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Research Article

The Management of Wastewater Treatment Plants at Bhayangkara Hospital Kendari in 2022

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Abstract.
There is efforts to manage wastewater and liquid waste, especially at the Bhayangkara Hospital Kendari, with various treatment processes to ensure it meets the requirements. The health of the hospital environment is essential. Therefore, proper and correct waste management efforts are needed so that its disposal complies with hospital wastewater quality standards requirements. Based on this, the researchers are interested in evaluating the management of the wastewater treatment plants at the Bhayangkara Hospital Kendari. This study aimed to evaluate the effectiveness of wastewater management and quality standards. The parameters of wastewater examined were temperature, TTS (Total Suspended Solids), pH (Degree of Similarity), NH3 (Ammonia), COD (Chemical Oxygen Demand), BOD (Biochemical Oxygen Demand), and Coliform MPN. The method used in this study was descriptive by collecting data through interviews and field observations to get an overview of the evaluation of wastewater treatment at the Bhayangkara Hospital Kendari, which would then be analyzed. The results of this study indicated that the effectiveness of treatment at the Bhayangkara Hospital Kendari had met the requirements according to Decree of the Minister of Health No. 1204/Menkes/SK/X/2004 regarding the process of treating wastewater using an Anaerobic-Aerobic Biofilter system and a chemical wastewater treatment system with an anaerobic-aerobic biofilter system to produce effluent according to quality standards. The measurement results for each waste parameter were by the Decree of the Minister of Environment No. 5 of 2014 concerning hospital wastewater quality standards, namely the temperature value at the outlet (after processing) was 28, TDS at the outlet was 170 mg/L, TSS at the outlet was 45 mg /L, PH at the outlet was 7.89 mg/L, Free NH3 at the outlet was 0.057 mg/L, COD at the outlet was 15.70 mg/L, BOD at the outlet was 3.9 mg/L, and fatty oil at the outlet was <0.002 mg/L. Therefore, Bhayangkara Hospital Kendari already had quality standards and was suitable for disposal into the nearest canal.

Keywords: Wastewater, Quality Standards, Management of Wastewater Treatment Plants, Bhayangkara Hospital Kendari

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1. Introduction

Management of solid medical waste Hospital has various problems, to remember processing of medical waste good pain could protect patient , visitor and officer health as well as public around Hospital from deployment infection and injured. In North Konawe there are 22 Community Health Centers most of which have problems regarding solid medical waste that have not been properly managed. The sample in this study health workers on solid medical waste management.[1]

In order to overcome the problem of contamination of water bodies by household wastewater, especially hospital waste, the provincial government of Southeast Sulawesi issued a Kendari Mayor's Decree Number 1293 of 2017 concerning granting permission to treat wastewater into water bodies for Bhayangkara Hospital Kendari.[2] The technology applied to the wastewater treatment plants at the Bhayangkara Hospital Kendari is a chemical process wastewater and anaerobic-aerobic biofilter system.[3] Wastewater is based on the technology recommended by the Indonesian Ministry of Health, namely anaerobic and aerobic biofilter technology.[4]However, along with the demands of the times for better quality results of processed waste, occupational health and safety for wastewater treatment plant workers in a hospital are important to facilitate the operation of wastewater treatment plants. Thus, the building structures and piping system is designed in such a way and developed into a chemical wastewater technology for the anaerobic-aerobic biofilter system process. This technology is chemical wastewater from an anaerobic-aerobic biofilter system process to maximize the ability of the wastewater treatment process at the Bhayangkara Hospital Kendari health service facility so that it can be optimal, efficient and produce effluent that meets applicable quality standards.

2. Research Methods

1. This study was a descriptive observation describing the condition of aspects of liquid waste management at the Bhayangkara Hospital Kendari.

2. The research variables in this study were methods and tools (materials).

3. Population, sample, and sampling technique. The population was Bhayangkara Hospital Kendari, and the sample was the manager of the wastewater treatment

plants at the Bhayangkara Hospital Kendari. The sampling technique used was purposive sampling, a method to determine the sample with certain considerations. The selection of a group of subjects in purposive sampling was based on certain characteristics considered to have a close relationship with the characteristics of the previously known population. In other words, the sample units contacted were adjusted to certain criteria based on the research objectives or problems.

3. Results

TABLE 1: The sources of wastewater and contaminant substances in waste at the Bhayangkara Hospital Kendari.

No.	Sources of Wastewater	Room or Place	Contaminant Substances
1.	Washing, Toilets	Toilet, Wastafel	Organic materials, nutrients, suspended solids, and pathogenic bacteria.
2.	Clinical (medical, hand, and tool washing)	Inpatient, outpatient, laboratory, clinic, pharmacy, delivery, nutrition, immunization, emergency room	Organic and inorganic materials, water with acidic/alkaline pH, and pathogenic bacteria and viruses.
3.	Kitchen	Kitchen room	Organic materials, nutrients, suspended solids, and oil/fat.
4.	Laundry	Laundry room	Alkaline water (pH 8-10), organic and inorganic materials, surfactants

Source: Data from Bhayangkara Hospital Kendari and Analysis Results

The results from Table 2.1 show that the operational activities of Bhayangkara Hospital Kendari are dominated by producing domestic waste. Wastewater originating from domestic waste generally contains quite high levels of organic pollutant compounds and can be treated with biological treatment processes. This wastewater comes from a laboratory that contains heavy metals and wastewater.[3]

The success rate of wastewater treatment at the Bhayangkara Hospital Kendari[5]can be determined by calculating the processing efficiency shown in Table 3.1.

Based on test results data on the influent and effluent of the wastewater treatment plants at the Bhayangkara Hospital Kendari, the treated water meets the quality standards of the Minister of Environment of the Republic of Indonesia Number 5 of 2014. These results are obtained based on the results of sampling and laboratory testing of air quality, ambient, hygiene, and sanitation at the Bhayangkara Hospital Kendari by

Figure 1: WWTP from Bhayangkara Hospital Kendari.

Table 2: The results of the environmental chemical test of WWTP at the Bhayangkara Hospital Kendari.

Parameter	Inlet Wastewater	Outlet Wastewater	Quality standards	Method Specific
Temperature	25	25	28	SN 06-6989.23-2005
PH	7.5	7	6-9	SN 06-6989.11-2004
TDS (mg/l)	650	170	2000	Gravimetry
TSS (mg/l)	152	45	200	Gravimetry
NH3 (mg/l)	129.5	0.57	10	Spectrophotometry
COD (mg/l)	60.88	15.70	80	Titrimetry
BOD (mg/l)	28.0	3,90	50	BOD meters
Detergent (mg/l)	0.328	0.016	5	Spectrophotometry
Fat Oil (mg/l)	0.5	< 0.0002	10	Gravitmetry

officers from the Health Laboratory Center of Southeast Sulawesi Province on January 3, 2022.[6]

4. Discussion

The Wastewater Treatment Plants (WWTP) function to reduce a load of organic substances contained in wastewater resulting from hospital activities.[7] The principle and basis of the treatment process are to breed and maintain aerobic bacterial life in water to reduce the organic content in the wastewater.[8] The amount of liquid waste in the Bhayangkara Hospital Kendari environment must be managed in a Wastewater Treatment Plant (WWTP) based on the assumption that 80% of clean water use will be wasted in the form of liquid waste. The results of the calculation of the wastewater capacity of Bhayangkara Hospital Kendari are 13,950 liters/day, which is equivalent and rounded up to 15 m3/day. The treated wastewater is a type of gray waterwaste originating from various sources of operational activities/rooms at the Bhayangkara Hospital Kendari. The detail can be seen in Table 2. Meanwhile, blackwater and infectious wastewater are from medical washing, hands, and hospital equipment activities, such as wound cleaning. The residual blood contaminated by infectious agents will be accommodated for further cooperation with a third party licensed by the Ministry of Environment and Forestry.[3]

In general, the treatment process for hospital wastewater from health facilities in the form of blackwater, greywater, and clinical, which has been accommodated in a septic tank or bitank, will go inside and flow into the fine screen unit. The fine screen unit aims to separate smaller discrete solids still carried after the pretreatment unit in water so that they are not carried into the processing unit.[3]

The equalization tank temporarily accommodates wastewater to produce homogeneous wastewater characteristics and stable concentrations and stabilizes the discharge that enters the WWTP by regulating the water discharge at the pump. This tank is equipped with a submersible pump engine with an automatic system. After the water level reaches a certain height and touches the sensor, the submersible pump engine will automatically start and then push the wastewater into the sedimentation tank. Sediment, in this case, includes sand, particulate matter, turbidity, and organic matter. The sedimentation tank also functions as a process chemical vessel in the form of neutralization with the addition of chemicals (HCL and NaOH) to maintain the pH as

neutral as possible and the addition of Bio NT1 and Bio NT2 with hydraulic stirring. In the next process, the wastewater enters the biological treatment stage in Bio Filter Tank 1, which will flow through the honeycomb and coral media.[3]

Wastewater enters the media through upflow. The aeration process is carried out by blowing air through a diffuser using two air blowers. Aerobic conditions occur in the aeration reactor, so the organic pollutants that have not decomposed in the anaerobic biofilter reactor will be broken down into carbon dioxide and water. Meanwhile, ammonia or ammonium will be oxidized (nitrification process) and converted to nitrate. In addition, the hydrogen sulfide gas formed due to the anaerobic process will be converted to sulfate by the sulfate bacteria in the aerobic biofilter. This tank is also treated with aerobic bacteria (Microplus) as a catalyst in aerobic processing. Sedimentation tank 2 is used to separate solids or flocs formed due to biological reaction processes in aeration. The deposition process is carried out using a gravity system deposited in the sedimentation tank 3. The principle is the same as sedimentation 1 but the objects deposited are different, in which sedimentation tank 3 is the processed sludge in the aeration tank (sedimentation types 3 and 4). The sludge produced in this process is relatively small. The resulting sludge will be pumped back into the aeration tank to maximize. Bio Filter tank 2 is used to re-occur the anoxic process. After the anoxic process in this tank, the wastewater is planned to be free from oil and organic matter.[3]

The disinfection process is a process to kill viruses and bacteria using ozone. The total coliform bacteria and viruses are expected to decrease simultaneously at this stage. This tank functions for fully oxidized ozone so that the residual ozone is not harmful to the environment and becomes a stabilization pond for organic matter and nutrients. The final tank, the disinfection process, and the preliminary oxidation with ozone are the reservoir for the final processed water, which will be added with the chemical HCl or NaOH if the final pH of the processor is above or below the proper pH. After the wastewater is suitable, the water will flow through the pump to the filtration stage. The filtration process uses a high-pressure pump and a filter tube containing carbon and sand to separate (filter) the impurities (particulates) contained in the water and adsorb organic chemicals so that processed products will be better released into the environment.[3]

Microfiltration is a semi-membrane technology with a pore size of 0.1 µm. At this stage, the water produced has removed a small portion of turbidity bacteria, colloidal particles, and compounds of molecular size or more than 0.1 µm. The series of processes in

the waste management installation above will still leave coliform bacteria, pathogenic bacteria, and viruses that can potentially infect the community and the environment. Therefore, it is necessary to carry out the main disinfection process using Ultra Violet light with water conditions expected to be clear with low turbidity. At this stage, total coliform bacteria are expected to decrease drastically and below the quality standard so that the processed product is safe for disposal into the environment. The presence of a chlorine tank is necessary to handle the disinfection process when electrical problems occur in the ozonation process and Ulta Violet.[3]

5. Conclusion

The management of the wastewater treatment plants at the Bhayangkara Hospital Kendari is in accordance with the quality test standards in the Regulation of the Minister of Environment of the Republic of Indonesia Number 5 of 2014 concerning liquid waste quality standards and has also obtained a permit from the Mayor of Kendari regarding the permit to issue permits for discharging wastewater into water bodies. The management of wastewater treatment plants is also more modern by using anaerobic and aerobic biofilter technology. With the existence of a wastewater treatment plant treatment technology at the Bhayangkara Hospital Kendari, it is hoped that it can maximize the quality of quality liquid waste.

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