BaraSure™ W-674 and CLAY GRABBER® Shale Stabilizers Provide Reliable Inhibition in Two Reactive Intervals

PAKISTAN

CHALLENGE
Provide reliable inhibition in two reactive intervals in formations known to cause wellbore instability and drilling delays related to reactive clay

SOLUTIONS
Testing in the regional and global labs identified the clay type and helped determine the optimal WBM formulation:
» 5 percent KCl base brine
» BaraSure™ W-674 shale stabilizer
» CLAY GRABBER® flocculent and encapsulator

RESULTS
» Provided economical formulation that combined the inhibitive effects of KCl base brine with the BaraSure W-674 and CLAY GRABBER shale stabilizers
» Achieved zero NPT related to shale instability, saving an estimated USD 300,000

FULL SUITE OF SHALE AND FLUID ANALYSIS DETERMINES OPTIMAL WBM
Extensive lab testing was performed to characterize the reactive clays and to identify the optimal fluid formulation for drilling the Khadro and Mughal Kot formations. Both the regional lab and the global Pune, India, research and development lab participated in this project.
Clay mineralogy was determined by X-ray diffraction (XRD) testing of formation samples. The results showed 20 percent illite clay content.
Capillary suction time (CST) testing confirmed that 5 percent potassium chloride (KCI) should be used as the base fluid. The Baroid team then tested the performance of various formulations including different additives. Five mud samples were tested against the reactive clays, using the linear swell meter (LSM). Two additives clearly emerged as the most effective inhibitors:
» BaraSure™ W-674 shale stabilizer
» CLAY GRABBER® flocculent and clay encapsulator

Improvements in rate of penetration (ROP) range from 42 percent to 56 percent in intervals drilled with WBM treated with BaraSure™ W-674 shale stabilizer (red). Gray bars show ROP in intervals drilled without BaraSure W-674 shale stabilizer additions.

The BaraSure™ W-674 shale stabilizer reduced swelling over 60 percent compared to a WBM treated with a conventional shale stabilizer, and by 34 percent compared to an untreated KCl-based WBM.
A HYDRO-GUARD® WBM formulation was finalized based on test results and prior experience with these reactive formations. BaraSure W-674 shale stabilizer was the lead inhibitor, supplemented by the CLAY GRABBER flocculent and encapsulator. Compared to conventional inhibitor options, this formulation achieved up to a 60 percent reduction in swelling per LSM results. The recommended concentration of BaraSure W-674 shale stabilizer was 4.0 lb/bbl.

OPERATOR ACHIEVES ZERO NPT RELATED TO REACTIVE SHALE

The operator was able to drill the 12-1/4-inch and 8-1/2-inch sections successfully with zero NPT related to bit balling, shale swelling, delayed tripping operations, or backreaming. Cuttings reached the surface dry and fully encapsulated, allowing for easy removal by solids control equipment.

The potential cost of NPT caused by reactive shale was estimated at USD 300,000, if the inhibition had been unsuccessful.

These good results were achieved with an economical formulation that combined the inhibitive effects of KCl base brine with the BaraSure W-674 and CLAY GRABBER shale stabilizers.