

## Moving up a gear

Auckland-based Cubed3 has swept into the market with a range of gearboxes and CNC machined products being used for everything from aerospace to America's Cup yachts.

A premium machine tool for a premium product is the basis of the successful partnership between Cubed3 and DMG/Mori Seiki.

Cubed3 designs and manufactures innovative gearboxes and CNC machined products for a versatile range of industries.

At the forefront of product design, the company creates an assortment and combination of gearboxes including bevel, planetary, helical and worm gearboxes. The business has two core markets – the marine industry and industrial applications.

Cubed3 offers a complete solution to worldwide customers where projects often start with the highly skilled design team for conceptual exploration and detailed design.

Once a design is complete the manufacturing team take over.

The manufacturing team specialises in the manufacture of prototypes and testing of products right through to full manufacturing.

Company owners Stephen and Kate Horsfall are enjoying high demand for their products and are proud to be at the forefront of an increasingly technical field. "We are dedicated to becoming a world leader in the design and manufacture of

gearboxes and CNC machined products and therefore need to be using the best available solutions," says Mr Horsfall. Cubed3 took delivery of its new DMG five-axis machining centre in August last year after visiting the DMG/Mori Seiki stand at Austech, the Australian CNC machine tool fair in Melbourne.

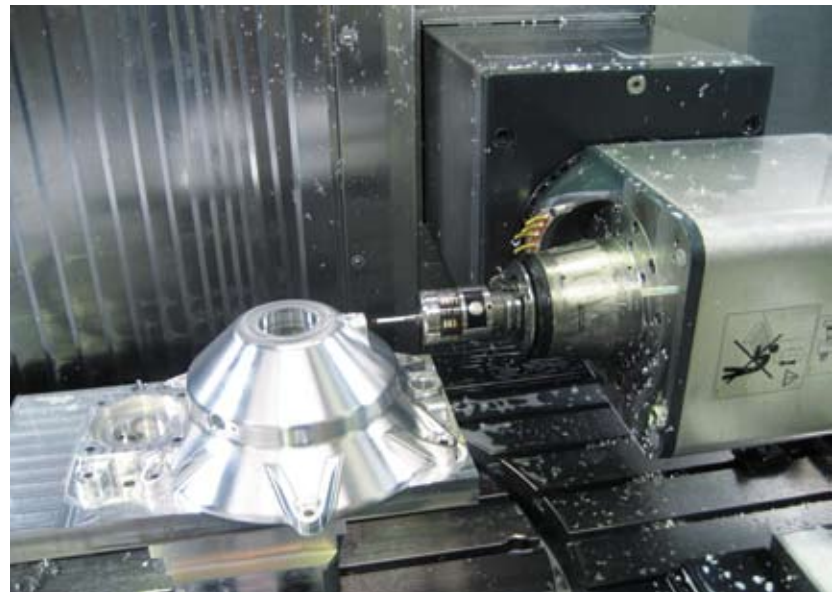
Managing director Stephen Horsfall and his wife and business partner Kate identified the need for a flexible and modern CNC machining centre to suit their rapidly growing business.

After seeing the capabilities of the DMF180 in person an order was placed with Ben Heywood, the DMG/Mori Seiki area sales manager.

Increased demand has led to recent investment in top class machine tools and CAM software.

"We researched the market thoroughly and are delighted with the combination of our DMG five-axis machine and Delcam's PowerMILL CAM software," says Mr Horsfall.

Ease of programming and reliable toolpaths were key requirements for Cubed3 in selecting a CAM solution.



*The flexibility of the DMF180 was a key factor in Cubed3 machine selection as it would be required to perform a diverse range of functions from product development through to lights out machining. Ease of programming and reliable toolpaths were instrumental in the choice of a CAM solution with Delcam's PowerMILL*

"We needed the CAM software to be intuitive, easy to learn and reliable. We are very happy with PowerMILL," he says. The flexibility of the DMF180 was a key factor in machine selection as it would be required to perform a diverse range of functions from product development through to "lights out machining". With a travel of X 1800mm, Y 700mm and Z 700mm, Mr Horsfall could immediately see the benefits of the large

stationery table measuring 2100mm x 700mm with the integrated round C axis table in the centre for his changeable and demanding workload.

"During the day I can machine large gearbox housings from huge billets and then run lights out at night with multiple small parts mounted vertically on a tombstone fixture on the integrated C axis table as you would on a horizontal machining centre", he says.

## The best to run the best and produce the best

The 2012 version of Delcam's PowerMILL CAM system for high-speed and five-axis machining includes a number of new strategies, together with more general enhancements to make programming faster and machining more efficient with the best-possible surface finish.

The most important new option is flowline machining. With flowline machining, the toolpath is divided between a pair of drive curves in a constant number of passes, rather than having a varying number of passes with a constant

stepover.

The toolpath will have its start and end passes on the drive curves, with the intermediate passes blending between them.

This approach gives smoother results since it ensures that each pass travels over the full length of the area, rather than leaving the part or making major changes in direction during the pass. It produces a better surface finish on the part and minimises wear on the cutter and the machine tool.

Flowline machining can be applied across

part of a surface, across a complete single surface or across multiple surfaces. In addition, intermediate curves can be added between the boundaries of the area to give even greater control over the toolpaths. These might be needed for particularly complex fillets or when machining gently-curved surfaces to a smooth finish.

Another important new option in PowerMILL 2012 is the ability to control the angular point distribution during five-axis machining.

This option can be used to keep the machine tool moving smoothly when there is rapid angular change in one of the rotary axes of the machine tool. The problem occurs mainly when moving around sharp corners but is also important when the

machine is operating near a vertical tool axis.

If the machine tool is near the gimbal lock position, small movements in the tool-axis vector can result in large movements in one of the axes.

In both examples, smoother tool-axis changes can be achieved by increasing the density of the points in these areas. The user can specify the maximum angle that the tool axis can move between points. Extra points are inserted automatically to ensure the specified maximum angle is not exceeded.

*Full details, including videos demonstrating the new functionality, can be seen on [www.delcam.tv/pm2012/lz](http://www.delcam.tv/pm2012/lz)*

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"I looked at other machines but none could come close to the DMF 180's large useable machining envelope combined with a +/- 100 degree swiveling B axis head.

"Even with the swiveling B axis head at 90 degrees I still have full useable Z and Y axis travel of 700mm – long tool overhangs and deep hole drilling are no problem".

The DMF180 excels in both heavy and high accuracy machining due to an extremely stable foundation made of polymer concrete.

The huge machine base is a mineral casting made of polymer concrete which is

extremely dense, thermally stable and will not twist or bend.

Polymer concrete absorbs vibration up to 10 times better than cast iron and is less influenced by fluctuation in workshop temperatures.

"The proven effects are a reduction of natural frequencies, quick abating of frequencies, reduction on noise emissions and an improvement in the work piece surface finish and increased cutting tool life of up to 30 percent", Mr Heywood says.

"It's also ecologically friendly as the mineral casting process uses 30 percent less primary energy when compared with

cast iron – and the polymer concrete is recyclable".

The travelling column achieves 40m per minute in the X, Y and Z axis on large 45mm guide ways. A closed loop measuring system with glass scales maintains 0.01mm positional accuracy anywhere in the machining envelope.

Short "chip to chip" times are achieved by fixing the tool magazine to the travelling column so there is no waiting for the machine to return to a home position to perform tool changes.

The oil/air lubricated spindle exceeds Mr Horsfall's requirements for both large diameter roughing with 100Nm of torque, and high-speed machining in aluminum with 14,000RPM.

This spindle is also equipped with through-spindle coolant and air changeable via M code – a stand-alone coolant tank handles the 600 litres of coolant and keeps it in good condition with 50 micron paper filtration.

To further assist Cubed3 with quick set up and maintained accuracy in a production environment the machine was equipped with touch probe, laser tool setting, 3D Quick set and a 3D model for integration into the CAD system.

The Blum laser will measure tool length and diameter in seconds to micron accuracy saving huge amounts of time in set up.

"We also utilise the laser for tool breakage and wear detection when machining critical parts," Mr Horsfall says.

"Parameters for tool wear/breakage are easily set by the operator and new tools can be selected from the magazine or machine stopped if they fall outside my preset tolerances preventing scrap components being machined".

To further maintain accuracy, five-axis DMG machines are supplied with hardware and software for checking and calibrating the kinematics of the machine. "The machine kinematics can be checked and automatically adjusted by the operator running a simple measuring cycle which takes less than a couple of minutes to complete," says Mr Heywood.

In the past this was a time consuming job for a skilled engineer – DMG have eliminated the need for an engineer to call and the downtime which would be required". As many of Cubed3's clients are at the cutting edge of their respective industries such as aerospace and international marine, the company looked to partner with a machine-tool supplier which reflected these same values of quality design and technology.

"We support Cubed3 to achieve its goals and the company supports us in return – an order for CTX510 eco-CNC lathe has since been placed and will be exhibited at EMEX in May before delivery to Cubed3". "Another DMF180 will be on display at EMEX this year, so please visit EMEX in May and see this machine in action," says Mr Heywood.

## DMF Series - Travelling Column Machining Centres

- **Large working area** – 1,800mm, 2,600mm or 3,600mm in X  
700mm or 1,100mm in Y
- **Symmetrical travelling column** – high stability and accuracy
- **Connected tool magazine** – for short chip-to-chip-time
- Standard machine with **ball screw drives** – 40 m/min rapid traverse, 4m/s<sup>2</sup>
- Dynamic option with **linear drive in X-axis**  
80 m/min rapid traverse, 8m/s<sup>2</sup>
- Spindle as vertical or B-axis head
- Rigid table with integrated C-axis
- C-axis option Mill Turn table up to 1,000rpm



See the DMF180 in action at booth 4036



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