NORWEGIAN UNIVERSITY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF PETROLEUM ENGINEERING
AND APPLIED GEOPHYSICS

Contact during exam:
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Exam results are due in week x, 2006.

EXAM IN COURSE
TPG4145 RESERVOIR FLUIDS

Wednesday December 5, 2005

Time: 0900 – 1300

Permitted aids:
C:

- Any written and handwritten materials are permitted. Certain, specified calculator are permitted.

General Description

The exam assumes a 2005 TPG4145 Project has been completed and delivered.

All PVT and relative permeability properties are identical to the original class Project. This is also valid for the porosity. The geological description, however, has changed.

A single-well radial fine-gridded model has been built. In the new geological model, a shale break is located at the gas-oil contact at 6550 ft, sealing the gas zone completely from the oil zone. The gas-oil contact is located half way through the 100-ft sand zone (6500-6600 ft), with 50-ft gas and 50-ft oil. There is no bottom water below the oil zone in this well. The outer radius for the well model is 2000 ft, and the wellbore radius is 0.33 ft. Initial pressure at the GOC is 2800 psia at 6550 ft. The well produces from both gas and oil zones at a constant bottomhole flowing pressure of 500 psia. A zero skin is assumed for the well.

The simulation results show the following behavior of rate-time:

Gas Zone Gas Rate Decline: qgi=18.365 MMscf/D, b=0.173, Dg=0.00188 1/day.

Oil Zone Oil Rate Decline: qoi=1605 STB/D, b=0, Do=0.000728 1/day.
Oil Zone Gas Rate: qg = 1 MMscf/D (approximately constant).

where the Rate Decline equation is $q = qi/[1 + bDt]^{(1/b)}$

Problems:

1. Calculate IOIP in RG (gas zone) and RO (oil zone).

2. Calculate IGIP in RG (gas zone) and RO (oil zone).

3. After 2000 days, calculate the gas flow velocity (ft/d) in the gas zone at the wellbore.

4. After 2000 days, calculate the gas flow velocity (ft/d) in the oil zone at the wellbore.

5. After 2000 days, calculate the oil flow velocity (ft/d) in the oil zone at the wellbore.

6. When the Gas Zone reaches an average pressure of 2000 psia, estimate the producing GOR from the Gas Zone.

7. Assuming the well is on top of the reservoir structure, and further downdip on the flanks a water-oil contact exists at 7000 ft. Calculate the pressure at the water-oil contact.

8. Which Zone (Gas or Oil) will deplete more rapidly – i.e. which Zone average pressure will drop faster. Explain your answer.

9. If the well was initially stimulated with a skin of -4, estimate the new qgi and Dg values and the new qoi and Do values. Assume b values and ultimate recoveries from the Gas Zone and the Oil Zone are unchanged by the stimulation treatment.

10. Describe (in words) how the well performance (rate-time behavior) and recovery from Gas and Oil Zones would change if the shale break at the GOC was not sealing.