Honeywell UOP

PETROCHEMICALS

UOP Oleflex™ Process for Butylene Production

Butane dehydrogenation

Introduction

UOP's Oleflex process is a catalytic dehydrogenation process for the production of light olefins from their corresponding paraffins. It efficiently converts isobutane to isobutylene, normal butane to normal butylene, or mixed butanes to mixed butylenes. The resulting olefins can then be used as feed stocks to make octane-boosting gasoline additives or a number of other C_4 olefin derivatives.

In addition, the Oleflex process can incorporate UOP's proven, high-performance 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.

Application

Butylenes are primarily produced as a by-product of other operations, such as ethylene steam crackers, refinery FCC units, and extraction from refinery C_4 raffinate streams. 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, who have a source of butanes, to catalytically make on-purpose butylenes independent of the demand for ethylene or gasoline.

In the presence of a strong acid, isobutylene reacts with isobutane to produce a high quality alkylate. The resulting product is made up of branched paraffins with low volatility, high octane, zero aromatics and olefins, and very low sulfur, making it an ideal blend stock for cleaner burning gasoline. The highest octane alkylate can be produced from the dehydrogenation of normal butane to butene-1 and butene-2 and subsequent conversion via sulfuric acid alkylation technology. The UOP Oleflex process can supply suitable olefin feed stock for any of the commercially available alkylation technologies. In addition, UOP offers alternative alkylation technologies, such as the UOP ISOALKY™ and AlkyPlus™ processes, using ionic liquid and hydrofluoric acid catalysts respectively.



Oleflex offers the lowest CapEx and OpEx dehydrogenation solution and maximizes return on investment

FEATURES & BENEFITS

An Oleflex process provides:

- Lowest capital and operating expense
- Lowest feedstock consumption and energy usage
- Lowest flue gas and wastewater emissions
- Highly active, stable platinum-based (nontoxic) catalyst
- Flexible operation: Independent reactor and UOP Continuous Catalyst Regenerator (CCR) systems enabling catalyst replacement without stopping propylene production
- High on-stream factor

Isobutylene can also be reacted with methanol to produce methyl tertiary butyl ether (MTBE), which is used as an octane booster and a supply of contained oxygen for unleaded gasoline. The future growth of this market is highly dependent on associated environmental concerns and legislative mandates.

Finally, butene-1 is used a co-monomer in the production of polyethylene such as linear low density polyethylene (LLDPE) and high density polyethylene (HDPE). It is also used in a number of specialty applications like polybutene-1, butane oxide, and co-monomers in olefin elastomers.

Description

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

Feedstock

UOP offers the Oleflex process for the dehydrogenation of isobutane, normal butane, mixed butanes, as well as propane. The desired olefin product will dictate the feed type.

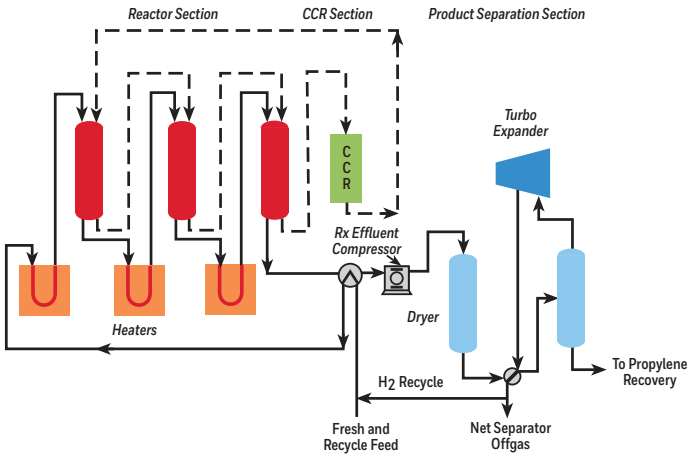
Catalyst

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. UOP continuously develops new catalyst formulations to further enhance performance.

Commercial Experience

The Oleflex process was commercialized in 1990. There are eight C_4 Oleflex units in operation, operating with performance and reliability that achieved record catalyst life in dehydrogenation service of more than seven years. They produce nearly 2.4 million MTA of isobutylene. In addition, there are 15 operating C_3 Oleflex units producing more than 6.8 million MTA of propylene, and three operating C_3/C_4 mixed units. More than 28 additional units have been awarded and are in various stages of design, construction, and start up.

C_4 Oleflex Process



For more information
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