CORROSION

STEEL GOING STRONG

ICCP Offshore Wind

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We bring successful sustainable solutions

Modern day wind turbines are often located in or near (sea) water. This means they too are susceptible to corrosion. CORROSION is at the forefront of innovation in the wind sector and is the worldwide market leader in protecting wind turbine foundations against corrosion in an environmentally friendly way by using ICCP.

With our Dutch roots in the use and development of wind turbines, we as CORROSION are proud to contribute to this industry. We were the first to see the possibilities and we continue to bring successful sustainable solutions to this industry.

In today's environmentally conscious world, industry classification societies establish and maintain a growing set of standards regarding the protection of submerged and buried parts of wind turbine foundations against corrosion. Cathodic Protection (CP) systems are one example of these mandatory systems.

CORROSION is market leader in protecting wind turbine foundations against corrosion in an environmentally friendly way by using ICCP.

CP is a technique used to control the corrosion of a metal surface by making it the cathode of an electrochemical cell. This can be achieved in different ways. One way is to use a passive Galvanic Anode Cathodic Protection (GACP) installation system which uses aluminium anodes. However, this system is a major source of pollution due to the extreme amounts of anode material it deposits into the water as the anodes dissolve.

A more eco-friendly manner is to use an almost inert mixed-metal oxide coated titanium anodes in an active electrical controllable system called an Impressed Current Cathodic Protection (ICCP) system. Because the world is becoming increasingly aware of environmental factors, some countries now prohibit the use of GACP installations as the CP for metal constructions in open waters. Then, an ICCP system is the only solution to protect the assets. What's more, ICCP is less expensive in both OPEX and APEX.

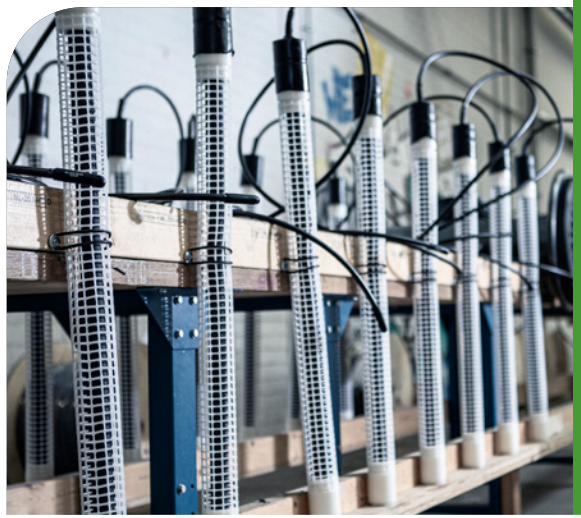
CORROSION is the global leader and specialist in designing, manufacturing, maintaining, and operating ICCP-systems. Our systems are innovative and compliant to legislative regulations. And they achieve the highest levels of efficiency and protection.

ICCP systems

The ICCP-system consists of:

- Anodes made of an inert mixed metal oxide (MMO) anode material
- Sensors that continuously measure the protection rate of the foundation construction
- Cabling, specially designed and tailor-made to meet the challenges of the harsh offshore environment
- High frequency power control unit that provides the required protective currents calculated by a software control program specifically designed for ICCP systems
- SCADA system for remote monitoring and control from any location, such as a substation, an onshore control centre, or directly from our offices

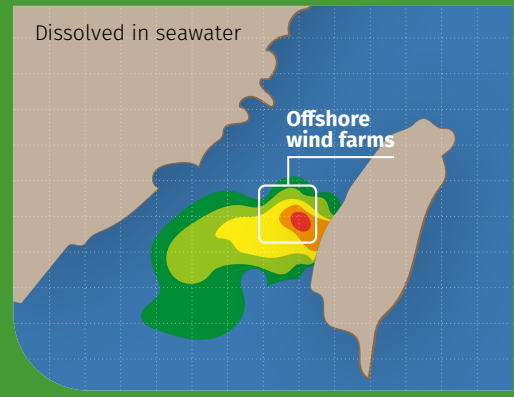
ICCP systems have become the standard solution for internal protection against corrosion in monopile foundations. Only a few ICCP anodes are needed to provide optimum protection. Several low weight ICCP anodes hang down from the airtight platform in the monopile and provide optimum cathodic protection. The control of the internal protection requires precise and ongoing attention due to the confined space and special environmental conditions. CORROSION has developed a unique Reduced Hydrogen Development Software program (RHDS) specifically for the internal protection of monopiles.



Sustainability

Companies that respect the environment and want to improve their green footprint should always choose an ICCP system. This preference can be explained quite simply by looking at the dissolution rates of the different anode materials. Aluminium anodes dissolve at a rate of approximately 3500 grams per ampere per year and the ICCP MMO anodes dissolve at approximately 0,003 grams per ampere per year. When we apply these figures to monopile foundations, we see an incredibly dramatic difference in the amount of material being released into the oceans.

For example, the mean current requirement for an average monopile with coating is approximately 100 amperes. The average design life is 27 years (2 years construction and 25 years operation). The figures per construction reveal an astounding difference!



Required aluminium anode weight per mono pile construction:

12,500 KILOGRAMS

- versus -

Required MMO anode weight for the same construction:

0,0081 KILOGRAMS

In larger terms, like an entire wind park, the results are even more significant. An average wind turbine park of 80 turbine foundations requires 1,500,000 kg of aluminium anodes versus 0.972 kg of MMO material.
Further, when compared to an ICCP system, the use of aluminium anodes requires a great deal of energy for production, transport, and installation. All in all, they leave behind a devastatingly large carbon footprint.

Our highly sophisticated ICCP systems are long-lasting and will effectively protect steel wind turbine foundations against corrosion problems for decades. Our specially made ICCP anodes are designed to outlive the design life of the offshore wind park without releasing harmful material into the environment!

You can follow each wind turbine from the location of your choice

Accessibility

CORROSION ICCP systems have been designed to be SMART. You can follow the corrosion protection performance of each wind turbine from your own location. Reading data and making adjustments can be done with the click of your mouse.

In addition to working well for traditional monopiles or jackets, an ICCP is the perfect solution for the even more recently developed floating wind turbines. As weight is the biggest challenge in the development of the floaters, the light weight of an ICCP system is the optimum way to achieve a durable, efficient CP system.

CORROSION. Steel going strong.

Some of our projects

- Greater Gabbard
- Riffgat
- Dan Tysk
- Luchterduinen
- Butendiek
- Zhongmin I
- Albatros
- Hohe See
- Horns Rev III
- Merkur
- Borkum West II
- Borkum West II phase II
- Meerwind
- Sandbank
- VejaMate
- Zhongmin II
- Galloper
- Belwind II
- Yunlin
- Triton Knoll
- Akita Port
- Borssele III & IV
- Borssele V
- Noshiro Port
- Mermaid
- Seastar
- Rentel
- Arkona Becken
- Northwester II
- Borssele V
- St. Nazaire
- Deutsche Bucht
- Kaskasi

Offshore wind substations

- Dan Tysk
- Dan Tysk OAP
- Meerwind
- Borkum West II
- Global Tech
- Xinghua Bay
- Northwester II Dolwin Gamma
- Baltic II
- Riffgat

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