



Machining

When to Use More Flutes: The Machining Labyrinth

Brought To You by KYOCERA SGS Precision Tools | Apr 01, 2025

In the intricate world of CNC machining, choosing the right tool can sometimes feel like navigating a complex maze. Each decision impacts your journey towards achieving the perfect balance of efficiency, precision, and productivity. One of the critical decisions you'll encounter is whether to use a multi-flute tool. Let's explore this maze together, drawing from the wisdom shared by Jason from KYOCERA SGS Precision Tools R&D department, to help you decide when more flutes are the key to unlocking your machining potential.

The Intersection of Feed Rate and Productivity

Imagine you're at the intersection where speed and efficiency meet. Here, multi-flute tools shine brightly. Jason succinctly explains, "The greater number of cutting edges on a cutting tool allows you to achieve a greater feed rate. Feed rates then allow you to gain greater productivity." This means that when you're aiming to move through material quickly and boost productivity, multi-flute tools are your allies.

The Twist and Turns of Tool Core and Chip Evacuation

As you navigate further into the maze, you'll encounter a twist: the relationship between the number of flutes and the tool core. More flutes mean a larger core, which reduces flute depth and limits chip space. This trade-off is crucial. Jason notes, "As you add cutting edges or flutes to a cutting tool, the center of the tool, which is known as the core, gets larger. This gives you less flute depth or less space for creating chips during the machining process." Understanding this balance is key to choosing the right tool for your specific path.

Formula (Chip Load Increase)

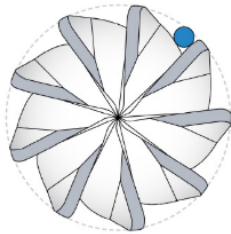
0.006" (Chip Load per Tooth) x 5 (Cutting Edges) x 1,500 (Revolutions per Minute) = **45.0 IPM**

0.003" (Chip Load per Tooth) x 9 (Cutting Edges) x 1,500 (Revolutions per Minute) = **40.5 IPM**

Chip Evacuation

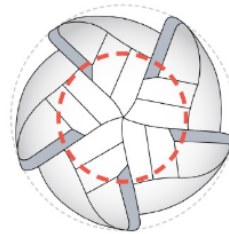


5 Flute

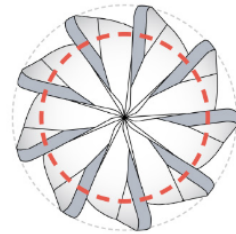


9 Flute

Core Thickness



5 Flute

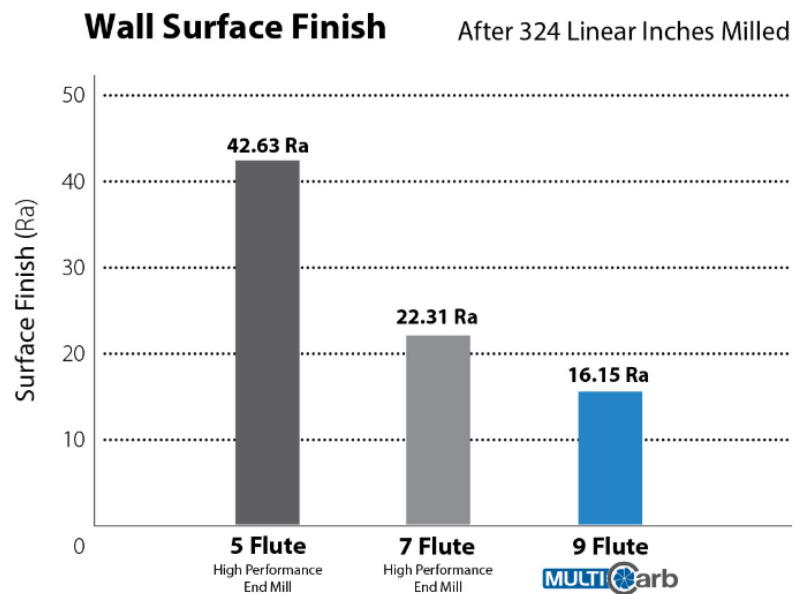
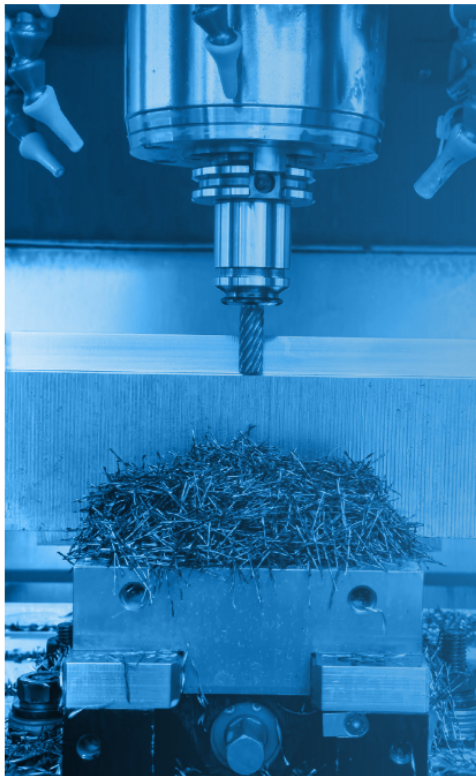


9 Flute

The Strength of Rigidity

In the labyrinth of machining, you'll often find yourself at a challenging crossroad as you deal with tough materials that resist cutting. Here, the rigidity of your tool can make or break your journey, literally. A thicker core from additional flutes enhances rigidity. Jason highlights this, saying, "The heavier the core or the backbone of that tool is, the greater the rigidity that tool has. So, if you're in a situation where you're machining difficult-to-machine materials that resist the cut, that creates a situation known as deflection in the cutting process. The stronger that tool is, the more rigid that tool is, the more it will resist deflection."

Deflection can lead to common pitfalls like chatter and part inaccuracy. By choosing a more rigid tool, you can navigate these obstacles smoothly, ensuring a straighter path to precision and quality, especially when dealing with hard materials like Inconel or Hastelloy.



The Harmony of Odd Flutes

As you venture deeper, you might encounter rhythmic obstacles—harmonics and vibrations that disrupt your progress. **KYOCERA SGS's MultiCarb tools**, with their odd number of flutes, offer a clever solution. Jason explains, "The odd number of flutes on this cutting tool also allows us to avoid a natural rhythm or harmonics that can occur with an even number of flutes. So, this too will allow us to avoid some of those chatter situations." This innovative design is a helpful tool to keep in your proverbial back pocket as it helps prevent disruptive chatter that can derail your machining progress.

Deciphering the Application-Specific Code

The final part of the maze is recognizing that multi-flute tools are not a one-size-fits-all solution. Jason emphasizes, "A multiple flute tool is great for peripheral cuts, finishing cuts, and high-speed, high-efficiency machining strategies. In the right application, it can certainly bring you great advantages."

Take into account the material and the type of cut when deciding on the number of flutes. During a demonstration cutting Inconel, tools with 5, 7, and 9 flutes displayed different performance traits. In the video, when these three tools were tested simultaneously at the correct speed and feed settings tailored to each tool, the one with the higher flute count finished the cut significantly faster. This highlights how the choice of tool impacts both the speed and quality of the machining process, emphasizing the critical need for selecting tools based on the specific application.

Learn more in this short video:

Finding Your Way to Machining Mastery

In the intricate maze of CNC machining, choosing the right tool can significantly impact your

productivity and the quality of your work. Multi-flute tools, with their ability to enhance feed rates and provide superior rigidity, are powerful solutions. However, understanding their limitations and selecting the right tool for the right application is essential.

As Jason from KYOCERA SGS advises, if you have questions or need assistance, don't hesitate to reach out to experts or your local representatives. Embrace the power of multi-flute tools and keep those chips flying.

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