Corrosion of Surface Casings of Offshore Wells

Casings on offshore wells act as additional safety barriers to prevent potential contamination of seawater, strengthen well hole structure and keep fluids or gases from seeping into the formation.

Corrosion attack happens predominantly at sea level and can affect both the conductor and surface casings. Based on previous experience:
1. Surface casings of some wells are severely corroded. The degree of corrosion varies greatly between wells, some having no or little wall loss, others corroded to perforation. Reasons for these variations have not been fully explained.
2. Wall loss is concentrated near the fluid interface. This interface is the splash zone for those wells in open contact with the sea but could be at another level for wells with closed conductors.
3. Corrosion extends over lengths of about 0.6m to 3 m, all the way around the circumference.
4. Wall loss on the surface casing is not correlated to that of the conductor. Wall loss measured on the conductor may therefore not be used to determine the integrity of the surface casing and vice versa. Corrosion variations in conductor and surface casings are attributed to a difference in temperature; surface casing usually being hotter than conductor casing.

A proper corrosion evaluation is imperative to preventing well failures, risks to well integrity and environmental hazards.

Inspection Technique

Shell Global Solutions in Amsterdam, the research and technical service organization of Royal Dutch Shell Group, has developed an inspection technique for effective corrosion inspection of surface and conductor casings. This method overcomes the challenges of accessing hard-to-reach areas and of working on producing wells. It is based on the pulsed eddy current (PEC) technique and has been well proven in the field.

Licensed to operate PEC well-inspection equipment, TÜV Rheinland Sonovation offers inspection of surface casings and conductors on offshore wells using the pulsed eddy current technique. We are able to provide you with grounded advice as to whether this technique is suitable for application in your particular case.

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Our experience - your benefit

TÜV Rheinland Sonovation has gained several years of experience with inspections based on the pulsed eddy current technique. A large team fully trained in the procedure is available on a worldwide basis.

Validations

Based on data from several validation exercises carried out on pipes, an accuracy of ±5% (2-standard deviation) is expected for PEC wall thickness measurements on surface casings and conductors.

Benefits at a Glance

- Ability to measure without surface preparation.
- Non-magnetic materials like deposits, dirt, sea water, etc. have absolutely no influence on PEC signal and are therefore irrelevant to PEC inspection.
- PEC measurements tolerate considerable tilt of the PEC probe in relation to the steel surface. This is an important feature, since accurate alignment of the probe cannot be guaranteed due to restricted access.

Along with clear advantages, the pulsed eddy current technique has its limitations. PEC measures general wall loss but could miss localized damage. Therefore, it can be used to detect variations of wall thickness within an object, but not to interpret absolute wall thickness.

Results

Results of the inspection, shown on standard TÜV Rheinland reporting formats, are illustrated in the following figure.

![Graph showing wall thickness measurements](image)

About TÜV Rheinland:

Founded 140 years ago, TÜV Rheinland is a global leader in independent inspection services, ensuring quality and safety for people, the environment, and technology in nearly all aspects of life.

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