Offshore latticed structures – Analysis of the lattice crane boom
with Det Norske Veritas, Recommended practice DNV-RP-C203

Overview

The aging offshore crane fleet in oil and gas industry, with many units being in operation for over 30 years, is one of the biggest safety issues the industry faces today. The main objective of this research is therefore to estimate the useful life of offshore crane by analysing the most fatigue sensitive parts of the crane – the boom structure. The analysis is based on the typical offshore crane built in the 1986 with crane boom length of 30 m. To analyse physical damage on the structure due to fatigue, relevant CAD model was prepared and analysed in Solidworks Simulation FEA software to obtain the spot with highest stress. Then critical weld at this point was analysed accordingly to DNV-RP-C203 standards for steel structures.

Based on pure fatigue analysis (without corrosion impact) it can be concluded that remaining life of crane boon structure is about 20 years under the stress of 62.56 MPa. However, a further study including other important factors like corrosion should be performed as an integral part of fatigue analysis.

Analysis

(Phase 1) Preparation of CAD model in SolidWorks

(Phase 2) Searching for most stresses area with FEA method

Phase 3 Obtaining DNV stress concentration factor and fatigue life expectancy

Conclusions

The main conclusion of this study is that fatigue life expectancy for this old structure is immense. This is mostly due to fact that finite element analysis software was not widely used at the beginning of 80’s and designers that days were very conservative especially in case of structures like cranes operating in harsh offshore environment. Another reason for is lack of corrosion influence in analysis.