In recent years, the whirling of threads for manufacturing high-quality screws for the medical technology industry and other sectors has become established. This manufacturing process is particularly suitable for long workpieces with small diameters, e.g. bone screws.

**Thread-whirling: Efficiency, quality and short chips**

If the length is more than three times the diameter, unstable conditions arise when long workpieces are machined – the workpiece starts to bend. Because of the unfavourable length to diameter ratio, the conventional processes, such as thread cutting, become problematic, or the workpiece can no longer be machined at all. With thread-whirling on the other hand, the cutting point is close to the guide bush of the Swiss-type automatic lathe, and is produced in a single operation from bar stock. This provides for a stable cutting situation, short machining times, high surface quality and long service life.

Thread-whirling also creates short, well-defined chips, which means that materials that are normally difficult to machine pose no problem at all. During turning, the materials frequently used in medical technology, e.g. titanium, produce long chips that are difficult to control and remove. The short chips that are created by whirling are expelled from the machining area during whirling, thanks to the centrifugal forces, or evacuated using high-pressure cooling.

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**THREAD-WHIRLING WITH 12 BLADES**

Thanks to the 12-blade thread whirler from Utilis, the medical technology firm Stuckenbrock Medizintechnik GmbH was able to almost halve the machining time for the production of bone screws. The increased number of blades and high-pressure cooling means that the service life has been almost doubled and the surface finish improved.
Higher number of blades for longer service life

Instead of conventional whirling tools with the usual 3 or 6 blades, Utilis AG supplies tools with 9 or 12 blades. Using these innovative tools allows you to profit from shorter machining times, longer service life and higher cutting speeds, as the example of Stuckenbrock Medizintechnik GmbH clearly shows.

Stuckenbrock, a shareholder company in the KLS Martin Group, based in Tuttlingen in Germany, is a manufacturer of orthopaedic implants and wrist prostheses. The company considers itself as a technological trailblazer, wanting to make full use of a machine’s potential, and therefore decided in favour of the 12-blade whirling tool from Utilis. Jürgen Klemm, which means that chips are not so easily removed if there is insufficient pressure. “We tried, but it just wouldn’t work at all”, says Jürgen Klemm. He goes on: “The chips were not removed, and some of the workpieces were completely destroyed. It was not until we obtained the new unit that the head was even able to move, but once it did, its action was very powerful.”

In the end, the results exceeded Stuckenbrock’s expectations. They were able to almost halve the machining time – from 29.9 to 17 seconds. At the same time, the service life was also increased from 4 to 7 shifts, leading to an improvement in the finish.

Technical Operations Manager at Stuckenbrock, explains their decision: “We already had a 6-blade tool, but the leap in productivity made possible by the 9-blade tool was still not enough for us”.

High-pressure cooling for chip removal

To produce their bone screws, Stuckenbrock uses a Deco 20 from Tornos. The Swiss-type automatic lathe did, however, have to be fitted with a high-pressure cooling system. The spaces between the teeth on the 12-blade thread-whirling heads are very narrow,

Design and mode of operation of the whirling tool

One advantage of the new whirling tool from Utilis is its increased number of blades. There is a direct link between productivity and the number of teeth. The efficiency of the tool increases noticeably, without having to change the feed of each tooth on a blade. In addition, the increased number of blades leads to fewer vibrations, which in turn leads to lower wear. This enabled Utilis to substantially increase the service life of the cutting edges. The selected basic substrate
INTERVIEW WITH MATTHIAS FILIPP, PRODUCT MANAGER AT UTILIS AG

SMM: What are the advantages of having a 9-blade whirler, when there is a more productive tool with 12 blades?
Matthias Filipp: Only if the Swiss-type automatic lathe has no high-pressure cooling, is a head with 9 inserts to be recommended - because of chip evacuation.

What effect does the coating on the whirling tool have on the quality of the thread?
Filipp: In general, coatings provide for a longer service life thanks to their high wear resistance, but they also have an effect on temperature development in the form of friction and heating, on the reduction in the cutting force through the decrease in the friction coefficient and on more stable cutting edges through the decreased impact sensitivity.

What effect does the workpiece material have on the choice of whirling tool?
Filipp: The properties of the workpiece material are decisive for the machining process, and are taken into account when selecting the substrate, cutting geometry and coating of the insert.

SMM: When thread-whirling bone screws or other threads for the medical technology industry, are there any particular issues to be borne in mind?
Filipp: It is important to keep the distance to the guide bush as small as possible. In addition, the angle of the driven tool must be precisely adjusted, and the cooling system must be properly aligned. To achieve high levels of precision, careful installation of the thread-whirling head and blades should go without saying.

Where do you see further possible applications for thread whirling?
Filipp: Every possible type of thread is suitable for thread whirling.
Presentation

possesses high wear resistance, is more resistant to the repeated impacts that occur during a milling operation, and thereby also more resistant to abrasion.

**Further improvements expected**

The new 12-blade thread-whirling head is being used by Stuckenbrock on a trial basis, and has not as yet been tested to its limits. The tool may be working well, but not well enough for the needs of Stuckenbrock. The blades of the thread-whirling head do not work close enough to the guide bush.

To provide a remedy, a spacer ring is to be installed, which Stuckenbrock expects to provide yet another increase in productivity: “Once we are working with the spacer ring and getting ever closer to the bush, then I can see us getting even more out of the tool”, affirms Jürgen Klemm.

Matthias Filipp

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