

Time Management of an Anaerobic Solid Waste Digester With Leachate As A Starter To Obtain The Continuous Biogas Production

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Abstract – The limitation resources of fossil energy requires an exploration of another energy resources which could be renewable energy. One proper energy sources that considerable as the biogas is generated from solid waste. Anaerobic digester technology could be applied to process solid waste into renewable energy sources such as biogas, yet the widespread application of these technologies can solve the problem of environmental pollution which caused by waste piles. In this study, the anaerobic digester technology is applied to obtain biogas from organic solid waste using the leachate as a starter. By using 4 pieces of digesters, it takes cultivation process of sewage which carried out within an interval of 14 days between one digester to another one. The production of the gas is controlled every day, and the quality of the gas is measured in every 10 days. The result of the measurement for all digesters show that the production of the gas from the day 20th to the day 30th produce the good quality of the gas which contains methane gas for more than 40 %. Therefore, as the biogas production that fulfills the requirement as the fuel which takes time of 10 days, so in order to keep the continuation of the gas production it is advisable to take the cultivation process of sewage for each digester is 10 days.

Keywords : renewable energy, solid waste, leachate.

1. INTRODUCTION

The human needs of energy are increasing from time to time. Nowadays the fulfillment of needs for energy majority comes from the fossil energy such as oil, coal, and gasses. On the contrary, the availability fossil energy gets more decreased so many efforts has been made to get more new energy and renewable. One of noticeable energy source is biogas which comes from the anaerobic degradation process of organic composition.

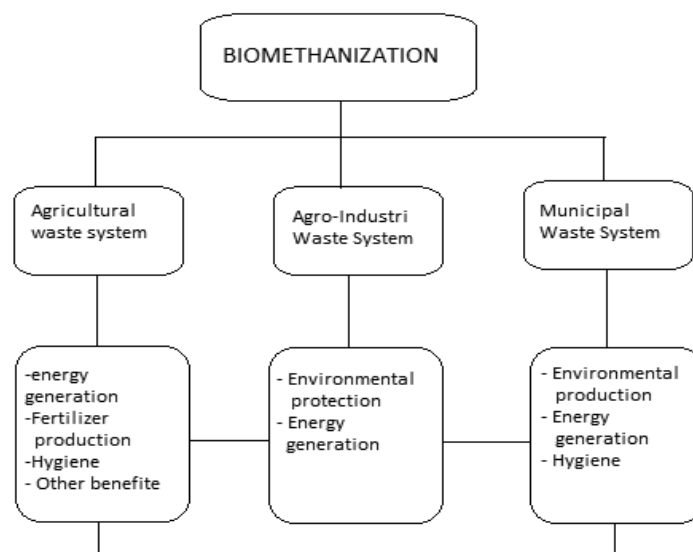


Fig 1. The benefit of biogas technology applications [sherwin]

Biogas technology is worth to applied for changing organic waste which comes from : Agriculture, farming, industrial and many more human activities to be an energy source. The application of energy source that comes

from wastes could make the better environment, health improvement and socio-economic improvement of the society as shown in Figure 1.

The potential of biogas as the energy source is enormous as it could solving the problem of waste that comes from industry, agriculture and domestic [1][2][3][4]. The application of biogas for an electric generator is possible to be done with some preparation on the specific gas turbine which will be used to solve the impurity of the gas fuel [5].

The handling technic of municipal waste to produce biogas and also to avoid the air pollution and bad odor is using landfill method. From the application of landfill, a method is still found the liquid waste which known as leachate that contains high toxic, so it is not allowed to be freely thrown to the environment. The usage of leachate that recirculated to the landfill bioreactor shows the improvement of quality and quantity of the biogas significantly [6].

This research has done the experiments of organic waste processing with leachate using as a starter on anaerobic biodigester with a hope that produces high quality of biogas which contains the methane more than 40%.

2. EXPERIMENTAL METHODS

The research is using leachate which earned from the final waste of Bandung , Cilegon City, which previously has using landfill method to process the pile of municipal waste. The result of a laboratory test to the leachate composition is shown in Table 1.

Table 1. Leachate composition

No.	Parameters	unit	values
1	COD	mg/l	3636
2	pH		9
3	Total Solid Suspension	mg/l	347
4	Fe	mg/l	6.5
5	Pb	mg/l	20

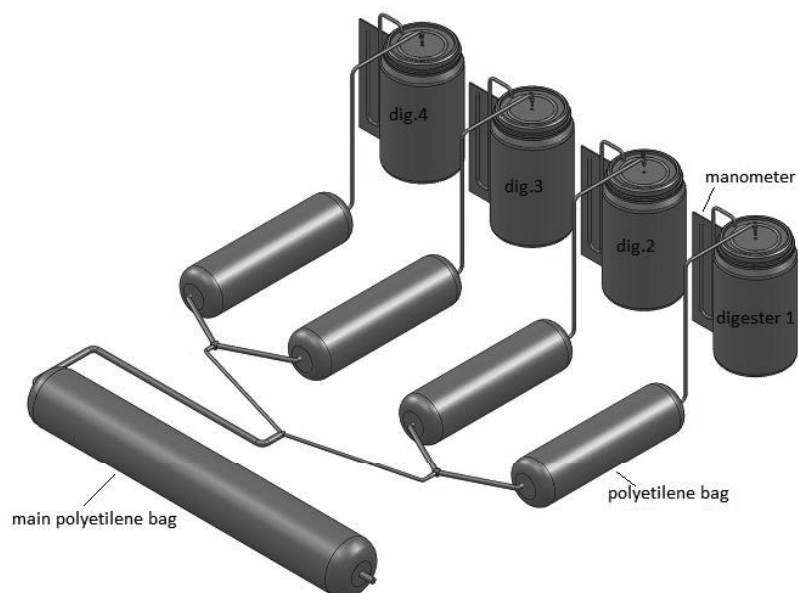


Figure 2. Digesters and gas storages.

Four digesters are used in this research with the cultivation of the composition has a duration of 14 days from one digester to another. Figure 2 shows the scheme of all digesters which has tubes and valves that control the flow. From day one to the day fourteen only digester 1 that works and fill the polyethylene bag 1. When the contain of the methane on polyethylene bag 1 has reached 40 %, so the gas will be flown from the polyethylene bag 1 to the main polyethylene bag. Next, when the day 14th digester 2 start operated, biogas which produces on the polyethylene bag 2 will be measured by the quality and the quantity. If the contain of the methane has reached 40 % then the biogas will be flown to the main polyethylene bag. The same will be applied for the digester 3 and 4 which each of them will start to operate on the day 28th and 42th.

Specification of the tester

- Digester drum capacity : 150 l
- Gas storages : polyethylene bag
- Composition : 50 l organic waste + 50 l leachate

3. RESULTS AND DISCUSSION

The results of the measurement of biogas production which produced from each digester are shown in Figure 3.

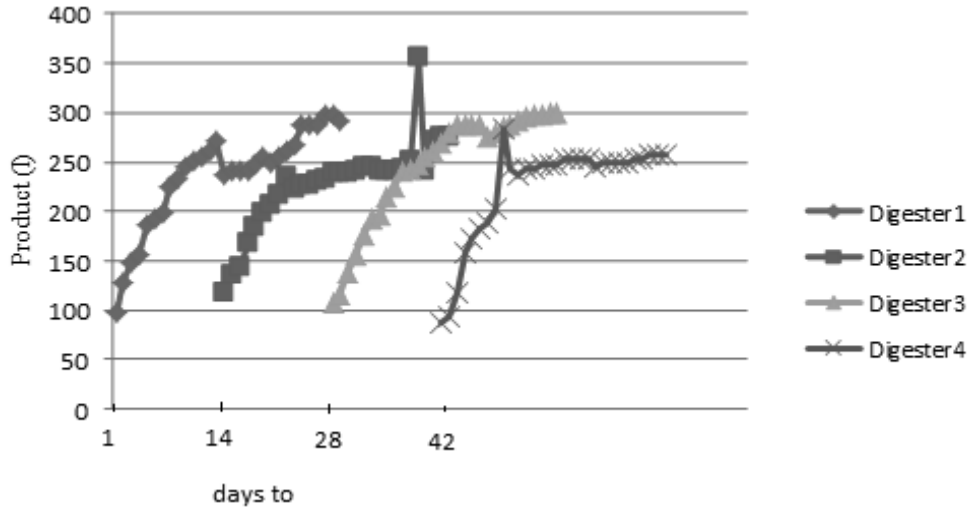


Figure 3. Biogas production (l) from each digester

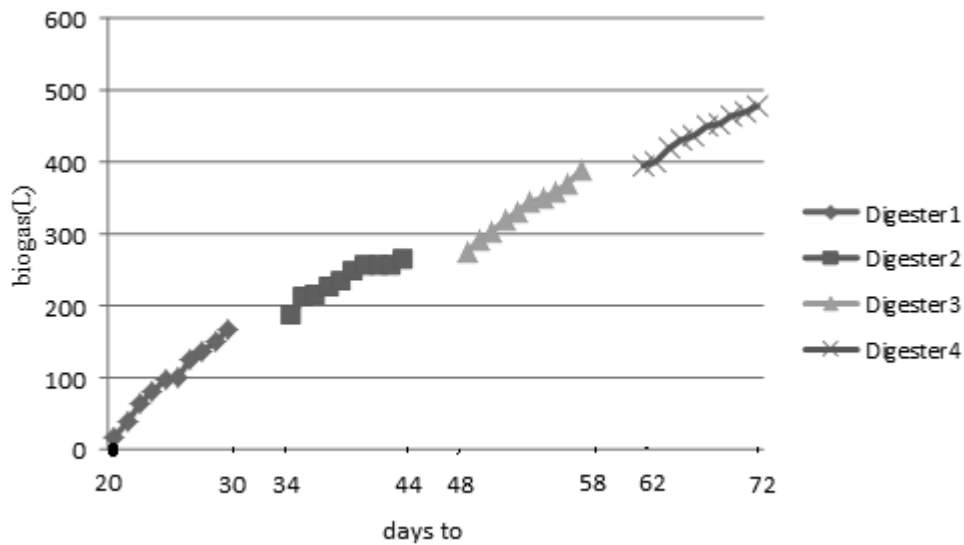


Figure 4. Volume of the biogas on the main polyethylene bag With the contain of methane > 40%

The production of biogas on the first 10 days generally increasing sharply, after that the rate of production get slower until the day 30 that shows nothing increased in the production.

The contain of methane on the polyethylene bag from each digester are scrutinized, and when the methane has reached 40 %, the biogas will be flown to the main polyethylene bag by opening the valve. The result on the polyethylene bag is shown in Figure 4.

The main polyethylene bag start to filled from the digester 1 on June 4th, 2016 to June 14th, 2016 (10 days duration). Next, on the 4 days break the biogas from a polyethylene bag of the digester 2 can be flown to the main polyethylene bag because the contain of the methane on the biogas has reached 40 %. The same is also done for the digester 3 and 4. In average the digesters are enabled to produce the biogas with the contain of the methane for more than 40 % on the days 20th – 30th. So to keep the continuity of the biogas production on the digester with leachate starter the duration of the cultivation of the composition to the digester tank should be done on 10 days.

4. CONCLUSIONS

The results of the experiment of forming of biogas from the organic solid waste using the method of the anaerobic digester with leachate as the starter show that the biogas with the contains of methane for more than 40 % happened on the duration of 10 days which is the day 20 to the day 30 for each digester. So in order to get the biogas continually the time of the early waste cultivation and leachate as the starter to the digesters should be taken the duration of 10 days from one digester to another one.

5. REFERENCES

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