Pall Corporation

Case Study

Pall's PhaseSep® Coalescer Effectively Protects Food-Grade Hexane Reactor Catalyst

March 2007

Case History

A major refinery owned by the Indian government operates an 11.7 MMTPA refinery in Mumbai. The refinery treats reformate from a UOP reformer and untreated naphtha through a Merox[1] caustic treater, which is followed by a water wash step prior to the food-grade hexane plant. The hexane plant uses a precious metal catalyst in the converter which is extremely sensitive to contaminants like water and caustic.

The refiner sought to obtain a liquid/liquid coalescer, and requested quotes from several companies, including Pall.

Pall had quoted budgetary pricing and had conducted on-site pilot test work with a liquid/liquid coalescer test rig to demonstrate its performance in the field using the actual fluid to be treated. However, a local Mumbai-based fabricator offered extremely aggressive vessel sizing, which reduced their net capital cost and enabled them to secure the purchase order, as the refinery typically makes their purchasing decisions based solely on the installed capital cost criteria.

The refinery purchased the coalescer and pre-filter from the local vendor despite the fact that they did not conduct an on-site pilot test demonstration of the coalescer's performance.

Problem

The refinery soon began experiencing problems:

1) The inlet caustic/water emulsion to the food-grade hexane plant was approximately 1000 ppmw though the spec required <50 ppmw free water level
2) The food-grade hexane plant was suffering due to excess caustic carryover into the plant. The precious metal catalyst in the converter was poisoned and had to be replaced at a significant cost, both for the new catalyst and in lost production time.

After the original equipment vendor was unable to improve its performance and bring it to an acceptable level, the refinery called on Pall to make the coalescer functional.

[1] *Registered trademark of UOP.*

Solution

Pall needed to modify the existing coalescer skid to fit the Pall PhaseSep® elements. This was to be done at the Pall India Santej factory.

The refinery could not place another order as they had already capitalized the existing coalescer. Instead, they needed to modify it. The existing coalescer vessel was cut out and a new coalescer vessel was installed, keeping the collection sump. The pre-filters were also scrapped, and new Ultipleat® High Flow pre-filters installed. Piping with bypass arrangement, valves, and instrumentation was designed, supplied, and completed.

A complete PhaseSep coalescer skid assembly was sent to the refinery on a flatbed truck to be installed with the piping adjusted to efficiently hook up to existing lines.

The original system had nine 30" long pre-filters in duplex mode, two 6" x 36" coalescers, and one 6" x 36" separator. The new Pall system consisted of a duplex 2-around Ultipleat High Flow filter (HFU620GF100H13) with 7-around PhaseSep (LCS4H1AH) coalescers in a horizontal configuration.

Pall Ultipleat® High Flow Pre-filter and PhaseSep® Coalescer System.

Performance

During the Site Acceptance Test, several samples of the inlet and the outlet were taken for analysis. The results showed that the outlet was well under the required specification of 50 ppmw free caustic and water. The average total water was 190 ppmw, and the reported average soluble water was 180 ppmw by the refinery.

The refinery continued testing for two weeks and reported that the performance of the PhaseSep system remained constant.

Benefits

1) Caustic-free naphtha was continuously fed to the food-grade Hexane unit

2) Maximized catalyst life -- no further catalyst poisoning

3) PhaseSep coalescer system showed consistent removal efficiency and protected the catalyst effectively during the upset condition

4) Prevents corrosion in downstream fractionation columns

Cost Benefit Analysis

Projected annual savings: US $126,000

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