EXTRACTION OF ACETIC ACID FROM BENZENE BY USING WATER AS A SOLVENT

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PROBLEM STATEMENT:

Extraction of Acetic Acid from Benzene by using water as a solvent.

➢ OBJECT USED:

1. Distillation column
2. Material Stream
3. Recycle block
4. Cooler
5. Mixer

➢ DESCRIPTION:

I. Abstract:

In this process Extractive Distillation takes place for Extaction of Acetic Acid. Extractive Distillation technique for the separation of Acetic Acid and Benzene by using the solvent of water. Two columns are used, Bottom product from the first column is Acetic Acid and other column is for Feed recovery where Benzene is separated from Top. The mixture from the Bottom of second column is recycled back with the feed stream with makeup.

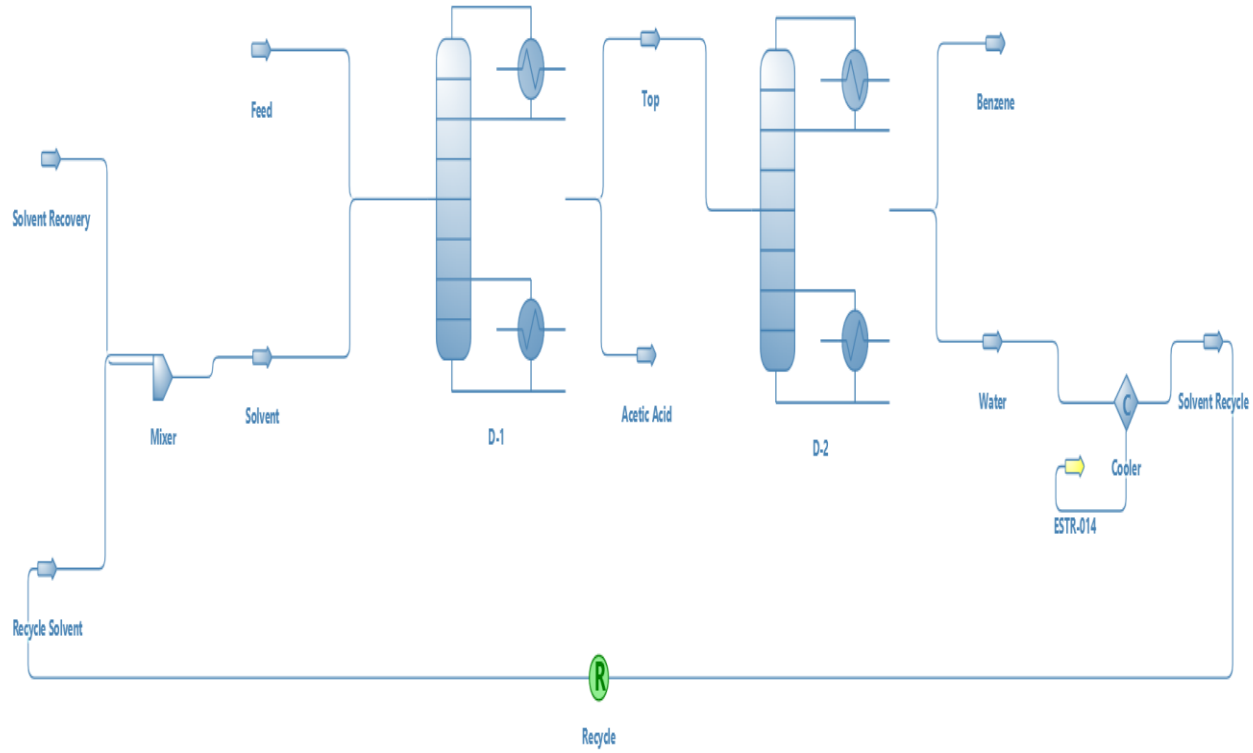
II. Introduction:

Extractive distillation is a commonly used method for the separation of azeotropic mixture. In this method, a third component is added into the system as solvent to alter the relative volatility of the component to be

separated. With the presence of the suitable solvent, the relative volatility of the original two components can be enhanced.

III. Flowsheet Description:

This process content a two-column design with a solvent. The reproduced flowsheet is shown below. Among the various solvent available like DMSO, DMF here Water is used as it is easily and cheaply available. In below figure column-I is Extractive column and column-II is for recovery of Benzene. The mixture of Acetic Acid-Benzene along with solvent is fed to column-I, the bottom product of column-I is our desired product i.e. 99 wt. % Acetic Acid. The top product is fed to column-II for further separation where Benzene is separated from mixture and separated Benzene is then obtained from the top with 95 wt. % purity. This bottom product mixture is again recycled to column-I after cooling and adding make-up stream to account for the loss in distillates of column-I and column-II. Fresh feed flow rate is kept at 14.4756 mol/s containing 0.5 wt. % Benzene and rest Acetic Acid at a temperature of 298.15 K. The pressure of both the columns are maintained at 101325 Pa.



Flowsheet of Extractive Distillation of Acetic Acid-Benzene Solution

The property table for the flowsheet is given below:

Object	Water	Top	Solvent	Feed	Benzene	Acetic Acid	Units
Temp	371.445	371.438	298.15	298.15	354.182	390.76	K
Pressure	101325	101325	101325	101325	101325	101325	Pa
Molar Flow	6432.12	6434.75	6427.51	14.4756	2.63712	7.2335	mol/s
Molar Fraction (Mixture)/ Benzene	0.07869	0.07905	0.078015	0.5	0.95	9.12E-07	
Molar Fraction (Mixture)/ Acetic Acid	0.00131	0.001305	0.00129	0.5	2.02E-06	0.99	
Molar Fraction (Mixture)/ Water	0.92	0.919643	0.9207	0	0.049998	0.0099	

Table-1 Streamwise Result for Extraction of Acetic Acid from Benzene Solution

➢ REFERENCES:

Unit Operations of Chemical Engineering by Warren L. McCabe, Julian C. Smith, Peter Harriott, 7 Edition, McGraw Hill Education.