

Simutech Assignment 2

Project: Distillation Column Design

Group Members:

1. Harsh Vijayvargiya
2. Sanidhya Singh

System Used:

1-Butanol and Methacrylic acid

Dataset Used: given as "data.csv" file in .zip folder

Work allotment:

Combined work from both the partners.

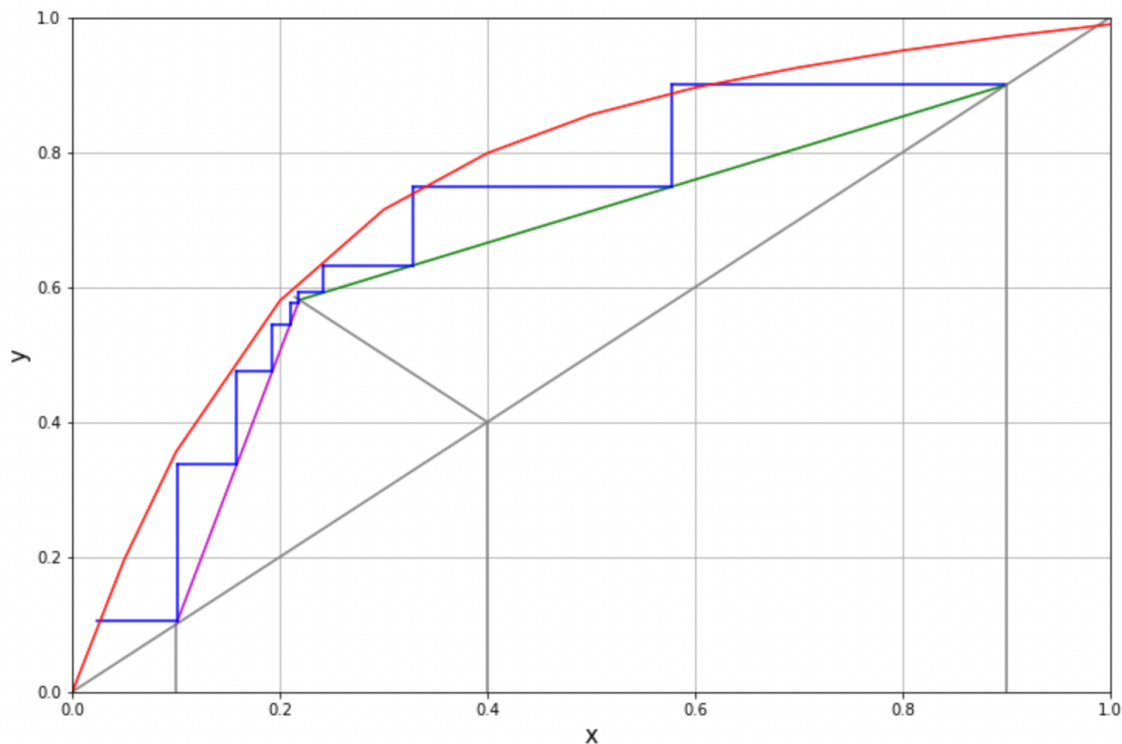
Q1. From your previous assignment, you have drawn a Y Vs X (vapour equilibrium) curve assuming the system to be non-ideal. Now for the same selected system, you have to find the followings with the help of MATLAB

1. *Actual number of stages(trays) required to achieve separation(with graph) in a Distillation column with the help of [McCabe-Thiele](#) method.*

Approach:

- ➔ Used the data obtained from the first assignment, then fitted a curve to get a general equation for the equilibrium curve.
- ➔ Drawn the $y=x$ line and obtained input from the user about the feed, top, bottom composition along with reflux ratio.
- ➔ Drawn the stripping, feed and enriching lines.
- ➔ Then using for loop made the step function to count the actual number of trays in the distillation column.

Graph Obtained: (for example input)

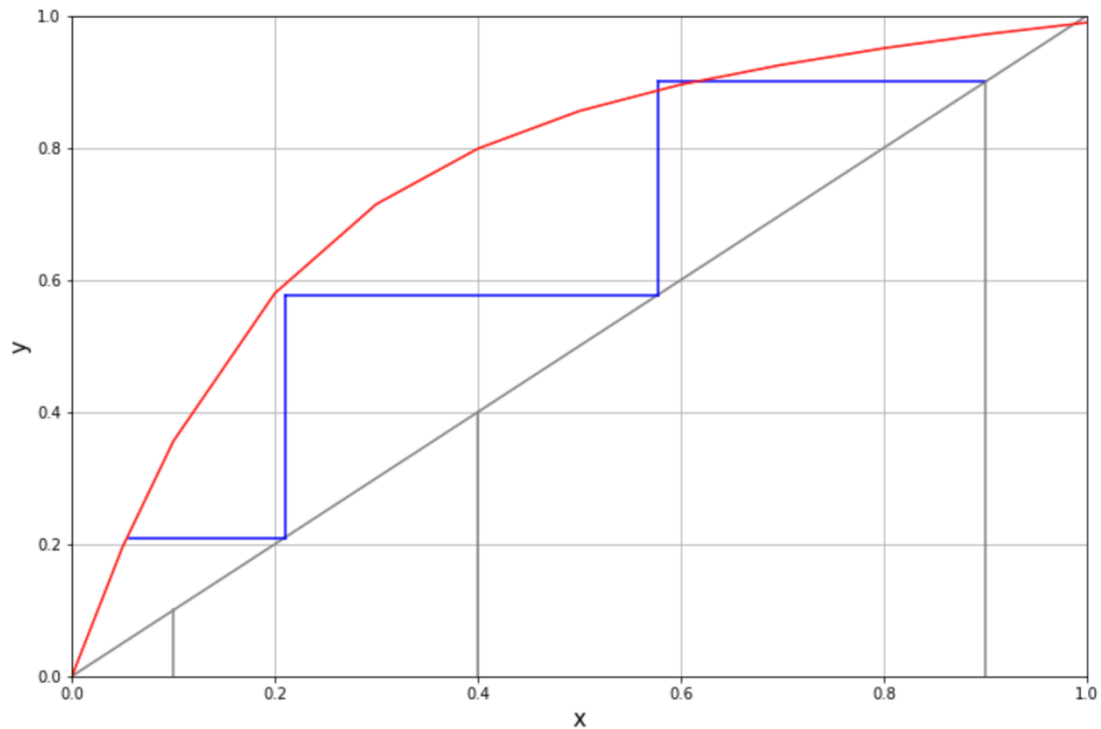


2. *Minimum number of stages(trays) required to achieve their separation with graph.*

Approach:

- ➔ For minimum number of stages the reflux ratio is assumed to be infinity doing which the stripping and enriching lines meet along $y=x$.

Graph Obtained: (for example input)



3. Minimum Reflux Ratio

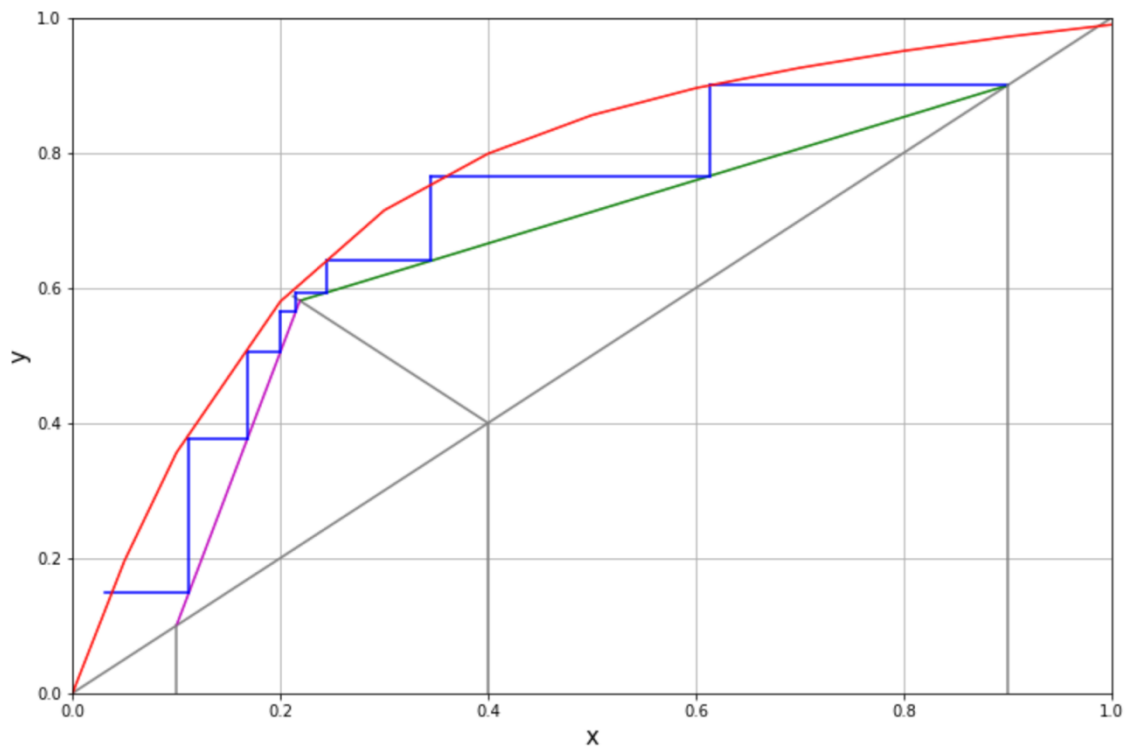
Approach:

- ➔ For minimum reflux ratio, the enriching line meets the feed line on the equilibrium curve.
- ➔ Doing so obtained the slope of the enriching line, using the formula of slope of enriching line obtained the min reflux ratio, which in the example case came out to be 0.847.

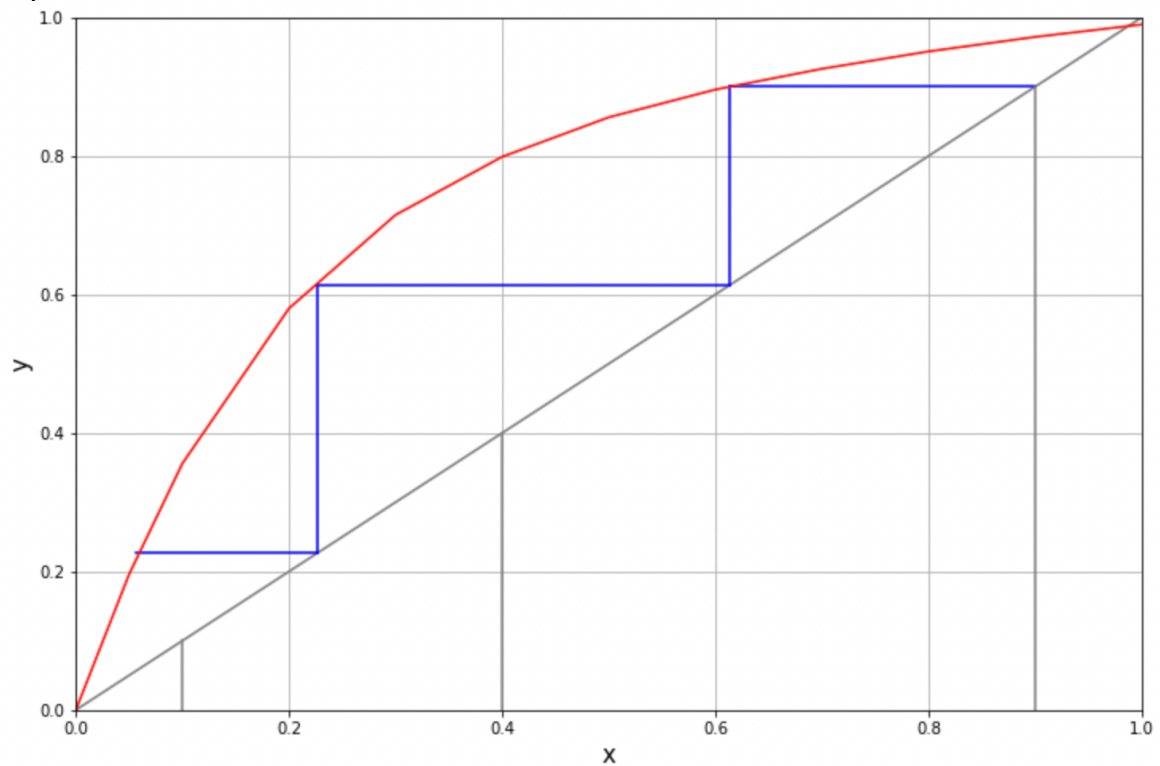
Q2. Repeat Q1 assuming that the system is ideal (system following Raoult's law). Compare the graphs, no. of trays obtained in both the cases for each sub-problems and mention the reasons for differences

Using same approach obtained following results:

1. Actual number of stages(trays) required to achieve separation(with graph) in a Distillation column with the help of [McCabe-Thiele](#) method.



2. Minimum number of stages(trays) required to achieve their separation with graph.



3. Minimum Reflux Ratio

-> Minimum reflux ratio came out to be 0.88.

Conclusions:

- ➔ Actual number of trays in non-ideal case is more than in the ideal case
- ➔ Minimum reflux ratio of ideal case is more than the non-ideal case