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cescor

OFFSHORE CATHODIC PROTECTION AND INTEGRITY

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SEA WATER CORROSION AND PROTECTION.

OUR CHALLENGE FOR OFFSHORE INTEGRITY.

Sea water is known to be one of the most aggressive environments for metals and for steel in particular. Corrosion represents the major cause of damages to submarine pipelines resulting in leakages.
Sea water, however, because of its high conductivity, represents one of the most suitable medium for cathodic protection.
The offshore industries rely on cathodic protection to guarantee the integrity and the durability of their assets, like offshore platforms, subsea pipelines or marine terminals.
Offshore cathodic protection, by galvanic anodes or by impressed current, needs specific competences and products to face a harsh environment like the sea.

We care about your expectations.

cescor

OUR MISSION

Integrity of offshore metallic structures can be seriously compromised by corrosion caused by sea water and by the chloride contained in the marine environment. Degradation mechanisms range from general corrosion to localised attacks affecting welds, up to corrosion-fatigue, with damages enhanced by mechanical solicitations caused by waves and marine currents.
Our mission for offshore industry is to provide the best expertise in corrosion prevention and management, including material selection and design and supply of cathodic protection systems and inspections.

INTEGRITY ASSESSMENT

Results from cathodic protection inspections are used to assess the external corrosion status of the structures under investigation.
For subsea pipelines and risers, the cathodic protection inspection data are used together with the structure data (dimensional, operating, monitoring, conveyed fluid, etc.) to perform a global - internal and external - Corrosion Risk Assessment.

CATHODIC PROTECTION EXPERTISE: ON LAND AND OFFSHORE

For steel structures permanently immersed in sea water, cathodic protection represents a valuable and cost effective technique suitable to indefinitely extend their life.
Cathodic protection in sea water presents unique features, determined by the chemistry of sea water and by the nature of the offshore context, which shall be accounted for all phases of a project.
Cescor has developed a wide experience in marine cathodic protection applications, including design, component selection, installation procedures, monitoring and inspections.

festina lente

Festina lente is a classical motto and oxymoron meaning 'make haste slowly' and illustrated by different pairings, especially the dolphin and the anchor. Festina lente was adopted by Cescor to express its vision for offshore integrity activities: firmly based on sound knowledge – the anchor, but moving fast, like the dolphin, where the Client needs are.

Periodical inspections of cathodically protected structure are mandatory to guarantee their integrity. Underwater inspections are planned and executed to verify the cathodic protection level of platform steel jackets and subsea pipelines and to assess the consumption of galvanic anodes.
Inspection of subsea pipelines is performed with probes installed on Remotely Operated Vehicle (ROV) or handled by diver, recording the potential and the gradient profile.
The inspection can be extended to the shallow water shore approaches of the pipelines and to their on land portions.

UNDERWATER INSPECTIONS

OFFSHORE STRUCTURES INTEGRITY THROUGH CATHODIC PROTECTION

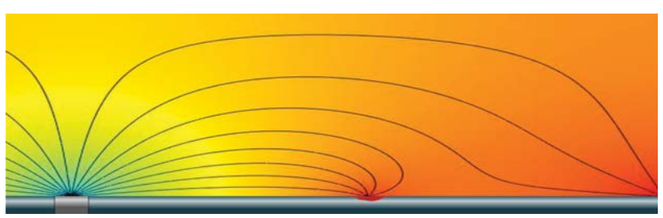
DESIGN, INSPECTIONS AND RETROFITTING




OFFSHORE STEEL PLATFORMS
RISERS
SUBSEA PIPELINES
COASTAL STRUCTURES
SHEET PILINGS
PIERS
LNG REGASIFICATION TERMINALS
FLOATING PRODUCTION, STORAGE AND OFF LOADING

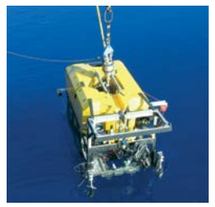
- Corrosion prevention philosophy
- Underwater inspection specifications and inspection plans
- Expert reports
- Design of galvanic anodes and impressed current CP systems
- CP monitoring systems
- Coating specifications
- Optimization of anode distribution by Finite Elements Methods (FEM)
- Requalification and life extension studies
- Cathodic protection retrofitting Design and turn-key systems



Finite Element Methods (FEM) are used to model the electrical field around the pipeline and close to coating defects. Modelling allows to correctly interpret the inspection results. In case of buried pipelines, the electrical field is modelled considering the burial depth and the sea mud resistivity.

UNDERWATER INSPECTIONS

OFFSHORE STRUCTURES

- Potential measurements survey.
- Anode current measurements for residual life assessment.

SUBSEA PIPELINES AND RISERS

- Underwater CP inspection, including:
  - anode potential direct contact measurements;
  - contact-free potential profile;
  - potential gradient profile.

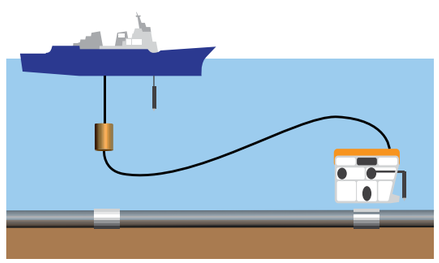
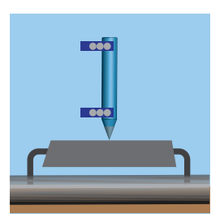
  Survey performed with CP probes assembled on ROV.
- Direct contact potential profile by trailing wire method.

SHORE APPROACHES AND ON LAND SECTIONS

- CP inspection of pipeline shore approaches performed in shallow water with probes handled by diver or assembled on ROV.
- On land survey by DCVG (Direct Current Voltage Gradient) or CIPS (Close Interval Potential Survey) methods.

EXPERT REPORT AND RISK ASSESSMENTS

- Inspection reports.
- Residual life assessment studies.
- CP systems life extension.
- Corrosion Risk Assessment studies covering:
  - internal corrosion;
  - pipeline external corrosion (submarine; shore approach; on land);
  - risers internal and external corrosion.

The Remotely Operated Vehicle (ROV) runs above the subsea pipeline. By the two-electrode probe assembled on ROV, the potential between the probe and a remote electrode, and the potential gradient in close proximity of the pipeline, are measured. Every time an exposed anode is met along the pipeline, a direct contact measurement is taken. The two recorded profiles allow to calculate the potential profile of the pipeline and to localize the coating defects.