

Analysis Of Biogas Methane Quality At IRRC-WTE (Integrated Resource Recovery Center For Waste Treatment Energy) Jambi

M.Syaiful, Rusdianasari, Leila Kalsum, Endi Adriansyah, Santoso

Abstract: IRRC-WTE The main goal is to make Jambi City a pilot in managing waste problems in a modern, low cost (cheap), environmentally friendly, economically valuable for the community. WTE is a new, renewable energy that uses waste to become biogas. Organic waste that is processed comes from market waste, 1000 kg of processed waste is carried out 3 times a week, namely on Tuesday, Thursday and Saturday. The methane gas test was carried out five times. The first test the methane gas content was 68%, the second test decreased the methane gas content by 64%, the third test was 64%, on the fourth test the methane gas content increased by 69%, and at In the fifth test, there was a decrease in methane gas content by 66%. The highest methane gas content in IRRC-WTE Jambi City is at 69% carried out using a portable gas analyzer and the average analysis shows that at 66% the biogas content has met quality standards and is suitable for use Based on the results of the analysis, the application of WTE technology is expected to contribute greatly in solving the problem of municipal solid waste in Jambi, which can reduce dependency on the Talang Gulo Final Disposal Site, where the capacity and carrying capacity is reduced, and on the other hand electricity production is also obtained and biogas as the development of new and renewable energy in the framework of the success of sustainable development. The development of WTE made from organic market waste can be implemented well and sustainably, therefore it is necessary to make WTE in every market in the Jambi City

Index Terms: IRRC-WTE, Organic Waste, Energy, Biogas, portable gas analyzer, Jambi City,

1 INTRODUCTION

Indonesia is a country that is rich in natural resources, but they have not been used optimally to produce energy. Indonesia has enormous potential in the energy sector, both renewable and non-renewable energy (fossil energy). Energy is very necessary in everyday life. Energy sources can come from the sun, fuel oil, natural gas and firewood. This energy is used for household purposes such as cooking and lighting. Oil fuel scarcity, one of which is caused by the significant increase in world oil prices. Efforts to save energy for fuel should have been driven long ago because the supply of fuel originating from oil, gas and coal is an unrenovable source of fossil energy, while demand continues to rise, so is the price so there is no stability. balance between supply and demand. One of the ways to save fuel oil and unrenovable energy sources is to look for alternative energy sources that can be renewed (renewable). Fossil fuels such as petroleum and coal are the main energy sources in Indonesia, however these energy sources have a damaging impact on the environment including air pollution, greenhouse gas emissions and global warming. Another problem is the high price of fossil fuels, the increase in the amount of petroleum imports due to national fuel consumption. Petroleum energy occupies the first rank in the composition of the national energy mix, which is around 48% of the total national energy mix and the expounded petroleum resources are predicted to be exhausted in the next 12.26 years [1].

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Indonesian government is trying to increase the use of non-fossil energy in the form of new and renewable energy (EBT). Renewable energy sources are environmentally friendly energy sources that do not pollute the environment and do not contribute to climate change and global warming [2]. This is reinforced by the existence of Government Regulation (PP) No. 79/2014 concerning the National Energy Policy (KEN), where the target of EBT utilization in 2025 increases to 23% while energy utilization from petroleum decreases to 25%. Renewable energy is one of the options for future energy needs. The advantages highlighted are renewable energy as a substitute for electricity generation from fossil with the use of solar energy, reducing carbon dioxide and decentralizing energy power generation [3] Garbage is the residue of human activities in the form of solid, waste is something that is not used [4]. leachate is a factor in polluting waste [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]. Something useless trash can actually be used for new and renewable energy [7]. as a power plant via IRRC-WTE. IRRC-WTE (Integrated Resource Recovery Center Waste Treatment Energy) is a grant project from UNESCAP (United Nations Environment and Commission for Asia and the Pacific) in partnership with UCLG-ASPAC (United Cities and Local Governments Asia Pacific). The project was implemented in two locations, namely Jambi City and Malang Regency. Jambi City was chosen for the grant project from UNESCAP because it can manage the same waste problem as other parts of the world and the average amount of waste from Jambi City is 1,838,473.39 liters, which is equivalent to 1,838.48 m³/ day. The characteristics of waste were dominated by inorganic waste, amounting to 67.02% and organic waste by 32.98% [8]. WTE management in Jambi can also reduce organic waste by 34.08% of the total waste in the city of Jambi [9]. The feeding of the organic fraction to the reactor with the right feed composition will determine the success of biogas production. The imbalance caused by excess organic loading will lead to the accumulation of intermediate acid products

that inhibit methanogenic microorganisms. The complexity of the organic materials that make up the organic fraction of municipal solid waste makes it difficult to predict the changes that need to be anticipated in the biogas reactor design due to possible fluctuations in the composition of raw materials. The organic fraction of municipal waste which is used as raw material for biogas production consists of a mixture of fruit and vegetable waste with low nitrous (N) content, so that the C/N ratio value of organic matter is relatively above the ideal value for producing biogas. The optimum C/N ratio in anaerobic digester which states the relationship between the amount of carbon and nitrogen contained in organic matter is 20-30. The waste management in Jambi City has social, economic and environmental benefits for the surrounding community, in the form of compost, gas and electricity energy which can be used by the community for free, build sustainable solid waste management in Jambi City. So far, the biogas produced from WTE Talang Banjar, Jambi City is used as an energy source to replace kerosene or liquid petroleum gas (LPG) for cooking for residents around WTE and the rest of the biogas is used as electrical energy for market needs using a biogas generator and there is no quality analysis. Biogas from the WTE Talang Banjar process in Jambi City, so the researchers wanted to analyze the quality of the biogas from WTE. From the results of this analysis, it can be seen that the composition of the gases contained in the biogas produced from WTE and so it can be seen whether the biogas has the potential to produce electrical energy. Referring to the problem formulation formulated by the researcher, the objectives to be achieved from this research are. Analyze the characteristics of WTE Talang Banjar in Jambi City based on the quality of biogas

2 MATERIAL AND METHOD

2.1 Material

Organic waste, The IRRC-WTE (Integrated Resource Recovery Center for Waste Treatment Energy).

2.2 Method

Biogas Analysis Procedure

Organic waste taken from the Talang Banjar market is sorted first, where plastic or other impurities are separated, after which the organic waste is chopped with a chopper. The chopped results are put in an inlet tub with a ratio of 1: 1 where 1,000 grams of chopped organic waste are mixed with 1,000 ml of water. After it is put into the inlet basin, it is stirred. Each inlet container is put in organic waste with a mixture of water, the time for filling is 7 days, after which it is carried out routinely in 1 week 3 times on Tuesday, Thursday and Saturday. Anaerobic processes will occur in the digester. In the digester an anaerobic process occurs and produces biogas, the biogas is then flowed and collected in storage bags / balloons. Record the volume of methane gas produced in a day

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 IRRC-WTE (Integrated Resource Recovery Center for Waste Treatment Energy).

3 RESULT AND DISCUSSION

3.1 Subsection Of Results

WTE (Waste Treatment Energy) in Jambi City Located in Talang Banjar Village, East Jambi District with an area of 843.71 m³. WTE is a new renewable energy that utilizes waste into biogas and produces electricity[10]. WTE is also one of the promising methods to overcome the problem of waste by converting waste into renewable energy in the form of electricity and heat [11]. The application of the WTE concept has been practiced by researchers and institutions by burning biomass to produce energy that can be used as fuel for stoves and lighting lamps. There are several WTE options throughout the world such as anaerobic digestion (AD), incineration, and gasification [12]. The biggest waste produced in the market is organic waste, based on law number 18 of 2008 [13]. The results of the biogas from the fermentation process of raw vegetables from Fixe Dome Digester at WTE Talang Banjar, Jambi City 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	68	14,5
2	64	19,1
3	64	17,9
4	69	17,3
5	66	18,3

Source: *Portable gas analyzer (Bosean)

3.2 Biogas analysis

The methane gas test was carried out five times from figure 1. The first test the methane gas content was 68%, the second test decreased the methane gas content by 64%, the third test was 64%, on the fourth test the methane gas content increased by 69%, and in the fifth test, there was a decrease in methane gas content by 66%.

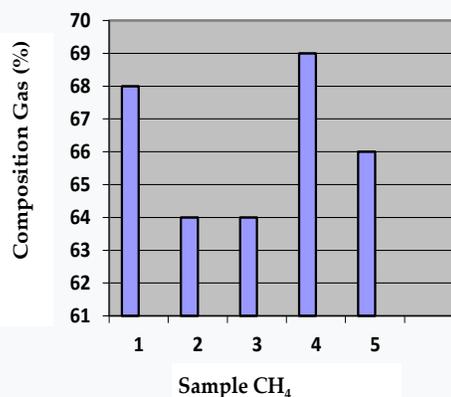


Figure 1 Composition Biogas CH₄

From figure 2 The first test the oxygen content was 14.5%, the second test experienced an increase in oxygen content by 19.1%, on the third the oxygen content decreased by 17.9%, on the fourth test the oxygen content decreased by 17.3 %, and in the fifth test there was an increase in oxygen content

by 18.3%. Production of methane gas using cow dung is 59% CH₄ [14,15]. the methane gas content of 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. [19,20]

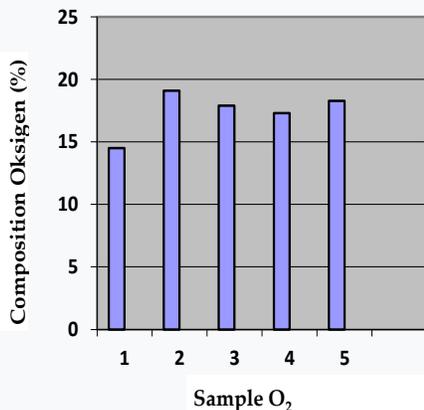


Figure 2 Composition Biogas O₂

Based on the results of the analysis, the application of WTE technology is expected to contribute greatly in solving the problem of municipal solid waste in Jambi, which can reduce dependency on the Talang Gulo Final Disposal Site, where the capacity and carrying capacity is reduced, and on the other hand electricity production is also obtained and biogas as the development of new and renewable energy in the framework of the success of sustainable development. The development of WTE made from organic market waste can be implemented well and sustainably, therefore it is necessary to make WTE in every market in the Jambi City. Processing organic waste will make good biogas energy when it succeeds in finding the right composition between each component [16]. To support zero waste all components must be reused [17]. The water used in the WTE process is not discharged but is treated again for reuse and 500 kg of compost can be used for parks in the Jambi City. For the time being, residents around the Talang Banjar village do not incur any costs. Because it's only been a year for WTE to operate. To get maximum results, it is necessary to increase the number of WTE operating hours every day and increase the number of WTE employees, because the number of employees is directly proportional to the amount of gas obtained in the WTE Talang Banjar, the number of employees can also reduce the level of waste reduction of important factors in WTE. WTE must be routinely controlled so that the pipes can flow smoothly. In addition, it is necessary to provide counseling by the operator about the operation of the tool, if the operator does not properly perform maintenance, WTE will experience interference. Hopefully, in the future, many markets in Jambi will want to take advantage of the new renewable energy. The amount of waste composition that has been successfully decomposed with the WTE program can be seen in the Table 2.

Table 2. Organic Waste

Amount of Organic Waste	Treatment WTE
18.755 Kg (m ³)/ Month	4.000 Kg (m ³)/ Month

The table 2 based on organic waste that is processed as much as 4.000 Kg (m³)/ Month, which is about 23% of the total amount of organic waste as many as 18.755 Kg (m³)/ Month, shows that the more often the processing is done, the greater the energy that is obtained, the proper care and composition needs to be done so that the WTE in Jambi can provide maximum energy in the city of Jambi [18].

4 CONCLUSION

The highest methane gas content in IRRC-WTE Jambi City is at 69 percent carried out using a portable gas analyzer (Bosean) and the average analysis shows that at 66 percent the biogas content has met quality standards and is suitable for use.

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