Schlumberger

Optimized ESP Solution Reduces NPT >88% in Liquid-Loading Horizontal Gas Well, Russia

Integrated technologies efficiently remove liquids despite long horizontal, high gas volume fraction, and variable flow

CHALLENGE

Eliminate lengthy production interruptions due to liquid loading of a well.

SOLUTION

Stabilize production with a REDA* Maximus* ESP system equipped with REDA Continuum* unconventional extended-life ESP stages and monitored via the Lift IQ* production life cycle management service.

RESULTS

Reduced time required to unload the well from 3 weeks after every 1 week of production to 3–5 h twice or thrice a week, despite multiple challenges to ESP operation.

Liquid loading periodically killed horizontal gas well for 3 weeks

A well in Siberia was unable to produce at a steady rate because of liquid loading. The long horizontal wellbore, >500 m [>1,640 ft], leads to gravity separation of gas and liquid—water and gas condensate—phases. The liquids collect in the horizontal section. After every 1 week of production, the accumulated liquids would kill the well for 3 weeks—the time it took the formation to accumulate enough energy to lift the liquids.

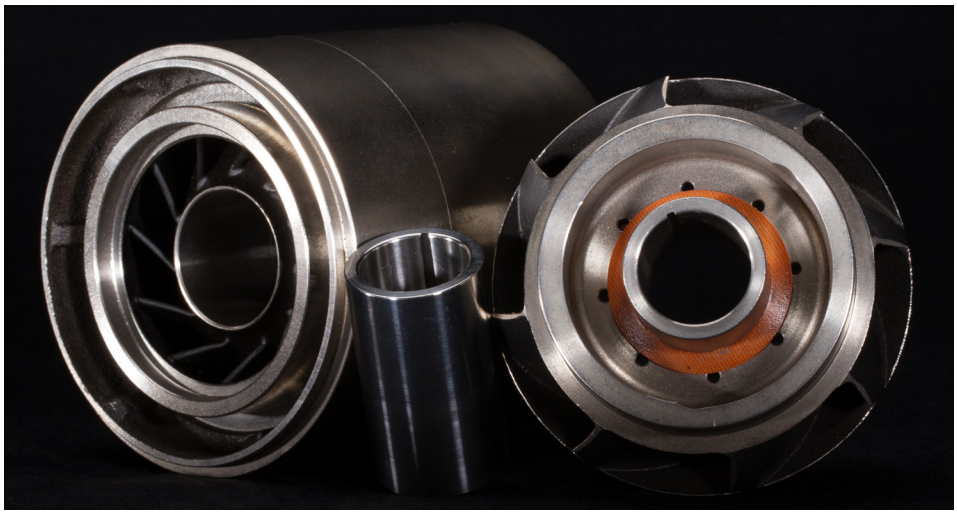
Flaring some of the gas to increase the drawdown and help lift the liquids was not feasible because the large amount of water accompanying the gas extinguished the flare. Northgas, the operator, sought an efficient and reliable solution that would stabilize gas production into the surface pipeline by removing liquid at a sufficient rate to create the specified drawdown.

Integration of multiple advanced technologies solved the challenge

After a comprehensive analysis of all available dewatering technologies and the specific well conditions—including location remoteness and compressed natural gas unavailability—Schlumberger proposed deploying an ESP system, but it had to overcome several challenges:

- The >3,500-m [>11,485-ft] measured depth and high dogleg severity (DLS) limited ESP applicability.
- The ESP had to operate despite the large percentage of free gas in the flow.
- It had to cope with periodic or continuous operation, as required, across a wide range of flow rates.
- Uncertainty regarding the liquid production led to uncertainty about the required pump capacity.

The field-proven Maximus ESP system equipped with Continuum 1000 stages provided the answer. It uses factory-filled components; simpler, more reliable electrical connections; and a motor protector to expedite installation and minimize risks. Continuum ESP stages are mixed-flow pump stages engineered for unconventional flow behavior and challenging environments. Featuring enhanced compression design and wide-opening vanes, they improve recovery and reliability in gassy and abrasive applications.



REDA Continuum unconventional extended-life ESP stage.

Continuum 1000 stages and a variable speed drive (VSD) can handle flow rates ranging from 32 to 215 m^3/d [200 to 1,350 bbl/d]. Tungsten carbide radial bearings maximize abrasion resistance while the VGSA* vortex gas separator assembly, MGH* multiphase gas-handling system, and mixed-flow stages enable the system to handle gas volume fractions (GVFs) up to 90%. Use of a bottom-feeder gas separator enables effective operation in horizontal wellbores.

Stable production with much shorter interruptions improved well economics

Additional support is provided by the Lift IQ service, with remote monitoring in real time by the Schlumberger Artificial Lift Surveillance Center (ALSC) in Tyumen, Russia. Whenever the gas rate starts to decline, the ESP is switched on to unload liquids. The ALSC monitors ESP operating parameters and corrects settings remotely, as required. Currently the ESP operates—and gas production stops—for 3–5 h two or three times a week, a dramatic improvement of 88% or more compared with previous production interruptions.

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