

ZEOSOM TECHNOLOGY: LIGHT NAPHTHA ISOMERIZATION

Introduction

In recent years, Light Naphtha Isomerization has become increasingly important to help refiners in meeting stricter gasoline specifications.

This process converts straight chain light paraffinic hydrocarbons (pentane and hexanes) to the corresponding branched isomers, having higher octane number (known as isomerate) free from sulphur, olefins and aromatics. Another important feature of Light Naphtha Isomerization process is that it saturates the benzene (RON 120) present in the feed to cyclohexane (RON 77), which subsequently gets isomerized to methylcyclopentane (RON 85). Hence, the process provides the refiners with the advantage of reducing benzene, olefin and sulphur in the gasoline pool, without significantly sacrificing the octane.

IndianOil and Engineers India Limited (EIL) have jointly licensed the Light Naphtha Isomerization Technology. The IndianOil-EIL process is designed for zeolite based isomerization catalyst, which has several distinctive process features compared to the conventional isomerization process with Platinum (Pt) on chlorinated alumina catalyst.

Process

The typical operating conditions of IndianOil - EIL Isomerization process are:

Temperature : 240 – 280°C

Pressure : 17 – 35 barg

The process scheme (once through or with recycle) depends on the feed quality and desired RON of isomerate. Once through process scheme is simple, typically containing a single reactor, a charge heater, coolers, separator, recycle gas compressor and stabilizer column.



Isomerization Micro-reactor unit

Salient Features

- Up to 10 wt% of aromatics/ benzene and 5 wt% of C7+ in the fresh feed can be handled in the single reactor through a suitable process scheme.
- Close to 100% benzene saturation takes place within the reactor.
- Due to the higher tolerance towards sulphur and water, feed hydrotreatment, feed drying and make-up hydrogen drying are not mandatory, thereby significantly reducing the capital investment.
- Employs commercially available Platinum promoted zeolite based catalyst, with very good tolerance to feedstock contaminants.

Impurities	Max limit (ppmw)
Sulphur	200
Water	200
Basic Nitrogen	2
Halogens	1
Alkaline/Alkaline Earth metals	50

- Catalyst does not require addition of any chemicals such as organic chlorides for maintaining the activity.
- Catalyst is fully regenerable and can be regenerated in-situ after a cycle time of two to four years.
- Once through octane gain of 9-13 can be achieved depending on the feed quality.
- With inclusion of De-iso-hexaniser in the flow scheme, octane gain of more than 15 can be achieved.
- The product sulphur is negligible even without feed hydro-treatment as the sulphur present in feed is mostly converted to H₂S.

Advantages

The major benefits of this process as compared to the process based on conventional Pt chlorinated alumina catalyst are:

- Due to high tolerance of catalyst towards the feed contaminants such as sulphur, water etc., elaborate feed/ make up hydrogen drying and feed desulphurization are not mandatory, thereby reducing the investment and operating cost.
- Ease of start-up and operation due to elimination of elaborate drying procedure of feed and make up/ recycle gas.
- Process scheme is much simpler with single reactor instead of complicated lead-lag reactor configuration.
- As the process does not require handling of toxic material, there is no need for selection of exotic material of construction, caustic treatment of fuel gas/ LPG for reduction of chloride content and resultant effluent treatment.
- Catalyst is fully regenerable having > 10 years of ultimate life. Catalyst is robust and does not undergo permanent deactivation with typical process upsets.
- Ideal for revamp of fixed bed units such as catalytic reformers, hydrotreaters, etc. as no major modifications are required.

Backup Strengths

IndianOil-EIL Light Naphtha Isomerization technology is backed by a vast databank generated in state-of-the-art facilities at IndianOil R&D as well as EIL's long experience in process design and engineering.

Light Naphtha Isomerization unit of 154,000 MTPA capacity licensed by IndianOil-EIL was commissioned in IndianOil's

Bongaigaon Refinery in September 2011. This unit processes light straight run naphtha and light reformate feed to get a product Isomerate with 87 RON and almost zero benzene without employing feed

hydrotreatment and drying section. The performance guarantee test run of the unit was conducted and all the guaranteed parameters have been demonstrated successfully.



Naphtha Isomerization unit at Bongaigaon Refinery

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