

Production and Purification of Biogas; A Research

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Abstract—In recent trends, most of the countries in the world are switching over to renewable source of energy instead of conventional sources of energy. Bio gas is one of the most used source of renewable energy. Bio gas is clean and renewable energy source. Due to the changes in environment condition by burning of fossil fuels and others this has led to the development of Eco friendly practises. the one we are talking about is bio gas which is Eco friendly and can be produced easily just by using vegetable waste, rice, cow dung and the bio gas can be used for our day to day activities. In this review paper we are discussing about the various type's production and purification sources of Bio Gas.

I. INTRODUCTION

Biogas is a green source of energy which is produced by breakdown of organic matter by microbes such as methanogens in the absence of oxygen. Biogas is mainly a mixture of methane (CH₄) and carbon di oxide (CO₂) with small amounts of hydrogen sulphide (H₂S), moisture and siloxanes. The conventional energy sources would last only a bit more than half a century but the serious threat of using these sources is pollution which lead to greenhouse effect and acid rain. The main means in which pollution can be controlled and the non-renewable energy source can be preserved for future is the use of renewable energy sources. Biogas is one such promising renewable energy source which can be used instead of conventional energy sources. Unlike other renewable resources biogas plant doesn't require high initial investment which makes it suitable for houses to industries. In northern European countries such as Finland and Norway biogas is used to power the vehicles which is the recent innovation. Since biogas is basically conversion of waste into energy it solves the problem of waste management which creates a healthy environment around us and can also be used to generate revenue by producing it from waste.

Most of the countries in the world are switching over to renewable source of energy and one of the most used source of renewable energy is bio gas. and the one country that now we are talking about is Singapore where it has limited natural resources like tidal, wind energy and most part of the country is urbanized however there are few areas in the country where agriculture is done and that waste is being used for the bio gas

Revised Version Manuscript Received August 19, 2019.

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production. By adopting this method wastage of products is recycled and agriculture waste is lowered and waste of

chicken used in bio gas is being used as manure and that of waste water is not wasted because it is re circulated in the system and the country is now pushing towards renewable sources so that the country is Eco friendly and the impact to the environment is less and renewable source of energy is cost effective and can also be used in agriculture and also it can earn revenues and it is not harmful to the society.

The research was about wobble index a wobble index is one which shows relation between burners and gas properties. In this study different substrate was used and the different substrate that was being used were hen manure, pig manure and pig blend with hen manure and the heat obtained by using this type was found to be high[1]–[3][4].

II. DIFFERENT SOURCES OF BIO GAS PRODUCTION

The main study of this was to produce bio gas using chicken waste and to generate bio gas to produce electricity this was done by putting chicken waste, waste water and aerobic digester and the output from this was about 1MW of power according to the factory claims and the use of integrated system being used in the bio gas plant helps in reusing the same materials for the production of the bio gas [5].

In this study it was found that from luminaria japonica when fermented using hydrolysis the production of bio gas was increased and the level of hydrogen and methane was found out to be 327.4% for hydrogen and 354.99% for methane and the production of hydrogen and methane was higher when compared by other methods [6]. Moreover, the solid substrate is also one of the useful resource of bio gas [3].

Traditionally animal manure and sewage have been used as feedstock for biogas production. But any organic substance from leaves of sugar beets, waste from agriculture related industries, food and organic municipal wastes to agricultural wastes can be used. However, fats provide highest yield but retention time is very large relative to carbohydrates and proteins. Carbohydrates and proteins oxidize faster but yield is low compared to fats. Other pathogens or microbes inversely affect the yield, so it recommended that sterilization of feed stock be done before fermentation. Wastes from plants like maize and wheat corn gives the highest yield. Non -agricultural wastes like food



residue, used grease, etc. provide considerable increase in yield [7].

Sewage sludge is one of the most commonly used biomass along with feedstock (agricultural and non-agricultural) in wet fermentation. But in conventional digesters, degradation of sludge is slow, which leads to longer retention time. This can be solved by thermophilic anaerobic digestion, which significantly reduces the retention time and stabilizes the sludge. Thermophilic anaerobic digestion involves digestion of biomass at slightly elevated temperature of about 55°C. It is observed that there is an increase of biogas production up to 50% due to heat treatment of sludge up to 70°C [8].

The previous researchers suggested the different sources of biogas. We can produce the Bio gas from the easy available sources. The production rate of the Bio gas is varying according to the sources. To improve the production of bio gas different method have been used such as; Additives, recycling of slurry and slurry filtration, variation in operational parameters like temperature etc.

III. DIFFERENT TYPES OF PURIFICATION METHODS

This article discusses the purification process of biogas by the use of biomass ash as a filter in order to entrap Carbon dioxide (CO₂) and Hydrogen sulphide (H₂S) to obtain pure methane. It was found that the mass of the biomass ash increased as crude biogas was passed through it, the reason for this was mainly due to the uptake of CO₂ and H₂S by biomass ash. The uptake of CO₂ was mainly due to carbonation reaction which converted all hydroxides present in ash to stable carbonates. The removal efficiency was found to be 33-36% during first 24-48 hours. The removal efficiency of H₂S was just 50% for a duration of 14-18 days. H₂S was removed as a result of iron purification due to the presence of Fe in biomass ash. It was determined that the removal of CO₂ and H₂S per ton of ash was 35kg and 0.56-1.25kg respectively [9].

This paper discusses the influence of sheep manure and cow dung (without the use of inoculum) on biogas production and methanogenic communities. As the demand for biogas is increasing it is necessary to increase the biogas yield in a shorter period of time with the use of suitable substrates. Due to the presence of lignin in cow dung anaerobic digestion process becomes slow in order to fasten this digestion process sheep manure was used as a substrate and was tested. In the test it was found that cow dung had more methanobacteriales a type of archaea (methanogenic community) and it increased during the course of the reaction which was the reason for greater biogas yield but methanobacteriales number decreased during the course of reaction in sheep manure leading to lower biogas yield [10].

This paper discusses the technical and economic approach to capture CO₂ by retrofitting a device to the biogas plant in order to capture CO₂. Three retrofits were used and tested separately using gas engine- First system which captures CO₂ from crude biogas by chemical absorption process Second system which captures CO₂ after combustion of biogas by chemical absorption process and third system which captures CO₂ after combustion of raw biogas with pure O₂ instead of air (oxy-fuel combustion process). Moreover, after the

comparison we have found that first system provides the better results compare with the other two systems [11].

However, Biogas is used for power generation as well as cooking purposes but the presence of large amounts of CO₂ limits it to be used due the presence of excess CO₂ which decreases the heating value of the fuel. Therefore, excess CO₂ should be captured to enhance the heating value of the fuel. This article discusses the efficient means to remove CO₂ from biogas using vacuum pressure swing process using silica gel as adsorbent. Four bed vacuum pressure swing adsorption was used to capture CO₂ in the test. The vacuum pressure swing process is a technique used to separate gases from its mixture by the use of adsorbent and applying pressure in order to adsorb target gas i.e. CO₂. The CH₄ purity decreases with increase in adsorption time and desorption pressure. It was found that using this method to purify biogas would yield a CH₄ of purity greater than 98%. Hence this method can be adopted to capture CO₂ because of its low investment and cheaply available adsorbent i.e. silica gel [12]–[14]. Moreover, there are various purification techniques are suggested by the researchers.

IV. RESULTS AND DISCUSSION

In this study we have discussed about the various sources of bio gas production and we found that at the time of production some amount of unusual gases such as; CO₂ and H₂S etc. gases are also produced that directly effects on the production of bio gas. To improve the production rate it is necessary to remove that CO₂ and H₂S gases from the bio gas. There are various type of bio gas purification processes are available. All the purification processes divided in to two ways that is Biological and physicochemical methods.

V. CONCLUSIONS

Both biological and physicochemical methods are applicable to purify the bio gas.

The biological purification methods huge area to explore.

Fixed bed and bio reactor purification method more suitable process.

The combination of these method provides the better S-capture efficiency, low media and operating costs, energy prices and socio-economic policies.

To find the better ways to produce the bio gas from composite of different material.

there are different types of sources available for the production but still required to find the better ways to produce the bio gas from composite of different material

VII. ACKNOWLEDGEMENT

The manuscript is prepared by taking assistance from Accendere Knowledge Management Services Pvt. Ltd. We are thankful to them. We also express our gratitude to our teachers and mentor for guiding us throughout the work



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