CHE 4063 Project 2

INSTRUCTIONS FOR PREPARING THE PROJECT

All pages should be 8 ½" x 11". Make xerox copies of all pages over 8 ½" x 11" including computer programs if necessary. Do not include any foldout pages.

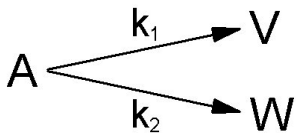
1. Staple the project once in the upper left-hand corner. Do not use folders of any type.
2. Cooperation among students is forbidden.
3. Follow this format:
    a. Cover page
    b. Statement of the problem and data you were given.
    c. Theoretical development including equations you developed and calculations you set up.
    d. Results
        i. Explanation and final numbers
        ii. Graphical plots
    e. Appendix – Computer program and raw data output.
4. Neatness and organization counts 10% of the project!

Calculational tools used to solve this project are the students' choice. You may use a programming language such as C++, Visual Basic, or Fortran, or HYSYS.

ChE 4063 Project 2 October 22, 2002

Due Date: December 3, 2002

The parallel reactions:



take place in a PFR. The gas phase reaction kinetics are known to be:

$r_V = k_1 C_A^2$ (Second order)
$r_W = k_2 C_A$ (First order)

The following data are available:

$A_V = 1.667 \times 10^4$ lt/mole-sec	$A_W = 1.667 \times 10^5$ sec^{-1}
$E_V = 83{,}684$ J/mole	$E_W = 125{,}526$ J/mole
$C_{P,V} = 29.29$ J/mole-K	$C_{P,W} = 33.47$ J/mole-K
$\Delta H_V = -20{,}921$ J/mole	$\Delta H_W = -62{,}763$ J/mole

The reactor operates at 6 bar total pressure which may be assumed to be constant. The feed to the reactor is 100 moles/min of A and 500 moles/min of an inert material I. The heat capacities of A and I are 25.11 and 37.66 J/mole-K, respectively. All physical properties may be assumed independent of T and ideal gases may be assumed.

Provide plots of the following:

1. Y_V versus f_A for an isothermal reactor (of variable size) which operates at 700 K.

2. F_A, F_V, and F_W (all on the same graph) versus f_A for an isothermal reactor (of variable size) which operates at 700 K.

3. $Y_{V,EXIT}$ versus T_{IN} for an adiabatic reactor which has a space time τ = 3000 seconds where T_{IN} varies from 650 - 750 K.

4. F_A, F_V, and F_W (all on the same graph) at the reactor exit versus T_{IN} for an adiabatic reactor which has a space time τ = 3000 seconds where T_{IN} varies from 650 - 750 K. Find the inlet temperature which maximizes F_V at the reactor exit.