BENTONE® 38
Rheological Additive
for HTHP drilling muds and working fluids

BENTONE 38 rheological additive is the oil service industry’s standard for a high temperature/high pressure performance organoclay. This additive is manufactured with a high efficiency hectorite clay noted for imparting superior heat stability. BENTONE 38 exhibits an excellent balance of dispersibility and efficiency. BENTONE 38 performs well in diesels, mineral oils, poly, linear and isomerized alpha olefins and vegetable oil derivative base fluids.

Applications

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

Based on:
- Synthetic Oils
- Mineral Oils
- Low toxicity oils and fluids
- Diesel oil
- Crude oil

- Manufacturing fluids at low temperatures
- Conditioning mud before storage
- Increasing suspending properties of packer fluids
- Preparing spotting fluids to free stuck pipe

Attributes

BENTONE 38 gellant
- Confers superior downhole stability to muds and completion fluids versus conventional organoclays
- Delivers high rheology efficiency over a wide range of intermediate and low polarity base fluids including diesels, mineral oils, poly, linear and isomerized alpha olefins and vegetable oil derivatives
- Effectively suspends weighting agents and cuttings
- Improves cuttings carrying capacity and hole cleaning
- Is not harmful to the environment

Chemical and Physical Data

Composition: organically modified hectorite clay
Color: cream white
Form: finely divided powder
Specific Gravity: 1.7
Moisture: 3.0% maximum

Incorporation

Good agitation should be used when incorporating BENTONE 38 into the drilling or completion fluid. The amount of stirring needed will depend on the temperature of the oil, with the rate of organoclay gelation increasing with increasing temperature, and the level of shear available. Downhole circulation after the initial mixing will aid in achieving the full viscosity and yield.
A chemical polar activator may be 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 further enhance efficiency.

The following activators have proved effective for BENTONE® 38 in waterless systems:

<table>
<thead>
<tr>
<th>Suitable Chemical activators</th>
<th>Use level as a percentage of BENTONE 38 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 the base oil being used. Pilot trials are recommended to optimize performance before field use.

The following loading “rules of thumb” are offered as starting point levels for screening BENTONE 38 in typical all oil and 80/20 inverts muds. Recognize other ingredients can influence ultimate YP/PV values and the BENTONE 38 level should be optimized to the target YP in the full formulation.

<table>
<thead>
<tr>
<th>Pounds per Mud Type</th>
<th>barrel</th>
<th>Kg/m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Oil Diesel Oil</td>
<td>4 – 10</td>
<td>11 – 28</td>
</tr>
<tr>
<td>Mineral Oil</td>
<td>8 – 12</td>
<td>23 – 34</td>
</tr>
<tr>
<td>Diesel Inverts</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>5 – 9</td>
<td>14 – 26</td>
</tr>
<tr>
<td>Alpha olefins (PAO, LAO, IAO)</td>
<td>5 – 10</td>
<td>14 – 28</td>
</tr>
<tr>
<td>Modified Vegetable oil</td>
<td>4 – 8</td>
<td>11 - 23</td>
</tr>
</tbody>
</table>

**Performance Invert Muds**

**Diesel Invert, 80/20, 14ppg**
Aged 16 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 38, ppb: 3
- Fluid Loss Additive, ppb: 8
- Barite, ppb: 325
- Brine, 30% CaCl₂, bbl: 0.17

**Properties**

- Initial Plastic Viscosity, cPs: 30, 33
- Yield Point, lbs./100ft²: 10, 7
- Gels, 10sec/10min, lbs/100ft²: 7/11, 7/10
- ES, volts: 704, 704
- Brookfield, 0.3 RPM, cPs: 20,000, 17,600

**Mineral Oil Invert, 80/20, 14ppg**
Aged 16 hrs. @ 300°F, Tested @ 120°F

**Formulation**

- Mineral Oil, bbl: 0.52
- Primary Emulsifier, ppb: 9
- Secondary Emulsifier, ppb: 2
- Lime, ppb: 5
- BENTONE 38, ppb: 6
- Fluid Loss Additive, ppb: 8
- Barite, ppb: 325
- Brine, 30% CaCl₂, bbl: 0.17

**Properties**

- Initial Plastic Viscosity, cPs: 11, 38
- Yield Point, lbs./100ft²: 11, 10
- Gels, 10sec/10min, lbs/100ft²: 8/13, 9/15
- ES, volts: 760, 1080
- Brookfield, 0.3 RPM, cPs: 12,800, 12,400

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**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.

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IAO Invert, 80/20, Unweighted  
Aged 16 hrs. @ 300°F, Tested @ 120°F

Formulation

IAO, bbl 0.8  
Primary Emulsifier, ppb 10  
Secondary Emulsifier, ppb 3  
Lime 1  
BENTONE® 38, ppb 10  
Brine, 30% CaCl₂, bbl 0.2

Properties  Initial  @300°F
Plastic Viscosity, cPs 9 10  
Yield Point, lbs./100ft² 8 7  
Gels, 10sec/10min, lbs/100ft² 5/6 6/5  
ES, volts 672 565  
Brookfield, 0.3 RPM, cPs 13,300 15,000

Properties –#2 Diesel

Initial
Plastic Viscosity, cPs 13  
Yield Point, lbs./100ft² 10  
Gels, 10sec/10min, lbs/100ft² 4/7  
Brookfield, 0.3 RPM, cPs 15,600

Properties – Mineral Oil

Initial 5 ppb 10 ppb
Plastic Viscosity, cPs 10 16  
Yield Point, lbs./100ft² 2 10  
Gels, 10sec/10min, lbs/100ft² 4/5 12/16  
Brookfield, 0.3 RPM, cPs 4,000 16,000

Vegetable Oil Derivative Invert, Unweighted  
Aged 16 hrs. @ 250°F, Tested @ 120°F

Formulation

Base Fluid 0.73  
Primary Emulsifier, ppb 10  
Secondary Emulsifier, ppb 8  
Lime, ppb 2  
BENTONE 38, ppb 6  
Brine, 30% CaCl₂, bbl 0.18

Properties  Initial  @250°F
Plastic Viscosity, cPs 13 12  
Yield Point, lbs./100ft² 9 8  
Gels, 10sec/10min, lbs/100ft² 7/7 5/6  
ES, volts 1179 1157  
Brookfield, 0.3 RPM, cPs 29,500 NA

Properties –#2 Diesel

Initial 5 ppb
Plastic Viscosity, cPs 10  
Yield Point, lbs./100ft² 2  
Gels, 10sec/10min, lbs/100ft² 4/5  
Brookfield, 0.3 RPM, cPs 4,000

Properties – Mineral Oil

Initial 5 ppb 10 ppb
Plastic Viscosity, cPs 10 16  
Yield Point, lbs./100ft² 2 10  
Gels, 10sec/10min, lbs/100ft² 4/5 12/16  
Brookfield, 0.3 RPM, cPs 4,000 16,000

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

Initial properties - aged 16 Hours at 150°F

All muds tested at 120°F.

Health and Safety Data

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