

ABSTRACT

Production of Methyl Tert-butyl Ether (MTBE)

- **Background:**

MTBE is key component used in octane number enhancer, it is most attractive to use because of variety of technical reasons, it can be blend easily with different fuels without phase separation. Also despite of popularity of MTBE in industrial setting, it is also used as a solvent in academia with some exceptions. The traditional process of simulation of MTBE by reaction and distillation, and also the referred process gives a 87-92% conversion and a reactive distillation gives 99.2 % conversion.

- **Description of the flowsheet:**

This simulation consist the optimization and production of the conventional process of synthesis of MTBE. The process uses the direct addition of methanol to the butenes stream. This simulation gives a optimum conversion of 100%. The process has to raw material streams

- (i) Methanol
- (ii) butenes(57% isobutene,20% 1-butene,23% trans-2-butene)

The butane stream is obtain from a refinery cut, having the mol% as mentioned above, this feed is entered in a mixer where the butenes and methanol feed mixed then the mixed stream is send in the centrifugal pump to increase the pressure of stream to 2970000Pa and then heated in normal heater to 333.19 °K which is then feed in a conversion reactor column this is where the reaction tacks place the reaction is as follows: $\text{CH}_3\text{OH} + \text{i-C}_4\text{H}_8 \rightarrow \text{MTBE}$

The reaction is adiabatic and reactor is set at pressure drop of 180000Pa, and temperature is 333°K. This reaction only a bottom product of 100% converted MTBE and the extra butenes, to separate the product and butenes this stream is feed to a distillation column where MTBE is separated out as product (0.99mol fraction) from the butenes and the remaining butenes are removed from the top of the distillation column, the column operates at reflux ratio of 2.5, 369°K and the pressure drop in condenser and reboiler is 23×10^5 Pa. Mole fraction of top product butenes is 0.46 of 1-butene and 0.40 of tran-2-butene.

Result:

This process gives a 100% conversion and a fraction separation of MTBE to 0.992 Mole Fraction

MTBE Product Stream:

Property	Value
Temperature	460.39°K
Pressure	2000000.00Pa
Mass Flow	7.700572Kg/s
Mole Fraction	Value
Methanol	0.0074
MTBE	0.992511
1-butene	0.000002
Trans-2-butene	0.000015
isobutene	0.00

Raw Material Stream:

Properties	Value
Temperature	289.055°K
Pressure	2970000.0Pa
Mass Flow	11.721Kg/s
Mole Fraction	Value
Methanol	0.3910
MTBE	0.0000
1-butene	0.1217
Trans-2-butene	0.1400
isobutene	0.3470

Conclusion and Recommendations:-

Using this simulation we can get optimum temperature pressure and mass flow in production of MTBE, pure fractionated product and this convectional process give better result as the Reactive distillation process.