DETOL®, LITOL®, and PYROTOL® Hydrodealkylation

MCDERMOTT TECHNOLOGY

Overview

The DETOL®, LITOL®, and PYROTOL® processes for hydrodealkylation are used to convert aromatic streams into high purity benzene. Lummus Technology has exclusive worldwide licensing rights to these processes, which are in service in more than 30 plants throughout the world.

These hydrodealkylation technologies can be designed for a client's specific feedstock. Three possible sources of aromatic streams can be converted to high purity benzene, each requiring a different balance of hydrodealkylation, desulfurization, and hydrocracking reactions.

DETOL process: converts alkyl aromatics in the C_7 to C_{10} range. Also converts C_9 - C_{10} aromatic concentrates to C_8 aromatics. Mainly requires hydrodealkylation.

LITOL process: converts C_6 to C_9 by-products from the coking of coal. Mainly requires desulfurization and smaller amounts of hydrodealkylation and hydrocracking of non-aromatics.

PYROTOL process: converts C_6 to C_9 fraction of pyrolysis liquids obtained as a by-product of ethylene production. More hydrocracking of non-aromatics than the LITOL process, but a smaller amount of desulfurization, as well as a comparable amount of hydrodealkylation.

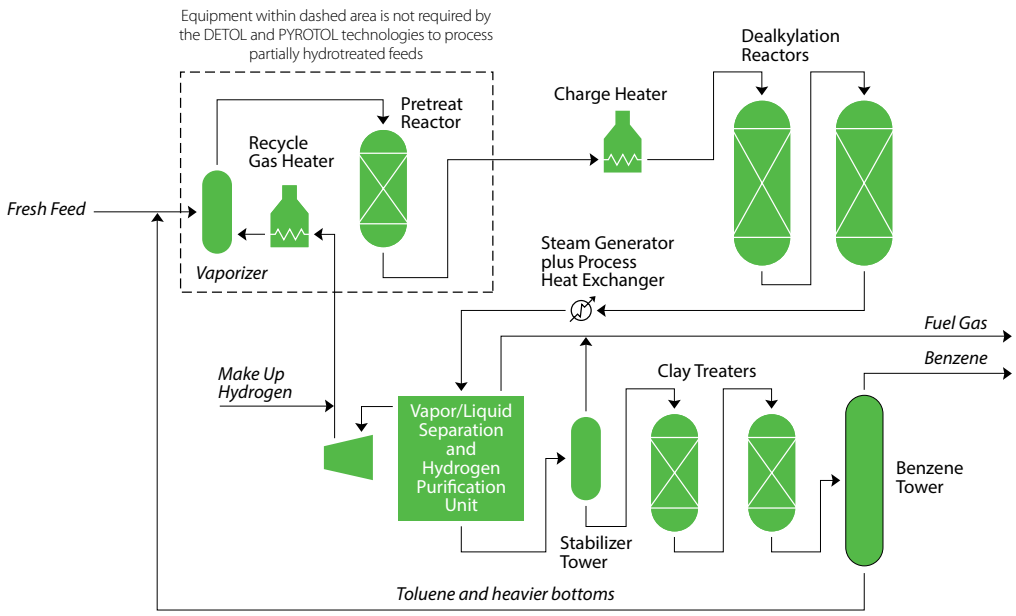
Advantages

Process Features	Process Benefits
High aromatic selectivity	Higher product rate for a given feedstock
Single step process	Eliminates need for separate hydrotreating steps to reduce olefin or sulfur content in feedstock • Reduces cost
Lower operating temperature	Eliminates need for sulfur injections for metal passivation • Allows use of lower alloy metals
No coking in heat exchange system	Low maintenance costs • Eliminates aromatics saturated solid waste material
Highest product purity exceeding 99.93 wt%	High value product

Performance Characteristics

Feeds		Products	
DETOL	*MT*	**DETOL**	*MT*
Toluene (98% Purity)	1,000	Benzene (99.95% purity)	835
Makeup Hydrogen (70% purity)	36	Fuel Gas	201
LITOL		**LITOL**	
Light Oil		Benzene (99.95% purity)	925
(96% BTX, 1.7% Styrene, 0.4% Sulfur)	1,000	Fuel Gas and Oil	128
Makeup Hydrogen (70% purity)	53		
PYROTOL		**PYROTOL**	
Pyrolysis Gasoline		Benzene (99.95% purity)	695
(73% BTX, 3.1% Styrene, 0.1% Sulfur)	1,000	Fuel Gas and Oil	374
Makeup Hydrogen (90% purity)	69		

Block Flow Diagram



Process Description

In LITOL and PYROTOL plants processing raw pyrolysis gasoline, the fresh feedstock is combined with recycled, unconverted aromatics and brought to system pressure. The total liquid feed is vaporized with preheated make-up hydrogen and hydrogen-rich recycle gas. The vaporizer overhead is sent to a pretreat reactor where diolefins and olefins are partially hydrotreated, and a portion of thiophene and other sulfur compounds are converted to H_2S. The pretreat reactor effluent is brought to dealkylation reactor temperature in a fired heater. Dealkylation reactor effluent heat is used to produce steam and to heat other process streams.

In DETOL and PYROTOL plants processing partially hydrotreated pyrolysis gasoline, the vaporizer, recycle gas heater and pretreat reactor are eliminated and the steam generator can be replaced by reactor feed effluent heat exchange.

In all three processes, dealkylation is carried out catalytically. This permits the highest commercial conversion at the lowest temperatures, and also results in the highest selectivity and purity of recovered benzene. Catalytic dealkylation is performed at a temperature 38 to 52°C lower than the thermal route.

Aromatics are recovered in a separation and purification unit and sent to the stabilizer tower. Reactor effluent vapor and liquid are also separated, and hydrogen is purified and combined with recycle gas.

Impurities in the stabilized aromatics are removed by polymerization and absorption in clay treaters. The benzene tower produces high purity benzene, as well as a toluene and heavier bottoms product that is recycled as feedstock.

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