Merox™ Process for Kerosene/Jet Fuel Sweetening

Introduction

The Merox process for kerosene/jet fuel sweetening is one of the family of Merox process applications developed for control of mercaptans (thiols) in hydocarbon streams. The conventional version of this process uses a fixed-bed catalyst, air, and caustic (NaOH) to sweeten kerosene feedstocks. Pre- and post-treatment sections are included to ensure that other jet fuel specifications are met.

Chemistry

Merox sweetening involves the catalytic oxidation of mercaptans to disulfides in the presence of oxygen and alkalinity. Air provides the oxygen, and caustic provides the alkalinity. The disulfides formed remain in the treated hydrocarbon stream. The sweetening reaction is shown below:

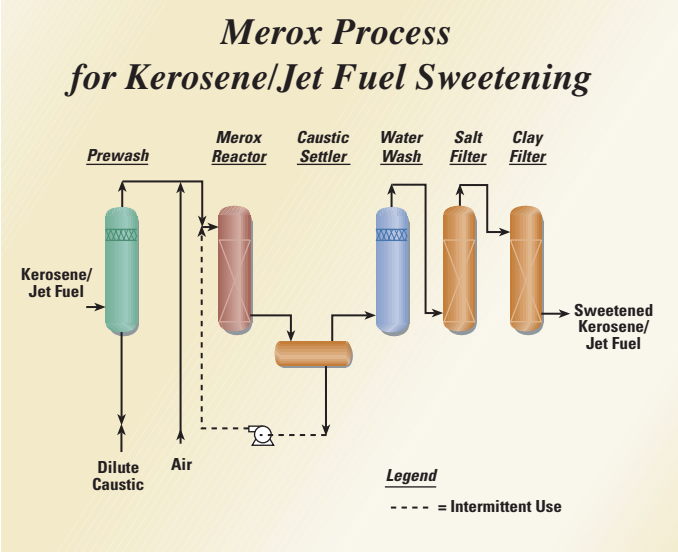
$$4\ RSH + O_2 \rightarrow 2\ RSSR + 2\ H_2O$$

Merox catalyst accelerates the reaction rate to permit economical treating at normal refinery product rundown temperatures.

Process Flow Description

Prior to flowing to the reactor, the chargestock is passed through a caustic prewash in order to reduce the naphthenic acids present in the kerosene feed.

The reactor section of the kerosene/jet fuel Merox unit consists of a fixed-bed reactor followed by a caustic settler. Air, the source of oxygen, is injected into the feedstock upstream of the reactor. The mixture enters the top of the reactor and percolates downward through the catalyst bed. The operating pressure is chosen to assure that the air required for sweetening will be completely dissolved at the operating temperature. The sweetened kerosene exits the reactor and flows to the reactor caustic settler. The caustic settler contains a reservoir of caustic for use in keeping the Merox catalyst alkaline. The caustic is periodically circulated over the reactor bed, while maintaining operations.



The kerosene leaving the caustic settler passes through a water wash which removes trace quantities of caustic as well as water soluble surfactants.

Kerosene product leaving the water wash is directed to a salt filter containing a simple bed of coarse rock salt that is used to remove free water and a portion of the dissolved water from the product. This will protect the water sensitive clay from premature failure.

To assure that jet fuel product specifications such as thermal stability, microseparometer, and water reaction, will be met, a product clay filter is included. The clay filter removes oil soluble surfactants, organometallic compounds (especially copper which may have been present in the kerosene feed), and particulate matter, which would jeopardize jet fuel product specifications.

Benefits

Low Capital Investment

The non-corrosive environment, near ambient operating temperature and low design pressure allow for carbon steel construction throughout. In comparison, the cost of a hydrotreating unit for producing jet fuel would be many times the cost of a Merox unit.

Low Operating cost

Operating costs are very low. Catalyst, chemical, and utility costs are only a few U.S. cents per barrel of treated product. In contrast, the operating costs of a hydrotreating unit can be $0.50 to $1.00 per barrel of product, depending on the price of hydrogen.

Ease of Operation

A kerosene/jet fuel sweetening Merox unit is easy to operate. A wide range of feed rates and mercaptan concentrations can be accommodated by adjusting prewash caustic rate, air injection, and periodic reactor caustic circulation.

Feedstock Flexibility

- Conventional fixed-bed sweetening Merox units have successfully treated kerosene feedstocks from more than 100 crude sources.
- With the use of Merox 10™ catalyst, the Merox process is able to sweeten all kerosene feeds being processed world-wide.

Product Quality

- The Merox process reliably produces a sweetened product meeting kerosene/jet fuel specifications.
- The jet fuel treated in a Merox unit is superior to hydrotreated jet fuel in lubricity.

Experience

The Merox process is overwhelmingly the most widely applied kerosene/jet fuel sweetening technology. More than 200 kerosene/jet fuel sweetening Merox units, having a total design capacity greater than 1,700,000 BPSD have been placed on stream.

Catalyst

To ensure that catalyst of the highest quality is available, UOP manufactures a family of highly active and selective catalysts for the fixed-bed sweetening Merox process.

Merox FB™ catalyst is used for in-situ impregnation of the activated charcoal in the reactor. Alternatively, Merox No. 8™, pre-impregnated catalyst can be supplied. Merox No.10 catalyst has been developed for sweetening extremely difficult to treat kerosenes. UOP also offers Merox Plus™ activator to significantly extend catalyst life and provide additional catalytic activity when treating more difficult feedstocks.

For More Information

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

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