Regions: Lombardy, Scotland, Saxony, Tampere, Flanders, Basque Country, Norte
Technical Coordinator: Marcello Colledani

Presenter: Marcello Colledani, Politecnico di Milano, Lombardy
AFIL: Intelligent Factory Lombardy Region Cluster

Workshop on Investment Platforms
November 20, 2017
Berlaymont, 200 rue de la Loi, Brussels
Pilot Idea: Concept

_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.

EU – Towards a circular economy, a zero waste programme for Europe, COM (2014) 398 final
Economic Benefits of Circular Economy at large scale

Shifting toward a circular economy model would deliver better outcomes for the European economy and yield annual benefits of up to €1.8 trillion by 2030.

Annual total cost of producing and using primary resources, EU-27, euros trillion

Source: Europe’s circular-economy opportunity
McKinsey Center for Business and Environment September 2015
Strategy: demonstrating integrated innovative solutions and de-risking private investments in Circular Economy

G7 Summit Declaration June 2015: The G7 Alliance on Resource Efficiency promotes Circular Economy, Remanufacturing and Recycling as strategic actions.

At European level, the Commission has launched in December 2015 the strategic initiative “Closing the loop - An EU action plan for the Circular Economy”.

H2020 R&I projects under the Focus Area “Industry 2020 in the Circular Economy”, calls CIRC, Spire and FOF, at TRL 6-7.

Lack of infrastructures that can demonstrate to industry integrated circular economy solutions and business models, de-risking the private investment.

These Innovation Hubs should act as “technology gateways” that any business sector can use.

De- and Remanufacturing Pilot Network
The main objective of the De- and Remanufacturing pilot network is 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 a synergic way to offer services to European end-users, mainly manufacturing companies, to solve specific sustainability-oriented problems related to their products.

The pilot network nodes will act as Innovation Hubs for Circular Economy, being a network of competence and technology centers and supporting future producer-driven replication at industrial scale (TRL 9).
Pilot Idea: Application Domain

The Pilot Network is seen as a **One-stop-shop** for delivering innovation services to the industrial end-users with a multi-regional approach.

<table>
<thead>
<tr>
<th>Industrial Innovation Service Portfolio</th>
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</thead>
<tbody>
<tr>
<td>Product Life-cycle information management.</td>
<td><strong>De-and Remanufacturing Process-chain design and demonstration.</strong></td>
</tr>
<tr>
<td>Environmental sustainability assessment and LCA.</td>
<td>System integration and control.</td>
</tr>
<tr>
<td>Patent and technology IPR searches.</td>
<td>Product design/re-design for circular economy.</td>
</tr>
<tr>
<td>Market analysis and business models.</td>
<td>Prototyping and product testing.</td>
</tr>
<tr>
<td>Legislation review and innovation deals.</td>
<td>Production of pre-series.</td>
</tr>
<tr>
<td><strong>Product and process certification.</strong></td>
<td>Process chain optimization, simulation, and analytics.</td>
</tr>
<tr>
<td>Business case validation and scenario analysis.</td>
<td>Value-chain integration.</td>
</tr>
<tr>
<td><strong>Circular economy training.</strong></td>
<td>Support to Environmental Technology Verification (ETV) applications.</td>
</tr>
</tbody>
</table>
Pilot Geographic Configuration and Regional Specialization

The network will be composed of:

- New infrastructures, which will be designed, developed, and installed on purpose for this pilot network.
- Existing infrastructures, which will be upgraded towards integrated pilot plants.

**Key Issue**: integrated pilot plant solutions, needed by industry to **validate high-risk investments** in circular economy businesses before the industrial implementation.
Benefits of the multi-regional, value-chain oriented approach

**Enabling technologies and processes**
(collaborative disassembly by robotics, remanufacturing, inspection, demanufacturing, re-processing, coating and recovery)

**Digital Innovation**
(IoT, smart products, cloud-based platforms, Things Lifecycle Management, data analytics, process and system simulation)

**Innovation in eco-products, processes and business models**

**Cross-regional Value-chain building**
(new service-oriented business models, open innovation, product re-design, cross-sectorial industrial symbiosis, ecosystems)

An effective transition to new circular economy businesses in Europe requires a *systemic approach* and cross-KETs innovations, in traditional and emerging sectors (SCREEN CIRC-3, FiberEUse CIRC-1).
SCREEN Synergic Circular Economy Across European Regions

SCREEN H2020 aims at the definition of a replicable and scalable approach, to support European Regions in the transition to new Circular Economy cross-regional value-chains. This will be done through the identification and implementation of operative synergies between R&I investments of H2020 program and EU structural funds.

The methodology developed within the project will be replicable in all the European Union, thus creating an interregional framework for financing Circular Economy value chains.
Industrial Participants and investors.

More than 60 European companies, with a cumulative turnover of 32 B€ and with some 175,000 employees, and 69 universities and RTOs distributed among the involved regions are involved.

The stakeholders have signed Letters of Intent to participate to the definition of this Pilot Network and, in the case of future end-users, to access the pilot network and to carry on industrial take-up, in case of positive evaluation of the developed solution.
Industry-led use cases and related business cases

A detailed analysis of identified *sectorial Use Cases*, with industrial partners associated, has been performed, where more regions are involved. For each Use Case, a business case has been detailed including a *business plan* for the industrial take-up of the solutions.

<table>
<thead>
<tr>
<th>Regional/Cross-Regional Use Case</th>
<th>Involved Regions</th>
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</thead>
<tbody>
<tr>
<td>Composite Recovery from Wind Energy System</td>
<td>Basque Countries, Saxony, Lombardy, Tampere</td>
</tr>
<tr>
<td>Heavy machinery components remanufacturing</td>
<td>Tampere, Basque Countries, Lombardy, Saxony</td>
</tr>
<tr>
<td>Automotive parts remanufacturing</td>
<td>Scotland, Lombardy, Saxony, Norte</td>
</tr>
<tr>
<td>High-value TLC systems and Electronics Recovery</td>
<td>Lombardy, Tampere</td>
</tr>
<tr>
<td>Metal components reprocessing</td>
<td>Saxony, Tampere, Lombardy</td>
</tr>
<tr>
<td>Remanufacturing of e-motors</td>
<td>Saxony, Lombardy, Norte</td>
</tr>
<tr>
<td>Plastics recycling from WEEE</td>
<td>Flanders, Lombardy</td>
</tr>
<tr>
<td>E-mobility batteries remanufacturing for re-use</td>
<td>Lombardy, Saxony</td>
</tr>
<tr>
<td>Photovoltaic panels de-manufacturing</td>
<td>Flanders, Lombardy</td>
</tr>
</tbody>
</table>
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 €.
The FiberEUse proposal aims to develop and demonstrate at a large scale:

- The integration of **innovative remanufacturing technologies** addressed to develop profitable reuse options for mechanically or thermally recycled EoL GFRP and CFRP composites.

- The development of **an innovation strategy for mobilization and networking of stakeholders** from all the sectors related to composites.
Vanguard De and Remanufacturing multi-regional offer

New end-users (e.g. TLC systems, industrial equipment, etc.)

Metal refining by plasma processes

Smart robotic disassembly, mechanical and chemical recovery processes, in-line material inspection technologies and material re-processing and re-use processes.

Digital innovation solutions for product-use monitoring and product data traceability, Open Industrial IoT Platform, advanced simulation and analytics, new service oriented business model development and LCA tools.

A new infrastructures will be designed and installed in Lombardy

<table>
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<td>1,6</td>
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<td>0,2</td>
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Lombardy financial needs

De- and Remanufacturing Pilot Network
From Use Cases to the Business Model of the Pilot Network

Procedure for Business Model development

Pilot network on De- and Re-manufacturing

De- and Remanufacturing Pilot Network
Operational and Business Model of the Pilot Network

Regional, national, EU, projects exploitable results and competences.

Industrial users (first group from use-cases)

Private investments for industrial take-up

**New Circular Economy businesses in EU.**
**New jobs, social and environmental impact.**
This pilot network is designed to be a “generator” of new industrial plants for European circular economy solutions.

**Pilot Network Revenues:**
- The User will pay a *daily fee* for each access.
- The User will share with the pilot network a portion of the revenues obtained by selling the product/service demonstrated by the business case developed by the platform (IPR exploitation).
- The core partners of the pilot (companies, universities and RTOs) will pay a *yearly fee* to be part of the pilot network and to access the generated knowledge and best practices.

**Pilot Network Costs:**
- Each demonstration project will have a *specific duration* and will requires a group of full-time dedicated persons (hired and paid by the pilot network).
- *Maintenance* and upgrade costs of the pilot network facilities will be covered yearly by the pilot.
- A cost of *customization* of the platform for each new project will be incurred (paid by the pilot).
### Business Model of the Pilot Network

#### Year after installation

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<tr>
<td><strong>Accesses to the pilot network (n°)</strong></td>
<td>18</td>
<td>23</td>
<td>30</td>
<td>33</td>
<td>36</td>
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<tr>
<td><strong>Pilot total revenues (mln €)</strong></td>
<td>2.281</td>
<td>3.414</td>
<td>4.916</td>
<td>5.963</td>
<td>7.565</td>
</tr>
<tr>
<td><strong>Total costs (mln €)</strong></td>
<td>0.88</td>
<td>2.34</td>
<td>2.69</td>
<td>2.86</td>
<td>3.03</td>
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<tr>
<td><strong>Installation &amp; Launch costs co-funding (mln €)</strong></td>
<td>12</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td><strong>Installation &amp; Launch costs funding (mln €)</strong></td>
<td>28</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
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<tr>
<td><strong>Annual margin (mln €)</strong></td>
<td>-10.6</td>
<td>1.07</td>
<td>2.23</td>
<td>3.1</td>
<td>4.53</td>
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<tr>
<td><strong>Cumulative margin (mln €)</strong></td>
<td>-10.6</td>
<td>-9.53</td>
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<td>-4.2</td>
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#### Graphs

(a) Users’ access profile

(c) Revenue profile
## Business Model of the Pilot Network

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<td>0.34</td>
</tr>
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- The installation and launch investments will be paid back in 5 years if **4 demonstration projects** are attracted per year (on average) by each regional pilot.
- Considering a successful industrial replication rate of the developed solutions of 25%, about **35 new industrial installations** will be originated by the pilot network in these 5 years.
- The cumulative revenue for the involved companies of about **215 million Euros**.
- The 35 new installations will mobilize private resources for 535 million Euros.
- **Leverage factor** for the public investment of about **19** in five years from the pilot network installation.
## Implementation & Investment Plans

### Timeline

- **Concept & Business Plan**: Today
- **Detailed Design**: M9
- **Installation & Commissioning**: M21
- **Marketing & Launch**: M24

### Integration of existing, new and upgraded facilities

<table>
<thead>
<tr>
<th>Phase</th>
<th>1 Concept &amp; Business Plan</th>
<th>2 Detailed Design</th>
<th>3 Installation &amp; Commissioning</th>
<th>4 Marketing &amp; Launch</th>
<th>Total</th>
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<tr>
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<td>3.15</td>
<td>24.5</td>
<td>0.35</td>
<td>28</td>
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<td><strong>Co-funding</strong></td>
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<td>0.85</td>
<td>10.5</td>
<td>0.15</td>
<td>12</td>
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<tr>
<td><strong>Total</strong></td>
<td>0.5</td>
<td>4</td>
<td>35</td>
<td>0.5</td>
<td>40</td>
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</tbody>
</table>

### Schedule

- Achieved 2015
- M1-M9
- M6-M21
- M18-M24

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*De- and Remanufacturing Pilot Network*
Highlight 1: Relight s.r.l., Hydro WEEE.

“The Vanguard De- and Remanufacturing pilot network is a new way to share innovation.”

“Relight as a member of this pilot, aims at opening new markets by establishing a sustainable cooperation within the pilot to attract new industrial users of Relight technologies and to pave the way for new recycling services.” Bibiana Ferrari, CEO of Relight s.r.l.
“Xnext developed the most advanced real time material scanner that will revolutionize the quality control testing for manufacturing and will make possible to identify and separate the materials in circular economy applications. In perspective, the 30% of Xnext sales 2020 budget will be generated by revenues from circular economy applications”.

“The De-and Remanufacturing pilot will represent a fundamental installation for show-casing the potentiality of our technology in an integrated pre-industrial environment, thus supporting Xnext in gaining market shares in many different sectors”

Bruno Garavelli, Founder of Xnext
Impacts: supporting re-industrialization of Europe and growth

Demonstrating new De-and Remanufacturing solutions for circular economy businesses will bring social benefits worldwide:

- **New jobs** coupled with technological and automation innovations, due to the increased competitiveness of companies through the ability of delivering products at lower cost (*15000 new jobs* for the considered access profile);

- **New effective technologies** to be exported also to emerging countries;

- **Environmental**, social and image advantages for global manufacturing enterprises (total savings of emissions of *60000 KTons CO2/year*, of energy of *10 TWh/year* and of materials, that otherwise would go to landfill, of *200 kTons/year* for the considered access profile);

- **Political benefits** in terms of independency from fluctuations and turbulence in the primary material market (e.g. for rare earths).
Financial Needs, challenges and next steps

The De-and Remanufacturing demo-case is in a very advanced state. However, challenges are found:

- Financial mix for “layer 1” (Regional and European sources) still to be defined;
- Lack of a clear time-line for the investment;
- Uncertainty in the implementation mechanisms;
- In spite of the significant industrial involvement.

De-and Remanufacturing demo-case next steps:

- A Memorandum of Understanding (MoU) has been defined and share among the 7 regions involved in the pilot. It is ready to be signed.
- Seven additional regions expressed interest to be involved.
- An Expression of Interest for the DG Regio call for Thematic Partnerships to Pilot Interregional Innovation Partnerships has been submitted.
- New proposals for innovation projects will be launched in in H2020 programs (SPIRE, CE, SC5, ICT, ITN).
Thank you for attention

“De- and Remanufacturing” Pilot Network

<table>
<thead>
<tr>
<th>Region</th>
<th>Technical contact</th>
<th>Organization</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lombardy</td>
<td>Marcello Colledani</td>
<td>Politecnico di Milano</td>
<td><a href="mailto:marcello.colledani@polimi.it">marcello.colledani@polimi.it</a></td>
</tr>
<tr>
<td>Tampere</td>
<td>Minna Lanz</td>
<td>Tampere University of Technology</td>
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</tr>
<tr>
<td>Norte</td>
<td>Luis Carneiro</td>
<td>INESC Porto / PRODTECH Cluster</td>
<td><a href="mailto:luis.carneiro@inescporto.pt">luis.carneiro@inescporto.pt</a></td>
</tr>
<tr>
<td>Scotland</td>
<td>Winifred Ijomah</td>
<td>Scottish Institute for Remanufacture - Strathclyde</td>
<td><a href="mailto:w.l.ijomah@strath.ac.uk">w.l.ijomah@strath.ac.uk</a></td>
</tr>
<tr>
<td>Saxony</td>
<td>Katja Haferburg</td>
<td>Fraunhofer Institute for Machine Tools and Forming Technology</td>
<td><a href="mailto:katja.haferburg@iwu.fraunhofer.de">katja.haferburg@iwu.fraunhofer.de</a></td>
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<tr>
<td>Basque Country</td>
<td>Ane Irazustabarrena</td>
<td>Tecnalia</td>
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<td>Flanders</td>
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<td>Ku Leuven</td>
<td><a href="mailto:joost.duflou@kuleuven.be">joost.duflou@kuleuven.be</a></td>
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</table>
**IPR Management**

**Guidelines for management of IPR:**

- The signature of an IPR Agreement between the user and the node of the network delivering the service is required **before starting** each project delivery.
- If a user intends to keep the full rights on the foreground knowledge, a **specific fee** shall be negotiated (function of the revenues).
- If the pilot keeps the IPR on the foreground knowledge, it will constitute the **“best practices”** knowledge base, at disposal of the whole network.

IPR claim is justified when the activities made possible by the platform have led to de-risking private investment in industrial upscale and new market access.
Pilot Network operational framework

- Technological capabilities inventory.
- Service portfolio.
- Best practices repository.
- Regional Infrastructures.
Pilot Network operational framework

- Technological Capabilities inventory.
- Service portfolio.
- Best practices repository.

- Regional Infrastructures.
**Governance: Two-level Structure**

*Proposed Business Entity:* Association (EU-level), Clusters or RTOs (Regional level).

*Two-level governance:*

- **European Pilot Network Board.**
  **Main Role:** to coordinate the interregional cooperation activities with decision-making power at operational, monitoring and strategic levels.
    - To monitor the pilot network operations and the coherence of the projects with the pilot network mission;
    - To monitor the industrial accesses to the infrastructure;
    - To evaluate and approve any change in the pilot network architecture;
    - To provide standard IPR agreement forms to the Regional Boards for industrial accesses;
    - To market and promote the Pilot Network;
    - To exploit the best practices generated within the network at European level.

- **Regional Pilot Board, lead by the Regional Pilot Coordinator (RPC).**
  **Main Role:** to effectively deliver the services to customers.
    - Effectively delivers the services to the users in line with the Pilot network quality standards;
    - Attracts new local customers;
    - Reports the technical developments and best practices.
Governance Structure – Local Regional level

Full time personnel.
Governance Structure – European level

European Pilot Network Board

- Regional Representative
- Elects
  - Industrial Advisory Board
- Elects
  - Administrative Coordinator
- Elects
  - Exploitation Leader
- Regional Pilot Coordinator