



ED Sulfolane™ Process

Aromatics

Application

The Extractive Distillation (ED) Sulfolane process uses sulfolane solvent for the recovery of high purity benzene and toluene products from hydrocarbon mixtures, such as catalytic reforming naphtha (reformate), pyrolysis gasoline (pygas), and other aromatic rich streams. The ED Sulfolane process is also a lower capital investment alternative to the traditional liquid-liquid extraction Sulfolane process. Assuming the same processing objectives, the ED Sulfolane process requires less than 80% of the capital investment required to construct a traditional Sulfolane unit.

For petrochemical applications, benzene and toluene need to be produced at very high purity. The ED Sulfolane process can be used to produce these pure benzene and toluene products. The traditional liquid-liquid extraction Sulfolane process would typically be used for very lean aromatic feeds or when xylene products need to be extracted along with benzene and toluene.

For gasoline applications, the ED Sulfolane process can be used to produce a benzene-free raffinate stream suitable for gasoline blending or downstream processing. High purity benzene is recovered as a by-product from a downstream benzene column.

Sulfolane solvent was developed in the early 1960s and is still the most efficient solvent available for the recovery of aromatics. Most extraction units can be made to operate at high purity and recovery by circulating more solvent. Because sulfolane solvent exhibits higher selectivity and capacity for aromatics than any other commercial extraction solvent, ED Sulfolane units operate at very low solvent-to-feed ratios. Therefore, ED Sulfolane units are less expensive to build and operate than other types of extractive distillation units.

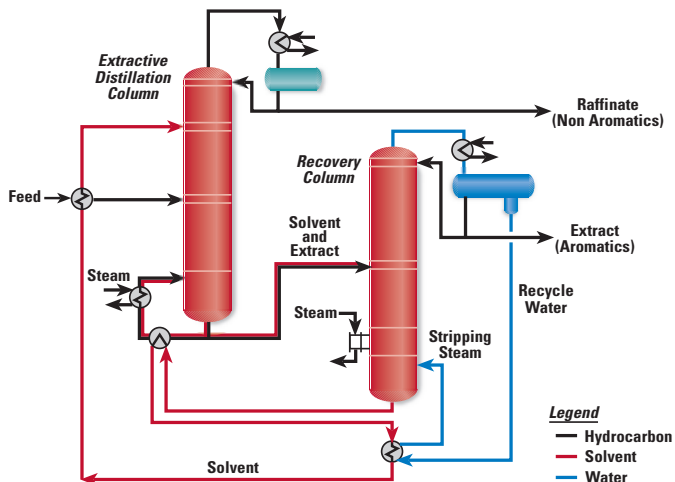
In a fully integrated UOP aromatics complex, an ED Sulfolane unit recovers high-purity benzene and toluene products from reformate. The ED Sulfolane unit processes reformate splitter column overhead liquid, mainly C₆ and C₇ hydrocarbons. The aromatics extract from the ED Sulfolane unit is clay treated to remove trace olefins, and individual benzene and toluene products are recovered by simple fractionation. The raffinate

from the ED Sulfolane unit can be used as naphtha cracker feed, aliphatic solvents or blended into the gasoline pool.

Features and benefits

- **High Purity Benzene** - The benzene produced in an ED Sulfolane unit (with downstream benzene and toluene fractionation) is typically 99.9 wt-% purity ASTM "Refined Benzene-545." Alternatively, the more stringent ASTM "Benzene for Cyclohexane Feedstock" grade may be produced.
- **High Purity Toluene** - The toluene produced is at least TDI grade with less than 1000 wt-ppm non-aromatics.
- **High Recoveries** - The expected recovery of benzene and toluene is greater than 99.5% of these aromatic components present in the fresh feed. The make-up rate for sulfolane solvent is negligible.
- **Compatible Solvent** - Sulfolane is the most widely used solvent for aromatics extraction and a readily available commodity chemical. There are no co-solvents or proprietary additives. In addition, sulfolane does not contain nitrogen which can be harmful to catalysts in downstream process units.
- **Energy Efficient** - The ED Sulfolane process demonstrates low energy consumption.

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Process description

Fresh aromatic feed, which is typically pre-fractionated, is sent to the extractive distillation column (ED Column). The feed is preheated with lean solvent and enters the middle of the ED Column. Lean solvent, essentially free of hydrocarbon components, is introduced near the top of the ED Column. The denser solvent phase travels down the column from tray to tray as the hydrocarbon phase travels upward. On each tray, both the solvent and hydrocarbon phases are intimately contacted and re-separated.

Non-aromatic hydrocarbon overhead vapors from the ED Column are condensed and the net overhead liquid is known as the non-aromatic "raffinate" product. A portion of the condensed liquid is refluxed to the rectification section of the ED Column.

The ED Column net bottoms liquid contains solvent and highly purified aromatics which are sent to the solvent recovery column (Recovery Column). In the Recovery Column, aromatics are separated from solvent under vacuum using stripping steam generated from a closed loop water circuit.

Purified benzene or benzene-toluene vapors from the Recovery Column are condensed, and the net overhead liquid is the "extract" product which is either sent to storage or to clay treating prior to product fractionation. A portion of the condensed liquid is refluxed to the rectification section of the Recovery Column.

The bottoms product from the Recovery Column is essentially aromatics-free solvent. Lean solvent from the Recovery Column bottoms is passed through heat exchange before being sent back to the ED Column.

Economics

Basis: 560 KMTA (11,200 BPD) of benzene-toluene feed, derived from reformate. The blended feed is 67 wt-% aromatics.

Estimated Erected Cost, US\$ MM **14**
(2006 US Gulf coast basis, inside battery limits only)

Estimated Utility Consumption

Electric power, kW	335
Medium pressure steam, MT/hr	21
Cooling water, m ³ /h	229

Commercial experience

The ED Sulfolane process is a simplified, low capital investment version of the well-proven Sulfolane process operated in over 129 units. As of 2006, there are three ED Sulfolane units in operation and 14 other ED Sulfolane units in design and construction.

For more information

ED Sulfolane technology services are available on request. For more information, contact your local UOP representative or our Des Plaines sales office:

e-mail: info@uop.com
 fax: +1-847-391-2253
 phone: +1-847-391-2000

UOP LLC

25 East Algonquin Road
 Des Plaines, IL 60017-5017
 U.S.A.
www.uop.com

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