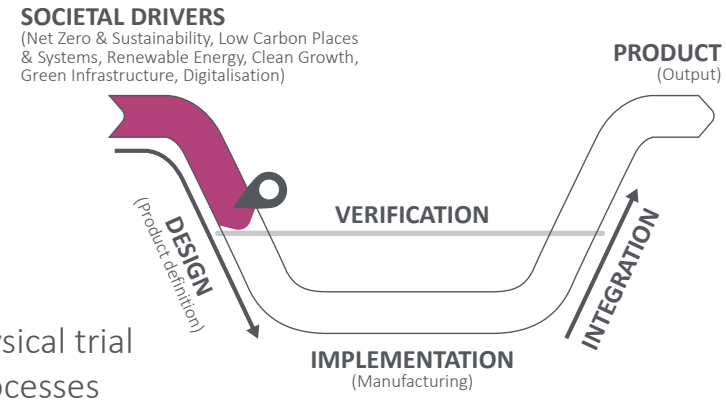
Driving sustainable prototyping **with digital technology**



CHALLENGE

A physical prototype is a working model of a product, which can be used to perform a physical trial to validate the design and manufacturing processes prior to investing in full scale manufacture.

Physical trials help to understand the number of variables in the manufacturing process, which need to be controlled to make the right product. As we introduce new, sustainable materials or lower energy processes, continuing with a more traditional physical trial approach to understand the variables and develop the manufacturing process will become more wasteful. The use of advanced simulation, data driven decisions and digital technologies in manufacturing processes will reduce physical trials, developing a 'right first time every time' approach, generating less waste and environmental impact.

This is particularly true in sectors where composite parts are commonly used; aerospace, automotive, marine and construction sectors, to name but a few. As the number of products being made from composites is significantly increasing, a change to traditional physical prototyping processes is required. Composites are viewed as a solution to achieving net zero targets due to their light weight which will reduce emissions, and offer flexibility in design, and high-performance strength and durability. Known for their longevity, they hold up well against fatigue, corrosion, and are resistant to many environmental factors such as UV, temperature, chemical and moisture exposure.

RESULTS AND THE DIGITAL OPPORTUNITY

DETI has successfully trialled a digital system that monitors the application of a composite resin when injected into the manufacturing mould of a product, designed to produce 'right time first time' products and prototypes.

The system focuses on providing the engineer with a digital tool that will aid monitoring and controlling resin distribution. The use of digital technology in this process will enable informed decisions to be made, increasing the effectiveness and outcome of the process. This is crucial to producing a high quality, fault free product. Referred to as Liquid Resin Infusion (LRI), this manufacturing technique produces high performance composites, for use in sectors where lightweighting, strength and durability are key.

Consisting of a series of sensors which are placed inside the mould, the system allows the engineer to view the movement of the resin through the mould using a visual dashboard, gathering the data relating to the process. As this type of composite is cured in high temperature ovens, the system also gives the engineer crucial visibility into the process which allows them to make interventions when required, supporting and enhancing operations delivered.

This is the first time in industry that this type of sensor has been used in a 4G network, allowing the data to be displayed on an app accessible from any device, enabling more flexibility in analysing, processing and integrating the data.

Incorporating digital technologies into manufacturing process development will help to refine and validate composite designs requiring less prototypes to be made, reducing the amount of waste produced, and a better outcome for the environment.

This project builds off the earlier partnership between NCC and CFMS from the Computer Learning in Automated Manufacturing (CLAMPS) project.

Partners

NATIONAL COMPOSITES CENTRE

cfms