CASE STUDY

ELECTRICAL ANALYSIS

Sector: Cement

Asset: Main gearbox of an induced draft fan (ID Fan) on the kiln process line, driven by a medium-voltage electric motor. This is a highly critical asset, since its unavailability affects the stability of the thermal process and may compromise production continuity.

Initial situation: The plant had been observing a progressive increase in vibration in the motor–gearbox–fan assembly, accompanied by variations in casing temperature and an increase in operating noise reported by maintenance. The historical trend showed sustained growth in components associated with gear mesh frequency and harmonics, but without conclusive evidence of imminent catastrophic failure.

The main concern was that the equipment was operating at a critical stage of the process, so an unplanned intervention could lead to production loss, impact the kiln thermal balance, and increase corrective maintenance costs. There was also uncertainty as to whether the dominant cause was misalignment, gear wear, or deterioration of the gearbox bearings.

Metodología de trabajo:

- Acquisition and analysis of vibration data at strategic points on the motor, gearbox, and fan.
- Review of historical trends to assess symptom evolution and its rate of deterioration.
- Spectral and envelope analysis, focusing on gear mesh frequency, sidebands, and bearing-related components.
- Correlation with process and load conditions to rule out behavior induced exclusively by operation.
- Inspection of lubricant condition and review of the recent maintenance context.
- Risk prioritization and issuance of a technical recommendation for a planned intervention.
- Post-intervention validation by comparing vibration signatures before and after the work performed.

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Identified technical findings: The analysis made it possible to identify that the main problem was associated with incipient wear in the gearbox gear train, accompanied by modulation of the gear mesh frequency consistent with localized deterioration and loss of uniformity in contact. Secondary indications compatible with slight misalignment were also observed, accelerating the severity of the phenomenon.

Based on the diagnosis, it was recommended to schedule an intervention during a controlled shutdown, including internal inspection of the gearbox, alignment correction, and review of lubrication condition. During the intervention, the onset of surface damage on the gear teeth and non-uniform contact condition were confirmed. After the correction, the validation measurement showed a clear reduction in vibration levels and stabilization of the trend.

Conclusions: The case demonstrated the value of combining vibration monitoring, trend analysis, and criticality criteria to detect a developing fault before it evolved into a major event. The intervention made it possible to move from a condition of technical uncertainty to a well-supported decision, preventing the gearbox deterioration from resulting in an unplanned fan shutdown and affecting kiln continuity.

From the business perspective, early diagnosis made it possible to plan the intervention, reduce exposure to secondary damage, and protect a key asset for process stability. In addition, it established a reliable baseline for future system follow-up and strengthened the condition-based maintenance strategy for critical rotating assets.

Impact indicators:

- Failure avoided: unplanned shutdown of the induced draft fan.
- Risk reduction: intervention carried out within a controlled window rather than under emergency conditions.
- Improved reliability: stabilization of the vibration condition of the rotating train.
- Process protection: lower probability of affecting the kiln thermal regime.
- Estimated savings: avoidance of costs due to production loss, major gearbox repair, and urgent corrective response.