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COLLEGE OF ENGINEERING

DEPARTMENT OF CHEMICAL AND PETROLEUM ENGINEERING
B.ENG. CHEMICAL ENGINEERING PROGRAMME

Computer Applications in Chemical Engineering II (CHE 471) Assignment V

Given Date: 24/11/2018
Submission Date: 28/11/2018

PROBLEM STATEMENT

The reactions between propylene and chlorine occur as shown in the equations below in a 144-in. long and 2-in ID tube isothermal plug flow reactor. The feed, which is a 4:1 molar ratio of propylene to chlorine, contains 0.80 lbmole/hr of propylene and enters the reactor at a temperature and a pressure of 1000 Rankine and 2 atm, respectively.

$$C_3H_6 + Cl_2 \xrightarrow{k_1} C_3H_5Cl + HCl\,; \qquad k_1 = 206000e^{-\frac{27200}{RT}}\,; \qquad r_1 = k_1 P_{C_3H_6} P_{Cl_2}$$

$$C_3H_6 + Cl_2 \xrightarrow{k_2} C_3H_6Cl_2\,; \qquad k_2 = 11.7e^{-\frac{6860}{RT}}\,; \qquad r_2 = k_2 P_{C_3H_6} P_{Cl_2}$$

If the rate constants have units of lbmoles/(min-ft^3-atm^2), T is in degrees Rankine and R (universal gas constant) is in BTU/(lbmole ^{o}R), with the aid of ChemCAD and Peng-Robinson as the Global K-Value Model, estimate the mass flowrates of the components in the exit stream. Also, plot the molar composition profiles of all the components involved in the system.