CASE STUDY

HALLIBURTON

Oman

Nanoparticle fluid helps operator reduce costs, elevate performance on HPHT well

BaraHib® Nano high-performance water-based mud reduces dilution rates, lowers viscosity, and tightens filtration rates during 22-day interval with maximum temperature of >300°F

CHALLENGE(S)

- Achieve HPHT and PPA fluid loss control at 302°F
- Minimize plastic viscosity in the WBF by curbing the use of synthetic fluid loss polymer
- Eliminate the overpull typically experienced during extended wireline logging programs

SOLUTION(S)

- Halliburton Baroid customized BaraHib Nano drilling fluid using a newly developed wellbore sealant as the main fluid loss agent
- Fluid delivered lower viscosity, reduced equivalent circulation density, downhole pressures

RESULT(S)

- PPA and HPHT fluid loss was maintained between 8-12 ml/30 min. at 500 psi and 150°C (302°F) with minimal fluid maintenance while drilling
- 5% ECD and 6% SPP reductions
- Logging was smooth with no overpull while taking pressure points

The operator achieved wellbore stability with the help of Halliburton Baroid high-performance water-based fluids. These systems deliver similar performance to oil-based muds.

Overview

A major operator in Oman drilled 6-inch diameter vertical hole sections to access gas reservoirs at >5,000 meters with a high temperature salt and polymer water-based fluid (WBF) that contained bridging agents.
The operator sought an alternative WBF formulation to improve drilling and wireline performance. They also wanted to maintain tight filtration characteristics and a thin filter cake. The operator expected to realize reduced dilution rates and lower fluid maintenance costs during the lengthy interval.

Challenge

The operator drilled multiple wells using a salt and polymer fluid mix that depended on a high-viscosity synthetic polymer to control high-pressure, high-temperature (HPHT) filtration and particle plugging apparatus (PPA) spurt and filtrate values. The limitations of this approach were apparent when additions of the polymer to lower the filtration rate caused high viscosity events. This slowed progress with drilling. Lower viscosity and filtrate were desired, but this ideal combination was not possible given the behavior of the conventional system components.

Solution

Baroid used new technology to design a custom BaraHib Nano fluid. BaraFLC® Nano-1 wellbore sealant replaced the high temperature synthetic fluid loss polymer from the formulation. Baroid performed extensive laboratory work to qualify the fluid for its first HPHT application. The optimum fluid formulation exhibited tight filtration characteristics with an improved rheological profile. The operator approved the fluid design and deployment recommendation.

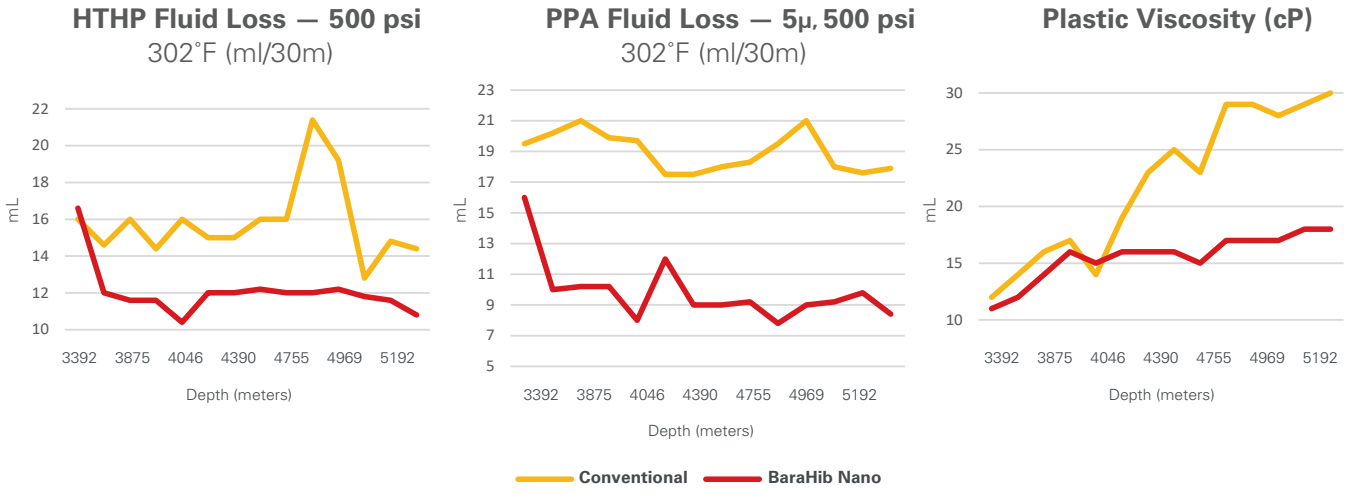
The fluid system was treated with BaraFLC Nano-1 wellbore sealant while drilling ahead. After the completion of two circulations, the filtration characteristics improved with HPHT fluid loss (302°F) reduced from 60 to 10 ml and total PPA dropped from greater than 50 ml to 11 ml/30 minutes (Δ500 psi on 10µ ceramic disc). The PV was maintained at an average value of 16 cP.

The section was drilled in 22 days with three bit runs required through hard, abrasive formations. Stable hole conditions were observed while drilling, tripping, logging, and running tubing. Despite the length of time needed to complete the interval, the fluid consumption was low. This confirmed the resilience of the BaraHib Nano fluid formulation. Minimized dilution factors and maintenance treatments reduced fluid costs and simplified logistics to the remote location.

Results

- Low, easily controlled HPHT and PPA fluid loss with minimal maintenance
- An improved rheological profile through reduced plastic viscosity, limiting SPP and ECD
- Simplified logistics by eliminating 1½ truckloads of product between the warehouse and rig
- Reduced manual labor at the rig site by decanting 11 IBCs of liquid BaraFLC Nano-1 as compared to mixing 965 sacks of dry products
- Excellent tripping through the open hole with no reports of tight spots or over-pulls
- Good logging performance with no signs of sticking during the measurement of pressure points

PERFORMANCE COMPARISON | Conventional versus high-performance water-based fluid systems



For more information, contact your local Halliburton representative or visit us on the web at www.halliburton.com