

CARBON COMPOSITE CYCLE WHEELS



Partington Advanced Engineering (formerly 36T) is a company using sophisticated digital modelling and a novel, patented multi-material architecture to create the world's best bicycle wheels. Founder Jonathan Partington has taken his concept from PhD research to manufacturing readiness level (MRL) 3 as part of a six-month project providing a much-needed boost in developing tooling, automated processes, and other final steps needed to get to market.



How the Growth Centre helped

The project was supported by a \$175,000 co-funded program from the AMGC. Partington praises the role of the AMGC in supporting what is an expensive and difficult prospect for a start-up: preparing to begin high-tech manufacturing of a highly complex product.

What's changed?

The project will move manufacture of multi-material wheels from MRL 3 to MRL 8, with validated off-tool samples and commencement of low-volume production. The company will also rebrand for its product launch. Achieving its medium-term targets will create an estimated 13 fulltime roles and an additional five to 10 jobs within the supply chain.

Success story overview

36T was founded in 2014 by long-time automotive engineer and Deakin PhD student Jonathan Partington.

Partington began his career in the UK straight after finishing high school, progressing through to technology roles at motorsport companies including Le Mans Prototype. After moving to Australia in 2009 and working for two years at Ford Australia, he enrolled at Deakin University. Research on advanced composites led him to prototype a bicycle wheel based on his "multi-material architecture" approach, and patenting this.

This involves using digital design techniques, such as computer-aided engineering and finite element analysis, to create structures marrying the best aspects of different advanced materials.

Applying this approach enables a high-performance, premium wheel for professional or affluent cyclists, offering a 30 per cent weight saving and other advantages against comparable wheels made by the category's market leader, Meilenstein Lightweight.

The multi-material design combines carbon fibre composites with other advanced materials. Carbon fibre composites are typically characterised as being light and strong, but have certain engineering drawbacks. These composites are often used as a direct substitute for metals, such as in bike wheels, but there is a better way.

“Material substitution is not necessarily the most appropriate route to utilise composites,” explains Partington.

“They're got very different qualities to metals and they process very differently. They have different strengths and weaknesses to metals. The whole design needs to be sympathetic to these characteristics. This drove a design mentality to... review the whole portfolio of materials from very conventional materials to advanced materials to everything in between.”



The product has been assembled by hand, though the start-up is preparing to take production out of the garage, translate it into an industrialised form, and target the export market.

Partington is collaborating with participants including Deakin University, materials supplier TedTex and tooling specialist Plastool International on the 24-week project, which will move the Manufacturing Readiness Level from 3 to 8.

Tooling design dedicated manufacturing cells will be developed, along with processes and SOP documentation.

The final stage of the project will culminate with validation of off-tool samples, as well as a rebrand of the company, which will become known as Partington Advanced Engineering, for the product launch.

A target of 4,000 units annually has been set for 2020, with export via a strategic international distribution partnerships, covering North American, European and Asian Markets. Australia's Baum Cycles and Bastion Cycles have signed MoUs to purchase wheels.

The target represents revenues of \$12 to \$15 million and will see 13 fulltime roles created at the wheel manufacturer, plus five to 10 jobs within its supply chain.

As technology matures, Partington believes it will be broadly applicable in other markets, such as automotive and defence. The most obvious market for the multi-materials architecture would be in automotive underbody components, where it would be a good match for demands around geometric complexity, resilience and structural strength, believes Partington.



He says the Advanced Manufacturing Growth Centre's support has been valuable, with high-technology manufacturing a daunting, capital-intensive exercise for a promising start-up.

“To commission a facility, capable of manufacturing and developing these advanced structures in advanced composite materials, you'd be hard pushed or it would just be impossible to do it independently,” he says, shortly before the company's move into the ManuFutures hub at Deakin's Waurin Pondscampus.

“The AMGC have made a generous contribution, and we have more than matched that, and it became a much more viable prospect. To be associated and collaborate with someone such as the AMGC also validates what I'm doing and offers invaluable support.”

Contact us

www.amgc.org.au



@AMGC_Ltd



Advanced Manufacturing Growth Centre Ltd



AMGC_Ltd