

BLACK-OIL PVT TABLES - ECL100

JKIGC.ecl on Handouts

Same reservoir fluid as the gas condensate PVT report.

What are Black-oil PVT tables (Ch. 7)

① BO PVT Properties (Parameters)?
Surface Process

$$B, R_s, r_s = f(T, p, \underline{P}, S/U)$$

OIL PHASE

μ_o R_s B_o

$$B_o \equiv \frac{V_o(p, T)}{V_{oo}} \quad \text{same "v"}$$

$$R_s \equiv \frac{V_{go}}{V_{oo}}$$

GAS PHASE

μ_g $r_s (R_v)$ B_{gd}

$$B_{gd} \equiv \frac{V_g(p, T)}{V_{gg}}$$

$$r_s \equiv \frac{V_{og}}{V_{gg}}$$

Saturated Tables

$$p = p_b @ T \text{ ("x": } \underline{R_s})$$

$$p = p_d @ T \text{ ("y": } \underline{r_s})$$

	$p = p_b$	$\underline{R_s}$	$\underline{\mu_{ob}}$	$\underline{B_{ob}}$
P_{bi}	5200	$\underline{R_{s1}}$		
	5000	R_{s2}		

	$p = p_d$	$\underline{r_s}$	$\underline{\mu_{gd}}$	$\underline{B_{gd,d}}$
P_{di}	5200	r_{s1}		
	5000	r_{s2}		

4500
 ⋮
 250
 (15)

15 values

4500
 ⋮
 250
 (15)

Undersaturated Tables

For each saturated
 $\omega_{IL}(R_s, P_b)$, we need
 $\mu_o, B_o @ P > P_b$

Likewise for gas
 phases @ "U" pressures

15 "U" tables

(1) $\left. \begin{array}{ccc} P & \mu_o & B_o \\ \hline P_{u1} > P_{b1} & \checkmark & \checkmark \end{array} \right\} \begin{array}{c} \text{"U"} \\ R_{s1} \\ (P_{b1}) \end{array}$

⋮

P_{max}

(1) $\left. \begin{array}{ccc} P & \mu_g & B_{gd} \\ \hline P_{u1} > P_{d1} & \checkmark & \checkmark \end{array} \right\} \begin{array}{c} R_{s1} \\ \mu_g \\ B_{gd} \end{array}$

⋮

P_{max}

(2) R_{s2}

$\left. \begin{array}{ccc} P & \mu_o & B_o \\ \hline P_{u2} > P_{b2} & \checkmark & \checkmark \end{array} \right\} \begin{array}{c} R_{s2} \\ \mu_o \\ B_o \end{array}$

⋮

P_{max}

⋮

$P_{max} > P_{ri} > \underbrace{P_{mij,max}}$

(2) R_{s2}

$\left. \begin{array}{ccc} P & \mu_g & B_{gd} \\ \hline P_{u2} > P_{d2} & \checkmark & \checkmark \end{array} \right\} \begin{array}{c} R_{s2} \\ \mu_g \\ B_{gd} \end{array}$

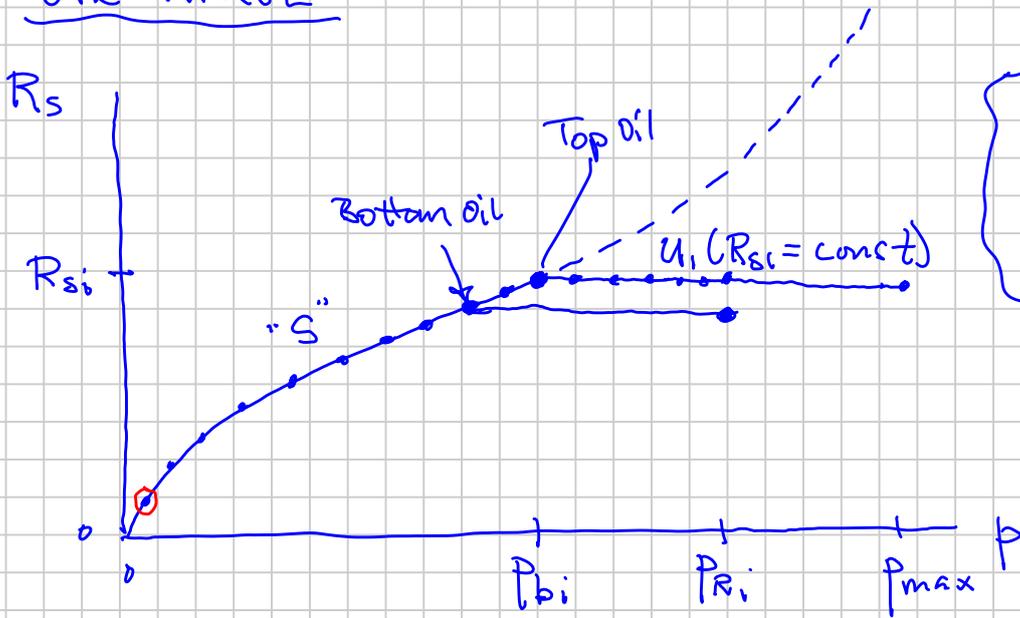
⋮

P_{max}

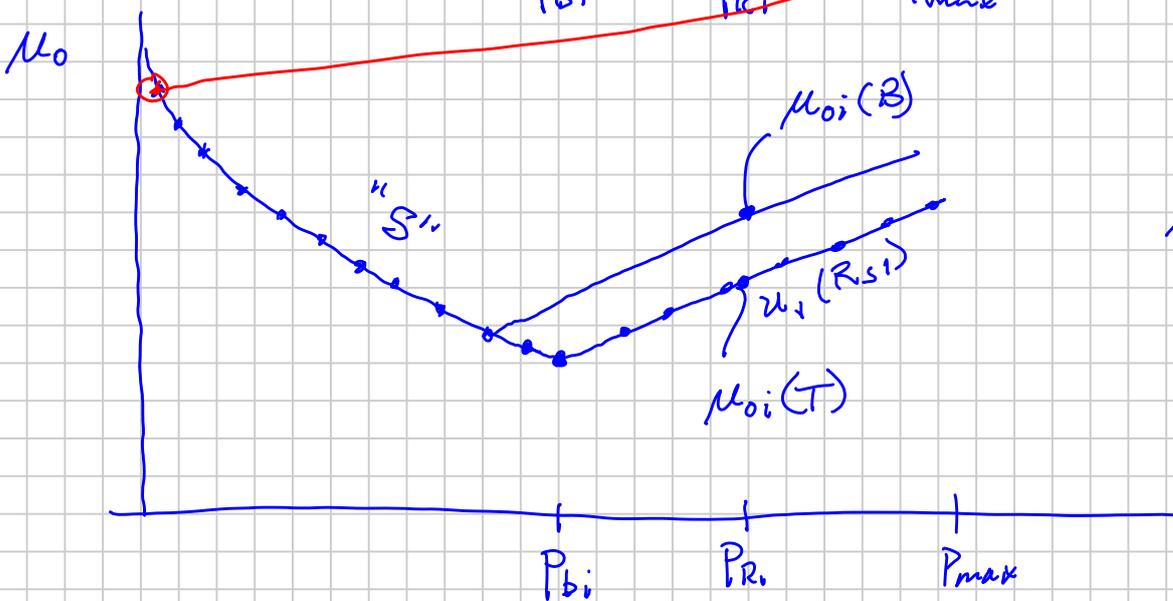
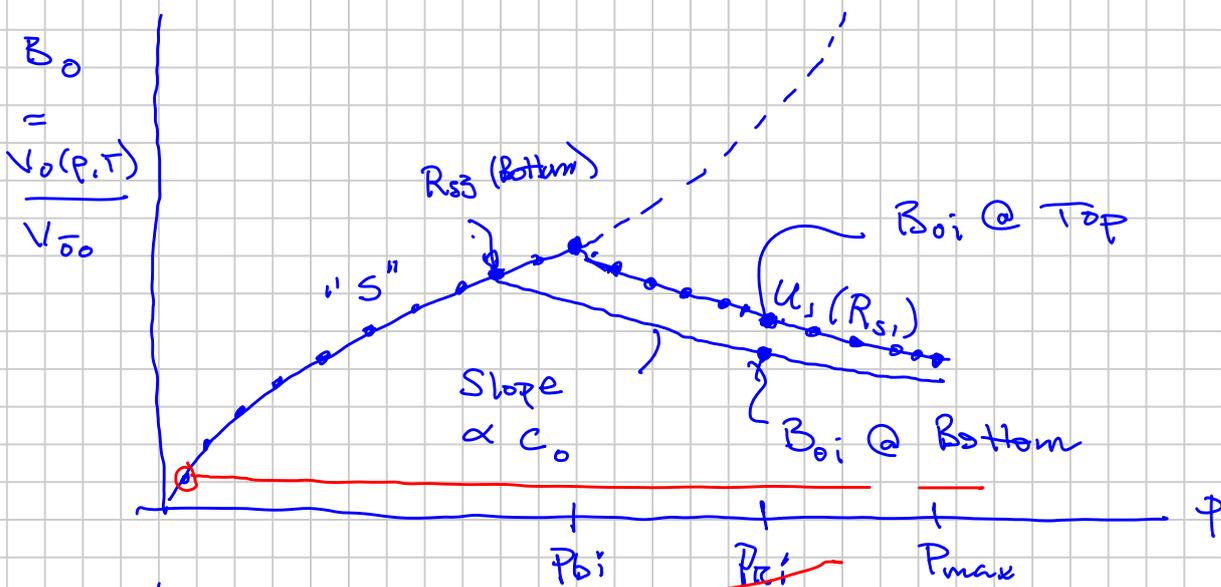
⋮

⋮

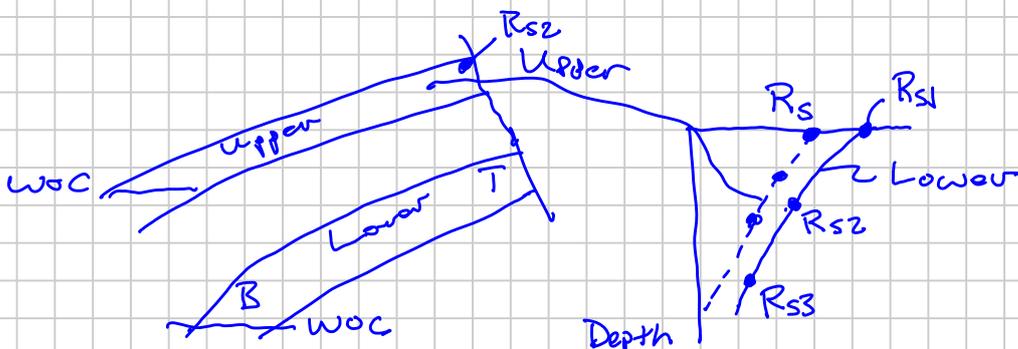
OIL PHASE



R_{s1} (max value)
 $\geq (R_{s1})_{\text{Reservoirs}}$ using the BOPF Table



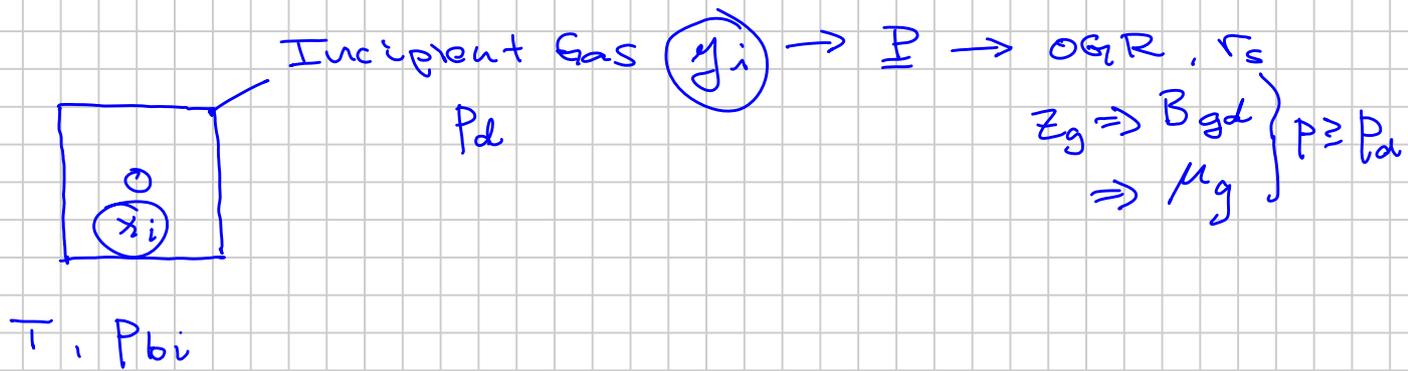
$\mu_o \propto p_o^4$



$p_{ri} \sim 7000$

ECLIPSE 100 Bo PVT FORMAT (PVT0 | PVTG)

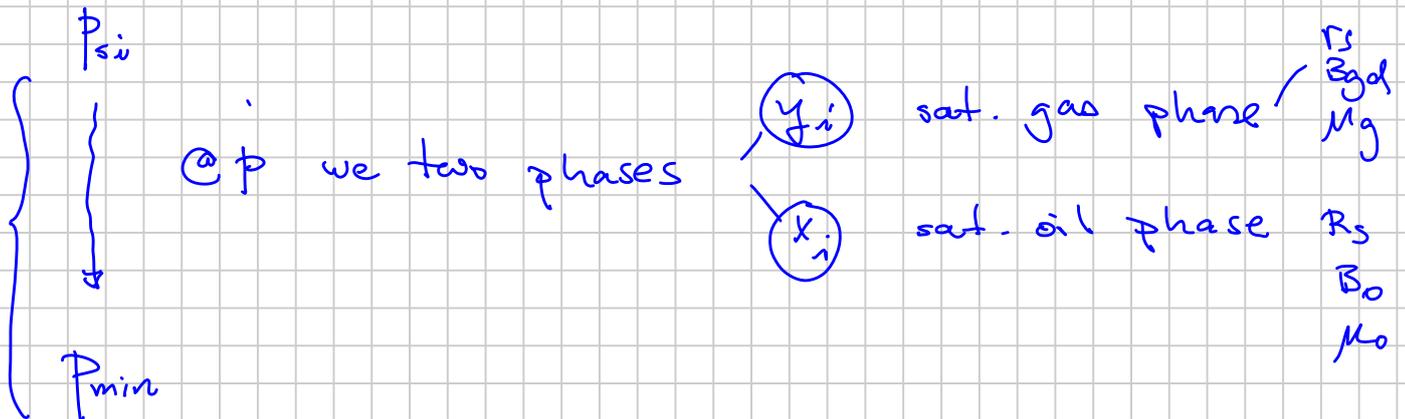
most commonly used



Saturated Stage 2, 3, ...

Depletion Test : CCE, CVD, DLE

① ② ③



Footnote:

Bo PVT Assumes surface gas $(\bar{g}) = \text{constant}$ $\delta_{\bar{g}}$
 surface oil $(\bar{o}) = \text{constant}$

$\int_{\bar{g}} = \text{constant}$ } but they aint! API
 $\int_{\bar{o}} = \text{constant}$ }

- which two values to choose?

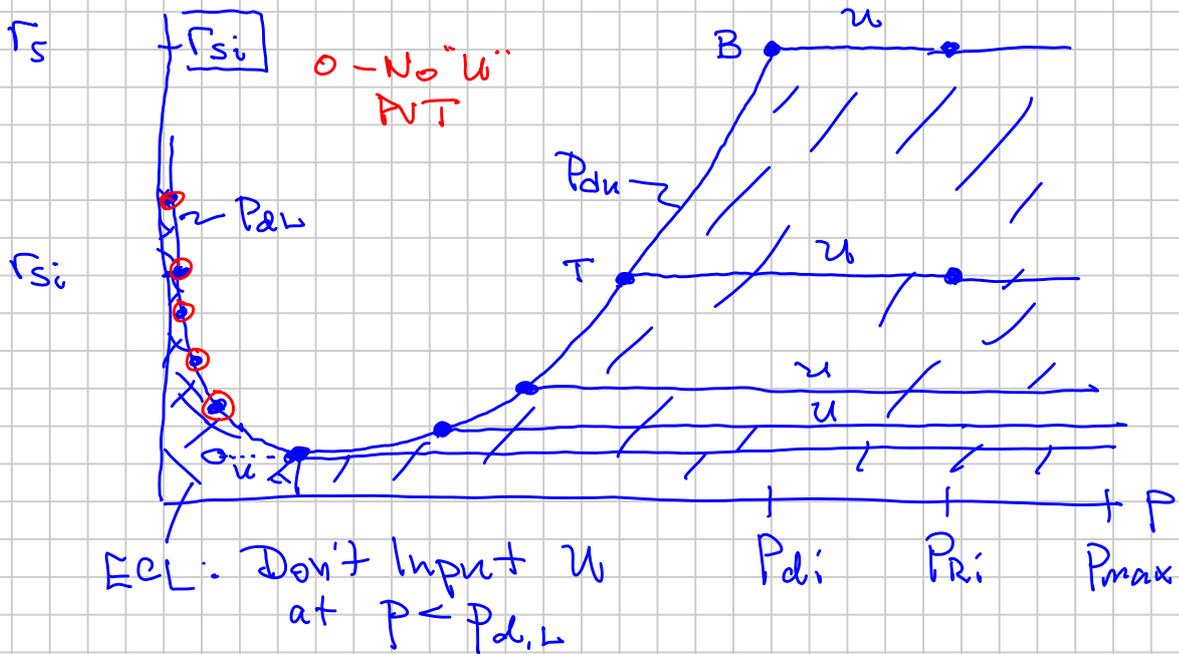
- what are these two values used for?

ONLY TO CALC:

$$\bullet \quad f_0(p) = \frac{f_0 + f_g \cdot R_S(p)}{B_0(p)}$$

$$f_g(p) = \frac{f_g + f_0 \cdot r_S(p)}{B_{gd}(p)}$$

Gas PVT G:



$B_{gd} (s | u)$

$M_g (s | u)$