CASE STUDY: ARTIFICIAL LIFT, BAKKEN SHALE, UNITED STATES

Baker Hughes ESP solution improved gas separation efficiency, increased production by 30% in Bakken Shale well

CHALLENGES

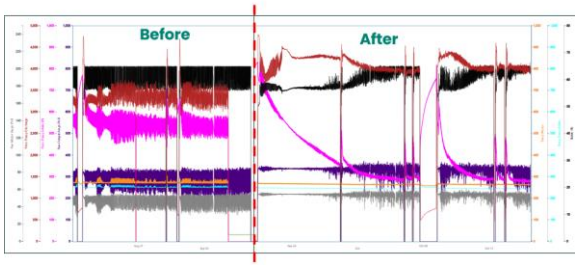
- Gas interference/gas lock, gas-to-liquids ratio of 500 to 1.800 scf/STB
- Electrical submersible pump (ESP) installation at a depth of 9,500 ft (2,889 m) with downhole temperatures of 270 to 280°F (132 to 138°C)
- Low pump intake pressure (PIP)<400 psi
- Significant motor amperage swings

SOLUTION

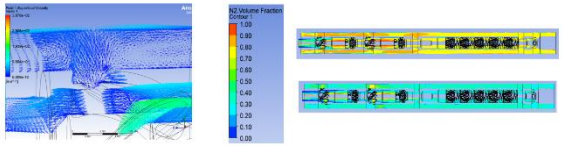
- A robust, comprehensive ESP solution was deployed, consisting of:
  - Boosted gas separator with pump configuration
  - Ace Plus™ gas handler 400 Series GH-6000 booster pump
  - 400 series LIFTPrime™ high-efficiency E1000 producer pump
  - FLEXPump™ series 400 FLEXPumpER & MVPER
- A computational fluid dynamic (CFD) analysis was then conducted to confirm performance

RESULTS

- Increased production by 30 percent to 1,350 BFPD exceeding the customer's expected 1,000 BFPD
- Increased drawdown by 54 percent to 646 psi compared to previous runs, breaking the 330 psi barrier
- Reduced current swings by 32 percent (based on 320 drive standard amp)
- Increased lift inside the gas separator, in turn increasing recirculation (flow out of vent) with boosted stages
- Reduced motor temperature by 20°F, compared to previous runs in the same well



Operational trends show improvement of the ESP with the boosted gas separator before and after installation.



CFD analysis was performed to validate system design.

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