



Process Technology and Equipment

Caustic-Free Merox™ Process for Kerosene/Jet Fuel Sweetening

INTRODUCTION

The Caustic-Free Merox process for kerosene/jet fuel sweetening is one of the family of Merox process applications developed for control of mercaptans (thiols) in hydrocarbon streams. The Caustic-Free Merox process was developed specifically to eliminate the use of caustic for mercaptan sweetening. This was accomplished by the development of special high activity catalysts and activators that allow the mercaptan sweetening reaction to take place in the presence of a weak base, ammonia.

As well as being applied to new units, Caustic-Free Merox technology can readily be adapted to existing kerosene/jet fuel Caustic Merox units.

CHEMISTRY

Caustic-Free Merox kerosene/jet fuel sweetening involves the catalytic oxidation of mercaptans to disulfides in the presence of ammonia. The disulfides formed remain in the treated hydrocarbon stream. The sweetening reaction is shown below:

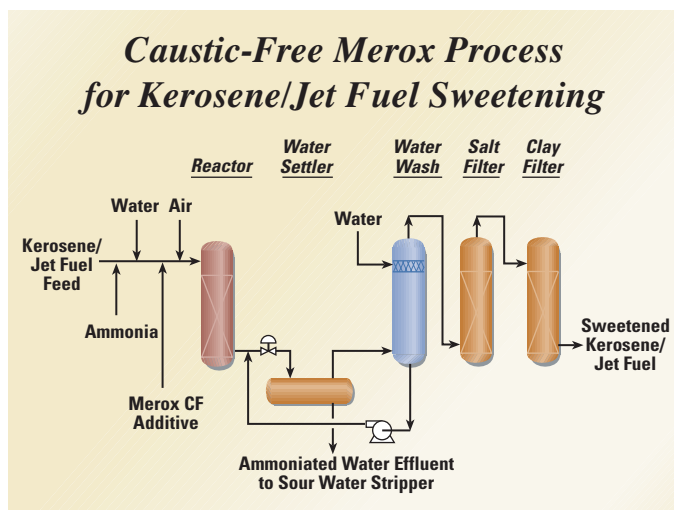


A special pre-impregnated catalyst developed specifically for caustic-free kerosene sweetening accelerates the reaction rate to permit economical treating at normal refinery product rundown temperatures without the need for the presence of a strong base (NaOH). A catalyst activator is also used in this application.

PROCESS FLOW DESCRIPTION

A kerosene/jet fuel Caustic-Free Merox unit does not require a prewash section for removal of naphthenic acids, for charge stocks with low acid numbers. For feeds with high acid numbers, ammonia prewash is employed. A small quantity of ammonia is continuously injected into the reactor feed, along with a small amount

of Merox CF™ activator. Water is also injected upstream of the reactor, as is air. The vertical fixed-bed reactor contains Merox No. 31™ catalyst.



The sweetened kerosene exits the reactor and flows to a horizontal water settler where the ammoniated water is separated from the treated product. This vessel also is used as the first stage of water wash. A second stage of water wash is provided downstream of the water settler to ensure complete removal of ammonia and soluble naphthenates. Wash water exiting the second stage water wash vessel is pumped to the water settler.

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 will remove 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

LOW OPERATING COST

Operating costs are low, especially when compared to hydrotreating. Catalyst, chemical, and utility costs are only a few U.S. cents per barrel of treated product.

ELIMINATION OF CAUSTIC

- This technology has been developed by UOP specifically for refiners that require complete elimination of caustic for sweetening applications due to environmental concerns or high caustic disposal costs.
- The Caustic-Free Merox process produces an ammoniated water effluent that is readily disposed to a sour water stripper. The flow scheme can also include a dedicated ammonia stripper that recovers and recycles ammonia while reducing the load to an existing sour water stripper.
- Existing kerosene/jet fuel Caustic Merox units can easily be converted to Caustic-Free Merox technology.

EASE OF OPERATION

A kerosene/jet fuel sweetening Caustic-Free Merox unit requires minimal operator attention. Air, ammonia, water and activator injection rates are the only adjustments necessary to accommodate a wide range of feed rates and mercaptan concentrations.

PRODUCT QUALITY

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

EXPERIENCE

Seven kerosene/jet fuel sweetening Caustic-Free Merox units, having a total design capacity of more than 80,000 barrels per stream day, 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 and activators for the Caustic-Free Merox process. Merox No. 31™ catalyst has been developed specifically for kerosene/jet fuel sweetening applications. Merox No. 31, which is supplied as a pre-impregnated catalyst, is used with Merox CF™ activator.

FOR MORE INFORMATION

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