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Collis Toolholder

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High-Speed Machining Demands a High-End Toolholder

Choosing the right fixturing device will mean greater precision, longer tool life, and lower machining costs

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Any machinist will tell you that in precision cutting, turning, grinding, and boring procedures, the role of a reliable toolholder cannot be overstated. The quality of the device used to fix tools and inserts is even more important when precision machining must be done at higher speeds. High-speed machining is typical in aerospace and medical equipment manufacturing, where machinists often work with "exotic" or precision alloys, and harder metals like titanium alloys.

However, with RPMs reaching 20,000, 30,000 or even higher, precise and secure seating of a properly balanced toolholder in the spindle becomes even more critical. At these rates of speed, even minor flaws in toolholder manufacturing can reduce the precision of the machining process, diminish tool and spindle life, and even damage the high-value workpieces. This is why it is important to understand the crucial role of a quality toolholder, which for tapered varieties can be evaluated according to two main factors: fit and concentricity.

- Without any holding or locking mechanism, self-releasing toolholders must fit precisely within the spindle, with only the smallest allowance to maintain accurate location, repeatability, and proper hold.
- The other factor, concentricity, refers to the amount of "wobble" that may be tolerated when the toolholder is rotating or spinning. In machining, this is called "the whipping effect," and it can lead to inconsistent results and out-of-tolerance parts.

Decreased tool life, damaged workpiece — Using a less precise or imported toolholder for high-speed machining also may decrease tool life or damage the workpiece.

“If the toolholder is not concentric or is a little off-center, you will have rubbing, wear, and more friction, which decreases the life expectancy of the tools,” explained Bart Fellin of Fellin Industrial Sales, a company that represents several machine tool and toolholder product lines.

When machining exotic alloys and hard metals, cutting tools already must be changed out more frequently as they dull or break. The cost of tool replacement, not to mention loss of production time due to frequent changeover, adds up quickly.

“The higher-end technical carbide inserts really demand a high-precision toolholder,” said Fellin. “If you end up breaking a tool it could cause hundreds of dollars’ worth of damage.”

“Not only is the tool expensive,” he continued, “but you have to change it out more often and that takes time. So when you cost-out a job, you may find you are over budget rather than making a profit. It can make or break a deal.”

Less precise or imported toolholders also can damage the workpiece, which would then have to be repaired or discarded.

“You could be spending hundreds of man-hours designing a tool and then finding out that it is cutting slightly oversized holes, as an example, because the toolholder could not hold the tool properly,” Fellin said.

Quality assurance — Fellin cautioned against purchasing less expensive, imported toolholders based on cost alone. “There is a lot of competition from

imports, and a lot of misleading information where they claim their toolholder is just as good (as a high-value design)," he said. "But 'time is money', so when you have to get a quality part out and you don't want it getting rejected, then you want to make sure the (design) accuracy is going to be there."

One way to ensure you are buying a quality toolholder is to look for its certification, which should be "AT3 or better." AT3 refers to the tolerances related to the fit of the toolholder in the spindle.

Collis Toolholder manufactures devices certified to AT3 or better, and states it is the only supplier that can make that assertion. While some manufacturers claim to offer AT3 or better, Collis certifies its toolholders through a rigorous process of quality control and metrology testing to ensure its toolholders meet that specification.

Also, Collis emphasizes the importance of accurate concentricity. To prevent the aforementioned wobble or "whipping effect" from occurring, manufacturers often will specify the level of unbalance by a "G" number, with units in millimeters per second (mm/sec.) This is why machine-tool spindles and machine-tool parts usually are specified with vibration levels of G2.5 and G6.3. This is also why Collis toolholders are balanced to the higher G2.5 standards: By producing tapered toolholders with a superior fit and greater balance, its toolholders can run at higher RPMs with less fretting, resulting in more accurate work and better surface finishes.

According to Fellin, in precision machining operations supplying aerospace and medical device manufacturers also want toolholders to provide repeatability. "Being able to know that from the first toolholder they purchase to the fifth, to the twentieth, they are going to get the same quality is very important," said Fellin.

“You can always find someone in the industry that will provide a lower price, but there is usually a sacrifice in terms of (product) quality,” Fellin concluded “So, if you are looking for a toolholder, saving a few dollars for a no-name brand is not worth it. It will end up costing you a lot more in the long run.”

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