FiberEUse

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

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Sustainable smart manufacturing

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Manufuture 2019 Conference – Finlandia Hall, Helsinki 01/10/2019
Introduction – What is FiberEUUse

• Funding body: **EU Horizon 2020** (Grant Agreement No. H2020-730323-1)

• Grant: **€ 9.8 million**

• Duration: **4 years** started June 2017, end May 2021

• Consortium: **20 partners**, from **7 EU countries**.

• Aim: **Integrating different innovation actions through a holistic approach to enhance the profitability of composite recycling and reuse in high value-added products.**
Project partners

7 nations
- Austria
- Finland
- France
- Germany
- Italy
- Spain
- United Kingdom

20 participants
- 12 industrial partners
  - 7 of which SMEs
- 6 academic and research partners
- 2 industrial associations
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 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.
Introduction – What is Rivierasca

- RIVIERASCA S.p.A. is a SME founded in 1963
- 30 employees
- 10 milion € revenue
- Raw material consumption:
  - UP (uninsatured Polyester) 3.000 ton/year
  - GF (Glass fiber) 1.000 ton/year
- Production: 4,5 milion m²/year of GRP laminates
- Market: Do it Yourself, Industrial roofing, cold chain,
- Waste production: 250 ton/year
In 2001 RIVIERASCA starts looking for suitable solutions to recycle its internal scraps (250 ton/year) and develops/tests several technologies till 2012. At that time seven technologies were tested and the name “Glebanite” was given to this new material. Glebanite is GRP recycled into GRP again by using one or more of the seven technologies developed.

- Open mold casting
- Wrapping & plastering on mold (hand lay-up)
- Closed mold cast and press
- Continuous cold extrusion (patented)
- Continuous lamination
- Ibrid 3D printing and milling with robotic arm
- 7 axis milling and laser engraving
- more to be investigated...(BMC, centrifugal, filament winding)
Glebanite technology: cast in open mold and milling

Parfume packaging: Francesca Gotti design for Rubini Profumi. ADI INDEX 2016

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Open mold casting:
Cheap technology suitable for single pieces and prototype. Mold are prepared using milling facilities with “soft” material like PU, PA, PP, HDPE, PET, PTFE. Metallic (steel or aluminum) mold are suitable too. Used to prepare the row material for milling processing. Manual production.
Glebanite technology: cast in open mold

Display for jewelry shop: prototype 360x410x50/160 mm
Wrapping & plastering on mold (hand lay-up):
Another easy and cheap way to produce thin wall (less than 3 mm) prototype and complex surfaces. Manual production.

Mustafà Sabbagh: personal show c/o Contemporary Cluster – Roma January 2017

GioMinelli design: Kernel collection, Glebanite table
Glebanite technology: wrapping
Technologies: plastering

«The art of free form modeling design»: academy of fine arts G. Carrara Bergamo – December 2016
Closed mold pressing: More expensive than open mold technology but allow to grant better geometry of the piece (specially for plane surfaces). In some application is absolutely necessary. Semi automatic production. Today 80% recycled

Glebanite board for milling a mold.
- 1580 x 1400 x 25 mm
- 66 kg
- density 1,19 kg/m³
MDF (Medium Density Fiberwood) Vs. Glebanite for marine application?
Lombardy Region: Call “INNODRIVER-S3 -Edizione 2017 - Misure A-B-C”
“Glemould” project: GLEBANITE® FOR MODELS AND MOLDS IN SHIPYARDS APPLICATIONS RATHER RESORTING TO MONOMATERIC SOLUTIONS
Glebanite technology: closed mold pressing
Glebanite technology: closed mold pressing

Tom Tjaarda: Glebanite model for car bodywork «Escondido» - Compotec April 2019
Continuous cold extrusion (patented):
Technology developed for high productivity (up to 950 kg/h) and low cost. Useful for continuous production of rod and axle. Glebanite produced with this technology is extremely compact thanks to a vacuum camber in the equipment.
Continuous lamination:
Good technology for high productivity. It allows flat and corrugated sheets from 3,5 to 5 mm thickness (higher thickness on test). Maximum width 1400 mm. Plant produce laminates adding glass reinforcement on top and bottom surfaces so to give good mechanical resistance. Flat laminates can be glued together.
**3D printing** (Additive manufacturing: FDM and SLA/DLP) with robotic arm for large 3D printed objects (KUKA KR120 with spindle 7kW and laser 60W). Powerful technology for complex pieces still needs developing (in 2019) specially for robotic arm movement and Glebanite’s extruder integration.

**7 axis milling and lasering**
Ready to use equipment
Glebanite technology: samples

Glebanite 44% recycled, laminated, milled, assembled.
Glebanite laminate, closed molded, milled...for road sign?
Glebanite technology: samples

Glebanite cast in open mold, milled...Vs marble for water tap
Glebanite multilayer cast in open mold and milled.

Salone del mobile Milano 2016

Gent Design Museum Bruxelles
Glebanite technology: samples

OneOfThose: “Inaccessible perfume” design Francesca Gotti
ART BASEL MIAMI 2016
Glebanite technology: samples

Structural laminates cast in open mold
Structural part: laminate, milled, glued. Sailing boat kneel
Glebanite technology: samples

Gio Minelli design: Tiles (internal or outdoor): closed mold laminate, water cutted
Gio Minelli design: Table deck
Glebanite technology: samples

Martina Hatzenbichler design for FiberEUse: Wine cooler, cast in open mold
Glebanite technology: samples
Glebanite technology: samples
Glebanite technology: samples
Dissemination & exploitation

**Milano Fuorisalone**

**who participates?**

Designers and companies participate in this widespread macro event with the aim of showing new products and technologies, in order to find new business partners and new audiences.

Design is here understood as a system that links companies from sectors that are only apparently distant, as for example:

- Furniture
- Construction
- Automotive
- Fashion
- Food
- Art

![Arper – furniture](image1)

![Cosentino – construction](image2)

![Audi - automotive](image3)

![Missoni - fashion](image4)
Business model for mechanical recycling

because a recycling chain doesn't exist for thermoset composites

Waste / EoL

Standard Production

Internal waste

Innovative Recycling Technology

Company #1

Company #2

Company #3

Standard Product

hight added value products

not circular MKT:

• renting ...
  • exhibit
  • shops
  • visual

EoL managing operator: collection, transportion, primary treatment…?

laws and regulation needed

let’s start with a lot of small recycling plants

www.fibereuse.eu

Facilitator/service provider

Designer Co-design activities

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Thank you for your attention

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