



Mercox™ Process for Mercaptan Extraction

INTRODUCTION

The Mercox process for mercaptan extraction is one of the family of Mercox process applications developed for control of mercaptans (thiols) in hydrocarbon streams. The extraction Mercox process can be applied to gases, C₃s, C₄s, LPG and naphtha streams. In the extraction Mercox process the caustic soluble mercaptans are removed in a single, multi-stage extraction column using high efficiency trays designed by UOP. A caustic regeneration section converts the extracted mercaptans to disulfides that are separated and removed, while the regenerated caustic solution is recycled back to the extraction section.

For treatment of light feedstocks such as LPG, no sweetening is required, since mercaptans are nearly completely removed by extraction. After Mercox extraction, LPG is low enough in sulfur to be fed directly to alkylation and isomerization processes. Other feedstocks such as pentanes, light straight-run and cracked naphthas, and NGL contain higher molecular weight mercaptans, and may require a combination of Mercox extraction and sweetening.

CHEMISTRY

Since low molecular weight mercaptans are soluble in caustic soda (NaOH), when treating feedstocks such as C₃, C₄, LPG, and light naphtha fractions, it is feasible to remove these mercaptans via NaOH extraction. After extraction, the mercaptans are oxidized to disulfides.

The extraction reaction is shown by the following equation:



Extraction equilibrium is favored by lower molecular weight mercaptans and lower temperatures.

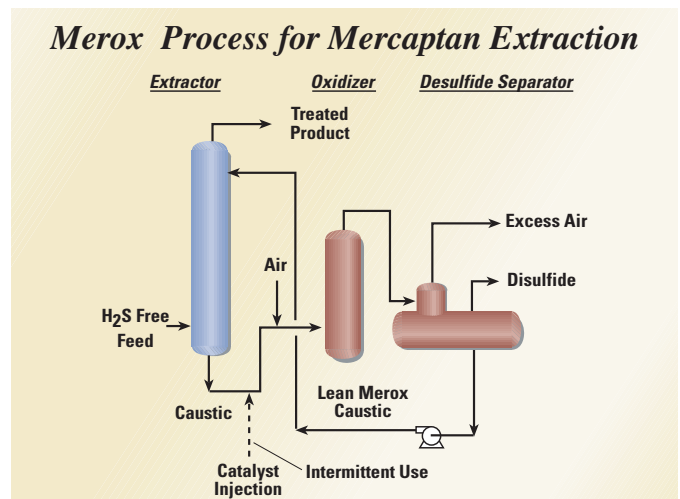
The rich caustic, containing the extracted mercaptans in the form of sodium mercaptides, is regenerated as shown in the equation given below:



The reaction is accelerated to an economically acceptable rate at mild conditions by Mercox WS™ catalyst which is dispersed in the aqueous caustic solution.

PROCESS FLOW DESCRIPTION

Feedstock enters the extractor and flows upward, contacting caustic solution flowing counter-currently down the column. Multi-stage extraction is accomplished in a single extractor vessel containing high efficiency trays designed by UOP. The caustic soluble mercaptans are transferred from the hydrocarbon to the caustic phase. The treated product passes overhead to storage or further processing.



The mercaptan rich caustic solution containing Mercox WS catalyst is injected with air and the mixture flows into the oxidizer where the dissolved mercaptans are catalytically oxidized to water insoluble disulfide oil.

The oxidizer effluent flows to the disulfide separator where vent gas is separated and sent to disposal. The regenerated caustic and disulfide oil mixture is then coalesced into separate phases. The disulfide oil is decanted and sent to fuel or to further processing in a hydrotreater. The regenerated caustic is recirculated to the extractor.

BENEFITS

LOW CAPITAL INVESTMENT

The non-corrosive environment, near ambient operating temperature and low design pressure allow for carbon steel construction throughout. The simple process flow lends itself well to modular fabrication.

LOW OPERATING COST

Operating costs are minimal. Catalyst, chemical, and utility costs are only a fraction of a U.S. cent per barrel of treated product.

EASE OF OPERATION

Minimal operator attention is required. Air injection rate, caustic circulation rate, and periodic catalyst addition are the only adjustments normally required to control operation.

HIGH EFFICIENCY DESIGN

- Multi-stage extraction is accomplished in a single vessel with high efficiency trays designed by UOP.
- Low caustic flow rates are employed, resulting in minimal re-entry disulfides in the product. The majority of applications do not require naphtha wash.

PRODUCT QUALITY

- The extraction Merox process reliably produces products containing minimal mercaptans.
- Extraction Merox units can readily be designed to produce products suitable as feeds to alkylation, oligomerization, and isomerization processes, as well as for low sulfur gasoline pools.

CAUSTIC USAGE AND DISPOSAL

The extraction caustic gradually loses strength due to pickup of CO₂ in regeneration air supply or accumulation of reaction formed water. However, the caustic retains a high level of alkalinity making it suitable for reuse in other services, such as prewashing feed for removal of H₂S.

EXPERIENCE

UOP has designed well over 700 extraction Merox units. Nearly 500 of these units were designed for mercaptan removal from C₃s, C₄s and LPG feedstocks and more than 200 of these units were designed for straight-run and cracked naphtha range feedstocks. The design capacity of Merox extraction units placed on stream, to date, is greater than 5.2 million barrels per stream day. The Merox process, by far, is the world's most widely applied mercaptan treating technology.

CATALYST

To ensure that catalyst of the highest quality is available, UOP manufactures highly active and selective catalysts for the Merox process. Merox WS catalyst is a totally water-soluble, specially formulated catalyst that is used for mercaptan extraction.

FOR MORE INFORMATION

For more information, contact your UOP representative or UOP at:

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