

CLAR13939A REDUCES PRODUCED WATER COOLER FOULING AND IMPROVES HEAT EXCHANGER EFFICIENCY



SITUATION

A SAGD producer in the Cold Lake region of Alberta, Canada was experiencing fouling in their produced water cooling heat exchangers, leading to plugging of tubes and requiring regular solvent cleaning. In addition to the cost of each cleaning, the cleanings required equipment to be taken offline, resulting in operational downtime.

CHALLENGE

SAGD-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 two sets of shell-and-tube heat exchangers: first, cooling the water from 160°C (320°F) to 110°C (230°F) by exchange with colder boiler feed water, and second, cooling the water to 85°C (185°F) by exchange with glycol. 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 inorganic scales that form, and also become stuck to the organic deposits. These deposits can plug tubes leading to impinged water flow, reducing the efficiency of the exchangers and potentially causing mechanical failure. To avoid such failures, the heat exchangers must be regularly removed from service and cleaned. In addition, when boiler feed water exchanger efficiency is especially low, they must be bypassed entirely, creating additional load on the glycol heat exchangers that follow.

SOLUTION

Drawing on success of anti-foulant programs in the Lloydminster, Alberta area, Nalco Champion account representatives surveyed the different programs in that area for suitability. After assessing the customer's operation for critical program requirements, it was determined that CLAR13939A was the most suitable solution.

CLAR13939A ensures that water-soluble organics remain dispersed in the produced water at lower temperatures, reducing deposition in the tubes and lengthening the run time of the produced water cooler heat exchangers.

RESULTS

Prior to CLAR13939A injection, each produced water cooler had an average run time of 21 days before it required cleaning. Cleanings were performed when the exchanger efficiencies dropped below 20 percent, which was typically accompanied by 50 to 70 percent of the produced water volume bypassing the BFW exchangers entirely. After beginning injection of CLAR13939A at 20ppm, the produced water cooler run time was increased threefold, to a projected run time of more than 60 days before reaching an efficiency of 20 percent (Figure 1). The CLAR13939A program enabled the customer to perform exchanger cleanings at 40 percent efficiency, allowing them to reduce produced water bypass and maintain higher overall exchanger efficiency.

CONCLUSION

Under the new cleanout schedule the customer performs half as many cleanings, saving in cleanout costs and reducing exchanger downtime. In addition, the injection of CLAR13939A allowed the primary reverse emulsion breaker dose rate to be decreased. Total savings from cleaning costs and reduced chemical rates are \$240,000 per year. Higher heat exchanger efficiencies have also led to an increase of 1.5°C in the average boiler feedwater temperature entering the steam generators, yielding an additional \$25,000 per year savings in third-party fuel gas costs.

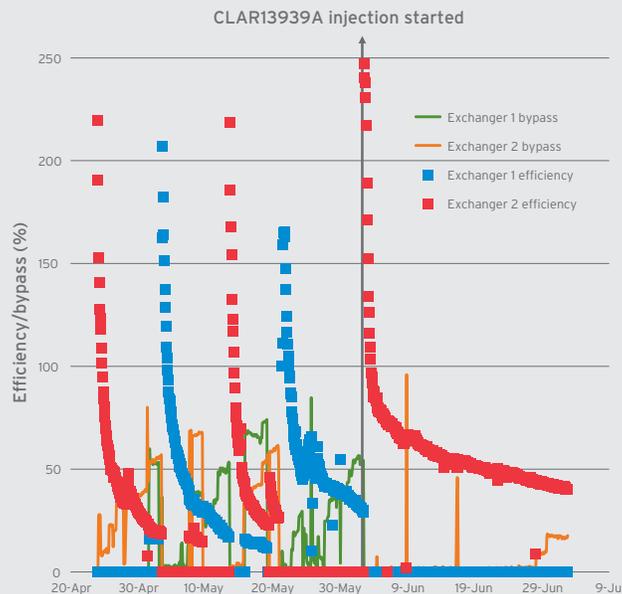


Figure 1. Heat exchanger efficiency and bypass time before and after CLAR13939A injection.

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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