



Drilling Fluids

Successful deepwater well drilled with high-performance HYDRO-GUARD® water-based mud avoids zero-discharge costs

Location: Offshore Angola

Operator's Challenge

The operator was concerned about the new zero-discharge regulation for offshore Angola and needed a high-performance water-based mud (WBM) to replace the oil-based muds (OBMs) traditionally used there. The challenges included reactive clay in the post-salt formation and extended lead times for materials. This operator had used the HYDRO-GUARD® WBM system in deepwater operations in Brazil.

Halliburton's Solution

Baroid technical personnel began testing formulations that could inhibit the shale in the post-salt formations, using also an offset well information in Namibia and a shale study run in the area. In order to meet the region's toxicity testing requirements and zero-discharge specifications, the Baroid team replaced the CLAY GRABBER® shale stabilizer, a product normally used in HYDRO-GUARD systems, with the non-toxic EZ-MUD® DP clay encapsulator.

The proposed system was formulated using 3 wt%–6 wt% KCl as the base fluid, and CLAYSEAL® PLUS and CLAY SYNC™ II shale stabilizers for inhibition. The detailed formulation is shown at right.

Logistical arrangements were put in place to ensure that the system additives were available to support the well and future operations, if the HYDRO-GUARD application proved successful.

Economic Value Created

The well was drilled to total depth successfully within the projected time frame. No wellbore issues related to hole instability were experienced during the project.

The HYDRO-GUARD system provided excellent inhibition while drilling through the post-salt section and eliminated the environmental risks associated with OBMs. The projected savings include avoiding skip rentals, transportation, and disposal costs related to cuttings when the zero-discharge regulation is fully implemented. The cost per barrel of the HYDRO-GUARD system was lower than OBM options.

Product	Concentration, ppb
Soda ash	0.1 – 0.25
Caustic soda	0.1 – 0.25
Potassium chloride	10 – 20
BARAZAN® D viscosifier	0.75 – 1
DEXTRID® LTE filtration control agent	1.75 – 3
PAC™ filtration control agent	0.7 – 1.5
CLAY SYNC II shale stabilizer	2 – 4
CLAYSEAL® PLUS shale stabilizer	1.5 – 4.5
Barite	As required

CHALLENGE	SOLUTION	RESULT
An operator offshore Angola needed a high-performance water-based mud system to replace oil-based mud systems in order to meet the region's new zero-discharge regulation.	The Baroid team used the environmentally friendly HYDRO-GUARD® water-based mud system, which met the zero-discharge requirements and can be discharged overboard.	The operator avoided the cost of cuttings handling and disposal, while achieving excellent wellbore stability and drilling performance.