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## **Effectiveness of Simple Screening Media of Activated Charcoal and Zeolite to Reduce Waste Water Levels in Laundry Detergent**

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### **Abstract**

Detergent is a synthetic compound surface active agent (surface active agent) is used as a washing agent that is good for household use, textiles, cosmetics, pharmaceuticals, metals, paper, and rubber. Detergent dispersing properties, washing and emulsifiers, detergents with phosphate lower risk of causing irritation to the hands because more is known is alkaline, acid levels are between 10 - 12. The purpose of this study was to determine the effective media activated charcoal and zeolite with a thickness of 40 cm, 50 cm and 60 cm in the lower levels of detergent in the laundry waste water, the type of experimental research with active charcoal filter media and zeolite. The results showed levels of laundry detergent waste water after treatment is done with a simple screening method decreased for activated charcoal filter media 20 cm and 20 cm zeolite is 86.85%, activated charcoal media 20 cm and 30 cm zeolite is 98.20% and media activated charcoal 20 cm and 40 cm zeolite is 99.02%. Conclusion of the study is most effective on activated charcoal thickness of 20 cm and 40 cm zeolite with the rate of decline is 99.02%. Thus the detergent levels produced meet the appropriate standard of South Sulawesi Governor Regulation No. 69 Year 2010 regarding Standard and Criteria for Environmental Damage. It is recommended that a simple filtering with the use of active charcoal and zeolite media can be used as an alternative wastewater treatment facility.

**Keywords:** Media active, zeolite, waste water, laundry detergent

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## **1. Introduction**

In the era of globalization in several developing countries including Indonesia, the issue of environmental quality an issue which needs to be solved. Environmental degradation in a country will greatly affect the quality of the population and the impact on the health level of the population because of their place of residence has been contaminated. One of the causes of environmental degradation is the contamination of water, where the water is used every day cannot be separated from the effects of pollution caused by human activity. Some pollutants such as microbiological materials, organic materials such as pesticides, detergents and other harmful chemicals commonly found in water used daily. Along an increasing number of very significant population in which the increase of population, there will be increased demand for goods and services. Washing clothes and other household items (laundry) is one of the businesses engaged in services that are mounting. On the other hand, the presence of laundry can bring considerable benefits to the economy by reducing the number of unemployed and can improve people's lives around. However, the laundry business had a negative effect, namely the generation of waste generated by the rest of the laundry process so that the potential to cause pollution to the environment, especially in water bodies. The increasing number of industries will result in increased use of laundry detergents. By paying attention to the above problems would require an alternative technology that can reduce the level of danger posed by the waste washing clothes and household items (laundry).

Most laundry business use tap water, but there is also the use of well water. Discharge of wastewater generated fluctuates depending on the number of customers who washes clothes with average effluent as much as 550L / day (based on research results [1, 2]). Laundry dominant waste originating from the fabric softener and detergent, generally directly dumped into the channel leading water bodies without proper management. The active ingredients contained in many fabric softener and detergent is a quaternary ammonium chloride, LAS, sodium dodecyl benzene sulfonate, sodium carbonate, sodium phosphate, alkylbenzene sulfonate. These materials are materials that are environmentally friendly and biodegradable. Detergent is a synthetic compound surface active agent (surface active agent) is used as a washing agent that is good for household use, textiles, cosmetics, pharmaceuticals, metals, paper, and rubber. Detergent dispersing properties, washing and emulsifying. The main constituent of these compounds are Dodecyl Benzene Sulfonate (DBS) which has the ability to produce foam [3]. Laundry waste water generated by the high phosphate detergents containing Mg reaches 253.03. Fospat the excessive amount will cause harm to eutrophication and algal blooms at sea [4]. Sodium phosphate is derived from Tripolyphosphate (STPP), which is one of the major ingredients in detergent levels. In detergents, STPP builder which serves as the second most important element after surfactant because of its ability to disable hardness minerals in the water so that the detergent can work optimally. The content of the surfactant also contains builder (precursor). Builder works to increase the efficiency of washing of the surfactant by turning off the mineral hardness causes cleaner, water softener, surfactants are the most important ingredient in laundry detergents. The content of the waste water is very dirty laundry which contains mineral oil, heavy metals and harmful compounds in which the price of COD reaches 1,200 to 20,000 mg O<sub>2</sub> / L.

Based on the results of research by [5] with the title minimize the levels of detergents with the addition of coagulants and sewage filtration media filter on the shower, get results by using sand and zeolite media can

reduce levels of detergent with initial waste 56.742. After processing by 3 times replication fell to 0.059 with an average reduction percentage is 99.89% and is based on research of [6] with the title of simple filtration efficiency with cipping media, activated carbon, danzeolit in lowering laundry detergent liquid waste household business in the city of Makassar, get the detergent concentration at the beginning of sewage 21.34 mg / l down to 3.52 mg / l with a percentage decrease reached 83.50%. Based on the above, the authors tried to examine the laundry waste water with detergent pollutant parameters is by using active carbon and zeolite media in order to obtain results that meet the standards requirements. The aim of this study was to determine the effectiveness of activated charcoal and zeolite media with a thickness of 40 cm, 50 cm and 60 cm in the lower levels of detergent in the laundry waste water.

**2. Materials and Methods**

This study is experimental, is to determine the effectiveness of filtration using activated charcoal and zeolite media in lowering levels in wastewater laundry detergent filtration. This research was conducted at the Polytechnic Campus Environmental Health Workshop Makassar, and examination of the initial levels of detergent and after processing is checked at the Laboratory of the Health Makassar. While the sample liquid waste originating from household laundry business on the road Talasalapang, Gunung Sari, Rappocini District, Makassar. Primary data obtained from the research, as well as the analysis of the results of laboratory tests on the content of detergent in household waste water, both before and after treatment. The data obtained from the study of libraries, books, internet and data obtained from the relevant agencies, such as the service industry that has to do with the object of research.

**3. Results**

Based on the results of experiments conducted starting from the date of 29 April 2015 s / d May 5, 2015 by using simple filtration media activated charcoal and zeolite with a residence time for 3 hrs, The obtained results:

**3.1 Preliminary Examination Household Laundry Liquid Waste**

The results of the initial examination of household laundry waste water in the city of Makassar held on 30 April 2015 can be seen in Table 1 below:

**Table 1:** Preliminary Examination Household Laundry Liquid Waste, 2015

No	Parameter	units	Analysis Result	Standard
1.	Detergent	mg/l	14,31	Detergent limit on
2.	Temperature	<sup>0</sup> C	30,3	Waste water is
3.	pH	p	7,2	0,2 mg/L

On the table, it shown that the household Laundry Liquid Waste was 14,31 mg/L, with the temperature 30,3 <sup>0</sup>C and pH 7,2. As a result those are not meeting the requirement

**3.2 Analysis result of Domestic Laundry Wastewater after Treatment.**

Laundry waste treatment results in these experiments, the examination content of laundry detergent wastewater samples after the screening process using activated charcoal zeolite 20 cm and 20 cm, 30 cm and 40 cm. The effectiveness of the media used in lowering the levels of detergents, can be seen in table 2.

**Table 2:** Average levels decline Detergent After the Active Charcoal Filtration Media And Zeolite With Different Media Thickness

No.	Media	Initial sample (mg/L)	Average (mg/L)	decrease	Percentage decrease (%)
1.	Activated charcoal 20 cm and Zeolite 20 cm	14,31	1,88		86,85
2.	Activated charcoal 20 cm and Zeolit 30 cm	14,31	0,25		98,20
3.	Activated charcoal 20 cm and Zeolit 40 cm	14,31	0,14		99,02

Based on table 4.2 above, it can be seen that the result of laundry waste water treatment using activated charcoal media zeolite 20 cm and 20 cm, showed a percentage decrease in the average levels of inspection of up to 86.85% of detergent, 20 cm media activated charcoal and zeolite 30 cm, showed a percentage decrease in the average is 98.20% whereas the activated charcoal media 20 cm and 40 cm zeolite, showed a percentage decrease in the average levels of detergent into 99.02%.

**4. Discussion**

Results of the analysis and conclusions are based on laboratory test results by comparing the levels of detergent before regulatory standard treatment of waste water quality standard South Sulawesi Governor Regulation No. 69 Year 2010, concerning quality standards and criteria for environmental damage that is 0.2 mg / l. Detergent Ingredients early in laundry waste water before processing is 14.31 mg / L, the average reduction in detergent levels after treatment with up flow filtration method using activated charcoal filter media 20 cm and 20 cm zeolites with three times the average obtained refleksi ie a decline of 1.88 mg / l (86.85%). Results of laboratory tests showed that the screening process using activated charcoal media zeolite 20 cm and 20 cm in the laundry waste water, household businesses, have not been able to reduce levels of detergent required.

Decreased levels of detergent after processing by upflow filtration method using activated charcoal filter media 20 cm and 30 cm zeolite average reduction of 0.25 mg / l (98.20%) were able to get off in accordance with the standards required limits), decreased levels of detergents with filter media active rang 20 cm and 40 cm zeolite obtained results with an average decrease of 0.14 mg / l (99.02%), the results obtained by decreased levels of

detergent that qualifies under the required standard. Decreased levels of laundry detergent waste water after treatment due to adsorption properties owned by activated charcoal. Activated charcoal used to filter granular form with a size of 2-4 mm. Activated charcoal is charcoal made such that the pores open, and thus will have a high absorption. This active charcoal filter serves to eliminate micro pollutants eg organic substances, detergents, odor, phenol compounds as well as to absorb heavy metals. In addition the activated charcoal can absorb gases and chemical compounds specific or selective adsorption properties, depending on the size or the pore volume and surface area. On activated charcoal, there are two types of processes, namely the process of adsorption. Adsorption is a process that is rapid and reversible (reversible), an element that is not bound strongly absorbed on the surface of the absorbent. Reversible adsorption (reversible) depending on the power of attraction between molecules absorbing and weakly adsorbed material then there is a process of adsorption, the redemption molecule absorbent material.

While zeolites can function as a water softener replaces polipospat which can cause ecological damage. This is because the water is used to wash difficult because calcium and magnesium compounds react with soap to form sludge and prevent foam in water. Therefore, the production of soap polipospat often added as an additive, but because they can damage the ecology, polipospat then replaced using a zeolite that adsorbs and also has the ability to exchange cations. In general, magnesium and calcium which causes hardness in the water will be absorbed and exchanged with sodium ions contained in the zeolite so that water hardness can be soft. Zeolites are dehydrated will have an open pore structure with a large internal surface area so the ability mengadsorb higher than water molecules. The size of the pore diameter to the cavity determine the size of molecules that can adsorbed . Very specific filtering that can be used for purification and separation.

Zeolite which has enabled both physically by heating or chemically by the addition of acid or base capable of reducing / lowering the pollutants found in groundwater. Zeolite which has been activated or dehydrated so the loss of the water molecules cause cavities that there would be more effective to absorb pollutants existing in the waste water. This is also supported by the data processing results which showed that decreased levels of detergent with media activated charcoal 20 cm and zeolite 40 cm greater levels decrease the detergent of the treatment with media activated charcoal 20 cm and zeolite 20 cm, active charcoal 20 cm and zeolite 30 cm. Danger detergent when disposed on water presents the effect of the oxygen transfer coefficient thus endangering the aquatic life, the onset of foaming, state toxic water bodies because of some surfactant and its partial derivatives are dangerous. More specifically, it has been studied the toxicity of Sodium Dodecyl Benzene Sulfonates on aquatic biota, especially zooplankton, which gives the effect of death. Besides water containing phosphates can cause poisoning if swallowed by humans. Laundry waste water rich in phosphate content reaches 253.03 mg, so that if the amount of excess will lead to the danger of eutrophication and algal blooms in water bodies.

According to previous research conducted by [6, 7] that reduced levels of laundry detergent waste after processing the adsorption process that occurs is done by the two zeolite adsorbent and activated carbon. The existence of two types of adsorbent which is used to make detergents decreased levels that occur the greater. This is due both activated carbon and zeolite having an absorbent properties, which only compounds the size and the specific conditions that can be captured, so that if it used two types of adsorbents, the absorption

detergent will also increase and this study was also conducted by [8, 9, 10] which proving that a decline in detergents by using activated carbon. This for water treatment to eliminate / reduce the detergent is the adsorption process is a process that uses activated charcoal as a medium material to absorb the detergent from the water. In this study a reduction in detergent made with the oxidation process carried out by microorganisms, so that the detergent compound transformed into other compounds. The oxidation process requires oxygen, so the aeration of the oxidation process is carried out is a way of inserting oxygen by spraying water into the air.

## 5. Conclusion

1. Decreased levels of detergent that occur in a simple filtration using activated charcoal media zeolite 20 cm and 20 cm, where the levels of the beginning of the examination is 14.31 mg / L down to 1.88 mg / L with a percentage of 86.85%.
2. In a simple filtration using activated charcoal 20 cm and 30 cm zeolite decreased levels of detergent, wherein the initial sample inspection of the laundry waste water is 14.31 mg / L down to 0.25 mg / L with a percentage of 98.20%.
3. Decreased levels of detergent that occur in a simple filtration using activated charcoal media zeolite 20 cm and 40 cm, detergent concentration control checks 14.31 mg / L decreased to 0.14 mg / L and the percentage decreased levels of detergent that is 99.02% , Of the three types of different media thicknesses can be seen that, decreased levels of the most effective detergent occur on activated charcoal media thickness of 20 cm and 40 cm zeolite.

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