PETE 310

Lecture # 20

Properties from Reservoir Fluid Studies Report

Recall Nomenclature…

TABLE 10–3

Nomenclature used in analysis of reservoir fluid studies

B_{oD} = relative oil volume by differential vaporization, page 5, column 3, Table 10–1

B_{oDb} = relative oil volume at bubble point by differential vaporization, page 5, column 3, Table 10–1

B_{oSb} = formation volume factor at bubble point from separator test (at selected separator pressure), page 7, column 6, Table 10–1

$(V_t/V_b)_F$ = relative total volume (oil and gas) by flash vaporization, page 4, column 2, Table 10–1

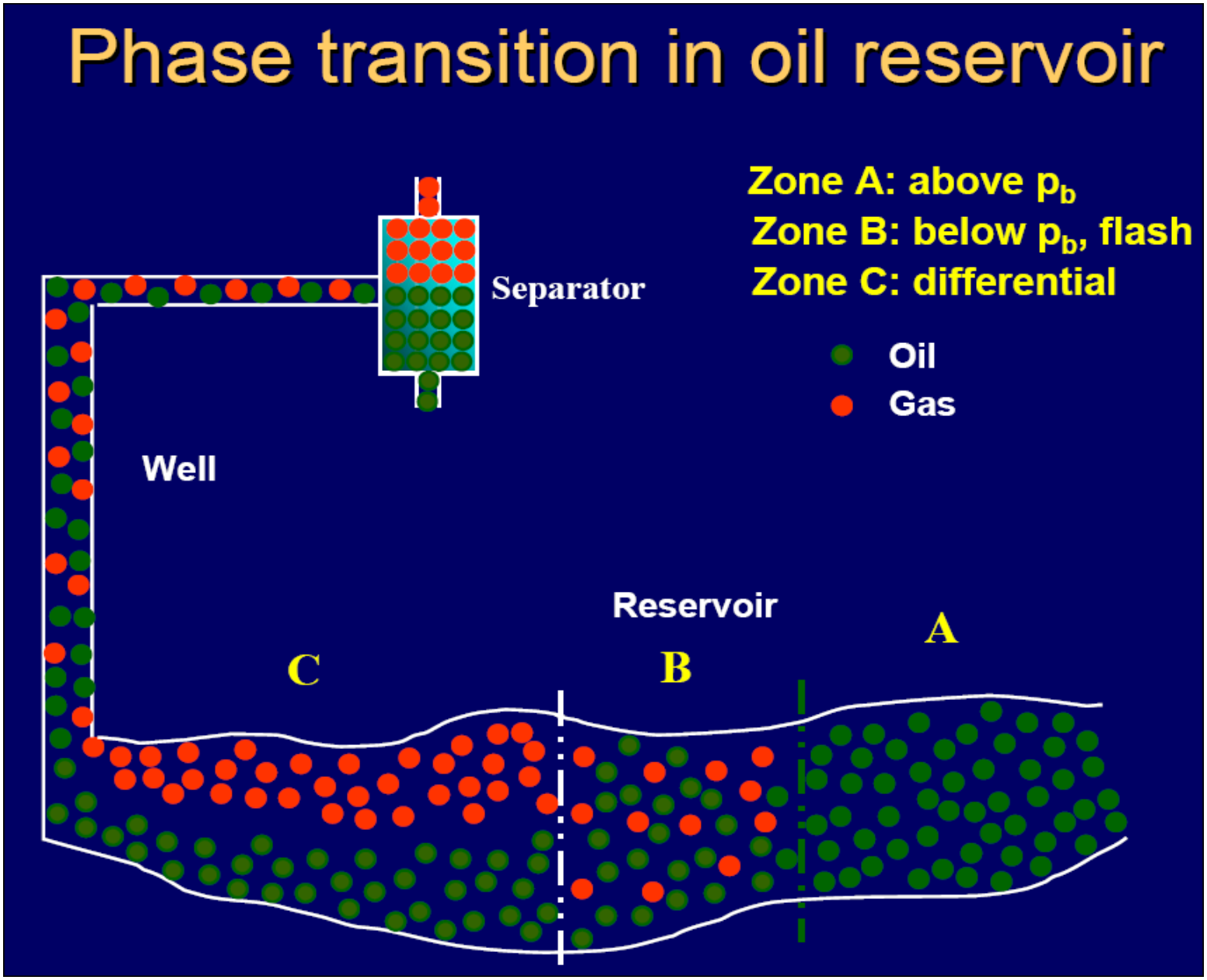
B_{tD} = relative total volume (oil and gas) by differential vaporization, page 5, column 4, Table 10–1

R_{sD} = gas remaining in solution by differential vaporization, page 5, column 2, Table 10–1

R_{sDb} = gas in solution at bubble point (and above) by differential vaporization, page 5, column 2, Table 10–1

R_{sSb} = sum of separator gas and stock-tank gas from separator test (at selected separator pressure), page 7, column 4, Table 10–1

Phase transition in oil reservoir



Assumptions

- **For $p > p_b$ fluid properties are computed by combining data from the CCE test and a separator test**

$$B_o = B_{oSb}\left(\frac{V_t}{V_b}\right)_{CCE} \quad p \geq p_b$$

Assumptions

- For $p < p_b$ the process in the reservoir can be simulated from a DL test, the region from the bottom of the well to the stock tank can be represented by a separator test
- Thus fluid properties for $p < p_b$ are computed by combining data from DL and separator tests

$$B_o = B_{oD} \frac{B_{oSb}}{B_{oDb}}$$

$$R_s = R_{sD} \frac{R_{sSb}}{R_{sDb}}$$

Note: Do not use expression for Rs in book – This is NEWER

Possible Exercises

- Given the following PVT reports determine
  - Isothermal compressibility at p=2200 psi
  - Bubble point pressure

Constant Mass Expansion at 150.0 F

Pressure psi	Rel Vol V/Vb	Compressibility 1/psi	Y-factor
3500	0.9643	9.44E-06	
3000	0.9698	1.02E-05	
2500	0.9757	1.11E-05	
2000	0.9823	1.22E-05	
1500	0.9896	1.34E-05	
1000	0.9977	1.49E-05	
500	1.5053		1.45

Possible Exercises

- Given the following PVT reports determine
  - B_o and R_s at p = 2000 psi (> p_b)

Constant Mass Expansion at 150.0 F

	Pressure psi	Rel Vol V/Vb	Compressibility 1/psi	Y-factor
	3500	0.9643	9.44E-06	
	3000	0.9698	1.02E-05	
	2500	0.9757	1.11E-05	
	2000	0.9823	1.22E-05	
	1500	0.9896	1.34E-05	
	1000	0.9977	1.49E-05	
Pb =	866	1.0000	1.54E-05	
	500	1.5053		1.45

Fluid : TEST 3 PT 1 SEP LIQUID BOTTLE # K-6000
Standard Characterization

Differential Depletion at 150.0 F

	Pressure psi	Oil Form Vol Fact Bod	Solution GOR (Rsd) Scf/bbl	Gas Form Vol Fact Bg	Res Oil Density lbm/ft3	Comp. Fact Z	Gas Gravity air=1
	866	1.206			44.16		
Pb =	866	1.206	307.0		44.16		
	600	1.165	223.2	0.026450	44.94	0.915	0.7638
	400	1.134	160.4	0.040427	45.54	0.932	0.8164
	200	1.097	90.2	0.082588	46.24	0.950	0.9526
	100	1.071	44.6	0.167457	46.71	0.960	1.1696
	14.7/60	1.000			49.17		

Exercise

- Given the following reports determine
  - B_o and R_s at p = 400 psia (< p_b)

Fluid : TEST 3 PT 1 SEP LIQUID BOTTLE # K-6000
Standard Characterization

1 Stage Separator Test

Pressure psi	Temp F	Gas Oil Ratio Scf/bbl STO	Gas Gravity Air = 1	Oil Density lbm/ft3	Formation Factor bbl/bbl STO
866	150.0			44.2	1.210
150	100.0	224.2	0.843	47.5	1.070
15	60.0	90.0	1.294	49.2	1.000