Operator Uses Customized WBF for Formation Evaluation Program in High-Temperature Horizontal

BARAFLC® W-950 FLUID SYSTEM MAINTAINS STABLE PROPERTIES EXPOSED TO 185°F BHT FOR EXTENDED STATIC PERIOD OF SEVEN DAYS

EAGLE FORD SHALE, UNITED STATES

CHALLENGE

- Perform open hole formation evaluation in high-temperature environment, with BHST as high as ~185°F
- Improve fluid performance and cost effectiveness with new technology
- Ensure fluid properties remain steady for extended static logging periods

SOLUTION

- BaraFLC® W-950 high-temperature, water-based fluid – used as shale stabilizer after thorough lab testing and analysis
- INVERMUL® fluid system – used for coring operations

RESULTS

- Successfully maintained fluid properties for 7 days of static logging activities
- Saved operator >USD 40,000 over previous 2-component fluid solution
- Became preferred HTWBF for the operator's future formation evaluations

OVERVIEW

A major operator in the South Texas region was planning an open hole formation evaluation that required a water-based fluid (WBF) system tolerant of a high-temperature environment. The operator had previously conducted a similar logging program for a nearby offset well, where it leveraged a third-party product package for shale stability. Revisiting that fluid solution in light of current operational challenges, the Halliburton Baroid team recommended a recently commercialized alternative product that could meet or exceed the customer's expectations on both performance and economics.

CHALLENGE

An 8¾-in. production horizontal section was to be drilled with an INVERMUL® invert-emulsion fluid system applied to the Eagle Ford shale formation. The operator's drilling program called for an open hole direct displacement to a high-temperature, water-based fluid (HTWBF) supporting the formation evaluation activities. While there would be no drilling with this fluid, it would need to remain stable for "static" logging periods. Operational challenges like additional logging runs, tool-related issues, etc. could potentially extend the HTWBF formation exposure time to several days at a projected bottomhole static temperature (BHST) of ~185°F.

SOLUTION

Based on the operator's offset well information, the Baroid team conducted iterative lab testing and comparative analysis to evaluate the legacy products against Baroid's BaraFLC® W-950 shale stabilizer. An optimal product concentration was derived that met the performance and economic criteria of the operator. Targeted wellbore contaminants were also introduced to evaluate the fluid system's tolerance of worst-case scenarios. Test results and findings were presented to the operator for review and acceptance. After careful consideration, the operator selected the BaraFLC W-950 HTWBF system as the preferred solution.

PROJECT DETAILS

A local mixing facility was identified to prepare the HTWBF away from the rig's critical path. An onsite Baroid team built, tested, and stored a total of 1,866 bbl of completed volume close at hand for the logging operation.

As planned, the well was drilled to 16,653 ft MD with an INVERMUL fluid system. Due to downhole losses encountered while drilling the 8¾-in. hole section, the operator decided to reduce the planned density of the BaraFLC W-950 HTWBF. A Management of Change (MOC) was created to document the requested change from 13.6 to 13.2 ppg and assess any potential risks. Onsite pilot testing was completed by the Baroid team to support the density adjustment and verify required system specifications.

The completed BaraFLC W-950 HTWBF volume was shipped to rigsite containment while planned coring operations were conducted with the preexisting INVERMUL system. Quality assurance inspections and testing were conducted at each transit point of volume movement to minimize the risk of surface contamination. Upon completion of coring operations, excess INVERMUL volumes were moved to isolated surface containment or backloaded to the area Baroid liquid mud plant. All rig pits and lines were thoroughly cleaned prior to moving the BaraFLC W-950 HTWBF to minimize the opportunity for oil-based mud (OBM) contamination. A direct displacement was performed from the preexisting INVERMUL to the 13.2 ppg BaraFLC W-950 HTWBF system, using a 40 bbl of base oil and 70 bbl viscosified WBM spacer. No incidents of channeling or excessive interface were reported. A total of 1,380 bbl were handled as part of the displacement operation, with no fluids-related HSE issues.

With pipe on bottom, a third-party logging service was rigged up and logging tools pumped to bottom. A total of three logging runs were required to complete the planned formation evaluation over an estimated time span of 96 hrs. The initial runs failed due to issues with the logging tool integrity (~4,700 ft MD) and telemetry (~12,500 ft MD). While preparing for a third tool run, the fluid system was circulated to verify properties were within program specifications. Logging tools were successfully pumped to a depth of 16,501 ft MD, without any fluids-related events. All operator-defined formation evaluation objectives were achieved, and logging tools were successfully retrieved to surface, along with wireline retrieval.

The HTWBF was direct displaced out of the hole to the preexisting INVERMUL system. As per plan, all displaced returns to surface were captured and hauled off for disposal. It should be noted that the BaraFLC W-950 HTWBM system time in hole exceeded the plan by 72 hrs., for a total of seven full days with no system integrity issues reported.

RESULTS

The customized Baroid HTWBF fluid solution was formulated, lab qualified, pre-mixed, and delivered to location exceeding the expectations of the operator. BaraFLC W-950 proved to be a superior, single-sack solution in the high-temperature environment for extended static periods of time. Additionally, the operator realized an economic cost savings of more than USD 40,000 over the previous solution. Finally, the operator's Global Fluids Advisor recognized the new fluid system for its performance and indicated it would be the preferred fluid system for future formation evaluations of this type.

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