

Making it big

Massive yet finely tuned muscle power is offering heavy engineering the prospect of a thriving future. Steed Webzell reports

What constitutes heavy engineering? Historically, figures like Stephenson and Brunel come to mind. However, with utmost respect for past centuries' engineering achievements, today the sector is much more high tech and it encompasses everything from power generation and oil exploration, through to yellow goods, large machinery and aircraft wings.

Geographically, the spread of heavy engineering in the UK has remained relatively unchanged over the last 100 years. Despite the decline of steel mills in Yorkshire and shipyards in Scotland, these areas retain their industrial heritage. Most of Scotland's heavy engineering is now linked to the North Sea oil industry with fabrication yards in the Moray and Clyde firths and rig service industries in the Moray and Tay.

This is good news for suppliers of machine tools for heavy engineering

applications, such as Asquith Butler, which is enjoying something of a renaissance since its reformation five years ago. As a designer and manufacturer of large capacity, heavy duty machining centres, the Yorkshire-based business is now part of the Kingsbury Group, and according to managing director Paul Hinchliffe, sales of new machines are growing far better than expected.

"The market for our heavy duty machines is worldwide, with sales particularly strong in India," he says. "As for the UK, I feel we have at least retained our market share and we still find significant business in the oil, steel, nuclear, yellow goods, marine and aerospace sectors."

The manufacture of large fabrications is kept within the Kingsbury Group while components such as head and ram assemblies are completed on its behalf by an established UK supplier base. New machines manufactured by the company include travelling gantry vertical and horizontal machining centres.

"The largest machine manufactured by the company to date has X, Y and Z axes of 30, 5 and 1.75 m, and is being used in the manufacture of TGV coach panels, but we could make even larger machines," says Mr Hinchliffe.

Another of its customers, Brownhills-based sub-contract machine shop Forth Engineering is achieving better-than-grinding tolerances of sub-10 micron flatness and straightness on an Asquith Butler Starmill 280 (18 tonnes component capacity). AsquithButler's engineers used an FEA system to design



the machine's beam, based on known deflections. The new beam is 54 per cent stiffer than its predecessor, uses less material and is easier to manufacture.

Another big-spending heavy engineering sub-contract specialist is Sheffield-based Barker Collins Engineering. Since a management buy-out four years ago, it is pouring in around £2 million to equip its 60,000 ft² facility with the tools it needs to rival its competitors.

LOW VOLUME HIGH QUALITY

"Barker Collins is proving that heavy engineering in Sheffield can have a future if firms are prepared to adapt and invest," says sales and marketing director John Sidebottom. "It's obvious from the failure of some big names in the city in recent years, that we can't just go on doing what we've always done and hope to survive. But by concentrating on high skill, high value sectors we have turned the company around and given it a bright future."

Barker Collins today has 40 staff and is working day and night to keep up with demand from a variety of industries, including marine, nuclear, yellow goods, power generation, mining, steelmaking, rail and defence.

The new model for success is low volume and high quality. "Heavily specialised projects that carry high value



An Asquith Butler Starmill 280 in build



*Destined for China; made in Sheffield.
A 320 tonne boring machine head*

Since the beginning of 2006, earthmoving plant manufacturer Komatsu has increased production output from its Birtley, Co Durham, factory by over 40 per cent and nearly halved delivery time for its excavators to 22 days.

HIGH SPEED INVESTMENT

A key element in the improvement was the replacement of two machines at a cost of £2.7 million. One of the machine tools was a CNC straightening press to take the place of a manually operated model that fed a 20-year-old Japanese SNK vertical machining centre. This has also been replaced by two high speed machining centres that have horizontally opposed spindles to machine both sides of a revo frame simultaneously. SNK was the chosen supplier for all the machines, via UK agent Matsuura.

At a stroke, the SNK cell reduced overall cycle time for a benchmark frame for a mid-range PC-210 excavator from 2 hours 12 minutes down to 45 minutes. While one revo frame is being machined, a new frame fabricated from grade 43A mild steel plate is straightened to within a couple of millimetres accuracy on the CNC press and is lifted by crane on to one of two tilting tables serving the twin SNK machining centres. The largest

and demand high degrees of skill are the future for companies like ours," says Mr Sidebottom. "Additionally, the size and scale of our projects means there is not a threat from China or India because time and transport costs become a major issue with heavy engineered goods."

Also located at Sheffield is arguably one of the country's most notable heavy engineering companies, DavyMarkham, which was the subject of a management buy-out last year. Today, the company works closely with Sheffield Forgemasters – which has just won a £5 million casting contract for SMS Meer's 12,000 tonne open-die forging press in Völklingen, Germany (the largest such press in Europe) – and with another neighbour, Siemens VAI, which retains a global heavy engineering expertise in South Yorkshire.

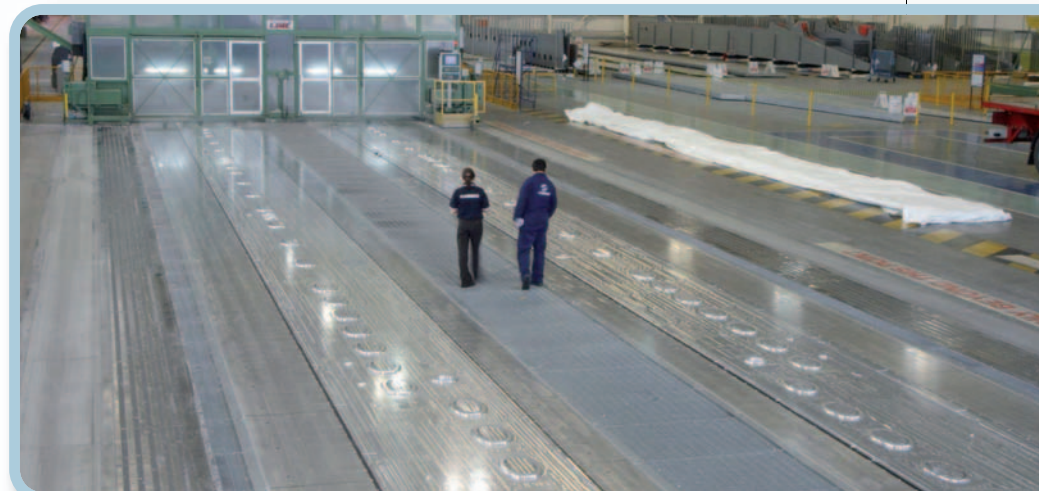
TUNNEL BORER CHALLENGE

One of DavyMarkham's most recent projects witnessed the completion of a 320 tonne cutter head for a 12.4 m diameter tunnel boring machine being built by the Robbins Company of Ohio, a manufacturer of underground construction machinery. It has been despatched to the mountains of Sichuan Province, China, where it will be employed in one of the biggest TBM-driven tunnelling projects in Chinese history, for the new 4,800 MW Jinping II

hydropower station on the Yalong River.

Davy Markham fabricated the machine's main cutterhead in six separate sections, for ease of shipping and lowering below ground: one segment weighing almost 60 tonnes. In a contract valued at £1.15 million, the Sheffield firm employed a newly-developed cutting tool for rough machining, which resulted in a metal removal rate five times faster than normal, and deployed the latest carbide U-drill technology, which cut holes eight times faster.

A couple of hours further up the A1, an OEM is proving that sub-contractors don't have the monopoly on heavy engineering success stories.



Machining wing skins for the Airbus A380



Machining both sides of a boom at once at JCB on a SHW Powerspeed 5 Duplex machine

component size currently produced is 1,500 by 4,000 by 1,000 mm which weighs 4.5 tonnes.

PROBING THE DIFFERENCE

A machining centre featuring a 16 m X-axis is assisting in the manufacture of the welded steel booms of the JCB Loadall telescopic handler range.

CNC machining welded fabrications is difficult, as every one is slightly different. The problem of aligning the component prior to milling and drilling has been solved on the twin-spindle, 5-axis machining centre by pre-cycle probing.

Manufactured in Germany by SHW and supplied through UK agent, Geo

Kingsbury Machine Tools, the machining centre started operating 24/7 at JCB, Rocester, last year.

The SHW Powerspeed 5 Duplex is essentially two travelling column, 5-axis machining centres installed on either side of a fixed, ground-level table. This configuration allows a boom to be machined in one hit on both sides simultaneously, without having to be rotated or repositioned. The long X-axis of the table gives sufficient space for a boom (up to 7 m long) to be machined at one end while another is being clamped at the other.

Flying further and for longer with greater numbers of passengers has led to

a noticeable increase in aircraft size being built by Boeing and Airbus. The latter's most recent programme, the A380 superjumbo, has a wing span of 80 m. This means that the A380 wing skin mill at the company's Broughton plant near Chester has to machine the 35 m long by 35 mm thick aluminium alloy billets for the aircraft's wing skin panels.

MILLING WING SKIN PANELS

The facility houses two Canadian-built Henri Liné gantry type high speed milling machines with 40 m of capacity in the floor-level X-axis. The machines take approximately 70 hours to mill a pair of skin panels, reducing the original castings by 85 per cent of material volume. Swarf fall is heavy when roughing 400 wing skin sets a year for the A380 at spindle speeds of 12,000 rpm and feedrates of 7 m/min.

Most A380 skin panels have little machining on the outside face but the inside faces incorporate machined features such as stringer ramps, facets and strip surfaces. The extreme outboard skin panels additionally have ribs machined as integral features.

While we marvel at the intricate components required by industries such as electronics, telecommunications and medicine, heavy engineering remains the backbone of infrastructure development, and will continue to thrive as long as there is demand for services such as construction, oil field exploration and aircraft manufacture. □

Big solutions

Demand for heavy engineering means that machine tool manufacturers work hard to bring new and innovative solutions to the market.

Among the latest is the Deckel Maho DMC 340 UFD 'Giga', universal mill-turn centre that has a working area of 16 m³. The portal design machine has a rotary pallet of 2.5 m diameter, an X-axis of 2.8 m and a Y axis of 3.4 m, along with spindle power of 44 kW. It has been developed to

satisfy production demands for large components weighing up to 16 tonnes.

Offering a similar component weight capacity is a new range of elevating cross rail-type vertical turning lathes being introduced to the UK through Dugard offering turning diameters up to 2.8 by 1.6 m height. The base is heavily walled and multi-ribbed for rigidity and to retain high thermal stability when supporting workloads up to 15 tonnes.

Among the new machining centres with 2 m or more available in the X-axis

are the Hartford Blockbuster Pro-2150 double-column vertical machining centre from Ward CNC, which has a 2,100 by 1,450 mm table.

Of similar capacity is the new Famup MMV200-80 linear from Ward Hi-Tech: a moving column, high speed vertical machining centre that is designed for machining both large, heavy workpieces and, if required, smaller components utilising a programmable centre partition guard allowing pendulum machining to be carried out.