Technical report

Rounding of cutting edges at the touch of a button

OTEC drag finishing machines for the defined edge rounding of cutting tools

Castings and hardened steel components for axles, differentials and drive shafts used in commercial vehicles and trailers are machined around the clock.

During this manufacturing process a variety of carbide drills and blades are used which are in most cases resharpened in the company's own tool grinding shop. The demands made on the tools in terms of service life, tolerances and achievable surface quality are of prime importance.

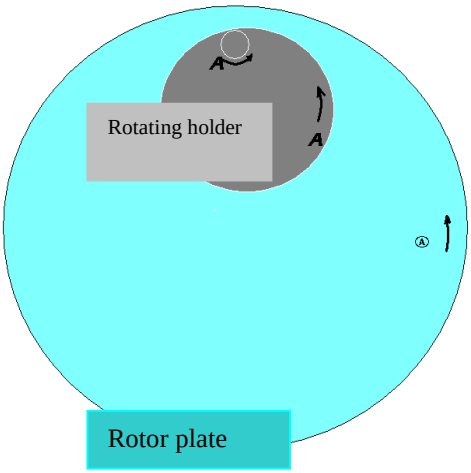
Investigations were made to find a process for reliable rounding of the cutting edges of drills. After a comprehensive one year project, the drag finishing process was introduced. Together with the Mercedes-Benz plant in Kassel OTEC Präzisionsfinish GmbH established the basic parameters required, which were then optimized still further during the course of the extensive project.

As a rule, the cutting tools are clamped in the rotating tool holders by means of special clamping devices, which in turn are inserted into adapters.

Fig.: Tool clamping system with special clamping device

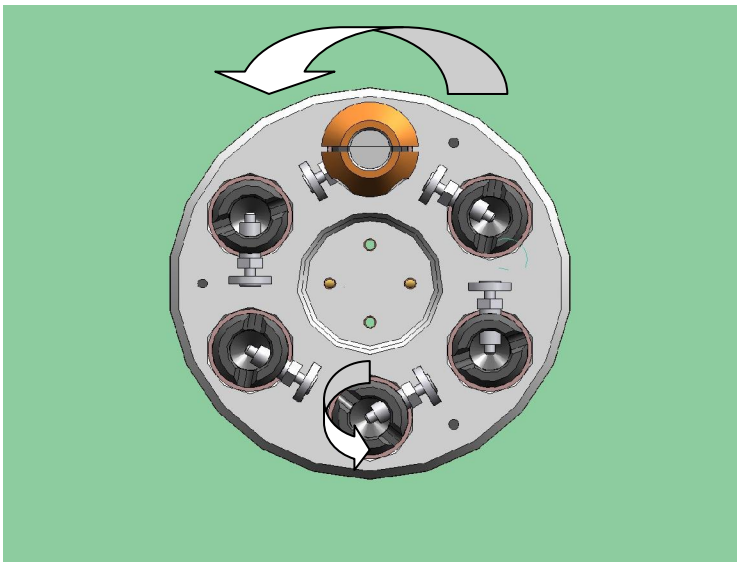
Depending on the size of the machine, from 3 to 10 holders can be suspended in a single drag finishing unit.

Depending on the nominal diameter, from 4 to 6 tools can be placed in each holder.



The rotary motion is transmitted to the rotor plate by means of a planetary gear system.

In the rotating holder the rotary motion is similarly transmitted to the tool by means of an integrated planetary gear system.



With this method, speeds of up to 600 rpm can be achieved at the workpiece, enabling high contact pressures to be reached end ensuring effective and uniform treatment of the complex geometries of the cutting tools.

The following illustration shows the main cutting edge of a 10 mm tungsten carbide twist drill before processing:

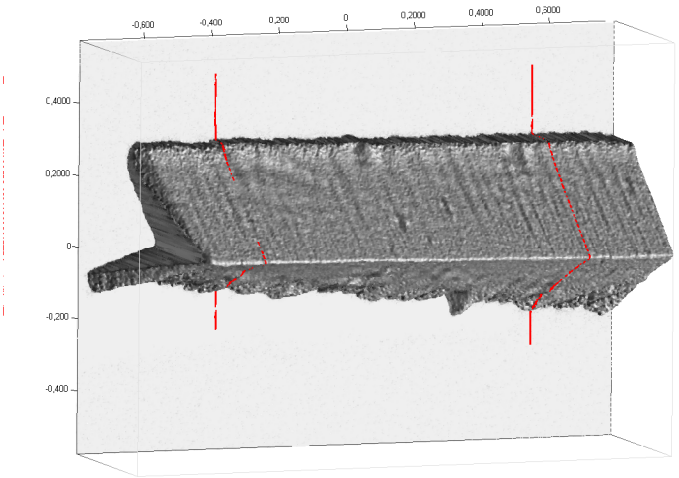


Fig.: Cutting edge of a twist drill before processing

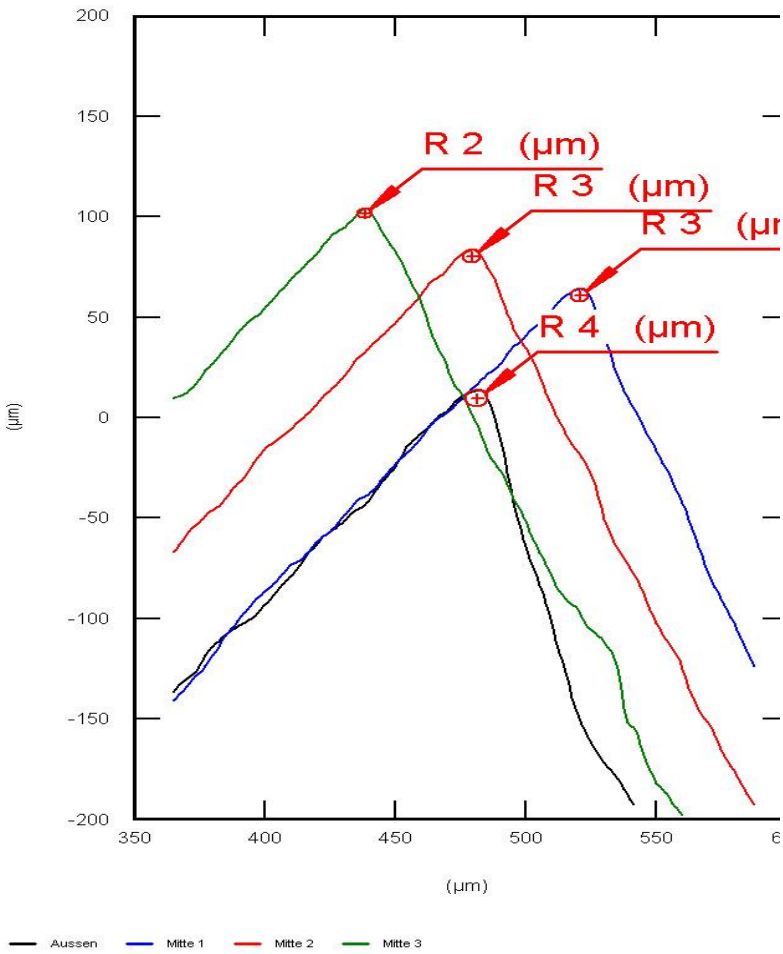


Fig.: Cutting edge radius before processing

Fig.: DF 140 / 10 Tool for processing tools

The clamped workpieces are dragged through a special medium (granulate) selected to match the specific requirements in terms of edge rounding and surface finish.

Fig.: Tool holder with workpieces just before immersion in the process container.

Various parameters can be defined with regard to the finishing process. The media used, direction of rotation, speed, processing time, immersion depth, size and geometry of the workpieces being processed are the main factors involved in achieving the results required of the process.

After processing, the effects of smoothing and rounding can be seen on the surface of the cutting edge:

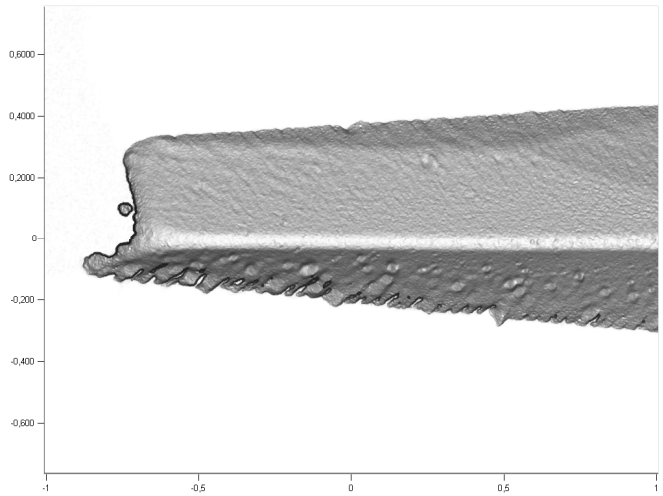


Fig.: Cutting edge after processing

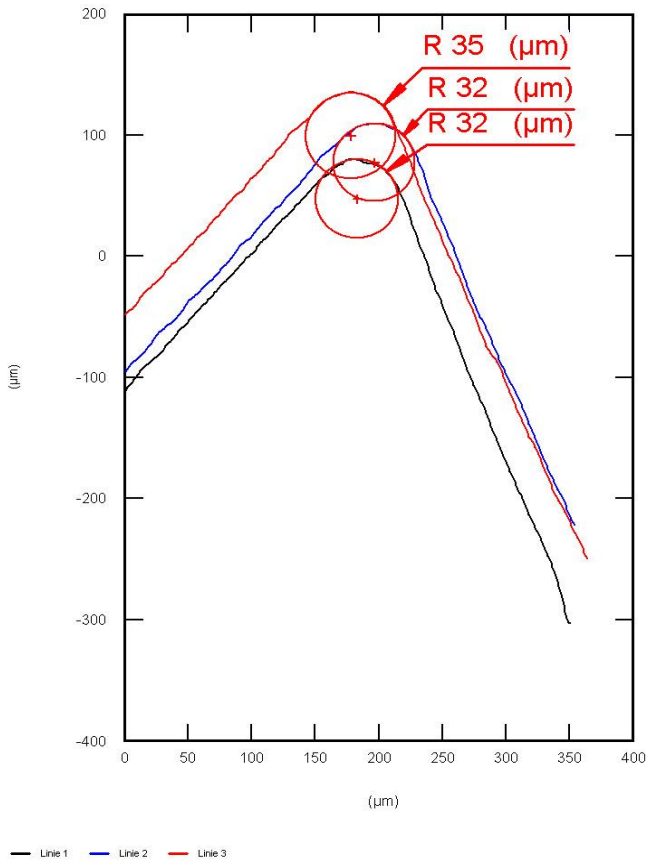


Fig.: Cutting edge radius after processing

Until very recently, the tool grinder used brush-type devices to round the edges manually. This resulted in variations in the precise microgeometry and consequently also in the life of the tool.

After the OTEC DF drag finishing machine has been in operation for about a year, Dipl.-Ing. Stefan Reisner (dept. TM/TGE-W) who is responsible for the tool management sums up the situation: “The drag finishing process has enabled us to reliably define the microgeometry at the cutting edge of the tool and to achieve it with a high degree of reproducibility.”

With the aid of OTEC drag finishing technology, all parameters relevant to the reproducibility of the required cutting edge geometry can be called up at the touch of a button.
As beneficial side effects, the process also smoothes the chip flutes, thereby reducing friction, and better prepares the surfaces for coating.

The company:
OTEC is a medium-sized manufacturer of drag finishing and disc finishing machines. Founded in 1996 by Helmut Gegenheimer, the company has successively established itself on the market through new machine concepts and numerous patented processes - first in the jewelery industry then increasingly in the toolmaking, pharmaceuticals and automotive industries as well as in medical and CNC processing technology. The key has always been new, better solutions which were superior to the surface treatment processes previously in use. Today OTEC is the technological leader in many markets and maintains a worldwide presence with branches of its own.

OTEC Präzisionsfinish GmbH
Dieselstraße 12
75334Straubenhardt-Feldrennach
www.otec.de