A carbon-fibre workholding solution addresses the exacting production demands required for revision prosthetics

Joint effort brings results

German company Peter Brehm develops, manufacturers, and sells medical implants for primary and revision joint surgery. The company's strength is revision prosthetics for large joints such as hip, knee and spinal column. Here, a carbon-fibre workholding solution from Hainbuch, available from Tamworth-based workholding specialist, Leader Chuck Systems, has addressed exacting production demands.

Hip endoprosthesis or spine fixators are important products in Peter Brehm's portfolio. The product line includes special implants that are used if the patient's bone defects are so extensive that they can no longer be covered with standard implants. The company also manufactures the instruments necessary for the implantation.

The right materials

Peter Brehm uses high-quality materials such as titanium, cobalt-base alloy, and ceramics that are bio-compatible, strong and low-wearing. All semi-finished materials are forged so that the possibility of imperfections and fatigue failures are almost completely excluded. "The titanium material we often use is the alloy TiAl6V4," says production manager Gerd Kirsch. "We use pure grade 1 titanium for hip sockets and cobalt-base alloys for knees due to the excellent polish ability and strength."

For implants the batch sizes extend from five to 100 parts, depending on the product. "The trend is downward," says Kirsch. "This development also applies for smaller parts, like screws, which we formerly manufactured in lots of 500 or 1,000. Today it is 200 or 300 pieces." However, the instrument sets the company produces in five to 20-fold types can include 3,000 individual parts. So the quantity is low and the variation is high.

Machining of the implants and instruments is carried out in the prefabrication department. "Fixed and sliding headstock lathes can cover everything that is customary in the turning area," says Kirsch. "Six years ago we decided on Hermle milling machines. Now we are prepared and set up for every application in the field of medical technology. We invested in four C30 machines that are configured for simultaneous five-axis machining. We have automated one so we can manufacture unmanned with even shorter cycle times."

Milling technician Walter Kloha says: "We decided on pallet automation so we can manufacture either batches or just a single part in any sequence, unmanned. We have integrated a pallet changer that has more than 24 pallet positions, and can handle pallet weights up to 60kg."

Marco Horny and Stephan Stahl, who alternately program the machine and run the parts, currently operate the automated C30. They clamp round material with nine manual Manok CFK stationary chucks from Hainbuch.

Chucks from a competitor, used prior to automating, did not have a construction height sufficient to move the loading station into the machine. The company was also dissatisfied with the shape of these clamping devices and the resulting swarf ingress. In the search for an alternative, these were the crucial factors, along with criteria including that the new stationary clamping device should also be able to accommodate bars that are as long as possible, have a low construction height to avoid waste material, and should be easily accessible.

High-quality materials such as titanium and cobalt-base alloy are used

Kirsch says: "Preliminary discussions with Hainbuch had shown that our idea of obtaining a steel clamping device with as smooth a surface for diameters to 65 mm were achievable. We decided on the Manok that is made from carbon fibre. In addition to the minimal size, the CKF Manok also offers a significant weight-saving compared with the steel version."

The carbon version is as much as 70 per cent lighter and is extremely rigid because it is equipped with hexagon Toplus clamping heads that offer a positive locking of the clamping head and clamping device.

Unlike the round clamping heads, the hexagon model prevents radial displacements to the taper of the clamping device. Therefore, the chips cannot penetrate into the Manok. This is important when milling as chips often fall into the clamping device.

Currently, a wide range of parts are milled from solid material using the CKF Manok system. The clamping devices have repeatedly proven their capability for lot sizes of 30, 50 or 150 pieces.

"In addition to functionality, the appearance of our components also plays a very important role," says Kloha. "Previously, we could produce parts with the same quality. However, the effort was significantly higher. We simply had more rework.

"Moreover, we were by no means able to run the cutting parameters that we are running today. Formerly, two stages were required. Today it is often just a single step."