AMGC
ADVANCED MANUFACTURING GROWTH CENTRE LTD

CURING TECHNOLOGY

Quickstep

Quickstep is a carbon fibre composite parts manufacturer established in 2001 to commercialise an out-of-autoclave curing process, now named Qure. This collaborative project progresses Qure via Quickstep, four other manufacturers and three university teams. The aim of this two-year, $2.78 million effort will be to formulate production technology ready to supply parts to major aerospace manufacturers.

How the Growth Centre helped?

The Advanced Manufacturing Growth Centre has contributed $700,000 in co-funding.
This investment builds on a previous AMGC-supported project to develop Qure and associated production methods for automotive fenders.

What's changed?

The new generation of Qure, called AeroQure, will move from Technology Readiness Level (TRL) 3 to TRL 7.
The project will require up to three new engineers, and five current engineers will be upskilled. A future commercial contract is estimated to require between three and ten new operators.

Success story overview

According to legend, the "Eureka moment" dates back to a moment of revelation when Archimedes stepped into a bath[1]. The origins of Quickstep's creation goes back to an inventor in a similar situation[2].

Instead of curing composites in a pressurised oven, thought Neil Graham in 1994, this could be done by bathing them in a fluid, which was originally water.

1 https://www.scientificamerican.com/article/fact-or-fiction-archimede/

2 https://www.abc.net.au/radionational/programs/scienceshow/new-method-for-making-composite-materials/3265988#transcript

Fluid in a bladder heats and cools parts in a mould configuration that has been likened to a clamshell.

This approach has long offered promise in disrupting autoclave curing, which is time and energy-intensive[3]. A capability to make large, complex parts, quicker, cheaper and with lower pressure and energy has obvious appeal.

"Aerospace companies are investing in technologies capable of shortening production cycles," explains David Doral, Chief Technical Officer & Head of Engineering at Quickstep.

"Because this technology has been in the making for a long time, it is very close to the maturity level required."

Quickstep manufactures at Bankstown, mainly for defence exports. It produces centre fuselage and tail components for the Joint Strike Fighter program, delivering its first part in 2012[4]. The company carries out R&D at the Waurn Ponds campus of Deakin University, which it has worked with since 2004. Numerous Deakin PhDs have improved Quickstep's curing process.

This project aims to develop Qure further, integrating it with other production technologies including robotics, automated fibre placement (AFP) and digitalisation, and bringing it closer to application in commercial aerospace. It builds on a previous AMGC-supported project, which successfully developed production cells for composite fenders[5].

"AeroQure" uses pressure of 2.5 bar. According to Quickstep initial tests show "equivalent performance to autoclave at 6.2 bar pressure" for internal and surface porosity[6].

"The core technology is the same. We manufacture parts and this technology is to cook, so to speak, in a much shorter and more economical way," adds Doral.

Quickstep is investing $1,136,000 in cash and $947,000 in-kind to develop AeroQure through this collaborative project.

Special Patterns and Marand Precision Engineering are combining to contribute expertise in areas including tooling design, layup trials and materials handling.

Germany's Netzsch Group will be paid up to $120,000 to deliver Industry 4.0 hardware, sensors and analytics.

Highlighting the complexity of this undertaking, three research institutes are handling different facets.

Deakin University's Carbon Nexus facility will investigate consumables required for the process. Swinburne University will contribute Industry 4.0 expertise, such as development of a "digital thread." The University of Southern Queensland's contribution is process monitoring and control.

A collaborator that has not yet been selected will lend expertise around Automated Fibre Placement.

It is expected the project will move AeroQure from Technology Readiness Level (TRL) 3 to TRL 7.

Further development will industrialise the process to satisfy increased production rates among commercial jet builders. Output of single-aisle planes, such as the Airbus A320 or Boeing 737, is currently close to 60 per month. Doral believes this could increase to 100. AeroQure could also have applicability in urban air mobility, part of Quickstep's diversification plans in 2024 and beyond[7].

"Right now there is no technology that can do this with high reliability, and we are aiming to get to that point," Doral says.

This project requires up to three new engineers, with five current workers to be upskilled. Between three and 10 jobs will be created in the first phase of a contract to deploy AeroQure.

Doral says AMGC's support includes sharing knowledge from other projects, connections with potential customers, and understanding the value of bold collaborative R&D projects. AMGC is contributing $700,000 in co-funding.

"The trust that they are putting in us is firstly in helping us develop the preceding technology, and now extending that," he shares.

"That shows a strategic vision in investing with us in a development that may take a few years to see its commercial end goal. It is not just about creating quick returns in six months, but a long strategy to develop a significant revenue source for Australian industry in global aerospace."

3 https://www.sciencedaily.com/releases/2001/04/010424073249.htm

4 https://www.australiandefence.com.au/news/quickstep-completes-first-production-parts-for-jsf

5 https://www.amgc.org.au/wp-content/uploads/2018/10/Quickstep-Project-Profile.pdf

6 https://www.quickstep.com.au/qure/

7 https://www.asx.com.au/asxpdf/20191121/pdf/44bt2qs554w1bb.pdf