

Pressure Swing Distillation Of Ethanol-Water Mixture

Flowsheet Description:

Here the system used is Ethanol and Water. The thermodynamic package used in this simulation is Raoult's law. In this simulation we use two distillation columns as the name suggest one with the low pressure and another one with the high pressure both with 22 stages. The low pressure column operates at 1 atm and high pressure column operates at 11 atm. . The feed with a flow rate of 27.7778 mol/s and at a composition of (mole fraction 0.3 ethanol). The feed is introduced at 16 stage in LPC, there are actually two inputs to the LPC feed at 16 and recycled out at 5 stage respectively. After passing through the LPC we achieve our motive actually the distillate is pure ethanol while the bottom containing the mixture of ethanol and water is introduced as a feed to HPC at stage 7.

Stream	Bottoms 1	Bottom 2	Distillate 1	Distillate 2	Feed	Recycle	Unit
Temperature	354.187	457.676	351.868	430.328	348.15	348.524	K
Pressure	101325	1.1145E+06	101325	1.1145E+06	101325	101325	Pa
Molar Flow	146.756	19.4114	8.29421	146.658	27.7778	155.043	mol/s
Molar Fraction(Mixture)/ Ethanol	0.841053	0.005	0.995629	0.946295	0.3	0.94629488	
Molar Fraction(Mixture)/ Water	0.158947	0.995	0.00437082	0.0537051	0.7	0.053705118	

References:

Iqbal, A., & Ahmad, S. A. (2016). Pressure swing distillation of azeotropic mixture—A simulation study. Perspectives in Science, 8, 4-6