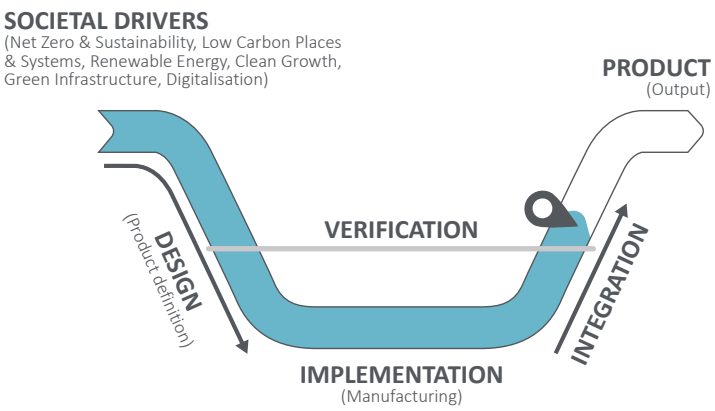
Automating and digitalising the inspection process of composite materials



CHALLENGE

Despite their numerous advantages compared to traditional materials, carbon fibre composites still have challenges associated with their efficient and defect-free manufacture.

In particular, the black and shiny nature of the composite surfaces make both manual and automated inspection of both raw materials and completed cured parts difficult. Commonly used in aircraft wings, fuselage, tail surfaces and doors, polarisation imaging is used in this scenario to detect surface roughness, scratches, dents, surface coatings and stress to composite materials.

RESULTS AND THE DIGITAL OPPORTUNITY

Facilitated by DETI, a novel software system has been developed which is based on state-of-the-art Machine Learning (ML) techniques. ML is the application of Artificial Intelligence (AI) that enables systems to access data and automatically learn and improve for themselves without being programmed. The system that has been developed is able to automatically detect the (manually induced) defects, as shown by the rectangles.

The image below (left) shows a polarisation image of a defected component – that is, an image emphasising the effects on surface structure on the nature of light reflected towards the camera. The defected regions are clearly more visible compared to the standard image (right).

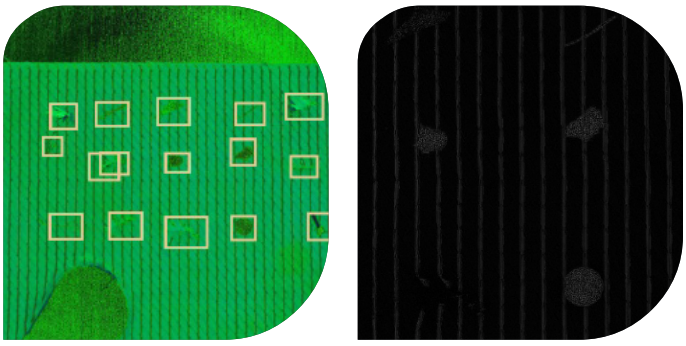


Figure: Polarisation of a fabricated defect component compared to a standard image

The next stages of the project will involve the optimisation of this approach to detect real defects and the incorporation of the moving-light scanner to detect more subtle and hard to detect issues with the material.

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