

Oman

Custom high-temperature, water-based fluid system helps operator save \$349K per well

Nano technology additive delivers wellbore stability in hard rock formation, facilitates 7-day reduction in drilling time

CHALLENGE

- Slow ROP in hard rock formation
- High temperatures up to 148°C that impact fluid stability and result in poor HPHT and PPT fluid loss control
- High differential sticking risk with differential pressure up to 1,600 psi overbalance
- Effective hole cleaning with low rheology
- Cutting slip with static conditions or connection time with a low rheology profile

SOLUTION

- Incorporate BaraFLC® Nano-1 and BaraVis® W-637 additives to minimize fluid invasion, promote stability, reduce differential sticking, and prevent washout
- BaraXtreme® Nano fluid designed to promote turbulent flow for hole cleaning

RESULT

- 6-in. section drilled 6.98 days ahead of AFE with ROP ~two times faster than offset wells
- No hole cleaning issues; pump rate increased by 8%
- No signs of cuttings settling
- No differential sticking during drilling and wireline logging

Overview

Drilling through hard rock formations is a standard challenge in Oman's deep gas wells, where abrasive sandstone, siltstone, and old shale formations are encountered. These difficult conditions often result in a slow rate of penetration (ROP) and average 5 m per hour during the drilling of the 6-in. interval. Halliburton Baroid introduced BaraXtreme® Nano a low-rheology, near solid-free drilling fluid enhanced with nano sealant particulates. The solution optimized bit hydraulic efficiency and reduced equivalent circulating density (ECD) with the creation of a turbulent flow regime throughout the wellbore. The fluid also controlled fluid loss into the formation and exhibited good stability under elevated bottom hole static temperatures (BHST) up to 148°C.

Challenge

Six-inch wellbore sections face significant drilling challenges, including abrasive hard rock formations, high differential pressure (1,600 psi), and elevated bottom hole temperatures (148°C). The main objective is to enhance the rate of penetration (ROP) to achieve faster drilling and reduce wellbore construction time.

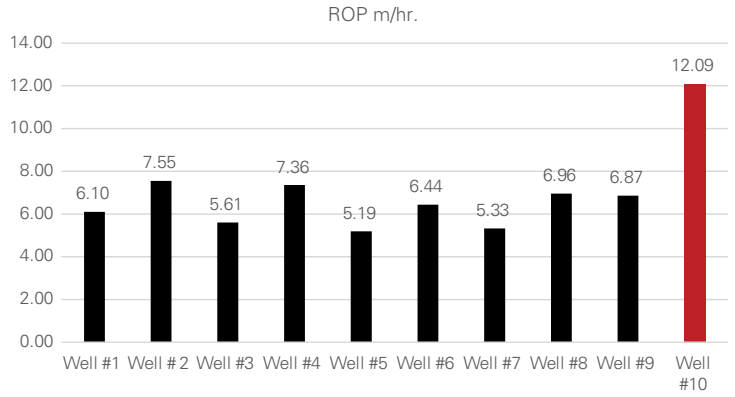
Solution

Baroid's BaraXtreme® Nano drilling fluid system, with the advanced additives BaraFLC® Nano-1 and BaraVis® W-637, was designed to help mitigate differential sticking risk and control fluid invasion into the formation. Extensive laboratory testing that simulated downhole pressure and temperature conditions validated the fluid's performance under operational scenarios. Baroid's team used proprietary hydraulic modeling software (DFG™ drill-ahead and hydraulics) to optimize wellbore flow regimes and ensure maximum hydraulic horsepower delivery and a turbulent flow regime. This is essential for effective hole cleaning and bit performance.

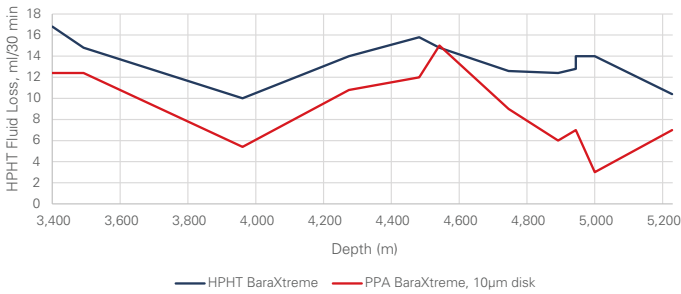
Result

The 6-in. interval was successfully drilled without wellbore stability issues. A turbulent flow regime ensured exceptional hole cleaning efficiency without noticeable increases in torque or drag during drilling or tripping. Controlled PPT/HPHT minimized differential sticking risk and produced a slick, thin mud cake, that prevented washouts. This optimized strategy increased the drilling rate by approximately 89% compared to previous fluids used in offset main holes. The section was completed 6.98 days ahead of schedule (AFE), saving the client an estimated \$349,000.

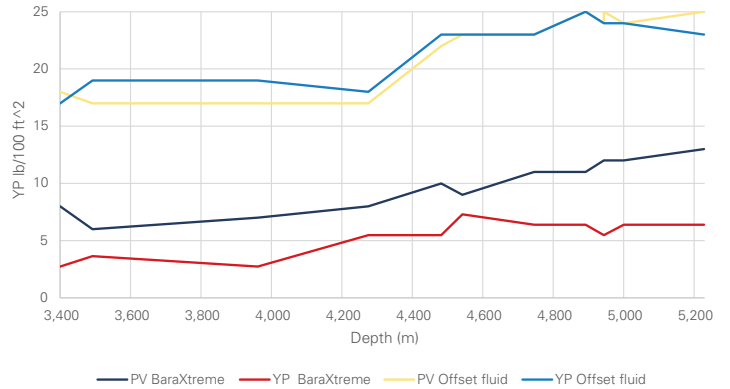
BaraXtreme Nano fluid system with nano technology improved drilling performance



BaraXtreme Nano fluid system filtration performance: HPHT and PPT 500 psi, 150°C (10 microns disk)



Low rheology BaraXtreme Nano fluid system properties compare to offset



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