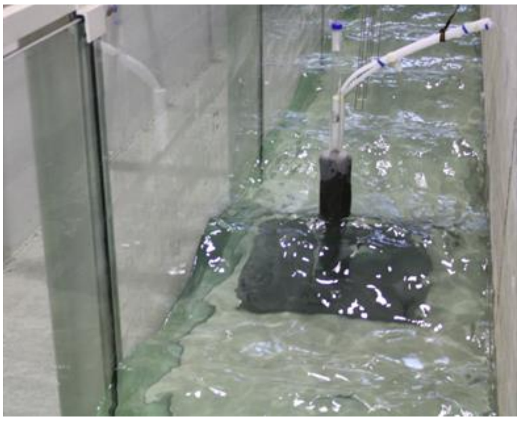
PRESS-RELEASE

Issue №4, July 2024

The MAREWIND project is developing durable materials and recyclable solutions for the offshore wind industry, while extending the service life of the wind facilities. In this context, ACCIONA and CETMA are pioneering the development of ultra-high-performance concrete (UHPC) and Alkali-Activated concrete (AAC) that are more durable and sustainable. To monitor the performance of both concretes, a mock-up floating platform and a Gravity-based structure (GBS) prototypes have been fabricated.

At present, the UHPC and AAC have been tested in real environment to evaluate the durability of the developed materials in a harsh – chloride intrusion – and relevant environments. Specifically, the response of the fiber reinforced polymer (FRP) bars to dynamic waves. Furthermore, the structural health monitoring (SHM) system, employed for testing in relevant environments, utilise fibre-optic sensors (F.O. sensors) embedded in the FRP reinforcement to monitor deformations induced by waves of different frequency and height.

Tests in real environment have been essential to ensure the materials meet the standards. In particular, to evaluate the dynamic response of the floating models under wave action, which is monitored with F.O. sensors, comprehensive tests were carried out at EUMER laboratory (Italy). The AAC for fixed structures and the UHPC have been tested in EUMER test basin where waves motion can be simulated by setting wave height, period and frequency.



Wave basin for floating prototype testing (left image) and wave channel for gravity prototype testing (right image)

Both concrete solutions use an SHM system on the reinforcing bars made with composite material or glass fiber reinforce polymer (GFRP). This technology enhances structural integrity management by providing precise condition assessment, reducing the need for frequent inspections and repairs. Several studies have demonstrated cost savings and lower maintenance expenses thanks to the monitoring of component conditions.

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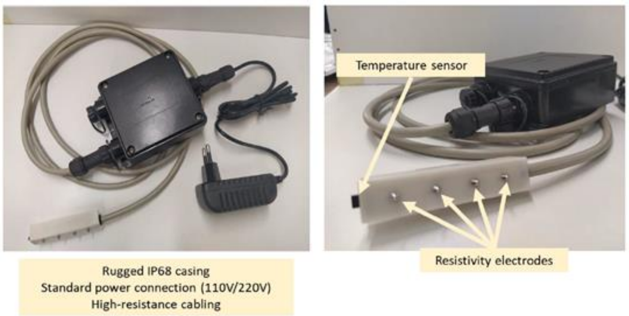
In general, the developed AAC and UHPC have demonstrated superior performance and durability compared to the standard concrete currently used for the offshore market, resulting in reduced maintenance of the structure. Thus, thanks to the inclusion of recycled materials, both concretes are more sustainable.

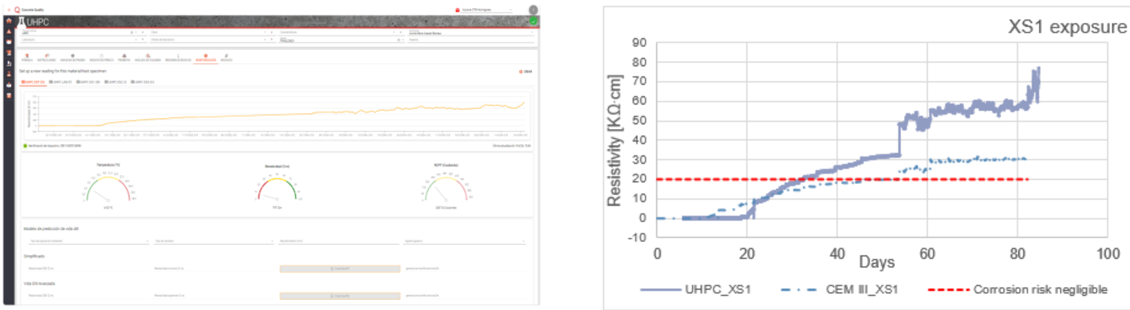
Additionally, at present real environment corrosion tests are ongoing at Gijon Harbour.

The Concrete Quality Platform provides selected sensor system for continues concrete corrosion monitoring. These sensors are embedded in concrete and the technology is based on 4-pole method or Wenner method for resistivity measurement. Consequently, the data is automatically collected in the Concrete Quality Cloud.



Corrosion wireless and embedded Quality Control sensors

As main conclusion, the data indicates that the corrosion risk with the MAREWIND solution is negligible and significantly lower compared to the standard solution.



Example of the on-going corrosion monitoring, Concrete Quality platform and resistivity measurements at different locations.

Further details regarding the outcomes from the real test environments will be communicated in the coming months, providing valuable insights for the future adoption of the MAREWIND innovative solutions.

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