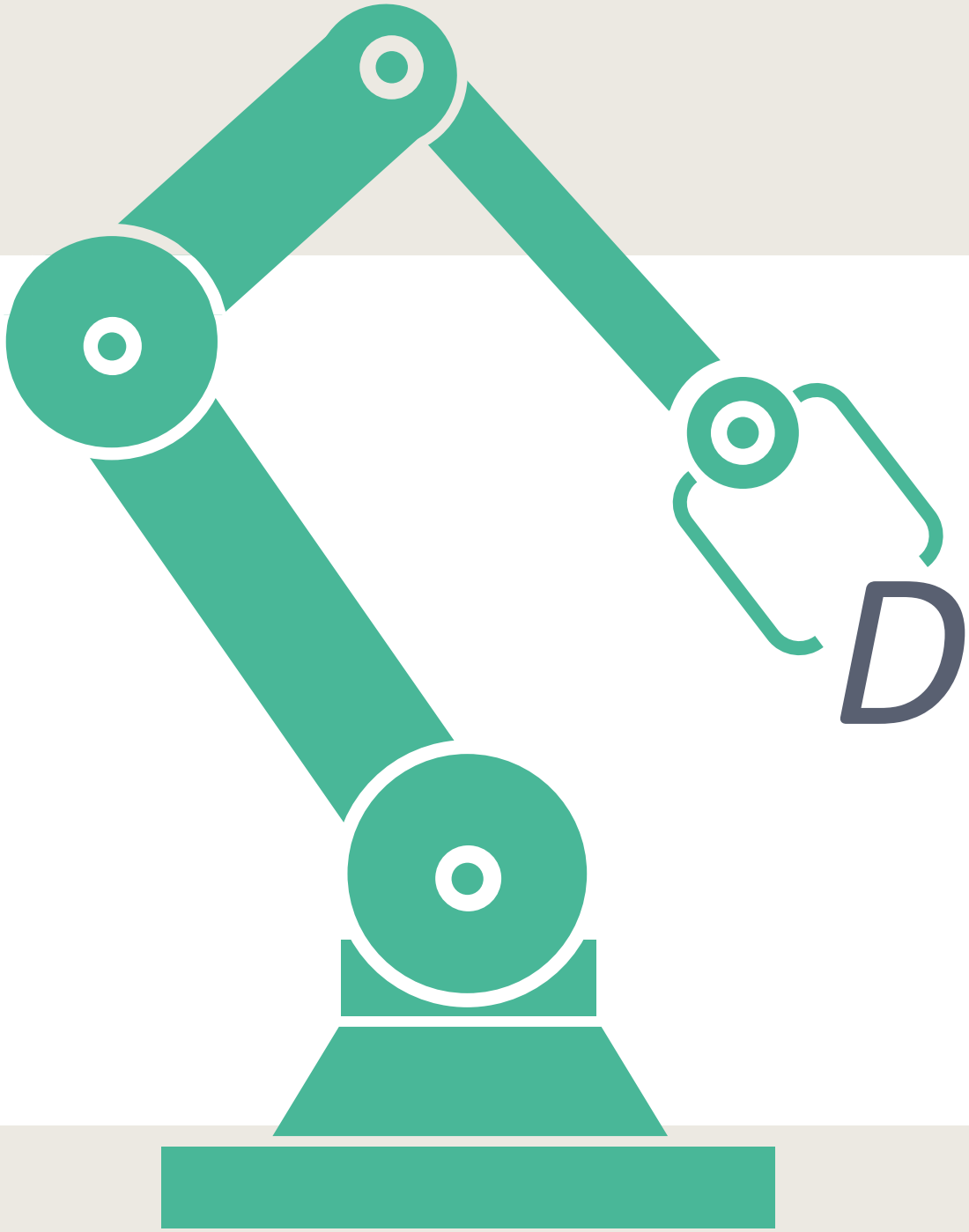

RDCR

Recycling.
Disassembly.
Circular materials.
Reuse.

Disassembly

Disassembly for Repair

Investigate and demonstrate localised disassembly of products to facilitate repair on a sub-component level

Description

- This project will look to identify and develop methodologies for implementing disassembly techniques with the aim of facilitating component repair
- This could include techniques for identifying where repairs are most often required, and designing potential disassembly strategies with this in mind

Background

- At current, very few products are designed to facilitate of disassembly
- Disassembly techniques are often either highly manual or highly crude (e.g. shredding)
- The first is high cost and therefore isn't often economically viable for component repairs
- The second renders the part beyond repair

Objectives

- Identify methods for quantifying likelihood of components needing maintenance
- Outline and demonstrate design tools to allow design for disassembly of these parts
- Demonstrate disassembly techniques

Benefits

- Product lifespan extension through accessible and achievable repairs
- Less virgin material needed as lower requirement for new parts
- Cost and environmental impact reductions

Disassembly with Industry 4.0

Investigate how digital and Industry 4.0 can support more accurate and efficient disassembly processes for end of life components

Description

- This project will investigate how implementation of digital techniques and Industry 4.0 can be used to aid end of life
- This could include investigation into how AI simulation and 'disassembly digital twin' visualisation may be able to support design for disassembly and the realisation of effective disassembly in critical sectors

Background

- Current disassembly methods are often either very manual (e.g. aircraft dismantling) or vey crude (e.g. 'disassembly' of vehicles through crushing)
- Outside of end of life, other areas of the supply chain are becoming increasingly intelligent
- Some of this developed digital knowledge could be directly implemented into disassembly

Objectives

- Understand the current capabilities and applications for Industry 4.0 and digital twins
- Evaluate existing manufacturing intelligence tools, and how they could be transferable
- Demonstrate applicability to disassembly

Benefits

- Link Industry 4.0 and digital with sustainability and end of life
- Faster, more accurate disassembly, leading to overall cost savings
- Digital visualisation of potential added value

Materials Passports

Develop electronic materials passports to accurately define the content and mechanical properties of a composite, as well as the environmental stresses it has been subjected to

Description

- This project will look to develop electronic passports for composite materials to allow an accurate record of its state at end of life, enabling effective location, assessment, and recovery of components for reuse
- This could include setup of a cloud to make the right information easily accessible to third parties

Background

- There is no dependable, accurate method to determine the contents or quality of composites at end of life
- This prevents potential reusers from fully understanding the capabilities of their materials
- Applications following end of life are commonly considered to be downgraded or limited
- Although this maintains safe practice, it limits applications

Objectives

- Establish the most impactful parameters to be included in a material passport
- Create an accessible, cloud-based pilot system to enable recycling and reuse of materials across applications and sectors

Benefits

- Maintain the value of materials and products over time through accurate data recording
- Make it easier for organisations to use end of life components and materials through the provision of accurate information

Design for Disassembly

Investigate, develop, and demonstrate design toolsets focused specifically on design for disassembly

Description

- This project will look to develop new design toolsets that are specifically designed to facilitate disassembly
- This could include identification of any additional stages needed within product design to facilitate inclusion of disassembly strategies
- This could also include aspects of modular design or standardised parts

Background

- At current, performance and function are at the forefront of the majority of requirements for new products
- There is rarely any consideration for how the product behaves at end of life
- Disassembly strategies are devised in order to solve a problem, not predetermined to prevent a problem, this can cause issues at end of life

Objectives

- Identify a process flow for product design, and determine the most appropriate position for design for disassembly
- Devise, implement, and demonstrate integration strategies in industry

Benefits

- More efficient and effective disassembly techniques, saving time and money
- Greater likelihood of implementation of effective recycling processes, gaining value from the produced recyclate

Reversible Joints

Investigate, develop, and scale up effective but reversible composite joining methods for easier product disassembly

Description

- This project will look to develop and implement reversible joining methods to facilitate disassembly of parts
- This could include reversible or disbondable adhesives, methods for reversing single-sided fixtures, and novel joining techniques
- It could also look into innovative welding methods or non-permanent alternatives

Background

- Increasingly, adhesives and single-sided fixtures are used to join lightweight multi-materials without drastically increasing overall system weight
- Reworks, repairs, and modifications of these are complex due to the irreversible nature of the joints
- These multi-material systems prove difficult at end of life

Objectives

- Evaluate the academic and industrial landscape to identify potential solutions
- Devise, scale up, and implement a relevant industrial demonstrator for reversible joints
- Display the associated business case

Benefits

- Facilitates system disassembly, allowing repair, rework, and part replacement
- Easier end of life for multi-material systems, allowing reclamation of valuable parts
- Could result in possibility of secondary lives

Automated Disassembly and Materials Characterisation

RDCR Recycling. Disassembly. Circular materials. Reuse.

Develop and implement automated techniques for component or system disassembly and/or materials characterisation

Description

- This project will look to identify feasible methods for automating end of life including disassembly and materials characterisation processes
- This may also need to include assessment of joining fixtures and fittings
- This could include linking automation with Industry 4.0 and digital twins

Background

- To enable effective reuse or recycling, structures must be disassembled into sub-components
- Current technologies for disassembly are typically either crude shredding or manual disassembly
- Structures are designed to be fitted together rapidly and are difficult to disassemble due to fixtures and adhesives

Objectives

- Identify the current state of the art in robotic/automated disassembly and materials identification
- Develop and implement a method in a relevant application

Benefits

- Automated disassembly is a key enabler for facilitating end of life in high volume industries (e.g. auto)
- Possibility to retain higher value of the reclaimed components/materials