

Case study: Gulf of Mexico, United States

DELTA-TEQ saved \$5.5 million USD in rig time, reduced downhole losses by 86%

An operator in the Gulf of Mexico struggled with an ultra-deepwater exploration well. The directional well—one of the deepest in Mexico with a water depth of 9,715 ft (2,961 m)—had a projected inclination of 45°. It was expected to lose approximately 6,000 bbl of drilling fluid in intermediate hole sections based on offset well data. In addition, the narrow drilling window made reaching target depth a challenge.

The operator was drilling in formations that required mud density ranging from 9.2 ppg (1.10 sg) to 11.3 ppg (1.35 sg). The drilling fluid needed to withstand 12,000 psi and 187°F (86°C), while maintaining constant rheology, lower viscosity, and fragile gel strengths in order to optimize drilling performance. Complex shales and sandstones were expected, along with lost circulation.

To achieve these drilling objectives, Baker Hughes recommended the operator use the **DELTA-TEQ™ low-pressure-impact drilling fluid**.

The DELTA-TEQ fluid is a non-aqueous, advanced formulation of specialized clay and polymers that creates a non-progressive gel structure, and reduces hydraulic impact with a rapid-set/easy-break profile. This profile maintains fluid integrity if operations are paused, mitigates pressure spikes when circulation resumes, and protects the formation from surge pressures when running casing.

In addition, the DELTA-TEQ fluid has the unique ability to manage hydraulic impact by maintaining

the right viscosity in the right areas of the well for optimal hole cleaning and penetration rates without putting excess pressure on the formation. Like a “viscosity clutch,” it engages viscosity at low shear rates and disengages at high shear rates for true optimization.

A constant rheology seed mud was treated and converted to the DELTA-TEQ fluid to drill three hole sections. The DELTA-TEQ fluid reduced the delta between the equivalent circulating density (ECD) and equivalent static density (ESD) to lower than 0.5 ppg. This minimized hydraulic impact and stress on the wellbore. In addition, the DELTA-TEQ fluid retained stability through an interval of 8,630 ft (2,630 m) and maintained constant rheology across temperatures ranging from 39°F (3.9°C) to 187°F (86°C). The Baker Hughes **ADVANTAGE™ engineering software** was used to predict circulating pressures, densities, hole cleaning issues, and surge and swab tripping profiles.

The DELTA-TEQ low-pressure-impact drilling fluid, in conjunction with **BRIDGEFORM™ single-sack wellbore strengthening system**, extended the narrow drilling window and reduced downhole losses by up to 86% compared to offset wells. This enabled the operator to achieve successful liner/casing runs, setting deeper than programmed depths:

- A 16-in. liner was placed at 15,988 ft (4,873 m), 436 ft (133 m) deeper than planned.

Challenges

- Ultra-deepwater well—seafloor at 9,715 ft (2,961 m)
- Narrow drilling window
- Deviated borehole with maximum inclination of 45°
- Projected downhole mud losses of 6,000 bbl

Results

- Improved ROP to reach total depth 8 days earlier than planned
- Extended the drilling window and reduced the delta between ECD and ESD to less than 0.5 ppg
- Reduced downhole mud losses by 86%
- Captured \$5.5 million USD in rig time reduction savings

- The 13 ³/₈-in. casing was set at 18,215 ft (5,552 m), 154 ft (47 m) deeper than planned.

In addition, the customer was able to obtain 60 ft (18 m) of high-quality core samples with 100% recovery in a 12 ¹/₄-in. hole section and performed five wireline logs without issues being recorded.

The DELTA-TEQ low-pressure-impact drilling fluid and BRIDGEFORM wellbore strengthening material allowed the customer to drill faster—reaching the well's final measured depth at 20,341 ft (6,200 m), 8 days ahead of schedule—and captured \$5.5 million USD in savings due to rig time reduction.

