

An Investigation of Amine Circulation Pump (Motor Driven and Steam Turbine Driven) Problem at Gas Processing Plant B, Santong, Paka, Terengganu, 2005

The frequent failures of the amine circulation pump were investigated. Based from the Modal analysis and Finite element analysis on the amine circulation pump, the base plate looseness or “play” had generated unexpected lower natural frequencies and mode shapes in the operating region of the amine circulation pump. In conclusion, these problems are classified as a combination of near resonance and stiffness-controlled situation.

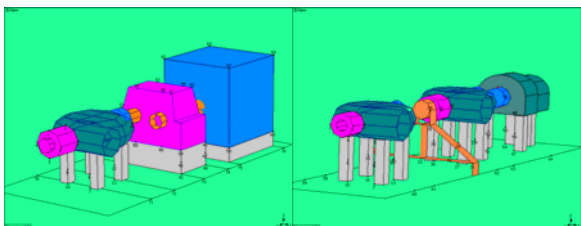
ODS analysis revealed the movements of the amine pump mainly due to the base plate may not be rigidly fixed / attached to its foundation. Although, observation of the amine pump operation shape showed large deflection on the pump bearing housing, etc; but it was the secondary effect caused by the base plate movement. These secondary effects of the base plate movement that had caused the repeated failures of the bearings, mechanical seals, and etc.

From Modal analysis, it indicates a number of natural frequencies close to the operating frequencies of the electric motor driven (25Hz and 75Hz) and the steam turbine driven (75Hz). These unexpected lower modes were generated by the flexibility of the base plates. Modeling the machine assembly condition using Finite Element Analysis, and performing two extreme cases;

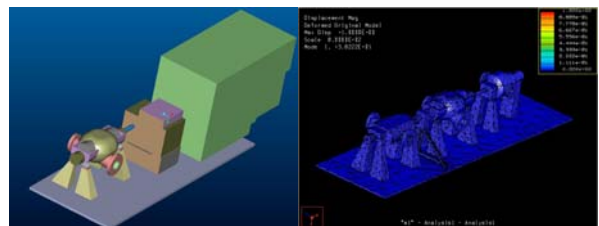
- (I). Constraint on the base plate was removed in all direction except at the sides joining to the I-beams allowing the base plate and foundation to have free play or loose.
- (II). Constraint on the base plate were totally fixed or in other words; assuming that the whole base plate is rigidly fixed to the foundation.

Item (I) correlates with the modes obtained from Modal FRF, while item (II) had pushed these natural frequencies up to more that 100Hz region. These finding had confirmed that there is an indication of “play” or looseness in the base plate foundation.

The recommendation is to rectify / strengthen the base plate of both electric motor driven pump and the steam turbine driven pump by bolting it to the foundation. Additional stiffening with rectangular bars is also required to further shift the natural frequencies away from the running speed. The recommended stiffening is calculated as per the structural dynamic modification using FEA. Concurrently, it was also recommend that the pump to be overhauled and the sub-structures to be inspected during the modification work carried out on-site to rule-out possibilities of machine wear and looseness due to long operations in an undesirable operating condition.



Wire-mesh Model for Electric Motor Driven and Steam Turbine Driven units



Finite Element Model for Electric Motor Driven and Steam Turbine Driven units