

## PRESS RELEASE

Aachen, September 17<sup>th</sup>, 2020

### Tool Life Increase by a Factor of 20 for Fine Blanking with Carbide Punches

#### Successful Cooperation of the Working Group Fine Blanking for the Process Reliable Use of Carbide Punches

Due to its high compressive strength, carbide offers the potential to fine-cut high-strength sheet materials in a reliable and efficient process. This significantly reduces tool wear compared with conventional punches made of high-speed steel. Until now, however, the necessary process understanding for the use of carbide as a punch material has been lacking. Due to frequent punch breakage of the brittle hard carbide, economic tool life has since then only been achieved in isolated cases.

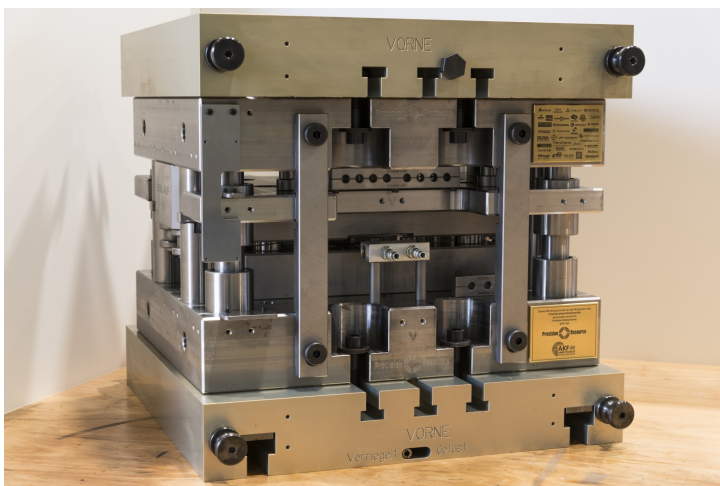
The working group fine blanking (AKF), a strategic research network for international and innovative companies in the fineblanking sector, pursues the goal of using carbides in a process-safe manner for the fine blanking of high-strength steel. This should significantly increase the economic efficiency of the production process. In cooperation with the working group fine blanking, the Laboratory for Machine Tools and Production Engineering WZL of the RWTH Aachen University has now succeeded in significantly improving the performance of fine blanking by using carbide punches.

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Fine blanking tool optimized for the application of carbide (© WZL)

Using scientifically developed methods, a fineblanking tool for the use of carbide punches was constructed and the process control was optimized. High-strength sheet metal was fine-blanked in a series of tests on the Feintool XFT 2500 speed fineblanking press with a thickness of six millimeters and a test series of 10,000 strokes was carried out.

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The carbide punch showed hardly any wear characteristics, while a conventional HSS punch as a reference was almost at the end of its service life. The economic efficiency of fine blanking was significantly increased by a significant reduction in wear.

### Use of Carbide in Fineblanking – a Comprehensive Approach

The fineblanking process for the application of carbide punches was first comprehensively evaluated in a research project lasting several years. From this evaluation, measures were derived to control the mechanical stress on the carbide during stripping, whereby the factors fineblanking press and process control, tool making, strip layout and carbide machining played a central role.



Feintool XFT 2500 speed fineblanking press at the Rotter Bruch site of WZL (© WZL)

With the Feintool XFT 2500 speed servo-mechanical fineblanking press, exact process control in terms of process forces and guiding accuracy is possible. The selection of suitable press parameters can further reduce the load on the active elements. The fineblanking tool has been completely redesigned to ensure exact and rigid guidance of the blanking punches. On the occasion of the tool redesign, all process- and tool-related influences that cause a bending moment in the punch were considered and eliminated. The result is a detailed list of requirements and design recommendations for fine blanking tools with carbide punches. On the basis of the requirements determined, the working group member Precision Resource Canada designed and manufactured a new type of test tool.

The focus was on the production of the cutting punches. Since the production of active elements is usually carried out by fineblanking companies without any experience in carbide machining, a major focus was on illuminating the machining of carbide and acquiring the necessary knowledge.

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The carbide manufacturer CERATIZIT Empfingen GmbH, for example, has contributed its expertise to enable shaping by wire spark erosion with optimum surface integrity. The coating company Platit has made an important contribution to surface technology. For cutting edge preparation, the brush polishing technology at the WZL has shown excellent results.

The stripe layout was adapted for the test tool in such a way that interactions of piercing punches with each other during multiple falling fine cutting and interactions with the cutting grid are in balance. This balance is necessary to avoid a bending moment in the punch caused by different boundary conditions along the cutting line contour. Bending moments can cause difficult application conditions for carbide punches, which ultimately lead to breakage.



Cut parts and punching waste of test parts with various geometric elements (© WZL)

The project fine blanking of high-strength steel with tungsten carbide has proven the effectiveness of the cooperation of companies from different disciplines in the working group fine blanking. In joint cooperation, knowledge about fine blanking with carbide punches was generated at the WZL, enabling users to apply the technology in industrial practice. In further work of the working group fine blanking all measures taken for the project will be revised in order to enable an economic use of carbide with the simplest possible measures under the conditions of the special requirements. Thus, the basis for future detailed basic research on the stress situation of carbide punches during the stripping process is laid.

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### Working Group Fine Blanking

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### Laboratory for Machine Tools and Production Engineering

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 re-search 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