International Process Plants

Stock #600652

30,000 BPD
Isomerization Unit

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Brief Overview

- The Isomerization plant started up in 1993 and shutdown in 2009
- It has a capacity of 30,000 BPD (5,000 tons/day).
- The plant is operated to maximize MON.
- The reaction process is licensed by UOP on the Penex UOP process.
- There are 6 main sections to the plant:
  1. H2 compression
  2. Charge Drying
  3. Reaction
  4. Stabilization
  5. Deisohexanizer
  6. Washing
Major Equipment

- H2 Compressor
- Charge Feed Pump
- Reactor Pre-Heat Exchangers
- Resin Bed Dryers
- Deisohexanizer Column
- Wash Column
- Reactors
- Isomerate Vaporizer
Process Summary

- Normal pentane and normal hexane are found in abundance in straight-run gasoline. Isomerization converts normal pentane and normal hexane into their respective isoparaffins which have a substantially higher octane number. As Pentane/hexane isomerization increases the octane number of these key light gasoline blending components, Isomerization is critical to increasing octane across the entire pool of blended gasoline in the refinery.

- The Isomerization unit was installed in 1993. The unit has a capacity of 30,000 barrels/day (or approx 5,000 tons/day). The plant is operated to maximize Motor Octane Number (MON). The reaction process is licensed by UOP on the Penex UOP process.

- The Isomerization Unit consists of (6) main process units:
  - Hydrogen compression
  - Hydrogen and charge drying
  - Reaction
  - Stabilization
  - Deisohexanizer
  - Washing
H₂ Compression/Charge Drying Sections

- Hydrogen compression and Hydrogen charge drying

Hydrogen (H₂) is fed at a rate of 1-2 TPH into a drum to remove any water, as water is a poison to the reactor catalyst. The H₂ is compressed in an electrically driven compressor and fed to the resin dryers. Each dryer is operated for about a week while the standby unit is regenerated. The gasoline feed from the Deisopentanizer (DIP) plant is pumped through a different set of resin bed dryers to remove any traces of water and then is mixed with the H₂ supply.
Reaction & Stabilization Sections

➤ Reaction

This mixed stream is preheated through a series of preheat shell and tube heat exchangers and then a final steam heat exchanger before being fed into the first reactor at a temperature of 140°C. Chlorine liquid in the form of Hydrochloric acid (C2CL4) is added to the charge it enters the preheat train. The exit temperature of the reactor is 170°C. The effluent is then cooled by heat exchanger and two air-fin fan coolers to about 135°C, after which the cooled stream is fed to the second reactor. Both reactors are fixed bed and the catalyst is normally changed on a five year cycle.

➤ Stabilization

The output from the second reactor is sent to the C501 tower to separate any C4 products from the top of the column. The column operates at 30 Bar with a temperature across the column of 115°C to 167°C. The C4 vapor and hydrochloric acid are cooled and then washed with sodium hydroxide and water in the wash column to remove the chlorine. About 6 tpa of fuel gas is produced in this process.
Deisohexanizer and Washing Sections

- **Deisohexanizer**
  The bottoms from the C501 tower are sent to the deisohexanizer column. This column has trays and operates at 1 Bar, with a temperature across the column of 70°C to 106°C. There is a steam reboiler for the bottom-end recycle stream. A 40-50 tph stream is taken from the middle of the column to recycle back to the start of the process to mix with the initial plant charge. C5’s are taken from the top of the column and pumped to storage (typically 40 tph). A lower cut of C6’s are taken and sent to the gasoline Separation Plant for further processing. The C7 product is taken from the bottom of the column and pumped to storage (typically 11 tph).

- **Washing**
  The isomerate is washed with caustic and water, acid stripped, and stabilized before going to storage.
Photos

Deisohexanizer Column

Isomerization Plant
Photos

Reactors

Resin Bed Dryers

Reactor pre-heat Heat Exchangers
Photos

Wash Column

Charge Feed Pump

H2 Compressor
Photos

Column

Isomerat Vaporizer

Drums