MATURE FIELDS

CASE STUDY

BaraLogix® Services Enable Operator to Maintain Stable Wellbore in HPHT Conditions

KHURSANIYA FIELD, SAUDI ARABIA

CHALLENGES

Offset wells encountered multiple issues related to drilling fluid control in HPHT conditions:

- Tight hole and/or shale sloughing
- H_2S influx
- Abnormal pressure
- Lost circulation and stuck pipe

SOLUTION

Baroid installed the BaraLogix® Density and Rheology Unit (DRU) at the rigsite and provided a team of BaraLogix engineers to continuously monitor fluid properties while drilling the problematic hole section.

RESULTS

The interval was drilled with zero instability issues, 13 days faster than the planned time.

- USD 650,000 saved in operational costs
- Sidetrack avoided, saving potentially USD 1.4 million

OFFSETS TO HPHT WELL ENCOUNTERED SEVERE WELLBORE INSTABILITY ISSUES

The operator expected several challenges while drilling the proposed high-pressure/high-temperature (HPHT) well:

- Tight hole and/or sloughing in the shale formation
- H_2S influx
- Abnormal pressure in the dolomite formation
- Lost circulation and stuck pipe

Similar issues were encountered while drilling the 8-3/8-inch interval on offset wells, where mud weights ranging from 85 pcf (11.4 ppg) to 155 pcf (20.7 ppg) were used due to uncertainty about formation pressures. Losses, stuck pipe, and well control incidents occurred when mud weights were raised from 148 pcf (19.8 ppg) to 155 pcf (20.7 ppg). Two wells were suspended after getting stuck, representing 30 percent of the total wells drilled in the field in the last two years.

BARALOGIX® MONITORING SERVICES DELIVER REAL-TIME FLUID OPTIMIZATION

To help the operator optimize mud properties and avoid the severe disruptions experienced on offset wells, the Baroid team installed the BaraLogix® Density and Rheology Unit (DRU) at the rigsite and supported it with BaraLogix real-time monitoring services. The focus was on successfully drilling the 8-3/8-inch interval through the Jilh formation.

Combining DRU data with BaraLogix monitoring and trend analysis allowed the operator to drill the entire section faster as compared to the other wells in the field, with zero losses or downhole issues.

During the drilling operation, the BaraLogix team identified trends that revealed significant improvement opportunities in surface management of the drilling fluids. The resulting on-the-fly modifications helped minimize fluctuations in the equivalent circulating density (ECD) and prevent losses. The BaraLogix early warning and detection system found a total of 171 density and rheology changes that could potentially affect wellbore stability. These observations were recorded and promptly communicated to onsite personnel over the course of 22 days of operations.

For example, the BaraLogix engineer used Stop Work Authority and informed the drilling foreman that excessively heavy mud was being pumped into the well. The foreman decided to stop the drilling, pick up off bottom and circulate until the mud density was reduced to the specification. The early detection and reporting provided through BaraLogix monitoring services prevented the losses and stuck pipe that might have occurred with the non-spec mud.

The BaraLogix DRU system is a stand-alone sensor package that measures laboratory-grade pressurized density and six-speed rheology via rapid sampling at the collection point.

Its installation allowed an unprecedented volume of data to be displayed on the Petrolink real-time system. BaraLogix DRU outputs are also incorporated into the Halliburton InSite® rig information system. Alarm systems and an effective communication protocol allowed the drilling fluid information to be distributed at the rigsite in a timely manner. The operator's drilling staff and Baroid's BaraLogix engineers had direct visibility of dynamic fluid properties, allowing for immediate correction of any inefficiency in fluids management.

BARALOGIX SERVICES HELP REDUCE DRILLING DAYS BY 37 PERCENT

BaraLogix technology made it possible to maintain wellbore stability while drilling the entire 8-3/8-inch section. The ability to optimize mud properties on the fly resulted in a reduction in mud mixing and a savings of approximately USD 650,000, which also accounts for the cost of the BaraLogix services.

BARALOGIX
HELPS SAVE OPERATOR
13 Days | $650K

HAL88719

The operator also avoided spending USD 1.4 million on a sidetrack operation.

In this field, the average time to drill the 8-3/8-inch section was 35 days. If a sidetrack was required, that time was extended by an average of 28 days. Using the BaraLogix system and monitoring team, the interval was drilled in 22 days.

The BaraLogix DRU combined with monitoring services delivered 171 communications confirming mud density and rheology deviations, leading to improved control of fluid properties pumped into the well and the elimination of mud-related nonproductive time (NPT). The BaraLogix data also provided lessons learned and strategies for better fluid optimization in upcoming similar wells.

The BaraLogix services worked exactly as expected by the customer. While drilling the entire section, the DRU continuously provided a total of 15,657 density and 1,788 rheology measurements. The accuracy and frequency of the DRU data promptly gained acceptance within the operator's drilling team and with rigsite service providers.

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