Case study: Permian Basin, North America

Slimline CENesis PHASE system eliminated gas lock conditions, increased oil production 61%

An operator in the Permian basin was experiencing electrical submersible pumping (ESP) system failures in an unconventional horizontal well producing from the Wolfcamp formation, due to gas slugs in the production stream. The well had a high gas-to-liquid ratio of 1,700 SCF/STB, a low flow rate of 219 BFPD, and was completed with 5-½ in. 17 lb casing.

Unconventional horizontal wells present unique production challenges, particularly gas slugs that accumulate in the high side of undulations in the lateral section and then break free. These gas slugs affect the operation of ESP systems, causing gas locking conditions that shutdown the system and/or pump cycling that can lead to motor overheating. These issues shorten the life of the ESP system and limit oil production.

The operator contacted Baker Hughes for a solution to improve ESP performance in the well. After reviewing the production data, Baker Hughes Artificial Lift Systems engineers recommended the slimline patented* **CENesis™ PHASE multiphase encapsulated production solution**, featuring a **300 series FLEXPump™ 6 production pump** combined with a **GI™ gas insurance boost pump**.

The CENesis PHASE solution fully encapsulates the ESP system to naturally separate gas from the fluid stream, preventing the majority of the gas from entering the ESP. The design creates a reservoir of fluid to keep the ESP system primed when gas slugs displace fluid in the well and a recirculation pump keeps fluid flowing past the motor to prevent overheating.

The CENesis PHASE solution was installed in the small-diameter well. The operator has experienced no ESP shutdowns related to gas slugs and daily oil production increased by 71 BOPD. Mitigating stops and starts of the ESP system significantly improved the life of the equipment.

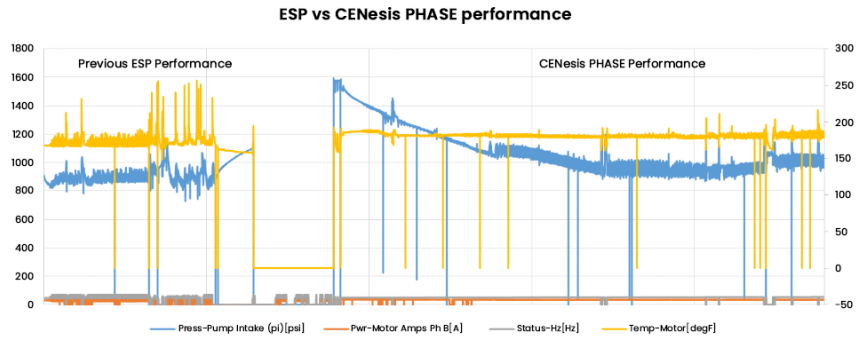
In just four months, the CENesis PHASE solution drew down the reservoir pressure to 460 psi versus the previous competitor's system that was gas locking at 550 psi—improving daily production. Remotely managing the well via the Baker Hughes ESP monitoring service helped the operator to check the ESP's performance and adjust operating parameters to further improve system run life.

Challenges

- High gas-to-liquid ratio of 1,700 SCF/STB
- Gas slugging conditions
- Low flow rate
- 5-½ in. casing

Results

- Increased oil production 71 BOPD
- Improved reservoir pressure drawdown to 460 psi from 550 psi with previous competitor's system
- Eliminated ESP system gas locking due to gas slugs



CENesis PHASE performance in a well with high gas content in the fluid stream.

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