MATURE FIELDS

CASE STUDY

HYDRO-GUARD® WBM Outdrills Conventional OBM in Reactive Shales

HIGH-PERFORMANCE FLUID SOLUTION STABILIZES DRILLING IN COMPLEX SHALE FORMATION

SABRIYAH FIELD, KUWAIT

CHALLENGE

- Provide a high-performance WBM that could minimize pore pressure transmission and stabilize a problematic shale formation
- Achieve faster ROP than conventional OBM and save drilling time through the problematic intervals

SOLUTION

- HYDRO-GUARD® high-performance WBM to seal microfractures, minimize pore pressure transmission, and stabilize shale formation

RESULTS

- Achieved PPT values of <5 ml, showing effective sealing
- Optimized fluid at the rigsite to reduce PPT value to 4.2 ml
- Delivered faster ROPs than OBM, saving 51 hours of drilling time
- Saved over USD 50,000 in rig time

OVERVIEW

HYDRO-GUARD® WBM
drills reactive formations
51 HOURS
FASTER THAN OBM

HAL124900

Although Kuwait Oil Company (KOC) typically uses an oil-based mud (OBM) to drill the 12¼-in and 8½-in intervals in horizontal wells, a diesel shortage significantly reduced OBM availability. An inhibitive water-based mud (WBM) that would minimize pore pressure transmission and stabilize a problematic shale formation was needed. The Baroid HYDRO-GUARD® high-performance water-based mud (HPWBM) system was selected for this purpose.

On several previous attempts, drilling with a HPWBM had failed to satisfactorily seal the microfractures and minimize pore pressure transmission. These wells encountered severe shale instability and cavings, which led to long hours of non-productive time (NPT) while circulating to increase the mud weight. Mud densities used while drilling the 2,100-foot (640-meter) trouble zone ranged from 11.6 ppg to 12.7 ppg.

SOLUTION

KOC requested a polymer additive that would seal microfractures to minimize pore pressure transmission to the reactive shale. The Baroid team confirmed internally that standard WBM polymer additives would not be sufficient to prevent this type of shale destabilization.

Adhering to the Baroid Technical Process, the team tested an HPWBM formulation that contained LIQUITONE® fluid loss agent. The LIQUITONE copolymer latex additive is intended for use in OBM. When added to the HYDRO-GUARD HPWBM, it creates a soft gel after hydration.

Extensive lab testing demonstrated that the addition of this polymer improved particle plugging test (PPT) results, indicating it would help lower pore pressure transmission downhole. Lab tests were then optimized to achieve the best PPT value (< 5 ml for total losses at 180°F/82°C using a 20µ ceramic disc).

Testing continued at the rigsite, where Baroid personnel achieved an even lower total PPT value (4.2 ml), which further decreased pore pressure transmission.

ECONOMIC VALUE CREATED

The success of the engineered HYDRO-GUARD system in this application helped prove that an HPWBM can replace conventional OBM for drilling reactive formations such as those encountered in the KOC fields.

Compared to wells drilled with OBM, the customized HYDRO-GUARD WBM formulation delivered a faster rate of penetration (ROP) and saved 51 hours of drilling time through the problematic intervals. The saving in rig time was estimated to be over USD 56,800.

The option to drill with the HYDRO-GUARD system eliminated issues related to diesel supply and prevented rig shutdowns due to base oil shortages. The HPWBM system is also considered to be more environmentally friendly than OBM fluids.

The KOC drilling team acknowledged the success of this solution and commended Baroid personnel for effective fluid design and excellent communication throughout the process. This has led to additional opportunities in Kuwait where drilling with HPWBM may be the preferred option.

HALLIBURTON