Catalytic

Distillation

Technologies

Increased TAME From Refinery and Steam Cracker C_5 Feeds

CDISOTAME®

Technology Profile

Overview The CD*Isotame* process combines skeletal isomerization and etherification steps to maximize the production of TAME from refinery and steam cracker C_5 streams. The CD*Isotame* process is one of a family of process technologies developed and commercialized by Catalytic Distillation Technologies (CDTECH) for license to the petroleum refining and petrochemical industries. CDTECH is a partnership between Lummus Technology, a CB&I company, and Chemical Research & Licensing, a CRI company.

TAME Synthesis-General TAME is formed by the catalytic etherification of reactive isoamylenes with methanol. Skeletal isomerization increases TAME production from an olefinic C_5 stream by converting normal amylenes to isoamylenes.

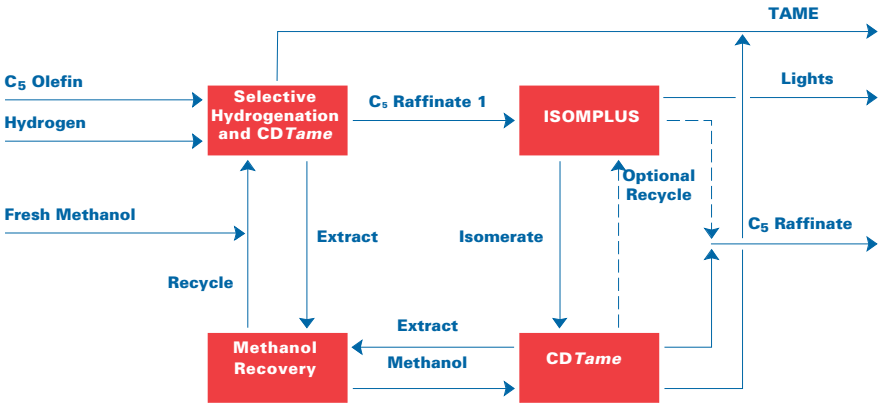
The optimum process configuration is presented below. This scheme provides the minimum capital cost at about 80% C_5 olefin reduction. The olefinic C_5 stream is fed to a selective hydrogenation step where dienes are converted to olefins. Removal of dienes reduces color and gum formation in the TAME product. In addition, unreactive 3MB1 is converted to reactive isoamylene via hydroisomerization, thus increasing the TAME yield. The primary TAME product is made in the first CD*Tame* unit where greater than 90% conversion of isoamylene is achieved.

Raffinate 1 from the first CD*Tame* unit is fed to a skeletal isomerization unit (ISOMPLUS®) where normal pentenes are converted to isoamylenes at high yield and selectivity. The vapor phase reaction takes place over a robust catalyst with long cycles between regenerations.

The isomerate is then fed to a second CD*Tame* unit where additional TAME is produced at greater than 95% conversion of isoamylenes. Even higher conversion of normal pentenes to TAME can be achieved by an optional raffinate 2 recycle to the skeletal isomerization unit. A purge stream serves to remove the saturated C_5s from the recycle stream.

A common methanol recovery unit serves both CD*Tame* units.

CD*Isotame* Block Flow Diagram



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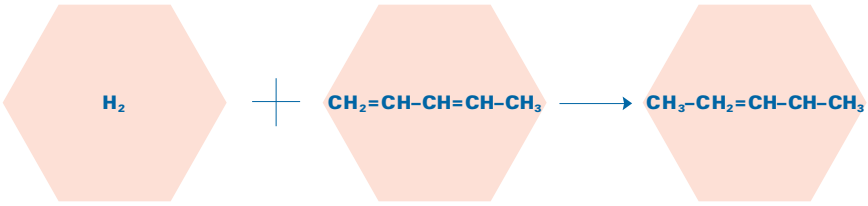
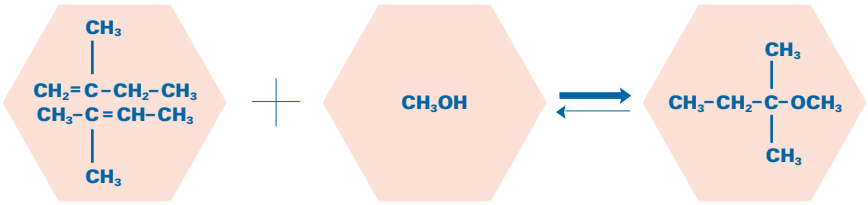
Process Chemistry

Selective Hydrogenation



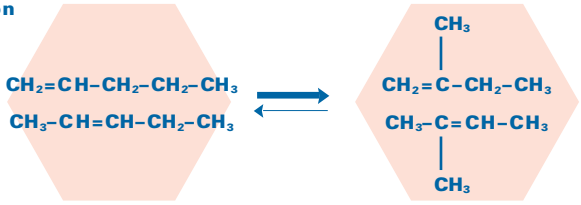
Hydrogen | Pentadiene | Pentene

Etherification



2MB1 & 2MB2 Isoamylenes | Methanol | TAME

Skeletal Isomerization



Normal Amylenes | 2MB1 & 2MB2 Isoamylenes

Advantages

CD*Isotame* offers:

- Selective hydrogenation of diolefins at minimum capital cost
- High conversion of isoamylenes (>95%)
- High conversion of normal pentenes (>70 %)
- High selectivity of isomerization (>90 %)
- Isomerization of 3MB1 to reactive isoamylene
- Improved C_5 raffinate as gasoline feedstock due to reduced
  - Color
  - Gum formation
  - Olefin content
- Increased TAME production
- Increased gasoline pool octane
- Decreased gasoline pool RVP
- Low capital and operating cost
- Superior economics and performance over C_5 alkylation
- High quality TAME product without objectionable odor or color

Typical Overall Material Balance

Feeds	**LB/HR**
C_5s (Pentenes 50 wt. %)	102,133
Methanol	17,700
Hydrogen	29
Products	
C_5 Raffinate	55,006
TAME product	63,410
Light ends (C_4–)	1,446

TAME Product Composition (excluding C_6+)

	Wt.%
C_5s	<1.0
Methanol	<0.1
Di-isoamylene	0.5
TAA	0.4
TAME	95.6
MTBE	2.4
Total	**100.0**

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