



Metalworking

Turn It Up: Taking Advantage of Indexable Tools

Kip Hanson | Oct 24, 2023

As a turning specialist at Sandvik Coromant, John Winter has helped countless companies transition from manually sharpened carbide and HSS tool bits to indexable alternatives.

And no, he doesn't miss the largely bygone era that preceded their arrival. Today's *indexable carbide cutting implements* are not only more cost-effective than previous options, they also *reduce CNC machine downtime* significantly while cranking out far more parts per shift. And they're constantly improving.

Following ISO Guidelines

Cutting tool development is a dynamic industry, Winter says, evidenced by the fact that the company introduced its first indexable tools in the early 1940s, with countless advances in carbide, coatings and geometries since then.

The lion's share of them follow guidelines set by the International Organization for Standardization, or ISO, which seek to standardize the specifications and terminologies used to describe these essential products and provide interchangeability to their users, whether they purchase them from Sandvik Coromant or another cutting tool manufacturer.

One of the guidelines is ISO 1832, the standard for turning tools. It defines and helps control manufacturing of the now familiar shapes that CNC lathe operators use daily.

The ubiquitous CNMG-432 roughing insert follows the 1832 standard, for instance, with each character representing attributes such as insert shape, relief angle, tolerance and size.

Insert Security

Many hundreds of other unique combinations exist. While few would dispute that inserts made to the ISO standard increase overall efficiency and reduce manufacturing costs, Winter and other team members are also open to new ideas, even if it means bypassing those standards.

The company has found, for instance, that "proprietary pockets" increase insert security. Sandvik

Coromant's PrimeTurning is one well-known example, where inserts with a football shape are said to increase metal removal by a factor of three or greater, even in heat-resistant superalloy metals like *Inconel 625*.

"As a result, we're able to push our turning products harder than ever before," Winter says.

Other innovations include locating rails (iLock) on the bottom surface of select turning inserts to prevent movement and cuboidal eight-sided turning inserts (CoroTurn 300) that promise improved chip control and high-quality surface finishes.

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Sandvik Coromant is not alone. Iscar's HELI-TURN, Kennametal's FIX8, Ceratizit's FreeTurn and Tungaloy's TurnTenFeed are just a few examples of how cutting tool manufacturers are straying from ISO specifications in favor of greater throughput and lower insert cost per piece.

Proprietary Grades and Coatings

There's more to this metal removal story than adherence to international standards, Winter says.

Proprietary grades and coatings are also making their mark, the most recent of which is Sandvik Coromant's GC4405 turning grade that boasts the company's second-generation Inveio coating.

Advanced-grade technology has created some unexpected challenges, however.

"Between the amount of heat we're able to generate and sustain with our inserts and the greater security produced by our pocket designs, we're able to push them harder than ever before," Winter says. "Because of that, we're quickly reaching a point where machine tools cannot keep up in terms of surface speed."

That's not a concern for larger parts, but for those in the 1-inch and smaller range, spindle rpm might be insufficient for the manufacturer's recommended cutting parameters. Winter offers a counter-intuitive solution: Run it dry.

"When you tell machinists to turn off the coolant, the first reaction is often one of incredulity, but that quickly changes when they see how much longer the tools last," he says. "In numerous cases, we're seeing increases of 50 percent or more, with commensurate improvements in throughput and surface finish."

Precision Coolant Capabilities

For applications where cutting fluids are required, it's important to point out that toolholders have enjoyed similar advancements over recent years, most notably in their ability to deliver high-pressure coolant directly to the cutting area.

Sandvik Coromant and many of its competitors have introduced toolholders with "precision coolant"

capabilities, which typically have internal plumbing options that allow the machinist to send high-pressure coolant over the insert, underneath or both at once.

This approach provides numerous benefits. Better tool life, *chip control* and part surface finish are the most obvious, but with that comes the possibility of eliminating plastic lines that are prone to undesirable movement, possibly resulting in scrapped parts.

It also eliminates the need to struggle with rigid copper lines that are not only time-consuming to install and maintain, but often miss the target besides.

Invite a machining expert like Winter or one of his colleagues from a competing company and you'll receive plenty of helpful (and free) advice. Some examples include:

- There's no reason to settle for long, stringy chips that are dangerous and can lead to unexpected downtime. Always choose the best insert geometry for the material and feed it according to the manufacturer's recommendations.
- If chatter is a problem, use a smaller nose radius to reduce vibration. Also, utilize a wiper insert where fine surface finishes are needed (albeit at the risk of increased tool pressure).
- Although 80-degree diamonds and trigon-style inserts are the go-to roughing tools for many turning departments, a positive lead angle tool or round insert helps to thin the chip and reduce depth-of-cut notching.
- Whether troubleshooting a problem or optimizing a process, be scientific. Take notes, make one change at a time, and recognize that slowing down or backing off is sometimes the wrong approach.

Above all, keep current on machining advancements: Your company might have to spend a few bucks to implement the cutting tool and toolholder technologies just described, but as others have found, it's a small price to pay for greater competitiveness and process security.