

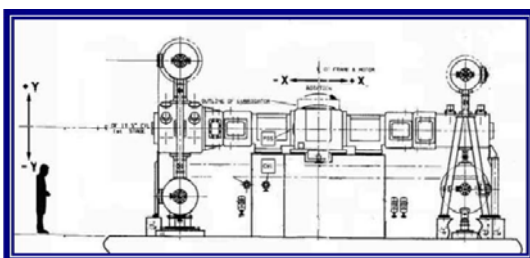
An Investigation of Structural Vibration on Reciprocating Compressor, 2000

High vibration of the HP H₂ Compressor unit A, B and C was investigated. Analysis techniques used in the investigation included visual inspection of the cracks on the grouting, machine maintenance history and trending and operation deflection shape analysis of the HP H₂ Compressor unit A, B and C.

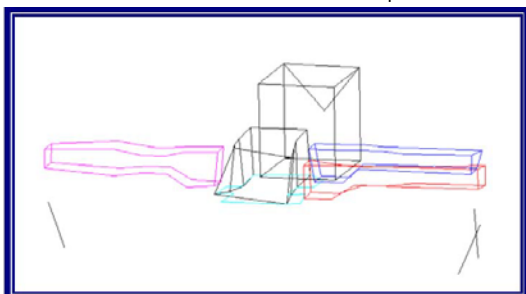
Operating Deflection Shape Analysis has identified the location of high vibration on the three units of compressors leading to cracks at the grouting, holding bolts looseness, and lubrication oil leakage. The results indicated that the main source of excitation came from the 3rd stage cylinder, causing the crankcase to be twisted and oscillates vertically. The twisting of crankcase later forced the 2nd and 3rd stage to swing in horizontal y-direction pivoted at the cross-head section.

It is recommended that monitoring and trending should be done in displacement, μm to eliminate the high frequency harmonics; having a more meaningful information from the spectral plots. Visual inspection of the gaps, bolts and the cracks should be part of the monitoring procedure. If any sudden change in the gradient of the vibration trending curve and rapid growth of cracks on the grouting, then the machine should be stopped. It is also vital to check the allowable gaps of the journal bearing at the non-drive end side of the crankcase. Maximum deflection recorded at the crankcase should be less than the gaps in-between the journal bearing. Exceeding the allowable gaps will lead to other secondary problems such as knocking of the journal, whirl and whip and etc.

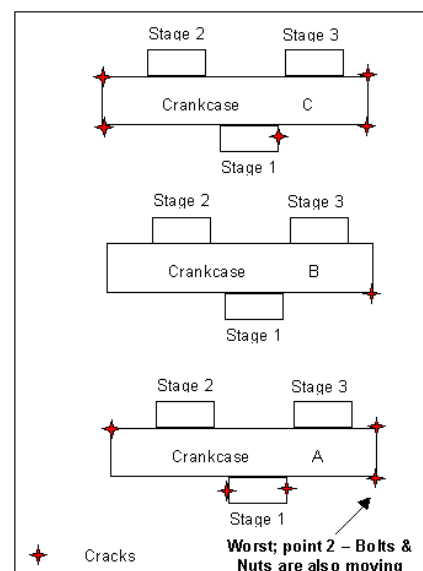
Stiffening all the 3 cylinders to restrain its movement would be the solution to avoid further damage to the entire machine. It requires further discussion for a proper stiffening method due to limited space to the ground. Most importantly, end users managed to re-solve dispute among manufacturers and the main contractor as to whom should be responsible on the crack grouting issue.



Front view of the HP H₂ Compressor



Operation Deflection Shape for all Components investigated on Reciprocating Compressor



Crack locations observed at all three Reciprocating Compressors, Unit A, B and C