

CMM inspection: “There is no other option to REVO, nothing else comes close”

ANT Industries, a supplier to Rolls-Royce, has cut inspection times on complex parts by up to 83%, using Renishaw’s REVO® five-axis measuring system fitted to a Metris CMM.

In 2008, when aerospace sub-contractor ANT Industries carried out a study on its production processes with the aim to make improvements, it was clear that inspection was a major bottleneck. “There were thousands of non-productive hours a year where parts were either in inspection or waiting to be inspected. These are expensive parts without any value being added”, says Shaun Rowley, ANT’s Manufacturing and Sales Director.

Significant requirement for final part inspection

However, following the purchase of a new co-ordinate measuring machine (CMM) equipped with a Renishaw REVO five-axis scanning system, the situation has changed markedly. “Now we have the new machine we are playing a different game – there is no other option to REVO, nothing else comes close”, adds Mr Rowley. “The closest alternative was a system costing five times as much, but it wouldn’t have achieved the same levels of throughput.”

ANT produces over 1000 different machined parts, approximately 85% of which are supplied to the aerospace industry, requiring a high proportion of final part inspection.



Shaun Rowley with a jet engine part, one of over a thousand components that ANT produce



REVO five-axis measuring system inspecting a blade profile, including the previously un-measurable leading edge

CMM inspection of finished parts is taken for granted in the aerospace industry, and ANT has to offer it to their customers as part of the manufacturing process. Some parts need 100% inspection, while others must have at least 1 in 10 inspected. "REVO gives us a clear competitive advantage, I am in no doubt it will help us win work", says Alan Naylor, ANT's Technical Director, who is very pleased with the new CMM. "Not only does it massively reduce inspection time, it also measures complex features like the leading edges of blades, which we just couldn't do before."

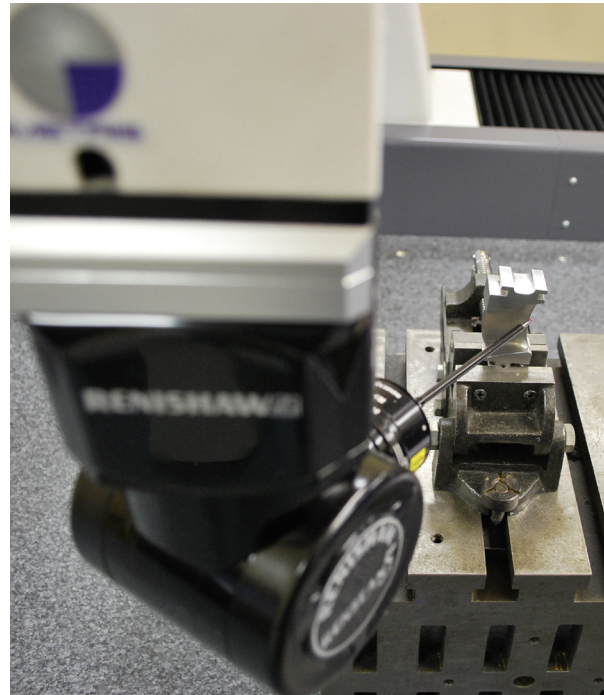
Solution needed to address measurement inconsistencies

With a sophisticated, highly efficient machining operation, ANT Industries also use Renishaw's spindle-mounted touch probes and tool monitoring systems for process control on their multi-axis machining centres and CNC lathes. However, post-process inspection had to be improved to keep pace.

"Our inspection method now uses a completely different approach," Mr Rowley explains, "We have taken a big jump in a very short time from slowly taking multiple touch-trigger points with the old Tesa CMM, to rapid 5-axis scanning. But the operator has taken to it very well and we are currently, on average, programming one new job a day. Added to that, the old CMM really struggled to maintain the accuracy needed; there were small but frustrating inconsistencies all over the measuring volume which we had to correct to keep an acceptable standard. We had to do something."

83% inspection time reduction and measuring the 'un-measurable'

Mr Rowley is particularly impressed with how the REVO system measures one type of turbine blade with a very complex form. "Each of these blades used to take 2 hours to measure, now it can be done in 20 minutes. With this sort of throughput I'm happy to agree to customer requests for 100% inspection of most components. But that's not the whole story; this is a complex shape with a critical leading edge that the touch-trigger CMM just couldn't measure at all."



REVO scanning the leading edge of a turbine blade



ANT's efficient machine shop includes multi-axis machining centres and turning centres equipped with touch probes

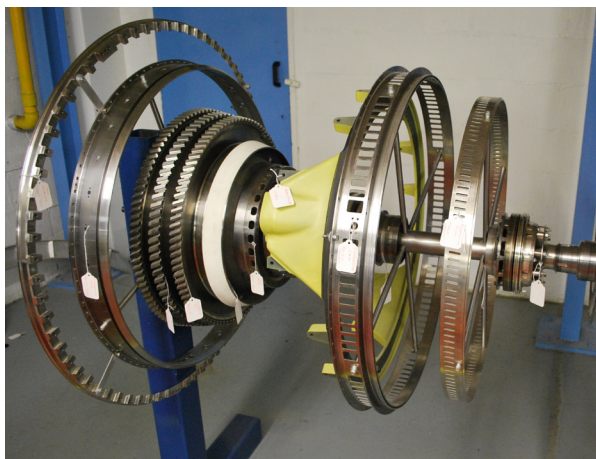
Prior to the new REVO-equipped CMM, ANT had to analyse the form using a projector technique to measure the shape – a long and laborious task. Now, the REVO system does the same job with a rapid profile scan, overlaying measured data onto the CAD design model and applying variable tolerances in different areas. “The ability it has given us is undoubtedly a key business advantage”, adds Mr Rowley.

Calibration of the probe, required periodically to ensure accuracy, is also an area which has seen significant benefits. Previously it took some two hours to calibrate all the different probe angles needed for a measurement routine, whereas the REVO system calibrates in just 20 minutes.

Rapid introduction of the REVO equipped CMM

ANT needed their new CMM to be supplied quickly to satisfy the measurement needs of a large blade contract. They decided to purchase a new ceramic CMM frame from Metris (now Nikon Metrology), without a probe system or controller, with axis travel of 2 m in Y, 1.2 m in X and 1 m in Z to allow the measurement of large engine rings. Renishaw then fitted the frame with its REVO five-axis measuring head and probe system, together with its UCC2 universal CMM controller. The work was done at Renishaw’s Gloucestershire assembly plant prior to installation at ANT, although Renishaw also carries out retrofits at a customer’s site.

The system uses Renishaw’s new MODUS™ metrology software, which has particularly impressed Mr Naylor. “Support from Renishaw has been excellent, not just in training operators in using the MODUS software, but also introducing a new way of thinking to inspection methods. It could have been intimidating but it turned out to be a very straightforward transition.”



A display of the multiple components ANT produces for multiple engines



Parts with complex forms are produced on multi-axis machining centres

Fully integrated CAD/CAM and inspection programming

Another potential benefit of the new CMM has been identified by ANT, as Mr Rowley explains. “The customer gives us some part designs as 3D CAD models, but most parts are defined with 2D CAD drawings, which our CAD department turns into 3D models to enable the calculation of machining paths in a CAM system.” However, the plan is now to train one of ANT’s CAD/CAM team to also program the REVO inspection routines so that they have an overview of the whole production process. “He will then be able to consider all the implications for machining and inspection when creating the CAD model”, adds Mr Rowley.

Efficient operation with machine tool probes

ANT’s machine shop includes 14 machining centres, most of which are fitted with Renishaw spindle-mounted touch probes or tool setting systems. The probes were introduced in 2004, and the cost of each system was repaid in 2 or 3 jobs, simply through the elimination of expensive fixturing which prior to probing was needed to accurately locate parts relative to the machine’s co-ordinate system. Simple load-bearing clamps are now used to provide approximate positioning, with the Renishaw probe systems and software automatically measuring the position of key features in a matter of seconds and adjusting the co-ordinate system to prepare for machining.

Competitive advantages gained

Summing up, Mr Rowley has no doubts about the difference the REVO system will make. “This is new technology for us and took a change in thinking but, with the system up and running, we’ve transformed our inspection capacity and capability. We’re ahead of the game and have a clear advantage.”