Reservoarfluider og Strømning

Reservoir Fluids and Flow

Course TPG 4145

Problem 4 – Conventional PVT Measurements

Handed Out: 2016-03-02 (Wed) <u>Due Date</u>: 2016-03-15 (Tues)

General

The fluid data given by the lab is often given in a form that is not directly applicable to (and should never be used directly in) engineering calculations. This assignment is an exercise in converting DLE, CCE, and SEP lab data to a Black Oil (BO) PVT table. Both the necessary lab data and the empty BO table to be filled out are given in the provided Excel file. Use Field Units (you can create a 2nd solution sheet with results in SPE preferred SI units, optionally).

Part 1:

- A. Given the results of the multi-stage separator test, which separator pressure is recommended to this for well? HINT: the highest stock-tank (surface) oil volume is desired.
- B. Assuming that the optimal separator pressure from problem A is used, find the following from the constant composition (CCE) and separator test (SEP):
 - p_b
 - B_{ob}
 - R_{sb}
 - ρ_o (surface oil) density and/or specific gravity
 - ρ_q (surface average gas) density and/or specific gravity

Part 2:

The solution GOR $R_{sd}(p)$ and relative oil volume $B_{od}(p)$ obtained from a DLE experiment are volume ratios with respect to residual oil. These numbers can be converted to "separator-flash" GOR $R_s(p)$ and FVF $B_o(p)$ using results from the separator test and the CCE test.

- A. Assuming that the optimal separator pressure from Part A is used, calculate the R_s(p) and B_o(p) for saturated conditions (p≤p_b). Plot R_s(p) and B_o(p) on same figure, left y-axis B_o and right y-axis R_s.
- B. Calculate the $B_o(p)$ for undersaturated conditions (p>p_b) for the initial oil (with $R_s=R_{sb}$). Add to plot of saturated $B_o(p)$ in part A.
- C. A separate DLE experiment is performed (on the same fluid) to determine the viscosity, but are reported at different pressures than those in the first DLE experiment. Use interpolation to determine the viscosity at the pressures specified in the black oil table. Plot $\mu_0(p)$.
- D. Calculate oil densities for all pressures at reservoir temperature using black-oil PVT tables. Plot $\mu_o(\rho_o)$ for all pressures, saturated and undersaturated.
- E. Plot saturated B_0 vs R_s . Discuss and explain the apparent intercept at $R_s=0$ that is greater than 1.