

# Flights of efficiency

**With the aerospace manufacturing sector buzzing, increasing capacity while also improving productivity is the order of the day, as Andrew Allcock discovers**

**A**erospace specialist RE Thompson, based in Whitchurch, Hampshire, aimed to achieve a step-change in its manufacturing methods and productivity. The company has been using Mori Seiki machines and before that Hitachi Seiki machines for 18 years. "We wanted to grow our turnover by 100 per cent, and we could not achieve that with our existing equipment, leading us to re-evaluate every aspect of our business and methodology including batch sizes, machine tools, fixtures, clamping, inspection and tooling," says managing director Michael Thompson.

In a first phase of reorganisation, RE Thompson installed a Mori Seiki NH5000 40 DCG horizontal machining centre with a 12-pallet Fastems Flexible Pallet Magazine and a Zoller CNC tool presetting machine. A second, third and fourth Mori Seiki and Fastems combinations are already in view.

The company aims to migrate the majority of its production onto the new Mori Seiki and Fastems systems which will each do the work of four conventional CNC machines. The

immediate benefit is the ability to economically manufacture batches of just five components; previously batches were around 50.

"When we had to manufacture large batches, the components would remain in storage until the customer required them and if a design change occurred this could not be reflected in the manufactured parts," Matthew Shaw, business development manager, explains. "Additionally, planning to meet sudden changes in production requirements was very complex."

With the introduction of the Mori Seikis, storage costs have been eliminated, design iterations can be incorporated immediately and the company can be responsive to changing delivery priorities.

## REDUCED SET-UPS

Each Mori Seiki has 240 tools and 12 pallets fitted with tombstone fixtures, presenting 48 faces for machining. Parts can be completed in two



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settings – up to six were required on the vertical machining centres.

"We maximise jobs on each pallet, rationalise the tooling and reprogram the part to enable us to stay within the 240-tool limit," explains Mr Thompson. "That way we can ensure each pallet is machining for at least one hour, optimising the machine efficiency."

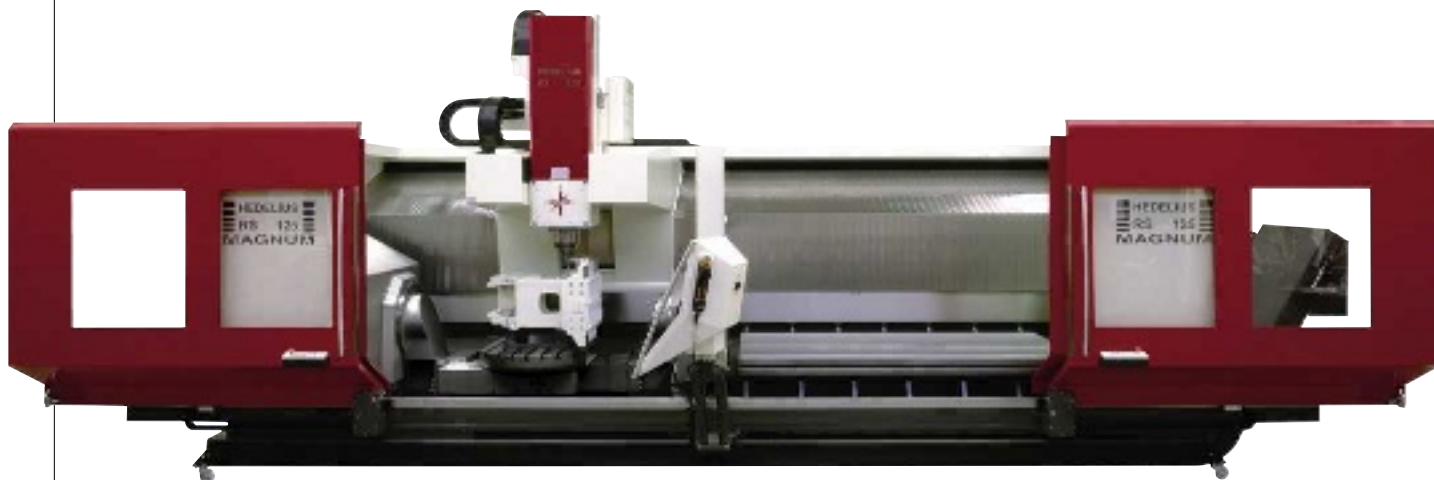
"Similarly, we also try to arrange for parts that are in the same assembly or family to be located on the same fixture, simplifying our ability to meet production requirements. We are planning to achieve

## Tool vending cuts stockholding

A Toolvend 123 machine was installed as an experiment in October 2005 at 32-employee Ravenscourt of Yate, Gloucestershire. A specialist sub-contractor to the aerospace and oil and gas sectors, Ravenscourt undertakes electron beam welding repairs on aircraft like the Tornado.

Prior to installing the Toolvend the company's tool stock value was £22,500 but today the vending machine holds less than £3,000 worth of tooling on the shopfloor.





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a 50 per cent reduction in total component cycle time."

Each machine is loaded with components during a 12-hour day shift, allowing unmanned machining 24/7. Further savings come from the on-machine probing which automatically checks some of the key component dimensions and verifies the condition of the tooling before each operation.

The investment is seeing RE Thompson introducing a 'just in time' ethos that extends to the company's suppliers. The company has been able to achieve cost-down targets and build its customers' confidence in the continuity of supply of high quality products. "The investment in Mori Seiki and Fastems will enable us to grow our long term profitability, increase our flexibility and enable us to offer our customers a rapid turnaround for their jobs, achieving a step change in our business," concludes Mr Thompson.

#### **HORIZONTAL MOVE**

Another company moving to horizontal machining centres is Freshwater, Isle of Wight-based RD Precision. The largest metalcutting firm on the island, it installed a third Okuma twin-pallet horizontal machining centre of approximately 750 mm<sup>3</sup> capacity in November 2007.

It joins a similar MA-50HB model delivered in January 2007 and an older

machine of equivalent size dating back to 2004. All have four CNC axes, including programmable rotary movement of the table, and were supplied through NCMT, Coventry.

The £750,000 investment in two machines plus tooling and training in 2007 were partly a result of an upturn in demand for steel engine mounts for the Hawker jet. The components are supplied direct to the assembly line at Airbus, Broughton, where the fuselage and wings for the jet are produced under contract.

Whereas six 3-axis vertical machining centres are currently used to manufacture the four engine mount variants, the work will be transferred to the two additional HMCs which will provide sufficient capacity to meet future production requirements. They will also reduce the current scrap and rework created by the VMC process.

Prior to 2004, all of RD Precision's aerospace parts were machined on 3-axis vertical machining centres using multiple vice set-ups. But the move to horizontal production has seen set-ups slashed and cycle times cut courtesy of the higher power and faster machines.

Production is on average 25 per cent quicker on the horizontals than on the verticals, while fewer set-ups have resulted in better component accuracy and lower scrap levels as a result of reduced cumulative error. Faster delivery to customers and less money and space

consumed by work-in-progress are further advantages.

Pendulum machining of larger aluminium and titanium aerospace components offers benefits to Bristol-based Oldland CNC Engineering. The 5-axis C Dugard-supplied Hedelius travelling column RS 125-K provides X, Y and Z-axis travels of 4,500, 1,250 and 770 mm.

The key factor in this choice of production platform for John Tucker, managing director, was the ability to machine in 3-axis mode to, say, produce original reference or datum faces on one side of the machine and then, via a large programmable trunnion mounted rotary and tilting table fitted to the other side of the machine base, produce true 5-axis toolpaths in a single cycle on the remainder of the component.

#### **ONE-MAN JOB**

With the latest Hedelius RS 125-K a single operator can prepare, manipulate, and load/unload, deburr or inspect a component on one side while the machine continues its automated cycle on the other.

In addition to this latest machine, the company also has two smaller capacity Hedelius RS 80 5-axis units plus additional 5-axis capacity in the form of two large capacity Edel CyPort 4020 gantry machining centres, the first installed in 2004, the second 18 months



later, both also from C Dugard. The Edels have a capacity of 3,970 by 2,310 by 1,250 mm.

The first Edel machine took the company into Airbus A380 component machining, providing the capability for structural parts such as wing skins that is a particularly successful area of expertise for the Bristol-based company.

"Following the first Edel we became more competitive and significantly increased our order book for large and more complex parts. That success led to the second machine with all the advantages of common tooling, fixturing and programming," explains Mr Tucker.

Like the Hedelius machines, the Edel gives flexibility to cope with a wide range and challenging components and when required, multiple quantities of smaller parts can also be positioned around the table area to further improve machine utilisation while helping to reduce work in progress and cycle times.

From 5-axis machines to the business end of an application – tooling. A special solid carbide roughing cutter with fully integrated chip breakers developed by LMT Fette for the Airbus plant in Varel, Germany has not only enabled axial feed rates on a Dörries Scharmann 5-axis machining centre to be increased by

## Solvent cleaning compliance

Abbey Metal Finishing Company, Nuneaton, is the first 'aerospace finisher' business in the UK to respond to the Solvents Emissions Directive (SED) legislation by installing an EVT hermetically sealed solvent degreasing system supplied by IB Industries.

Following careful analysis of both aqueous and solvent-based cleaning alternatives, Abbey Metal Finishing's environmental manager, Graham Vaughan, says: "It was decided that the EVT system gave us the best chance of compliance with the SED requirements while offering excellent degreasing results at a very competitive price."

For larger aerospace parts, the first chamber accommodates a 1,500 by 1,000 by 700 mm static basket, with an easily installed 1,300 by 600 by 600 mm rotation basket available for complex parts with blind holes on various faces. The second, smaller chamber accommodates two 480 by 320 by 200 mm standard baskets, with immersion initiated by an ultrasonic push-pull oscillator. This allows smaller components to be cleaned and degreased effectively by a more efficient combination of solvent and ultrasonic capacity.

A spraying system is optimally adjusted for the workpieces and is also effective in rinsing off solids like swarf. After spraying, the solvent is pumped directly from the cleaning chamber for recycling ready for the next load. Solvent vapour is directed into the working chamber where it condenses on the cold parts, degreasing even the most complicated of shapes with the smallest of drill holes.

In the eight months since installation, the machine has used approximately 300 litres of trichloroethylene, "a vast improvement on previous performance", offers Mr Vaughan.

50 per cent to 13.5 mm/rev when machining wrought aluminium alloy, it totally eliminated previous erratic tool performance. Also, the new tool reduced power draw on the spindle, even when removing material at 3,000 cm<sup>3</sup>/min, and provided an in-cut time of 300 minutes before the tool needed changing.

### BIRD'S NEST NO MORE

The LMT Fette cutter totally solved the problem of swarf 'bird's nesting' around the spindle and cutting tool, the original reason LMT's specialist was called in by Volker Dittmar, Airbus' manager of pre-production, to try to provide a solution during the machining of aluminium air inlet flanges for the Eurofighter Typhoon aircraft. Previous tooling, based on solid shank endmills, could not reduce the 'bird nesting' problem that raised issues with quality of the workpiece, while the cutters continuously drew excessive power from the machine.

The final 25 mm diameter tool from LMT's Airline Series, specially developed for aluminium processing, incorporates a special chip breaker and has helical internal coolant passages. While the geometry of the chip breaker actively breaks up the swarf, the emulsion coolant fed direct to the cutting zone also helps to prevent built-up edge on the tool. The tool has three helical cutting edges 22 mm long and a cutting angle radius of 4 mm.

In producing the Typhoon air inlet flange, the Dörries Scharmann ACM-H HPC machining centre initially performs solid groove cutting at a 25 mm depth of cut followed by line machining at 17 mm/min using a coolant pressure of 25 to 50 bar. Cutting speed is maintained at 1,492 m/min using a spindle speed of 19,000 rpm and a feedrate of 9 m/min. The axial edge of cut is 13.5 mm and pitch is set at 0.16 mm. Tooling development to improve performance is ongoing. □