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Eco-friendly drilling fluid water loss controlling agents

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ABSTRACT

The water loss from the drilling fluid with the addition natural additives like bagasse, natural sugar, and natural rubber was studied. The entire study is focused on improving the quality of controlling fluid loss with effect of natural additives. The concentrations of the additives were changed to achieve the desired reasonable value of fluid loss with the help of High Pressure and High Temperature (HPHT) filter press which worked at the condition of 500 psi and at 300ºF temperature. Rheology and various tests of these different samples were studied, and the result is tabulated in this article.

Keywords— *Natural additives- Bagasse, Natural sugar and rubber, HPHT, Fluid loss*

1. INTRODUCTION

Oil and gas industries are very much concerned about the environment and reduction in the usage of the non-toxic compound in the operation of extraction of petroleum. The major function of the drilling fluid is to remove the cuttings from the bottom hole and lubricating the bit and to seal the more permeable zones in the borehole. This article concerns about the loss of water from the drilling fluid to the permeable zones. In the case of general drilling fluid loss in the water, the table zone might affect the groundwater and related problems may be followed by. This paper deals with this sort of case to make the drilling fluid more eco friends whether in the water table or the disposal of fluids. Therefore, this research is developed to enhance the property of the drilling fluid in the manner of eco-friendly and make it cost effective.

2. APPARATUS AND METHODS

The experiment is carried with the help of equipment includes High-Pressure High-Temperature filter press (HPHT), mud balance, VG meter, pH meter, resistivity meter, weighing machine, marsh funnel, stopwatch, beaker, agitator, grinding machine, de-ionized water. The raw materials used are bentonite, barite, bagasse, natural rubber, and natural sugar.

3. PROCEDURE

Bagasse, natural rubber, natural sugar was separately grinded and other raw materials were taken. According to the standard procedure of preparing drilling mud adopted by Akpan et al was employed. The raw materials used in the mud formulation were measured using the graduated cylinder and electronic weighing machine. The mud samples were formulated with bagasse, natural rubber and natural sugar, in the presence bagasse alone, the presence of natural rubber alone, the presence of natural sugar alone and the combination of bagasse and rubber, combination of rubber and sugar, combination of bagasse and sugar and the combination of all rubber, bagasse, sugar. The initial experiment was conducted with no additives to compare the results of each additives. A further experiment was conducted in the presence of the mentioned additives in the concentration of 2g, 4g, 6g, 8g and 10g. The agitation is done for a whole day per sample of fluid. Mud balance was used to measure the density, specific gravity and the filter press is used to measure the filtrate volume and the cake thickness.

4. FORMULATION OF MUD SAMPLES

- Mud sample without any fluid loss additives (MWAFLA)
- Mud sample with bagasse (MWB)
- Mud sample with natural rubber (MWNR)
- Mud sample with natural sugar (MWNS)
- Mud sample with a combination of bagasse and rubber (MWCBR)
- Mud sample with a combination of bagasse and sugar (MWCBS)
- Mud sample with a combination of rubber and sugar (MWCRS)

Table 1: Concentration of mud samples

Samples	MWAFLA	MWB	MWNR	MWNS	MWCBR	MWCBS	MWCRS
Bentonite (g)	30	30	30	30	30	30	30
Barite (g)	90	90	90	90	90	90	90
Water (ml)	360	360	360	360	360	360	360
Bagasse (g)	NIL	2,4,6,8,10	NIL	NIL	NIL	NIL	NIL
Rubber (g)	NIL	NIL	2,4,6,8,10	NIL	NIL	NIL	NIL
Sugar (g)	NIL	NIL	NIL	2,4,6,8,10	NIL	NIL	NIL
Bagasse and rubber (g)	NIL	NIL	NIL	NIL	2,4,6,8,10	NIL	NIL
Bagasse and sugar (g)	NIL	NIL	NIL	NIL	NIL	2,4,6,8,10	NIL
Rubber and sugar (g)	NIL	NIL	NIL	NIL	NIL	NIL	2,4,6,8,10

Table 1 is used to compare and analyses the fluid loss property of different samples.

5. EXPERIMENTAL RESULT

5.1 Mud Sample Without Any Fluid Loss Additives (MWAFLA)

Table 2: Properties of mud sample

Physical property	Value
Ph	9.5
Mud density (ppg)	8.74
Fluid loss (ml)	12
Specific gravity	1.05
Resistivity (ohm)	370

5.2 Mud Sample With Bagasse (MWB)

Table 3: Properties of mud sample

Physical Property	Concentration of Bagasse				
	2g	**4g**	**6g**	**8g**	**10g**
pH	9.5	9.5	9.6	9.6	9.6
Mud density (ppg)	8.7	8.78	8.81	8.85	8.87
Fluid loss (ml)	12	12	11.5	11.3	11
Specific gravity	1.044	1.05	1.057	1.06	1.064
Resistivity (ohm)	372	375	377	377	379

5.3 Mud Sample With Natural Rubber (MWNR)

Table 4: Properties of mud sample

Physical Property	Concentration of Rubber				
	2g	**4g**	**6g**	**8g**	**10g**
pH	10	10	10.4	11	12
Mud density (ppg)	8.9	8.97	9.2	9.5	9.7
Fluid loss (ml)	11.5	11.3	11.3	11	10.9
Specific gravity	1.068	1.076	1.104	1.14	1.164
Resistivity (ohm)	383	385	390	393	397

5.4 Mud Sample With Natural Sugar (MWNS)

Table 5: Properties of mud sample

Physical Property	Concentration of Sugar				
	2g	**4g**	**6g**	**8g**	**10g**
pH	9.5	9.7	9.7	9.9	10
Mud density (ppg)	8.8	8.89	8.96	9.2	9.27
Fluid loss (ml)	11.8	11.5	11.2	11.1	10.9
Specific gravity	1.056	1.066	1.075	1.10	1.112
Resistivity (ohm)	370	372	373	378	380

5.5 Mud Sample With a Combination Bagasse And Rubber (MWCBR)

Table 6: Properties of mud sample

Physical Property	Concentration of bagasse and rubber				
	2g	4g	6g	8g	10g
pH	9.8	10.3	10.7	11.1	11.3
Mud density (ppg)	8.9	9.24	9.37	9.5	9.62
Fluid loss (ml)	11.5	11.1	10.8	10.5	10.2
Specific gravity	1.068	1.108	1.123	1.14	1.154
Resistivity (ohm)	380	383	387	390	392

5.6 Mud Sample With a Combination Bagasse And Natural Sugar (MWCBS)

Table 7: Properties of mud sample

Physical Property	Concentration of bagasse and sugar				
	2g	4g	6g	8g	10g
pH	9.7	9.8	9.89	9.97	10.1
Mud density (ppg)	8.9	9.1	9.25	9.36	9.41
Fluid loss (ml)	11.7	11.5	11.2	10.9	10.7
Specific gravity	1.068	1.092	1.11	1.123	1.129
Resistivity (ohm)	375	382	384	387	388

5.7 Mud Sample With a Combination Rubber And Sugar (MWCRS)

Table 8: Properties of mud sample

Physical Property	Concentration Of Rubber And Sugar				
	2g	4g	6g	8g	10g
pH	9.8	9.87	9.92	9.95	9.97
Mud density (ppg)	8.82	8.97	9.10	9.21	9.25
Fluid loss (ml)	11.7	11.4	11.1	10.9	10.7
Specific gravity	1.0584	1.0764	1.092	1.105	1.11
Resistivity (ohm)	38	387	389	391	393

6. CONCLUSION

The results of laboratory experiments are tabulated through the tabulation 2, 3, 4, 5, 6, 7 and 8 for various concentrations of the samples. Results showing that the increase in the concentration of the additives will result in a decrease in the filtration loss. Every single additive gives a good result, but the combination of additives gives a better result on fluid loss control.

The combination of bagasse and natural rubber gives the highest control on loss comparatively with other concentration.

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