



Process Technology and Equipment

Mercox™ Process for Gas Extraction

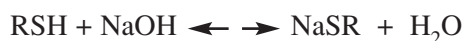
INTRODUCTION

The Mercox process for gas extraction is one of the family of Mercox process applications developed for control of mercaptans (thiols) in hydrocarbon streams. The gas extraction Mercox process can be applied to natural gases or to refinery gases. In the gas extraction Mercox process, the caustic soluble mercaptans are removed in the multi-stage extraction section of a combination column that may also include prewash and post-treatment water wash sections.

CHEMISTRY

Since low molecular weight mercaptans are soluble in caustic soda (NaOH), when treating feedstocks such as natural gases and refinery gases, it is feasible to remove these mercaptans by NaOH extraction.

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

A gas extraction Mercox unit will normally consist of a combination column that includes prewash, extraction, and water wash sections. A caustic regeneration system will convert the extracted mercaptans to disulfide oil

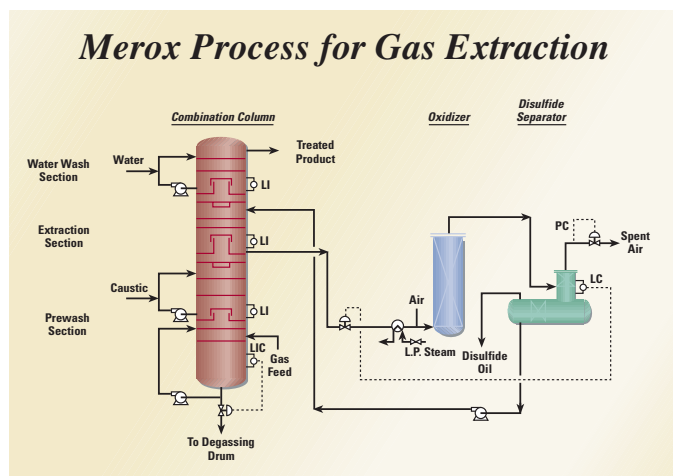
that is separated and removed, while the regenerated caustic is returned to the extraction section.

Feedstock enters the bottom of the combination column into the prewash section. The gas passes upward through the trays of the prewash section where it is contacted with circulating caustic solution for removal of H_2S and CO_2 .

The gas leaving the prewash section flows upward through the trayed extraction section where it is contacted with regenerated caustic that enters at the top of the extraction section. Mercaptans are absorbed into the caustic solution through intimate counter-current contact between caustic and feed.

The water wash section is located above the extraction section. The gas from the extraction section passes upward through the trays of the water wash where water is counter-currently circulated to remove traces of entrained caustic from the treated gas.

The rich caustic containing the extracted mercaptans flows from the bottom of the extraction section to the caustic regeneration section.



In the caustic regeneration section, 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 into 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 a hydrotreating unit. The regenerated caustic is recirculated to the extractor.

BENEFITS

LOW CAPITAL INVESTMENT

The non-corrosive environment and near ambient operating temperature allow for carbon steel construction throughout

LOW OPERATING COST

Operating costs are minimal. Catalyst, chemical, and utility costs are only about 1 to 2 U.S. cents per thousand SCF of treated gas.

EASE OF OPERATION

An extraction Merox unit requires minimal operator attention. Air injection rate, caustic circulation rates, and periodic catalyst addition are the only adjustments normally required to control operation.

HIGH EFFICIENCY DESIGN

- The mercaptan extraction section as well as the prewash and water wash sections of the unit are normally included in a single combination column.
- Caustic usage is minimized through efficient regeneration and reuse of the caustic.

PRODUCT QUALITY

The gas extraction Merox process reliably produces a treated product containing minimal mercaptans. Contaminants such as H₂S and CO₂ are effectively removed in the prewash section. Total sulfur can be minimized further by including a naphtha wash or a downstream lean oil absorber.

EXPERIENCE

The design capacities of the UOP gas extraction Merox units placed on stream vary from 4.5x10⁶ SCFD to 72x10⁶ SCFD for refinery gases. A multi-train gas extraction Merox unit treating 2.9x10⁹ SCFD of natural gas has been placed on stream.

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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