

Parameter Analysis of COD and BOD Liquid Waste at Sidoarjo Steel Company 2022

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ABSTRACT

Waste is material or substance originating from a production process, both industrial and domestic. Steel companies in Sidoarjo monitor their domestic waste referring to the Regulation of the Minister of Environment and Forestry of the Republic of Indonesia number P.68/Menlhk/Setjen/Kum.1/8/2016 concerning Domestic Wastewater Quality Standards. This study aims to analyze the COD and BOD parameters resulting from the processing of domestic waste from a steel company in Sidoarjo. This research is a non-reactive research, presenting information with secondary data sources from monitoring the quality of domestic wastewater and presented in a narrative descriptive manner. Sampling of wastewater at primary treatment outlets at 5 points, every month in 2022. COD and BOD analysis is carried out in the laboratory with procedures according to SNI. The results of monitoring the COD parameter tended to fluctuate and did not exceed the established quality standards, the same for the BOD parameter. It was concluded that the quality of the steel company's domestic waste for COD and BOD parameters met the applicable environmental quality standards.

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1. INTRODUCTION

Waste is unwanted material or substance originating from a production process, both industrial and domestic (Arief, 2016). Industrial waste can be in the form of solid waste, gas, hazardous and toxic materials (B3) and liquid. Water quality is the result of measurement and testing of several parameters that have been determined by methods that have been determined based on applicable laws and regulations. A steel company in Sidoarjo conducts routine tests on its domestic wastewater, referring to the Regulation of the Minister of Environment and Forestry of the Republic of Indonesia no. P.68/Menlhk/Setjen/Kum.1/8/2016 concerning Domestic Wastewater Quality Standards.

Liquid waste parameters that must be measured before being discharged into the environment include pH (potential hydrogen), COD (Chemical Oxygen Demand), BOD (Biochemical Oxygen Demand), DO (Dissolved Oxygen), suspended solids (Total Suspended Solid, TSS), turbidity, and color (Widayatno, 2008). This steel company in Sidoarjo produces domestic waste which will be discharged into water bodies so it needs proper management and periodic monitoring, every month.

If the liquid waste produced has parameters that exceed the quality standards that have been set, then the waste is not allowed to be disposed of directly into water bodies. This is intended to protect the quality of the environment, especially the receiving and maintaining water bodies environmental sustainability. This study aims to analyze the COD and BOD parameters of domestic wastewater at a steel company in Sidoarjo.

2. METHODS

This research is a non-reactive research, presenting information with secondary data sources from monitoring the quality of domestic wastewater and presented in a narrative descriptive manner. The COD and BOD parameter data analyzed is monitoring data carried out by the company in January - December 2022 which is a document from the Health and Safety Environment (HSE)

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department of a steel company in Sidoarjo. The results of the laboratory examination are submitted to the HSE section to be documented as a monitoring effort if there is a need to take action.

Sampling of wastewater at 5 primary treatment points of wastewater originating from several areas of a steel company in Sidoarjo. Point 1 is the primary treatment outlet for domestic wastewater from toilets, bathrooms, security posts, offices, canteens and prayer rooms. Point 2 is an outlet for the primary treatment of domestic wastewater originating from office areas, garages and warehouses. Point 3 is an outlet for primary treatment of domestic wastewater originating from health clinics, mechanic workshops, offices, electronics workshops, and personnel and quality control offices. Point 4 is the outlet of the primary treatment of domestic wastewater originating from the finishing area, office toilets and workshops. While point 5 is the outlet of the primary treatment of domestic wastewater originating from vehicle repair shops, logistics area, and garage. Water samples will be taken every month in 2022 according to the procedures stated in the SNI and analyzed in the laboratory according to the COD and BOD measurement procedures listed in the SNI. This activity of monitoring the quality of domestic wastewater refers to the Regulation of the Minister of Environment and Forestry of the Republic of Indonesia no. P.68/Menlhk/Setjen/Kum.1/8/2016 concerning Domestic Wastewater Quality Standards.

3. RESULTS AND DISCUSSION

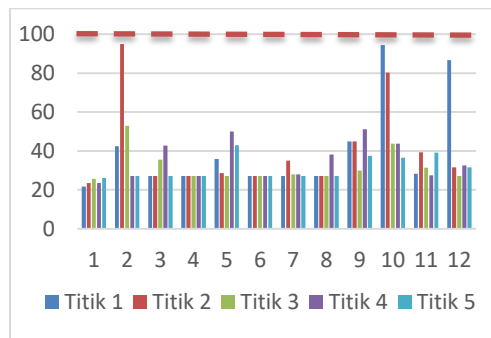
COD

Chemical Oxygen Demand(COD) is an important water quality parameter used to measure the amount of oxygen needed to chemically oxidize organic and inorganic substances in water. This is a test commonly used in environmental management and wastewater management to assess the degree of contamination and organic content in water samples. An increase in COD will result in reduced dissolved oxygen in the water(Sami, 2012). The higher the amount of oxygen content in the water, the smaller the COD yield, which means that the amount of organic matter contained in it is getting smaller. The use of organic matter is to convert oxygen into carbon dioxide and water so that the waters become deficient in oxygen. This is an indicator of the amount of pollution in the liquid waste by domestic and industrial disposal. The greater the amount of oxygen in the water means the smaller the amount of pollution and vice versa(Prahutama, 2013).

Analysis of COD content at a steel company in Sidoarjo was carried out using a COD meter in collaboration with a designated laboratory. The results of tests carried out for a year in 2022 show that there are differences in COD levels each month, this is due to the presence of chemical compounds in the liquid waste. The large amount of organic matter in the waste means that the pollution load is getting bigger. High COD test results will have an impact on oxygen deficit in river water so that it can result in the death of fish and aquatic plants(Dewa & Idrus, 2017).

Water sources that are polluted due to domestic waste or industrial waste usually have a high COD value or exceed predetermined quality standards. The level of COD in domestic wastewater can be reduced by trickling filters. In the trickling filter, the process of decomposing organic matter in the waste occurs. The decomposition of the organic matter is then assisted by microorganisms attached to the filter media in the form of a biofilm layer. This biofilm layer is an aerobic micro organism that has a role in reducing COD levels in waste.

Data on COD analysis results in domestic wastewater taken from 2022 for a year are presented in the following figure:



Picture 1. Results of Monitoring COD Levels at 5 monitoring points of the Sidoarjo Steel Company domestic wastewater in 2022

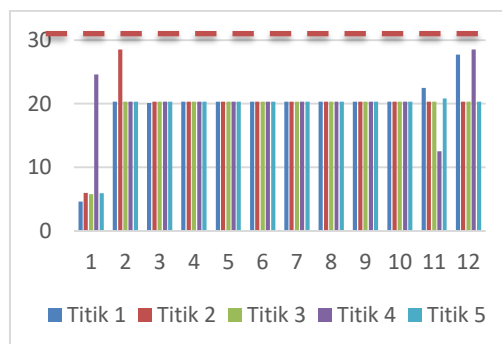
Based on Figure 1, the quality of domestic wastewater produced by the Sidoarjo steel company appears to fluctuate. The lowest measurement result for the COD parameter was 21.73 mg/L detected at Point 1 of measurement results in January 2022. While the highest result was 95.0 mg/L at Point 2 of measurement results in February 2022. The average result of COD measurement was obtained each point in one year as follows: Point 1 is 40.83 mg/L, point 2 is 40.56 mg/L, point 3 is 31.90 mg/L, point 4 is 34.89 mg/L, point 5 of 31.37 mg/L, which means that for a year at all points the COD quantity is below the established quality standard.

From Figure 1 it can be concluded that the COD parameter changes up and down every month, with safe results, which means it does not exceed the quality standard, namely 100 mg/L so that it can be processed immediately according to the policy of the Sidoarjo steel company before being discharged into water bodies.

BOD

Biochemical Oxygen Demand(BOD)is Biochemical Oxygen Demand (BOD) is a water quality parameter used to measure the amount of oxygen needed by microorganisms in water to decompose organic compounds contained in water samples. BOD is one of the main indicators in measuring the level of organic pollution in water. According to(Santoso, 2018)the material needed by microorganisms (usually bacteria) is in the form of oxygen to break down organic matter in an aerobic way.

Data on BOD analysis results in domestic wastewater taken from 2022 for a year are presented in the following figure:



Picture 2 Monitoring results of BOD levels at 5 monitoring points of the Sidoarjo Steel Company domestic wastewater in 2022

Based on Figure 2, the quality of domestic wastewater produced by the Sidoarjo steel company appears to fluctuate. The lowest measurement result for the BOD parameter was 4.62 mg/L at Point 1 measured on January 10, 2022 and the highest result was 28.5 mg/L at Point 2 measured in February 2022 and Point 4 measured in December 2022. Obtained the average results of BOD measurements at each point in one year are as follows: Point 1 is 19.77 mg/L, point 2 is 19.79 mg/L, Point 3 is 19.09 mg/L, point 4 is 20.69 mg/L, point 5 is 19.14 mg/L which means that for a year at all points the BOD value is below the established quality standard.

From figure 2 it can be concluded that the levels of BOD in domestic wastewater vary from month to month. However, the BOD content in the domestic wastewater of the steel company in Sidoarjo does not exceed 30 mg/L according to quality standards, so it is safe and does not have the potential to damage the environment if discharged into water bodies.

Before being discharged into water bodies, the Sidoarjo steel company conducts domestic waste processing as follows:

1. First Treatment (Primary Treatment)

This stage aims to remove solids mixed in the waste, such as oil, residual fat, and soap. The waste that has gone through this stage is flowed into the collection tank.

2. Second Processing (Secondary Treatment)

This stage aims to reduce organic matter in waste by using microorganisms. This helps break down the organic matter in the waste.

3. Third Treatment (Tertiary Treatment)

This stage involves the use of filters with the Nano Filter system to improve waste treatment.

4. Fourth Processing (Bio Control)

Processed water or effluent is stored in a bio-control tank. Additionally it can be used as a BIO indicator, which may refer to monitoring or testing to ensure that the effluent generated reaches an appropriate standard prior to discharge into the environment.

5. Disinfect with Chlorinator

The disinfection process involves the use of chlorine to reduce or kill any pathogenic microorganisms that may be present in the wastewater. The aim is to protect water quality in receiving water bodies.

6. Discharge into water bodies

After going through all stages of processing and disinfection, the processed water from the Wastewater Treatment Plant (IPAL) is channeled to the receiving water body in accordance with applicable environmental requirements and permits..

4. CONCLUSION

The quality of COD and BOD domestic wastewater from steel companies in Sidoarjo has met environmental quality standards in accordance with the Minister of Environment and Forestry of the Republic of Indonesia No. P.68/Menlhk/Setjen/kum.1/8/2016 concerning domestic waste. Before being discharged into water bodies, steel companies in Sidoarjo pre-treat their domestic waste with the aim of reducing negative impacts on the environment and complying with applicable environmental regulations.

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