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PARTNERSHIPS

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- Help Others Succeed
- Collaborative Solutions
- Passion For Manufacturing

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- Contagious Energy
- Family-centric
- Generous Intent
- Open Possibilities

CGTECH
VERICUT®

- CNC Machine Simulation
- CNC Program Verification
- Cutting Speed Optimization

Okuma / Sandvik

Industry leaders CGTech,
Okuma, and Sandvik
Coromant collaborate
on feedrate optimisation
technology



User Story





Once in a while, a new technology rolls around that promises to change the face of machining. Computerised numerical control (CNC). Carbide cutting tools. Multitasking machines. Additive manufacturing. Set aside your favorite Star Wars aphorism, but the most recent of these game-changers is Force, the newest addition to Irvine, Calif.-based CGTech Inc.'s VERICUT suite of toolpath simulation, verification and optimisation software products.



Forceful results

According to CGTech VERICUT product specialist Pete Haas, the Force module uses physics-based optimisation methodology to reduce cycle times by 40% or more and improve tool life significantly. "It's the perfect example of data-driven manufacturing," he said. "Force helps machinists and programmers to make decisions based on facts, not guesses, past experience, or tribal knowledge. Most importantly, Force does the heavy lifting by providing the optimal cutting solution for the NC Programmer."



On milling and turning applications alike, Force optimisation works by analysing cutting conditions encountered during simulation and looking for opportunities to increase feedrates where possible, slowing down when cutting forces or spindle power demands are excessive, and breaking up motions into smaller blocks as needed to both maximise chip thickness and keep it consistent throughout the cut.

"VERICUT Force achieves what feedrate calculators can't and what manufacturers have been trying to do for many years—True constant chip thickness machining, he said. "Instead of maintaining a constant feedrate throughout the cut, with chip thickness changing as the tool encounters varying amounts of material, VERICUT Force speeds up or slows down to keep cutting forces steady. It's very similar to how a machinist might dial the feedrate override up or down based on the sounds coming out of the machine, except that VERICUT does it proactively and more effectively, rather than reacting to cutting noise levels."

Seeing is believing

Too good to be true? Don't take CGTech's word for it. John Giraldo, aerospace engineer at Sandvik Coromant Inc., had a chance to put Force through its paces recently. The results were surprising. "To be honest, I used Force on a program that I'd already optimised with a popular CAM system, so I really wasn't expecting much improvement," he said. "But Force lopped 40% off the cycle time on the first go. It was

pretty impressive to watch.”

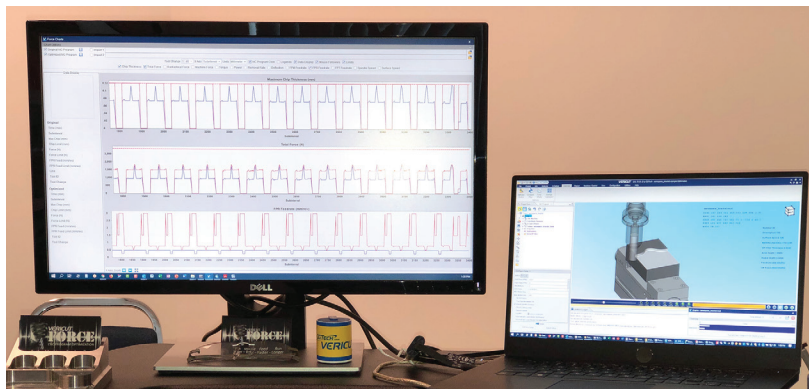
Giraldo is part of Sandvik Coromant's team of application specialists at the machining solution provider's Fair Lawn, NJ, facility. He and others around the United States work closely with customers or potential customers on ways to improve their manufacturing operations. This might mean reprogramming a job, helping out with unfamiliar material, suggesting and then validating new cutting tools, or developing a complete machining process.

As with many of his customers, Giraldo's been using VERICUT for “around eight years or so” to simulate NC toolpaths and therefore avoid crashing an expensive machine tool. He also works with many of the industry's leading CAM systems, so is quite familiar with modern programming technology. He's no stranger to toolpath optimisation, and because his customers are coming to him with their problem jobs, he's also no stranger to difficult materials and challenging workpiece geometries.



Sharing the wealth

After seeing the results, Giraldo wanted a chance to spread the good word on Force, so when a customer came to him with a tool life problem machining Haynes 282—one of the more difficult to machine nickel-based superalloys—he was ready.



“Using a trochoidal toolpath [i.e., a more efficient way to mill a slot or pocket by using circular movements with lighter radial engagement at higher feedrates] to machine a deep pocket in a cylindrical casing, they were burning up two end mills per pocket,” he said. “With Force optimisation, we increased tool life to five pockets per tool—a tenfold improvement—and reduced cycle time by 25% to boot. It made a night and day difference.”

Giraldo has also shared his Force experiences with other members of the Sandvik Coromant technical team. “Everyone has been both shocked

and positively impressed with the results. We have machining application experts here with 15 to 25 years of experience, and they are invariably amazed by what Force can do.” He laughed. “About the only downside is that we have to rethink all of our machining parameter recommendations when we know that one of our cutting tools will be used with a Force-optimised program. It’s made a huge improvement on everything we’ve thrown at it.”

Doing the math

It is important to note that CGTech has done its homework. VERICUT Force has been developed over the last few years through actual on-machine testing, first with an advanced manufacturing research center, and then using its own dynamometer force measurement system. That testing continues today at Okuma America Corp.’s facility in Charlotte, N.C., where CGTech’s Haas was headed shortly after our interview.



Wade Anderson was there. The technical center and product specialist’s sales manager for Okuma, he’s seen firsthand the effort CGTech has put into the development of the Force material files that make Force tick. “Everything we’ve seen so far has been phenomenal,” Anderson said. “They’ve set up dyno equipment on some of our CNC lathes and milling machining centers, and are taking cuts on different materials, using a range of speeds and feeds, and measuring how much force is encountered for each cut. It’s a very unique approach, and I don’t see any other companies taking their products to this level. It’s great to see because I know it’s going to help CGTech, tool manufacturers like Sandvik and Okuma customers alike.”

Use the Force

Haas said the ability to create these Force material files has recently become available to end users via a software option called “Force Calibration.” This will not only allow customers to fine-tune Force optimisation based on their specific cutting tools and operating parameters, but addresses the needs of those in the aerospace, nuclear, medical, and other industries using proprietary materials that cannot be shared. As for Giraldo’s earlier quip about machining recommendations, Haas noted that determining the correct force settings is actually quite simple. If

you're using one of Sandvik Coromant's Plura end mills, for example, all you have to do is look up the tool data and plug it into Force along with a few parameters like chip thickness, helix and rake angles, and the number of flutes. Or even easier, download the cutting tool data from CoroPlus directly into VERICUT. The software takes care of the rest.

"Force is now a mature product with proven results in the industry, from large landing gear parts to small medical device components and everything in between," Haas said. "The payback for our Force product can be quite fast—depending on the part and quantity, most shops achieve ROI within 3 to 6 months."

"But it's not just about going faster, or making more money," he added. "Force-optimised programs are safe because the software protects the NC program from machining excesses using programmer-defined limits on feedrate, cutting forces, power consumption, and tool deflection. As a result, we've consistently seen significantly reduced cycle times, greatly improved tool life thanks to less heat and rubbing, and the cutting tool is now utilised to its full performance potential. And as with VERICUT itself, Force works with anyone's machine tool and anyone's NC program, whether it's newly-created or a legacy file from ten years ago. It's simply a great tool for any shop to have in its machining toolbox."

www.cgtech.com

www.okuma.com

www.sandvik.coromant.com

All photos courtesy CGTech

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