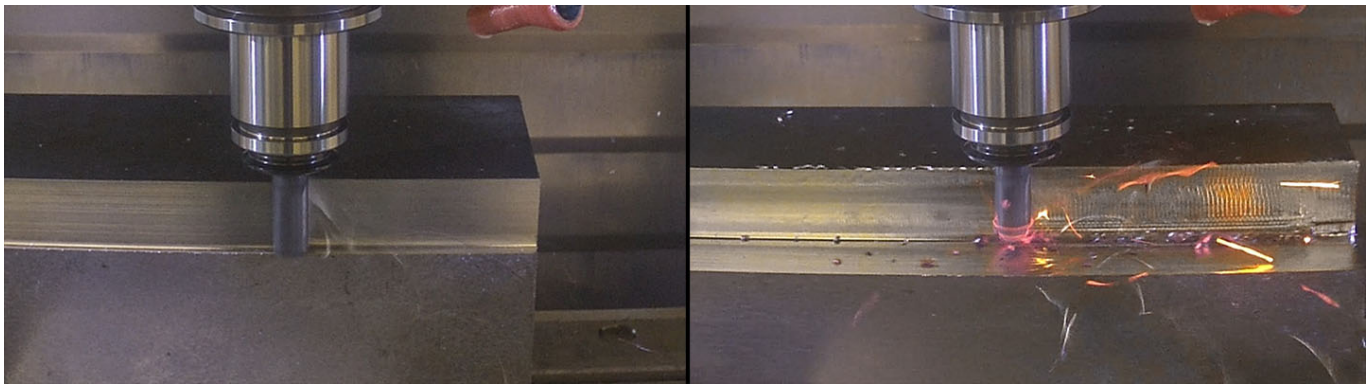


Machining

Navigating the Mysteries of Speed and Feed

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

In the realm of CNC machining, tool wear and damage are perpetual challenges that can significantly impact productivity and tool longevity. The primary factors influencing these issues are speed and feed. This article delves into these concepts, providing CNC machinists with a detailed exploration of how to balance these parameters for optimal performance.

Fundamentals of Speed and Feed

Speed and feed are fundamental to the machining process. Speed, or revolutions per minute (RPM), refers to the rotational speed of the tool or the workpiece. Feed, on the other hand, is the rate at which the tool advances into the material. Synchronizing these two parameters is crucial; an imbalance can lead to rapid tool wear and suboptimal machining results.

Watch now to optimize your speeds and feeds: Is Speed and Feed Killing Your Tooling?

It's important to note that RPM is a resultant value influenced by both the surface speed (or cutting speed, SFM) and the cutter diameter. Surface speed is a more precise and practical metric for CNC machining as it directly relates to the tool's interaction with the material. Focusing on surface speed can provide a more consistent basis for optimizing machining parameters.

Achieving the Optimal Balance

The key to maximizing both productivity and tool life lies in finding the "sweet spot" between speed and feed. While manufacturers provide speed and feed charts as a baseline, these are conservative estimates that often do not account for the numerous variables present in real-world machining environments.

"It's not about taking your speeds and feeds to the maximum or bringing them all the way down to the minimum. It's about trying to find that sweet spot that allows you to maximize your productivity and your tool life," says Jason from Kyocera SGS, who works in Research and Development.

As machinists, we know that pushing beyond the provided parameters can sometimes yield better productivity, but it's a balancing act. We have to tread carefully, adjusting parameters based on real-

world results to avoid adverse effects. This delicate balance between caution and efficiency is what makes our work both challenging and rewarding.

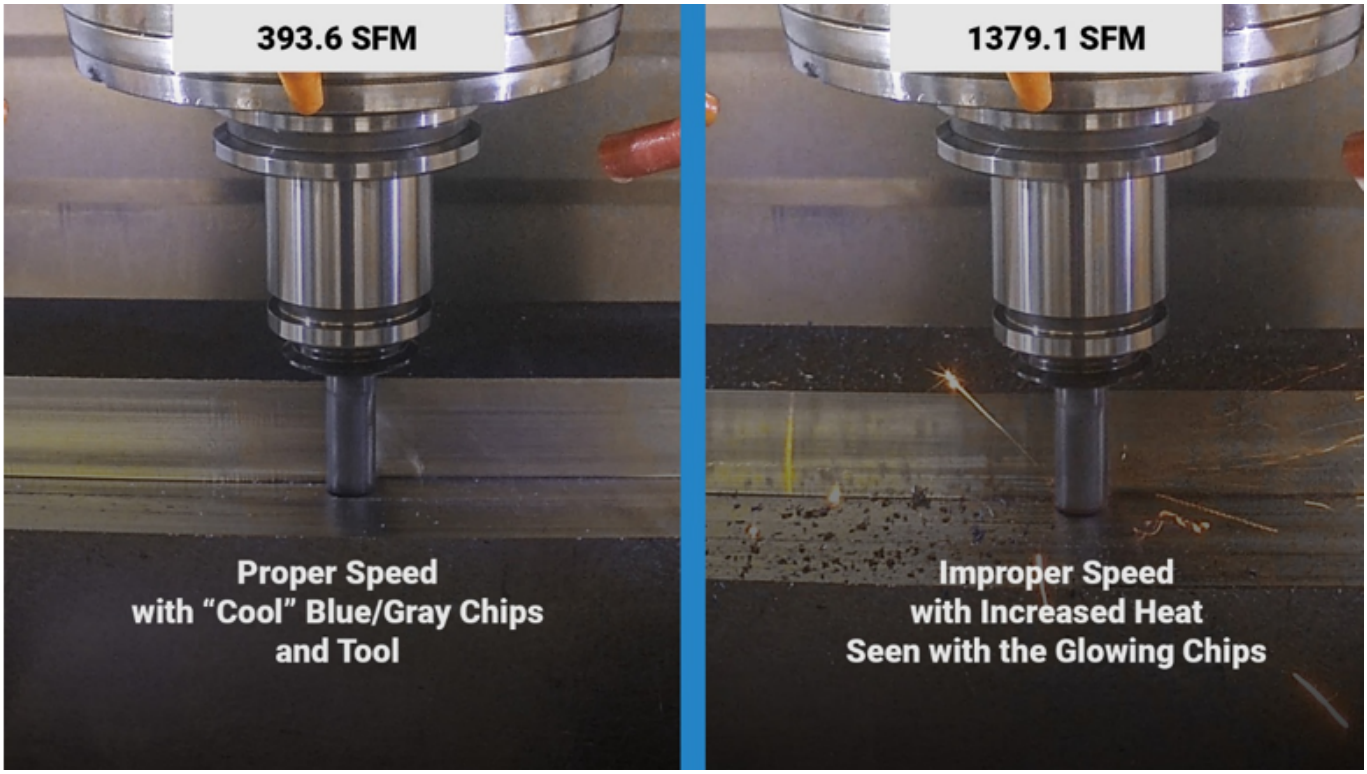
Diagnosing Tool Wear: Heat and Load

Major Sources of Tool Wear

Tool wear can be attributed to four primary sources: thermal, abrasive, chemical, and load. For simplicity, we can narrow these down to two main categories: heat and load. Understanding these categories is essential for diagnosing and addressing tool wear effectively.

Heat and Speed

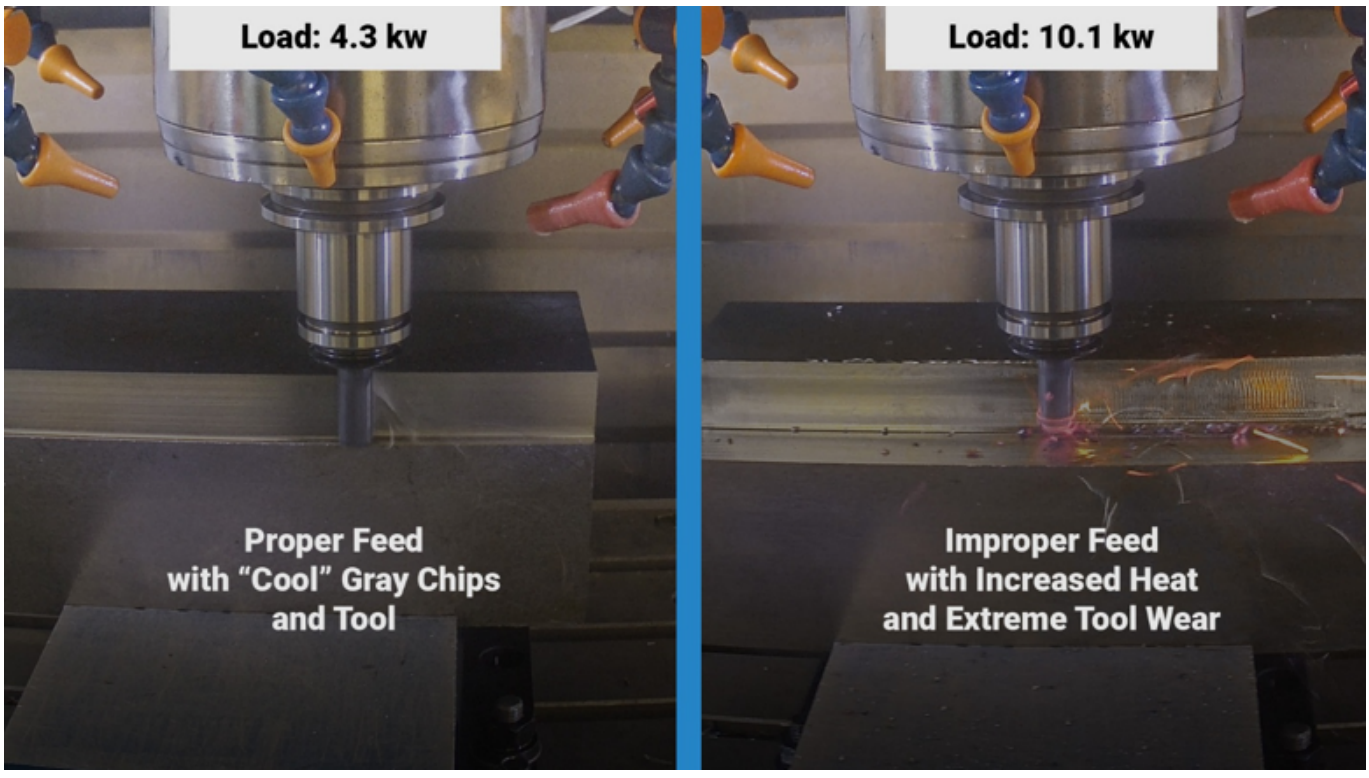
By varying speed while maintaining a constant feed rate, one can observe the impact of increased speed on heat generation. Higher speeds result in greater heat during machining, which can lead to thermal wear.



Load and Feed

Conversely, varying the feed rate while keeping the speed constant illustrates how different feed rates impact the load exerted on the tool. Excessive load can cause mechanical stress and lead to wear.

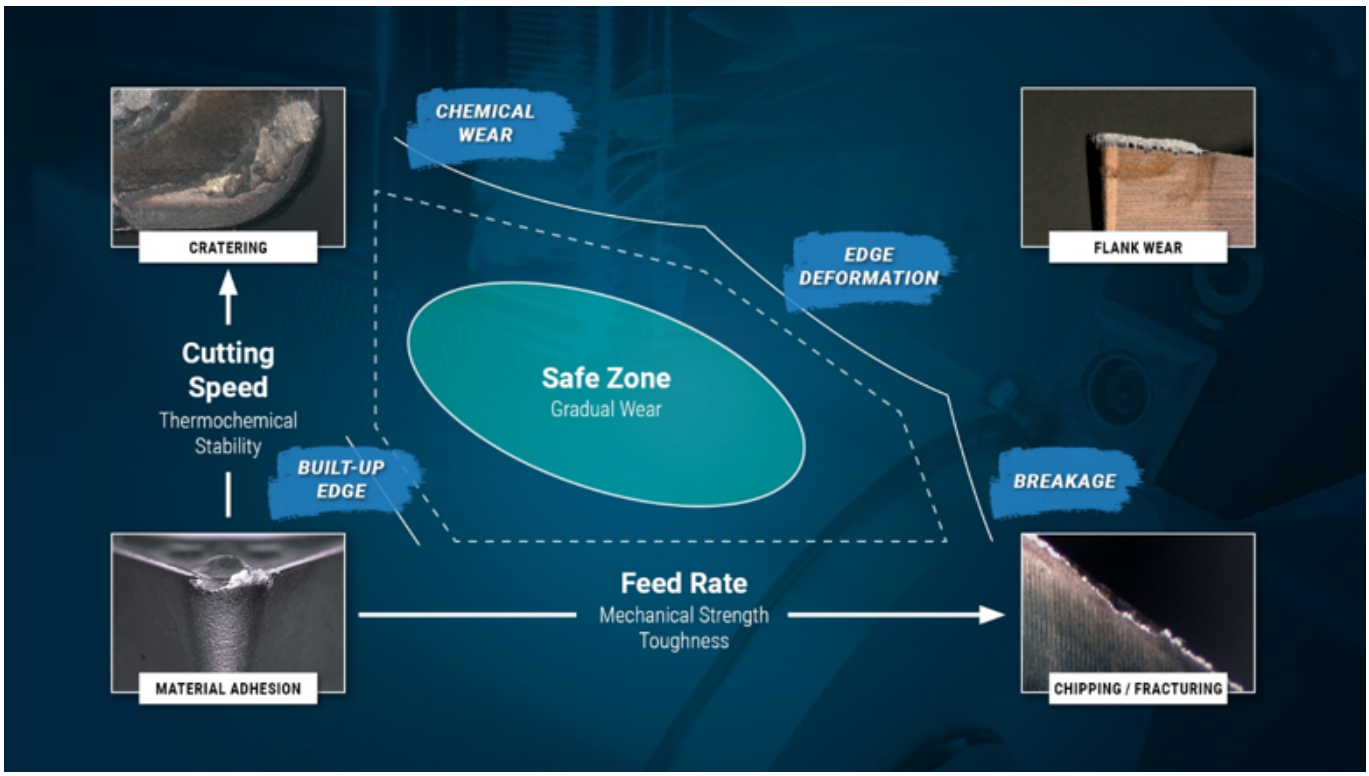
“We can think of speed as heat and feed as load and start that as our process of elimination and investigation,” Jason explains. This structured approach helps machinists systematically diagnose the root causes of wear and implement effective solutions.



Analyzing Tool Damage

Identifying the Causes of Wear

A detailed analysis of tool damage can be conducted using a chart that correlates speed and feed with various types of wear. The vertical axis represents cutting speed (a primary factor in heat-related issues), while the horizontal axis represents feed rate (a key factor in load-related issues).



Material Adhesion

Material adhesion occurs at low cutting speeds and low feed rates, where the material has sufficient time and heat to weld itself to the cutting tool.

Cratering

Cratering results from high cutting speeds and low feed rates, caused by thermal chemical reactions.

Chipping and Fracturing

Chipping and fracturing occur at high feed rates and low speeds, leading to excessive load and stress on the tool.

“Always trying to work our speed and feed in balance to achieve that safe zone found in the center of this chart,” advises Jason. This balance is key to maintaining a safe zone that minimizes wear and damage and optimizes machining processes.

Balancing speed and feed is essential for optimizing CNC machining processes. By understanding and

adjusting these parameters, machinists can enhance tool performance and extend tool life. This analysis underscores the importance of continual adjustment and observation to achieve the optimal balance.

Additionally, investing in quality tools is crucial for achieving optimal results. Tools from the KSPT Group offer excellent high performance options for both ***indexable*** and ***solid round tools***, providing durability and precision that can withstand the rigors of varied machining conditions.

Previously Featured on KYOCERA SGS Precision Tools' blog.

Browse solutions from KYOCERA SGS on MSCDirect.com.