

Oman

Engineered HP water-based fluid optimizes performance in unstable, reactive shale

BaraHib® Nano trackable inhibitive system delivers wellbore stability and helps operator save \$25,000 per well

CHALLENGE

- Facilitate a trouble-free 7-in. liner run with the stabilization of unstable formations
- Improve filtration characteristics with tight PPT and HPHT values to reduce pressure transmission into the shale formation
- Mitigate the tendency for shale hydration and dispersion

SOLUTION

- Baroid proposed a customized BaraHib® Nano drilling fluid solution using the BaraFLC® Nano-1 wellbore sealant to stabilize troublesome formations

RESULT

- Filtration properties improved with PPA and HPHT fluid loss maintained between 8-12 ml/30 min at 500 psi and 120°C (25%-30% lower than the offset well) with minimal system maintenance while drilling
- No instances of wellbore instability while drilling and running the 7-in. liner

Overview

A major operator in Oman drills vertical gas wells with the 8 1/2-in. interval through unstable shale formations. Shale instability is frequently observed when running the 7-in. liner. The operator sought to include nanotechnology with the high-performance water-based fluid to stabilize the troublesome formations.

Challenge

This interval is drilled through reactive and unstable formations. The shales consist of 13-44% hydratable, mixed-layer clays and approximately 5% dispersible kaolinite. The shales typically need to be stabilized for three to four days.

Solution

Halliburton and the operator's representatives worked to qualify the BaraHib® Nano high-performance water-based fluid system for drilling the interval. Halliburton and the operator performed extensive laboratory work to validate the performance of candidate fluid technologies.

The BaraHib® trackable and inhibitive system was proposed because of its proven effectiveness in suppressing swelling and minimizing dispersion. To enhance wellbore stability by reducing pressure transmission near the wellbore, the fluid system was supplemented with BaraFLC® Nano-1 wellbore sealant. The nanoparticles in BaraFLC® Nano-1 decreased the permeability of the filter cake, reduced filtration rates, and minimized the interaction of filtrate with pore fluid. Additionally, BaraFLC® Nano-1 wellbore sealant improved the rheological profile by lowering plastic viscosity (PV) and reducing equivalent circulating density (ECD) across the shale formation.

Result

Field deployment of the BaraHib® Nano high-performance fluid system confirmed its differentiated filtration properties. The system exhibited improved performance in the particle plugging apparatus (PPA) test and high-pressure high-temperature (HPHT) filtration test. Notably, the system maintained stable filtration characteristics at 248°F (120°C) for 48 hours. BaraSure® W-988 shale stabilizer inhibited the fluid's interactions with the formation.

The integrated solution's key advantage is the tracking capability included in the kit, allowing for optimized wellbore fluid management and cost efficiency with the targeted addition of products only when depletion is detected.

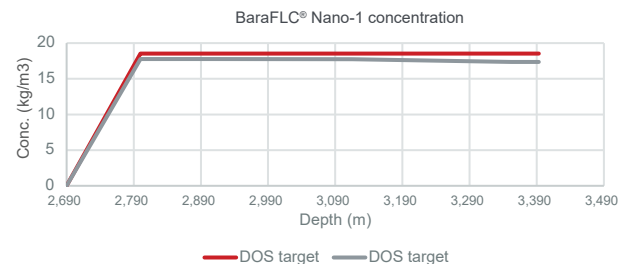
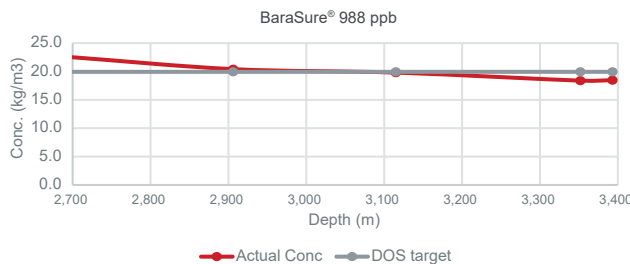
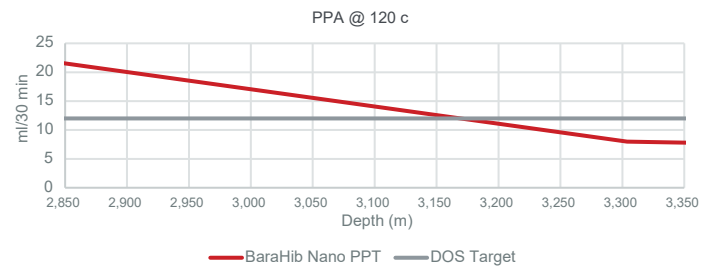
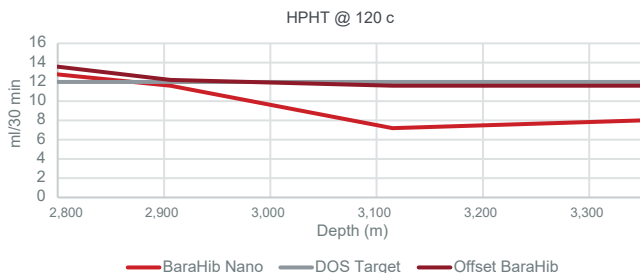
The incorporation of the BaraHib® Nano high-performance fluid system, treated with the BaraFLC® Nano-1 wellbore sealant and BaraSure® 988 shale stabilizer additive, enhanced wellbore stability and facilitated improved tripping times while drilling through shale formations.

Comparison of BaraHib® fluids for two wells

Operational time saved with the use of BaraHib® Nano high-performance water-based fluid systems

DESCRIPTION	WELL #1: BARAHIB® NANO FLUID	WELL #2: BARAHIB® FLUID
Tripping with 8½-in. BHA across open hole (hrs)	10.75 hrs	16 hrs
Open hole interval (m)	3,387 – 1,506 m	3,409 – 1,571 m
Running of 7-in. liner across Gharif formation (hrs)	4.5 hrs Smooth running across Gharif	9 hrs Tendency for packing off across Gharif

Operational and performance testing



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