



Machining

When to Upgrade Your Taps

Kip Hanson | Apr 21, 2020

What are the important considerations when planning to upgrade the taps in your shop? Here's the latest on tap evolution and the unique features being developed for high-precision and high-production thread-making.

Tapping is tough work to begin with, but without the right tool it often gets a lot tougher.

Poor chip evacuation can lead to scrapped parts and tap shrapnel everywhere, while the wrong coating or geometry means less-than-desirable tool life and productivity.

The good news is that cutting tool manufacturers have stepped things up by offering a range of high-quality tapping solutions. Among those solutions are roll and form taps, helical and straight-flute cut taps, taps with material-specific coatings and geometries, and taps that break the rules of traditional tapping.

“Cutting tools overall have improved greatly over the years and taps are no exception, so there’s simply no reason to settle for old technology.”

Paul Motzel

Product Manager for Threading Tools, Guhring

The challenge is understanding which one is best for your material and machine tool, making sure you have the right toolholder and cutting fluid, and understanding how to troubleshoot a problem application.

Choosing from a Wide Array of Tapping Options

When it comes to tapping decisions, Lefty Zuo first asks his customers what kind of production quantities they are running and what kind of materials they use.

A regional product specialist for tooling systems and taps at Kennametal, Zuo notes that the needs of an automaker are far different than those of a job shop, for example, or the needs of a tool and die maker. While the former might use a highly specialized tap and base its success on how many seconds

of cycle time it can shave off a given component, others might be looking for a general-purpose tap that provides good tool life in a wide range of materials.

Tapping Best Practices: Four Basic Principles

Though each of the experts interviewed for this article has differing opinions on which tap is best, all agreed on four basic tapping principles.

1. For starters, a synchronous toolholder is preferable for rigid tapping operations, together with a square-drive tap collet. This provides a no-slip grip and just enough axial float to prevent damage to the tap, workpiece and possibly machine tool.
2. Secondly, a high-quality, well-maintained and properly mixed cutting fluid should be used, preferably one with extreme pressure (EP) compounds for maximum lubricity.
3. Thirdly, if tapping problems do occur, recognize that it might not be the tap. Using a dull drill or feeding too hard—especially in nickel-based alloys—can lead to work hardening of the surrounding area, making even the best tap fail prematurely.
4. Finally, a more modernized tap can cost more than its historic general-purpose equivalent, but with significantly improved tool performance and tool life it can actually be more cost effective. Fewer scrapped parts and improved productivity can translate into far more savings.

“For shops that thread Inconel one day and aluminum the next, and do so in relatively low quantities, we typically recommend a G0tap,” Zuo says.

“Spiral flute and spiral point geometries are available, as are a variety of coatings, making it possible to keep inventory levels low while still providing excellent tool life and fast, predictable threading,” he adds. “If the production needs are higher or the material is more demanding, one of our high-performance taps in either solid carbide or PM (powdered metal) might be more suitable. Whatever the case, it’s important for shops to recognize that there is a wide array of tooling options out there, and no one should settle for poor performance, regardless of the material.”

Tools for a Flexible Manufacturing Environment

Pete Gennuso, product engineering manager for OSG USA, agrees on the need to balance tool performance with tool crib inventory levels, which is why he recommends the company’s A Brand taps to many of his customers.

“It’s great in steel, stainless steel, cast iron, some of the nonferrous materials, and even hardened steel up to about 35 Rockwell,” he says. “So, it really covers the vast majority of applications that a job shop or another flexible manufacturing environment is going to encounter.”

As with Kennametal and most other cutting tool suppliers, OSG offers taps in both carbide and PM grades, with geometries and coatings that cover as broad a material range as possible without sacrificing tool life, hole quality or throughput. Many are also equipped with through-the-tool coolant, a no-brainer when you consider the need to keep holes well-lubricated and free of chips during tapping operations.

"You should do whatever's possible to evacuate the chip," Gennuso says. "That's why we apply a variable helix to the flute. With a higher helix angle right at the chamfer, where all the cutting takes place, this increases the sharpness of the cutting edge and also keeps the chip nice and compact. And then toward the flute exit, we have a lower helix angle that helps pull the chip away from the part, eliminating the bird nests that so often occur during tapping."

Read more: "When to Upgrade Your End Mills"

Pick the Right Tap Tool for the Job

There are plenty more options to choose from.

Guhring's product manager for threading tools, Paul Motzel, says his Powertap brand is intended as a general-purpose tool, while the High Performance series is more material-specific, and the recently introduced Pionex line is offered as a premium tapping line designed for higher production runs and demanding applications.

"We've tweaked the geometry and added some features that greatly extend tool life, starting with the tool's surface," he says. "The Pionex is ground, honed and coated like many cutting tools—taps included—but is then given a final polish and coated again. This creates a microscopic break on the cutting edge, just enough to prevent chipping when it first meets the workpiece. And because the surface is smoother, it reduces friction and therefore heat, further extending tool life."

For machinists and manufacturing engineers alike, this abundance of tap offerings might make tool selection more difficult than deciding which sports car you want to take home from the auto show. But when it comes to selecting a cutting tool, as always, the choice depends on the material you're machining, how many parts you need to produce, how quickly you need to make them, and lastly, how much you want to spend.

Whether it's his brand or someone else's, however, one thing that Motzel doesn't recommend is sticking with the status quo.

"I get calls all the time from people who grabbed whatever tap was in the drawer and are now wondering why they're scrapping parts," he says. "Cutting tools overall have improved greatly over the years and taps are no exception, so there's simply no reason to settle for old technology."

Broad Lineup of Tapping Solutions

Emuge is another company that dismisses the status quo, especially when it comes to tapping. Product Director Mark Hatch points to the company's broad lineup of tapping solutions, which includes Emuge's universal MultiTAP for general-purpose use, the TI tap (for titanium), the NI tap (nickel-based alloys), the A-HCUT (hardened steels) and A-GJV taps (cast iron high in vermicular graphite), and the "revolutionary" Punch Tap, which was designed for use on specially equipped machine tools running high production volumes.

"The Punch Tap is aimed at the automotive industry, where they need the lowest cycle time possible on engine blocks, transfer cases, and so forth, most made out of die-cast aluminum," he explains. "Through internal testing, we determined that even with an rpm multiplier like our Speedsynchro, there's a limitation on how fast you can tap a hole. Our Punch Tap, on the other hand, uses a proprietary technology to produce threads in a single spindle rotation, providing up to a 75 percent reduction in cycle time. Granted, it's a specialized application, but for anyone who needs to produce millions of threads annually, there's nothing faster."

Which factors matter most to you when selecting taps? How do you determine the best ones for your shop's needs?

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