An operator had a very challenging well that produced high gas content with rapid declination of well production. The previous artificial lift system had failed due to low/no production after it ran for 396 days. Due to the presence of gas, the rapid pump intake pressure (PIP) started to decrease. The total production had dropped from 1,800 BFPD to 900 BFPD and the well was finally shut in due to low production. The operator considered a pump with extended operating range that would have handled high gas production around 800 mcf.

Representatives from Baker Hughes, a GE company (BHGE), studied the operator’s well data. Based on the production decline and high levels of gas, the engineers provided solutions to solve the production challenges. BHGE suggested a pump from the FLEXPump™ series of pumps and installed a tapered electrical submersible pumping (ESP) system in the well. The tapered system consisted of a FLEXPump17.5 pump combined with an MVP™ pump. In addition to this tapered system, BHGE installed a vortex gas separator that helped separate the gas from the liquid itself.

The innovative design of FLEXPump17.5 technology used computational fluid dynamic (CFD) patent-pending design concepts, which reduced the thrust profile throughout the pump. As a result, the pump has a wider operating range from 700 to 2,600 BFPD. Even though the FLEXPump17.5 pump’s minimum recommended operating range was 700 BFPD, the system was able to produce 536 BFPD. The FLEXPump17.5 technology’s recommended operating range is from 700 to 2,600 BFPD, however, with tapered system and gas purge software, the system handled the lower operating range.

These results were achievable because the tapered system helped break the gas and provided more hydraulic energy to prevent gas locking even though the produced fluid was less than desired.

As demonstrated in the graph below, once the tapered system was installed, ESP run life was extended by 31%. This was credited to the tapered system as well as the gas purge software on the VSD that was used to control the gas locking phenomenon that usually rises when the total produced fluid starts to decrease. The operator’s well had an increase in run life of 31% with the tapered ESP system.

Challenges
- Existing ESP system was interrupted by total gas production of 675 mcf
- Rapid pump intake pressure declined due to the presence of high levels of gas
- Well was 10,250 ft (3124 m) TVD
- During operations, temperature often rose from 200°F to 245°F (93°C to 118°C)

Results
- ESP system with FLEXPump17.5 technology increased both oil and gas production
- Eliminated equipment change out with improved ESP system run life
- Reduced workover expenditures
Properties/specifications

Graph 1: chart shows run life extension after the tapered ESP system with FLEXPump17.5 technology was installed in the well. The system extended the run life from 396 to 519 days.

Graph 2: ESP run time increment after tapered ESP system installed.

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