Artificial Lift in High GOR Horizontal Wells

• 26 people
  – Engineers, Foremen, Automation
  – Chesapeake, EOG, Chevron, Newfield
  – Weatherford, CDI Energy Services
  – Some late comers who did not get introduced
Artificial Lift in High GOR Horizontal Wells

• Michigan Low Pressure Oil Wells – drilled with sump in vertical section

• Austin Chalk (early 90’s until today)
  – Success as long as pump at less than 90°
  – No special cages, valves or equipment needed
  – Thousands of installations
    • At kick off point, down to toe and everywhere in between.
  – Increased Failures when below kickoff point
Artificial Lift in High GOR Horizontal Wells

- North East Texas Panhandle (Cleveland Sand)
  - Plunger lift extremely successful (+/- 200 wells)
  - Wells have scale and paraffin
  - 1500 – 2000’ lateral
  - 60º best place for plunger lift and rod pump
  - Brush and standard plungers had same result – if paying attention
    - No real idea how far down plunger is going
Artificial Lift in High GOR Horizontal Wells

- North East Texas Panhandle (Cleveland Sand)
  - 38 rod pumped wells
    - 28 are “Golden Child”
    - 10 are problem wells
      - 250 to 600# side loads
      - Rod parts (body) & Tubing failures
      - Both above the kick off point
      - Gas locking, gas interference
  - Running wheeled rod guides –
    - Too early to determine success or failure
    - New tubing and rods installed with wheeled guides
Artificial Lift in High GOR Horizontal Wells

• Barnett Shale
  – Two piece plungers are not sticking when well sees increased fluid (and more sand)
  – 8 to 12 month run on plungers
  – Get plunger into well before it loads up.
    • If well loads up at 350mcf, install plunger at 500mcf
    • Wait too long and get introduced to a bunch of sand when well first unloads
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- EOG trying some “Dip Strings”
  - 4 ½” Casing with 2 3/8” Tubing
  - Smaller slugs
    - Lower peaks, higher valleys
  - Push Dip String in as far as possible

- EOG one Beam well in Barnett Shale
  - Set intake at 1st low spot
  - Pumped fine for one week
  - Sand packed off between casing & tubing
    - Expected sand was falling back down low side of casing and collecting around tubing
Artificial Lift in High GOR Horizontal Wells

- Weatherford – Gas Lift
  - As much as 80°
  - Can’t lower bottom hole pressure when at 90°
  - No problem with sand
  - Increased velocity = increased fluid movement
  - Flowline accelerator may help with slugging
Artificial Lift in High GOR Horizontal Wells

- Weatherford expects hydraulic pumps to improve in coming years
  - 5500’ maximum depth today
- EOG just installed Chamber Lift
  - 6000 TVD
  - < 25 BPD
  - Possible paper in 2009 (come on Bill)
Artificial Lift in High GOR Horizontal Wells - Conclusions

• Gas wells are more difficult to artificially lift from below the kickoff point
• Dumping tubing full of water back into formation can be a pain in the gas
• Some Operators and vendors recommend plungers at no more than 45°
  – Some go to 60°
Artificial Lift in High GOR Horizontal Wells - Conclusions

- Line fluctuations impact velocity and production
- Design drilling so that Artificial Lift can be done in 5 – 15 years
  - Drill rathole for drainage if possible
    - Pump set in vertical section
- Best application – Heal Low & Toe High