TAKAMAZ RYU-GI vol.20

We have verified a method for effectively dealing with the stagnation of chips that impedes efficient inner diameter finishing.

Measures against chips in inner diameter finishing

Current inner diameter finishing

Chip disposal is greatly affected by the properties of the material, and it is very difficult to break up chips of copper, aluminum, and press worked materials such as mild steels, in particular.
There is little freedom to adjust the feed rate and depth of cut in the turning process, and the chips interfere with the workpiece and do not curl enough, which makes them difficult to expel during inner diameter finishing, and also greatly affects the utilization rate and stability of quality in mass production.

Toward reliable chip removal

In the situations where chips are difficult to expel, proper chip removal is considered to improve the utilization rate and quality on production lines. We verified the possible solution to reliable chip removal during inner diameter finishing.

Intentional creation of variations in depth of cut

Due to the evolution of chip breaker design, the chips are tightly curled, but in situations where the depth of cut and cutting conditions are restricted, as is the case with finishing, the probability of chip breaking is rather low without making some change, such as changing the depth of cut during turning.
Therefore, we decided to provide variations on the surface of the workpiece and deliberately create conditions where chip breaking would be initiated at those variations.
The specific strategy was to make a lengthwise groove on the inner surface before starting the inner diameter finishing, providing a location where the depth of cut could be changed once every revolution as the point of initiation of chip breaking.

Validation results

A lengthwise groove was created on the aluminum (A5052) workpiece to a depth of 0.3 mm using a slotter tool (special tool of Sumitomo Electric Industries, Ltd.) as shown in Figure 1,

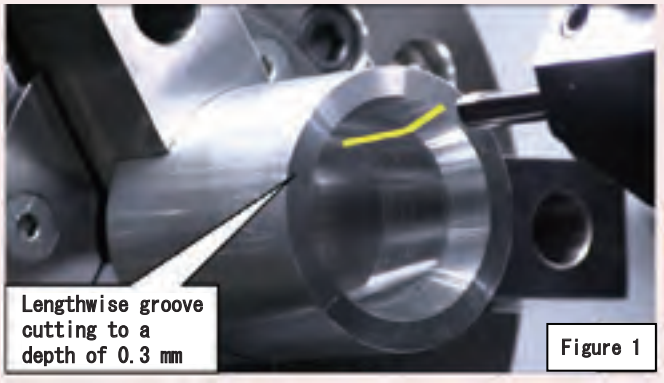

Figure 1

to provide a location where the depth of cut fluctuates. Then, by finishing with a depth of cut of 0.5 mm as shown in Figure 2, we were able to make chip breaks whose point of initiation was the position where the depth of cut changed (Figure 3).
Since the lengthwise groove depth is shallower than the finishing depth of cut, there is no groove mark left on the finished surface.

Figure 2

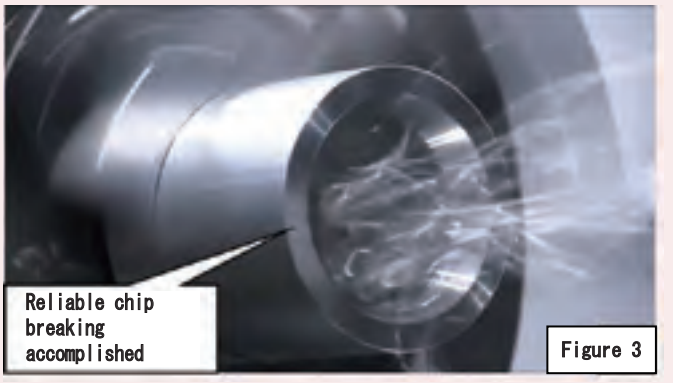

Figure 3

Supplementary note

Because changing the depth of cut causes the cutting load to fluctuate, if the tool or the workpiece itself has poor rigidity, the amount of deflection may change momentarily and affect the roundness.
An essential condition for this solution is to use a rigid tool, which will enable stable cutting while breaking the chips.

Click here for a video of the actual cutting!!

In order to continue to provide machines that earn money and to propose high-efficiency cutting methods that make even better use of these machines, we will help to improve our customers' productivity by taking on difficult challenges and finding ways to resolve them.

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