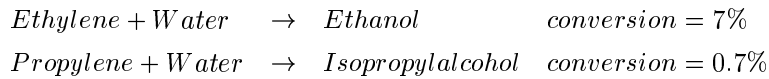# Recycle Calculations in CHEMCAD

Problem 1: A simplified flowsheet for the ethanol process is given in Figure 1. The specifications for the feed and each unit operation are given below:

Feed: The feed is available at 300 k and 1 bar and has the following composition:

Ethylene	96 mol/s
Propylene	3 mol/s
Methane	1 mol/s
Water	770 mol/s

Reactor: The reactor operates at 590 K and 69 bar. The following reactions occur:

$$Ethylene + Water \quad \rightarrow \quad Ethanol \qquad conversion = 7\%$$
$$Propylene + Water \quad \rightarrow \quad Isopropylalcohol \quad conversion = 0.7\%$$

Flash: The flash operates at a pressure of 68.5 bar and a temperature of 393 K.

Absorber: The solvent for the absorber is pure water at a flowrate of 38 mol/s at 310 K. The vapor comes in at 393 K and the absorber operates at 68 bar.

Splitter: The purge fraction (moles purged/moles entering the splitter) is represented by ξ.

- Determine the flowrates of each component to the reactor for a purge rate of $\xi = 0.003$, $\xi = 0.005$, and $\xi = 0.007$,

- Determine the mole fraction of methane at the reactor inlet for the above purge rates.

- How much ethanol goes in the absorber liquid stream if the solvent flowrate to the absorber is increased or decreased by 25% for each purge rate.
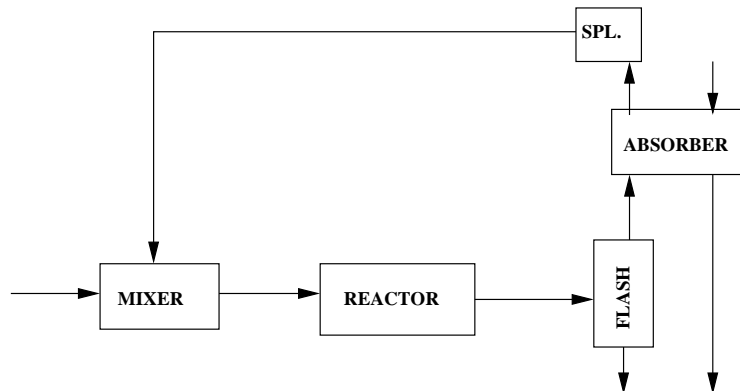

Figure 1:

All calculations should be done in CHEMCAD. Only 1 report per team needs to be submitted.