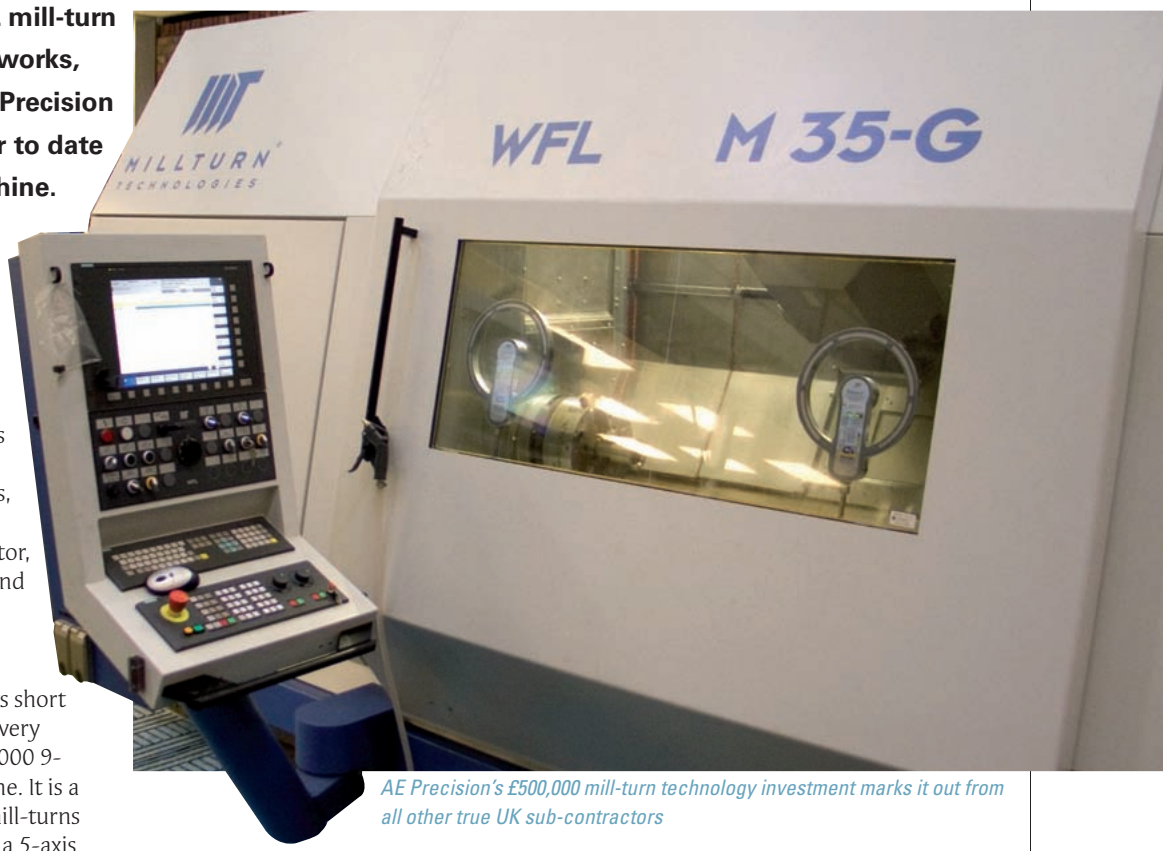
The science of engineering

You'd expect to find a WFL mill-turn machine in a large OEM's works, but UK sub-contractor AE Precision is WFL's smallest customer to date worldwide for such a machine. Andrew Allcock went to find out more



AE Precision's £500,000 mill-turn technology investment marks it out from all other true UK sub-contractors

AE Precision's company literature sports the phrase "The science of engineering" on its front page. It is not immediately apparent what this actually means, but a while spent with the company's young managing director, David White, soon reveals more and explains the company's ground breaking investment.

The High Wycombe-based company is five years old and in its short life it has invested £3 million; the very latest investment being the £500,000 9-axis WFL M35-G mill-turn machine. It is a major step up from its previous mill-turns – a 4-axis Hitachi Seiki HiCell and a 5-axis Super-HiCell. In fact, AE Precision is the smallest company in the world yet to have purchased such a machine, and the only true UK sub-contractor to do so.

This one investment is an immediate indication that the firm is more than a little bit different, but it is not the only one. Just how many other companies of this size have a large, automated vertical carousel storage system to hold both its tools and raw material? And how many will have invested in a full MRP manufacturing control software Factory Master? There's more – standardised toolbox for engineers and machines and a Zoller tool pre-setter to set tools prior to machine setting; while Mr White talks of '5S and the '5 whys' – "ask five questions and you get to the root of a problem", plus personnel training in line with a formal skills matrix approach. This organised environment is part of what underpins the company's "science of engineering" statement.

This focus on organisation and systems is not the sort of talk you expect from an engineer. David White started his career at 16 as apprentice draftsman in a company that designed overhead conveyors. He went on to work in his father's company where he finished his apprenticeship and gained invaluable shopfloor experience.

Upon his father's decision to retire, the company was closed down. So, at 27

WFL M35-G specification in brief

Having a centre distance of 1,800 mm, the M35-G with main and sub-spindle plus upper single-tool and lower disc turrets, takes standard chuck diameters of 250/315 mm. Power at each 4,000 rpm spindle is 29/33 kW (100/40 per cent duty) with maximum torque of 550/630 Nm (100/40 per cent duty). Milling spindle power for the top turret is 15/20 kW (100/40 per cent duty) with maximum torque 125/165 Nm (100/40 per cent duty). Milling spindle rpm is 9,000. The upper turret swivels ±110° and moves in Y by +150/- 100 mm. Coolant pressure is 80 bar.

WFL mill-turn investment for Delcam operation

While AE Precision is a sub-contract-only business, another small facility that is involved in sub-contracting as part of its activity is CADCAM developer Delcam. At its Birmingham headquarters, the company has recently installed WFL mill-turn machine within its Tooling Services Division, with an eye towards the aerospace sector.

"The Tooling Services Division has always had a dual role within Delcam," explains division director, Brian Hawkshaw. "While we provide a real-world testing environment for our CAM software during its development, we are also required to operate as a profitable business in our own right."

"Until recently, we have concentrated on 5-axis machining, both because that was the main focus for our PowerMill development team and because 5-axis operation increased our ability to take on more complex jobs and complete them more efficiently," Mr Hawkshaw continues. "The move into mill-turn has similar motives."

"First, Delcam has expanded its product range with the acquisition of FeatureCAM and PartMaker, both of which offer mill-turn functionality, so we needed equipment with the ability to test new developments in these programs. Second, we have received more enquiries for large-scale projects that would only be possible to undertake efficiently with a mill-turn machine. We were taking orders for work even before we acquired the machine and its capacity is already booked for most of this year.

"The Tooling Services Division also duplicated the diversification into other industries that has been seen in Delcam's software business in recent years. The aerospace sector now provides our biggest source of work, rather than the toolmaking industry. The new WFL machine will offer us even more aerospace opportunities."

The installed machine is a M65 model sporting 3 m between centres. "The manufacturing expertise gained within the Division forms an important part of the comprehensive support given by Delcam to all its customers," adds Mr Hawkshaw. "As well as helping our development teams, the experience we gain is passed on to our support staff. They can use this knowledge to give our software users advice on all areas of their work, including aspects like the best choice of machining strategy and cutter selection, as well as the operation of the software."

Being able to test such developments on-site obviously gives Delcam a major advantage in proving out its software. "Many CAM programs generate data that is mathematically correct but that is often impossible to machine in practice," offers Mr Hawkshaw. "The toolroom has played its part in establishing PowerMILL's leading position for high-speed machining and shop-floor programming. With the addition of the mill-turn equipment, we can also help Delcam reinforce its strength in multi-function machining."

"When potential software customers first hear about Delcam, they often ask why we operate the toolroom," adds Mr Hawkshaw.

"Once they have seen our facilities and we have explained the benefits, both in the reliability of the software and in the quality of our support, they find it difficult to understand how other CAM developers expect to develop and sell software without a similar resource."

years of age, Mr White set up his own engineering company. With his business plan in place, he sought bank backing and with the sale of his house had enough money to start. Mr White's business plan and strategy were modest at first: "I just wanted to give it go, but did want to create an F1 image, a clean and well-run workshop."

Initial work at start-up came from jigs and fixtures for the mobile phone industry, specifically the Vertu ascent Ferrari mobile phone, priced at €18,000, which had to be produced in absolute secrecy. This sort of work was fine but Mr White wanted to expand the company and try to offer a service that would differentiate him from the masses, so in year two AE Precision parted company with this sector and turned its attention to a rather different sector, oil and gas.

A SLICE OF A BIG PIE

Mr White had done his background research which revealed a booming sector and thought: "as a £1-2 million turnover company, I don't need much of the billions of pounds worth of oil industry expenditure to be successful". Chasing a big contract for a large OEM project two years ago, the decision was made to invest in the WFL M35-G. Already machining difficult materials such as Inconel, Duplex, Monel and Hastelloy for oil industry customers, this machine would also process jobs already undertaken, but much more efficiently.

A highly unusual investment for such a small company, to say the least, but that thought did not enter Mr White's mind.

"As I investigated, I discovered that even the large sub-contract companies supplying the oil and gas industry didn't have WFLs. It just seemed logical that as this is the best mill-turn machine on the market today, why would you go and buy anything else? Other machines are cheaper, but not hugely so; you pay a little less but get a lot less in terms of capability."

The machine was ordered in March 2006 following an initial first viewing at EMO 2005. The machine was delivered in January 2007 and its first job was one previously undertaken by the super HiCell, a 316 stainless steel part. It took six weeks to prove out, not because the part was complex or the machine was hard to use, but the learning curve of using TopSolid (a new CADCAM system), a new Zoller Tool Pre-setter and a new Siemens control all took time to get to grips with. All nine axes were used and although it wasn't the fastest cycle time, it still only took 45 minutes against the previous 58. "We now believe we can get that down to 20 to 25 minutes," says the managing director.

As at *Machinery*'s early February visit, some eight different components (one existing, seven new) had been run on the WFL for four customers with some beginning to repeat. The machine is running 50 hours/week, with the target being round the clock, five days a week.

From his initial ambition "to give it go", Mr White is now determined to succeed and "build a world class sub-contract company". A concerted effort to raise the performance of the existing set-up is planned for the coming year before further investment.

This is set to include the application of TopSolid CADCAM in conjunction with proven methods/technology, and in the future, Vericut simulation software to generate ready-to-run, collision-free programs in partnership with Crash Guard on the WFL; Zoller pre-set tooling; integration of TopSolid with the vertical carousel unit to close the stockholding/usage loop; the integration of a shopfloor finite capacity scheduler to Factory Master; improved toolholder, jaw and fixture storage/management (via Zoller Tool Management Software); plus introduction of 5S, '5 whys', and additional employee training on such things as coolant, chuck maintenance, CNC programming and cutting tool technology.

The WFL mill-turn machine is just one facet of AE Precision's scientific approach to engineering

All this to deliver programs and pre-set tools to well-trained setters who can set a machine effectively, press the button and achieve maximum machine utilisation, even unmanned running – given some easier materials to cut, that is. "I want zero shopfloor prove-out," confirms Mr White.

On the customer liaison and production management side, Factory Master is central, bringing automation to business processes and, crucially – with the finite scheduling element – will support detailed, reliable planning and scheduling.

"I am very much a systems person – I like to calculate things and get them right; that's why I use the phrase 'the science of engineering'," he says.

FUTURE VISION

While AE Precision is consolidating its position this year by focusing on improving performance with its current set-up, Mr White is not afraid of considering further investment in WFL technology, even a large machine like the WFL M120 or M150 (on a lead time of 24 months currently), but he does require commitment from customers on a level of business to support this.

He is currently having discussions with large aerospace OEMs that also have WFL machines with a view to being able to realise this, and is also in talks with major suppliers to the F1 industry, where easier-to-work materials are a feature. He has yet to break into either area.

But having added another three major customers to the existing customer base last year, he anticipates adding a further three this Spring (March-April), boosting turnover to £3 million (essentially by reducing set-up times), with the ultimate target being a core of 10 major customers all spending £1 million with the company which at that point will probably not employ more than 40 people.

Just as with everything else, Mr White is scientific about the business numbers.□