

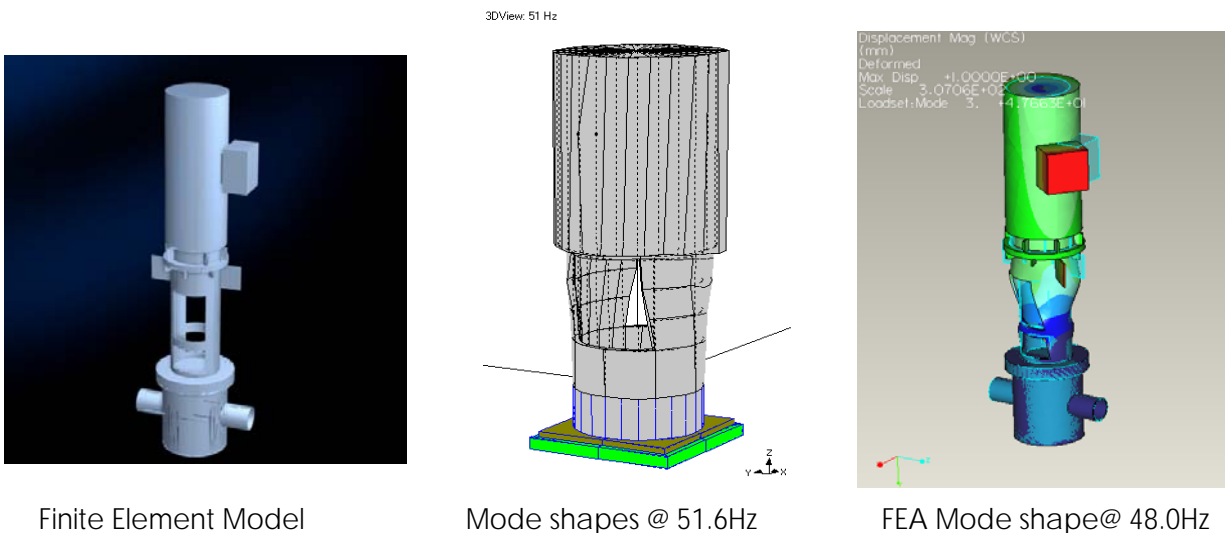
An Investigation of Propane Feed Pump Vibration Problem, 2006

The Propane Feed Pump high vibration problem was investigated. Based from the Modal analysis and Finite element analysis on the Propane Feed Pump, the “cut-out” of the pump discharge had generated unexpected natural frequency and mode shape in the operating region of the Propane Feed Pump. In conclusion, these problems are classified as a combination of near resonance and stiffness-controlled situation.

The mechanics of failure can be explained as follows; these dynamic design weaknesses is evident from the commissioning of the pump due to its twisting mode at 51.6Hz; close to the running speed of 50 Hz and has caused the excitation of the 0.4x speed component. The excitation from the twisting mode generates fluid instability in the pump that shows in the spectrum as 0.4x excitation. This excitation was further amplified by the suspected rotor/shaft natural frequency, leads to the premature or accelerated wear of the shaft bushing and other components.

Structural Dynamic Modification was performed and recommended by introducing rectangular bars to stiffen the vertical pump, hence increasing its natural frequencies. The objective of the modification is mainly to stiffen the twisting mode as well as the lower bending modes.

Performing these structural dynamic modification had managed to sufficiently shift all the natural frequency away from the operating region. Hence, it is strongly recommended that the pump discharge head to be rectified / stiffen according to the prescribed SDM. The recommended bars and ring for stiffening are calculated as per the structural dynamic modification using FEA.



Finite Element Model

Mode shapes @ 51.6Hz

FEA Mode shape@ 48.0Hz