Effectivity additives of baggase, ash straw, and sawdust wood albasia to compressive strength drilling cement

L Yunita[1]* and A I Irmaya[1],

[1]Department of Petroleum, Proklamasi 45 University

*corresponding author: yunitalia478@gmail.com

Abstract. Cement drilling is one of the factors that influence the success in drilling. Cementing is the process of pushing the cement slurry into the casing and up to the annulus of the borehole casing, then the cement slurry is allowed to harden. The main purpose of this study is to determine the effect of add natural additives which include bagasse, ash straw and sawdust wood albasia on drilling cement. Natural additives have advantages over chemical additives such as cheap, easy to obtain and more friendly to the environment. The natural material serves as extender, which lowers the density of the cement also serves to increase the yield slurry, reducing free water in the cement suspension resulting in strong compressive strength of cement. The first sample is the basic sample, the second sample is the first sample of 0.3% additive of bagasse, the third sample is the first sample of 0.3% additive of ash straw, the fourth sample is the first sample of 0.3% additive of sawdust wood albasia. The results of the research showed that the composition of cement slurry with ash straw additive has the best compressive strength.

Keywords: Effectivity natural additive, compressive strength, drilling cement

1. Introduction

Cementing is a process of pushing the cement slurry into the casing and rising to the casing of the drill hole, then the cement slurry is allowed to harden. Cementing is done to attach the casing to the wellbore wall, protecting the casing from the mechanical problems of a drilling operation [1]. In the cementing process, calculations should be made on the amount of cement sack used, the amount of water used and the natural additive materials used according to the well conditions to be cemented. The calculated volume and material is then poured into the mixer jet until it becomes slurry and then pumps the slurry into the well where the calculation should be done appropriately to get a good cementing result. Cement quality testing includes density testing, filtration loss, shear bond strength, compressive strength, thickening time and free water conducted in the laboratory[3].

The main purpose of this study is to determine the effect of adding natural additives which include bagasse, ash straw and sawdust wood albasia on drilling cement. Natural additives have advantages over chemical additives such as cheap, easy to obtain and more friendly to the environment. Straw is a rice crop that has been grabbed (grain) so that leaves the stems and leaves that are the largest agricultural waste in some areas in Indonesia, straw is usually transported entirely for animal feed. Rice straw is a solid waste

generated from community agricultural land. Ash straw comes from rice stalks and rice leaves that are not used anymore then finely ground and burned.

One of the factors affecting the quality of well construction is the extent to which the quality of cement is used. For this reason laboratory test is needed to know the composition and physical properties of cement. It is expected that with good cement quality well construction can last more than 20 years. The minimum standards that must be possessed of cement properties planning are based on "Brookhaven National Laboratory" and API Spec 10 "Specification for Material and Testing For Well Cementing"[1]. In the cementing process, which needs to be considered one of them is strength. Strength on cement is divided into two namely Compressive Strength and Shear bond Strength. The compressive strength is defined as the strength of the cement in resisting pressures derived from the formation as well as from the casing. As for shear bond strength is defined as the strength of cement in holding the weight of the casing [2]. This compressive strength retains the pressure in the horizontal direction, while the shear strength retains the pressure in the vertical direction. Like other cement suspension properties, compressive strength is also affected by additives. The additive serves to raise compressive strength or to decrease compressive strength. Additives to increase compressive strength include calcium chloride, pozzolan, barite, while additives to lower compressive strength include bentonite, lignosulfonate, sodium silicate[6]. In this experiment natural lignosulfonate is used as an additive. In measuring compressive strength is used hydraulic press tool. To achieve the desired cement yield, the strength of the cement must: ♣ Protect and support the casing. ♣ Hold high hydraulic pressure without the occurrence of fracture. ♣ Restrain shock during drilling and perforation operations.

2. Methods

a. Study of literature
The data obtained include library books, journal, and internet

b. Data collection
The data we obtain is information from the laboratory about what we practice in the laboratory and the results are used as a reference in case studies and discussions then conclusions.

c. Processing, Testing, Calculation, and practice in Laboratory
The data we get in the form of an analysis that convinces the results of the research we are doing to get a conclusion in the form of valid and correct data.
Equipment used
- Weight Scales
- Mixing Container
- Glass Scale
- Glass Suspension
- Sample molds are cube and cylindrical
- Stopwatch
- Ruler
- Mud Balance
- Filter Press
- Atmospheric Consistometer
- Hydraulic Press

Material used Portland Cement Class A, bagasse, ash straw, and sawdust wood albasia.

Flowchart of Research

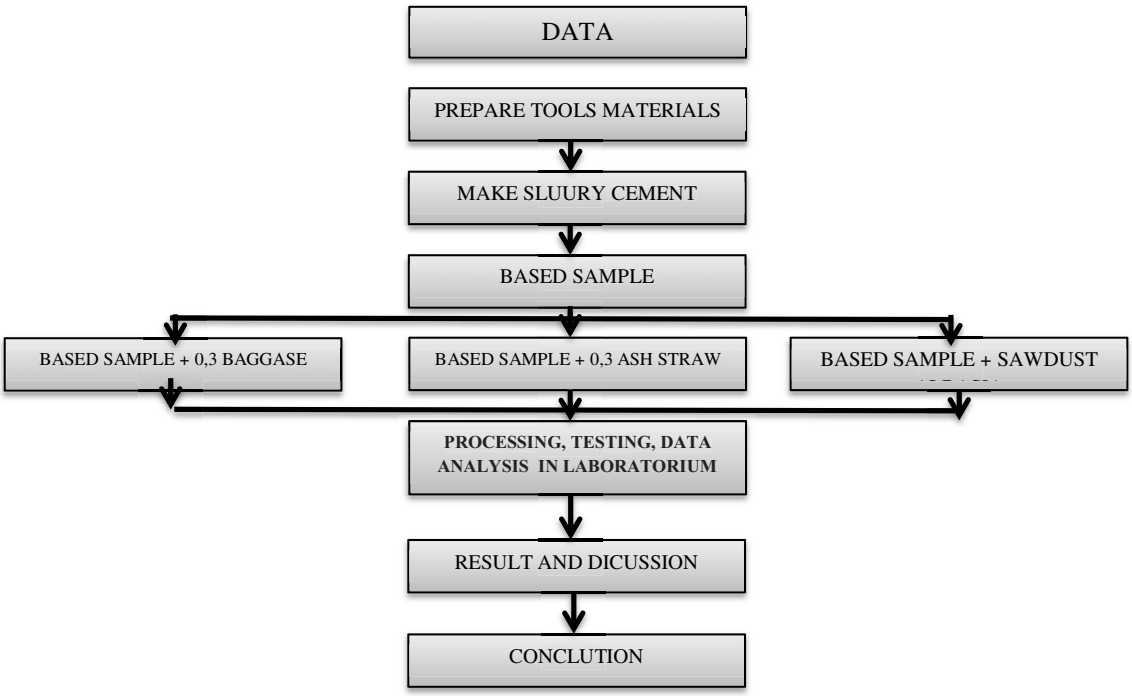

Figure 1. Flowchart Research

3. Discussion Data

3.1 Results and Density Testing Analysis

Mud Balance is a tool used to measure density, while the cement used is cement class A. This class A semen is used from depth 0 (surface) to 6000 ft. This cement is present in ordinary type only and is similar to ASTM C-150 type 1 cement. The normal water content in cement suspension recommended by API for grade A cement is Water-Cement Ratio (WCR) of 46%.

Working step in the measurement of suspense density of cement is by making a sample of cement suspense with water mixture 276 ml and cement 600 gr. Stirring process is done by using a mixer. After the cement suspension is formed then calculate the density, which first calibrate the mud balance with water. After that measure the density, so that the average density of cement suspension is obtained at 16 ppg. Based on the API standard of cement density is higher than mud density. For the standard value of mud density of 8.9 ppg so that the density of Cement is greater than the density of drilling fluid.

3.2 Results and Analysis of Free Water Testing.

This free water experiment, cement suspension was used with the composition of 600 grams of cement, 276 ml of water. The finished cement suspension is fed into a 250 ml measuring cup. Measuring cup coated with grease to prevent the stickiness, free water is obtained as much as 1 cc. For this cement suspension, the price of free water is still within the normal limit of not exceeding the maximum free water limit of 3.5 cc

3.3 Results and Testing Filtration Loss

Filtration loss testing in the laboratory usually uses a tool called filter press, at a circulation temperature with a pressure of 100 psi. although this filter press also has a weakness that is the maximum temperature that can be used only up to 82 ºC (180 ºF). The magnitude or occurrence of filtration loss is known from the filtrate volume stored in a tube or measuring cup for 30 minutes of testing. Due to the less than 30 minutes then calculated with the formula that has been determined and obtained the results of filtration loss on the base cement of 167.9 cc of the results of the basic cement does not meet the standard API requirements. For standard API permitted filtration loss is about 150-250 cc measured for 30 minutes.

3.4 Results and Testing Thickening Time

Thickening time test on the cement suspension aims to determine how long the time is required in cement jetting and to know the additive effect of adding to the thickening time of a cement using atmospheric consistometer. But because of time limitations for testing thickening time is done by qualitative. Qualitatively Thickening Time is silenced at temperature and environmental pressure (600 F and 14.7 psi) with 24 hours. The results obtained 100 uc or hard perfect and with the result, Thickening Time cement base meets the standard.

3.5 Results and Testing Compressive Strength

Compressive strength testing aims to determine the magnitude of compressive strength of the cement, the effect of addictive addition to cement as well as the workings of the hydraulic press tool. In this test is a cement base with the composition of 600 gr class A cement and water 276 cc. In this test obtained the maximum average loading of 900 psi with the price of Constant Correction (K) of 2 and the price A1 = A2 of 4.15 obtained compressive strength price 1800 psi. of these results, the basic cement compressive strength meets the requirements because the compressive strength value of the base cement exceeds the standard API value of 1000 psi.

3.6 Results and Testing Shear Bond Strength

Shear Bond Strength testing aims to determine the amount of suspension shear bond strength, the effect of adding additives to shear bond strength. Cement sample used in this test is a cement which has been made first in the experiment of making cement suspension. In this experiment obtained the maximum loading result of 1500 psi. The correction constant (K) of 2 is obtained by extrapolating because the high comparison price with the sample diameter is not listed in the table. and the price of A1 = A2 is 4.15. The price shear bond strength of 3000 psi is obtained. From the test results and calculation of shear bond strength values meet the API standard because the value exceeds the minimum limit of 100 psi

4. Results

Table 1. Laboratory Testing Results and Calculation.

NO	Testing	Sampel I (base sample)	Sampel II (based sample add baggase)	Sampel III (based sample add straw powder)	Sampel IV (based sample add sawdust wood)	STANDART API
1	Density(ppg)	16	16.15	16.2	16.08	> 8.9
2	Free Water (cc)	0.4	0.8	0.9	0.65	< 3.5

3	Filtration Loss (cc)	167.9	196.92	172.3	185,3	150 - 250/30 menit
4	Thickening Time (uc)	100	110	105	108	>100
5	Compressive Strength (psi)	1800	1850	1900	1820	> 1000
6	Shear Bond Strength (psi)	3000	3300	3500	3100	> 100

5. Conclusion

a. Density of sample I obtained, the value of 16 ppg, sample II, 16.15 ppg sample III, 16.2 ppg and IV sample, 16.08 ppg and all entered in the standard API.
b. Free water obtained sample I, value 0.4%, sample II, 0.8% sample III, 0.9% and sample IV, 0.65 cc and all entered in the standard API.
c. Filtration loss obtained sample I, value 167,9cc, sample II, 196.92 cc sample III, 172,3 cc and sample IV, 185,3 cc and all included in standard API, but sample IV not enter.
d. Tickiningtime obtained sample I, the value of 100 samples II, 110 samples III, 105 and sample IV, 108 and all samples entered in API standards.
e. Compressive strength obtained sample I, value 1800 psi, sample II 1850 psi sample III, 1900 psi and IV samples, 1820 psi and all samples entered in API standard.
f. Shear bond strength obtained sample I, 3000 psi value, sample II, 3300 psi, sample III, 3500 psi, and IV sample, 3100 psi, and all entered in standard API.
g. Based on compressive strength test by adding additive of bagasse, ash of hay and sawdust of albacia wood, it is found that the composition of cement slurry with ash additives has the highest compressive strength capable of harvesting the strength.

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