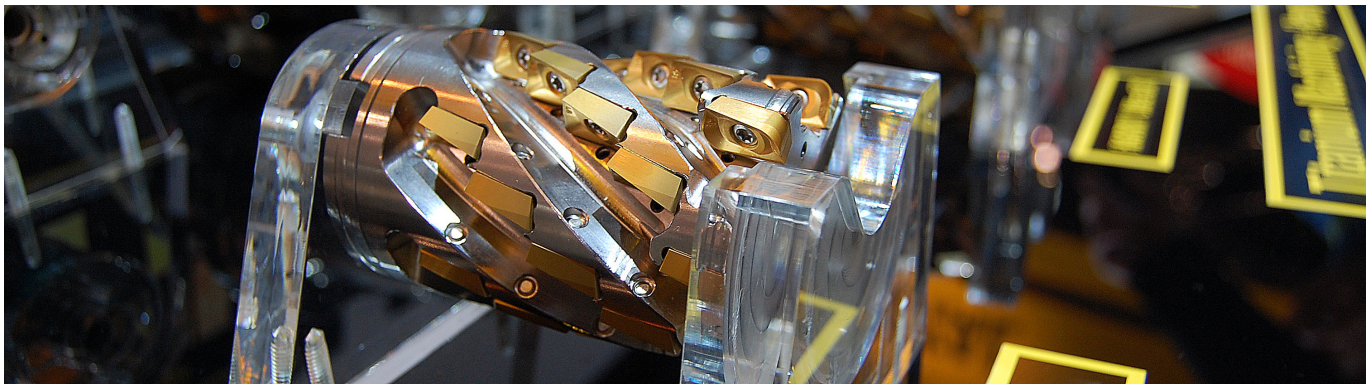

Machining

IMTS 2018: Kennametal Gets Innovative with Spindle Connections

Don Sears | Sep 17, 2018

In an interview with Kennametal at IMTS 2018, we take the pulse of the industry and the state of innovation from the cutting tool maker's perspective. We also discuss one of Kennametal's own innovations in spindle connections.

This year's International Manufacturing Technology Show was the biggest on record. When nearly ***130,000 people attend***, the question naturally arises: Where are we in the metalworking industry right now—and where are we going? To find out, we spoke with an executive from one of the industry's largest cutting tool manufacturers.

"I believe our situation worldwide in manufacturing is very strong," says Doug Ewald, vice president of sales at ***Kennametal***, who has been in the industry for 30 years and has a background as a metallurgical and materials engineer. "The industry has matured a little bit so you see fewer big breakthroughs, but you do see continued advancements that really make our products more efficient for our customers and really help them keep their costs down."

Ewald leads a global group focused on machine tool builders, the companies that make advanced CNC machines that house cutting tools. He began his career with Kennametal in one of its manufacturing facilities, but he also worked on research for metal grades and grade development.

IMTS 2018

For all our coverage from the show, go to ***Better MRO at IMTS 2018****.*

The Connections Between the Machine, Cutting Tool and Spindle: Tool Holding

In a conference session at IMTS, Ewald gave a technical presentation focused on maximizing productivity, with the angle that the spindle connection is the "weakest link."

How do you take the capabilities of today's machines and match them with optimized cutting tools to gain the most output and be the most profitable? There are three elements: the machine tool, the cutting tool and the spindle interface—which Ewald contends is an overlooked aspect in solving for productivity.

"You need to choose the right machine tool and make sure you have the right cutting tool, and what we want to highlight is what really connects those two things together: the spindle interface or the clamping in the spindle in that machine," Ewald says. "We really feel that for our customers to maximize their effectiveness, they need to pay attention to all of these."

Things to consider: Rigidity is important to help resist bending, as is whether there are long reaches between the part and the cutting tool and whether you have tough finish requirements. Fundamentally, can you take off the metal with the torque and horsepower of a given machine? And depending on what you're cutting, there is the spindle speed to understand, Ewald explains.

"A big, big consideration is the material being cut," Ewald says. "A tool designed to cut titanium is going to be really quite different than the tool designed to cut cast iron."

One of Kennametal's most recent innovations is the Harvi Ultra 8X line of tools, designed with a brand-new grade, the KCM40, focused on titanium aerospace machining. It's a two-sided insert with eight cutting edges.

"The grade itself has very special characteristics with a special alloy within the part that gives us very good deformation properties at higher temperatures, which you tend to see with titanium because the titanium makes the cutting tool hot," Ewald says. "Titanium has poor heat transfer, so the chips get very hot, so you need a grade that has very good thermal deformation resistance."

The properties within the cutting tool help double and triple the metal removal rate and simultaneously increase your tool life up to 100 percent, Ewald says.

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> Global Vice President, Kennametal

Balancing Bending and Torque Capabilities in Cutting Applications

Why is resistance to bending important when cutting metal? Some connections may be able to handle substantial torque, but the cutting forces necessary to generate such high torque will also generate large bending moments on the tool.

"As you get into end-milling operations, especially with longer overhang, many of the spindle connections have quite a serious limitation of bending moment that they can carry," Ewald says. "So there are many cases where you have a very rigid machine tool, a super cutting tool, but a weak spindle interface, so you will really not be able to get the same performance on that machine than if you had a more optimized and stable spindle."

The examples used by Ewald are focused on aerospace, where the materials for metal removal require high-performance tools and machine power. To balance torque and bending moments with the ability to take "aggressive cuts," Kennametal promotes its ***KM4X spindle connection system***, which it says based on its own testing has lower load deflection results than its competitors.

“There is a lot of science behind this design. … By the combination of forces we provide with the locking system, we get a mechanical advantage that is almost five times,” Ewald explains. “If the machine pulls on the draw bar with 10 pounds of force, the system, through its geometrical advancement, gives you 50 pounds of clamping force.”

KM4X is a front-loaded clamping system and is designed to give three points of surface contact, including two areas on the taper and one on the face of the connection. The first contact is at the gage diameter area between the tool taper and the spindle taper. As the tool is drawn into the spindle, contact is created in both areas of the tapers—and because of the interference fit, there is still no face contact.

In independent static deflection testing between its own products (KM4X63 versus HSK63), Kennametal discovered the KM4X bends roughly 40 percent less than its HSK product using the same load and operating conditions—meaning the identical machine and same cutting tool. It also found that it produces a 50 percent better surface finish and 20 percent longer tool life.

“Due to this very stable contact, you can turn the spindle much faster,” Ewald says. “And it’s also designed to deal with coolant very, very efficiently.”

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