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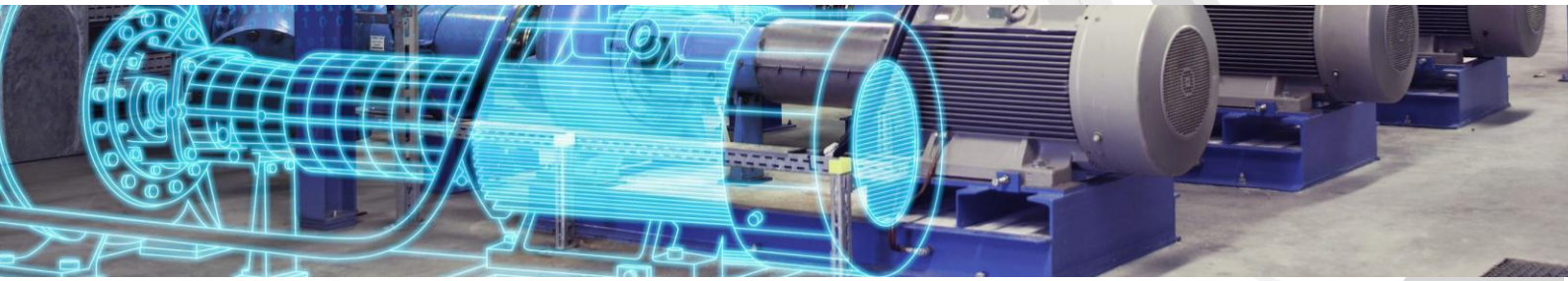
Avoid costly pump replacement with HotSense™

Continuous monitoring of pump casing thickness to optimise maintenance and prevent loss of containment



Key Deliverables/Value

- Centrifugal pumps were known to suffer from severe erosion and required frequent replacement to maintain efficient operation and mitigate loss of containment risks.
- Improved maintenance planning by shifting from calendar-based assessments to real-time erosion and event-based tracking, reduced unnecessary inspections, minimizing downtime.
- Early identification of process specific conditions that lead to accelerated erosion, enabled the plant to adjust operations to avoid high-risk scenarios, plan outages, and improve process operational efficiency.
- Automatically operated HotSense™ sensors with Caliperay UT nodes enables real-time wall thickness data to be collected as often as required from remote locations, with accurate and reliable data to assess the state of the equipment.

Overview

A major multi-national materials and chemical manufacturing company relies on high-temperature centrifugal pumps to move aggressive, explosive and potentially toxic fluids around the plant for processing into valuable products.

Depending on the process and pump parameters, these corrosive and erosive fluids can cause rapid wall thinning, depending on the process parameters, which can lead to unplanned shutdowns and costly maintenance. In the most severe cases, loss of containment could occur, which have catastrophic impacts on health and safety, local ecology and operational risk.

Previously, the plant relied on infrequent manual ultrasonic testing (UT), which provided only a snapshot of wall thickness and correlated loss rates with calendar time rather than operational cycles. This approach left the maintenance team with limited insight into whether specific conditions were exacerbating erosion. To optimise performance, the

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plant required a continuous monitoring system that could provide real-time data, correlating wall loss with actual operating conditions to prevent failures and extend asset life.

The Challenge

Several key high-temperature centrifugal pumps were experiencing significant, accelerated wall loss when operating with high-value, erosive fluids, which was resulting in highly disruptive and costly maintenance and replacement schedules, sometimes being replaced as often as every 6 months, and resulting in the process line being offline or in the worst case, could lead to a loss of containment.

- The pumps can operate at temperatures up to 120 °C, and are in close proximity to piping circuits, with tight space requirements.
- Manual UT was infrequent and ineffective in linking wall loss trends to specific operational conditions, leaving maintenance teams unable to take proactive action.
- High flow rates, solid particle size, shape & concentration and temperature, can increase the risk of rapid corrosion/erosion, making it essential to continuously monitor the pumps.

The Solution

To address these challenges a service provider, Apave UK, deployed HotSense™ high-temperature ultrasonic thickness monitoring system, integrated with a Field Data Logging Kit (FDLK), for automated data collection and analysis. This solution was delivered as part of the Apave CEMS monitoring-as-a-service, ensuring seamless implementation and ongoing support.

- Several dual element, HotSense™ sensors were installed on to critical pump positions known to experience accelerated wall loss to provide continuous, real-time wall thickness measurements.
- The sensors were deployed using magnetic attachment and epoxy couplant to ensure reliable data collection on the tight contours of the pump casings and to remain secure during vibration whilst operating.
- Data was collected and processed through FDLK, offering high-frequency monitoring and trend analysis.
- Wall loss trends were correlated with plant operational data, including temperature and flow rate.
- The system was configured to alert maintenance teams to high-risk conditions, enabling proactive intervention.

Execution

- The HotSense™ monitoring system was deployed to track wall loss trends in real time, with automatic temperature compensation.

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- Rapid wall loss rates of over 3.6 mm/a were detected across the sensor locations simultaneously, over a 1 month window, directly linked to specific process conditions, validating the plant's justification for real-time monitoring, see Figure 2.
- Casing wastage rate can now be assessed against actual running hours and correlated with process conditions or events.
- Maintenance teams used the insights provided to adjust process parameters and operating procedures, and were able to proactively plan and execute maintenance activities, based on real-time degradation rate data rather than estimated timelines.

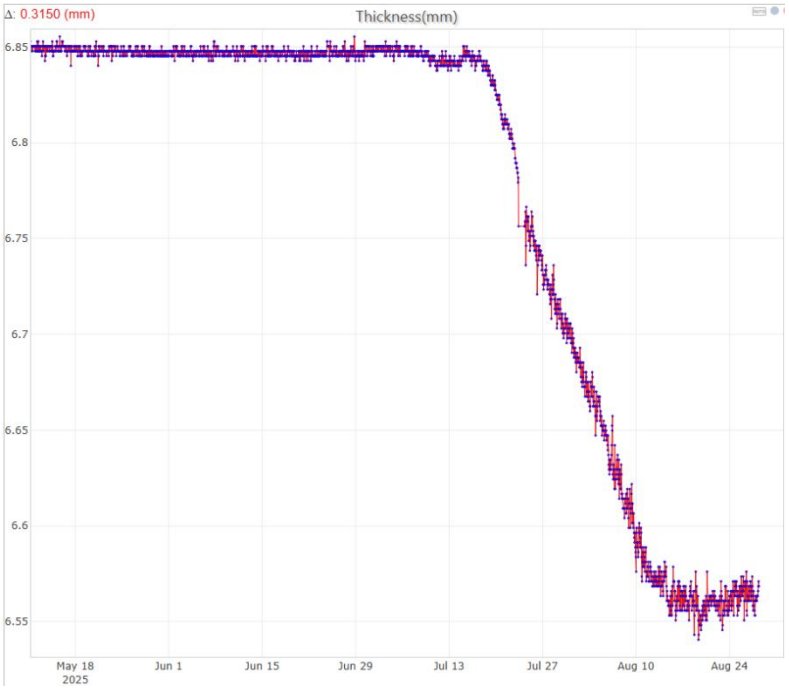

Figure 2: Sanitised data from one of the HotSense™ sensors showing the detection of 0.315 mm wall loss over a 4 week period, caused by the process conditions of the pump.

With the implementation of automated UT monitoring, the chemical plant can now optimise maintenance planning, extend the life of critical assets, and improve operational efficiency. By shifting from calendar-based inspections to condition-based maintenance, the plant has enhanced safety and reliability and minimised unplanned downtime.