

DECONTAMINATION OF A PREHEATER EXCHANGE TRAIN ELIMINATING THE NEED FOR MECHANICAL CLEANING

Project

ZymeFlow team partnered with a large scale refinery in South America to decontaminate a preheat train bank consisting of 6 tube and shell heat exchangers processing vacuum tower bottoms as feedstock.

Challenges

Past cleaning procedures resulted in lingering high concentrations of H₂S and benzene in the heat exchangers as well as challenging extraction of the bundles for mechanical cleaning and inspection due to high levels of remaining asphaltene rich solids that caused the bundles to tightly adhere to the heat exchanger shells.

These procedures included steaming the exchangers for decon and/or circulating aqueous solutions to degrease the bundles. These decon and cleaning procedures were ineffective requiring large amounts of equipment and personnel to complete. Such practices generated high volumes of waste-water from hydroblasting and circulation activities resulting in lost time and excessive mechanical costs to the refinery because of the additional cleaning requirements.

Engineered Solution

Originally ZymeFlow recommended a light cycle oil (LCO) Flush and Vapour-Phase[®] application for all 6 exchangers. However, challenges at the refinery led to mechanically isolating 2 of the 6 heat exchangers away from the rest of the bank. Based on the utilities available for the two groups of exchangers, 2 different decontamination plans were implemented: the 4 exchanger bank was filled up and circulated with LCO enriched with Rezyd-HP[™] Z71 and Zyme-Flow[®] UN657. The solution was circulated for 16 hours at approximately 180 F and after draining it a Vapour-Phase procedure was performed using saturated steam (125 psi) enriched with Zyme-Flow UN657 for 7 hours. Conversely, there was no possibility of filling or circulating in the 2 heat exchangers isolated from the bank. Decon for these two heat exchangers was performed via a Vapour-Phase procedure for this bank using saturated steam (125 psi) enriched with Zyme-Flow UN657 for an 11-hour period.

Results

Decontamination of both sets of exchangers was 100% effective rendering them H₂S, LEL and Benzene free (0%, 0 ppm) after the Vapour-Phase procedure was completed. All asphaltene compacted solids were dissolved facilitating the extraction of all 6 bundles without incident. There was a radical difference in the amount of solids remaining in the two sets of bundles.

The exchangers that were circulated with Rezyd-HP Z71 showed no solids at all and did not require additional mechanical cleaning. In contrast, the two bundles not circulated with Rezyd-HP Z71 showed loose coke particles and required additional hydroblasting. The overall time for the inspection and reinsertion of the bundles was greatly reduced by ZymeFlow's decontamination procedure as well as the amount of manpower required. ZymeFlow's approach reduced costs by eliminating the need for mechanical cleaning in 4 out of 6 heat exchangers, as well as drastically reducing the lost time associated with the cleaning portion of the turnaround.



● Preheater train heat exchanger E-2505H decontaminated (0% LEL, 0% H₂S, 0% benzene) using Vapour-Phase method in 11 hours without viscosity wash with LCO and Rezyd-HP Z71.*



● Preheater train heat exchanger E-2505F decontaminated (0% LEL, 0% H₂S, 0% benzene) using Vapour-Phase method in 7 hours after a viscosity wash with LCO and Rezyd-HP Z71 was circulated for 16 hours.**