Aplication Activated Carbon As a Result of Physical Activation Brown Coal (Coal Low Grade) East Kalimantan in Industrial Textile Waste Processing Samarinda

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Abstract: Indonesia is one of the countries that has large coal reserves in the world, but its utilization is still limited to the manufacture of briquettes and as fuel for electricity generation. On the one hand the results of the study indicate that activated charcoal can be made from organic and inorganic materials mentioned in high carbon content. In this case it is as raw material for making activated carbon because it has a high carbon content. Meanwhile, the textile industry is one of the industries that developed in East Kalimantan, especially Samarinda. Where liquid substances from chemicals can increase the concentration of pH, TSS, BOD and COD if directly discharged into the environment without first processing. One way to reduce levels of pollutants from liquid waste is by means of adsorption using activated carbon. This study aims to determine the capacity of activated carbon to the pH, TSS, BOD and COD values in Samarinda waste cloth wastewater. Low rank coal is carbonized at 600 for 1 hour, then activates physics at 800 for 2 hours. As much as 700 ml of Samarinda waste cloth industrial wastewater is adsorbed with activated carbon from low rank coal with a mass of 5, 10 and 15% by mass to waste with an adsorption time of 120 minutes. The best results are obtained at a mass of 15% with a percentage decrease or % removal in conditions: pH value 7.67; TSS 92%; BOD 47.1% and COD 39.26%

Index Terms: activated carbon, adsorption, liquid waste, textile

1 INTRODUCTION

Samarinda textile or Tajong Samarinda is a type of traditional industri for woven fabric that can be found in Samarinda city at side Samarinda, East Kalimantan. This textile is produced without modern machine only by woven traditional is called Gedokan. Before weaving, raw materials still have to undergo several processes to be strong when spinning. Textile waste produced by Samarinda Garments industry is mostly in liquid form resulting from the coloring process, rinsing/washing has the potential to pollute the environment. This is because textile waste contains pollutants that are very complex and have high color intensity. The value of biological oxygen demand (BOD) and chemical oxygen demand (COD) for textile waste ranges from 80-6,000 mg/L and 150-12,000 mg/L (Azbar et al., 2004). This value exceeds the threshold of textile industry wastewater quality standards when viewed from the Ministry of Environment No.51/ MENLH/10/1995. Characteristics of liquid waste produced by the textile industry are closely related to materials used in the stage of the textile manufacturing process. The characteristics and quality standards of textile industry wastewater are presented in Table 1 below:

Table 1. *Textile Industry Liquid Waste Quality Standards*

Parameter, mg/L	Maximum levels according to the Ministry of Environment's No. 51/MENLH/10/1995
Biological oxygen demand (BOD)	60
Chemical oxygen demand (COD)	150
Total suspended solid (TSS)	50
pH	6,00 - 9,00
Color, Pt-Co	

(***refer:*** *Ministry of Environment No. 51/MENLH/10/1995)*

The existence of textile industrial waste in the water can interfere with the penetration of sunlight, consequently the life of organisms in the water will be disrupted and at the same time threaten the sustainability of the aquatic ecosystem.The physical processing of the samarinda textile fabric wastewater treatment with adsorption method using activated carbon derived from brown coal in East Kalimantan is very feasible to apply considering the adsorption method is simpler and economical compared to other textile industry wastewater treatment methods. Besides that, activated carbon is a species with amphoteric characters which can be negatively or positively charged and depends on the pH of the solution to absorb organic and inorganic materials, color absorption, and deodorization. Activated carbon adsorption capacity is a very important characteristic because this property

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2 EXPERIMENTAL SECTION

2.1 Materials

Raw materials of Coal low grade were obtained from PT. Tribhakti Inspektama. Solvents from Samarinda textile industrial wastes were obtained from Samarinda textile Craftsmen in Side Samarinda. Other analysis materials were obtained from the Basic Chemical Laboratory of the Department of Chemical Engineering, Politeknik Negeri Samarinda.

2.2 Methods

Low grade coal was carbonized at T = 6000C for 1 hour and uniformed in size -45 +60 mesh, then activated physically at T = 8000C for 2.5 hours. Then an analysis of activated carbon is carried out according to the quality requirements of the Indonesian Industrial Standard SNI No. 06-3730-1995. Activated carbon produced is then applied to the waste water treatment industry in the Samarinda textile industry. The riset was conducted by adding 5%, 10% and 15% active carbon to 700 ml of liquid waste with an adsorption time of 120 minutes. After the adsorption process, it is continued with the screening process and analysis of environmental pollutant parameters such as pH, TSS, BOD and COD.

3 RESULT AND DISCUSSION

3.1 Result

Table 2. *Low grade Coal Activated Carbon Quality Test*

No	Parameter Uji	Result	SNI No. 06-3730-1995
1.	Water content	1,89	Maks. 15
2.	Ash content	5,6	Maks. 10
3.	Volatile conten (%)	5,11	Maks. 25
4.	Fixed Carbon (%)	69,73	-
5.	Iod adsorption (mg/g)	955	Min. 750

Table 3. *The Result Adsorption of Actived Carbon Low Grade to Liquid Waste Industry Textile Samarinda*

No	Mass %	Parameter						
		pH	TSS mg/L	%Remo val	BOD mg/L	%Remo val	COD mg/L	%Remo val
1.	privios	6,78	3750	-	4140	-	14341	-
2.	5	7,26	840	77,6	3330	19,56	10774	24,87
3.	10	7,76	1000	73,34	2870	30,67	10418	27,35
4.	15	7,67	300	92	2190	47,1	8710	39,26

3.2 Discussion

Base on the Table 2 it can be seen that the activation of KALTIM Browncoal is fulfilled in the activated carbon standard required by SNI No. 06-3730-1995, so that it can be further applied to the waste processing of the Samarinda textile industry. The activation goal is to enlarge the pores with the methode breaking hydrocarbon bonds or oxidizing surface molecules so that the carbon undergoes changes in properties, both physics and chemistry, namely its surface area increases and influences the adsorption power indicated by the ability/absorption of iodine (I2). The amount of percent absorption capacity of I2 causes the ability of the absorption of activated carbon to be better. In the iodine absorbent power quality test where the result is 955 mg/g. The absorbency obtained is very good. From the data analysis of Samarinda's waste textile industry liguid waste, the first presented in Table 3 shows that the parameter values of pH, TSS, BOD and COD of liquid waste exceed the threshold of industrial wastewater quality standards required by the Ministry of Environment No.51/MENLH/10/1995.

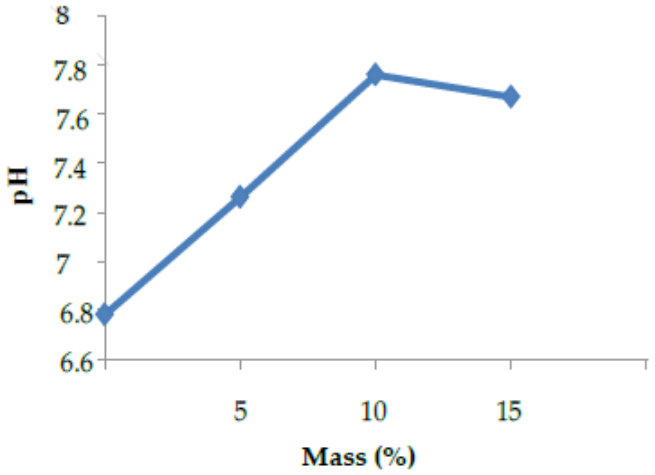

Figure 1. *Mass variation to pH*

The pH value before adding activated carbon is 6.78, the value is relatively neutral in slightly alkaline. After adding activated carbon with a mass per volume of 5% to 15% the pH is relatively stable available between 7.0 - 7.8. The use of activated carbon does not provide a significant variable to the increase or decrease in pH value. According to Ministry of Environment No.51/MENLH/10/1995, the pH value obtained has met the standards of 6.78-7.67. Total Suspended Solid (TSS) is a suspended substance, usually consisting of organic and inorganic substances that float in the air. Liquid waste which has a high suspended substance content exceeding the required limits cannot be disposed of directly into the air body because it can cause silting of the river/sea. High TSS values can be used to access sunlight to the bottom of the water. The photosynthesis process of microorganisms in the landscape cannot be optimal.

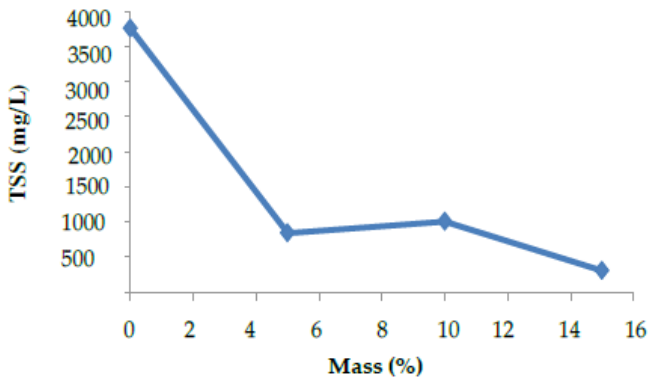

Figure 2. *Mass variation to TSS content*

The decrease in TSS value in liquid waste occurs along with the addition of activated carbon. The more activated carbon used, the more organic substances in liquid waste are absorbed through the pores of activated carbon. Fig.2 shows that the activated carbon of coal was able to reduce the TSS value of Samarinda liguid waste from 3750 mg/L (initial characteristics of liquid waste) to 300 mg/L with a decreasing efficiency of 77.6% to 92%. Biological Oxygen Demand (BOD) is the amount of oxygen consumed or needed by microbiology in the process of decomposition of organic materials that require oxygen dissolved in water to remodel organic matter into simpler compound.

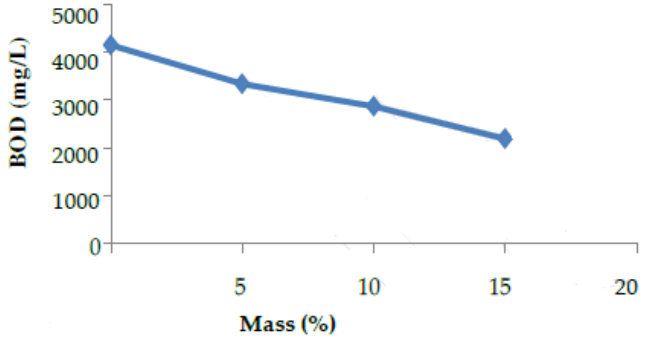

Figure 3. *Mass variation to BOD Content*

In Fig. 3 shows that there is a decrease in the value of BOD along with the addition of activated carbon. The greater the mass of activated carbon used, the more organic matter that is dissolved and suspended in Samarinda liguid waste of textile which is absorbed through the pores of activated carbon which is indicated by the optimal value of 15% active carbon waste absorption, can absorb waste 47.1% with the concentration of liquid waste initially 4140 mg/L to 2190 mg/L.The concentration of BOD can be reduced because organic matter dissolved and suspended in water is absorbed by activated carbon. If a body of water is polluted by organic substances, bacteria will be able to deplete the dissolved oxygen in the water as long as the biodegradable process takes place, so it can resulting in death in aquatic biota and the condition of the water body can become anaerobic which is characterized by the appearance of a foul odor. Chemical Oxygen Demand (COD) figures are a measure of water pollution by organic substances which can naturally be oxidized through microbiological processes, and result in reduced dissolved oxygen in the water.

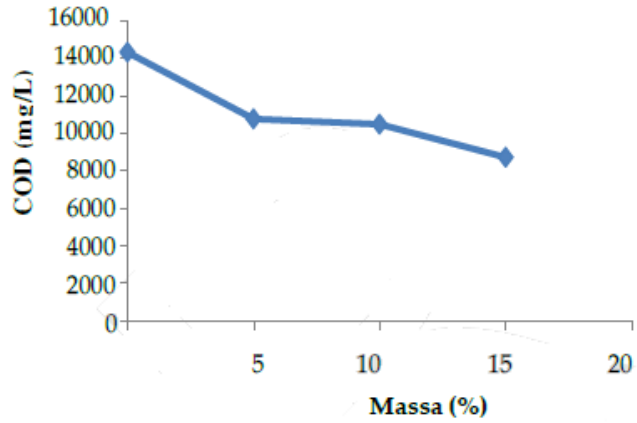

Figure 4. *Mass Variation to COD content*

Can be seen in Fig.4 there is a decrease in COD value or an increase in% removal along with the addition of activated carbon. The more activated carbon used, the organic compounds found in liquid waste are absorbed through the pores of activated carbon so that the COD value decreases. The optimum mass to reduce the COD value was shown at 15% activated carbon mass, can absorb COD values from 14341 mg/L (initial characteristics of liquid waste) to 8710 mg/L with a decrease efficiency from 24.87% to 39.26%.

4 CONCLUSION

1. The characteristics of coal activated carbon used have a water content of 1.89%, ash content of 5.6%, and volatile matter of 5.11% and iodine absorbency of 955 mg/g.
2. The optimum mass of coal activated carbon to reduce TSS, BOD and COD values of Samarinda Sarong industrial wastewater was obtained at a mass of 15% with a percentage reduction or % removal of TSS, BOD and COD are 92%, 47.1% and 39.26%.
3. The use of activated carbon does not have a significant effect on the pH value where the pH of the liquid waste industry in Samarinda Gloves before and after adsorption is relatively stable.

5 ACKNOWLLEDGMENT

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