enventives

Ven-BHC™

2016-2017

EVOLVING SOLUTIONS & INDUSTRY PROVEN DRILLING FLUID PRODUCTS

WE INNOVATE OTHERS DUPLICATE

Ven-BHC™ is a unique inorganic, synthetic gel-strength modifier for water-based drilling, milling, HDD and completion fluids.

MANUFACTURING • GRINDING • BLENDING • SIZING

IS Ven-BHC™ PART OF YOUR NEXT H.D.D. FLUIDS PROGRAM?

Several problems plague the HDD industry that are directly associated with drilling fluids. The purpose of this summary is to showcase the marketability of this unique Ven-BHC™ (also known as Poly Hydroxy Silicate) Fluid System by solving many of the traditional HDD drilling fluid problems.

Some of the proven benefits of the Ven-BHC™ (H.D.D. Drilling Fluid System) include:

- **Hole cleaning**
- **A "simple" fluid system**
- **Ease of use**
- **Increased ROP**
- **Less frac outs**
- **Less pack offs**
- **Directional control**
- **Less shipping / trucking costs**
- **Less overall 'material' usage and handling (ex. Bentonite)**
- **Corrosion inhibition**
- **Extended bit and/or cutter life**
- **Less drill string erosion**
- **Maximize solids control efficiency**
- **Overall Cost savings (example days saved in drilling time)**
- **Unique high / low end rheology (High Yield Point / Low Plastic Viscosity)**

The primary reason for using a Ven-BHC™ - - (Poly Hydroxy Silicate) System on your next borehole, is first and foremost (although not exclusively) - - hole cleaning.

The reason for 'frac outs' and 'pack offs', poor directional control and short cutter life are directly related to poor hole cleaning. The conditions that result in hole 'pack offs' and 'frac outs' are eliminated with the Ven-BHC™ – H.D.D

Fluid System. In addition the cuttings bed build ups that effect the efficiency of directional stering tools are removed or greatly reduced.
Another benefit of using the Ven-BHC™ Fluid System, is improved solids control, over all equipment efficiency and less pump wear and repair.

It may 'look' like the hole is being cleaned, due to the volume of sand (or whatever is produced over the shakers) but there is another far larger amount that can't be seen and therefore left in the hole. The Ven-BHC™ fluid is a unique 'zero slip velocity' fluid. Typical rheology for this fluid would be in the range of 2 to 10 plastic viscosity and 35 to 80 yield point. 10/sec. and 10/min. gel strengths are typically high and relatively flat and non-progressive.

This translates into a fluid with extremely effective flow properties and hole cleaning characteristics.

This Ven-BHC™ Fluid is also by nature very "thixotropic" (or shear thinning), meaning that when the mud is static or sitting still, it very rapidly thickens (almost a gelled solid).

But, when the mud is dynamic or moving, it rapidly thins (almost water like). This dynamic fluid would maintain and hold cuttings in 'situ' - - even as the fluid moves - - and of course when the fluid is at rest - - always while maintaining good hole conditions and suspension throughout.

Superior hole cleaning, enhanced ROP, and reduced downtime with a more economic fluid system will get you to the other side faster and easier than ever before.

**STILL NOT CONVINCED?
SAVE YOURSELF A SIDETRACK AND GIVE US A CALL BEFORE YOU GO IN THE WRONG DIRECTION.**

CONTENTS

MEMORANDUM

Subject: Ven-BHC (BoreHoleControl) and Ven-BHC HT (high temperature). Both are also known as a Poly Hydroxy Silicate which is an inorganic, synthetic gel-strength modifier for waterbased drilling, milling, HDD, and completion fluids.

A brief description of the two VEN-BHC products:

Ven-BHC and Ven-BHC HT are the base and key component for a drilling fluid "system" that is capable of remarkable solids suspension, yet exhibits extreme shear thinning flow characteristics. The result is a low-solids fluid that drills almost like water, yet forms a unique "gel" structure (that appears very much as a solid) that carries and suspends drilled cuttings in "near perfect" transport.

Ven-BHC and Ven-BHC HT is a proprietary 'poly hydroxy silicate' technology which through rheology modification, provides superior hole cleaning for the milling of casing, drilling highly deviated or horizontal sections as well as straight hole drilling applications. These products and the fluid systems they create, are especially effective when drilling unconsolidated, unstable, stressed or faulted formations. Ven-BHC exhibits a viable bottom hole temperature stability in excess of 250°F and Ven-BHC HT now increases its bottom hole temperature stability to in excess of 325°F.

Features of the VEN-BHC and VEN-BHC HT products and systems:

- *Achieve high rates of penetration thereby reducing drilling days*
- *Has few "system" components and easy to use and maintain*
- *Works with low concentrations of Bentonite. Also creates this dynamic rheology with Attapulgite and Sepiolite*
- *Provides high yield point with low funnel viscosity*
- *Has high "low end" rheological properties (6 and 3 rpm, Plastic Viscosity and 10sec /10 min gels) which contribute to its extremely fragile gel structure*
- *Optimizes hole cleaning capabilities, zero "slip" velocity and has excellent suspension characteristics*
- *Virtually zero "shear stress" at borehole*
- *Minimize torque and drag*
- *Environmentally safe fluid system*
- *Requires no special or sophisticated rig equipment, just good solids control*
- *Replaces both DRILPLEX and Mixed Metal Oxide at a greater than 1 to 4 ratio*
- *Ven-BHC HT has a greater bottom hole temperature stability (in excess of 325°F) than does the reported temperature limitation of Dril-Plex (300°F)*
- *Both Ven-BHC and Ven-BHC HT can perform well using both Treated (Peptized) Bentonite and Un-Treated Bentonite.*
- *Can be used with anionic fluid loss agents (e.g., PAC R)*

TEST DATA

DATA SUMMARY

Ven-BHC versus DRILPLEX, and MMO at 0.50 lb/bbl in 10, 11 & 12 lb/bbl Treated (Peptized) Bentonite (Brookfield data included) (Pages 6-11).

These six pages of test data with accompanying graphs display the same concentration (application rate) of Ven-BHC (0.50 lb/bbl) in three increasing amounts of "treated" or "peptized" bentonite (10.0 - 11.0 – 12.0 lb/bbl) and where the make-up water was city tap water having calcium present at ≤ 120 ppm.

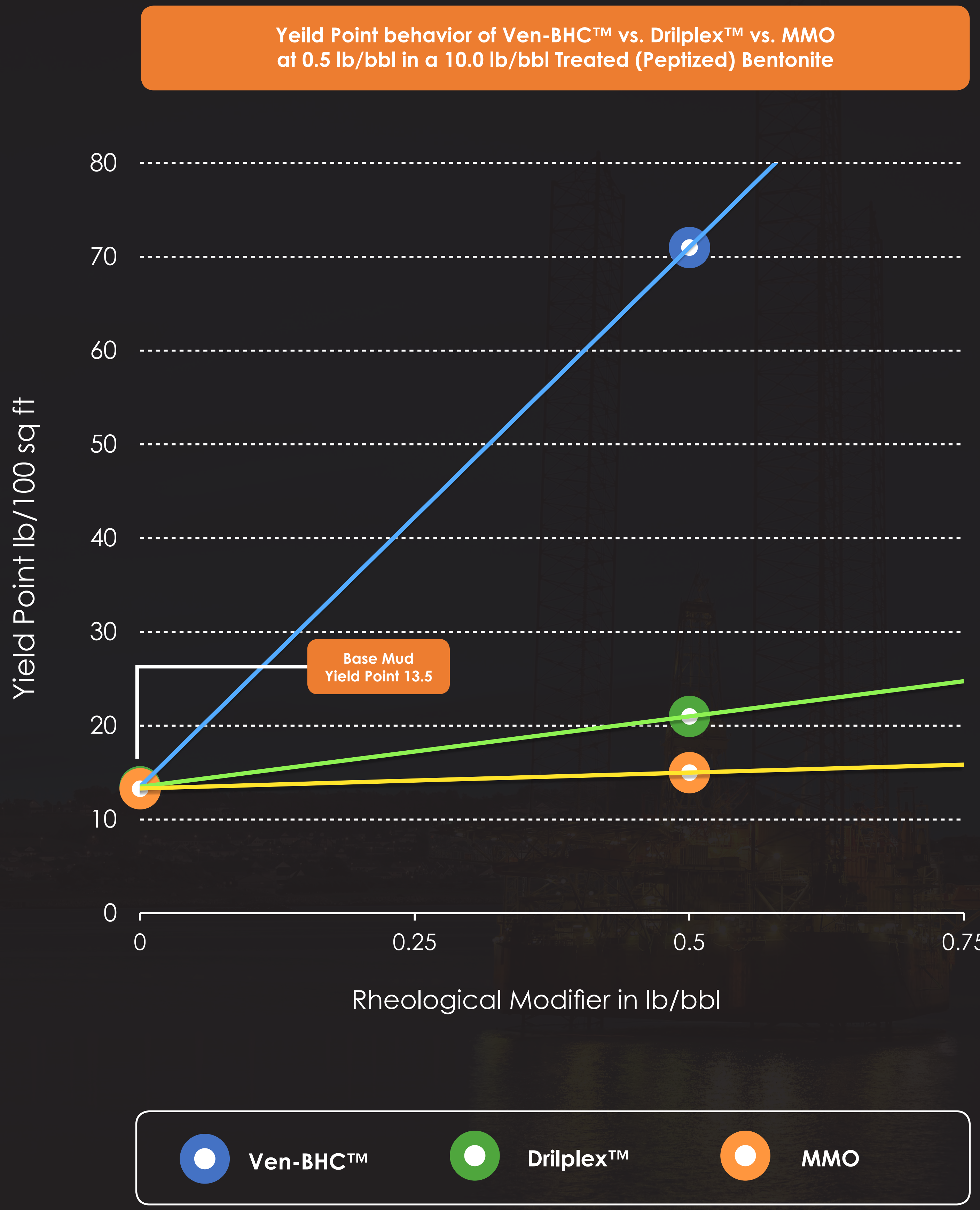
All three concentration levels of treated Bentonite show a classic "high - low end rheology" noting a very low Plastic Viscosity (PV) and high Yield Point (YP). In the first test comparing Ven-BHC, DRILPLEX and MMO it is noted that while the two competitive products have a lower PV – the most important YP number of Ven-BHC is well over 3 times that of the others. With the 11 lb/bbl of treated bentonite test it is important to note that the YP of Ven-BHC is over 7.25 times higher than the competitors.

The low PV and high YP values couples with the closeness of the 10 sec / 10 min gels further indicates an extremely fragile gel structure (both of which are typical of a Ven-BHC fluid). With the 12 lb/bbl of treated bentonite test it should be noted that the difference in YP verses the competitors is in the range of 7.25 times greater. Additionally, the difference in both the 6 rpm and 3 rpm numbers in this test, coupled with the gel numbers demonstrate that the Ven-BHC has a far superior cutting / carrying capacity, suspension ability and highly fragile gel structure.

It also means a Ven-BHC fluid exhibits zero "slip" velocity and virtually zero shear stress characteristics in the borehole and no pump or pressure surge noted with the fluid. As a final note, these three tests prove that the concentration levels of Ven-BHC are much higher than necessary to achieve the same or similar rheology levels than either the DRILPLEX or the MMO.

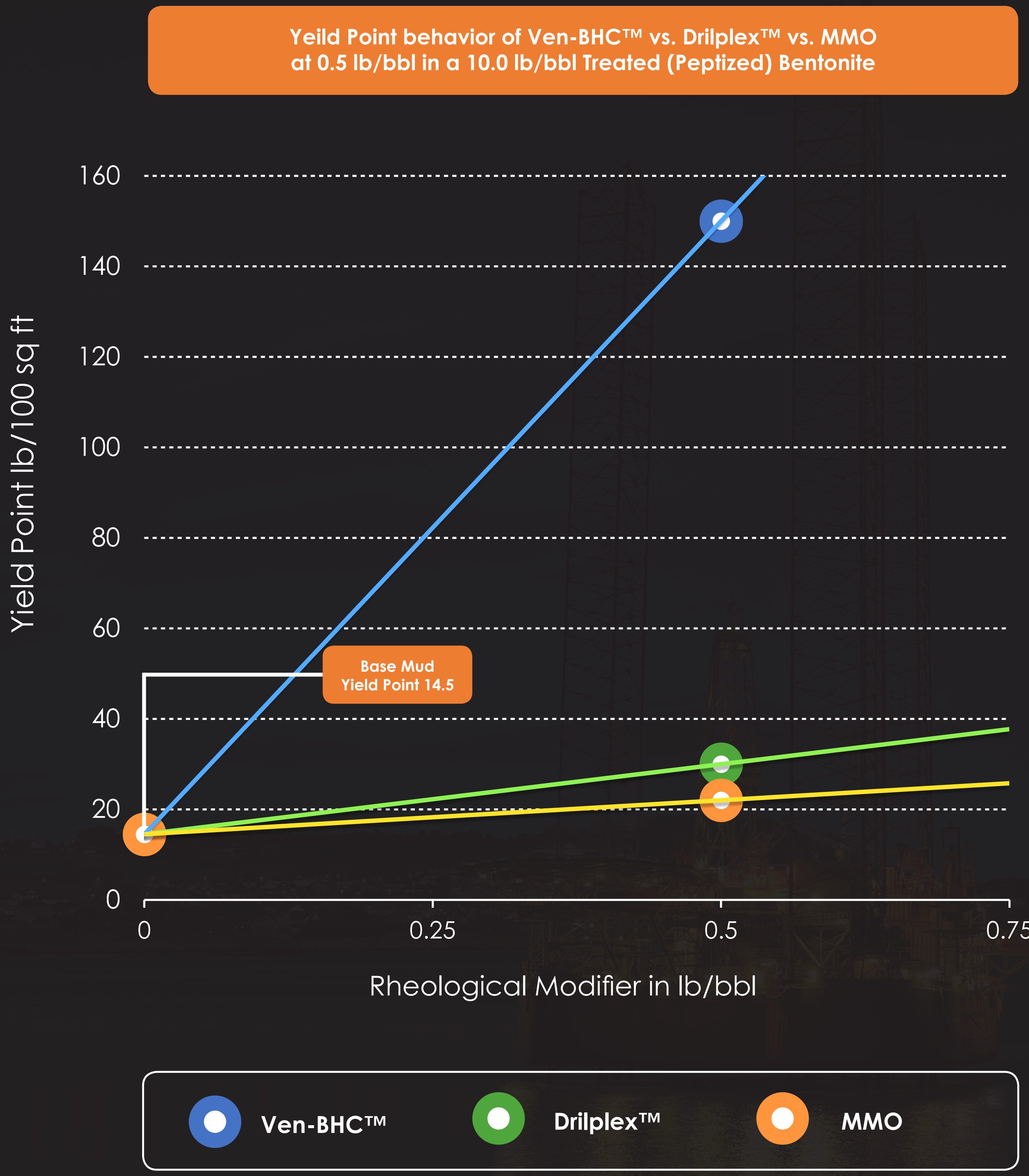
Sample #	Base Mud	1	2	3
Calcium Content of, ppm (ph Strip test: Total HWaterardness)	120	120	120	120
Tap Water; ml	350	350	350	350
Treated/Peptized Bentonite; g	10.00	10.00	10.00	10.00
3% NaOH; ml	0.50	0.50	0.50	0.50
Stir Bentonite Slurry for 30 minutes High Speed – OSTERIZER BLENDER				
pH		9.07	8.91	9.07
Adjust the Bentonite Slurry pH – to pH 9				
Ven-BHC; g		0.50		
Drilplex; g			0.50	
MMO; g				0.50
Mix Bentonite Slurry and ADDITIVES for 10 minutes (medium speed Hamilton Beach)				
pH	8.68	10.21	10.17	10.35
Fann Model 35A Viscometer Rheology				
600 rpm	26.5	111.0	31.0	28.0
300 rpm	20.0	91.0	26.0	21.5
200 rpm	16.5	81.0	24.0	19.0
100 rpm	13.0	70.5	21.0	17.0
6 rpm	7.5	23.0	16.0	13.0
3 rpm	6.0	14.0	15.0	12.0
Plastic Viscosity; cP	6.5	20.0	5.0	6.5
Yield Point; lb/100 sq.ft.	13.5	71.0	21.0	15.0
10 sec Gel; lb/100 sq.ft.	9.5	12.0	15.5	15.0
10 min Gel; lb/100 sq.ft.	21.0	25.0	24.0	37.0
LSYP	4.5	5.0	14.0	11.0
Brookfield Viscometer Rheology				
0.3 rpm	5,573	32,493	13,297	16,996
% Torque (Spindle #)	27.6% (61)	32.5% (62)	13.3% (62)	17.0% (62)
0.5 rpm	2,783	19,016	8,638	8,21
% Torque (Spindle #)	23.2% (61)	31.7% (62)	14.4% (62)	13.7% (62)
100 rpm	160.5	629.9	453.5	652.7
% Torque (Spindle #)	53.5% (62)	52.5% (63)	37.6% (62)	54.4% (63)
Temperature, deg F	80.5	85.4	83.0	79.0
STI no. 1, 0.5 rpm/100 rpm	17	30	19	13

Ref : Report # E1214-A


Yeild Point behavior of Ven-BHC™ vs. Drilplex™ vs. MMO
at 0.5 lb/bbl in a 10.0 lb/bbl Treated (Peptized) Bentonite
80
70
60
50
40
30
20
10
0
Yield Point lb/100 sq ft
Base Mud
Yield Point 13.5
0
0.25
0.5
0.75
Rheological Modifier in lb/bbl
Ven-BHC™
Drilplex™
MMO

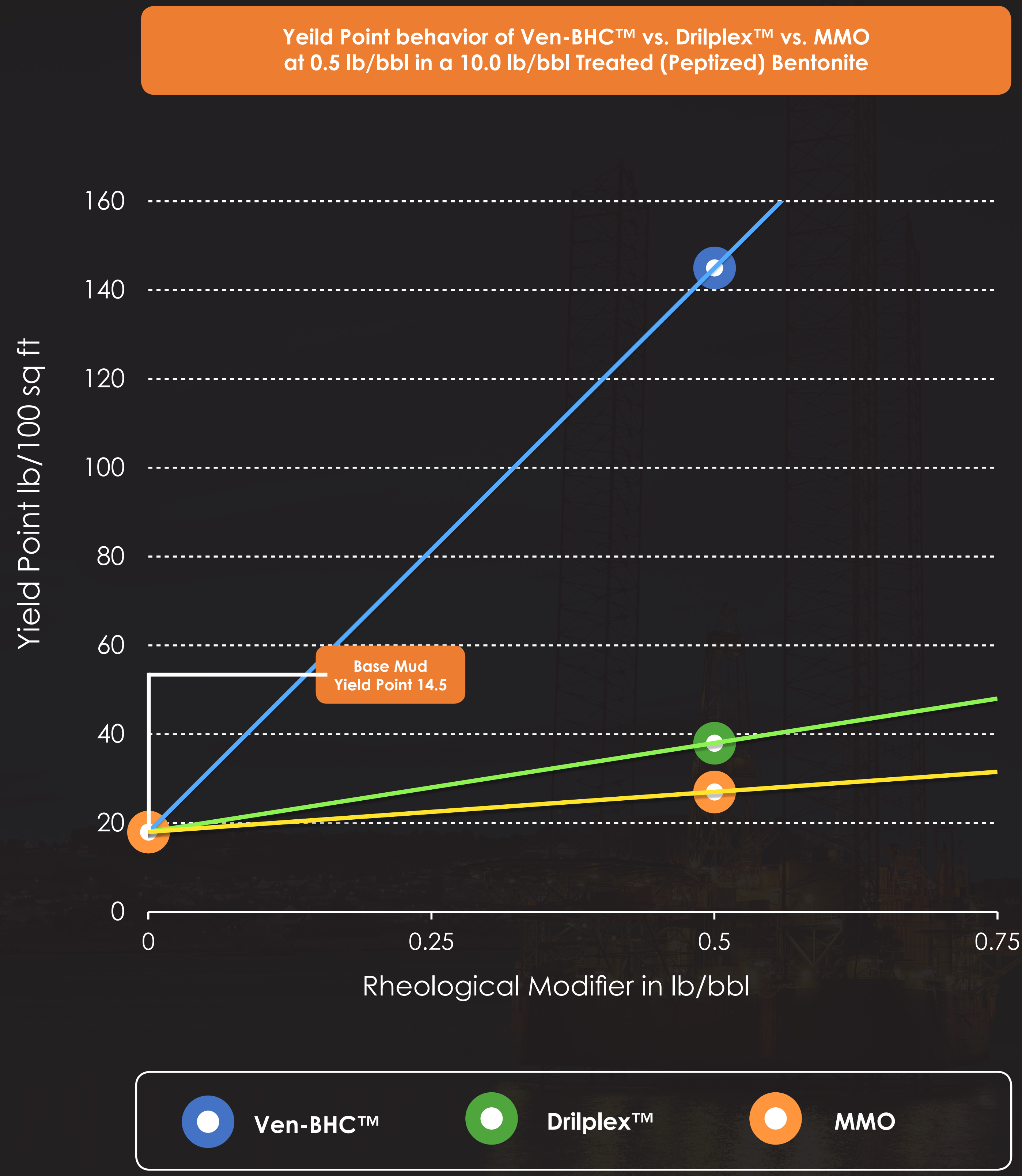
Sample #	Base Mud	1	2	3
Calcium Content of, ppm (ph Strip test: Total HWaterardness)	120	120	120	120
Tap Water; ml	350	350	350	350
Treated/Peptized Bentonite; g	10.00	10.00	10.00	10.00
3% NaOH; ml	0.50	0.50	0.50	0.50
Stir Bentonite Slurry for 30 minutes High Speed – OSTERIZER BLENDER				
pH	8.97	8.97	8.89	8.97
Adjust the Bentonite Slurry pH – to pH 9				
Ven-BHC; g		0.50		
Drilplex; g			0.50	
MMO; g				0.50
Mix Bentonite Slurry and ADDITIVES for 10 minutes (medium speed Hamilton Beach)				
pH	8.73	10.24	10.09	10.42
Fann Model 35A Viscometer Rheology				
600 rpm	25.5	186.0	43.0	33.0
300 rpm	20.0	166.0	37.0	27.0
200 rpm	17.0	154.0	33.0	25.0
100 rpm	13.0	136.0	31.0	22.0
6 rpm	10.0	56.5	23.5	19.0
3 rpm	9.0	31.0	22.0	18.0
Plastic Viscosity; cP	5.5	20.0	6.0	6.0
Yield Point; lb/100 sq.ft.	14.5	146.0	31.0	21.0
10 sec Gel; lb/100 sq.ft.	11.5	29.0	21.0	19.5
10 min Gel; lb/100 sq.ft.	28.0	33.0	23.0	52.0
LSYP	8.0	5.5	20.5	17.0
Brookfield Viscometer Rheology				
0.3 rpm	18,796	47,790	22,495	28,594
% Torque (Spindle #)	18.8% (62)	49.8% (62))	22.5% (62)	28.6% (62)
0.5 rpm	7,438	26,934	14,497	20,456
% Torque (Spindle #)	12.5% (62)	44.9% (62)	24.0% (62)	34.1% (62)
100 rpm	290.3	671.9	553.1	543.5
% Torque (Spindle #)	24.2% (63)	56.0% (63)	46.1% (63)	45.2% (63)
Temperature, deg F	77.8	82.7	80.9	75.3
STI no. 1, 0.5 rpm/100 rpm	26	40	26	38

Ref : Report # E1214-B


Yeild Point behavior of Ven-BHC™ vs. Drilplex™ vs. MMO
at 0.5 lb/bbl in a 10.0 lb/bbl Treated (Peptized) Bentonite
Yield Point lb/100 sq ft
160
140
120
100
80
60
40
20
0
Base Mud
Yield Point 14.5
0
0.25
0.5
0.75
Rheological Modifier in lb/bbl
Ven-BHC™
Drilplex™
MMO

Sample #	Base Mud	1	2	3
Calcium Content of, ppm (ph Strip test: Total HWaterardness)	120	120	120	120
Tap Water; ml	350	350	350	350
Treated/Peptized Bentonite; g	12.00	12.00	12.00	12.00
3% NaOH; ml	0.50	0.50	0.50	0.50
Stir Bentonite Slurry for 30 minutes High Speed – OSTERIZER BLENDER				
pH	8.95	8.06	8.06	8.06
Adjust the Bentonite Slurry pH – to pH 9				
Ven-BHC; g		0.50		
Drilplex; g			0.50	
MMO; g				0.50
Mix Bentonite Slurry and ADDITIVES for 10 minutes (medium speed Hamilton Beach)				
pH	8.94	10.01	10.11	10.14
Fann Model 35A Viscometer Rheology				
600 rpm	30.0	163.5	48.0	39.0
300 rpm	24.0	154.0	43.5	32.0
200 rpm	20.5	149.0	42.0	30.0
100 rpm	18.0	138.5	39.5	27.5
6 rpm	13.0	70.5	35.0	24.0
3 rpm	11.0	53.5	29.0	22.0
Plastic Viscosity; cP	6.0	9.5	4.5	7.0
Yield Point; lb/100 sq.ft.	18.0	144.5	39.0	25.0
10 sec Gel; lb/100 sq.ft.	14.5	49.0	27.0	18.0
10 min Gel; lb/100 sq.ft.	31.0	54.0	29.0	20.0
LSYP	9.0	36.5	23.0	20.0
Brookfield Viscometer Rheology				
0.3 rpm	12,297	88,581	29,594	31,493
% Torque (Spindle #)	61.5% (61)	88.6% (62)	29.6% (62)	31.5% (62)
0.5 rpm	11,110	52,309	16,776	23,335
% Torque (Spindle #)	92.3% (61)	21.8% (63)	27.7% (62)	38.9% (62)
100 rpm	381.5	823.0	757.0	793.0
% Torque (Spindle #)	31.8% (63)	68.7% (63)	63.1% (63)	66.1% (63)
Temperature, deg F	79.3	80.0	79.6	78.6
STI no. 1, 0.5 rpm/100 rpm	29	64	22	29

Ref : Report # F1714



Yeild Point behavior of Ven-BHC™ vs. Drilplex™ vs. MMO
at 0.5 lb/bbl in a 10.0 lb/bbl Treated (Peptized) Bentonite
Yield Point lb/100 sq ft
160
140
120
100
80
60
40
20
0
Base Mud
Yield Point 14.5
0
0.25
0.5
0.75
Rheological Modifier in lb/bbl
Ven-BHC™
Drilplex™
MMO

TEST DATA

DATA SUMMARY

Ven-BHC versus DRILPLEX, and MMO at 0.25, 0.50, 0.75, and 1.0 lb/bbl in 12 lb/bbl Premium (Untreated) Bentonite (Pages 14-16).

This lab data clearly shows in the 12.0 lb/bbl bentonite environment and extremely low concentration rates of Ven-BHC, DRILPLEX and MMO, the Ven-BHC out performs at each of the four application amounts (0.25-1.0 lb/bbl of product). Note that there a recorded rheology only with the 0.25 lb/bbl test of Ven-BHC.

The remaining tests where Ven-BHC is tested (>0.25lb/bbl) the rheology exceeds the rheometer scale. However, in each of these cases, both the 6rpm and 3 rpm readings coupled with the 10 sec. and 10 min gels indicate an extremely fragile gel structure is still present and the fluid exhibits "high low end rheology". In other words, even at the "off scale" numbers present, the fluid while at rest, would appear as a gelled solid.

With any stress, pressure, shear or force exerted against it, the fluid would move as if it had a similar viscosity to water. This test confirms the ability to use very low concentration rates of Ven-BHC versus DRILPLEX and MMO indicating a very significant reduction in cost per barrel of fluid to the operator. Additional benefits, to using Ven-BHC are a bore hole efficiently cleared of drilled cuttings (thereby reducing torque and drag) and noticeably increasing the days saved in drilling time.

Sample #	Base Mud	1	2	3
Calcium Content of, ppm (ph Strip test: Total HWaterardness)	0	0	0	0
Tap Water; ml	350	350	350	350
Treated/Peptized Bentonite; g	12.5% (62)	12.00	12.00	12.00
3% NaOH; ml	2.00	2.00	2.00	2.00
Stir Bentonite Slurry for				
pH	10.03	10.03	9.94	9.98
Adjust the Bentonite Slurry pH – to pH 9				
Ven-BHC; g		0.25		0.50
Drilplex; g			0.25	
MMO; g				
Mix Bentonite Slurry and ADDITIVES				
pH	9.56	10.19	9.95	10.05
Fann Model 35A				
600 rpm	12.5	244.0	26.5	300+
300 rpm	8.0	223.0	21.0	300+
200 rpm	6.5	214.0	20.0	300+
100 rpm	5.0	197.5	17.5	280.0
6 rpm	1.0	132.0	13.5	150.0
3 rpm	1.0	86.0	13.0	98.0
Plastic Viscosity; cP	4.5	21.0	5.5	*
Yield Point; lb/100 sq.ft.	3.5	202.0	15.5	*
10 sec Gel; lb/100 sq.ft.	1.5	83.0	15.5	124.0
10 min Gel; lb/100 sq.ft.	1.5	85.0	45.0	123.0
LSYP	1.0	40.0	12.5	46.0

* Fluid viscosity exceeded the Fann Viscometer scale reading

Ref : Report # B2014-A&B

4	5	6	7	8	9
0	0	0	0	0	0
350	350	350	350	350	350
12.00	12.00	12.00	12.00	12.00	12.00
3% NaOH; ml	2.00	2.00	2.00	2.00	2.00
30 minutes High Speed – OSTERIZER BLENDER					
10.12	9.98	10.12	9.94	10.37	10.49
Slurry pH – to pH 9					
	0.75		1.00		
0.50		0.75		1.00	
					1.00
for 10 minutes (medium speed Hamilton Beach)					
9.98	10.16	10.11	10.48	10.04	10.06
Viscometer Rheology					
109	300+	300+	300+	300+	238
102	300+	300+	300+	300+	177
101	282	291	287	289	168
97	261	267	250	265	156
71	141	143	135	151	61
67	116	95	100	117	45
7	*	*	*	*	61
95	*	*	*	*	116
74	134	101	114	97.5	54
42.5	14	86.5	12	93	50
63	91	47	65	83	29

Visual comparison, over time, of a Ven-BHC™ Fluid System (Jar 3), a Xanthan Gum (Duo-Vis) Fluid System (Jar 2), and a standard Gold Seal Bentonite Fluid System (Jar1).

JAR 1 | JAR 2 | JAR 3

Just Shaken

Photo 1 (from left):

JAR 1

12 lb/bbl Gold Seal Bentonite;
6 rpm - 1, 3 rpm - 1, PV - 3, YP - 3

JAR 2

4.0 lb/bbl Duo-Vis Xanthan Gum;
6 rpm - 34, 3 rpm - 30, PV - 13, YP - 56

JAR 3

10.0 lb/bbl Gold Seal Bentonite & 0.1 lb/bbl Ven-BHC
6 rpm - 85, 3 rpm - 77 , PV - 9, YP - 115

90 minutes Static

Photo 2 (from left):

JAR 1

12 lb/bbl Gold Seal Bentonite;

JAR 2

4.0 lb/bbl Duo-Vis Xanthan Gum;

JAR 3

10.0 lb/bbl Gold Seal Bentonite & 0.1 lb/bbl Ven-BHC

4 hours Static

Photo 2 (from left):

JAR 1

12 lb/bbl Gold Seal Bentonite;

JAR 2

4.0 lb/bbl Duo-Vis Xanthan Gum;

JAR 3

10.0 lb/bbl Gold Seal Bentonite & 0.1 lb/bbl Ven-BHC

20 hours Static

Photo 2 (from left):

JAR 1

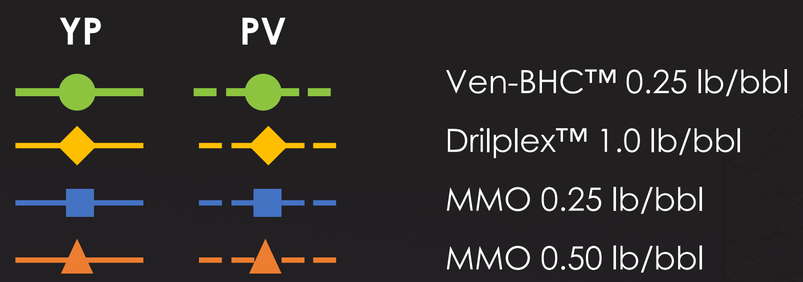
12 lb/bbl Gold Seal Bentonite;

JAR 2

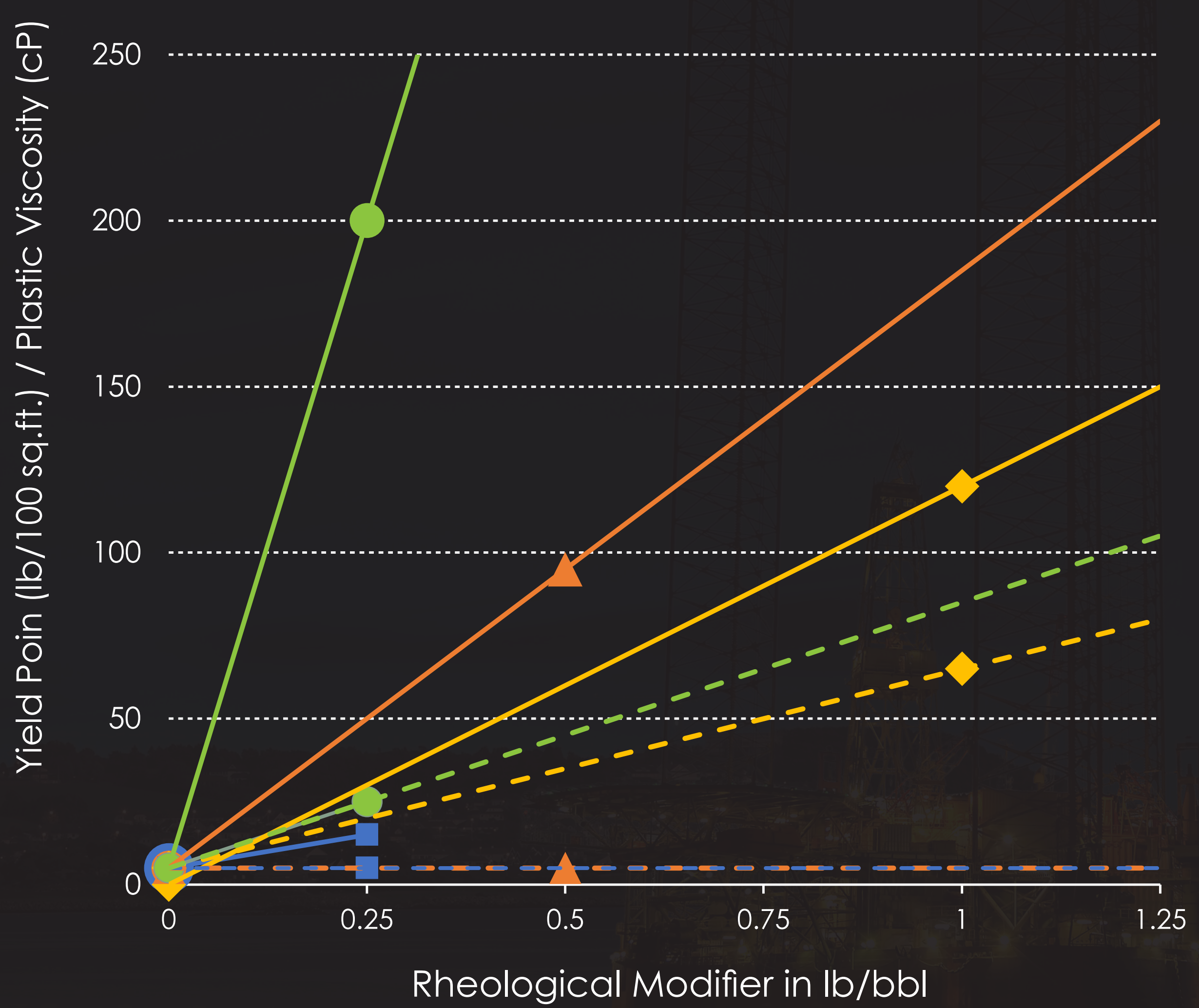
4.0 lb/bbl Duo-Vis Xanthan Gum;

JAR 3

10.0 lb/bbl Gold Seal Bentonite & 0.1 lb/bbl Ven-BHC



Yield Point & Plastic Viscosity Behavior of Ven-BHC vs DRILPLEX & MMO at 0.25, 0.50, 0.75, and 1.0 lb/bbl in 12 lb/bbl Premium (Un-treated) Bentonite



Note that the following data points are omitted since they exceeded the maximum Fann rheometer reading

Ven-BHC @ 0.5 lb/bbl YP
Ven-BHC @ 0.5 lb/bbl PV
Ven-BHC @ 0.75 lb/bbl YP
Ven-BHC @ 0.75 lb/bbl PV
Ven-BHC @ 1.0 lb/bbl YP
Ven-BHC @ 1.0 lb/bbl PV

MMO @0.75 lb/bbl YP
MMO @ 0.75 lb/bbl PV
MMO @ 1.0 lb/bbl YP
MMO @ 1.0 lb/bbl PV

TEST DATA

DATA SUMMARY

Ven-BHC at 2, 3, and 4 lb/bbl in 12 lb/bbl Premium (Un-treated) Bentonite (Before & After Hot Roll at 300˚ F, 16 hours, 250 psi) (Pages 18 & 19)

With this test, three different application rates of Ven-BHC were used. The "before Hot Roll" and "after Hot Roll" were combined in one table for easier comparison. The purpose of this test was to display a matrix following the Hot Roll (16 hr.) at 300°F of the Ven-BHC.

As anticipated, the rheology (at these application rates) exceeds the viscometer scale readings which would normally indicate that too much of the Ven-BHC was being used in that test. However, we anticipated that temperature might alter normal rheology. These application rates were selected to discover at exactly what temperature more Ven-BHC would be needed to overcome the test temperature and present a viable fluid under field conditions.

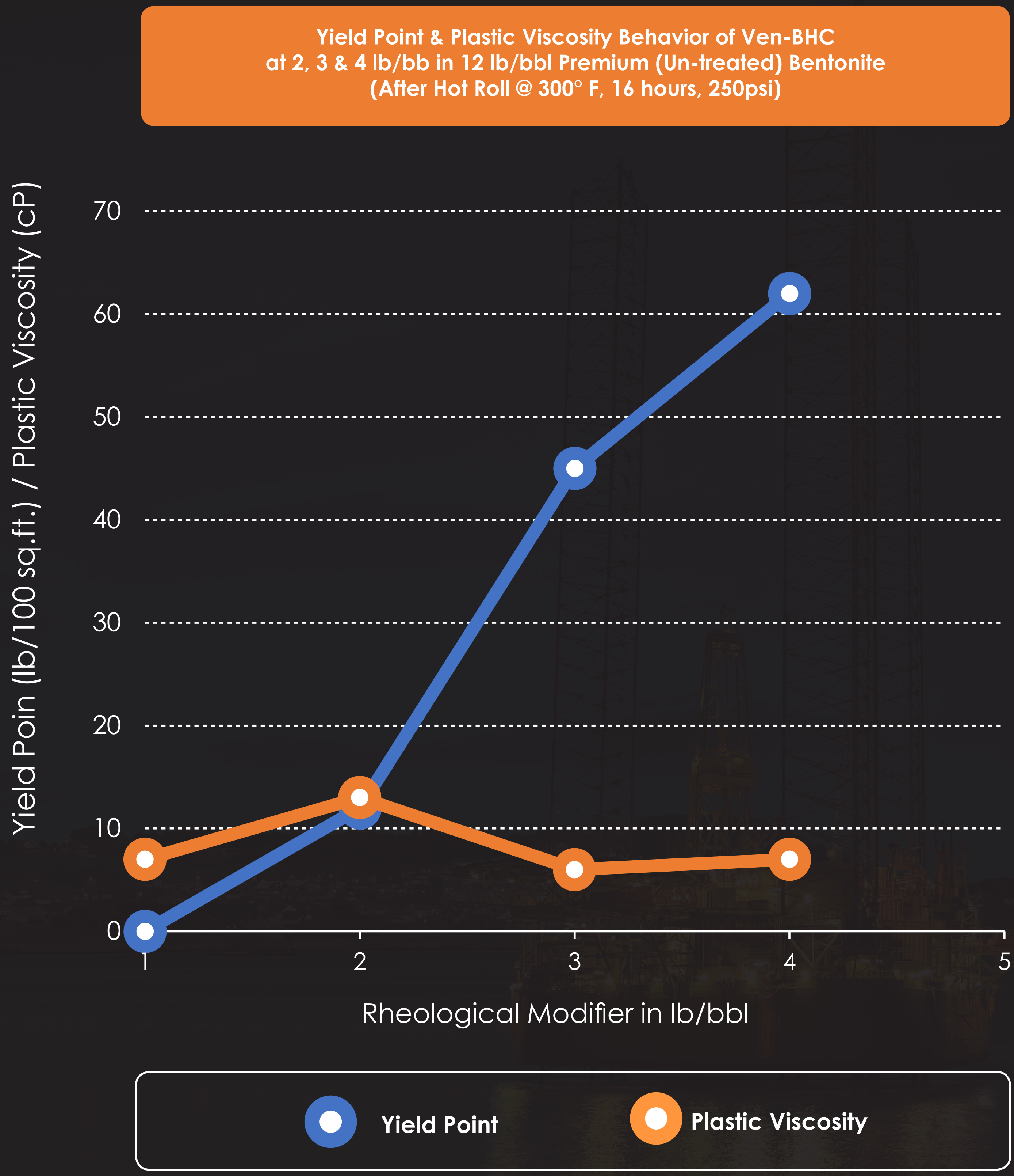
We noticed at 2.0 lb/bbl there was simply NOT enough Ven-BHC (as noted in the rheology) in the test fluid and there was no "high/low end rheology" present. However at 3.0 lb/bbl of Ven-BHC we were presented with an excellent rheology which would be typically used in a field situation. With both the 3.0 lb/bbl and 4.0 lb/bbl application rates, excellent PV and high YP values were observed. This test also proved that before and after Hot Roll, adding too much product would not cause a total breakdown in fluid properties, while still providing good temperature stability.

It was at this point that Enventives completed its High Temperature version of Ven-BHC and that high temp product is called Ven-BHC HT.

Sample #	Base Mud	1	2	3
Calcium Content of Water, ppm (ph Strip test: Total Hardness)	0	0	0	0
Tap Water; ml	350	350	350	350
Treated/Peptized Bentonite; g	12.00	12.00	12.00	12.00
3% NaOH; ml	2.00	2.00	2.00	2.00
Stir Bentonite Slurry for 30 minutes High Speed – OSTERIZER BLENDER				
pH	10,01	10,06	10,06	10,01
Adjust the Bentonite Slurry pH – to pH 9				
Ven-BHC; g		2.00	3.00	4.00
Mix Bentonite Slurry and ADDITIVES for 10 minutes (medium speed Hamilton Beach)				
pH	9.45	10.83	10.99	11.05
Fann Model 35A Viscometer Rheology				
600 rpm	14.0	300+	300+	300+
300 rpm	7.0	300+	293.5	296.0
200 rpm	5.0	300+	278.0	275.0
100 rpm	3.0	280.0	264.0	265.0
6 rpm	2.5	142.0	131.0	148.0
3 rpm	1.0	125.5	114.0	115.0
Plastic Viscosity; cP	7.0	*	*	*
Yield Point; lb/100 sq.ft.	0.0	*	*	*
10 sec Gel; lb/100 sq.ft.	3.0	132.0	110.0	107.0
10 min Gel; lb/100 sq.ft.	14.0	140.0	103.0	103.0
LSYP	-0.5	109.0	97.0	82.0
Hot Roll 300°F, 16 hours, 250 psi Mix 5 minutes (medium speed Hamilton Beach)				
pH	8.42	10.47	11.12	11.35
Fann Model 35A Viscometer Rheology				
600 rpm	14.0	42.5	55.0	75.0
300 rpm	7.0	28.0	49.0	68.5
200 rpm	5.0	21.0	45.5	68.5
100 rpm	3.0	14.0	45.0	71.0
6 rpm	2.0	1.0	46.0	68.0
3 rpm	1.0	0.5	28.0	41.0
Plastic Viscosity; cP	7.0	14.5	6.0	6.5
Yield Point; lb/100 sq.ft.	0.0	13.5	43.0	62.0
10 sec Gel; lb/100 sq.ft.	3.0	1.0	45.0	49.0
10 min Gel; lb/100 sq.ft.	4.0	1.0	46.0	64.0
LSYP	0.0	0.0	10.0	14.0

* Fluid viscosity exceeded the Fann Viscometer scale reading

Ref : Report # B2014-A&B


Yield Point & Plastic Viscosity Behavior of Ven-BHC
at 2, 3 & 4 lb/bb in 12 lb/bbl Premium (Un-treated) Bentonite
(After Hot Roll @ 300° F, 16 hours, 250psi)
Yield Poin (lb/100 sq.ft.) / Plastic Viscosity (cP)
70
60
50
40
30
20
10
0
1
2
3
4
5
Rheological Modifier in lb/bbl
Yield Point
Plastic Viscosity

TEST DATA

DATA SUMMARY

Ven-BHC HT at 4.0 lb/bbl in 12.0 lb/bbl Premium (un-treated) Bentonite (After HR at 325°F and 350°F, 16 hr 250psi) (Pages 21 & 22)

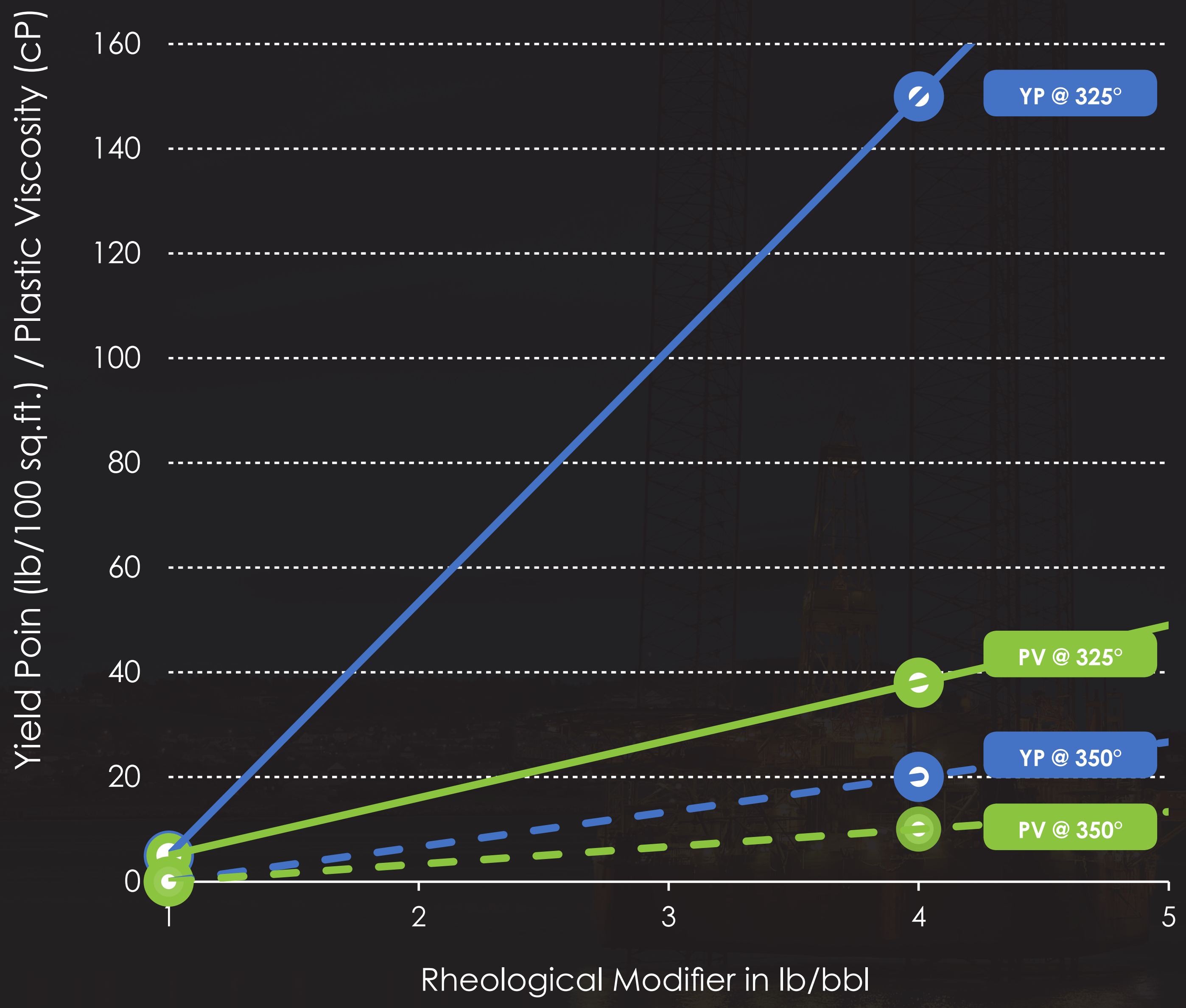
This final data shows the control fluid before & after Hot Roll at 325°F and before & after Hot Roll at 350°F. It was an arbitrary decision to do both Hot Rolls at 4.0 lb/bbl with the information gathered prior to this test. The actual numbers shown here might indicate that at 325°F the application rate is possibly too high and a lower application rate could possibly be used successfully.

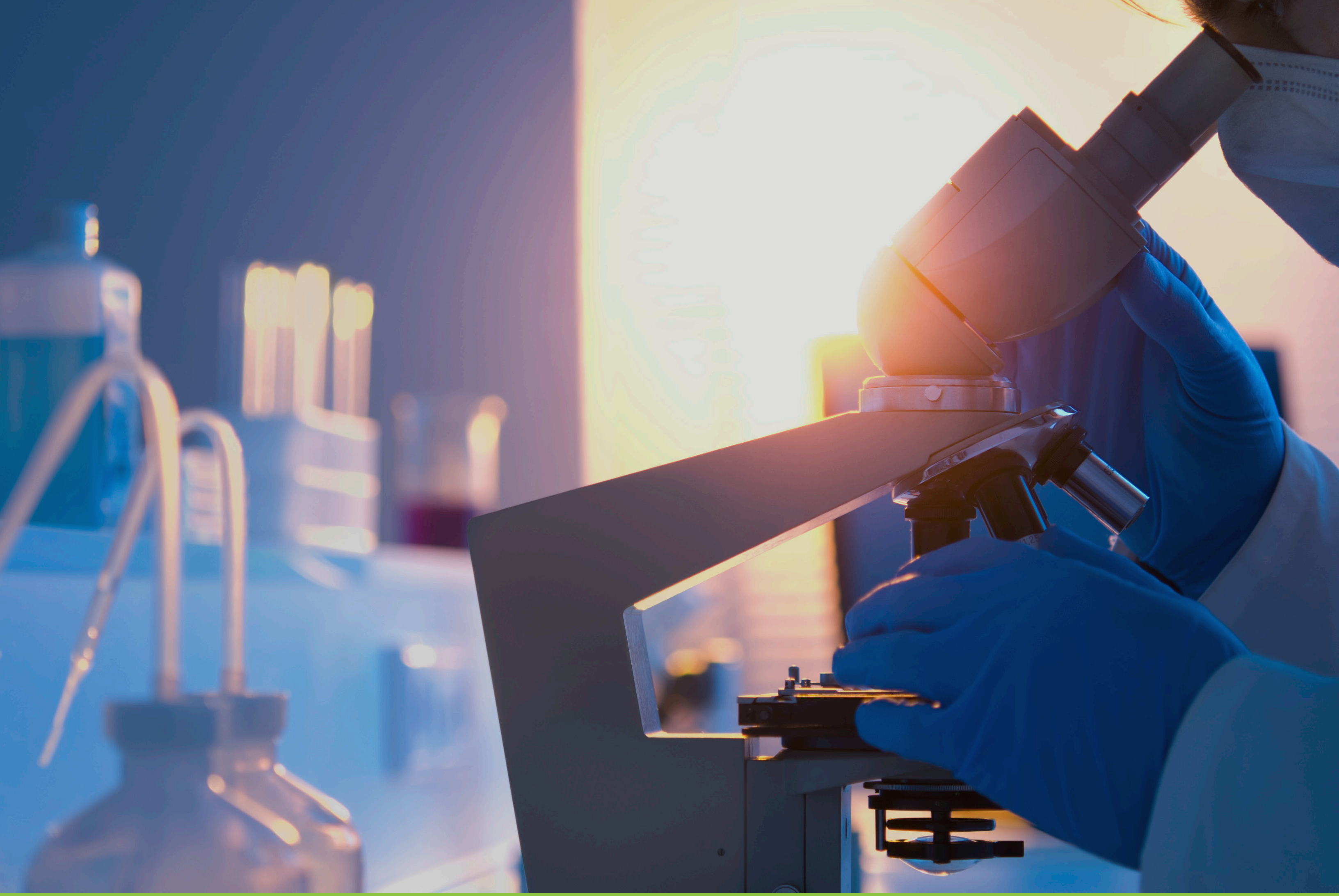
However, at 350°F the indication is that additional product may be necessary to bring the Ven-BHC HT in to a more traditional fluid of "high/low end rheology". Although the numbers at 350°F may be acceptable for most field fluids and while temperature does deplete the overall rheology, at 4.0 lb/bbl of Ven-BHC HT and at 350°F there is still adequate rheology for being a successful Ven- BHC HT drilling fluid! The above is critical for several reasons: 1) Most, if not all bio-polymers lose most if not all of their effectiveness at temperatures above 315°F. 2) Costs of Ven-BHC HT have proven to be far less on a direct cost per pound basis, a lb/bbl basis and on a cost per barrel of fluid. 3) Competitor products (such as DRILPLEX and MMO are reported to have lower temperature stability (300°F) than Ven-BHC HT (effective in excess of 325°F).

Sample #	Base Mud	
Calcium Content of Water, ppm (ph Strip test: Total Hardness)	0	
Tap Water; ml	350	
Treated/Peptized Bentonite; g	12.0	
3% NaOH; ml	2.00	
Stir Bentonite Slurry for 30 minutes High Speed – OSTERIZER BLENDER		
pH	9.98	
Adjust the Bentonite Slurry pH – to pH 9		
Ven-BHC; g	4.00	
Mix Bentonite Slurry and ADDITIVES for 10 minutes (medium speed Hamilton Beach)		
pH	9.81	
Fann Model 35A Viscometer Rheology		
600 rpm	200.0	
300 rpm	192.0	
200 rpm	181.0	
100 rpm	175.0	
6 rpm	76.0	
3 rpm	63.0	
Plastic Viscosity; cP	8.0	
Yield Point; lb/100 sq.ft.	184.0	
10 sec Gel; lb/100 sq.ft.	62.0	
10 min Gel; lb/100 sq.ft.	65.5	
LSYP	50.0	
Hot Roll 300°F, 16 hours, 250 psi	**2 (325°F)**	**2 (350°F)**
RheologyMix 5 minutes (medium speed Hamilton Beach)		
0.3 rpm	9.42	9.17
Fann Model 35A Viscometer Rheology		
600 rpm	190.0	64.0
300 rpm	169.0	51.0
200 rpm	159.0	48.0
100 rpm	150.0	45.0
6 rpm	100.0	35.0
3 rpm	84.0	22.0
Plastic Viscosity; cP	21.0	13.0
Yield Point; lb/100 sq.ft.	148.0	38.0
10 sec Gel; lb/100 sq.ft.	70.0	22.5
10 min Gel; lb/100 sq.ft.	75.0	18.0
LSYP	68.0	9.0

Average Base Mud PV/YP Before Hot Roll; 5.0/5.0
Average Base Mud PV/YP After Hot Roll; 2.5/7.5

Yield Point & Plastic Viscosity Behavior of Ven-BHC HT at 4 lb/bbl in 12 lb/bbl Premium (Un-treated) Bentonite (After Hot Roll at 325° F & 350° F)





Mixing Procedure for Ven-BHC and Ven BHC HT with Treated (Peptized) Bentonite in Tap Water pH adjusted to 9.0

CHEMICALS:

- Treated (Peptized) Bentonite
- Tap Water (< 120 ppm Ca^{2+})
- 3% (w/v) NaOH
- Ven-BHC™ and Ven-BHC HT™

EQUIPMENT:

- Balance: +/- 0.01 gram
- Graduated Cylinder (500 ml)
- Osterizer Blender, 14 speed
- Hamilton Beach Mixer (Model 936-2 or 941-1)
- Fann 35A Rheometer
- Timer (+/- 1 second
- pH meter / probe

LAB PROCEDURE

For Ven-BHC: Follow Step # 1 through 16
For Ven-BHC HT: Follow Step # 1 through 21 and see Notes

1. In an Osterizer Blender, add 350 mL of Tap Water
   a. Check water hardness (Ca 2+ concentration) with a test strip. Dip one strip into water sample for 3 sec onds (no agitation). Remove test strip and immediately match to the color chart (color development within 1 minute). Record results in ppm based on color match. Value should be below 120ppm (120mg/L)

2. Weigh out Treated (Peptized) Bentonite at desired application rate (10.0 to 12.0 lb/bbl or 10.0 to 12.0 grams).

3. Turn on Blender and let mix on High (Grate)

4. Set time to 30 minutes. Turn on timer.

5. Slowly sift in Treated (Peptized) Bentonite at a uniform rate over a time interval of between 30 seconds to 1 minute. (The Treated (Peptized) Bentonite should be added into the vortex away from the impeller shaft to minimize dusting).

6. Add 0.5 mL of 3% (w/v) NaOH to the mixture. (The pH is raised on Treated (Peptized) Bentonite to maximize gel yield and is added early in the pre-hydrating period. The fluid does not need to be adjusted again after the pre-hydrating period).

7. Turn off mixer when timer ends.

8. Check pH and temperature of fluid. Average pH range for the Treated (Peptized) Bentonite slurry is 8.75 +/- 0.25 . Average Temperature range (110°F +/-10°F).

9. Transfer 350 mL fluid to a Hamilton Beach mixer cup.

10. Place Hamilton beach mixer cup in a Hamilton Beach Mixer on Medium Speed

11. Have a pre-weighed Ven-BHC or Ven-BHC HT sample ready. Weigh out at desired application rate for Ven-BHC (0.50, 0.75, and 1.0 lb/ bbl or 0.50, 0.75, and 1.0 grams per sample respectively). Weigh out at desired application rate for Ven-BHC HT (1.0, 2.0, 3.0, and 4.0 lb/ bbl or 1.0, 2.0, 3.0, and 4.0 grams per sample respectively).

12. Set time to 10 minutes. Turn on timer.

13. Slowly sift in Ven-BHC or Ven-BHC HT at a uniform rate over a time interval of 30 seconds to the Hamilton Beach mixer cup while on medium speed. (The Ven-BHC or Ven-BHC HT should be added into the vortex away from the impeller shaft to minimize dusting).

14. Turn off mixer by removing Hamilton Beach mixer cup when timer ends.

15. Check pH and temperature of fluid. Average pH range for Ven-BHC (pH 10.25 + 0.25). Average pH range for Ven-BHC HT (pH 9.5 – 10.5). Average Temperature range (100°F+/-10°F).
16. Obtain data points of the fluid using Fann Model 35A Rheometer: 600, 300, 200, 100, 6, and 3 rpm

and Gels (10 sec and 10 min).

17. Collect the sample and place in aging cell to be Hot Rolled overnight at desired temperature. Please see NOTES for further details.

18. After sample has been aged under desired temperature, remove cell from oven, cool down sample, and transfer all material in cell to a Hamilton Beach mixer cup, shear for 5 minutes in Medium Speed.

19. Turn off mixer by removing Hamilton Beach mixer cup when timer ends.
20. Check pH and temperature of fluid.

21. Obtain data points of the aged fluid using Fann Model 35A Rheometer:

NOTES:

- Use of Treated (Peptized) Bentonite preferred

- We indicate a pH range (pH 8.75 +/- 0.25- adjusted with 3% (w/v) NaOH) for the Treated (Peptized) Bentonite to maximize gel yield when testing Ven-BHC HT. The 3% (w/v) NaOH is added early in the re- hydrating period.

- We would prefer for this test – to use 12.0 lb/bbl of the Treated (Peptized) Bentonite. pH does not need to be adjusted again after the pre-hydrating period.

- Also for this test, regarding lab make-up water (If the water used is "tap" water – since the Ca2+ etc. can be controlled / treated in the field with Soda Ash) – we prefer Ca 2 + below 120ppm (120 mg/L). OR – we would simply prefer distilled water used throughout. Calcium ions retard the hydrating of Treated (Peptized) Bentonite to a degree. Any water treatment should be added early in the pre-hydrating period.

- Application rate of the Ven-BHC HT should be trialed beginning with the base mud with no Ven-BHC HT and then increasing amounts (sifted into the Treated (Peptized) Bentonite slurry) of the product – from:
    - 1.0lb/bbl Ven-BHC HT
    - 2.0lb/bbl Ven-BHC HT
    - 3.0b/bbl Ven-BHC HT
    - 4.0lb/bbl Ven-BHC HT

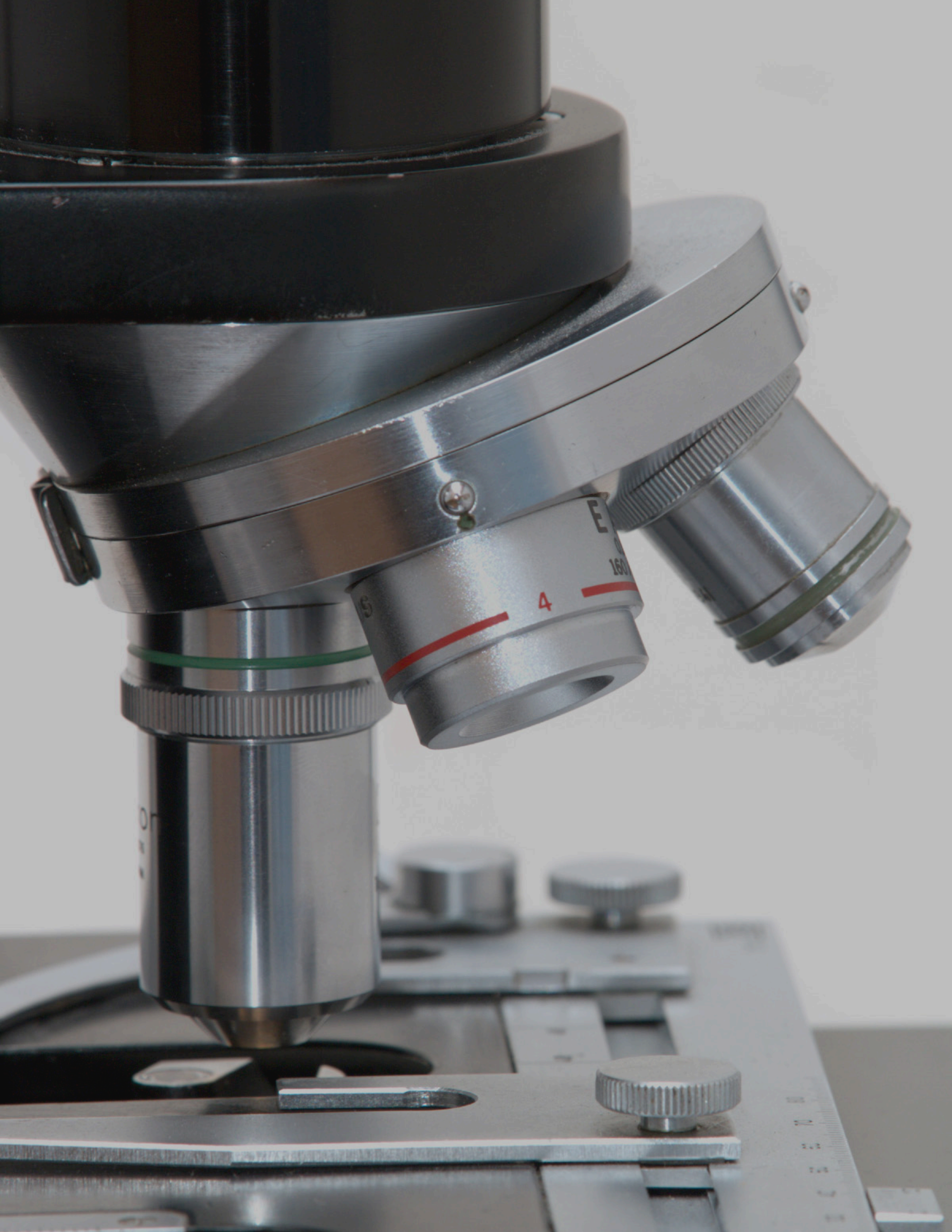
- First run – without hot roll and check values

- Cell pressure set at what your normal setting would be for a water- base fluid at these temperatures)

- Second run – Hot Rolled at the initial desired temperature eg. 275°F and check values.

- Third run – Hot Rolled at 325°F and 350°F and check values.

- After cool down of the aging cell, the slurry is decanted. Re-shear for 5 minutes on medium speed in the Hamilton Beach and record values.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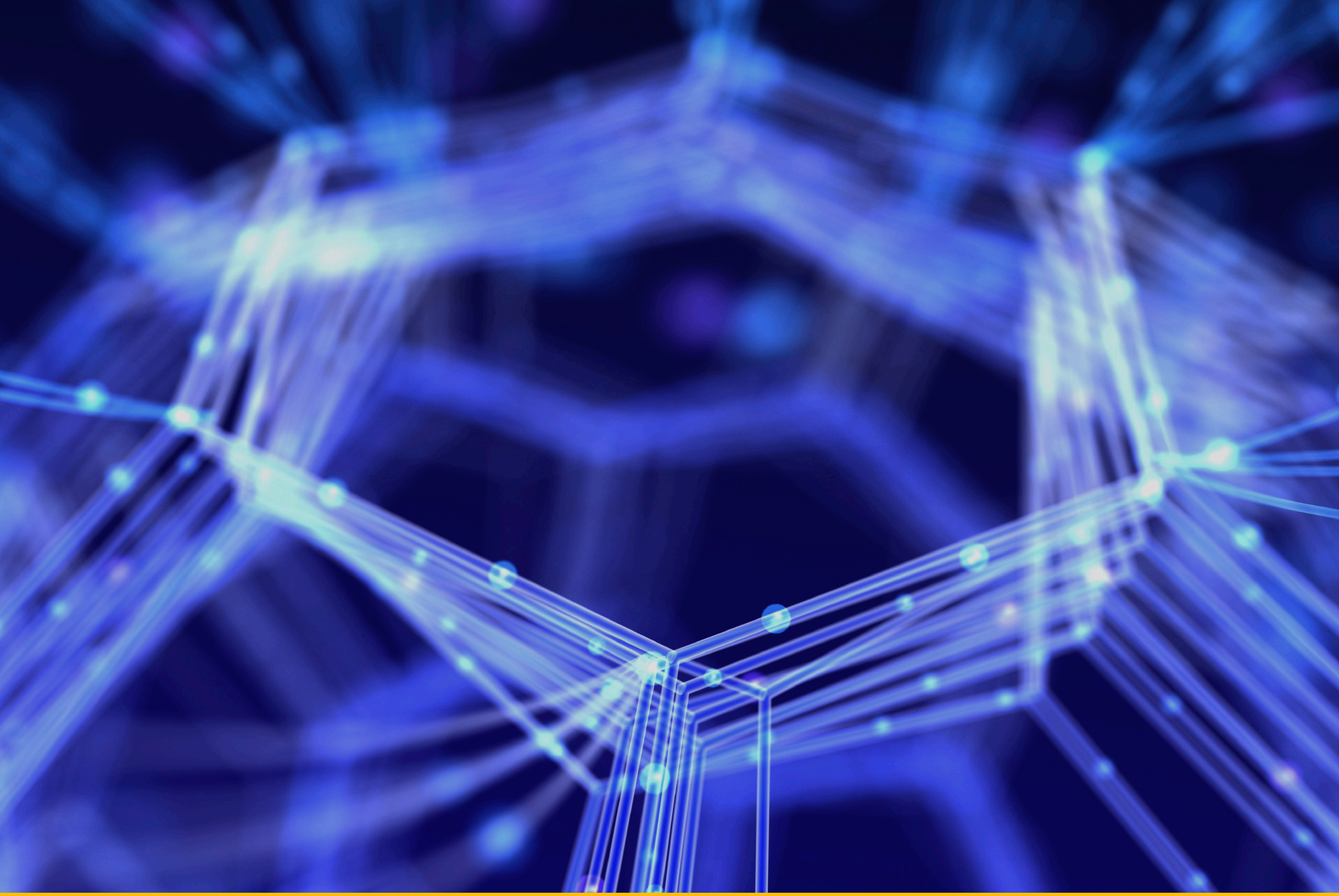


Mixing Procedure for Ven-BHC and Ven BHC HT with Premium (Un-treated) Bentonite in Distilled Water pH adjusted to 10.0

CHEMICALS:

- Premium (un-treated) Bentonite
- Distilled Water
- 3% (w/v) NaOH
- Ven-BHC™ and Ven-BHC HT™

EQUIPMENT:

- Balance: +/- 0.01 gram
- Graduated Cylinder (500 ml)
- Osterizer Blender, 14 speed
- Hamilton Beach Mixer (Model 936-2 or 941-1)
- Fann 35A Rheometer
- Timer (+/- 1 second
- pH meter / probe
- Total water hardness test strips (water works p/n 480008)

LAB PROCEDURE

For Ven-BHC: Follow Step # 1 through 16
For Ven-BHC HT: Follow Step # 1 through 21 and see Notes

1. In an Osterizer Blender, add 350 mL of Distilled Water
   a. Check water hardness (Ca 2+ concentration) with a test strip. Dip one strip into water sample for 3 seconds (no agitation). Remove test strip and immediately match to the color chart (color development within 1 minute). Record results in ppm based on color match. Value should be below 60ppm (60mg/L)
2. Weigh out Premium (Un-treated) Bentonite at desired application rate (12.0 lb/bbl or 12.0 grams).
3. Turn on Blender and let mix on High (Grate)
4. Set time to 30 minutes. Turn on timer.
5. Slowly shift in Premium (Un-treated) Bentonite at a uniform rate over a time interval of between 30 seconds to 1 minute. (The Premium (Un-treated) Bentonite should be added into the vortex away from the impeller shaft to minimize dusting).
6. Add 2.0 mL of 3% NaOH (w/v) to the mixture. (pH raised on Premium (Un-treated) Bentonite to maximize gel yield – added early in the pre-hydrating period and does not need to be adjusted again after the pre- hydrating period).
7. Turn off mixer when timer ends.
8. Check pH and temperature of fluid. Average pH range for Ven-BHC (pH 10. 00 +/- 0.25). Average pH range for Ven-BHC HT (pH 9.5 – 10.5). Average Temperature range (110°F +/-10°F).
9. Transfer 350 mL fluid to a Hamilton Beach cup
10. Place Hamilton Beach mixer cup in a Hamilton Beach Mixer on Medium Speed
11. Have a pre-weighed Ven-BHC or Ven-BHC HT ready. Weigh out at desired application rate for Ven- BHC (0.50, 0.75, and 1.0 lb/bbl or 0.50, 0.75, and 1.0 grams per sample respectively). Weigh out at desired application rate for Ven-BHC HT (1.0, 2.0, 3.0, and 4.0 lb/bbl or 1.0, 2.0, 3.0, and 4.0 grams per sample respectively).
12. Set time to 10 minutes. Turn on timer.
13. Slowly shift in Ven-BHC or Ven-BHC HT at a uniform rate over a time interval of 30 seconds to the Hamilton Beach mixer cup while on medium speed (The Ven-BHC or Ven-BHC HT should be added into the vortex away from the impeller shaft to minimize dusting).
14. Turn off mixer by removing Hamilton Beach mixer cup when timer ends.
15. Check pH and temperature of fluid. Average pH range for Ven-BHC (pH 10.25 +/- 0.25). Average pH range for Ven-BHC HT (pH 9.5 – 10.5). Average Temperature range (100°F +/-10°F).

16. Obtain data points of the fluid using Fann Model 35A Rheometer: 600, 300, 200, 100, 6, and 3 rpm and Gels (10 sec and 10 min).
17. Collect the sample and place in aging cell to be Hot Rolled overnight at desired temperature. Please see NOTES for further details.
18. After sample has been aged under desired temperature, remove cell from oven, cool down sample, and transfer all material in cell to a Hamilton beach cup, shear for 5 minutes in Medium Speed.
19. Turn off mixer by removing Hamilton beach cup when timer ends.
20. Check pH and temperature of fluid.
21. Obtain data points of the aged fluid using Fann Model 35A Rheometer: 600, 300, 200, 100, 6, and 3 rpm and Gels (10 sec and 10 min).

NOTES:

- Use of Premium (Un-treated) Bentonite preferred
- We indicate a pH range (pH 9.5-10.5- adjusted with 3% (w/v) NaOH) for the Premium (Un-treated) Bentonite to maximize gel yield when testing Ven-BHC HT. The 3% (w/v) NaOH is added early in the re- hydrating period.
- We would prefer for this test to use 12.0 lb/bbl of the Premium (Un- treated) Bentonite. pH does not need to be adjusted again after the pre-hydrating period.
- Distilled Water should have a value below 60ppm (60mg/L). If not, treat with Soda Ash. Calcium ions retard the hydrating of Premium (Un-treated) Bentonite to a degree. Any water treatment should be added early in the pre-hydrating period.
- Application rate of the Ven-BHC HT should be trialed beginning with the base mud with no Ven-BHC HT
- For subsequent trials, add increasing amounts (sifted into the Premium (Un-treated) Bentonite slurry) of the product – from:
  - 1.0 lb/bbl Ven-BHC HT
  - 2.0 lb/bbl Ven-BHC HT
  - 3.0 lb/bbl Ven-BHC HT
  - 4.0 lb/bbl Ven-BHC HT
- First run – without hot roll and check values
- Cell pressure set at what your normal setting would be for a water- base fluid at these temperatures)
- Second run – Hot Rolled at the initial desired temperature eg. 275°F and check values.
- Third run – Hot Rolled at 325°F and 350°F and check values.
- After cool down of the aging cell, the slurry is decanted. Re-shear for 5 minutes on medium speed in the Hamilton Beach and record values.

VEN-BHC™
(Bore Hole Control)

RECOMMENDATIONS

Treat water with soda ash to reduce hardness below 60 ppm (60 mg/l) to improve yield of bentonite. Pre-hydrate Premium (untreated) bentonite for at least one hour before adding caustic soda, mix Peptized (treated) bentonite for at least 15 minutes.

Add pre-hydrated Premium (untreated) bentonite or Peptized (treated) bentonite and Ven-BHC™ when necessary to increase viscosity.

Dilute with water when necessary to decrease viscosity.Maintain pH betwen 9.5 - 11.5 (to enhance bentonite hydration)

BENEFITS

Environmentally safe fluid system provides excellent shale stability achieve higher ROP, reduced drilling daysHas few system components and is easy to use.

Works with Bentonite, Attapulgite and SepioliteCan be used with either Premium 'un-treated' bentonite or Peptized 'treated' bentonitePro-vides high YP with low funnel viscos-ityHas high 'low end' rheological propertiesOptimizes hole cleaning capabilitieszero 'slip' velocity excellent suspension characteristicsVirtually zero shear stress at borehole

Maintains filtration control in the presence of contaminantsMinimize torque and dragMinimal dynamic fluid loss Solids and fluid are prevented from entering production zones (due to the bridging agents particle size distribution assuring a thin, low permeability filter cake)Requires no special or sophisticated rig equipment, just good solids control.

GENERAL INFORMATION

Ven-BHC™ is an inorganic, synthetic gel-strength modifier and shale stabilizer designed for waterbased drilling, milling and completion fluids. Ven-BHC™ is a proprietary poly hydroxy silicate technology. Ven-BHC™ provides borehole stability and superior hole cleaning for miling of casing and drilling highly deviated or horizontal sections as well as straight hole drilling applications. This fluid is especially effective when drilling unconsolidated, unstable, stressed or faulted formations.The Ven-BHC™ drilling fluid system is capable of remarkable solids suspension, yet exibits extreme shear thinning flow characteristics. The result is a low-solids fluid system that drills like water, yet forms, almost instantly, a unique gel structiure that carries and suspends cuttings in 'near perfect transport' while providing superior shale stabilizing characteristics.

PACKAGING

Ven-BHC™ is packaged in twenty-five (25) lb. multi-wall, mylar lined bags.

TYPICAL PROPERTIES

Form	:	Powder
Color	:	White
pH, in water (3% solution)	:	10.9-11.9
Solubility, in water	:	Insoluble, Dispersible
Bulk Density, lb/ft compacted	:	65-85
uncompacted	:	45-65

TYPICAL FORMULATIN

Soda Ash	Hardness reducer	0.05-0.25 lb/bbl, (0.15-0.7 kg/m3)
Premium bentonite or Peptized bentonite		8.0-15.0 lb/bbl, (23.0-43.0 kg/m3)
Caustic Soda Alkalinity		as needed for pH
CM Starch	Fluid Loss Control	2.0-6.0 lb/bbl, (6.0-17.0 kg/m3)
Ven-BHC™	Rheology Modifier	0.25-10lb gel, (0.05 kg/kg gel)
Calcium Carbonate (weight and bridge)		As needed
Pac R (Anionic Fluid Loss Additive)		As needed

PRECAUTIONS

Some anionic products may cause adverse de-flocculation or dispersion -thinning. Do not add any chemicals (i.e. fluid loss control additives or thinners) that are not on the formulation list without prior pilot testing.To prevent contamination clean tanks prior to addition of fresh fluids. When milling casing, the old drilling fluid left behind casing may cause de-flocculation or thinning.

Keep calcium in make up water levels below 60 ppm (60 mg/l) with soda ash.

See the Safety Data Sheet for more detailed information concerning storage, handling, transportation, disposal and safety requirements.

VEN-BHC HT ™

(Bore Hole Control)

RECOMMENDATIONS

Treat water with soda ash to reduce hardness below 60 ppm (60 mg/l) to improve yield of bentonite. Pre-hydrate Premium (untreated) bentonite for at least one hour before adding caustic soda, mix Peptized (treated) bentonite for at least 15 minutes.

Do not add any chemicals (i.e. fluid loss control additives or thinners) that are not on theformulation list without prior pilot testing. Add pre-hydrated Premium (untreated) bentonite or Peptized (treated) bentoniteb and Ven-BHC™ when necessary to increase viscosity.

Dilute with water when necessary to decrease viscosity. Maintain pH betwen 9.0 - 10.0 (to enhance bentonite hydration). Some anionic products may cause adverse de-flocculation or dispersion -thinning

To effectively bridge off the production zone 20-30% by weight of the bridging agent should be 1/3 of the pore size in microns.
To prevent contamination clean tanks prior to addition of fresh fluids. When milling casing, the old drilling fluid left behind casing may cause de-flocculation or thinning.

Keep calcium in make up water levels below 60 ppm (60 mg/l) with soda ash.

Typical Formulation:

Soda Ash	.05-.025 lb/bbl
Bentonite	8.0-15.0 lb/bbl

(Treated or Untreated)

Caustic Soda	pH 9.0-10.0
Ven-BHC	0.25-1.0 lb/bbl

Calcium Carbonate :
As Neededfor bridging and weight

GENERAL INFORMATION

Ven-BHC™ HT is an inorganic, synthetic gel-strength modifier and shale stabilizer designed for waterbased drilling, milling and completion fluids. Ven-BHC™ HT is a proprietary poly hydroxy silicate technology. Ven-BHC™ HT provides borehole stability and superior hole cleaning for milling of casing and drilling highly deviated or horizontal sections as well as straight hole drilling applications.
This fluid is especially effective when drilling unconsolidated, unstable, stressed or faulted formations. The Ven-BHC™ HT drilling fluid system is capable of remarkable solids suspension, yet exibits extreme shear thinning flow characteristics. The result is a low-solids fluid system that drills like water, yet forms, almost instantly, a unique gel structure that carries and suspends cuttings in 'near perfect transport' while providing superior shale stabilizing characteristics.

Ven-BHC™ HT is Temperature stable above 325°F.

Some of the benefits of Ven-BHC™ HT are:
Achieve higher Rates of Penetration, save on reduced drilling days.
Has few system components and is easy to use.
Works with Bentonite, Attapulgite and Sepiolite.
Can be used with either Premium (untreated) bentonite or Peptized (treated) bentonite.
Provides high yield point with low funnel viscosity.
Has high 'low end' rheological properties. Optimizes hole cleaningcapabilities, zero 'slip' velocity, has excellent suspension characteristics.
Provides excellent shale stability
Virtually zero shear stress at borehole.
Maintains filtration control in the presence of contaminants.
Minimize torque and drag.
Environmentally safe fluid system.
Requires no special or sophisticated rig equipment, just good solids control.
Solids and fluid are prevented from entering production zones (due to the bridging agents particle size distribution assuring a thin, low permeability filter cake
Can be used with anionic fluid loss agents (PAC R)

PACKAGING

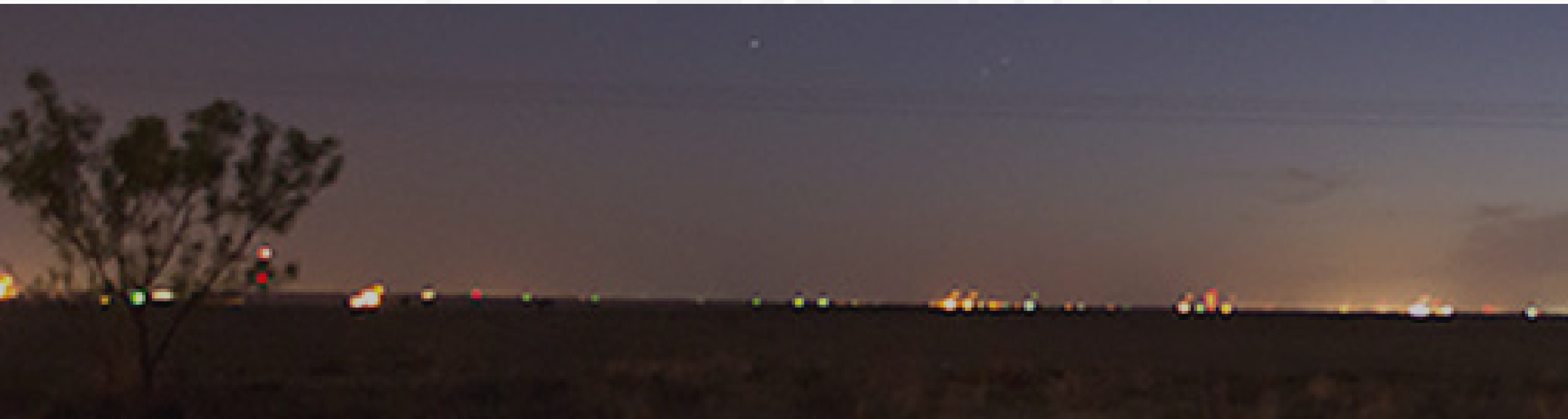
Ven-BHC™ is packaged in twenty-five (25) lb. multi-wall, mylar lined bags.

TYPICAL PROPERTIES

Form	:	Powder
Color	:	White
pH, in water (3% solution)	:	9.0-10.0
Solubility, in water	:	Insoluble, Dispersible
Bulk Density, lb/ft compacted	:	45-65
uncompacted	:	65-85

PRECAUTIONS

See the Safety Data Sheet for more detailed information concerning storage, handling, transportation, disposal and safety requirements.



enventives

PRICE QUOTES

Please contact enventives, LLC or your local enventives distributor for current availability and to obtain current price quotes.

PRODUCT DATA INFORMATION

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