

NEW ANTI-FOULANT CLAR10670A IMPROVES PRODUCED WATER COOLER FOULING PERFORMANCE OVER PREVIOUS GENERATION



SITUATION

A thermal heavy oil producer in the Lloydminster, Alberta region was experiencing fouling in their produced water cooling heat exchangers, leading to plugging of tubes and requiring regular mechanical and chemical cleaning if untreated. In addition to the cost of each cleaning, the cleanings require that equipment be bypassed, resulting in operational downtime and heat transfer inefficiencies.

CHALLENGE

Thermal heavy oil produced fluids often reach temperatures in excess of 160°C (320°F). At these high temperatures, many organic compounds become soluble in the produced water. When produced water is separated from the produced emulsion in separation vessels, these water-soluble organics exit the vessel with the produced water. Produced water is then passed through shell-and-tube heat exchangers, cooling the water from 125°C (257°F) to 90°C (194°F) by exchange with colder boiler feed water. At these lower temperatures, the water-soluble organics are less soluble and begin to precipitate onto the inside of the exchanger tubes.

Further challenges are caused by solids, such as sand and inorganic scales, that can become stuck to the organic deposits. These deposits can plug tubes leading to impinged water flow and hot spots, reducing the efficiency of the exchangers, and potentially causing mechanical failure. To prevent these failures and reduce the frequency of costly cleanouts, Nalco Champion injected a first-generation dispersant to prevent the organics from depositing in the tubes. This dispersant required high rates of injection, however, and the customer sought a more cost-effective solution.

SOLUTION

To develop a more cost-effective solution, Nalco Champion began by creating an instrument to simulate the conditions in the produced water cooler heat exchangers. The instrument was designed to simulate the drop in produced water temperature that occurs in the exchangers and observe whether deposition was taking place using the same key performance indicators that would be used

in a live plant: pressure differential and inlet/outlet temperatures. This instrument allowed Nalco Champion's technical experts to use produced water directly from the customer's operation to develop a superior dispersant, CLAR10670A. CLAR10670A was designed to provide the same robust protection against produced water cooler fouling at a lower dosage than the incumbent first-generation chemistry.

RESULTS

Key performance indicators for the CLAR10670A program included the pressure differential across the inlet and outlet of the produced water cooler heat exchangers, as well as inlet and outlet temperatures of the produced water. To be successful, CLAR10670A would need to generate no increase in either of these parameters. Through the course of a one-month field trial, the dosage rate was optimized from 106 ppm (incumbent) down to 49 ppm (CLAR10670A), while maintaining the same performance, yielding a savings of \$72,000 per year for the customer and continuing to prevent costly cleanouts.

In addition to the chemical savings, CLAR10670A also improved the efficiency of the heat exchangers, resulting in a 38°C (68°F) increase in boiler feed water outlet temperature. This improved the customer's energy/steam ratio, reducing their demand on fuel gas and yielding an additional estimated \$21,000 per year savings on third-party fuel gas.



Sample of the organic deposits formed on a scale coupon installed at the heat exchanger.

GOALZERO

SAFETY MATTERS

The safety of our associates, customers and communities is vitally important. From the way we operate, to the products we develop, to how we partner with customers, our goal is zero: zero accidents, zero incidents and zero environmental releases.

At Nalco Champion, safety is more than a metric, it's a mindset. It's how we conduct ourselves, every day, everywhere it matters.

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