

Analysis Of Biogas Methane (CH₄) Quality At Landfill Talang Gulo Jambi

Dayaningrat¹, Leila Kalsum², Rusdianasari³, Endi Adriansyah⁴, Santoso⁵

Abstract: Landfill place for processing and returning waste to environmental media. Talang Gulo Landfill has made efforts to independently process biogas or methane gas from the Landfill area. The biogas has been used to fuel household cooking needs in the settlements around the Landfill and for its own electricity needs at the Talang Gulo Landfill. Test the methane gas done five times. The first test reduced the methane gas content by 72%, the second test reduced the methane gas content by 74%, the third test reduced the methane gas content by 86%.77%, in the fourth test the methane gas content increased by 69%, and in the fifth test, the methane gas content decreased by 66%.The highest level of methane gas in the IRRC-WTE Jambi City was 76% carried out using the Bosean portable gas analyzer and the average analysis results showed that at 86% the biogas content has met quality standards and is suitable for use. It is hoped that it can make a big contribution in overcoming the problem of municipal solid waste in Jambi

Index Terms: Landfill Talang Gulo, Organic Waste, Energy, Biogas,

1 INTRODUCTION

Renewable energy (RE) is a non-fossil energy source that is environmentally friendly and has an important role because of its contribution to efforts to reduce the impact of climate change and global warming given its low emission and sustainable nature. However, the role of fossil energy still dominates the use of domestic energy and RE is only an alternative energy source [1]. Indonesia has a great opportunity to develop RE. This is not only due to the large potential of RE resources, but also the various types because Indonesia has almost all types of RE [2]. To optimize the use of renewable energy in Indonesia, the government has issued Government Regulation Number 79 of 2014 concerning National Energy Policy which describes the priorities for national energy development [3]. In Article 9 letter F, Indonesia has set a target of achieving energy of around 30% by 2050 [4]. Garbage is the residue of human activities in the form of solid, waste is something that is not used [5]. Organic waste is one of the causes of the large amount of waste in the market, this waste will produce leachate which is very dangerous for groundwater [6]. Law Number 18 of 2008 concerning Waste Management has stipulated that waste management aims to improve public health and environmental quality as well as to make waste a resource [7]. Waste handling activities include processing in the form of changing the characteristics, composition and amount of waste, and / or final processing of waste in the form of returning waste and / or residue from previous processing to environmental media safely. Final Processing Place, hereinafter abbreviated as TPA (Landfill) is a place for processing and returning waste to environmental media.

- ¹ Dayaningrat is Applied Master of Renewable Energy Engineering Politeknik Negeri Sriwijaya, Indonesia,,
- ² Maintenance Plan of Mining Support and Production Equipment, PT Bukit Asam Tbk Tanjung Enim, Indonesia. Email: dningrat@gmail.com
- ³ Leila Kalsum Renewable Energy Engineering Department, Politeknik Negeri Sriwijaya, Indonesia
- ⁴ Rusdianasari Renewable Energy Engineering Department, Politeknik Negeri Sriwijaya, Indonesia
- ⁵ Endi Adriansyah is Bangkitku Waste Bank of Jambi City, Indonesia
- ⁶ Santoso is Enviromental Agency of Jambi City, Indonesia

TPA Talang Gulo is one of the facilities for the final processing of urban household waste which is managed by the Regional Technical Implementation Unit (UPTD) under the Jambi City Environment Agency (DLH) organizational structure. Since 2018 the Talang Gulo Landfill UPTD has made efforts to independently utilize biogas or methane gas (landfill gas) from the landfill area. The landfill gas has been used for fuel for household cooking needs in the settlements around the landfill site and for self-use electricity at the Talang Gulo Landfill.

2 MATERIAL AND METHOD

2.1 Material

Organic waste and Anorganic waste, Landfill Talang Gulo

2.2 Method

Biogas Analysis Procedure

Prepare a portable gas analyzer, Prepare Tedlarbag as a container for biogas samples, Installing the gas supply hose from the outlet pipe to the Tedlarbag valve, Flow of gas from the outlet pipe by opening the valve to regulate the gas flow so that the sample gas enters the Tedlarbag until the volume is full, Close the gas pipe flow control valve and close the Tedlarbag valve tightly so that there is no loss / leakage of gas from the Tedlarbag, Pack the gas samples in , Pack the gas samples in Tedlarbag properly and bring them to the laboratory for analysis

2.2 Data Analysis

This study conducted a direct analysis using a portable gas analyzer bosean as a result of quantitative methods and using an associative descriptive analysis with the correlation approach of Landfill Talang Gulo Jambi.

3 RESULT AND DISCUSSION

3.1 Subsection Of Results

The final processing site for gutters produces an average of 1,838,473.39 liters of solid waste from Jambi City, which is equivalent to 1,838.48 m³ / day. The characteristics of waste are dominated by inorganic waste, amounting to 67.02% and organic waste by 32.98% [8] the waste in the Talang Gulo

TPA produces biogas were analyzed using a portable gas analyzer from table 1.

Table 1
Results Of Analysis Composition Biogas

Sample	Methane(CH ₄)	Oxygen(O ₂)
1	72	5,2
2	74	4,7
3	86	6,5
4	77	6,8
5	76	6,8

Source: *Portable gas analyzer (Bosean)

3.2 Biogas analysis

The samples were taken five times, two analyzes were carried out. First, it was carried out using a portable gas analyzer directly at the landfill site of the landfill. The methane gas test was carried out five times from figure 1. The first test the methane gas content was 72%, the second test decreased the methane gas content by 74%, the third test was 86%, on the fourth test the methane gas content increased by 77%, and at In the fifth test, there was a decrease in methane gas content by 76%.

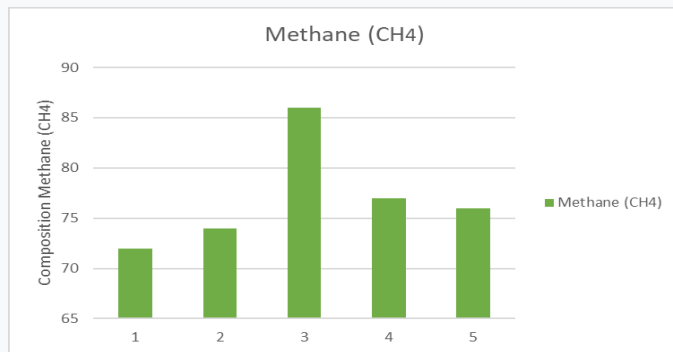


Figure 1 Composition Methane CH₄

From figure 2 oxygen sample conditions show the best results The first test the oxygen content was 5,2% , the second test experienced an increase in oxygen content by 4,7% , on the third the oxygen content decreased by 6,5%, on the fourth test the oxygen content decreased by 6,8 % , and in the fifth test there was an increase in oxygen content by 6,8%.The content of methane gas from cow dung with a mixture of palm oil was found to be 64% CH₄ and the methane gas content of cow dung mixed with slurry was obtained at 54% CH₄ [9]. the production of methane gas using cow dung is 59% CH₄ [10]

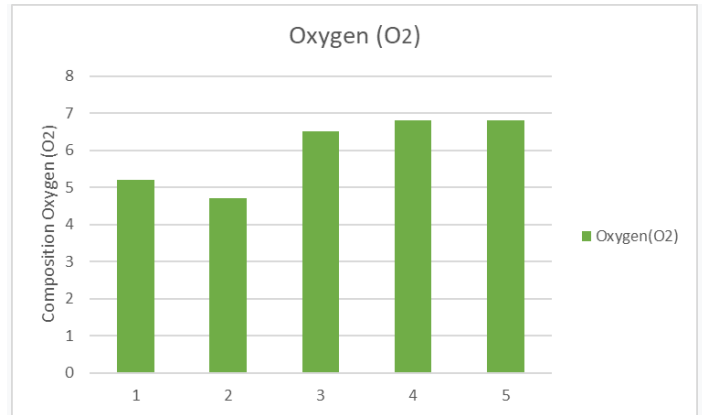


Figure 2 Composition Oxygen O₂

Based on the results of the analysis, the application of the Talang Gulo Jambi landfill has been carried out with the Controlled Landfill system since 1997 and in the last three years the total volume of managed waste volume has an average of 373,888 m³ / year with an average growth rate of 373,888 m³ // year. 21,380 m³ / year or an average of 6%. waste in landfills will produce leachate, each parameter will affect the quality of leachate. The presence of biogas processing will reduce pollutant levels in the soil [11] and the use of biogas can be directly utilized by the surrounding community.

Conclusion

The highest methane gas content in Talang Gulo Jambi Landfill is at 86%, carried out using a portable gas analyzer bosean and the average analysis shows that at 72%, the biogas content has met quality standards and is suitable for use.

ACKNOWLEDGMENT

Thanks addressed to Talang Gulo Jambi Landfill, Bangkitku Waste Bank of Jambi City, Indonesia and Enviromental Agency of Jambi City, Indonesia.

REFERENCES

- [1] Den. 2019. Ketahanan Energi Indonesia. 2019. Jakarta: Dewan Energi Nasional.
- [2] P. Albores, K. Petridis, and P. K. Dey. 2016. "Analysing efficiency of waste to energy systems using data envelopment analysis in municipal solid waste management", *Procedia Environmental Sciences*, vol. 35, pp. 265-278.
- [3] Peraturan Pemerintah Nomor 79 Tahun 2014 tentang Kebijakan Energi Nasional
- [4] Taqwa, 2019. Higher Education Role in Supporting Indonesian Government Policy in Developing Renewable Energy, *J.Phys.: Conf. Ser.* 1167 012010.
- [5] E. Damanhuri, W. Handoko and T. Padmi. 2014. *Municipal Solid Waste Management in Asia and The Pacific Islands*, Springer, Singapore.
- [6] Adriansyah, E. Agustina, T.E and Arita. S. 2019. "Leachate Treatment Of TPA Talang Gulo Jambi City By Fenton Method And Adsorption". *Indonesian Journal Fundamental Applied Chemistry*. Vol 4 No 1 pp. 20-24.

- [7] Undang-Undang Nomor 18 Tahun 2008 tentang Pengelolaan Sampah
- [8] DLH, 2017. Laporan Status Lingkungan Hidup Kota Jambi, Jambi
- [9] Fatin, M. H., Husaini, A., & Kalsum, L. 2021. Effect of Adding Palm Oil Mill Effluent (POME) and Slurry on Biogas From Cow Manure to Produced Methane Gas. In 4th Forum in Research, Science, and Technology (FIRST-T1-T2-2020) (pp. 75-80). Atlantis Press.
- [10] L. Kalsum, A. Hasan, Rusdianasari, A. Husaini and Y. Bow. Evaluation Of Main Parameter Process Of Anaerobic Digestion of Cow Dung in Fixed Dome Biodigester on Methane Gas Quality, in Journal of Physics: Conference Series 1500(012060), 2020.
- [11] Adriansyah, E. Kasman, M. Prabasari, I.G. dan Permana. E 2019 "Korelasi Parameter Pencemar Fisika dan Mikrobiologi Dalam Leachate Dengan Response Surface Methodology". Jurnal Teknik Kimia Universitas Sriwijaya. Vol 25 No 3 pp. 87-90.