Acetaldehyde Plant

- Flowsheeting "Views"

- Reaction Kinetics

- Units R-plug // Heat-X { Shortcut Rig

- Pressure profile in Radfrac

- Concentration profile in R-Plug

- Recycle and Purge

Problem Statement

- Ethanol is to be converted to Acetaldehyde using a Plug flow reactor.
- The Reactor is to be isothermal, 274°C, Single-tube → L = 6m, D = 0.12 m
- The reaction kinetics are known
  - Ethanol → H2 + Acetaldehyde (desired)
  - Ethanol + Acetaldehyde → Ethyl Acetate + H2 (undesired)
- Separation of the gases (H2 ,mostly) is imperative
- Final Product must be separated from the mix, at least 2/3
- Purge can be added, recommended recycle ratio is 90% molar

Design Methodology

- (A) Run the PFR with no recycle
- (B) Add separation scheme (Flashing, Degasser, Distillation Column)
- (C) Add recycle + purge stream

SImulation Design
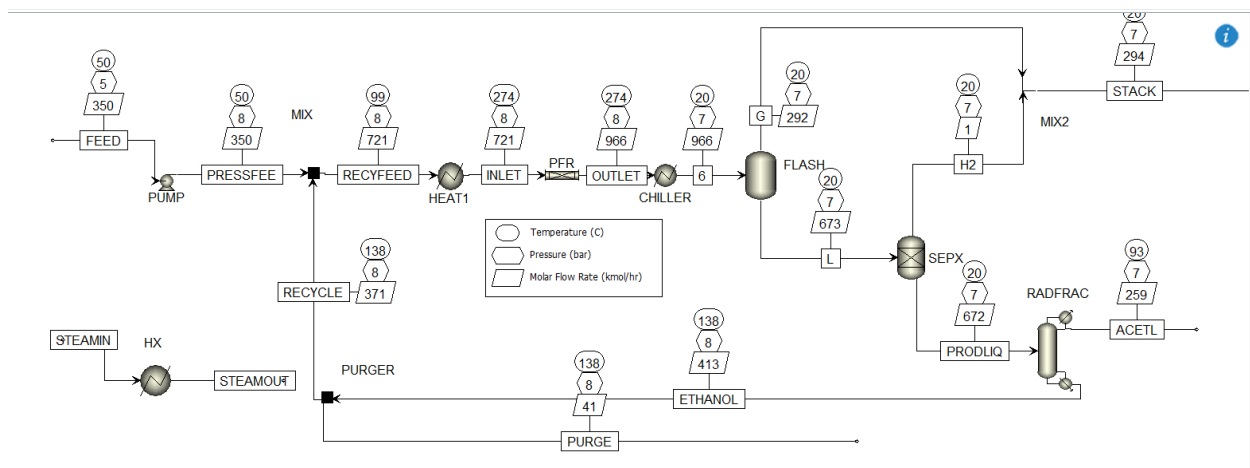
Pressure Profile For RadFrac

Stage	Pressure(atm)
1	6.8
2	6.92
3	6.95
4	6.93
5	6.97

6	7
7	7.08
8	7.11
9	7.15
10	7.18
11	7.22
12	7.25
13	7.23
14	7.27
15	7.3
16	7.38
17	7.42
18	7.45
19	7.5
20	

Results After Recycling:

Mole Fractions			
ETHANOL		0.803678	0.312519
H2		0	0.287862
ACETA-01		0.00087364	0.218709
ETHYL-01		0.195449	0.180911
WATER		0	0