

Capture of Methane and it's Use

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Abstract:

This paper aims to study how to capture methane and how it can use in different way. As we know methane is a very powerful greenhouse gas. Methane is also the main ingredient in natural gas. Because methane can be captured from landfills, it can be burned to produce electricity, heat buildings, or power garbage trucks. Capturing methane before it gets into the atmosphere also helps reduce the effects of climate change. Methane is challenging to capture from air because its concentration is low, but burgeoning technologies, a good news is methane from dairy manure can be captured and converted into energy using existing technologies. The resulting biogas can be used to create: Renewable electricity. Renewable vehicle fuel (biomethane). Methane is a hydrocarbon and lighter than air. Therefore, it produces more energy per unit weight in comparison to oil and coal. It is also preferred for cooking. While it's important to reduce, reuse, and recycle as much as you can, it's hard to avoid throwing out some trash every week. Trash that cannot be recycled or reused often ends up in landfills, where it produces methane as it decomposes.

Keywords: Biogas production, Methane fermentation, Sanitary landfills, Power generation, wastewater treatment, Solid wastes, Power plant fuel consumption.

1. Introduction

Methane is produced by the breakdown or decay of organic material and can be introduced into the atmosphere by either natural processes – such as the decay of plant material. In wetlands, these seepage of gas from underground deposits or the digestion of food by cattle – or human activities – such as soil and gas. Methane is non-toxic and creates no hazard when inhaled in limited quantities, however, if large quantities of natural gas or methane is allowed to displace air, lack of oxygen may result in suffocation. Methane is lighter than air, colourless and, despite what you might think considering animals burp it out, odourless. It is a truly universal gas: it occurs naturally in the environment, it's made by animals, and it can be released as a result of human activities such as agriculture, Fossil fuel production and rotting landfill. Chemically, methane is a compound made up of one atom of carbon and four atoms of hydrogen (CH₄). It is the main component of natural gas. Over the past 10 y, governments worldwide have been establishing policies to provide renewable and clean energy. Their

positions, which have been established from both increasing recognition of environmental problems and from economic demand, have led scientific and industrial communities to study and exploit fresh and useful alternatives to decrease the environmental effects from the use of fossil fuels. For these reasons, the increasing demand for electrical energy and transport fuel has motivated the United States and European Union Governments, as well as scientific communities, to find new and green energy carrier resources. Until recently, renewable and clean energy accounted for only a small section of the energy market, however, recent demand has led to growth in this area. Moreover, the abundance of Natural gas deposits in some parts of the world will provide a massive resource of energy in the upcoming decades. Natural gas is considered an alternative fuel because of its very low price as an efficient resource. In addition, many researchers and industrial administrators are interested in using universal applications that can be used as alternative fuels for vehicles. The greenhouse effect, which is widely believed to cause global warming, is a result of Industrialization and the generation of gases such as methane (CH₄), carbon dioxide (CO₂), Nitrous oxide (N₂O), and

so on. Because of the rise in the production of greenhouse gases over the past century, the temperature of the earth has increased by 0.76% and is gradually increasing. Many researchers have raised concerns over greenhouse gases and have studied methods directed at their elimination. In particular, CH₄, which is generated by organic waste, cow manure, and industrial waste, is being studied.

2. Methodology

The main component of the set-up is the digester, which is cylindrical in shape made by rolling mild steel sheet. The cylinder is to be protected against corrosion by coating its internal part with red oxide and the external part with black paint for maximum heat absorption. At two 3 inches Sockets and plugs could serve as Inlet and Outlet pipes through which the food waste and water will pass to the digester and exit of the effluent respectively. The stirrer is to be use with blades and passed centrally from the top of the digestion chamber to the bottom with the aid of bearings on top and bottom of the digester which are meant to make the stirrer in position and provide ease of rotation in order to thoroughly mix the slurry in the digester. A gas outlet pipe, pressure gauge and thermocouple are fixed on top of the digester. The biogas from the digester will be conveyed to the gas storage tank through ¾ inch hose with a non-return valve and then safety valve attached to it. When the gas passes through the hose, it is accumulated in the gas storage tank which is a plastic jerry-can. The gas storage tank has a tap on it that is used for controlling the outflow of the gas to the stove. A 3/8 inch hose is used to convey the gas from storage tank to the stove.

3. Results and Discussion

In this method we studying methane capture

and its uses. You've probably heard about the three R's. While it's important to reduce, reuse, and recycle. Methane is a very powerful greenhouse gas. One pound of methane traps 25 times more heat in the atmosphere than a pound of carbon dioxide. Methane is also the main ingredient in natural gas. As part of four Hon. Prime Ministers' vision of doubling farmers income by 2022 Banas Dairy has taken initiatives for further value addition in milk, milk products and started value addition of other agricultural products like Potato, Honey, Edible Oil, Take Home Ration etc. which shall greatly augment the farmers income. Banas Dairy was paying Rs.9 Cr per day to farmers for milk in 2014 and currently paying Rs.24 Cr Per day- More than double in five years. Started production of value added Potato products, investing more than Rs.100 Cr. to set up own potato based value added products.

Farmers shall get better and consistent prices of their potato production. Started Honey bee rearing, Honey collection, processing and packing; collected 80 tons of Honey in year 2019-20 from farmers. Started 200 tons per day of edible Oil packing facility and started marketing in Gujarat, Madhya Pradesh, Rajasthan and Maharashtra Started Take Home Ration plant Of capacity 200 MT/day- ready to cook with essential nutrients for malnourished children, pregnant women, adolescent girls and lactating mothers. Started Banas Medical College and Research Institute at Palanpur- shall provide quality healthcare to farmers and huge boost to medical education. Ambitious plan of fodder development through Hydroponic technology. Target to plant 10 Cr. Tress in 10 years in district. Plan to harvest rain water throughout district by people participation.

As part of four Prime Ministers' vision to increase farmers' income to double by the year 2022, Banas Dairy have taken many initiatives as described above including multi beneficial Biogas project. • Banas Dairy have set up a pilot project Biogas generation plant at its Dama Semen station and presently production of a gas has been started. 5 • In future Banas Dairy has ambitious plan to set up at least 50 such biogas plants in the district. The farmers shall get a good price of their

cow dung which shall be an additional income to them along with milk income.

8 Considering: -5 Cows 15 Kg

Dung/Cow/day 1 Kg Cow dung = Rs

1 Biogas reduces two critical important greenhouse gases –

Carbon dioxide (Its emission shall get reduced when biogas shall

replace fossil fuel use (i.e., coal, petrol, natural gas)), Methane (CH₄). Reduction of greenhouse gases: -800 kg/day of CH₄ equivalent to 20 tons of CO₂/day.

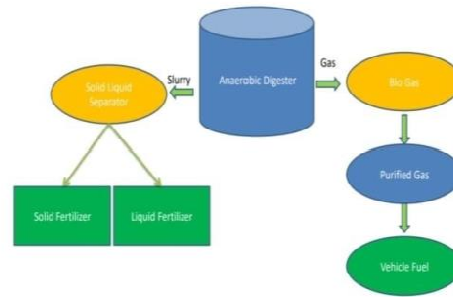
Additionally there shall be reduction of 2.87 tons of CO₂/day when 800 Kg CBG replaces the petrol as fuel. Daily 40 ton of cow dung is required for the plant, which is collected from 254 farmers of 12 numbers of villages. • Daily Cow dung is collected from the farm of the farmer and then transferred it to the plant through tractor or trolley. • From the plant about 2000 CUM/day Raw Biogas is generated which shall be purified and to around 800 kg/day Bio Gas.

A system is developed through which cow dung is collected from the villages

- The tractors with trolleys move from farm to farm and collect the dung from the farmers.
- The dung is weighed at farmers place.
- The farmers are paid Rs.1 per kg of cow dung. The payment of cow dung is paid to farmer with the milk payment on every 15 days. Collected dung from the farmers is transfer to the Biogas plant at Dama. The tractor trolley with dung is weighed at the plant and Quality is checked.

Cow dung	Income
75 kg/day	75 Rs/day
2,250 kg/month	2,250 Rs /month
27,375 kg/year	27,375 Rs/year

Income Chart of BioGas Plant



4. Conclusion

Energy is a fundamental input in the development of any human society. However, the amount of energy required per capita to foster sustainable development depends largely on the state of development, the local resources, the social and economic model chosen by the country and other factors. Today most countries rely on local or imported nature, coupled together with environmental effect of the fossil fuels have remarkably influenced the development of energy sources with particular attention focused on the field of renewable energy sources as biogas. The demand for fuel wood has grown with rural populations, leading to the loss of trees and forests. To decrease reliance on fuel wood, the Government has promoted the use of biogas (a mixture of methane and carbon dioxide produced by decomposing organic matter) for cooking fuel. There is also a growing demand for energy and for that which contributes to the greenhouse gas effect and climate change.

Biogas reduces two critical important greenhouse gases – Carbon dioxide (CO₂) (Its emissions shall get reduced when biogas shall replace fossil fuel use (i.e. coal, petrol, natural Gas))
.Methane(CH₄).

We have used the method of biogas to produce more amount of methane in less time, although our some attempts went wrong, but it could be done if proper facilities are available and with proper guidance too.

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