INSPECTION INTELLIGENCE NDT GLOBAL

STATOIL

CUSTOM SOLUTION FOR AN EXTREME SUBSEA PIPELINE

CASE STUDY

Photo: Statoil

CHALLENGE

Statoil required an accurate and detailed baseline survey on their new thick lined Polarled gas pipeline. This pipeline brings significant operational and environmental challenges.

SOLUTION

A robust and timely redesign to accommodate increased operating pressure levels and also battery enhancements in excess of the expected run time.

RESULTS

A customized fully certified tool which made a first run success possible. Manufacturing defects are now known and corrosion growth can be confidently monitored.

CHALLENGE

Statoil required a baseline survey of their new Polarled gas pipeline as part of the commissioning process. When working with gas pipelines, inline inspections (ILI) identifying corrosion are typically completed with magnetic flux leakage (MFL) technology due to the absence of a liquid coupling medium.

However, MFL depth sizing accuracy is reduced in direct proportion to the pipe wall thickness. This pipeline has a varying wall thickness range of 28.9 mm to 37.5 mm (1.1" to 1.5") which meant that ultrasonic technology (UT) offered a solution which was up to 80% more accurate for depth sizing. UT inspection was feasible as prior to operation, the pipeline was filled with treated seawater.

Polarled is the first pipeline on the Norwegian continental shelf that crosses the Arctic Circle which brings both operational and environmental challenges. The Polarled pipeline is 482 km (299 miles) long and 36" in diameter running from Nyhamna in western Norway to the Aasta Hansteen field in the Norwegian Sea. The key operational challenge was that the ILI tool could not be pumped in one go. A series of cleaning pigs were first launched into the line, 25 km (15.9 miles) ahead of the tool but they could not be recovered by the subsea receiver at the same time as the intelligent pig. Due to variability in weather conditions Statoil needed the intelligent pig to remain powered while waiting for extended time periods. To meet this requirement, a modified ILI tool with 470 hour battery life was required, well in excess of the actual expected run time of 270 hours.

The main environmental challenge related to the ruggedness of the tool. The field water depth is 1,260 m (4,133 ft 10") at Aasta Hansteen. This depth combined with the pressure in the line gives an expected operating pressure of 170 bar (2,465 psi). Normally, intelligent ILI tools are certified to 120 bar (1,740 psi) so this required a robust redesign, additional testing and assurance to meet these enhanced limitations.

SOLUTION

NDT Global performed the inspection run using high-resolution pinhole and pitting (UMp) metal loss inspection technology. This configuration features an optimized sensor carrier design and a high-resolution grid that is unmatched in the industry. The ultrasound measurement is ideal for thick walled pipes used in deep sea operations. It provides absolute measurement data (unlike MFL which measures relative changes) and a depth sizing accuracy of 0.4 mm (0.02 in), offering 80% more accuracy for corrosion depth sizing.

ULTRASONIC TECHNOLOGY OFFERED 80% MORE ACCURACY FOR CORROSION DEPTH SIZING.

A varying wall thickness range of 28.9 mm to 37.5 mm (1.1 in to 1.5 in)

Customized inspection tool with master and slave battery modules

A new 36" battery module was built for this project. The applications and tooling teams also converted a 36" battery module into a slave battery module so that 2 battery modules could be used in the same tool to meet the extended run time of 470 hours.

Normally, NDT Global's ILI tools are certified to 120 bar (1,740 psi). Given the depth of pipeline the tool was expected to operate at a pressure of 170 bar (2,465 psi). NDT Global had confidence in its design, materials and assembly and decided to do the work to certify to 200 bar (2,900 psi) to provide full assurance to Statoil.

These changes required additional testing of pressure vessels, sensors, cables and the odometer system. Any malfunction at high-pressure had the potential to severely damage the tool and risk the whole project so this advanced certification project was a very important part of the overall solution. One recertification was completed, ILI tools were launched onshore at the gas plant in Nyhamma. In order to flood the line and facilitate the ILI equipment, temporary piping was introduced. This inspection had to be completed before winter set-in hard and as the seawater would freeze in these extreme conditions.

RESULTS

Customization to overcome operational and environmental challenges. The project was designed and delivered to meet the operational specifications of this undersea pipeline. A customized tool was fully certified to the harsh operating environment to ensure safe operation and a trouble free project.

An exacting dataset to more accurately monitor future corrosion. This baseline inspection with UT was collected with the highest accuracy available today. Not only is the pipeline ready for operation but the operator now has the inputs required to improve integrity management over the lifetime of this strategic asset. Given the accuracy of the data, the baseline manufacturing defects are now known and corrosion growth can be confidently monitored.

Excellent project execution and first run success. This carefully designed and meticulously planned inspection was completed with a first run success. This was important, not only due to support team costs but also due to the oncoming winter and the short window available for the inspection.