

Characteristics of Organic and Inorganic Substances in Leachate Wastewater Talumelito Regional Waste Final Disposal Site

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ABSTRACT

Leachate or leachate is a solution that occurs as a result of mixing rain runoff with decomposed trash and containing very fine suspended substances and pathogenic microbes that can cause potential contamination of surface water and groundwater. This study aims to analyze organic and inorganic substances (Pb, Cd, Mn, Fe and Cu metals) in leachate waste. Leachate water sampling was carried out at the Talumelito Waste Disposal Site, Gorontalo District by composite sampling at 5 location points, namely A1, A2, A3, A4, A5. The research procedure was divided into 4 stages, namely the preparation phase, the sampling stage, the sample analysis stage and the data analysis stage. Metal analysis using the AAS method. The results of the analysis at 5 location points showed the highest Lead (Pb) metal reached 0.0248 ppm, Cadmium (Cd) < 0.0009 ppm and Copper (Cu) ± 0.02 ppm. For iron (Fe) the highest reaches 3.1029. For Manganese metal (Mn), they are 1.2779 ppm, 1.1441 ppm and 1.2779 ppm. Heavy metal parameter, the value is still far below the quality standard for leachate in samples A1, A2, A3, A4, and A5. As for the analysis of organic substances, nitrates and nitrites using the Uv-Vis spectrophotometry method showed the highest levels of organic matter were 40.97, nitrates 5.77 and nitrites 0.0065. However, the pH value is above the leachate quality standard of 6.9 at 3 location points, 7.8 - 8.2. And turbidity level of leachate for sample A1 reaches 135.5. From these results it can be seen that the function of the leachate control pool in the Talumelito landfill is still ineffective.

Keywords: Leachate; Landfills; Heavy Metal; Talumelito

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INTRODUCTIONS

The UPTD-Landfills Talumelito Final Disposal Site, located in Talumelito Village, Gorontalo District, is the only Landfills that serves waste from all regions of Gorontalo, namely Gorontalo City, Gorontalo Regency includes Telaga, Limboto and West Limboto Districts and part of Bone Bolango Regency, namely District Kabila, Tilonkabila and Suwawa. UPTD-Landfills Talumelito, started operating at the end of 2011 and accommodates ± 30 thousand tons / year of waste. Based on statistical data, the waste pile that enters Landfills-Talumelito is quite high, ± 80% from Gorontalo City, Gorontalo Regency ± 15% and Bone Bolango Regency ± 5%. As a result, the capacity of Talumelito Landfills has decreased and it is predicted that from the 700 tonnes of waste that is collected in the Landfills every day, it will produce at least 42 liters of leachate. Leachate (leachate) is a solution that occurs as a result of mixing rainwater runoff (either through infiltration or percolation processes) with decomposed waste containing very fine suspended substances and pathogenic microbes (Soemirat, 1996). Leachate has the potential to cause water pollution, both groundwater and surface water, which occurs when external water infiltrates the garbage pile, for example from surface water, rainwater, groundwater or other sources. The liquid then fills the cavities in the waste, and when the capacity has exceeded the water pressure capacity of the waste, the liquid

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will come out and extract organic and inorganic materials resulting from physical, chemical and biological processes that occur in the waste. (Tchobanoglous et al., 1993). Generally, leachate contains a lot of organic matter such as ammonia-nitrogen, heavy metals, inorganic and chlorinated organic salts, which are a major threat to the surrounding soil, groundwater and even water bodies (S. Renou et al., 2008 and Robinson, AH, 2005). Given leachate pollution as a result of chemical reactions that occur in piles of garbage where this liquid is very dangerous and pollutes the soil and water especially if it enters river bodies. Of course, it will affect the quality of well water for residents around the Talumelito Landfills. On the other hand, the leachate treatment at Talumelito Landfills uses a controlled landfill system in which the leachate produced is collected in a pond and allowed to settle to be flowed into the river. This precipitation will cause high levels of COD which will affect the dissolved oxygen content in water. In 2013, COD levels in the Landfills -Talumelito leachate waste exceeded the quality standard based on PP. 82 of 2001 the concentration reached 193.28 mg / L (Kalapati, 2013). This phenomenon requires the need to analyze the content of organic and inorganic substances in the leachate at Talumelito landfill because the Talumelito landfill location has a river where leachate flows, so it is feared that it will contaminate the well water of residents around the Talumelito Landfill. This study aims to determine the content of organic and inorganic substances in leachate wastewater from the UPTD-Landfills Talumelito location as a biological decomposition effect of waste that has the potential to pollute the surrounding water bodies. The analysis includes the analysis of inorganic substances, namely Pb, Cd, Mn, Fe and Cu metals using the AAS method and analysis of organic substances including nitrates, nitrites and Organic C.

METHODS

Lindi water is a sample to be tested in this study. The sampling location was carried out in a reservoir of Lindi Water in the Talumelito Final Disposal Site (Landfills), Telaga Biru District, Gorontalo District. The research flow is shown in figure 1.

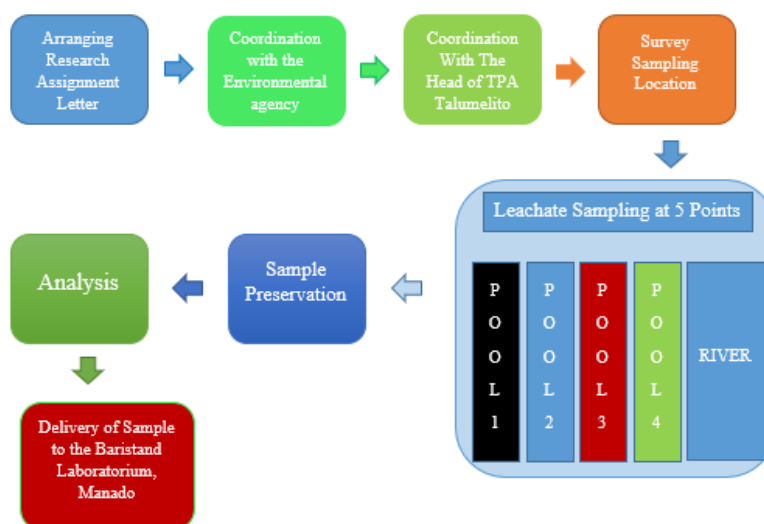


Figure 1. Research flow chart

The materials and tools are coolbox, plastic bottle (Polyethylene Terephthalate), concentrated HNO₃ for sample preservation, Senz brand pH meter. Sampling was done using composite sampling at 5 points, namely (A1), (A2), (A3), (A4) and (A5). Each distance was taken from a distance of > 100 m from the source of leachate discharge.

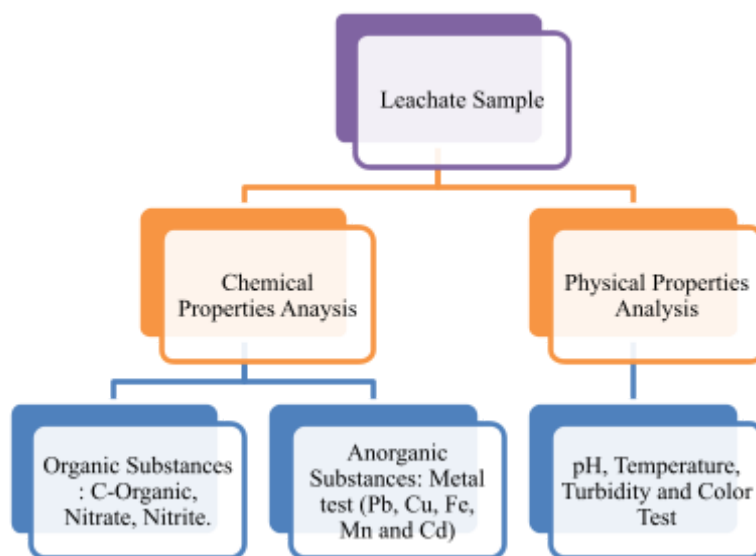


Figure 2. Analysis stage

Sampling was done manually and put in a plastic bottle labeled PET. Direct pH and temperature measurements are carried out on site by dipping the pH meter and recording the pH value that is read. Analysis of Pb, Cd, Mn, Fe and Cu metal content using the Atomic Absorption Spectrophotometry (AAS) Brand Shimadzu AA-7000 which was carried out at the Laboratory of the Manado Industrial Research and Standardization Center.

Results and Discussion

This research was conducted at Landfills Talumelito on leachate samples. The following map of the location is shown in figure 3.



Figure 3. Sampling location map

Based on the results of the analysis of leachate samples at 5 location points A1, A2, A3, A4 and

A5, the pH values are in the range of pH quality standards (6.0 - 9.0). \pm 7.0-8.0. While the temperature ranges from 28 °C - 29 °C, it is still within the leachate water quality standard, namely 38°C. As for turbidity, the location of the sample point A1 has a high level of turbidity, namely 135.5 followed by the turbidity value in the leachate sample at points A2, A3, A4 and A5 respectively. For the analysis of organic substances at point A3 location had the highest organic matter content, namely 40.97 mg/L. At point A5, which is where the leachate water has entered the river/ditch, has an organic substance level of 32.95 mg/L. Analysis of the concentration of nitrite levels <0.0002 mg/L and at point A5 the nitrite level reached 0.0065. The nitrite level has not exceeded the threshold value for nitrite content in water, which is 0.06, but for the nitrate content varies and the highest level is in the A2 leachate sample, reaching 5.77 mg/L. Nitrate levels have not exceeded the threshold level, namely 10 mg/L.

Table 2. Results of analysis of the physical properties of leachate Landfills Talumelito

No	Analysis Parameters	Analysis Results					Unit	Method
		Point A1	Point A2	Point A3	Point A4	Point A5		
1	Temperature	26	26	26	26	26	°C	pH Meter
2	pH	7.7	7.7	8.0	8,2	8,1	-	pH Meter
3	Turbidity	135,5	122	84	46	79	NTU	SNI 06-6989.25-2005

In this study, an analysis of the levels of inorganic substances, namely Fe, Cu, Cd, Mn and Pb, was also carried out at 5 locations A1, A2, A3, A4 and A5. Iron (Fe) content at 5 location points, namely locations A1, A2, A3, A4 and A5 respectively 3.0070 mg/L, 2.6813 mg/L, 2.8661 mg/L, 3.0273 mg/L and 3.1029 mg/L. The concentration of Fe, has a value smaller than the water quality standard stipulated in Ministerial Regulation No. 5 of 2014 and PP No.82 / 2001 of 5 mg/L.

The content of heavy metal lead (Pb) at 5 location points, namely locations A1, A2, A3, A4 and A5 each of 0.0132 mg/L, 0.0130 mg/L, 0.0098 mg/L and 0.0109 mg/L. Based on the Pb concentration, the leachate water at the Talumelito LANDFILLS has a value below the quality standard of Government Regulation No. 5 of 2014 and PP No.82/2001 which is 0.1 mg/L. The Pb content may come from types of waste such as batteries, paint, and cans.

For the content of heavy metal copper (Cu) at 5 location points, namely locations A1, A2, A3, A4 and A5 each of 0.0273 mg/L, 0.0204 mg/L, 0.0204 mg/L, 0, 0129 mg/L and 0.0129 mg/L. In general, the Cu content in the leachate water sample is smaller than the quality standard stipulated by Government Regulation No. 5 of 2014 namely 2.0 mg/L.

Analysis of the content of heavy metal manganese (Mn) at 5 location points, namely locations A1, A2, A3, A4 and A5 are all above the Threshold Value based on Permenkes 416/Menkes/Per/IX/1990 for leachate, which is 0.5 mg/L. Each point is 1.2779 mg/L, 1.1441 mg/L, 1.0436 mg/L, 1.0108 mg/L and 1.0048 mg/L.

Table 3. Chemical Properties analysis results: Metal Pb, Mn, Cd, Fe, Cu, and Substances

No	Metal Type	Analysis Result (mg/L)					Analysis Method
		Point A1	Point A2	Point A3	Point A4	Point A5	
1	Pb	0,0132	0,0130	0,0098	0,0109	0,0248	SNI 6989.46:2009
2	Mn	1,2779	1,1441	1,0436	1,0108	1,0048	SNI 6989.5:2009
3	Cd	<0,0009	<0,0009	<0,0009	<0,0009	<0,0009	SNI 6989.16:2009
4	Fe	3,0070	2,6813	2,8661	3,0273	3,1029	SNI 6989.4:2009
5	Cu	0,0273	0,0204	0,0204	0,0129	0,0129	SNI 6989.66:2009
6	Organic Substances	24,17	22,6	40,97	18,87	32,95	SNI 3554:2015 Butir 3.6
7	Nitrate	1,10	5,77	1,4	3,5	2,76	SNI 3554:2015 Butir 3.8
8	Nitrite	<0,0002	<0,0002	<0,0002	0,004	0,0065	SNI 06-6989.99-2004

For the content of heavy metal cadmium (Cd) locations A1, A2, A3, A4 and A5 respectively smaller than the quality standard stipulated by Government Regulation No. 5 of 2014 which is 0.1 mg L. The Cd content at all points was <0.0009 mg/L.

Conclusions

The results of the metal analysis of leachate water at the Talumelito Final Disposal Site (Landfills) show that the highest levels of heavy metals contained have an Fe content of 3.0070 mg / L in sample A1. Then followed by sample A3, 2.8661 mg / L. And sample A2 with Fe metal content of 2.6813 mg / L. Some other heavy metal content is Pb (Lead) with the highest level of 0.0132 mg / L, Mn (Mangan) with the highest level of 1.2779 mg / L, Cu (Copper) with the highest level of 0.0273 mg / L. And the last one is the metal content of Cd (Cadmium) with the highest level of <0.0009 mg/L.

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