PRODUCTION OF DIETHYL ETHER FROM ETHANOL

PINTU KUMAR PATEL
email id: pintu131099@gmail.com
GUJARAT TECHNOLOGICAL UNIVERSITY,GUJARAT

INTRODUCTION:

Diethyl ether (C2H5)2O is an organic compound which is also known as ethyl ether, ether or ethoxyethane. It is a colourless, highly volatile flammable liquid with a characteristic odour. It is commonly used as a solvent and as a general anesthetic. It has narcotic properties so it has been known to cause temporary psychological addiction, sometimes referred to as etheromania. Diethyl ether may have been created by either JabiribnHayyan in the 8th century or RaymundusLullus in 1275, as there is no any evidence of this. It was first synthesized in 1540 by ValeriusCordus, who called it "sweet oil of vitriol" (oleum dulcevitrioli) - the name reflects the fact that it is obtained by distilling a mixture of ethanol and sulfuric acid (then known as oil of vitriol). At about the same time, Paracelsus discovered the ether's analgesic properties in chickens. The ether name comes in 1730 by August Sigmund Frobenius

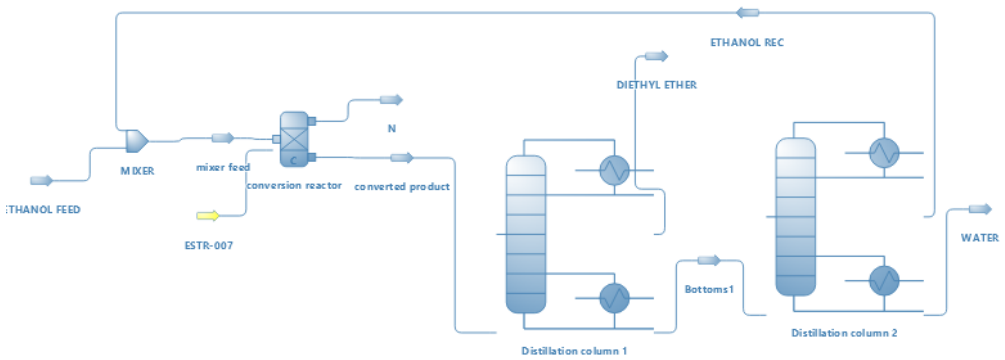
DESCRIPTION OF THE FLOWSHEET:

The flowsheet for the Diethyl ether production consist of a mixer to mix the recycle stream (ethanol) and Ethanol feed stream,Conversion reactor and two Distillation columns .One distillation column is to purify diethyl ether and later is for seperating water and recycle stream.About 50% conversion is obatined in the conversion reactor with reaction as follows

$$2\ C_2H_5OH \longrightarrow (C_2H_5)_2O + H_2O$$

The product from the mixer is sent to the coversion reactor ,the product from the reactor is sent to the Distillation column 1 to seperate pure Diethyl ether and mixed bottom which is a feed to the Distillation column 2 where recycle ethanol stream and water are being seperated. All the streams are at Atmospheric pressure.

FLOW SHEET:



PROPERTIES OF DIETHYL ETHER:

Molecular formula : C4H10O
Molecular weight : 74.12gm/mole
Appearance : Colourless liquid
Odour : Penetrating ethereal odour
Boiling point : 34.60C at 0.101kPa
Melting point : -116.00C
Flash point : -40.00C
Autoignition temperature : 1600C
Density : 0.71gm/cm3 at 20OC
Refractive index : 1.353 at 200C
Solubility : Miscible with water

RESULT :

RESULT 1						
Object	WATER	ETHANOL REC	ETHANOL FEED	DIETHYL ETHER	Bottoms1	
Temperature	99.6033	74.4518	45	34.7458	76.4117	C
Pressure	1.01325	1.01325	1.01325	1.01325	1.01325	bar
Mass Flow	743.642	3151.82	0	2272.42	3895.46	kg/h
Molar Flow	41.2149	74.7231	65	30.801	115.938	kmol/h
Molar Enthalpy (Mixture)	-40191.6	-36182.4	-40587.9	-25320.2	-37593.7	kJ/kmol
Molar Entropy (Mixture)	-106.295	-94.4157	-107.072	-80.7567	-96.6166	kJ/[kmol.K]
Molar Fraction (Mixture) / Diethyl ether	1.34319E-19	0.0250525	0	0.99	0.0161466	
Molar Fraction (Mixture) / Ethanol	0.001	0.811268	0.8	0.00767802	0.523226	
Molar Fraction (Mixture) / Water	0.999	0.163679	0.2	0.00232198	0.460628	

RESULT 2					
Object	mixer feed	converted product	N	ETHANOL REC	
Temperature	63.9833	25	25	74.4518	C
Pressure	1.01325	1.01325	1.01325	1.01325	bar
Mass Flow	5454.17	5454.17	0	3151.82	kg/h
Molar Flow	131.63	131.63	0	74.7231	kmol/h
Molar Enthalpy (Mixture)	-38087	-39558	0	-36182.4	kJ/kmol
Molar Entropy (Mixture)	-99.7394	-104.471	0	-94.4157	kJ/[kmol.K]
Molar Fraction (Vapor)	0	0	1	1.37743E-05	
Mass Fraction (Vapor)	0	0	0	1.54075E-05	

REFRENCES :

Flowsheet :
https://www.cocosimulator.org/index_sample.html
Thoery :
http://nptel.ac.in/courses/103106109/3140/Lecture%2040%20Diethyl%20ether.pdf