Analysis of the Effectiveness of a Floating Septic Tank with BOD, TSS, pH, Temperature, and MPN Coli as parameters from Black Water Waste in Kodingareng Island, Makassar City

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Abstract

One of the important aspects of the environment is sanitation. Sanitation is human effort to create a safe and comfortable environment. Processing of liquid waste through a floating septic tank is a form of environmental sanitation. The purpose of this study was to determine the effectiveness of floating septic tanks in Kodingareng Island, Makassar City, in terms of parameters of BOD, TSS, pH, temperature and MPN Coli.This research is experimental. This research begins by reviewing related literature, environmental survey, preliminary study, making a model of floating system waste management and checking the results of the effluent. This floating septic tank is expected to be the right sanitation facility to be used by people on the coast and islands. After 45 days of septic tank installation and 3 effluent sampling with a span of 2 days at the same effluent point, the research shows several results. Measurement of BOD and TSS and MPN Coli levels in the effluent of waste treatment, with a septic tank, showed results above the quality standard of the Minister of Environment and Forestry Regulation No. 68 of 2016 concerning domestic waste requirements. The decrease in BOD levels from the first test sample to the third test sample was 40.9% (580 mg / l, 483.24 mg / l, 342.3 mg / l). At TSS levels, the decrease from the first to second test samples was 22.7% (180 mg / l, 139 mg / l, 207 mg / l), while the temperature and pH were still in accordance with the quality standard. For MPN Coli parameter is still far above the quality standard. The result of parameter test is an extrapolation or estimation model. This method can show the estimation

model of the residence time of wastewater in the treatment system so as to achieve the estimated time of effluent according to quality standards.

Keywords: Floating Septic Tank, BOD, TSS, MPN Coli

INTRODUCTION

Environmental health problems always been the main topic in efforts to improve the quality of the environment in various countries in the world (Jannatietal., 2015). Indonesia as an archipelago, has more than 17,000 islands and coastal area of 80,000 km or twice around the earth through the equator. (Worang et al., 2017).

Poor environmental conditions greatly affect the increase in vector development in the environment, for example an environment where waste management is not good. It provides a medium for flies breeding that can transmit diarrhea. This condition is exacerbated by poor fecal management, a good media for flies to breed, thereby facilitating the spread of e-colli bacteria.(Singga & Dukabain, 2019).

Waste is an outcast in form of substances which contain hazardous and toxic materials which due to its nature and concentration or quantity, either directly or indirectly, can pollute or damage the environment, and endanger the environment, health, survival of humans and other living creatures. Khamidahetal (2018) wastewater is the remaining water that is discharged from household, industrial, and other public places and generally contains materials or substances that are very dangerous to human health, also disturb the environment.(Sasiang et al., 2019)

The septic tank system is the most common form of domestic sewage treatment which is a potential source of pollution (Withers et al., 2014). The septic tank system (STS) is the most widely used collection system for the treatment and disposal of domestic wastewater worldwide. Rural (Richards et al., 2016). Apart from that, aeration systems are also used for wastewater treatment. Metcalf & Eddy (2004) explained that there are several types of aeration systems that are used for wastewater treatment (Jufri, 2020; Narethong, 2020). Many studies support the septic tank system, one of which is research by Safriani&Putri (2019) showing that the use of drums in a septic tank can lead to achieving access to a toilet to reach the first pillar of STMB. The used drum which is designed as compartment A can function as a Septic Tank and Compartment B as WWTP so that it can change the physical form of feces and reduce the quality of wastewater.

In the Regulation of the Minister of Environment of Indonesia Number 68 year of 2016 concerning Domestic Wastewater Quality Standards of 30 mg / l (BOD), respectively, total Coliform amount / 100mL 3000 and 6-9 (PH). The main purpose of wastewater treatment is to reduce BOD, dissolved particles, remove nutrients, toxic materials, and kill pathogenic bacteria to protect the aquatic environment and prevent the spread of diseases transmitted through wastewater.(Timpua&Pianaung, 2019).

METHODS

This research is an experimental study to determine the effectiveness of a floating septic tank in reducing physical parameters (temperature, TSS), and pH, BOD, MPN Coli parameters. The sample research is located in the Laboratory of Environmental Health and Technology Center and analyzed in Makassar Polytechnic Health Laboratory, department of environmental health. While the effluent sample was taken based on the source of black water waste. The research was conducted in July-September 2020.Sampling of wastewater was carried out at the outlet point of the floating septic tank on Kodingareng Island. Sampling was carried out after 30 days of floating septic tank usage. Sampling according to SNI. From the results obtained from laboratory examinations on samples after processing, analyzed using descriptive analysis with graphical tables and narratives that describe thoroughly the effectiveness of floating septic tanks in reducing chemical parameters (pH, temperature, TSS, and BOD) and bacteriological (MPN Coli). black water waste.
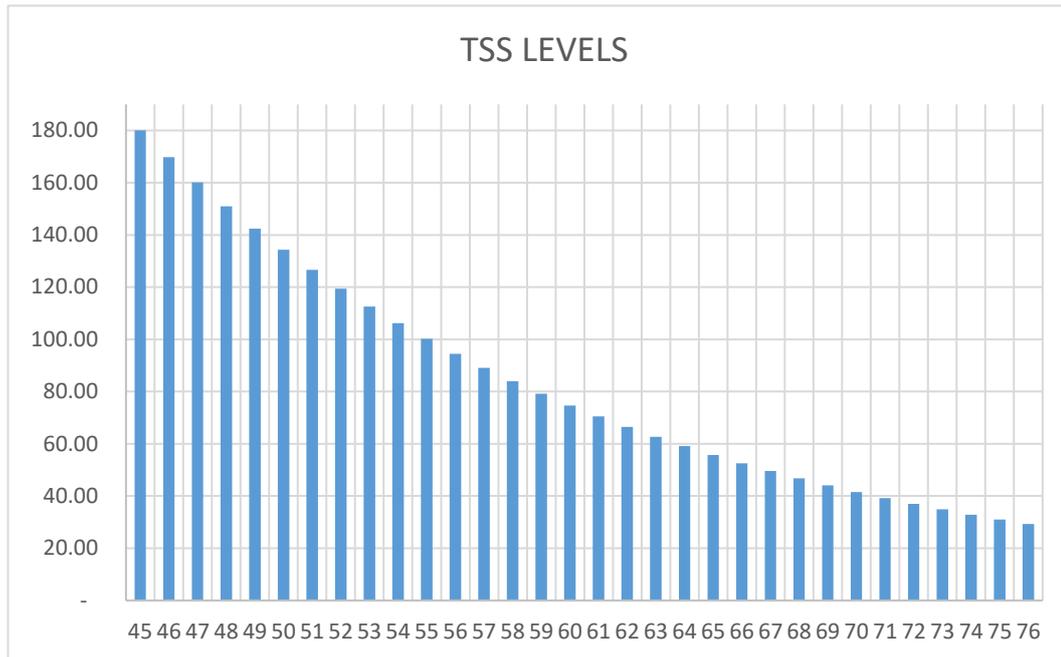
RESULTS

Figure 1 Graph of Estimated BOD Effluent Value of Black Water Domestic Wastewater with Floating Septic Tank in Coastal and Archipelago Areas in 2020
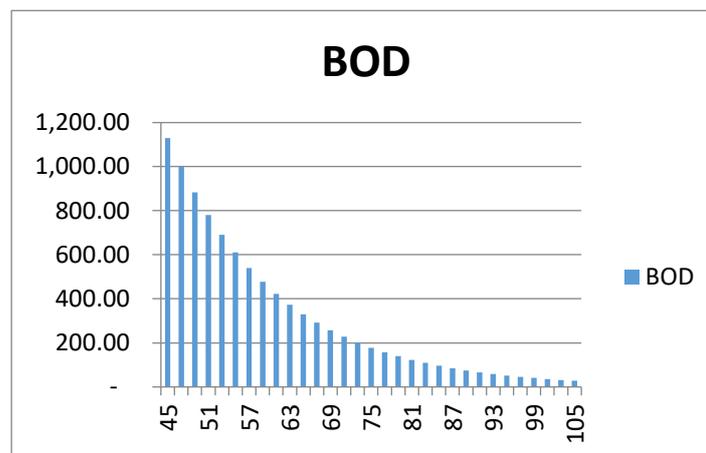

Based on the BOD graph data, it can be seen that the estimated time for the results of floating septic tank waste treatment requires a residence time of 105 days until the eluent time with the resulting BOD parameters align with the quality standards. From the graph, it can be concluded that the longer the residence time of BOD, the lower the level.

Figure 2 Graph of TSS Effluent Levels for Domestic Wastewater Black Water with Floating Septic Tank in Coastal and Archipelago Areas in 2020

From the TSS estimation graph data above, it can be seen that the estimated time for waste treatment with a floating septic tank requires a residence time of 76 days until the effluent time with the resulting TSS parameters is in accordance with raw quality standards or is safe for disposal to the surrounding environment.

Figure 3 Graph of MPN Coli Levels in Black Water Domestic Wastewater with Floating Septic Tanks in Coastal and Archipelago Areas in 2020
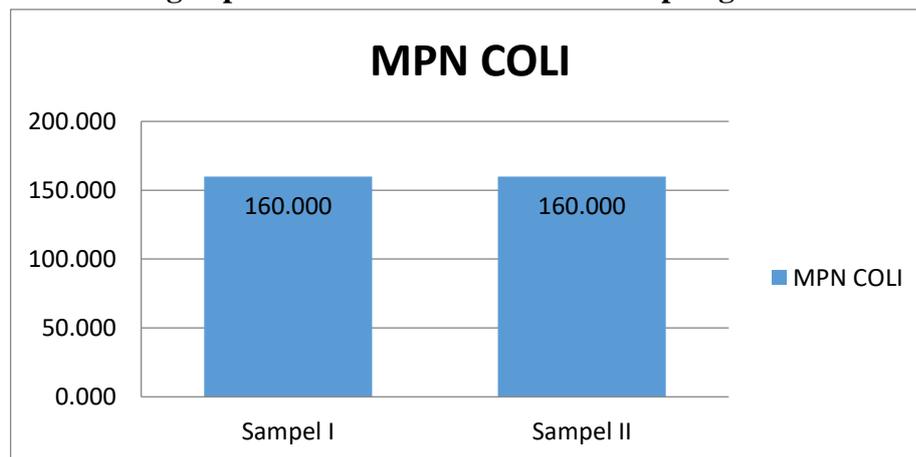
Graph 3 shows the results of MPN Coliform levels in black water dosmestic wastewater in sample I taken on 9 September 2020 of> 160,000 mL from the maximum standard of 3,000 mL and in sample II taken on 11 September 2020> 160,000 mL from the maximum standards of 3,000 mL. Based on this, the MPN Coliform level in black water dosmestic wastewater is still in the very high category so that it does not meet the raw quality standard. Based on these

observations that along with the length of residence, the MPN Coliform level also does not change.

DISCUSSION

Based on the results of this research measuring BOD in domestic waste with a floating septic tank with a residence time of 31 days, by examining the effluent sample 3 times in a span of 2 days, the results obtained were in very high category of the maximum standard that had been set, but if we look at the trend of the test results with the length of residence time, the BOD levels will decrease. Therefore, in measuring the estimated time span required for waste management using a floating septic tank, a data exploration model is calculated. From the data that has been processed, the estimated time span is 31 days of residence time to get the yield from the waste by processing a floating septic tank in accordance with raw quality standards.

This research is in accordance with the research conducted by Affifetal (2017). Demonstrating a retreatment using Horizontal Roughing Filtration (HRF) with pumice stone filter media that can remove organic compounds in the form of COD from an initial concentration of 2630 mg / l to 1748 mg / l and BOD from an initial concentration of 852 mg / l to 568 mg / l with COD removal efficiency of 33% and BOD of 33.4%. The process of decomposition of organic matter in liquid waste is strongly influenced by water temperature because the activity of microorganisms is higher at increasing temperatures.

The BOD value is influenced by the type of waste, the degree of acidity (pH) and the overall water condition. The results of the analysis of the initial content of waste generated from this inlet, will later become a reference for the variation of waste during processing (Pamungkas, 2016). The high content of organic compounds in wastewater results an increase in the value of suspended solids.

The research results of TSS effluent measurement with 45 days WTH, 3 times sample examination with a span of 2 days at the same effluent point, the septic tank floating sewage treatment system results were still above the quality standard based on Regulation of the Minister of Environment and Forestry No. 68 year of 2016 about domestic waste requirements. To predict the decrease in TSS concentration with a floating septic tank, extrapolation of the effluent result data was carried out with the estimation model, so based on the estimated value, it takes up to 76 days for the TSS effluent results to meet the quality standard. The results of the research conducted by Rizki showed that the effect of contact time on the efficiency of decreasing COD and TSS concentrations occurred well in drums and ponds, where the longer the effect of contact time on decreasing COD and TSS concentrations. The highest COD concentration efficiency in ponds and drums (biofilter reactor) is at the 8th hour of contact time with an efficiency of 22.89% and 15.49%. And the highest efficiency of TSS concentration in ponds

and drums (biofilter reactor) is at the 8th hour of contact time with an efficiency of 80.60% and 72.99%.

The temperature of the water effluent during sample examination is in the range of 22°C to 23°C, but this is also influenced by various factors including environmental conditions such as during high tides and low tides, as well as when the weather is hot and rainy, it can affect the temperature conditions of the effluent. . Mesophilic microorganisms have a temperature in range of 20 - 40 °. Increasing the temperature can cause a decrease in processing efficiency. With increasing temperature, the growth of nitrifying bacteria will be accelerated, and nitrification will be achieved without difficulty. Conversely, with decreasing temperature, the growth rate of nitrifying bacteria will slow down (Gerardi, 2002).The effluent temperature from processing at the time of sample inspection was 22-23 0C, which was still below the quality standard of the Regulation of the Minister of Environment and Forestry No. 68 year of 2016 about domestic waste requirements. High temperatures will damage the process by preventing enzymes from being present in cells. Increasing temperature can also cause a decrease in processing efficiency.

The pH concentration in the wastewater media greatly affects the proteins (enzymes and transport) present in the cell membrane. The structure of the protein will change when the pH in the media changes. If there is a deviation in the pH level, the growth and metabolism of microorganisms can stop which can affect the quality of wastewater.

Coliform bacteria are an indication of water pollution. Apart from the above methods, the gram stain method is usually used. Gram stain becomes a differentiation stain because this staining differentiates the characteristics of bacteria based on Gram using two dyes. In Gram staining, Gram positive characteristics will appear if the color of the bacteria is purple and negative if the color of the bacteria is red (Anathanarayan&Paniker, 2006; Cappuccino & Sherman, 2012). Apart from this there is also the MPN method.In microbiological determination of water quality, the presence of these bacteria is determined based on certain tests which generally use tables or better known as MPN (Most Propable Number). The basis for this estimate is an estimate of the most likely number of coliform organisms in 100cc of water.

Coliform bacteria are bacteria that are used as indicators of the presence of pathogenic bacteria. Faecal coliforms are bacteria that are used as indicators of pathogenic bacterial contamination.The faecal coliform is determined to be an indicator of water immersion because the number of colonies is associated with the presence of pathogenic bacteria. In addition, coliform examination is much cheaper, faster and simpler than detecting other pathogenic bacteria. Examples of coliform bacteria are, Escherichia coli, Enterobacter aerogenes, Klebsiella pneumonia, Klebsiella ezanae, Klebsiella rhinoscleromatis, Shogellasonnei, Pasteurella mulrocida, Pseudomonas coccovenenans and Vibrio cholera. It can be

concluded that coliform is an indicator of clean water quality, the less coliform content means the better the water quality.

CONCLUSION

BOD levels showed a decrease in the first and third samples. In the third sample 342.3 mg / L but still very far from the maximum standard of 30 mg / L. TSS also decreased levels in the first sample to the second sample, namely 139 mg / L. TSS levels were also found to be far from standard. For temperature and pH are still in accordance with existing standards. Meanwhile, MPN Coli levels were found to be greater than 160,000 mL, while the standard was 3,000 mL. MPN levels are still too far from the specified standard. Levels of BOD, TSS, and MPN that are still in the high category can pose a high risk to public health. Therefore, it is very necessary to carry out further treatment of wastewater effluent so that the results of the effluent are not only safe to dispose of into water bodies, but can be safely reused.

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