The Study of Liquid Waste Management in the Marine Product Processing Industry (Case Study of PT Bumi Menara Internusa Lamongan)

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Abstrak. Lamongan regency has direct lines physical boundaries with coastal lines with potential sea waters and pond waters. The fishing industry is one of the fastest-growing industries in Lamongan District. Rapidly growing industrial activities cause environmental pollution caused by industrial waste disposal. This research aims to find out the process of liquid waste treatment processed through WWTP (Wastewater Treatment Plant) and analyze the quality standards of wastewater treatment plant effluent. Data collection techniques are conducted through interviews, observations, and documentation. PT Bumi Menara Internusa Lamongan has a conventional Suspended Solid Wastewaters Installation System which is aerobic decomposition that oxidizes organic materials into CO2, H2O, and NH4. Standard Wastewaters Quality Standard PT. Bumi Menara Internusa Lamongan refers to The Governor of East Java Regulation No. 72 of 2013 concerning Wastewater's quality standards for the industry and /or Other Business Activities. Liquid waste treatment process through stages (1) Screener (filtration stage), (2) Equalization (decomposition stage), (3) Stabilization (Stabilization stage), (4) Clarifier (separation process between microorganisms and water treatment), and (5) evaluation (liquid waste worth exhausts or not). The results of the quality check effluent Wastewater Treatment Plant found no deviations in the results of effluent that exceeded the quality standards. Liquid waste that has been processed allows it to be used to water plants.

Key words: liquid waste, industry; management.

How to Cite: Nafisah, D., Setyowati, D. L., Banowati, E., Priyanto, A. S. (2021). The Study of Liquid Waste Management in the Marine Product Processing Industry (Case Study of PT Bumi Menara Internusa Lamongan). *ISET: International Conference on Science, Education and Technology, 7*(1), 114-120.

INTRODUCTION

Indonesia is one of the countries rich in marine products. The production of Indonesian marine catches used in the traditional processed form is 30.19%, the wet form is 57.05%, the modern processed form is 10.90%, and other processed forms are 1.86%. The export volume of fresh crab meat in frozen form is quite high (Oktavia et al., 2012). One of them is the Lamongan Regency area which has a direct physical area with the coastline, which is a potentially reliable location in the regional economy in terms of developing fish cultivation and income in the marine fisheries sector. In addition to the potential of marine waters, there are several areas of Lamongan Regency that have the potential of pond waters, with the mainstay potential in the form of milkfish and shrimp production. The development of the marine fisheries sector is faster than the land fisheries sector because it is supported by the development of marine product processing industry activities (Tri Setyo Wibowo, Purwanto, 2013).

Lamongan Regency is one of the regencies designated as a Special Economic Zone (SEZ) in the maritime industry (Mahaputra & Santoso, 2018). Currently, the most productive industry in Lamongan Regency is PT Bumi Menara Internusa Lamongan. PT. Bumi Menara Internusa Lamongan as stated in the Business Permit Number 3/35/IU/PMDN/2016 dated February 3, 2016, issued by the Integrated Licensing Service Unit for the Investment Board of East Java Province is the Freezing Industry of Other Aquatic Biota for export needs which have entered the stage of which officially operated in January 2016. Freezing is a method of processing fishery products to preserve food based on inhibiting the growth of microorganisms, restraining the activity of enzymes and chemical reactions (Putra, 2018). Production capacity of PT. Bumi Menara Internusa Lamongan includes frozen raw prawns (4,800 tons/year), frozen cooked shrimp (4,800 tons/year), frozen flour shrimp (2,400 tons/year), frozen crabs (4,800 tons/year), pasteurized crabs (4,800 tons) /year) and frozen fish (4,800 tons/year). Purwanto, 2013).

The marine and maritime product processing industry has become one of the leading industries that drive job creation and poverty reduction, which has been a priority for the government since 2005. Marine is a sub-sector that needs to be developed because it can increase the country's

foreign exchange and absorb labor (Hudaningsi et al., 2015). However, there is public unrest due to environmental pollution due to industrial waste that is not managed properly. This anxiety will increase if the handling of the problem is not finished even though various mitigation projects have cost billions of rupiah (Setiyono & Yudo, 2018).

In 2018 PT. Bumi Menara Internusa Lamongan emits an unpleasant odor around the factory area. Drivers who pass through the factory area and residents, especially the Rejosari Village Community, are very complaining about this condition because it has an impact on the environment, including air, water, and pungent odors (Fatma Wati, 2019). The results of an interview with the Environment Agency of Lamongan Regency that there was an error in biological processing with many dead bacteria eventually resulted in air pollution, namely a very pungent odor. Meanwhile, the results of interviews with the people of Rejosari Village stated that the unpleasant odor came from improper sewage treatment and there was a leak in the waste boundary foundation so that the waste in the shelter polluted the river. The marine product processing industry has a negative impact, namely disturbance to the surrounding environment, especially when the waste is not managed properly. Although there is already a Waste Water Treatment Plant (WWTP) but it has not been used optimally due to a lack of awareness of waste management from the fisheries industry and requires expensive costs.

Water pollution occurs due to the presence of other elements or substances that enter the water, resulting in a decrease in water quality (Della Pavita, K., Widiatmono, B. R., & Dewi, 2014). The current environmental problem is that liquid waste comes from industry. Nature can neutralize pollution if the amount is small, but if the amount of pollution is large it will have a negative impact in the form of changes in environmental balance. This can be prevented through the treatment of liquid waste produced by the industry before being discharged into the river (Patria & Hatmanto, 2006).

PT. Bumi Menara Internusa Lamongan already has a Conventional Suspended Solid Wastewater Installation (WWTP) system which is basically aerobic decomposition that oxidizes organic matter into CO2, H2O, and NH4. These efforts are expected to reduce the burden of environmental pollution and industrial wastewater quality standards according to East Java Governor Regulation No. 72 of 2013. The main purpose of wastewater treatment is to reduce particles, BOD, and microorganism waste so that liquid waste can meet the requirements to be discharged into rivers so that river pollution does not occur. The purpose of the study was to determine the process of treating liquid waste through WWTP (Wastewater Treatment Plant) and to analyze the quality standards of the Wastewater Treatment Plant.

LITERATURE REVIEW

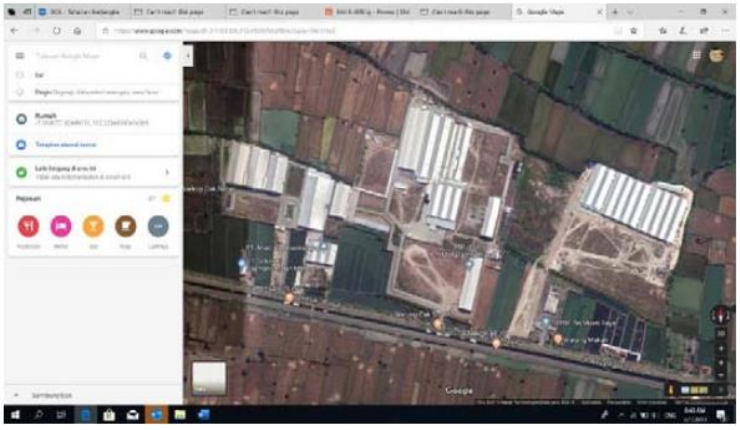
The concept of waste management is the act of minimizing waste or efforts to prevent waste from spreading to the environment to a minimum. The first time the management effort is to minimize waste by reducing it at the source and followed by the utilization of waste both inside the factory (on-site) and outside the factory (off-site). Reduction of waste at the source is an effort to reduce the concentration, volume, toxicity, and the level of danger of waste that will spread to the environment, preventively directly at the pollutant source. Waste utilization is an effort to reduce concentration, volume, toxicity, and the level of danger that spreads in the environment, by utilizing it through reuse, recycling, and recovery (Fitriyanti, 2015). Many terms used in waste management efforts include waste minimization, waste reduction, reduction at the source, and pollution prevention. Waste minimization according to the US-EPA (the United States Environmental Protection Agency) is an effort to reduce the burden of various waste processing, storage, or disposal facilities by reducing the amount or toxicity (Panggabean, 2000). Liquid waste before being discharged into the river must be processed first to prevent environmental pollution both to water sources, aquatic biota, public health, and other damage caused by liquid waste.

There are two types of wastewater treatment, namely curative and preventive efforts. Curative efforts are wastewater treatment, in general, depending on the type of pollution including biological, physical, chemical, or a combination. The degree of treatment desired depends on the state of the wastewater being discharged and depending on the receiving water body (Kristanto, 2004). Pollution occurs because the discharged wastewater contains substances, energy, living things, or other components that make the environment unable to function according to its designation. Liquid waste generated by industrial activities must be

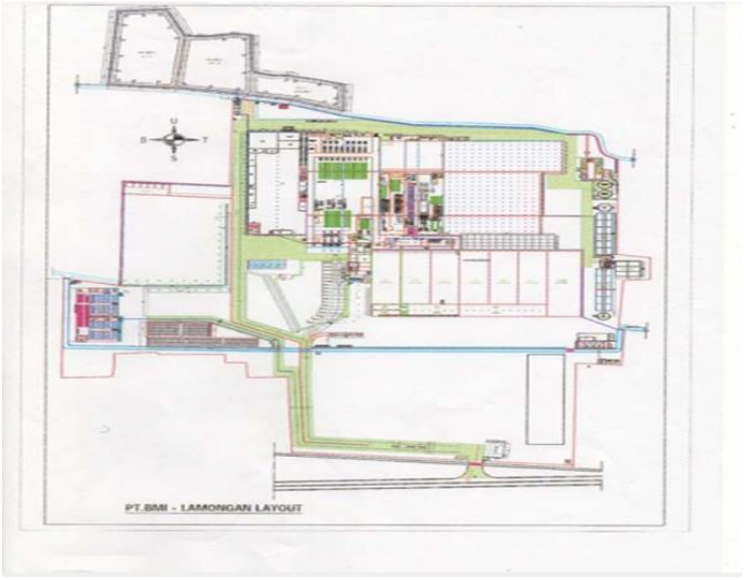
processed first with the right technology. The function of wastewater treatment is to prevent environmental pollution. Things that need to be considered in choosing the appropriate liquid waste treatment technology include land use data, data on environmental conditions of receiving water bodies, data on quantity and quality of liquid waste, and information on regulations for liquid waste disposal. The appropriate effluent treatment method depends on the content of the pollutant material, its properties, and the ultimate goal of treatment. It also depends on the available costs and wastewater quality standards. A biological treatment unit is a type of wastewater treatment that uses biological activity in reducing polluting elements contained in liquid waste or reducing organic matter that is easily decomposed in dissolved or colloidal form. A physical treatment unit is a waste treatment process using physical mechanisms, namely screening, filtration, flotation, and gas transfer. A chemical treatment unit is a type of wastewater treatment that uses chemical reactions or the addition of chemicals to reduce pollutant elements contained in wastewater (Cheremisinoff, 1996).

METHOD

This research was conducted at PT. Bumi Menara Internusa Lamongan is located on Jalan Raya Surabaya-Lamongan, Dusun Gajah, Rejosari Village. Deket District, Lamongan Regency, with coordinates 70 07'11.07" S and 112027'28.12"T. The location is bordered by the north (river), east (PT. Cahaya Bintang Olympic), south (Jalan Raya Surabaya-Lamongan, East Java), and west (PT. Wira Inti Nurmala). The location map of PT Bumi Menara Internusa Lamongan can be seen in Figure 1, while the layout can be seen in Figure 2.



Picture 1. Maps of PT. Bumi Menara Internusa Lamongan



Picture 2. Layout of PT. Bumi Menara Internusa Lamongan

The research method used is qualitative. Primary data collection is done by conducting interviews and observations. The results of interviews and observations were made in the form of field notes. Secondary data collection is done by documentation and conducting literature studies. Data analysis was carried out descriptively on primary and secondary data. The description focuses on the wastewater treatment process and finds efforts to improve it.

RESULT AND DISCUSSION

Liquid Waste Treatment Process

PT. Bumi Menara Internusa Lamongan as stated in the Business Permit Number 3/35/IU/PMDN/2016 dated February 3, 2016, issued by the Integrated Licensing Service Unit for the Investment Board of East Java Province is the Freezing Industry of Other Aquatic Biota for export needs which have entered the stage of operations which officially started operating in January 2016. In general, the stages of activities in the production process include 1) Weighing of materials; 2) Receipt of raw materials from suppliers; 3) Preparation of raw materials in the production room for rinsing; 4) Cutting head is done manually; 5) Classification/grouping of materials based on size which is carried out using machines; 6) Packaging with added shaved ice and then put into the refrigerator until frozen at -18º C; 7) Put in a container to be sent to the destination. The production capacity of PT Bumi Menara Internusa Lamongan is 12000 tons of shrimp per year. The operational activities carried out by this factory will have an impact on the source of the production process activities. Waste generated from fish processing consists of two types, namely solid waste and liquid waste (Desi Wulansari, 2019). The waste generated by PT Bumi Menara Internusa Lamongan consists of solid waste in the form of domestic solid waste, production process waste, and B3 solid waste. This production solid waste has been collected, packaged which is then handed over to a third party every day. Management of solid waste in the form of remaining pieces of skin and shrimp heads purchased by a third party.

The liquid waste produced by PT Bumi Menara Internusa Lamongan comes from washing raw materials, pasteurization processes, and the remnants of the processing process. Liquid waste is often found in industries that use water in the production process, starting from pre-management of raw materials to the end of production (Ginting, 2018). Calculation of water use at PT. Bumi Menara Internusa Lamongan is described according to water needs at the operational stage, which is estimated at an average of 1000 liters/day if the production process runs normally. Besides, in supporting the need for clean water, PT. Bumi Menara Internusa Lamongan treats wastewater that has been treated through WWTP (Wastewater Treatment Plant) using RO (Reverse Osmosis) technology in collaboration with third parties. This liquid waste will go through several processing processes in the WWTP (Wastewater Treatment Plant) unit before being discharged into the receiving water body.

PT. Bumi Menara Internusa Lamongan already has a Conventional Suspended Solid Wastewater Installation (WWTP) system which is aerobic decomposition that oxidizes organic material into CO2, H2O, and NH4. The main WWTP has expanded as shown in Figure 3. The expansion includes 1) Contact and stabilization to 1577 m3; 2) Clarifier to 1577 m3; The slurry drying basin becomes 522.5 m3.

Picture 3. Waterwasted Treatment Plant as a whole

PT. Bumi Menara Internusa Lamongan is as follows: 1) Liquid waste enters the Screener Tub for the stage of filtering liquid waste from the production process. The initial stage of wastewater treatment is defined as the removal of elements in large-sized liquid waste that can disrupt operations or maintenance (Indrayani, 2018). Liquid waste originating from all divisions is channeled to the first liquid waste reservoir. Next, it is pumped to the second reservoir. In the continuous transfer process, the liquid waste passes through a filter before moving to a second tank. The screener serves to reduce the number of solids measuring > 1.5 mm (Daniel, 2014). 2) Liquid waste enters the processing of the Equalization Tank, in this process decomposition occurs in liquid waste with a holding capacity of 1300 m3. Equalization aims to homogenize liquid waste so that there is no deposition and accommodate liquid waste. This process is carried out by pumping to the next pond to maintain the volume of supply that enters the treatment process before it comes into contact with the activated sludge system; 3. Liquid waste enters the Stabilization Tank in this process the liquid waste is stabilized so that microorganisms can be rested with a capacity of 3600 m3; 4) Liquid waste enters the Clarifier for the stirring stage of the liquid waste and a separation process occurs between microorganisms and treated water with a capacity of 580 m3; 5) Liquid waste enters the fish pond where the fish pond is an indicator of whether or not liquid waste is worth throwing into the river.

Effluent Quality Standard for Wastewater Treatment Plant

PT. Bumi Menara Internusa Lamongan checks the quality of wastewater that is released into water bodies every month. The results of checking the quality standards of the effluent of the Wastewater Treatment Plant are in table 1. The quality of the Wastewater generated as a result of the activity is strived to always meet the quality standards through wastewater treatment at the Wastewater Treatment Plant.

Table 1. Effluent Standard Quality for Wastewater Treatment Plants

Content		January	February	March	April	May	June	Standard Quality
pH	Actual	8.36	6.75	6.66	7.07	7.04	7.16	6 – 9
	Standart	6 – 9	6 – 9	6 – 9	6 – 9	6 – 9	6 – 9	6 – 9
BOD_5	Actual	3.81	8.7	9.65	6.33	8.11	7.65	100
	Standart	100	100	100	100	100	100	100
COD	Actual	28.00	40.92	33.91	31.84	40.56	32.67	200
	Standart	200	200	200	200	200	200	200
TSS	Actual	<2.38	6.0	<2.38	53.50	19.0	15.0	100
	Standart	100	100	100	100	100	100	100
Amonia (NH3-N)	Actual	0.5042	0.6925	0.9167	2.164	0.7762	0.6720	10
	Standart	10	10	10	10	10	10	10
Oils/Fats	Actual	<1.15	1.5	1.25	1.25	1.25	1.25	15
	Standart	15	15	15	15	15	15	15
Free Chlorine	Actual	0.2	0.18	0.19	0.16	0.14	0.11	1
	Standart	1	1	1	1	1	1	1

From the evaluation results, it can be seen that the liquid waste of PT. Bumi Menara Internusa Lamongan meets the quality standards according to East Java Governor Regulation No. 72 of 2013 concerning Wastewater quality standards for the industry and/or other business activities. The meaning of sewage treatment is technical efforts to remove organic materials dissolved in wastewater or reduce it to a limit that is not harmful to health (Rolia & Amran, 2015). Wastewater that is disposed of without going through a waste treatment process will disturb the surrounding community. The wastewater seeps into the ground contaminating the water sources in it, including water bodies such as rivers.

After checking the liquid waste by the factory, the next step is to make a report and send it to the Lamongan Regency Environmental Service. In 2021 the report will be sent via the SILILA (Lamongan Environmental Information System) application. From the results of the wastewater quality tests carried out, Bumi Menara Internusa Lamongan is a company that has carried out waste treatment properly. From the data reported,

the level of water pollution is very low and meets the quality standards set by government regulations, namely East Java Governor Regulation No. 72 of 2013 concerning Wastewater quality standards for the industry and/or other business activities. The industry is required to manage liquid waste because liquid waste contains various hazardous materials that can be categorized as heavy metals or hazardous and toxic materials (B3) that have the potential to reduce environmental quality (Cahyono, H. B., & Yuliastuti, 2016)

CONCLUSION

Waste generated by PT. Bumi Menara Internusa Lamongan one of which is a liquid waste. The liquid waste is processed in the Conventional Suspended Solid Wastewater Treatment Plant (WWTP), which is basically an aerobic decomposition that oxidizes organic material into CO2, H2O, and NH4. The waste treatment process at PT. Bumi Menara Internusa Lamongan goes through several stages, namely 1) Liquid waste enters the Screener Tub; 2) Liquid waste enters the Equalization Tank processing; 3) Liquid waste enters the Stabilization Tank; 4) Liquid waste enters the Clarifier; 5) Liquid waste enters fish ponds to determine whether the liquid waste is suitable for disposal into river bodies or not. Wastewater treatment aims to accelerate the process of purifying wastewater and reducing the concentration of toxic compounds contained in wastewater so that it is safe to be discharged into receiving water bodies and meets Environmental Quality Standards. In the implementation of checking the effluent quality standard of the Wastewater Treatment Plant, there were no deviations from the effluent results that exceeded the quality standard as found in the previous report. So that the liquid waste that has been treated and if possible, can be used for watering plants.

ACKNOWLEDGMENTS

Conveyed to the Directorate of Research and Community Service (DRPM) of Higher Education for funding this research. This research is part of the Doctoral Dissertation Research with the contract number 132/E4.1/AK.04.PT/2021 dated July 14, 2021.

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