**Background**

A large number of facilities and parts of the infrastructure located offshore are approaching or have exceeded their original design life. Thus, formal assessments are necessary to demonstrate the integrity of structures and pipelines to continue safe operation throughout their life-cycle.

Cathodic protection (CP) systems are a standard practice for corrosion protection of offshore structures and pipelines. In order to evaluate the performance of CP systems, FORCE Technology developed FiGS®. This tool performs accurate measurements of electric currents in seawater, with a resolution and detection level that surpasses all other field gradient (FG) sensors available in the market.

**Cost efficient offshore operations**

A FiGS® CP survey provides both the strength and direction of the electric field, providing detailed information about the distribution of the CP system. The direction feature also makes filtration of compromising noise fields from subsea vehicles far easier. A FiGS® CP survey eliminates the need for contact with the structure or pipeline to calibrate the CP readings. This enables faster inspections, which reduces the operating time of costly vessels required to operate Remotely Operated Vehicles (ROVs).

**Cost efficient life cycle for structures**

The use of FiGS® enhances the ability to determine the current CP condition of pipelines and structures, providing valuable input for life extension studies. The combination of innovative technology and world class expertise within cathodic protection, allows FORCE Technology to provide solutions that reduce life-cycle cost of the subsea structure.

The detailed information provided with a FiGS® CP survey, combined with with CP design and CP modelling allows us to optimise the CP design, maintaining retrofit cost at a minimum, as well as ensuring optimal operation.

Inspection with FiGS® provides detailed information on anode performance and the integrity of the coating (if any). After determining the current state of the asset, modelling is then used to predict future behaviour and life expectancy of the CP system. We base our retrofit CP designs on values from the FiGS® CP survey, enabling us to eliminate layers...
of conservatism and reduce the retrofit extensiveness and cost, compared to using conservative design codes. If a CP retrofit is engineered without the actual measured data and the use of computer modelling, fairly conservative design values have to be applied. Given the high cost of subsea retrofitting, the use of FiGS® CP survey data and computer modelling creates significant savings.

In cooperation with an oil & gas operator, we recently achieved savings of 70 MNOK (approx. 65% of the original retrofit estimate) by using FiGS® data together with CP modelling, instead of design codes. This approach enabled the optimisation of the retrofit of the CP system of a jacket structure.

The use of SeaCorr™, a CP computer modelling tool, made it possible to simulate several retrofit solutions to find the most cost efficient solution for retrofit, considering hardware and installation cost. The team involved in the project, used our SeaCorr™ software to create a CP model to analyse and forecast the CP performance of the jacket. The model was built based on the jacket design geometry and calibrated with cathodic protection and field gradient data from a comprehensive FiGS® CP survey.

**Safety**

> The use of FiGS® ensures safe offshore operations by performing subsea pipeline inspections that help prevent hazardous consequences

> Subsea inspection with FiGS® minimises injuries associated with heavy excavation and diving operations

*figs.no*
FiGS® CP survey on jackets

**Figure:** Protection potential distribution of an offshore jacket.