

# Tomorrow's materials today

Delcam recently staged a seminar on composite product development at its Birmingham HQ where a number of experts presented their latest innovations. Steed Webzell listened in

The exceptional strength-to-weight ratio of carbon fibre composite has ensured its evolution into the material of choice for a growing number of applications, predominantly in the aerospace and motorsport industries.

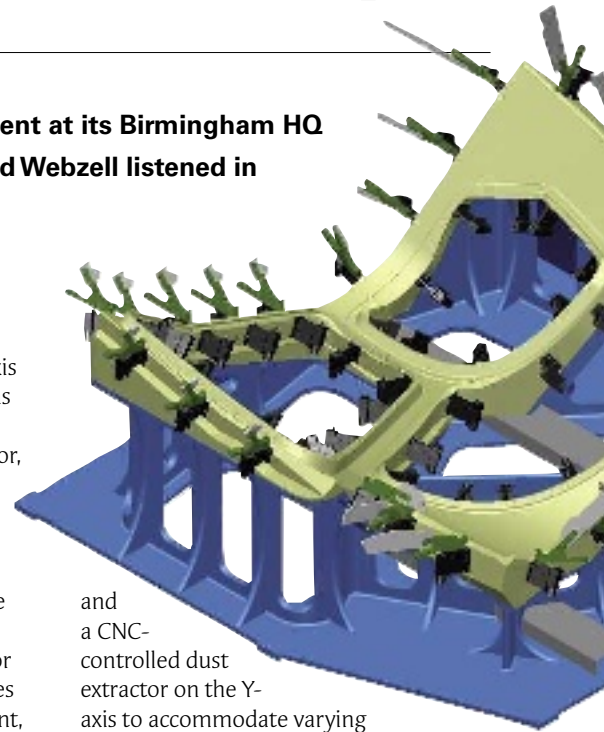
However, this innovative material poses a number of manufacturing challenges for those more familiar with processing conventional metal or plastic components. The Delcam-hosted seminar provided around 70 delegates with the opportunity to learn about them.

Graeme Cartwright, the sales manager of CMS Group (UK), talked in detail about the strides his company has made in recent years to develop machines capable

of handling composites.

CMS now has a range of 3- and 5-axis machining centres suited to applications such as machining carbon fibre honeycomb parts in the aerospace sector, body and interior automotive components, sports equipment, as well as a variety of machining tasks in the marine industry, such as producing mould and plugs for yacht hulls and the trimming and chamfering of decks.

Special features of CMS machines for composite machining include enclosures designed for dust and noise containment, high level electrical protection against carbon fibre dust, special vision panels to protect against carbon fibre dust abrasion



and a CNC-controlled dust extractor on the Y-axis to accommodate varying lengths of cutting tools.

UK customers using CMS technology for composites machining include Lola Composites, Brookhouse, the Advanced Composites Group, Atlas Composites and WJ Todd.

## TECHNOLOGY AT WORK

The very nature of carbon fibre composite materials results in the generation of high cutting forces when undertaking machining operations which can lead to delamination. To overcome this difficulty, SGS Carbide Tool has been working on a new development in partnership with Boeing in the US.

With over 600 orders confirmed for its 787 Dreamliner, Boeing needed to increase its efficiency when machining the large number of composite components present in the new aircraft. Prior to developing the new Series 20-CCR solid carbide cutter with SGS Carbide, Boeing had been using helical



Left – machining composites at Delcam, Birmingham: Above – fixtured composite parts

## Material world

Other speakers at the Delcam event included Andy Smith, composite research engineer at the Composites and Advanced Materials and Technology Centre. CAMTeC is a new initiative flowing from the collaboration between the University of Sheffield and Boeing that operates under the umbrella of the Advanced Manufacturing Research Centre (AMRC).

CAMTeC is expected to create a range of commercial openings for partner companies and becomes the UK's fifth centre of excellence for composites research; the other four being the Northwest Composites Centre in Manchester, the NDT Validation Centre at Port Talbot, GKN's Aerospace Composites Research Centre on the Isle of Wight and the Airbus Composites Development Centre at Filton.

Also speaking at the seminar was director of the National Composites Network (NCN) Ajay Kapadia. According to Mr Kapadia, the UK composites market already supports 20,000 employees and turns over £800 million in finished parts, 40 per cent of which are exported into a global market worth £25 billion.

The NCN ([www.ncn-uk.co.uk](http://www.ncn-uk.co.uk)) is a government-funded initiative designed to stimulate business growth and is three years into a five-year, £30 million strategy.

milling cutters normally used for metal parts, but these often caused problems such as fibre breakout, delamination and excessive tool wear.

The new Series 20-CCR is a 12-flute range of routers for machining composite materials that overcomes these issues and provides a better cut edge. It is essentially an end cutter and profiling tool that will also plunge to produce holes and pockets. The secret behind its success lies in the very shallow helix which reduces the cutting forces that lead to delamination. The 20-CCR is patented and SGS is licensed to produce the cutter. David Cawkwell, the company's UK sales manager revealed that the Vodafone McLaren Mercedes Formula One team is currently testing the cutter, while Airbus and BAE Systems are also interested.

Delcam has itself been actively involved in the composites market for a number of years. Delcam's software for pattern makers has a number of synergies with composites and many of its latest developments are based on these routines.

For example, Delcam pattern making functionality such as wire cutting of foam

can get rid of huge quantities of bulk material. The result is massive time savings for roughing operations. Delcam's PowerMill can also be used for paste deposition on foam patterns, where the spindle of a milling machine is loaded with a paste gun and used to add material before it is machined away again for a smooth finish.

### ON MACHINE VERIFICATION

Peter Dickin, Delcam's marketing manager, also pointed to the company's on-machine verification (OMV) routines in PowerInspect as helpful when machining composites. This is largely because these materials can distort or shrink under cutting force; OMV can identify out-of-tolerance features on a first-off and generate another toolpath to compensate. This can be done over a number of passes, with the resulting toolpaths 'merging' each time to create an

optimum final toolpath.

Mr Dickin said that Delcam customers in the composites area include the Team Roberts Moto GP team, which is using PowerMill to drill and trim composite parts, and Coventry-based Visioneering, which used PowerMill to produce the carbon-fibre-reinforced body and under-floor for the record-breaking JCB Dieselmax car (picture, below).

Delcam has also successfully transferred technology from its Crispin CAD/CAM product for shoemakers to the composites sector where it can be used to 'unwrap' 3D CAD models into 2D shapes for tape laying.

Tape laying and fibre placement are central to the production of composite parts and it is in these two areas that MAG Cincinnati is already successful.

Offering what MAG Cincinnati's European sales manager Julian Frankland calls "machine tools of the future", material lay-up rates can be increased to more than 60 kg/hour using automated methods compared to lay-up rates of around 1.5 kg/hour for manual methods.

Automation also offers the ability to condense several parts into a single, more cost-effective component. The front end of a fuselage produced by Raytheon was recently reduced from a staggering 3,400 different parts into just one, using a MAG-Cincinnati automated solution.

The company has sold 51 flat/contour tape layers worldwide, including 21 to Boeing. Bombardier in Belfast is one of the few UK customers to date: the company's Global Express machine runs around the clock producing horizontal and vertical stabilisers. □

