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## **POTENTIAL HUMAN SEWAGE INTO RENEWABLE ENERGY AND ORGANIC FERTILIZER PLANTS IN SOCIETY**

**Lambok Parulian Simbolon**

*Department of Mechanical and Bios stems Engineering, Bogor Agricultural University, Bogor, Indonesia*

*[paruliansimbolon17@gmail.com](mailto:paruliansimbolon17@gmail.com)*

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### **Abstract**

*Human excrement or feces is considered extremely disgusting by the man himself, even rarely used as organic fertilizer. Stool very useful in mixing ingredients in organic fertilizer or planting medium. On the other hand, the stool has a great potential to be used as biogas, as well as cow dung the is now used as a biogas flare. With the human population is very much, the stool has a very high probability to be used in biogas. Furthermore, waste biogas can be used as organic fertilizer for crops.*

### **Keywords**

Human, feces, biogas, fertilizer, organic, population

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### **1. Introduction**

Last time at this moment, our world is being confronted with so many problems about energy crisis that are befalling society in daily life. This is because the depletion of fossil energy reserves contained in the earth. And so we need new innovations that can maintain the stability of the energy in the present and the future. Scientists and engineers were trying and finding a

new solution that we usually known with the name of renewable energy. Which uses the power of solar cells, water, wind, geothermal, tidal wave, fuel cell and even the use of plants into renewable energy.

But the constraints that a new problem is that any renewable energy cannot be generated in every place where people lived. Not every place has the same source and can be processed into energy. Besides the quality of the different sources of energy in every place does not even exist. Each region has a hemisphere solar radiation is different, different potential energy of water to turn turbines. The source of power of the wind is very different; sometimes even the wind often a very destructive hurricane human life. Not all countries have a coastline that wind strength is very supportive in turning the wheel Earth also radiates heat very significant difference. It is becoming a topic of new problems for regions that do not have the potential to establish a new energy storage station. Another reason is some of those resources are too expensive.

However, energy is not the only issue is the subject of the problems in society. Start buildup of organic waste and inorganic waste, environmental pollution due to waste, global warming due to the accumulation of toxic gases of the greenhouse effect as well as from waste animal or human feces. As a result, the natural balances to be disrupted. This problem is also very threatening human survival.

Scientists and engineers began to answer and respond for problems that are going on, with a waste processing into renewable energy. Through this particular process has yielded very good results, although this is still being developed in the increased efficiency of the results obtained. Moreover, the organic waste like some waste form of impurities animals have also been developed and applied in public life, both large and domestic scale. This result is known as biogas.

But with this success, engineers and scientists back got a new challenge and an opportunity in the process of development and improvement of functionality and efficiency as well as additional sources of raw materials biogas. What if human feces or feces were process into a biogas? What if implemented societaydaily on a large scale and households. Because this energy source is available in every community at large. Plus is currently the world's human population is starting solid and probably will continue to rise. Therefore, the author tries to study the problems that occur in the community and also the opportunities utilization of human feces

as biogas and development of utilization in organic farming.

Before discussing more about biogas utilization of human waste, some of the things you needs to understood so that we can know the flow of development of renewable energy inventions from time to time.

- a. What is that of renewable energy, especially biogas and what is biogas?
- b. Why should use biogas as and why you should use human sewage as biogas?
- c. What are the prospects development of biogas made from human sewage and what advantages and disadvantages compared to the other human waste as an energy source biogas?
- d. What are the benefits of human waste in agriculture and how its implementation in the environment of organic farming?

With an understanding of each process, we can evaluate every achievement there is to be improved and developed further. Next we need to set the direction and focus of every science that we develop. The aim of this paper is

- Study, consider, and to implement the use of human sewage as raw material biogas potential and existing information.
- Analyze how to increase the efficiency of utilization of human sewage in the agricultural environment.
- Enhance the reader's curiosity and enthusiasm in the development of science and engineering science. As well as the readers should be able to analyze and improve the utilization of other wastes into something better.

## **2. Review of Literature**

New or renewable energy is energy in general utilizing renewable non-fossil resources or if managed properly, the resources will not be exhausted. Sources of energy are included in renewable energy is geothermal, hydro, solar, wind, waves, biomass, biogas, fuel cells, and nuclear energy (Fabricant E.Y. & Priyono S., 2012).

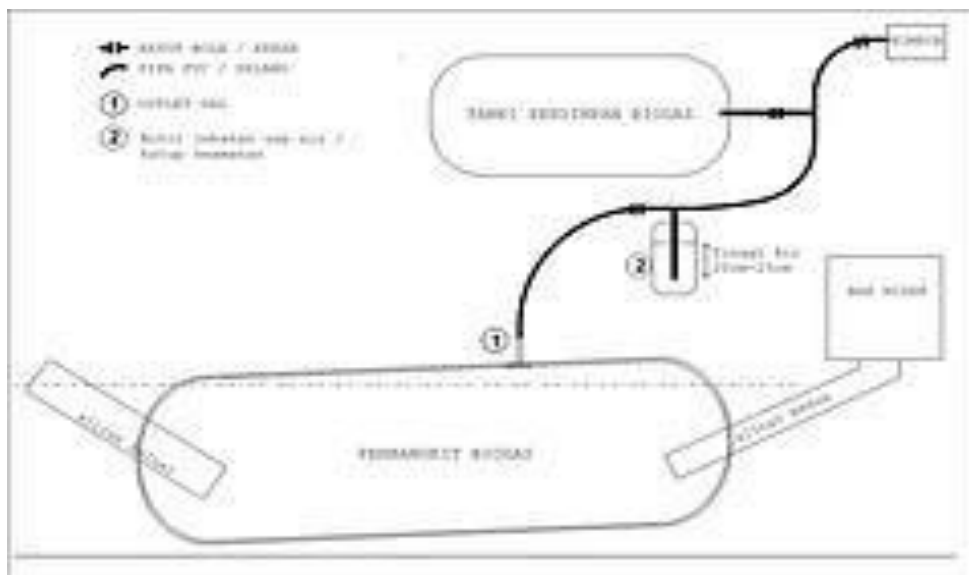
Biogas is a combustible gas derived from decomposing biological waste under anaerobic conditions and normally consists of 50-60% methane. Anaerobic digestion mean a microbiological process of decomposition of organic matter, in the complete absence of oxygen, Carried out by the concerted action of a wide range of micro-organisms. Anaerobic digestion

process is common to many natural environments and it is applied today to produce biogas in airproof reactor tanks, commonly named digesters (Seadiet et al., 2008).

Biogas potential as a renewable energy source because the content of methane (CH<sub>4</sub>) is quite high and the calorific value is high enough, that is 50 MJ / kg. In addition, methane, because it has one carbon in each chain, can produce more environmentally friendly combustion of fuel compared with a carbon chain length. This is due to the amount of CO<sub>2</sub> produced during the combustion of fuels fewer short carbon chain (Wawan J et al., 2012). In a biogas insulation consists of a tube in which there fermented human waste and produce gas that contained 60% methane (CH<sub>4</sub>) (Tri PS, 2002). Feces and urine of men classified as organic material is the result of an overhaul and absorption the rest of the digestive system. Based on the results of the capacity of the average adult feces 0.20 kg/day/person (Sugiharto, 1987).

The main infectious disease incidence can be reduced with the introduction of safe waste disposal is a disease infections and intestinal worm infections, including cholera, typhoid and par typhus fever, dysentery and diarrhea, hookworm, schistose miasis and filariasis. High-risk groups are children under 5 years old, because their immune systems have not fully developed and further damaged by malnutrition (Sasimartoyo T.P., 2002).

Utilization feces as soil conditioner material is an effective solution for resource-limited areas and difficult to obtain agricultural inputs. This reason also encourages people in the Lahaul Valley, Himalayas, and India, to make compost of human excrement. In addition to a very remote location, climate unfriendly also makes farmers there developed a unique way of cultivation. But before this socialized utilization, the biggest problem faced is how to eliminate disgust. In addition, at the beginning of the 20th century in northern Vietnam, farmers used to use fresh feces for fertilizing their fields. This practice is less healthy because the risk of transmitting diseases (Mwalukisa P & Santaran S.O, 2000).



**Figure 1:** Reaktor Digester plastic biogas Source: <http://manglayang.blogsome.com/biogas-infrastruktur-part1>

### 3. Methodology

The methodology used in writing this paper is in the form of collection of related theories. Moreover, writer also tried to collect relevant literature in the form of biogas and renewable energy utilization. Furthermore, the existing theories about the content of human sewage (feces), literature about the nature and benefits as well as the use of feces in support of biogas energy and agriculture. Results of the analysis examines the potential of human waste in biogas production and utilization as organic fertilizer in the field of organic agriculture.

### 4. Conclusion

Renewable energy is energy that utilizes non-fossil resources are updated or if managed properly, the resources will not be exhausted. Sources of energy are included in renewable energy is geothermal, hydro, solar, wind, waves, biomass, biogas, fuel cells, and nuclear energy. Additionally renewable energy is the energy eventually intended to reduce its use should even be able to replace fossil energy materials. Biogas is a flammable gas obtained from decomposition of organic waste in an anaerobic and usually contains 50-60% methane.

Increasing human population, resulting in a drastic increase demand for energy, but fossil energy sources contained in the Earth dwindling and it took a very long time (thousands or even millions of years) to obtain new fossil energy. Although this crisis as a result of the engineers and scientists have developed renewable energy from water energy, solar cells, wind, geothermal tidal wave, fuel cell, there are still some weaknesses weaknesses in the application of renewable energy. The fact that not all places or countries that have a potential energy that can be used to drive a turbine, not all places or countries have solar radiation good for solar cells, not all had current wind that can move windmill, not all countries have high geothermal, not all countries or places have marine waters, and not all countries can develop fuel cell technology. Sometimes to apply, more energy is sacrificed to develop tools to obtain renewable energy. Not only that, the problems encountered. Sewage waste problems arise which are basically considered to be highly contaminating, damaging the environment, and even disrupt the balance of nature that affect the health and survival of mankind.

With these problems, the engineers and scientists back to bring innovation to the field of biogas processing organic wastes into fuel. Besides inorganic waste also has to be processed and used as renewable energy. Generally, the use of biogas is still dependent on raw materials from livestock waste. In addition to generating new energy, processing of animal manure can also reduce the toxic gases that pollute the environment in the waste. Such as the erosion of the ozone layer due to the accumulation of toxic gases in the atmosphere. But the problem arises in the community, that not all people have cattle. So the problem is yet to be developed further. What can we do? What the opportunities can be obtained from any achievement and this problem? Organic wastes are not only derived from plants or animals. Humans also produce waste every day. What about the human waste?

Human waste is often called the stool has great potential to be tapped into biogas. Similarly, animal waste, feces also contain methane gas which is very abundant. At least among among 60%. Moreover, in human feces are also contained other gases that contain necessary nutrients the plants, even bacteria live in feces. Including the hydrogen gas that can be used as an energy source. With a diverse and gaseous substances, substances and bacteria contained in the feces, feces also are a serious contender for humans if it is not harnessed into biogas and collected in an isolated room in a digester. If feces contaminated with a stream of water, or

contaminated with humans. Stool also has the potential to spread infectious diseases such as disease infections and intestinal worm infections, including cholera, typhoid and par typhus fever, dysentery and diarrhea, hookworm, schistosomiasis and filariasis. High-risk groups are children under 5 years old, because their immune systems have not fully developed and further damaged by malnutrition (Sasimartoyi T.P., 2002).

Now in 1 July 2015, estimate of human amount in the earth around 7,324,782,225 people. According to Wawan J et al., (2012), the Biogas potential as a renewable energy source because the content of methane (CH<sub>4</sub>) is quite high and the calorific value is high enough, that is 50 MJ / kg. Besides that, according to Sugiharto (1987), feces and urine of men classified as organic material is the result of an overhaul and absorption the rest of the digestive system. Based on the results of the capacity of the average adult feces 0.20 kg/day/person. 50 MJ/ kg and 0.20 kg feces/day/person waste is enough resource. We can see that in a calculation. If we make calculation about energy that we can produce from human waste, every person produce 0.2 kg feces and every kg feces can produce 50 MJ.

**Table 1:** *Estimate Count of Human in the Earth in 1 July 2015*

No	Continent and Region	Amount of Inhabitant	%
1	Asia	4,384,844,097	59.86%
2	Afrika	1,166,239,306	15.92%
3	Eropa	743,122,816	10.15%
4	Amerika Selatan dan Karibia	630,088,917	8.60%
5	Amerika Utara	361,127,819	4.93%
6	Australia dan Oceania	39,359,270	0.54%
	<b>Total</b>	<b>7,324,782,225</b>	<b>100.00%</b>

Energy produces by human/person/day

$$\begin{aligned}
 E &= 0.2 \text{ kg} \times 50 \text{ MJ/kg} \\
 &= 10 \text{ MJ} \\
 &= \frac{10\text{MJ}}{24 \times 60 \times 60} \text{ (time in a day)}
 \end{aligned}$$

$$= 115.7407 \text{ Watt}$$

Energy produce by all of people in the earth, where N = human amount

$$E = E_{person} \times N \text{ (equation 1)}$$

$$E = 115.7407 \text{ watt/person} \times 7,324,782,225$$

$$= 847.7554 \text{ GW}$$

According to the calculation, all of human in the earth can produce energy at least 847 GW every second. We can use that energy for human necessary, at least to support other energy source. Beside that this resource is a sustainable energy, during human alive.

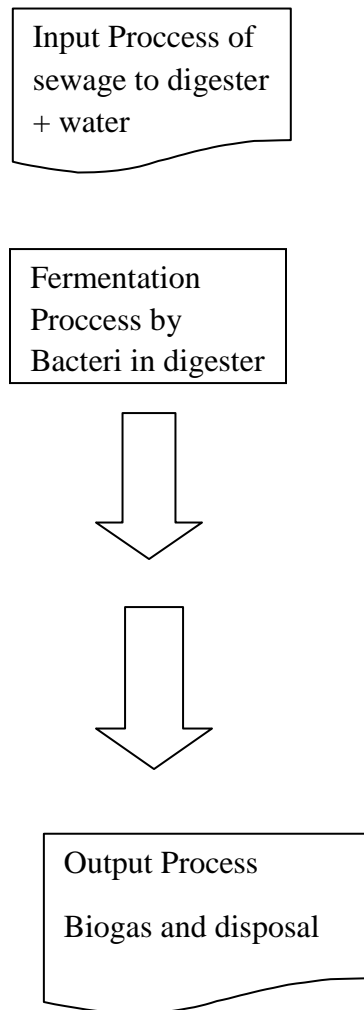
Biogas made from human feces has many advantages that can be used as an excuse to be developed and implemented in the daily life of the raw materials available in each place around the earth in the sense where the human being will inevitably result in feces. In addition to the enormous human population allows biogas with human faeces need to be applied and developed. Many places that will produce biogas in large quantities such as schools, hotels, campuses, offices, hospitals, and so many place more and for small scale can be applied every home. Once biogas is used, people can also take advantage of residual waste water and waste fermentation biogas to be used as organic fertilizer. Because feces also contain organic matter, nitrogen, phosphorus, potassium and other nutrients that plants need. In addition to containing the necessary nutrients the plants, residual waste fermentation and biogas also serves as a destroyer pathogen that attacks plants, soil moisturizer safe for plants. This is because the feces have sufficient water binding capacity is good and healthy for the plants.

### **The formation process of biogas**

Because the most important component of biogas is methane and other gases that would be obtained from space called a digester. From some other sources also stated that the biogas produced from digester chamber able to achieve between 54-70% methane, 27-45% carbon dioxide, 3-5% sulfur, hydrogen 0-1%, 0-0.1% carbo monoxide, 0.1% oxygen, and a little hydrogen sulfide.



In the process of fermentation in the digester, there are some bacteria that have an important role in the fermentation process, streptococci, bacteroides, and some types of enterobacteria. Furthermore, the bacteria will ferment in the digester or a drainage pit. Further disposal can be processed into organic material which is very useful.



**Figure 2:** *The formation process of biogas*

The use of biogas is excellent in combustion. Heat gained quite high (blue flame), does not produce smoke. Of unused waste material into biogas (liquid), can be used as organic materials that are good for plants.

Installation of the biogas production is consisting from:

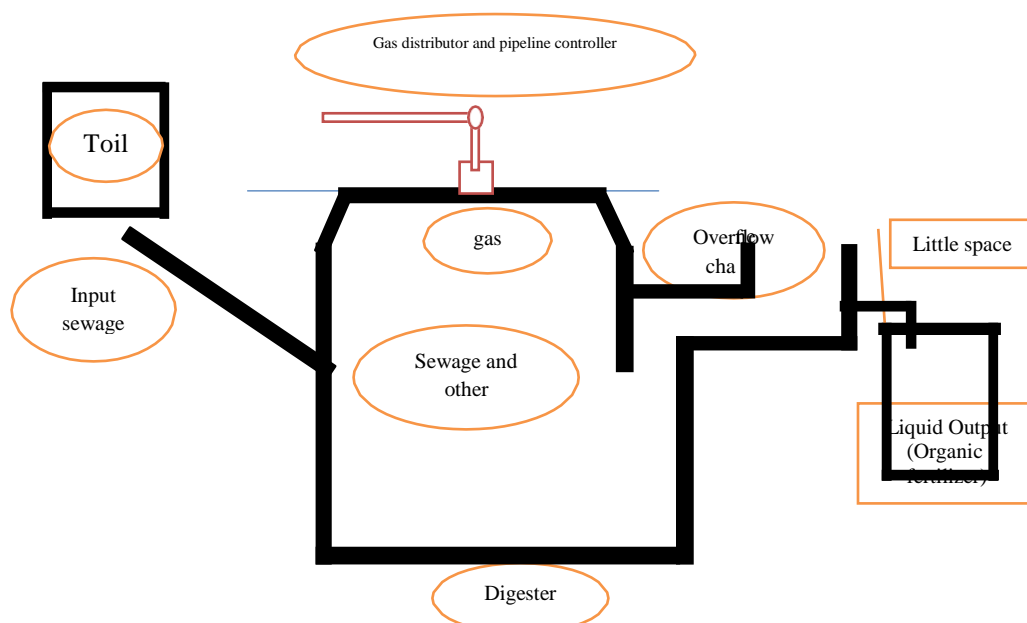
- WC (toilet) as human waste collecting
- Distributor pipe
- Digester
- Face downward of gas
- Gas distributor pipeline and controller
- Distributor pipe of residue
- Well reservoir of residue

### Benefit targets

- ✓ To help provide energy for household needs
- ✓ Helps reduce energy use conventional obtained from the processing of fossil energy
- ✓ Helps reduce environmental pollution caused by the waste that occurs in both rural and urban communities, especially densely populated area
- ✓ Help improve the quality of organic farming in the present.
- ✓ Increase the use of renewable energy as a source of additional energy
- ✓ Able improved its standard of living and economy of communities in rural areas



Figure 3: Simple Installation for a Home use Animal Sewage Source:  
<http://www.biru.or.id/index.php/digester/>



**Figure 4:** Simple scheme for human sewage biogas planning

## Using of Sewage for Plants

### Processing

According Francis's, Pickford and Reed, published by Tri Preset you, human was tee should be valued as natural resources are conserved and reused undercar full setting-hit than used good sari dumped. It is very appropriate given the scarcity of natural resources and also support so organic farming program which lately began to be developed. According Try Preset yon, human was tee is derived from:

- Night soil or was Te that is collected directly by the canal system of settlement.
- The solid material original ting from the pit.
- Sludge, scum and liquid from septic tanks, square view, and vault sand cesspit.
- And waste water that has not be entreated as well as sludge from waste water treatment plant.

In agriculture, human waste rich source of nitrogen and nutrients needed by plants. Such as night soil sample containing 0.6% nitrogen, 0.2% phosphorus and 0.3% pos tedium which is

an excellent nutrient for plants. According to Strauss (1985), the nutrient content of various nature If fertilizers including human waste is presented as the following table:

**Table 2:** Estimate of Nutrient Content from various Organic Fertilizers

Type of Fertilizer	Nutritional Content ( % Dry Weight )		
	Total N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
Human Sewage	5 - 7	3 - 5.4	1 - 2.5
Human Urine	15 - 17	2.5 - 5	3 - 4.5
Night Soil fresh	10.4 - 13.1	2.7 - 5.1	2.1 - 3.5
Fresh Manure Livestock	0.3 - 1.9	0.1 - 0.7	0.3 - 1.2
Pig Fertilizer	4 - 6	3 - 4	2.5 - 3
Crop Residua	1 - 11	0.5 - 2.8	1.2 - 11

*Source: Table 3. Media Lit bang Kesehatan Volume XII No.1 Tahun 2002 Tri Presto)*

Ways of processing human waste by composting is the most appropriate. This processing can reduce or even eliminate the possibility of disease transmission. It has been applied by farmers and even around the world for centuries.

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