

## WORLD LEADING COMPOSITE MANUFACTURING PROCESS



Geelong's **Sykes** Racing and Carbon Revolution are two global leaders in composites. Together, they are collaborating with Deakin University to develop a tool for predicting part failure during resin cooling, a critical issue for the US\$72.6 billion global composites industry.



### How the Growth Centre helped:

**The Advanced Manufacturing Growth Centre has contributed \$80,000 in co-funding for this project. The scientific project manager calls AMGC's support for this and other projects important for Australian manufacturing which employs over a tenth of the country's workforce.<sup>1</sup>**

### What's changed:

Sykes and Carbon Revolution will produce better, cheaper parts more quickly. The companies estimate an extra \$4 million to \$5 million in additional annual revenues could be a result, as well as production costs reduced by a tenth and five to ten new jobs created. Both companies will own the IP for the new software.

### Success story overview

Sykes Racing and Carbon Revolution are two Geelong-based manufacturers who have led the world in adopting composite materials for their respective industries. Seeking to maintain competitive advantages over their rivals, the two are collaborating with Deakin University and others to develop a tool to model part failure and to develop advanced production processes based on this unique technology.

Sykes was established in 1966 and has had its rowing boats used in numerous Olympics and world championship events. It was among the first to use composites in boatbuilding which it started in the late 1980s working with Kevlar®, carbon fibre and Nomex® honeycomb.

Carbon Revolution is the world's only maker of one-piece carbon composite wheels, and has its origins in Deakin University's 2004 Formula SAE team. Its successes include supplying the Ford Shelby Mustang GT350R and this year being named strategic partner for the Ferrari Pista 488.

Composite materials are increasingly popular due to their strength and weight advantages over metals. However, everyone using them has to deal with inherent issues as a resin matrix cools.

**“The resin shrinks during cure but the fibre doesn't causing problems with the final product,”** explains Professor Russell Varley.



“The resin sticks to the fibre causing the composite to warp after processing which impacts its properties and long term behaviour and is related to the chemistry and physics during cure.”

Ultimately, this can cause cracking and the need for rework, which is time consuming and expensive, requiring extensive filling, sanding and recoating.

The software-based solution under development will move from Technology Readiness Level (TRL) 4 to TRL 7 over the project. This world-first solution will numerically model material system interactions, leading to better production processes.

“The real modelling challenge is in understanding the resin shrinkage and how to control that,” explains Prof Varley.

“That is the hard part, because it requires a knowledge of chemistry and materials science.”

A successful project would deliver technical superiority for both manufacturers in the fast-growing global composites market. Markets and Markets research expect the sector will see compound annual growth of 8.13 per cent from 2017 - 2022, reaching \$US 115.45 billion.<sup>2</sup>

The project contains five parts. This includes analysing and understanding system behaviour, simulation of this using numerical modelling, fabricating a part in a lab, comparing failures to modelling, and developing new manufacturing protocols based on results.

Successful completion of this project will build on Geelong’s standing as a region with world leading expertise in composite materials.<sup>3</sup> Prof Varley, says it is exciting to be working among such innovative research and industrial activity.

“Carbon Rev, Quickstep and Sykes and a host of new companies just getting started in the region, all doing some really exciting work. It is inspiring. The opportunity to play a role in supporting the growth of these companies from a Deakin perspective and a personal perspective is just fantastic.”

Of the Advanced Manufacturing Growth Centre, which contributed \$80,000 in co-funding for the collaborative project, Varley says they were essential to this project getting off the ground.

“We are really grateful and fortunate that we have got an organization that sees the value of supporting manufacturing research in Australia,” he says.

“And we still think it’s important, because this is where jobs are still going to come from, and, for me personally, it shows Australia still cares about making stuff. And I think that is important. We are really lucky to have the AMGC.”

<sup>2</sup> <https://www.marketsandmarkets.com/PressReleases/composite.asp>

<sup>3</sup> <https://www.compositesaustralia.com.au/birth-of-australian-made-carbon-fibre-industry/>