Customer Case Study

25 Days Of Remaining Useful Life(Rul) Prediction Detecting Cavitation And High Vane Pass Frequency For Pumps

BACKGROUND

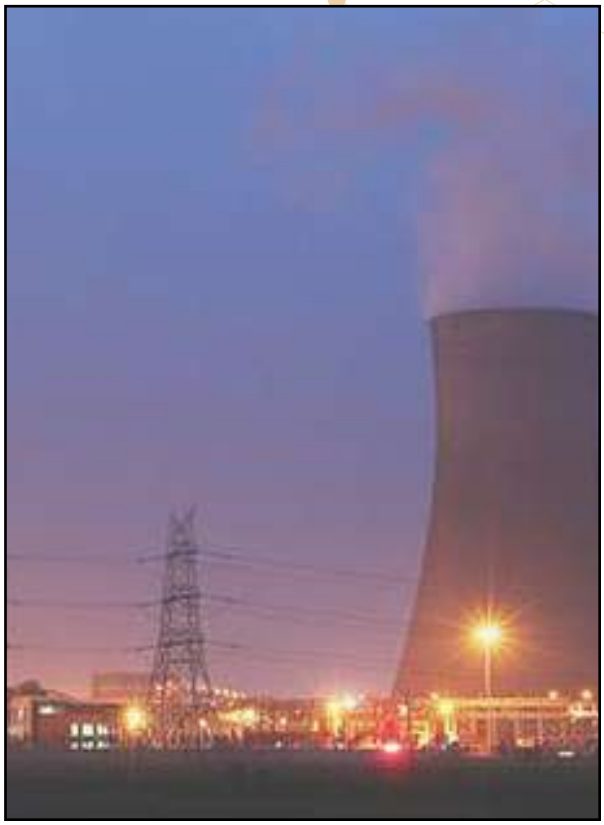
Nabha Power Plant is a supercritical 700 MW thermal power plant located near Rajpura Punjab, India. For an industrial plant of this magnitude, unplanned shutdown maintenance can significantly impact productivity and profitability.

THE CHALLENGE

The Condensate Cooling Water (CCW) pump, one of the critical pumps in maintaining steady- state operations, is a horizontal vane pump operating at up to 1650 m3/hr with a discharge pressure of 9 MPa (62 psi) at 986 rpm. The Larsen & Toubro (L&T) Nabha Power 700 MW thermal powerplant in Punjab, India, is one of the most efficient power generation facilities in the country. Each day this pump is offline, it costs the plant $250,000 in lost revenue and each failure costs tens of thousands of dollars to execute an unplanned repair. Thus, Larsen & Toubro (L&T) needed a predictive maintenance solution to detect faults at an early stage and provide a reliable prediction of Remaining Useful Life (RUL).

THE SOLUTION

We proposed our RotationLF system under which we installed around 24 wireless sensors as a part of a pilot project on air compressors, ACW and CCW Pumps, and Fans.



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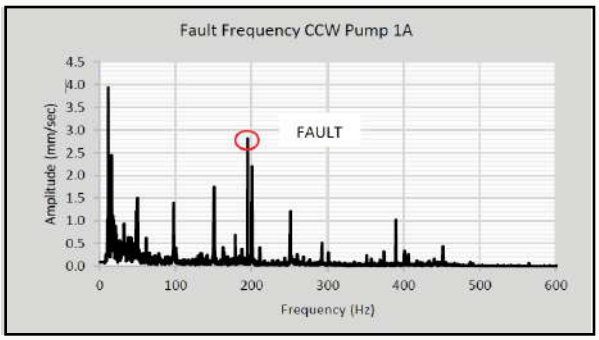
The specific placement of the VibrationLF sensors are selected to monitor:

1. Non-drive side bearing, electric motor
2. Drive side bearing, electric motor
3. Drive side Bearing, pump
4. Non-drive side bearing, pump

Once installed, strong battery-powered wireless sensors started monitoring pumps, motors and began sending data to our SaaS-based platform through an encrypted & secured network using Edge and Cloud computing. As the system received data, the RotationLF platform worked on data analysis using highly sophisticated algorithms.



Approximately six weeks after the sensors were installed, the AI alerted L&T that a vane fault had been detected on the pump, causing cavitation. The fault frequency depicted in the below plot is indicative of an early stage failure.

As cavitation damage to the vanes and housing progressed, the amplitude increased, and the RUL decreased. The decrease is a function of the load conditions and is not linear, requiring constant monitoring.

THE RESULT

The RotationLF analytics sensed & detected the anomaly in the pattern and alerted L&T plant staff about this unusual trend automatically through mobile text and email alerts. The maintenance team used a hand-held vibration meter to verify the fault detected by RotationLF and then partially disassembled the pump to visually confirm that the vanes were damaged. A temporary repair was made to the damaged vanes before putting the pump back in service. The RUL prediction of 25 days to failure provided sufficient time to schedule the pump replacement during an already planned maintenance outage.

ABOUT NANOPRECISE

Nanoprecise specializes in the implementation of Artificial Intelligence and IoT technology for predictive asset maintenance and condition monitoring. Our timely and accurate diagnosis of machine faults provides our clients insights that allow them to make decisions that will save them considerable time and resources. Nanoprecise is headquartered in Edmonton, Canada with branches in Bangalore, India; San Diego, USA, and Newcastle, UK. We have managed to establish ourselves as a trusted solution provider in the asset management industry.

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