Honeywell UOP

PETROCHEMICALS

Lummus/UOP EB*One*™ Process

High-reliability ethylbenzene production

Introduction

The Lummus/UOP EBOne process is an alkylation process that uses a proprietary zeolite catalyst developed and manufactured by UOP. The first unit was commercialized in 1990. UOP and Lummus have continued to improve the process, and in 2009 commercialized the highly selective EBZ-800 alkylation catalyst. The performance of the catalyst has been excellent with demonstrated improvement in low temperature, long term stability. It operates at low benzene-toethylene ratio, which reduces utility consumption and provides high ethylbenzene yield to minimize feedstock consumption. In addition, the new EBZ-800TL alkylation catalyst was commercialized in 2012 to further maximize those benefits.

Description

The Lummus/UOP EBOne process produces ethylbenzene from ethylene and benzene. There are two reactor sections: alkylation and transalkylation. Polyethylbenzenes produced from minor side reactions are recycled back to the transalkylation section and reacted with benzenes to produce more EB. The alkylator and transalkylator effluents are fractionated into recycle benzene, EB product, recycle PEB, and by-product flux oil streams using three distillations. A fourth column, the light ends column, is used to remove a small amount of light ends, light non-aromatics and water from the recycle stream. The benzene column recovers excess benzene from the reactor effluents. The recycle benzene stream for alkylator and transalkylator is obtained from the benzene column overhead. Benzene column bottom is then fed to the EB column where EB product is recovered overhead. The EB product is sent to the styrene section or to storage. Bottoms from the EB column is fed to the PEB column where PEB is recovered overhead and recycled back to the transalkylator. The high boiling bottoms, flux oil, is cooled and sent to storage.

The catalyst is regenerable with performance equal to or better than fresh catalyst. Regeneration cycle is roughly every two to four years. Catalyst poisons are sulfur, oxygenates, CO, CO2, methanol, amines and other basic compounds. If present, removal of these poisons can be easily incorporated in the process design. Propylene and heavier olefinic material should be minimized in the feed as they produce impurities such as cumene, heavy aromatics, etc. in the product.



The leading, commercially proven, liquid-phase alkylation technology supports your ethylbenzene production needs with high reliability and low operating costs.

FEATURES & BENEFITS

The Lummus/UOP EBOne process provides:

- High EB yield (99.7+ Wt%) for high EB product quality at minimum production cost
- High EB product purity (99.9+ Wt%, with undetectable xylenes production) for high SM purity
- Carbon steel construction with no fired heaters, to keep investment cost low
- Long-term catalyst stability for lower production costs
- Lower benzene and polyethylbenzene recycle rates

Because ethylbenzene is used as a feedstock to styrene monomer units, UOP also offers the Lummus/UOP Classic SM™ process, for the manufacture of styrene monomer product from ethylbenzene feedstock, and the Lummus/UOP Smart SM™ styrene monomer technology, for cost-effective revamps and expansions. An EBOne unit combined with a Classic SM or Smart SM unit provides a highly heat-integrated complex that results in significant savings in operating cost.

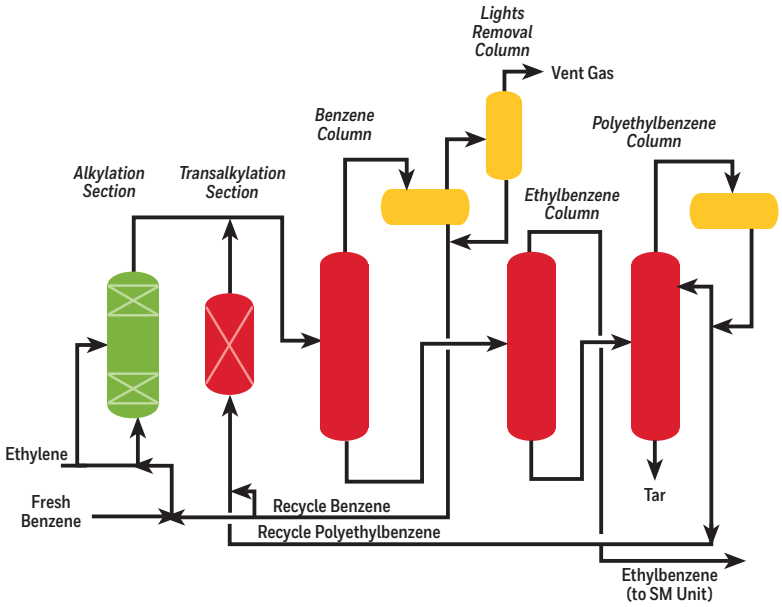
Feedstock and Products

Ethylene Feedstock	
Ethylene (Polymer Grade) (vol% min)	99.9
Acetylene (vol-ppm, max)	10
Dienes (vol-ppm, max)	1
Propylene (vol-ppm, max)	25
C_3 and heavier (vol-ppm, max)	100
Benzene Feedstock	
Benzene (Wt% min)	99.9
Ethylbenzene	0.05
Ethylbenzene Product	
Ethylbenzene (Wt% min)	99.97
Xylenes	Undetectable

Commercial Experience

Since the introduction of the Lummus/UOP EBOne process in 1988, UOP and Lummus have been awarded 40 new and revamp projects with capacities ranging from 65,000 to 1,250,000 MTA. The first commercial plant of 250,000 MTA capacity was commissioned in Japan in August, 1990. Since 2000, licensees have selected Lummus/UOP EBOne technology on 60% of the projects. This technology is now used in 24 operating ethylbenzene units. The Lummus/UOP EBOne process is a commercially well-proven technology. Plant operation is very steady and the process has met or exceeded all design performance standards. The first commercial plant using Lummus/UOP EBOne process technology has now operated continuously at full capacity for more than 19 years.

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For more information
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