

REDA Continuum Stages Extend Flow Rate Range, Saving Operator USD 185,000 in Unconventional Well

Engineered REDA Maximus ESP system manages steep production decline to achieve 82% drawdown in the Bakken Shale, North Dakota

CHALLENGE

Draw down a well in a harsh environment from the initial high production rate of 1,918 bbl/d with a single ESP before switching to a low-flow artificial lift.

SOLUTION

Install Maximus* electric submersible pump system equipped with Continuum* unconventional extended-life ESP stages.

RESULTS

- Saved operator USD 185,000 in equipment replacement and workover costs.
- Avoided deferring oil production of approximately 4,000 bbl [636 m³].
- Achieved 82% drawdown with a single-ESP solution.
- Increased run life to more than double the average for the field.
- Maintained 97% uptime over ESP life.
- Resisted wear associated with pumping at low flow rates in harsh environments.



Harsh environment and production decline increase lifting costs

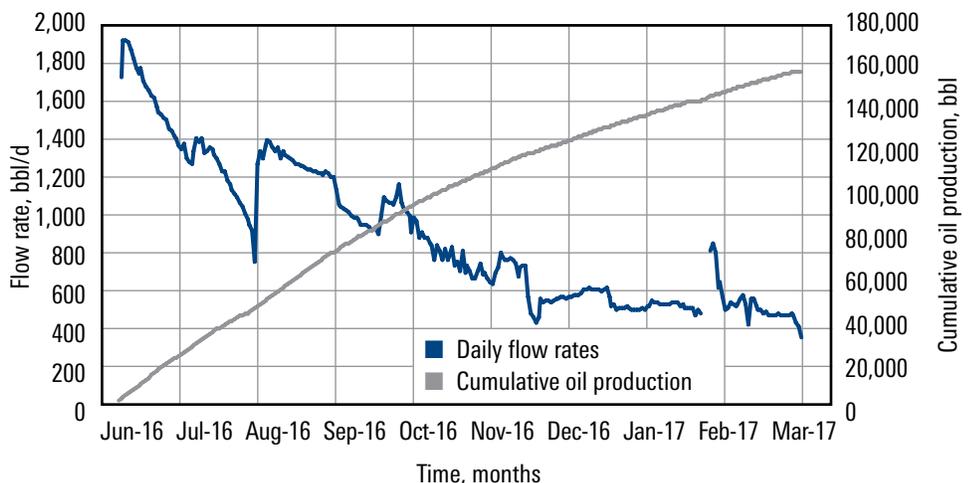
A typical unconventional well in the Bakken Formation experiences declining production and has a harsh environment due to abrasion from proppant flowback. These wells generally require either an expensive multiple-ESP solution or pausing production to replace a high-production ESP system with a low-production one. This occurs because the initial pump is not designed to deliver lower flow rates, thus requiring a pump downsize, or it fails prematurely in the harsh downhole environment.

An operator had a newly drilled unconventional well with a harsh environment with high frac sand flowback in this region. It had an initial high production rate of 1,918 bbl/d [305 m³/d]. Shortly after production began, the well experienced a steep production decline, an inherent trait for such wells.

Robust ESP systems operate across a wide flow range

The operator sought a simple single-ESP solution to continue production. Schlumberger suggested the installation of the Maximus system equipped with 2,500 Continuum stages, the best fit for the expected production range of 400 to 2,000 bbl/d [64 to 318 m³/d].

The optimized geometry, architecture, and material selection of the Continuum stages enabled the ESP to cover the flow range and rapid decline curve of production. The enhanced compression design and wide opening vanes enabled it to provide resistance to the harsh environment. Continuum stages were developed with the help of the Schlumberger Rockies US Land division specifically for this type of unconventional well profile, making it the right choice for this scenario.



The Continuum stages in the Maximus system enabled continuous production even as the flow rate decreased by 82% over 10 months. In August 2016, the Maximus system experienced downtime due to a power outage, and in January 2017 the ESP went offline for an unrelated elective well treatment.

ESP run life and cumulative production increase with successful drawdown

The ESP system ran for 271 days, more than twice the 130-day average ESP run life for this field. The flow rate was below the published curve range for 5 months—a scenario that 2500 Continuum stages were designed to handle—which was more than half of the run time. The Continuum stages' enhanced compression design improved downthrust management and resisted wear associated with pumping at low flow rates by avoiding metal-to-metal erosion, particularly in the abrasive environment.

The system continued to produce the well as production declined from 1,918 bbl/d to 347 bbl/d [55 m³/d], an 82% drawdown. It saved the operator USD 185,000 in workover costs, avoided 4,000 bbl [636 m³] in deferred oil production, and maintained 97% uptime over the ESP life.

The operator has since successfully installed the Maximus system with 2,500 Continuum stages in a total of 16 wells in the Bakken with the same downhole conditions.

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