

# BLADES2BUILD

Recycle, repurpose and reuse end-of-life wind blade composites – a coupled pre- and co-processing demonstration plant



Project coordinator: DTU - Technical University of Denmark  
(Dr. Ana Teresa Macas Lima)

## 1<sup>st</sup> Newsletter

BLADES2BUILD project started on January 2023 and aims to improve and support circularity options of End-Of-Life (EOL) wind blades by exploring three different circular stages (re-use, re-purpose, and recycling).

### End-of-Life Composites Characterisation

The main objective of this work is to characterise the EOL composite materials of the Wind Turbine Blades that are currently being disposed of having been manufactured at least two decades ago and assess the results for their suitability as circular construction materials. In the first months, the National Technical University of Athens and R-Nano lab identified the characterizations needed to assess the waste material properties for their incorporation into novel materials and subsequently their characterization requirements. In addition to those tests, a subtask under consideration is the examination of regulations surrounding these novel materials that are currently under construction, in order to ensure compliance. Materials are going to be fabricated using the composite waste in powder form and/or recycled fibres. Acciona supplied all the information required regarding the available equipment and test we can afford for concrete and asphalt.

### Testing and Identification of Scalable Circularity Frameworks

Since the beginning of the project, a state-of-the-art study was launched to fully understand the recycling, repurpose and repair for reuse of EOL windmill blades, led by Holcim and supported by GE, as an expert in wind turbine farm development. This report was successfully realized in July and presents a comparative analysis of potential frameworks and methods that foster composite circularity in the context of wind turbine blade handling, considering their environmental impact & feasibility and is structured into four chapters, each focusing on a specific aspect of circularity.



Chapter 1 endeavours to explore, distinguish, and categorize the end-of-life (EOL) management strategies for decommissioned Wind Turbine Blades (WTBs) in line with the circular economy's (CEs) 9R framework. Chapter 2 concentrates on repair technologies for wind turbine blades. In addition, the third part focuses on the repurposing of WTBs. It explores various options, including repurposing the entire blade, part (s) of the blade, and processed blades. Finally, chapter 4 explores recycling methods for WTBs. Upon reviewing the collected literature, it becomes evident that mechanical recycling and co-processing generally emerge as the most environmentally friendly EOL solutions.

## Developing circular construction materials

In this, a market analysis was done by Holcim to define the type of product that will be manufactured later. The primary material to be looked at is low-grade cement-based concrete. The Technical University of Eindhoven (TUE) developed a test plan that will be implemented in the forthcoming months on characterization wastes provided by Prezero and glass fibre scraps provided by LM Wind Power. Additionally, the Technical University of Denmark (DTU) and TUE started working on a review paper on cement-based composites with recycled blade wastes. Preliminary characterization tests of blade wastes, mostly glass fibre reinforced composites, had been done by TUE on particle size analysis, water content, and density. DTU and RWTH Aachen University, as academic partners, performed preliminary tests of blade waste impact on workability and strength parameters of cement-based mortars. Acciona provided a list of feasible applications for the wastes in concrete and asphalt, with their standard requirements (workability, compressive strength, e.a.) and/or formulation according to its experience and/or literature review.

## Design and Development of a Flexible Production Line

This task ensures the overall coordination of partners and materials that will be used for the preparation and establishment of the Demonstration Phase from sustainability aspects. Therefore, technical, legal, environmental, and economic assessments and planning have been designed and developed for the deployment phase of the project. A deep investigation of market conditions and potential technical constraints for mechanical recycling operations was defined in order to operate efficiently and effectively. Life Cycle Assessment and Life Cost Cycle studies have been managed with a focus on gate-to-gate analysis. Expected initial investments and operational costs were also analysed and the development of financially sustainable business models has been initiated. The green business plan is expected to be ready for submission for the assessment of the European Commission by the end of 2023.



## Demonstration of the on-site flexible pilot

The main objective of this work is to develop an innovative and multipurpose wind blade recycling pilot plant to demonstrate the technical feasibility and economic viability of the concept developed within BLADES2BUILD. This demonstration plant will be erected in Cubillos del Sil (Leon), located in northwest Spain. This is a strategic location for a wind blade recycling plant because Northwest Spain concentrates an important amount of EOL wind turbines for the period 2024-2037. PreZero and Endesa have focused their efforts on three main objectives:

- 1) To test different shredding technologies and provide samples of shredded composite at different particle sizes to the partners for testing purposes.
- 2) To develop the basic engineering of the demonstration plant including description, drawings and diagrams, topographic and geotechnical studies, budget, etc. This design will be adapted to the requirements that partners will provide. Eldan performed the design of a plant for recycling of precut windmill blades. The blades should be precut to the size of 1.000 mm X 500 mm as well as the capacity for the plant will be up to 6 tons/hour.
- 3) To prepare and submit (in July 2023) the documentation required for the application of the environmental permitting (Integrated Environmental Authorization and Environmental Impact Study) based on basic engineering.

## Knowledge Hub, Dissemination, Communication and Exploitation

This task consists of the dissemination, communication, and exploitation activities as well as the development of the BLADES2BUILD knowledge hub. In the first months, Global Consulting Sustainability AS (GCS AS) developed the dissemination kit of BLADES2BUILD which contains the project logo, the project website and the establishment of social media accounts, a poster/banner, a two-side leaflet & a public presentation. The BLADES2BUILD official website is [www.blades2build.com](http://www.blades2build.com). In order to maximize the visibility of the project, different accounts were created on social media such as LinkedIn, Facebook, Twitter, YouTube and Instagram. In addition, a plan for the realization of the dissemination and communication activities of the project was appropriately managed, to protect intellectual property. As of now, BLADES2BUILD attended more than 15 events including conferences, exhibitions such as JEC World 2023, workshops such as the Wind Europe's Technology Workshop, and trade shows as JEC Italy 2023.

◆ Ana Teresa Macas Lima (Project coordinator): [atmli@dtu.dk](mailto:atmli@dtu.dk)

◆ Gaylord Booto (D&C responsible): [contact@globalconsultingsustainability.com](mailto:contact@globalconsultingsustainability.com)



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