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RESEARCH ARTICLE

EFFECT OF VARIOUS THICKNESS ACTIVATED CARBON WASTE PLASTIC SHOPPING BAGS IN WASTE REDUCTION IN INDUSTRIAL CLEANING CLOTHES PHOSPHATE (LAUNDRY)

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ABSTRACT

Laundry industry directly in the form of phosphate throw waste into the drainage channel or body of water without prior treatment. One of the alternative technologies that can be used to overcome this problem is biosand filter and activated carbon. Activated carbon is very effective in reducing the organic materials one phosphate, wherein the activated carbon made from waste plastic bag crackle of the type of polyethylene. The general objective of this study to determine the effect of various thickness of plastic bag litter activated carbon in reducing phosphate in industrial waste washing clothes (laundry). The study design was a laboratory-scale experiment, which studied the effect of the influence of various thickness of plastic bag litter activated carbon in reducing phosphate in industrial waste washing clothes (laundry). The study design was a laboratory-scale experiments, design done in this research is completely randomized design. The population is all the waste industry washing clothes contained in Cimahi Pasantren North Road area. Statistical test results obtained p value was 0.000 ($p < 0.0050$, so there are differences in average thickness of activated carbon waste crackle in reducing phosphate in waste water washing (laundry). The conclusions of this study there is the influence of the thickness of the active carbon garbage plastic bag in reducing phosphate in industrial waste Laundry (Laundry) with a thickness of 10 cm which can reduce waste highest phosphate.

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INTRODUCTION

The increasing number of laundry industry will cause an increase the use of detergent. dominant substances contained in detergents are sodium tripolyphosphat that serves as builder and surfactant, which contains phosphate (Ward *et al,* 2009) Until recently, almost all the laundry industry waste water is discharged into the drainage channel or body of water without any prior treatment. It will disturb the environment, which can cause eutrophication, water bodies become rich in dissolved nutrients, decreased of oxygen content, and decrease the capacity of water biota. Other waste which is very distracting environment is plastic waste, resulting in increased waste plastic, because plastic waste is difficult to degrade. Other waste which is very distracting environment is plastic waste, resulting in increased waste plastic, because plastic waste is difficult to degrade. With paying attention to both problems above we need an alternative technology that can reduce the level of hazard that generated by waste of washing clothes and household items (laundry).

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One of the alternative technologies that can be used is biosand filter and activated carbon (Kubare, M. and Haarhoff, J. 2010). This research use batch experiment. batch experiment is using a variation of various sizes adsorbent of activated carbon which is made of polyethylene plastic waste.

MATERIAL AND METHODS

The study design was a laboratory scale experiment, which studied the effects of various thickness crackle Plastic Waste Activated Carbon to Reduce Waste Phospat In Industrial Washing Clothes (Laundry). The study design used was a completely randomized design because it homogeneous. The first thing to do in this study is to make an activated carbon-based plastic bag with a thickness of 5 cm, 7.5 cm and 10 cm are used to reduce phosphate Waste In Industrial Washing Clothes (Laundry). The Inclusion criteria of plastic bags: (1) plastic containing polyethilen, (2) the type of plastic is quite thick, (3) a flexible plastic type (not easily broken). Laundry wastewater sampling sites is at the industrial washing clothes in the Pasikaliki District of North Cimahi. Meanwhile, for the examination of phosphate concentration in laundry waste clothing industry performed in the laboratory of Environmental

Health Department of Health Polytechnic Bandung. The population is the entire waste of industral washing clothes that are in Pasirkaliki District of North Cimahi. The sample is partly industrial waste contained washing clothes in Pasirkaliki District of North Cimahi.

The sample size was calculated based on the number of treatments and the number of repetitions in the study. With a completely randomized design formula and uses three kinds of treatment 5 cm, 7.5 cm and 10 cm obtained six repetitions, each using one control treatment. The sample taken is 250 ml so that the number of samples required is 250 x 6 repetitions x 3 treatments = 4500 ml 4750 ml + 1 control. Counting the number of repetitions using the formula t (r-1)> = 15 , thus obtained six times repetition. Data is collected by taking samples of waste water washing (laundry) pencuciaan waste from companies located in the Village of North Cimahi Pasirkaliki as much as 5 liters. Next is checking the levels of phosphate contained in the waste water and waste leaching results obtained has a phosphate content of 4.7 mg / lt far exceeded NAB. Furthermore, the data collected from recording the results of a decrease in phosphate conducted in six repetitions with 3 treatments and 1 control, that is, each for 1 hour reduction in phosphate seen by taking 25 ml of the waste water that has been given activated charcoal crackle, then measure the levels of phosphate with using a spectrophotometer. After noting any reduction in all variations of activated carbon thickness, which is 5 cm, 7.5 and 10 cm and controls were analyzed using ANOVA test.

RESULT

Temperature measurement results of laundry waste water after treatment of various thicknesses of carbon plastic bag seed (5 cm, 7.5 cm, 10cm and control) ranges from 25 ° C, that temperature is relatively homogeneous, it can be seen in Table 1 Below.

Table 1. Result of the temperature measurement of the laundry wastewater sample

Repetition	Thickness			Control
	5 cm	7,5 cm	10 cm	
1	25ºC	25ºC	25ºC	25ºc
2	25ºC	25ºC	25ºC	25ºc
3	25ºC	25ºC	25ºC	25ºc
4	25ºC	25ºC	25ºC	25ºc
5	25ºC	25ºC	25ºC	25ºc
6	25ºC	25ºC	25ºC	25ºc

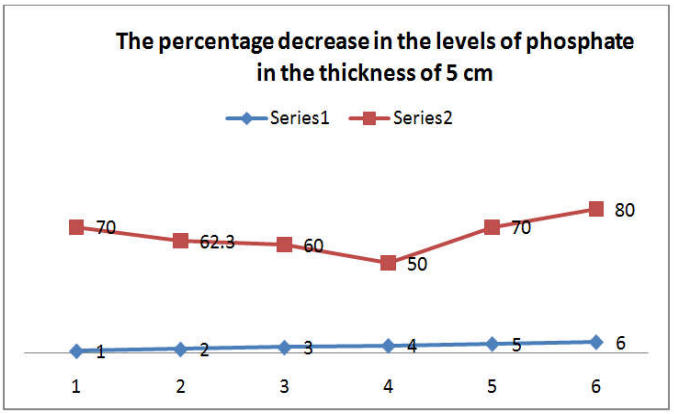
Results of pH measurement laundry waste water after treatment of various thicknesses of carbon plastic bag seed (5 cm, 7.5 cm, 10cm and control) ranged from 9.00 to 9.37 can be seen in Table 2 below

Table 2. pH measurement data of the laundry wastewater samples

Repetition	5 cm	7,5 cm	10 cm	Control
1	9,12	9,06	9,02	9,37
2	9,13	9,06	9,00	9.20
3	9,15	9,12	9,10	9,20
4	9,14	9,05	9,02	9,30
5	9,18	9,02	9,00	9,30
6	9,16	9,05	9,00	9,18

The pH value plays a role in influencing the toxicity of a chemical and biochemical process waters, for example, the nitrification process ends if the pH value is low. In this study, waste water pH ranged from 9.00 to 9.37. If the water source backwardly base because contaminated by waste washing will result in the waste becomes difficult to disentangle, especially by way of biology, it is caused by bacteria decomposing dead. pH value tends to increase with time until the eighth day reached a value of pH = 9. This is according to research Efendi (2003) that the Most natural waters have; pH ranging between 6-9. most of the aquatic biota are sensitive to changes in pH and liked the Ph value of about 7 to 8.5.

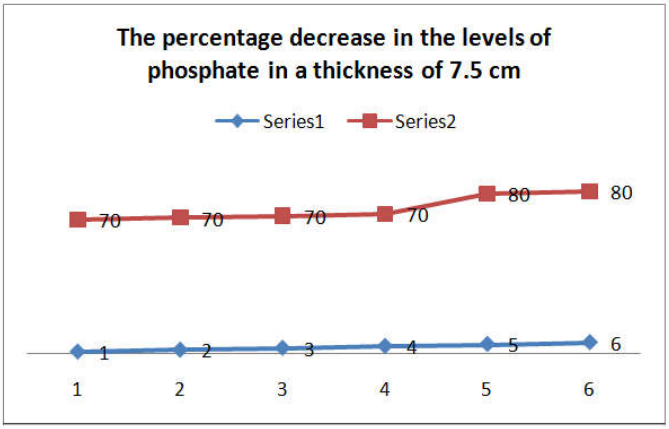
Phosphate content measurment of the water is done by measuring the levels of phosphate in each treatment (thickness cm, 7.5 cm, 10 cm and in controls) with a contact time is 1 hour. the measurement results can be seen in Table 3. Based on Table 3 percentage decrease in phosphate content of laundry waste water samples at a thickness of 5 cm in the lower ranges between 50-80%, while 7.5 cm thickness ranging between 70-80%, and at a thickness of 10 cm ranged from 70-80% with the greatest average reduction was at a thickness of 10 cm, can be seen in the graph below:



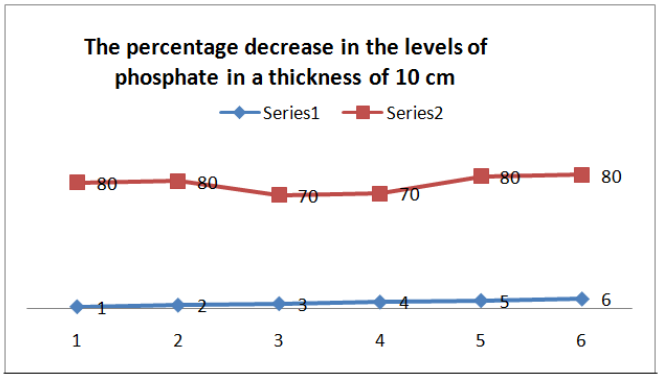
Graph 1. Precentages The Decrease of Posphate Levels In 5 Cm Thickness

Table 3. Phosphate content measurment data of the laundry wastewater samples

P	control	5 cm thickness	% Decrease	7,5 cm thickness	% decrease	10 cm thickness	% decrease
1	4.47	1,71	70 %	1,45	70 %	1,287	80 %
2	4.34	1,64	62.3 %	1,34	70 %	1,25	80 %
3	4,18	1,74	60 %	1,44	70 %	1,275	70 %
4	4,25	2,375	50 %	1,62	70 %	1,43	70 %
5	4,75	1.80	70 %	1,29	80 %	1,10	80 %
6	4,20	1.25	80%	0,87	80 %	0,96	80 %
	4.365	1.7525	65%	1.335	73%	1.217	77%



Graph 2. Precentages The Decrease of Phosphate Levels In 7,5 Cm Thickness



Graph 3. Precentages The Decrease of Phosphate Levels In 10 Cm Thickness

To determine the effect of various thicknesses of plasic bag activated carbon in reducing phosphate waste in industrial washing clothes (Laundry) can be seen from the results of the bivariate statistical test using ANOVA statistical test., Can be seen in the following Table:

Table 3. Effect of the thickness of Plastic bag Waste Activated Carbon to Reduce phosphat waste In the Industrial Washing Clothes (Laundry)

thickness	n	Mean (SD)	Min - max	P value
5 Cm	6	1.7500 (.13506)	1.64 – 2.00	
7.5 Cm	6	1.4183 (.11583)	1.29 – 1.62	
10 Cm	6	1.2628 (.10572)	1.10 – 1.43	0.00001
control	6	4.3217 (.22991)	4.16 - 4.75	

Based on the statistical test results in Table 4 above, the value p value = 0.000 at alpha 5%, it can be concluded that there are differences in reduction of waste phosphate on any thickness of plastic bag activated carbon, where the average reduction is highest in activated carbon from plastic bags with thickness of 10 cm, ie 1.2628 mg / l.

DISCUSSION

pH is a very important parameter in determining the conditions of microbial life in the tank during anaerobic fermentation takes place and is a factor that showed a decrease in the pH value of waste which contains detergent and indicate the occurrence of biodegradation LAS (Linear Alkyl Sulfonate). It can also be influenced by the addition of aqueous urea solution that is given as a nutritional source of microorganisms in the growth of biofilm layer so that the pH becomes alkaline water is 9.00 to 9.37. The temperature in this study are relatively homogeneous, which is 25 ° C, thus is not a factor that can influence the plastic bag waste activated carbon in the process to reduce phosphate waste (Efendi H, 2003).

In this study, it can be seen that the result of decreased levels of phosphate in waste water washing , the 5 cm thickness plastic can reduce at 65% phosphate (1.75 mg / lt), 7.5 cm thickness plastic can reduce 73% phosphate (1.33 mg / lt) and 10 cm thickness plastic can reduce 77% phosphate (1.22 mg / lt), thus the contact is about 1 hour with various thicknesses can reduce phosphate to far below the threshold value. Before the treatment is given the levels of phosphate in laundry waste is 4.17 mg / lt.

This proves that through the carbonation process which done by cut into small and then burned until it melts Through this heating, it will evaporate the water and volatile organic materials, thus what is left is a charcoal / carbon. This carbon is porous solids that largely pore is still closed. Furthermore, carbon is activated by adding the aceton solution (Sugiarto, 2008) The acetone solution will dissolve the dirt which still clinging to the surface of the carbon that is made of plastic. Activation also assisted with heating that aims to open up the pores as a result of the exclusion of materials that cover, this is evidenced by a reduction in the weight of carbon before and after activation.

In this study, 10 cm thickness can reduce phosphate levels in the washing waste water as much as 77% this is because the more number of plastic activated carbon is added, the percentage decrease in the concentration of phosphate is also getting bigger. This condition is caused by the increasing number of active carbon were added means more pores in activated carbon plastic which can adsorb phosphate ions, so the concentration of phosphate ion is much reduced with activated carbons. However, the 5 cm and 7 cm thickness activated carbon can also reduce levels of phosphate in the washing wastewater to below the threshold value determined by the goverment regulation number 82 in the 2001 about teh Management of Water Quality and Water Pollution Control, which the phosphate Threshold Limit Value laundry wastes in water bodies is ≤ 2 mg / liter. Activated carbon is a form of amorphous carbon material consisting mostly of carbon-free and have the absorb ability (Kubare, Haarhoof J, 2010). Activated carbon is used as a the ingredient of color bleaching ,gas absorbent, metal absorbent, and so on. From these materials are most often used as the adsorbent material is activated carbon (Sihombing, J. B.F., 2007, Anggi Rizkia Utami, 2013)

The most important character of activated carbon is the ability of absorption. Absorption in general, is a process of collecting objects that are dissolved in the solution between the two surfaces. Inter surface it may be a liquid and a gas, liquid and

solids. Absorption material used on the surface is solid and slurry. The mechanism of absorption can be explained as follows, absorbate molecules diffuse through a boundary layer to the outer surface of the absorbent, called external diffusion (Some are absorbed on the outer surface, but most diffuses further into the pores of the absorbent (internal diffusion). If the absorption capacity is still very large, most of the absorbate will be absorbed and bound to the surface. However, if the surface is saturated or nearly saturated with absorbate, there can be two things, namely the absorption layer formed above the second and so on absorbat that have bound on the surface (Anonim, 1999 and Anonim, 2003). Based on these results above, where the affixing of activated carbon made from plastic bag waste with a thickness of 5 cm, 7.5 cm and 10 cm with a contact time about 1 hour was able to reduce the phosphate level in washing waste water (laundry) below the threshold value limit, that is ≤ 2 mg / l. The method used is very simple and the cost is not too expensive, so easy to apply

Conclusion

ANOVA test results prove that there is a difference on average significantly with p value: 0.00 of various thicknesses of plastic bag activated carbon in reducing phosphate waste in industrial washing clothes (Laundry). While the optimal concentration of various thicknesses of plastic bag activated carbon in reducing phosphate waste in industrial washing clothes (Laundry) is at a thickness of 10 cm, which can reduce waste by 77% phosphate (1.22 mg / lt) with a contact time about 1 hour.

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