MagneScan XHR — Pathfinder in Corrosion Monitoring

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ABSTRACT

Corrosion monitoring requires the detection of potential anomalies in pipelines at a very early stage. A precise characterization with respect to position, type and dimension is necessary in order to enable the operator to undertake preventive actions or to reduce corrosion growth right from the beginning. The tool accuracy has a significant impact on the calculation of the allowable safe operating pressure. Existing magnetic flux tools have not up till now been able to meet these requirements. Especially in offshore lines with a heavier wall thickness, where the detection threshold is decreased, the results obtained were not accurate enough to facilitate secure metal loss growth predictions.

For this reason, Pipetronix has developed a corrosion inspection tool based on the well-established magnetic flux leakage principle, especially suited for the use in offshore applications. Since the tool had to be developed for the use even in thick-walled offshore pipelines, the magnetic circuit was improved significantly. The use of the latest Hall-Effect Sensor technology along with improved sensor arrangement and increased sampling frequency resulted in improved sensitivity and detection quality. Finally, advanced interpretation methods allow an accurate sizing of defects. This tool, with its high resolution, was built on the basis of latest technological advancements and permits corrosion measurement with a threshold (minimum detectable flaw depth) of 5% of the nominal wall thickness. The impressive sizing and detection capabilities allow a precise determination of corrosion growth rates based on consecutive inspections and advanced statistical methods. The results can be used for a high level risk assessment. A potential life-time extension of the pipeline is also given, as the results point out the requirements for preventive actions at a very early stage. The results of several thousand kilometers of inspection runs have proved that the tool meets the high demands.

KEY WORDS

Pipeline Integrity, Intelligent Pigging, In-line Inspection, Corrosion Monitoring, Nondestructive Testing, Corrosion Growth, Statistical Approach

INTRODUCTION

As far as their technical design is concerned, corrosion detection tools based on the magnetic flux leakage principle have until now been able to detect and measure corrosion only of a dimension (diameter) of approximately twice the nominal wall thickness and a minimum depth (threshold) of 20% of the wall thickness, with an accuracy of ±10%. For offshore lines with heavier wall thickness, the threshold increased up to 40% of the wall thickness. It was therefore essential to develop a new pipeline inspection tool to meet the increasing demands.

For this reason, Pipetronix and Norwegian Statoil have developed and built a new generation of corrosion inspection tools based on the well-established and proven magnetic flux leakage (MFL) principle. Considering the demands for the Statoil pipeline system, which is shown in Fig. 1, the tools are, in addition to the use in onshore lines, especially suited for the application in thick-walled offshore pipelines. The project was part of an engineering and service contract between the two companies.