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Biogas Bike

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Abstract - Biogas is one type of natural gas. It produces by storing wastage such as dungs with water in a brick covered storage tank. The biogas can fill up into cylinder with the help of compressor, so we can try to run a single cylinder engine by biogas. The benefits of biogas are free of cost and easily available, pollution free. Our target is to achieve more efficiency of engine obtained by filtering biogas rather than use of L.P.G. in single cylinder engine.

Key Words: Single cylinder engine, Biogas plant, Filtering process.

Nomenlature:

L.P.G–Liquified Petrolum Gas
I.C Engine–Internal Combustion Engine

1. INTRODUCTION

We have try to run single cylinder engine with biogas, we purchased and hired some components and also we were making the filter and assemble the each components as per the requirements and we have go to the biogas plant place, for the first time we have fill up the biogas but we were unable and then find out the problem and its solution. Second time we have fill up the biogas successfully. Then, we installed biogas kit in bikeand finally we injected biogas into cylinder of engine.

1.1 Literature Review

- Ilona Sarvari Horvath and his team (3) have given a paper onbiofuel production, in which described about biogas can be produced from various organic waste stremes or as a byproduct from industrial process.
- Attila Meggyes (1) has given a paper on Biogas and energy production by utilization of different agricultural wastes. The paper introduces biogas production and utilization methods that are suitable for providing continuous operation of existing biogas plants and also for determining the parameters of establishing biogas plants.
- Abisheak Gangwar and his group (4) have given a paper on gas as a fuel in two wheeler. In this paper, also mentioned about High rating of octane has ability to rapid burn and this increase the engine performance and more efficient.
- Sagar P Mistry and his team (6) have given a paper on four cylinder four strokespetrol engine.

2.SYSTEM DESCRIPTION

2.1 Composition of Biogas

- Biogas is a mixture of different gases produced by the breakdown of organic matter in the absence of oxygen. Biogas can be produced from raw materials are such as crop residue, wet cow dung, vegetable waste, algae, poultry or piggery droppings and biogases. It is a viable and abundant resource that can be used as renewable energy source. Biogas is produced by anaerobic decomposition of organic wastes by suitable bacteria. It contains methane (CH4), carbon dioxide (CO2) and hydrogen sulphide (H2S). It can be used for any heating purpose, such as cooking. It can also be used in a furnace as fuel to produce electricity and heat. It qualifies for renewable energy subsidies in some parts of the world. Biogas can be cleaned and upgraded to natural gas standards, when it becomes bio methane.

Components	Composition (% by volume)
CH_4	50% to 65%
CO_2	30% to 45%
H_2 and N_2	5% to 10%
H_2S and O_2	Very less amount

Table. 1 Biogas Composition Table

2.2 Types of Biogas Plant

Fixed Dome Type Biogas Plant:

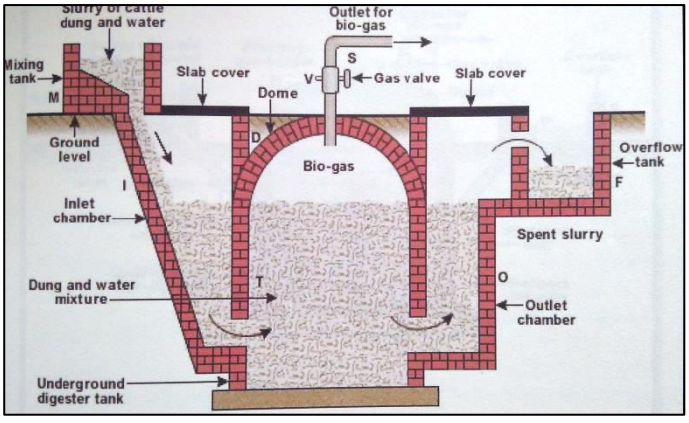

Fig. 1 Fixed dome type biogas plants

- In fixed dome type biogas plants, the digester and the dome (gas collector) are combined and enclosed in the same chamber. These types of plant are best suited for batch type gas plants. This type of gas plant is more economical compared to floating drum type since only masonry work is needed for their construction. When gas production starts, the slurry is displaced into the compensation tank. The gas pressure inside the dome varies depending upon the rate of gas production and its consumption. However, the total volume of gas inside the dome remains constant due to which this is also called as constant volume type biogas plants. The height difference between two levels helps in regulating the pressure of gas within the digester. The gas pressure obtained may be as high as 0.1 bars pressure above atmospheric. Since this plant is constructed underground, their temperature of operation remains unaffected by the environment. Hence, this plant is suitable for winter operation.

Floating Drum Type Biogas Plant:

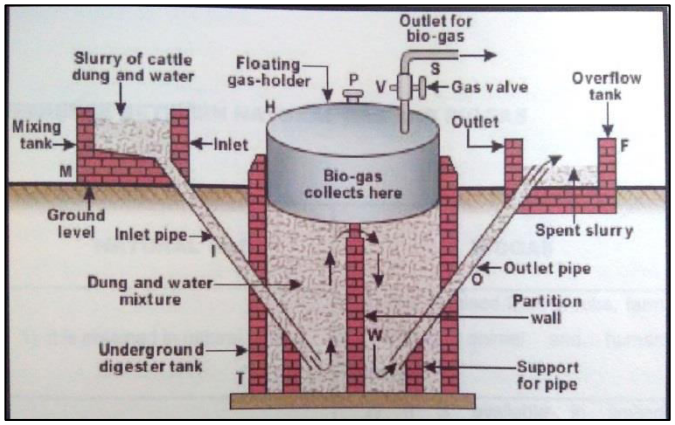

Fig. 2 Floating type biogas plant

- A common gobar gas plant suggested by Khadi and Village Industrial Commission (KVIC) is as shon in figure. These are suitable for small scale gas production. The plant consists of a digester made of masonry construction in the form of a well below the ground level and the ficating gas hoider, also called as dome, made of mild steel. The well is divided into two parts. One side has the inlet, from where slurry is fed to the tank. The tank has a cylindrical dome made of stainless steel that fioats on the slurry and collects the gas generated.
- The slurry is made to fement for about 50 days. As more gas is made by the bacterial fermentation, the pressure inside drum increases. The gas can be taken out irough outet pipe and valve. The decomposed matter expands and overfiows into the next Ciamber in tank. This is then removed by the outlet pipe to the overfiow tank and is used as manure for cultvation purposes.

2.3 Advantages and Disadvatages of Biogas

Advantages of Biogas:

- **Renewable source of energy:** Biogas is considered to be a renewable source of energy. Biogas can be produced from raw materials are such as crop residue, wet cow dung, vegetable waste, algae, poultry or piggery droppings and biogases.
- **Non-polluting:** It is also considered to be non-polluting in nature. The production of biogas does not require waste materials so it also helps us to clean environment.
- **Reduces landfills:** It also uses up waste material found in landfills, dump sites and even farms across the country, allowing for decreased soil and water pollution.
- **Heat generation:** In the same way as natural gas, bio gas can be used for household applications such as cooking and heating. Compared with other renewable heat sources biogas is one of the costlier fuels, however, it offers to operate an existing natural gas heating system with green energy.
- **Reduces greenhouse effect:** It does not produce any toxic gases which are responsible for greenhouse effect. On the other hand, it uses the waste as feed to produce an environmental friendly gas.

Disadvantages of Biogas:

- **Littie Technology Advancements:** First of all, the cament systems in place used to create biogas are not as efficient as they get. Little new techncicgy has been introduced tor streamlining the process and making it more cost effective. As a result. large scale indusmal production of biogas is still not on the energy map. Although it could scive the energy issUes being faced by countries all over the world, very few investors are willing to put in the startup capital. It is also not the best idea to construct one Biogas piant per house atich means that a central system will have to be put into place.
- **Contain Impurities:** Biogas contains a number of impurities even after refining processes have been put into place. When compressed for use as fuel, these can become corrosive the metal parts of engines.
- **Unstable:** It is also somewhat unstable, making it prone to expicsions if the methane comes in contact with oxygen and become flammable in nature. Even with all of the disadvantages present, countries have started to apply the uses cf biogas in everyday life. Pubic transportation has been renewed and made efficent with the help of CNG. Remote locations that are off the electric grid receive a steady supply of power from these piants. The future use of biogas is bright, even with the problems it faces.

3. L.P.G KIT AND ITS STORAGE SYSTEM

3.1 Composition and Description of L.P.G

- Liquefied petroleum gas or liquld petroleum gas also referred to as simply propane or butane, are flammable mixtures of hydrocarbon gases used as fuel in heating appliances, cooking equipment, and vehicles. It is increasingly used as an aerosol propellant and a refrigerant, replacing chlorofluorocarbons in an effort to reduce damage to the ozone layer. When specifically used as a vehicle fuel it is often referred to as auto gas.
- Mostly butane [(C 4 H 10) Varieties of LPG bought and sold include mixes that are mostly propane (C 3 H 8)] and most commonly, mixes including both propane and butane. In the northern hemisphere winter, the mixes contain more propane, while in summer, they contain more butane.

- LPG has a typical specific calorific value of 46.1 MJ/kg compared with 42.5 MJKg for fuel oil and 43.5 MJ/kg for premium grade petrol (gasoline). However, its relative density per volume unit of 26 MJ/L is lower than either that of petrol or fuel oil, as its relative density is lower (about 0.5-0.58 kg/L, compared to 0.71-0.77 kg/L for gasoline). As its boiling point is below room temperature, LPG will evaporate quickly at normal temperatures and pressures and is usually supplied in pressurized steel vessels. They are typically filled to 80-85% of their capacity to allow for thermal expansion of the contained liquid. The ratio between the volumes of the vaporized gas and the liquefied gas varies depending on composition, pressure, and temperature, but is typically around 250:1. The pressure at which LPG becomes liquid, called ts vapor pressure, like wise varies depending on composition and temperature.
- There are two main dangers from this. The first is a possible explosion if the mixdure of LPG and air is within the explosive limits and there is an ignition source. The second is suffocation due to LPG displacing air, causing a decrease in oxygen concentration.

Uses of L.P.G

- LPG has a very wide variety of uses, mainly used for cylinders across many different markets as an efficient fuel container in the agricultural, recreation, hospitality, calefaction, construction, sailing and fishing sectors. It can serve as fuel for cooking, central heating and to water heating and is a particularly cost-effective and efficient way to heat off-grid homes. In the safety font LPG cylinders must be updated to new standards in safety and user experience, giving a huge contribution for domestic usage.
- **Cooking:** LPG is used for cooking in many countries for economic reasons, for convenience or because it is the preferred fuel source. According to the 2011 census of India, 33.6 million (28.5%) Indian households used LPG as cooking fuel in 2011, which is supplied to their homes in pressurized cylinders. LPG is subsidized by the government in India.
- **I.C. Engine;** When LPG is used to fuel internal combustion engines, it is often referred to as auto gas or auto propane. In some countries, it has been used since the 1940s as a petrol alternative for spark ignition engines. In some countries, there are additives in the liquid that extend engine life and the ratio of butane to propane is kept quite precise in fuel LPG.
- **Refrigeration:** LPG is instrumental in providing off-the-grid refrigeration, usually by means of a gas absorption refrigerator. Blended of pure, dry propane (refrigerant designator R-290) and isobutene (R- 600a) the blend "R-290a" has negligible ozone depletion potential and very low global warming potential and can serve as a functional replacement forR-12, R-22, R-134a and other chlorofluorocarbon or hydro fluorocarbon refrigerants in conventional stationary refrigeration and air conditioning systems.

3.2 L.P.G Kit

- The fuel LPG conversion kit is shown in fig. the important part is kit is pressure reducer. This pressure reduce is to be manufactured with high standard of safety.
- This reducer is to be tested for at least 40 bar pressure. At present in our country no-body is manufacturing as kit with proper safety standard. Hence it is safe and advisable to use imported kit. This kit should be fitted by well-trained person with necessary installation safety procedure.
- LPG tank is filled with LPG fuel. The basic principle of a gas conversion unit is to convert the liquid LPG into gaseous from. Its pressure is also reduced to some suitable pressure to convert the liquid into gas.
- The engine the outlet from pressure reducer (regular) is to the vaporizer. The gas is vaporized since the gas is throttled in the reducer. The temperature of this vapor will also reduce the pressure is further reduced to atmospheric pressure so that it can be fed into much due to throttling. The vaporizer is cooled properly so that the liquid LPG is not converted back to gas and also to prevent it from freezing.
- Pressure leaving low pressure regulator is being a sucked into the carburetor. This required quantity of air is mixed with gas entering the carburetor. This mixture is then sucked into the cylinder by the vacuum created inside the engine cylinder. As soon as engine is stopped the gas supply to the engine gets cut automatically.
- When electrical supply is off, the gas solenoid cuts off the gas. In a good conversion kit there are good safety precautions. This will prevent any gas leakage by accidents. The vaporizer, as show in fig., the engine cooling water is passed to prevent from freezing within the vaporizer.

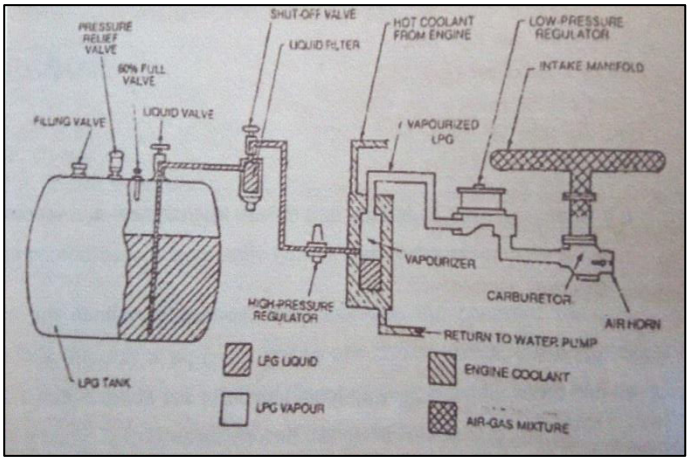

Fig. 3 L.P.G Kit

3.3 L.P.G Storage

- Every building must be designed and constructed in such a way that each liquefied petroleum gas storage installation, used solely to serve a combustion appliance providing space heating, water heating or cooking facilities.
- Be protected from fire spreading to any liquefied petroleum gas container. Not pemit the contents of any such container to from explosive gas pockets in the vicinity of any container.

Limitation:

- The standard does not apply to liquefied petroleum gas storage containers, for use with portable appliances.

4. BIOGAS BIKE AND COMPRESSOR

4.1 Hermetically sealed Compressor

- A hermetic or sealed compressor is one in which both compressor and motor are confined in a single outer welded steel shell. The motor and compressor are directly coupled on the same shaft, with the motor inside the refrigeration circuit. Thus the need for a shaft seal with the consequent refrigerant leakage problem was eliminated.
- All the refrigerant pipeline connections to the outer steel shell are by welding or brazing. The electrical conductors to the motor are taken out of the steel shell by sealed terminals made of fused glass. The figure below shows the cut-away view of a hermetic compressor. One can see the cooper windings inside the outer shell and also the refrigerant conections (copper pipes).
- Hermetic compressors are ideal for small refrigeration systems, where continuous maintenance (replenishing refrigerant and oil charge etc) cannot be ensured. Hence they are widely used in domestic refrigerators, room air conditioners etc. Since, the motor is in the refrigerant circuit, the efficiency of hermetic compressor based systems is lower as the heat dissipated by the motor and compressor becomes a part of the system load. Also material compatibility between the electrical windings, refrigerant and oil must be ensured.
- Since the complete system is kept in a welded steel shell, the hermetic compressors are not meant for servicing. A variation of hermetic compressor is a semi-hermetic compressor, in which the bolted construction offers limited serviceability.

Fig. 4 Hermatically sealed compressor

4.2 Biogas Bike

- Gas-grid injection is the injection of biogas into the methane grid (natural gas grid). Injections includes biogas until the breakthrough of micro combined heat and power two-thirds of all the energy produced by biogas power plants was lost (the heat), using the grid to transport the gas to customers, the electricity and the heat can be used for on-site generation resulting in a reduction of losses in the transportation of energy. Typical energy losses in natural gas transmission systems range from 1% to 2%. The current energy losses on a large electrical system range from 5% to 8%.

Advantages of Biogas bike:

- Provides a non-polluting and renewable source of energy.
- Efficient way of energy conversion (saves fuel wood).
- Saves women and children from drudgery of collection and carrying of firewood, exposure to smoke in the kitchen, and time consumed for cooking and cleaning of utensils.
- Produces enriched organic manure, which can supplement or even replace chemical fertilizers.
- Leads to improvement in the environment, and sanitation and hygiene.
- Provides a source for decentralized power generation.
- Leads to employment generation in the rural areas.
- Household wastes and bio-wastes can be disposed of usefully and in a healthy manner.
- The technology is cheaper and much simpler than those for other bio-fuels, and it is ideal for small scale application.
- Dilute waste materials (2-10% solids) can be used as in feed materials.
- Any biodegradable matter can be used as substrate.
- Anaerobic digestion inactivates pathogens and parasites, and is quite effective in reducing the incidence of water borne diseases.
- Environmental benefits on a global scale: Biogas plants significantly lower the greenhouse effects on the earth's atmosphere. The plants lower methane emissions by entrapping the harmful gas and using it as fuel.

Disadvantages of Biogas bike:

- The process is not very attractive economically (as compared to other bio fuels) on a large industrial scale.
- It is very difficult to enhance the efficiency of biogas systems.
- Biogas contains some gases as impurities, which are corrosive to the metal parts of internal combustion engines.
- Not feasible to locate at all the locations.

5. FILTERATION PROCESS

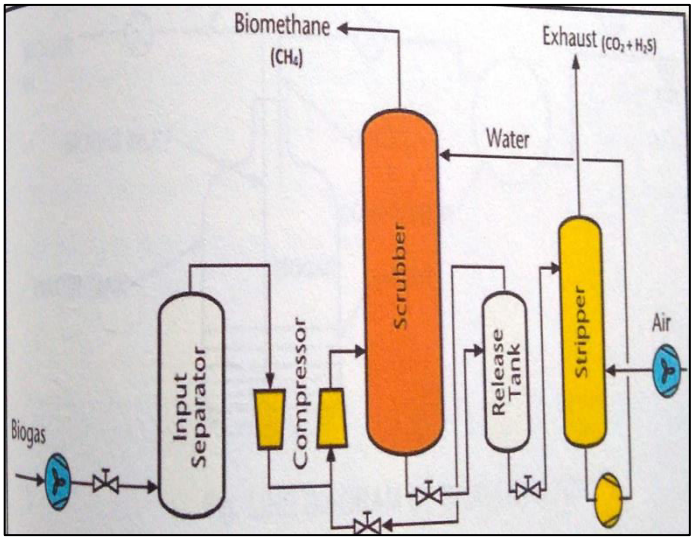

Fig. 5 Line diagram of filter

- Carbon dioxide is more soluble in water than methane. This phenomenon is employed to remove carbon dioxide (CO2) from biogas in water scrubbing technologies. Biogas is fed to a column where it is "washed" with counter-current water that is sprayed from the top of the column. The column is normally filled with some material to enhance the interface area promoting carbon-dioxide (CO2) absorption.
- The carbon dioxide (CO2) is dissolved in the water that is then pumped to a "regeneration column" where carbon dioxide (CO2) is released. The regeneration of the water scrubbing process can be carried out at higher temperatures or at lower pressures. In this technology, H2S is removed with carbon dioxide (CO2). Also the purified CH4 stream (with purity up to 98%) should be dried after leaving the scrubber.
- The solubility of carbon dioxide (CO2) in water strongly increases at lower temperatures. In order to reduce pumping energy, the water should be available at low temperatures. In fact, this technique is being employed in several countries with cold weather (Sweden, Switzerland, Germany, Austria, etc).
- Cooling down water may still be efficient for large facilities, but not for small applications. Nowadays, water scrubbing is the most employed technique for upgrading biogas.

Biogas filter by water:

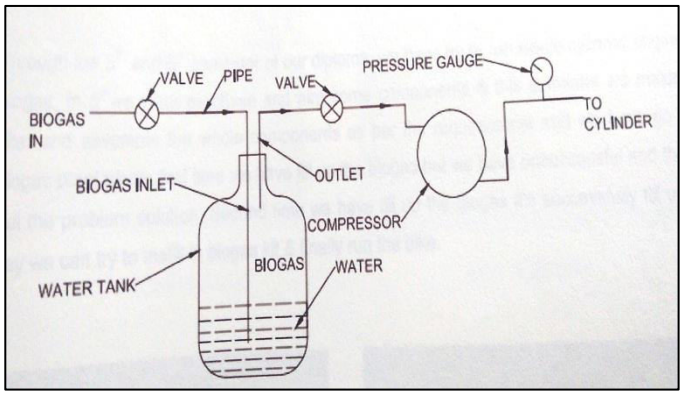

Fig. 6 Line diagram of biogas filter

6. EXPERIMETAL WORK

- we have try to run single cylinder engine with biogas, then we were purchase and hire some components and also we worked on the filter and assemble the whole components as per the requirements and we have go to the biogas plant place first time we have fill up the biogas but we have unsuccessful and then find cut the problem solution. Second time we have fill up the biogas it's successfully fill up. Next day we can try to Instill in biogas kit and finally run the bike.

Fig. 7 Biogas generation plant

Fig. 8 Filter and L.P.G Kit

Fig. 9 All Components of System

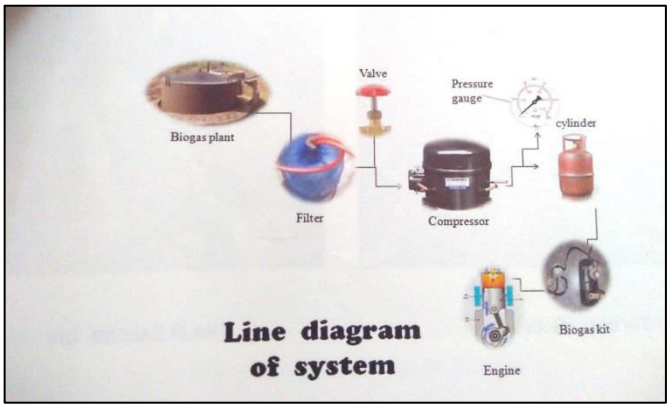

Fig. 10 Working of System

7. CONCLUSION

- By this project we get to know that single acting cylinder can be run by biogas. By this project it is also cleared that its average of 35 km/kg can be obtained. We are gratefully to say our project is success.
- In future, any one place collect the wastage like crop, wet cow dung. vegetable wastages of cities and produce biogas. That biogas use produces electricity as well as makes the biogas station and provides gas for biogas.

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