Arbuckle Water Control Program

Tertiary Oil Recovery Project
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Arbuckle Gel Program

- Objectives
- Current Practice
- TORP Program
- Pressure Buildup Analysis
- Pressure Data During Gel Treatment
- Analysis of Data
Objectives

- Develop improved understanding of gelant behavior during treatment
- Improve design of treatment
  - Treatment Size (Predictable?)
  - Concentration Sequence
- Post treatment -- investigate methods of reduce water production after gel treatment
Current Practice

- 2000-4000 barrels of gelant (if injection and budget allows)
- Staged concentration (3500 ppm, 5000 ppm, 6500 ppm)
- Formulations gel in 24 hours at reservoir temperature (~106°F), 72-96 hours at room temperature
- Some wells pressure up
- Most are treated on vacuum so pressure behavior during gel placement is unknown
- Oil/water overflush to clear tubing, wellbore
Objectives: Determine if pressure data obtained prior to, during and after treatment can be used to design and interpret results of treatment.

Approach: Obtain pressure data from:
- Fluid levels from buildup tests before treatment
- Downhole pressure gauge during treatment
- Buildup at some point after well is on production
Pressure Buildup Program

- Seven well program-Arbuckle wells
- Fluid level determined at preset times using computerized Echometer
- Fluid levels converted to bottom hole pressures
- Buildup analyzed to estimate reservoir/well properties using state of the art software
Analysis of Pressure Buildup Data

Expectations:

- Identification of dominate flow region in the vicinity of the well
  - Matrix flow (radial or linear)
  - Fracture flow
- Extent of fracturing if present
- Average permeability of matrix rock
- Ambiguity
Buildup-Vess Hall B#4

- Bemis Shutts Field-Ellis County
- Depth~2900 feet
- Net pay open-10 feet
- Water production rate 611 B/D
- Oil production rate 6 B/D
- Static BHP 935.3 psig
- Producing BHP 501. psig
Hall B#4

Data
Simulated

Perm = 500 md
h = 50 ft
Partial penetration
Interval open - 8 ft
Gel Treatment-Hall B#4

- 0.75 BPM (1080 B/D)
- Down tubing on packer
- 976 bbl --- 3500 ppm
- 988 bbl --- 5000 ppm
- 264 bbl --- 6500 ppm
- 100 bbl oil overflush
- Shut in
Hall B#4

6500 ppm
Radial Flow-no retention

Vess Hall B4
Open Interval 10 ft
Gel Treatment-Hadley A#3

- 0.75 BPM (1080 B/D)
- Down tubing on packer
- 1997 bbl --- 3500 ppm
- 1482 bbl --- 5000 ppm
- 506 bbl --- 6500 ppm
- 100 bbl water overflush
- Shut in
Buildup-Hadley A#3

- Bemis Shutts Field-Ellis County
- Net pay open- 8 feet
- Water production rate  733 B/D
- Oil production rate         7.5 B/D
- Static BHP  1099 psig
McCord A#4

- Bemis Shutts Field
- Net pay open-38 feet
- Oil column 64 feet
- Water production rate 684 B/D
- Oil production rate 7 B/D
- Static BHP 954 psig
- Production BHP 476 psig
McCord A#4
Open Interval 38 feet
Net Pay~64 feet
Perm-246 md
McCord A#4-Treatment

- 448 bbls-3500 ppm
- 85 bbls-6000 ppm
- 100 bbls-oil overflush
- 335 psi surface pressure at 543 end of 6000 ppm injection
- Down hole pressure gauge
- Mysteries remain