Extractive Distillation of Toluene & MethylCycloHexane using Phenol

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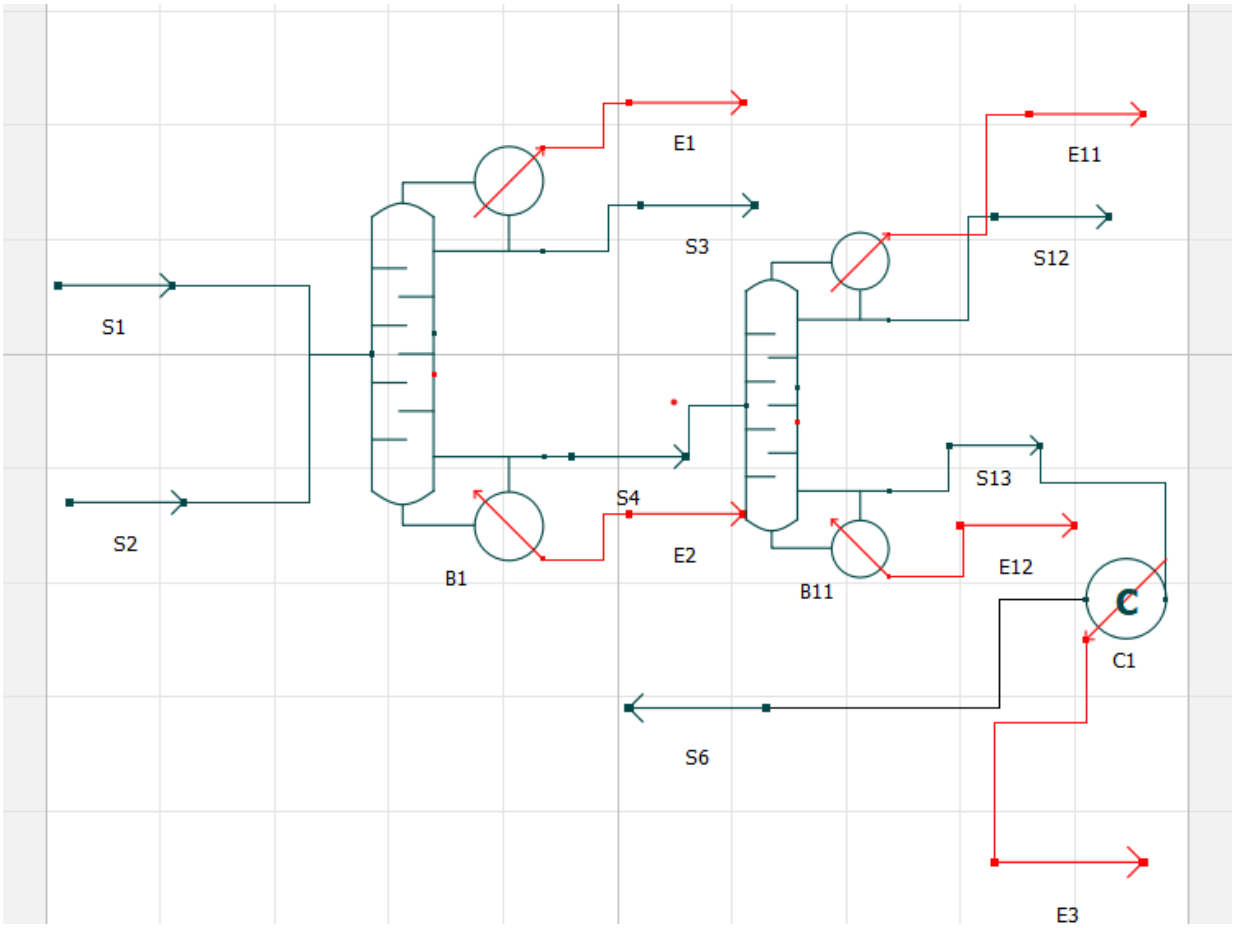
Background & Description:

Background Extractive distillation is the process of distillation using a high-boiling, miscible, nonvolatile solvent that doesn't forms any azeotrope with the other components in the mixture. Solvent is chosen with a higher boiling point than that of feed mixture so that formation of newer azeotrope is impossible. MethylCycloHexane (MCH) along with toluene forms a close boiling mixture and therefore conventional method of distillation cannot be carried out to separate them. Hence, Phenol is used as a solvent to separate them

Process

20 mol/s of Toluene and MethylCycloHexane (MCH) mixture in equimolar composition is fed to an extractive distillation column in its 25th stage. A stream of phenol with molar flowrate of 50 mol/s is fed to the 10th stage of the column. On separation, MCH is obtained as top product while mixture of toluene-phenol is obtained as bottom. The extractive column has 40 stages. Further, the toluene-phenol mixture is sent to another distillation column to obtain toluene as top product and recover phenol from the bottom. The solvent recovery column has 20 stages and the feed enters at 12th stage. The recovered phenol is then recycled to makeup mixer.



Results:

	S1	S2	S3	S4	S12	13	S6
Pressure (Pa)	101325	101325	101325	101325	101325	101325	101325
Temperature(K)	384	323.116	375.046	431.956	382.607	454.23	373
Molar flowrate(mol/s)	20	59.7225	10.0435	59.9565	9.96	49.9885	49.9885
X_{phenol}	0	0.0.9998007	0	0.833772	0.00697503	0.99864	0.99864
$X_{toulene}$	0.5	0.0001929	00.117	0014733	0.879652	0.00130112	0.00130112
X_{MCH}	0.5	0	0.882854	0.018898	0.113373	0	0