Desalter Continuous Improvement

OVERHEAD CORROSION REDUCTION LOWERS COSTS

BACKGROUND AND CHALLENGES

An inland refinery processing approximately 50,000 bbls per day of crude oil was concerned overhead corrosion due salt concentrations in the desalted crude, chlorides in the distillation tower overhead water and oil content of the desalter brine. The incumbent chemical vendor had recommended a program of purging the interface from the desalter via the effluent brine water.

Prior to Athlon, a Halliburton Service, being asked to evaluate the system, the desalter washwater was added just upstream of a global mix valve with the mix valve ΔP being set at 20 psi. This procedure did not allow for adequate mixing of the oil/water phases, resulting in elevated salt concentrations and fluctuating chlorides in the overhead system. The mud-washing procedure at the refinery was unsatisfactory and could only be accomplished by injecting fresh washwater into the vessel via the mud header. During this period, the desalter vessel remained in an upset condition that was caused by the erratic water level control that resulted from the introduction of fresh water directly into the vessel from an external source.

ATHLON'S RECOMMENDATION

Athlon implemented a field trial in a series of phases. Each phase consisted of modifications in the desalter operation with each phase having a purpose and goal.

Phase 1: A number of bench evaluations of Athlon desalting aids, utilizing our portable laboratory desalting equipment, were conducted over a period of several weeks. Samples of the refinery's raw crude charge were emulsified with desalter washwater from the refinery. These emulsions were subjected to various chemical-desalting formulations, numerous levels of shear/mixing and also caustic/acid addition. We recommended a desalter field trial using our demulsifier and modifications of operational procedures.

Phase 2: The field trial was started with the intent to gain control of the desalter and reduce the amount of oily undercarry and salt residuals in the desalted crude. The crude unit was dumping approximately 400 bbls of emulsion to the API separator on a daily basis. Salt content of the desalted crude ranged from 1 to 4 ptb of salt and the overhead chlorides averages in the 35 to 95 ppm range. Overhead exchangers were corroding at a rate, which produced leaks on nearly a weekly basis. The profile had improved greatly with four trycocks of clean water. The brine effluent water's quality had also improved and now contained less than 100-ppm oil and grease. The desalter is equipped with a mud-washing header that Athlon representatives recommended a modification of the mud header piping to facilitate the recycling of brine water to the header.

Phase 3: We asked operational personnel to relocate the washwater injection to enhance salt/solids removal. The water injection was moved ahead of the unit's booster charge pumps. Given the intensive mixing of the water and oil phases through the centrifugal booster pump and the pre-heat exchangers, we recommended reduction of mix valve ΔP. It was determined that the mix valve ΔP could be set at zero psi with no detrimental effects.

Phase 4: It was recommended that the addition of caustic to the desalter washwater combined with the use of the very effective demulsifier desalting aid would remove the metal salts and produce quick/complete phase separation.

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PERFORMANCE RESULTS

The results were a reduction in crude solids and sale concentrations and desaltereffluent quality improved. The following table contains the data contrasting the performance prior to our program and following our changes.

	Desalted Salt	Overhead Chlorides	Brine Oil Content	Salt Removal Efficiency
Pre-Athlon	**1.5 to 4 ptb**	**35 to 50 ppm**	**Percentage**	**97 to 98%**
Athlon, a Halliburton Service	**0.5 ptb**	**5 ppm**	**<200 ppm**	**>99%**

With Phase 3, the water injection being moved ahead of the unit's booster charge pumps resulted in increased mixing residence of the water and crude oil. Since this change, the average salt content of the desalted crude has been < 0.7 ptb. The unit's overhead chlorides have averaged 7 ppm are virtually non-existent. This increased the exchanger life, while reducing exchanger fouling and leaks due to crude distillation overhead corrosion. The use of overhead neutralizer was discontinued reducing overall chemical costs. The total cost reduction was close to half a million annually.