



IMPACT OF INTERNAL INSPECTION DATA UNCERTAINTIES ON RISK ANALYSIS FOR DESIGN LIFE EXTENSION OF SUBSEA PIPELINE: A CASE STUDY

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Many existing subsea pipelines are approaching or have exceeded their original design life. Pipelines are designed for a specific life span, depending on the reservoir capacity, as well as on process parameters and substances that should be conveyed. Nevertheless, many fields have a reservoir capacity larger than the predicted one. In this case, oil companies check if it is possible to extend the design life of the pipeline, i.e. if the status of the pipeline is capable to withstand the maximum allowable operating conditions foreseen during this additional period. The internal inspection performed by means of intelligent pig, when feasible, is the most efficient solution in order to highlight the real status of the defects of a subsea pipeline. The intelligent pig is a vehicle capable to run through the pipe and to gather positions and dimensions of the pipeline defects. In order to extend the design life of the subsea pipelines, risk analyses are carried out to define the risk level, until the line is in operation. The risk level is a combination of frequencies and consequences of the identified accidental scenarios, following a possible release. Frequencies are evaluated considering all potential causes that can lead to loss of containment scenarios. In particular, release frequencies due to corrosion are calculated considering the probabilities that material defects result in failure scenarios. These probabilities depend on the inspection data and are affected by the data uncertainties. A probabilistic assessment is performed considering the uncertain data collected by the internal inspection. The calculated risk level changes according to the data uncertainties: if the measurements of the inspection vehicle are not so much accurate, an intolerable risk level can be found even when the pipeline defects are not so critical. This paper reports the approach used for an actual case study: a subsea pipeline with a twenty-five years design life, carrying multi-phase oil with sour gas (i.e. with H₂S). The paper focuses on the impact of the detection accuracy during the pipeline internal inspection on the calculated risk level, as well as on the risk reduction measures to be adopted in practice.

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