

Enabling Repair and Remanufacture through Digital Product Passports in High Integrity Sectors

Abstract

The transition to a circular economy in high integrity sectors such as aerospace, defence, energy and wind requires more than technical advances in repair and remanufacture. It demands a system level approach that combines process innovation, digital integration, business models, policy frameworks and workforce skills. The UKRI funded [ReMake Value Retention Centre](#) (RVRC), a £10.5 million national programme in the UK, is pioneering this integrated approach to overcome barriers to adoption and accelerate value retention at scale in high integrity sectors.

At the technology level, RVRC is advancing reconditioning processes such as cold spray repair, demanufacturing and in-line non-destructive testing, enabling the recovery of safety critical components to original or upgraded specification. However, without access to accurate lifecycle data, repair and remanufacture are frequently constrained by costly reverse engineering, uncertainty over material condition and the risk of obsolescence. To address this, the National Manufacturing Institute Scotland (NMIS) has created the UK's first ReMake Digital Product Passport (DPP), purpose-built to support repair and remanufacture. Aligned with the European Union's Ecodesign for Sustainable Products Regulation (ESPR), the ReMake DPP provides a unifying digital framework that supports not only advanced technologies, but also new business models, policy development and emerging standards. By integrating design, manufacturing, in-service and repair data, the ReMake DPP reduces uncertainty, accelerates certification and enables predictive inspection and remanufacture pathways.

This paper will present three industrial use cases where the ReMake DPP, in combination with advanced repair processes, business models and policy, creates practical pathways for returning products to service. These cover the remanufacture of an industrial compressor, recovery and reuse strategies for electronics, and predictive repair approaches in future aerospace applications.

The ReMake DPP provides the integrating mechanism through which RVRC connects technology development, business models, policy and standards into a coherent system for value retention. This integration takes remanufacture from isolated technical demonstrations into scalable, certifiable and commercially viable practice. Results have shown that the approach enables deployment closer to aftermarket operations, supports customers by providing approved parts with full traceability, and allows both OEMs and independent remanufacturers to monetise data through new service and warranty models.