa indicate that tool making technology was exactly the same, unchanged, for hundreds of thousands of years. Now consider also what author, engineer and Renaissance Man Richard Buckminster Fuller observed in his book Operating Manual for Spaceship Earth: The industrial 'tooling generation' in the late 1960s, he claimed, was just 25 years. In other words, at that time, it took around a quarter century for all tooling to be replaced with newer, more efficient technology. To reiterate, that was more than 40 years ago.

'Bucky', as his friends called him, coined the phrase Spaceship Earth and at a turn helped his peers and contemporaries to think of the planet as a mechanical system: a vessel that needs maintenance and upkeep, as do it's passengers. Our goal, he said, should be "To make the world work for 100% of humanity, in the shortest possible time, through spontaneous cooperation without ideological offence or disadvantage to anyone."

There are those who think that all we need to do to solve our global environmental problems is to butt-out: to remove ourselves as much as possible from the coupling between man and planet and allow the Earth's inherent stability to right things. That may have been a remote possibility a few decades ago, but unfortunately, even if it were economically feasible, the Earth's stability has been altered forever. In his book Eaarth, American author Bill McKibben claims the world and its systems of climate equilibrium have already changed irrevocably; that we live on a new planet different to the old Earth, and that we need new strategies if we're going to survive.

Shakespeare's King Lear referred to men (mankind) as 'ruined pieces of nature', an epithet and a sentiment with which perhaps Bill McKibben might agree. British environmentalist and author Mark Lynas, on the other hand, calls us The God Species in his book of the same name. He argues that we have the power and the opportunity to determine our own destiny and that of the 11 million or so known species on this planet. Not by doing less, but by doing more: by the careful, considered and judicious use of technology. Generally, his arguments are that we need to engineer solutions, be wary of bad science, and not turn our backs on progress.

We have much better tools now than ever before and they get better by the day. We have bigger brains than those early hominids and we currently have the time and (thanks to fossil fuels) sufficient energy to prioritise things other than simple materialism: things such as conservation and good stewardship of our resources. Free markets, science & engineering technology, and global economic cooperation are some of the most important and powerful tools we have at our disposal.

Today, as I write, is World Teacher's Day. October 5th. It's also, by coincidence, Manufacturing Day. If you're a teacher or an instructor in a Haas Technical Education Centre, this is very definitely your day.

Buckminster Fuller – the teacher and polymath who in a fit of boundless thinking once proposed and designed a geodesic dome to cover all of Manhattan, warned against the dangers of specialisation. He urged us instead to "dare to think competently regarding our potentials," claiming, "(w)e find it socially easier to go on with our narrow, shortsighted specialization's and leave it to others — primarily to the politicians — to find some way of resolving our common dilemmas." We shouldn't, he maintained, leave our future for anyone else to determine. Perhaps we should all try to be more like him, or maybe like Australian poet Les Murray: "I'm only interested," he once remarked, "in everything."

**Matt Bailey**

## On The Cover

**While it may look vintage, this is a brand-new high-performance 500cc Norton engine created by Works Racing in the UK.**

# Water Powered

by Matt Bailey

Kendal is in the Lake District, Cumbria, in the north west of England. By rights, it should be called the Wet District, but as anyone who has ever been to the exposed reaches of our fair but damp island will understand; honesty isn't necessarily good for tourism. So, the area has always been known and described by dogged and enterprising locals for the weather's pretty and marketable side effects, rather than for its towering hills or craggy mountain tops, like its less wet, less famous neighbour, The Peak District.

Long before its natural history drew the huddled holidaying masses, the town's people got along nicely producing pipe tobacco, snuff and Mint Cake, an invention from the 1860's that's still made and sold today. Kendal Mint Cake isn't cake at all, but dense, glucose-based confectionary that could just about keep you alive if you're an injured shepherd or a wretched hill-walker traipsing ever decreasing circles in thickening cloud - at least, long enough to enjoy one last smoke of your local tobacco.

North West England in the mid-19th century may not have been the tourist destination it is today, but it became a place of great industrial activity. The coal-powered revolution had begun one hundred years previously, one hundred and fifty miles or so to the south, but in the valleys of what used to be the old Westmorland and Kendal baronies, those who owned the means of production covetously eyed the cascading water as an alternative and cheaper source of potential power, to run their machinery and turn their mill wheels.

The firm of Gilbert Gilkes and Gordon Ltd was founded in 1853 to design and manufacture the turbines and infrastructure to capture the energy sliding off the hillsides. The company is still there today, in Kendal town, doing what


it always did, and it still occupies the building it moved in to 120 years ago, where part of the Lancashire Canal once passed through, bringing packet boats of freight and passengers from the neighbouring county. The tunnels that carried the boats along the canal and under the Gilkes factory were blocked a long time ago, but the brickwork arches remain where the old building abuts the new, and a sepia-toned photograph hanging beside the current production line shows workers shifting supplies into and out of boat hulls.

There are few other reminders that this privately owned company has been here since Queen Victoria celebrated her Crystal Jubilee; one half of the factory floor is packed with the latest Haas CNC machine tools, arranged in cells and making pumps for diesel engines; the other is open space where components of hydro-power turbines are assembled before being shipped somewhere in the world, to add to the impressive tally of more than 6500 'installations' in 80 countries.

The Haas CNC machine tools are used to manufacture a range of sophisticated pumps for the cooling of diesel engines and plant. Gilkes supplies many of the world's major diesel engine manufacturers, and also produces pumping solutions for the lubricating of oil or gas and steam turbines. In fact, says Operations Director Andy Poole, Gilkes produces pumps for virtually any application, and has been trading on a reputation established during the Second World War.

"We developed a pump which went on trawlers," he says. "When the war finished, the fishermen remembered the name. Then, when they built their own boats, they told the engine suppliers what pumps they wanted and the demand has just grown from there."

Many similar pumps are manufactured using rubber impellers (the part that goes inside the pump and does all the work), and rubber wears out. "We've always offered metal impellers," says Andy Poole, "which means our pumps last longer and perform better for longer. This year we'll make about 19,000 units, all here,

in this facility on Haas machine tools." By contrast, turbine parts are not manufactured in Kendal. "We do all the design work," says Mr. Poole, "but the components are made by sub-contractors and only assembled here. We also have a pump plant in Houston, which was established around 35-years ago to refurbish units for our US customers.

"Both Caterpillar and also Cummins run refurbishing programmes, where they take engines back from customers and overhaul them. They usually send the pump back to us for rebuilding. So, we're working on pumps now for generator-sets and industrial and marine applications that we may get back for reconditioning in around 7 or 8 years time. Many of the bronze pumps you see around the factory are for marine applications."

In goods inward, pallets are stacked high with cast pump bodies in different finishes and colours. The castings are all sourced in the UK, which means any quality issues can be resolved quickly and easily. Assuming the casting is good, it becomes a finished pump in around a week, and is then most likely shipped to one of Gilkes' customers' plants in the UK or overseas.

"We don't run a kanban system," says Andy Poole. "We make for stock or to order. We have a warehouse in the United States because our largest customer, Caterpillar, rarely gives us more than one or two days notice."

The decision to invest in Haas CNC machine tools had a lot to do with the company's US-operations.

"We researched the market," says Mr. Poole, "but one of our main considerations when we shortlisted the choices was that we wanted to have the same machines at our US


plant in Houston as we use here, in the UK. We wanted a machine tool that was going to be supported both sides of the Atlantic and used the same control. Haas has a huge user base in America, plus they have a wide range of different machines for different applications. It also means our engineers in the UK can easily share their experience and best practice with their US counter-parts."

Gilkes' Haas machine tools are organised in product cells – or on a 'group technology' basis, as the company refers to the layout. The eventual aim is to have 6 cells, with Haas machines replacing all of the company's older machine tools.

One of the lines runs two Haas SL-30 turning centres and an EC300 horizontal, making small bearing houses and bodies. Another, non-Haas line runs shafts - Haas machines will eventually replace all of these, older machine tools. "Some of these machines are actually older than me," says Mr. Poole.

A third line runs SL-40 turning centres and VF-3 vertical mills making larger housings and bodies. The fourth line is actually a dedicated, high-volume cell that during my visit was

being installed and tested: it's a Haas DS-30SSY high-speed turning centre with Y-axis and live tooling. There's a Haas bar feed, an ABB robot for unloading parts, and a Renishaw Equator bench top gauge, for in-process testing. When the cell is fully commissioned, it will work two shifts a day making one collar and one spacer for every pump, plus spares, which will add up to around 50,000 parts a year. The whole investment totals more than £400,000!

"We also have 2 more Haas lathes coming on later this week," says Mr. Poole, "which will make up the fifth cell, to machine impellers."


Standing alongside one another are two Haas TL-2 toolroom lathes, making bronze parts for marine pumps, and alone in the middle of the workshop is TM-1P, dedicated to making impellers.

Gilkes is a very busy, British manufacturer developing and making perdurable industrial products for global customers and applications. The company is still managed by members of the founding family, but unlike some firms that find it difficult to let go of the past, this one is planning and investing for future glories and has recently received a government grant for a purpose-built factory on the outskirts of town, where it will have room for its biggest ever expansion.

In this day and age of super-profit making, self-congratulating corporations, the example this self-assured firm sets, begs the question, How many will be around 160 years from now, doing more-or-less what they were doing when they were founded, but doing it better with every passing year? As long as the Lake District is wet, I predict that there will always be a Gilbert Gilkes and Gordon Ltd.

**www.gilkesenergy.com**

# Haas Technology Implanted at PPM

Before he founded his company 40 years ago, Fran Phillips was a lone machinist – a hands-on guy with a mill and a lathe during the space-race era, when NASA was spending liberally to make JFK's promise a reality, and every willing and able machine shop in the country could benefit. One of the parts Fran made at that time, I'm told, is still on the moon, precisely where the Apollo astronauts left it. By contrast, one of the parts he made more recently – just as out-of-reach, but much closer to home – is lodged precisely and in perpetuity in his own spine. Like many thousands of patients around the world, Fran Phillips lives with an implant made on Haas CNC machine tools by Elmwood Park, New Jersey-based Phillips Precision Medicraft (PPM).



Located less than 20 miles from New York City, PPM has grown to become a recognized leader in the manufacture of advanced orthopedic implants, instrumentation, and sterilized delivery systems. The company uses 40 Haas CNC milling machines and 6 Haas CNC turning centers, and specializes in implants for the knee, hip, elbow, shoulder, and spine, as well as the instrumentation and tooling necessary to install such devices in the body.

"We purchased our first Haas mill in 1992, and have continued investing in Haas technology ever since," states John Phillips, Fran's eldest son and PPM's President of Operations. "Standardizing on the Haas platform makes it easier to schedule work, and to move employees from machine to machine."

PPM provides a made-to-order service for orthopedic industry customers that include Stryker, Zimmer, and Biomet, to name but a few. The company's machining capability helps facilitate a complete "art-to-part" offer, using Haas Super VF series mills and SL series turning centres.

"We've had Haas machines for the past 20 years, but we've retired only a few," says John. "Most of them run 20 hours a day, but still produce the same quality as when they were new. We certainly get our money's worth. In our opinion, the ratio of performance to price offered by Haas cannot be matched."

PPM isn't making commodity parts; the components produced on the long lines of neatly laid out machines contain high-precision, high-complexity features.

"Take this hip broach, for example," says John, holding a part approximately 10" long with tapered cutting-tooth geometry at one end, transposing to hexagon geometry at the other. "It would normally be produced on a CNC grinding machine, but we use Haas fourth-axis and right-angle head technology to introduce a tool at such an angle and high rpm that we're able to simulate a five-axis application, producing the broach with a tool geometry that cannot be duplicated using grinding technology. The resulting broach offers a very aggressive cutting-tooth design, which the doctors love because they can get in and out very quickly, reducing surgery times."

John Phillips says that the company rarely gets much advance notice of what parts will be required, or when. As a result, the flexibility of the Haas machines is another vital element in the day-to-day success of the business. PPM can offer up to 60 different sizes of conical stems, for example, at the touch of a "start" button, often in batches up to 1200 or 1500 a month. At the same time, the company will often produce custom runs of just 5, 20, or 100 off.

**Text and photos by Matt Bailey**


PPM's conical stems are complex titanium parts that utilize several Haas machines for operations that include close angular tapers, milling, drilling, tapping, turning, and broaching hexagons. It's all a far cry from the business that Fran Phillips started in his basement back in 1967. However, from modest beginnings, the business soon grew, and moved to a 40-man machine shop in the '70s, before a strategic shift in the early '80s was to shape the future of PPM thereafter.

"Basically, we upgraded to the manufacture of medical devices and never looked back," says John. "No one was in orthopedics back then, so it was a major opportunity for the business. Obviously, nowadays it's a whole different game. We made a concerted effort to invest a few million dollars to build our quality systems, procedures, and control plans to ISO 13485 standards, which is what we've done. After all, the key to our success – the most important thing we build – is not for sale: our reputation."

Today, the pressures faced by PPM center largely on customers seeking offshore solutions, typically from China, Malaysia, and other low-cost areas of the world. As a result, the company has created a niche for machining high-end medical components that "no one else wants to cut, because it's just not profitable for them."

John Phillips describes PPM's manufacturing style as "probably a little different," positively "attacking CAD models in Pro-Engineer, and then generating our machine code in the same CAD package, returning seamlessly what the client ordered from solid geometry to the reality of actual products manufactured exactly to specification.

"Using Haas technology, we get greedy," he adds. "We utilize a fourth-axis rotary head to machine four sides of the workpiece with one fixture, and then we flip it, and we're done in two operations, before it goes into our finishing department for deburring."

Typical materials processed on the Haas machines include 17/4 stainless steel, 400- and 300-series stainless steel, titanium, cobalt chrome, and PEEK (polyether ether ketone). In terms of the latter, PPM has just secured its first order for PEEK, and these parts will also be produced using Haas technology.

"We're a no-debt operation – we buy our equipment, pay it off, and move on," explains John. "The Haas machines are particularly good for us, as is the price structure. The machines we acquired weren't $500,000, like some makes; they were a lot less, so we

had the means to bring them in as needed, and we could own them outright. In addition, for the size of product that we manufacture, the machining envelopes and tables are just the right size, and the machines have no problem holding the close tolerances our parts require."

John Phillips and his family understand fully the importance of the parts they are making, the difference they can make to a recipient's life, and the need to pay close attention to specifications and quality.

"My father has just turned 73," says John, "but when he was 62, he had only recently begun to enjoy a reduced work schedule, and was spending more time playing his favorite game, golf. However, he fractured his L4 lumbar spine and couldn't walk. He was on pain pills, and clutching chairs to move around. Here was a guy coming into his golden years and wanting to enjoy himself, and suddenly, he's debilitated! Well, that same guy now has new PPM spine parts, and you would never know he had a problem. In fact, he just won his golf club championship!"

**Phillips Precision Medicraft**
**www.phillipsmedicraft.com**
**201-797-8820**

Steven M. Kille, President and CEO of DesignWerkes, started his business as a freelance design engineer. Later, he began making durability test equipment for his customers to destructively test the automotive parts he and other suppliers were designing. Later, still, he found himself involved in the design, engineering, and assembly of complex electro-mechanical subsystems for hybrid public transportation vehicles. He's a man dedicated to refining "the process," which, he claims, is the only way manufacturing companies can still thrive long-term in the USA.

# Haas Conviction


On the face of it, DesignWerkes appears to be a regular, run-of-the-mill subcontract machining business, no different than thousands of other Haas-equipped shops up and down the USA. But what sets DesignWerkes apart, is that 95 percent of what it creates, the company has also designed.

"So, we're not a typical job shop," emphasizes founder and owner Steve Kille. "Before I bought my first Haas VF-3 in 2002, I didn't, in fact, build anything. I was a plain-paper designer of mechanical products."

Specifically, Mr. Kille was designing electro-mechanical automotive systems such as switch assemblies, the likes of which are tested rigorously. If an auto company has to recall a product due to a premature failure, the potential costs can be very high. "As the product designer," he says, "I found myself explaining to job shops how to build this test equipment. Then, one day, it just occurred to me that this was kind of foolish: We're a mechanical design firm, and we're giving away the design to other people to make the products and the test rigs." He figured he could add considerable value by not just designing the product, but also designing and building the test equipment, and qualifying the end product for the customer.

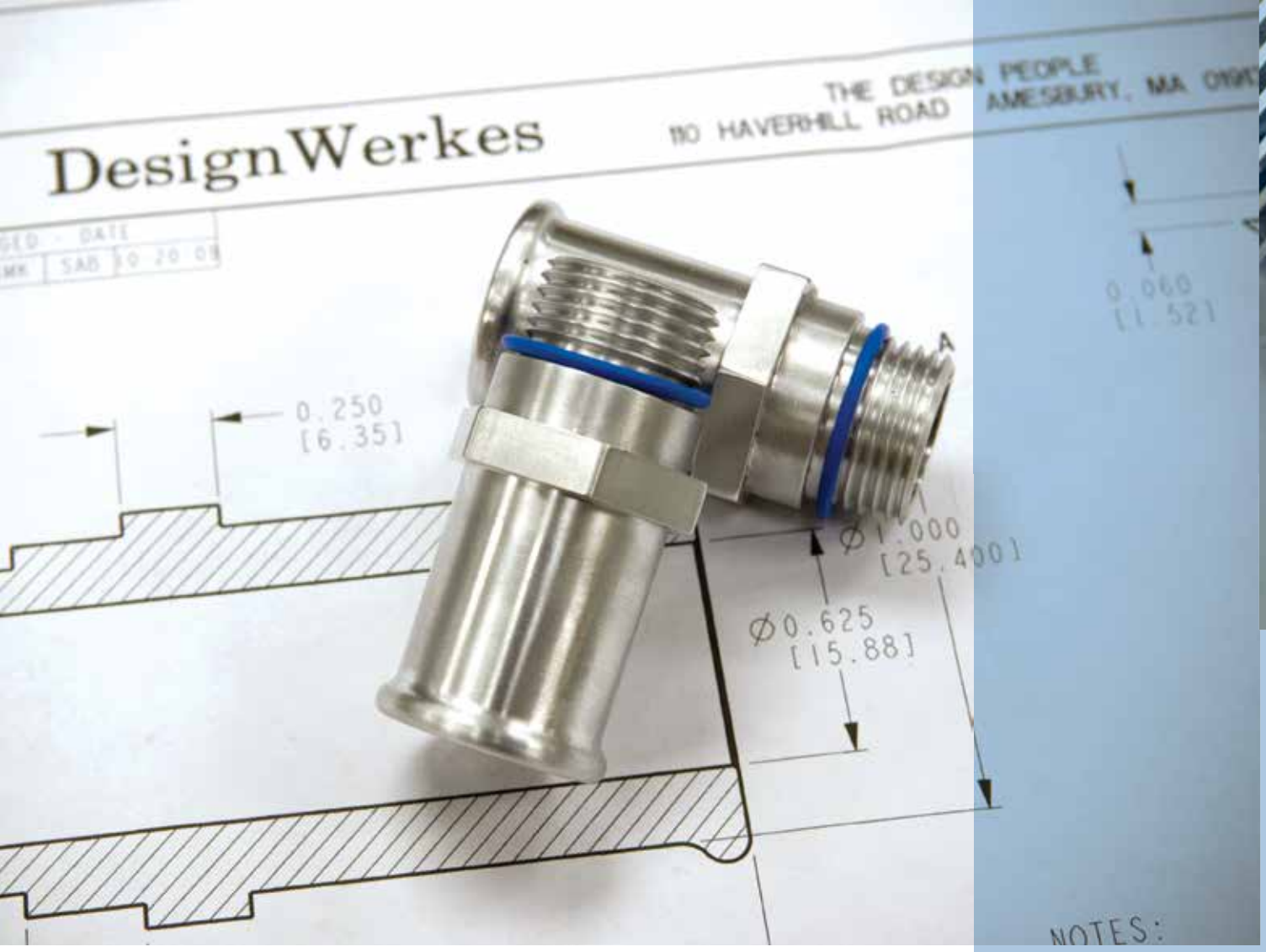
During and after a lengthy tenure at GE, Steve Kille managed large CNC machine shops, so he wasn't short of hands-on machining experience. "Once we'd made the decision to cut metal, we went looking for machines," Mr. Kille explains, "and we realized quickly that Haas was absolutely the best value for the money. I began by looking at both used and new equipment, and I saw that Haas machines hold their value, so I decided to contact the Haas Factory Outlet in New Hampshire, and went to look at a few different models. We went over there one night after work, and they did a demo for us. I took all the guys who worked here at the time, and we agreed we should buy the VF-3."

About a year later, Mr. Kille also bought a VF-2 and an SL-10 turning center. "I bought another VF-3, too; then the economy tanked, so we slowed down for a while. As things began to pick up again, I bought an SL-20 and a VF-5, then another VF-3. Two years ago, I bought a VF-6 and my first VF-5SS. Then, in December, I bought another VF-5SS." Mr. Kille claims that buying the high-speed Haas machines was a turning point. "I don't think we'll ever buy anything but Haas Super Speed machines from now on," he says. "I believe we are seeing about a 20 percent productivity improvement over standard-speed machines. Plus, ninety percent of what we make is in aluminum, so the 12,000-rpm spindle is very important for us."

The cell of high-speed Haas machines constitutes what could be regarded as the machining heart of DesignWerkes: a finely tuned, integrated manufacturing process of which Steve Kille is particularly proud. "We run 19 operations on 4 parts in this cell," he says. "It's a permanent setup, so we can run it extremely lean.

"I've integrated my supply base right into my production schedule, so that I run the cell five times a day. The supplier brings material every Tuesday and Thursday, and every morning the plating company comes in and picks up five sets of parts and delivers them back the next day. Organizing in this way means we run with low overheads."

Mr. Kille is adamant that cost-effective CNC machining isn't about where a company is located, or about simply achieving low labor costs. "Of course, there are some things you cannot make in this country anymore," he says, "like circuit boards. However, if you machine parts on a CNC machine, I don't believe it makes any difference where you are based. The trick is to take the labor out, economically. You can't spend millions on automation, because there's not enough payback. But if buy the right equipment and you run a lean operation




. . . So there is no advantage in having your machine in India or China. If the production cost were comparable to what it would be here, you'd still have to add shipping costs. Anyway, in the automotive world, time is key. You don't want parts held up during export or shipping. We're making components that will be shipped and assembled two weeks from now, so we simply cannot have delays."

DesignWerkes' Haas machines run two shifts a day, totalling 20 hours. "Last November and December, we were running 24 hours a day, to meet our customers' deadlines. We didn't lock the doors for eight weeks!"

Steve Kille is always keen to reiterate why his company is not just a run-of-the-mill machine shop. "None of the large design firms in Boston do what we do," he states. "We design things, but we also know all the engineering processes, like plastic injection molding, for example. So we can design, prototype, produce, and test the products we're making. You can't be a good design engineer if you don't understand how the products go together. If we have any failure at testing, I'll go in and do the analysis to determine why it failed, and I'll make the change in conjunction with the customer. Really, we're a 'super consultancy.' But whereas the business was once 60 percent design, 40 percent manufacturing. It has now inverted."

Mr. Kille claims that the big opportunity for his business in the future is green technology. The final product may be new, but the challenge, he says, is always the same. "The power transfer unit we're making is for a hybrid train system for city transit buses.

The customer hired me as a consultant, as they were having problems. I analysed their designs, and highlighted three major issues, which, fortunately, they had also identified. This created a great deal of credibility for me. I also identified three more problems that they hadn't seen yet, and assured them that they would cause complications if they were not corrected. Things went quiet, and then a couple of weeks later, they called and asked me what I would do if I were going to design the system from scratch. So, we built a few prototypes of this system to see how ours tested compared to theirs. We solved all their problems, and took so much cost out of the product that they funded my redesign from the savings we made." This is the order that convinced the company to invest in the Haas Super Speed cell.

"I'd rather not be specific about production numbers, but we built hundreds of systems for this particular customer last year. Our plan this year was to double that production, but we are actually going to do almost three times the volume! I'm negotiating volumes for next year, and I've just bought two more Haas VF-2SS machines. We have plans to add a VF-6 and a VF-3SS, which will bring us to a total of 14 machines by year's end."

The economics are simple, claims Mr. Kille. "Investing in a Haas machine means I have a huge competitive advantage over someone who buys a machine with similar performance, but for $50,000 more than I spent." And good luck to anyone who tries to convince him otherwise.

**DesignWerkes**
**978-388-7830**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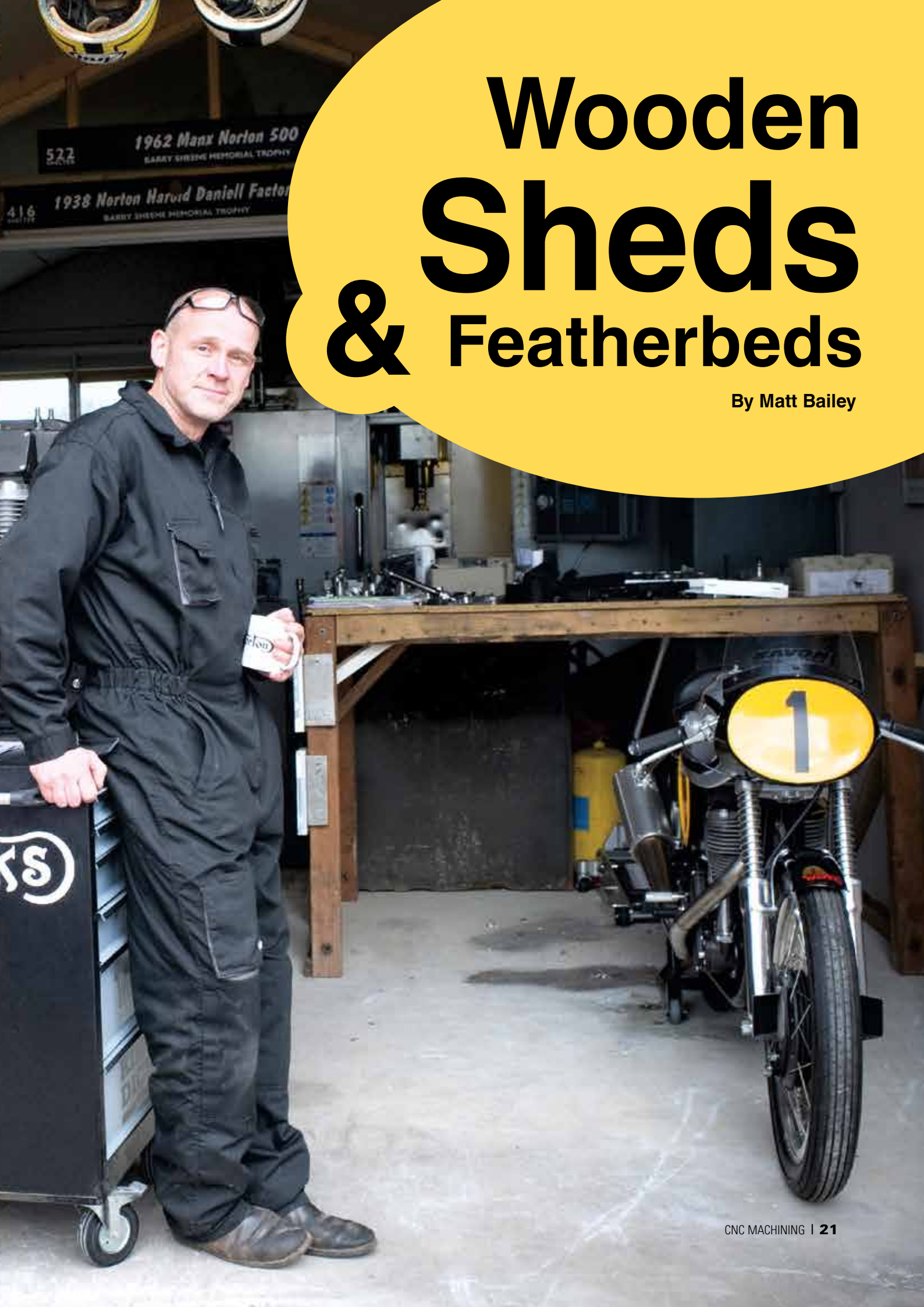
# Wooden Sheds & Featherbeds

By Matt Bailey



In the 1950s, Enzo Ferrari referred to precocious British Formula 1 teams as garagisti, a condescension suggesting that, as humble garage dwellers, they should be taken less seriously than the Maranello scuderia, which liked to see itself as motor racing aristocracy: a blue-blood in a sport of oily-rag upstarts. It would have been more accurate, however, if the "Old Man" had referred to his racing adversaries as *shed-ites*.

Englishmen are famed for many things, but the cultural, economic, and psychological importance of the garden shed is little known or understood beyond the country's shores and borders.

Usually a relatively temporary wooden building, built on an allotment of land or adjacent to the owner's home, a shed may have been bought as a flat pack from a DIY (Do-it-Yourself) superstore or, more typically, assembled and patched-up over generations from flotsam and jetsam, household junk, and anything to-hand when the roof springs a leak.

Some sheds are built simply as places of predictable calm, where a harried father and husband can escape the demands and emotional up-and-downs of family life, perhaps to read the newspaper. Others are places of quiet, after-hours industry, where beer is brewed, flies are tied, or wood is turned on ancient capstan lathes. Some sheds contain the manifestations of their owners' childhood dreams: Perhaps a sprawling, lovingly detailed model railway, or even – and I've seen this with my own eyes – a 12-seat recreation of a vintage Picture Palace movie theatre. Often, there are few outward clues to what a modest, dilapidated shed may or may not contain. Windows are usually opaque with grime or pipe smoke; sheds are tidied and swept, but most are never cleaned, for fear they may lose their patina, or worse, fall apart.

The English love the idea of the underdog, and nothing houses that self-effacing concept quite as fittingly as the common garden shed, within which great goliath-slaying plans are hatched, and winning contraptions and inventions are tinkered with, usually over a mug of steaming tea.

**"It's vitally important that our engines have more power than the competition, so the engines are designed and made to very tight tolerances. Precision means power!"**

Patrick Walker is what the vintage motorcycle fraternity affectionately refer to as a *Fred-in-a-Shed* supplier. Based in the West Midlands, his company, Works Racing Ltd, makes engine parts for treasured Norton Manx 500s from the 1950s and '60s. His "factory" is nothing more than an unadorned, largely unprepossessing wooden shell next to the home he shares with his wife, three children, and two dogs, halfway along a muddy lane near Stratford-Upon-Avon, the birthplace of William Shakespeare. When the weather is fine, as it was on the day of my visit, Mr. Walker throws open the double door of his south-facing workplace and sunshine illuminates a curiosity shop of engines, half-finished restorations, work benches, vintage motorcycle memorabilia, and a Haas Mini Mill 2. It is a shed to be envied; a shed *par-excellence.*

As its name suggests, the Norton *Manx* (of or relating to the Isle of Man) was designed and developed to contest the annual Tourist Trophy (TT), the world's oldest motorcycle road-race. The TT follows a circuitous 37-mile course through the villages, byways, and mountains of the island, and since 1907, the bravest bikers in the world – some privateers, others riding for works teams – have been coming here to test themselves and their machines. The first ever race was won by a Norton twin, and despite being eventually usurped, the English marque has always, for many, personified the TT spirit.

The Norton Manx 350/500cc of the late '50s and early '60s represent perhaps the company's heyday, before the more technically advanced engines from Japan eventually forced them off the road. These days, "Manxs" are coveted machines, and although worth as much as $50,000, they are still campaigned with vigour and passion at nostalgia events like the Goodwood Revival, held every year and attended by such surviving motorcycle racing legends as Giacomo Agostini and John Surtees.

"My business partner Miles Robinson and I decided to start Works Racing Motor Cycles Ltd. in 2008, whilst racing at Goodwood," says Patrick Walker, "probably as a result of drinking too much champagne. We thought that we would manufacture our own 350cc and 500cc engines and parts, and sell them to Norton owners around the world." Just three years after that lightheaded moment, Works isn't only building the engine, it's also building the entire bike.

**"For a small, start-up company, it was a big investment decision to undertake the machining in-house, but it has definitely paid off. The Haas Mini Mill 2 is incredibly accurate, and the parts it's making are excellent.**

The engine Mr. Walker produces is aimed squarely at very competitive classic motorcycle racing. Works customers are racers through-and-through and, he says, they race to win, notwithstanding the historical value of their machines. "It's vitally important that our engines have more power than the competition, so the engines are designed and made to very tight tolerances. Precision means power!"

Before starting Works Racing, Patrick Walker spent almost 20 years in high-performance engine development, which, he claims, was excellent training for his new venture. The early days of that training were spent at the original Norton Motorcycles Company, working alongside engineer Doug Hele, a name that will be familiar to Norton aficionados around the world. Mr. Hele was the last of the Norton engineers who was working on the Manx race bikes, in 1962.

"I'm really privileged to have been trained by Doug," says Mr. Walker. "It's a great link to the original company. But, I wanted to use all of the processes and know-how I'd learnt in my career, and apply them to producing a better version of a very old engine design. For example, instead of going to traditional pattern makers to produce our castings and moulds, we had all of our tooling for the foundry cut straight from the CAD models on CNC machines. That means the castings are extremely accurate, far more accurate than the originals."

Despite his many years of engineering and engine development experience, Mr. Walker had limited hands-on experience with CNC machine tools or CAD/CAM software. "In my previous company, I managed a machine shop, and rarely had the chance to do any of the programming. When I began Works Racing, it took me about six month's hard graft to design the complete engine in SolidWorks®. I was a reasonably competent CAD modeler, but not an expert, by any means. Because it's an old engine, it was produced originally using wooden patterns, so there were lots of parts that were not easy, geometric shapes. Some of them were made by hand, which made modeling them quite a challenge. As a result, I ended up being pretty expert with CAD."

Once the designs were finalised, the question became one of how to make them. Mr. Walker considered three different routes:

"We could have employed somebody and bought a machine; we could have subbed-out all our parts, which I suppose is the most obvious route; but we decided there was a third way, and that was to buy a machine, and have me drive it myself." It was at that stage that he spoke to Haas UK – the exclusive Haas distributor for the UK – and eventually decided to buy a Haas Mini Mill 2, a compact, small-footprint CNC machine tool with single-phase power, making it ideal for the Works Racing shed, without having to upgrade the power supply.

"I took delivery of the Haas Mini-Mill," Mr. Walker explains, "and the first thing I needed to do was to learn how to use it. Thankfully, it turned out to be a remarkably simple process. The machine is so intuitive to use I was able to produce all my jigs and fixtures and a full set of castings for the first engine in eight weeks, which was just remarkable."

A particular advantage of designing the engine in 3D is that the CAD models can be used for finite element, stress, and thermal analysis. "We can really optimise the design of the parts. Mind you, they all have to be interchangeable or identical to the originals, so I haven't made any big changes. Analysing the designs has allowed me to make lots of very subtle tweaks to improve durability and performance."

The way Mr. Walker produces the many different engine castings is, he says, a little unusual. Rather than machining in batches of 10 or 20 parts, which would perhaps be the normal approach, he produces a complete engine-set, with parts machined as one-offs. "Instead of making 10 crankcases, 10 cylinder heads, 10 cam boxes, etc, before I start to build an engine, I actually make a set of everything to the customer's exact specification. That engine then gets built and shipped before I start on the next. I use Planit's Edgecam 3D CAM software to programme complex 3D profiles, such as combustion chambers. The SolidWorks-Edgecam-Haas arrangement is absolutely fundamental to our success. It's a powerful and flexible combination."


To reduce machining time lost as a result of multiple setups, Mr. Walker employs a simple, quick-release Stark SPEEDY® module plate, which allows him to make parts economically as one-offs, rather than as batches. "It's a piece of equipment that is permanently fixed to the bed of my machine," he says, "and it enables me to change from a chuck to a jig to a vise in literally 5 seconds. I don't have to clock each time I change the jig or workholding. Each jig goes on in exactly the same position within a few microns. The plate works very well with the Haas machine."

The decision to buy the Haas Mini Mill 2, rather than subcontract production to an external supplier, has enabled Works Racing to move ahead at its own pace and without risking or compromising quality and delivery. For the first 18 months of its existence, the company focused exclusively on producing engine parts, but more recently has moved into making and assembling complete bikes, and now offers an exact recreation of a 1962 500cc Manx Norton. In a second, smaller shed at the bottom of his garden, Mr. Walker keeps the black, powder-coated "Featherbed" frames that will eventually become customers' Manx Nortons. The famous Featherbed was designed originally by the McCandless brothers of Belfast, Ireland, and was the frame of choice of racer Geoff Duke and his contemporaries in the 1950s.

**"We can really optimise the design of the parts. Mind you, they all have to be interchangeable or identical to the originals, so I haven't made any big changes.**

"I'm really pleased with my Haas machine," concludes Mr. Walker. "For a small, start-up company, it was a big investment decision to undertake the machining in-house, but it has definitely paid off. The Haas Mini Mill 2 is incredibly accurate, and the parts it's making are excellent. It's also reliable. For the two years I've had it, it hasn't missed a beat, and if ever I need help, I just call Haas UK and they tell me what I need to know."

It goes without saying that Patrick Walker is a dyed-in-the-wool Norton enthusiast. "I've always owned Nortons,"


he says. "I've always been obsessed by the Norton story, and I'm also very proud to be associated with the new factory at Donnington Park. We're official Historic Racing Partner to Norton, which is a great accolade. It's really nice to be involved with those guys, and to feel like we're helping keep the Norton name alive."

During the off-season, Works Racing rarely opens its double door, except on those unseasonably warm and dry days that remind us spring will once again eventually come around. When it does, Patrick Walker's customers will head to the country's hallowed race venues to ride and race their finely-tuned and loved machines, and prove, if ever proof were needed, that great things can still come from the garden sheds of rural England.

**Works Racing Motor Cycles Ltd**
**www.worksracing.co.uk**
**+44 (0)1789 750105**


RIGOUTAT
PARIS

*A few years ago there was an advertising booklet for iMac computers that ran the tagline: "You have 206 bones in your body. Surely, one of them is creative." Visitors to the Rigoutat oboe workshop in Saint Maur des Fossés, just outside Paris, France, could be forgiven for admonishing themselves likewise: "You have 206 bones in your body." I told myself, while I was there. "Surely, one of them is musical." After all, to paraphrase Johannes Sebastian Bach, it's easy to play an oboe. All you have to do is touch the right key at the right time and the instrument will play itself.*

# High Praise for the Hautbois

If only it were that easy, Johannes, I would have bought a Rigoutat oboe there and then, just like eight years ago I bought the alluring, white iMac. The density of the dark African hardwood and the glint of the silver-plated nickel keys are more desirable than anything plastic out of Cupertino, California, before or since. To see a beautifully crafted Rigoutat on my desk every day would be a pleasure, albeit a silent and guilty one. Getting an iTune out of the iMac, on the other hand, has never been much of a challenge.

For those who admire rather than play, it's heart-warming and, to be honest, a little galling to hear the oboe – any instrument, in fact, played extremely well. It can move you to an altered state, but it can also make you wonder what you've done with your time when you could have been studying the higher arts.

Company owner Philippe Rigoutat loves oboe music and like his ancestors, has dedicated his time to playing and to making them, as if one challenge were not enough. Philippe's grandfather founded the firm in 1922 after working for his stepfather, Monsieur Leblanc, who owned a famous firm of clarinet makers. Despite becoming head of the factory, Rigoutat was fired for being an active communist during what became known as the rise of the Paris Red Belt. Job offers were few and far between so, unlike most of his Bolshevik brethren – many of whom were artists and writers drawn to the city by the social upheaval, he did what he had to do: embraced private enterprise and started his own business.

"The company really began to evolve after my father joined in 1945, when he was just 14," recounts Philippe. "In those days, he made just two or three oboes a month using a paddle-lathe to turn the wood. He had to subcontract a lot of the work. When the firm bought its first electric-lathe in 1950, it was a revolution!" Although, not exactly the sort grandfather Rigoutat had originally hoped for.

Recently, the company began using a Haas CNC Toolroom Lathe and a Haas Mini Mill to make the intricate metal components and also the carefully crafted, seasoned wooden body.

"These days we make 50 to 60 instruments a month and, although we still outsource the silver-plating and the casting, we can make and finish almost every part here in our factory. That's the benefit of using Haas CNC machines: they are easy to use, they are not too expensive, and they give us the control to make exactly what we want. By contrast, when we were subcontracting we still had to make changes to components in-house, before they were ready to use."

It takes around 50+ hours to make each oboe. "We have 15 employees, including one operator for each Haas machine," says Philippe. "They work five days a week. Although I also learnt how to make oboes here, and I can work in both wood and metal, my skill is in the 'critical eye' – quality control, you could call it; examining each instrument for workmanship."

Rigoutat uses African Blackwood from Mozambique or Madagascar: "It has the best qualities for oboe; it's expensive, but not too much. It is very hard, so we have to use carbide cutting-tools on our Haas lathe. We buy the wood in oblong blocks, pre-cut to the size we need. We drill the air hole through the middle then turn the outside by hand to create the basic shape Then we set them aside to rest for five years. This allows the wood to react to temperature changes, so it no longer moves in different environments and is less likely to crack.

"Machining the wood is critical. If you make a mistake with the mechanism, you can change it. Whereas, if you do something wrong with the wood, it can spoil the whole oboe but you won't know it until you have finished it."

Once the wood has aged, Rigoutat machine operators use the Haas TL lathe to perfect the body of the oboe. "We make the holes that make the notes and add the cushion that holds the mechanism to the wood. The body of the oboe has 20-22 holes for the notes and 50-55 holes to hold the cushion in place, while a 'full conservatoire' oboe has 45 keys."

The Haas Mini Mill is used to cut the mechanism from a single bar of cast nickel silver and to make the individual keys, before sending them away for silver-plating and polishing. "This is an expensive process," explains Philippe. "Precious metal prices have increased over the past few years so we recycle the waste metal and sell it back to the metallurgists, who blend old-with-new to improve mechanical properties."

Finally, one of Rigoutat's finishers fits the mechanism, springs and reeds that make the oboe complete. Only then does Rigoutat invite musicians and experienced teachers to test their professional and student oboes. "They check for sound quality and playability," says Philippe, "and confirm whether the instrument is good enough to sell."

The firm's Haas machines are supplied by the local Haas Factory Outlet (HFO) RealMeca S.A. "We were impressed with their service as well as with the quality of the Haas machines," says Philippe, "which offered us all the precision and flexibility we needed."

Cost control, says Philippe, was the main driver for buying the Haas CNC machines: “They have directly helped us reduce our production costs by around 20%. However, we have also gained in terms of quality control and independence, which is equally important but impossible to quantify. All I can say is that it has really helped us to further enhance our reputation with our distributors and our customers, the musicians.”

That reputation has grown as classical music has also grown in popularity globally. “When musicians who played our instruments first started performing abroad, they effectively became our representatives. Other musicians then asked to try our oboes and to meet my father. Unfortunately, he only spoke French so it was not easy for him. After I joined the firm in 1977, I started to travel and build relationships with our customers. Now, we export 70% of our instruments to musicians all over the world!”

Personal service is an important part of that relationship building. “Each oboe is different, so we try to match the customer to the oboe. Professionals always want to try a number of instruments, while teachers or students are less demanding. Nevertheless, the finished oboes sometimes stay with us for one or two months but eventually we always find a student: someone who says ‘that’s my oboe!’”

In French, the word for oboe is hautbois, where ‘haut’ can translate as top-, high-, brilliant-, even the more poetic celestial; and ‘bois’ refers to woodwind. As well as the regular oboe and cor anglais (English horn) the company also makes the oboe d’amore – literally, the oboe of love, which, I’m told, has an alto voice.

It’s not difficult to find online, enthusiastic reviews of Rigoutat oboes posted by dealers and musicians on both sides of the Atlantic. This bodes well for the future of the company: as the user-base grows, repeat orders also increase. Unlike some instruments (such as violins), oboes have a naturally short life because blowing into them creates a very strong resonance, which makes the sound deteriorate over time. Professional musicians tend to need a new one after six to eight years.

Philippe's overriding concern is that not enough young people are training as oboists, and that this will have an impact on business and the profession in the longer term. "Musicians will tell you that the oboe is one of most difficult instruments to play because you have to learn to control your mouth, your fingers, and the reed. So, young people tend to prefer learning easier instruments such as the piano, guitar, flute, or clarinet."

Nevertheless, there are also opportunities in relatively new markets. "Japan has a lot of potential for us, which is good news. Although we prefer to deal directly with the musicians in our Paris studios, there are very good agents and shops that sell our instruments in other countries. And, of course, there are still the many famous musicians who choose our oboes and are happy to endorse our products.

"We have no plans to diversify," concludes Philippe, "because there are established companies making other instruments and no one seriously thinks we can make them any better – there isn't a new market just waiting for Rigoutat. Our business is not so much about growth as about managing what we have: our skills and our reputation. We will continue to look for ways to become more efficient, which may mean using more Haas machines, but we will always strive to make the very best instruments." The sort of instruments, in fact, that can inspire students of all ages to never stop looking for that one musical bone in their body they may or, in my case, may not posses.

**www.rigoutat.com**


The team involved in producing Haas Automation's 125,000th machine tool poses in front the historic machine outside the factory in Oxnard, California.

When Haas Automation introduced its first machining center – the VF-1 – in 1988, it was an industry milestone: the first American-built vertical machining center (VMC) to sell for less than $50,000 – a price unheard of at the time. The Haas VF-1 quickly became the industry benchmark for affordable CNC technology.

Earlier this year, Haas Automation achieved yet another milestone: the production of the 125,000th Haas CNC machine tool: Machine number 125,000 – a 2012 VF-1 bound for a customer in the Philippines.

It is fitting that the 125,000th Haas machine was a VF-1, as it is the model that began the Haas story nearly 25 years ago. A simple comparison of that first VF-1 to the modern version of the same machine proves how far Haas has come, and how much value a Haas machine provides.

When Haas introduced the VF-1 in 1988 at IMTS in Chicago, the suggested retail price was $49,900. Adjusting for inflation, that's equivalent to about $94,880 in 2011 dollars!* The machine featured 508mmx406x508mm travels, a 5.5Kw (peak) spindle motor, speeds to 5000 rpm, brush-style servomotors on all axes, 12m/min rapids, a 16-tool ATC, and the Haas CNC control, which featured a whopping 128 K of program memory, and a maximum processing speed of 20 blocks per second. Additional options were essentially non-existent.

Today's VF-1 is easily 10 times the machine as its 1988 namesake, yet its base price is equivalent to less than $25,000 in 1988 dollars. The VF-1 still has travels of 508 x 406 x 508mm but now features a 22Kw (peak) spindle with a high-performance vector drive, speeds to 8100 rpm standard, brushless servos on all axes, 25m/min rapids, a 20-tool ATC, and the Haas control, which now features 1 MB of program memory (8 times the 1988 figure) and provides processing speeds up to 1000 blocks per second (or 50 times faster than in 1988). And that's the base model machine. A wide selection of high-productivity options is available to boost performance – and value – even further.

**U.S. dollar equivalents calculated using inflation conversion factors published January 19, 2012, by the U.S. Department of Labor Bureau of Labor Statistics.*

# Haas Automation Produces 125,000th CNC Machine

# **FELCO** Trims Part Costs

**FELCO is perhaps the world's leading brand name for garden secateurs, certainly Europe's. The company manufactures around 1 million pairs every year at its Swiss headquarters, where two, fully automated Haas DT-1 CNC drill-tap machines have replaced conventional stamping with state-of-the-art machining.**

Located in the village of Les Geneveys-sur-Coffrane, around 5km from Neuchâtel in the French-speaking west region of Switzerland, FELCO SA is a company with a history dating back to the end of World War II, when Félix Flisch, a trained fitter and turner, set himself what was at the time a very ambitious goal: to create the best pruning shears and sell them in Switzerland, Europe and beyond.

Mr Flisch fabricated the first pair of FELCO secateurs in the garage of his home, alongside which the current factory still sits, today. The reliability inherent in their simple design, almost unchanged 70years later, caught the attention of winemakers at the region's many local vineyards; with revenue from early sales, he set-up his nascent business.

The company's early products were designed to offer comfort and ergonomics, inter-changeability of parts and durability – attributes which have since become common features of all FELCO products. Owners of FELCO secateurs made in the 1950s and 60s can still buy replacement blades and other components, in the unlikely event that they should fail.

With the exception of screws and springs, all of the company's secateurs components are manufactured at its Swiss plant - the two blades being, of course, the critical parts. Traditionally these are produced by stamping, a process practiced by almost all companies in the garden tools industry – until now. With the aid of the latest Haas DT-1 drill-tap-machining centres, integrated with robot loading and transfer, FELCO has differentiated itself by transitioning to CNC machined blades.


"With our previous method we required several stamping machines to produce the blades," explains the company's Manufacturing Manager, Mr Sébastien Nussbaum. "The initial idea was to switch to an automated machining cell to mill and bore, instead of stamp. This is when we started to look for a suitable CNC machining centre."

The company installed its first Haas, an EC500 CNC horizontal machining centre, in July 2011. A VM-2 vertical machining centre followed soon after, and thanks to their performance and reliability, Haas machines also climbed swiftly up the list of potential investments for the company's latest project: the automated blade machining cell, where Mr Nussbaum says he wanted machines that could, amongst other things, change tools quickly. The Haas DT-1 has a high-speed, side-mount, 20-pocket tool changer, where chip-to-chip times are just 1.8 seconds. "Together with a generous working area, powerful direct drive spindle and high rapids and accelerations, the Haas DT-1 machines offered me an exceptional price-specification ratio," he says. "They provide the foundation for a manufacturing solution that has changed the way we make our products."

FELCO's two Haas DT-1s combine to form a single cell using Fanuc LR Mate 200iC vision-enabled robots, set-up to orientate, load and transfer parts between the machines. The company splits the operations on the DT-1s – one for each side of the steel blades, which are handed either left or right by the robots. Operations to tolerances of 0.03mm include profiling, bore production, feature milling and blade point milling. Cycle times average out at around 40 seconds and annual blade volumes top 700,000!

"Today, only FELCO is milling blades, and by doing so we get much higher quality compared to the stamped alternatives offered by our competitors," says Mr Nussbaum. "Not only is milling a lot faster as a complete process, there is no grinding required to finish the blades."


The new Haas cell runs seven days a week, 24 hours a day. FELCO has factory operatives in the plant between 05:00 to 22:00, who "keep an eye on things", but during the hours 22:00 to 05:00 the cell works unmanned, lights-out – a period Mr Nussbaum refers to as the "ghost shift".


From its earliest days FELCO has sought to bring in-house every process required to manufacture its product range. This approach has allowed the company to systematically integrate technological advances into each stage of production and to enhance them with know-how acquired over 60 years. Today, FELCO is widely acknowledged as the leading brand in its field, and has six subsidiaries distributing its products in more than 120 countries.

Cutting and pruning are seasonal, of course, by their very nature. In general there is no pruning in summer, so FELCO's production continues for stock purposes only, with sales typically recommencing in the autumn, dropping off later in the year and recommencing in spring. In total, 90% of the one million secateurs produced at the FELCO factory every year are exported: 15-20% to the United States, with Europe the next big market.

FELCO has a history of developing solutions in-house, even building its own machines in the past. "We did our homework before selecting the DT1 machines," recalls Mr Nussbaum. "They were supplied by Haas Factory Outlet, Urma AG, and the robots were supplied by Robotec. We preferred not to ask for a finished solution; instead, we wanted to assemble the cell and create our own process from scratch, simply because we have always done so and we have the in-house expertise.

Reflecting on how things are done differently compared to when he joined the company, Mr Nussbaum also summarises the challenges of keeping a well-established, Europe-based manufacturing firm at the forefront of its market, given the competition it faces from companies located in lower-cost regions of the world.

"There were 15 people working in component manufacturing when I started in 2005," he says, "whereas today there are only five. We've pushed to use CNC wherever possible, to keep costs down and quality high. As well as replacing our 15-year-old stamping cell, the Haas DT-1 cell has allowed us to remove a number of old, FELCO-built machines and other conventional mills, which were not suitable or reliable enough for high-volume manufacturing.

"It was also important that we improved the perception of FELCO as a manufacturer, bringing it into the 21st century. But, it wasn't easy. Without affordable technology like the Haas machine tool cell, it wouldn't be possible. Salaries 30-40 years ago were quite low in Switzerland, and critically there was little competition. But, today you need CNC and you need automation if you want to maintain quality at high-volume and you want your products to remain affordable. It's as simple as that!"

**www.felco.com**

# Cycle Time

## New Schools Make the Grade

By the end of 2012 there will be at least another four new Haas Technical Education Centres in Europe, bringing the number of new facilities opened this year to 13.

The new CNC teaching centres will include LES COMPAGNONS DU DEVOIR, Saint-Etienne, France; EONSI INDUSTRIAL DEVELOPMENT SL, O Porriño, Spain; STŘEDNÍ PRŮMYSLOVÁ ŠKOLA, Prague, Czech Republic; and INSTITUTI DI ISTRUZIONE SUPERIORE ALDINI VALERIANI SIRANI, Bologna, Italy.

"The HTEC in Saint Etienne will be the fourth in France," says Mr. Bert Maes, marketing supervisor at Haas Europe. "Those in Spain, Czech Republic and Italy are all significant because they are the first in those particular countries.

"Everyone is aware of how difficult the economies of Spain and Italy are at present. So, to establish HTECs in each is a breakthrough, and offers tremendous opportunities for all those involved. These schools will attract more students; the teachers will be inspired by the new technologies; companies around the HTECs will grow as they will have access to very skilled new employees; and students will see that sculpting something from stubborn material such as metal is an exciting, creative and worthwhile career."

In the case of the Czech Republic, engineering students have had little or no access to modern, advanced machine tools. The country's industrial infrastructure is enormous and extensive but dates back to the 19th century and needs considerable investment. "As well as new manufacturing technology, Czech companies need bright, young people to run it," says Mr. Maes. "Our new HTEC in Prague is the ideal place for companies to find well-educated individuals to transform entrepreneurial manufacturing ideas into productive, economic activities."

Earlier this year, Haas Europe, its distributors and the HTEC industry partners opened new HTECs in Germany, Portugal, Finland, Poland, Bosnia, Slovakia and Lithuania. The four latest HTECs will make a grand total of 70 in Europe, stretching from Portugal to Siberia, Iceland to the Mediterranean.

# Haas Celebrates Top HFOs

Europe's leading Haas Factory Outlets (HFOs) were recognized for excellence at the Haas Automation annual distributor conference, held at AMB 2012, Stuttgart, Germany, in mid-September.

Following a celebratory dinner, General Manager of Haas Automation Inc., Mr. Bob Murray, and Managing Director of Haas Automation Europe, Mr. Alain Reynvoet presented the awards to senior managers from the four, top European HFOs. Both Mr. Murray and also Mr. Reynvoet praised the distributors for their continued investment in service and support infrastructure, and trained, dedicated sales and technical personnel.

"All of our award-winning HFOs can be proud of what they have achieved," said Mr. Reynvoet. "Haas sets high standards for its distributors, so that Haas customers can enjoy industry-leading support wherever they are located and however large or small they are." Mr. Murray added: "Above all others, these four particular HFOs meet and exceed those standards and we are very happy to recognise their hard work."

Despite their reputation for dependability, Haas machines the world over are backed by one of the most carefully conceived service and support infrastructures of any machine tool company. The Haas European distribution system is designed around a network of local Factory Outlets, each one of which is dedicated to the Haas product line. Also, each HFO employs factory-trained service personnel and carries a substantial inventory of spares. All told, more than (US) $50 million in spare parts are stocked at 160 locations worldwide. Haas customers can rest-assured that on those rare occasions when a machine does need special attention, the right part is never more than a few hours away.

## The top-four European HFOs are:

1st Prize: EDSTRÖMS MASKIN, Sweden.

2nd Prize: KATZENMEIER, Germany.

3rd Prize: TEXIMP, Czech Republic.

The prize for best service went to:
ABPLANALP CONSULTING, Poland.

Investing in a multi-axis CNC machine tool shouldn't require nerves of steel. But, for owners of small- to medium-sized machine shops with a need for high-productivity, that's exactly what used to be the case. Purchase cost and complexity were usually high enough to put-off those with anything less than cast-iron composure. Until now! Haas Automation has designed and built two machines in particular that offer all the advantages of multi-axis machining, without the traditional sleepless nights.

# Multiple Choice


Flexible, multi-axis machining offers reduced set-up times and increased accuracy for multi-sided and complex parts. Five-axis CNC machining centres, for example, use cutters more efficiently than 3-axis machines, which can greatly reduce machining time whilst simultaneously giving better surface finishes. Five-axis machines can also eliminate the need for multiple set-ups, usually required to position the part when cutting complex features. Having fewer set-ups not only reduces total machining time, but also eliminates opportunities for errors, and the need for expensive, dedicated jigs and fixtures.

The new Haas UMC-750 Universal Machining Centre, for 3+2 and simultaneous 5-axis machining, offers all of these benefits at an affordable price, and with Haas Automation simplicity and peace-of-mind as standard.

The Haas UMC-750 offers travels of 762mm x 559mm x 508mm and an integrated dual-axis trunnion table. The machine is equipped with an inline direct-drive, low-heat 40-taper spindle (8100 standard, or optional 12,000 rpm), and comes standard with a 40+1 tool side-mount tool changer. The trunnion can position parts to nearly any angle for 5-sided (3+2) machining, or provide simultaneous 5-axis motion for contouring and complex machining. The machine provides +110 and -35 degrees of tilt and 360 degrees of rotation for excellent tool clearance and large part capacity.

"The UMC has been designed and built based on what our users have told us they need in a universal machine," says Haas Automation Europe Managing Director, Mr. Alain Reynvoet. "In a nutshell, it is a high-performance CNC machine tool for a fraction of the usual cost associated with machines of such significant capability and high quality. Our customers have come to expect innovative, affordable machining solutions that do not compromise on performance and reliability. They won't be disappointed with this latest machine tool from Haas."

A wide selection of high-productivity options is available for the UMC-750, including a belt-type chip conveyor, high-pressure through-spindle coolant systems, high-speed machining control software, the Haas Wireless Intuitive Probing System, expanded program memory, and much more.

What multi-axis machining centres have done for prismatic parts, live tooling and Y-axis motion are doing for turned parts. Instead of moving a semi-finished part to a second or third machine for subsequent operations, multi-axis turning centres allow parts to be finished in one set-up, dramatically reducing total machining time, improving accuracy and eliminating opportunities for error and scrap. In essence, a CNC turning centre with live tooling and Y-axis is like having two machines in one: a two-axis lathe and a milling machine. However, just like multi-axis milling machines, multi-axis turning centres have, until recently, proved to be beyond the reach of small- to medium-sized machine shops.

The Haas DS-30 Series Y-axis turning centres combine dual-spindle turning with Y-axis, C axis, and live tooling to create powerful 'done-in-one' machining solutions. The opposed spindles support fully synchronized turning, and allow on-the-fly part pass-off to reduce cycle times. The machines provide 102mm of Y-axis travel (±51mm from the centerline) for off-centre milling, drilling, and tapping, and come standard with high-torque live tooling and a servo-driven C axis for versatile 4-axis capability. The machines are available in standard and Super Speed configurations. Standard equipment includes high-torque live tooling with C axis, rigid tapping, spindle orientation, a 15" color LCD monitor, and a USB port. Available high-productivity options include a belt-type chip conveyor, automatic tool probe, automatic parts catcher, high-pressure coolant systems, and more.

"Haas has been setting precedents in performance and value for more than 20-years," says HAE's Mr. Reynvoet. "For the past 3 to 4 years, the mechanical engineering team at Haas Automation Inc. has been busy on multitudinous projects to develop new and better CNC machine tools. The DS-30Y dual-spindle lathe and the latest development, the UMC-750 Universal Machining Centre, bring levels of performance, accuracy, and quality within the grasp of almost all Europe's machine shops at a critical time. For time- and cash-strapped companies, every investment has to be the right one at the right price. Backed by our Haas Factory Outlet network, we're confident no other machine tool builder can provide customers with the same peace-of-mind when investing in multi-axis machine tools."

# the ANSWER MAN

**Dear Answer Man,**

I have a Haas VF-6 with the Haas Intuitive Probing feature, which is absolutely awesome. Being that the tool probe uses a lot of variables, which variables are available to me for my own custom macros?

*Sincerely,*
*Michael*

**Dear Michael,**

There are several variables that are available. These are general-purpose variables that are saved on power off:

**#100-#199, #500-#699, #800-#999**

• • •

**Dear Answer Man,**

I saw your equipment on the TV show Sons of Guns. Where can I learn to operate these machines? I live in Auburn, WA, near a lot of Boeing

facilities that are constantly advertising job openings, and I would like to obtain the necessary qualifications.

*Sincerely,*
*Andrew*

**Dear Andrew,**

Haas Automation, Inc. provides extensive support to schools worldwide through its Haas Technical Education Center (HTEC) network – a collection of more than 1800 high schools, colleges, technical schools, and universities throughout the U.S. and around the globe that offer classes and degrees in the machining technology and manufacturing fields.

To find an HTEC near you, visit the Haas Technical Education Center (HTEC) website at: www.htecnetwork.eu for a complete list of Haas Technical Education Centers.

• • •

**Dear Answer Man,**

We have 32 Haas machines in our shop; they are equipped with Ethernet ports, and we have networked all of the machines together with a PC. We currently transfer a program to the control and edit that copy. Sometimes, we use USB and end up with multiple copies and revisions of every NC file. When the time comes to run that job again, we are unable to find the latest revision. Is there another way to handle the file transfers?

*Sincerely,*
*Ted*

**Dear Ted,**

Haas machines with Ethernet have the ability to read programs that reside on a PC or server in a Net-Share folder. This can be done through FNC. FNC does not require the file to be moved or copied from the network. A single copy of the NC file exists and can be run on any machine. Due to the fact that there is only one copy of the file, multiple copies and revisions are not cluttering the control. This style of file hosting is ideal for shops that program with CAM software. The CAM file can be edited and then reposted, minimizing the chance for error. In addition to NC files, all of the machines' back-up files, like settings and parameters, can be saved and uploaded to the PC, and can be changed remotely as well.

• • •

**Dear Answer Man,**

We have recently set up a brand-new TL-3 in our shop, and everything is running fine except for the coolant. It won't turn on, manually or through its M-code in a program. The display monitor reads coolant n/a while a program is running.

*Sincerely,*
*Brent*

**Dear Brent,**

Setting 32 controls how the coolant pump operates. Change setting 32 to NORMAL, and coolant operation will function normally. If setting 32 is set to IGNORE, any commands to activate the coolant are ignored, but the pump can be activated manually. If setting 32 is set to OFF, then an alarm is generated when a coolant command is encountered or manual activation is attempted.

• • •

**Dear Answer Man,**

I would like to perform some calculations on the Haas control using Sine, Cosine, and Tangent. Does Haas have this functionality?

*Sincerely,*
*Jeff*

**Dear Jeff,**

There are commands for each of these arithmetic functions. Those commands require the Macros option and they are listed here:

**Sine = SIN[...]**
**Cosine = COS[...]**

**Tangent = TAN[...]**

Here is a program example:

```
#101= SIN[330]  (THE RESULT WOULD BE -.5)
#102= COS[60]   (THE RESULT WOULD BE .5)
#103= TAN[45]   (THE RESULT WOULD BE 1)
```

• • •

**Dear Answer Man,**

I have a small shop with a handful of machines and one operator: me. I usually do complex parts in small quantities, so I do lots of setups. I sometimes have to stop the machine and open the doors to measure a feature or blow chips out of the way. Is there a better way to do this than resetting the machine each time?

*Sincerely,*
*Gabino*

**Dear Gabino,**

The easiest way to gain access to check a feature or clear chips is to add an optional stop (M01) or program stop (M00) into your machine program. With the optional stop set to "on" in the control, whenever an M01 is reached, motion will stop, the spindle will stop, and the doors will unlock, giving you access to the machine. Press CYCLE START, and the machine will continue. M00 works exactly like M01, only the machine always stops, without requiring the optional stop button. Which is better really depends on whether you want to stop on every part or only sometimes.

Another, albeit more complicated, solution is to press FEED HOLD, stop the spindle using STOP, and turn off the coolant using the COOLNT key. At this point, the machine will beep and unlock the doors so you can remove the obstructing chips, measure your feature or even change an insert.

Further, if you need to move the cutting tool out of the way, you can use a Haas control feature called Run-Stop-Jog-Continue. To do this, press FEED HOLD, STOP, and COOLNT as before, then press the corresponding letter of the axis you would like to jog (XYZ from the alphabet keypad section), and then press HAND JOG. The control will store your current position and display "Jog Away." You can then jog your tool away from the part. You can jog additional axes in a similar manner.


Once you are ready to resume, jog to a safe position from which the machine can return to its stored position. Press CYCLE START once, and the machine will return to its stored position; press CYCLE START again, and it will continue its tool path. The spindle will resume its commanded speed, but the coolant needs to be re-activated manually.

# Simple Math.

# 3+2=1

Sure, 3+2=5, as in 5-axis machining. And it's just that ability that allows our brand-new Haas UMC-750 to increase your bottom line numbers. Use those 5-axes (3+2) to convert your multiple setups into 1. Reach 5 sides of a part in a single setup. Save time and money, and do it at an affordable Haas price.

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