NOVOMET

CASE STUDY

Permanent Magnet Motors Used in Two Motor-Killing High-Gas Wells, Both are Still Running 4 Years Later

CHALLENGE

Improve ESP efficiency with permanent magnet motor performance

SOLUTION

Deploy PowerSave ESP systems with permanent magnet motors on two high-gas wells

RESULTS

- Increased ESP runlife from 3–6 months to over 4 years
- Lowered lifting costs by 37% and 20% in two high-gas wells
- Delivered continuous production, even with 88% gas in one well

Wyoming, U.S.A.

First ESP Permanent Magnet Motors in Wyoming

When the first ESP permanent magnet motors used in the Big Horn Basin were installed in gas-plagued wells, the operator was testing efficiency. What it got in return was an increase in ESP runlife of over 800%.

In an effort to reduce the cost of electricity to power electrical submersible pumping (ESP) systems, an operator in Wyoming wanted to install PowerSave ESPs. PowerSave systems deliver best-in-class efficiency by using permanent magnet motors (PMMs) and high-speed pumps to reduce electrical waste.

The operator had two high-gas wells that were causing competitor asynchronous induction motors to burn out and fail every 3 to 6 months. To continue to replace the ESP systems would make the wells economically unviable.

Before abandoning the problem wells, the operator decided to use them to test the reliability and viability of the PowerSave ESP systems. A Novomet ESP was installed in each well in March 2017, marking the first deployment of permanent magnet motors on ESPs in the Big Horn Basin.

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Well 63

The basics:

- Conventional vertical well
- 5½-in. casing
- ESP intake set at 1,507 ft (459.3 m)
- 490 BFPD (65 m^3/d)
- 44% gas production

The high gas-to-oil ratio (GOR) had caused repeated failures in earlier ESP systems. ESP motors depend on the reservoir fluid flowing around them to dissipate heat and keep them cool. When high volumes of gas pass through an ESP, it displaces the fluid. With no fluid to keep the motor cool, the motor can easily overheat and shut down. The more this cycling occurs, the shorter the motor runlife.

The asynchronous induction motors used in the competitor ESPs lose a great deal of electricity to heat, meaning they run hotter than PMMs. The induction motors were gas-locking repeatedly and failing every 3 to 6 months. The competitor was unable to deliver an ESP design that would withstand 44% GOR.

Novomet PMMs perform well in high-gas wells because they lose less electricity to heat. Not only do they save power consumption, but the lower operating temperatures enable the motors to endure longer periods without being in contact with cooling reservoir fluids. In effect, our PMMs "coast" through gas slugs, reducing cycling and extending runlife.

Novomet installed a PowerSave ESP system that featured a 4.06-in. PMM and a 4.06-in. high-speed pump designed to lift up to 1600 BFPD (254.4 m^3/d). The ESP was commissioned on March 30, 2017.

Not only did the system continue to run beyond 6 months, but it is still running as of the date this case study was published, over 1,538 days later. The GOR has continued to increase over the last 4 years.

At the time of publication, this well was producing 88% gas and the ESP was still going strong.

Well 66

The basics:

- Conventional vertical well
- 5½-in. casing
- ESP intake set at 1,210 ft (368.8 m)
- 3,796 BFPD (604 m^3/d)
- 39% gas

Similar to Well 63, the induction motors used by competitors were overheating and cycling due to gas slugging. The motor was burning out every 3 to 6 months and causing the ESP system to fail.

Novomet installed a PowerSave system that featured a 4.60-in. PMM and a 4.60-in. high-speed pump designed to lift up to 5000 BFPD (794.9 m^3/d). Given well conditions and flowrate, a 4.06-in. multiphase gas-handling charge pump was also added to the system. The ESP in Well 66 was commissioned on March 28, 2017.

The PowerSave ESP system in Well 66, driven by a Novomet PMM, is still running as of the date of publication, 1,540 days later.

Results

In addition to dramatically improving ESP reliability and runlife, Novomet PMMs and advanced ESP technology reduced KVA by 24% in Well 63 and by 23% in Well 66. Lifting costs have dropped by 37% and 20% in the wells respectively. The addition of the multiphase charge pump in Well 66 explains the disparity in efficiencies in these two systems.

About Novomet PMMs

Novomet PMMs are the preferred ESP motor in the artificial lift industry. They are the most reliable, robust, energy efficient motors available. They also have the widest range of available sizes and horsepower options.

- Unconventional—most reliable motor on the market
- Conventional—superior runlife with reduced power consumption
- Slimhole—additional oil production after the competition is forced to quit due to technological limitations and larger ODs

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