Evaluation of Wastewater and Hazardous Waste Management Planning in Hospital X, Jakarta

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Abstract

Environmental permits from hospital activities must meet good solid and liquid waste management. Hospital waste management is closely related to patients' infectious status, so it is dangerous and toxic. One that can be used as a reference is a study of the construction of Hospital X in the Cengkareng area, West Jakarta. The purpose of this study was to evaluate waste management for environmental permits from the activities of Hospital X. This study was conducted using field observation techniques. Wastewater that is treated from an activity produced in health care facilities consists of domestic wastewater, clinical wastewater, laboratory wastewater, etc. The WWTP planning design that several health care facilities have widely used has an aerobic biofilter system that requires oxygen assistance. Therefore, in optimizing the operation and maintenance functions of the wastewater treatment system, it is necessary to have an exceptional understanding from the WWTP operator as the basis for the WWTP treatment planning process. Solid waste from hospital activities is estimated to cause health problems for living things and the risk of environmental pollution. B3 waste can come from medical waste, used batteries and lamps, expired medicines, used ink storage containers, leftover cleaning packages, and others.

Keywords: *hospital, waste, WWTP*

I. INTRODUCTION

An environmental permit is a permit given to every person who carries out a business or activity for which EIA or UKL-UPL is required in the context of environmental protection and management as a prerequisite for obtaining a business and/or activity permit [1]. Infrastructure planning and development activities must be balanced with continuous monitoring. The process of social infrastructure construction, which aims to expand economic development in Indonesia [2], [3], will undoubtedly have several impacts on the environment, such as reducing green open spaces and water catchment areas.

Health services carried out in health facilities include outpatient services, inpatient care, emergency services, medical support services, and non-medical services [4]. One sector that produces hazardous toxic waste is the health sector, namely the hospital, where the hospital is a means of improving health and can also be used as an educational institution for health workers and research. Health services provided by the hospital are in the form of healing activities for patients recovering from physical and mental disabilities. Hospital activities certainly produce various kinds of liquid and solid waste [5]. The process of activities within the hospital can affect the social-cultural environment, and in carrying out these efforts, technology can be expected to have great potential for the environment. Waste generated by hospitals can endanger public health, namely, waste in the form of viruses and germs originating from the Virology and Microbiology Laboratory [6]. There is no antidote, so it isn't easy to detect. Liquid waste and solid waste originating from hospitals are media for spreading disorders or diseases for officers, sufferers, and the community [7]. These disturbances can be air pollution, water pollution, soil, food, and beverage pollution. Such pollution on environmental health can have a significant impact on humans.

Hospitals and other health facilities have an "obligation to care for" the environment and public health and have special responsibilities concerning the waste generated by these installations. The obligations borne by these installations include the commitment to ensure that the handling, processing, and disposal of waste that they carry out will not harm health and the environment. By implementing health care waste management policies, medical facilities and research institutions are getting closer to meeting the goal of creating a healthy and safe environment for their employees and the surrounding community. This study aims to evaluate the management of liquid and solid waste from X Hospital in the Cengkareng area of West Jakarta.

II. METHOD

This research activity was carried out on July 13, 2020 – September 28, 2020, at the X Cengkareng Hospital Infrastructure Development. The address for the practical work location is Daan Mogot, Kalideres, West Jakarta. This research was conducted by direct observation in the field regarding the existing conditions of the construction

project. WWTP and Temporary Storage Place B3 plan following applicable regulations and to guide the contents of practical work reports with agencies. This research has also discussed with contractors regarding price offer letters and WWTP flow diagrams for RS X Cengkareng. In addition, the hospital carries out the WWTP development planning to prevent the negative impacts of liquid waste, such as environmental pollution.

III. RESULT AND DISCUSSION

An increase in the number of health care facilities has increased the potential for environmental pollution. Potential ecological pollution can be caused by waste disposal activities, namely, liquid waste that can cause a decrease in the level of health of living things. To create a healthy, comfortable and sustainable environment, a control effort is needed to prevent or minimize the impact of pollution from an activity in a health care facility [8]. Therefore, health service facilities such as hospitals must establish a wastewater treatment plant unit.

Wastewater that is treated from an activity produced in health care facilities consists of domestic wastewater, clinical wastewater, laboratory wastewater, etc. Although domestic wastewater usually has the largest percentage, the wastewater produced consists of wastewater from bathrooms, kitchens, and water used for laundry. Meanwhile, clinical wastewater comes from blood washing, wound washing, etc. Finally, the residual percentage of wastewater generated consists of sewage contaminated by infectious carriers of a microorganism, blood discharge, discharge from patients suffering from infectious diseases, and others [9].

Health care facilities have wastewater that generally contains high organic pollutants from domestic and clinical wastewater, and the treatment planning can be done biologically [10]. Meanwhile, the liquid waste generated from an activity in the laboratory usually contains a lot of heavy metals that can be a nuisance in the biological treatment process. Therefore, a chemical and physical treatment process is needed in the initial treatment, flowing to the wastewater treatment plant (WWTP).

The WWTP planning design that several health care facilities have widely used has an aerobic biofilter system that requires oxygen assistance. In optimizing the operation and maintenance functions of the wastewater treatment system, it is necessary to have a special understanding from the WWTP operator as the basis for the WWTP treatment planning process. The existence of technical guidelines regarding WWTP planning can be used as a reference in the implementation in the field, such as planning, operation, and maintenance of WWTP. The processing results obtained take place optimally and follow a good WWTP's criteria or requirements.

The domestic waste volume reservoir design at Hospital X is adjusted based on the discharge of wastewater that employees will generate, wastewater from patients, wastewater to maintain the cleanliness of the building, and wastewater from the rest of the watering plants. The daily need for clean water and wastewater is calculated according to the Regulation of the Governor of DKI Jakarta Province Number 122 of 2005. The estimated volume of domestic waste storage is adjusted to the incoming wastewater discharge, which is 600 liters/number of patient beds/day from 80% (eighty percent). The need for clean water usage is 750/liter/number of beds/day for medium-sized hospitals. The location of the WWTP is planned to be next to the building or parking lot so that the treated runoff water can be channeled to the drainage channel on the north side of the building, namely Jalan Melati.

Based on the WWTP Technical Guidelines for Health Service Facilities by the Ministry of Health of the Republic of Indonesia in 2011, Chapter 3, the standard WWTP equipment has been following that proposed by the contractor. The WWTP unit namely primary processing in the form of a collection tank, a fat separator unit, a solid filter unit, and an equalization tank, as well as secondary processing which in the form of an aeration pond with an air supply device, a final settling basin, and a stirring system equipped with a disinfectant compound. The stages of wastewater treatment with an aerobic system are as follows:

1. Wastewater effluent from hospital activities will first enter the collection tank.
2. Wastewater that produces oil and grease from kitchen and canteen activities will enter the grease trap unit with a residence time of between 30 minutes - 60 minutes. There will be a separation process between oil and fat and water by gravity in the fat separator unit. To maintain the continuity of the performance of the WWTP, the separation of the oil and fat content at the beginning serves so that the transfer of oxygen in the aeration tank will not be hampered later. In the early stages of wastewater treatment, a filter is also used to separate solid materials. This unit is useful so as not to cause damage to the equipment when operating, such as blocking pipelines and pumping equipment.
3. The wastewater is then channeled to the equalization tank and will have a residence time of about 6 hours – 10 hours. The equalization tank regulates the wastewater discharge so that the treatment can operate stably.
4. Wastewater in the equalization tank is channeled into the aeration tank using a submersible pump generally used in wastewater flow with a head that is not too high.
5. There are gravel media in the aeration tank, and an air supply device (blower) is used to add oxygen to the wastewater. This is so that microorganisms grow and stick to the surface of the gravel media. The existing microorganisms are used to decompose organic substances and accelerate the nitrification process so that the ammonia contained in wastewater can be removed more easily.

6. Wastewater in the aeration tank is then channeled to the final settling basin. In the unit, the deposition of activated sludge containing a mass of microorganisms will occur. Some of the wastewater will be re-flowed by a mud circulation pump to the inlet of the aeration tank.
7. Overflow from the final settling basin will be channeled directly to the chlorination tank. In the chlorination tank, wastewater will be in contact with disinfectant compounds that aim to kill pathogenic microorganisms.
8. After the chlorination process, the treated water can be directly discharged to the nearest river or public channel. In addition, treated water can also be channeled into biological ponds equipped with carp to find out directly whether the processed water is good or still bad. Of course, an analysis must also be carried out in the laboratory to find out for sure that the treated water has met the quality standards. Processed water from this biological pond can be reused for watering the garden (recycling water).

Hazardous and Toxic waste generation in hospital activities is estimated to cause health problems for living things and the risk of environmental pollution. B3 waste can come from medical waste, used batteries and lamps, expired medicines, used ink storage containers, leftover cleaning packages, and others. Therefore, efforts are being made to handle B3 waste in hospitals by making temporary shelters (Temporary Storage Place) valid for accommodating B3 waste. Previously, the hospital had to obtain a permit to temporarily store B3 waste from the Ministry of Environment and Forestry.

Residual waste from chemicals or pharmaceuticals in liquid form is prohibited from being discharged into the domestic waste treatment pipeline network because it will interfere with biological processes, so the B3 liquid waste must be returned to the distributor who produces the chemicals. Likewise, solvents containing large amounts of chlorine or fluorine, such as halogenide solvents are prohibited from being processed into the incinerator unless the machine is equipped with a gas purifier. In processing B3 waste after temporary storage, the hospital will cooperate with third parties who also have permits to transport and treat B3 waste.

The hospital needs to develop and prepare procedures for handling B3 waste for emergency conditions that may occur, such as natural disasters or fires. Emergency handling procedures may include establishing an emergency unit and the division of labor for each personnel, accompanied by an emergency response mechanism in dealing with B3 waste independently or in combination for each person who has conducted the training. The hospital must also identify emergency-prone routes to determine safe distances, gathering points, and evacuation routes. The hospital needs to prepare a light fire extinguisher and an emergency telephone number at each post [11]. In addition, it is necessary to plan the layout of danger signs that are easily accessible, with the aim that emergency information can be quickly spread to the general public around the location.

Construction of Temporary Storage Places (Temporary Storage Place) for B3 waste is built following applicable regulations. It may refer to the Regulation of the Minister of Environment and Forestry of the Republic of Indonesia Number P.12/MENLHK/SETJEN/PLB.3/5/2020 [12] and Regulation of the Minister of Health of the Republic of Indonesia Number 7 2019 concerning Hospital Environmental Health in the implementation of B3 waste security [13].

The hospital needs to provide B3 waste handling facilities with a B3 waste storage container near the source location. Tools used to transport B3 waste from the source to a Temporary Storage Place (Temporary Storage Place), provide a temporary storage building for B3 waste, and machines to treat waste. B3 is like an incinerator. In article 7 paragraph (1) P.12/MENLHK/SETJEN/PLB.3/5/2020, the requirements for the location of a temporary storage place for B3 waste include [12]:

a. Free flood; and
b. Not prone to natural disasters.

Article 11 paragraph (2) P.12/MENLHK/SETJEN/PLB.3/5/2020 B3 waste storage facilities in the form of buildings must meet the following requirements [12]:

a. Design and build based on the type, characteristics, and amount of hazardous waste stored;
b. The area of the storage space is following the amount of B3 waste stored;
c. Design and construction capable of protecting hazardous waste from rain and sunlight;
d. The roof of non-combustible materials;
e. Has a ventilation system for air circulation;
f. The lighting system is adjusted to the design of the hazardous waste storage area;
g. The floor is waterproof and not corrugated;
h. The inner floor is made sloping down towards the spill reservoir with a maximum slope of 1% (one percent);
i. The outer floor of the building is made so that rainwater does not enter the building where the hazardous waste is stored;
j. Have drainage channels for spills, spills of B3 Waste and/or water resulting from cleaning up spills or spills of B3 waste;

k. Have a spill receptacle to accommodate spills, spills of B3 Waste and/or water resulting from cleaning up spills or spills of B3 waste; and
l. It is equipped with the B3 Waste symbol following the provisions of the legislation.

The building in the Temporary Storage Place needs to be divided into several rooms for the storage of B3 waste, which has an infectious nature, a B3 waste room that does not have an infectious nature with a liquid phase and B3 waste that does not have an infectious nature with a solid phase. The distance for placing B3 waste between containers is about 50 cm. Liquid B3 waste is placed in a leak-proof container accompanied by an anti-seepage base, also equipped with drains and embankments to accommodate spills in the event of a leak. Meanwhile, solid B3 waste is placed in a strong, waterproof container, non-corrosive, easy to clean, and covered with a wooden or plastic stand [13].

Hospital Temporary Storage Place buildings need to be equipped with security systems such as installing a safety fence and locking the temporary storage place door with a padlock [14]. In addition, on the outside and inside of the building, emergency telephone numbers can be affixed, such as the number of the related hospital security office, the number of the fire department, and the number of the nearest police station for handling potential hazards. The outside of the Temporary Storage Place also needs to be equipped with a sign that reads a temporary storage place for B3 waste [15]. The coordinates of the Temporary Storage Place location, a sign prohibiting entry for unauthorized persons, and a B3 symbol according to the characteristics of the waste. In addition, Temporary Storage Place needs to be equipped with Standard Operating Procedures (SOP) for handling B3 waste and SOPs for emergency conditions and recording documents such as logbooks [16].

CONCLUSION

The hospital carries out Environmental Protection and Management Planning (PPLH) as an obligation to complete administration and proof of compliance with applicable laws. The environmental planning carried out is planning the design of the Wastewater Treatment Plant (WWTP) facility, which refers to the WWTP Technical Guidelines by the Ministry of Health of the Republic of Indonesia in 2011. The Temporary Storage Place for Hazardous and Toxic Material (B3) waste includes containers, packaging, and labels.

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