Metalworking

M.A. Ford Tackles High-Feed Machining Jobs with TuffCut FHFP End Mills

James Langford | Dec 30, 2024

Talk about high-feed machining technology, and one of the first things that metalworking professionals think of is the die and mold industry.

That's where it all started.

But while the FHFP series of end mills from M.A. Ford's TuffCut HF family marks the toolmaker's first foray into true high-feed cutting geometries, it has applications far beyond any single sector.

"Since parts are getting more and more complex in all industries today, with different three-dimensional surfaces and Z-level changes, there's growing demand for high-feed cutting geometries," says Derek Nading, product development manager with M.A. Ford. "Even though the FHFP has only been on the market for a short while, launched at the beginning of 2024, it has already been applied successfully in industries from oil and gas to general machining, medical components and aerospace."

High-feed machining, popular because of its cost-effectiveness, employs a large radial width of cut—greater than 50 percent is common—together with a small axial depth of cut and extremely high chip loads to increase metal removal rates.

The feed mills typically used have a very shallow lead angle—say 20 degrees or so—and a geometry similar to that of a face mill or button mill but with relatively large, radiused cutting edges. That yields chip thinning that is axial rather than radial, as seen with high-speed and high-efficiency milling strategies.

The positive axial rake geometry of the FHFP makes it well suited for high-feed machining of softer materials—those 52 or lower on the Rockwell hardness scale, M.A. Ford says.

Dual-Radius Geometry

Its dual-radius design yields much thinner chips than a traditional torical radius, helping to reduce cutting forces axially and radially, Nading explains.

Available in neck lengths of three, five and eight times the tool's diameter (8xD), the FHFP series is well suited for high metal-removal roughing in three-dimensional shapes and very effective in long-reach applications with deep/tight pockets and slots, M.A. Ford says.

"The dual-radius geometry creates very minimal cutting forces and the vast majority of those cutting forces are directed axially back up into the tool so that you get very stable machining processes," Nading says.

Designed with a central coolant hole that aids in chip evacuation, the tool is available in diameters from 6 to 16 millimeters for the 3xD and 5xD neck lengths and 6 to 12 millimeters for the 8xD neck length, M.A. Ford says.

Introduced in January 2024, the FHFP series reflects not only improvements in machining technology and capability but requests from customers for tools that could speed up work with deep, tight pockets.

For those types of machining jobs, Nading notes, "it's just a much faster way of removing material in comparison with a standard four-flute necked end mill in a lot of cases."

While the tool was designed for softer materials, M.A. Ford also tested it successfully with stainless steels and even high-temperature alloys.

Durability and Tool Life

In one field test, on an aerospace component made with Inconel 718—a nickel and chromium alloy, M.A. Ford used a 12-millimeter 5xD FHFP mill to reduce cycle time for clearing out a tapered pocket, Nading says. The tool remained operational with over an hour of cutting time, illustrating its durability.

That's an important quality for machine shops and manufacturers, since tool life generally declines as feed rate increases, and businesses are trying to maximize both as they grapple with higher inflation, disruptions in supply chains and a widening shortage of workers.

"The FHFP is a very versatile tool when it comes to not only the industry sectors that it can be applied in but also the materials on which it can be used," Nading says. "While it's a high-feed tool, it's not restricted to the die and mold industry, and it can be very, very efficient and save our customers a lot of money."

How could a high-feed end mill boost productivity in your machine shop? Tell us in the comments below.