



Separation of propylene oxide-methanol-water mixture via enhanced extractive distillation

B. Eliazer

National Institute of Technology , Warangal.

Email: eliazerbittu2@gmail.com

Unit System: Temperature - C , Pressure-bar , Molar flowrate - kmol/hr, Mass flowrate kg/hr Volumetric flowrate m³/h (other units SI)

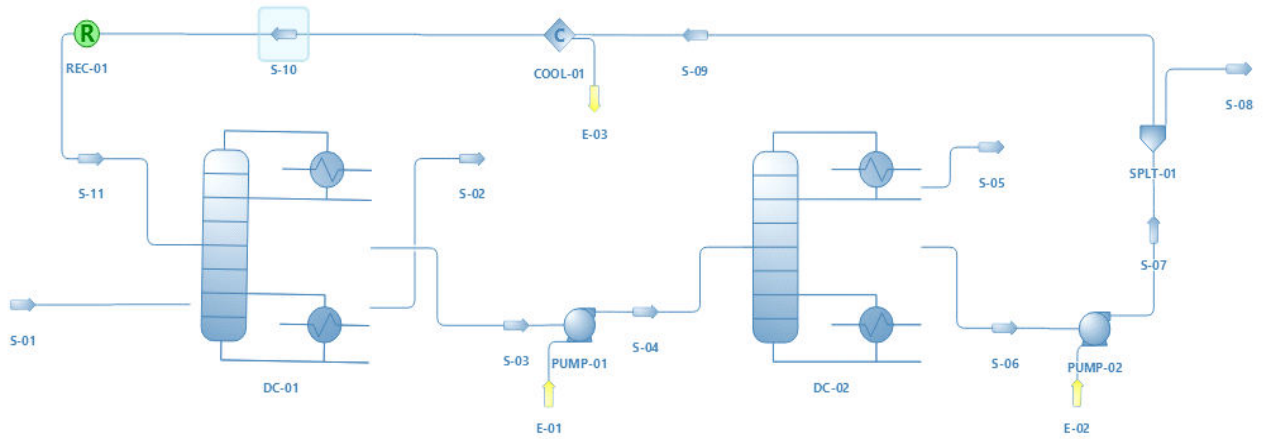
Background:

This flowsheet explores the ternary azeotropic mixture of propylene oxide, methanol and water. This can be done using water as a solvent, and by extractive distillation. Water will allow propylene oxide to separate in the first column and then in the next column methanol and water can be separated.

Description of Flowsheet:

The flowsheet contains two distillation columns with names DC-01 and DC-02. Both have 52 stages. A mixture of 0.5mol% methanol 0.4% water and 0.1% propylene oxide is fed from S-01 to the 41st stage of DC-01. The mixture separates into pure propylene oxide with 99.09% purity in the top product S-02 and a mixture of methanol and water S-03 in the bottom which is pumped by PUMP-01 into the second column. The stream S-04 enters the 45th stage of the second column and gets separated into pure methanol with 97.79% purity in top product S-05 and 99.99% pure water in the bottom product S-06. The bottom product is pumped by PUMP-02. 10% of the bottom product of DC-02 is split as S-09 and cooled with COOL-01 to 26C and used as recycle stream for DC-01 at 33rd stage.

FLWSHEET:



RESULTS:

Master Property Table										
Object	S-10	S-08	S-07	S-06	S-05	S-04	S-03	S-02	S-01	
Temperature	26	99.9872	99.9872	99.9736	61.9977	90.6364	90.6267	54.8529	25.85	C
Pressure	2.0625	2.0625	2.0625	1.01325	1.01325	2.5	2.0265	2.0265	2.0265	bar
Mass Flow	799.811	7198.3	7998.11	7998.11	16630.7	24628.8	24628.8	5205.88	29034.8	kg/h
Molar Flow	44.3946	399.551	443.946	443.946	510.449	954.395	954.395	90	1000	kmol/h
Molar Fraction (Mixture) / Water	0.999951	0.999951	0.999951	0.999951	0.000918346	0.465628	0.465628	2.40536E-13	0.4	
Molar Fraction (Mixture) / Methanol	4.94036E-05	4.94036E-05	4.94036E-05	4.94036E-05	0.9779	0.523044	0.523044	0.00902449	0.5	
Molar Fraction (Mixture) / 1,2-propylene oxide	2.68111E-11	2.68111E-11	2.68111E-11	2.68111E-11	0.0211818	0.0113289	0.0113289	0.990976	0.1	

Master Property Table				
Object	E-03	E-02	E-01	
Energy Flow	87.6778	0.324364	0.494947	kW

Reference:

<https://www.sciencedirect.com/science/article/pii/S0255270119307330>