

GAS MATERIAL BALANCE

Note Title

5/26/2007

GAS PV EQ. - REAL GAS LAW

$$pV = nRTZ$$

Assumptions:

$$V = HCPV = \text{constant} \otimes$$

$$Z = f(p, T)$$

$$T = T_R = \text{const.}$$

$$n_R = n_i - n_p$$

Introduce: Surface Gas Volumes

$$V_{gsc} = \underbrace{\frac{RT_{sc}}{p_{sc}}}_{\substack{379 \text{ scf/lbmol} \\ 23.64 \text{ Sm}^3/\text{kgmol}}} \cdot n$$

$$(G) \quad IGIP = n_i \cdot 379$$

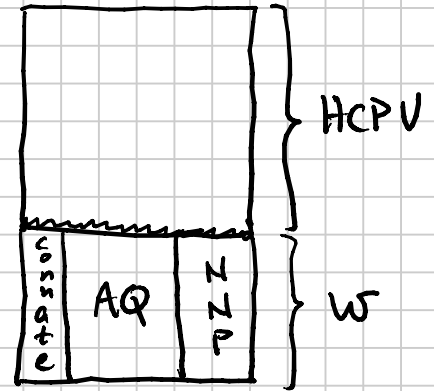
$$(G_p) \quad \text{Cum. Gas Prod.} = n_p \cdot 379$$

⇒ Straight-Line Gas. M.B

$$\left(\frac{p}{Z} \right) = \left(\frac{p}{Z} \right)_i \left(1 - \frac{G_p}{G} \right)$$

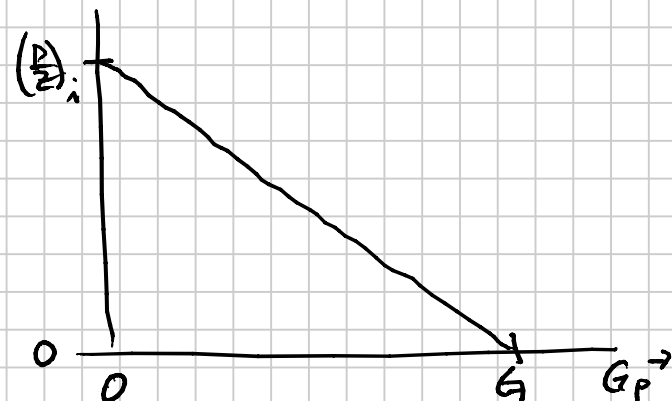
↑
RF

$$\frac{G_p}{G} = 1 - \frac{(p/Z)}{(p/Z)_i}$$



"Pot Aquifer"
Small AQ
High k

"S.C." 1 atm (14.7 psia)
60°F (15.56°C)



Pot Aquifer Model

$$\frac{P}{Z} \left[1 - \bar{c}_e (P_i - P) \right] = \left(\frac{P}{Z} \right)_i \left(1 - \frac{G_p}{G} \right)$$

$$\bar{c}_e = \frac{c_f + c_w S_{wc} + M (c_f + c_w)}{1 - S_{wc}}$$

$$S_{wc} \sim 0.25$$

$$c_f \sim c_w \sim 5 \cdot 10^{-6} \text{ psi}^{-1}$$

$$M \sim \frac{V_{AA}}{V_{PHC}} \sim 1-5 \text{ (Pot Ag.)}$$

} $c_e =$

$$\frac{G_p}{G} = 1 - \frac{\left(\frac{P}{Z} \right) \left[1 - \bar{c}_e (P_i - P) \right]}{\left(\frac{P}{Z} \right)_i}$$