Isopropanol and Water separation using 3 column Distillation at vacuum pressure using Dimethyl Sulfoxide as entrainer

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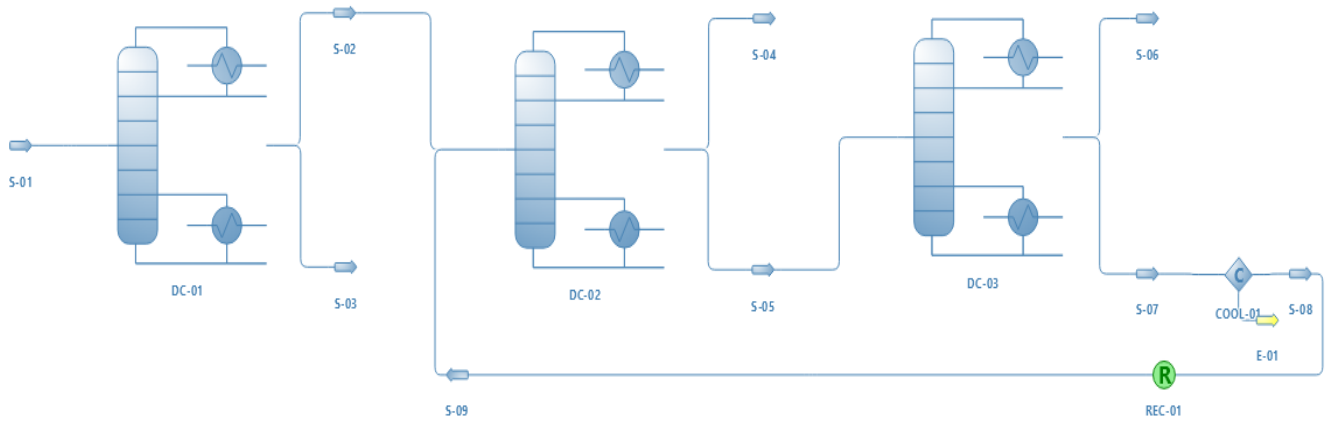
Background and Description:

Isopropanol is mixed with water for using it as a rubbing-alcohol antiseptic. Isopropanol is also used in aftershave lotions, hand lotions, and other cosmetics. In industry it is used as an inexpensive solvent for cosmetics, drugs, shellacs, and gums, as well as for denaturing ethanol.

Here Isopropanol and water mixture enters the process at DC-01 through the stream S-01. The top product of DC-01 is given out through S-02 and bottom product through S-03 with 99% water. The S-02 from DC-01 and recycled stream S-09 is then fed to DC-02. The top product with 100% IPA and tracers of other compound is obtained at S-04 and the bottom product of DC-02 through stream-05. The bottom stream S-05 from DC-02 is then fed to DC-03. The top product of DC-03 with 99% water is obtained through S-06. The bottom product of DC-03 is obtained through S-07 containing DMSO and some tracers of water and IPA. The product obtained through S-07 is sent to cooler (COOL-01) and the outlet of it is sent to recycle block REC-01 through S-08. The outlet of the recycle block i.e., S-09 is connected to DC-02.

Flowsheet:



Results:

Mastery Property Table-IPA and Water separation using 3 column Distillation at vacuum pressure using DMSO as entrainer							
Object	**S-09**	**S-06**	**S-05**	**S-04**	**S-03**	**S-02**	**Units**
Temperature	83.63	73.1024	111.613	70.3892	82.7085	67.1899	C
Pressure	0.610639	0.4	0.61	0.61	0.558	0.558	atm
Mass Flow	3978.37	546.328	4524.7	2945.59	3116.13	3491.68	kg/h
Molar Flow	50.9176	29.7376	80.6552	49.0155	171.25	78.75	kmol/h
Molar Fraction (Mixture) / IPA	3.39E-20	0.00831983	0.00306752	1	0.00430399	0.625561	
Molar Fraction (Mixture) / Water	1.03E-14	0.991576	0.365594	7.33E-09	0.995696	0.374439	
Molar Fraction (Mixture) / DMSO	1	0.0001042	0.631338	8.46E-08	0	0	

From the results table it is seen that there is 100% recovery of IPA from stream-04(S-04) and almost 99% recovery of water in stream-06(S-06) and stream-07(S-07).