



Wastewater Treatment in PT. Solusi Bangun Andalas

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Abstract

One way to improve the quality of wastewater and preserve the living environment is to use WWTP. WWTP is the final wastewater disposal and treatment facility. Pre-treatment, primary treatment, secondary treatment, and tertiary treatment are several stages of the wastewater treatment process. Wastewater treatment can reduce the levels of organic substances, nutrients, and harmful substances in wastewater, as demonstrated by liquid waste characterization values such as pH, TDS, TSS, BOD, and COD. As a result, WWTP can be used in a variety of industries. Wastewater management meets environmental standards set by government regulations. Wastewater treatment with WWTP can improve the quality of wastewater before discharging it into the environment and reduce waste pollution.

Keywords: Waste Water, PT SBA

1. Introduction

Wastewater, also called wastewater, is wastewater that is disposed of from households, industries, or other public places. In general, wastewater contains substances that may be harmful to human health and the environment [1]. Therefore, it is essential to manage industrial waste professionally.

Under the Republic of Indonesia Act No. 32 of 2009 on the Protection and Management of the Environment, all and organizations must be responsible for managing the waste generated by their operations. Wastewater treatment in industrial areas is carried out with the objective of reducing the level of pollution of wastewater so that the rate of drainage can meet the quality standards permitted by the government [2].

The wastewater Treatment Plant (WWTP) is a facility designed to clean waste water before it is re-used in the environment or for other purposes. It is one of the most effective ways to treat waste water and is an important process that ensures the protection of the environment and public health [3]. WWTP wastewater treatment uses physical, chemical, and biological processes to remove contaminants from wastewater. It produces water that meets pre-established quality standards. Wastewater characteristics vary depending on the source and exposed activity. Therefore, understanding the characteristics of wastewater is essential for the design and effective operation of WWTP[4].

To remove various types of contaminants from wastewater, WWTPs usually consist of several processes that work together. To remove solid and large residues from wastewater, the primary treatment process uses physical separation techniques such as sedimentation and filtration. Furthermore, secondary treatment uses biological processes to break down organic material and remove nutrients from it. Finally, wastewater is treated through a disinfection process to kill the remaining pathogens before being disposed of or reused.

The use of the Water Waste Treatment Protocol (WWTP) for wastewater treatment has several advantages. First, it protects our water resources by removing contaminants and pollutants from wastewater before being thrown into rivers, lakes, or oceans. Second, it prevents the spread of diseases that are transmitted through water by eliminating pathogens from waste water. In addition, WWTP can also recover energy and nutrients, valuable resources of wastewater, through technology.[5].

One of the projects of PT Andalas Building Solutions (SBA) is the Wastewater Treating Facility (WWTP). WWTP at PT SBA is the waste water treatment infrastructure aimed at reducing the amount of pollution present in waste water.

In this study, we will discuss the process of wastewater treatment with WWTP at PT SBA. This process uses a combination of physical, chemical, and biological processes to remove contamination from wastewater so that the water produced meets the quality standards that have been set before. The main objective of this research is to reduce the level of liquid waste in the industry PT SBA. With the treatment of waste water by WWTP, PT SBA can ensure that it meets previously established quality standards [6].

The best methodology will be used in this research to realize a green strategy and business profit consistent with PT. SBA. This research will also be the basis for the development and testing of efficient and environmentally friendly waste treatment technologies. It will also help reduce environmental pollution and improve public health.

2. Materials and Methods

2.1 Materials

The materials used in this study are liquid waste derived from PT. SBA.

2.2 Methods

Methods used in liquid waste treatment by PT. SBA include several stages of WWTP process units. The process units covered in the WWTP Installation Disc consist of:

2.2.1 Sedimentation tanks

The sewage will be gathered in the sedimentation tank, and the suspended solid will settle at the bottom of the sedimentation tank. (sludge).

2.2.2 Automatic Disc Filter

The drainage water from the sedimentation tank enters the processing unit through a 50-micron and 5-micron porous microfilter to separate the TSS. The backwash process of the microfilters is carried out automatically after a pressure difference of 1 bar between the input pressure and the output pressure of the filter.

- a. Disc filters have two phases of operation, the filtration phase and the backflushing phase. When the filter phase of the water enters through the manifold intake pipes and the valve of the backrush on the microfilter is in closed condition. The backrusching phase occurs automatically when there is a difference in pressure at the time of filtration between the inlet and the outlet of the microfilter.
- b. At the time of the backflushing phase, 3-way valves will close the filter inlet, and the auxilliary tank valve will open so that the water in the auxiliary tank will enter through the filter outlet and exit through the drainage pipe.
- c. The disc filter system uses the air-assisted system during the backwash process with the compressor facility.



Figure 1. Automatic disc filter

2.2.3 Wire Working Mechanisms

- a. Wastewater is rainwater contaminated with solid coal particles that have passed the coal trap into the IPAL inlet, i.e, the channel to the sedimentation tank 01 (run off wastewater tank 1 (TK-01) and the sedimentation tank 02 (run off waste water tank 2). (TK- 02). Where TSS levels in the wastewater are still high (TSS > 200 ppm). Based on studies that have been carried out in the Front End Engineering Design (FEED) report, suspended solid

- substances will settle into the basin after about 2 hours of rain lasts and the remaining TSS levels in the water decrease by 10%, in other words, TSS values are at a rate less than 200 ppm.
- b. Then, the waste water in the sedimentation ponds (TK 01 and TK 02) is pumped by a feed pump of 21 m³/h toward the pH adjustment equipment that functions to adjust the pH with the addition of NaOH, so that the pH value reaches 6.9, where there are pH sensors and turbidity sensors that help in the process at this stage.
 - c. Then, the waste water that has met the pH value goes into the Automatic Disc Filter 1 (F-01) of 50 microns. The filtration process at this stage can reduce TSS levels from 200 ppm to 100 ppm. As much as 3% of the water that has been filtered is used for the backwash process to clean the filter and from particles that can block the filter, then this water is returned to the sedimentation pool.
 - d. The next stage was the water that has been filtered by F-01 flows towards the advanced filter Automatic Disc Filter 2 (F-02) of 5 microns. This second phase of filtration can reduce TSS levels to 20-30 ppm, so the TSS value in water is ≤ 80 ppm. The same was true of the previous process, where a total of 3% of filtered water is used for backwashing automatically for filter cleaning.
 - e. The water from the F-02 filtering process will be inserted and re-filtered by the filter media (AFM/F-03). This process will produce treatment water with a TSS level of ≤ 10 ppm. This processed water then becomes an effluent, where the effluent will be used for roadside irrigation in the factory area.

3. Results and Discussion

Wastewater treatment studies using wastewater treatment plants (WWTP) aim to reduce the amount of pollutants in wastewater. The quality of wastewater from WWTP inlets and outlets is measured in this study, conducted at PT. SBA. The results of the third-party analysis, Standardization and Service Room (BSPJI) Industry Banda Aceh, explain the parameters of WWTP inlet and outlet waste water. These parameters are compared with the port quality standards, which are established according to Government Regulations RI No. 22 of 2021 on Maintenance, Protection, and Management of the Environment and are categorized as seawater.

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The measured wastewater quality parameters include pH, soluble solids (TDS), suspension residues (TSS), BOD, and COD. The study also uses prototypes to monitor and control WWTP on Internet of Things-based output channels. This is done by measuring wastewater parameters using an internet of things-based pump output control system.

Table 1. Wastewater quality parameters in WWTP

Water Parameters	Test Methods	Condition 1	Condition 2	Average
pH	SNI.6989.11.2019	7.70	7.52	7.61
TDS (mg/L)	IK.5.04.01.78 (Conductometry)	152.55	186.3	169.43
TSS (mg/L)	SNI.6989.3.2019	17.60	53.40	35.50
BOD (mg/L)	SNI.6989.72.2019	3.19	2.76	2.98
COD (mg/L)	IK.5.04.01.40 (Titimetry)	51.20	35.20	43.20

Table 2. Wastewater quality parameters out put WWTP

Water Parameters	Test Methods	Condition 1	Condition 2	Average
pH	SNI.6989.11.2019	7.71	7.44	7.58
TDS (mg/L)	IK.5.04.01.78 (Conductometry)	144.90	182.90	163.90
TSS (mg/L)	SNI.6989.3.2019	17.40	53.20	35.30
BOD (mg/L)	SNI.6989.72.2019	3.09	2.00	2.54
COD (mg/L)	IK.5.04.01.40 (Titimetry)	33.60	12.80	23.20

According to data from Table 1 and Table 2, wastewater treatment with WWTP can help reduce waste pollution values, which affect human health and the environment. Waste management must comply with environmental standards established by law [8].

3.1 pH

The pH has a significant influence on the industrial WWTP process, because, in the PT. SBA industry, the pH is the parameter that determines the performance of an ideal wastewater treatment process.

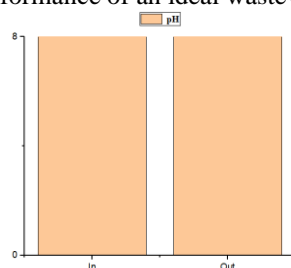


Figure. 2. Nilai pH in out of WWTP

The pH value in the WWTP process has no significant influence, according to the data collected. The pH values before (in) and after (out) on WWTP show this, describing the state of industrial processes in PT SBA. A good pH value, based on seawater quality standards 7-8.5, was found during WWTP processes at 7.61 and 7.58, which indicates that the pH meets the established standard seawater quality standards. Corrosion, which can definitely interfere with the existing marine biosphere, can be caused by low pH. [9].

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3.2 Total Dissolved Solids (TDS)

TDS is the amount of solid solids dissolved in water, including organic and inorganic materials, and can pollute the environment and harm human health, so waste must be handled.

According to the seawater quality standards for TDS, this study produces TDS values. The permissible TDS level for drinking water is 500 mg/L.[10]. Figure 3 below shows the results of the liquid waste process of PT. SBA in WWTP. TDS values after and before the process according to seawater quality standards.

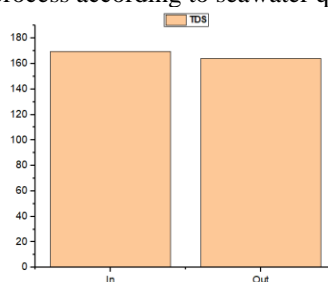


Figure. 3. WWTP in and out TDS values

Before the waste is treated, testing and quality control of the waste are required to control the liquid waste TDS value of PT. SBA. Liquid waste that is not properly managed and is only thrown into wells or marine bodies will pollute the environment. The WWTP process can lower the liquid waste TDS value in the SBA PT from 169.43 mg/L to 163.90 mg/L, as shown in Figure 2 above. This shows that the WWTP procedure has the ability to lower the TDS of liquid waste.

3.3 Total Dissolved Solids (TSS)

The value of total suspended solids (TSS) in liquid waste in the cement industry is crucial to determining the quality of the waste produced. The amount of solute solids dissolved in water (including organic and inorganic materials), known as high TSS, can pollute the environment and harm public health, so waste management is necessary.

As this research on the cement industry shows, liquid waste treatment can produce products that meet certain specifications. Liquid waste treatment results are very different from the raw quality limits. Despite the low TSS values, the wastewater treatment processes performed are very effective in reducing TSS levels in the liquid waste of the cement industry, as shown in Figure 4 below.

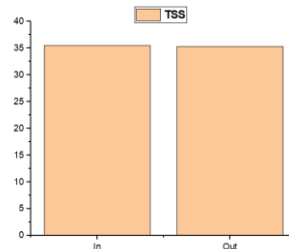


Figure. 4. WWTP in and out TSS values

There may be small differences based on the TSS values generated during the WWTP process. This indicates that the liquid waste from the PT.SBA cement industry is still safe and is below the 80 mg/L raw quality of seawater, with an the inlet TSS value of 35.5 mg /L and an outlet value of 35.3 mg/ L. This state suggests that the quality of seawater around PT.The SBA is heavily dependent on the water quality of its source, so it requires parameters that can be used as a standard for measuring water quality, as was done during WWTP.

3.4 Biochemical Oxygen Demand (BOD)

Research on liquid waste management in the cement industry suggests that liquid waste treatment in the semen industry can produce products that meet certain specifications. BOD is a parameter that measures how strong water is to reduce the concentration of dissolved organic compounds in water. As shown in Figure 5 below, the result of liquid waste treatment is very small compared to the default limit.

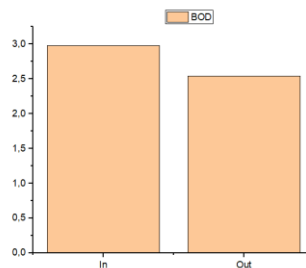


Figure. 5. WWTP in and out BOD values

The BOD values before and after the process in WWTP show a significant difference in results, as shown in Figure 5. This indicates that the WWTP process can decrease the BOD value. Therefore, the WTTP process must control the BOT values on industrial liquid waste in the PT.SBA and must test and control the quality of the waste before discharging it into the sea around the SBA. The effect of the WWTP process on seawater at the industrial level is pollution of seawater, which does not interfere with the balance of the marine water ecosystem. The BOT levels resulting from this process must also be controlled before discharge [5].

3.4 Chemical Oxygen Demand (COD)

The pollution of the surrounding seawater can be caused by the level of COD (Chemical Oxygen Demand) in the liquid waste of the cement industry. COD is a measure of how strong water is to reduce the amount of organic compounds dissolved in water. According to research conducted in the PT.SBA industry, liquid waste treatment can produce a qualifying product, as shown in Figure 6 below.

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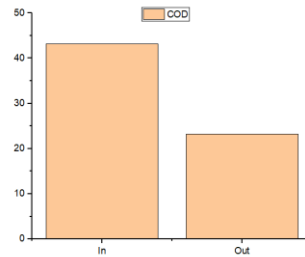


Figure . 6. WWTP in and out COD values

The results of the liquid waste treatment at SBA using the WWTP process show a big difference between the one and the other WWTP. This shows that the wastewater treatment process performed very well reduces the level of COD on industrial liquid waste in SBA, so that liquid waste is safely disposed of into the surrounding marine waters. Low COD levels indicate low levels of pollution and inhibit the penetration of light into the water.

4. Conclusion

WWTP focuses on lowering the pH, TSD, TSS, BOD, and COD of the adhesive water and producing effective result change, WWTP installation is a very appropriate decision. This is demonstrated by a value that shows the ratio of wastewater before and after WWTP. A decrease in the value of each characterization is the expected result of the installation of IPAL. WWTP is very effective in reducing this value.

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