Long-lasting coatings for offshore renewable energy

February 1 2016

EU researchers have developed an innovative and environmentally friendly new aluminium-based coating to provide protection for offshore energy installations.

The Advanced Coatings for Offshore Renewable Energy (ACORN) project has developed a new protective coating that will extend the lifetime of marine structures to 20 or more years and avoid the need for supplementary cathodic protection.

The result will be an entirely new, non-paint solution for the protection of offshore renewable energy steel structures including docks, buoys, and oil and gas rigs. Once successful, the coating will boost the

competitiveness of the industry and help trigger a widespread roll-out of the different offshore technologies.

Corrosion, fouling and cavitation represent a huge challenge for the industry, especially since offshore structures cannot be dry-docked to fix these problems.

Use of a pure aluminium coating

The project involved the creation of a highly differentiated and patentable technical solution that could even be extended in the longer term. It uses thermally sprayed aluminium (TSA) – a substance with proven long-term corrosion resistance - to provide a matrix coating with a lifespan of 20 + years.

This porous mix is then dotted with environmentally-friendly active antifouling substances in very tiny concentrations (

Project scientists chose a 99.5 % pure aluminium coating applied with the twin arc spraying method. The eco-friendly anti-fouling substances were then chosen for their performance, commercial availability and regulatory approval for use in EU waters.

Scientists also evaluated the inert antifoul carriers for stability in seawater, hydrophobicity and for low processing temperatures to protect the anti-fouling agents. Barnacle resistance tests were then undertaken in marine trials off the coast of Sweden.

Coatings for tidal power to boost lifespan

ACORN is also developing a corrosion and cavitation-resistant coating with a 10 + year design life for tidal energy generators which operate in

high-velocity environments.

Three coatings were selected: a tungsten carbide containing alloy, an aluminium oxide and an iron-based alloy. They were chosen for their behaviour under cavitation conditions, compatibility with the substrate material, corrosion performance, a lack of heavy metal content, environmental safety and finally, cost and manufacturing considerations. The three substances were coated onto initial test coupons and assessed for resistance to both cavitation and seawater corrosion.

Computer simulations supported the studies on hydrofoils and model turbine blades in a cavitation tunnel to fully assess each coating's performance under expected service conditions.

Now that the project is working on the commercialisation of the new coating, it is hoped that this will make a major contribution to providing environmentally safe solutions as global energy demands and a shift towards renewable energies will likely see the construction of more offshore energy installations over the next decades.

More information: For more information please see the ACORN project website. www.acorn-project.eu/

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