Improvement of part-off tools and its selective use

Parting tool is mainly used in horizontal and vertical lathes, turret lathes and back wheels, automatic and semi-automatic lathes, CNC lathes and turning centers to cut off the stem material, it can also be used for grooving, face cut around, chamfering work.

The limited space in the cutting zone characteristic of parting-off and grooving operations creates challenges regarding control of the chips produced in machining. Especially in the parting-off process, the cutting tool is surrounded on both sides by workpiece material while in the cut, restricting the chips' path of escape. Finally, depending on the workpiece material, the thin chips generated in parting-off and grooving operations tend not to break. An uncontrolled continuous chip can jam in the cut, mar the workpiece, and endanger the operator. In addition, chip control problems will preclude untended or "lights out" operation.

Many tools for parting-off and grooving feature cutting edge geometries with features engineered to bend the chip and break it if possible. Seco's example is its MC chip breaking geometry. If surface finish and other considerations permit, a pause in tool feed – known as dwelling – during the cut can help break chips. Another method for chip control is application of coolant, which can flush away chips that otherwise might clog the cutting zone. However, traditional flood coolant usually has insufficient pressure to reach the cutting zone in parting-off and grooving applications. Additionally, it is difficult to position flood coolant nozzles for optimum placement of the coolant stream. Finally, the relatively weak flow of flood coolant may turn to steam in the cutting zone and actually form an insulating barrier that can contain, instead of dissipate, the heat generated in the cutting process.

An alternative to flood coolant is coolant applied at high pressure and as close to the cutting edge as possible. Today's machine tool coolant pumps generally provide coolant at pressures between 20 bar (290 psi) and 70 bar (1,015 psi). Seco's coolant delivery tooling system, for instance, offers the versatility to operate from low pressures with some productivity impact at around 5 bar (72 psi) to high pressures at 70 bar (1,015 psi), as well as extended capacity of 275 bar (4,351 psi).

For maximum effectiveness, high-pressure coolant must be delivered in a targeted fashion, as close to the cutting zone as possible. Tool manufacturers have developed a number of high-pressure coolant delivery systems. A popular method involves routing the coolant through the cutting insert. Seco has determined, however, that the most effective coolant flow generates a "wedge" between the insert rake cutting zone and the chip, lifting the chip and breaking it off. It is apparent that when coolant is channeled through cutting inserts, it is difficult to direct the stream into the optimum direction to create the wedge. It is not enough to get the coolant in the neighbourhood of the cutting zone; to act as a wedge, the stream must be positioned closer to and directed towards the cutting edge.