Higher reliability in deeper parting off

Tool overhang is one of the main factors to always minimize in any machining operation but in parting off large-diameter bars and when having to have extended reach, long overhang is unavoidable. This leaves it up to the tool to compensate for the inherent instability of the operation and to have the capability to ensure a safe, satisfactory operation that is also competitive. A parting-off tool-system dedicated for depth and overhang is a necessity today.

Prioritized user requirements ...

.... for deeper parting-off operations were recognized at an early stage of developing a new concept. This was on the basis of broad industry involvement:

- Process security is the absolute leading point,
- Tool-life is important to ensure a satisfactory number of cuts per edge,
- User-friendly tooling and an easy-to-select, comprehensive programme covering as many applications, machines and materials as possible,
- Minimization of bar material wasted through the cut,
- Chip-control and evacuation that is good and reliable,
- Satisfactory surface finish when high levels are demanded,
- Optimized productivity, low machining-cost per cut with high operational efficiency in line with other machining operations.

How were these requirements fulfilled in a new tool concept?

The demands on a parting-off tool increase in relation to the depth of the cut and this is why tool dedication to greater depth and reach is vital to success. In this context the plunging-depth relates to diameters of 38 mm (1.49 inch) and larger on a turning machine, where bar-feed machines dominate, and 32 mm (1.25 inch) on sliding head machines.

In parting off there are three stages of the plunge:

- the main long cut through most of the bar,
- the approach towards the end of cut,
- the short stage just before reaching the centre-line.

The three make distinct demands on the tool, all of which have to be taken into account when developing a new generation. The main cut involves cutting-edge durability, cutting action, chip control and chip evacuation resulting in process efficiency, security as well as satisfactory surface finish. The levels attained here are dependent upon the tool design and level of technology.

The end-of-cut approach is partly an application factor with suitable programming and certain precautions taken as this has a huge impact on tool-life and process security. The end-of-cut also needs precautionary programming as this stage makes considerable demands on the parting-off tool. The strength of the cutting edge, resistance to built-up-edge formation on the insert and the durability of the insert coating are all critical factors. This also has to be combined with achieving insert-grade capability for high cutting speeds and feeds during the main plunging cut.

A big, new step forward in parting-off technology

The background to today´s development is Sandvik Coromant as the pioneer and market leader in indexable-insert parting and grooving tools. The first tool was introduced in 1976 and consecutive generations of Coromant parting and grooving tool concepts have elevated performance and result levels continually since then. Vast experience from this development and from working with industry to solve and optimize operations, have provided a base for the substantial step that the CoroCut QD concept now provides.

CoroCut QD is a unique, new development of tools for parting off larger diameter bars as well as optimizing cuts requiring longer tool overhang, such as when reaching past a sub-spindle. A number of criteria were fulfilled in the development of the concept, which is now a new, dedicated part of, and extension to the established CoroCut system of parting off, grooving, turning and face-grooving tools.

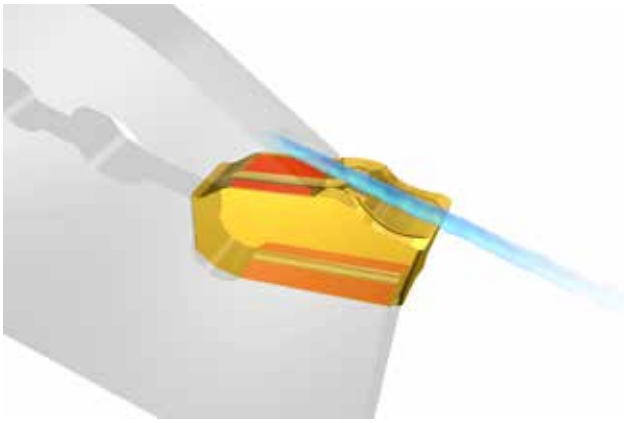
Insert development factors

As in all modern machining, insert development is a substantial factor in the evolution of a new concept. Dedicated deep-parting-off inserts with new geometries for all materials, chip breaking where needed and Wiper cutting edges for surface finish are essential today. Inserts have also been designed to make optimum use of the precision-coolant jets applied as part of the CoroCut QD-concept. Lower cutting forces are generated with chip control for efficient evacuation. New, improved insert grades have been established for the programme where coating adhesion and edge-line security have been prioritized to better cope with all the stages of the parting-off plunge. A broad assortment of inserts that are straight forward to select ensures a good starting-off level as well as broad optimization possibilities.

Blade limitations overcome

Relatively narrow blades are necessary in parting off but how narrow can they be without risking security and limiting performance?

The background to this tool dimension is that material saving is often a manufacturing issue when parting off bars. With CoroCut QD a new balance between blade-width and performance-capability has been struck, partly thanks to blade-material development, where improved cutting-action from inserts and better location and support are the important contributing factors.



The new tool-steel alloy for the blades has considerably higher fatigue and bending resistance and better insert-seat properties. The quality of the insert-location design plays a major role here and the QD-rail location provides a new level of performance, location, precision and reliability. The new interface between blade and insert makes possible dependable blade-widths of down to 2 mm for deep parting-off operations.

High-precision coolant ....

....has been pioneered and evolved by Sandvik Coromant for a number of tool-types over many years and has now become a fine high-tech art. Coolant supplied and directed through nozzles as precision jets makes a profound difference to machining performance even when the coolant is supplied at considerably lower pressure than the recommended optimum of 70 bar. The CoroCut QD concept makes extensive use of high-precision coolant in that the jets are directed from below and from above to assist the cutting process, chip control and limit tool wear. Internally supplied through the inside of the tool-blade, the coolant is applied where it has the best effect and allows for improved performance with tougher insert grades and higher cutting data.

Tools that are user-friendly are becoming more sought after in machining because of the difference they make to machine stoppages, as a security factor for correct tool changes and in setting- up. With the QD rail-interface ensuring exact, firm insert location and clamping, the new concept makes tool changing easy and safe. This means foolproof insert changing without torque control and easy blade adjustment in the holder along with plug-and-play, high-precision coolant connection. Suitable for most machines, this takes a load and risk off operator and tool-room procedures and contributes to higher productivity through green-light machining.

A new potential in security and efficiency

Like some other machining operations, with slender tools protruding out-of-sight into the material during cut, there is often a tendency to under-perform the operation in the name of “just-in-case” security. Fear of a vulnerable tool being subjected to excessive demands is a natural phenomenon in metal cutting but one that can be overcome through correct application and trust in a qualified concept with proven performance.

CoroCut QD is a tool concept that is the result of a combination and coordination of advances in cutting-tool technology. Not only does it provide a higher level of reliability to deeper parting off operations, it does so with a saving in material throughout a substantially longer tool-life. Importantly as well, it makes available a potential for higher productivity thanks to higher performance and simplified, safe handling and selection.