## GRP Recycling

### Investigate glass fibre polymer composite recycling technologies able to reclaim greater value fibres from waste than is currently commercially available

<table>
<thead>
<tr>
<th>Description</th>
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<tbody>
<tr>
<td>• This project will look to investigate fibre reclamation technologies that are applicable to glass</td>
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<tr>
<td>• This could also include reprocessing technologies such as alignment, weaving or resizing</td>
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<td>• The primary focus will be recovering valuable fibres using an economically viable route</td>
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<th>Background</th>
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<tr>
<td>• Currently only approximately 2% of GRP is recycled</td>
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<td>• Commercial recycling routes are limited to grinding or co-processing in a cement kiln</td>
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<td>• These routes significantly reduce the value of the reclaimed glass</td>
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<td>• Other routes (e.g. pyrolysis) degrade glass fibres to the point that they are no longer of use</td>
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<table>
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<tr>
<th>Objectives</th>
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<tbody>
<tr>
<td>• Identify the GRP recycling landscape</td>
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<tr>
<td>• Develop a proof of concept for a new technique</td>
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<tr>
<td>• Test and validate the recyclate produces, and assess the associated business case</td>
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<table>
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<tr>
<th>Benefits</th>
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<tr>
<td>• Development of economically viable GRP recycling route reclaiming valuable recyclate</td>
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<tr>
<td>• Supply chain for end of life GRP</td>
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<td>• Applications for end of life GRP</td>
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<td>• Validated properties for the recyclate</td>
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## Recycling of Consumables & Tooling

**Understand the needs and limitations associated with effective end of life solutions for composite manufacturing consumables and tooling**

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| - This project will look to identify the range of materials in need of processing, and the cost implications associated with sending them to landfill  
- It will seek and assess a range of potential solutions for minimising or eliminating this  
- This could include new, less impactful alternatives, or the development of methods for effective reuse/recycling | - There are numerous well-established manufacturing processes for composites, each with consumables  
- Selection of these is based on process parameters, volumes, costs etc.  
- End of life is rarely taken into consideration  
- These materials effect the overall impact of composite part production | - Identify currently used materials and volumes  
- Research and develop effective, lower impact alternatives to current strategies  
- Realise the associated business cases | - Development of low impact, low cost consumables and tooling  
- End of life strategies – reduced landfill costs  
- Lower impact composite production (both environmental and cost) |
Matrix Reclamation

**Develop cost effective recycling technologies that focus on reclaiming the matrix of a composite part, enabling recycling of the entire composite (fibres and resin)**

**Description**
- This project will look to develop methods for effective reclamation/recycling of the polymeric matrix
- This could look into thermal, chemical, or biological recycling methods amongst others
- It will look to draw on the experience of other industries, such as waste processing, or commodity plastics

**Background**
- The global use of composites is expected to reach $95bn by 2020
- At current, the predominant focus of composites recycling is on the higher value fibres
- As a result, the value of the matrix is lost during recycling
- There is increasing dive (both from legislation & consumers) for a process capable of recovering value from both

**Objectives**
- Review current technologies for reclaiming polymeric material (composites and wider)
- Develop, optimise, and scale up a cost effective process
- Realise the associated business case

**Benefits**
- Develop UK supply chain
- Direct learning from and into commodity plastics recycling
- Gaining value from the matrix
- Help to meet future legislative targets
Applications for Recyclate

**Investigate and identify future applications, end users, and potential supply chains for recycled composite materials**

**Description**
- This project will look to identify valuable uses for composites recyclate
- It could look at parts or components that need recycling, and applications for the recyclate produced
- Alternatively it could to identify solutions needed in industry, and identify potential products that could be recycled into that solution

**Background**
- Current carbon composite recyclate is predominantly short and discontinuous
- Recycled glass is often grind and only usable as filler
- Regardless of material, applications are often limited due to format and/or reduced mechanical performance
- Limited applications result in limited demand, reducing value and cost

**Objectives**
- Identify applications for recyclate families or individual parts and determine feasibility
- Identify customer-supplier relationships to create a recyclate supply chain
- Identify the variance that occurs in recyclate
- Monetisation of waste could result in less waste to landfill by giving it value
- Pairing waste companies with end users could result in a new circular supply chain
- Lower volumes of virgin materials required

**Benefits**
Innovative Reclamation Technologies

Develop, scale up, and commercialise new and innovative composite reclamation technologies with clear advantages versus current commercially available alternatives

Description

• This project will look to identify and develop innovative composite reclamation technologies
• This could include reclamation technologies for different fibres and/or resin systems
• It could also look into novel methods or technologies with a distinct unique selling point. E.g. lower energy, in a box, enzymatic etc.

Background

• Current commercial composite recycling methods are limited
• Carbon composites are usually recycled via pyrolysis
• Glass composites are largely recycled by grinding, or co-processing in a cement kiln
• The recycleate reclaimed in both instances in sub optimal, both in terms of mechanical performance, and in value
• New techniques are needed

Objectives

• Evaluate the current academic and commercial landscape
• Downselect a method against a relevant set of requirements
• Develop, scale up, and demonstrate method
• Reclaim fibres with higher value than currently commercially possible
• Develop new recycling technologies that are lower impact
• Help stakeholders meet future legislation

Benefits

• Reclaim fibres with higher value than currently commercially possible
• Develop new recycling technologies that are lower impact
• Help stakeholders meet future legislation
# Reprocessing of Reclaimed Fibres

**Description**
- This project will look to develop reprocessing methods that give added value to reclaimed composite recyclate.
- This could include alignment technologies, fabric making techniques, and methods for handling reinforcement, amongst others.
- It could also look into resizing capability and how this can enhance recyclate usability.

**Background**
- To recycle fibres into a usable format, two steps – reclamation and reprocessing – are required.
- A good reprocessing phase can increase the performance of the recyclate produced.
- Current existing reprocessing technologies for the creation of high value, high performance recyclate are primarily small scale/academic.

**Objectives**
- Evaluate current reprocessing technologies.
- Identify, scale up, and implement a fibre reprocessing technology.
- Develop the associated business case.
- Determine mechanical performance.

**Benefits**
- Develop UK supply chain.
- Direct learning from and into commodity plastics recycling.
- Gaining value from the matrix.
- Help to meet future legislative targets.

**Identify and develop possible and economically favourable reprocessing routes for composite recyclate**