PRESS RELEASE

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New developments in the manufacture of precision tools

On show at METAV 2020 – Measurement equipment and new technologies play key role in the toolmaking process chain

Frankfurt am Main, 03 December 2019. *Tool production demands maximum precision and quality. New technologies, such as additive processes or laser-assisted production for the fine structuring of design and functional surfaces, are increasingly being used alongside conventional manufacturing processes. Exhibitors at METAV 2020 from 10 to 13 March in Düsseldorf will be highlighting crucial aspects in the manufacture of precision tools.*

Tools must be of the required quality to fulfil their machining tasks and ensure maximum productivity. "There are major production challenges in the manufacture of special tools, such as custom-adapted stepped or fine drilling tools. The speed with which these tools can be produced is often decisive," says Prof. Dirk Biermann, Head of the Institute of Machining Technology (ISF) of the Technical University of Dortmund. Leading tool

manufacturers have made enormous progress recently in this area in an attempt to meet the demands for ever shorter delivery times for special tools. Additive manufacturing offers many advantages here. "Targeted developments are also crucial, such as cutting edge preparation or layer post-treatment. The aim is to have appropriately constructed precision tools, especially for the machining of challenging high-performance materials," says Biermann, mentioning a further aspect.

Thomas Feile, test engineer at Mapal Dr. Kress KG says: "Of course, the grinding of tools at accuracy levels down to the nearest µm requires modern machinery and highly qualified employees." Further crucial aspects for precision tool manufacturers are data consistency and the reliable exchange of files and information from the design, production planning and production departments, for example.

Measurement technology plays key role in tool manufacture

Measurement technology plays a decisive role in production at Mapal, especially in the testing of critical features. "We check the diameters, the grinding qualities, the cutting edge rounding as well as the micro and macro geometries, for instance. And measurement technology is not only a key factor in the manufacture of our tools, it is also crucial in their deployment by our customers. That is why we include measuring and setting devices in our portfolio. They allow customers to adjust their tools with absolute precision," explains test engineer Feile. "Tools nowadays usually require special microshaping of the cutting edges in order to ensure maximum productivity. And that's why suitable measuring systems and evaluation strategies need to be deployed for the precise analysis and quantitative determination of the various aspects of the cutting edge microstructure," adds Biermann, who is also a member of the WGP (German Academic Association for Production Technology).

Process chain analysis for optimum surface quality

A further key aspect of tool production is surface quality. Depending on the tool requirements, Mapal uses various finishing processes such as grinding, honing, vibratory grinding and polishing. "The challenge is to select the right grinding wheel parameters, for example, for the material being machined. The flutes of solid carbide tools, for example, are polished. The company differentiates between six different accuracy levels for solid carbide tools. These are manufactured using different processes - from grinding and fine finishing to fine polishing," says Feile, describing the Mapal approach.

"Polish-grinding is appropriate for the active surfaces of precision tools. A good flute surface is important in drilling tools in order to ensure effective chip removal even with high cutting data levels and challenging workpiece materials, especially when producing deep bores," explains Biermann. The ISF joined forces with well-known industrial companies in an AiF (Arbeitsgemeinschaft industrieller Forschungsvereinigungen "Otto von Guericke" e.V.) research project to carry out tests into improving the targeted use in terms of grinding wheel selection, dressing conditions and process parameters. The Institute will be reporting on its research work at METAV.

Arndt Fielen, sales manager at Zecha Hartmetall-Werkzeugfabrikation GmbH in Königsbach-Stein, emphasises: "When machining workpieces, the best possible surface quality is achieved by conducting a precise and specific analysis of the entire process chain in your own company's production facilities and those of the customer." It is also important to scrutinise details and, where necessary, to change and optimise the existing processes. Special tools are often required in production process changeovers during the processing of lead-free materials, for example. In

this case, it is often minor details which decide whether a tool is appropriate or not. Does the cutting edge radius match the feed per tooth? Are the tool angles correct for the toughness of the material in order to optimise the surfaces and chip breakage, or must a new tool clamping option be considered in order to avoid vibration? "We often cooperate with the customer to generate different tool variants which we then test in order to obtain the most economical result," reports Fielen.

New solutions for enhanced performance

A further crucial aspect in tool manufacturing is innovative technologies. "We want to make the best possible products for our customers. And that's why we also rely on new solutions," says Thomas Feile. "One example is additive manufacturing. This has considerably optimised our hydraulic expansion chucks with regard to temperature resistance and geometry etc."

Mapal has also developed its own open cloud platform, c-COM, in order to ensure consistent and transparent tool management. This will provide the data which industry requires in order to go fully digital. The platform links all the companies along the supply chain and, according to test engineer Feile, reduces the effort and costs for all involved. At the same time, the solution also enables forward-looking, company-wide planning and cross-company collaboration in the manufacture of precision tools. With this in mind, Mapal will be exploring the subject of "Communication between machine and tool - Digitisation" in detail in the VDMA Clamping Technology Forum at METAV.

"We are generating new ways for increasing customer benefit by constantly optimising and investing in our own production capacities and tool technologies. One example of this is a high-end tool line with a laser-machined diamond-coated cutting edge that offers economical

machining – even of lead-free or non-ferrous materials which are difficult to machine," says Arndt Fielen, citing one of Zecha's new solutions. At METAV, the company will be presenting new developments in the field of micro cutting tools. "These include our high-end tool series for machining challenging non-ferrous materials and for hard milling in tool and mould making," says Fielen.

The Dortmund-based ISF also offers various process development possibilities for adapting precision tool production to the respective application in the most effective way. "We are happy to help industrial companies in their own development efforts by providing technical know-how, special analysis equipment as well as machines and systems. Some of these are unique and are designed to help optimise precision tool details for a particular application," says Prof. Biermann, describing the ISF's potential for new tool developments. In addition to various preparation methods, the ISF has special facilities for the basic analysis of chip formation processes with modified tools, and for material characterisation under near-identical machining conditions. Furthermore, ISF is currently working on additive manufacturing developments which permit the manufacture of tool holders with improved damping properties. The Institute's scientists are also devising simulation-based ways of improving understanding of the various and often very complex interrelationships, with the aim of supporting customised tool development.

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Clamping Device Forum at METAV 2020

The theme of the 4th Clamping Device Forum. organised by VDMA Precision Tools and scheduled for 11 March, is "Clamping Equipment – Solutions for Megatrends". The Forum will feature numerous presentations on clamping equipment solutions which are aimed at helping customers overcome the challenges posed by

megatopics such as smart manufacturing, cloud platforms, additive manufacturing, alternative drive concepts, digitalisation, etc. The presentations will focus on innovative workpiece and tool clamping technology as well as the latest research findings. For further information and registration visit: https://pwz.vdma.org/kalender/-/event/view/53963

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Background – METAV 2020 in Düsseldorf

METAV 2020 - 21st International Trade Fair for Metalworking Technologies displays the full spectrum of manufacturing technology. The focus is on machine tools, manufacturing systems, precision tools, automated material flows, computer technology, industrial electronics and accessories. Added to this are new topics such as Moulding, Medical, Additive Manufacturing and Quality. They are firmly established in so-called Areas in the METAV exhibition programme, each with its own nomenclature. The target group of METAV visitors includes all branches of industry that process metals, in particular mechanical and plant engineering, the automotive and supply industry, the aerospace sector, the electrical industry, energy and medical technology, tool and mould making as well as metalworking and trades.

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