

HYDRO-GUARD® WBM Saves Six Days on Long 12-1/4-Inch Section with Reactive Clays, Potential Loss Zones

OMAN

CHALLENGES

Experience on offset wells showed that reactive clays and lost circulation issues made drilling the long 12-1/4-inch section difficult.

- » Excessive backreaming delayed trips.
- » Casing string had to be washed to bottom.

SOLUTION

After running multiple shale analysis tests, the Baroid team identified HYDRO-GUARD® inhibitive WBM as the right drilling fluid to stabilize shales and minimize the risk of downhole losses.

RESULTS

The interval was drilled and 9-5/8-inch casing was run with minimal complications.

- » Casing was set six days ahead of the plan.
- » Savings in rig time was valued at USD 378,000.

LONG 12-1/4-INCH INTERVAL PLAGUED WITH REACTIVE CLAYS, SEVERE LOSS ZONES

The 12-1/4-inch section was the longest interval of the well, with a planned casing setting depth of approximately 3,600 meters (11,811 feet). Three reactive clay formations would be encountered while drilling this section: the Natih D, Nahr Umr, and Gharif shales. On previous wells, these formations had destabilized, resulting in excessive backreaming during trips and hole pack-off conditions.

Lost circulation was also a significant issue in the Natih, Khuff, and Habshan formations. Severe to total losses occurred on offset wells while drilling natural fractures and vugs in the Habshan formation. Seepage was a known problem in the Khuff formation.

Because of these issues, the operator had difficulty running the 9-5/8-inch casing string on most offset wells. Backreaming and washing down the casing consumed days of rig time. These delays were attributed to the failure of the drilling fluid to adequately inhibit the reactive shale formations.

SHALE ANALYSIS RESULTS IN OPTIMAL FLUID SELECTION: HYDRO-GUARD® WBM

Baroid technical personnel conducted a laboratory study to identify a fluid formulation that would provide effective inhibition for the reactive clays. The study focused on three types of shale and fluid analysis:

- » X-ray diffraction (XRD) to determine the clay mineralogy of the Natih, Nahr Umr, and Gharif shales
- » Shale accretion testing of Natih and Nahr Umr shales, using several fluid systems
- » Shale dispersion testing of Nahr Umr shale, using the optimal system as determined by accretion

Based on improvement in accretion results compared to previously used fluids, the clay-free HYDRO-GUARD® water-based mud (WBM) system was recommended to maximize inhibition in these clay types. HYDRO-GUARD WBM prevents shale hydration and dispersion, seals micro-fractures/fissures, minimizes cuttings disintegration, and reduces dilution rates. It contains polymeric flocculants and encapsulators to minimize degradation of drill solids, and inhibits amines to prevent clay from dispersing in the system. Solids removal efficiency at the surface is significantly improved, further reducing fluid costs.

The HYDRO-GUARD system is engineered to provide effective hole cleaning and prevent excessive equivalent circulating density (ECD) values. This helps reduce the risk of downhole losses.

All the performance characteristics of the HYDRO-GUARD system combine to help lower overall well costs.

INTERVAL DRILLED AND CASING SET SIX DAYS AHEAD OF PLAN, SAVING USD 378,000

The 12-1/4-inch interval was drilled smoothly. All trips were completed with very little backreaming compared to offset wells. Downhole losses while drilling were insignificant. The 9-5/8-inch casing was run to bottom with minimal washing.

The operator was able to drill the 12-1/4-inch section and set 9-5/8-inch casing six days ahead of plan, creating a savings of USD 378,000 based on a rig rate of USD 60,000 per day.

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