BaraShale™ Lite Fluid System
For Fields with Salt Formations and Low Fracture Pressures

CHALLENGE
Unconventional and Mature Fields with salt formations and low fracture pressures pose a challenge for standard water-based drilling fluids. Freshwater or cut brine systems can cause extreme washout and dissolution of the salt. This can result in operators losing cement to the formation during cementing jobs as well as creating the need for operators to place additional strings of casing to secure the wellbore before drilling ahead.

The low fracture gradients in these weak formations increase the likelihood of encountering lost circulation and water / gas influxes. Cut brine systems struggle to perform at the low weights required to prevent losses while a typical salt-saturated system being utilized in this type of field will have a higher density than the lower sections of some wells can hold back.

OVERVIEW
Halliburton's BaraShale™ Lite Water-based Drilling Fluid is engineered to more efficiently drill in fields that contain salt formations with low fracture gradients. The system contains a proprietary emulsifier that tightly combines the base fluid, which consists of brine to prevent salt washout, and oil to lighten the mud weight. The result is a fluid system that prevents lost circulation and washout while minimizing dilution and waste volumes.

BENEFITS
» Helps maximize drilling efficiency
   ▪ Increases wellbore stability
   ▪ Increases hole cleaning efficiency
   ▪ Increases ROP
   ▪ Decreases disposal volume for easy handling and safer transport
   ▪ Cleans up like a standard water-based fluid

» Helps Reduce Costs
   ▪ Reduces downhole losses, salt washout
   ▪ Re-usable for multiple wells
   ▪ Requires minimal dilution

FEATURES
» Direct Emulsion System
» Brine with 10-50% Diesel base
» Proprietary emulsifier technology
» Straightforward produce mix
» Highly maneuverable mud weight
» Tolerant of water flows, cement, acid gas, oil-based mud displacement and weight-up
» Compatible with water-based/brine chemicals

APPLICATIONS
» Intermediate sections
» Salt formations and underlying weak, loss-prone formations
» Where rapid density reductions may be required to prevent mud losses
INCREASE DRILLING EFFICIENCY

In addition to the prevention of lost circulation and washout while minimizing dilution and waste volumes, operational efficiency is also enhanced by reducing the need for displacements and enabling mix on the fly instead of batch mixing of the fluid. Field brine can also be used as the base fluid rather than trucking in fresh brine; and unlike other water-based fluids, this fluid can be re-used on multiple wells.

REDUCE COSTS

Not only can the BaraShale Lite fluid system help lower costs through the reduction of downhole losses, salt washout, dilution, and waste volumes, but operators may also be able to change casing designs so that salt sections and lower formations can be drilled together, eliminating the need to run extra casing strings.

MANAGING DRILLING FLUID VOLUMES AND DILUTION

Table 1 below compares the calculated amounts of freshwater and diesel that would be required to cut a 10.0 lb/gal saturated salt brine to a 9.5 lb/gal density. A reduction like this might be required to reduce or eliminate downhole losses in weaker formations. More than twice the volume of freshwater is needed. BaraShale™ Lite can achieve a density below 10.0 lb/gal with salt saturation, and can be used to build stable emulsions which show no hydrocarbon separation after several weeks.

WHY WATER-BASED?

A high-performance oil-based mud can be engineered to successfully drill in this environment; however, these systems tend to generate a greater volume of waste which can result in higher disposal costs and higher risks to operators that have to dispose of the cuttings. Water-based drilling fluids can help minimize these waste volumes.

CASE STUDY

The BaraShale Lite system was recently applied on several wells in the U.S. Delaware Basin. The system delivered outstanding performance with rate of penetration higher than the operator’s average. The operator saw a decrease in washout and downhole losses compared to wells previously drilled in the same location. Additionally, fluid waste haul-off costs were 70 percent of those for previous wells.

Table 1. Calculated Dilution Volumes to Reduce Fluid Density(based on one barrel)

<table>
<thead>
<tr>
<th>Brine system</th>
<th>Water</th>
<th>Diesel</th>
<th>lb/gal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dilution fluid</td>
<td>8.345</td>
<td>7.010</td>
<td></td>
</tr>
<tr>
<td>Starting Density</td>
<td>10.00</td>
<td>10.00</td>
<td>lb/gal</td>
</tr>
<tr>
<td>Desired density</td>
<td>9.50</td>
<td>9.50</td>
<td>lb/gal</td>
</tr>
<tr>
<td>Amount dilution</td>
<td>0.43</td>
<td>0.20</td>
<td>bbls</td>
</tr>
<tr>
<td>Ending Volume</td>
<td>1.43</td>
<td>1.20</td>
<td>bbls</td>
</tr>
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