Marginal and Mature Field Development and Operation

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Successful Cost-Effective Surface-Controlled Gas Injection Dumpflood Application

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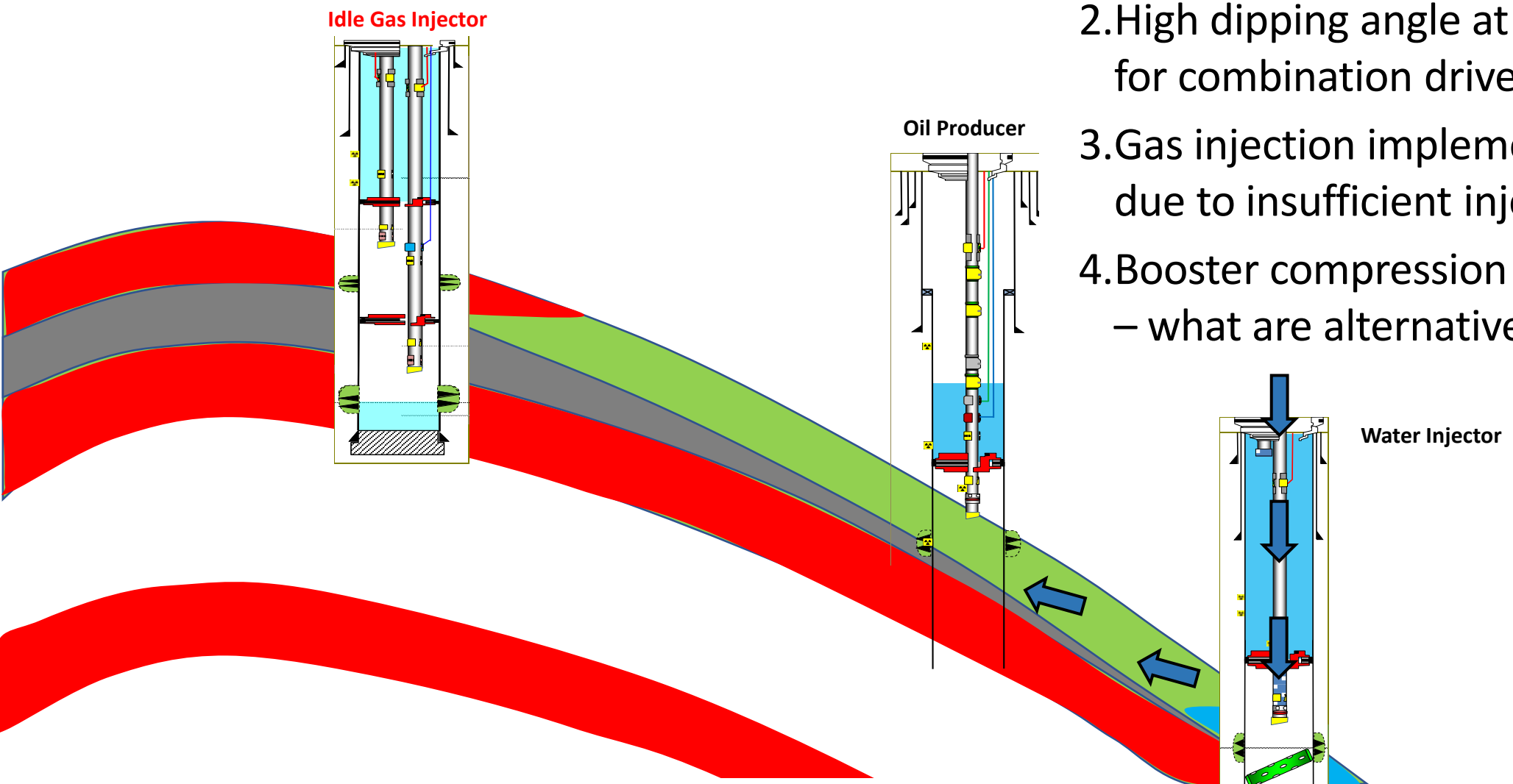
Outline

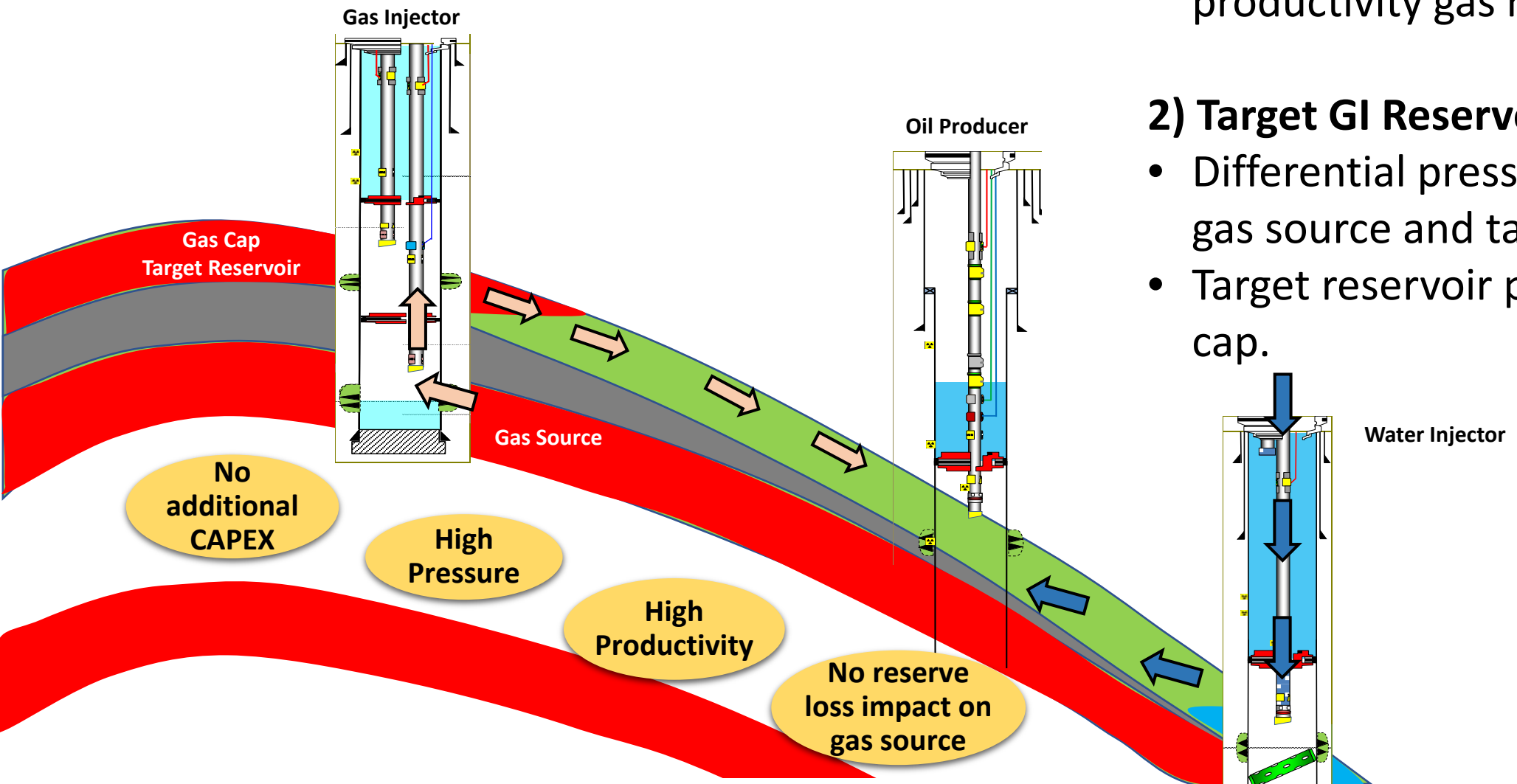
- Field Background
- Phase 1: Subsurface Dumpflood – Proof of Concept
- Learnings from Phase 1
- Going Back to the Drawing Board
- Phase 2: Surface Controlled Dumpflood
- Conclusion

Field Background

1. Complex mature field, developed in stages.
2. High dipping angle at crest – optimum for combination drive.
3. Gas injection implementation on hold due to insufficient injection pressure.
4. Booster compression require high CAPEX – what are alternative options?



Phase 1: Subsurface Dumpflood



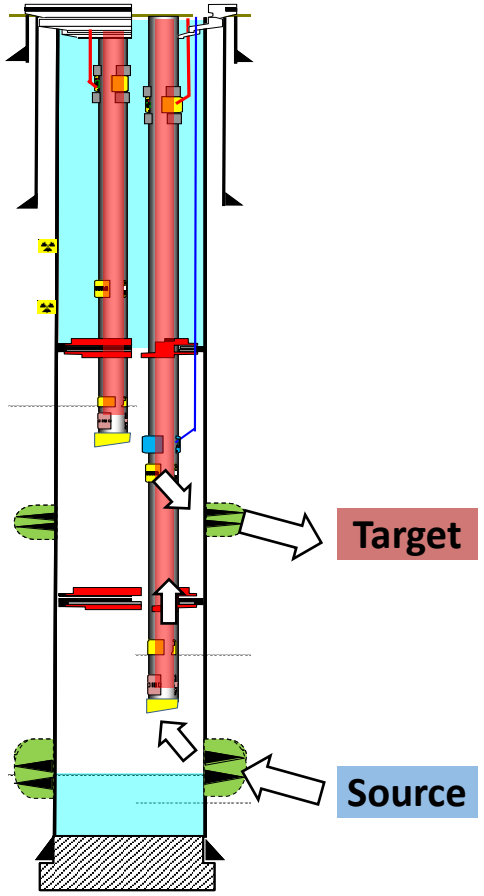
1) Gas Source Reservoir:

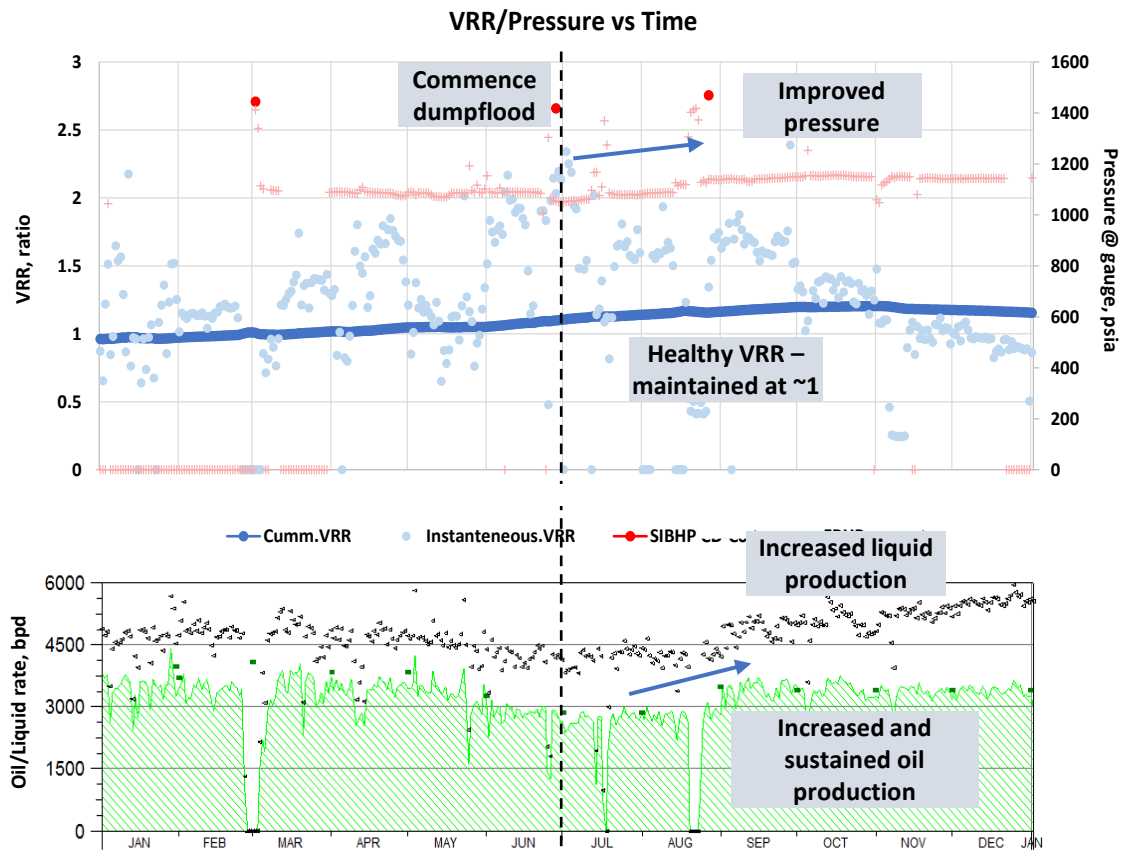
- High pressure, high volume, high productivity gas reservoir.

2) Target GI Reservoir:

- Differential pressure exists between gas source and target reservoir.
- Target reservoir penetrated in gas cap.

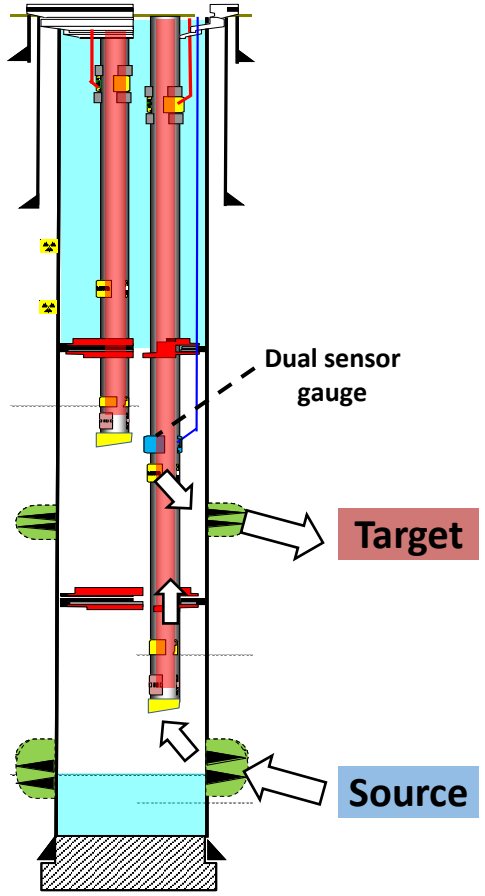
Observations from Subsurface Dumpflood [1]

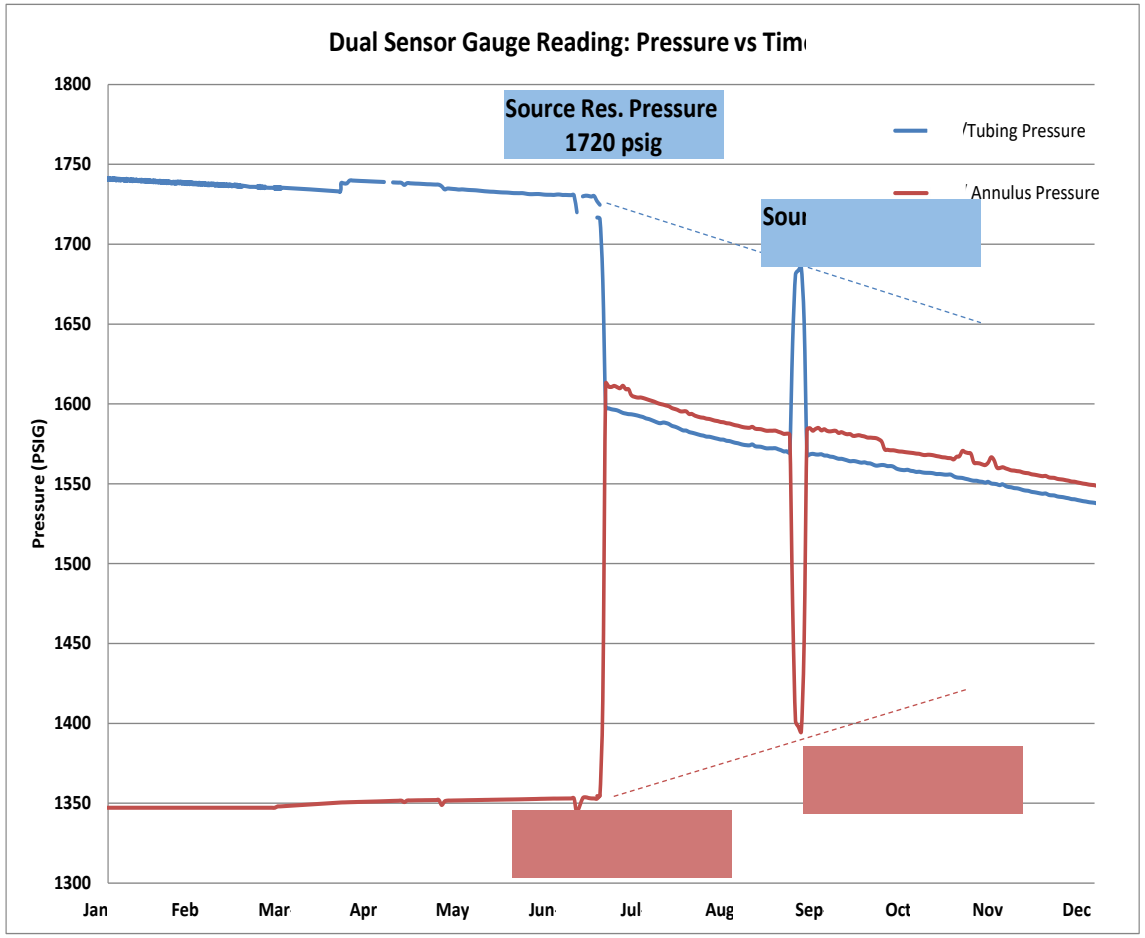




1. No CAPEX required.
2. Improved pressure at target well.
3. Increased liquid production.
4. Improved and sustained oil production.
5. Gas injection complimented water injection support.

Observations from Subsurface Dumpflood [2]



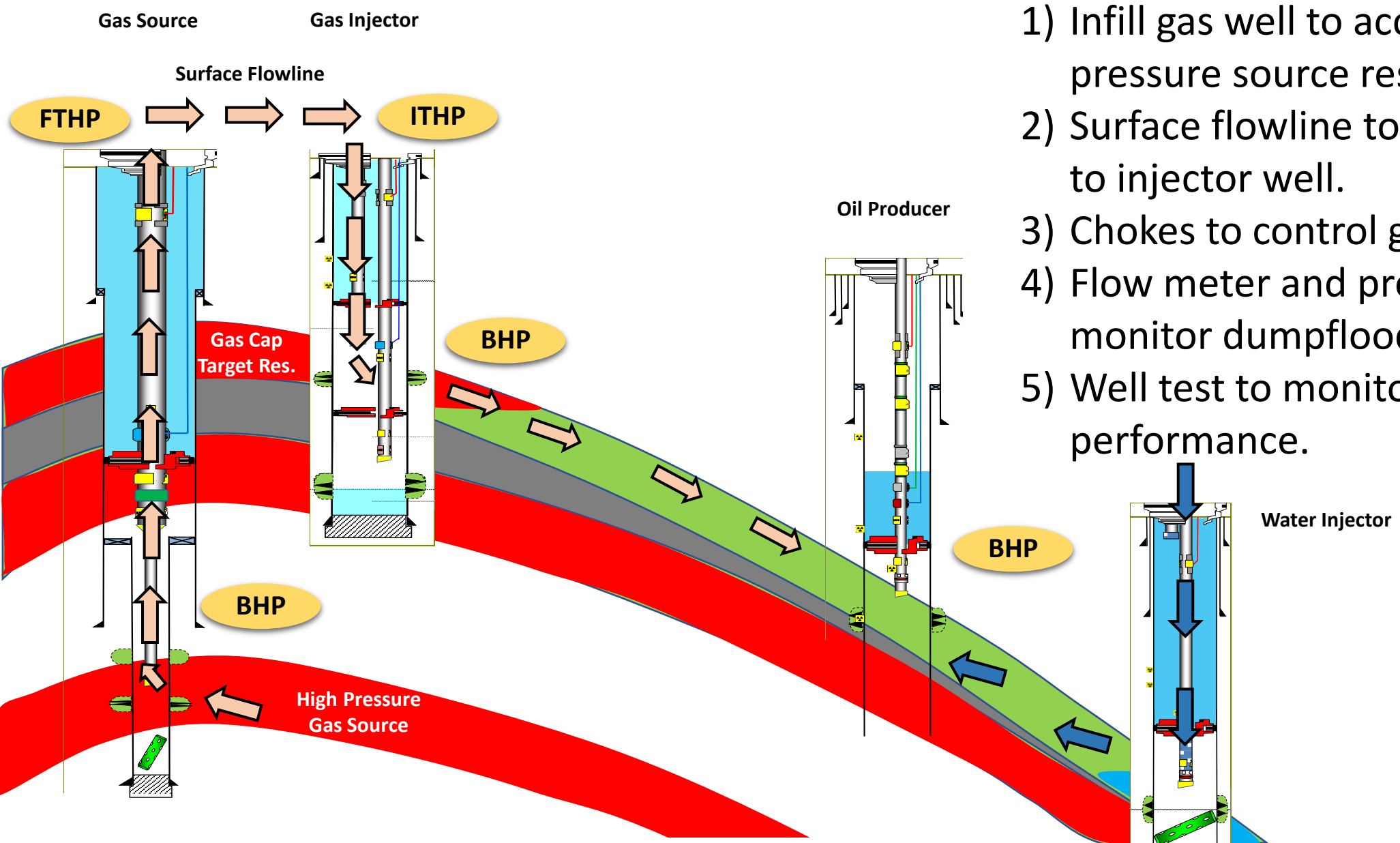


1. 400 psi initial pressure difference.
2. Target reservoir pressure increased after dumpflood.
3. Parallel with reduction of pressure in source reservoir.
4. No control over gas dumpflood rate.
5. Need higher pressure gas source for long term!

Going back to the drawing board

1. What is the optimum gas injection scheme for the field?
2. What is the required gas rate and injection pressure?
3. Can identified high-pressure gas source deliver the required volume at the desired pressure?
4. For how long?
5. Any additional requirements?
6. What is the resultant incremental oil and cost?

Phase 2: Surface Controlled Dumpflood



1) Infill gas well to access deeper high-pressure source reservoir.
2) Surface flowline to connect source to injector well.
3) Chokes to control gas injection rate.
4) Flow meter and pressure gauges to monitor dumpflood performance.
5) Well test to monitor target well performance.

Conclusion

1. Pay attention to idle wells.
2. An alternative solution is out there – don’t forget physics.
3. Innovation can lead to UDC reduction.
4. Flow meter and PDG is key in monitoring dumpflood performance.
5. Properly engineered dumpflood = long term solution.

Notes:
UDC – Unit Development Cost
PDG – Pressure Downhole Gauge