

PRESS RELEASE

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Complex manufacturing methods for medical technology

METAV 2022 showcasing solutions by companies from alternative backgrounds

Frankfurt am Main, 03 March 2022 – More and more manufacturing companies are expanding their product portfolios and service offerings in order to attract a broader customer base. This gives production companies greater independence from sectors such as the automotive or aerospace industries. Medical technology is an example of such market expansion, although it does present a wide range of challenges. METAV 2022, International Exhibition for Metalworking Technologies, is reflecting the importance of this sector by giving it its own dedicated area. From 8 to 11 March 2022, researchers and experts from the companies exhibiting in Düsseldorf will be providing practical and theoretical insights.

Tools for medical technology

"The dynamic development of medical technology is unstoppable. The demands being placed on manufacturers – and in turn on their suppliers – are constantly increasing. Products designed for use in the human body are becoming smaller, more minimally invasive, more precise, safer and better

tolerated," says Markus Horn, Managing Director of Paul Horn GmbH in Tübingen. These are just some of the demands faced on a daily basis by manufacturers of medical products. As a producer of tools, Paul Horn GmbH is well qualified to meet these challenges and is constantly developing new tool solutions and manufacturing strategies for the medical technology industry: from micro-milling cutters for the production of sensitive titanium spinal implants through to grooving tools for the aluminum pump housing of a heart-lung machine.

Horn is continuously expanding its know-how in the field of medical tooling technologies. A good example here is whirling technology. High metal removal rates, long threads with high quality finishes, deep thread profiles, short metal chips, multi-start threads and low tool load levels are key advantages of the whirling process. However, these are offset by various technical challenges. One important aspect is the materials used in bone screws in implants. The cutting edges of the whirl plates are subjected to very high loads when machining titanium, stainless steel and other superalloys. Horn is constantly refining its technology in order to counteract cutting edge wear at high chip removal rates and with short machining times. Markus Horn: "Medical technology will play a central role for us, too, at METAV 2022 in Düsseldorf." We will be showcasing not only whirling products but also our solutions for the manufacture of implants, medical instruments and devices."

Multi-axis 3D printing for cartilage implants

According to Prof. Oliver Riedel and Prof. Alexander Verl, directors at the Institute of Control Technology of Machine Tools and Manufacturing Systems (ISW) at the University of Stuttgart, "Our job as engineers is to develop technologies that serve people. Medical technology plays a very special role here." Bioprinting, for example, is a new type of technology. Its purpose is to produce biological tissue structures to replace diseased patient tissue. Research is underway at ISW on a 3D printing application to cure osteoarthritis in the knee using personalized cartilage implants. The researchers are taking

advantage of the fact that additive manufacturing can be used to produce complex components whose internal structures can be defined by graduated material compositions.

A continuous process chain from the MRI scan of the patient's knee through to the finished personalized implant is being developed at ISW (part of the WGP – German Academic Association for Production Technology – an association of leading academics in the industry). The scan data is used to generate a replacement geometry for the defective section. This geometry can be used to calculate spatially curved paths for the printing process. The NC program is then executed on a 7-axis printing system. A specially developed print head has been coupled with a CNC control system featuring a feed forward with real-time capability. It compensates for the non-linear tracking behavior of the extrusion-based printing process. The material consists of methacrylate-modified gelatin solution, which is hardened using UV LEDs. Cell cultures grown in a bioreactor are dissolved in the cartilage equivalent before being implanted. The biomaterials are being developed at the Institute of Interfacial Process Engineering and Plasma Technology (IGVP) and the Fraunhofer Institute for Interfacial Engineering and Biotechnology (IGB) in Stuttgart. METAV 2022 is devoting separate areas to both future fields - medical and additive manufacturing.

Shrink fit and presetting for greater productivity

Abutments, titanium adhesive bases as well as laboratory and implant screws are complex turned parts, numerous variants or which need to be produced in large quantities. This in turn means frequent retooling of the lathes. Here, a tool management system consisting of shrink collets and a shrink fit and presetting device yields a variety of advantages. This combination ensures particularly high accuracy levels, but also fast and safe tool presetting. "Roughly eight minutes can be saved per tool when setting up the machine," argues Haimer GmbH based in Igenhausen, which provides complete packages of appropriate solutions. The European market leader for tool

clamping technology offers shrink fit collets which – in contrast to conventional ER collets – facilitate quick and simple tool changes and are characterized by their excellent radial run-out accuracy. They help to reduce vibration, which in turn optimizes surface quality and tool life.

Haimer has a device for the shrinking process whose horizontal design allows small tools in particular to be handled. The shrink fit device is easy to operate via a 7" touch display and intuitive software – and the i4.0 version is equipped for digital integration into the production system. Haimer recommends another product for tool presetting. Providing fully automatic tool measurement, it offers absolute operator independence and can be used with virtually no prior knowledge or experience. The device also allows the measurement data to be transmitted digitally to the lathe – either via the integrated postprocessors or using a QR code and scanner.

Rapid clamping is half the battle

In its production of intricate surgical instruments, Anton Betzler GmbH from Tuttlingen exploits the superior efficiency offered by Schunk's flexible, stationary modular system for clamping and setup on 5-axis machining centers. The components of the micro scissors and scalpels are first manufactured on the machine and then finished manually using fine craftsmanship. Here, Betzler combines a zero-point clamping system with two manual clamps from the Schunk range. These clamps are supplied complete with matching clamping pallets. The clamping force in the vises can be adjusted as required, thus preventing any deformation of the thin forged parts. The medium-sized family-owned company has equipped all machines with two zero-point clamping modules each, thereby ensuring rapid mounting of each clamp. The entire clamp (including the pallet) is changed during the setup process. This is easier and faster than changing the clamping jaws alone. This helps avoid bottlenecks and shortens delivery times. The changeover repeat accuracy of < 0.005 mm ensures high precision.

However, even greater accuracy is possible: a newly developed small parts clamp with rapid jaw change system can be changed quickly and completely without the need for special tools. The superior accessibility makes this particularly suitable for 5-sided machining. Despite its compact dimensions, it offers high clamping forces up to a maximum of 16 kilonewtons. Combined with an extremely flat zero point clamping system, this makes the best use of the machine space on small machine tools. "Our modular system offers users maximum flexibility and helps them minimize their setup times," sums up Markus Michelberger, Sales Manager for Clamping Technology at Schunk. "We are delighted to be demonstrating our expertise at METAV 2022."

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Faster setup

Non-productive time also plays an important role in medical technology. Tool shrink fit and presetting devices can represent ideal solutions for small, complex turned parts, such as those required in dental prosthetics. This considerably speeds up the time required for setting up sliding headstock automatic lathes – leaving more time for machining.

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Background

METAV 2022 will take place from 21 to 24 June in Düsseldorf. It will showcase the entire spectrum of production technology. The main focuses are on machine tools, tools, accessories, measuring technology, surface and computer technology for metalworking, software, machines and systems for additive manufacturing, production systems and components for medical technology. In addition, METAV 2022 will highlight specific solutions in four theme areas: Additive Manufacturing, Medical, Moulding and Quality. METAV 2020 had to be cancelled due to the COVID pandemic and was held as a digital event in 2021.

Detailed information, offers and registration documents for METAV 2022 are available at www.metav.de

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