OPEN ACCESS

International
Journal
Of Modern Engineering Research (IJMER)

To make a biogas energy from different sources & creating awareness between human begins – case study

Neeraj kumar[1], Gourav Dureja[2], Sandeep Kamboj[3]
Assistant Professor, Department of ME1
Lecturer, Department of CE2
Assistant Professor, Department of ME3
Maharishi Markandeshwar Group of Institutions (Ramba) Karnal, India

ABSTRACT: *Biogas from biomass appears as an alternative source of energy, which is potentially enriched in biomass resources. This article gives an overview of present and future use of biomass as an industrial feedstock for production of fuels, chemicals and other materials. However, to be truly competitive in an open market situation, higher value products are required. Results suggest that biogas technology must be encouraged, promoted, invested, implemented, and demonstrated, but especially in remote rural areas. Different types of wastes are used for production of biogas .these wastes are found very easy and an every palace. This article helps to make biogas form different wastes. From this study, it can be concluded that this method not only contributed to renewable biogas production but also improved the effluent quality.*

Keywords: *Biogas, biomass, waste, biogas plant, methane, alternate source.*

I. Introduction

Achieving solutions to possible shortage in fossil fuels and environmental problems that the world is facing today require long-term potential actions for sustainable development. In this regard, renewable energy resources appear to be one of the most efficient and effective solutions[1].A naturally occurring gas formed as a by-product of the breakdown of organic waste materials in a low-oxygen (e.g., anaerobic) environment. Biogas is composed primarily of methane (typically 55% – 70% by volume) and carbon dioxide (typically 30% – 45%). Biogas may also include smaller amounts of hydrogen sulfide (typically 50 – 2000 parts per million [ppm]), water vapor (saturated), oxygen, and various trace hydrocarbons. Due to its lower methane content (and therefore lower heating value) compared to natural gas, biogas use is generally limited to engine-generator sets and boilers.[2]. one type of biogas is produced by potential advantages include: The replacement of an anaerobic digestion or fermentation of biodegradable inefficient (but traditional) fuel with a more efficient and materials such as biomass, manure or sewage, municipal flexible one, the recoupment of the fertilizer value of the waste, green waste and energy crops [3].

Biogas technology is based on the phenomenon that in a number of countries when organic matter containing cellulose is fermented in After treatment biogas approximate to pure methane the absence of air (aerobically), combustible gases but with a calorific value of about 40 MJ/m . Biogas is an majorly (methane) is formed [4]. Producing and utilizing renewable energy – both in a global and a national context– is necessitated by the synergistic effect of climate change and the long term, continuous price rise of fossil fuels.[5]. there are several problems comes to run a biogas plant. in rural area a abundant amount of bio waste are discarded into river and open area which is very harmful to our heath. because it produced many dangeroures gasas. Improper handling and storage of methane is a very dangrour for human beings.[6].

II. Biomass- based Energy Production (Biogas)

Energy is a complex system; hence, energy-production and energy-conversion require systemic thinking, for which firstly a change of aspect is necessary[6]. Biogas is generated by micro-organisms in the absence of air by a so called anaerobic metabolism. Industrial biogas is produced at sewage treatment plants (sludge fermentation stage), landfills, sites with industrial processing industry and at digestion plants for agricultural organic waste, both mesophilic (35 °C) and thermophilic (55 °C). Biogas from anaerobic digestion and landfills consists primarily of CH_4 and CO_2.[7]. In this paper biomass like different type of wastes include convert into biogas by anaerobic digestion process.

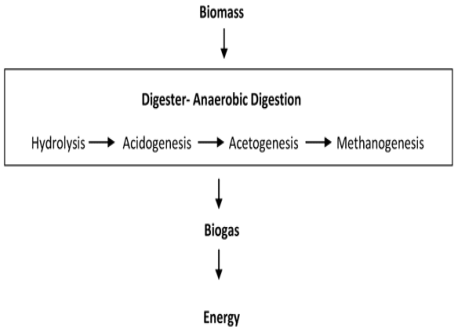

Figure No-1,Biogas coversion process

Waste includes all items that people no longer have any use for, which they either intend to get rid of or have already discarded. Additionally, wastes are such items which people are require to discard, for example by lay because of their hazardous properties. Many items can be considered as waste e.g., household rubbish, sewage sludge, wastes from manufacturing activities, packaging items, discarded cars, old televisions, garden waste, old paint containers etc. Thus all our daily activities can give rise to a large variety of different wastes arising from different sources.[8].

III. Biogas Resources

Biogas resources include different type of wastes in india.in this paper we discuss seven types of wastes which is shown in this figure.

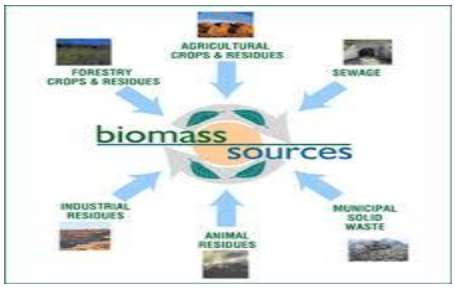

Figure No-2(Biomass sources)

3.1 Municipal solid waste
3.1.1Agricultural waste
3.I.2 Industrial waste
3.1.3Household waste
3.1.4 Hazardous waste
3.1.5Hospital waste
3.1.6 Kitchen waste

3.1.Municipal solid waste:

Municipal Solid Waste (MSW) contains organic as well as inorganic matter. the latent energy present in its organic fraction can be recovered for gainfulutilisation through adoption of suitable Waste Processing and Treatment technologies solid waste (MSW) includes Municipal wastes (household waste and similar commercial, industrial and institutional wastes) including separately collected fractions household garbage and rubbish, street sweeping, construction and demolition debris, sanitation residues, trade and non-hazardous industrial refuse and treated bio-medical solid waste. Municipal Solid Waste is defined in Ireland as household, commercial, and street cleaning wastes.[9].

ure (8): Solid Waste on Water Stream Banks.

Figure (9): Open Dumping.

Figure No-3, Munciple solid waste

3.1.1 Agricultural waste:

Agriculture waste is an organic material and can be used to produce biogas through anaerobic digestion, thus providing an alternative for Agriculture waste use and mitigating the pollution. Agriculture waste is mainly composed of three groups of polymers, namely cellulose, hemicelluloses, and lignin. Cellulose and hemicellulose are sugar rich fractions of interest for use in fermentation processes. [10]

3.1.2 Industrial waste

Anaerobic processes are largely used for the treatment of industrial wastes and waste water for more than a century and AD is today a standard technology for the treatment of variousindustrial **.**waste waters from food-processing, agro-industries, and pharmaceutical industries. AD is also applied to pre-treat organic loaded industrial waste waters, before final disposal. Due to recent improvements of treatment technologies, diluted industrial waste waters can also be digested.[11].

3.1.3 Household waste

The systematic development and promotion of household (Hh) biogas technology programme is over 60 years old in India. The demonstration and limited extension phase of Hh biogas plants was first initiated in India by KVIC, using their floating steel gas holder model, in 1960. However, the implementation of Hh plants got impetus in India, only after the Ministry of Non-Conventional Sources of Energy (MNES- earlier known as DNES), Govt. of India, launched a centrally sponsored scheme, known as National Project on Biogas Development (NPBD), in 1981-82.

3.1.4 Hazardous waste

Waste and waste reduction are increasingly becoming the focus of numerous national administrations and environmental agencies around the world. country must make every effort to stem the rising tide of garbage and industrial waste through a more aggressive use of waste minimization and recycling practices. international shipments of hazardous wastes are the primary focus of this document, the preamble states that the signatory parties to this convention were motivated by the idea that, "the most effective way of protecting human health and the environment from the dangers posed by [hazardous] wastes is the reduction of their generation to a minimum in terms of quantity and/or hazard potential [12].Industrial and hospital waste is considered hazardous as they may contain toxic substances. Certain types of household waste are also hazardous. Hazardous wastes could be highly toxic to humans, animals, and plants; are corrosive, highly inflammable, or explosive; and react when exposed to certain things e.g. gases. India generates around 7 million tonnes of hazardous wastes every year, most of which is concentrated in four states: Andhra Pradesh, Bihar, Uttar Pradesh, and Tamil Nadu.

3.1.5 Hospital waste

(A) Clinical Waste: this includes body fluid, drainage bags, blood collection tubes, vials, culture dishes, other types of broken/unbroken glassware that were in contact with infectious agents, gauze, bandages or any other materials that were in contact with infectious agents or blood, pathological waste including organs, body parts, tissues. These are potentially dangerous and present a high risk of infection to the general population and to the staff.

(B) Laboratory Waste: This is also high risk category waste. This includes chemicals used in the pathological laboratory, microbial cultures and clinical specimens, slide, culture dish, needle, syringes, as well as radioactive waste such as Iodine-125, iodine -131 etc.
(C) Non-clinical Waste**:** this includes wrapping paper, office paper, and plastic that has not been in contact with patient body fluid.[13].

3.1.6 Kitchen waste

Kitchen waste: This includes food waste, wash and waste water. kicthen wastes include vegetables waste, garbage, broken material which are found in homes and these are discarded into open areas. "Food waste" refers to food that is of good quality and fit for human consumption but that does not get consumed because it is discarded. Fruits, milk, paper, Fish, Food cooked but not eaten, eggs, Chicken, breasts, Mushrooms, Lemons, Fruit pies, Onions, Mixed vegetables.

Figure No-4, Kitchen waste

IV. Biogas Production process

There are three stages which are discussed about biogas generation. and In this paper we are discussed about one by one .
4.1 Hydrolysis:
4.2 Acetogeness
4.3 Methangenesis

Anaerobic digestion is a multistep biological and chemical process that is beneficial in not only waste management but also energy creation. There are four fundamental steps of anaerobic digestion that include hydrolysis, acidogenesis, acetogenesis, and methanogenesis

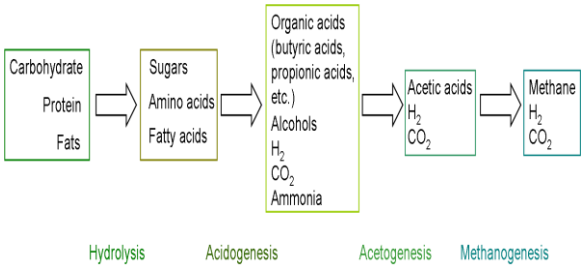

Figure No-5, biogas process

Biogas production is a three stage biochemical process comprising hydrolysis, acidogenesis/acetogenesis and methanogenesis.

(C6H10 O5(C6H10 O5)n + nH2O → n (C6 H12 O6) - Hydrolysis
n (C6 H12 O6**)** →n CH3 COOH -Acetogenesis/Acidogenesis
3nCH3 COOH → n CH4 + CO2 – Methanogenesis

Biogas technology amongst other processes (including thermal, pyrolysis, combustion and gasification) has in recent times also been viewed as a very good source of sustainable waste treatment / management, as disposal of wastes has become a major problem especially to the third world countries[1].In a first step, known

as the hydrolysis process, carbon hydrates are broken down into simple sugars, proteins into amino acids, and fats into fatty acids. The products of the hydrolysis undergo an acidogenic process (acidogenesis) where organic acids and low alcohols are produced. The subsequent acetogenic process (acetogenesis) leads to the production of methane.The products of the acidogenic process are converted into acetic acid, carbon dioxide and hydrogen, which are the compounds required for the methanogenic process. (methanogenesis).

V. Biogas Plant

There are many types of biogas plants in India.

In this paper we study the only one type of biogas plants which is very economical. cheap and easy in construction.There are many types of plant but fixed dome type plants are very easy in construction and working.in this article we have study the fied dome plant which is very economical.

5.1 Fixed dome type biogas plant:

A fixed-dome plant comprises of a closed, domeshaped digester with an immovable, rigid gas-holder and a displacement pit, also named "compensation tank". The gas is stored in the upper part of the digester. When gas production commences, the slurry is displaced into the compensating tank. Gas pressure increases with the volume of gas stored and the height difference between the slurry levels in digester and compensation tank. If there is little gas in the gasholder, the gas pressure is low. The cost of a fixed-dome biogas plant is relatively low, and it is simple as no moving parts exist. There are also no rusting steel parts and, hence, a long life of the plant (20 years or more) can be expected. The plant is constructed underground, protecting it from physical damage and temperature changes.

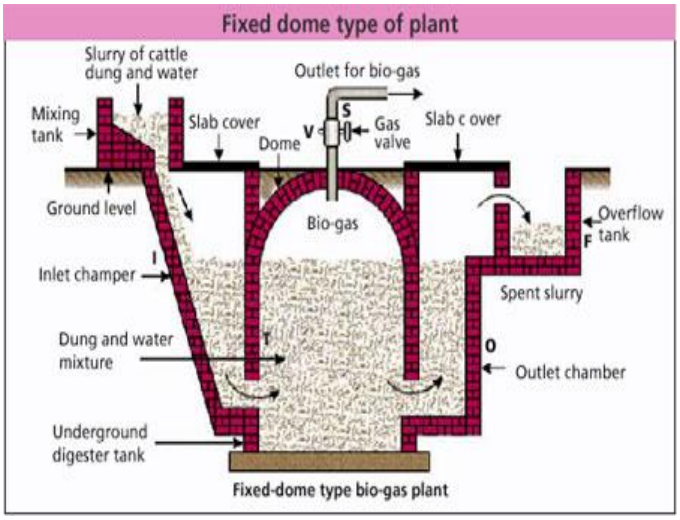

Figure No-6 , Fixed dome type biogas plant

The main parts of plants are mixing tank, overflow tank, dome type digester, inlet chamber, outlet chamber, gas valve. In this type of plant any type of waste are used like slurry of cattle dung and its mixed with water. during a retentions period a reaction takes place. And gas is produced at upper part of the tank .and this gas is used by a gas holder valve. and overflow scullery are dumped into field.

VI. Conclusion

With the help of this biogas plants we produsedd a gas. And in rural area the wastes like cow dung, waste material are dumped into open area .due to this causes some dangerous gases are produsedd.which are very harmful to our health. To solve this type of problems we can uses these wastes.and in a village two or three homes are make a small type of biogas plant.and biogas as a alternate sources of energy for human beings. Which is used for lighting.power gaeration , cooking purposes.the life of other conventional sources like coal,oil, fuel.are very low and we are searching a lot of energy resources.so biogas is a renewable energy resources.

REFERENCES

[1] Ofoefule, Akuzuo U.*1, Nwankwo, Joseph I.2, Ibeto, Cynthia N.1, Biogas Production from Paper Waste and its blend with Cow dung, Pelagia Research Library,Advances in Applied Science Research, 2010, 1 (2): 1-8, ISSN: 0976-8610

[2] Ken Krich ,Don Augenstein, JP Batmale, John Benemann ,Brad Rutledge, Biomethane from Dairy Waste: A sourcebook for the production and Use of renewable natural gas in California, page no-14/282 July 2005.

[3] Shelef, G., H. Grynberg and S. Kimchie, 1981. High rate thermophilic aerobic digestion of agricultural wastes, Biotechnology and Bioengineering Symposium, 11: 341-342.

[4] I.R. Ilaboya, F.F. Asekhame, 3M.O. Ezugwu, 4A.A. Erameh and 5F.E. Omofuma, Studies on Biogas Generation from Agricultural Waste; Analysis of the Effects of Alkaline on Gas Generation, World Applied Sciences Journal 9 (5): 537-545, 2010, ISSN 1818-4952.

[5] Attila Meggyes, Valéria Nagy, Biogas and Energy Production by Utilization of Different Agricultural Wastes, Acta Polytechnica Hungarica ,Vol. 9, No. 6, 2012

[6] E.J. DaSilva, Biogas generation: developments, problems, and tasks - an overview, Division of Scientific Research and Higher Education, Unesco, Paris, France

[7] Patricia cekanova,natalia jasminska, Tomas brestovic,Eva schvarzba cherova, Biogas upgrading process for the production of natural gas substitute, ISSN 1848-0071 ,(24 may 2011).

[8] Eze J. I.1,2* and Ojike O.1,2, Anaerobic production of biogas from maize wastes International Journal of the Physical Sciences Vol. 7(6), pp. 982 - 987, (2 February, 2012).

[9] Mamdouh A. El-Messery*, Gaber AZ. Ismail*, Anwaar K. Arafa**,Evaluation of Municipal Solid WasteManagement in Egyptian Rural Areas,J Egypt Public Health Assoc Vol. 84 No. 1 & 2, (2009)

[10] TR Sneha R. Vattamparambil, Anaerobic Microbial Hydrolysis of Agriculture Waste for Biogas Production , International Conference on Emerging Frontiers in Technology for Rural Area (EFITRA-2012)

[11] University of Southern Denmark Esbjerg, NielsBohrsVej 9-10, DK-6700 Esbjerg, Denmark, Teodorita Al Seadi, DominikRutz, Heinz Prassl, Michael Köttner, Tobias Finsterwalder, Silke Volk, Rainer Janssen, ISBN 978-87-992962-0-: Copyright © 2008.

[12] Christa D. Jensen, Who Generates Hazardous Wastes? Attribution of Producer and Consumer Responsibility within the US, Regional Research Institute, Department of Economics, West Virginia University, PO Box 6825, Morgantown, RESEARCH PAPER 2010-16

[13] Nasima Akter, Medical Waste Management: A Review, Environmental Engineering Program School of Environment, Resources and Development, January, 2000