UNCONVENTIONALS

CASE STUDY

BaraShale™ Lite Fluid System Helps Achieve Superior Cost Control in Unconventional Wells

DIRECT EMULSION DRILLING FLUIDS PREVENT SALT WASHOUTS OR LOSSES FOR BETTER FLUID PERFORMANCE

PERMIAN BASIN, TEXAS

CHALLENGE

An operator in the Permian Basin needed a reliable solution for avoiding:

- Salt washouts in Salado formation due to reduced cut brine densities, resulting in high cementing costs and remedial stages for zonal isolation (top up)
- High dilution rates for conventional water-based systems due to salt uptake, resulting in increased waste haul-offs and water requirements
- Multiple casing strings and fluid sets needed to isolate the salt layers and prevent losses in lower sections

SOLUTION

- Halliburton Baroid developed BaraShale™ Lite fluid system based on field brine and emulsified base oil in order to reduce salt washouts while maintaining a lower mud weight
- Customized fluid rheology to meet aggressive drilling rates with minimal hydraulic pressure
- Paired fluid system with multiple centrifuges to maintain low drill solids content

RESULTS

- BaraShale Lite system delivered high drill rates while minimizing washouts and losses
- Reduced fluid waste disposal costs
- Successfully eliminated multiple salt casing strings to achieve savings in time and cost
- Used highly durable fluid for multiple wells and pads, with additional recycling options
- Achieved savings of USD 100,000 to USD 200,000 per well

OVERVIEW

MORE THAN USD 850,000 SAVED IN FIRST 7 WELLS

Salt section washouts and resulting mud weight gains historically take a major toll on drilling costs in the Permian Basin's complex Salado formation. The source of the long-standing challenge is a combination of a shallower salt section and a deeper low-fracture gradient section. Now, however, significant cost reductions are being achieved with the Halliburton BaraShale™ Lite fluid system, which uses field brine and emulsified base oil to reduce salt washouts while maintaining a lower mud weight. In addition to addressing wellbore challenges, the system greatly reduces waste disposal costs and enables reuse in multiple well applications.

CHALLENGE

Conventional water-based fluid systems elevate drilling expenses in the Salado formation due to two key factors: salt washouts, which raise cementing costs, and the resulting brine saturation, which increases mud weight – leading to fluid losses and disposal requirements. The significance of the cost and the need for greater efficiency has grown with increased drilling intensity. Since completion and stimulation programs make up the bulk of a well's cost, minimizing time and cost requirements to reach the reservoir has become paramount. Conventional drilling fluids and casing designs often do not achieve these goals. While evolving casing designs with fewer strings simultaneously expose salt sections and weak underlying loss zones, freshwater resources are increasingly limited and brine disposal costs steadily grow.

SOLUTION

To meet these challenges, Halliburton screened several types of emulsifier additives to advance the design of an oil-in-water fluid formulation. The resulting fluid design, the BaraShale Lite fluid system, eliminates the issues of traditional water-based systems. A proprietary emulsifier combines a brine base fluid with oil in order to prevent salt washout and to lighten the mud weight to prevent lost circulation. With better solids management, the system lowers transport costs, and, because it can be used from well to well, disposal costs are greatly reduced or eliminated altogether.

Close collaboration with an early-adopting operator of this system ensured that more advanced testing was also performed. Field brine, a complex mix of salts, was tested in the formulation for compatibility. Corrosion levels were assessed and verified as safe.

The initial commercial application was executed with additional oversight from the operator and Halliburton fluids specialists. Batch mixes were carried out in a timely manner and drilling was commenced. Daily communications between the development team and field team ensured that multiple checks were made and actions taken to provide fluids that would be meeting all parameters throughout the first well. Multiple sections were drilled with this original mix, allowing for valuable comparisons to previous wells when the customer had utilized conventional fluids.

Extensive testing was done to ensure that the formula contained the correct fluid density, emulsion stability, rheological profile, and alkalinity.

RESULTS

The BaraShale Lite fluid system achieved the primary objective of reducing cost in all aspects of the drilling process. Aggregate cost savings of approximately USD 854,000 were realized for the first seven wells. This was mainly due to a 70 percent reduction in waste haul-offs, as well as savings from reduced washouts and lower cement volumes.

After this initial success, several other customers in the Permian Basin adopted the BaraShale Lite fluid system. Since BaraShale Lite fluid was used in these initial trial wells in 2017, this system has been used to drill approximately 100 wells in Texas and New Mexico. The system has continued to perform well, offering similar or greater savings for operators. In particular, it has reduced the number of casing strings compared to older well designs. Additional value was realized from reuse of the fluid for later wells or to dilute other systems.

The BaraShale™ Lite system proved effective for drilling in the complex Salado formation.

Based on this track record and on detailed discussions with several operators, the aggregate value realized for the BaraShale Lite fluid system is estimated at approximately USD 15 million dollars to date. This savings has allowed for sustained activity and greater focus toward optimized well completion and stimulation techniques.

www.halliburton.com

HALLIBURTON