

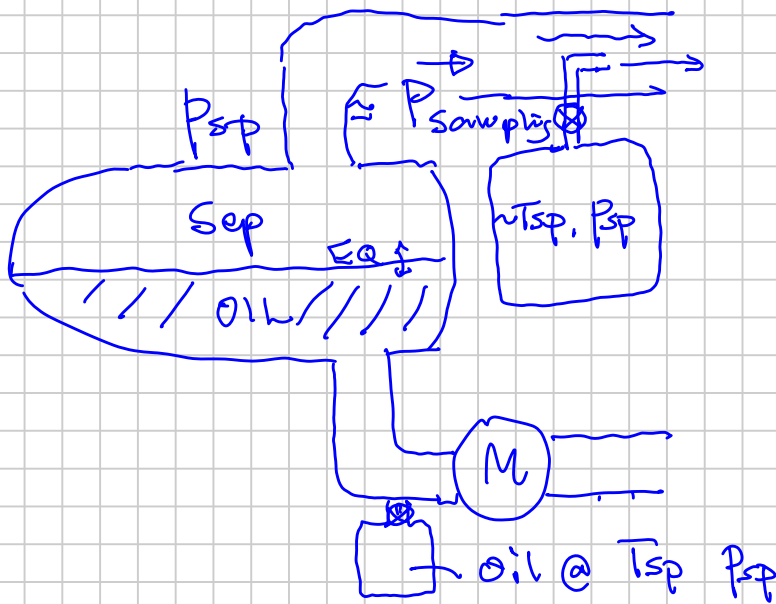
Chapter 6

PVT Laboratory Tests

- * QC Samples (checking if leakage during transport)
- * Compositional Analysis (w_i, z_i, y_i, x_i)
- * PVT Experiments
 - CCE : Constant Composition Exp.
 - SEP : Multi-stage Surface Separation
 - DLE : Differential Liberation Exp.
 - CVD : Constant Volume Depletion

Sample QC :

- Separator Samples
 - Sep. Gas



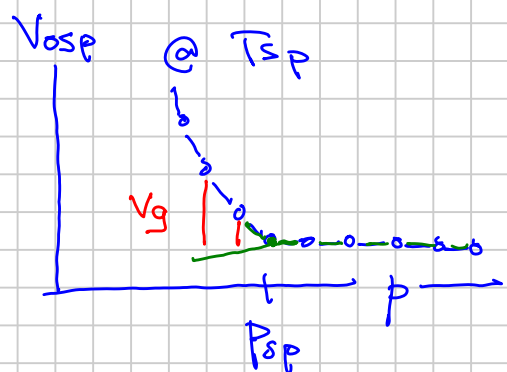
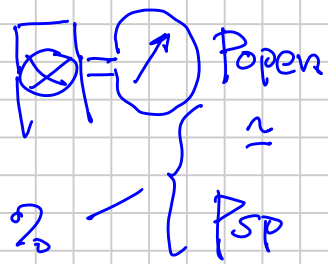
QC Sep. Oil : $P_b(T_{sp}) = P_{sp}$
 $\pm 5\%$

$$pV = nRTZ$$

$$\left(\frac{P}{T}\right)_{sp} \approx \left(\frac{P}{T}\right)_{lab}$$

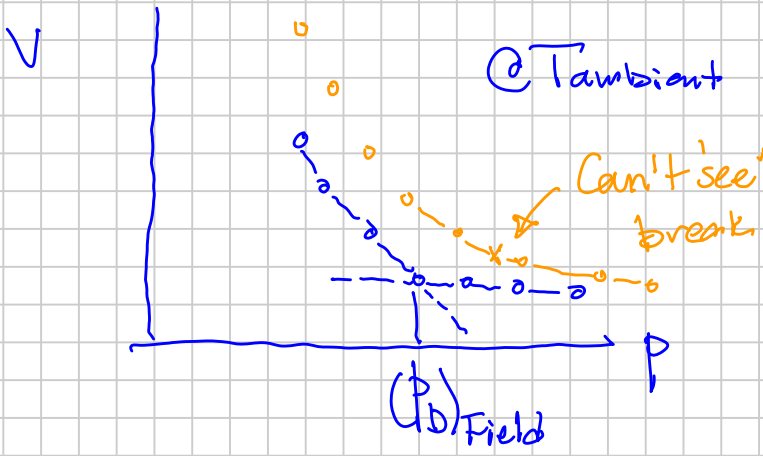
$T_{lab} \neq$

Lab bring to (T_{sp})



• BHS (Oil)

higher GOR Oil (≥ 1500 scf/STB
 ~ 300 Sm³/Sm³)



Lab would do the same test @ Tambient

$$(P_b)_{Field} \approx (P_b)_{Lab}$$

± 5%

* (2) Measure Compositions

↳ Amounts (mass → moles) of each component

N₂ CO₂ H₂S | C₁ C₂ C₃ iC₄ nC₄ iC₅ nC₅ |

Bunch of HC isomers C₁₁ C₁₂ C₁₃ ... C_{N+}
C₆ ... C₁₀
 80-90s



↳ M_{N+} (Y_{N+})
 ± 10-15% Accuracy < 1%
 Vary (for a given C_{N+}) from reservoir to reservoir

C₇₊ : measured
 > C₁₀₊ : back-calculated

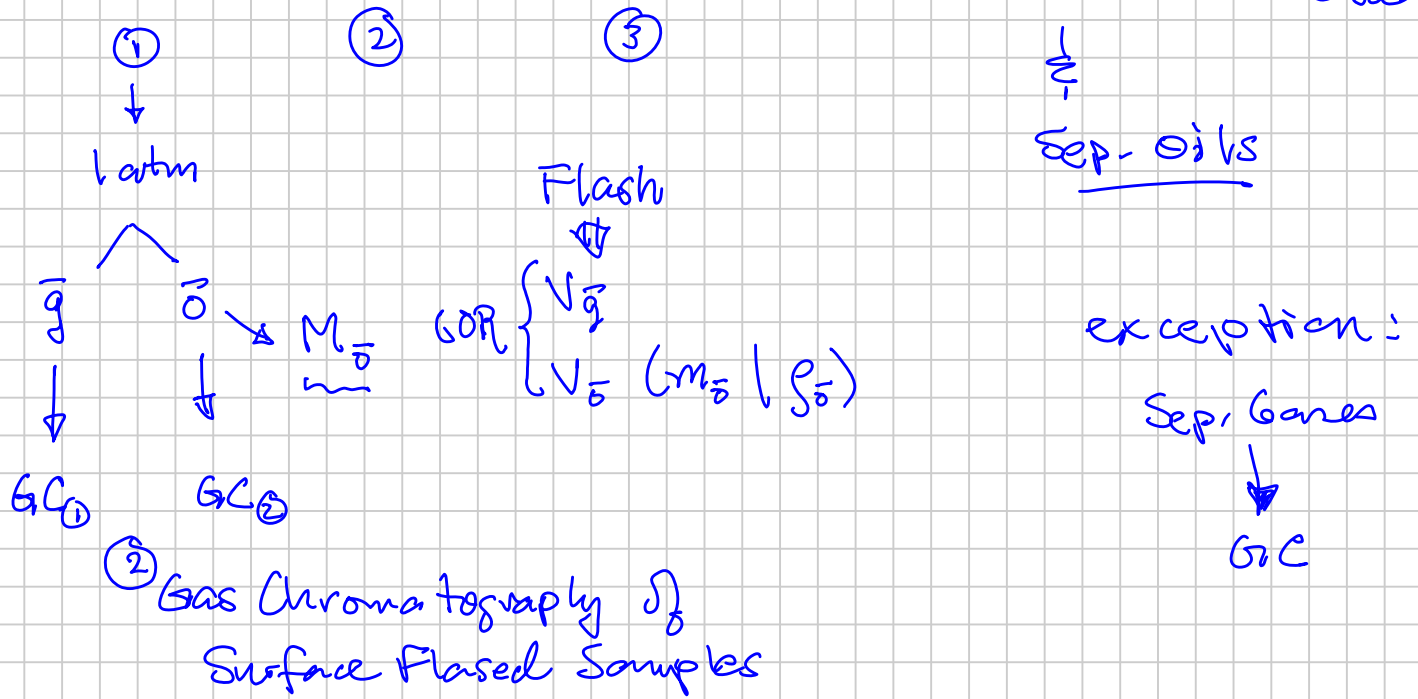
$$M_{NT} \geq M_{CN} \rightarrow \text{higher}$$

Reservoir	C_{10+}	γ_{10+}	Character
Curtis	195	0.846	(normal)
Sugh	195	0.792	(paraffinic)
LA	195	0.892	(aromatic)

Compositional Analysis - Gas Chromatography (lower-p device)

Pressurized Samples 10-100-500+ bar

Flash - GC - Recombine : All BHS (MDT Cased Hole)



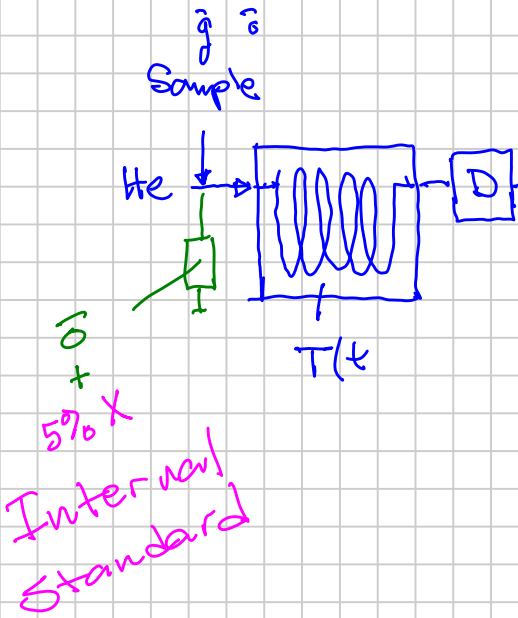
Recombine $\bar{g} \bar{o}$

C_1 total amount was in the sample

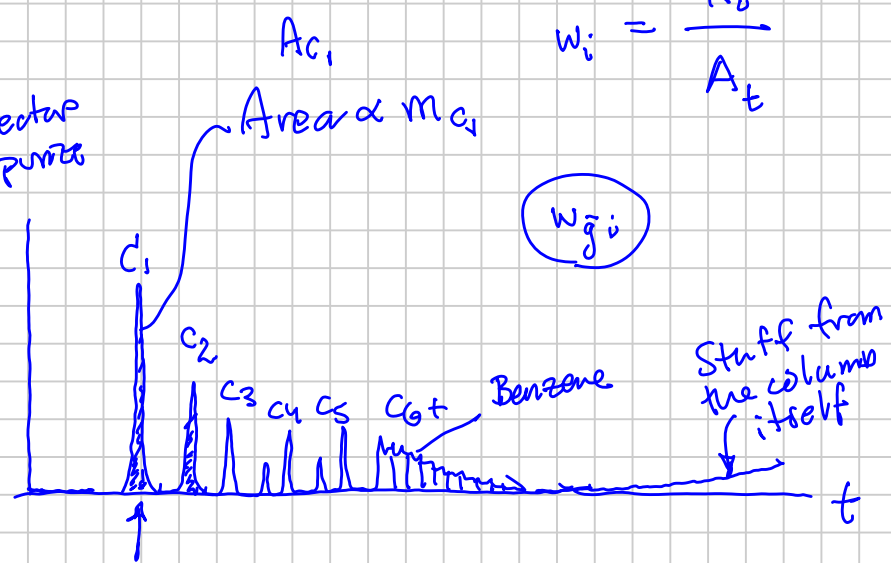
C_2 - " -

⋮
C_b
⋮

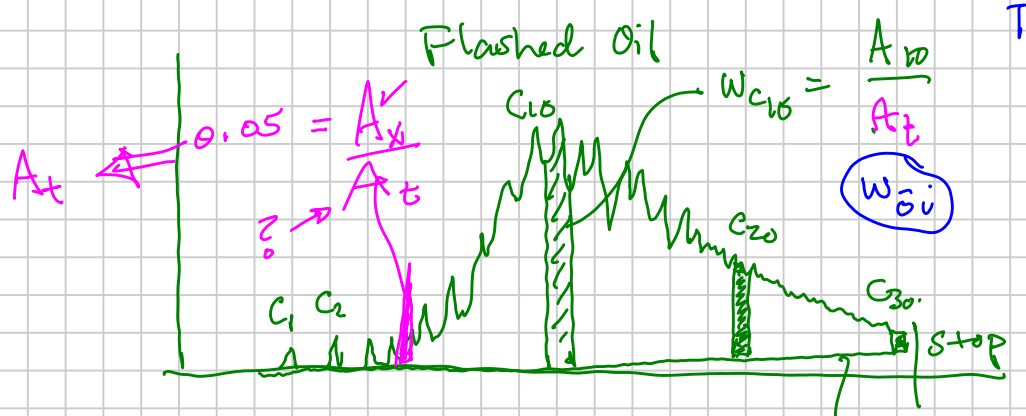
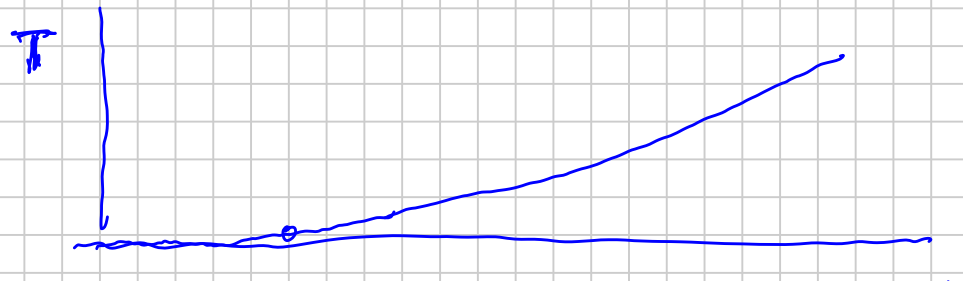
G.C doing ?



Detector Response



$$w_i = \frac{A_i}{A_t}$$



$$w_{C_{10}} = \frac{A_{C_{10}}}{A_t}$$

GOR \rightarrow

$$m_{\bar{g}} \quad y_{\bar{g}i} \Rightarrow n_{\bar{g}}$$

$$m_{\bar{o}} \quad w_{\bar{o}i} \Rightarrow x_{\bar{o}i} \quad n_{\bar{o}}$$

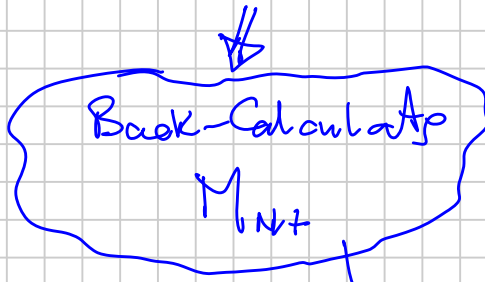
$$\approx M_{\bar{o}i}$$

$$(M_{\bar{o}})_{lab} = \frac{\sum w_{\bar{o}i}}{\sum \frac{w_{\bar{o}i}}{M_{\bar{o}i}}} = \frac{1}{\sum \frac{w_{\bar{o}i}}{M_{\bar{o}i}}}$$

est. $\frac{1}{2} \pm$

$w_{\bar{o}i}$ $i > C_{25}$
 \pm

Some labs $i = C_6 \dots C_{N-1}$: { Use Table 5.2 }
 use $w-C_i$
 Other est.



Not used much/at all

Recombination:

$$y_{\bar{g}i} = \frac{w_{\bar{g}i}}{M_{ij}} \bigg/ \left(\sum_{j=1}^N \frac{w_{\bar{g}j}}{M_{ij}} \right)$$

$$x_{\bar{o}i} = \frac{w_{\bar{o}i}}{M_i} \bigg/ \left(\sum_{j=1}^N \frac{w_{\bar{o}j}}{M_j} \right)$$

52.3681 mol% C_1 ± 0.5-2 mol-% for C_1
 C_{7+}

Sample $z_i = f_g y_{\bar{g}i} + (1-f_g) x_{\bar{o}i}$

$$f_g = \frac{1}{1 + \frac{1}{GOR} \left(\frac{P_5}{M_{\bar{o}}} \right) \left(\frac{RT_{sc}}{P_{s0}} \right)}$$