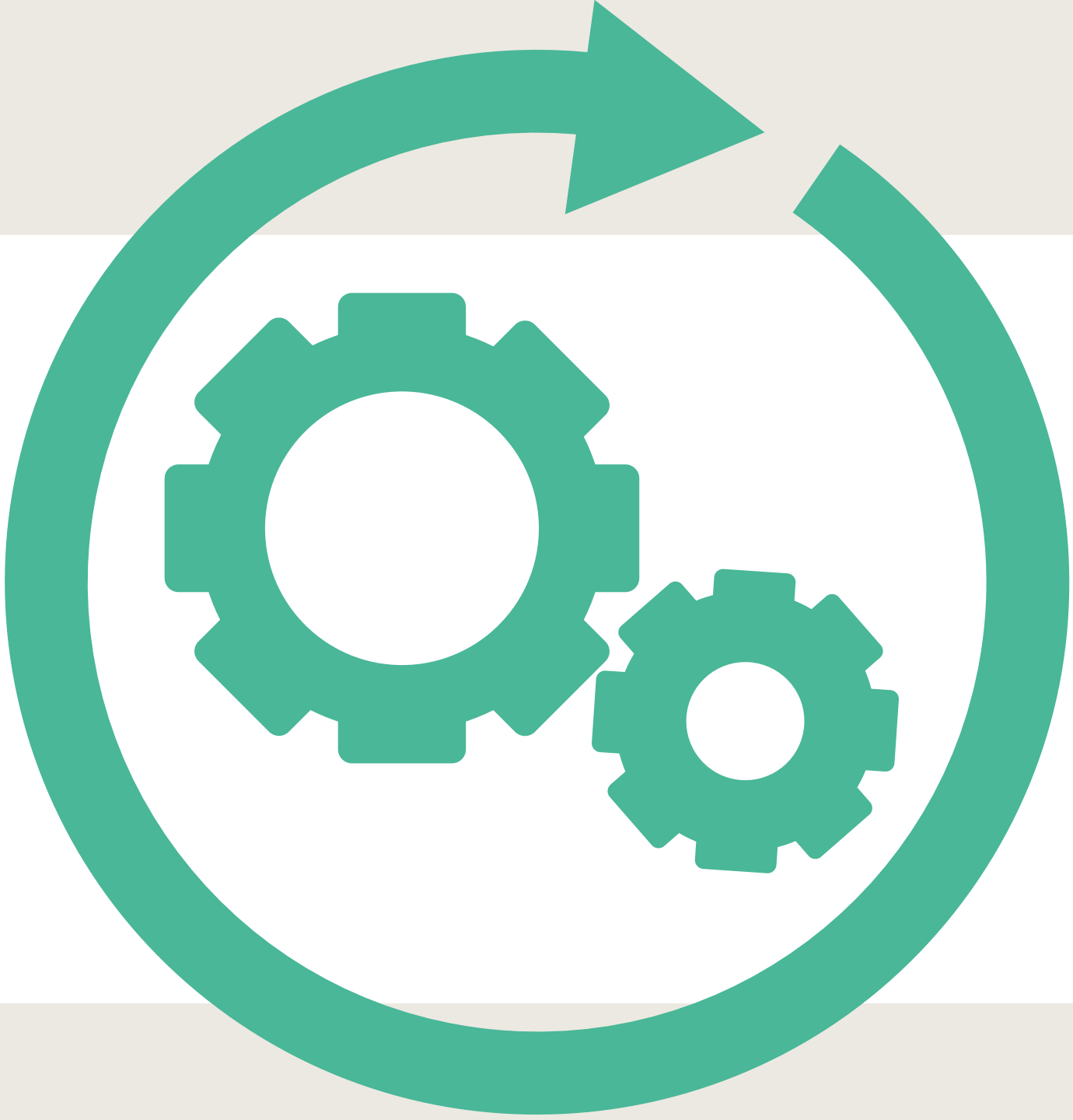
RDCR
Recycling.
Disassembly.
Circular materials.
Reuse.



Reuse

Advanced NDT

Investigate the application of composite non-destructive testing (NDT) techniques in novel or extreme environments

Description

- This project will look to determine and demonstrate how well-understood NDT techniques can be applied to novel or extreme environments
- This may include investigation into the automation or remote operation of NDT techniques
- Applications could include in-situ wind turbine blades, off shore oil and gas etc.

Background

- Composite NDT techniques are well understood, however they are predominantly performed by hand and in controlled environments
- NDT is primarily used to detect manufacture defects, and is rarely used to recertify parts at end of life
- Remote/automated methods could allow hard-to-reach structures to be monitored

Objectives

- Assess pre-existing NDT techniques and determine which could work for end of life
- Identify methods with the potential for remote or automated operation
- Develop and prove the technology

Benefits

- Automation of NDT could lead to faster, more repeatable, and lower cost methods
- In-situ inspection could reduce/eliminate structure down-time or logistics issues
- Safer inspections due to remote nature

Life Span Modelling

Combine sensors with modelling techniques to accurately measure environmental impact and stresses in order to predict repair, remanufacture, maintenance, and reuse

Description

- This project will look to determine how sensors and modelling software can be used in combination to accurately quantify lifetime performance
- This could include modelling environmental impact and stresses
- It could also be used to predict end of life, maintenance, and necessary repairs

Background

- Composite modelling techniques are reasonably well understood and utilised during the design phase, however they are rarely implemented later on in the life cycle
- Consequently, predicted repair cycles, and environmental impacts aren't always accurate
- These inaccuracies can result in unnecessary costs, safety hazards, and incorrect data

Objectives

- Identify and assess the currently available modelling techniques
- Determine feasibility of integrating sensors and models
- Demonstrate the technology

Benefits

- Increased model accuracy, therefore increasingly accurate repair predictions
- Potential product life extensions
- More accurate reporting of data leading to increased safety and product understanding

Composite Repair

Investigate composite repair methods to enable increased part life, and reduce the need for part replacement

Description

- This project will look to investigate different composite repair methods with the aim of enabling part life extension
- This could include methods for repairing composites, or methods for repairing non-composite structures using composites
- It could also look to quantify post-repair performance

Background

- The need for composite repair methods exists in all sectors for structural, non-structural, composite, and non-composite applications
- Examples of composite repair techniques exist in the aerospace and construction industries, however there is a need for other sectors to learn from these examples and innovate horizontally

Objectives

- Evaluate academic and commercial landscape
- Develop and demonstrate cost effective repair technique for new applications
- Evaluate the repairs (performance, cost etc.)

Benefits

- Build on UK composite repair expertise
- Reduce the number of parts being scrapped prematurely
- Reduce costs by limiting part replacements
- Develop high cost, reliable repair methods

Sensor Technologies

Investigate the feasibility of incorporating or embedding sensor technologies into composite materials and structures

Description

- This project will look to develop how sensors can be incorporated into composites to allow real-time assessment of environmental stresses
- This could include identifying applications for sensor technologies, and methods for installing or removing sensors
- It could also look at how sensors can be used with digital twins and Industry 4.0

Background

- Products are assigned life spans during design at current
- Little is done during use to determine the effects of environmental stresses
- As a result, structures can be subjected to maintenance, or can be decommissioned prematurely resulting in unnecessary costs and time
- Smart sensors could allow manufacturers to reassess this

Objectives

- Identify sensors that could be used in composites
- Examine efficacy of using them with digital twins to monitor environmental stresses
- Demonstrate the technology

Benefits

- Accurate prediction of environmental stresses
- If used with digital twins, could allow more accurate modelling of stresses and wear
- Predict maintenance needs

Collaborative Design for Reuse

Work with the supply chain to develop toolsets and guidelines specifically to facilitate design for reuse

Description

- This project will look to develop a set of tools and guidelines that can be used to enable collaborative design for reuse
- This could include devising methods to link the supply chain, enabling designers of primary parts to form relationships with designers of potential secondary parts, inviting collaboration

Background

- Composite structures often have predetermined life spans, however decommissioning often occurs for reasons outside of structural integrity
- These are often then deemed to be useless, although their remaining value could be exploited in other applications
- Linking primary and secondary users is not often practiced at current

Objectives

- Understand the current landscape of the use of parts for secondary applications
- Link primary designers and manufacturers with potential secondary users
- Increase the awareness of secondary uses

Benefits

- A suite of readily available toolsets to help inform decisions to aid design for reuse
- Fully functioning supply chain of cross-sectoral collaboration
- Reduction in end of life waste to landfill

End of Life Recertification

Develop methods and guidelines to enable user and consumer confidence in recertification of end of life parts

Description

- This project will look to develop methodologies for verifying end of life composite parts for recertification and redeployment
- This could include destructive testing to identify what 'good' looks like, and subsequently look to link with NDT
- It could also look into legislation, user perception, validation, and certification

Background

- Composite structures undergo various loading conditions over their life span, as a result, uncertainty around their structural integrity is generated
- Consequently, structures are sometimes decommissioned prior to full use
- Legislation surrounding reuse is sector-dependent and highly variable

Objectives

- Investigate current technology landscape
- Identify destructive testing techniques to be able to quantify what 'good' is at end of life
- Determine how this correlates to NDT reporting and demonstrate technology

Benefits

- Reduction in the amount of composite waste going to landfill
- Reduction in the amount of virgin materials required
- Greater user confidence in recertification