

Tidal corrosion monitoring of wind turbines using WAND corrosion coupons

Overview

Tidal corrosion on the inside of wind turbine monopiles is a major risk for offshore wind turbine foundations, and can lead to expensive retrofitting, downtime and safety issues. It is therefore essential to monitor the rate of corrosion to mitigate against these problems

The current method requires corrosion coupons to be placed inside the monopile in the tidal zone. The corrosion coupons need to then be taken back to a lab, have the corrosion products removed and be weighed. From the loss in weight of the coupon the corrosion rate can be calculated. This process can be expensive, takes time and prone to errors. Furthermore, the coupons can only be used once, requiring numerous coupons to build up an accurate picture of the corrosion rate at a point inside the monopile.

Inductosense, in partnership with EDF Energy, conducted a 6-month trial to demonstrate that the Inductosense WAND sensors could be used to accurately monitor tidal corrosion, and potentially replace traditional corrosion coupons.

For this application, the WAND sensors were permanently installed on certified corrosion coupons and protected with a rubber coating. Using the WAND handheld data collector to acquire the readings from the sensors, the wall thickness of the exposed face of the coupon was then periodically measured as it corroded



The results from the tests show that:

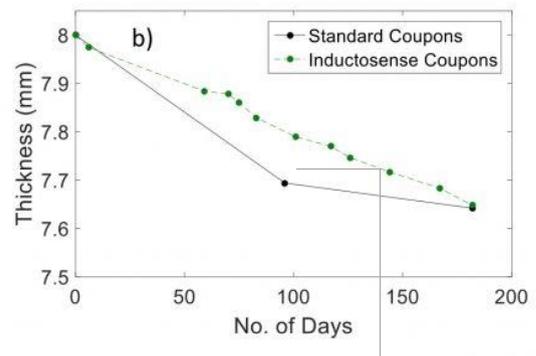
- ✓ **The WAND sensors with the protective rubber coating could withstand tidal conditions, and could accurately measure the wall thickness of the exposed face of the coupon as it corroded, therefore giving a reliable indication of the corrosion rate**
- ✓ **Using the WAND system, corrosion rate can be determined in situ. There is no need to remove the WAND coupons from the site and ship them for lab analysis, as is the case with traditional coupons**

The testing, at a glance...

- 1 The corrosion coupons with installed WAND sensors were placed in a tidal corrosion rig at the EDF laboratories alongside standard corrosion coupons as control samples
- 2 Measurements from the WAND sensors were taken frequently, over a period of 6 months, by lifting the coupons out of the water and acquiring the signal wirelessly with the probe.
- 3 The standard coupons were removed in batches, after a period of 3 and then 6 months, providing a singular averaged wall thickness measurement each time. The results were then compared.



Coupons in the tidal corrosion test rig



Average measured wall thickness for the WAND coupons shown in green, compared with standard coupons shown in black

Feature	WAND coupon	Standard coupon
Fast data acquisition and analysis	✓	✗
Low labour intensity – easy, convenient process	✓	✗
Reusable – can use the same coupon over time	✓	✗
Accurate – measurement excludes errors due to discontinuities	✓	✗

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