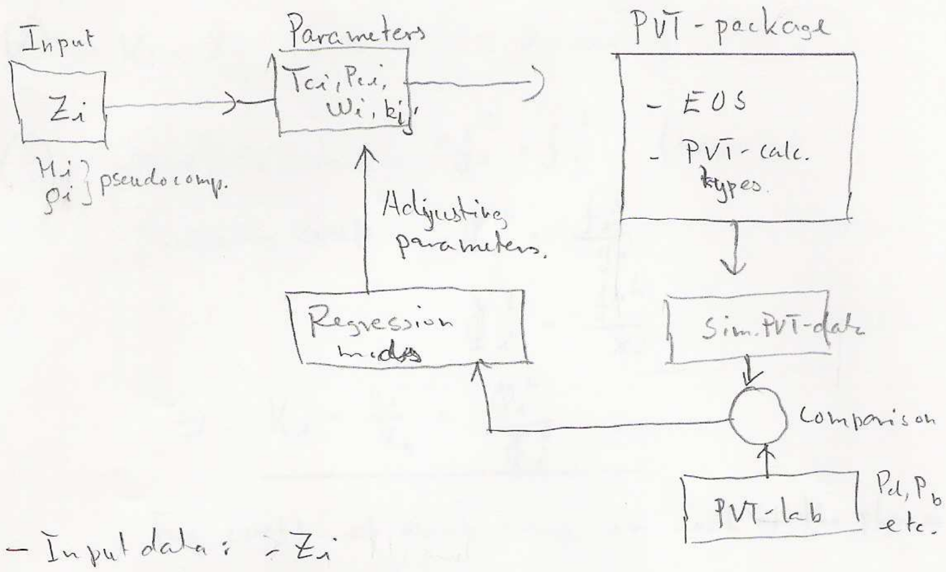
PVT - H-06 Kort løsnings-skisse.

Oppgave 1.

a)



- Input data: - z_i
  - ρ_i and M_i for pseudocomp.
- Parameters: $T_{ci}, P_{ci}, \omega_i = f(M_i, \rho_i)$ for pseudocomp.

//

b)

(1) $P = P^{rep} - P^{att}$

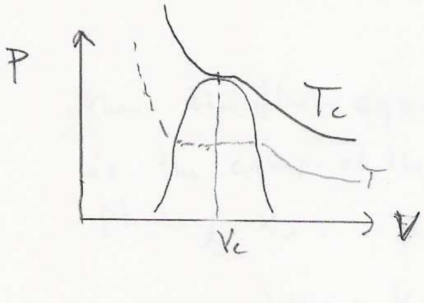
P^{att} ↑ tiltrekningskrefter mellom molekyler

P^{rep} ↑ repulsive krefter mellom molekyler

(2) $a(T)$: beskriver interaksjon mellom molekyler

b : volumet som molekylene okkuperer.

(3)



ved T_c og P_c:

$$\left[\left(\frac{\partial P}{\partial V}\right) = \left(\frac{\partial^2 P}{\partial V^2}\right) = 0\right]_{T_c, P_c}$$

Herav 2 ligninger med 2 ukjente

↓: a_{ci} og b_i kan bestemmes.

c) ① Z_G : compressibility of the vapor phase

Z_L : —— " —— " – liquid –"–

② $K_i = \frac{y_i}{x_i}$, $K_i = f(T, P, comp.)$

③ At equilibrium : $f_i^G = f_i^L$ (fugasity)

Fugasity coeff. $\Phi_i^G = \frac{f_i^G}{y_i}$

$\Phi_i^L = \frac{f_i^L}{x_i}$

$$\Rightarrow K_i = \frac{y_i}{x_i} = \frac{\Phi_i^L}{\Phi_i^G}$$

Fug. coeff. of each comp. in each of the phases:

$$\ln \Phi_i = -\frac{1}{RT} \int_{\infty}^{V} \left[\left(\frac{\partial P}{\partial n_i} \right)_{T,V,n_j} - \frac{RT}{V} \right] dV - \ln Z$$

↑ compress.

PS: (Forventer ikke at de kan denne formelen)

④ Flash equations. (1 mol fluid)

① $L + V = 1$
② $z_i = L \cdot x_i + V \cdot y_i$
③ $K_i = \frac{y_i}{x_i}$
④ $\sum x_i = \sum y_i = \sum z_i = 1$

$$\Rightarrow \sum x_i = \sum \frac{z_i}{L + K_i \cdot V} = 1$$

~~$y_i = K_i x_i$~~

Løses ved iterasjon.

konvergens ⇒ L and V.

⑤ When the flash-equation is solved, each term is the comp. of the actual comp. in the liquid phase, x_i.

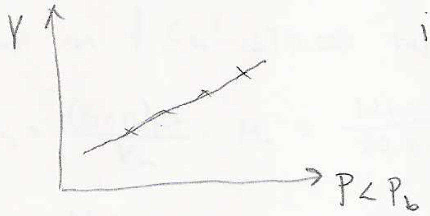
$\Rightarrow y_i = K_i \cdot x_i$ comp. in gas phase.

Oppgave 2.

a) BHS : - because $P_i >> P_b$

- Slow production with $P_{wf} > P_b$.

b) Plot of Y vs. P should give a straight line if P_b is correctly determined.



$$Y = \frac{P_b - P}{P\left(\frac{V_t}{V_b} - 1\right)} \quad (P < P_b)$$

c)

$P_i = 450$ bar $\Rightarrow (B_o)_i = 0.9693 \frac{m^3}{m_b^3} \cdot 1.340 \frac{m_b^3}{Sm^3} = 1.2989 \frac{m^3}{Sm^3}$

$P_b = 253.3$ bar $\Rightarrow (B_o)_b = 1.340 \frac{m^3}{Sm^3}$

$HCPV = 10^6 m^3 \cdot \Phi(1 - S_{wr}) = 2 \times 10^5 m^3$

$V_{STO} = \frac{HCPV}{(B_o)_i} - \frac{HCPV}{(B_o)_b} = \underline{\underline{4.722 \times 10^3 \ Sm^3}}$

$(GOR)_{tot} = 73.7 + 31.1 + 21.3 = 126.1 \ Sm^3/Sm^3$

$V_g = (GOR)_{tot} \cdot V_{STO} = \underline{\underline{5.954 \times 10^5 \ Sm^3}}$

d) $$(\gamma_g)_{av} = \frac{(GOR)_1 \cdot (\gamma_g)_1 + (GOR)_2 \cdot (\gamma_g)_2 + (GOR)_3 \cdot (\gamma_g)_3}{(GOR)_{tot}}$$

$\underline{\underline{(\gamma_g)_{av} = 0.7507}}$

$M_g = (\gamma_g)_{av} \cdot M_{air} = 0.7507 \cdot 28.96 = \underline{\underline{21.74}}$