



Operator uses customized drilling fluid to optimize wellbore stability

PERFORMADRIL® high-performance, water-based mud system delivers superior shale inhibition in Nahr Umr and Laffan formations

OFFSHORE PERSIAN GULF

CHALLENGE

- » Enable effective hole cleaning in a large-bore interval
- » Prevent bit balling in shale formations
- » Minimize trip and back-ream times, and shale exposure

SOLUTION

- » **PERFORMADRIL® fluid system** customized to prevent bit balling and inhibit the reactive clays
- » **DFG® Drill Ahead software** to optimize drilling performance
- » **BAROLIFT® sweeping agent** to provide a supplemental hole-cleaning strategy

RESULTS

- » Achieved higher rate of penetration with “zero” bit balling events
- » Significantly reduced tripping and back-ream time, and occurrence of pack-off events
- » Allowed operator to successfully run and cement 16-inch tie-back casing 10 days faster than offset well, saving approximately \$1.5 million

OVERVIEW

A major offshore operator faced continuous challenges drilling the 20-inch interval through troublesome shale formations. When using conventional water-based mud (WBM) and a competitor’s high-performance water-based mud (HPWBM), a low rate of penetration (ROP) and balling tendencies were experienced with these fluid systems. Excessive back-reaming was required on trips through the reactive and mechanically unstable shales that resulted in further destabilization of the wellbore and occasional pack-off events. The operator required an alternative fluid formulation to drill the Nahr Umr and Laffan shales without incurring non-productive time (NPT) and with optimal ROP.

CHALLENGE

The large hole size planned through unstable clay conditions posed several challenges to drilling engineers. A highly inhibitive, water-based mud would be needed to maintain wellbore stability, especially when navigating the anticipated 16-degree inclination. The large hole size would also cause low annular velocities and present hole-cleaning issues, impacting the overall well delivery results.

SOLUTION

The Halliburton Baroid Technical Team initially performed an in-depth review of suitable fluid technologies. Extensive laboratory testing was performed to evaluate the swelling, dispersion, and accretion tendencies of the Nahr Umr and Laffan shales in candidate formulations. The customized PERFORMADRIL® fluid system with BaraSeal® W-1040 sealing agent exhibited optimal test results, with 2.1% dispersion and 2% accretion tendency. Before being deployed, the PERFORMADRIL fluid was also stress tested against London Clay and achieved <3% accretion. BaraSeal W-1040 was added to PERFORMADRIL to minimize filtrate invasion and further stabilize the Nahr Umr and Laffan formations. Detailed DFG® Drill Ahead hydraulics modeling was performed during the well planning and execution phases. Finally, BAROLIFT® sweeps were employed as a supplemental hole-cleaning strategy through the interval.

10 >> days of rig time saved attributed to Baroid fluid solutions.

RESULT

The 11.9 ppg PERFORMADRIL fluid system was successfully deployed, and the 20-inch section was drilled to target depth. The benefits of this innovative system compared to legacy applications can be summarized as follows:

- » 60% increase in ROP
- » 40% reduction in back-reaming time
- » 80% reduction in pack-off events
- » 61% increase in tripping speeds
- » 0 bit balling events

The operator was satisfied with the outstanding performance of Baroid's customized PERFORMADRIL plus BaraSeal W-1040 formulation, as efficiency improvements resulted in an estimated savings of 10 days of rig time, with a value of \$1.5 million.

SHALE TESTING

The following chart shows shale test data measuring accretion, erosion, and swelling across different drilling fluid formulations, with the PERFORMADRIL® fluid system delivering superior results.

