

Case study: California, North America

MaxRate software increased ESP average run life 182%

An operator had problems with multiple electrical submersible pumping (ESP) system shutdowns a field near Bakersfield, California. The main cause of failure was high gas content in the fluid stream. This caused the motor to run hotter and pump intake pressure (PIP) to be erratic. Run life was decreased due to high motor temperature and underload shutdowns.

The ESP systems operated in this field for years with gradual decline in run time. Baker Hughes has continuously improved the ESP system application and equipment specification by making the material and equipment configuration fit-for-purpose.

MaxRate™ software was introduced through an **Electrospeed Advantage™ Variable Speed Drive (VSD)**.

The wells repeatedly shut down due to underload when gas slugs entered the pump. MaxRate software and the

VSD allowed the ESP to ride through the gas and withstand gas-related events. As motor amperage decreased due to the presence of gas, the VSD sped up the pump by a few Hz using I-limit settings. If the speed increase did not clear the gas, MaxRate software was activated and allowed the pump to slow down and purge the gas from the pump. When gas did not clear after the first purge attempt and after a predetermined set time, the purge cycle was activated again.

MaxRate gas mitigation software improved ESP system gas handling performance and multiple gas-related shutdowns were eliminated. Since MaxRate software was added to the drive in wells A and B, cumulative ESP run time has increased from a field average of 164 to 425 and 499 days respectively.

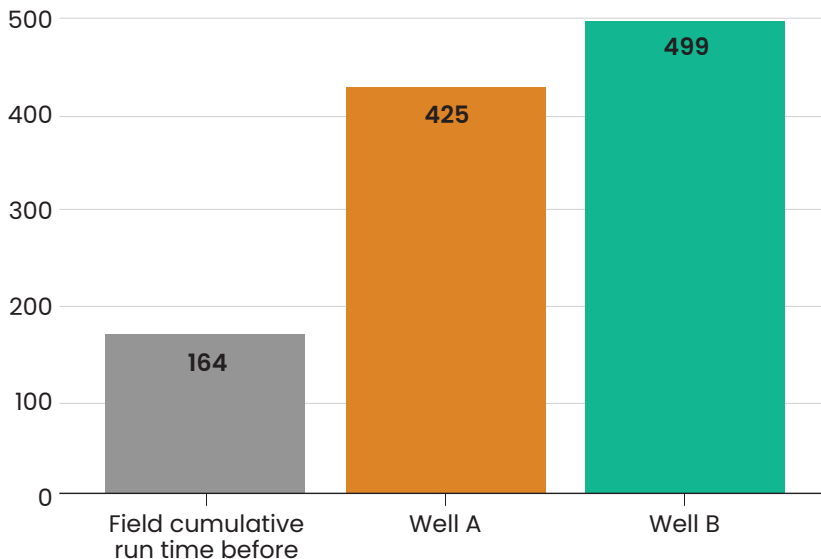
Challenges

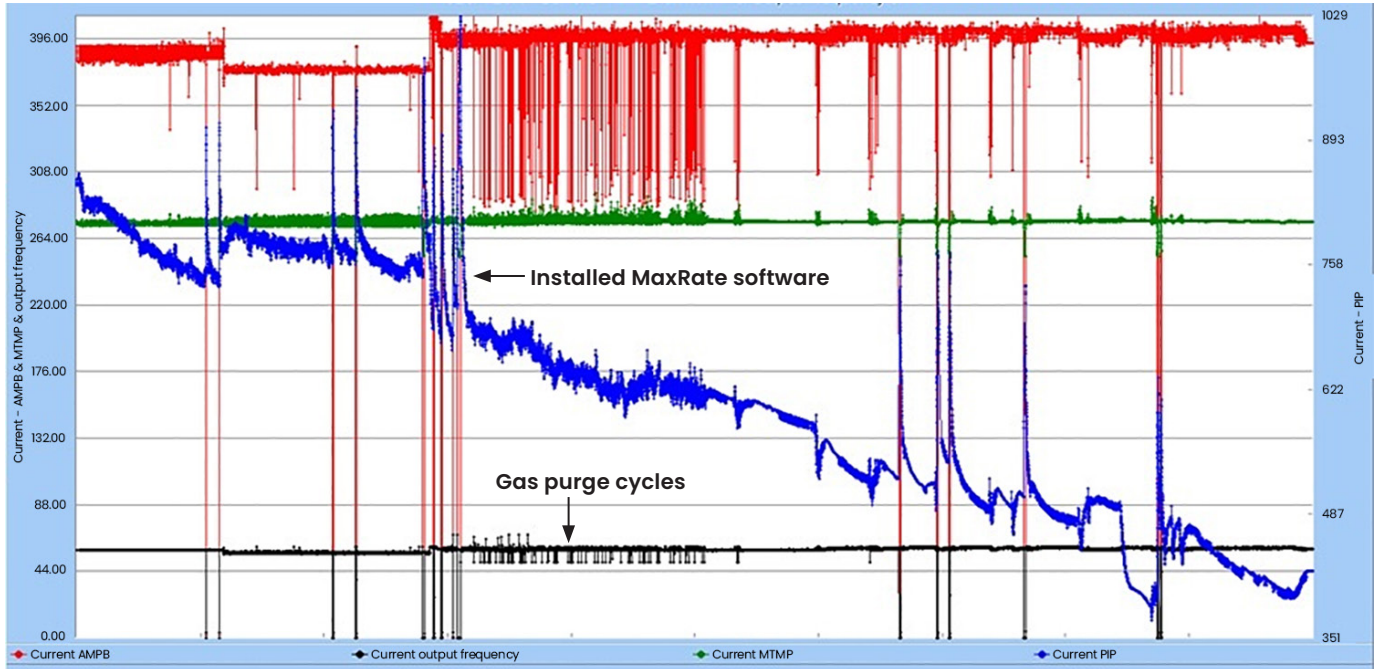
- ESP system operation was negatively affected by production of 400 to 500 Mcf/d of gas
- Operator's wells were 9,600 feet TVD
- ESP motor operating temperature was around 270°F at system start with tendency to rise once operational
- Rapid pump intake pressure variations occurred due to presence of gas

Results

- Improved run life from 164 to 425 and 499 days respectively for two ESP systems using MaxRate software
- Maintained 200 to 300 psi pump intake pressure with ESP
- Eliminated ESP changeout with improved run time
- Analyzed the operator's well conditions and recommended MaxRate software for Electrospeed Advantage VSD

Operating time in days





Software ran at Set Frequency Mode and I-Limit. Fluctuated current chopped over time (red line). Software allowed ESP to stay operational and continue to draw down the fluid level. Gas lock events became less frequent over time.