PRESS RELEASE

Aachen, July 17, 2023

Laboratory for Machine Tools and Production Engineering (WZL) of RWTH Aachen University

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Manufacturing of tool components made from tungsten carbide - Milling as an alternative to EDM?

Project launch of "ProWerWolf"

The selection of suitable substrate materials is becoming increasingly relevant to improve the efficiency and productivity of manufacturing processes. Particularly in the field of tool and die making, the use of wear-resistant materials offers great potential to enhance component quality and reduce production costs at the same time. Thus, tungsten carbide with its favorable material properties is more and more selected for the manufacturing of punches and dies. The increasing demand for carbide forming tools requires more cost-efficient, productive and faster manufacturing processes for these tools.

The conventional production chain for tool components made of carbide involves time-consuming and cost-intensive shaping of the sintered blanks by EDM with subsequent grinding and polishing. Alternatively, new cutting tool and coating technologies and more rigid machine tools in combination with CAM programming already allow milling of carbides. By exploiting the possibilities of advanced machining processes, the conventional process chain can be significantly shortened, revealing time-saving potential. The route to the finished part can therefore be reduced to powder preparation, pressing and sintering, and subsequent hard milling. An increase in geometrical freedom and the generation of service life-enhancing compressive stresses in the rim zone of the forming or stamping tool components are further advantages of milling. However, the machining of carbides by interrupted cutting is associated with high demands on the tools, the machine and the process planning. A lack of knowledge about the relationships between material composition, tool geometry, coating, path planning and cooling strategy additionally complicates optimized process configuration.

The existing knowledge gap shall be closed within practical investigations in the research project "ProWerWolf - Tool and process configuration to improve machinability and increase process reliability in the milling of WC-Co cemented carbides" together with partners from the industry at the Laboratory for Machine Tools and Production Engineering (WZL) of RWTH Aachen University in the next two years. Based on experimental investigations, a design model will be developed that supports companies in the optimized tool and process configuration for milling of tungsten carbide using CVD diamond-coated solid carbide tools.

To achieve this goal, fundamental observations are first made by performing orthogonal cutting tests using different tool coatings as well as tool macro- and tool micro-geometries. In addition, the test materials are varied in terms of cobalt content and tungsten carbide grain size to capture material influences on chip formation mechanisms. In the next step, the knowledge gained about the machinability of carbide with a geometrically defined cutting edge will be transferred to roughing and finishing milling operations. In these milling investigations, the influence of different path planning and cooling strategies on process stability, tool life and component quality will be empirically analyzed.

The findings from existing literature, the orthogonal cutting tests and the milling investigations are summarized in a design model for tool and process configuration. Finally, this elaborated design model for the milling of carbide is benchmarked against the conventional process chain of EDM, grinding and polishing, to provide companies with a decision basis for the operational introduction of carbide milling.

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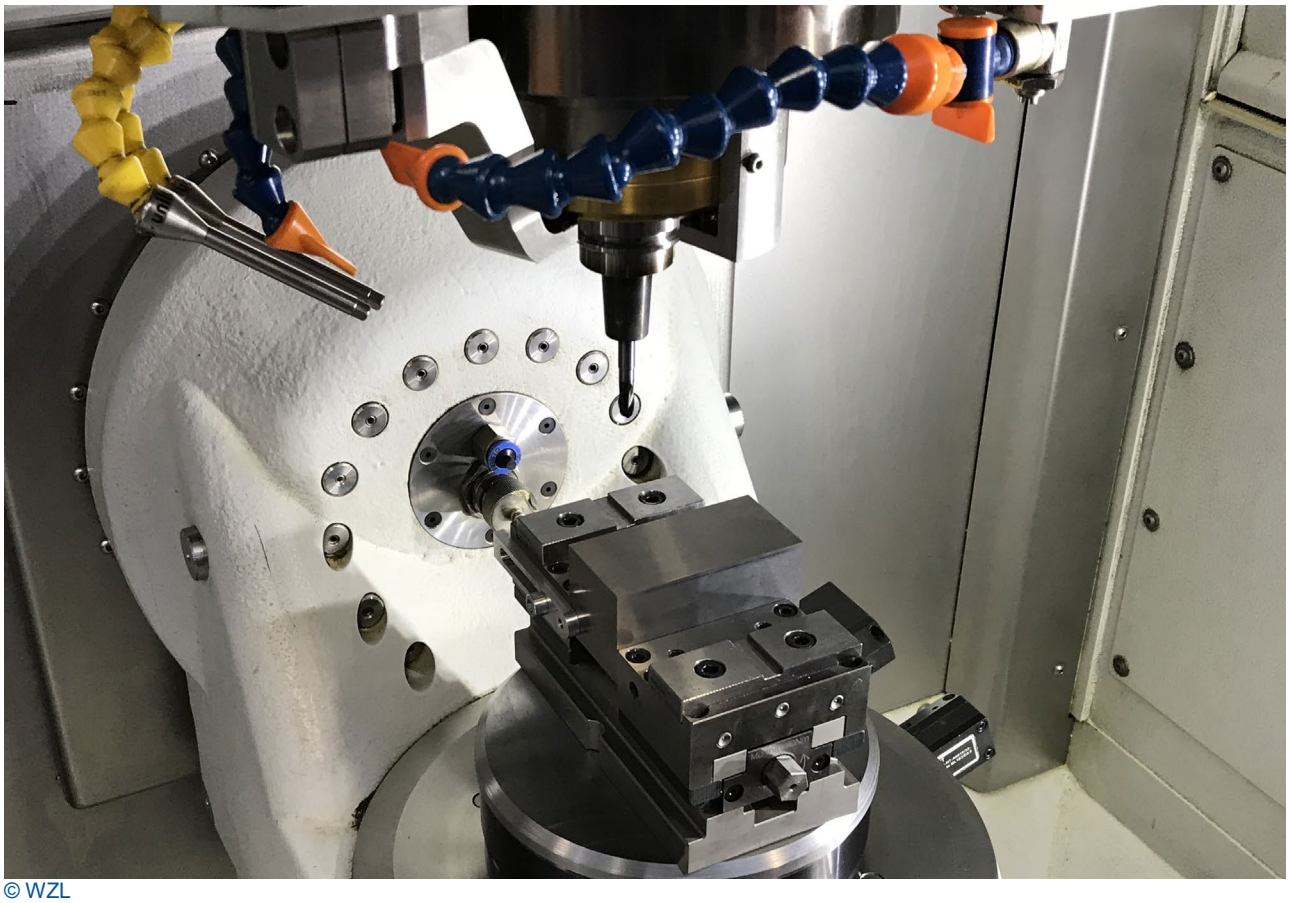
Funding notice

The IGF project 22847 N/1 of the Forschungskuratorium Maschinenbau e.V. (FKM) is funded by the Federal Ministry for Economic Affairs and Climate Action via the AiF within the framework of the program Förderung der Industriellen Gemeinschaftsforschung (IGF) based on a resolution of the German Bundestag.



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Laboratory for Machine Tools and Production Engineering (WZL)

The Laboratory for Machine Tools and Production Engineering (WZL) of RWTH Aachen University enhances the innovative strength and competitiveness of the industry with trend-setting basic research, applied research and the associated consulting and implementation projects in the field of production technology. In the research fields of manufacturing technology, machine tools, production engineering, gear technology as well as production metrology and quality management, practical solutions for rationalizing production are developed with industrial partners from a broad range of branches.