

## VIBRATION ANALYSIS


**Sector:** Power generation

**Asset:** Main cooling pump driven by a medium-voltage electric motor. Critical equipment for plant operational continuity, with high availability requirements and minimal margin for unplanned shutdowns.

**Initial situation:** The plant detected intermittent increases in overall vibration in the motor-pump assembly, accompanied by a temperature rise at the support on the coupling side. Although the equipment had not yet shown functional failure or loss of service capacity, the behavior indicated a change in condition that needed to be evaluated as a priority due to its operational criticality.

The main challenge was to differentiate whether the dominant cause was associated with an alignment problem, incipient bearing deterioration, or a structural condition of the base. The technical uncertainty made it impossible to define with confidence whether the intervention should be brought forward or deferred until the next scheduled outage.

### Work methodology:

- Review of the measurement route and validation of acquisition points at both motor and pump bearings/supports.
  - Capture and analysis of FFT spectra, time waveform, and historical vibration trend.
  - Comparison of the dynamic signature of the motor-pump assembly between the non-drive end and the drive/coupling end.
  - Correlation of vibration data with the equipment load and operating condition.
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- Evaluation of spectral components associated with misalignment, mechanical harmonics, looseness, and incipient bearing defects.
  - Issuance of a technical diagnosis with a recommendation for action during a scheduled shutdown.
  - Specific recommendation to verify alignment, correct the base condition, and perform post-startup verification to validate the effectiveness of the intervention.

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### Identified technical findings:

- The analysis showed a combination of symptoms: predominance of components consistent with misalignment, presence of mechanical harmonics, and increased energy in the high-frequency band, consistent with the onset of bearing deterioration. Additionally, the dynamic response suggested slight base looseness, which could amplify the vibratory behavior of the assembly.
- During the scheduled shutdown, the inspection confirmed alignment deviation outside tolerance and premature bearing wear at the affected support, validating the previously issued diagnosis.

**Conclusions:** The case showed that the value of vibration analysis lay not only in identifying an increase in severity, but also in discriminating the probable failure mode and defining a planned intervention before the equipment evolved into a functional failure. The combination of misalignment, incipient bearing deterioration, and slight base looseness would have increased the risk of secondary damage, affecting both the pump and the motor and increasing the overall repair cost.

Thanks to early detection and the data-based technical recommendation, the plant was able to intervene within the appropriate window, reduce risk exposure, and restore a more stable mechanical condition of the assembly.

### Impact indicators:

- Estimated reduction in overall assembly vibration: 35–60%.
- Estimated temperature decrease at the coupling-side support: 10–20%.
- Estimated extension of the service life of the replaced/corrected bearing: 20–40%.
- Probable avoidance of an unplanned shutdown of critical equipment.
- Reduction in potential intervention cost by converting an emerging failure into a scheduled correction.

