Catalytic

Distillation

Technologies

Selective Hydrogenation of Refinery C_5 Feeds

C_5 CDHYDRO®

Technology Profile

Overview The C_5 CD*Hydro* catalytic distillation technology processes C_5 streams from refineries to produce a stream with a high isoamylenes content that is essentially free of diolefins. The treated C_5 stream is suitable for TAME production or alkylation feed. The C_5 CD*Hydro* 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.

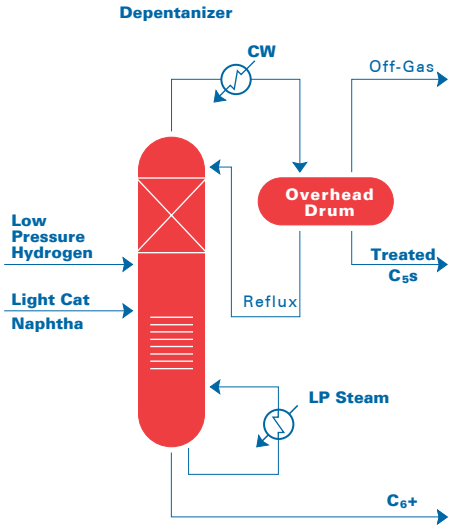
Selective Hydrogenation The patented C_5 CD*Hydro* process achieves selective hydrogenation of diolefins to amylenes in a catalytic distillation column. Selective hydrogenation is a required pretreatment step for TAME production and C_5 alkylation, improving product quality in both, and reducing acid consumption in the latter. The process uses commercially available catalyst in proprietary catalytic distillation structures.

Refinery C_5 streams are combined with hydrogen in the catalytic column. Treated C_5 products are taken overhead. The washing action of the reflux minimizes oligomer formation, flushing heavy compounds from the catalyst and promoting long catalyst life. The catalyst will react acidic sulfur compounds with diolefins to form heavy compounds which exit in the tower bottoms. The distillate product is essentially mercaptan-sulfur-free.

The unique catalytic distillation column combines reaction and fractionation in a single unit operation. This constant pressure boiling system assures precise temperature control in the catalyst zone. Low reaction temperature and isothermal operation enhance selectivity and minimize yield losses to paraffins. Non-reactive 3-methyl butene-1 is isomerized to reactive 2-methyl butene-2, which increases potential TAME production. Pentene-1 is isomerized to pentene-2, which improves octane number.

Capital costs are considerably lower than conventional hydrotreaters since the single column design eliminates costs associated with fixed-bed systems. Additionally, the ability to remove acidic sulfur compounds eliminates the need for sweetening. The C_5 CD*Hydro* process would typically be installed in a depentanizer, either as a retrofit or in a new column.

C_5 CD*Hydro* Process Flow Diagram



CDTECH®

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Advantages

C_5 CD*Hydro* process offers:
Low operating pressure
Low operating cost
High product yield (low paraffin make)
No polymer recycle across catalyst
No sweetening required
Essentially mercaptan-sulfur-free distillate product
Retrofit to existing C_5 columns
All carbon steel construction
Isomerization improves feedstock quality
No hydrogen compressor

CDTECH's catalytic distillation offers:
Isothermal operation
High conversion
Low capital cost
Low utilities
Long catalyst life with sustained high conversion
Reduced plot area

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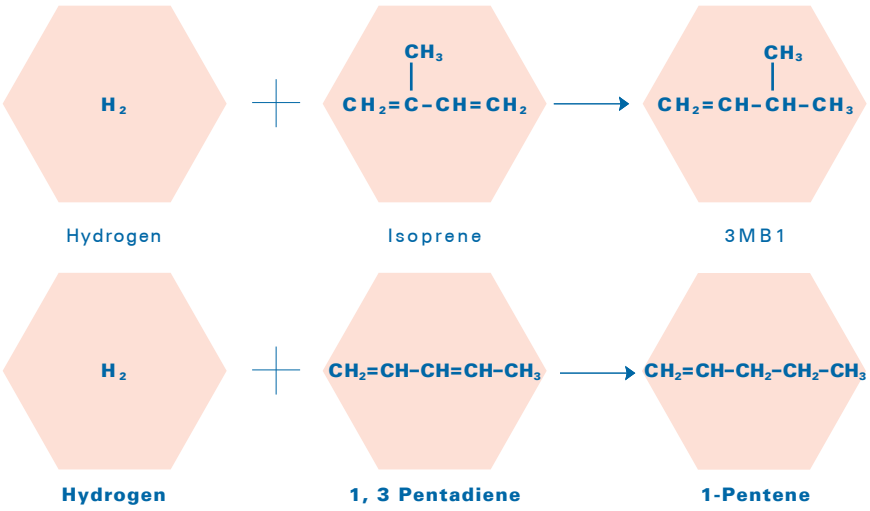
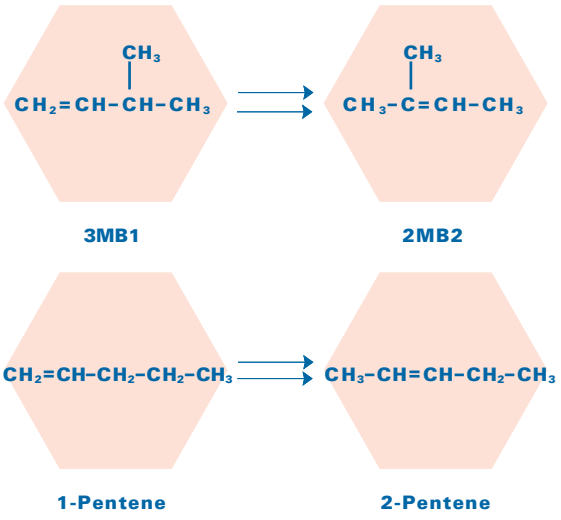
Process Chemistry

Selective Hydrogenation



Isomerization



Typical Overall Material Balance

Feeds	**LB/HR**	
Light cat naphtha (C_5 diolefins 0.35 wt. %)	304,000	(30,000 BPD)
Hydrogen (100 % basis)	40	(182,000 SCFD)
Products (will depend on separation requirements)		
Treated C_5s	106,500	
C_6+	197,300	
Off-gas	240	(zero if PSA hydrogen used)

Typical C_5 Product Composition

(will depend on feed composition and client requirements)

Residual C_5 Diolefins	<10 ppm
Paraffin make (pentanes)	<1 %
Sulfur	<1 ppm