

A picture of health

The strength of demand from the medical sector over the past decade has created a new niche in which many machine shops now flourish. Steed Webzell reports

The UK is well known for punching above its weight in medical engineering, serving a healthcare market measured in hundreds of billions of pounds annually," says Julia Moore, CEO of the GTMA, an organisation taking an increasingly proactive approach to this blossoming sector.

It's a sentiment shared by one of the government's top advisory groups, the Council for Science and Technology, which recently selected medical devices as one of the six new technology areas central to the UK's future prosperity.

However, medical engineering is a highly competitive field and successful UK suppliers have become so by collaborating with partners in the supply chain to provide demanding customers with world class products. As part of its *Buyers:Suppliers Network initiative*, GTMA is working closely with buyers in the medical device industry and has already established a sector register of more than 50 engineering supply companies in the

UK and Ireland.

Among them is Darlington-based Paragon Rapid Technologies, a company that began trading in 2003 but already employs 26 staff. Paragon's contention is that rapid prototyping is moving from indulgence to necessity, particularly in the medical sector. One project in which the company has participated recently is the development of the skin for the i-LIMB hand, a first-to-market prosthetic device with five individually powered digits. The replacement hand looks and acts like a real human hand and represents a generational advance in bionics and patient care.

GOALPOSTS KEEP MOVING

Medical equipment developments such as these call for the use of the most advanced machining technology and techniques – and the goalposts keep moving; dimensions that were considered challenging a couple of years ago are now considered every-day, while what was previously technically impossible is now a specified requirement.

At least this is the experience of Southampton-based Simplefit, a GTMA member that offers precision engineering capability for the design, manufacture and production of pressings and

associated parts, as well as light fabrication and tube manipulation for an increasingly wide range of medical components. Over the past 18 months it has developed new and different methods of producing parts for the medical sector with specially developed press tooling.

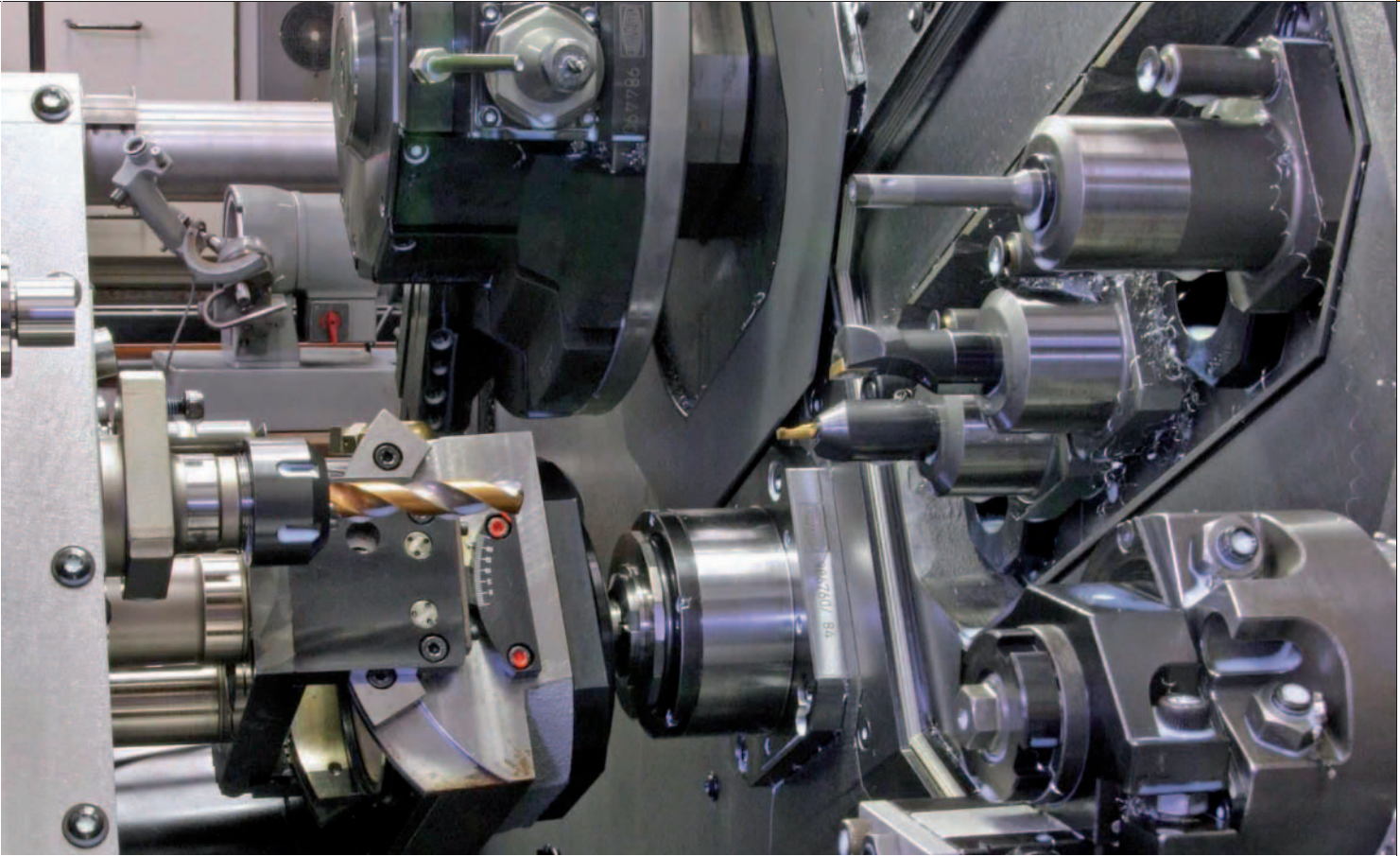
"Using a combination of pressing, shear forming and piercing techniques, we can save the customer about 75 per cent of the unit cost once they have invested in our tooling," says managing director Jason Macdonald. "We currently produce a 3 mm aluminium fascia plate for docking stations that go into hospitals and are used for syringe pumps. As well as holes and apertures, which can be easily pressed, there are pockets in the metal that are normally milled. Instead, we have developed a new way of working with our customer to form these indents, and remove metal that costs a few pennies rather than a few pounds.

This kind of innovative thinking, in tandem with the latest manufacturing technology, sets many UK companies apart from their European counterparts, ensuring that an increasing slice of capacity is engaged in machining for medical sector customers.

Take Welwyn Garden City-based Unicut Precision, for example, where two of the company's nine Citizen M32 CNC sliding-head automatic lathes are running around the clock producing special connectors for respirators. Unicut now creates around 15 per cent of its turnover from the medical industry, which includes the production of drill blanks up to 350 mm long for femur reamer tools,

Simplefit has, over the last 18 months, developed new methods of manufacture involving piercing rather than milling, for example





The thread whirling attachment on Ottaway Engineering's TNL26 allows it to produce threads 4.5 mm deep at high helix angles in a single pass

needle-less syringes and a whole range of surgical implant screws.

Most materials are difficult to machine and include titanium, 316 implant stainless steel, 17.4 pH medical stainless and Custom 55. Good swarf control is key to get the material to chip, which is why Ucut has the 2,000 psi Cool Blaster high pressure coolant system fitted to its Citizen machines, ensuring it can run at maximum speeds and feeds without fear of component damage.

On the subject of sliding-head lathe technology, if a machine operator wants to thread-whirl components like self-tapping bone screws and surgical implants, the machine supplier will normally provide an attachment that fits into a live position in either a tool turret or the front end-working station. The German lathe manufacturer, Traub, in addition to offering this solution, has now introduced a far more robust alternative in the form of a heavy duty whirling attachment driven by its own, high power motor.

Among the first British users (supplied through UK agent Geo Kingsbury

Machine Tools) is Eastleigh-based contract machinist, Ottaway Engineering, which retrofitted the unit to its Traub TNL26 sliding headstock turn-mill centre.

Having extra thread whirling power and rigidity allows the company to produce threads up to 4.5 mm deep at high helix angles in a single pass on its bar-fed Traub lathe. The independent whirling unit is too heavy to mount in a turret and has to be secured, but not driven, by two of the five stations in the front end-working slide. This rigid construction provides for vibration-free machining under extreme conditions. Standard materials can be machined in typically half the time and hard or tough metals can be tackled with comparative ease right up to the available 200 mm length, according to managing director, Luke Ottaway.

PRISMATIC MACHINING

Investment in prismatic machining equipment is also high as a result of medical device contracts. Sligo-based Avenue Mould Solutions, a provider of precision mouldmaking and

moulding services to medical and pharmaceutical OEMs, has invested over €500,000 in a Kern Pyramid Nano 5-axis machining centre.

Kern offers a range of three micro-milling machines of which the Pyramid Nano is the most advanced, being capable of an accuracy of ±0.001 mm in three axes, a positioning accuracy of ±0.003 mm and spindle speeds of up to 50,000 rpm.

"Our existing machines are capable of working to 0.01 mm or slightly less," says

Avenue's €500,000 Kern Pyramid Nano





Hip sockets manufactured by Corin

managing director Felim McNeela. "However, we are experiencing a growing demand for even higher accuracy and even greater repeatability, particularly in multi-cavity moulds for the medical and pharmaceutical sectors. There is a growing trend for customers to specify the Cpk value of mould cavities, and therefore to look for a higher degree of accuracy than is apparent from the tolerance on the drawing. This is where the Kern machine comes into its own."

Elsewhere, Cheltenham sub-contractor Pharma Tooling has more than doubled its maximum component size capacity with the purchase of a new Hurco VMX64 vertical machining centre. It was supplied with a rotary turntable and high pressure coolant delivery through the BT40 spindle.

"My plan is to grow the business and to do that we have to be able to tackle anything that comes through the door, 24 hours a day," says owner and managing director Phil Vines.

"We can now machine bigger components within the Hurco's working envelope of over 1,600 by 850 by 750 mm, and we also have the flexibility to produce smaller parts by setting up two or even three together on the table, using the 4th axis if required."

Around one third of Pharma Tooling's business is pharmaceutical-related. Blister pack tooling is regular work, which involves machining a 1.6 m long, aluminium bed-way that joins the forming and sealing sections in the production line. The bed-way is now machined in one-hit on the Hurco, rather than in two set-ups as previously.

Cirencester-based Corin Group has also enhanced its prismatic machining capacity with a 600 Centre-supplied Fanuc Alpha T21E 24,000 rpm vertical machining centre. By establishing cell machining incorporating the new machine, Corin has, for example, been able to slash on hip replacement 'cups' lead times from three days to one.

PROBING ESTABLISHES DATUM

A flagship product, the Cormet Hip Resurfacing system combines the principles of conservative arthroplasty with metal-on-metal bearing technology

to provide a solution for patients with osteoarthritis or rheumatoid arthritis. And this is where the Fanuc Alpha T21E machining centre has been applied to impressive effect.

In particular on each cup, the machine initiates a probing cycle as a datum using its Renishaw MP700 optical probe before machining three circumferential slots approximately 3 mm long by 1 mm wide and 1.5 mm deep. The surgeon uses these to hold and push the cup, without it deforming, into the patient's hip.

Corin Group has also invested in two Fanuc Alpha wire EDM models, again from 600 Centre. These are used in the production of a diverse range of instruments to match the different sizes of hip replacements produced. Once installed, the machines immediately enabled Corin to eliminate both the high weekly cost (around £1,000) of wire EDM outsourcing and the vagaries of lead time, for example, that can arise from such supplier dependency. □

Polished performance for better joints

The good news is that we are all living longer. The bad news is that we need increasing medical intervention to make the most of our additional years. Of course, this is not bad news for fast-growing medical device manufacturers and the sub-contractors that supply them with replacement knees and hips, surgical plates, pins and profiles.

Regarding hip replacement, so successful has this become that each year approximately 35,000 hip replacements are carried out in England and Wales on the NHS, not to mention private operations – a significant market opportunity, but also a considerable engineering challenge.

"The manufacture of replacement hip components must overcome a number of engineering challenges, including machining expensive and difficult-to-work materials, creating complex shapes to very fine tolerances and obtaining burr-free surfaces and fine finishes," says John Wellings, managing director of superabrasives specialist, Engis UK.

"To produce the final mirror finish on the ball joint from the original cast component, the item is first CNC turned before undergoing a grinding stage with cup wheels and final polishing with alumina slurry. An optimally designed abrasive system, including grinding tools, software and machine, can significantly enhance the efficiency of the manufacture of hip joints.

"We are seeing the use of more ceramic materials for medical components, often being ground with diamond wheels, in which case the selection of the correct wheel – including diamond type and coating, abrasive concentration and mesh size, bond type and hardness – is essential to the optimisation of the process, as all these characteristics affect productivity as well as workpiece integrity," he adds.