
# Vibration Analysis: Case Study on Crude Oil Stripper Pump

Case Study on Crude Oil Stripper Pump

Condition Monitoring, Blog
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This study was conducted to evaluate the results of highly elevated vibrations due to COUPLING DAMAGE in CRUDE OIL PUMP.

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**Objective**:

In recent trends the industries are transforming from preventive maintenance to predictive maintenance. Vibration analysis is one of the most effective approach opted to check the health of plant machinery and diagnose the causes. The health of machine is checked by routine or continuous vibration monitoring with sophisticated instruments, which will provide early indication of failures and can apply countermeasures to avoid major risks to the business/operations.

**Background**:

TECHNOMAX has been providing services to its offshore customers both on request and planned for many years. Services included vibration analysis, thermography inspections, Ultrasound and Oil analysis.

In one of the project site, while conducting routine vibration checks, we had experienced high vibration issue in one of the customer's critical crude oil pump. The team collected all necessary data (vibration, phase data) for completing a detailed analysis.

**Equipment Details**:

| | |
|---|---|
| Machine Name | CRUDE OIL STRIPPER PUMP |
| Description | Motor – Coupling -Pump |

| | |
|---|---|
| Motor Rating | 110KW |
| Coupling Type | Shim Packed Coupling |

**Instrument & Software**:

Instrument: Scout 140 Advanced 4-channel Vibration Analyzer

Make: GE Bently Nevada

Software used: Ascent level-II

**Initial Findings**:

Our team of engineers acquired vibration data with high resolution spectrums to detect the cause of high vibration in motor and pump. The below spectrum shows that 2X, 3X rotational frequency is dominant on motor and pump bearings, in which we suspected there were some anomalies in coupling.

To complement the analysis, cross channel phase readings were taken across different points of the unit. This analysis determined that one of the main causes for the high levels was due to misalignment of the equipment.

It was noted that the vibration was higher all around the unit. See Figure 1 for Pump Drive End Bearing Velocity Spectrum and Figure 2 for Motor Drive End Velocity Spectrum.

Fig 1: Pump Drive End Bearing Velocity Spectrum

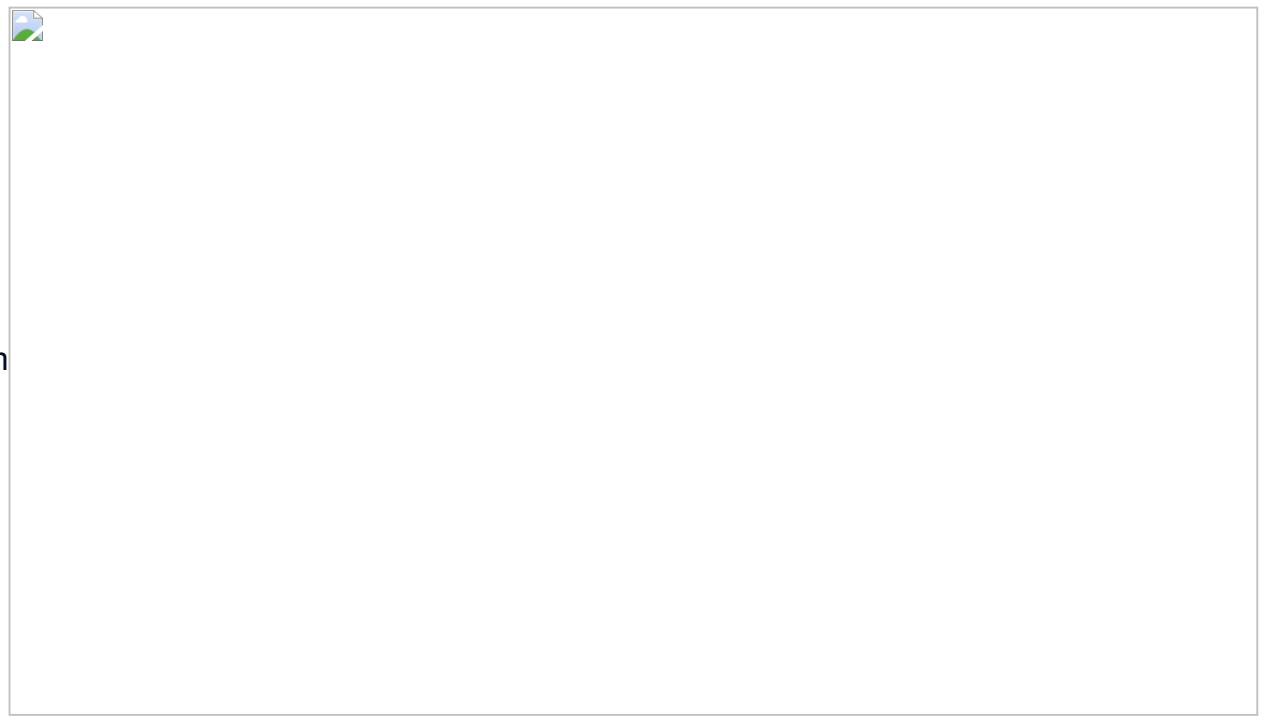

Fig 2: Motor Drive End Bearing Velocity Spectrum

**Our recommendations**:

Based on the analysis, we recommended inspecting coupling for any anomalies/damages and replacing it. Precise alignment to be carried out after aforementioned maintenance actions.

**Maintenance Action Taken**:

- Replaced coupling set with new
- Replaced pump with refurbished one
- Alignment was carried out between Motor to Pump

**Post Maintenance**:

After the maintenance completion, the vibration was tested across the unit and a significant reduction in vibration from 12.6mm/sec to 1.4mm/sec. This reduction was up to 89% less vibration in some points of the machine. See below table for more details.

| Location | Before | After | Units | % change |
|---|---|---|---|---|
| PDE-Horizontal | 12.6 | 1.4 | mm/s RMS | -89% |
| PDE-Vertical | 9.7 | 1.8 | mm/s RMS | -81.5% |
| MDE-Vertical | 6 | 1.5 | mm/s RMS | -75% |

The below given two vibration spectrums comparing the changes in amplitudes. 2X and 3X completely disappeared after replacing coupling.

Fig: 2X, 3X peaks reduced after maintenance actions

**Conclusion**:

Vibration Analysis: Different mechanical faults produce different vibration signature/spectrums. Careful in-depth analysis and deep study eliminates different possibilities and concludes to single fault.

This type of problems will be identified when there is a regular condition based monitoring which helps to reduce the downtime, and sudden failure/breakdown of equipment in peak production time. Technomax will provide condition based monitoring for all types of industries across the Middle East with its well experienced and certified engineers.

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