Oil & Gas Well Drilling

A Brief Overview of Oil/Gas Well Drilling, Completion, Production, & Potential Contamination Issues

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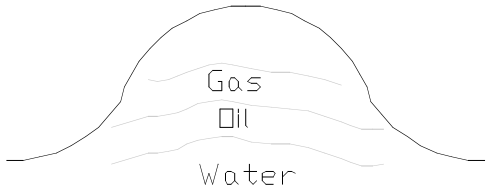
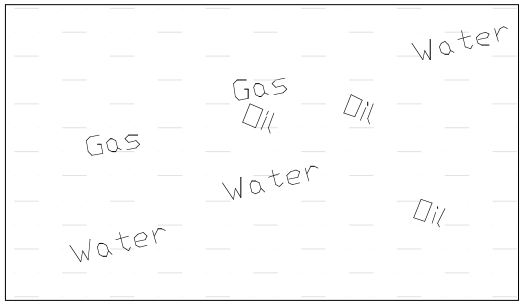
Oil/Gas Reservoir

- Classic versus Reality
- Reservoir is not neatly stratified
- Oil, gas, & water are intermixed



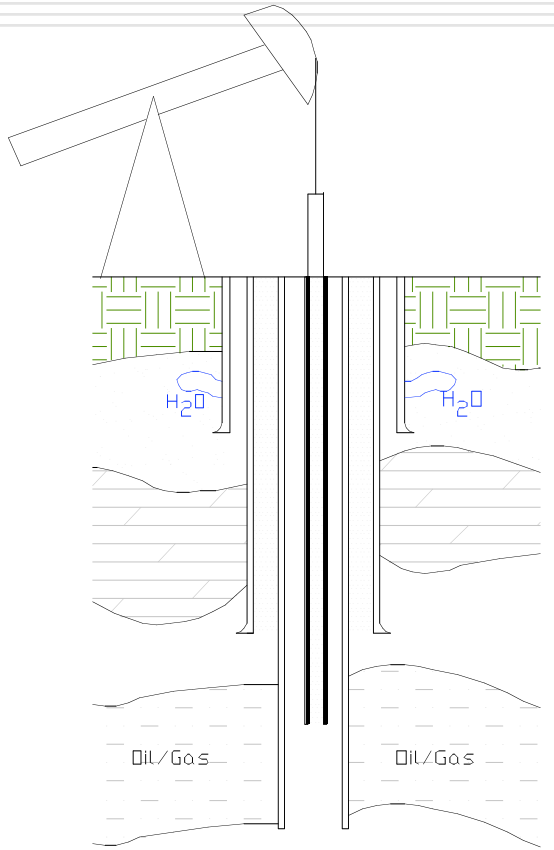
Ideal Oil and Gas Reservoir



Actual Oil and Gas Reservoir

Life of Oil & Gas Wells

- Exploration
- Drilling
- Completion/Treatment
- Production
- Closure

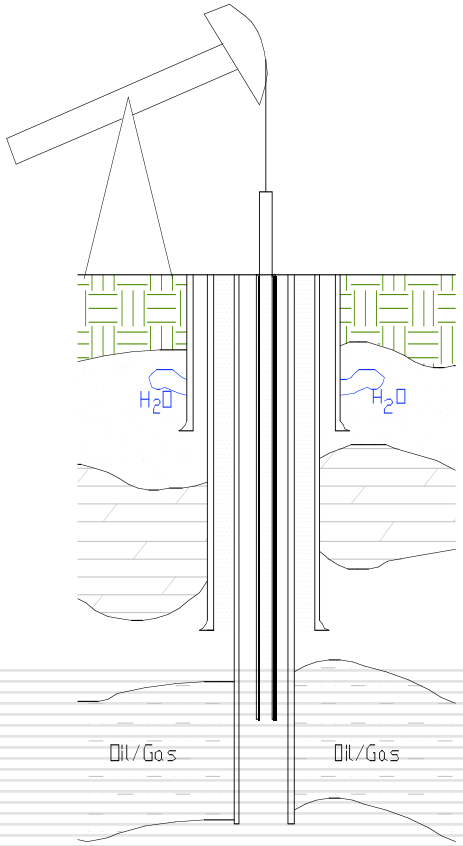


Potential Contamination

- *Drilling:* The drilling process interconnects formations
- *Completion/Treatment:* Introduces physical stresses and/or synthesized chemicals into formations
- *Production:* Isolate produced fluids from interconnected formations
- *Closure:* Plug & abandon the well

Potential Contamination

- Drilling
  - Fluids are circulated from the surface into the well bore & back to the surface
  - Well is cased during the drilling process & casing is cemented

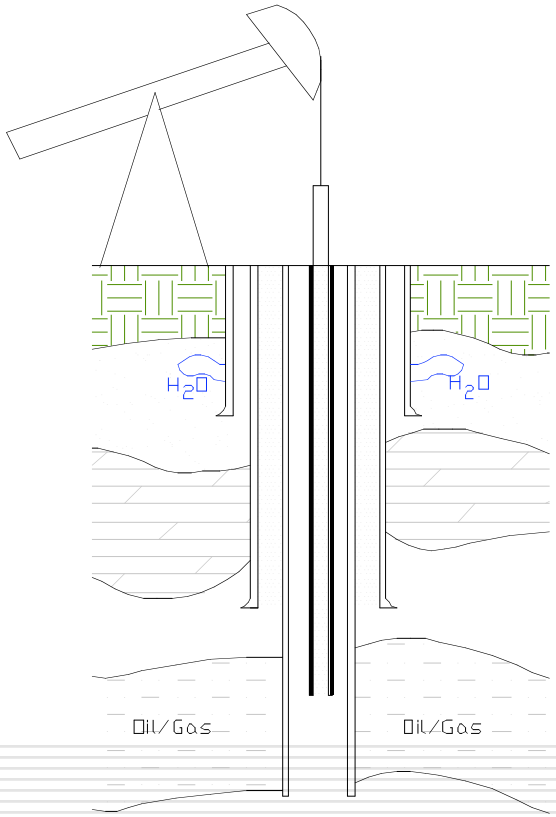


Potential Contamination

- Completion/Treatment
- Hydraulic fracturing (fracing)
  - Introduces physical stresses
  - May use synthesized chemicals
  - Fracture migration or propagation relies on frac design and knowledge of geology/lithology
    - Permeability & resistance to fracture of surrounding formations
    - Existing fractures in production zone formation
    - Presence of “outlying” materials (such as clay lens, ash, etc.) in fracture zone
    - Frac fluid injection rate & viscosity
    - Bulk properties versus specific well conditions

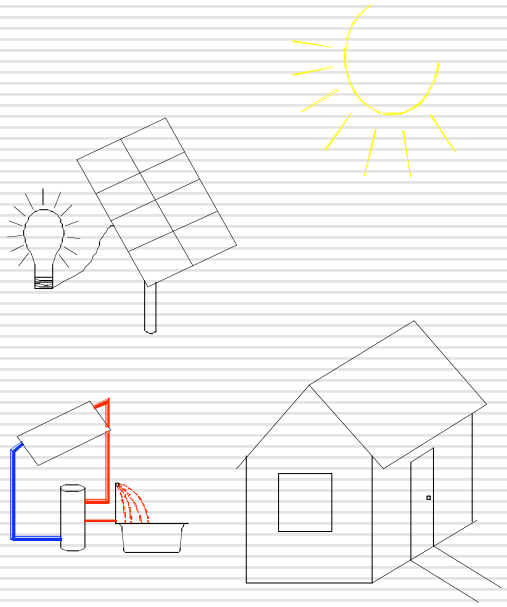
Potential Contamination

- Production
  - Maintain isolation of interconnected formations from produced well fluids
    - Corrosion prevention required
    - Cement seal integrity required



Potential Contamination

- Well Closure
  - Remove production equipment
  - Plug well with cement
- Legacy Issues
  - Integrity of cement plug to maintain formation isolation
  - Integrity of cement “seal” on casing
  - Corrosion of casing
  - Tremendous potential for migration of fluids between originally isolated formations

Better Idea

- Renewable Energy!
  - Produce Electricity
  - Heat Water
  - Heat Our Homes