THE IMPACT ON THE COMMUNITY USING BIOGAS TECHNOLOGY IN THE COMMUNITY

[1]NUTTIDA CHANHOM, [2]PRUNGSAK UTTAPHUT, [3]TANAPORN PANTUPRECHARAT

[1,2]Electrical Industrial Technology Department, 3Computer Engineering Department, Faculty of Industrial Technology, Suan Sunandha Rajabhat University, Bangkok, Thailand
E-mail: [1]nuttida.c@gmail.com, [2]prongsaku@gmail.com, [3]vtanaporn@hotmail.com

Abstract- Biogas is a renewable alternative species that can be made from household to industrial plants. Raw materials are mainly biomass waste from the animals in the community. Result show that of potential at Banmuang sub district, Bandung district, Udonthani province have pigs of 5-10 per household, Cody-Buffalo of 2-8 per household and duck - chickens of 10-15 per household on average to produce biogas. The installation of biogas systems for storing information measuring 5-8 cubic meters because it is appropriate to breeders household level. Biogas can be used to cook 1-3 hours per day or amount of methane per day, about two cubic meters for enough to use the cooking gas LPG. Cattle - Buffalo 2-5 per household to get enough produce biogas. The results of economics was the cost savings per household on average 370 baht per month/household. The investment community farmer household installations of value investing is at 3,000-5,000 baht. Saving the equivalent of 3,840 baht/year grant period is 0.91 years. The investment period with a short payback period and the economic returns are high. Household savings and reduces the pollution is another way.

Keywords- Dung, Biogas, Agricultural, Community

I. INTRODUCTION

Biogas is a clean energy which is made from organic waste products such as animal waste, sewage from the ranch, waste water from industrial factory, garbage and agricultural residues. It is produced by fermentation to decompose organic matter without oxygen (Anaerobic Digestion). The animal husbandry is an important part of Thai agriculturist that can be a major or minor income of the family but it has a byproduct of animal dung leading to health problems. The animal waste can spread germs to humans or other pets, such as diseases of the digestive system and parasites, and also attract animals that are disease vectors like flies. The methane gas from waste can directly affect the health of humans and animals, and carbon dioxide gas is also believed to be a major cause of global warming. Another problem is an odor pollution from hydrogen sulfide gas that can affect to landscape and community relations. In addition, the animal husbandry in Thailand is often found near the water resource. If animal wastes are discharged into water resource, it can lead to water pollution. Therefore, the production of biogas from manure or food waste is interesting method that can be used as a source of renewable energy in the household to save money and also helps eliminate many problems, i.e., health, social and environment.

In the current issue of the global shortage of energy particularly oil more intense every moment. Many countries look for new technologies in the production of energy to replace oil. Biomass energy is one of the countries interested in research and development. The biogas is currently the most widely used research attention. In order to maximize the benefits to humans and to produce biogas as a renewable energy source in the household to the other one. Creating a gas ranch the biogas produced from manure and promote the production of electricity as a potential. It also allows farmers to reduce the spread of animal diseases. So, should encourage farmers who have pets have led many biogas systems for application in the community.

II. DETAILS EXPERIMENTAL

2.1. Materials

Banmuang sub district, Bandung district, Udonthani province, located on the north-east of Thailand. People have agriculture and livestock farming as the main occupation such as pigs, cody-buffalo and duck – chickens. There are also food waste and residues from agriculture. Which can be used to produce biogas.

Fig. 1 Resources for production of biogas energy

2.2. Biogas Technology

Biogas is the cause of the decay of organic matter decomposition and caused the nebula. Precursors of biogas The organic remains of a creature or a

component in the waste water and waste. The bacteria are common to many types of degradation. Approximately 80-90 percent of organic matter is decomposed and converted into biogas, which consists of various gases. Most of the methane (CH4) 50-70%, and carbon dioxide (CO2) 30-50%, the rest is other gases, such as ammonia (NH3) and hydrogen sulphide (H2S) and water vapor (H2O) etc.

Fermentation of organic matter to biogas can be divided into three phases. The first was hydrolysis, decomposition of organic matter with large molecules into organic compounds are small molecules. The second was acid formation, the solution is decomposed by bacteria in the air that do not need oxygen, Finally phases was Methane formation, the solution is to change the gas instead. The bacteria that generate methane a condition that does not require oxygen (Fig 2).

2.3. Design and Test Digester Biogas

2.3.1 Process of building biogas plants

The process of creating a digester biogas. Start by exploring the area and type of soil prior to construction of the pond. Next, lay the mortar, sprinkle the area to dig. There are three wells, the wells filling the pond, fermentation tanks and which are filled.

Biogas and compost bags PVC Sized for smallholders. The animal (cattle) 5-10 should bag lengths of PVC 4-6 meters (the size of the pond is

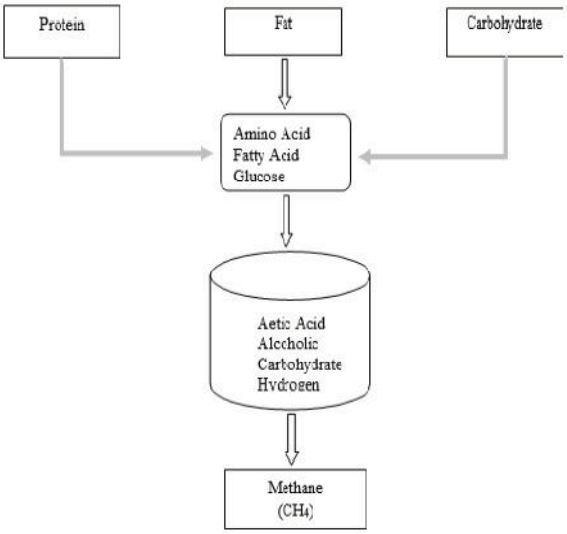

Fig. 2 Process flow diagram conversion into biogas process

1.80 meters long, 3.80 meters wide and 0.80 meters deep).It has a volume of 5.5 cubic meters of landfill by separating the liquid 4.125 cubic meters of gas of 1.375 cubic meters. This amount is sufficient to bring the gas to the stove furnace number 2 (0.15 cubic meters of gas per hour) for use in household cooking.

The cow manure generally has a solid 15% (aged manure, fresh up to 15 days) in which the digester water containing solids of approximately 3%, gas production is using the ratio of the value and equal to 1: 1 to 1: 4 by the need to fill dung one day at a time

2.3.2 Process of building the digester

Step 1 The production of biogas digester. There are three main components of the system components, the pond is filled bags, compost manure digester, which is PVC. And a pond overflow drain waste information through decomposition is complete.

Step 2 Site preparation by space exploration and the type of soil in the area farmers. Select the light shines of the area. Because the fermentation work effectively. Should slope slightly below the stables. The manure drain flows into the pond itself. Or maybe a depression-type scoop dung to fill regardless of the digester to the stables.

The size of the hole have a width of 1.80 meters, long of 3.80 meters and deep of 0.80-meter. Perform a trapezoid and the cross-sectional area of the pond that is slightly narrower. The top and bottom of the pit dug for laying pipes and drain of dung. The entrance has a higher value than the drain grounded out about 10-15 cm.

Fig. 3 Design and building of digester biogas

Step 3 Prepare other materials as PVC thickness 0.35 mm wide 2 meters and long 18 m to prepare bags of compost and prepare 4 inch PVC pipe 60-100 cm and long 2 pieces for connect wells to fill the bags of manure compost PVC. Next, Welding PVC bags, compost manure pit with the overflow pipe and toilet preparations (cement), 0.60 to 0.80 meters in diameter and two tube wells. Hose lines are made and a plastic pipe for the gas trap. PVC pipe have ½ inch, screw off – in, valve open-off the third-sensitive adhesive systems and gas fields

Fig. 4 Prepare of fermentation bag

Fig. 5 Prepare pothole of fill dung

Step 4 Assembling PVC bags, compost and equipment. Cut the PVC to 1.8 meters long, 6 meters wide and has a number of three pieces. Next, Place a sheet of plastic wrap, then the third piece along the long sides overlapping about 2-3 inches from the plastic stick together with glue. When all three pieces and then glued a plastic bag that looks like a circular cylinder. Will implement a series of gas from fermentation bags. The area is adjacent to the middle of the bag. Use a knife to cut along the length of 2-3 cm. Then, attach the supplied gas in spiral PVC inner bag and screw off the line for the gas side. Later to tie the four-inch diameter PVC pipe length from 0.60 to 1 meter at both ends of the bag. Then the rubber band with old motorcycles. The end of the PVC pipe into the bag for about two thirds of the length of the pipe. Off pipe with a plastic bag to keep the air out. After assembling PVC bag with marinated. And then closed pipe.

An important step is to test the leakage of silage bags by blowing air into the pipe on the other side with an electric blower. The compost bags are inflated to fill the volume of bags of compost. Please tie the pipe with a plastic bag to keep the air out. Use soap and water to test the leakage point to fix it. Next, lifting bags of compost PVC has to dig wells already prepared. Be careful with the sharp end Bring a bag of compost into the holes and set the gas hose to the top of the compost bags has implemented already. Then add water to flood the inside of the pipe compost bags on both sides. Install sump inlet and install overflow tanks at the end of the PVC pipe on both sides to complete. When the pipe and flooded both the sheep and the bales of plastic PVC pipe on both sides out.

Fig. 6 Test the digester of biogas system

Step 5 The gas transmission operator with mounting pressure and trap water bottles to the first point, close to the digester. Choose a digester built near the stove (within 12 meters), then install gas pipelines and gas control valve. Around the stove.

III. RESULTS AND DISCUSSION

3.1. Potential for Biogas System

Table1: Potential for Biogas System at Bandung, Udonthani

Type of Dung	Amount of Pet (Number/Household)
pig	5-10
Cody-Buffalo	2-8
Duck-Chicken	10-15

3.2. Performance analysis of biogas

The data in Table 1, Efficiency of biogas that should be installed biogas systems for storing information measuring 5-8 cubic meters. It is appropriate to breeders household level. The biogas is used for cooking in households 1-3 hours per day or the amount of methane per day, about two cubic meters, enough to use the cooking gas LPG. So, should 2-5 of cody-buffalo that be enough to produce manure and the end result is humus, which is the waste through anaerobic digestion without any investment.

Table 2: Performance analysis of biogas at Bandung, Udonthani

Type of Dung	Amount of Pet (Number/Household)	Methane (m^3)
pig	5-10	6-8
Cody-Buffalo	2-8	2-5
Duck-Chickens	10-15	1.5-2

3.3. Assessment of the economic sector. Social sector and the application of the system to produce biogas

Evaluation of operations in the area. And installation of biogas plants. Result show that farmers in the community of 95 % households was impressed and gain knowledge. The results of economics was the cost savings per household on average 370 baht per month/household (Reference price of gas for one barrel tank at 370 baht / 15 kg). The investment community farmer household installations of value investing is at 3,000-5,000 baht. Saving the equivalent of 3,840 baht/year grant period is 0.91 years. The investment period with a short payback period and the economic returns are high. Household savings and reduces the pollution is another way.

CONCLUSIONS

This research to Potential study and promote the use of biogas in the community. Including the assessment of the impact of the economic sector. Social sector and the application of the system to produce biogas. Conclusions are as follows:

1. Biogas is a renewable energy alternative that can be done from one household to the industry. Raw materials are mainly biomass of the waste from the animals in the community. At Banmuang sub district, Bandung district, Udonthani province have pigs of 5-10 per household, Cody-Buffalo of 2-8 per household and duck - chickens of 10-15 per household on average to produce biogas. The installation of biogas systems for storing information measuring 5-8 cubic meters. It can be seen that the dung can be used to produce biogas for use in households.

2. Promoting biogas households in the community. That should be the installation of biogas systems for storing information measuring 5-8 cubic meters.It is appropriate to breeders household level.The biogas is used for cooking in households 1-3 hours per day or the amount of methane per day, about two cubic meters, enough to use the cooking gas LPG. So, should 2-5 of cody-buffalo that be enough to produce manure and the end result is humus, which is the waste through anaerobic digestion without any investment.

3. Evaluation of operations in the area and installation of biogas plants. Result show that farmers in the community of 95 % households was impressed and gain knowledge. The results of economics was the cost savings per household on average 370 baht per month/household (Reference price of gas for one barrel tank at 370 baht / 15 kg). The investment community farmer household installations of value investing is at 3,000-5,000 baht. Saving the equivalent of 3,840 baht/year grant period is 0.91 years. The investment period with a short payback period and the economic returns are high. Household savings and reduces the pollution is another way.

ACKNOWLEDGMENTS

We would like to show our deepest gratitude to Research Institute of Suan Sunandha Rajabhat University for giving us the opportunity and scholarship to do this research.

REFERENCES

[1] Energy Research and development Institute – Nakornping, Chiangmai Unversity “Biogas Production System ” http://www.erdi.cmu.ac.th/index.php/services/view?pid=1
[2] Jiying Zhu, Caixia Wan, and Yebo Li. 2010. Enhanced solid-state anaerobic digestion of corn stover by alkaline pretreatment. Bioresource Technology.101: 7523-7528.
[3] M.S. Fountoulakis,I. Petousi, T. Manios. 2010. Co-digestion of sewage sludge with glycerol to boost biogas production. Waste Management 30: 1849–1853
[4] Ministry of Energy, “Production of biogas from food waste and degradation under anaerobic conditions and two respectively
[5] http://www.eppo.go.th/encon/abstract/2547-KU-Wilawan.pdf
[6] Nasir, I.M., Mohd Ghazi, T.I., Omar, R. and Idris, A. (2012). “Palm Oil Mill Effluent as an Additive with Cattle Manure in Biogas Production” Procedia Engineering 50: 904 – 912
[7] Rekha, B.N. and Aniruddha, B.Pandit., 2013. Performance enhancement of batch anaerobic digestion of Napier grass by alkali pre-treatment. International Journal of ChemTech Research, 5 (2), 558-564
[8] US Environmental Protection Agency [Online]. Available : http://www.epa.gov
[9] Wilawan, W., Pholchan, P. and Aggarangsi, P., 2014. Biogas production from co-digestion of Pennisetum pururem cv. Pakchong 1 Grass and layer chicken manure using completely stirred tank. Energy Procedia, 52, 216 – 222.

★★★