CUTSFORTH

The Power of Innovation

Cutsforth™ specializes in developing innovative new technologies and monitoring systems empowering data-driven decisions to improve availability, reliability, and operating costs for asset-intensive industries.

Case Study: San Jose Water & Electrical Signature Analysis (ESA)

San Jose Water: Background & Challenges

Founded in 1866, San Jose Water (SJW) is an investor-owned utility serving over one million people in the greater San Jose area. It is one of the largest and most technically sophisticated public water utilities in the United States. Prior to working with Cutsforth, SJW had limited online motor-pump performance monitoring for predictive maintenance and energy conservation.

Annually, San Jose Water saw five to twenty motor-pumps fail. These failures forced SJW into frequent major repairs and replacements, causing increased asset downtime, and dependence on less-efficient secondary motor-pumps. SJW hoped to shift from a costly reactive maintenance strategy to a predictive maintenance approach with online monitoring. This strategy improves uptime, reduces costly unplanned downtime, and optimizes asset utilization.

Recommendations:

The Cutsforth InsightCM™ platform with Electrical Signature Analysis and Vibration Monitoring provides the online monitoring capabilities to meet San Jose Water's predictive maintenance and power monitoring needs. InsightCM offers the most comprehensive online monitoring platform for predictive maintenance, while prioritizing data security and ensuring that the end customer retains full ownership of the data.

ESA hardware install in or near Motor Control Center provides high speed three-phase voltage and current monitoring to access pump motor health

Cutsforth ESA uses high-speed voltage and current waveform acquisition and process to identify pump motor faults including rotor bar damage, misalignment, bearing faults, and mechanical looseness.

A single distributed system can monitor up to nine motors on a single voltage bus. Edge-based processing minimizes network bandwidth and storage requirements. This intelligent gating provides continuous screening of data and data transfer on an event basis. Every motor start-up and significant event will be captured.

Vibration Monitoring provides early detection of machine failures with long-range wireless hardware that monitors motor-driven pumps. Triaxial wireless sensors with temperature monitoring provide waveform data to assess bearing and rotating equipment health.

The ESA and Vibration Monitoring hardware are supported within the InsightCM platform, providing easy analysis of data and waveforms as well as the ability to export and share data. Engineers, analysts, and maintenance personnel can monitor and track motor trend data to make data-driven maintenance decisions to improve operations.

Cellular modems provide remote site connectivity for ESA and Vibration to the cloud instance of InsightCM™

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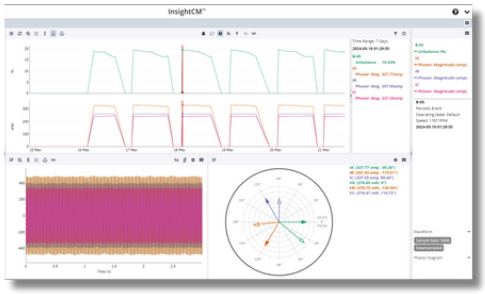
Initial Findings:

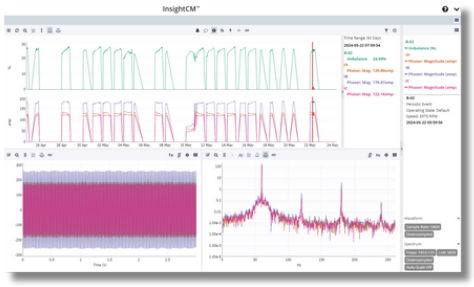
By reviewing data within InsightCM, one of the motors (B-05) at a major pumping station was found to have an unusually high current unbalance of around 18%. Additionally, the unbalanced A-phase was significantly higher than the service factor rating of the motor. The startup time was also significantly higher (3x) than other similar motors in the system.

A second motor of interest (B-02) was found at another major station, exhibiting similar symptoms as the first motor. Unbalance was around 25% with a high B-phase.

In both cases there was an impending stator fault. The motors were scheduled to be taken out of service for timely repair and a catastrophic failure was avoided.



B - 05



B - 02

Impacts:

Initial review of the ESA data directed San Jose Water to the exact motors in need of inspection, thus reducing the risk of the primary pump failing. SJW were able to minimize downtime by making planned minor repairs and to continue providing reliable drinking water for their customers. The positive financial impacts are outlined below:

- Motor-pump B-02: Early detection avoided full motor failure and only bearings needed to be replaced. This resulted in savings of $16,000 and a three week repair rather than 6-12 month effort with long lead time for motor replacement.
- Motor-pump B-05: The machinery health issue was discovered during commissioning of the new online monitoring system and was too late to save the motor. However, the pump could be repaired and did not need to be replaced resulting in a savings of $13,000. This reduced down time from 6-12 months to six weeks.

San Jose Water can begin to minimize spend as they pivot away from calendar-based maintenance. They are now better equipped to catch problems early and perform maintenance as needed. SJW can prioritize their maintenance needs resulting in greater efficiency and a reduction in O&M expenses.

SJW can increase their equipment resiliency by reducing asset downtime and the risk of unexpected failures. They can perform minor repairs and planned replacement without the threat of a costly forced outage, thus enhancing the integrity of their service.

Online Monitoring & Predictive Maintenance ROI

Return on Investment	5-10X
Reduction in Maintenance Costs	25% to 30%
Elimination of Breakdowns	70% to 75%
Reduction in Downtime	35% to 45%
Increase in Production	20% to 25%

Source: U.S. Department of Energy, Federal Energy Management Program
Operations and Maintenance Best Practices Guide, Section 5.4 Predictive Maintenance
https://www.energy.gov/sites/prod/files/2013/10/f3/OM_5.pdf

Return on Investment when adding predictive maintenance solutions

"More informed replacement schedules optimize asset lifetime and performance, thereby reducing operational costs and business risk from unexpected failures."

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