

ADNOC Uses Advanced Fluid Technology to Drill Longest Onshore ERD Well in UAE Saving 10 Rig Days

BARAXCEL™ HIGH-PERFORMANCE INVERT EMULSION WITH DIESEL-BASED FLUID ENHANCED ROP BY 29% OVER SHORTER WELLS IN THE SAME FIELD

UNITED ARAB EMIRATES

CHALLENGE

- » Drill an extremely long horizontal section (20,000 ft) with top drive limitations of 130 rpm and hole cleaning concerns
- » Implement client's first-time use of non-aqueous fluid (NAF) in the reservoir section
- » Better manage ECD and prevent lost circulation downhole

SOLUTION

Halliburton Baroid proposed the following integrated drilling and fluids solution:

- » BaraXcel™ High-Performance Invert Emulsion with diesel-based fluid – to formulate a 10.5 ppg low-solids NAF
- » Calcium bromide – used for the internal brine phase to minimize solids contents and maintain low ECD
- » Drilling Fluids Graphics (DFG™) hydraulic modeling software – to perform simulations and optimization analysis during the planning and execution phases
- » EZ-MUL® NT additive – to improve the drilling fluid's oil-wetting characteristics
- » BARACARB® calcium carbonate bridging agent – to seal the formation

RESULTS

- » Drilled ERD interval to planned depth in two runs, as planned
- » Maintained ECD below fracture gradient with minimal downhole losses and no hole cleaning issues
- » Completed drilling operation 10 days ahead of AFE
- » Improved ROP by 29 percent using diesel-based fluid versus the average ROP of same-field shorter wells that used water-based mud (WBM)

OVERVIEW

Abu Dhabi National Oil Company (ADNOC) planned to drill an onshore extended reach (ERD) well to 32,000 ft MD, which would be the longest ERD to date in the UAE, with Halliburton as part of an Integrated Drilling Services project. The 8½-in. lateral section of 20,000 ft was thought to require two bit runs, as it presented challenges around hole cleaning, equivalent circulating density (ECD) management, and the risk of lost circulation.

CHALLENGE

This ERD well was more than 2.5 times the length of the longest offset onshore well previously drilled by ADNOC. Losses were expected while drilling the lateral section due to natural faulting in the area, and ECD control was needed to maintain a fracture gradient (FG) below 13.46 ppg. Other hurdles to overcome were low solids control efficiency, mud pump reliability, and top drive limitations of 130 rpm.

SOLUTION

Prior to this project, reservoir sections were drilled with water-based fluids but due to the longer lateral and associated higher friction factors, Halliburton Baroid recommended an invert emulsion system. The ADNOC Onshore operator expressed a preference to drill with a "diesel-based" invert emulsion fluid. The Baroid Technical Team, therefore, selected a 10.5 ppg organophilic, clay-free BaraXcel™ system with a calcium bromide internal phase to be used in conjunction with EZ-MUL® NT for optimum emulsification. The low-solids invert emulsion and fragile gel structure would minimize ECD and the risk of induced lost circulation while drilling or tripping. A bridging package consisting of sized BARACARB® materials was also proposed for sealing the formation and developing a thin, tight filter cake. The lower drill pipe rotation was a result of top-the-top drive limitations. Although this presented a hole cleaning concern, the tuned fluid rheology and high flow rates proved effective for in-hole cleaning. DFG drill-ahead hydraulics confirmed hole cleaning efficiency during both the pre-drill and execution phases of the well.

RESULT

Halliburton Baroid delivered a successful, record-breaking ERD well with above-average ROP compared to shorter offset wells drilled with water-based fluids. The section was drilled 10

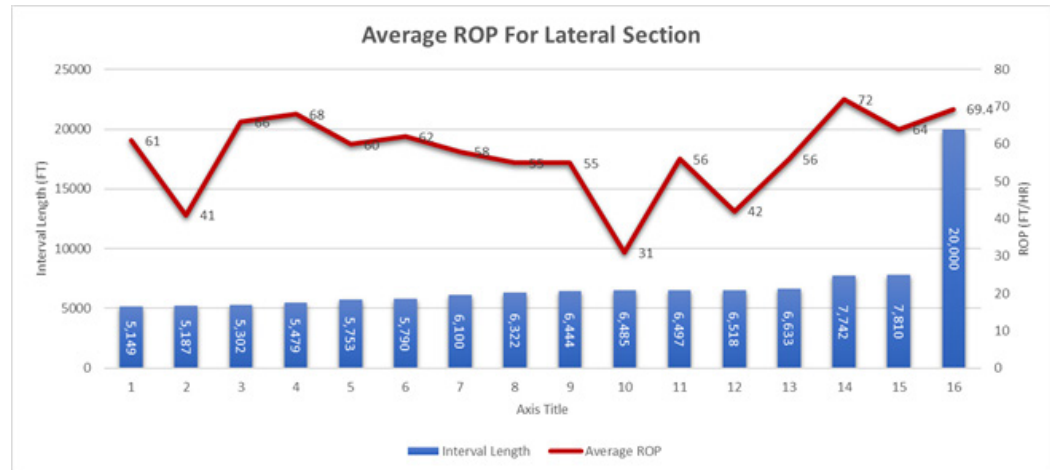
"The Baroid team has consistently delivered beyond expectations, giving us confidence when implementing changes to fluid programs. The success of this well using BaraXcel has renewed our interest to push the limits of lateral reach."

-Mr. Ahmed Abdulla Al Mutawa,
Vice President, Drilling Operations (ASR/Uc)

days ahead of plan with rig time savings estimated at USD 350,000. The ECD values of the BaraXcel fluid system were maintained below the maximum FG, eliminating the risk of induced fractures and lost circulation. Seepage losses of only 10-20 BPH were experienced towards the end of the 20,000-ft interval.

The BaraXcel High Performance Invert Emulsion with diesel-based fluid demonstrated stability while drilling the unusually long section, even under static wellbore conditions while tripping. Friction factors for the off-bottom torque were maintained below 0.18 while drilling the lateral section and 0.15 while tripping out of the well.

The BaraXcel system with accurate DFG hydraulics software simulations proved to be key success factors, causing ADNOC to consider these combined technologies for future ERD wells.



Comparative chart demonstrating the longest ERD well interval (#16) significantly outperformed the 15 offset wells in terms of ROP averages due to the integrated drilling solution featuring Halliburton Baroid's diesel-based fluid, BaraXcel.

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