PROJECT REPORT (PR-012)
SULFOLANE L/L EXTRACTION UNIT REVAMP FOR AROMATICS RECOVERY

Customer: Major Petrochemical Producer, Korea
Project: Sulfolane Extraction Unit Revamp
Date of Revamp: 2002

BACKGROUND

The Sulfolane Liquid-Liquid Extraction Process is commonly used in recovering high purity aromatics from hydrocarbon mixtures such as reformed petroleum naphtha (reformate), pyrolysis gasoline (pygas), or coke-oven light oil.

The capacity of the client's existing Sulfolane Unit has been limited due to the immediate bottleneck in its Sulfolane Liquid-Liquid Extractor. AMT performed process simulation of the existing Sulfolane Process, evaluated the existing major equipment, and identified all system bottlenecks that should be retrofitted to achieve the client's goal for > 34% capacity increase from its limit.

Upon evaluation, AMT designed and supplied its high performance mass transfer technologies for the project in 2002.

REVAMP OBJECTIVES

The objectives of this revamp were to:

1. Increase the Sulfolane L/L Extraction Unit capacity to 134% of original limit.
2. Reduce the aromatics content in the non-aromatics raffinate to be less than 0.5 wt%.

COLUMN PERFORMANCE

Before Revamp

The existing Sulfolane L/L Extractor, originally equipped with Rain-Deck Trays, was the immediate bottleneck to the Unit's capacity increase. Under lower throughput, the aromatic contents in the non-aromatics raffinate has been maintained below its requirement of <0.5 wt%. However, at higher throughput, the aromatics content in the raffinate was increased to ~0.7 wt% which limited further throughput increase to the Extractor, and to the Sulfolane Unit. In addition, AMT has identified the original column internals in the Sulfolane Stripper and the Recovery Column would also become next bottlenecks under the new throughput.

After Revamp

To meet the revamp objectives, AMT replaced all of the existing Rain-Deck Trays in the Extractor with AMT's proprietary ADE/ADEP High Performance Liquid/Liquid Extraction Trays. AMT has also revamped the Stripper and Recovery Columns with AMT's patented ADV Pinnacle Performance Trays and Structure Packing. Table 1 summarizes the project details:

Table 1

Column	Before Revamp	After Revamp
Sulfolane L/L Extractor	Rain Deck Tray	ADE/ADEP Tray
Raffinate Wash Column	L/L Sieve Tray	Re-use
Sulfolane Stripper Column	Valve Tray	ADV Tray
Recovery Column	Valve Tray	SP + ADV Tray
Water Stripper Column	Valve Tray	Re-use

After revamp, the debottlenecked Sulfolane Unit was successfully started up. Key performance parameters are listed in Table 2:

Table 2 Performance Comparison

	Before Revamp	After Revamp
Feed Rate	100%	137%*
Solvent Rate	100%	135%
Solvent/Feed Ratio, w/w	3.2	3.1
Solvent/Feed Ratio, v/v	2.1	2.0
ARO in Feed, wt%	70	70
ARO in Raffinate, wt%	0.68	<0.2
Steam consumption/Extract	100%	86%
*Exceeded 134% throughput target. Maximum achieved: **>158%.**		

As shown in Table 2, all the revamp objectives have been achieved and exceeded. Specifically,

- The bottleneck in the Sulfolane Extractor has been removed, and the overall Unit throughput was increased to 137% while exceeding all product specifications during the initial start-up.
- The mass transfer efficiency in Sulfolane Unit has been improved and the energy consumption per ton of Extract was reduced by 14% under same solvent/feed ratio.
- Due to improved liquid/liquid extraction efficiency, the client was able to lower solvent/feed ratio and further reduced the energy consumption and increased the Unit's throughput to >158% of original limit.

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