Extractive distillation of Benzene and Ethanol using p-Xylene as solvent

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Background & Description:

The separation of azeotrope and close boiling mixture is a challenge in most chemical process. For the separation, the use of a single convectional distillation column is impossible. Extractive distillation is a method where the relative volatilities of components to be separated are altered by using an additional component called solvent.

Process

In this current flowsheet extractive distillation of benzene and ethanol is carried out and P- xylene is used as solvent for this extractive distillation. Thermodynamic model Raoults law is used. The mixture "benzene and ethanol" is feed to the 3 stage of 25 staged extractive distillation column with the solvent 1 p-xylene fed to the 4th stage. The presence of solvent alters the relative volatility between the two, causing pure benzene to move toward the down and pure ethanol on the top of the column. The mixture is feed into the 8th stage of a 21st stage extractive distillation to produce almost benzene at top of the column.

Flowsheet:
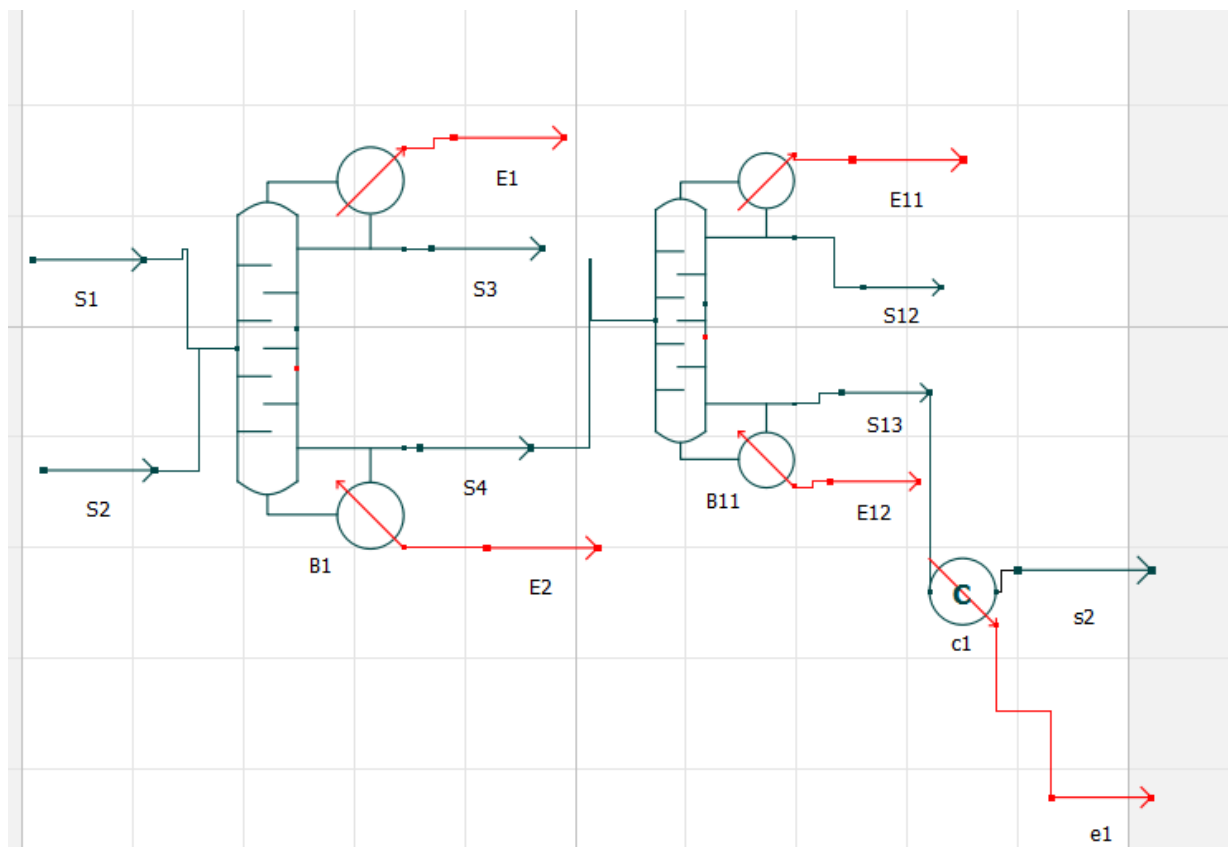
Results:

	S1	S2	S3	S4	S12	S13	s2
Pressure (Pa)	101325	101325	101325	101325	101325	101325	101325
Temperature(K)	298.15	323.116	372.271	436.987	353.216	410.831	323.15
Molar flowrate(mol/s)	27.7777	59.7225	14.3181	73.1822	13.4983	59.6839	59.6839
$X_{ethanol}$	0.5	0	0.918727	.0.0100362	0.0544059	0	0
$X_{benzene}$	0.5	0.0025	0.0806846	.01176021	0.945584	0.00197462	0.00197462
X_{xylene}	0	0.9975	0.000588172	.0813942	0	0.998024	0.998024