Effect of Cow Dung Concentration and Microbial Count on The Formation of Biogas in A Horizontal Digester

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Abstract. Biogas is a renewable fuel that produced through a process of anaerobic fermentation of a mixture of cow dung and water. The process of formation of methane gas occurs in a digester reactor with a capacity of 3500 kg/batch during a certain fermentation time with the help of anaerobic bacteria. This research studied effect of the comparison of cow dung and water as well as the number of microbes added. The process of formation of biogas run at varying of cow dung with water and microbes added. Fermentation process was running 16 days by varying the variables. Furthermore, every four days observed, and recorded pressure in the digester, biogas product was analyzed its content of methane gas were formed. Relatively good results were taken on cow dung and water ratio of 1: 1 with the addition of microbes as much as 50 ppm with a time of fermentation for 12 (twelve) days produce biogas of 5.1 m 3/batch with contents of methane about 74 %, carbon dioxide 19 %, and residual gas of 7 %.

Keywords: Biogas, Fermentation, Horizontal Digester

1 Introduction

The increasing number of people, especially those living in rural areas, household energy needs are still a problem that must be solved. Energy sources classified as renewable energy, available in big supply and environmentally friendly, among others is cow dung that can be used as raw material for biogas production. Biogas is one of the renewable energy sources that can meet alternative energy needs and can be used for cooking, lighting, and fuel for motors or generators (Agustin, 2011). Biogas has several advantages over fossil fuels. It is environmentally friendly and renewable are advantages of biogas compared to fossil fuels (Wahyuni, 2015). Biogas of produced from the fermentation process of organic matter due to the activity of anaerobic bacteria in an environment without free oxygen (Junus, M., 1987). Biogas energy is dominated by methane gas, carbon dioxide, and several other gases in smaller amounts (Chandra et al, 2017). The quality and quantity of biogas production is influenced by the concentration of cow dung, the number of microbes and the duration of the fermentation process as well as the operating conditions of the digester (Sanjaya, at al., 2015).

2 Research Method

Materials used in this study were fresh cow dung fresh obtained from cowshed in village Kedungdowo Situbondo and starter/microbial made from basic ingredients of cow dung.

At this stage of the production process which conducted was mixing cow dung and water with ratio (section): 1:0.5; 1:1; 1:1.5; 1:2; 1:2,5 and total of Metano bacterium which varied as much (ppm) (0) (50) (100) (150) (200). All experiments were carried out using a Horizontal Digester with a size 5.2 m3, diameter 1.82 m, Length 2 m with an initial raw material weight of 3500 kg (mixture of cow dung and water). This research was carried out for 16 (sixteen) days and observed and recorded/measured every day on changes in pressure, gas production, and gas contents (CH4; CO2; Residual Gas).

3 Results and Discussion

In the preliminary experiment, the characteristics of the equipment and calibration of the measuring instruments (flowmeter and manometer) were tested. The results of the anaerobic fermentation of cow dung were analyzed for contents of methane, carbon dioxide and residual gases using Gas Chromatography (GC). Results of the experiment on effect of raw material ratio of cow dung and water to gas product and contents of gas formed, shown in Figure 1, 2, and 3. In the variation of the

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research done on the amount of a mixture of cow dung and water as much as 3500 kg/batch and the number of microbes added was 50 ppm.

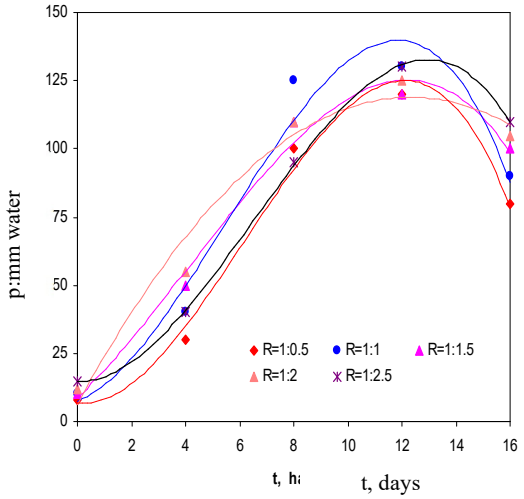

Fig. 1. Relationship of process time and gas pressure

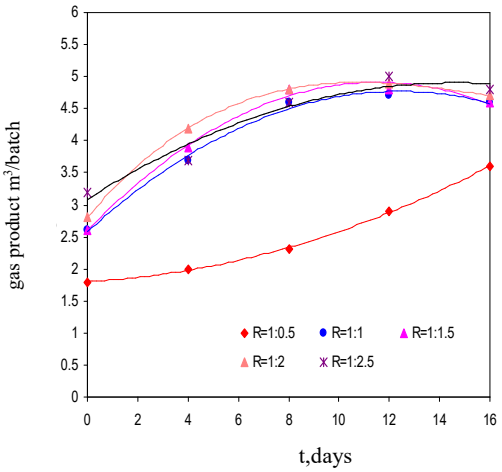

Fig. 2. Relationship of process time and gas products

In Figure 1 and 2, showed that the gas pressure in horizontal digester and biogas productions were influenced by the ratio of raw materials of cow dung and water process. The longer time process, the more gas was formed, so that the gas pressure in the horizontal digester increased and at 12 days tended to decrease.

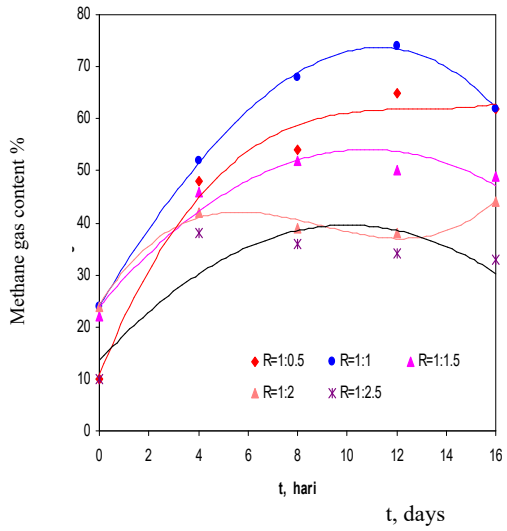

Fig. 3. Relationship of process time and gas content

As shown in Figure 3, that content of methane (CH_4) improved significantly with the length of time the fermentation process and on day 12 seemed decreased.

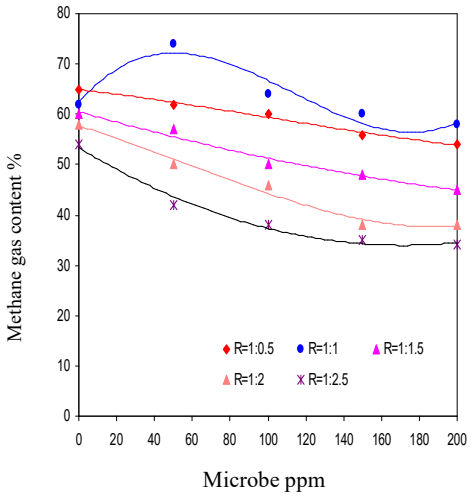

Fig. 4. Relationship of microbial number and gas content

Also, in the variation Total Project ah microbes are added (ppm) on contents of gas in various proportions of raw materials, the more the number microbial added contents of methane (CH_4) tended to decrease, and vice versa contents of carbon dioxide (CO_2) would increase as seen in Figure 4.

4 Conclution

In the study biogas production process that has been carried out based cow dung (biomass), it can be concluded that, the product of biogas and methane gas contents influenced by duration of fermentation time and materials used. Results relatively well obtained by mixing cow manure and water at a ratio of 1: 1 (section)

and the addition 50 ppm a microbial of fermentation processes for 12 days per batch. Biogas produced as much as 5.1 m 3/batch with gas contents of methane of 74 %, carbon dioxide of 19 % and residual gas of 7 %.

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