

CLAYSEAL® PLUS Shale Stabilizer Helps Operator Save Four Days of Rig Time and Almost USD 200,000

DIADEMA FIELD, ARGENTINA

CHALLENGES

When drilling the first horizontal reservoir in the field, the operator encountered several issues in the highly permeable sandstone:

- » Swelling clay stringers that made tripping more difficult
- » Excessive torque values
- » High clay content that required abnormally high dilution rates

SOLUTIONS

Baroid personnel performed extensive testing on cuttings samples, which indicated that:

- » A higher concentration of potassium formate paired with a powerful shale inhibitor would stop clay swelling.
- » The formate brine would help minimize formation damage.

RESULTS

- » The operator saved four days of rig time valued at time, valued at almost USD 200,000.
- » Torque was reduced by 80 percent.
- » No further clay swelling issues occurred during trips.

OVERVIEW

The first horizontal well in Argentina’s Diadema field targeted the Upper Garnet Zone (UGZ) formation, a highly permeable sandstone with interbedded clay stringers. A water-based mud (WBM) formulated with potassium formate brine was selected to drill this reservoir. The potassium formate concentration was approximately 10 l/m³, which was expected to help inhibit reactive clays while minimizing formation damage. The well profile is shown below:

Hole Size, inches	meters (m) MD
17 1/2	0–225
12 1/4	225–1,300 (950 m TVD*)
8 1/2	1,300–3,100 (950 m TVD*)

*True Vertical Depth

As drilling continued in the reservoir section, cation exchange capacity (CEC) test results indicated a significant increase in clay content in the drilling fluid (see table). This led to higher dilution rates than planned to help control low gravity solids (LGS). In addition, excessive torque and drag values were observed. When the torque reached 26 feet/Klb at 2,593 meters measured depth (MD), drilling was suspended. Pack-off incidents occurred during wiper trips.

When planning the next two wells, the operator wanted a drilling fluid that would provide effective inhibition throughout the horizontal section, improve tripping efficiency, and reduce torque. The plan also included running a slotted liner to total depth (TD), and the operator wanted to complete this operation without encountering tight spots.

INHIBITIVE WBM DESIGN BASED ON CUTTINGS SAMPLES, EXTENSIVE TESTING

Using mud and cuttings samples from the reservoir section of the first well, Baroid personnel conducted several lab tests to determine the optimal shale inhibition additives and concentrations:

- » Cation exchange capacity (CEC): to evaluate cutting sample reactivity; field data is reported as methylene blue test (MBT) values
- » Capillary suction time (CST): to determine better options regarding inhibition based on fluid/filtrate transmission to clay
- » Linear swell meter (LSM): to identify optimal inhibitor concentrations according to CEC identification of the worst trouble zones

“Based on the rig rate, the total savings was estimated at USD 199,968.”

The test results helped define the following formulation:

- » Potassium formate 20 l/m³
- » CLAYSEAL® PLUS shale stabilizer 10 l/m³

This fluid design was implemented on the second well in the 8-1/2-inch section. The MBT value was maintained at 14 Kg/m³. There were no issues with reactive clays. Torque was considerably lower than in the previous well – 5 feet/Klb at 2,517 meters MD – and there was no packing off or stuck pipe. Tripping efficiency also improved in comparison with the first well.

SUCCESSFUL COMPLETION AND TORQUE REDUCTION SAVES ALMOST USD 200,000

The second well encountered zero clay swelling during trips, no stuck pipe, and an 80 percent reduction in torque. The slotted production liner was run and installed with no issues.

The customized drilling fluid performance allowed the operator to save four days of rig time compared with the previous well due to torque reduction and improved trip quality. Based on the rig rate, the total savings was estimated at USD 199,968.

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