Case study: Kansas, United States

CENesis PHASE system increased run life 440% in unconventional well

An operator in Kansas completed a well using 7-½ in. casing and in the first year of production installed two separate standard electrical submersible pumping (ESP) systems and a gas lift system in an effort to maximize production. However, each form of artificial lift produced disappointing results. Gas lift was unable to draw down the bottomhole pressure, which limited production, and the standard ESPs experienced frequent shutdowns and high motor temperatures, resulting in deferred production and reliability issues.

Each conventional ESP system produced for several months but began to have gas interference when the pressure in the wells declined, leading to an increased number of gas slugging incidents. The increased gas volume in the wellbore resulted in frequent gas locking of the ESP, which resulted in little to no liquid flowing past the motor and through the pump. Fluid flow is necessary to maintain an adequate operating temperature. Gas-locking events eventually led to short runs of 144 days and 102 days respectively, for the first two ESP installations.

Following the short runs, the operator decided to try a gas lift solution. The gas lift system eliminated shutdowns due to gas interference, but production was extremely constrained. Production with the gas lift system never exceeded 4 BOPD versus an average of 66 and 59 BOPD for the two ESP systems. The limited oil production achievable with gas lift made the well uneconomical and the operator approached Baker Hughes for an alternative ESP solution.

After evaluating the performance of previous artificial lift methods, Baker Hughes suggested the 5½-in. patented* **CENesis™ PHASE multiphase encapsulated production solution** for 7-in. casing. This was the best option to decrease non-productive time (NPT) and increase the reliability and run life of the ESP system.

The CENesis PHASE system encapsulates the entire ESP in a shroud to allow natural separation of gas before it can enter the pump. The shroud provides a reserve volume of fluid that continuously primes the pump during a gas slug event to preventing pump off and/or low-flow or no-flow conditions. To further enhance reliability, the CENesis PHASE solution has an integrated recirculation system that continually pumps fluid past the ESP motor to prevent overheating in dynamic well conditions.

This was the first installation of the CENesis PHASE solution onshore and only the second installation globally.

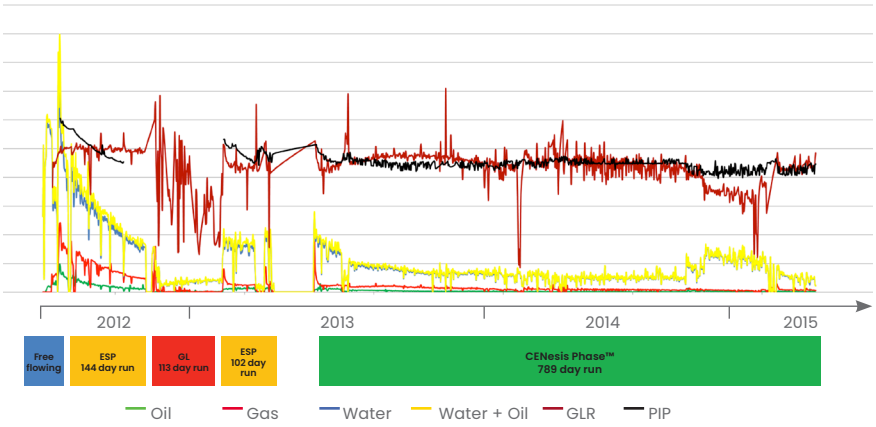
The CENesis PHASE solution not only eliminated temperature-related shutdowns but also maximized production and run life. At the time of publication of this case history, the system had run 790 days—a 440% increase compared to the standard ESP systems.

Challenges

- Large gas slugs in the fluid stream caused gas-locking conditions in the ESP system
- Frequent gas slugs caused ESP motor overheating
- Frequent shutdowns followed overheating events

Results

- Stabilized ESP system operating conditions
- Increased run life from 144 days to over 790 days
- Increased production 346% vs. gas lift



*The CENesis PHASE multiphase encapsulated production solution design is patented under Patent 9920611

Baker Hughes

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