Threaded Pipe Connections under Dynamic Loading Conditions

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I. Introduction

Threaded pipe connections are commonly used in the oil and gas industry in particular to connect casing strings, drillpipe strings or production and transportation risers and pipelines. When used in offshore environments, waves and currents cause dynamic loads acting on the pipelines. The pipe connections remain the weakest points because fatigue cracks can initiate in the connection's threads.

The aim of this study is to increase the fatigue life of these connections and to come to an optimum design.

II. Methodology

To study the influence of the connection's geometric design on its fatigue life, a parametric study was carried out in a newly developed finite element tool [1].

Based on the modeling results, specific connection designs were selected for experimental fatigue testing. Three different test setups were used, going from small to full scale testing conditions.

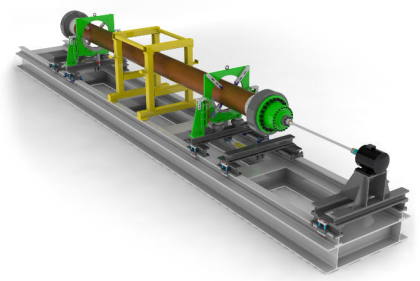

Figure 1: Resonant bending fatigue setup

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The small scale tests are four-point bending and easy to conduct due to the dimensions of the test specimens (33.4 mm diameter). Recently a full scale resonant bending fatigue setup was build, which is able to test pipes with a diameter up to 500 mm [2] (see Fig. 1).

III. Results

The obtained fatigue data was used to construct S-N curves where the applied dynamic stress S_a is plotted against the number of cycles to failure N. It can be seen from Fig.2 that a fatigue life improvement was obtained for the optimized threaded connection design.

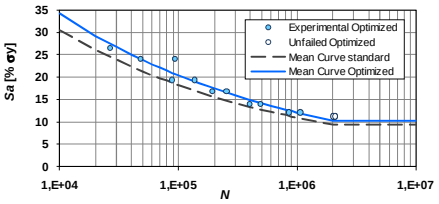

Figure 2: S-N curve

Acknowledgements

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References

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[3] J. Van Wittenberghe, et. al., *Fatigue life assessment of preloaded API Line Pipe Threaded connections*, Fatigue Design Conf., 2009.