Honeywell UOP

PETROCHEMICALS

UOP Oleflex™ Process for Isobutylene and MTBE Production

Isobutane dehydrogenation

Introduction

UOP's Oleflex process is a catalytic dehydrogenation process for the production of light olefins from their corresponding paraffins. It can be used to convert all types of butane feeds to butylenes. One specific application of this process is to produce isobutylene from isobutane. The olefins are subsequently used to produce methyl tertiary butyl ether (MTBE) or other chemical products. The growth in ether production is primarily driven by specifications for the gasoline pool, because oxygen in gasoline reduces the amount of CO produced. The future growth of this market is highly dependent on legislative mandates. An MTBE complex with the Oleflex process provides:

- Low feedstock consumption and low energy usage
- Dedicated reactor and UOP CCR Platforming™ regenerator systems
- Highly active and stable catalyst
- High on-stream factor
- Ability to change catalyst without stopping isobutylene production

In addition, the Oleflex process utilizes UOP's proprietary equipment and systems for optimal operations, including UOP Polybed™ PSA units, UOP modular CCR™ units, UOP lock hopper control, UOP MD™ distillation trays, UOP High Flux™ tubes, and UOP Process Instrumentation Controls. Integration of these products into the Oleflex process results in significant capital and operating cost savings for the complex and provides an overall guarantee for the Oleflex process and products. With the use of CCR catalyst regeneration, the processing unit does not have to be shut down to change out the catalyst.



Make fuel additives such as MTBE, ETBE, iso-octene and iso-octane at a low cash cost of production with isobutylene from the UOP Oleflex process.

Application

The majority of the ether capacity comes from olefins that are produced by steam crackers, propylene oxide plants, or refineries. As a result, most of the isobutylene used to make MTBE is a by-product of other operations. However, when production capacity is not coupled with a demand for those by-products, a supply/demand imbalance can occur. The Oleflex process provides petrochemical producers with a catalytic, on-purpose means of making isobutylene independent of the demand for ethylene, propylene oxide or gasoline. The MTBE complex provides producers with a high-quality source of isobutylene which leads to high-quality MTBE. With the Oleflex process incorporated into the complex, catalyst consumption is extremely low and on-stream operating efficiency is very high.

Description

An MTBE complex includes an Oleflex process unit, a UOP Ethermax™ process unit, a UOP Butamer™ process unit, a Hüls Complete Saturation Process unit (licensed by UOP), and an oxygen removal unit (ORU). The Oleflex process is separated into three different sections: the reactor section, the product recovery section, and the catalyst regeneration section.

The reactor section of the Oleflex process consists of three radial-flow reactors, charge and interstage heaters, and a reactor feed-effluent heat exchanger. In the product recovery section, the reactor effluent is cooled, compressed, dried, and sent to a cryogenic system to separate hydrogen from hydrocarbon. The net gas is recovered at 85-93 mol% hydrogen purity.

Separator liquid is sent to the Ethermax unit for reaction of isobutylene with methanol. The MTBE product is removed via fractionation in the catalytic distillation column in the Ethermax unit. The unreacted butanes are sent to a depropanizer for removal of light ends. The depropanizer bottoms are treated to remove trace amounts of oxygenates in the oxygenate removal unit. Finally any remaining olefins and C_4 diolefins are saturated in the Hüls CSP process. The olefins are then sent back to the deisobutanizer (DIB). A vapor side draw in the DIB feeds the Butamer unit, which converts the normal butane to isobutane. The DIB and Butamer unit provide an outlet for normal butanes to be removed from the recycle and converted to isobutane feedstock for the Oleflex unit. If high-purity isobutane is available, the DIB and Butamer process unit may not be required.

The catalyst regeneration section burns coke off the catalyst and restores it to fresh activity.

Feedstock

The feedstock to a C_4 Oleflex process unit has traditionally been isobutane. However, since the end of 2016, a C_4 Oleflex can now be designed to process normal butane as well mixed field butanes. The desired olefin product will dictate the feed type. The feedstock to the MTBE complex is derived primarily from field butanes processed by a DIB column and Butamer to generate isobutane. Butanes are also available in smaller quantities as a by-product from refinery operation such as fluidized catalytic cracking (FCC).

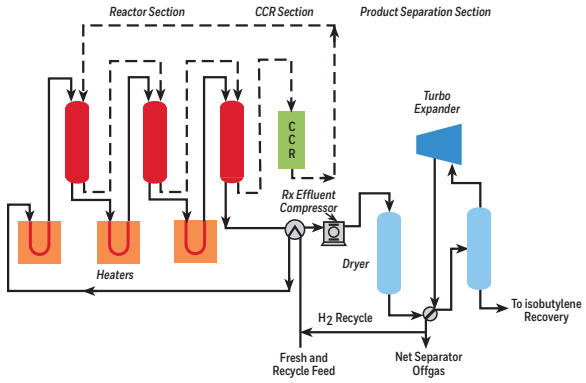
Catalyst

The Oleflex process uses a platinum catalyst to promote the dehydrogenation reaction. The DeH-16 catalyst, introduced in 2008, represents the sixth generation of Oleflex catalyst. Not only does the DeH-16 catalyst maintain the high activity, high selectivity, and low attrition rates required for the dehydrogenation process, it also has a lower platinum investment than previous catalysts.

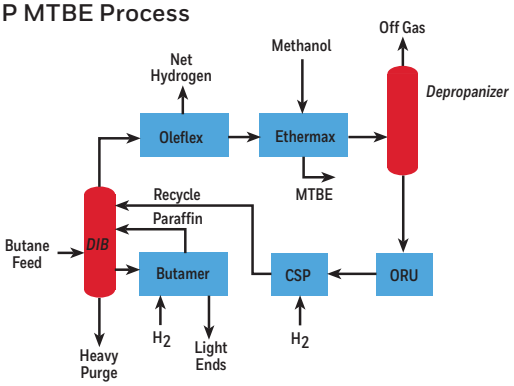
Commercial Experience

The Oleflex process was commercialized in 1990. Currently 15 propane units and three mixed propane/isobutane units produce more than 6,800,000 MTA of propylene. In addition, eight isobutane units have been commissioned and produce more than 2,400,000 MTA isobutylene.. At the end of 2016, seventeen additional Oleflex units were in various stages of design and construction.

C_4 Oleflex Process



UOP MTBE Process



For more information

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