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Contributing significantly to higher chip removal rate and cutting efficiency
Also enabling accurate coolant supply to the cutting point
and extended tool life

Wavy Nozzle®

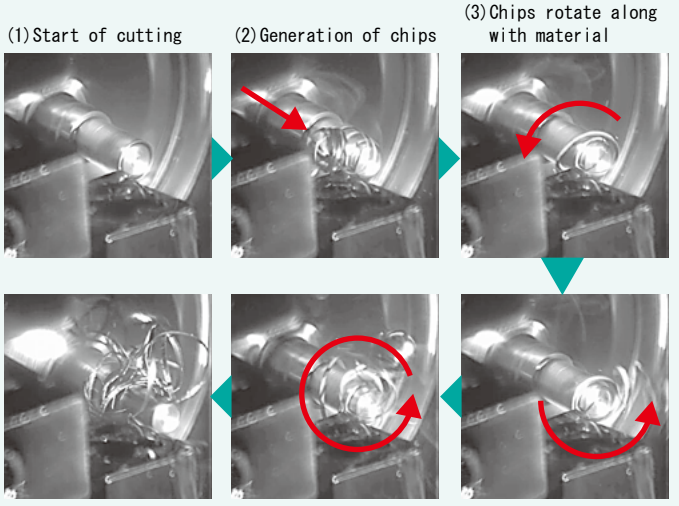
Moving nozzle coolant jetter

Chip entanglement problems and conventional measures to deal with chips

Measures against chips are a perennial issue in cutting. Chips entangling with the tool or chuck can lead to reduction of yield because workpieces are scratched, lost time through machine stoppages to remove chips, reduction of tool life, or in the worst case, damage to the machine.

The standard measure to deal with chips is to introduce a high-pressure coolant system. Chips are blown away using a system generating high-pressure coolant at 8 to 20 MPa. This method undoubtedly has significant effects, but on compact lathes it has the demerits of deteriorating cutting accuracy and shortening machine life due to the vibration of the pump for spraying the high-pressure coolant, and adversely affecting the factory environment by generating oil mist.

Mechanism of chip entanglement



Wavy Nozzle is a product that has been developed with a new concept of oscillating the coolant while spraying it.

"Swing jetting" the coolant rather than blowing chips away like a high-pressure coolant system guides the chips in one direction and makes it hard for them to entangle.

Wavy Nozzle installed inside a TAKAMAZ XG-4. It is compact and takes up little space. The nozzle swings in the directions indicated by the arrows.

Resolving the Issue of Entanglement

When workpiece materials whose chips are generated unbroken on lathes (e.g. aluminum and stainless steel), chips can be wound up as they are carried by the momentum of workpiece rotation and rotated together with the workpiece. This is the main cause of chip entanglement. Once chips have become entangled it is difficult to remove them however much coolant is applied.

When Wavy Nozzle is used, chips are flushed in a fixed direction, so they do not follow the rotation of the workpiece and are expelled. The tendency of chips to become wrapped round under their own weight once they have extended beyond a certain length is avoided, making it difficult for them to entangle.

To make it possible to deal with a variety of cutting shapes, there is a feature whereby the operating angle and swing speed of the Wavy Nozzle can be adjusted, and the adjusted values are stored in memory inside the Wavy Nozzle itself. Then, when the nozzle is actually operated, it can be controlled simply by calling up the values from memory with M codes in the cutting program. Using Wavy Nozzle does not lengthen the cycle time.

Other Effects of Using Wavy Nozzle

Swing jetting coolant with Wavy Nozzle not only suppresses chip entanglement but also has the effect of making it easier for the coolant to reach the cutting point. With simple spraying of coolant, its supply to the cutting point can be restricted by the pressure of the airflow generated by the rotation of the workpiece. The swinging of the coolant by Wavy Nozzle ensures that it is supplied to the cutting point accurately. The fact that coolant strikes the cutting point properly can be expected to have the effects of improving the surface roughness of finished faces and extending tool life.

Comparison of chips

Comparison with SUS303 (austenite stainless steel)
<O.D. turning>

●Conventional Standard Fixed Coolant

Large curls
Irregular curls

Inconsistent lengths
Sheared surface is serrated

Traces of applied force on fracture surface

●Wavy Nozzle Used (SWEEP Mode)

Small curls
Regular curls

Consistent lengths
Sheared surface is flat

Smooth fracture

Three optimized operation patterns for chip removal featured as standard: "FIX mode", "SWEEP mode" and "KICK mode".