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LAUNDRY WASTEWATER TREATMENT WITH REPEATED FILTER

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ABSTRACT

Water scarcity and water contamination are among the most challenging global issues today. Wastewater discharged into water bodies that are not appropriately managed causes a decrease in water quality, one of which is laundry wastewater which contains many hazardous materials resulting from the use of detergents and clothes deodorizers. This wastewater pollution management control uses a repeated filtration system with activated carbon as the main ingredient. This aims to determine the effectiveness of reducing the concentration of Chemical Oxygen Demand (COD), water turbidity, and odor level. Activated carbon effectively reduced the COD number from 964 Mg/L to 14 Mg/L. The turbidity level of water decreased from 302 to 2.29 on the NTU scale. This shows that a simple filtration system with activated carbon as the main ingredient for laundry wastewater treatment is very efficient in reducing COD levels, water turbidity levels, and odors from wastewater.

Keywords *: Laundry wastewater, COD, Turbidity, Odor, Active Carbon*

1 INTRODUCTION

Scarcity of clean water and contaminated water is a global problem today. Water is a basic need that humans have both for consumption and daily activities. However, along with industrial development and population growth, the availability of clean water is starting to run low and even more difficult to find. This situation indication by the large amount of waste that is disposed of carelessly, both industrial and household waste.

The disposal of waste that is not appropriately managed affects the condition of the surrounding water. Therefore it is necessary to treat wastewater before water is discharged into water bodies or reprocessed for use (Ho et al., 2021). Laundry wastewater treatment is one method to maintain the stability of the availability of clean water because the laundry business is a very fast-growing business now and can also protect the environment from the impact of the detergent water produced.

Laundry wastewater is disposed of carelessly and not managed properly will affect the environment. The laundry industry requires 15L/kg of fresh water for the washing process, while 60-140 L of fresh water is used per home washing cycle (Manouchehri and Kargari, 2017). Laundry wastewater from small-scale and residential laundry services a usually classified as greywater. Greywater is domestic wastewater that comes from household activities and is a combination of waste originating from washing clothes, cooking/washing kitchen utensils, and bathrooms, but excluding those from toilets (WC) (Widyarani et al., 2022).

Palembang, have led to the emergence of businesses that will help reduce community problems, such as some household chores (laundry business). But behind the many laundry business activities that are spread in the community, it turns out to have a negative impact, especially on water pollution in the environment where the laundry waste water is disposed. Due to the large amount of laundry wastewater entering the waters, the quality of the water and the purification of water bodies will decrease. This is related to PP No. 82 of 2001 concerning water quality management and pollution control. Therefore, it is necessary to do research on the laundry wastewater treatment process using simple materials and tools and activated carbon to reduce the impact caused by the liquid waste.

This study aims to determine the efficiency and ability of the filtration system using activated carbon to reduce the concentration of Chemical Oxygen Demand (COD), water clarity and odor from laundry wastewater. Wastewater from laundry businesses is classified as a domestic wastewater from laundry water such as detergents, soaps, softeners, and clothes deodorizers. In general, laundry businesses tend to use detergent instead of soap because detergents produce more foam which is believed to remove dirt faster than soap. The quality of clean water contaminated by domestic and industrial waste, can be indicated based on physical parameters such as turbidity, odor, taste, temperature and color (Widiyanto et al., 2015). Turbidity is a basic measure in determining whether the water is polluted or not, using the effect of light to measure the state of raw water using the NTU (Nephelometrix Turbidity Unit) scale. This turbidity can arise due to the presence of inorganic and organic materials present in the water obtained from industrial waste which makes a real difference in terms of aesthetics or in terms of water quality. Turbidity can affect water quality such as reducing the amount of light received for plant growth, and damaging sensitive gill structures in fish and aquatic organisms. Therefore, based on PP no. 82 of 2001 regarding water quality treatment and pollution control.

This laundry wastewater management is very necessary, that it can be reused for non-consumption daily activities and reduce the impact caused by laundry wastewater. This research uses simple tools and materials, repeated filter, with activated carbon as the main ingredient, which is in our expectation to reduce the concentration of Chemical Oxygen Demand (COD), water clarity, and odor from laundry wastewater.

2. MATERIALS AND METHODS

In this study, a repeated filtering system was used to see the efficiency of reducing COD levels and reduced the level of turbidity and odor produced by wastewater. The raw material used is laundry's wastewater. The study used a simple filtration method using active carbon, sand, and gravel filter media. From the results of research that is conducted at the Palembang Health Laboratory Center in order to find out how much environmental pollution is caused by laundry's wastewater, the application of simple and repeated filtration can reduce the levels of Chemical Oxygen Demand (COD), turbidity, and smell in laundry's wastewater significantly. The filtering media is designed in layers with a level distance of not more than 10 cm with diameter of 30 cm and a height of 60 cm, which refers to previous research.

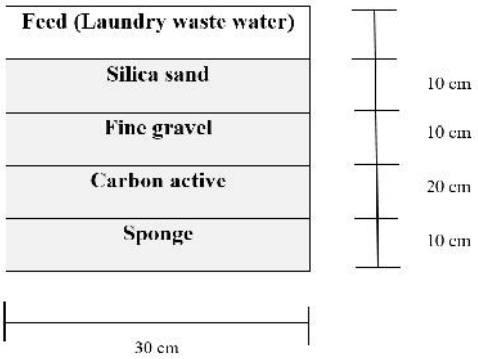

Figure 1. *Filter Circuit*

Based on Figure 1 above, the materials used in the filtering media are easy to obtain: Activated Carbon, Sponge, Silica Sand and Corn Gravel. Arranged by thickness and a predetermined arrangement.

3. RESULTS AND DISCUSSION

In this study, the raw material used is laundry wastewater. The study used a simple filtration method with activated carbon, sand, and gravel as filter media. From the results of research conducted at the Palembang Health Laboratory Center to determine how much environmental pollution caused by laundry wastewater, the use of simple and repeated filtration can significantly reduce levels of chemical oxygen demand (COD), turbidity, and odor in laundry waste.

Based on this research, 3 test samples were obtained: laundry wastewater, half-process wastewater, and repeated filtering processes.

3.1 COD (CHEMICAL OXYGEN DEMAND)

Three samples show a very drastic decrease in COD levels from 964 MgL^{-1} to 14 MgL^{-1}. Based on the COD threshold that has been determined by the Regulation of the Minister of Environment of Life of the Republic of Indonesia number 5, 2014th about materials quality Wastewater, the which is 180 MgL. This Provides information that repeated filtration by using simple tools is effective reduce COD levels and reduce the impact of environmental pollution caused by the laundry's wastewater.

The decreasing in COD levels is influenced by the presence of active carbon in the filtering media, active carbon itself has an important role in the filtering circuit because it has the ability to filter, adsorb, and exchange ions together, therefore it can decompose and be able to reduce organic matter in liquid waste (Delgado et al., 2018).

It is not only effective in reducing COD levels, but also active role in eliminating smell produced by the wastewater The smell of wastewater, laundry which is heavily dominated by detergents and clothes deodorizers that produce a

foul, rancid or unpleasant smell can be removed by simple repeated filtration. The reducing smell of the sample wastewater after being filtered can be indicated by the reduction of organic particles contained in the laundry's waste water.

It can be seen in Figure 2 that is not only the COD and smell levels have decreased significantly, the decrease in the turbidity level of the wastewater to the filtering products can be seen clearly only by using the naked eye. Turbidity is the condition of water that is not clear or dirty and opaque. The turbidity of water can be seen with the naked eye directly due to the presence of colloidal particles (10-8 mm in diameter) consisting of residual detergents, proteins and algae present in the waste.

In this study 3 samples with 3 conditions of laundry wastewater were tested to see the level of COD.

Table 1. Results of COD

No	Sample	Mg/L
1	Wastewater	964
2	Half Process	121
3	Result	14

In the table 1, COD testing on the three samples showed a very significant decrease in COD levels. In wastewater samples, the COD level reached 964 Mg/L, while in the filtering process the COD level decreased to 14 Mg/L. Based on the COD threshold that has been determine by the Regulation of the Minister of the Environment of the Republic of Indonesia Number 5 of 2014 concerning the Wastewater Quality Standard, which is 180 Mg/L (KEMEN LH. Water Quality Standard, 2014).

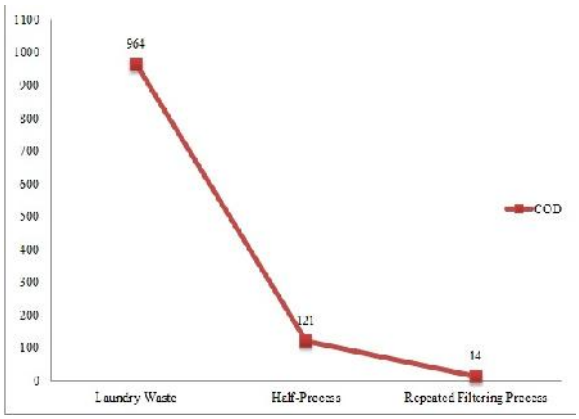

Figure 2. *Filter Circuit*

The decrease in COD levels (figure 2) influenced by the presence of activated carbon in the filtering media, activated carbon itself has an important role in the laundry wastewater filtering circuit, which can filter, adsorb, and exchange ions together. Therefore it can decompose and degrade materials organic matter in laundry waste.

3.2 TURBIDITY AND ODOR

Turbidity and odor are parameters of cleaned water quality. Laundry wastewater dominated by detergents and clothing fragrances has turbidity and a strong odor and is not suitable for reuse. Laundry wastewater filtration using activated carbon, silica sand, and small gravel produces optimal results. By reducing the odor from the waste after being filtered, it can be indicated that there is a reduction in the organic particles contained in the laundry wastewater. Meanwhile, turbidity also carried out at the Palembang Health Laboratory Center, it showed a significant decrease.

Table 2. Results of Turbidity

No	Sample	NTU
1	Wastewater	302
2	Half Process	42.9
3	Result	2.29

Laundry wastewater filtering using simple media can produce water that is not cloudy. Based on the graph in Figure 3, wastewater that has not undergone the filtering process has a very high value of 302 on the NTU scale, while for waste that has undergone one-time filtering, the value of turbidity reaches 42.9. NTU scale and for the results of screening 2.29 NTU scale. The results of repeated filtration produces water with clean water quality based on the maximum threshold for turbidity of clean water according to the PERMENKES RI Number 416 of 1990 is 25 on the NTU Scale (Nephelometric Turbidity Unit) (Ministry of Health, 1990).

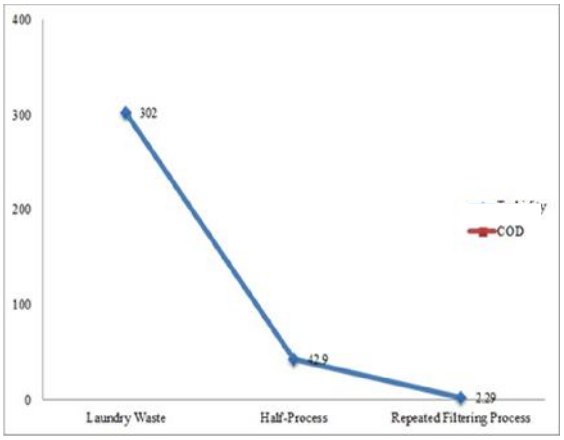

Figure 3. Turbidity Drop Graph

Figure 4. Samples

It can be seen in Figure 4, the cloudy nature of water can be seen with the naked eye directly due to the presence of colloidal particles with a diameter of 10-8 mm, produced from the remaining organic detergent ingredients in the waste. It is not only effective in reducing COD levels, but plays an active role in removing odors and turbidity produced by wastewater. The odors and turbidity of laundry wastewater which is heavily dominated by detergents and clothes deodorizers that produced a foul, rancid or unpleasant odor can removed by simple repeated filtration. From the whole filtering media ranging from silica sand, corn gravel, activated carbon, to sponges, they play an active role in reducing the turbidity level of wastewater due to working together in filtration, absorbing materials in wastewater and passing very small particles

4. CONCLUSION

Based on the results of data analysis and discussion of research results from this washing wastewater purification, it can be concluded that the ability of filter media which is made simply and with materials that are easy to obtain has been proven to be able to become a tool for purifying water suitable for non-consumption use. The use of activated carbon in filtration is considered effective in eliminating odors in laundry wastewater and is also effective in reducing COD levels. This research was conducted on 3 specimens, namely specimens that have not been filtered, specimens with one filtration process, and repeated filtration processes. The COD level in specimens that have not been tested is 964 MgL^{-1} to 14 MgL^{-1} in specimens with 2 times filtration, while the turbidity level of wastewater, which is 302 NTU scale in specimens without filtration, drops to 2.29 NTU scale with 2 times filtration. This shows that laundry wastewater treatment using simple filtration is very appropriate, besides having the capabilities mentioned above, it is also very effective and efficient in terms of the costs incurred and the materials used to filter the water.

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