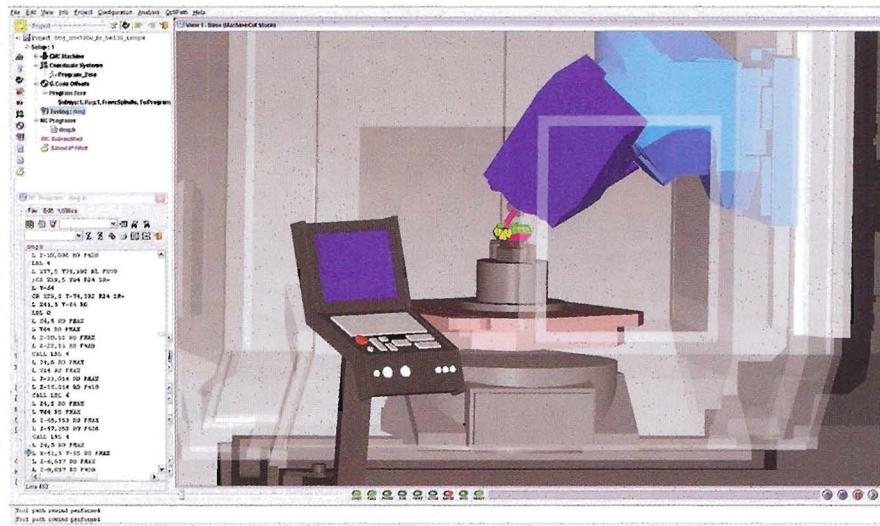




# Safe, efficient cuts



NC program simulation application can be broader than might, at first, be imagined



**V**ericut verification and simulation software from CGTech (01273 773538) allows manufacturing companies in many diverse industry sectors to fully test and evaluate machine tools and manufacturing methods in a virtual environment.

NC verification and simulation software has been available to manufacturers for over 20 years, yet most NC programmers do not take full advantage of the benefits it has to offer. NC simulation is generally regarded as an important step in the machining process, checking each machining operation as it is programmed, or as a final check after the programming is finished and post-processed, ready for the machine on the shopfloor.

## CUT AS EXPECTED

It is typically used to ensure the part is cut as expected, and to reduce the risk of a machine collision and subsequent damage.

These are certainly worthy and valuable uses that repay the investment made in the software, often many times

over. However, some resourceful companies have discovered that simulation software can be used to benefit their businesses in other ways - and in ways that may not have even been intended by the software developer.

One of the most obvious ways to get more from the software is to simply use it, try out new, unproven, machining strategies: as a virtual methods testing environment. Other than the time required to virtually create and test new methods, there is no physical cost. An NC programmer can try out and adjust radical new ideas several times over. A few hours spent trying out different methods could, potentially, save many hours of machine time, reducing tool and machine wear, wasted materials, energy costs and human fatigue as a result.

CGTech, the developer of Vericut software, has encouraged its customers to push the software to its limits. The company's managing director, John Reed, describes one example involving a creative NC programmer at a large

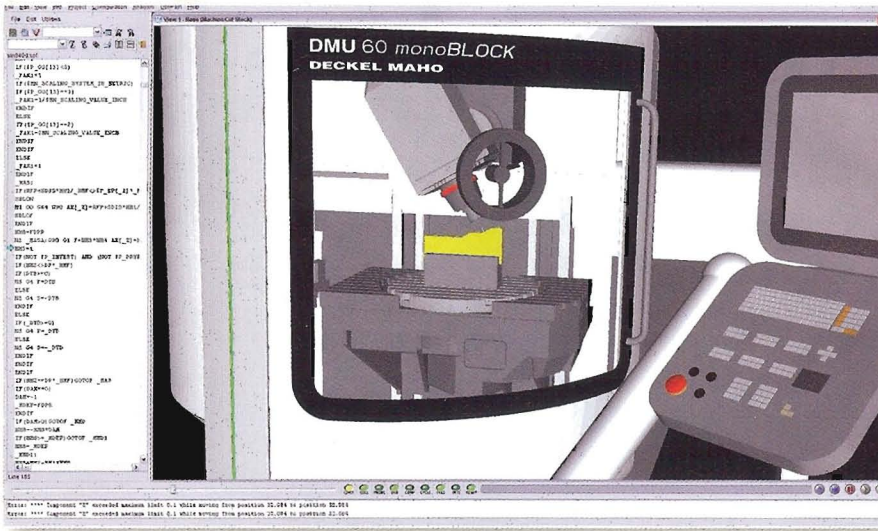
aerospace engine manufacturer. The company was looking for a faster way to make the leading edge of a titanium fan blade and the NC programmer theorised that a new machining method could make the difference required.

"Traditionally, the process for making the part took many hours using a grinding technique. The NC programmer believed the part could be created using a 5-axis mill, but knew that the management would need to be convinced before committing the expensive machine to the time required to cut a test part. By using Vericut to simulate the process, the programmer was able to create a video to prove the process would work," he says.

According to the Manufacturing Technologies Association, 5-axis mills and mill-turning machines have become increasingly popular - and for good reason. They enable the manufacturer to drastically reduce machining time and reduce the number of set-ups required to complete a job. Simulation software takes the fear out of programming a complex multi-axis machine. When a program can be simulated, from the same NC code that will be sent to the machine, there is no excuse for not taking full advantage of a 5-axis machine's capabilities.

## MOVING FROM 3 TO 5-AXIS

Mould makers are increasingly turning to 5-axis machining centres to improve machining processes traditionally carried out on 3-axis milling machines, often with little or no experience of 5-axis machining techniques. Even if they have experience, it is from aerospace component machining, not mould tool machining. So, new processes and new techniques must be employed, and 5-axis machine simulation software that accurately represents each 5-axis



machining cut in great detail provides the necessary confidence to succeed, while also allowing for new invention, experimentation and success with different techniques.

With simulation software, the manufacturer can also prepare to produce parts on the first day any new machine is installed, thereby efficiently using the time available between when the machine tool is ordered and its installation date.

"We have partnerships with many of the leading machine tool companies and they will often supply the CAD geometry for our joint customer's machines – before the machine is even shipped," John Reed explains. "The customer can then begin proving out programs immediately. We have had customers discover, before the machine is delivered, that the configuration ordered will not work or is not efficient for the parts they intend to produce. By

catching the machine specification error early, the customer was able to change the order before the machine was delivered.

"We have provided 'loan' machine models to customers, so they can fully evaluate the end-to-end machining cycle, which becomes vital as the complexity and, consequently, the cost of the machine tools increases."

The aerospace manufacturer working on the leading edge took the idea a step further. After proving the 5-axis milling process could work, it was ready to order production machines. Rather than simply picking the machine from a catalogue, the company designed the machine in the simulation software, where it had already proven the process would work. These files were then sent to the machine tool builder who built the machine exactly to the specifications described in a virtual machining simulation.

There are always opportunities to improve an existing process and applying creativity simulation software can help, giving the NC programmer the freedom to try practically any machining technique in a virtual world. The only real limit is the user's imagination. □

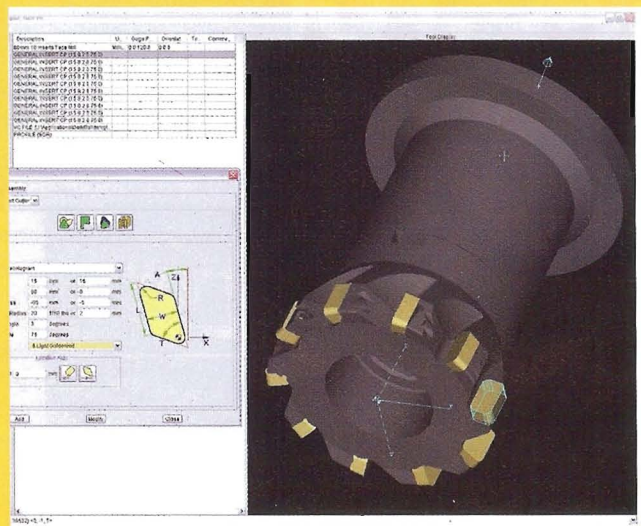
## Tool import process development

Vericut offers enhanced cutting tool manipulation and simulation with its comprehensive Tool Manager. The advanced software can import cutting tool and tool holder CAD models supplied by the world's leading tooling manufacturers, with STEP, IGES, Parasolid and .PRT models from Kennametal and STEP files from Sandvik.

Vericut simplified the CAD model to create an STL file, which improves the simulation process, but retains all of the critical features, such as the tool's exact geometric edge details. For both solid cutters and inserts, these are used to create a profile, so that the movement of the cutting tool relative to the workpiece is always accurately reflected by the material removed.

Tools can also be modelled directly in Vericut, with data taken from 2D drawing or measured off existing cutters. Likewise, the toolholder can be taken from a CAD model, simply created in Vericut or provided by the tool supplier. For the toolholder, Vericut also transforms the CAD model into an STL file in just a few easy steps.

The software has powerful search functionality to help find tools and holders in the cutter, tool extension and holder libraries, and also makes positioning the tool assemblies in the



machine's automatic tool changer or turret very quick and easy.

Beyond cutting tools and toolholders, importing STEP files allows workholding and fixture jigs to be manipulated within the software. Design models and machine tool geometry can also be imported this way.