PRESS RELEASE

Perfect surfaces for metal cutting tools

Rounding cutting edges and polishing to a high shine with the drag finishing process

Industrial specialists are increasingly focusing their attention on the matter of rounding the edges of cutting tools and polishing chip flutes. It is a well-established fact that the state of the cutting edge and the smoothness of the flute have a significant effect on tool life and cutting performance. There is now a more desirable alternative to conventional processes such as brushing or blasting.

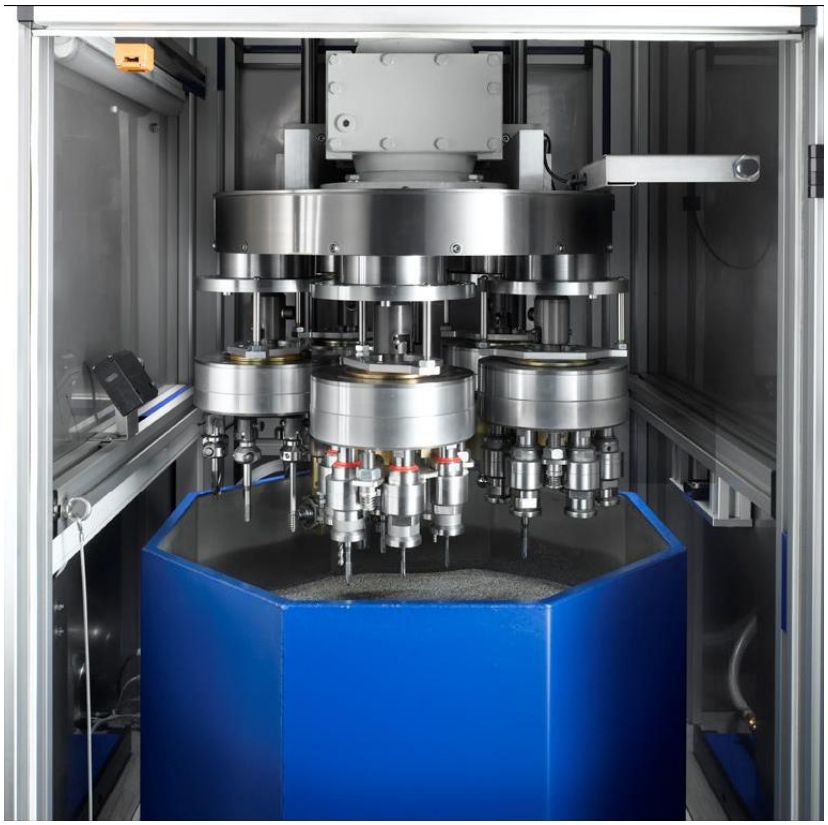

Fig. 1: Drag finishing machine with planetary driven multiple tool holders for efficient processing and perfect results
Photo: OTEC GmbH

The drag finishing process:

In the drag finishing process, tools are fixed in holders and dragged through abrasive media while they simultaneously rotate on their own axis. The tools describe a planetary orbit which ensures that the grinding or polishing media make uniform contact with all the surfaces to be finished. This also enables complex geometries to be processed. The degree of edge rounding and the surface finish are mainly determined by the process time, the speed, the immersion depth of the tools and the abrasive media itself. These parameters can all be accurately defined, which makes the process extremely reliable – a considerable advantage of the drag finishing process over other, more conventional processes. The key parameters are:

a) Immersion depth of the tool in the abrasive medium:

The larger the grain size of the media, the greater the static pressure will be, resulting in larger cutting edge radii and smoother surfaces. The immersion depth can be set at the control panel.

b) Speed:

This also affects the degree of rounding at the cutting edges. The speed is infinitely adjustable.

c) Process time:

The process time can range from just a few seconds (e.g. for removing droplets after PVD coating) to up to 20 minutes to give carbide tools a radius of 70µm.

d) Abrasive media:

The media affects the surface quality at the cutting edge and in the flute and of course the radius of the cutting edge.

e) Clockwise / anti-clockwise rotation:

Different results are obtained depending on whether the tool rotates in a clockwise or an anti-clockwise direction. This can also affect the geometry of the edge rounding (K factor).

Drag finishing is suitable for:

- tungsten carbide end mills and drills
- tap drills and tap forming tools
- CBN-PCD tools
- inserts
- small broaches
- reamers
- thread rolling tools
- stamping dies and forming tools

From theory to practice:

Deburring and edge rounding of tap drills

During the manufacture of tap drills, the grinding process generates small burrs between the tap profile and the chip flute. It is not possible to carry out grinding without creating burrs, so that extensive finishing is unavoidable. If the tap drills are not deburred, the burrs would have a detrimental effect on the geometry of the cutting edge. Moreover, burrs on uncoated tools could become bent over the cutting edge during machining or even break off and damage the cutting edge. This would result in reduced tool life, a poor surface finish and less accuracy. Furthermore, today's tool coating processes require the tools to be totally free of burrs. And in addition, the flute surface has to be very smooth in order to ensure good chip flow.

Nowadays it is well known that a cutting edge radius of 10 to 15 µm can extend tool life considerably.

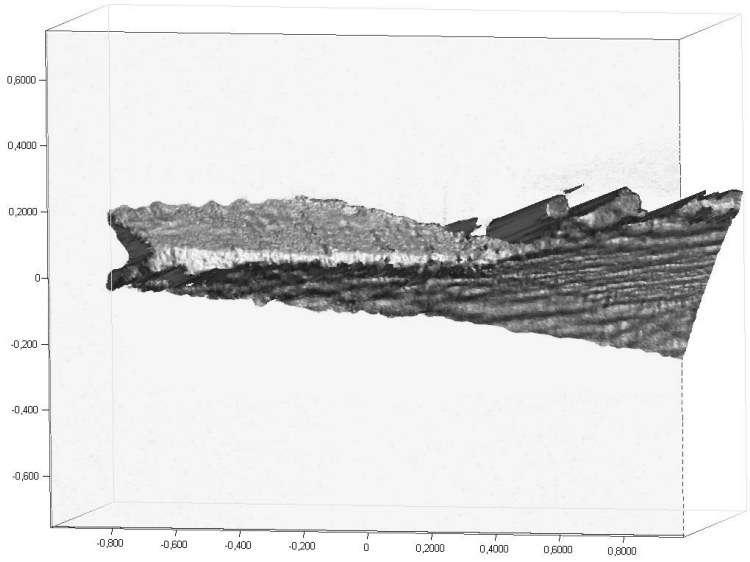

Fig. 2: Cutting edge of a tap drill with burring.
Photo: OTEC GmbH

Fig. 2 shows a typical cutting edge of an HSS tap drill immediately after the manufacturing process. Here, the mean jaggedness value is 2.7 µm. A large burr can be seen protruding on the left.

The average processing time for grinding tap drills in a drag finishing machine is about eight minutes. Up to 60 tools can be processed at the same time.

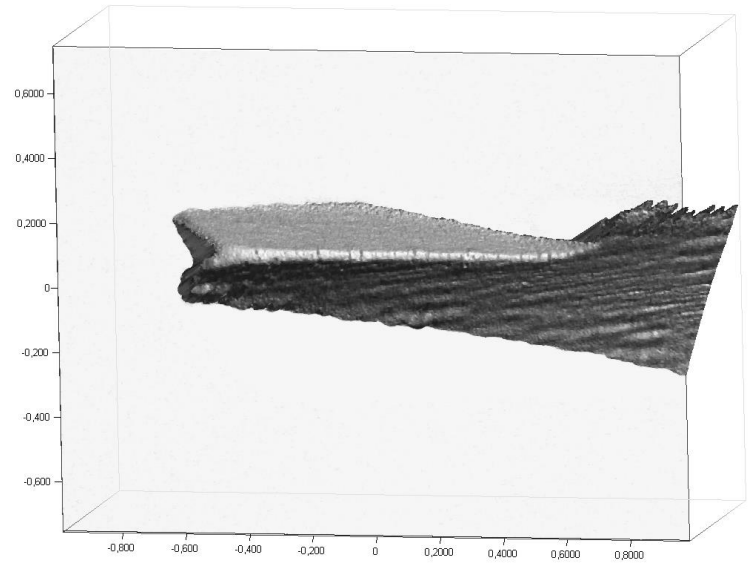

Fig. 3: Cutting edge of a tap drill after eight minutes' treatment in a DF Series drag finishing machine.
Photo: OTEC GmbH

After drag finishing, the cutting edge has an average edge radius of 12.5 µm. This is within the currently required 10 – 15 µm range for edge rounding. The average jaggedness was reduced from 2.7 µm to 1.1 µm and the burr has been removed completely.

OTEC Präzisionsfinish GmbH

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 jewellery industry then increasingly in the tool making, 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.

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