More efficient manufacturing with modern high-performance tools

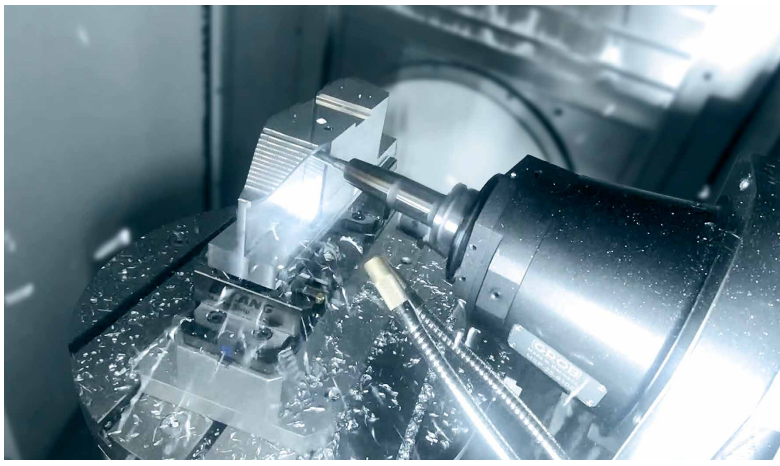
How you can achieve time savings of more than 80 percent in milling operations

This article answers the following questions:

- Survey results: To what extent do companies in the machining industry use high-performance tools and are the advantages well known?
- For what application areas is adaptive machining with HPC cutters appropriate?
- What´s the best way to use circle-segment cutters?
- What role does CAD/CAM software play in this?
- Where can I find more information?

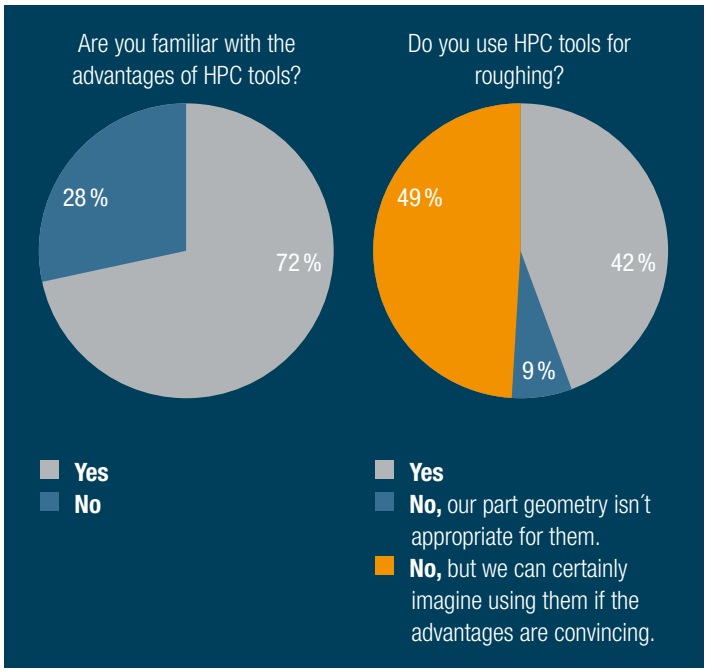
Modern high-performance cutters are very powerful. Time savings of more than 60 percent can be found in adaptive roughing with HPC (high-performance cutting) tools alone. And time savings of more than 80 percent can be achieved in finishing with circle-segment cutters – compared to machining with conventional ball cutters.

Time savings like this are impressive. But despite their potential, many companies hesitate to use high-performance cutters – especially circle-segment cutters. We´ve summarized in an overview the advantages of adaptive roughing with HPC cutters and of finishing with circle-segment cutters. The CAD/CAM software must also be compatible in order to obtain every benefit from modern high-performance tools.



Adaptive roughing with HPC cutters and time savings of more than 60 percent

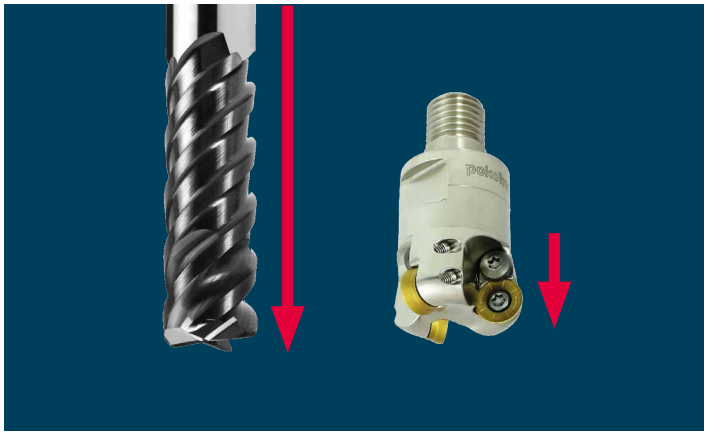
HPC cutters are well-known: In a survey conducted in September 2018, 72 percent of the respondents were aware of the benefits of these tools. However, only 42 percent used them. So there´s definitely room for improvement: Only nine percent categorically excluded the use of HPC cutters due to unsuitable part geometry. In contrast, 49 percent were considering using this type of tool.



Survey in September 2018, "Efficient manufacturing with modern high-performance tools" webinar, 78 respondents

High-performance cutting (HPC) for maximum material removal rate
Adaptive roughing goes right to work. The path layout is automatically adapted to the geometry without full-cut machining. Compared to conventional roughing, special HPC cutters achieve high material removal rates at constant cutting conditions with higher cutting speed and feed rate, smaller lateral stepovers and very large cutting depths – and time savings of over 60 percent are easily possible. Thanks to the large depth of cut and small lateral stepover, this roughing type is especially suitable for parts with many steep areas – whether you are manufacturing hard or soft materials.

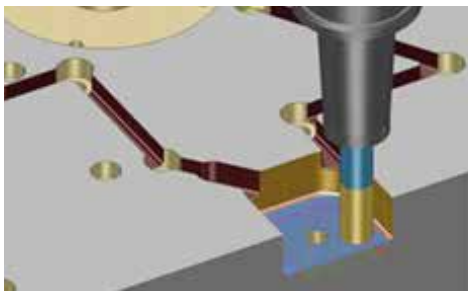
- For roughing parts with many deep cavities
- Also suitable for machining hard materials



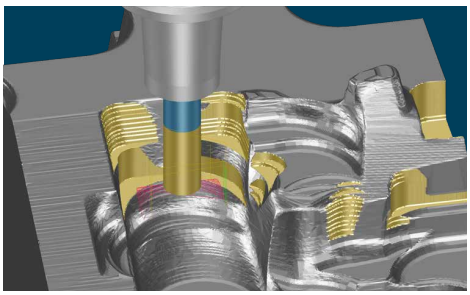
Comparison of HPC and indexable-insert tools

A comparison of full-cut machining and full-cut avoidance
The goal of every roughing operation is to remove as much material as possible within the shortest amount of time. This represents an enormous stress test for the cutter, which often ends up in full contact. Tebis therefore uses options for full-cut machining and full-cut avoidance. In full-cut machining, feed rates are automatically reduced, or full-cut areas are machined trochoidally. In full-cut avoidance, the path layout is automatically adapted to the geometry without full-cut machining. Full-cut avoidance is used in adaptive roughing.

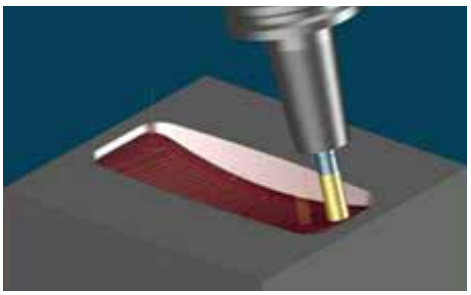
Adaptive machining is suitable for prismatic, 3-axis and 5-axis simultaneous machining.



2.5D HPC roughing



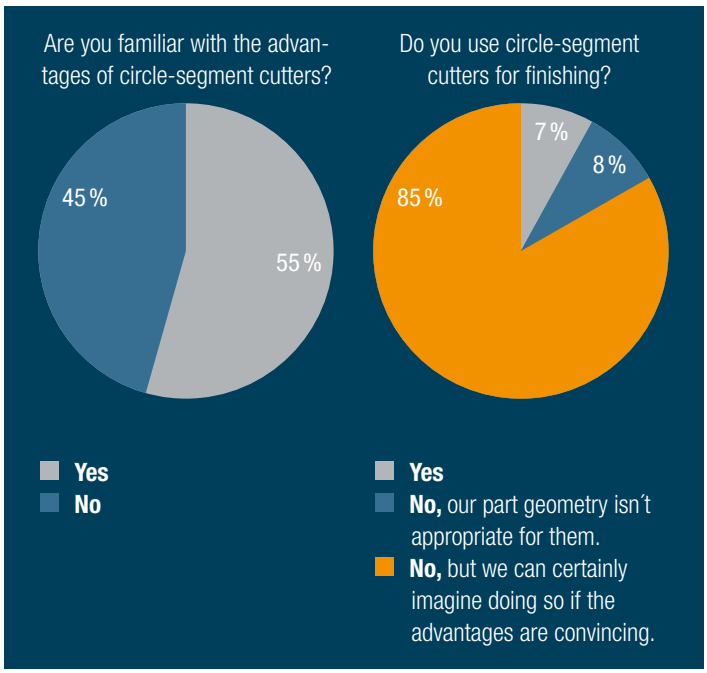
3D HPC roughing



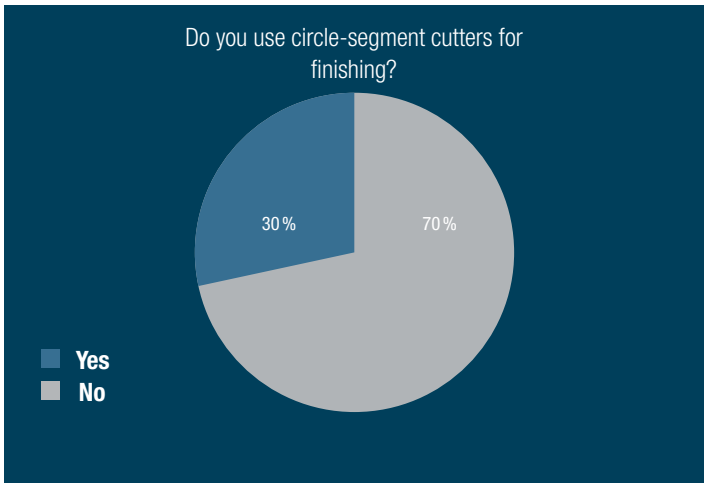
5-axis simultaneous HPC roughing

Time savings of over 80 percent in finishing with circle-segment cutters

We have two survey results for the less familiar circle-segment cutters. Although 55 percent of those surveyed in September 2018 were aware of their benefits, only seven percent were using them. 85 percent of the respondents could imagine using these tools more in the future. Considering this data, attempts to implement circle-segment cutters have been met with only moderate success: In May of 2020, these tools were used by 30 percent of the companies surveyed. This means that there is still potential for optimization.



Survey in September 2018, "Efficient manufacturing with modern high-performance tools" webinar, 78 respondents

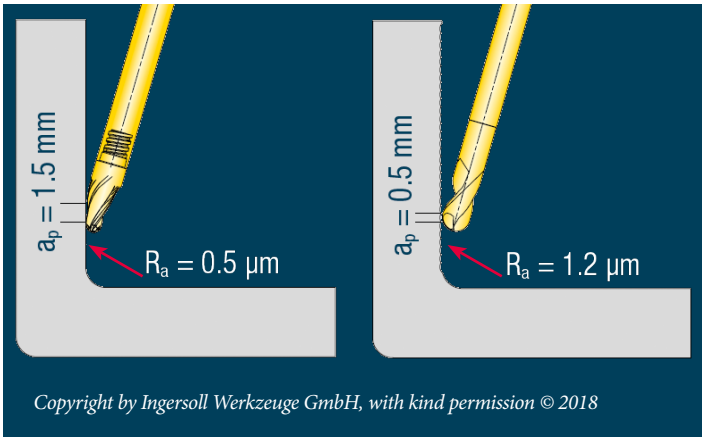


Survey in May 2020, "Better finishing" webinar, 198 respondents

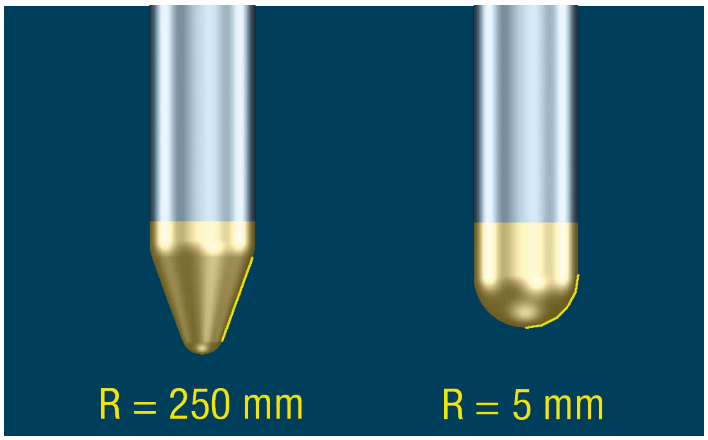
Overview of circle-segment cutters

With circle-segment cutters – also known as barrel cutters – the radii in the cutting area are significantly larger than with conventional ball cutters. The same surface roughness is achieved on the part with a significantly larger path distance. This can reduce your machining time by more than 80 percent in some cases, while simultaneously achieving outstanding surface quality.

- Suitable for planes and free-form surfaces
- For high-efficiency prefinishing and finishing

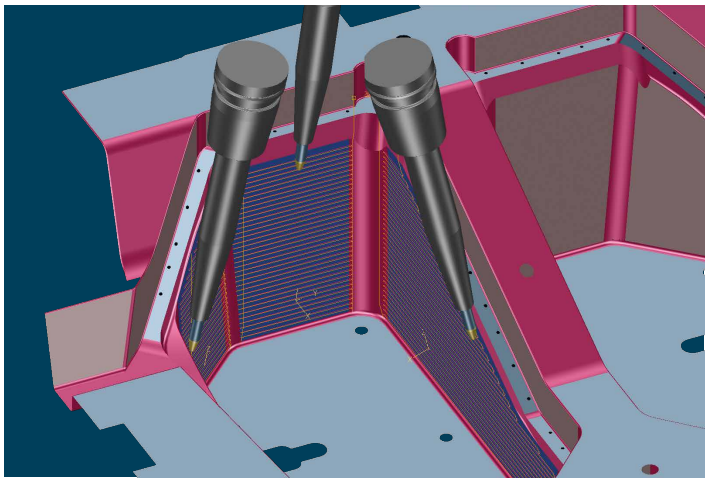


Comparison of circle-segment cutters and ball cutters

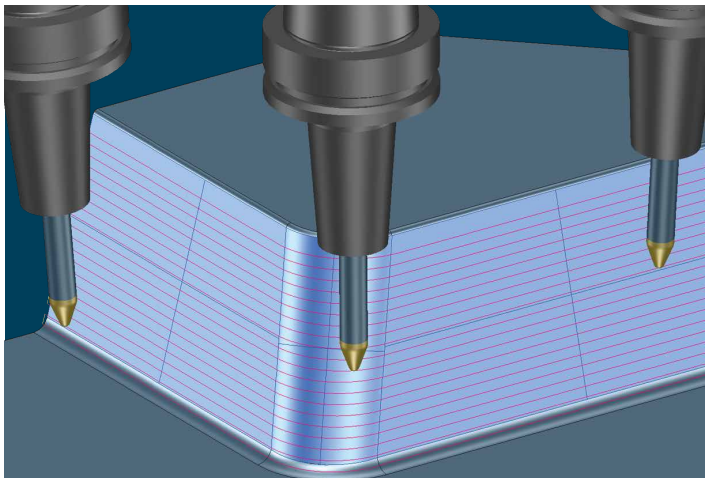


Larger path distances and better surfaces

Machining with circle-segment cutters is appropriate for both 3-axis tilted and 5-axis simultaneous machining.



For 3-axis tilted and 5-axis simultaneous machining



For 3-axis tilted and 5-axis simultaneous machining

The important role of CAD/CAM software

Determining the tools that are best suited for different machining operations depends on the geometry, material, machine tool and the required surface quality. The CAD/CAM software must also be compatible to get the optimal benefit from modern high-performance tools.

That's why Tebis CAD/CAM software is perfectly compatible with modern high-performance tools

- Tebis supports all tools: Any tool contours can be quickly and easily developed with a curve and can be represented one-to-one in the virtual world.
- Optimal roughing: 2.5D, 3D and 5-axis machining operations can be very easily combined using the integrated blank transfer.
- Efficient 5-axis milling: 5-axis milling doubles your benefits when you are finishing with circle-segment cutters. Connected milling areas can be machined in a single operation with no extra design effort.
- Tebis template technology ensures that the right tool and the optimal milling strategy are always used based on the specified criteria – including geometry, material, machine tool and surface quality.

Please contact us and find out more

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