



ASPIRE

Software Package

Assess structural integrity of
conductors/caissons

www.aspire-analysis.com

Objective

As life extension projects see many oil wells being used beyond their design life, ensuring the structural integrity of critical components to prevent unexpected failures has become more important than ever.

ASPIRE aims at delivering results to the operator in terms of risk, as the product of probability and consequence of failure. This provides the company with inspection recommendations based on the strength response of the corroded caissons/conductors. These mitigation actions will determine the acceptability of the caisson/conductor to remain in service within the acceptable risk. Through this comprehensive approach to structural integrity assessment, the operator's cost of inspection will be substantially reduced.

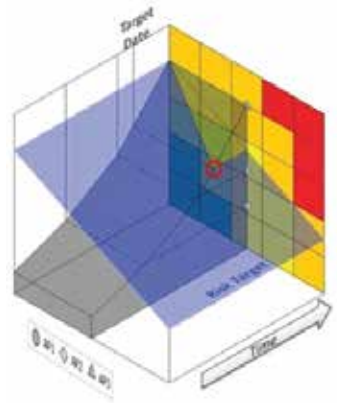


Figure 1: Corrosion monitored on conductors of well head towers (left), illustration of risk based remaining life (right)

Background

The ASPIRE components that are being integrated in a decision support integrity management tool for upstream assets are illustrated in Figure 2. There are four of them:

- 1 **Risk-based Inspection (RBI)** is a methodology for identification of high risk scenarios by review of active/potential damage mechanisms and the suitability of mitigation methods. RBI allows inspection/maintenance resources to be optimised. The challenge is that a standard approach cannot be adopted here as the complexity of equipment may not allow for this to take place. The solution could develop in the form of a software package that uses fundamental of probabilistic approach and can easily be customised to include limit state equation for any particular damage type as well as different consequence scenarios. This should, not only assess the risk, but also outputs a risk-focused inspection and maintenance plan in an auditable and highly user oriented format;

- 2 **Total Quality Inspection (TQI)** covers:
- Selection of the most appropriate NDT technique
 - Qualification of equipment, procedures and inspection personnel
 - Data recording and interpretation

TQI offered by Innospection and TWI as partners is based on NDT research undertaken over the past 25 years. The project partners – Innospection and TWI - continue developing new inspection techniques and tools for inspection and rating them by their performance for specific inspection tasks.

- 3 **Fitness for Service (FFS)** may allow for a detailed assessment of flaws using built-in Finite Element Analysis (FEA) capabilities following advanced inspection as offered by Innospection to evaluate complicated geometries and loadings. TWI has been involved in developing ECA/ FFS/ FFP procedures for 50 years and provides assessments in accordance with BS 7910 and API 579. TWI also offers a range of standard FFS software packages (ie CrackWISE, IntegriWISE, WeldCRO) for corrosion, fatigue, fracture and creep assessments.

- 4 **Optimum Repair Technologies (ORT)** provide operators with the means to establish the most cost-effective approach to reclaiming a damaged component. Through TWI expertise in weld repair, cladding, surfacing, coatings etc, the project partners are able to advise independently on all remediation techniques, e.g. replacement, modification or material upgrade.



Figure 2: Upstream Assets

Our Approach

The initial, high-level screening is based on a conservative effective area calculation and **Corrosion Rate (CR)** estimation, which establishes a **Remaining Life (RL)** for each conductor/caisson. An appropriate FFS approach will be selected for each conductor/caisson, depending on whether it is subjected to global bending, compressive loading, or a combination of the two. This assessment is facilitated by a stability check, based on international standards, of the well conductors/caisson.

The operator establishes risk targets (using ASPIRE) to determine the risk (Probability of Failure) target, with the remaining time to that target considered as the **Risk-Based Remaining Life (RBRL)** (as shown in Figure 1). This determines the point at which an inspection is recommended to be carried out to better quantify the damage state.

ASPIRE is also capable to perform the conductor assessment with the inclusion of any imperfections, even when the RL at the assessment target date was greater than zero.

ASPIRE then carries out a risk assessment to consider the likelihood (with limit state equation as the second moment of inertia) and consequence of failure, before putting forward suitable risk-mitigating actions.

About the Project Partners

TWI is one of Europe's largest independent research and technology organisations. TWI is a non-profit distributing, membership-based company. It is owned by its Members - 3,500 from 60 countries around the world.

Innospection is a service provider for advanced inspection of Oil & Gas installations located on- and offshore. Innospection is pro-active in developing innovative inspection solutions for a number of assets in the splash zone or subsea.