CH365 Chemical Engineering Thermodynamics

Capstone Design Project – IPR3 Guidance

19 November 2021

IPR2 AAR:

- Z_1 and Z_2 must be correct. Check your answers with CHEMCAD.

IPR3 Guidance – due **Friday 19 November at 1630 hrs**.

- Calculation of Z using the modified SRK equation in the form of equations 3.48, 3.50, and 3.51, where α and q are written as functions of x, as explained in the IPR2 guidance:

$$Z = 1 + \beta - q \cdot \beta \cdot \frac{Z - \beta}{(Z + \varepsilon \cdot \beta) \cdot (Z + \sigma \cdot \beta)} \qquad \text{(eq. 3.48)}$$

$$\beta = \Omega \cdot \frac{P_r}{T_r} \qquad \text{(eq. 3.50)}$$

$$q = \frac{\Psi \cdot \alpha}{\Omega \cdot T_r} \qquad \text{(eq. 3.51)}$$

- Calculation of H^R and S^R using the equations found (un-numbered) on page 488 and highlighted in red font on slide 7 of Lesson 28:

$$\frac{H^R}{RT} = Z - 1 + T_r \left(\frac{dq}{dT_r} \right) \cdot I$$

$$\frac{S^R}{R} = \ln(Z - \beta) + \left(q + T_r \frac{dq}{dT_r} \right) \cdot I$$

- Leaning forward (not graded in IPR3 but needed for final submission): Absolute stream enthalpy and entropy are calculated from Equations 6.50 and 6.51:

$$H = H_0^{ig} + \int_{T_0}^{T} C_P dT + H^R \qquad \text{(eq. 6.50)}$$

$$S = S_0^{ig} + \int_{T0}^{T} \frac{C_P}{T} dT - R \cdot \ln\left(\frac{P}{P_0} \right) + S^R \qquad \text{(eq. 6.51)}$$

  Note that H_0^{ig} and S_0^{ig} are the standard enthalpy and entropy of formation from CHEMCAD.

- Leaning forward (not graded in IPR3 but needed for final submission): Fugacity coefficients have not been covered in class yet but can be calculated with equation 13.85.
- Leaning forward (not graded in IPR3 but needed for final submission): Begin work on Aspen+.
- Update your summary table and abstract as appropriate.
- MMA and CHEMCAD files must also be in SharePoint.
- Cover sheet and Mathematica combined into single CAC-signed pdf in SharePoint.
- 30 points (25 tech, 5 writing)