CHARACTERISTICS COMPOSITE RESULTS BETWEEN WASTE ROCK AND COAL ASH IN PREVENTION EFFORTS FORMING ACID MINE WATER IN COAL MINES

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Abstract. Acid mine drainage (AAT) is the environmental impact arising from a process of coal mining operations. The formation affected by acid mine drainage and terhidrolisisnya oxidized pyrite content in the waste rock. The existence of this AAT negatively affecting the environment in which the lead increasing soil acidity, lowering the pH of the soil and water can corrode the mining process tool. In AAT prevention efforts done them with prevention and treatment. In the method of prevention can be done in an effort to avoid one of the AAT-forming factor is whether the process of oxidation or hydrolysis. The results of the sample characteristics can be stated that the 4 samples declared as rock acid-forming potential as to sample A, B, C and D and sample E as Uncertain. From the results of the study of the use of coal ash as material waste rock neutralizing potential sources of forming AAT then the result is that coal ash can prevent the formation of AAT. This test is done by layering and blending coal ash dumping ground further tested by flowing water into the material and can do analysis the results of leachate pH, content of metal (Fe, Mn and Al). The analysis results showed that the pH of the leachate in each test ranged 6-7, the metal content of Fe, Mn and SO_4 respectively 1.8 -0.1, 6 – 1,2 dan 0.9 -0.1

Keywords- waste rock, ash coal, and composite

I. INTRODUCTION

Coal is one of the sources of energy that is important to the world, which is used in generators plant to produce power nearly 40% in the whole world. In many countries these figures are much higher: Poland uses more than 94% for the power plant, South Africa 92%; China 77%; and Australia 76%. Coal is a source of energy that experienced a growth that most rapidly in the world in recent years - faster than gas, oil, nuclear, water, andreplacement resources.

In Industrial world record says that in 2009-2010, Indonesia is thesecond-largest coal exporter in the world, after Australia. Coal is needed for the power plant and a source of industrial fuel. Indonesian coal resources in 2011 is about 105,187.44 million tons with total coal reserve about 21,131.84 million tons, with the coal resource and reserve distributing area including 52,482.20 million tons in Sumatra, 52,326.23 million tons in Kalimantan, 233.10 million tons in Sulawesi, 128.57 million tons in Papua, 14.21 million tons in Java, and 2.13 million tons in Maluku. Coal production in 2005 is about 152,325.025 Ton with export capacity 93,758.806 Ton, the import 97,183 tons and domestic needs 36,081,734 Ton, at the end of 2011, the production increased to 353,383,341 tons.(sourceBadan Geologi, Kementrian ESDM 2011)

The relation between mining activities and environmental issues has always been a hot issue today. One of the concerns is the water pollution caused by mining activities, such as Acid Mine Drainage/ (AMD).Acid mine is runoff water which is caused from oxidation reactions rocks or soil containing pyrite (FeS2), or other produce sulfide with oxygen even oxygen from the air or in water. And also accompanied by hydrolysis reaction from rain or ground water in mine (Elberinget,al 2008).The problems caused by the water acid mine is one of the environmental impact on the mining industry. Water acid is usually characterize with the low pH, high content of heavy metals (Fe), aluminum (Al), manganese (Mn) in the water, and the water which are yellow. Acid mine drainage treatment needs to be done it aims to maintain the environmental conditions in the coal mining area so as to realize sustainable mining system in accordance with the Environment laws.

There are two methods that can be used in treatments acid mine drainage is by the method of prevention and treatment.

Methods of prevention can be done by isolating the source of acid mine drainage as acid rock with materials such as soil, water, whereas the method of treatment can be done with chemical and biological processes.

In this study will be assessed on a method of preventing the formation of acid mine drainage with the composite method of acid rock and coal ash.

II. RESEARCH METHOD

This research was conducted inthe laboratory Polytechnic of Sriwijaya, Department of Chemical and Energy Engineering and Laboratory Coal Mining of PTBA, TanjungEnim, Which begin with rocksamplingprocess, sample andequipment preparation, testingandanalysis.

Samples of rocks taken from waste rock coal mine inSouth Sumatra as many as five samples at the disposal dump area by taking samples at some point ordinate can be seen in Table 1.

TABLE I
CODE SAMPLES

No	Listing Samples	X	Y
1	A	362257E	9589795N
2	B	362285E	9589817N
3	C	363205E	9590045N
4	D	363305E	9589772N
5	E	365800E	9589635N

Source: primary data December 2013

A. ToolsandMaterials.

1. Tool
   The tool used in, balance sheet analytical, pH meters, Leached coulums, AAS
2. Material
   Materials used waste rock coal miners, ferrous sulphate, aquades, fly ash, manganese sulphate.

B. The Procedure

1. Preparation
   a. The sample acid rock preparation is done with the process of size reduction of 60 # .and characterized
   b. Rocks that are acid-forming potential of rocks used as a test sample for the prevention of the formation of acid mine drainage by conducting composite with coal ash
2. Research procedure
   1. The rocks are characterized as acid rock made of composite process with coal ash with a ratio of 20%, 40% and 60%
   2. Each of these composites included in the column leachate
   3. Each composite purged with distilled water.
   4. further characterization of the leachate in pH, contents ions Fe, Mg, sulphates and TSS
   5. Repeat steps 3 every day until a neutral pH

III. RESULTS and DISCUSSION

A. Result

1. Result of Characteristics Rock

Results from statictests is a reference to determine classification of a sample rocks. Based on the result of the test static in a laboratory, is as follows: each sample test result can be seen in Table III

Rock classification method based on a static test can be done by using a different interpretation.One of theclassifications is done by categorizing the sample with classification NAPP and NPR values (neutralization Potential Ratio = ANC / MPA)

TABLE II
MATERIAL CLASSIFICATION

	Potentially Acid Forming (PAF)	*Uncertain Zone*	*Non-Acid Forming*
ANC/MPA	<1	1-2	>2

Source:: (*AMD Book 2002)*

TABLE III
DATA ANALYSIS RESULTS SAMPLES ROCKS of STATIC TEST

No	Kodes ampel	Parameter				
		TS	*MPA*/ PKM	*ANC*/K PA	*ANC /MP A* KPA /PK M	*NAPP*/ PPAN
		(%)	Kg H_2SO_4/ton	Kg H2SO 4/ton		Kg H2SO 4/ton
1	A	0.90	27.56	5.08	0.18	22.48
2	B	2.42	74.11	-10.28	-0.14	84.39
3	C	0.76	23.28	9.46	0.41	13.82
4	D	0.79	24.19	12.86	0.53	11.33
5	E	0.21	6.43	15.65	2.43	-9.22

No	code sampel	Parameter			
		pH PASTA	*NAG*/PAN pH	*NAG*/PAN pH 4.5	*NAG*/PAN pH 7.0
				Kg H2SO4/to n	Kg H2SO 4/ton
1	A	3.66	3.11	17.15	35.10
2	B	2.62	2.94	22.34	34.30
3	C	3.48	3.20	10.37	24.73
4	D	6.90	3.06	11.17	21.14
5	E	3.41	4.32	0.40	6.78

Source: primary data (2013)

The results of the sample characteristics can be stated that the 4 samples declared as rock acid-forming potential as to sampleA,B,C and D and sample E as Uncertain.

Further samples A and B used as the test sample composites with coal ash

2. Result of characteristics each Compositesleachate

The characteristic of each composite leachate can be see on Fig 1.until Fig,5 .

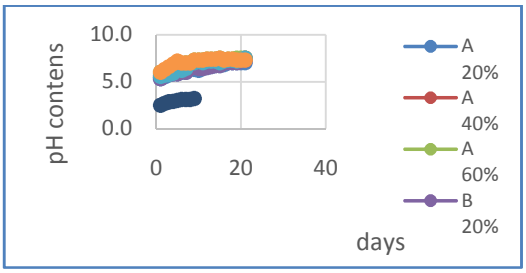


Fig.1. The graph Characteristic pH Vs time for each leachates

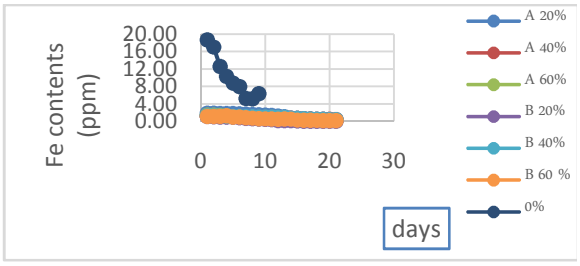


Fig.2. The graph Characteristic ions Fe Vs time for each leachates

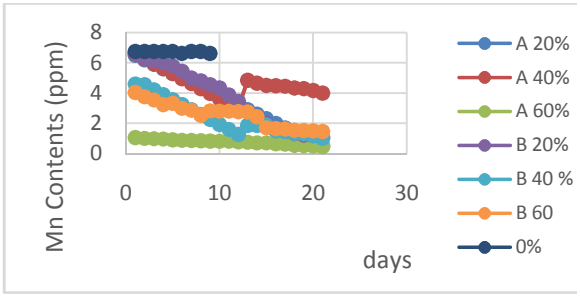


Fig.3. The graphCaracteristicions MnVs time for each leachates

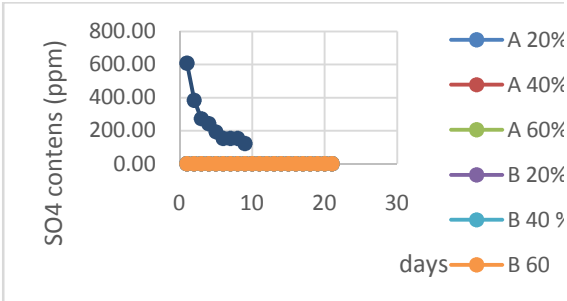


Fig.4. ThegraphCaracteristic ions MnVs time for each leachates

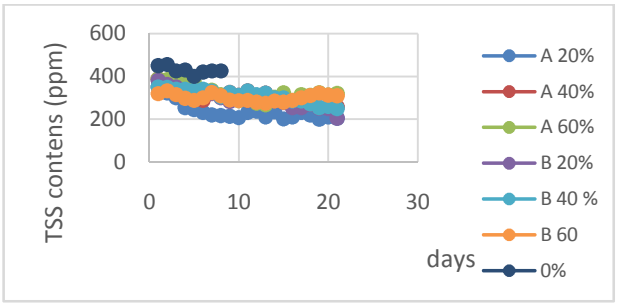
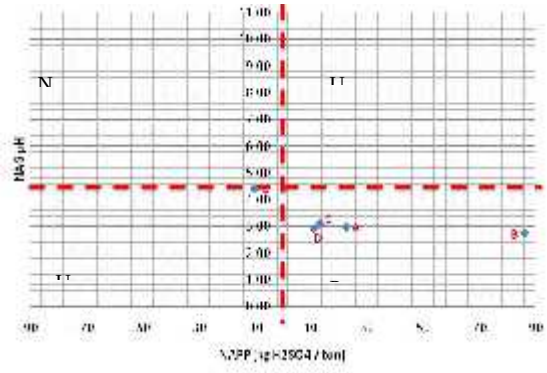


Fig.5. The graph Characteristic ions Fe Vs time for ach leachates

B. Discussion

1. Acid Base Acounting, (ABA)

Based on data from the test result static analysis geochemistry rocks with the ABA method, data in hatching according to analysis methods Graphics on the basis the ratio SPOKES/MPA, NAPP and NAG pH is as follows:



Source: primary Data 2013

Fig.6 Analysis of rocks Based Graphics

From results graph in the picture 6 then, that the result characteristic geochemical analysis to 5 (five) samples of rocks obtained 4 samples are samples had A,B,C and D include intorocksclass with type *PAF* and a sample E that include class *uncertain (UC)*, in detail can be seen in table III result of types of rock samples with test static. Samples advanced this will be tested kinetic and in test major justification would be with ash coal.

TABLE VI
RESULT OF CLASIFICATION SAMPLES ACID ROCK

No	Listing	Classification
1	A	PAF
2	B	PAF
3	C	PAF

4	D	PAF
5	E	UC(PAF)

According to analysis of types of material acid above, from the five samples that has been tested static, it can be said that thesamples that PAF strong, 3 samplesinclude PAF are, and a sample *uncertain PAF*. The sample take for analysis studyofcomposite 2 sample ei sample A and B.

2. The Characteristic Leachates Composite

Characteristic Leachate from each Composite can be seen from Figures 1 to 5 on the pH value, ions Fe, Mn, SO4 and TSS.

The results for the characteristics of the pH value of each of the composite state that the increase in the pH value is affected by the composite.

The content of Fe ions in the leachate decreased balanced by compositing and long time.

The content of sulfate ions is very small for each composite are also against long time.

The content of TSS is not affected by the composite and the length of time it is in because TSS is caused by fine particles in the leachate breakouts mitigation process can be carried out physically by way of deposition and fitrasi.

C. Conclusion

From the result of the research, it had taken some conclusions:

1. Coal ash (fly ash) can be used as a material in the process of prevention of the formation of acid mine drainage by means of composite between waste rock and coal ash.
2. Composite affect the value characteristics of the leachate to the pH value, the content of metal ions Fe, Mn, sulfate ions .

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