North Sea Operator Optimizes Power Consumption in 12 Wells While Improving ESP Run Life

Lift IQ service surveillance and optimization help enhance motor operating efficiency and reduce downhole stresses.

**CHALLENGE**
Optimize lifting costs and extend ESP run life to improve economics of production for a mature field in the central North Sea.

**SOLUTION**
- Monitor downhole data from REDA* Maximus* ESP systems installed in several wells, using Lift IQ* production life cycle management service.
- Use DesignRite* artificial lift design and optimization software to analyze the data and recommend optimal ESP operating parameters.

**RESULTS**
Reduced ESP electricity consumption by 124 kW across 12 wells and lowered downhole motor stresses and temperature, extending run life.

**Mature field’s economics require optimization of lifting costs**
An oil field in the central North Sea has been a key producer in that sector for decades. Oil is brought to surface with the help of electric submersible pumps (ESPs). The high costs of intervention and deferred production make it essential to maximize well uptime by extending ESP run life. Minimizing lifting costs is important for the profitability and continued operation of this mature field.

**Real-time surveillance and analysis identify ideal ESP parameters**
The Phoenix xt150* high-temperature ESP monitoring system measures downhole pressure, temperature, current leakage, and vibration, providing comprehensive data needed to protect ESP system integrity and extend its life. Continuous monitoring of this data via the Lift IQ service and analysis of both ESP data and production data (from a separator) with DesignRite software can help identify measures to optimize lift system and well performance. Monitoring pump performance also enables scheduled maintenance, which minimizes NPT and unplanned interventions.

**Motor voltage reduction lowers ESP power consumption and increases run life**
Maximus ESP systems are variable-rated for handling different operating conditions. Their operating efficiency can be enhanced by adjusting the voltage at surface, which changes the motor load factor. After performing a diagnostic simulation, Schlumberger recommended a reduction in the surface voltage for several wells where the motors were operating above the required rating; 12 wells were optimized in total. As a result, ESP power consumption reduced by 124 kW (89,280 kWh/month assuming 100% uptime) and operational efficiency increased with no change in the production rate.

The reduction in surface voltage also has an important long-term benefit because it helps to extend ESP run life, reducing workover frequency and avoiding the resulting deferred production. Lowering the voltage reduces the stress on downhole motor windings, mitigating the risk of developing an earth fault. Because the motor efficiency increased and core losses decreased, a drop in motor winding temperature was observed. A lower rise in temperature means less thermal degradation of the motor insulation, which also contributes to extending run life.

Monitoring and analysis of ESP operating parameters led to a recommendation to reduce motor voltage in several wells. The graph for one well shows power consumption (green) declined by 15% while the motor winding temperature (purple) dropped by 4 degC (7 degF). The lower electrical and thermal stress helps extend ESP run life, leading to fewer interventions.