



Case study - Engineering Criticality Assessment

Manufacture, storage and deployment effects on the fatigue life of pipelines

THE CHALLENGE

Our client had manufactured a deep-sea pipeline over 30km in length by welding straight pipe sections and then storing the final fabrication on a reel. However, for operational reasons they had a requirement to unreel the pipe on the sea-bed for a period, before re-reeling and final deployment.

OUR INVOLVEMENT

An earlier Engineering Criticality Assessment (ECA) had been undertaken and substantiated the design, but assumed that only a single reeling-unreeling cycle would be undertaken. We were asked to undertake a further analysis in considerable more detail, taking into account not only the reeling cycle, but also weld residual stresses and the effects of misalignments between adjacent sections of pipe. The final assessment also included some detailed J-integral analyses of some postulated cracks. This powerful numerical technique is a useful way of testing whether the fatigue and fracture assumptions within the design are justified.

EXTRA ADDED VALUE

The study generated some interesting conclusions. In particular, the effects of misalignment between pipe sections and the oval cross-section the pipe assumed after the first phase were shown to be very significant.

Our client now has a much better understanding of the effects of repeated reeling on the integrity of the pipe. We were able to provide this understanding by harnessing our considerable technical expertise with our knowledge of ECA methodologies.

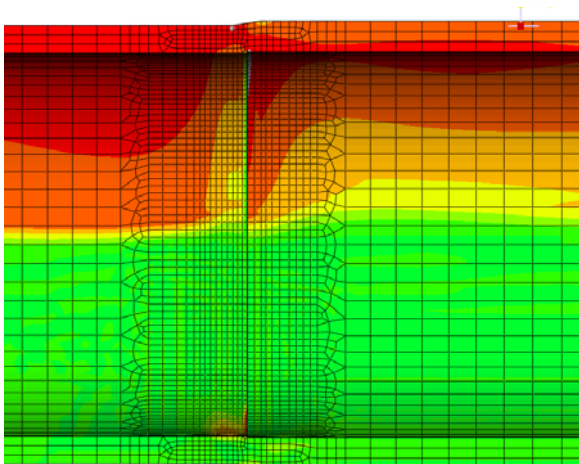


Figure 1: Calculated strain in the pipeline at final deployment.

Client

Major Oil and Gas Operator

Business need

The client was faced with either replacing the pipework or proving it retained sufficient operational life. The cost and lead time of our analyses is significantly less than replacing pipework.

Why Frazer-Nash?

We have developed and used these methods for a decade in the nuclear industry and therefore have the experience and knowhow to assess the most challenging oil and gas applications.

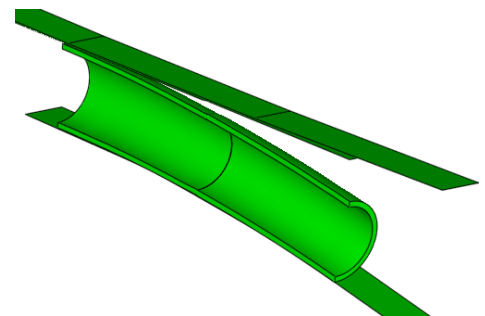


Figure 2: Simulating the pipe unreeling process to deform the pipe joint.

For more information, please contact customercontact@fnc.co.uk or visit www.fnc.co.uk