

## Extractive Distillation of Methanol and Toluene using Triethylamine-an intermediate boiling point solvent

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**Unit System: Temperature – C and Molar Flow- kg/hr (other units- SI)**

### ❖ **Background**

Methanol uses are in organic synthesis, as a fuel, solvent, and antifreeze. Methanol is a polar liquid at room temperature. It is used as antifreeze, solvent, fuel, and as a denaturant for ethanol. The chemical is also used to produce biodiesel via transesterification reaction while Toluene has numerous commercial and industrial applications and is a solvent in paints, lacquers, thinners, glues, correction fluid and nail polish remover, and is used in the printing and leather tanning processes. Solution of methanol and toluene cannot be separated by simple distillation process

### ❖ **Extractive Distillation**

Extractive distillation is the method of separating close boiling compounds from each other by carrying out the distillation in a multiple columns in the presence of an added liquid solvent. This liquid solvent is known as extractive agent or entrainer. The presence of the entrainer alters the volatility of compounds and thus the degree of separation increases with the same number of plates. This entrainer Triethylamine has an intermediate boiling point of the compounds which are going to be separated.

### ❖ **Description of Flowsheet**

The Flowsheet contains two Extractive Distillation Columns. The first column is fed with an equimolar stream of toluene and methanol blended with an entrainer stream comprising of Triethylamine. The column separates methanol as the top product while toluene and entrainer are obtained as bottom product. The bottom products are fed to the next Extractive column which further separates the entrainer from toluene, Toluene is obtained as bottom product while entrainer is obtained as top product.

The entrainer is reused after mixing with some makeup amount of entrainer to continue the process. Feed rate with the composition of compounds and the other necessary data for the column are shown in the table in Result section with the Top and Bottom products.

❖ **RESULT**

<b>NAME</b>	<b>Extractive Column (Methanol)</b>	<b>Extractive Column (Toluene)</b>
Feed Molar flow(Kg/hr)	73.3731	57.7461
Total Stages	27	32
Feed Stage	22	19
<b>Mole Fraction(Top products)</b>		
Methanol	0.96	0.0013
Toluene	0.0017	0.0012
Solvent	0.038	0.997
<b>Mole Fraction(Bottom Products)</b>		
Methanol	0.001	0
Toluene	0.26	0.99
Solvent	0.74	0.01
Reflux Ratio	2.89	2.44
Pressure(N/m <sup>2</sup> )	101325	101325

❖ **Reference**

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