Life Cycle Assessment and End of Waste to support innovation process

The circular economy approach, adopted by European Union in last years, provides for the reintegration of products at the end of life within the production cycles. This allows a double benefit: reduction of waste to be disposed and saving of virgin natural resources. Accordingly, the concept of waste must be redefined: it is no longer a problem to be discarded, but it represents a resource to be recovered, that in turn allows companies an economic convenience of raw materials supply and an environmental improvement. Clearly, the reintroduction of waste in production cycles as "secondary raw materials" must be properly regulated, in order to protect health and safety of man and environment, coherently with prevention and care principles, that are fundamental in European policy. In fact, defining the minimum quality and safety standards that must be respected for materials re-use, End of Waste Regulations (EoW) represent the framework for companies that want to invest in technological and production eco-innovations. This is the case of a Venetian company leader in the design, production and installation of expansion vessels for heating systems, as hydraulic components in domestic boilers (fig.1). Thanks to a collaborative project with our research group, this company conducted a preliminary Life Cycle Assessment (LCA) with the aim to identify the main environmental impacts associated with the life cycle of the product (fig.2). Through this preliminary LCA, the most promising opportunities for environmental improvement have been identified in the end of life phase of expansion vessel, going to enhance the EoW. Therefore, possible solutions for recovery of product at the end of life have been elaborated, including the return of replaced vessels to the company and the reintegration of materials and components within the production process to create new products. The solutions identified for recovery of materials at the end of life involves various innovations in the company. In a technological perspective, the production process must be adapted, to allow the processing of secondary materials. In an organizational perspective, the supply chain must be redefined, to allow the return of replaced vessel at the end of life. Now, it becomes essential for the company to know both the technological opportunity of product recovery at the end of life, and the economic convenience of innovative changes derived by this innovation.

Fig.1. Expansion vessel in domestic boiler

Fig.2. Steps of product's life cycle

Research topic:
Environmental and industrial safety

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Main research topics:
- Life Cycle Assessment
- Environmental Risk Assessment
- Sustainability Management
- Circular Economy Approach