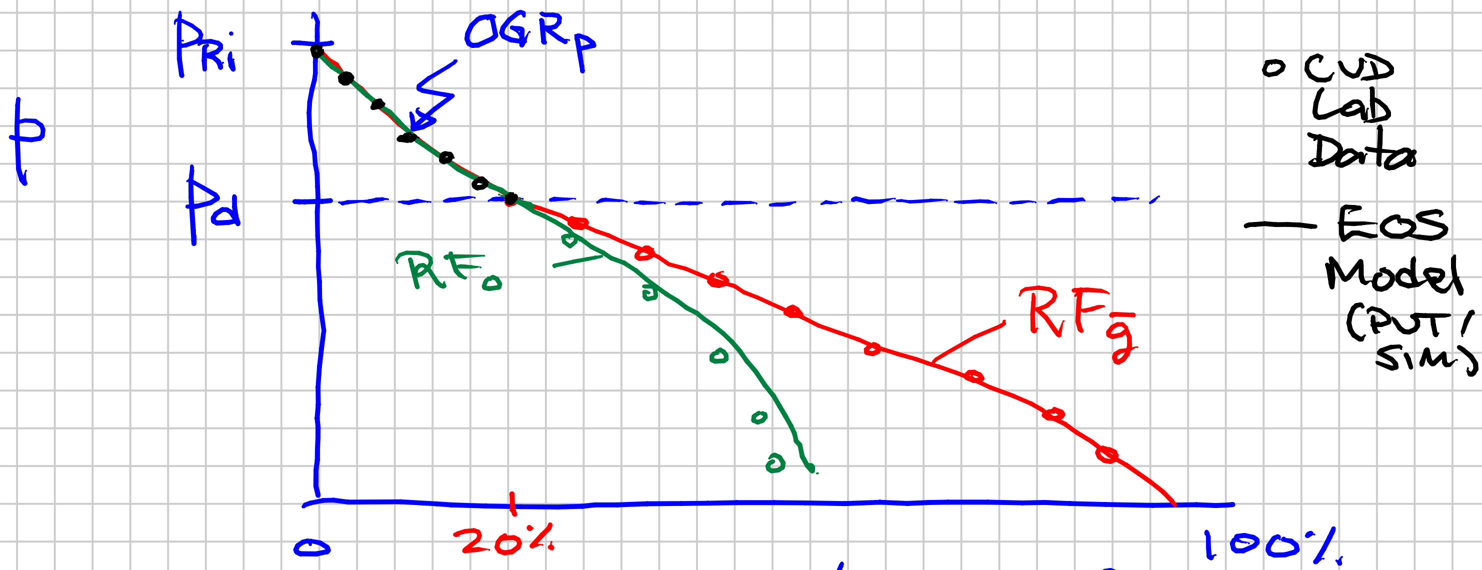
GAS CONDENSATE PVT – Depletion Recovery

Note Title 2012-02-24

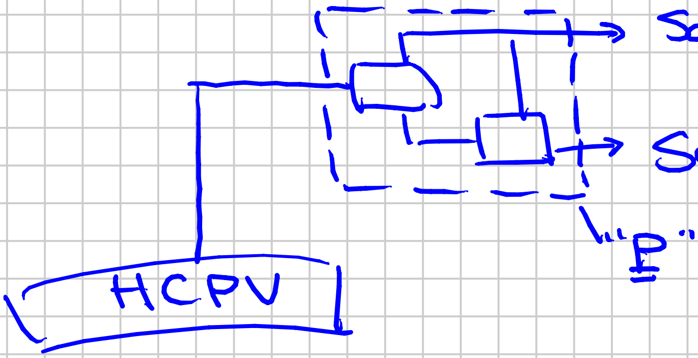
- EOS-based PVT Model
  - Defined consistently between the PVT simulator & Reservoir simulator
- Surface Process
  - Defined consistently between the PVT simulator & Reservoir simulator

If done properly then:

- Same initial GOR (OGR)
- Same (~ line thickness) $RF_o(p)$ & $RF_g(p)$ for depletion
  - CVD test for PVT simulator (PhazeComp)
  - Depletion for Reservoir simulator (SENSOR)



$$RF = \frac{N_p}{N} \text{ or } \frac{G_p}{G}$$



Sales Gas $\Rightarrow G$ (IGIP)

Surface Oil $\Rightarrow N$ (IOIP)

$$GOR_i = \frac{G}{N}$$

$$OGR_i = \frac{N}{G} \quad \frac{STB}{MMscf}$$

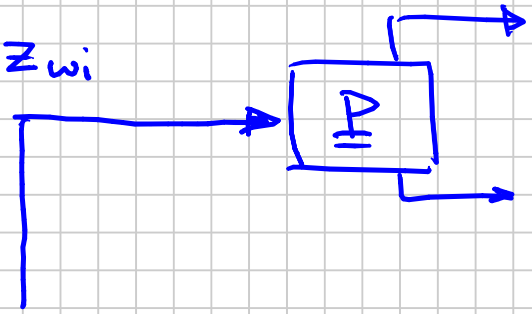
<u>$P_{Ri} \rightarrow P_d$</u> : $\frac{G_p^*}{G} = 0.2$

$$N_p = \int_{P_{Ri}}^{P_d} OGR_p \, dG_p = OGR_i \cdot G_p^*$$

$$OGR_p = OGR_i \quad \text{for } P_R \geq P_d$$

$$RF_{\bar{o}} = \frac{N_p}{N} = \frac{G_p \cdot OGR_i}{G \cdot OGR_i} = RF_{\bar{g}}.$$

$\underline{P}$: Component Liquid $RF_{\bar{o}i}$



$$n_{\bar{o}i} \equiv n_w z_{wi} \cdot RF_{\bar{o}i}$$

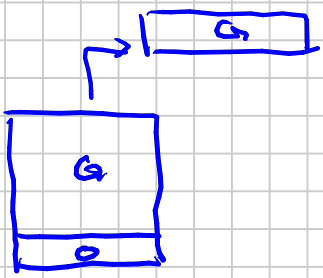
$RF_{\bar{o}i}$: 0 – 1

$$GOR = \frac{n_{\bar{g}} \cdot 379 \frac{scf}{lb\text{-}mole}}{n_{\bar{o}} \cdot \left(M_{\bar{o}} / \rho_{\bar{o}} \right) \cdot \frac{1 \ STB}{5.615 \ ft^3}}$$

$$= 2140 \, \frac{n_{\bar g}}{n_{\bar o}} \left(\frac{\rho_{\bar o}}{M_{\bar o}}\right) \quad \text{CVD Gas: } 2128 \, \frac{y_{\bar g}}{y_{\bar o}} (\;)$$

$$= 2128 \, \frac{(1-y_{\bar o})}{y_{\bar o}}$$

Wellstream from CVD test



(n_g) $\quad y_{\bar g} \quad y_{\bar o}$

$$\Rightarrow \frac{V_{\bar o}}{n_{\bar o}} = \frac{M_{\bar o}}{\rho_{\bar o}}$$

$$(M_{\bar o})_g = \frac{\cancel{\left(\sum (y_i \, RF_{\bar o i}) M_i\right)}}{\sum y_i \, RF_{\bar o i}}$$

$$(V_{\bar o})_g = \frac{(M_{\bar o})_g}{(\rho_{\bar o})_g}$$

$$(\rho_{\bar o})_g \cong \frac{\cancel{\left(\sum y_i \, RF_{\bar o i} \, M_i\right)}}{\sum \left(\frac{y_i \, RF_{\bar o i} \, M_i}{\rho_{Li}}\right)}$$

Sum masses

Sum ideal liquid volumes

$$= \frac{\sum \left(\frac{y_i \, RF_{\bar o i} \, M_i}{\rho_{Li}}\right)}{\sum y_i \, RF_{\bar o i}}$$

✓

$$GOR = 2128 \cdot \frac{1 - 0.0659}{0.0659} \left(\frac{0.781\,(62.4)}{133.66} \right)$$

$$= 11\,000 \text{ scf/STB} \quad \text{vs} \quad 11\,014$$

IGIP (G) & IOIP (N) ✓ GOR_i ✓

$n = 6.5061 \cdot 10^7$ lb-moles

RF_o	RF_g	P_R	
32.5	47.0	2011	K=100
33.1	46.8	2021	K=1000
33%	47%	2000	EOS Simulator

y-So