



Newsletter

2023 | Issue 3 | Carbo4Power

Project Overview

The Carbo4Power is a 4-year project, which started in November 2020 and it is led by the National Technical University of Athens (NTUA), with the participation of a multidisciplinary team of 18 partners (8 SMEs) from 8 countries provides technological know-how and industrial leadership, with well-balanced dissemination, communication & exploitation impact.

This project is funded by the H2020-EU.2.1.3. (€ 7 8 million – Grant Agreement 953192). The main objective is to develop a new generation of lightweight, high strength, multifunctional, digitalized multi-materials for offshore turbine rotor blades that will increase their operational performance and durability while reducing cost of energy production, maintenance and their environmental impact.

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AIMEN activities in the Carbo4Power Project

AIMEN leads the manufacturing tasks aimed at the construction of demo WTB module by means of Automated Composite Manufacturing Technologies, by Automated Fibre Placement (AFP) and Advanced Infusion.

Prior to the fabrication of the demo WTB module, AIMEN has performed the optimum processing window for Advanced Manufacturing using the novel materials developed within Carbo4Power project for implementation to the fabrication of demo WTB module in close connection to Partner's Carbo4Power.



AIMEN's AFP technology has been adapted to process the new developed tapes for WTB manufacturing. A processing window adjustment to obtain optimum processability was carried out.



Regarding the VPI process, the adaptability of the process has been studied to achieve the best impregnation of the developed resins in the different reinforcements to obtain the best composite qualities. Test coupons have also been manufactured according to the corresponding standard for each mechanical property, in order to obtain reference data on the mechanical behaviour of the of the new materials developed by intermediate testing.

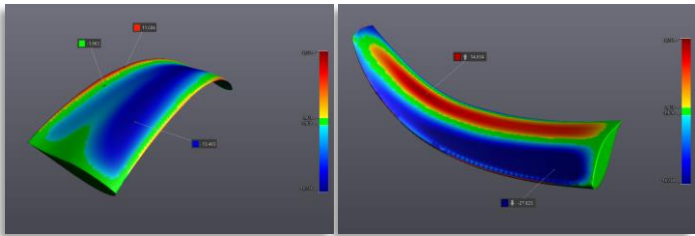


AIMEN will manufacture two demonstrators of modular wind turbine blades with a length of approximately 5.2 meters and a maximum external diameter of 0.260 meters. One of the demos will be manufactured using commercial materials and the other with the materials developed within the Carbo4Power project.

AIMEN has been working to define the best strategies manufacturing by integrating the developed materials, their manufacturing technologies, their scale-up and assembly strategy of the whole blade demo as a cost-effective solution.

BioG3D activities in the Carbo4Power Project

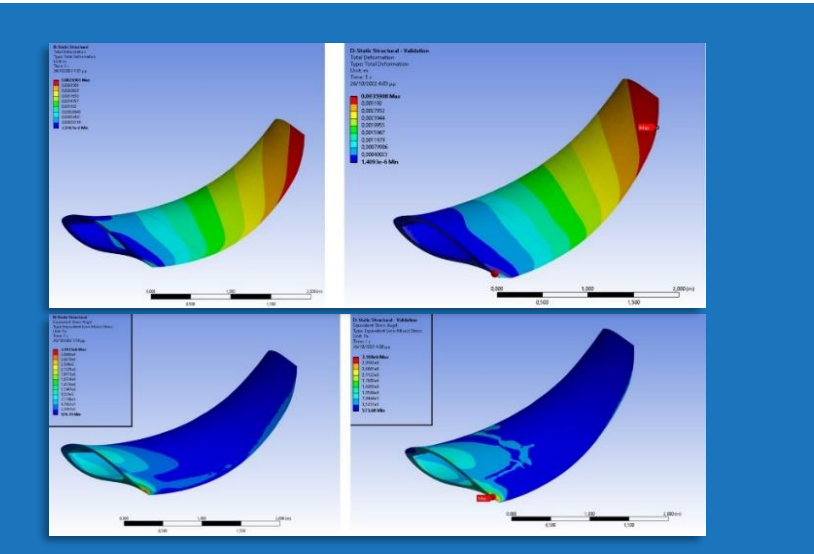
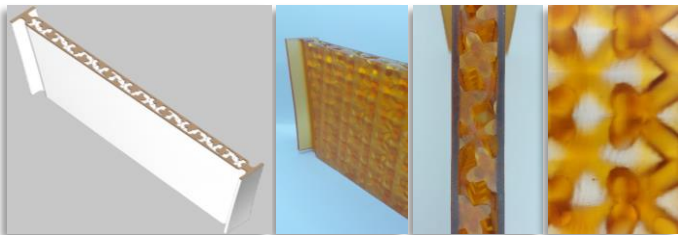
BIOG3D’s activities related to the design optimization of the bladelet component of a wind turbine blade demonstrator are finalized. A two-stage approach was followed involving iterative shape optimization of the external shape for performance enhancement and topology optimization of the internal structure for lightweighting, taking into consideration the design flexibility offered by Additive Manufacturing. The combined workflows resulted in a more lightweight component with higher cost efficiency.



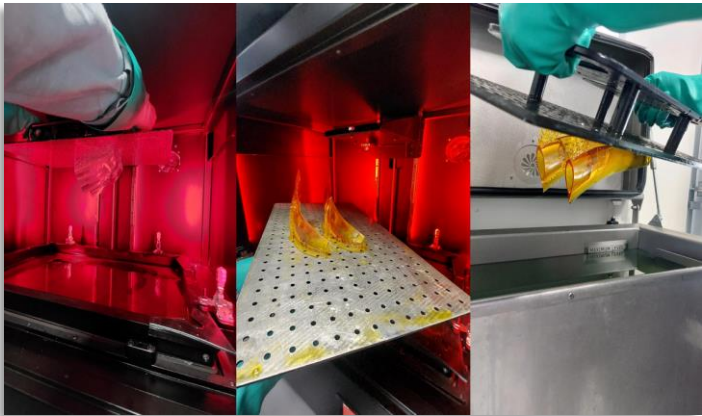
Badelet shape optimization: dimensional deviation colormaps

Blade Manufacturing Processes

BIOG3D’s activities that are related to the design optimization of the bladelet component of a wind turbine blade demonstrator are finalized. A two-stage approach was followed involving iterative shape optimization of the external shape for performance enhancement and topology optimization of the internal structure for lightweighting, taking into consideration the design flexibility offered by Additive Manufacturing. The combined workflows resulted in a more lightweight component with higher cost efficiency.



Bladelet topology optimization: comparative stress and deformation colormaps before and after topology optimization



Bladelet 3D manufacturing process

News from Partners

A New Publication from the Carbo4Power Project Partners

ORE Catapult has recently published a peer-reviewed journal article in the journal Coatings based on research performed in the Horizon 2020 Carbo4Power project in collaboration with Fraunhofer IFAM. This research features the development of a novel test method at ORE Catapult that evaluates the rain erosion resistance of leading-edge protection products for wind turbine blades in tandem with material property analysis. This test method may therefore effectively screen candidate product formulations at a faster rate before performing conventional rain erosion tests are performed. To access this publication, follow [this link](#).



Performance of an on-site exposure campaign at the ITAINNOVA premises



Dr Spyridon Damilos and Dr Nikolaos Moutzouris from the partner organisation IRES, performed an on-site campaign at ITAINNOVA – Instituto Tecnológico de Aragón in Zaragoza, Spain, on the 8-9 May 2023, during the synthesis of modified adhesive bonding chemicals with advance materials for the Carbo4Power project.

Participation in the NanoSAFE23 conference in Grenoble France – 5-9 June 2023

Dr Spyridon Damilos from the partner organisation IRES, participated in the 8th International Conference on Environmental, Health and Safety issues related to Nanomaterials, and NanoSafety Cluster joint conference (nanoSAFE23) in Grenoble France. Dr Damilos presented their work on the “advances in employing nanosafety standards in nanomaterial research”, related to the Carbo4Power project materials.



The Manufacturing of the one-shot demonstrator by IRT Jules Verne

A first TTB demonstrator, a scale 1/4 root blade was manufactured in One-Shot infusion by IRT JV. fQRS sensors were supplied and installed by Sense-In to detect the resin flow front during the infusion.

Participation at the 2nd Conference of Advanced Materials 13-15 Nov 2023

ITAINNOVA will represent the Carbo4Power Project at the 2nd edition of the Advanced Materials in Spain, which will take place in Zaragoza from November 13 to 15, 2023. They will give an elevator pitch and poster presentation related to the work of ITAINNOVA and NTUA in the Carbo4Power about adhesives modification with MNPs. For more information on this event, visit this [link](#).

CIDETEC represented the project at the AMI2030 workshop on Sustainable Materials

Elena Jubete from CIDETEC participated giving a speech titled "Greener pathways for Surface treatments and composite materials", in the AMI2030 Workshop on Sustainable Materials (21st Nov, San Sebastian) where the project Carbo4Power was presented. Also a roll up was showcased. Additionally, in the panel discussion, Carbo4Power activities were also highlighted. For more information on this event, please visit the [following link](#).

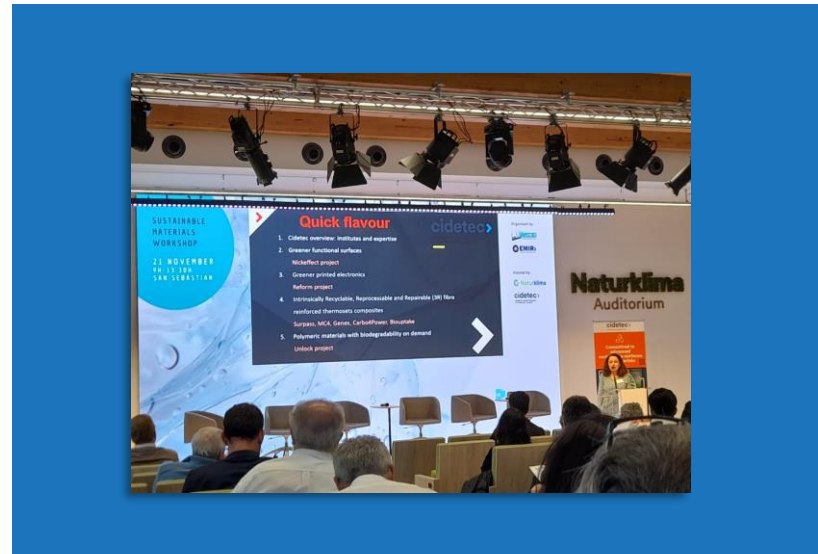


Participation at the Meeting for Composite Materials – 15-16 Nov 2023

IRT Jules Verne will represent the Carbo4Power Project at the BtoB Meetings for Composite Materials, taking place in Nantes on the 15-16 November 2023.

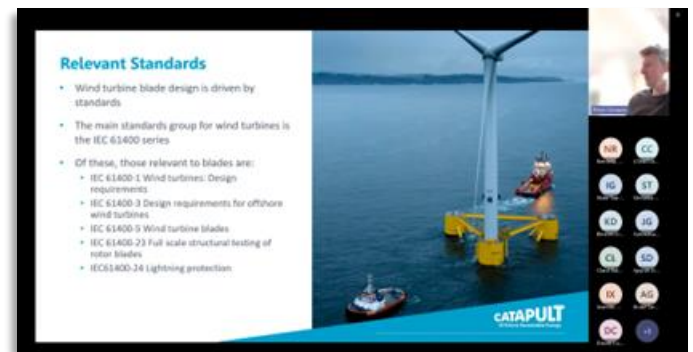
IRT will present its activities through the manufacturing of demonstrators with 3R resin and automated lay-up process. For more information on this event, please visit their website at this [link](#).

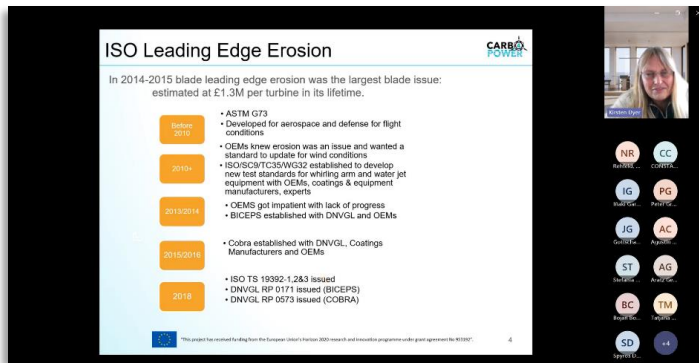




Carbo4Power workshop on ‘Offshore pre-normative activities and standard development processes’

On Thursday, November 30, 2023, an internal workshop entitled 'Offshore pre-normative activities and standard development processes' was held for Carbo4Power consortium partners, aiming to provide an overview of standardization procedures and best practices for engagement with national/international SDOs, followed by case studies by partners active in pre-normative or standardization-related activities. This insightful event provided an excellent opportunity to delve into potential pathways for integrating results developed within Carbo4Power project into the existing standards landscape, as well as recommendations for new areas of standards activity in the offshore renewable energy sector. The workshop was linked with standardisation support services offered by HSBooster platform, including a dedicated session by an assigned expert from Fraunhofer IWES. The expert provided valuable outlook on processes and outcomes of standardisation in the offshore renewable energy sector, followed by examples on relevant standards, pre-normative and standardization-related activities that drive wind turbine blade design (ORE Catapult), leading-edge erosion testing (ORE Catapult) and advanced coating systems for wind-turbine rotor blades (Fraunhofer IFAM). A round table discussion closed the event, allowing to exchange best practices on establishing robust links among research, standardization and innovation of European R&I technologies to increase and valorise project results.





Carbo4Power Partners



Carbo4Power Contact

