Pilot Installation of A Deep Gas Lift System to Optimize Gas Lift Well Performance

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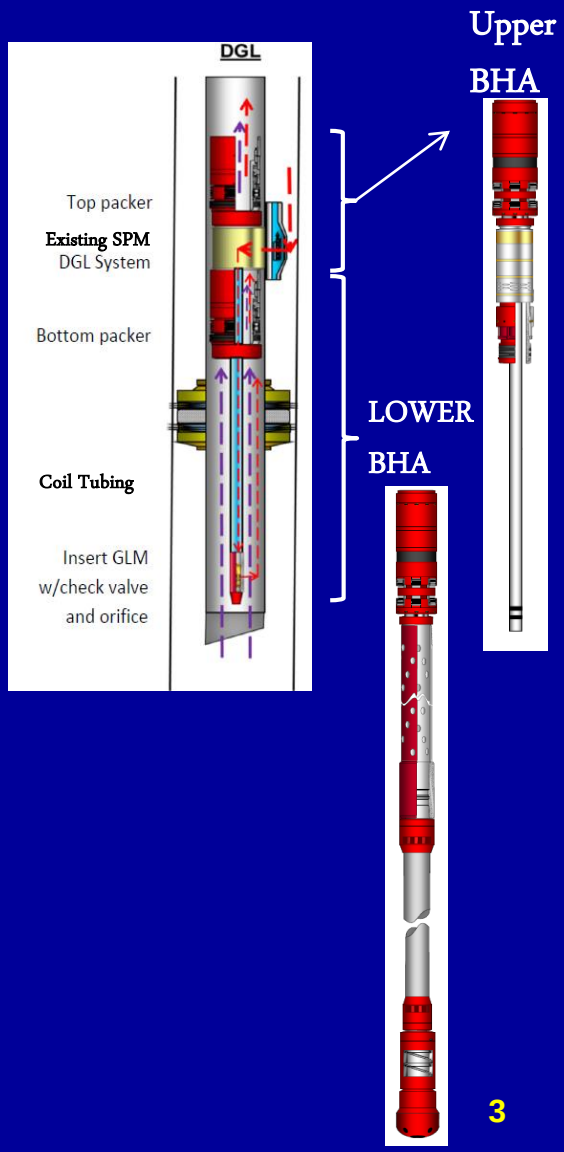
PRINCIPLE

Deep Gas Lift (DGL) System

- Production Oil flow through annulus tubing and Coil tubing (CT)
- DGL Cross Flow Injection Sub: to direct the GL injection going through coil tubing.
- Two run of straddle System are needed:
  - Lower BHA (run using CTU): lower packer, slotted joint, CT, Mandrel with dual CV and orifice.
  - Upper BHA (run using CT or slickline): upper packer, DGL Cross Flow Injection Sub, Seal assembly and injection tube and stinger.
- Slickline can be used to install/pull upper BHA for future well intervention.



FIELD IMPLEMENTATION IN WELL 1

Criteria:

Well with non optimized GL performance:

- **Shallow depth of deepest mandrel (still have space/distance between deepest mandrel and top of perforation)**
- **Low Reservoir Pressure (deep fluid level)**
- **Only small Drawdown with current existing mandrels**

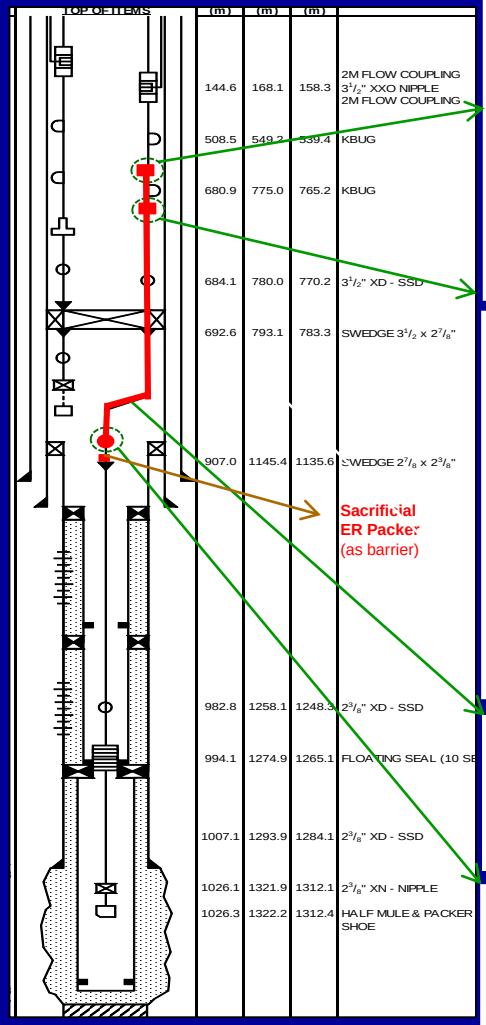
Additional Criteria:

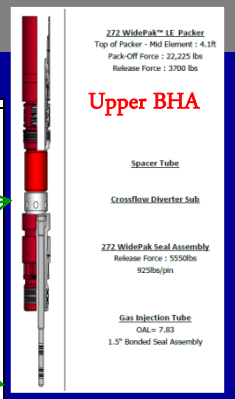
- **No sand production history**
- **From Reservoir Envelope, no issue to increase the drawdown.**

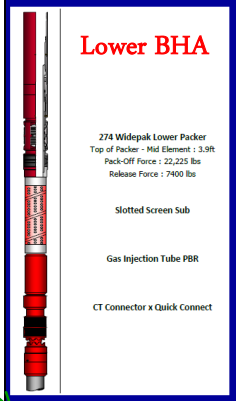
FIELD IMPLEMENTATION IN WELL 1

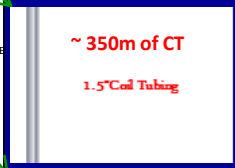
DGL sequential installation:

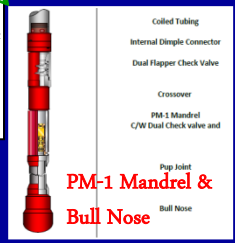
1. Set ‘Sacrificial’ ER Packer with pump out plug as mechanical barrier.
2. Deployed 342m of 1.5” coil tubing as injection string with the PM mandrel & assembly
3. Set Lower DGL assembly at 769m via CTU
4. Run kickover tool with Slickline to confirm lower packer is set below SPM (tag packer & locate SPM for depth correlation)
5. Set Upper DGL assembly using CTU







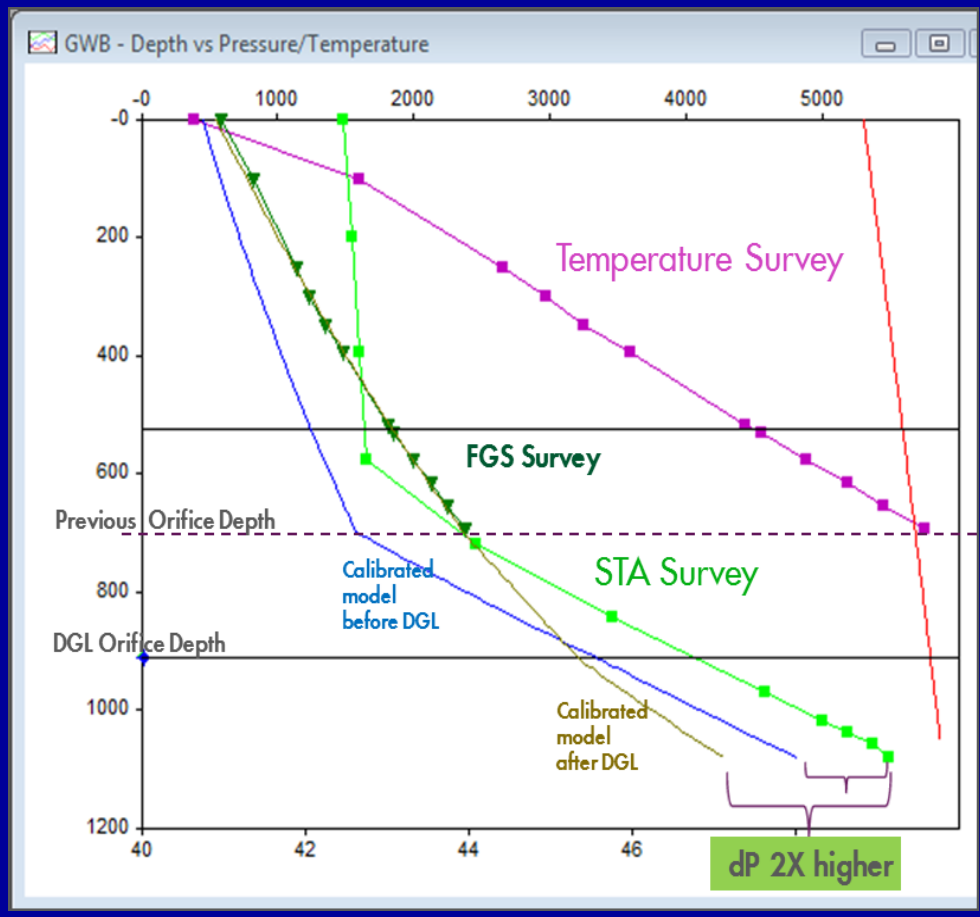




RESULTS

DGL system installation results:

- Drawdown increases 2 times (as per expectation)
- Production increases 5 times from previous production ➔ including stimulation job.



BEST PRACTICES

- **Integrated Well Review session between PT, RE and PG to evaluate the well candidate.**
- **Collaboration works between WRFM Team, Well Services Team and Contractor for the planning & execution.**
- **Execution:**
  - **Utilization of "Sacrificial" ER Packer as barrier during deployment.**
  - **Utilization of Kick over tool for depth correlation (SPM location)**
  - **Pressure test of every DGL connections are very important to ensure no leaking.**

CHALLENGES

- Availability of smaller size Coil tubing (1.25” or 1.0”) in the company ➔ smaller coil size gives bigger flow annulus area.
- Long Lead Items of DGL System (3-4 months).
- Availability of welltest unit in the platform ➔ Well production and gain was verified using Bulk Separator (tested by different) and well model (FGS data)
- Future well surveillances: Static Pressure, FGS, other cased hole logs ➔ limited only until top of DGL system (consider to use Wireless PDHG/ CaTs).

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