

Innovative Sag-Resistant Fluid Provides Cost-Effective Drilling Solution for High-Angle Wellbore

CUSTOMIZED NAF SYSTEM ENABLES OPERATOR TO SUCCESSFULLY DRILL DIFFICULT WELLBORE

GULF OF MEXICO

CHALLENGE

Enable successful drilling despite high-angle wellbore that presented significant risks of lost circulation and stuck pipe

SOLUTIONS

BaraECD® NAF system to:

- » Provide a unique rheological profile that would deliver low, controlled ECDs, along with low viscosities
- » Maintain adequate suspension properties to resist sag and combat stuck pipe in the high angle

RESULTS

- » Avoided barite sag and stuck pipe while drilling, tripping, logging, and running casing
- » Kept ECD within safe operating window
- » Enabled operator to deliver well on time, with no NPT or HSE issues

CHALLENGE

An operator was drilling a 7.5-inch hole at a high angle (64°) in deepwater Gulf of Mexico. At 17,000 feet (5,182 meters), the well was in a depleted, permeable zone and was being drilled at a 3,000-psi overbalance, causing a significant risk of lost circulation and stuck pipe. The high angle increased potential for barite sag. Elevated equivalent circulating density (ECD) was an added risk due to the narrow hole size; however, increased ECD could not be tolerated due to the narrow drilling window, as the fracture gradient was 14.8 lb/gal and the surface mud weight was 13.7 lb/gal. Fracture-induced losses were also a potential hazard due to this narrow window.

The operator's previous attempts at drilling wells in this location resulted in stuck production liners, lost returns, and well control issues. After performing extensive hydraulic simulations based on the proposed wellbore configuration, Baroid realized that a new fluid solution must be engineered and customized to meet the needs of wells in this location in order to safely and effectively drill.

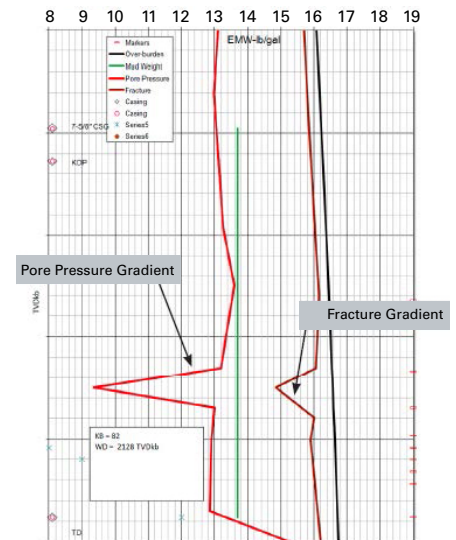
SOLUTION

Months of development and collaboration with this Gulf of Mexico operator yielded an enhanced fluid system that could meet each of the challenges presented by this extremely difficult wellbore. This system included non-organophilic solids, an enhanced emulsifier system, and a unique conditioning system.

Baroid designed a customized BaraECD® high-performance non-aqueous fluid (NAF) system to provide a unique rheological profile that would provide low, controlled ECD and low viscosity, but yet also maintain adequate suspension properties in order to resist sag and combat stuck pipe in the high angle.

To increase its effectiveness, the fluid was preconditioned by the unique Halliburton high-shear plant mixing system prior to being shipped to the location. Although the fluid remained

ZERO HSE INCIDENTS AND ZERO NPT



The pore pressure and fracture gradient profile for the trial well shows a narrow drilling window in some spots, necessitating ECD control.

The well was delivered under the specified authorization for expenditure (AFE) days, despite time delays due to initial problems.

stationary and unagitated for several days while being transported, when it arrived on location, all the same fluid properties were exhibited as when it was mixed, thus reflecting its superior suspension capabilities. A combination of specially sized lost circulation materials were used to seal off the permeable depleted zones, thereby mitigating any potential downhole losses and differentially stuck pipe.

RESULTS

The well was drilled, and there was no indication of barite sag or stuck pipe while drilling, tripping, logging, or running casing. ECD remained below 14.8 lb/gal, within the safe operating window. The operator successfully reached bottom with no further losses. Zero health, safety, and environmental (HSE) incidents were reported, and zero nonproductive time (NPT) was attributed to the fluid services. The well was delivered under the specified authorization for expenditure (AFE) days, despite time delays due to initial problems. This result proved that the high-performance BaraECD NAF system can provide a cost-effective and more reliable alternative for drilling narrow-margin, slim-hole, or high-angle wells.

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