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CGTech offers a commercial FORCE

The sharp downturn in travel caused by the global COVID-19 pandemic has resulted in the grounding of many aircraft and the largest contraction in the commercial aerospace sector's history, with most airlines around the world scaling back or cancelling orders. However, seen in the right context, the current challenges faced by the aerospace industry offer opportunities for commercial OEMs and suppliers to make needed changes. This is where the complete digital NC simulation and optimisation software solution offered by VERICUT can help.

According to a recent report by Glenn Brady, Global Aerospace & Defence Leader, and Partner at PwC in America: "The next six to 12 months are a critical period in which to prepare for the recovery. Rather than simply focusing on cuts, we believe that OEMs and large suppliers should also make needed investments in the future, in five key areas: using technology as an accelerator, stabilising the supply chain, streamlining the workforce, focusing on sustainability and making a co-ordinated pitch for government support."

His report concludes: "The coronavirus has had a devastating impact on the commercial aerospace industry, but it can also be a catalyst for needed change. When the recovery finally comes, the winners will be those businesses that capitalised on this window and took the steps necessary to emerge stronger from the crisis."

Technology as an accelerator

The use of the digital twin and applying the digital environment to the manufacturing industry is becoming more critical than ever to access commercial business benefits. It will not only ensure that the industry will continue to operate and grow, but also that jobs within the industry are retained, further industry investment is made, and a sustainably reduced carbon footprint can be achieved.

Dedicated to supporting aerospace and other advanced manufacturers in improving processes, CGTech is the original CNC 'Digital Twin' developer with their VERICUT software. Using a digital environment with a range of innovative solutions, VERICUT combines the real world with the digital world to ensure manufacturer's processes are detailed, safe and efficient.

VERICUT uses the CNC digital twin to provide accurate in process simulation, verification and optimisation of a true post processed NC file. The digital twin gives instant feedback on any errors or collisions and provides in-process cutting data. The product portfolio is further supported with the additions of VERICUT Composites and VERICUT Drilling and Fastening – both commonly used within the aerospace sector.

Technical Director, Gavin Powell, says: "With most already using advanced manufacturing technologies and equipment, many commercial aerospace companies still have the opportunity to apply digital techniques to unlock more value. OEMs and major suppliers should invest in digital throughout their organisation such as upgrading how new aircraft are designed and developed. Digital tools such as VERICUT can dramatically accelerate the development process ensuring components can be produced efficiently and reliably. This makes organisations more agile and responsive when dealing with dramatic changes in order volumes."

"In addition, any digital investment will capture better data allowing the Commercial, Financial and Managing Director to derive clear insights from it, leading to better decision making. So, the case for

making digital investments is clear and we believe the global application of VERICUT along with its FORCE module within the aerospace industry speaks volumes about the commercial benefits available.”

FORCE is a software module within VERICUT that uses a physics-based optimisation method to determine the maximum reliable feed rate for a given cutting condition based on four factors. They are force on the cutter, spindle power, maximum chip thickness, and maximum allowable feed rate. Force calculates ideal feed rates by analysing tool geometry and parameters, material properties of the stock and cutting tool, detailed cutting tool edge geometry, and of course VERICUT cut-by-cut contact conditions.

Commercial benefits

Force excels in difficult to machine materials, especially complex multi-axis cuts such as 5-axis flank milling. Whilst the calculations undertaken within the FORCE module are complex, the commercial benefits are straightforward and easy to measure.

UK Sale Engineer, Scott Ravenscroft, explains: “Using the digital twin to simulate every important part of the CNC machine tool VERICUT covers the obvious and visible production concerns, such as crashes, scrap, gouges and prove outs. However, FORCE addresses the hidden opportunities for cost savings, such as inefficient programming and suboptimal feedrates caused by the CAM system’s inability to adjust cutting feedrates for varying cutting conditions.”

Using the football analogy of ‘attack’ and ‘defence’ he highlights how the software achieves its goals: “In attack - we create optimal cutting conditions by maximising chip thickness and keeping the chip thickness constant. Defence comes from setting limits to prevent failure, such as maximum feedrate, cutting force and deflection. All of which are done without altering the trajectory or path of the cutting tool.”

Any business can access the commercial benefits available from VERICUT FORCE. The software relies on proven technology to maximise program efficiency and productivity and typically achieves savings of 8 – 15% on aluminium and more than 15% on difficult to cut materials. Return on investment can often be as little as one production component, with the opportunity to analyse cutting conditions, improve tool life, protect CNC machine tools and reduce operational costs.

This example of a typical aerospace component, an aircraft pylon produced from a titanium forging, has been FORCE optimised. The original cycle time for this component was 2 hours 47 minutes and the FORCE optimised cycle time dropped to 2 hours 12 minutes, a reduction of around 21%. Based on 500 parts charged at £100 per hour machine time, the optimised cycle would offer a £29,000 cost reduction over the batch.

And, FORCE is not only effective on exotic materials, as this example of an aerospace component that has been manufactured from aluminium billet shows. The original cycle time was 39 minutes and the optimised cycle reduced this by 17% to 32 minutes.

“Businesses don’t need to fully understand how FORCE works to apply it, CGTech has a global technical team that can help any company unleash its commercial benefits. We know the savings the software offers are measurable and robust, so the results are sustainable. Cycle time savings of around 20% should not to be ignored. If your machine shop has say ten machine tools running these parts using FORCE optimisation, then two of the machines are now potentially operating for zero cost. How the gains are applied to the bottom line of the business is an internal commercial decision,

but with year-on-year cost down pressures across the industry, having such an opportunity to make these savings should be a 'no brainer'," Gavin Powell explains.

He concludes: "The industry finds itself in strange and unprecedented times. It is critical that manufacturers embrace new methods, strategies and technology to ensure that processes are secure and stable. This will reduce scrap and waste, as well as increase profitability and capacity. Digital data applications can improve performance internally by showing clearly what is happening in areas such as operations, production and assembly. The array of applications is wide and varied, but VERICUT and, more recently, FORCE, have proven track records of providing commercial success for aerospace businesses around the world. If you want your company to exceed its Key Performance Indicators (KPI) you need to talk to CGTech."