KC32603 Process Simulation and Integration

In-Class Exercise 2 (CLO4 – PLO5; WP1, WP4; WK3, WK4, WK5 WK6)

Situation 1:

Feed 1:

Comp: Methane	Temp: 25 °C
Pres: 1 atm	EOS: Peng-Robinson
Flowrate: 100 kmol/h	

Feed 2:

Comp: Oxygen	Temp: 25 °C
Pres: 1 atm	EOS: Peng-Robinson
Flowrate: 100 kmol/h	

$$CH_4 + \frac{1}{2}O_2 \xrightarrow{40\%} CO + 2H_2$$

$$CH_4 + O_2 \xrightarrow{60\%} CO_2 + 2H_2$$

Simulate the reactions above. Take note of all output products. By doing some analysis, evaluate how that hydrogen product can be increased?

Situation 2:

Feed 3:

Comp: Water	Temp: 150 °C
Pres: 1 atm	EOS: Peng-Robinson
Flowrate: 100 kmol/h	

$$CO + H_2O \Leftrightarrow CO_2 + H_2$$

In hydrogen production, CO composition will be maintained as low as possible using Water-Gas-Shift (WGS) reaction. Simulate this WGS reaction using the simulated design in Situation 1. Evaluate how the CO can be decreased?