SGS Carbide Tool (UK) Ltd
10 Ashville Way
Wokingham
Berkshire
RG41 2PL

Tel: 01189 795200
Fax: 01189 795292
www.sgstool.com

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SGS composite tooling improves efficiency and extends tool life at T&R Precision

Aware of the growth of carbon fibre reinforced plastics (CFRP) within the aerospace industry, T&R Precision Engineering implemented a plan to further develop its composite machining capabilities to complement its existing hard metal/high speed aluminium machining facility. Initiated in 2012, the plan involved establishing and developing a proven subcontract supply chain for complex 5-axis non-metallic machining supported by advanced solid carbide cutting tool specialist, SGS Tool.

Based in Colne, Lancashire, T&R Precision Engineering is a privately-owned precision machining company providing finished components, kits of parts and sub-assemblies to the civil and defence aerospace industries. Accredited quality approvals held by the company include BSI ISO 9001:2008 AS EN 9100 REV C, with customer approvals gained from BAE Systems, Airbus UK and Aircelle (SAFRAN).

Its goal is to provide an efficient, cost-effective manufacturing facility for its customers. Constantly looking towards the future the company is committed to staff training and an on-going apprentice programme. “We recognise that good training is crucial to the future of the industry,” explains Quality and Business Development Manager, Jason McQuillan. With a highly skilled workforce of over 60, T&R Precision continues to increase the range of skills embodied within the company, paying particular emphasis to lean manufacturing techniques and continuous improvement methodology.

The shopfloor is currently equipped with a total of 24 advanced CNC machine tools. With the growth of exotic materials within the aerospace industry the company has further developed its hard metal machining capabilities, and new machines provide production and development support for complex titanium and Inconel components.

Expansion and investment during the past two years has seen the installation of six of the latest Mazak machine tools, ranging from 5-axis Variaxis simultaneous machining centres to 9-axis ‘done-in-one’ Integrex machines.

Following its done-in-one philosophy, T&R Precision Engineering’s composites division invested in a High Speed 5 axis CMS Antares machining centre equipped with a Renishaw Optical Inspection Probe system and MSP Metrology NC Perfect Part software. As Jason McQuillan says: “The overriding objective of T&R Composites is to provide a first class, precision machining service that is flexible, responsive and targeted at its customers’ needs, and the 5-axis CMS Antares helps to addresses these goals.”

One of the contracted composite components being machined on the CMS is for an aerospace defence customer. Five slots are machined into the 600x100x100 mm raw composite part, and a number of accurate counter-sunk and counter-bored holes are also required. This was originally done using standard ‘jobber’ drills and FGR fibreglass router tools. However, the drills had a very poor tool life, resulting in delamination of the component when the drill lost its sharpness, and the routers were very slow making the process unproductive.

SGS Carbide Tool’s Northern Area Sales Manager, Tony Theaker, approached T&R Composites with a solution. He suggested using an SGS Series 120 8-facet drill and the Series 20 CCR (Carbon Composite Routers) for the efficient profiling of the slots.

In place of the chain drilling operation followed by the FGR tool creating the slots, Tony Theaker suggested ramping in with the CCR and profiling out at full depth of cut using the flute length. SGS is a member of the National Composite Centre (NCC), near Bristol, and he took one of the components there to perform full cutting evaluation trials using the centre’s facilities.

He recalls: “The part was machined there using the new method with staff from T&R Composites watching, and significant cycle time savings were achieved. Following the successful trial run the component was loaded on to the CMS machine. Here, a pilot hole is drilled first because the vacuum system used to extract swarf operates more efficiently. Otherwise all the swarf created

by the ramping in before breaking through the component has nowhere to go. It does not take much extra time and improves swarf management."

Prior to the application of the Series 120 8-facteted drills the operation required a spot drill followed by peck drilling with the jobber drill. Now the hole quality is better and tool life is no longer a concern; the SGS Di-Namite crystalline diamond coated 8-facet drill has been running since October 2012, and is still loaded in the machine. The old jobber drills had to be replaced every few days and worn drills caused delamination. "When you look at the diamond coated tool, you initially think that's expensive. But it is not, when you consider the increased tool life," states Jason McQuillan.

Machine programming is done using Delcam and Gibbs CAD/CAM software, providing full Catia V5 compatibility. The software creates a fully integrated environment, from the customer model to the Faro Power Gauge 3D CMM inspection arm. All measuring is done using the Faro Arm, and the quality and surface finish has dramatically improved since the introduction of the SGS composite cutting tools.

The overall cycle time has been decreased by 50 per cent with further time savings available from rationalising tool changing operations. The contract is to produce 20 parts per month, so any cycle time saving is multiplied. The SGS composite tooling and the methods are now being applied to other components, saving cycle time, tool cost and improving quality.

Jason McQuillan concludes: "The technical challenges and service demands conspire to test the specialist machining skills and management capabilities of any precision engineering business operating in a globally competitive environment. With the support of knowledgeable partners such as SGS Carbide Tool, we can offer 5-axis complex feature machining in metallic and non-metallic materials, even against these pressures."

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Note to Editors

SGS Carbide Tool is a premier manufacturer of high performance, precision solid carbide rotary cutting tools, with a metric and an imperial inventory of over 16,000 items, plus an industry leading bespoke special tooling service to meet customer specific requirements. Headquartered in Ohio, USA, SGS has a 25,000 ft^2 European headquarters and manufacturing facility in Wokingham, UK.
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On behalf of:
SGS Carbide Tool (UK) Ltd
10 Ashville Way
Wokingham
Berkshire
RG41 2PL
Tel: 01189 795200

alanp@sgstool.co.uk
www.sgstool.com

Contact:

Alan Pearce

Issued by:
Complete PR Limited
14 Wickham Close
Newington
Sittingbourne
Kent ME9 7NT
Tel: 0203 289 7515

simon@complete-pr.co.uk

Contact:

Simon Simmons