Case study: Caspian Region, Russia

Intelligent Production System installed SureSENS system in extreme ERD well, shattered record depth

An operator in the Russia Caspian region consistently drills and completes some of the longest extended-reach wells in the history of the oilfield. Extended-reach drilling (ERD) is defined by a well in which the horizontal section is greater than the total vertical depth by a 2:1 ratio. Standard ERD wells are notorious for being challenging completions due to the long horizontal sections and high friction. These aspects of ERD wells pose risks to systems relying on control lines. What made this well particularly challenging was the extreme measured depth (MD): 38,047.5 ft (11 596.9 m). To enable efficient production, the operator needed reliable bottomhole production monitoring and turned to Baker Hughes, an industry leader with best-in-class tools, cutting edge technology, and flawless service delivery.

As a solution, Baker Hughes recommended the **SureSENS™ permanent downhole monitoring system** which supports multiple monitoring devices on a single tubing encapsulated cable (TEC) and interfaces with surface, subsea infrastructures, or floating facilities. Extensive qualification programs and superior metrology specifications offer the capability of delivering highly accurate information for extended periods of time. Gauges feature proprietary and high-resolution quartz crystal design and have numerous

configurations providing flexible solutions for applications such as high pressure/high temperature (HP/HT), high-rate gas wells, and subsea environments.

A dual SureSENS system was run in hole as part of a 7-in. upper completion to monitor pressure and temperature data at strategic reservoir level. The unique design of Baker Hughes dual SureSENS gauge enables monitoring tubing and annulus simultaneously at a single point, using a solitary gauge mandrel. The permanent installation, resolution of .0001, accuracy of +/- .015%, and maximum annual drift of 2 psi per year, makes this gauge an invaluable asset for the life of the well. Overcoming high inductance caused by the extremely large reel of spooled cable required the use of the extended reach card during the completion run.

This gauge was run to depth on a 7-in. completion string made up of 26# and 29# tubing, accompanied by a hydraulically controlled subsurface safety valve, flow couplings, a gas lift mandrel, a production packer, and seal assembly. Cross coupling protectors were installed at each joint coupling, maintaining tension on the tubing encapsulated conductor and protecting it with a cast iron barrier from the frictional forces applied to the completion string on the long run to total depth. Baker Hughes Intelligent Production Systems (IPS) and Upper Completions personnel worked in

Challenges

- Install monitoring system in extreme ERD well
- Deliver reliable bottomhole production monitoring

Results

- Deployed specially designed extended-reach interface card to facilitate communication to SureSENS gauge at record depths
- Enabled real-time pressure temperature data to provide remote bottomhole production observation and real-time reservoir decision making power
- Featured superior pressure and temperature resolution of .0001 psi
- Monitored single-point, simultaneous tubing and annulus data via a flexible design
- Reached record-breaking MD of 38,047.5 ft (11 596.9 m)
- Experienced no health, safety and environmental (HSE) issues or nonproductive time (NPT)

perfect cooperation with other service companies and the operator to achieve this milestone without any nonproductive time or operational delays.

The previous record for deepest installation resulted in an MD of 32,349 ft (9860 m). This well, at 38,047.5 ft (11 596.9 m) now becomes the new record-breaking depth.

The operator was extremely satisfied, and now has the ability, confidence, and run history to install electronic well monitoring systems at deeper-than-ever positions, allowing remote bottomhole production observation and real-time reservoir decision-making power.

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