The medical device sector has, thankfully, been breathing unaided for the past decade or so, and the prognosis is good too. Currently it is estimated that around 25 per cent of medical device manufacturing is outsourced; a figure that continues to rise. Global players such as Johnson & Johnson and Boston Scientific claim that their core competencies are in marketing and product design, rather than manufacturing. The latter function is therefore expected to be outsourced increasingly to companies with the skills to deliver machining and engineering services more cheaply and efficiently, especially where solid relationships already exist with strategic partners.

**OUTSOURCED INCREASE**

As an increased rate of outsourcing by OEMs has been observed, so the number of potential suppliers has swelled. And, while the sub-contract manufacturing base of the medical device industry has generally not been threatened by price pressures, the past two years have altered the perspective. Changes in managed care have placed pressure on OEMs to reduce costs – a demand that is passed down directly to manufacturers. Cost-structure efficiencies are also providing OEMs with the opportunity to threaten to switch suppliers if low-cost production needs are not met. As a result, countries such as Mexico and Malaysia have a growing medical device supplier base.

All this, coupled with stringent regulation, has made the phrase ‘faster, better, cheaper’ a mantra for the UK medical device industry, and there is good evidence to highlight the benefits of sliding-head turning technology to help firms compete with the growing offshore threat. For instance, two of Unicut Precision’s nine Citizen M32 CNC sliding-head automatic lathes are running around the clock producing special connectors for respirators used in the medical industry. The Welwyn Garden City sub-contractor now derives around 15 per cent of its turnover from the medical sector, which includes production of drill blanks up to 350 mm long for femur reamer tools, needle-less syringes, and a whole range of surgical implant screws.

Above, Chesham-based Euromoulds is using a number of Sodick machines to produce tooling for plastic medical components. Right, high-pressure drilling on Tornos machines is one of the capabilities that makes them suitable for medical parts manufacture.

Medical device manufacturing has been just what the doctor ordered for many UK machine shops, but continuing good health depends on them ‘keeping fit’, as Steed Webzell reports.
As joint managing director Jason Nicholson explains, most of the materials are difficult to machine and include titanium, 316 implant stainless steel, 17.4 PH medical stainless and Custom 55, which demand special application knowledge and the right machines and tooling. “But key is swarf control to get the material to chip, while maintenance of cosmetic super surface finishes are critical,” he says.

He adds that these materials tend to be ductile, very sticky and therefore create a built-up edge on the tools. Also, due to the specialist nature of the material, it is only available as ground stock in certain sizes. Here, he praises the Citizen M32 and cites the production of femur reamers as a classic case. These are produced by Unicut in batches of 80 to 150 in a variety of diameters and can be up to 350 mm long.

Because the most appropriate material stock size available is 16 mm diameter, it has to be reduced to around 10 mm to suit the ordered size of the reamer. “We are able to balance turn the diameter using two tools simultaneously and rough and finish turn the length of the component to remove up to 4 mm of stock in one pass,” says Mr Nicholson.

“However, as we have the 2,000 psi Cool Blaster high-pressure coolant system fitted to our Citizen machines by NC Engineering, this enables us to run at high speeds and feeds and control both swarf and surface finish.”

**LET’S HAVE A DECO**

When Advanced Coil Slitters, a Stevenage-based sub-contract manufacturing supplier to the medical industry needed a functional and productive turning centre, it also turned to sliding-head technology, this time a 12-axis Deco 26a from Tornos. Used for the manufacture of critical parts incorporated into medical gas, anaesthesia and optical equipment with tolerances of less than 0.005 mm, the 32 mm diameter capacity Deco 26a has been a valuable asset to the company, reducing some jobs from five operations to just one. One component, an oxygen regulator, underwent drilling, milling and turning with five set-ups. When moved to the Tornos the 12-minute production time was reduced to three minutes with only one set-up.

Tornos has done well introducing its sliding-head products into this growing market largely, the company says, because every year in Europe, roughly 700,000 people suffer the misfortune of a hip fracture, which is frequently linked to osteoporosis. The medical facilities available currently mean that rapid surgical intervention can be conducted to reduce the fracture by applying plates and retaining screws, thereby allowing patients to regain their mobility quickly. The hip screws used for surgery are highly complex parts that require numerous machining operations involving swarf evacuation.

The best solution in terms of
productivity and feasibility is to proceed with the complete machining of the parts in a single chucking operation on one machining unit. Using A-line products from Tornos (the Tornos Deco 20a in this case), it is possible to machine specific parts in minutes. The Tornos Deco simplifies allocation of the various machining operations from the bar (main spindle) and for back operations (counter-spindle). The procedure for the manufacture of hip screws involves turning, centring/drilling/reaming, high pressure drilling to 120 bar, tapping, hexagon broaching/swaging, external hexagon milling, external thread whirling in back-operation mode, deburring and part support. Over 20 tools are involved in carrying out all these operations.

SPARK EROSION
Another machine tool technology to prosper in the medical sector is EDM. Supporting this claim is Leeds-based EDM precision engineering specialist Aire Erosion Ltd, which has recently invested in a Roboform 550 spark erosion machine from Agie Charmilles – the first of its kind to be installed in the UK at a sub-contractor. Already the machine is making a significant and positive impact on Aire Erosion’s production capabilities. Aire Erosion is virtually exclusively involved in the manufacture of high-precision components for the medical sector (in 2005, 80 per cent of the company’s turnover came from parts manufactured for this sector). Such is its performance within the industry that the company is increasingly winning direct contracts with end-user customers – bypassing altogether third-party sub-contract arrangements.

To achieve and maintain ‘preferred partner’ status with these customers, Aire Erosion has repeatedly to demonstrate its skill in manufacturing complex surgical instruments such as saw guides, femoral reamers and rasps, as well as micro-implants for key hole surgery. EDM is at the heart of its operations (the company also owns a Robofill 440cc wire EDM). It is used from the outset to create the workpiece profiles and forms. Intricate and complex features (often micro-features) – slots, ribs, thin walls, contours and tight radii – are machined using EDM wire and/or spark erosion technology before second operation milling, turning or grinding.

Sodick is also enjoying success in selling its latest linear drive EDM machines into the medical industry. Customers include both device manufacturers, such as Limerick-based Croom Precision, which has acquired an AQ327L specifically for the production of orthopaedic implants – and to injection mouldmakers, such as Chesham-based Euromoulds which is using a number of Sodick machines to produce tooling for plastic medical components including thin walled surgical masks for anaesthesia applications. Euromoulds has targeted the medical sector purposely and managing director Richard Powell says the company is now recognising widely as having the equipment required to serve this growing industry.

There are many examples of how investment in the latest technology can create unexpected opportunities. For instance, when Middlesbrough-based Burdon acquired the UK’s first DMC160FD duoBLOCK from DMG for an oil and gas industry contract, the machine, which can accomplish milling and turning operations, soon provided the company with the opportunity to manufacture ring components required for body scanners in the medical sector.

TURNING CHALLENGE
Contrary to popular belief not all medical machining applications involve complex components. For example, Bacup-based Perplas Medical is a raw material producer and supplier to the medical industry, manufacturing from materials such as Ultra High Molecular Weight Polyethylene (UHMWPE), which is now the primary bearing material for orthopaedic applications. However, while this material lends itself to hip, knee, elbow, wrist and finger joint replacements, it is challenging to machine.

As many of its customers often require added value in the form of pre-machined blanks, Perplas has invested heavily in CNC machine tools supplied by Yamazaki Mazak, with the first of four Mazak machines, a Super Quick Turn CNC turning centre, installed at the company in May 2003.

The SQT 200M has since been joined by three multi-tasking machines – two Integrex 100 IIS models and a Quick Turn Nexus 200MSY, all three machines
equipped with a second spindle.

Elsewhere, at the United Bristol Healthcare NHS Trust, there is a certain amount of dependence on its Medical Equipment Management Organisation (MEMO) to provide an effective and systematic approach to medical device management.

This involves maintaining sophisticated medical equipment such as MRI scanners and the design and manufacture of anything from a simple surgical instrument to a complex ultrasound-scanning device.

MEMO’s most recent machining asset is an XYZ SM 1500 manual/CNC turret mill that, according to David Ford, MEMO’s mechanical services manager, “gives us total flexibility because we can switch between manual and computer control at any stage in the machining cycle”.

The new turret mill, with its robust Meehanite ribbed cast iron construction is well suited to MEMO’s role as a job shop, sub-contractor and specialist manufacturer of electro-mechanical medical devices.

Medical device manufacturing opportunities in the UK are widespread and diverse, which should encourage machine shops looking to gain entry into this flourishing sector.

Sub-contractors already active in the medical industry need to maintain best practice manufacturing techniques and keep investment levels high so that customers return time and time again.

With a clean bill of health, UK manufacturing could enjoy a long and prosperous future.

Engis’ Megasonic nozzle system uses a vibration transducer of megahertz order while delivering liquid and can remove very fine particles. It is supporting research into micro-tooling for non-silicon micro-components (see page 94)