

An Investigation of Structural Vibration on Main Oil Line Pump at Pulai-A Platform, Offshore Kerteh, Terengganu, 2001

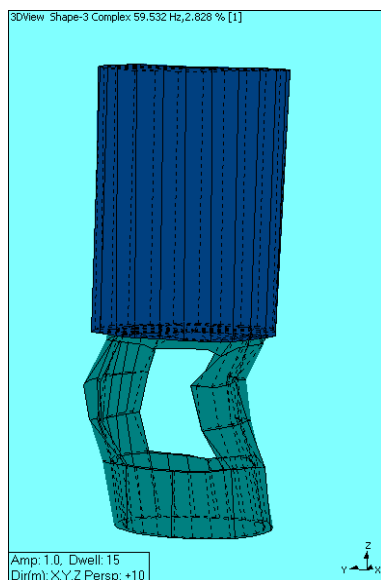
Frequent failure of the MOL Pumps at Pulai-A Platform, Offshore Kerteh, Terengganu is investigated. Analysis techniques include Operating Deflection Shape Analysis, Modal Analysis and Finite Element Analysis.

Based on the Modal analysis, natural frequency of 51.3Hz (twisting mode) and 78.6Hz (2nd bending mode) are obtained with the US Motor on Pump 1. While on Pump 2 with the GE Motor, natural frequency of 31.5Hz (twisting mode), 53.8Hz (2nd bending mode) and 59.5Hz (localized mode) are obtained.

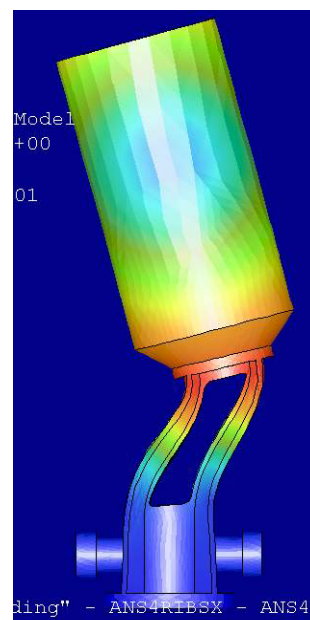
The MOL Pump unit 2 is having its localized mode (59.5Hz) very close to the operating speed of 60 Hz, hence, hitting the resonance. Results from ODS analysis, showed that the structural movements dominated by the localized mode of the discharge head assembly would eventually caused the bush to wear and leading to other component failure of the MOL pump. Modifications using Finite Element analysis on the MOL Pump discharge head structure have shifted the resonance frequency (59.5Hz) away from the running speed of the GE Motor to 81.5Hz.

On the other hand, the MOL Pump unit 1 having its natural frequency of 51.3Hz (twisting mode) and 78.6Hz (2nd bending mode), hence, no resonance occurred. However, the possibility of low frequency resonance has also been looked into. It was found that both of the MOL Pumps having its 1st bending mode at a relatively low frequency. This implied that the structure have less lateral resistance towards low frequency excitation. Modifications done by strengthening the structural stiffness had pushed both 1st bending natural frequencies of unit 1 and 2 to 16.1Hz and 12.9Hz, respectively.

Potential savings on maintenance cost for 2 units excluding unplanned breakdowns is about RM200, 000.00 per annum.



Localized Mode @ 59.5Hz for MOL Pump 2 coincides with the running speed of 60Hz



FEM results for MOL Pump 2 after modifications- 2nd Bending Mode