



United Kingdom - Case Study

Subsea Corrosion and Cathodic Protection Monitoring System (CPMS) in the UK North Sea

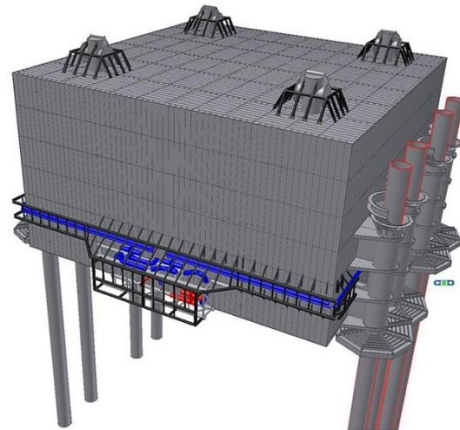


Key Facts:

A UK Operator sought a corrosion and cathodic protection monitoring system (CPMS) for real-time surveillance of a Subsea Oil Storage Tank (SOST). Subsea corrosion probes were required to ascertain the corrosive nature of the fluid inside the tank, and dual function targeted anode monitoring requested to determine the operational status of the cathodic protection system. It should be noted that a system such as this had never been deployed in a tank containing 'hot' hydrocarbons. The scope of work was tailored to client and project requirements.

Location: North Sea, UK

Industry: Oil & Gas



Challenges:

- Monitoring methods were not 'off the shelf' / required development of bespoke solutions
- The tank would be pile driven into the seabed via six piling legs. It was therefore imperative that any equipment inside the SOST would be able to withstand G-force values up to 25G, throughout the installation and commissioning phase
- Everything inside the tank must meet (at minimum) the tank design specifications: 95°C, 40 bar
- Material restrictions
- Only One (1) penetration to tank skin permitted for the corrosion monitoring system
- Variations in operating conditions and temperature
- Tank sealed after installation - no access for the remainder of design life
- No bolting to tank wall - welding only

Solution:

1. Corrosion Monitoring

Subsea corrosion probes using electrical resistance (ER) technology, welded at four (4) locations to monitor fluid corrosivity within the tank.

Deliverable

Real-time monitoring of the corrosivity of the fluid in the subsea tank would help to verify the expected design life of the subsea tank and could be correlated with direct anode monitoring to determine the status of the cathodic protection. Corrosion rate data output in mm/yr, which will be measurable and comparable to the original tank design predicted corrosion rate calculations.

2. Cathodic Protection Monitoring

Five (5) anodes directly monitored inside the tank; each monitored anode had 2 monitoring functions, through open and closed circuits. The outputs indicate if the anodes are still functional once submerged in hydrocarbons and / or water and also provide a universal voltage of CP across the tank.

Deliverable

Real-time indication of the effectiveness of the cathodic protection system via the dual monitoring of 5 anodes. Dual monitoring functionality:

- i. Measurement of anode current
- ii. Measurement of anode open circuit potential.

3. Subsea Pod

An enclosure specifically designed to house all the electronics to withstand the environment and protect the hardware in it. It also needed to overcome communication and power restrictions.



Sense



Understand



Perform

Subsea Corrosion and Cathodic Protection Monitoring System (CPMS) in the North Sea

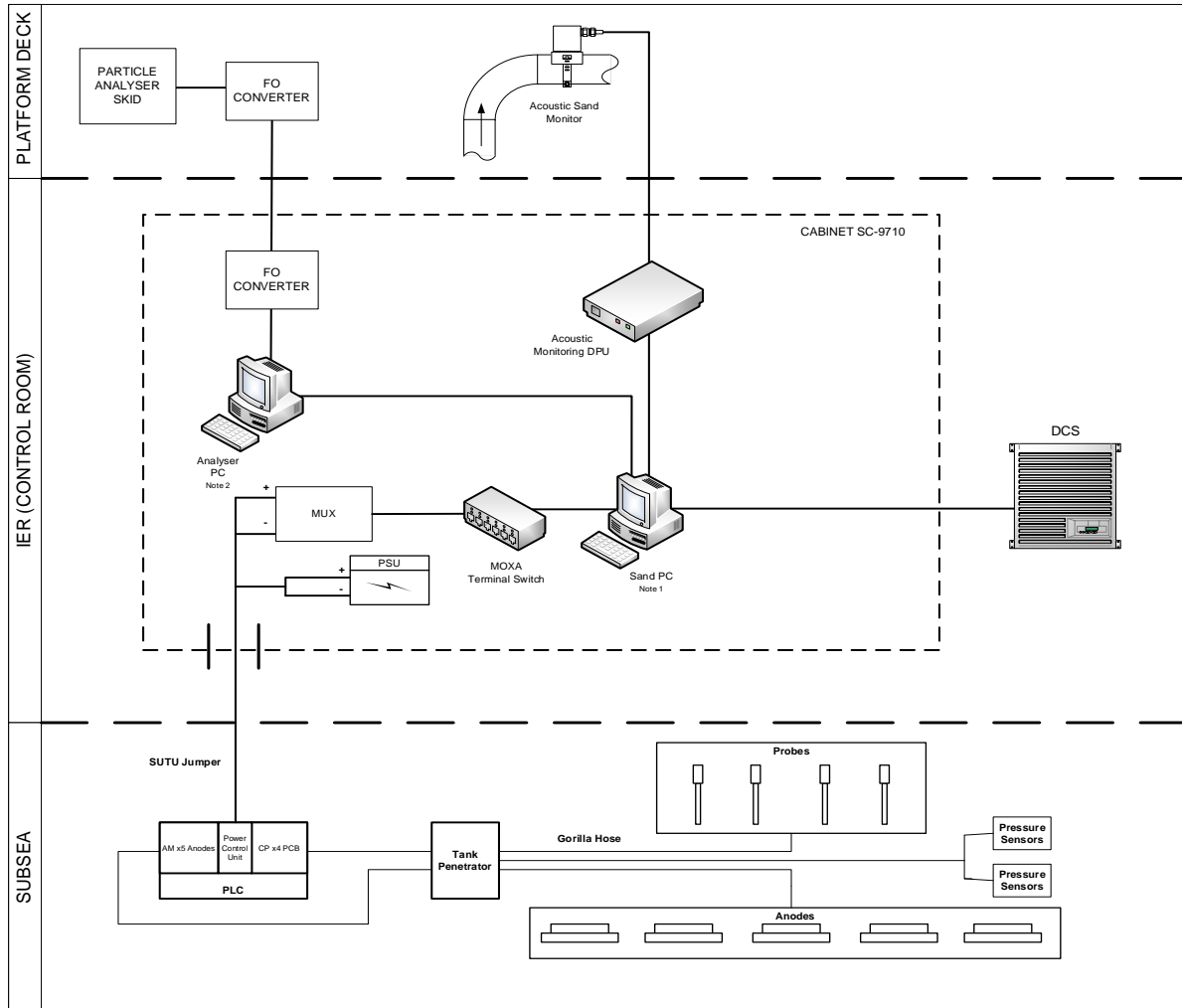
Deliverable

A Subsea pod to contain all the required electronics for:

- Communication with multiple equipment on a single channel
- House and protect all processing equipment
- Contain redundancy functions to comply with subsea requirements and full expected time of life
- Withstand the environmental requirements (pressure, temperature).

Results:

- A number of software versions developed to fulfil data acquisition & management scope
- All equipment tested and fully integrated during SOST pre-deployment at wet docks
- Datasets from the tank internal sensing array handed off to the topsides acquisition system via the subsea umbilical tether unit (SUTU).
- Topsides acquisition module fully integrated with client distributed control system (DCS)
- System fully commissioned offshore with Operator handover



Value to Client:

- **Remote Location Monitoring**
Early identification of corrosion events
- **Real-time**
Immediate data availability, for dynamic and informed decision making
- **Reduced Cost**
Minimal personnel and maintenance required
- **Repeatable and Reliable**
Reliable method of tracking corrosion

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