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Daftar Isi

Laboratorium study on oil based mud for field East Kalimantan

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Abstract

In a drilling process, the use of water based mud is often met some difficulties against shale zone. Such a situation is getting harder when the drilling is about drilling a deep reservoir that has high temperature. At high temperature, mud often has problems/complications against the change of form (deformation) and the current, particularly its physical properties which make the ability of the mud to do its function decrease. To solve the shale problem, oil based mud is used as the drilling fluid. It is because the filtrate from the oil does not result in clay swelling. Oil based mud can also restrain if it is used on drilling deep reservoir at high temperature up 150 °C and shale problem. This research method made based on Spec American Petroleum Institute (API) Recommended Practice (RP 13D) "Recommended Practice on the Rheology and Hydraulics of Oil well Drilling Fluids" and API RP 13I.

Abstrak

Pada proses pemboran, penggunaan lumpur berbahan dasar air sering menimbulkan problem jika digunakan untuk membor pada lapisan yang mudah mengembang (lapisan shale). Pada kondisi jika Lumpur berbahan dasar air tersebut digunakan pada pemboran dalam juga mengakibatkan terjadi perubahan sifat fisik sehingga lumpur tidak berfungsi dengan baik, karena tidak tahan atau stabil terhadap kondisi tekanan dan temperature tinggi. Untuk mengatasi hal tersebut dapat dilakukan dengan merubah bahan dasar air dengan minyak (oil base mud) yang relative stabil terhadap kondisi tekanan dan temperatur tinggi (150 °C) dan problem shale (clay swelling). Metode pengukuran adalah secara laboratorium dengan menggunakan batasan API Spec. RP 13 D dan RP 13 I.

Key words : *Drilling muds, muds problem, and API Spec.*

INTRODUCTION

Drilling mud consists of liquid components, solid components, and additives. Liquid components of drilling mud are water, oil, or the mixture of both. Solid components of drilling mud are non reactive solid (inert solid) and reactive solid. Additives are other mixed materials which are added into the mud to improve the properties of the mud so that it can be used as its function as well as reduce some possibilities or solve problems caused by the use of the water base mud without making changes of physical and chemical properties of reservoir due to self contamination. Selecting/choosing drilling fluid considers some factors including types of formation, conditions, and types of contents of the clay and mineral salt, and other factors. If using oil base mud (OBM) we can reduce of swelling clay because filtrate influx to formation is oil not water, so the oil can not swelling because the morfology of clay on surface area has water to changer cation exchange capacity (CEC) caused higher base line (swelling). So and formation deep drilling can be changes of water phase, caused muds such hydration and brittle hardness (the effects of temperature).

The formation pressure of fluid that will be penetrated is generally about 0.461psi/ft. At normal formation pressure, water and drilled solid have been sufficient to restrain this formation pressure, with the result that will cause some parts to disappear or even if the hydrostatic pressure of the mud has exceeded the formation pressure (a formation condition in which all drilling mud enter the drilled formation at a time of circulation). The detriment of disappearing mud and cause blow out to happen and cutting cannot be found for sample log with the result that the mud can control the formation pressure. Furthermore, on the permeable formation layer, the mud will form a slight solid layer called mud cake. If the wall of the mud cake is not very thick, it can prevent the mud to disappear (prevent the mud to enter the drilled formation) because the filtrate left on the wall of formation will restrain the current of the drilling fluid. On the other hand, very thick mud cake will cause the drilling pipe to stick (sticking). Accordingly, the role of formation condition really affects on the planning of drilling mud.

OBJECTIVE

The objective of the paper is to explains about the conduct an experiment in laboratories of oil base muds with the addition of Geltone and Duratone additive towards physical properties and rheology of ideal oil based mud to reducing of some problems if using of water base muds, clay swelling and hydrations of mud by high pressure and high temperature (deep drilling).

RESEARCH METHODS

All observations conducted in laboratory related to materials and instruments used, procedure of observation, and calculation of data are made based on Spec American Petroleum Institute (API)

Recommended Practice (RP 13D) "Recommended Practice on the Rheology and Hydraulics of Oil well Drilling Fluids" and API RP 131 "Recommended Practice for Drilling Fluids Research Laboratory".

In general, the experiment conducted is divided into several steps which can be seen as step first is making base drilling fluid (oil base mud) by mixer, rolling oven and balanced digital. Second step is oil base mud can be variation of additives by several variations composition and conditions (temperatures), thirth and end step to test of oil base mud in laboratories by laboratories instrument (mud balanced, Fann VG meter, pH meter or pH paper, API filtration Test, and glass measuring) and to do analysis and making plotting figure from table results. So the end of research is doing to the a conclusion. The step experiments can be show in figure 1.

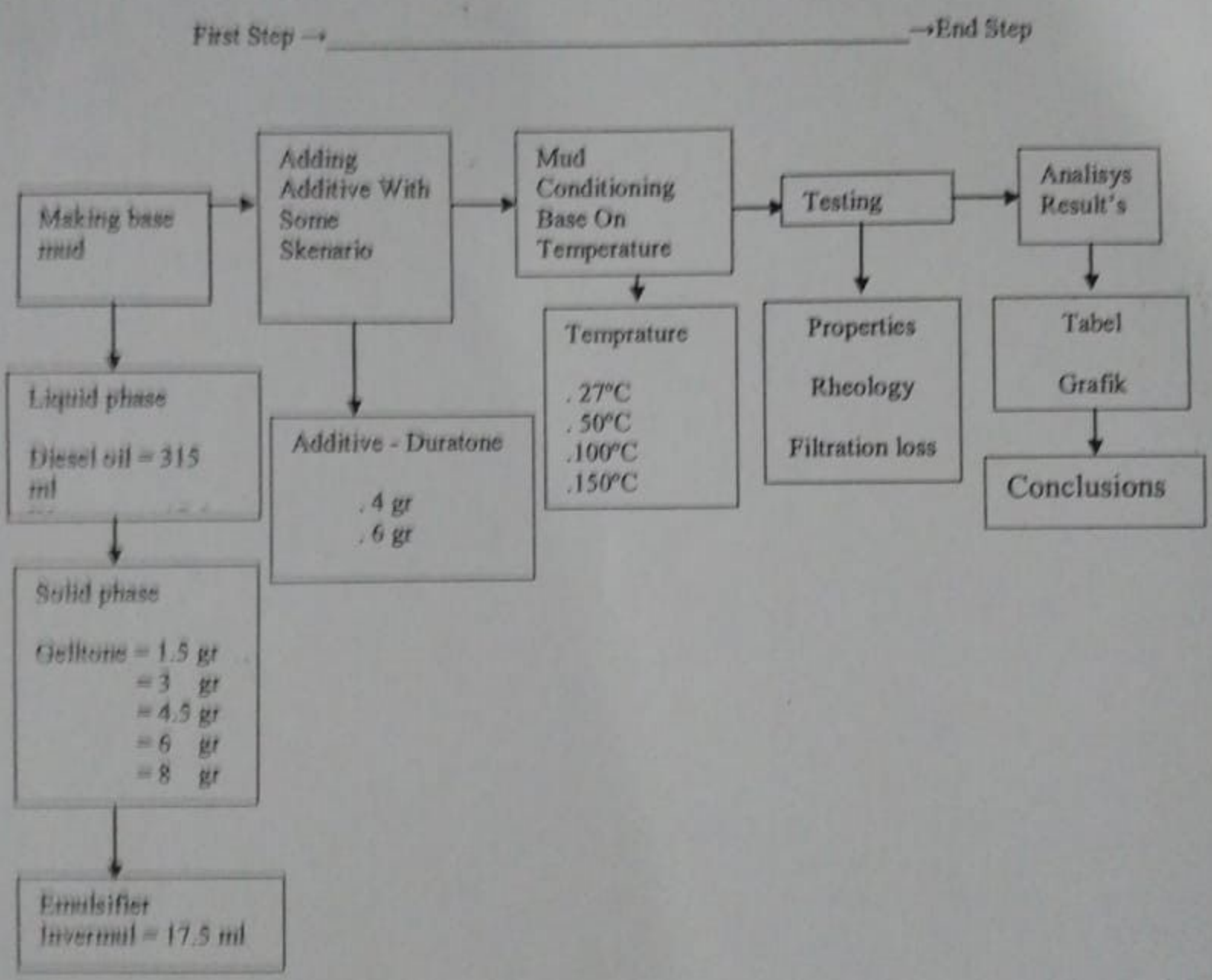

Figure. 1. Steps of Laboratories Experiment

RESULTS AND DISCUSSION

Changes on the physical properties of the drilling mud, which are rheology, filtration loss, and mud cake of oil based mud of "X" field East Kalimantan which were analyzed in Research Mud Fluids Laboratory of UPN 'VETERAN' Yogyakarta.

On appendix Table A, the oil base muds are content 90% diesel oil and water 5% and emulsifier agent is 5%. The emulsifier agent has add because during mixing of the mud with the reactive solids gel ton 1.5 gr is such emulsion water between solar. So the effects temperatures on this muds see in the table. The negative effect is on filtrate volume very high, great than 100 cc/30 menit, and pH is acid under 7 scale or scaling based 14. The composition of oil base mud using the research show on Table 1.

Table 1
The Compositions of Oil Based Muds for Research

No.	Name of Drliing Fluids	The Composition of Muds
1	Oil Base Muds (OBM) A	90% Diesel Oil+5% water+5% emulsifier+1.5 gr geltone
2	Oil Base Muds (OBM) B	Same of OBM A + 1,5 gr geltone
3	Oil Base Muds (OBM) C	Same of OBM B + 1.5 gr geltone
4	Oil Base Muds (OBM) D	Same of OBM C + 1.5 gr geltone
5	Oil Base Muds (OBM) E	Same of OBM D + 4 gr duratone+1 gr NaOH
6	Oil Base Muds (OBM) F	Same of OBM E + 2 gr duraton

On appendix Table B to D , the composition of oil base mud to be up add geltone (3 gr. 4.5 gr, and 6 gr). the effects are to reduced of filtrate volume, but the mudcake and density are increased, so that's value are applicable on API spec. but the filtrate loss is increasing not aplicable and so the pH is under 7 scale. The composition of OBM D to adden duratone and caustic soda (NaOH) to maintenances of filtration loss and alkalinity, by 4 gr and 6 gr duratone and 1 gr NaOH, see on appendix Table E and F. The effects of duratone best in added 6 gr on rheology and pH measuring is 8 for scale 14. The pH of oil based mud can be increasing by caustic soda (NaOH) to maintenance equipments of circulation mud.

Figures 1 to 7, we looks that the value of mud characteristics on temperature critical is 100 degree Celcius, but that conditions water content is boiled up to changes phase of liquid to steam, so the system mud is no stable conditions. The profiles of curves up 100 degree Celcius is similary conditions, if any occurs changer phase and bonding strength of solids content.

CONCLUSIONS

Several conclusions which can be made from the analysis of laboratory results are as follows:

Basic mud which uses geltone on oil based mud does not meet the standards. This is due to the Yield point which is still very low and the volume of mud filtrate which is very high (> 7mL)

As the temperature increases, the quality and rheology of the mud decreases.

Improvements particularly on the volume of filtrate and mud cake occur after the addition of Duratone additive in which the previous composition is below the standard to penetrate the productive formation and solve some problems.

The addition of Duratone gives positive effects on the physical properties of the mud in which the value of the volume filtrate almost meets the standard of API Recommended Practice (RP 13D) "Recommended Practice on the Rheology and Hydraulics of Oilwell Drilling Fluids" dan API RP 13I "Recommended Practice for Laboratory Testing of Drilling Fluids".

On Circulation conditions at temperatures 150 ^{0}C, the density mud to be decrease (7.15 ppg), if this mud to be applied at abnormal pressure, to be add use barite additives.

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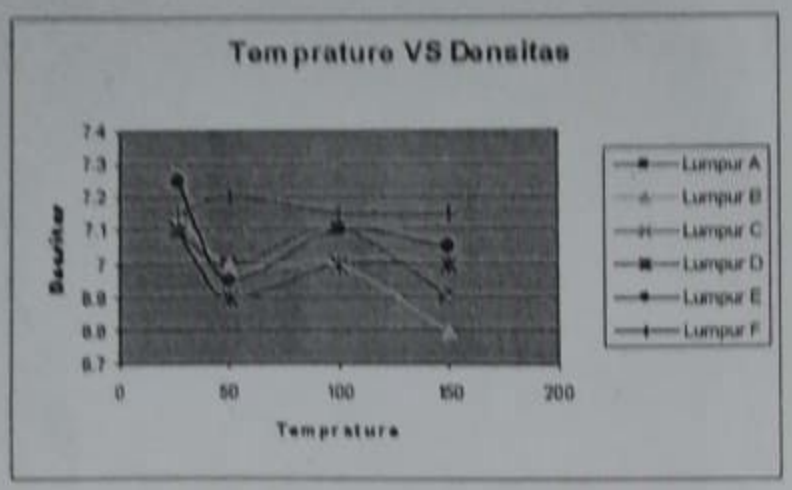

Fig.1. Density of Several Muds

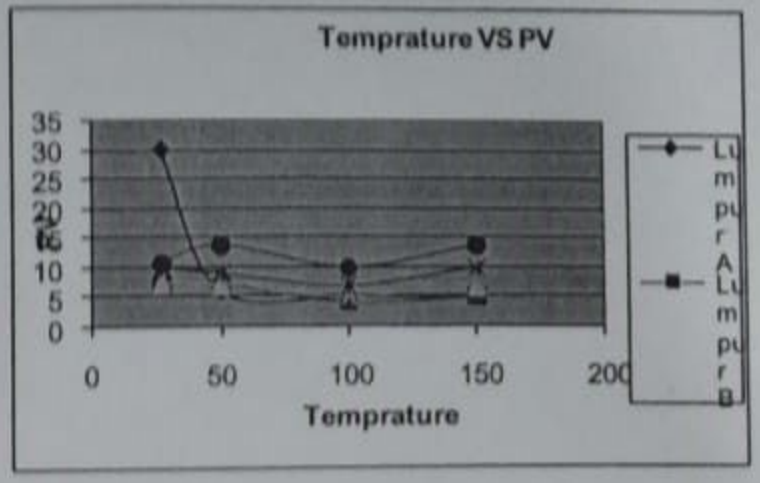

Fig.2. Plastic Viscosity (PV) of S Muds

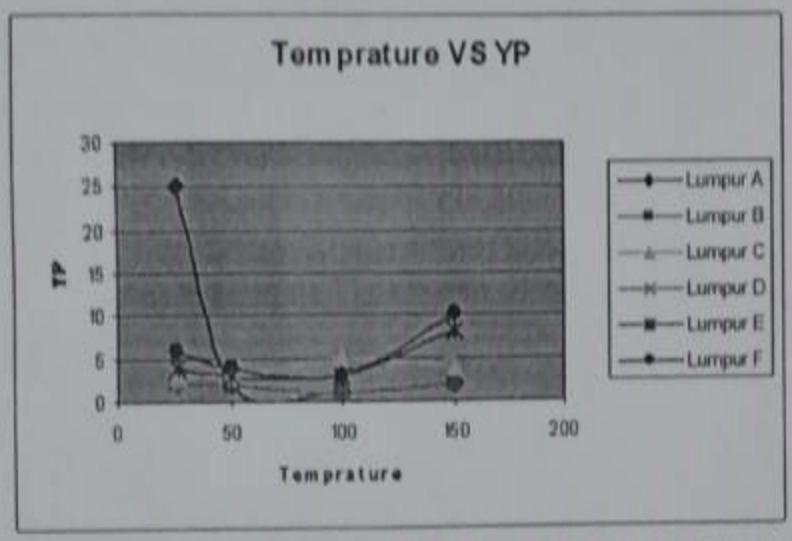

Fig. 3. The Effects of Temperature on YP Several Muds

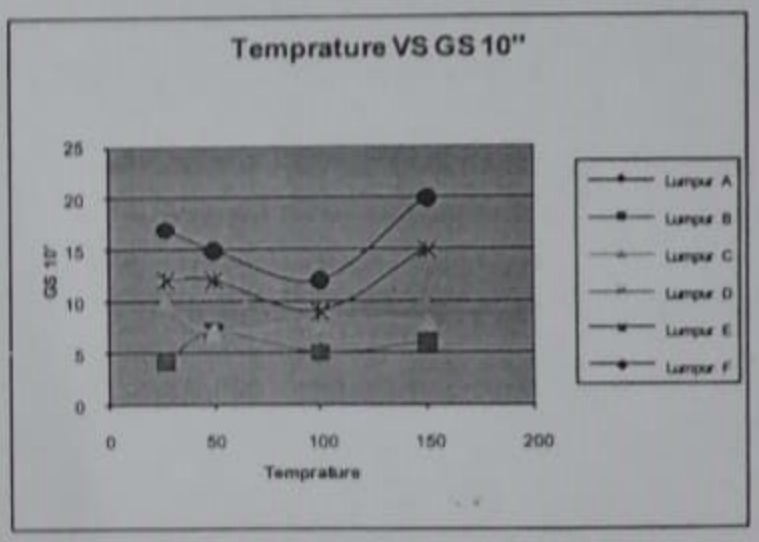

Fig. 4. The Effects of Temperature on GS 10" Several Muds

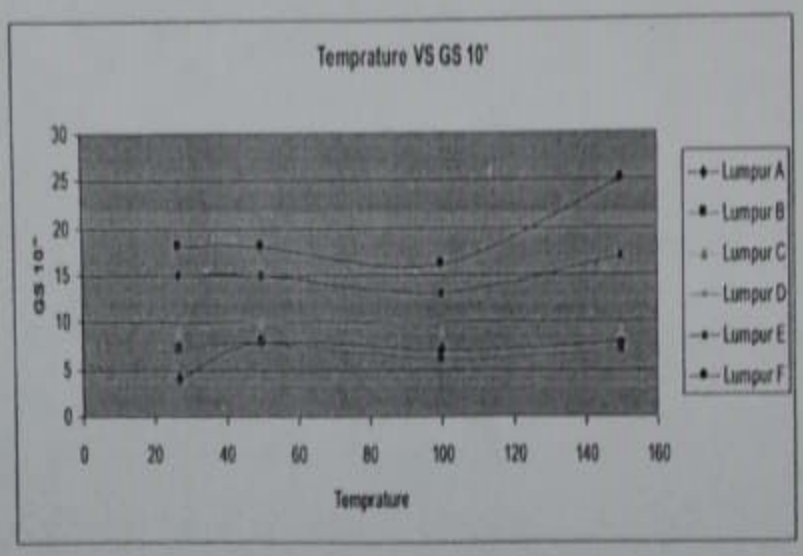

Fig. 5. Gels Strength 10 ' on Several Muds

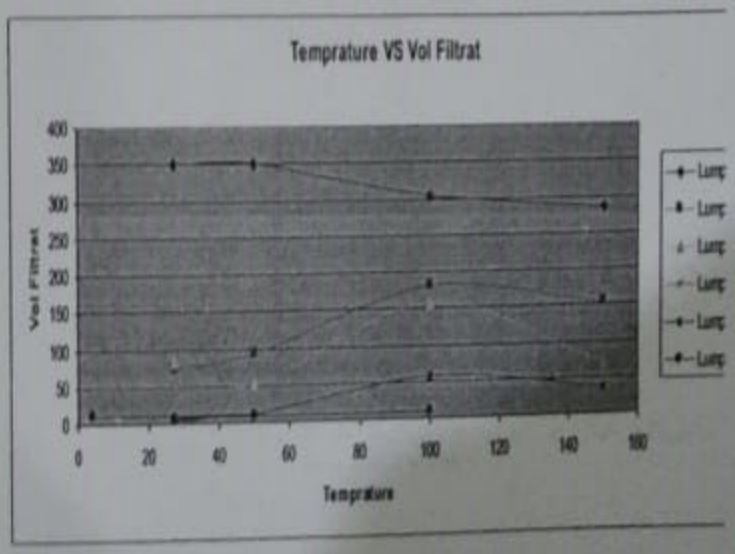

Fig. 6. Filtrates Volume on Several Muds

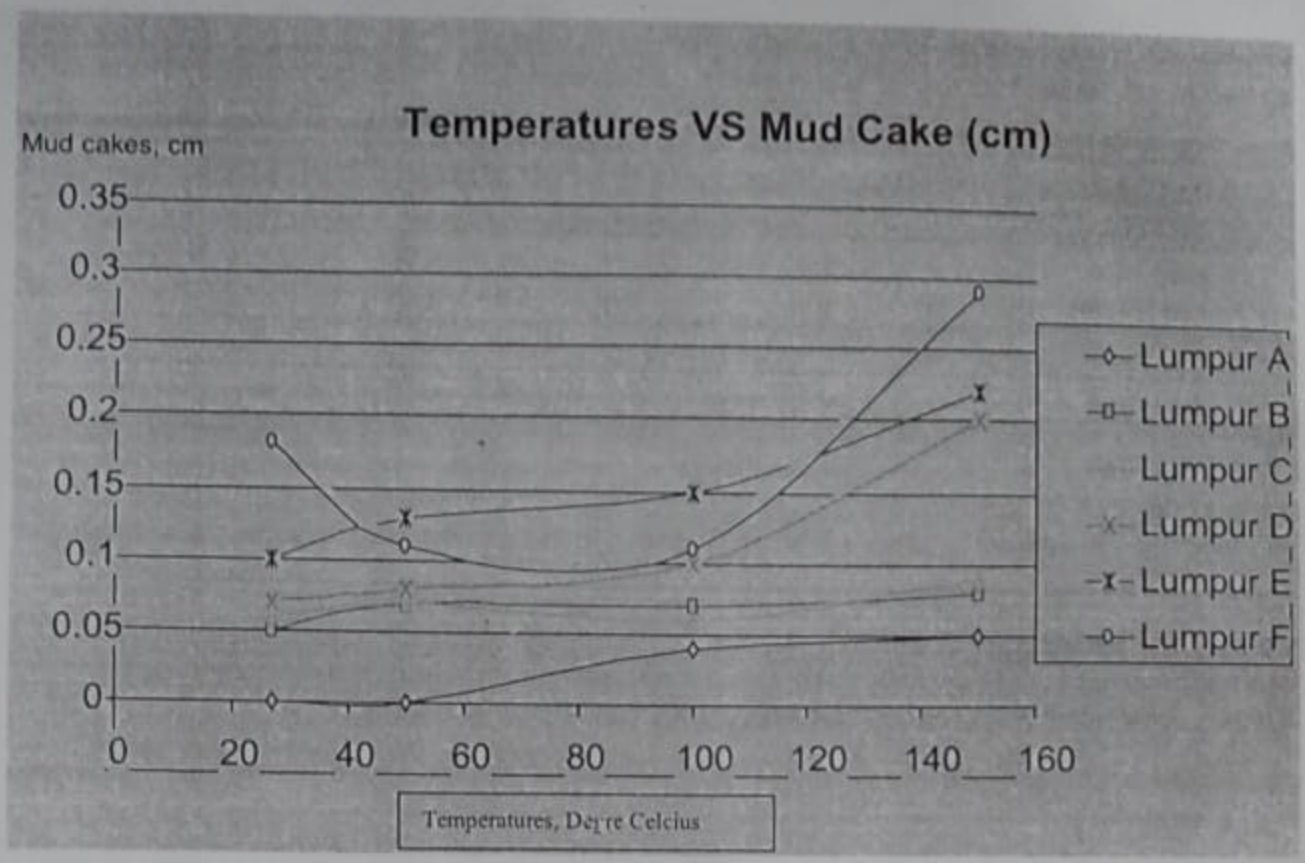

Fig. 7. Mud Cake of Several Muds

Appendix

Table A. Oil Base Mud A (90% diesel oil +5% water +5% emulsifier + 1.5gr geltone)

T	Densitas	Dial Reading		PV	Yp	Gel Strength		Vol Filtrat	Mud Cake	PH
(deg C)	(ppg)	600	300			10 detik	10 menit	(ml)	(cm)	
27	7.1	35	5	30	25	4	4	350	0	4
50	7	14	8	6	2	7	8	350	0	5
100	7.1	11	6	5	1	5	7	305	0.04	5
150	6.9	12	7	5	2	6	8	285	0.05	6

Table B. Oil Base Mud B (90% diesel oil +5% water +5% emulsifier + 3gr geltone)

T	Densitas	Dial Reading		PV	Yp	Gel Strength		Vol Filtrat	Mud Cake	PH
(deg C)	(ppg)	600	300			10 detik	10 menit	(ml)	(cm)	
27	7.15	16	9	7	2	7	7	75	0.05	4
50	7	16	9	7	2	9	8	92	0.07	5
100	7	9	5	4	1	4	6	181	0.07	5
150	6.8	12	7	5	2	5	7	153	0.08	6

Table C. Oil Base Mud C (90% diesel oil +5% water +5% emulsifier + 4.5 gr geltone)

T (deg C)	Densitas (ppg)	Dial Reading 600	Dial Reading 300	PV	Yp	Gel Strength 10 detik	Gel Strength 10 menit	Vol Filtrat (ml)	Mud Cake (cm)	PH
27	7.28	20	11	9	3	10	9	85	0.06	4
50	7.08	17	10	7	3	7	10	53	0.07	4
100	7.3	13	9	4	5	8	9	159	0.06	4
150	6.9	14	9	5	4	8	9	68	0.09	6

Table D. Oil Base Mud D (90% diesel oil +5% Water +5% emulsifier + 6gr geltone)

T (deg C)	Densitas (ppg)	Dial Reading 600	Dial Reading 300	PV	Yp	Gel Strength 10 detik	Gel Strength 10 menit	Vol Filtrat (ml)	Mud Cake (cm)	PH
27	7.1	22	12	10	2	11	12	48	0.07	4
50	6.9	20	12	8	4	11	11	63	0.08	4
100	7	14	9	5	4	8	10	70	0.1	4
150	7	21	13	8	5	10	13	54	0.2	6

Table E. Oil Base Mud E (90% diesel oil + 5% water + 5% emulsifier + 6gr geltone+ 4gr gram Duratone + 1gr NaOH)

T (deg C)	Densitas (ppg)	Dial Reading 600	Dial Reading 300	PV	Yp	Gel Strength 10 detik	Gel Strength 10 menit	Vol Filtrat (ml)	Mud Cake (cm)	PH
27	7.25	24	14	10	4	12	15	7	0.1	8
50	6.95	21	12	9	3	12	15	11	0.13	8
100	7.1	17	10	7	3	9	13	58	0.15	8
150	7.05	28	18	10	8	15	17	35	0.22	8

Table F. Oil Base Mud F (90% diesel oil + 5% water + 5% emulsifier + 8gr geltone + 6gr gram Duratone + 1gr NaOH)

T (deg C)	Densitas (ppg)	Dial Reading 600	Dial Reading 300	PV	Yp	Gel Strength 10 detik	Gel Strength 10 menit	Vol Filtrat (ml)	Mud Cake (cm)	PH
27	7.15	28	17	11	6	17	18	6	0.18	8
50	7.2	32	18	14	4	15	18	7	0.11	8
100	7.15	23	13	10	3	12	16	8	0.11	8
150	7.15	38	24	14	10	20	25	10	0.29	8