De- and Remanufacturing for Circular Economy
Composite Circular Economy use-case

Coordinating Region: Lombardy
Coordinating Person: Prof. Marcello Colledani

Vanguard Initiative, Efficient and Sustainable Manufacturing (ESM) pilot demo-case.
Pilot within the S3P – Industry, Efficient and Sustainable Manufacturing.
DG Regio Pilot Action for "Interregional innovation projects".
TAF supported partnership.

European Cluster Conference 2020
November the 10th
De- and Remanufacturing includes the set of technologies, tools and knowledge-based methods to recover, re-use and upgrade functions and materials from industrial waste and post-consumer high-tech products, under a new producer-centric Circular Economy perspective.

Why De-and Reman?

Shifting toward a circular economy model would deliver annual benefits of up to €1.8 trillion by 2030 -> Economic Recovery and Competitive Sustainability!

Source: Europe’s circular-economy opportunity McKinsey Center for Business and Environment
Objective of the partnership

To integrate a multidisciplinary set of advanced and innovative enabling technologies and digital innovations (TRL 7-8) and to exploit the regional Smart Specializations in synergic way to offer services to European manufacturing companies to solve specific sustainability-oriented problems related to their products, by involving all stakeholders of the Regional eco-system.

Innovation Hubs for Circular Economy, supporting de-risked private investments for industrial uptake (TRL 9).
The Pilot Network is a **One-stop-shop** for delivering innovation services to the industrial end-users with a multi-regional approach.

- Totally new pilot site
- Upgraded existing pilot site

### Cross-Regional Use Case | Involved Regions
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**Composite Recovery from Wind Energy System** | Basque Countries, Saxony, Lombardy, Tampere, Scotland
**Heavy machinery components remanufacturing** | Tampere, Basque Countries, Lombardy, Saxony
**Automotive parts remanufacturing** | Scotland, Lombardy, Saxony, Norte
**High-value TLC systems and Electronics Recovery** | Lombardy, Tampere
**Metal components reprocessing** | Saxony, Tampere, Lombardy
**Remanufacturing of e-motors** | Saxony, Lombardy, Norte
**Plastics recycling from WEEE** | Flanders, Lombardy
**E- mobility batteries remanufacturing for re-use** | Lombardy, Saxony, Basque Countries
**Photovoltaic panels de-manufacturing** | Flanders, Lombardy
**Remanufacturing and retrofit of machine tools** | Emilia Romagna, Lombardy
Fiber-Reinforced Plastics (FRPs) are widely adopted in several massively used products in the electronics, sport equipment, medical equipment, automotive, construction, wind energy, aeronautics and marine industries, due to their better lightweight and corrosion resistance compared to metals.
However, the recovery of plastics and fibers after the use phase of such products remains a challenge. Currently, the only solution is landfilling.

Composite re-use would support price reduction. However, barriers are found:
- Lack of a systematic value-chain integration approach for re-use of composites.
- Poor customer acceptance for remanufactured products.
- Lack of circular business models for boosting profitability.
- Unstable and unpredictable EoL products flows.
WindEurope estimates around 14,000 blades will be decommissioned by 2023, equivalent to between 40,000 and 60,000 tons. Recycling these old blades is a top priority for the wind industry.
The objective of this use-case is the development and industrial uptake of a cross-sectorial circular value-chain for the recovery and re-use of technology plastics into high added value products, specifically targeting Fiber-Reinforced Plastics (FRPs).

Motivation for a cross-sectorial approach:

Leveraging on a cross-sectorial approach can open new potentials for composite made parts recycling, remanufacturing and re-use under a systemic circular economy perspective.
Use-case 1: Composite Recovery from Wind Energy System
(used as a service validation use-case in the DG Regio Pilot)

Cross-regional approach:


**Saxony**: re-design and remanufacturing of composite parts. Output market: automotive.

**Lombardy**: mechanical demanufacturing processes and composite reprocessing. ICT for value-chain integration. Output market: furniture, sanitary and construction.

**Tampere**: composite material re-formulation and characterization and coating processes for composite materials.

**Scotland**: inspection for composite parts repair. Value-chain integration, market scouting.
Large scale demonstration of new circular economy value-chains based on the reuse of end-of-life fiber reinforced composites.

Topic: Systemic, eco-innovative approaches for the circular economy: large-scale demonstration projects (CIRC-1-2016)

The FiberEUse project aims at integrating in a holistic approach different innovation actions aimed at enhancing the profitability of composite recycling and reuse in value-added products.

Duration: 48 months, starting on June 2017.

Consortium: 21 partners, from 7 EU countries.

Coordinator partner: Politecnico di Milano

EC Funding: ca. 10 mln €.
DG Regio Pilot Action

Progress achieved:

• Focus on the Composite use-case 1.
• Focus on industrial users.
• The business context has been motivated and defined.
• 12 industrial investment and business cases have been reported from 4 different Regions. Strong link with the activities of the H2020 project FiberEUSe.
• The partnership infrastructure needs for supporting this use-case have been defined.
• The investment needs have been detailed.
• The partnership business model has been defined.
**Achieved results:**

- Focus on the Composite use-case 1.
- Focus on the whole set of layers (downwards approach from Layer 3 to Layer 1).
- BM Canvas elaborated and services formalized.
- The value-chain of reference have been formalized.
- New industrial users and input/output target sectors have been identified and interviewed (e.g. construction).
- The funding mechanisms have been framed and updated considering Horizon Europe instruments.

**Next step:**

- Formalization of the legal framework.
**Facts & Figures:**

- Active since 2015;
- > 100 industrial Letters of Intent to co-fund;
- MoU by Regions;
- Business model, Investment plan, governance and operational plan;
- Selected DG Regio Pilot action - 12 industrial investment plans reported, with specific interest to invest 6 M€.

**EU Impacts in 5 years:**

- 35 new CE-oriented real industrial installations ...
- ...that will mobilize private resources for 535 million Euros...
- ... with a Leverage Factor for the public investment of about 19...
- ... and a cumulative revenue for the involved companies of about 215 million Euros.

**Investment Needs:**

- 30M€ investment over the 8 Regions (7M€ for composite case).
- Co-funding of 15M€.
- Presented at: EIB, DG ECFIN, Ellen Mac Arthur Foundation, DIH Conference and more...
- TAF Service is currently ongoing for business fine-tuning.

**Why now?**

- CE increases resilience in terms of availability of resources.
- CE is enabler for local value-chains.
- Industry is looking for new post-covid models and paradigms.
- Need to decouple business revenues from resource consumption, EU Green Deal.
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• Regional, national funding.
• Projects exploitable results and competences.
• Co-funding:
  • SMEs tech providers.
  • MMs developers

• EU funding;
• Co-funding Industrial users (first group from use-cases)
• Private funding.

• Private funding for industrial take-up

Need to investigate different options taking into consideration the de-risking effect of the “layer 1”.

New Circular Economy businesses in EU.
New jobs, social and environmental impact.
More prototypes in demo-cases

Cloud-based platform

Validated re-use processes

Cloud-based platform for Value-Chain integration

Value-chain integration

Dismantling, cutting up & pre-shredding at the wind farm