Vericut

Keselowski Advanced Manufacturing

Reducing Risk

User Story

When machining parts that are worth a small fortune, you can't take any chances. According to operations manager James O'Toole, that's why Keselowski Advanced Manufacturing uses VERICUT

Mention the name Keselowski to a NASCAR enthusiast and you're sure to receive an affirmative, "Oh, yeah. Everyone knows Brad." Mention the name of the manufacturing company he founded a few years ago to an aerospace engineer and the response might be much the same. Since 2018, Keselowski Advanced Manufacturing (KAM) in Statesville, N.C., has become a preferred supplier to companies throughout the aerospace and defence, energy, space, automotive, and—of course—performance motorsports industries.

A to Z

Representing a new breed of vertically integrated hybrid manufacturing firms, KAM specialises in the design and production of 3D-printed metal parts that are then finish-machined on an impressive fleet of high-end CNC machine tools. It's demanding, difficult work that is only compounded by the fact that a simple mistake can undo weeks of laser bed fusion manufacturing and easily cost tens of thousands of dollars in material and machine time.

"Unlike machining from billet and bar stock, the parts we're cutting already have considerable value to them," said James O'Toole, who's been KAM's operations manager since late 2020. "Scrap at this point in the manufacturing process could cause serious problems for our customers, never mind the internal expense. That's why we use VERICUT to validate our part programs."

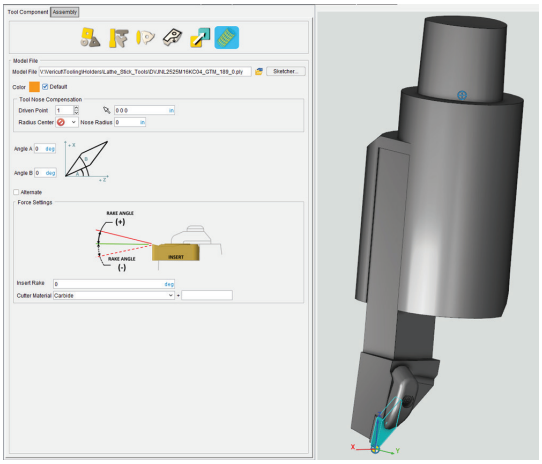
He's talking about VERICUT toolpath simulation and optimisation software from Irvine, Calif.-based CGTech Inc., which KAM's programming team has been using since the company's inception. They also use Siemens NX, a well-known and highly popular brand of CAM software. O'Toole agreed that NX enjoys strong simulation capabilities, but feels that VERICUT offers more in terms of toolpath optimisation and,

being a standalone simulation product, is more focused on collision avoidance and other potential risk areas.

KAM machines higher quantities of 3D-printed parts—some numbering in the hundreds— and shaving five or ten minutes off a half hour cycle time adds up to an incredible savings

Tooled up

They're well-equipped to do so. The shop floor is home to a variety of Mazak equipment, among them an HCN-5000 horizontal machining center, a Variaxis i-800 five-axis, twin-pallet vertical, a Quick Turn 350MSY turn-mill center, and several Integrex i-300S seven-axis multitasking lathes. These highly-capable machine tools are second only to the additive side of KAM's production area, which boasts nearly two dozen L-PBF (laser powder bed fusion) printers from EOS, SLM Solutions, and GE Concept Laser, some of them with dual and quad laser capabilities. All are capable of building parts from aluminum, Inconel 625 and 718, titanium Ti64, Haynes 282 superalloy, and several other aerospace-grade metals.

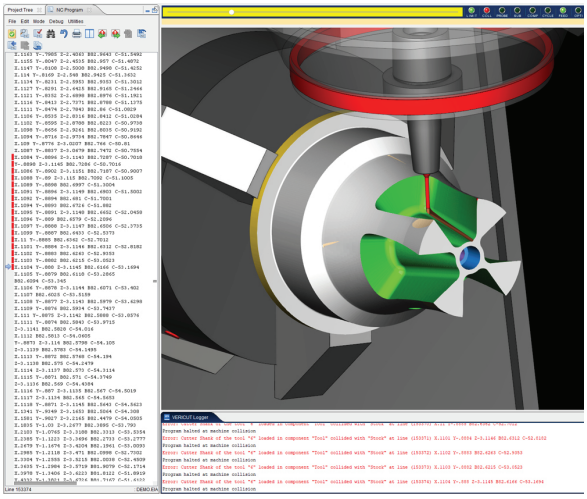


Under O'Toole's supervision, the two departments work very closely with one another and with KAM's design and engineering department. Producing components for industries in the space, aerospace, and defence industries the team carefully determines the best process plan possible.

This starts by creating the 3D printing job or "build" in Materialise Magics software, simulating it in Netfabb Ultimate, and then releasing it for 3D printing. After thermal processing, the now printed job moves to the machining area. It's here that VERICUT is used to simulate the NX-generated part program, checking for gouges, uncut material, and above all, collisions. "We have a very strong programming team, but we're all human, and humans make occasional mistakes," said O'Toole. "And while it doesn't happen very often, we've had multiple instances where VERICUT has caught errors that would have scrapped a very expensive workpiece."

Hang on tight

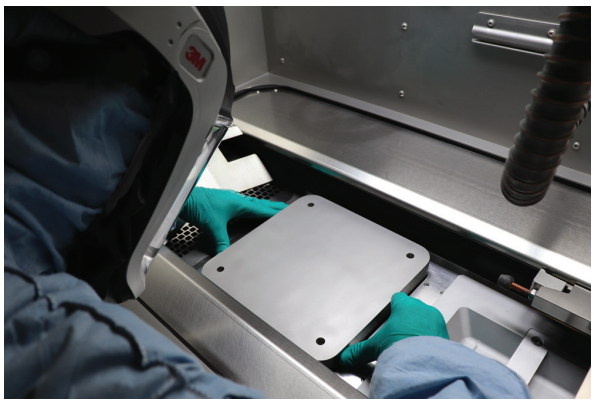
O'Toole noted that one of the more important considerations when machining 3D-printed parts is how to hang on to them. Some parts are machined still attached to the build plate, making workholding much easier, but others



are first cut away using KAM's wire EDM machine from GF Machining Solutions. In this instance, determining the best way to fixture what are often thin-walled parts containing complex geometries and freeform surfaces can be quite challenging.

On a traditional billet-made part, you determine any subsequent locating features during the first operation, O'Toole explained. With additive, you're handed a part that doesn't have any of those datums defined yet, even though there are features that must align to them when complete. It's similar to machining a casting or forging where, essentially, you need to find the "part within the part," he said.

"You need to strategically look at how you are aligning and then probing the part to make sure that the features you're machining end up in the right place. We use VERICUT here as well, to simulate our probing macros. So not only does it help us to assure that the first part is a good part, but also helps us to reduce our setup times, eliminate broke tools, and prevent crashes."



To those who suggest that toolpath simulation is a nice-to-have and that any available dollars would be better spent on an investment that can make parts rather than pretty pictures, O'Toole has a message. "Many shops might feel like they can function without toolpath simulation, just as they've been doing for the past ten or twenty years. The reality is that VERICUT can be just as much of a profitability driver as adding another CNC machine tool. The payback calculation might be hard to put down on paper, as in 'What will VERICUT actually do for the bottom line?' but I encourage people to take it for a test run and see what value it can present for the organisation. I think they'll be pleasantly surprised at the results."

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All photos courtesy Keselowski Advanced Manufacturing

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