

Nalco Water Advanced Primary Emulsion Breaker Technology and Overlay Program Helps Enhance Desalting Performance, Unit Reliability and Profitability



BACKGROUND

A major North American refinery operates a large crude unit processing a 26 API crude blend. The standard Nalco Water traditional primary emulsion breaker was in use, along with our overlay treatment program, yielding consistent compliance of the desalted crude prescribed KPIs and oil-free desalter brine during the normal operations. The refinery wanted to maintain elevated throughput in order to deliver more products to customers, while maintaining flexibility of feeds with a high degree of opportunity crudes.

The focus was protecting the brine effluent quality, yet this was a challenge due to desalter interface build when impacted by high solids. The crude filterable solids are around 60ptb, but spikes can be around 100ptb due to the challenging crudes. The refinery's goal was to increase the number of clear water trylines in the desalter (there were 8 trylines in total), and maintain the brine effluent quality to protect the wastewater treatment plant through enhanced emulsion resolution.

SOLUTION

A thorough system audit was conducted on site, evaluating the mechanical, operational, and chemical root causes. Our comprehensive approach enabled us to fully understand the unit and process from tank farm, the desalter, the overheads, and the wastewater treatment plant. Every element that was directly involved or an extension of the desalting process, was thoroughly examined and considered. Based on the review, Nalco Water's novel advanced primary emulsion breaker technology was recommended. The new technology contains innovative components for processing wider range of crude oil blends and helps improve desalter performance.

Prior to the trial, the desalter transformer tap setting was changed. There was no level change, and level control was kept constant during the trial and afterwards. A desalter trial with the new advanced emulsion breaker technology was implemented, replacing the refinery's incumbent treatment applications.

ANNUAL SAVINGS



PRODUCTIVITY

Increased unit throughput while enabling 20% reduction in chemical usage

US \$2,000,000



ENERGY

Improved desalter operational efficiency by using less fuel gas

US \$10,652



GREENHOUSE GASES

CO₂ emissions reduction by

165,251 lbs



ENVIRONMENTAL RESPONSIBILITY

Enable sustainable wastewater treatment operation through improved brine effluent quality (oil-free) and increased number of trylines with clean water from 3 to 4



ASSETS

Maximized crude blend flexibility and unit reliability

TOTAL VALUE DELIVERED

US \$2,010,652

RESULTS

Nalco Water's new primary emulsion breaker technology, combined with the overlay program demonstrated robust performance improvement at the unit, validating the higher efficacy of the new technology. The performance results met all of the KPIs when processing challenging crudes, while allowing for over 20% reduction in chemical demand.

Figure 1 shows the emulsion breaker dosage rate percentage before and after the trial, and the dots represent where there is clear water on the tryline. The first vertical line is where the operational tap change was made and the second vertical line is where the new emulsion breaker was started, resulting in another tryline of clear water.

The result of this transition to the new emulsion breaker technology in combination with the overlay program allowed the refinery to reliably process challenging opportunity crudes and maintain elevated rates, while achieving unit KPIs and environmental compliance. Through enhanced control and reduction of desalter interface, it was possible to help protect the water treatment facility by improving consistent brine quality. While doing this, it was also possible to decrease primary emulsion breaker demand by >20%. These gains combined resulted in approximately \$2MM in annual savings.

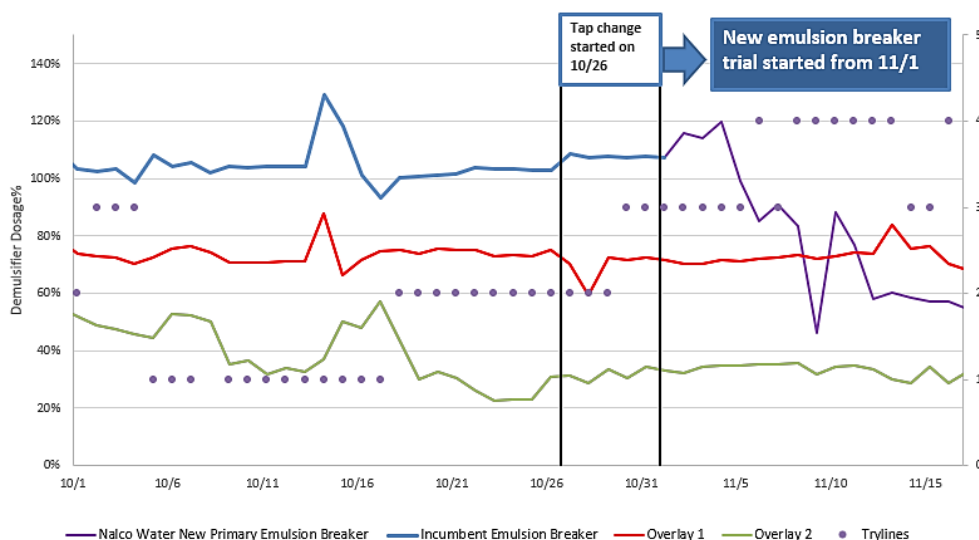


Figure 1. Emulsion breaker dosage rate and number of trylines with clear water before and after the trial.

Summary of the Results:

- Increase in crude throughput estimated to be \$2M/yr
- >20% decrease in total chemical usage was achieved
- Improved energy efficiency due to improved dehydration efficiency saving \$10,652/year
- CO₂ emission reduction by 165,251 lb/year
- Helped improve brine effluent quality and protect wastewater treatment plant

Pre-trial (after transformer optimization)



After trial (with new emulsion breaker)



Figure 2. Improved brine effluent quality after the trial.

CONCLUSION

Nalco Water delivered an innovative emulsion breaker technology that continuously improved the desalter performance. The refiner successfully and reliably was able to maintain high throughput in order to deliver products to their customers. This trial projects resulted in an equivalent to a >\$2M/year increase in annual profit. The customer was so pleased with the performance of Nalco Water's program and the value delivered that the new emulsion breaker technology was approved for ongoing implementation in the refinery.

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