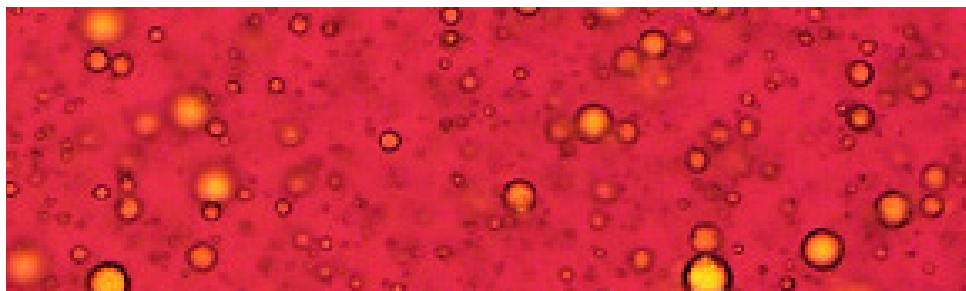


RESOLV™ Overlay Technology Reduces Desalter Emulsion and Saves Wastewater Treatment Reliability



INTRODUCTION

A Gulf Coast refinery operates a crude unit at approximately 80,000 BPD, while processing a blend of various crudes at an average API of 25. The crudes in the slate include a large proportion of Canadian crudes in combination with others. There are two Petreco Bilectric desalters on the unit that normally operate very well. Operations are diligent about keeping the desalters within the appropriate operating envelope, normally keeping system performance very efficient.

BACKGROUND

A challenging shipment of crude was required to be processed at the refinery. The crude was a heavy Canadian crude (API approximately 22). This crude made up nearly 70% of the crude slate during this period. To balance the API towards 25, it was blended with lighter crudes, which resulted in serious emulsion formation tendencies.

During this period, there was maintenance being performed at the wastewater treatment plant (WWTP) that resulted in a portion of the facility to be taken off-line. Due to this, the WWTP was not able to handle elevated levels

of oil and grease in the inlet stream. This limited the desalters capability to perform mud wash. It also caused concern with any amount of oil in the brine effluent from the desalters.

When the challenging crude was charged to the crude unit, the result was high levels of oil undercarry from the desalters. The operators worked hard to optimize the system, and were able to reduce the oil in the effluent to between 10-20%, which was still not acceptable. At this time, the emulsion breaker treatment consisted of a primary emulsion breaker injected into the raw crude feed to the unit, and a reverse emulsion breaker injected into the wash water.

Due to oil in the brine effluent from the desalters and the situation at the WWTP, the refinery decided to protect the WWTP by diverting the oily effluent from the desalter to rented frac tanks. The purpose was to recover the oil from the temporary tank system and reprocess it.

During the effluent issue, this was the safest strategy for the WWTP, yet it increased the cost to the refinery in rental equipment and reprocessing the recovered oil.

VALUE DELIVERED



PROFITABILITY

Reliably processed stressed feeds maintaining profit of

\$3.4 MILLION



COSTS

\$350,000

reduction in operational costs

VALUE DELIVERED

Annual savings of over

\$3.75 MILLION

SOLUTION

After working with the desalters for operational improvements, a novel application of emulsion breaker chemistries was proposed. The idea was to optimize the present oil-soluble primary emulsion breaker in the whole crude charge and to add another water-dispersible emulsion breaker into the desalter wash water. Figure 1 shows the injection point of the water-dispersible emulsion breaker. The reverse emulsion breaker was discontinued. The intention was to modify the interface between the oil and the water in the desalter to enhance separation of the hydrocarbon that was being dragged into the water phase through brine effluent.

RESULTS

The optimized application of the oil-soluble primary emulsion breaker and the water-dispersible emulsion breaker eliminated the oil undercarry issue. This is demonstrated in Figure 2 showing the desalter brine effluent samples prior to and after the application of the new emulsion breaker program. The time between the two photos is about half a day and there were no other operational or process changes made during that period.

During the days prior to the new program initiation, there were many frac tanks filled with oily desalter effluent water increasing storage costs on a daily basis. Considering that it would likely take several months to recover and process the oil, the cost is estimated to be well over \$300,000. This does not include manpower and associated equipment to transfer the hydrocarbon. Therefore, the savings from the program for this event was more than \$357,000.

The incremental cost of the emulsion breaker program for this term compared to the estimated cost savings alone yielded a return on investment with respect to the improved emulsion breaker program of 54:1. By utilizing the innovative chemical treatment approach the refinery had the confidence to maintain their crude diet flexibility through challenging conditions. In addition to the cost savings, the processing flexibility protected their margins and resulted in \$3.4M sustained profitability during the event. If the refinery could not have processed the crude and it was required to sell on the market, the potential lost profit may have been approximately \$8.4M.

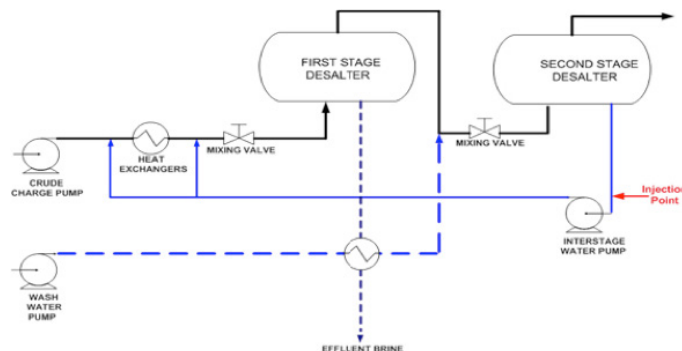


FIGURE 1: APPLICATION POINT OF THE WATER-DISPERSIBLE EMULSION BREAKER

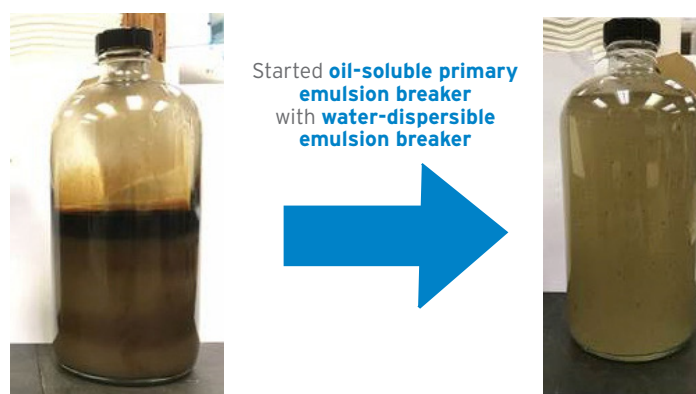


FIGURE 2: DESALTER BRINE EFFLUENT SAMPLES BEFORE AND AFTER EMULSION BREAKER APPLICATION CHANGE

CONCLUSION

This Gulf Coast refinery needed to process a significantly challenged opportunity crude, while having issues with the desalting processes. The operators did an excellent job in optimizing the process to the best of its capability, yet there were still limitations due to the emulsion stability tendencies of the blend crude slate. An optimized emulsion breaker combination, including an oil-soluble primary emulsion breaker and a water-dispersible emulsion breaker, allowed for more specific targeting of the emulsion issues and better resolution in the desalter. This resulted in the elimination of oil undercarry at the desalters and successful processing of the target crude.

By implementation of the desalting program, the refinery was able to maintain \$3.4M in margin profitability by being able to reliably process the opportunity crude, save \$357,000 in operational costs related to oil undercarry, and avoid a potential loss of \$8.4M in demurrage and costs of selling off a significant portion of the challenging crude. After the processing of the distressed cargo was accomplished and the blend crude slate returned to more normal components, the flexibility of the new emulsion breaker program allowed for further optimization and improvements to the process.

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