PRESS-RELEASE

Issue №2, September 2022

It has been a busy and productive first phase of the MAREWIND project. Since its launch in December 2020, the MAREWIND consortium has been working hard on progressing to achieve the ambitious goals of the project. And as a result, the second milestone of the project has been successfully achieved.

The European Union is committed to becoming the first climate neutral continent by 2050. According to the European Commission, "wind energy is the technology expected to provide the largest contribution to the EU renewable energy targets". In this context, the MAREWIND project is contributing by addressing the main aspects related to materials durability and maintenance in offshore structures. That said, its innovative technology will lower costs and increase the performance and reliability of offshore wind energy technology.

During the first 18 months of the project, the MAREWIND consortium has successfully achieved the second milestone of the project by fabricating and testing relevant elements individually. On the one hand, they have worked on the development of an anticorrosion coating for key metallic elements. This coating consists of three layers with different chemical compositions and, therefore, different corrosion protections. Different systems were proposed regarding matrices and additives to enable the target curing procedures at low temperature. Finally the system of anticorrosion coating was achieved validating also key parameters like adherence or hardness apart from resistance to corrosion by EIS and saline chamber testing.

On the other hand, based on the commercially available systems, the consortium has selected the wind turbine blade coating for trials. To achieve the desired repellence and erosion resistance, functional additives were incorporated into the selected coating matrix. As a result, developed coatings improved the repellent characteristics of commercial model matrix system, and thus, improved their abrasive and chemical resistance.

Based on room temperature curing strategy, MAREWIND has also developed a fouling-preventing coating for different materials of offshore structures that are submerged. The application selected was the spray gun because of its versatility for the target substrates. As a consequence, it is worth to highlight the good results with the latest developed formulation based on one layer and low curing temperature.

As a part of the development of new material formulations for wind blades, both the composite matrix and reinforcement were studied to improve the component performance and sustainability. On the one hand, numerous formulations of epoxy with functional nano silica particle (SiO_2) additives were developed with the aim of increasing the strength, fracture toughness and erosion resistance of the resin. The epoxy-SiO_2 formulations were developed in both powder and liquid media. Based off manufacturability and

The project has received funding from the European Union's Horizon 2020 research and innovation program under Grant Agreement N° 952960.

preliminary material tests, a liquid epoxy-SiO_2 formulation was down selected as the best performing resin and will be later used for further material characterisation and wind blade demonstrator manufacturing and testing. On the other hand, recycled carbon fibers were explored as an alternative to conventional glass fiber reinforcement to increase stiffness and strength while reducing the component weight and cost. Furthermore, innovative alternative materials, such thermoplastic reactive resins and recyclable thermosets, were proposed and successfully tested at lab scale as valuable matrix solutions to increase the recyclable content in the composite. The related recycling process, a thermo-mechanical procedure for thermoplastic reactive resins and a chemical solution-based protocol for recyclable thermosets, was preliminarily studied with interesting results in terms of effectiveness and yield. Finally, numerical models were developed to optimise the composite production using the infusion process and to predict mechanical properties of the recycled materials.

As part of the achievement of Milestone 2, the progress related to new concrete formulations with very high chloride penetration resistance is also worth to be mentioned. **New Ultra High Performance Reinforced** and **Alkaly Activated Materials concretes** were designed and optimized so that their properties fulfill design requirements of consistency (self-compacting concrete) and compressive strength. Moreover durability tests results show the ability of developed concretes to reproduce, or, as in the case of Ultra High Performance concretes, even enhance, standard C60 offshore concrete durability performance in chloride penetration resistance. Furthermore, the absence of Portland cement in the AAM concrete increases the sustainability of the structures made with these materials and, therefore, helps in reducing CO_2 emissions due to the production of cement clinker.

Currently, new technologies for predicting corrosion and modelling are being elaborated. In particular, a non-destructive testing system is being developed which is intended as a first version of the final blade testing system that will be produced in the coming months.

MAREWIND is moving forward with the aim to solve the technological, economical, business, and societal challenges Europe is facing today. Its innovative solution will establish technological base for competitive offshore wind farms constructions, exploitation and maintenance in Europe. The project outcomes will allow offshore wind energy to become the cheapest source of electricity and thereby making it attractive for everyday use of EU citizens.

CONTACT:

Coordinator:
Marta Mateo, Lurederra
marta.mateo@lurederra.es

Cristina Salazar, Lurederra
Cristina.salazar@lurederra.es

Find out more on:

The project has received funding from the European Union's Horizon 2020 research and innovation program under Grant Agreement N° 952960.