Catalytic

Distillation

Technologies

TAEE from Refinery C_5 Feeds

CDTAEE®

Technology Profile

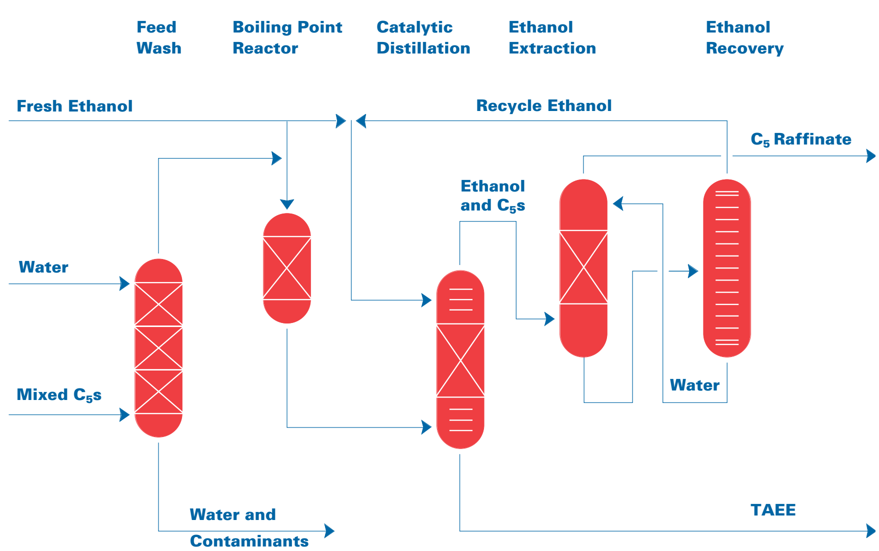
Overview The CD*Taee* catalytic distillation technology processes C_5 streams from refinery units to produce TAEE. The CD*Taee* process is one of a family of process technologies developed and commercialized by Catalytic Distillation Technologies (CDTECH) for license to the petroleum refining and petrochemical industries. CDTECH is a partnership between Lummus Technology, a CB&I company, and Chemical Research & Licensing, a CRI company.

TAEE Synthesis-General Tertiary Amyl Ethyl Ether (TAEE) is formed by the catalytic etherification of isoamylene with ethanol. The patented CD*Taee* process is based on a two-step reactor design, consisting of a boiling point fixed bed reactor followed by final conversion in a catalytic distillation column. The process uses an acidic ion exchange resin catalyst in both its fixed bed reactor and proprietary catalytic distillation structures.

The boiling point reactor is designed so that the liquid is allowed to reach its boiling point by absorbing the heat of reaction, after which a limited amount of vaporization takes place thereby maintaining precise temperature control. The maximum temperature is adjusted by setting the total system pressure. Since the reacting liquid mixture temperature cannot exceed the boiling temperature, control is far superior to those systems in which heat must be transferred by convection or conduction. This design retains the heat of reaction as latent heat, reducing heat input requirements for the ensuing fractionation.

The unique catalytic distillation column combines reaction and fractionation in a single unit operation. It allows a high conversion of isoamylene (exceeding fixed bed equilibrium limitations) to be achieved simply and economically. By using distillation to separate the product from the reactants, the equilibrium limitation is exceeded and higher conversion of isoamylene is achieved. Catalytic distillation also takes advantage of the improved kinetics through increased temperature without penalizing equilibrium conversion.

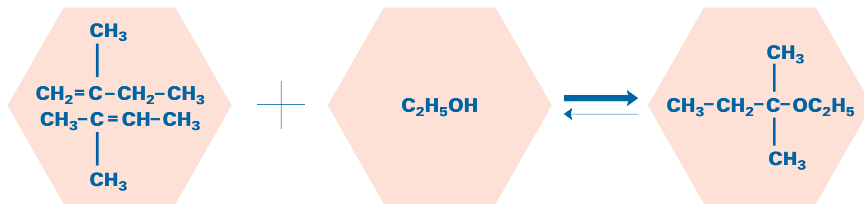
CD*Taee* Process Flow Diagram



CDTECH®

Process Chemistry

Etherification



2MB1 & 2MB2 Reactive Isoamylenes | Ethanol | TAEE

Typical Overall Material Balance
Isoamylene conversion percent: 85+

Feeds	**LB/HR**
C_5s (Reactive isoamylene 31 wt. %)	68,996
Fuel grade ethanol	13,300
Products	
C_5 Raffinate	49,452
TAEE product	32,844

TAEE Product Composition (excluding C_6+)

	Wt.%
C_5s	<1.0
Ethanol	1.0
Di-isoamylene	0.5
DEE	0.1
TAA	0.5–2.0
TAEE	95.5–97.0
Total	**100.0**

Advantages

CDTECH's 'Boiling Point' reactor offers:

- Simple and effective control
- Elimination of hot spots
- Long catalyst life
- High flexibility
- Low capital cost
- Elimination of catalyst attrition
- Most effective heat removal technique
- Elimination of cooling water requirement

CDTECH's catalytic distillation offers:

- Improved kinetics
- High conversion (beyond fixed bed equilibrium limit)
- Low capital cost
- Low utilities
- Long catalyst life with sustained high conversion
- Reduced plot area

CD*Taee* process offers:

- Low ethanol content in TAEE product without additional processing

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