



MATURE FIELDS



UNCONVENTIONALS

Operator Achieves 90% Intake Pressure Drawdown of High GOR Well

PROPOSED DESIGN OF ESP SYSTEM DRAWS FLUID LEVEL DOWN FROM OVER 5,000 PSIA TO UNDER 500 PSIA

BAKKEN

CHALLENGE

- » High GOR and bottom-hole pressure impeding production
- » Gas slugging and other significant failure modes

SOLUTION

- » Tandem Liberator™ gas separators and tapered Tiger Shark® pumps with wide operating range (395-2,900 BPD)
- » 24/7 well surveillance and monitoring service

RESULT

- » Successful drawdown from >5,000 PSIA to <500 PSIA despite dramatic increase in GOR
- » Monitoring and optimization achieved extended run life

OVERVIEW

The Bakken presents multiple challenges from a production standpoint. Foreign debris such as sand and plug parts pose a risk to artificial lift systems. Increasing gas-oil ratios (GORs) as liquid rates decline also complicate efficient production.

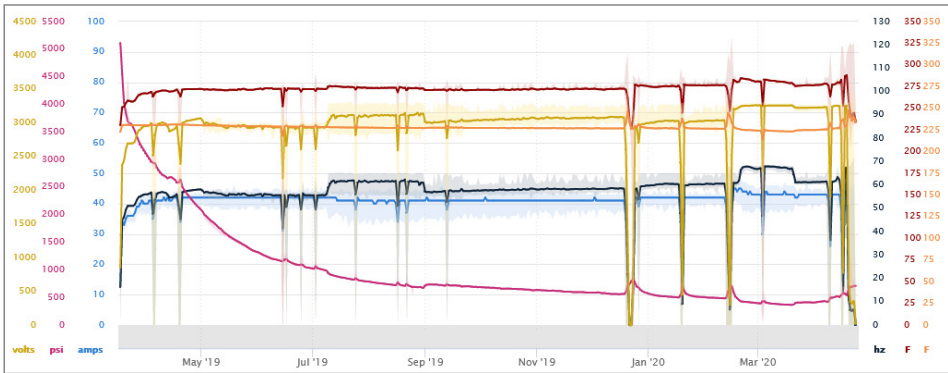
An operator in the Bakken approached Summit ESP with the goal of using an electric submersible pump (ESP) system to produce a well down to where a successful transition to rod lift could be made.

CHALLENGE

The operator's well had an anticipated set depth approaching 9,900 feet and set depth temperature of 235°F. Initial design production rates were 1,060 BOPD, 940 BWPD and 1,500 MSCFD with anticipated fluid near the surface. Failure modes in the field included gas locking, excessive erosion, shaft breaks, gas slugging, and stress from high bottom-hole temperatures. The operator wanted to draw down the well to below 550 PSIA (pounds per square foot absolute) pump intake pressure, read by the ESP sensor, and have combined production near or below 400 BFPD.

SOLUTION

Summit ESP® applications engineers collaborated with the operator to solve their severe



This chart is from Summit ESP Well Surveillance and Monitoring Service and is showing the trend of continuous drawdown of intake pressure (pink) with consistent motor loading (blue) and stable motor internal temperature (red).



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GOR environment challenges. The proposed ESP design focused on gas handling due to the GOR being 1,415 SCF/STB and likely to rise as is the nature of unconventional wells.

Unmitigated gas in the fluid stream can cause liquid flow to be blocked within pumps so the design consisted of tandem Liberator™ gas separators to increase gas separation prior to pumps. The gas separator acts as a centrifuge to separate fluids by their densities and drive less dense fluids (gas) into the annulus. Denser fluids are then forced into the pumps.

To compress the remaining gas into solution, the Tiger Shark SFGH2500 gas handling pump was proposed. These pumps handle gas effectively due to their open-face impeller design. The pumps were configured in a tapered design with the revolutionary Tiger Shark SFGH2500 pump at the base and the Tiger Shark SF2250 pump above due to its wide operating range (395-2,900 BPD). The tapered design maximizes both gas handling and pump efficiency.

RESULT

Installation took place in early 2019 and included the Summit ESP well surveillance and monitoring service. This service features a team of petroleum engineers tasked with monitoring wells on a 24/7 basis. With their focus on optimization and health of the ESP system, greater run life was achieved.

Results of the collaboration exceeded all expectations. The ESP was able to draw the fluid level down from an initial intake pressure of over 5000 PSIA to under 500 PSIA. This goal was achieved despite GOR almost doubling to more than 2,700 SCF/STB.

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