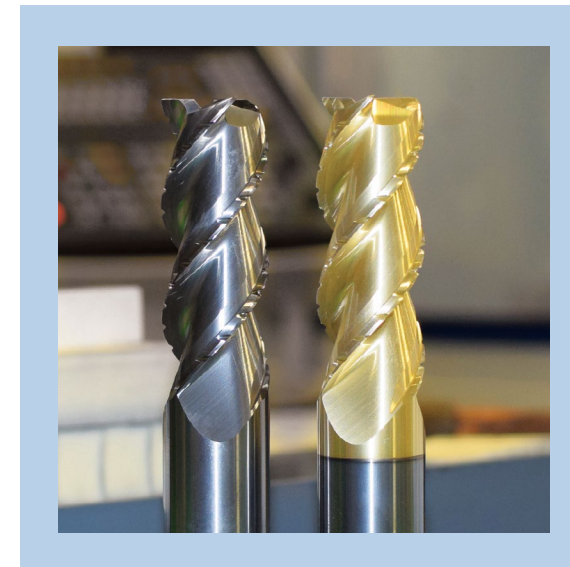


SHOP GRINDS



TOTAL TOOLING SOLUTIONS

unique



geometries

Toolmaker Helical Solutions of Gorham, Maine, fulfills manufacturers' needs for high-performance carbide endmills, with an emphasis on critical aerospace applications. And while that industry sector is an active one, it can present challenges for cutting tool manufacturers like Helical Solutions.

Superalloys such as Inconel, Hastelloy and Waspalloy, for instance, used in aerospace components provide great strength and heat resistance. But those same qualities make the alloys very difficult to machine efficiently, especially with standard tooling.

To tackle these tough materials, Helical Solutions offers its customers tools that represent "engineered solutions" or blends of tool material, geometry and coatings that maximize tool life and productivity. The shop always, according to Garth Ely, vice president of marketing at Helical Solutions, strives to offer not just a cutting tool, but an approach that includes proper feeds and speeds, programming techniques — the whole gamut that enables customers to machine aerospace materials in as optimized a manner as possible.

In addition to a comprehensive catalog offering, Helical Solutions creates modified standard and fully custom tools. It manufactures the tools from start to finish with WALTER tool grinding machines from UNITED GRINDING equipped with automation technology that allows production to continue lights-out, 24/7.

According to Adam Martin, plant manager at Helical Solutions, tool geometry is a key factor in overcoming exotic alloys' abrasiveness and tendency to work-harden or produce uncontrolled chips. Geometric details such as precision edge configurations, varying flute pitches and helix angles allow a tool to cut cleanly and redirect workpiece materials. Such complex geometries increase cutting efficiency and reduce stress on the tool to boost tool life. Martin added that the goal is "moving from producing one part per tool to machining a whole series of parts with that same tool."

Helical Solutions generates its special geometries with the help of HELITRONIC TOOL STUDIO software on the tool grinding machines. Vice President of Engineering Jeff Davis said the software helps "immensely" because it



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enables grinding of complex geometry features that, "way back when were just not possible to do. For example, HELITRONIC TOOL STUDIO allows us to break out in sections any part of the cutter that we are manufacturing and manipulate the geometries within any subset of a section. This means we can take a tool that at the tip may be a 30-degree helix but the end may be a 40-degree one and still maintain all the cutting geometries down the length of the tool. The advance of cutting tool geometries has changed dramatically as software has progressed."

Helical Solutions arrives at tool geometry designs in a number of ways. "We have the ability to take the customer's application, including their material, their process and their machinery, and design and manufacture a solution for them," explained Martin. Alternately, Davis added, "we can also work hand in hand with the customer's engineering team and employ their in-house expertise to design their tooling."

Helical Solutions' engineering staff often matches a special tool geometry to a specific material and part configuration. Davis used the example of thin wall parts that tend to deflect horizontally when machined.

"A tool geometry might be designed with a helix that works on the vertical forces to prevent part deflection," he explained. "Or the toolmaker may put a specific hone on cutting edges to extend tool life and also refine the finish of the surface being machined, which can be critical where mating surfaces are involved."

The rigidity of the WALTER grinding machines plays a key roll in Helical Solutions' tool grinding consistency. "In producing a 2"-diameter cutter, for instance, we have to maintain load force and pressure on that cutter to maintain a proper grind," said Davis. "The grinding wheel will play a factor as well as coolant and all the other aspect of the process, but the nuts and bolts of it really are the machines. Grinding larger tools generates greater grinding forces, and the WALTER machines lead the pack when it comes to making large endmills from 0.250" in diameter right on up." He also noted that the linear drives on the shop's WALTER machines eliminate any backlash typically experienced with those machines having ballscrews that can destabilize a grinding process.

Helical Solutions handles the entire endmill manufacturing process from purchasing of tool blanks through to the coating process. Catalog tools basically range in diameters from 0.125" to 1.250". However, the shop sometimes produces tools down around 0.060" in diameter and as big as 2.500" in diameter."

Tolerances on smaller tools are +/- 0.0001", and Helical Solutions checks them on several WALTER HELICHECK tool measuring systems that provide measurement value resolution of 0.25 µm. The shop measures the first item of each production lot, performs in-process inspections and confirms tool tolerances at the run's end. Davis said that the shop's automated HELICHECK systems boost continuity and consistency in the tool inspection process.

Automation is critical in Helical Solutions' ability to deliver its precision tools in a timely manner. "All the machines we acquire have autoloaders," said Martin. "Over the past several years we have been opting to go from the production style forklift loaders over to the articulated style robot loaders, and we always use multi-pallet systems."

The WALTER machine's integrated automation allows the shop to achieve the consistent production levels it requires. "If we didn't have the loaders we would be stopping our machines and having to rely solely on manpower to keep them up and operational," commented Martin. "Now, we can send work orders and routers in an unmanned state during the course of the night. And any loaders that we can purchase on the standard base equipment add up to improving our machine utilization and the throughput of our facility. UNITED GRINDING does a great job at that, and we definitely take advantage of all its different machine add-ons for our shop."

According to Davis, just-in-time (JIT) inventory management on the part of Helical Solutions customers "is not going away. Everybody waits until the last second to order a tool, so we grab any opportunity we can to cut the lead time without cutting quality and give them what they need faster."

Helical Solutions applies ongoing process engineering strategies to streamline its internal processes and

minimize production times. Shop personnel are trained to optimize every process throughout the facility to ensure continuous improvement.

In addition to a strong aerospace presence, Helical Solutions serves customers in the medical, oil and gas and automotive industries. The variety of customers engenders a variety of lot sizes, ranging from a single part to 3,000 piece orders, depending on the customer and their needs. Within such an environment, machine changeovers for different parts happen frequently and are dependent on batch size.

In retrospect, Davis said that the advances that have been made in manufacturing technology — specifically for tool grinding — are vast. "There was a time when you had to use two machines, one machine to cut the flutes and one machine to cut the ends," he explained. "Or you had manual machines and would flute and point manually, with a person sitting there pointing one cutter after the next. Now we use process control, thermal deviation control, all these capabilities that allow us to run lights out and to get the most out of our equipment with the least amount of manpower."

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