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THE VISPLEX SYSTEM OF LOCAL INDOBEN DRILLING MUD

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ABSTRACT

This paper discusses an laboratory investigation laboratories method of drilling fluid Visplex System with International Drilling Fluids (IDF) Specification. On this research bentonite from Indonesia is used Bentonite (Indoben Pre-hydrate) and The International Drilling Fluids laboratories used Wyoming Bentonite. Result of the research to be compared by International Drilling Fluids (IDF) specification rheological.

Visplex viscosifier has been optimized from the original visplex product to enable it to be added to prehydrated bentonite Indoben, neat as a dry product. It should be noted however that the full rheologucal profile takes approximately 20% longer develop. Some shearing is preferable to facilitate the product to yield.

The results of the researched are :
Bentonite : Visplex : Flopex = 10 : 1 : 2
The rheological properties, (1) density 8.65 ppg, (2) dial read $_{600}$ 53.5, dial read $_{300}$ 44, dial read $_{200}$ 38.5, dial read $_{100}$ 33, dial read $_{6}$ 30, (3) plastic viscosity 9.5 cp, (4) yield point 34.5 lb/100 sq.ft, (5) gel strength $_{10'/10''}$ 30/56 lb/100 sq.ft, (6) filtrate volume $_{7.5'/30'}$ 4.2 cc/8.8cc and mudcake 0.95 mm.

I. INTRODUCTION

The drilling mud rheological stability should undoubtedly be kept under control and should be suitable for the formation currently being penetrated. In order to keep the rheological stability certain chemical additives should be added to the base mud. The chemical additives used for this purpose are the visplex (mixed metal hydroxide) and floplex (filtration loss control) which are classified as new products of Dowell Schlumberger Co. The mud is then popularly known as the visplex system mud.

Some of the benefits expected from rheology of the visplex sistem muds are : (1) Exellent carrying capacity and solids suspension, (2) Low circulating pressures, (3) More available hydraulic horsepower at the bit, (4) Better down hole motor performance and (5) Easy screening even with high flow rates. It will also be observed torque and drag due to the lower concentration of the cuttings in the annulus. This is very important on high angle hole where use of the visplex system minimises the formation of cutting beds. Fluids loss control of the visplex system must be achieved through use of flopex if the rheological characteristics are to be maintained.

The visplex system are contains Al and Mg ion which has an electron lattice. When added to water, the small positively charged visplex particles are strongly attracted to the cation exchange sites in bentonite, forming a strong complex which structure the fluid, The slurry shows unsual physical properties, behaving like an elastic solid when at rest or when under conditons of minimal mechanical displacement. The pseudo solid is very shear thinning in nature and can be transformed into an extremely low viscosity fluid through the application of displacement energy. The visplex system exhibits low plastic viscosity (PV), high value for the yield point (YP), gels and low shear rate rheology and solubility at high pH.

2. VISPLEX BASIC THEORY

Visplex is a drilling mud additive which contains a chemical composition known as MMH (Mixed Metal Hydroxide). The function is to modify the bentonites rheology. On the system bentonite water the visplex mechanism are small visplex particle is dragged by negative ions of bentonite (figure 1.a and b), by then the Na ions from Bentonite is exchanged with Al ions of visplex which bonds stronger within the bentonites platelets). Therefore the clay platelets-

bond will grow stronger which eventually makes the clay minerals more stable.

The Visplex particles are crystalline, sizing around 0,05 microns which make it smaller than that of bentonite and contain metallic components such as aluminum (Al) and magnesium (Mg). Visplex system drilling mud has a minimum composition of base-mud (bentonite + water) and visplex (may optionally be added with any additive to control certain properties).

Meanwhile, floplex serves as a reducer filtrate loss on the visplex mud system whose mechanism is that floplex will shut every visplex system mud pores and intend to bind water in the system without breaking the chain-bond (connection) between bentonite and the visplex.

This mud shall produce a splendid rheology if it pH scale is between 10 to 10,5. This is caused by the visplex's hydroxide characteristic which makes it very sensitive towards basa (OH).

The advantages of visplex mud system lay on the good cutting transport and the reduction of cutting plugs on horizontal drilling, Mud transformation to gel is considered quiet fast and it can reduce pressure losses, drag and torsion effect it minimizes the mud viscosity when it reaches the bit and there fore increase the rate of penetration, avoid formation damage in the reservoir, minimizes failure/malfunction of the caliper logs and cementation.

The obtained result ratio from the experiment is compared with the IDF Specification Properties based on the API Spec.

3. EXPERIMENTS

3.1. Laboratory Tools

The laboratory apparatus currently used in this experiment are , fann VG meter, standard filter press, cup mixer, multi mixer, measuring glass, pressure mud balance, stopwatch and measuring compass.

3.2. Materials

Materials that are used in the current experiment are fresh water, bentonite (an Indoben product, formerly named as Pre-Hydrated Indoben) and chemical additives (that is visplex and floplex).

3.3. The Preparation of Visplex Drilling Mud

The preparation of vispex drilling mud system is conducted as follows:

1. The addition of visplex into the base mud which formerly has been settled overnight at desired weight (an exact material proportion) is conducted gradually to avoid flocculation.
2. The addition of floplex 5 minutes after the addition of visplex which is also conducted at the desired weight (an exact material proportion) in gradual mode. In the following experiment, the floplex variation concentration is set on 0, 2, 4 and 6 lb/bbl.
3. The addition of NaOH 50%solution until it produces a pH value = 10,5 (around 0,2 ml).

After the completion of the visplex mud system, then may be proceeded with the rheology measurement.

3.4. Investigation of the Visplex System Drilling Mud Rheology.

3.4.1. Density Measurement

Mud density measurement by the Mud Balance", that is a scaling apparatus which on one side is fitted with a cup which is to be filled by the measured mud The calibration of the apparatus may be conducted by using plain water (density of 8.33 ppg).

3.4.2. Viscosity and Gel Strength Measurement

Measurement of viscosity and gel strength is carried out with the Fann VG Meter, the cylinder rotation is exerted by the synchron engine which rotation per minute (rpm) is adjustable and can be set on 3, 6, 100, 200, 300 and 600 rpm.

Calculation:

Plastic Viscosity (PV)= $C_{600} - C_{300}$, cp.

Apparent Viscosity (AV)= $C_{600} / 2$, cp.

Yield Point (YP) $= C_{300} - PV$,lb/100 sq-ft

3.4.3. Filtrate Loss Measurement

The filtrate loss measurement is conducted by the filter press apparatus, with a pressure of 100 psi and measured on a time interval of 7.5 to 30 minutes.

4. DISSCUSION OF RESULTS

The investigation result ON the visplex system WITH INDOBEN BENTONITES mud on various floplex, visplex and bentonites concentration produced the following data : θ_6, θ_3, density (ρ), plastic viscosity (PV), apparent

viscosity (AV), yield point (YP), gel strength 10'' and gel strength 10'. The mud is observed on a pH scale of 10.5 with the addition of 50% NaOH solution (10 N) 0.2 ml. The result of the observed mud samples on various concentration ratio are illustrated in figure 2 and table 1.

Those data constitutes of density (ρ), plastic viscosity(PV), apparent viscosity (AV), yield point (YP), gel strength 10', θ_6, θ_3, 7.5' and 30' filtrate volume versus bentonite concentration on each visplex and floplex concentration being adopted, as it is viewed consecutively in table 2, table 3 and figure 3. Eventually, those parameters will be compared with the values obtained from the IDF Spec. to achieve a good rheology quality. The ratio of Indoben bentonite, visplex and floplex which produces the best rheology/approaching the IDF Spec. whose ratio is 10 : 1 : 2 lb/bbl with parameters as it is shown on Table 3.

5. CONCLUSION

Based on the research and the laboratory data processing results, the following conclusions are reached :

1. Rheological properties of the visplex system could fulfill the International Drilling Fluid standard (IDF) which pH value of 10.5., shown in table 3.
2. Filtrate volume at 7.5' (minutes) reading fulfill the IDF Spec. criterion but on the other hand the 30' (minutes) reading showed an over-value/excess that is 8.8 cc of filtrates (IDF maximum value is 6 cc), which in this case an addition of a filtrate control additive is obviously required.

6. ADVICE

It should be noted that an advance research concerning the rheology and mud filtrate under high temperature conditions is of a great value and worth to be conducted (enhanced by the implementation of a rolling oven apparatus and a fluid loss reducer additives).

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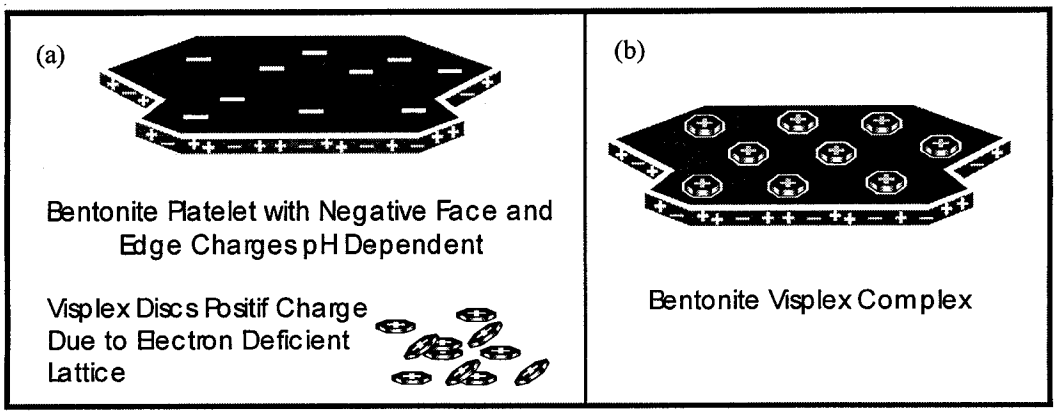

Figure 1. (a,b). Visplex System Mechanism

Table 1. Yield Point Measurement at Various Bentonite, Visplex and Floplex Concentration

Bentonite (lb/bbl)	Visplex (lb/bbl)	Yield Point Pada Konsentrasi Floplex (lb/100sq-ft)			
		0 lb/bbl	2 lb/bbl	4 lb/bbl	6 lb/bbl
14	1	14	53.5	99	119.5
12	1	11	43.5	73	91.5
10	1	8.5	34.5	52	78
8	1	8	19.5	41	44
6	1	7.5	14	17	26
11.2	0.8	10	33	59	90
9.6	0.8	3.5	21	43	74.5
8	0.8	3	17	32.5	45.5
6.4	0.8	2.5	12	17.5	34.5
4.8	0.8	0	8	13	33
8.4	0.6	1.5	19	37	52.5
7.2	0.6	0.5	11.5	21.5	40
6	0.6	0	9	13	32.5
4.8	0.6	0	7.5	12.5	20.5
3.6	0.6	0	5	11	17.5

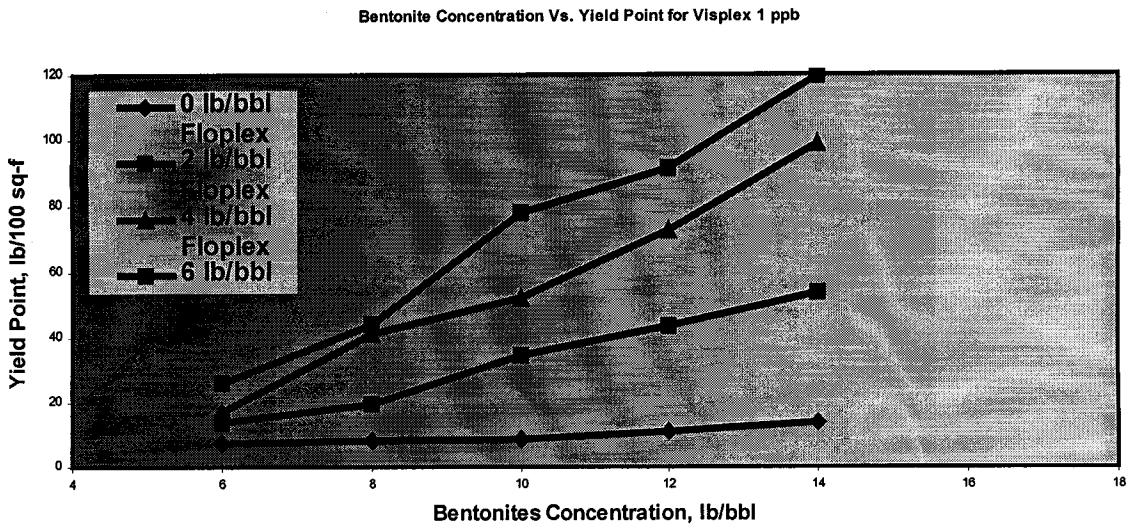

Figure 2. Correlation curve between bentonite concentration and yield point for a visplex value of 1 ppb.

Table 2 Measurement of Filtrate Volume 7.5' at Various Bentonite Concentration, Visplex and Floplex

Bentonite (lb/bbl)	Visplex (lb/bbl)	Filtrate Volume 7.5' at Floplex Concentration (cc)			
		0 lb/bbl	2 lb/bbl	4 lb/bbl	6 lb/bbl
14	1	5.5	3	2.1	2
12	1	6	3.75	2.4	2.2
10	1	6.8	4.2	2.8	2.4
8	1	8.6	4.8	3.4	2.8
6	1	11	5.4	4.2	3
11.2	0.8	6.4	3.6	3	2.3
9.6	0.8	7.4	4	3.3	2.4
8	0.8	8.2	4.4	3.8	2.8
6.4	0.8	10.4	5.2	4	3
4.8	0.8	12.8	5.8	4.6	3.4
8.4	0.6	7.4	3.8	3.1	2.6
7.2	0.6	9.2	4.2	3.4	2.8
6	0.6	9.3	4.6	3.9	3
4.8	0.6	12.3	5.3	4.2	4
3.6	0.6	13.4	6	4.4	4.2

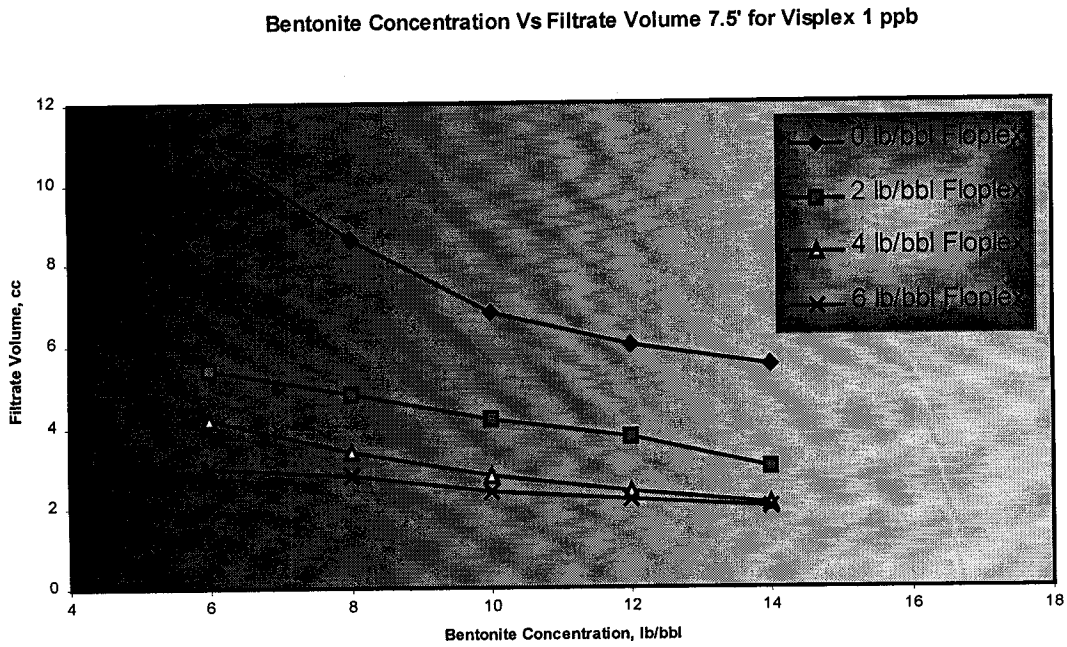

Figure 3. Bentonite Concentration Vs. Filtrate Volume 7.5' for Visplex 1 ppb

Table 3. Rheology and Visplex System Indoben Drilling Mud Filtrate Measurement Result

	10 : 1 : 2 lb/bbl Ratio	IDF Spec. Properties
Density (ppg)	8.65	As required
Yield Point (YP)	34.5	30 – 40
Plastic Viscosity (PV)	9.5	As low as possible
3 rpm reading (")	30	30 – 40
6 rpm reading (")	30	30 – 40
Gel Strength 10" (lb/100 sq-ft)	30	30 – 40
Gel Strength 10' (lb/100 sq-ft)	56	40 – 50
Filtrate Volume at 7.5 minutes (cc)	4.2	4 – 6
Filtrate Volume at 30 minutes (cc)	8.8	4 – 6
PH	10.5	10 – 10.5