

# PERFORMADRIL® System Helps Maintain Wellbore Stability and Eliminate Cuttings Costs on Challenging Deepwater Angola Project

OFFSHORE ANGOLA

## CHALLENGES

This deepwater Angola project posed both drilling and waste management challenges:

- » Highly reactive shale and salt sections traditionally drilled with oil-based mud
- » Costly skip-and-ship cuttings storage at the rigsite
- » Costly onshore treatment and disposal processes

## SOLUTION

Baroid applied a customized 9.2-ppg PERFORMADRIL® water-based drilling system to maintain hole integrity, maximize shale inhibition, provide lubricity, and enable overboard cuttings discharge.

## RESULTS

- » Saved five days of drilling time
- » Successfully drilled through shale and halite sections at unrestricted ROPs
- » Achieved 100 percent rate in overboard discharges, eliminating all cuttings storage and treatment costs
- » Recorded zero nonproductive time



## OVERVIEW

Drilling deepwater wells in Angola brings potentially costly environmental challenges, with a particular focus on chemical discharges. The operator worked with Baroid personnel to establish several critical objectives:

- » Maintain wellbore stability
- » Maximize shale inhibition
- » Reduce drilling time
- » Minimize environmental impact
- » Decrease waste disposal costs

A high-performance PERFORMADRIL® water-based drilling system was tested and optimized to achieve these objectives. The extensive laboratory and field testing program was based on offset data and wellbore behavior in the specific offshore block. This was the first time PERFORMADRIL fluid would be used under these conditions for the proposed water and well depths.

Several fluid-related goals were established for the system:

- » Minimize risk of deviation from specified properties
- » Use pre-mixed fluids to control properties and density
- » Monitor methylene blue test (MBT) and cuttings to ensure reliable inhibition and solids control, including maintaining specified solids control efficiency
- » Run Drilling Fluids Graphics (DFG™) software for hydraulics modeling simulations to allow for on-the-fly fluid adjustments
- » Prevent washout in the halite section
- » Facilitate mixing at the liquid mud plant (LMP) and rigsite



Figure 1 PERFORMADRIL® system helps preserve cuttings integrity and improve solids control efficiency.

## PLANNING AND EXECUTION

The 18-1/8-inch interval was known to generate the highest volume of cuttings and, consequently, the largest percentage of the waste disposal costs for the well. The operator was concerned about the reactive shale in the Tertiary or upper-hole section below the 22-inch casing shoe. The 18-1/8-inch interval also includes a halite section, typical of pre-salt well plans.

The finalized PERFORMADRIL system formulation was mixed at the LMP and shipped to the rig, along with potassium chloride (KCl) brine mixed at 30 ppb to be used as dilution fluid.

The interval was drilled with the PERFORMADRIL fluid with no issues, including drilling through the potentially troublesome shale. A bit trip was made at the top of sand (TOS) point, and every stand was pulled on elevator. No excess weight was required while tripping back to bottom. The KCl dilution regime ensured that the MBT was less than 5 percent and that total solids were kept at a minimum. Drilling through the halite was completed successfully with minimal washout.

The operator also reported a significant reduction in shock and vibrations, which helped extend the life of the lower bottomhole assembly.

Using the environmentally friendly PERFORMADRIL fluid allowed the operator to discharge all cuttings overboard, eliminating the need for cuttings boxes.

The casing was set and cemented per plan.

## RESULTS ON TARGET

On previous wells, the rate of penetration (ROP) had been limited by the flow tolerance of the shale shaker (configured for oil-based mud and cuttings management). There was no ROP restriction when drilling with the PERFORMADRIL system, since cuttings could be safely discharged overboard.

Further, no waste skips were necessary for cuttings storage while drilling of the section.

The estimated savings and performance goals achieved with the PERFORMADRIL system are summarized below:

- » **Average cost savings for skips and waste disposal:** USD 678,406.00
- » **Drill time savings:** Five days or USD 6 million
- » **Nonproductive time:** Zero
- » **Days lost:** None
- » **Stockouts:** None

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