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Improving pipeline integrity assessments using optimised probabilistic acceleration techniques.

Enhanced oil recovery techniques and the improved methods for discovery of small pools of hydrocarbons have helped to maintain the potential for continued hydrocarbon recovery in the North Sea basin.

The probability of continued export infrastructure availability can have a significant impact on the development, and redevelopment of marginal fields. If the life of existing aging export infrastructure can be safely extended, the stranding of proven hydrocarbon reserves can be avoided.

To help determine if a pipeline is safe for continued operation an integrity assessment is typically performed. Historically the choice has been to perform either a deterministic assessment or a probabilistic assessment. Both methods have advantages, a deterministic assessment can be relatively quick and low cost, whilst a probabilistic assessment can help demonstrate the relative probability of failure at various points in the future, and hence for how long the pipeline is likely to be acceptable for continued use.

Many probabilistic approaches use Monte-Carlo simulations to determine probabilities of failure. Typically, such simulations determine a failure probability for a specific time-interval. For a single defect this approach may be straightforward to carry out. However, for pipelines containing many defects this may not be the case, as performing multiple simulations can incur significant time and cost.

By using a blend of custom designed assessment and machine learning software the authors have developed a cost and time efficient method of assessing the risks associated with the life extension of existing assets.

Using modern computing techniques such as parallel processing and machine learning the authors have developed a form of defect assessment which aims to deliver the detail of a probabilistic approach with the speed and cost of a deterministic assessment.

Presenters' CV

Aidan Charlton

Aidan has had an unconventional work history, and has previously worked for a substantial time as a carbon composite fabricator, before re-entering education as a mature student.

Completion of an apprenticeship in welding and fabrication resulted in qualification for the national finals of the BOC apprentice welding competition, and formed a sound base for higher education.

Aidan excelled in fracture mechanics whilst completing a BEng(Hons) with the Open University, before graduating from Newcastle University with a Distinction in MSc Pipeline Engineering.

Aidan currently works for Penspen Asset Integrity in Newcastle.

Special interests within Penspen include;

- Development and testing of VBA based coding of a high definition tool to provide statistical analysis of effects of 3rd party interaction at all points on a pipeline.

- Development of a machine learning tool for use in defect matching between multiple ILI datasets.

- Further development and testing of VBA based coding of high definition RBI analysis tools, (Statistical and deterministic).

- Assessment of interacting dents using VBA based coding, (strain-based assessment).

- Development and testing of VBA based coding to support statistical R-STRENG river-bottom profile (RBF) analysis.