TAME Process with Extractive-Distillation Methanol Recovery

Ms Yutika Naik
Sardar Vallabhbhai National Institute of Technology, Surat

Background & Description:

Methanol recovery by distillation process uses water as an extractive agent in an extractive-distillation column to remove methanol from the distillate stream coming from the reactive-distillation column. A second column separates the methanol-water mixture coming from the base of the extraction column and recycles both methanol and water back to upstream units in the process.

Two Continues Stir Tank reactors each of 10 m^3 volume are used for the reaction. The methanol-containing distillate D1 from the top of the reactive column is fed to stage 6 of a 12-stage extraction column. Water is fed on the top tray at a rate of 1046.88 kmol/h and a temperature of 48.85 ℃. Bottom product of this column is fed to third column of 33 stages. Water and methanol are separated as bottom and top products respectively so that they can be used again.

System of Units:

Temperature : ℃,
Pressure : bar,
Molar Flow : Kmol/h,
Mass Flow : kg/h

Property Package:

UNIFAC

Reactions:

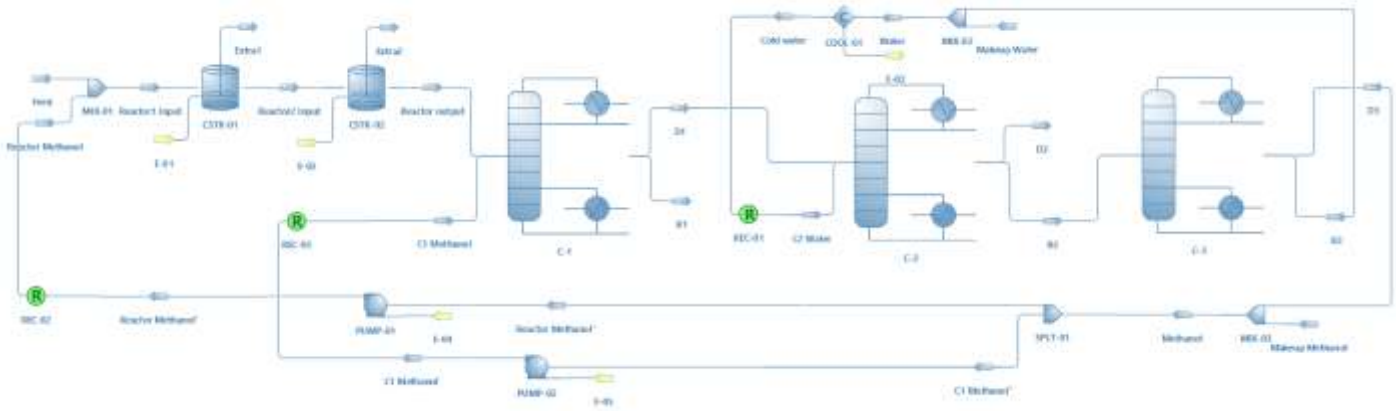
2M1B + Methanol <-> TAME (Esterification)
2M2B + Methanol <-> TAME (Esterification)
2M1B <->2M2B

Reaction	Af1(kmol s^-1kg^-1)	Ef1(KJ/mol)	Ab1(kmol s^-1kg^-1)	Eb1(KJ/mol)
1	1.3263*10^8	76.1037	2.3535*10^11	110.5409
2	1.3718*10^11	98.2302	1.5414*10^14	124.9940
3	2.7187*10^10	96.5226	4.2933*10^10	104.1960

Volume of CSTR:

10 m^3

Flowsheet:



Results:

Object	Feed	Reactor Methanol	Reactor Output	C1 Methanol	B1	Cold Water	B3	D3
Temperature: (℃)	69.85	77.3053	82.85	77.2094	138.569	48.85	115.51	78.736
Pressure: (bar)	10.1325	7.09275	6.0795	4.053	4.053	1.7225	1.722	1.722
Molar Flow: (kmol/h)	1040	313	1236.63	234.979	233.913	1046.8	1019.9	313.21
Mole Fraction(Water) :	0	5.7E-05	1.5E-05	5.7E-05	1.6E-09	0.9999	0.999	0.0001
Mole Fraction(Methanol) :	0	0.9999	0.15897	0.99994	0.00798	9.7E-05	0.0001	0.9999
Mole Fraction(2M1B) :	0.083	0	0.0262	0	5.8E-07	0	0	0
Mole Fraction(2M2B) :	0.16	1.2E-09	0.0841	1.2E-09	9.3E-06	1.4E-15	1.4E-15	2.1E-09
Mole Fraction(TAME) :	0	3.9E -15	0.0941	3.9E-15	0.992	2.9E-06	2.6E-06	6.7E-15