Project

The objective of this project is to study the dynamics of a distillation column and to design a controller for getting a desired concentration of the top and bottom products.

For Report 1, the following tasks need to be done:

1. Design a distillation column in CHEMCAD using the specifications given for your group. The specifications for each group are listed in Table 1 in the next page.
2. Develop a dynamic nonlinear model for the column that you designed in Part 1. Use the handout given in class and the 5 step procedure to develop the model for the column.
3. The manipulated inputs to the column are the vapor and liquid flowrates. The vapor flowrate is used to control the bottom composition and the liquid flowrate is used to control the top composition. The states of the column are the compositions on each tray. Find the steady state values of the column by putting the time derivative terms equal to zero.
4. Linearize the nonlinear model around the steady state values.
5. Study the linear and nonlinear response of the column to changes in feed flowrate and the feed compositions (plus or minus 10%) using MATLAB.
6. Compare the nonlinear response to the response obtained from the linearized model.

Group 1: Kibler, Kochanowski, Duckworth Feed: n-propane and n-butane 200 kmol of 50:50 mixture at 330K and 14.7 psia Specifications at top: 0.85 n-propane and 0.15 n-butane
Group 2: Bean, Anderson, Taylor Feed: benzene and toluene 200 kmol of 50:50 mixture at 330K and 14.7 psia Specifications at top: 0.92 benzene and 0.08 toluene
Group 3: Alexander, Bouldin, Storr Feed: n-hexane and n-methyl cyclohexane 200 kmol of 50:50 mixture at 330K and 14.7 psia Specifications at top: 0.90 n-hexane and 0.10 n-methyl cyclohexane
Group 4: Gilet, White, Campbell Feed: toluene and o-xylene 300 kmol of 50:50 mixture at 330K and 14.7 psia Specifications at top: 0.88 toluene and 0.12 o-xylene
Group 5: Thompson, Bouie, Stroud Feed: benzene and o-xylene 300 kmol of 50:50 mixture at 330K and 14.7 psia Specifications at top: 0.95 benzene and 0.05 o-xylene
Group 6: Richard, Allen, Hicks Feed: methanol and isopropanol 300 kmol of 50:50 mixture at 330K and 14.7 psia Specifications at top: 0.87 methanol and 0.13 isopropanol
Group 7: Fails, Ayanwale, Wawrzyk Feed: 3-methyl 1-butanol and isobutanol 300 kmol of 50:50 mixture at 330K and 14.7 psia Specifications at top: 0.95 3-methyl 1-butanol and 0.05 isobutanol
Group 8: Randell, Coppin Feed: n-octane and n-tetradecane 300 kmol of 50:50 mixture at 330K and 14.7 psia Specifications at top: 0.98 n-octane and 0.02 n-tetradecane
Group 9: Dupuis, Murray, Mondrinos Feed: n-heptane and methyl cyclohexane 300 kmol of 50:50 mixture at 330K and 14.7 psia Specifications at top: 0.70 n-heptane and 0.30 methyl cyclohexane
Group 10: Bell, Yoder, Achenbach Feed: acetone and propionic acid 400 kmol of 50:50 mixture at 330K and 14.7 psia Specifications at top: 0.90 acetone and 0.10 propionic acid
Group 11: Alleyne, Laudat Feed: acetone and cyclohexane 400 kmol of 50:50 mixture at 330K and 14.7 psia Specifications at top: 0.90 acetone and 0.10 cyclohexane