

## BENTONE® 42

### Rheological Additive Oil Based High-Temperature Viscosifier

#### GENERAL INFORMATION

**BENTONE 42** was designed to build gel strength and viscosity in synthetic based invert emulsion drilling fluids and maintain this viscosity build through extreme temperatures. It is a specially designed organoclay which was chemically engineered to maintain product performance when subjected to temperatures as high as 450°F for as long as 600 hours. Additionally, as temperature increases, the viscosity at temperature remains flat. This flat rheology over temperature minimizes the tendency for barite sag while improving cuttings transport and hole cleaning. **BENTONE 42** exhibits an excellent balance of dispersibility with initial viscosity build, efficiency and tolerance to adverse conditions for reduced depletion rates.

#### CHEMICAL & PHYSICAL PROPERTIES

Color	cream white
Form	finely divided powder
Specific gravity	1.7
Moisture	3.0% maximum

These are typical properties not to be used for specification purposes.

#### PERFORMANCE CHARACTERISTICS

- Stable to bottom hole temperatures in excess of 450°F
- Flat rheology with increasing temperature for antisag and improved carrying capacity
- Shear thinning rheological profile for improved ROP
- Compatible with conventional invert emulsion drilling fluid additives
- Optimized for use in synthetic oils (i.e. isomerized alpha olefins)
- Tolerant to salt, high lime, cement and drill solid intrusion
- Efficient hole cleaning and suspension properties
- Environmentally acceptable

#### APPLICATIONS

The optimum concentration of **BENTONE 42** required is dependent on the oil/water ratio and density of the system as well as type and concentration of surfactants used as emulsifiers and wetting agents. A fluid with a higher oil/water ratio (i.e. 90:10) will require more **BENTONE 42** than a fluid with a lower oil/water ratio (i.e. 70:30). A higher density fluid will generally require less **BENTONE 42** compared to a lower density fluid. Generally concentrations will be in the range of 2 to 20 pounds per barrel. Viscosity can be developed in:

- Oil Based Drilling Fluids
- Completion Fluids
- Invert Emulsion
- Drilling Fluids
- Workover Fluids
- Packer Fluids

**BENTONE 42** can be added at the mud plant when building new mud, or can be added directly to the mud pits when building volume during the drilling process. **BENTONE 42** exhibits optimum performance when applied in the absence of other organoclays and should always be used in the presence of EXCESS LIME. Adequate agitation is necessary when incorporating **BENTONE 42** into the oil based fluid. The amount of shear necessary will depend on the temperature of the synthetic oil, the rate of organoclay addition, the oil/water ratio, and the amount of solids and/or weight material in the system.

## BENTONE® 42

**BENTONE® 42**  
**High Temperature Organophilic Clay**

**Case History 1**

Duval County, Texas Q4/2000  
 TD - 15,850 Feet, BHT - 430°F

	<u>8 1/2" Interval - 13,500' to 14,350'</u>		<u>6 1/2" Interval - 14,350' to 15,850'</u>	
Mud Wt -	16.1	lbs/gal	16.8	lbs/gal
Oil:Water -	87:13		89:11	
P.V. -	64	cPs.	60	cPs.
Y.P. -	11	lbs/100ft <sup>2</sup>	9	lbs/100ft <sup>2</sup>
Gels -	4/10	lbs/100ft <sup>2</sup>	4/11	lbs/100ft <sup>2</sup>
HTHP -	2.5	cc (300°F,500psi)	6.5	cc (300°F,500psi)
XS Lime -	2.5	lbs/bbl	2	lbs/bbl
ES -	700	volts	1000	volts

Last treatment with BENTONE 42 was at 13,987'.  
 Drilling continued for 1,863' with no viscosity losses to TD.  
 Yield Point was maintained between 8 - 12 lbs/100ft<sup>2</sup> for the last 1,863' of hole.

**Case History 2**

Duval County, Texas Q1/2001  
 TD 15,170 Feet, BHT - 450°F

	<u>8 1/2" Interval - 9,000' to 12,000'</u>		<u>6 1/2" Interval - 12,000' to 15,150'</u>	
Mud Wt -	16.7	lbs/gal	18.2	lbs/gal
Oil:Water -	88:12		90:10	
P.V. -	46	cPs.	89	cPs.
Y.P. -	11	lbs/100ft <sup>2</sup>	12	lbs/100ft <sup>2</sup>
Gels -	5/10	lbs/100ft <sup>2</sup>	3/8	lbs/100ft <sup>2</sup>
HTHP -	5	cc (300°F,500psi)	2.5	cc (300°F,500psi)
XS Lime -	4.5	lbs/bbl	5.5	lbs/bbl
ES -	700	volts	800	volts

It took 2.8 PPB of BENTONE 42 to treat 18 PPG dilution mud to maintain desired properties.  
 Drilling continued from 14,500' to TD with no viscosity losses.  
 Yield point was maintained between 9 - 15 lbs/100ft<sup>2</sup> for the last 1,370' of hole.

**Case History 3**

Q4/2001  
 TD 16000 Feet, BHT - 460°F

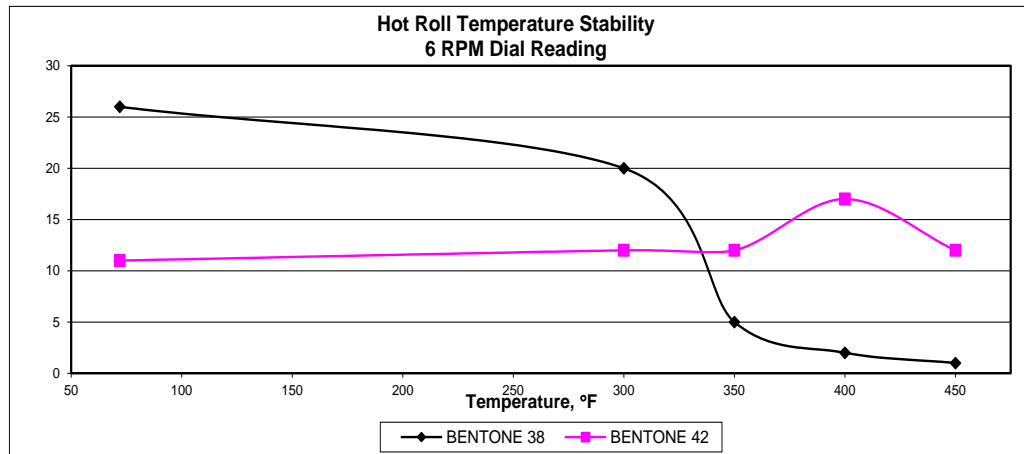
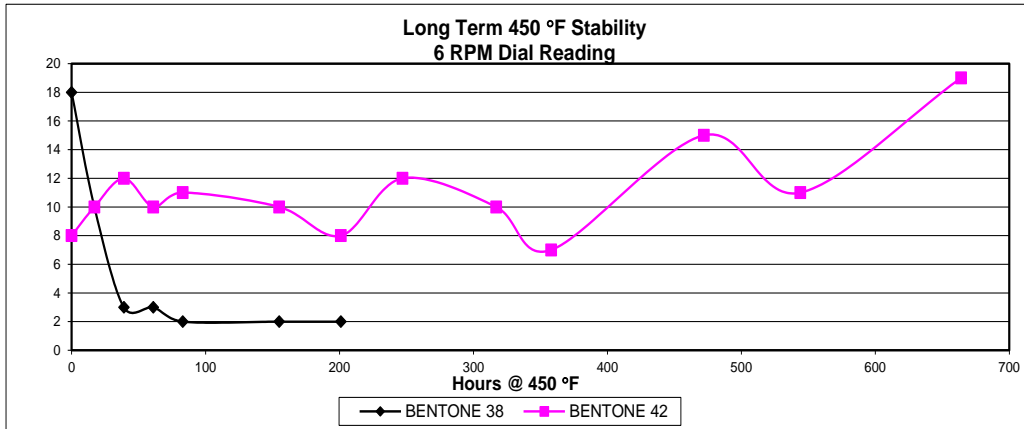
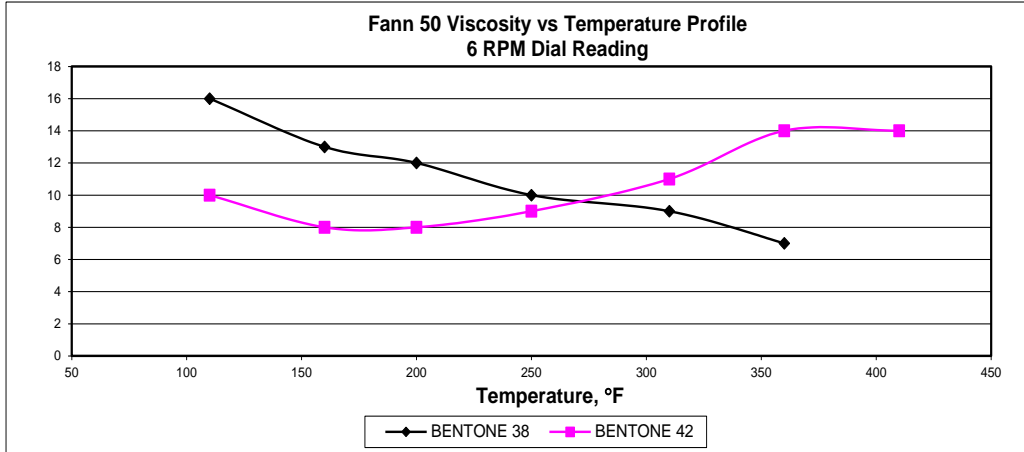
	<u>8 1/2" Interval - 9,000' to 13,600'</u>		<u>6 1/2" Interval - 13,600' to 16,000'</u>	
Mud Wt -	16.6	lbs/gal	17	lbs/gal
Oil:Water -	90:10:00		91:9	
P.V. -	58	cPs.	67	cPs.
Y.P. -	14	lbs/100ft <sup>2</sup>	11	lbs/100ft <sup>2</sup>
Gels -	8/18	lbs/100ft <sup>2</sup>	7/13	lbs/100ft <sup>2</sup>
HTHP -	4.5	cc (300°F,500psi)	2.5	cc (300°F,500psi)
XS Lime -	3	lbs/bbl	1.4	lbs/bbl
ES -	1400	volts	1500	volts

BENTONE 42 additions were consistent with increasing mud volumes from drilling.  
 Drilling continued from 13,600' to TD with no viscosity losses.  
 Yield Point was maintained between 10 - 12 lbs/100ft<sup>2</sup> for the last 2,400' of hole.  
 Additional BENTONE 42 was added at TD  
 to increase YP to 14 -16 lbs/100ft<sup>2</sup> for logging & running casing.

An independent testing laboratory pilot tested field mud and confirmed stable flow properties w/o heavy gelation when hot rolled for 16 hours @ 425°F

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### Hot Roll Temperature Stability Data

#### BENTONE 38

HR for 16 hrs. @ X°F	OFI 800 Viscosity @ 120°F				
	Initial	300	350	400	450
600 RPM	106	102	95	48	41
300 RPM	74	67	51	27	20
200 RPM	62	54	37	18	13
100 RPM	48	39	22	10	6
6 RPM	26	20	5	2	1
3 RPM	24	18	4	1	1
Initial Gel, lbs/100 ft <sup>2</sup>	24	18	4	1	1
Plastic Viscosity, cP	32	35	44	21	21
Yield Point, lbs/100 ft <sup>2</sup>	42	32	7	6	-1

#### BENTONE 42

HR for 16 hrs. @ X°F	OFI 800 Viscosity @ 120°F				
	Initial	300	350	400	450
600 RPM	80	95	96	82	97
300 RPM	51	57	62	58	59
200 RPM	40	44	48	47	46
100 RPM	27	31	32	35	31
6 RPM	11	12	12	17	12
3 RPM	9	11	11	15	11
Initial Gel, lbs/100 ft <sup>2</sup>	9	11	11	15	11
Plastic Viscosity, cP	29	38	34	24	38
Yield Point, lbs/100 ft <sup>2</sup>	22	19	28	34	21

### Fann 50 Data

#### BENTONE 38

RPM	600	300	100	40	6	3	PV	YP
Temperature°F	110	87	58	33	24	16	15	29
	160	59	40	25	19	13	12	19
	200	43	29	19	15	12	11	14
	250	33	22	15	13	10	10	11
	310	26	17	12	10	9	8	9
	360	20	13	10	8	7	7	6

#### BENTONE 42

RPM	600	300	100	40	6	3	PV	YP
Temperature°F	110	84	53	25	17	10	9	31
	160	50	29	16	12	8	8	21
	200	33	20	13	11	8	8	13
	250	28	19	13	11	9	9	9
	310	31	22	16	14	11	10	9
	360	42	32	25	23	14	11	10
	410	45	34	29	27	14	11	11

### Formulation

#### [80:20 12PPG]

IAO Base Oil	186 cc
30% CaCl <sub>2</sub> Brine	75 cc
Primary Emulsifier	8 gm
TOFA	4 gm
Barite	215 gm
Lime	8 gm
Organoclay	12 gm
note:an additional 4ppb lime was added after each hot roll cycle above 250°F	

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. Purchasers will be subject to a separate agreement which will not incorporate this document.

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