

“Ultrasonic vibration cutting” can shred the chips generated during turning and drilling.
We verified this function on TAKAMAZ products.

About “Ultrasonic Vibration Cutting (the Oscillation Function)”

One of the unavoidable aspects of turning work is that chips become entangled on the tool. The ways of dealing with this include changing the cutting conditions or chip breaker, and using a high-pressure coolant system, but this time, we are introducing “ultrasonic vibration cutting” by making use of one of FANUC’s optional functions called “Servo Learning Oscillation”.

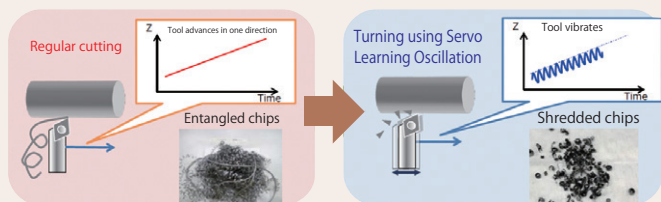
■ What is Ultrasonic Vibration Cutting (the Oscillation Function)?

It is a cutting technique in which the tool is slightly oscillated along the feed axis direction in synchronization with the rotation of the workpiece, thereby making the cutting edge break contact and thus shred chips. (Fig. 1)

On TAKAMAZ products, ultrasonic vibration cutting is achieved by using the oscillation function, which serves to shred chips not just in turning but in drilling operations too.

Ultrasonic vibration cutting can be performed by adding a simple program before and after the target cutting section, which means that the program and cutting conditions can also be changed easily.

It addresses concerns about machine stoppages, tool tip breakage and generation of defectives, and greatly helps to improve the utilization rate and quality stability.



[Fig. 1] Difference Between Regular Cutting and Ultrasonic Vibration Cutting

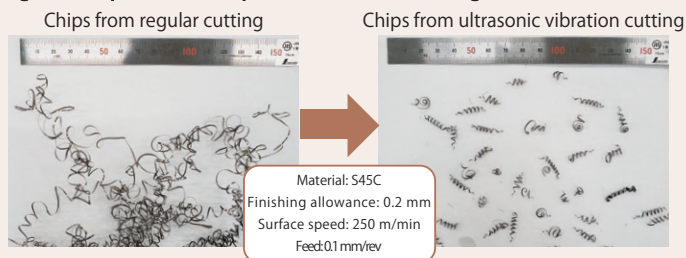
*Taken from FANUC’s website

■ Comparison of Chip Form and Surface Roughness

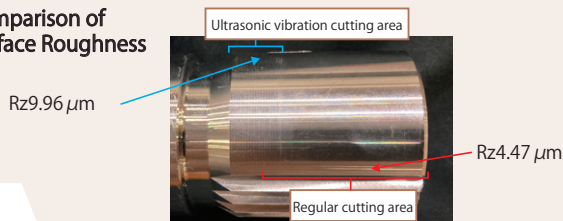
If we compare the chip forms in regular cutting and ultrasonic vibration cutting (Fig. 2), we see that with regular cutting they are long, while with ultrasonic vibration cutting they are shredded.

As for the comparison of surface roughness (Fig. 3), there is a difference of approximately $5 \mu\text{m}$, with a value of $Rz 9.96 \mu\text{m}$ for ultrasonic vibration cutting against $Rz 4.47 \mu\text{m}$ for regular cutting. There is no change in the cycle time as a result of using ultrasonic vibration cutting.

[Fig. 2] Comparison of Chip Form and Surface Roughness



[Fig. 3] Comparison of Surface Roughness



■ Issues and Points to Note to Maintain Stable Quality

● Affects on cutting accuracy

It may not be suitable for cutting with demanding dimensional tolerance and surface roughness requirements.

● Specification method

The oscillation function can only be specified for one feed axis. For cutting involving moving two axes simultaneously (e.g. taper turning), the vibration will take place on one specified axis only, either the X axis or Z axis. Vibration will not take place with rapid traverse commands or thread cutting commands.

● Level of impact on the machine

The impact of using this function will differ depending on how the machine is operated, but please be aware that there is a risk it could shorten the life of the machine since it applies loads to slides, ball screws, support bearings and other components.

● Efficacy of ultrasonic vibration cutting

In ultrasonic vibration cutting, the tracking ability of the servo axis motors and slides is important, so it is less effective on large-sized models and when high spindle speeds are used. Also note that backlash adjustment and other management is necessary.

● Compatible models/controllers

The function can be used with FANUC Oi-TF PLUS controllers. (Charged-for option) It can also be added as an option on existing machines. The only permissible modifications are changes to the control software.

● Compatible TAKAMAZ models

- XT-6/XT-6M [6-inch] •XT-8 [8-inch]
- XT-8M [8-inch] •XT-8MY [8-inch]

■ Summary

We introduced a special cutting technique called “ultrasonic vibration cutting” that resolves chip processing issues. We will continue our efforts to expand the range of models that can support the technique so that we can satisfy more customer needs. For more information on the method of use and machine specifications, please contact your local distributor.

Contact: 076-274-1402

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