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Top floor to shopfloor

Most software systems are designed to perform, and excel at, specific business functions, often with the ability to share information or data-based reports with additional departments within an organisation. An accounting package would be a great example of this. However, CGTech's VERICUT CNC simulation and optimisation software is truly enterprise inclusive.

From the team on the management board to the machine tool operator, at every step VERICUT provides clear and measurable benefits. We ask key members of staff from various advanced manufacturing and precision engineering companies, some of which are renowned multinationals while others are highly professional family-run businesses, to explain how the software has impacted their businesses.

Developed by CGTech, VERICUT is independent CNC machine tool simulation, verification and optimisation software that enables users to link all the machining operations end-to-end to evaluate and improve the entire manufacturing process. Every step, through engineering, design, CAM programming and machining and up to the final quality and inspection phase, can and should be optimized. Simulation ensures programs are error free and all operations work together as intended, but optimization ensures the whole process is operating as efficiently as possible to save time and money.

As machining gets more complex and customers expect more for less there is room for improvement in any manufacturing process. These improvements, which are not just about reducing costs, might include reduced NC program cycle times, increased throughput, making parts cheaper or getting a product from start to finish and out to market faster.

From the boardroom

As Stephen Ollier of Derby-based, Pentaxia, explains: "As Managing Director, I see my job as always providing the right equipment, the right machines to the right people. We have never been afraid of investing in the business and a key part of the investment is software."

Many of the jobs produced by Pentaxia are unique, as a batch of one there is no opportunity to prove out the NC code for errors so there is a high chance of collision, made more likely with the complexity of the 5-axis machine tools. "You need staff there on-hand to keep an eye, manning the machine almost full time. That is laborious and you can still suffer some collisions, we did and they can be expensive both in terms of repair and the impact on the ability of the whole business to deliver on scheduled work," Stephen Ollier says.

Every machine tool is programmed off-line using the latest CAD/CAM software, and the post-processed NC code is then taken straight in to VERICUT. "All NC programs have to go through VERICUT, anything else is unacceptable." he states.

Production planning

Production planning is another important touchpoint for VERICUT because any business working to an inaccurate schedule cannot achieve the forecast results, as highlighted by Mokveld's Production Engineering Manager, Bart van den Bosch.

From its state-of-the-art manufacturing and testing facility in Gouda, Holland, Mokveld supports the global oil and gas industry with expert knowledge and advanced engineered valve systems for critical control and safety applications. Here, the control and safety of the advanced machine tools on the shopfloor is provided by VERICUT.

As well as protecting the complex and expensive machine tools operated by Mokveld, VERICUT has also helped improve production planning. "With the variety of parts we produce at low volumes the production scheduling is done manually, so we select the next available machine tool capable of completing the task required. VERICUT helps us because the predicted machining cycle time required is very accurate," he says.

Adding: "A large diameter axial valve control cage may require up to 20,000 holes to be drilled. We do not run standard hole cycles and the CAD/CAM systems were always wide of the mark when it came to estimating the time required to complete the operations. However, as VERICUT simulates the exact movements of the whole operation it results in a predicted cycle time that is within 5 per cent of the actual time required, optimising not just the process but also the production control."

Fixtures and tooling

A family-owned and run business, Hampshire-based RE Thompson has relied on VERICUT for over 25 years, and it is fair to state that both the precision engineering business and the software has developed in parallel in terms of capability.

Responsible for the CAD/CAM programming of various customer projects, Production Engineer, Patricia Hunt, says: "With the CGTech interface between our CAD/CAM software, Pro/Engineer, and VERICUT which provides full simulation functionality we can operate within the CAD/CAM environment and create a project file that also takes all the tooling and fixturing over. Before we were creating an SDR file and we had a library of tools to pick from to build up, but now it is all much more efficient when proving out NC programs."

Prove out efficiency gains are vital for the business as the company aims to be able to introduce up to 10 components per week, from simpler prismatic or turned parts to complex freeform 5-axis components. The company has an unusual structure because there is no typical quality control department. Engineers fulfil that roll under a 'cradle-to-grave' philosophy, so the engineer that introduces a part will forever be responsible for it, and if any issues arise it is their job to sort it out.

RE Thompson prides itself on a 'zero defect' policy and on time delivery to meet customer production schedules using Line Side, JIT and Kanban manufacturing systems. As Patricia Hunt says: "With so many opportunities for errors the NC programs are never manually written or amended on the shopfloor. Errors eradicated by VERICUT include collisions between the machine's spindle and the workpiece or fixturing, or gouging of the raw material, which could result in a machine tool being out of action. This in turn could lead to a failed delivery or capacity shortage and neither is acceptable to us."

The role of VERICUT starts at the quotation stage for RE Thompson. "All CAD/CAM systems will provide a cycle time, however the time that VERICUT predicts from the simulation is far more accurate," Patricia Hunt says.

Optimising the process is the next key function of the software as it allows the engineers to refine machining strategies and apply different cutting tool techniques to save time and cost for the customer. As the changes are all tested in the virtual environment there is no disruption to the shopfloor and tweaks can be made without fear of any negative results.

VERICUT also makes the process more visible as it creates a fully simulated manufacturing file that can be shared with customers and shop floor via the VERICUT Reviewer. This boosts confidence in the machining process and subsequent timely delivery of the parts.

Reviewer

VERICUT Reviewer is a powerful software solution that provides enterprise-wide manufacturing collaboration that even extends beyond the geographic location of any company. A foundation for a truly paperless operation Reviewer can generate in-process inspection instructions and 3D digital documentation from simulated in-process machined features.

Seamless integration is the goal of CGTech and a big step towards this is the free issue software to run the VERICUT Reviewer files. It is available to download from the CGTech website, and it will play Reviewer files on all versions of Windows desktop PCs or Windows compatible handheld tablets.

“It is an advanced communications method, instead of using paper we are using the full simulation power of VERICUT. Although the file is generated by VERICUT once it is created it can be seen outside the software completely licence-free using Reviewer,” Technical Director, Gavin Powell, explains.

Proven results

MAN Energy Solutions is a multinational company that produces large-bore diesel engines and turbomachinery for marine and stationary applications, including marine propulsion systems, power plant applications and turbochargers. Employing a total of around 14,000 people at 120 sites across the globe, its T35 manufacturing facility located just a few miles away from Copenhagen airport in Denmark produces fuel injection systems that require extremely tight tolerance components for new installations and service life replacements, as well as refurbishment and retrofit of older vessels and static sites.

Here, the machine shop runs on a Continental five-shift system, but the CAM programmers are available for the day shift which is when prove-out occurs. If the prove out is not completed within one shift then the following two shifts can’t progress or make parts. This was one of the key reasons for investing in VERICUT and the software has helped significantly.

Process Owner of Digital Manufacturing, Mikkel Jon Hass, explains: “Before using VERICUT it would be difficult to quantify the time required to prove-out any new parts. We knew we had to get the new parts running, but nobody knew how long it would take, there was no transparency. They would allow months to get from the design phase to proven and ready for production.

“Now prove-out has been reduced from typically taking around 5 days, a whole week effectively, to just a few hours. We recently had a prototype design go through that had six redesigns before being proven in VERICUT, machined and measured in the quality department in just 24 hours.”

He continues: “With VERICUT we aim for the prove-out to be a factor of the cycle time, so for a 1 hour cycle time we want to prove out in 2.5 hours; we are currently at 3 to 4 hours. This is the goal for us going forward, so everyone has to be open to new ideas and new methods.”

Supporting upgrades

Globally renowned for its bespoke range of shotguns and rifles, Holland & Holland is a company that operates in an environment where art and engineering go hand-in-hand. Following the installation of the new machining centre, jobs were verified with VERICUT simulation software as they were required in production. Senior Engineer, Rob Bishopp, recalls: “CGTech created the model of the new machine and applied the dynamic parameters. As each job became necessary, I took the old program, run it through VERICUT and made a list of what needed to change to get it to a state where the NC code would run and then checked for any errors, which VERICUT flags up in minutes. Some programs worked, some needed minor changes while some of the older programs had to be updated.”

These updates are carried out using MasterCAM software with the new post processed tool path code sent straight to VERICUT to ensure it will run safely. For Holland & Holland, protecting the machine tool is of paramount importance as any collisions or crashes are difficult to repair and the lost production time is impossible to recover. “Once the NC code has been ‘VERICUT-ed’ and is ready to use it is transferred to the company server where it can be accessed by the machine, so the guys on the machine only see the safe code,” Rob Bishopp states.

End-to-end

CGTech’s Technical Director, Gavin Powell, concludes: “Globally, VERICUT has a diverse user base and our customers are found in almost every one of the advanced and demanding industry sectors, such as aerospace, defence, marine, motorsport, medical, oil & gas, petrochemical processing and other high precision engineering operations.

“At boardroom level any business can be confident that its decisions are based on accurately simulated scenarios and that expensive and critical production equipment is protected by the best software available. Production Managers and Engineers, as well as those in the CAD/CAM department know that optimised code produced by VERICUT is safe to run on the intended machine tools. With the ability to import tools, jig and fixtures the software can create a digital-twin of the real world to accurately simulate the machining process.

“Optimised parts are not only produced more efficiently but often with a ‘kinder’ cutting action that can improve the surface finish of the finished part – great news for the QA department. While Customer Support Engineers can go to meetings with the end customer knowing the business is doing its utmost to ensure good quality parts are delivered on time, every time and that VERICUT is supporting their goals for efficiency and productivity.”

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Note to Editors

About CGTech

CGTech’s VERICUT® software is the standard for CNC simulation, verification, optimisation, analysis, and additive manufacturing. CGTech also offers programming and simulation software for composites automated fiber-placement, tape-laying, and drilling/fastening CNC machines. VERICUT software is used by companies of different sizes in all industries. Established in 1988, and headquartered in Irvine, California; CGTech has an extensive network of offices and resellers

throughout the world. For more information, visit the CGTech website at www.cgtech.co.uk, call +44 (0)1273 773538, or email info.uk@cgtech.com.

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