CASE STUDY

eROI℠ by Ecolab

Gulf Coast Refinery Cooling System Uses Patented Deposit Sensor Technology for System Optimization and Risk Management

ANNUAL SAVINGS

ASSETS

Reduced risk for unscheduled unit downtime and production loss

$2,000,000

ASSETS

Reduced exchanger cleaning and corrosion related costs

$100,000

TOTAL VALUE DELIVERED

$2,100,000

BACKGROUND

All cooling systems are under stress. When stress is too high, scale, corrosion and microbial fouling occur. When stress is too low, water and treatment chemicals are wasted. When the stress on a cooling system changes rapidly or in unexpected ways, the potential for costly operational problems increases.

Adequate supplies of acceptable make-up water are not available in all locations or are prohibitively expensive. To effectively reduce operational problems and minimize operating costs, solutions to manage cooling system stress must address environmental, economic, and chemical variability changes.

At one Gulf Coast refinery, recent drought conditions, changing make-up water chemistry and tightened environmental rules had made cooling system control more challenging. Fouling problems in critical heat exchangers had led to production slow-downs, unexpected downtime and excessive turnaround costs. Often, the refinery engineering staff would discover deposition — either mineral scale or microbial growth — only after it had impacted production metrics. To improve performance, they sought a solution to help detect deposition problems earlier, allowing refinery engineers to implement effective corrective actions and minimize operational impact.

NALCO Water
An Ecolab Company

eROI℠ by Ecolab

SOLUTION

Working with their Nalco Water on-site technical expert, the refinery engineering staff evaluated how Nalco Water's deposit sensing technology could deliver the insights they sought. The deposit sensor is incorporated in Nalco Water's 3D TRASAR Cooling Water Technology Premium Plus program, a state-of-the-art feed, control and monitoring technology designed to manage a cooling system based on the stresses placed on it.

The program helps prevent operational problems and minimize operating costs by:

1. measuring key parameters related to system stress
2. detecting changes and upsets
3. implementing appropriate, automatic corrective action
4. communicating with users and the Ecolab Global Intelligence Center (EGIC)

The deposit sensor uses an array of eight Temperature Resistance Devices (RTDs) that are configurable to model various temperatures around the cooling system. The RTDs heat for one second and then cool for 59 seconds. As water flowing over the sensor cools the RTDs, the rate of change gives valuable insight into the type and severity of detected deposition.

Because biofilm and mineral scale form at different temperatures with different heat transfer characteristics, sensor insights drive appropriate corrective action without time lost waiting on a deposit analysis or for a measured decline in heat exchanger performance. The deposit sensor also reports data after corrective actions have been taken, providing feedback on their effectiveness. Coupling the sensor technology with Nalco Water's OMNI Heat Exchanger Intelligence program further reduces guesswork and improves performance.

RESULTS

The deposit sensor was configured to evaluate four temperatures: 120°F, 140°F and 160°F.

Over a short period of time, the deposit sensor generated data which indicated deposition. Coupled with other operational and chemical data from the 3D TRASAR controller and with review by the EGIC team of experts, the refinery staff gained insight into what was happening in the system along with recommended corrective actions.

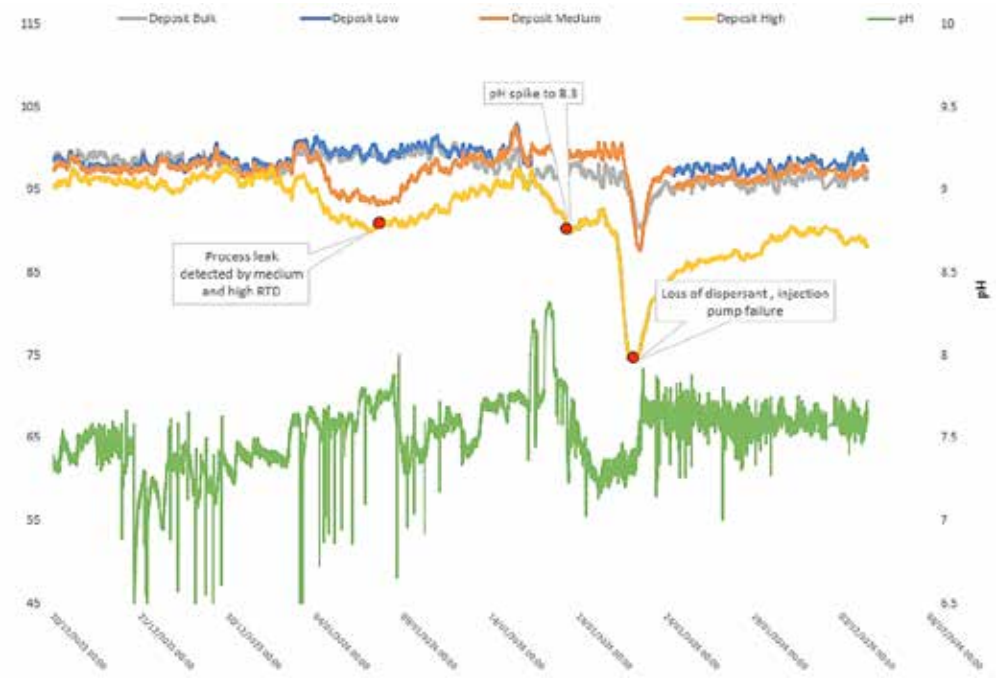

Fig. 1: The response of the deposit sensor reflected the process leak, pH spike and dispersant loss events. The graph shows sensor data at distinct temperatures: Bulk Water, 120°F, 140Fand 160°F. A decrease in the Deposit % indicates deposit occurrence

NALCO Water
An Ecolab Company

Figure 2 displays both the individual temperature profiles and an aggregate measurement, the Deposit Risk Index, illustrates how the deposit sensor data is turned into insights to drive actions that minimize problems and costs.

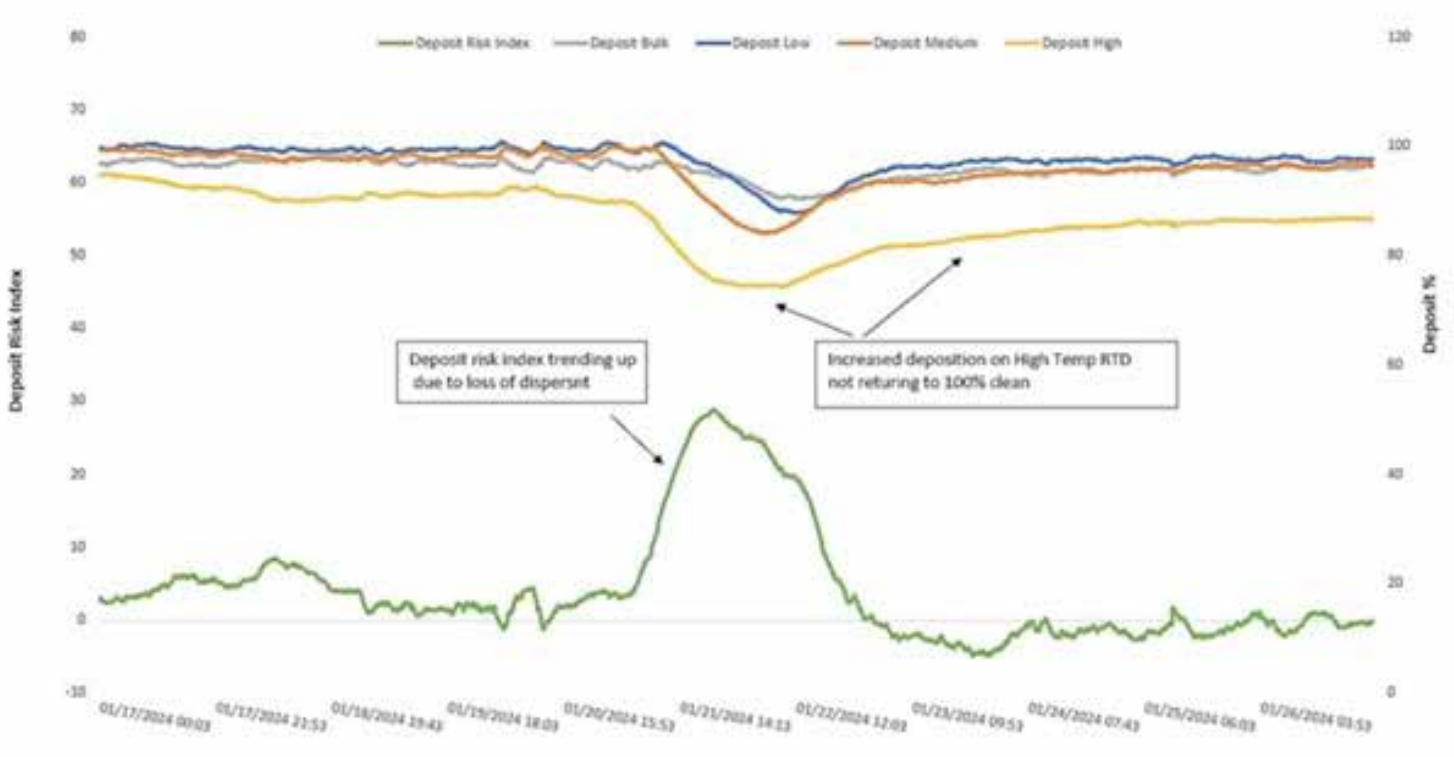

Fig. 2: Deposit risk index increases with loss of scale dispersant in the system

1. A process leak was detected by the higher temperature sensors. Once it was isolated from the system, heat transfer returned to normal levels.
2. A pH spike occurred, driving mineral scale formation and causing a drop in heat transfer efficiency on the sensor's high temperature RTD. This deposition also registered as an increase in the Deposit Risk Index. Operators found and corrected the problem causing the pH change, thereby minimizing further deposition.
3. A chemical feed pump failure reduced dispersant concentrations. Every sensor was impacted — indicating a problem that would occur across the system, not just in the highest temperature heat exchangers — and, again, the Deposit Risk Index rose. Once feed was restored, the sensors responded, the Deposit Risk Index dropped, and the heat exchange efficiency returned to almost 100% on the low- and medium-temperature RTDs.

eROI℠ by Ecolab

CONCLUSION

Nalco Water's patented 3D TRASAR™ Cooling Water Premium Plus Technology provides superior insight into the risk of heat transfer problems and associated reliability issues. The real-time recognition of this risk allows for the appropriate response and the actual performance evaluation of that response. This is the first of its kind, an operationally viable and cost-effective solution for on-line heat transfer surface modeling. Acute impacts to system reliability can now be seen immediately, with alarm oversight, rather than relying upon infrequent manual surveys. Previous fouling events at this site resulted in a shutdown and caused a $8M loss of operational profit. With the implementation of Nalco Water 3D TRASAR with deposit sensor the plant will have comprehensive performance information to reduce the risk of future shutdowns and productivity losses by approximately 25% saving them $2M. The technology will also help in reducing exchanger cleaning and corrosion related costs, while minimizing costs associated with heat transfer energy penalties and greenhouse gas production.

NALCO Water
An Ecolab Company

ecolab.com/nalco-water