PO.241

MAREWIND MAterials solutions for cost Reduction and Extended service life on WIND off-shore facilities



Cristina Salazar Castro, Claudio Fernandez Acevedo, Marta Mateo García de Galdiano

L'Urederra Technological Centre



CONCRETE

Performance ULTRA HIGH Concrete presents 33% reduction in cement used compared to standard. Durability tests according to NT-492 showed after a year of exposure negligible corrosion rate $(k\Omega \cdot cm)$ and extremely high chloride penetration resistance (0.008 m2/s). Freeze and thaw resistance test reflected high durability performance at 200 cycles.

MAREWIND project

The next generation of large offshore wind energy generators needs improvements to solve challenges related to materials, coatings and multi-material architectures increase to operational performance and allow an appreciable reduction of the overall cost. Corrosion and fatigue are the main mechanisms of deterioration in offshore structures affected by severe environmental factors such as extended periods of wetness, UV-radiation, abrasion and erosion, which eventually accelerate corrosion rates. In addition to productivity loss from repair operations, maintenance costs are extremely high due to several factors. Operations and Maintenance (O&M) account for approximately 25% of the costs of offshore wind farms. The MAREWIND project, funded by Horizon 2020 program of the European Commission, addresses the main aspects related to the durability and maintenance of the different materials used in offshore wind power plants. Long term problems derived from material degradation include plant failures, additional resources required for: maintenance and a loss of energy efficiency, which lowers their economic efficiency. Moreover, by enhancing the materials' durability, recyclability and reduce maintenance in offshore structures, the project will contribute to a more sustainable model for the offshore wind sector.







STRUCTURAL HEALTH MONITORING

integrated sensors based on fiber optic have been successfully implemented for Structural Health Monitoring (SHM) in novel



MARE ANTIFOULING COATING DEVELOPMENTS IAREWIND ANTIFOULING SOLUTION SUCCESSFULLY TESTED IN REAL EXPOSURE IMMERSED IN THE SEA Stainless steel coated non coated

Samples tested by ENEROCEAN in PLOCAN facilities (PLataforma Oceánica de CANarias) according to ASTM 3623 regulation, in conditions of full immersion after 2 months.

ANTIFOULING AND ANTICORROSION COATINGS

 Antifouling coated samples show significant delay in fouling cumulation. These results have been partially obtained at PLOCAN-Canarias after obtaining access for 2022-2023.

concrete formulations and blades.



CONCLUSIONS

Among the results obtained in MAREWIND, it is worth mentioning the following which will impact directly on sustainability and reduction on O&M Costs.

- Antifouling coatings: significant delay in fouling cumulation after several months immersed in the sea.
- Anticorrosion coating: the resistance achieved in the laboratory testing would correspond to CX corrosivity category, implying extreme resistance of more than 25 years. Easy and direct application of the coating by spray gun has been demonstrated and the production of 100 L is envisaged to validate its upscaling.

 Anticorrosion coating has been validated with no corrosion damage for more than 4200 hours in cycling tests exposure (1800h UV, 600h freezing and 1800h saline mist chamber) based on ISO12944-9.

- UHPC developed presents a more sustainable solution than standard UHPC and shows 90% durability improvement compared to a standard C60 at same age.

- Successful testing of sensors on concrete and composites for blades for SHM.

