Note Title 2/9/2016

HW Problem 2:

How to calculate surface oil volumes from Flash-calc'd oil molar composition $[x_i]$?

Oil at S.C. (HC mixture) ~ use Ideal Volume Mixing

$$m_i = x_i \cdot M_i \qquad \sum V_i \cong V_t$$

$$\rho_{\bar{o}} = \frac{\sum m_i}{\sum V_{\bar{L}i}} \cong \frac{\sum x_i M_i}{\sum \frac{x_i M_i}{\rho_{\bar{L}i}}} \neq \sum x_i \rho_{\bar{L}i}$$

$\rho_{\bar{L}i}$: Appendix A ; Measured (by lab) C_{7+} Pure Comp.

C_6 : Table 5.2 or $n\text{-}C_6$

Standing-Katz : 1942's

↓

Extension of Ideal Volume Mixing @ $(p, T) > S.C.$

1960's (Alani-Kennedy) vdW van der Waals a_i b_i

↓

1980's

① Eq. above w/ $\rho_{\bar{L}i}$

$[\rho_{\bar{o}}]$ includes light components (N_2 CO_2 H_2S C_1, C_2, C_3)

@ S.C. $\rho_{\bar{L}i}$

$\nabla \sim \rho_{\bar{L}}, C_1 =$

$0 \sim \rho_{P\bar{L}}, C_2 =$

} Ch. 3, App-B

② Standard (Tables & Eqs) HC Liquid thermal expansion (from 60°F) → $f(\rho_{\bar{P}^\circ})$

compressibility effect (from 1 atm - 5 atm)

$\Rightarrow \Delta \leq 2\%$

· Petroleum Engineering

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Process Industry : Still Use Empirical $\rho_o(P, T, x_j)$ methods developed in 1960s (Hankinson ---) ⇒ API ASTM

COSTALD

~ same A as Standing-Katz

K-values

Apparent

@ Convergence Pressure (P_K)

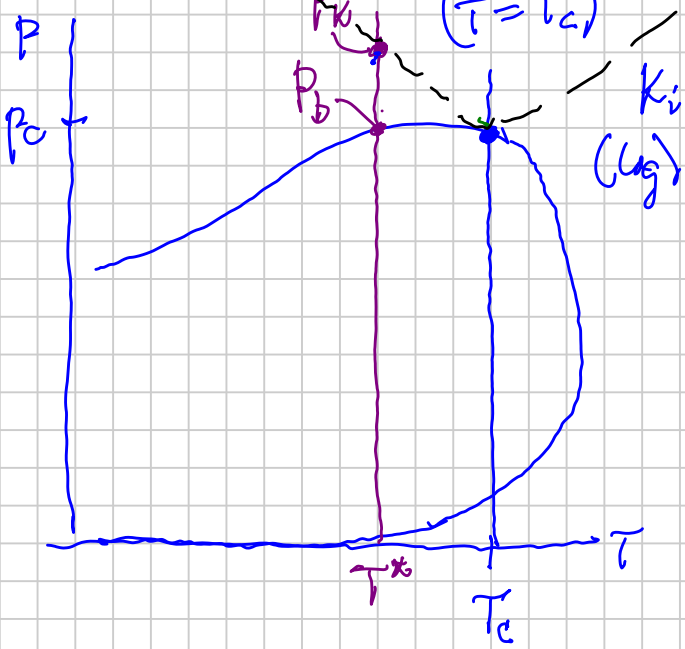
$K_i \to 1$

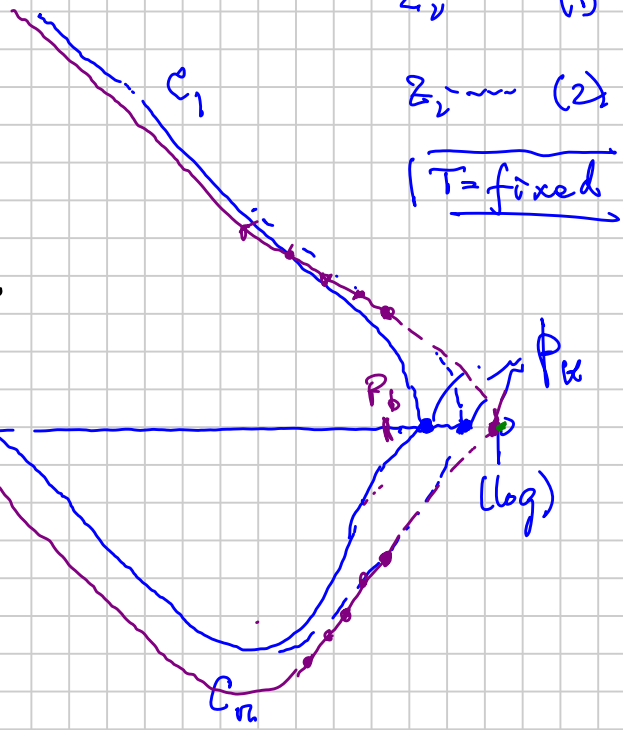
$y_i = x_i$

z_i (1)

$P_K = P_c$

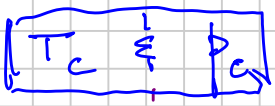
$(T = T_c)$

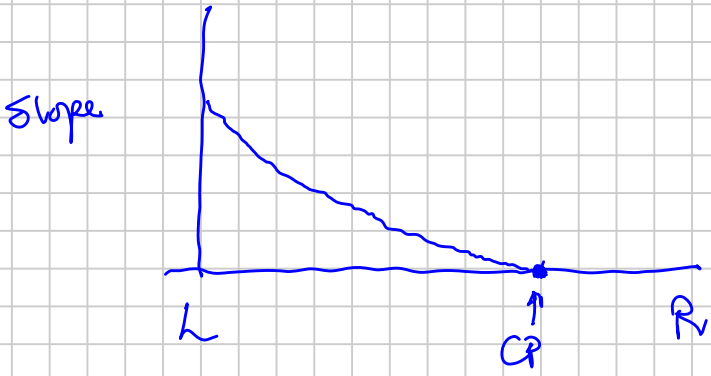




The Negative Flash

3-component system: $C_1 - C_3 - C_{12}$





Any composition along the critical tie line

① will have a true T_c equal to this system T_c.

② Flash of any w_i will yield $y_i = x_i = z_i$ and $f_v = \pm\infty$

$\Rightarrow$ $p > p_K(z_i, T)$ you can find a set of other compositions u_i which have a true critical point $(T_c, p_c)_{u_i} = (T, p_K)_{z_i}$.

u_i is on the critical tie line of z_i