NOTE: The information herein is currently believed to be accurate. We do not guarantee its accuracy. Purchasers shall not rely on statements herein when purchasing any products. Purchasers should make their own investigations to determine if such products are suitable for a particular use. The products discussed are sold without warranty, express or implied, including a warranty of merchantability and fitness for use. Purchases will be subject to a separate agreement which will not incorporate this document.

BENTONE® 910
economical rheological additive
for drilling muds and working fluids

BENTONE 910 rheological additive is an economical organobentonite viscosifier and suspending agent for oil–based muds, invert emulsion muds, completion fluids and workover fluids.

This viscosifier employs the composition most widely used through the years in oil–based muds, in a cost–effective economy form.

BENTONE 910 is suitable for drilling fluids based on diesel oil and mineral oil. It adds to the formulation the temperature stable rheology characteristic of organo clays.

Applications

Viscosifying drilling fluids including:
- Oil–based drilling muds
- Invert emulsion muds
- Packer fluids
- Completion fluids
- Workover fluids

Based on:
- Diesel oil
- Crude oil
- Mineral oil

Attributes

BENTONE 910 gellant

- Cost-effectively builds viscosity and yield point
- Suspends weighting materials and other solids
- Improves cuttings carrying capacity and hole cleaning
- Increases emulsion stability
- Aids control of fluid loss to the formation
- Confers temperature stability to the fluid
- Is not harmful to the environment

Chemical and Physical Data

Composition          organic modified bentonite clay
Color               light tan
Form                finely divided powder
Specific Gravity    1.7
Moisture            4% maximum

Incorporation

Good agitation should be used when incorporating BENTONE® 910 into the drilling system. The amount of stirring needed will depend on the temperature of the oil, with the rate of organoclay gelation increasing with increasing temperature, and on the level of shear available. Circulation downhole after the initial mixing will aid in achieving the full viscosity and yield. A chemical polar activator is needed to ensure full development of rheological properties. When water is present in the mud, it acts as the activator, and a separate activator is not needed.

However, in all–oil systems or in other fluids where no water is included in the formulation, or where water is unwanted, a chemical activator such as methanol or propylene carbonate should be added. Mixing 5% water, by weight, into the activator can enhance its efficiency.

The following activators have proved effective for BENTONE 910 in waterless systems:

<table>
<thead>
<tr>
<th>Suitable percentage</th>
<th>Use Level as of BENTONE 910 weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methanol/water (95/5)</td>
<td>33%</td>
</tr>
<tr>
<td>Propylene carbonate</td>
<td>33%</td>
</tr>
<tr>
<td>Propylene carbonate/ water (95/5)</td>
<td>33%</td>
</tr>
</tbody>
</table>
Levels of Use

The level of use depends on the rheological properties needed, and on the type of base oil being used. Pilot trials are recommended to optimize performance before field use.

Typical loadings are:

<table>
<thead>
<tr>
<th>Base System</th>
<th>Pounds per barrel</th>
<th>Kg/m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>All-Oil</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diesel Oil</td>
<td>6 – 12</td>
<td>17 – 34</td>
</tr>
<tr>
<td>Mineral Oil</td>
<td>8 – 14</td>
<td>23 – 40</td>
</tr>
<tr>
<td>Invert Emulsions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diesel Oil</td>
<td>2 – 6</td>
<td>6 – 17</td>
</tr>
<tr>
<td>Mineral Oil</td>
<td>6 – 12</td>
<td>17 – 34</td>
</tr>
</tbody>
</table>

Performance

Diesel Invert, 80/20, 14ppg
Aged hrs. @ 250°F, Tested at 120°F

Formulation

- #2 Diesel, bbl 0.52
- Primary Emulsifier, ppb 9
- Secondary Emulsifier, ppb 2
- Lime, ppb 5
- BENTONE® 910, ppb 3
- Fluid Loss Additive, ppb 8
- Barite, ppb 325
- Brine, 30% CaCl₂, bbl 0.17

Properties

<table>
<thead>
<tr>
<th></th>
<th>Initial</th>
<th>@250°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plastic Viscosity, cPs</td>
<td>32</td>
<td>31</td>
</tr>
<tr>
<td>Yield Point, lbs./100ft²</td>
<td>14</td>
<td>7</td>
</tr>
<tr>
<td>Gels, 10sec/10min, lbs./100ft²</td>
<td>11/13</td>
<td>7/10</td>
</tr>
<tr>
<td>ES, volts</td>
<td>750</td>
<td>704</td>
</tr>
<tr>
<td>Brookfield, 0.3 RPM, cPs</td>
<td>22,000</td>
<td>17,600</td>
</tr>
</tbody>
</table>

Mineral Oil Invert, 80/20, 14ppg
Aged @ 300°F, Tested @ 120°F

Formulation

- Mineral Oil, bbl 0.52
- Primary Emulsifier, ppb 9
- Secondary Emulsifier, ppb 2
- Lime, ppb 5
- BENTONE® 910, ppb 6
- Fluid Loss Additive, ppb 8
- Barite, ppb 325
- Brine, 30% CaCl₂, bbl 0.17

Properties

<table>
<thead>
<tr>
<th></th>
<th>Initial</th>
<th>@250°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plastic Viscosity, cPs</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>Yield Point, lbs./100ft²</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Gels, 10sec/10min, lbs./100ft²</td>
<td>3/5</td>
<td>5/14</td>
</tr>
<tr>
<td>ES, volts</td>
<td>2,800</td>
<td>12,800</td>
</tr>
<tr>
<td>Brookfield, 0.3 RPM, cPs</td>
<td>2,800</td>
<td>12,800</td>
</tr>
</tbody>
</table>

*All Oil Mud Performance: Properties developed in formulations without a polar activator. Yields and Brookfields will increase if an activator is used.

All muds tested at 120°F.

Note: Initial properties - aged 16 hours at 150°F

Health and Safety Data

Before using this product please consult our Material Safety Data Sheet for information on safe handling.