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Developing the Next Generation 12+ MW Offshore Wind Turbine for Clean and Competitive Electricity

Corrosion Protection and Durability Strategy for Floating Wind

Floating structures of offshore wind turbines are frequently built of steel and need a specific protection system against corrosion in offshore environment. This corrosion protection system represents a non-negligible cost of the overall structure.

Corrosion protection can be covered by cathodic protection, protective coating, chemical treatments or extra steel thickness. During the engineering phase, the objective is to define the most optimized corrosion protection system in each area, based on the local environmental data, the durability of each system and the costs of fabrication and maintenance.

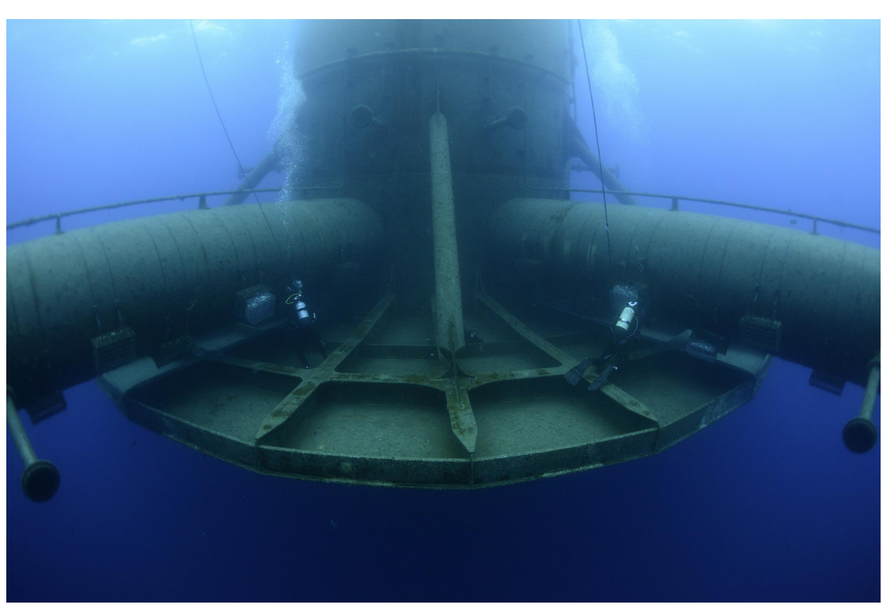
Corrosion protection system definition

Corrosion protection system is specifically defined according to the corrosivity of the environment of the steel structure and is split in 3 main zones: atmospheric zone, the submerged zone and the splash zone, which is the area intermittently wetted by waves.

Corrosion protection system in the atmospheric zone

The zone located above the splash zone, which is not frequently wetted, is protected with coating. The durability and cost of the system is driven by the coating quality, the surface preparation and number of layers. It was shown that major offshore coating repair is extremely costly and only local repairs are acceptable.

It showed the importance of setting high coating quality requirements to decrease the risk of offshore repair and associated costs. However, it comes to the windfarm owner to decide on whether to increase the risk of offshore repairs by decreasing the initial cost of coating during fabrication, or not.



WindFloat® Submerged area protected with Impressed Current Cathodic Protection and coating (Credit Remy Dubas / Ecocean)

Corrosion protection in the splash zone

The splash zone is the most corrosive environment. A combination of protective coating and cathodic protection is required, together with additional steel thickness to cope with residual localized corrosion and wear.

A risk-based assessment is conducted to identify the most optimized solution for this area, playing with the coating system quality, cathodic protection sizing, total steel thickness and inspection plan.

Corrosion protection in submerged zone

In the submerged zone, cathodic protection is used to protect against corrosion. Impressed Current Cathodic Protection (ICCP) or sacrificial anodes may be used. ICCP system is considered as more environmentally friendly but have increased costs and operational risks compared to sacrificial anodes.

In addition, coating may be added to decrease the quantity of anodes. An optimal coating quality in conjunction with decreased amount of anodes seems to decrease the overall cost of corrosion protection in the submerged area. Subsea coating repair is considered as unfeasible and is not included in the corrosion protection philosophy.

ReaLCoE's vision is to unleash the full potential of offshore wind energy
€35/MWh LCoE Goal, +12MW WEC Capacity, ~32 mio € Total Budget, 42 month project duration

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