

As an assignment,

- 1) Add two more **Heterogeneous Catalytic Reactions** for the existing **PFR** system.
- 2) Feed Stream conditions and **Plug-Flow Reactor** parameters remain unchanged.

Reaction rates and its coefficients:

Water Gas Shift Reaction:



$$R_2 = \frac{\frac{k_2}{P_{\text{H}_2}} \left[P_{\text{CO}} P_{\text{H}_2\text{O}} - \frac{P_{\text{H}_2} P_{\text{CO}_2}}{K_2} \right]}{\text{DEN}^2}$$

$$k_2 = 1.96 * 10^6 \exp\left(\frac{-67130}{RT}\right) \quad K_2 = \exp\left(-3.798 + \frac{4160}{T}\right)$$

Overall Reaction:



$$R_3 = \frac{\frac{k_3}{P_{\text{H}_2}^{3.5}} \left[P_{\text{CH}_4} P_{\text{H}_2\text{O}}^2 - \frac{P_{\text{H}_2}^4 P_{\text{CO}_2}}{K_3} \right]}{\text{DEN}^2}$$

$$k_3 = 1.02 * 10^{15} \exp\left(\frac{-243900}{RT}\right) \quad K_3 = \exp\left(34.218 - \frac{31266}{T}\right)$$