

Utilization of Bio Gas as a Fuel for Rural Area : Comparative Analysis

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ABSTRACT

Biofuel is a fuel that is produced from biological processes, such as agriculture and anaerobic digestion. Wood, Animals dung, Living organism etc. are used for biofuel production. Some years ago biofuel used as cooking fuel, lighting etc. This paper purpose is utilization of biofuel as a fuel for rural area for generating electricity and domestic fuel by using animal dung i.e. known as "GOBAR GAS". During these days demand of electricity and domestic fuel is increasing day by day but today there are shortages of these things because of increasing population, especially in rural area this problem occur. In rural area peoples not get these facilities and shortage of electricity & domestic fuel affect these people. In villages there is availability of animals dung specially cows and buffaloes dung. So this is very useful to generate electricity and domestic fuel from animal dung so that people get energy and from that country will grow. In this paper there is case study in India that how much electricity and domestic fuel we can produce from cows or buffaloes dung in a day or month.

Keywords : Biofuel, Gobar gas, Dung, Electricity

I. INTRODUCTION

From many years manure, organic waste, green waste or food waste was used as fuel by anaerobic digestion with anaerobic bacteria or fermentation of biodegradable materials for cooking, transport etc. that is called biogas. Biogas consists of different gas like methane (CH₄) and carbon dioxide (CO₂) and may have some amount of hydrogen sulfide (H₂S) moisture and siloxanes. Methane and carbon dioxide are primarily gas of biogas. When these gases oxidize with oxygen, the energy release are use in cooking, gas engine for electricity, motor vehicles etc. It is a renewable energy. Biogas can compressed, the same way natural gas is compressed to CNG and used in vehicles. Biogas production is clean carbon technology. It is renewable energy.

Biogas has methane 50-75%, carbon-dioxide 25-50%, hydrogen sulfide 0-3%.It is non-toxic, colorless and inflammable. It is 20% almost lighter than air. Calorific value of biogas is 21-23 MJ/m³.

Now India became the third largest electricity producer in year 2013 with 4.8% global share in electricity generation surpassing Japan and Russia but still people

suffer from lacking of electricity. Electric energy consumption in agriculture war recorded highest (18.45%) in 2014-2015.The Honorable Prime Minister of India Narendra Modi has launch a scheme "POWER TO ALL". This scheme is 24/7 continuous electricity supply to all households, industries, and commercial establishment by creating and improving necessary infrastructure. Currently nine state has join this scheme. If we talk about city area like Delhi consume more electricity than the state of Himachal Pradesh, Jammu and Kashmir, Uttarakhand, Chhattisgarh, Odisha and all state of North East according to CENTRAL ELECTRICITY AUTHORITY (CEA 2015-16)).The household electricity consumption per capita is about 43 units per month against a national average of 25.

So for provide electricity many thermal power plant are using but it cause pollution and global warming which give adverse effect on environment. Even using petrol & diesel vehicle which is source of pollution and temperature rise in a country and it increase day by day. So we have to go another resources which able fulfill the supply of energy to every people of our country which is free from pollution i.e. renewable energy like solar energy, wind energy biofuel etc.

II. METHODS AND MATERIAL

A. Indian Village Scenario

India has about 1.22 billion populations with an annual growth rate of 1.67% and rural area population was last measured at 68% of total populations. So due to increase in population consumption of fuel, electricity etc. is increasing and resource is limited or short day by day.



Figure 1. Children facing electricity problem while study in rural area

In India's rural area about two third of households still need of energy completed from Non-commercial energy like fuel wood & cow dung cake for cooking according to National sample survey(NSS) which destroy the forest and greenery but that's not their fault because there are no option for those peoples. Cow dung cake is very bad for health and environment because it produce undesirable smoke. Due to increase in population and higher living standard consumption of electricity, cooking fuel, fossil fuel etc .is increasing. About 80 million households use kerosene for lightning. 80 households with 400 millions peoples still live without electricity in country (a number larger than combine population of US and Canada).In Bihar about 73.5% and in Uttar Pradesh about 55% of households using kerosene for lightning. About 40% of rural Uttar Pradesh has electricity.



Figure 2. Women using firewood for cooking in village

India has many power plant, refinery etc to produce electricity, cooking gas, vehicle fuel etc. but that is not sufficient to fulfill the requirement of cooking fuel, electricity & vehicle fuel especially to rural people.

Some report including world health organization, claim 300,000 to 400,000 people in India die because of indoor air pollution and carbon monoxide poisoning every year using chullah. Burning of biomass and firewood will not stop untill electricity or clean burning fuel and combustion technologies become reliably available and widely adopted in rural and urban area in India.

B. Biogas In India

The first sewage plant was built in Bombay in 1859. The idea that rotten vegetable matter gives flammable gas has been understood since the ancient Persians. But the use of farm manure to generate methane was developed again in early 1930s. It was developed for use by Indian villagers by KVIC (KHADI AND VILLAGES INDUSTRIES COMMISSION) in early 1960s.

In India, the estimate for production of biogas is about 20,757 lakh cubic meters in 2014-15. This is equal to 5% of total LPG consumption in the country means about 6.6% crore LPG cylinder.

Maharashtra tops production with 3578 lakh cubic meters while Andhra Pradesh comes to next with 2165 lakh cubic meters.

From 2012-17, the government has set target a set up biogas plant upto 6.5 lakhs across the India with the budget of Rs.650 crore under a program that is called,

the “NATIONAL BIOGAS AND MANURE MANAGEMENT PROGRAM”(NBMMP).

In year 2014-15, of 1.1 lakh plants planned to be set up 45145 were already setup till 31 December 2014.comparing 2013-14 and 2014-15 year, both the years there is 1.7% increase in the number of plants that were planned to be set up and also 3% increase in the number of installed until the end of 2014.

C. Methodology In India

- One cow can produce manure in a day=30 gallons
- In gallon=3.78Kg
- 30 gallons=113.40 KG
- So, one cow can produce in one day=113.40 Kg of manure
- Cow dung require to produce 1 m³ of biogas=20 Kg
- So in one day from one cow of manure we can produce=5.670 m³ of biogas
- And from 1 m³of biogas we can produce=2 KW of electricity
- So, in one day from one cow of manure we can produce=11.340 KW of electricity
- 1m³ of biogas equivalent to .45Kg of LPG gas
- 5.670m³ biogas=.45*5.670=2.55Kg of LPG gas
- 1.7m³ of biogas =1 liter of gasoline
- In one day 3.33529412 liter of gasoline can produce from one cow of manure.
- In one day we can produce 113.4 kg of cow dung and from that 5.670 m³ of biogas can produce means 11.34 KW of electricity,2.55Kg of LPG gas & 3.33529412 liter of gasoline can produce from one cow.
- According to 19th livestock census the total livestock population in India is 512 million numbers in 2012.
- There is over 280 million cow in India.

So India can produce from cows:

- 31752 million Kg of cow dung.
- 1587.6 million Meter cubic of biogas.
- 3175.2 million KW of electricity.
- 4048.38 million Kg of LPG gas.
- 933.88 million liter of gasoline.

III. RESULTS AND DISCUSSION

Left side pie chart show the production of fuel by an one cow and right side pie chart show the production of fuels by whole cows (512millions) which is present. This pie chart show that how much effective biogas is. This result shows the production of biogas only by cow’s dung. The production of biogas by cow dung can clearly see in chart as shown in figure3 and figure4.

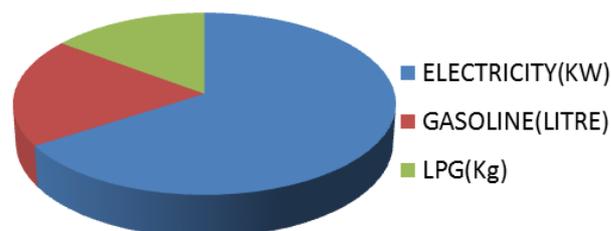


Figure 3. Production of fuels in one day by an one cows dung

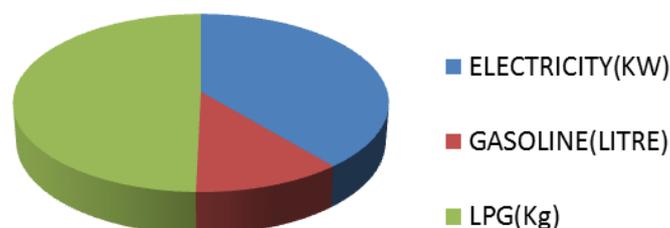


Figure 4. Production of fuels (in millions) by cows dung

IV. CONCLUSION

This paper focused on the calculation analysis of biogas for rural area and production of clean & environment free energy resources by cow dung. For development of country biogas is very good resources of energy. And from that biogas we calculate how much other energy resources can be produce like electricity, LPG gas and gasoline. In future biogas will fulfill the requirement of energy resources as the non-renewable energy resources finishing very fast.

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