Simutech Assignment 3 Project:

Distillation Column Design

Group Members:

1. Harsh Vijayvargiya

2. Sanidhya Singh

System Used:

1-Butanol and Methacrylic acid

Work allotment:

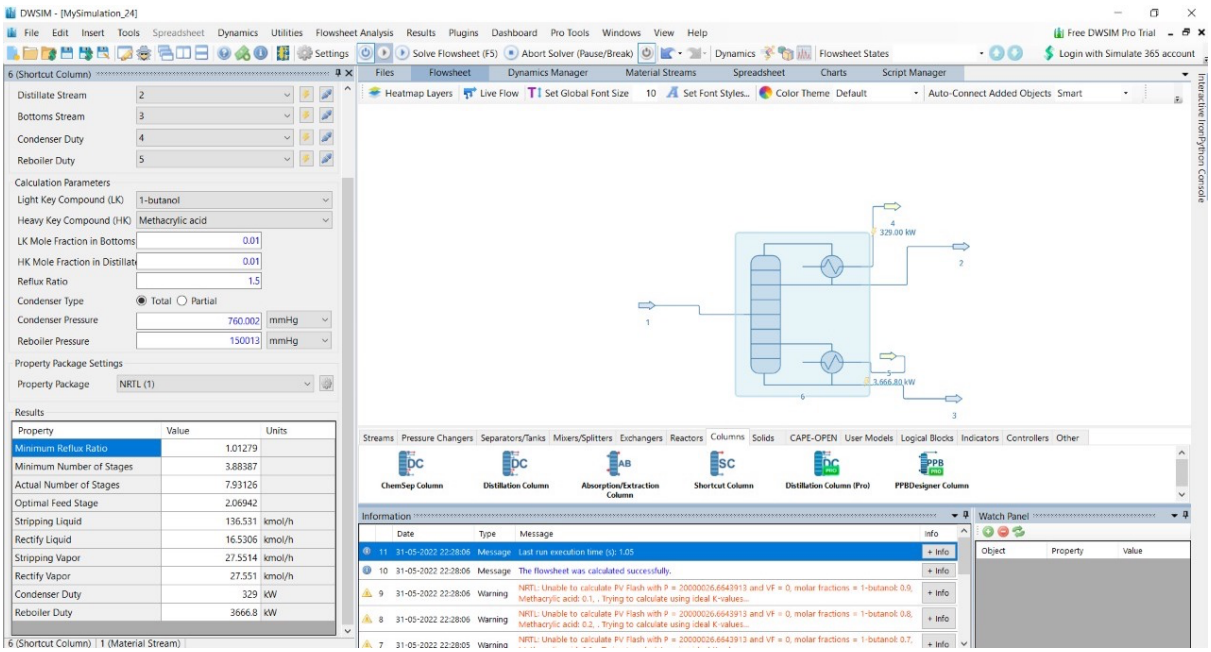
Combined work from both the partners.

Q1. Using DWSIM instead of Python/MATLAB for simulating a distillation column & verifying the results of the Python/MATLAB code through the software.

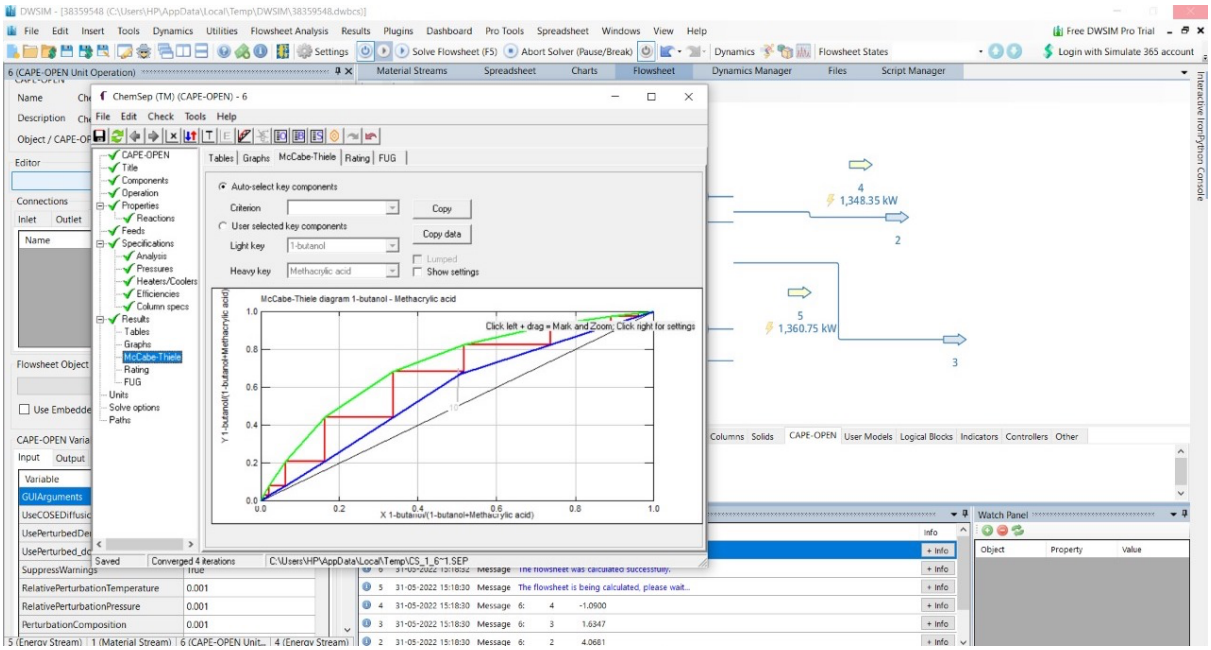
Procedure followed:

1. In assignment two we have used the system: 1-butanol and methacrylic acid
2. In the DWSIM software we have choosen the option “Process Modelling” and selected our compounds.
3. From the property package available we have used “NRTL”
4. Then we have selected Condenser pressure as 760 mmHg and reboiler pressure as 150000 mm Hg.
5. We have fixed the feed composition to 0.5
6. Then from the utility window selected “Binary Phase Envelope”
7. Using the above utility generated the (T)xy plot

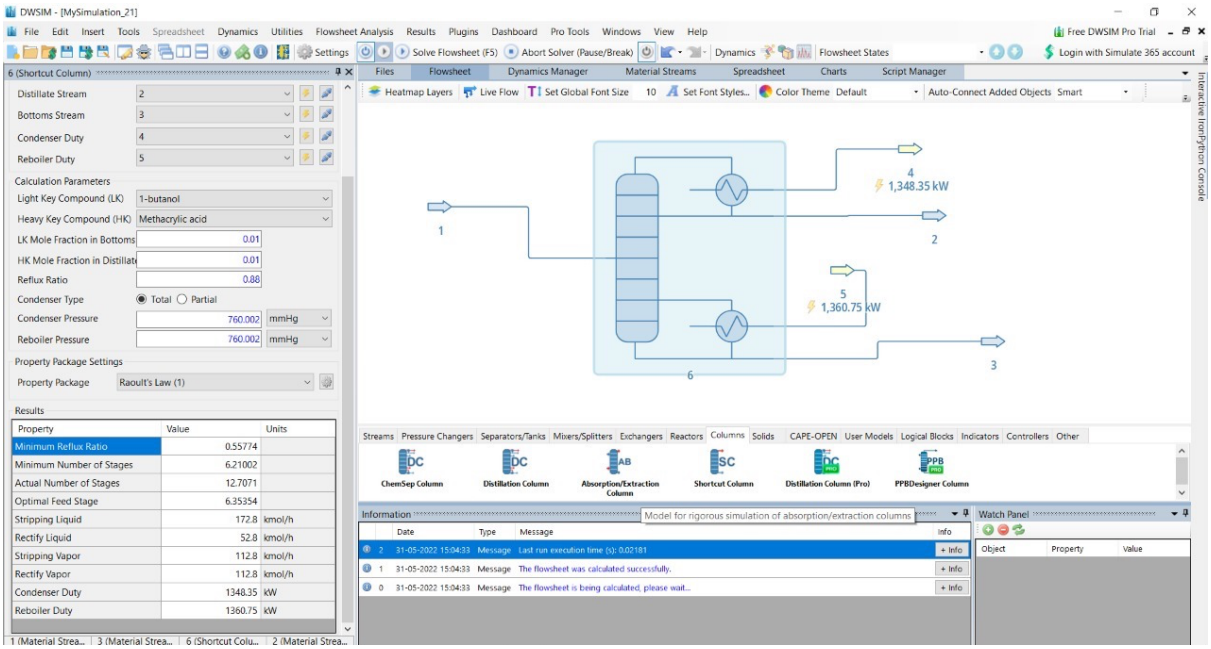
Flowsheet obtained for ideal mixture:



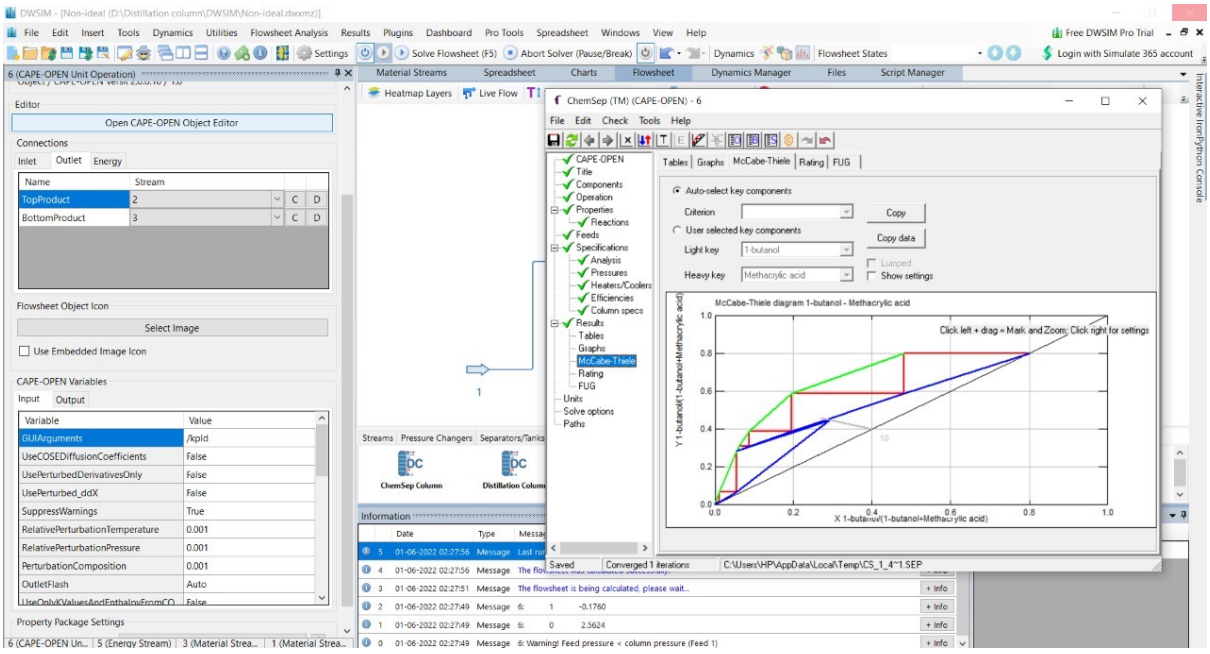
Graph obtained for ideal mixture:



Flowsheet for non-ideal system



Graph obtained for non-ideal system:

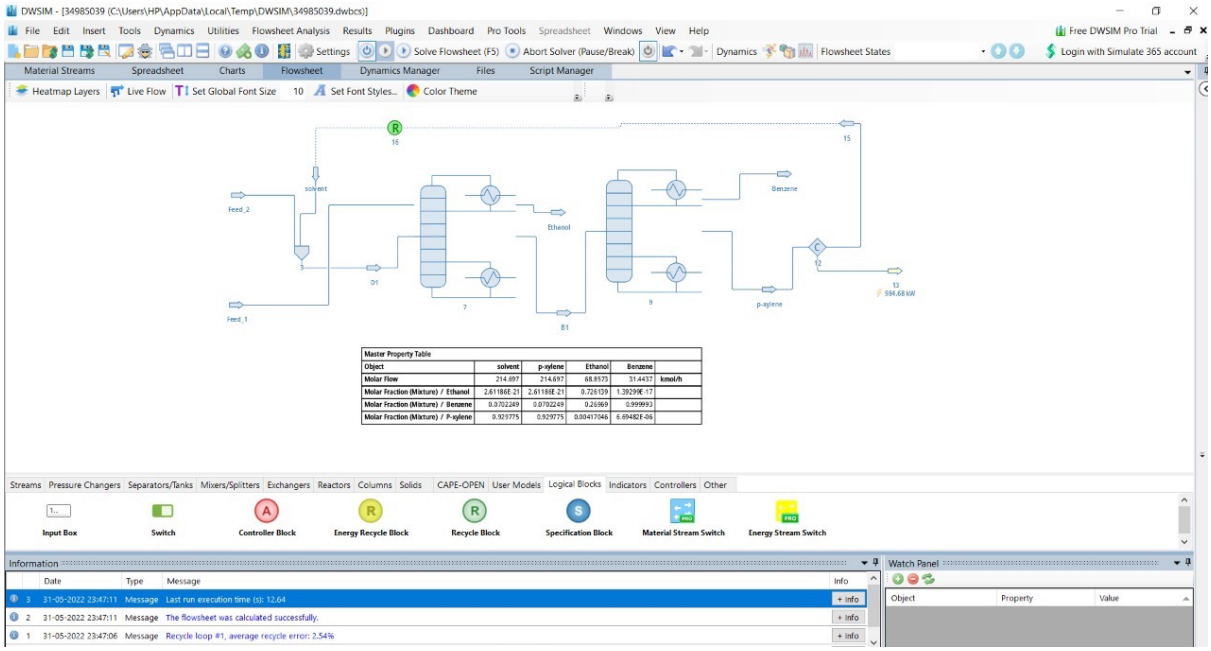


Q2. Separation of Azeotropic mixture by Extractive Distillation using Dwsim.

Procedure followed:

1. We have used azeotropic mixture of ethanol and benzene with flow rate as 100kmol/h.
2. Also, we have used Extractive distillation column with reflux ratio 2.13 and entrainer recovery column with reflux ratio 6.14.
3. The make-up entrainer will consist of p-xylene with molar flow rate 0.3kmol/h.
4. The pressure throughout the experiment is fixed at 1 atm.
5. We have used Cape open unit operation in the experiment.
6. In the Configuration of cape open we have selected Operation as “Complex column” with 71 stages, selected condenser as “Total (liquid product)” and selected reboiler as “Partial (liquid product)”
7. In the thermodynamics section, select K-value as DECHEMA, activity coefficient as UNIQUAC and Antoine as vapour pressure
8. Repeating the step 5-7 for Recovery column, and connecting all the feed lines our flowsheet will be complete.
9. After simulating the result we selected the desired object to be shown in results
10. The results are in tabulated manner under the table Master Property table.

Flowsheet obtained for extractive distillation:

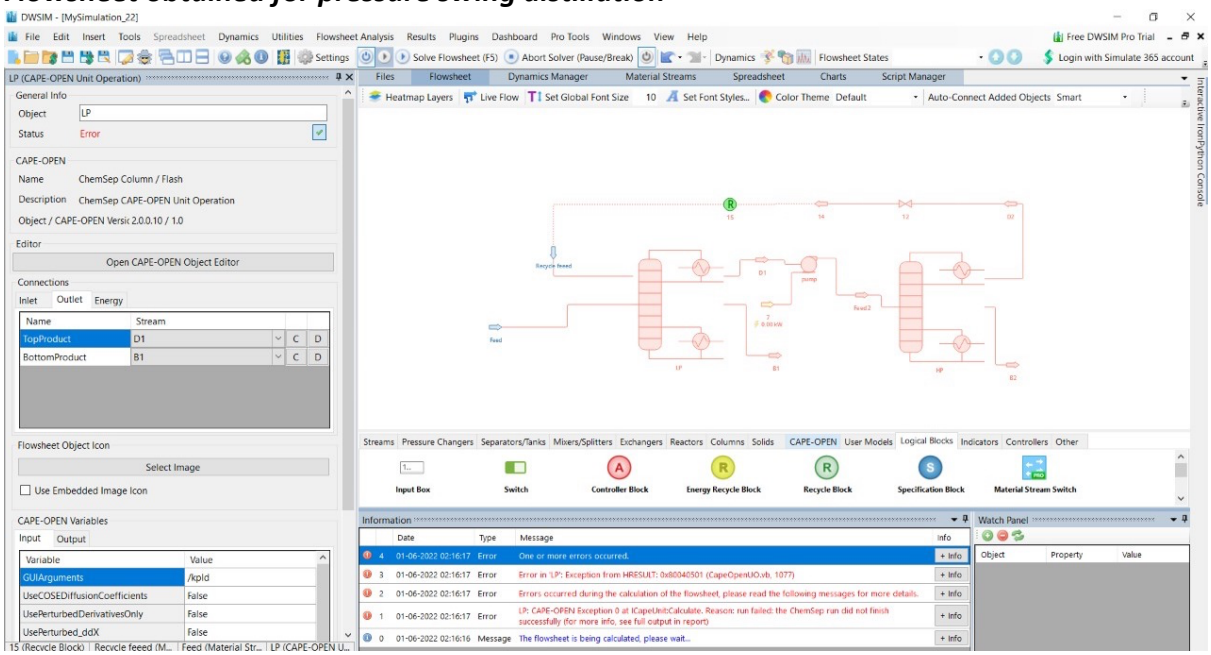


Q3. Separation by Pressure Swing Distillation using Dwsim.

Procedure followed:

1. We have used azeotropic mixture of ethanol and Toluene for Simulating Pressure Swing Distillation
2. The feed consists of ethanol and toluene ratio as 0.72 : 0.28
3. We expect 99% purity of benzene from low pressure column and 99% purity of toluene from high pressure column
4. The reflux ratio of low pressure column is set at 0.9 and for high pressure column is set at 0.8
5. From thermodynamic property we will use NRTL and in system of unit as SI_1

Flowsheet obtained for pressure swing distillation



Note: Even after making it from scratch several times, we were not able to eliminate the error obtained.