Reservoarfluider og Strømning

Reservoir Fluids and Flow Course TPG 4145

Problem 5 – Gas Rate Equation

Handed Out: 2016-04-05 (Tuesday) <u>Due Date</u>: 2016-04-14 (Thursday)

General

This problem will use the data and results from Well "C" in the M.J. Fetkovich paper "Multipoint Testing of Gas Wells".

- A. Replot Fig. 10. Compare the A and B given by Fetkovich with the A and B determined by "Trend Line" using Excel (with only the three highest rates). Use the Fetkovich-reported values in any calculations or work below.
- B. Replot a new version of Fig. 10 for the first four rates (before cleanup), ignoring the 4th point which indicates some cleanup has started. Redo calculations given on pages 17-18 of the paper for these (pre-cleanup) values of A and B.
- C. Replot Fig. 8 using log-log scale (do not use delta pressure squared in "thousands", just give the values with an exponential format 1.0E7, 1.0E6, etc.). Use two series, one for the first four points and one for the last four points. Try to make the grids "square" where one log cycle on the x-axis has the same (visual) length as one log cycle on the y-axis. Use Trendline analysis in Excel to find the values of slope and intercept which translate into C and n; compare with the values given by Fetkovich for before and after cleanup. When doing the Trendline analysis, use only the three points that you think should be used for pre- and post-cleanup sets of data; explain your choice.
- D. For post-cleanup value of A and B, make a log-log backpressure figure with (1) the line representing only Darcy (laminar) flow, (2) the line representing only non-Darcy or "turbulent" high-velocity flow, and (3) adding the two lines together to get the composite (total) pressure drop representing the reservoir backpressure line. Plot only from initial reservoir pressure (end point) down to a rate of 10 scf/D.
- E. Plot on linear scale the inflow performance relation (IPR) given by gas rate on the x-axis and flowing bottomhole pressure on the y-axis. Make IPR curves for (1) initial reservoir pressure p_R=p_{Ri}, (2) p_R=1000 psia and (3) p_R=500 psia. Plot the four post-cleanup test points on the same figure. Identify (label) Absolute Open Flow Potential (AOFP) values for each of the three curves.
- F. How much does the AOFP change (at initial pressure, p_R=p_{Ri}) if the partial penetration skin is completely removed by perforating the entire thickness of the reservoir?