

Influence Decrease in Chemical Oxygen Demand (COD) Against Biogas Quality and Production

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ABSTRACT: *Chemical Oxygen Demand or Need Oxygen chemistry is amount oxygen is needed for waste organic matter in the water can oxidized in a way chemistry . Chemical Oxygen Demand (COD) have the value which is size For level pollution by material organic . COD value contained in material standard such as palm oil mill effluent can converted into biogas due to its high value so that allow For produce high biogas production . On study This done data collection in direct that is with using secondary data and primary data. From the research that has been done , known that The more high COD Removal then the more The quality of the methane gas produced is also high . This is can seen based on at COD removal of 81%, it was obtained methane gas quality by 67%. And, increasingly high COD lowered so the more The biogas production produced is also high . This is can seen based on on COD reduction of 797,716 kg resulted in biogas production of 478,629 m³.*

Keywords: POME, biogas, COD, pH, suhu

1.INTRODUCTION

Palm Oil Mill Effluent (POME) is Wrong One waste that can potential as material standard biogas production . Processing on POME with content high organic This can done with anaerobic process . Degradation process anaerobic is a fermentation process material organic by activity bacteria anaerob on condition without oxygen . Fermentation anaerobic in COD overhaul done by microbes anaerobic in the digester lagoon. The digester lagoon is reactor closed Where material organic outlined by bacteria in a way anaerob with through a number of stages that is hydrolysis in the form of a decomposition process biomass complex become glucose simple , acidogenesis is an oxidation process anaerobic For to form sour organic chain short like alcohol , acetogenesis in the form of formation process acetate , carbon dioxide And hydrogen , stage final that is methanogenesis is change compound into methane gas which is biogas.

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high value so that allow For produce high biogas production . (Nugrahini & Parningotan , 2020

Along with the walk production , materials raw materials used in PLTBg Sei Mangosteen own different COD levels at each time . Change This COD level can influence biogas production and the quality of biogas that will be produced . So that the need checking COD levels on material the standard that will be enter into the digester lagoon or COD inlet and outlet COD levels . In study This will discussed about How influence COD reduction against quality And biogas production .

2.LITERATURE REVIEW

Palm Oil Mill Effluent (POME)

Waste liquid factory coconut palm oil or Palm Oil Mill Effluent is wrong One type waste organic agroindustry in the form of water, oil And solid organic origin from results beside the processing process bunch fruit fresh (FFB) coconut palm oil For produces Crude Palm Oil (CPO). Palm oil mill effluent (POME) is waste liquid results processing coconut palm oil . POME is usually only processed with use aerobic and anaerobic methods for lower COD and BOD levels (Nassya , 2023).

Chemical Oxygen Demand (COD)

Chemical Oxygen Demand (COD) is amount the oxygen needed For to describe all over material organic contained in water. COD measurements determine amount material organic in water and make COD as indicator burden pollution organics on the water surface . High COD in POME will produces large amounts of biogas (Nassya , 2023). Content substance organic shown with COD, the height COD value on POME can lowered with do processing in a way anaerobic which produces biogas. COD is also a material food microorganisms for the hydrolysis process in formation sour in a way anaerobic , acid formed will utilized microorganisms in produce biogas. The formation of biogas is very depends on composition chemistry substrate or degraded COD become compound simple in gas form (Nassya , 2023).

Biodigester

Biodigester is a tool that works as place the fermentation process takes place waste organic with help microorganism until produce biogas. Waste *Palm Oil Mill Effluent* (POME) is collected in biodigester during the decomposition process in progress or in other words until

waste the produce biogas. Covered anaerobic digester is type biodigester used in PLTBg Sei Mangkei . Advantages system This is low cost , convenience in construction , but need more land wide .

3.METHODOLOGY

Study This started with investigation POME start as feedstock for digester lagoon produce biogas, including in it taking sample in a way directly on location .

Besides it is also done investigation beginning about POME requirements on moment enter the digester, covering temperature , pH and COD value . With thus , on stage furthermore can the required parameters are known adjustment .

On study This done method data retrieval as following :

1. Primary Data namely the data obtained directly in the field about waste liquid used as material biogas raw material . Done gas check using a gas analyzer for know quality or levels of biogas produced , total gas and POME seen on flowmeter tool , and pH is measured use paper litmus with point intake in combined steel tank pipe towards the digester lagoon.

Table 1 Data Analysis Quality And Biogas Production

| Data To - | Total POME | Temperature | pH | CH ₄ | Biogas Production |
|--------------|---------------|-------------|-----|-----------------|----------------------|
| | (m3) | °C | | (%) | m3 |
| 1 | 16571 | 33.8 | 6.7 | 64 | 318877 |
| 2 | 17593 | 34.6 | 7.0 | 67 | 434866 |
| 3 | 19572 | 34.6 | 7.0 | 64 | 465666 |
| 4 | 18811 | 34.8 | 7.0 | 65 | 431949 |
| 5 | 17861 | 36.5 | 7.2 | 63 | 436641 |
| 6 | 20496 | 36.7 | 7.2 | 65 | 436202 |

2. Data Seconds

Secondary data is collection of data obtained writer in a way No direct through intermediary media like observation , interviews , and discussion and data from the Indonesian Surveyor sent to PLTBg Sei Mangkei .

Tabel 2 Data Analisa Kadar COD

INFLUENCE DECREASE IN CHEMICAL OXYGEN DEMAND (COD) AGAINST BIOGAS QUALITY AND PRODUCTION

| Data ke- | COD inlet | COD outlet |
|----------|-----------|------------|
| | mg/L | mg/L |
| 1 | 48555 | 10935 |
| 2 | 54593 | 10372 |
| 3 | 53240 | 12482 |
| 4 | 48862 | 10482 |
| 5 | 56456 | 15686 |
| 6 | 46130 | 10255 |

3. Data COD Removal

COD Removal is reduction process level the oxygen needed For oxidize all material existing organic in POME. Formula COD removal calculation :

$$\text{COD removal} = \frac{\text{COD inlet} - \text{COD outlet}}{\text{COD inlet}} \times 100\%$$

As for results from COD removal calculation and connection between CH₄ that is can seen on table following This :

Table 3 Observation Data of COD Removal and CH₄

| Data ke- | COD inlet | COD outlet | COD Removal | CH ₄ |
|----------|-----------|------------|-------------|-----------------|
| | mg/L | mg/L | % | (%) |
| 1 | 48555 | 10935 | 77 | 64 |
| 2 | 54593 | 10372 | 81 | 67 |
| 3 | 53240 | 12482 | 77 | 64 |
| 4 | 48862 | 10482 | 79 | 65 |
| 5 | 56456 | 15686 | 72 | 63 |
| 6 | 46130 | 10255 | 78 | 65 |

4. RESULTS AND DISCUSSION

Influence COD Decrease Against Biogas Quality

COD removal percentage is percentage showing how much maximum microorganisms For to describe material existing organic on a material . Methane (CH₄) this obtained from the

decomposition process material organic in substrate through the fermentation process anaerobic . This to signify in the process of formation the biogas walk with condition optimal operations . Factors that influence it That like temperature , pH is regulated For support growth And activity microorganisms responsible answer on production methane (Saraswat et al., 2019).

For see the quality of methane gas produced , study This used functioning gas analyzer For know How many percent of CH_4 gas produced . Measurement done through biogas outlet pipe after through anaerobic digester .

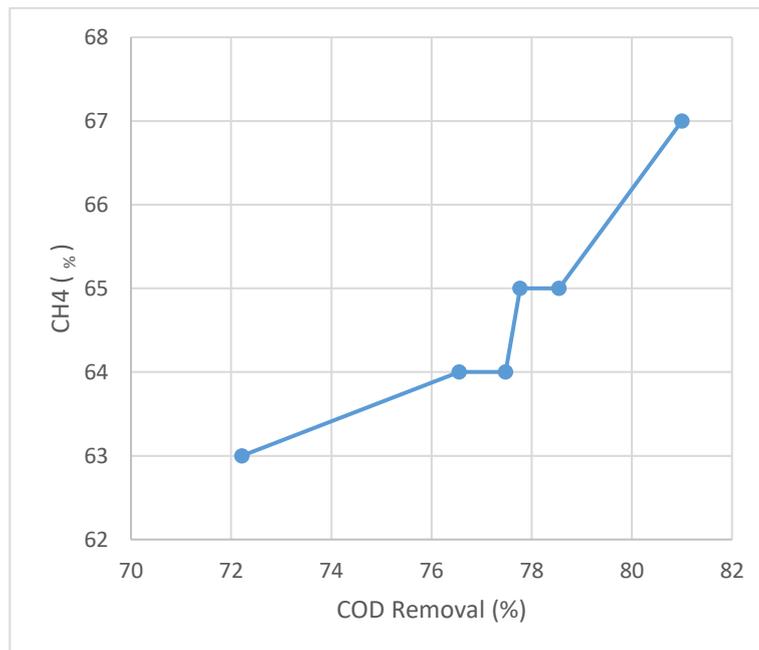


Figure 1 COD Removal of CH_4

On study This obtained COD *removal* relationship with methane gas , where the range of methane gas obtained range between 63-67%. The highest methane gas content obtained on the 2nd data, namely by 67% with COD *removal* percentage by 81%. and methane gas levels the smallest obtained that is by 63% with COD percentage of 72%. If seen on chart on This with the more height COD *removal* value so will cause CH_4 quality is also increasing increased . This is in accordance with experiments conducted by (Kaosol , et al. on 2013) which said If high COD reduction then the CH_4 produced will also be high . During the digestion process waste For COD reduction was observed with waste as substrate , where digestion anaerobic on waste *Palm Oil Mill Effluent* produce around 55-67% with an optimal pH of 7.

Influence COD Decrease Against Biogas Production

Biogas production is the amount of gas produced from *Chemical Oxygen Demand* (COD) in liquid waste such as *Palm Oil Mill Effluent* (POME). The biogas produced in this study is indicated by a decrease in COD levels during the biogas degradation process. The decrease in COD levels during this process indicates that there is activity of microorganisms in degrading organic materials so that they can produce biogas. This shows that the process is running effectively.

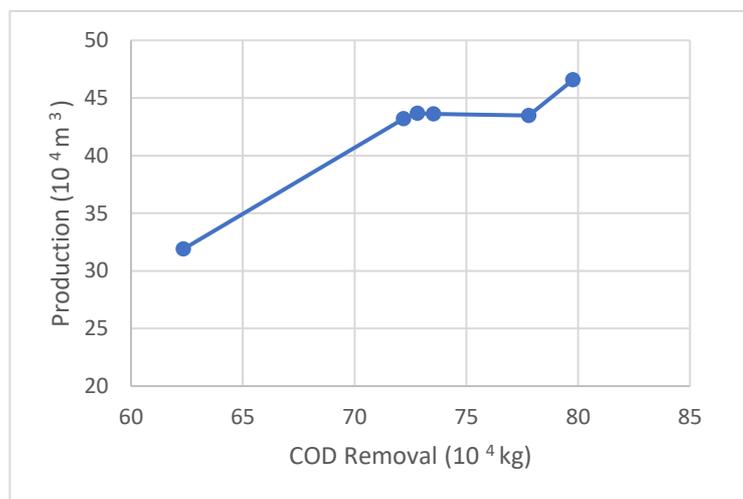


Figure 2 Relationship between COD and Biogas Production

From the graph above, it shows that the greater the decrease in COD levels, the greater the biogas production produced. This can be seen in the 3rd data, where the decrease in COD obtained was 797,716 kg resulting in biogas production of 478,629 m³. In the research of Deni Rachmat, et al (2023) which has been carried out, where if the COD decrease is high, the biogas production produced will also be high. This happens because microorganisms work well so that the process can take place to degrade/remove organic compounds in the waste perfectly. However, after looking at the consumption data on the gas engine, it was found that the usage was lower compared to the biogas production produced. This can be caused by factors such as maintenance activities on the gas engine so that the production produced is not used as gas engine consumption, but the biogas is disposed of through combustion through flares.

5. CONCLUSION

As for conclusion from study This is :

1. The more High COD *Removal* so the more The quality of the methane gas produced is also high . This is can seen based on on COD *removal* of 81 % , it was obtained methane gas quality by 67%.
2. The more high COD lowered so the more The biogas production produced is also high . This is can seen based on on COD reduction of 797,716 kg resulted in biogas production of 478,629 m³ .

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