

## **Triple Column Extractive Distillation Process to Separate the Mixture (Methanol-Toluene-Water) using Diethylene Glycol (DEG) as Entrainer**

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### **Background and Description:**

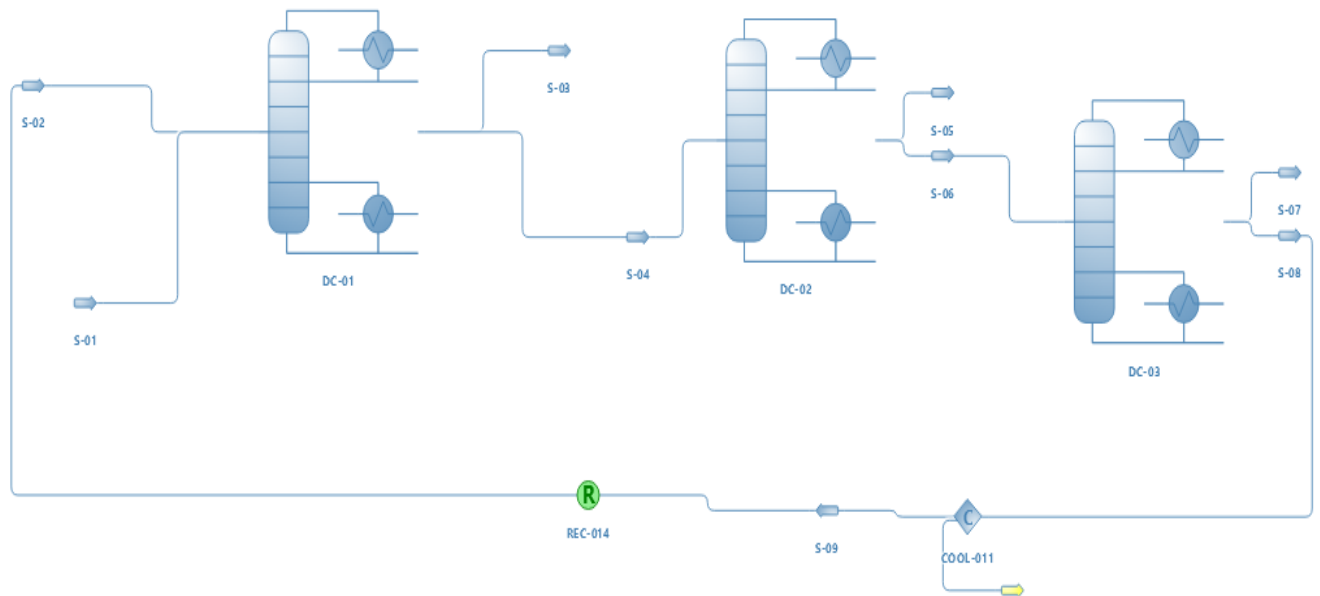
Both Methanol and Toluene are very important organic solvents and are used in many chemical and pharmaceutical industries. Many of these industries after the process sends out mixed Methanol and toluene, sometimes mixed with water. It is necessary to separate these mixture as it is a azeotropic mixture due to its usage in different industries.

Boiling point of methanol is 64.7°C, toluene is 110.6°C and water is 100°C.

### **Process:**

Here the Feed containing the mixture of methanol-toluene-water enters through stream-01(S-01) at stage 3 and the fresh Diethylene Glycol(DEG) and recycled DEG enters through stream-2(S-02) at stage 42. The feed and the DEG then passes through the extractive distillation column-01(DC-01). The DC-01 gives 99% toluene at the top through stream-03(S-03) and some traces of other compounds. The bottom products from the DC-01 through the stream-04(S-04) enters to DC-02 at stage 21. The DC-02 gives the top product with 99% of methanol and some traces of other compound which is obtained through stream-05(S-05). The bottom product of DC-02 which is obtained through stream-06(S-06) is then fed to DC-03 at stage 8. The DC-03 gives 99% water as the top product which is obtained at stream-07(S-07). And the bottom product of DC-03 containing 99% of DEG is sent to a cooler and then stream-09(S-09) takes it to recycle block which recycle back to stream-02(S-02).

## Flowsheet:



## Results:

Parameters	S-01	S-02	S-03	S-04	S-05	S-06	S-07	S-08	Units
Temperature	293.15	298.15	332.354	355.154	337.86	502.088	373.243	517.718	K
Pressure	0.1	0.103948	0.177156	0.177156	1	1	1.00419	1.00395	atm
Mass Flow	1.45316	8.10445	0.943756	8.61387	0.439329	8.17454	0.0700877	8.10445	kg/s
Molar Flow	100	274.998	37.0382	337.96	48.9598	289	14.0021	274.998	kmol/h
Molar Fraction (Mixture) / Methanol	0.49	0	0.00674362	0.144249	<b>0.995626</b>	1.60E-05	0.000330231	0	
Molar Fraction (Mixture) / Toluene	0.37	0	<b>0.993204</b>	0.0006318	0.00436097	5.26E-23	1.09E-21	0	
Molar Fraction (Mixture) / Water	0.14	0.000283291	4.10E-05	0.0416499	1.31E-05	0.0487036	<b>0.99967</b>	0.00028329	

From the results table it is seen that there is 99% recovery of toluene from stream-03(S-03), 99% recovery of methanol from stream-05(S-05) and 99% recovery of water from stream-07(S-07). And the remaining DEG is recycled back to stream-02(S-02).