This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. H2020-730323-1

FiberEUse

Large scale demonstration of new circular economy value-chains based on the reuse of end-of-life fiber reinforced composites

INFODAY HORIZONTE 2020: Acción por el Clima, Medio Ambiente, Eficiencia de los Recursos y Materias Primas,

Bilbao, 18 de Diciembre de 2017

Igor Otero, AERNNOVA ENGINEERING

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Introduction – What is FiberEUse

- Funding body: **EU Horizon 2020** (Grant Agreement No. H2020-730323-1)
- Grant: **€9.8 million**
- Duration: **4 years** started on June 2017
- Consortium: **21 partners**, from **7 EU countries**.
- Aim: **Integrating different innovation actions through a holistic approach to enhance the profitability of composite recycling and reuse in value-added products.**

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FiberEUse

Project partners

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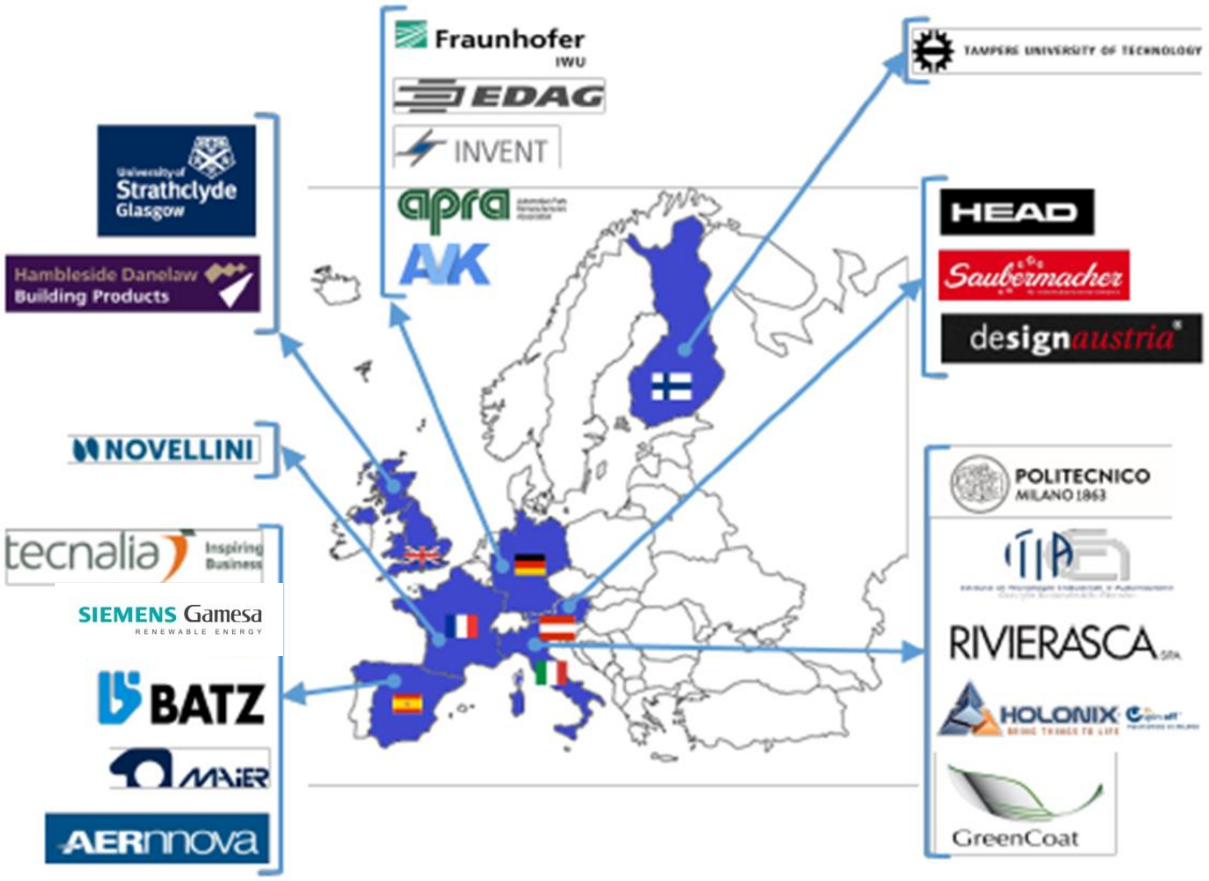
FiberEUse

Project partners

- **22** European Organizations
- **5** European Manufacturing Sectors
- **2** Sectorial European Associations from 7 countries
- **14** companies (**8 SME**
- **3** Research Centres
- **3** Universities



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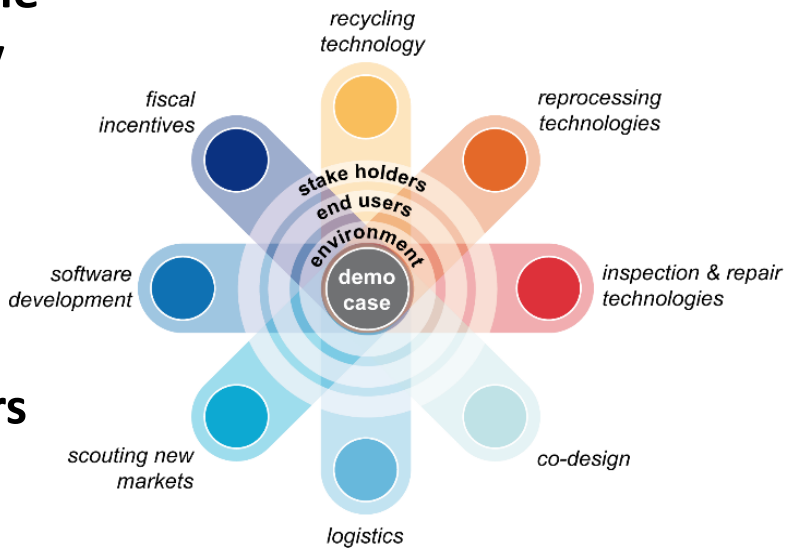
Project objectives

FiberEUse aims to develop and demonstrate a large scale reuse of end-of-life (EoL) composites materials via:

- **Integration of innovative remanufacturing technologies addressed to develop profitable reuse options for mechanically or thermally recycled EoL GFRP and CFRP composites** - enabling ease of operation, significant cost reduction, compliance with EU Directives
- **Development of an innovation strategy for mobilization and networking of stakeholders from all the sectors related to composites** - from original equipment manufacturers (OEMs) to tier 1 suppliers, logistical operators, technology providers and exploiters, designers, and end-user associations



FiberEUse Concept

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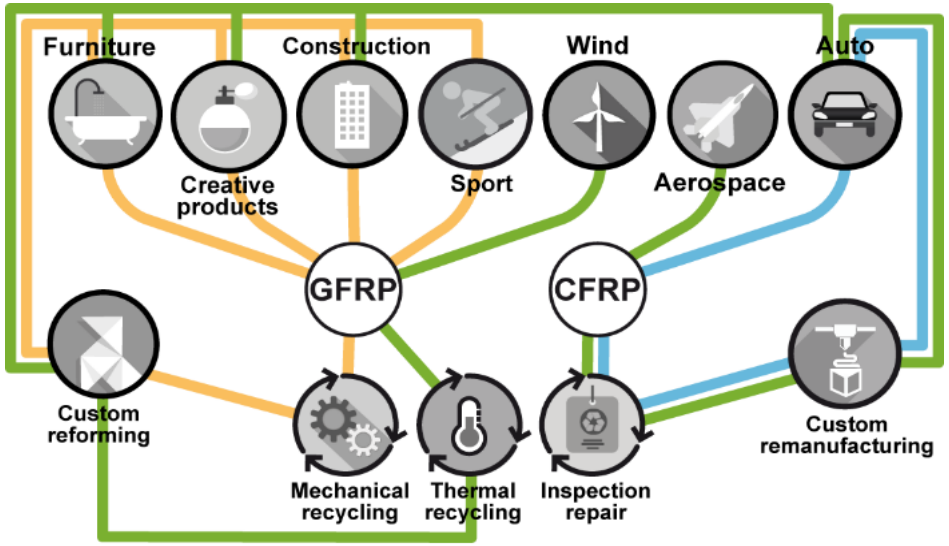
Project overview

FiberEUse is based on the realization of three macro use-cases, further detailed in eight demonstrators:

- **Use-case 1:** Mechanical recycling of short GFRP and re-use in added-value customized applications, including furniture, sport and creative products
- **Use-case 2:** Thermal recycling of long fibers (glass and carbon) and re-use in high-tech, high-resistance applications
- **Use-case 3:** Inspection, repair and remanufacturing for EoL CFRP products in high-tech applications



FiberEUse Use-Cases and involved industrial sectors

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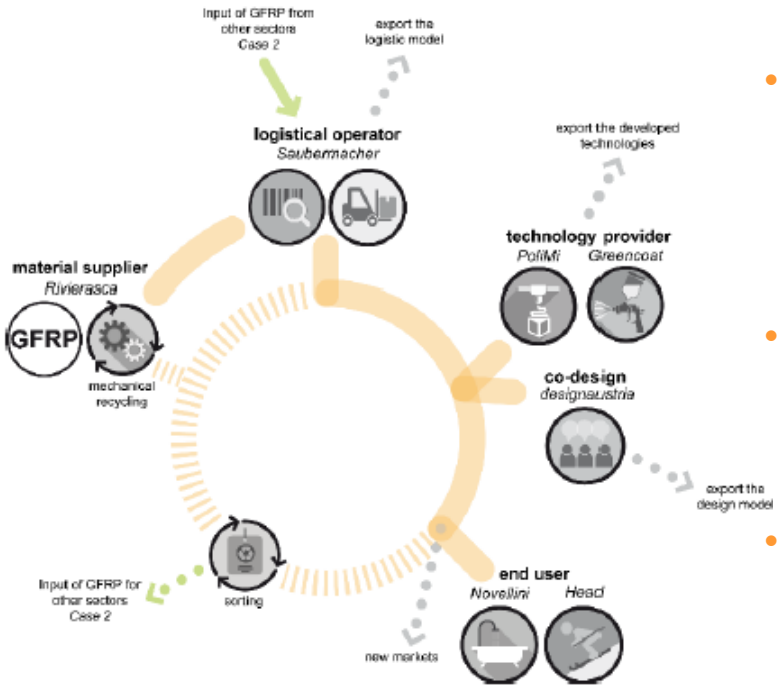
Project overview

Use-case 1: Mechanical recycling of short GFRP and re-use in added-value customized applications

Input sector: EoL GFRP from constructions
Output sectors: Furniture products, Creative products, Sport products
Materials: Resin containing short GF 3-10 mm
Recycling technology: Mechanical recycling
Reprocessing: Additive remanufacturing, compounding, extrusion, molding,



- **Demo-case 1.1** Use of a fraction (at least 40% w/w) of GFRP recyclate in open mould spray applications of GFRP for sanitary products products (bath tubs, shower trays).
- **Demo-case 1.2** Use of a fraction (at least 30% w/w) of GFRP recyclate for prototyping personalized and creative products (i.e. creative packaging etc).
- **Demo-case 1.3** Use of a fraction (at least 10% w/w) of GFRP recyclate to strengthen PU compounds for the realization of sport equipment (skis).

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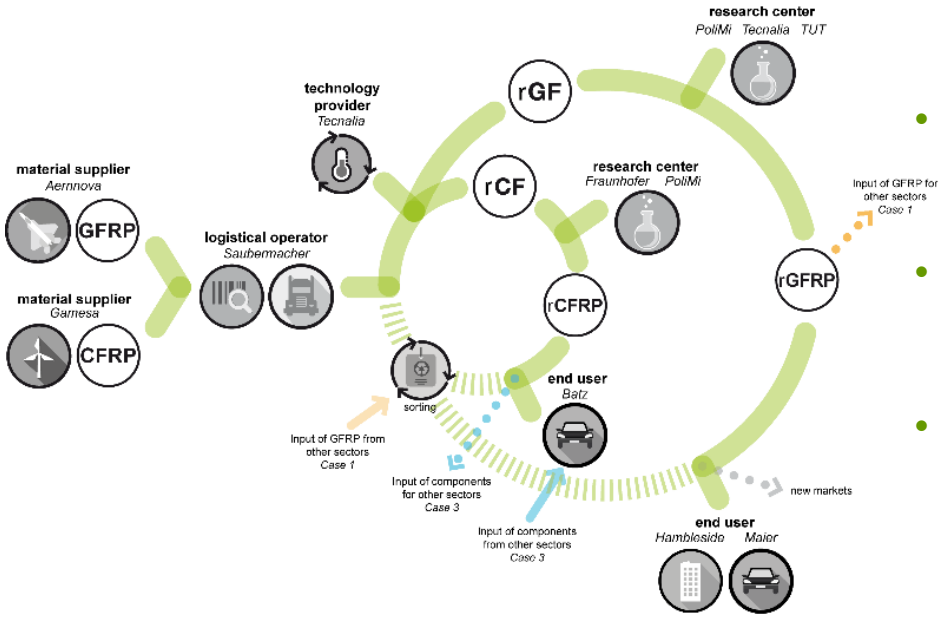
Project overview

Use-case 2: Thermal recycling of long fibers (glass and carbon) and re-use in high-tech, high-resistance applications

Input sectors:	EoL wind turbines and aerospace components.
Output sectors:	Automotive aesthetical and structural components, building
Materials:	Long/medium CF, long/medium GF,
Recycling technology:	Thermal recycling
Reprocessing:	Compounding, moulding, extrusion



- **Demo-case 2.1** use of a fraction (at least 20%) of thermally recycled GF for structural components in automotive
- **Demo-case 2.2** use of a fraction (at least 20%) thermally recycled CF for structural components in automotive
- **Demo-case 2.3** use of a fraction (at least 30%) of thermally recycled GFRP for the building industry (roofs)

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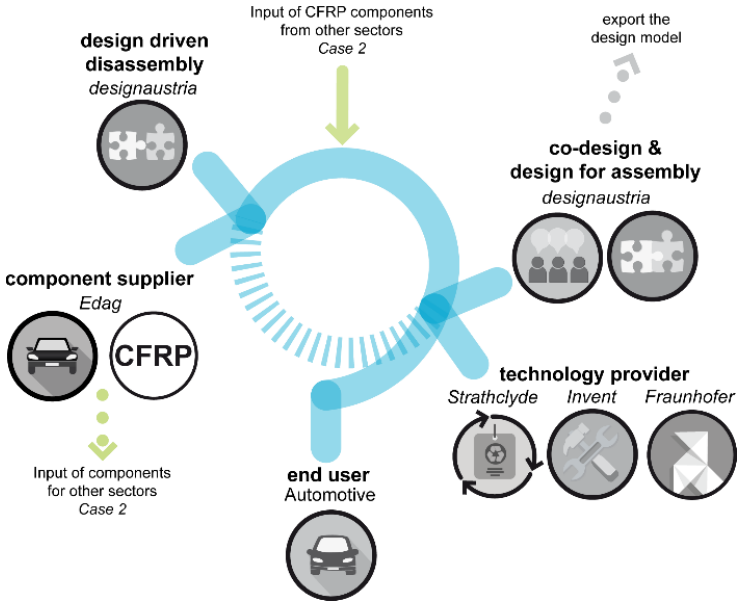
Project overview

Use-case 3: Inspection, repair and remanufacturing for End-of-Life CFRP products in high-tech applications

Input sector: EoL CFRP from automotive
Output sector: Automotive
Materials and technologies: CFRP, non-destructive inspection techniques, laser cutting and repair, adaptive design and CAM/CAD techniques.



- **Demo-case 3.1:** design and remanufacturing of a CFRP chassis component (see also synergisms with use-case 2)
- **Demo-case 3.2:** design and remanufacturing of inner body car structure with refurbished CFRP.

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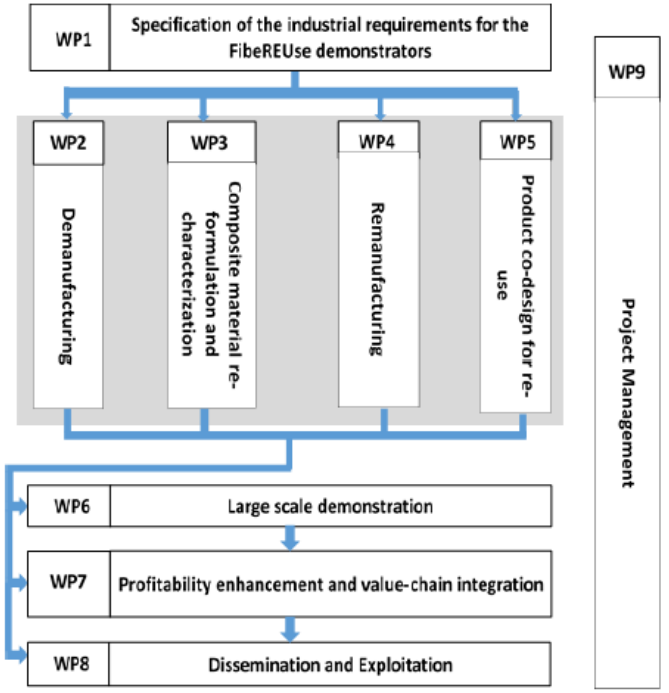
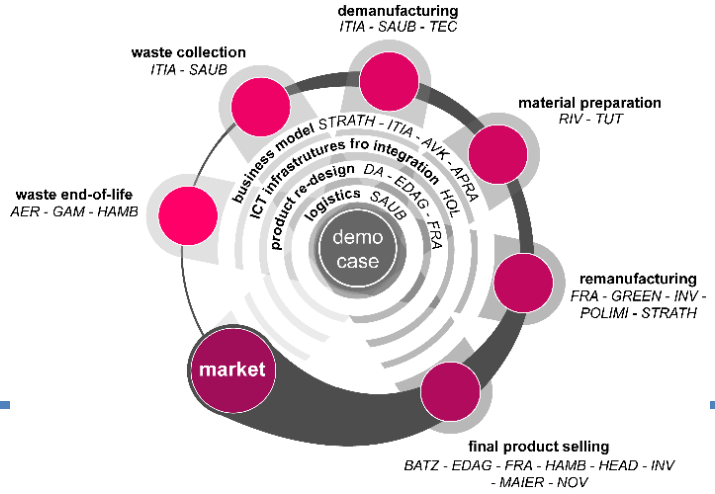
Project overview

From probed current TRL 4-5 technologies up to TRL 6-7 at demo scale applications

- **Innovative pyrolysis** process with mechanical assistance, aimed at the selective removal of the resin fraction without or with only minimal fabric damage
- **Additive remanufacturing** / 3D printing with customized 3D-printing machinery and software
- Development and automation of **non-destructive inspection** technologies for structural integrity and degradation evaluation
- Development and **automation of laser assisted cutting and repair** technologies for CFRP component reuse
- **Adaptive design** for component **reuse** in lightweight manufacturing





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FiberEUse

Use Case 2 further description

Thermal recycling of long fibers (glass and carbon) and re-use in high-tech, applications

SIEMENS Gamesa RENEWABLE ENERGY

- Consumption of **35,000Ton** of **GFRP** annually
- In the next **3-5 years removal and substitution** of the installed wind blades has to be accomplished
- By **2034, 225,000Ton** of rotor blade material has to be recycled
- Current wind turbine blade **EoL GFRP treatment**: **Landfilling or Combustion**

Aeronautic Systems (AERNNOVA):

AERnnova engineering

- Consumption of **1,000Ton** of **CFRP** annually
- The word aircraft fleet is expected **to double by 2030**
- **CRFP** account for about **30-50%** on the **total aircraft weight**
- Older less efficient airplanes will be replaced by **lighter ones**, ↑ **CFRP parts**
- Current **CFRP** aerospace component **EoL treatment**: **Landfilling**

Main Objective:

Development of an **innovative controlled thermal treatment** for the recovery of **GF** and **CF** from EoL parts originating **from Wind energy** and **Aeroespace** to **AUTOMOTIVE Sector (BATZ and MAIER)**

MAIER tecnalia Inspiring Business BATZ

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Use Case 2 further description

EXPECTED IMPACTS:

SIEMENS Gamesa RENEWABLE ENERGY

AERnnova engineering

Goal:

Recover and re-use composites from blades an aircraft parts in other industrial sectors (automotive and construction).

Impact:

- ***20M€ increase in revenues per year for the companies***.

Environmental Impact:

-Saving in material going to landfill, 32 GF and 1.8 CF kTons/year

Technical and Economical Impact:

-Assessment on the quality and quantity of recycled glass and carbon fibres performance to assure their implementation in real mass application, such as Automotive parts.

-To guarantee a stable EoL material supply which assures a continuous recycled material flow production.

Value-Chain Generation:

-Establish inter-company connections and cooperation for implementing multiple technically feasible end-of-life routes for composite made parts, that will bring economic benefits to all the involved stakeholders.

Acknowledgements

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