



BIOGAS POWERED ENGINE

Patil Pravin M¹, Patil Abhishek B², Patil Prakash R³

*^{1,2 & 3}U.G Student, Mechanical Engineering Department,
Dhananjay Mahadik Group of Institutions, Kolhapur (India)*

ABSTRACT

The world is under Environmental Crisis as fossil fuels are on the verge of extinction hence, to counter this crisis there is a intense need of not depending on conventional sources of energy. Biogas is such type of fuel which is not only renewable but, also easily accessible when it comes to rural areas .An attempt as been made to reduce the dependence on fossil fuels in a cheaper way as compared to other renewable sources like solar, wind, etc. As mentioned in the paper the Diesel engine is propelled by biogas due to which fuel is saved up to 80%. Slight modification is made in the suction section of the Engine, which is allied with the vaporiser. Vaporiser not only acts as a suction device but, also as a gas regulator in accordance with the load of the engine .overall this is a small step to probe the new limits of alternative sources of energy.

Keywords – Biogas ; Diesel Engine ; Vaporiser;

I. INTRODUCTION

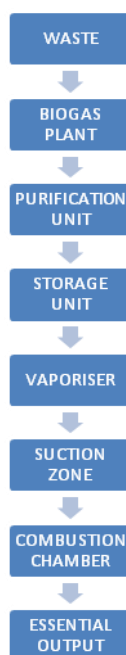
Biogas is widely implemented in Rural India but, for domestic purpose only. Thus, there is a strong need to use Biogas according to its potential. Biomass resources such as cattle dung, agriculture wastes and other organic wastes have been one of the earliest known energy sources to mankind. There is need for Biogas powered Engine to attract the Market towards them for the Melioration of the Planet. Biogas is a product of bio-methanation process when fermentable organic materials such as cattle dung, kitchen waste, agricultural wastes etc. are subjected to anaerobic digestion in the presence of methanogenic bacteria. Biogas comprises of 60-65% methane, 35-40% carbon dioxide, 0.5-1.0% hydrogen sulphide, rests of water vapours etc. it is non-toxic, colour less and flammable gas. Biogas produced from organic materials can be used directly to generate power. Last decade saw perpetual rise in the use of Biogas and this graph is only going to ascend however, upgraded biogas has a crucial role to play in future.I.C Engines in rural areas can be totally employed on Biogas with Slight modification. Yet, There is a wide scope for further Enhancement.

II.SURVEY

We surveyed rural areas of Nipani taluka and concluded that most of the farmers with chunk of land equipped with Diesel engine had concerns over the issue of Fuel. Since, the nearest Fuel pump is approximately 10 kms from their Engine setup. This not only consumed time but, also proved expensive. Hence, we came up with the innovation of Biogas powered Engine .As biogas is easily accessible in the vicinity.

III.THE PROCESS

The entire process is mentioned below



IV. STORAGE

It is hardly possible for this gas to be transported and used in Automobiles. On the other hand, Biogas can be stored tube or balloon, where the quantity of the gas can be approximately estimated by the size of the tube. However, during on-field testing we used the gas without the storage unit as the plant and engine setup were in the vicinity, that also proved fruitful. We have stored biogas in tube for the experiment purpose.

V.MODIFICATION OF ENGINE

ENGINE EMPLOYED

Power – 3.5 HP ,RPM – 1500 ,Cooling System – Air Cooled & Type – Vertical,4-stroke



Fig.1 Engine Employed

SUCTION ZONE

We made slight modification in the initial structure of the Suction portion of the Engine. The inlet manifold of the engine is provided with two holes both of them connected to the vaporiser. One of which is connected to the

suction inlet of vaporiser and the other to the Gas delivery outlet of the vaporiser. During the suction stroke, gas is pulled with the assistance of Vaporiser. As the force of suction of the Engine is directly transferred through Vaporiser. We replaced the air cleaner of the engine with air cap, since the amount of air required for intake needs to be reduced. Because, Biogas is supplied through the inlet manifold.



Fig.2 Modified Suction Zone of Engine with Fuel control Ratchet

GOVERNING

The Auto governing system of I.C Engine is replaced with manually operated ratchet, due to which the fuel is controlled to the combustion . That is the most crucial step to set the engine on idling. While, The regulation of gas is controlled by value on the vaporiser. The delivery value comes into play, when the flow of gas needs to be increased in accordance with speed and load. The manually operated Ratchet can set the amount of fuel from 10% to 100%.

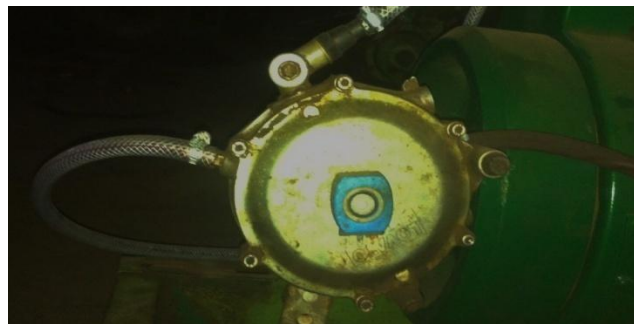


Fig.3 Vaporiser

VI. OPERATION

Initially, The engine is started on diesel for few minutes till the RPM is reached to 1500. After that the engine is set on idling and RPM is dropped to 400-500, This is done by the assistance of manually operated ratchet. When the engine is running on idling mode i.e. 500 rpm, the amount of diesel supplied is 10 to 20 % . hence, the ratchet is locked at idling mode. Now, the work of gas commences as the vaporiser's delivery value is opened manually. Eventually, the gas is passed through suction and intake manifold is closed with air cap. When the purified methane is supplied the air cap with air vent (since oxygen is required for combustion and purified methane does not contain oxygen) is equipped while, on the other hand when raw biogas is supplied the inlet manifold is totally closed as raw biogas contains oxygen which is necessary for combustion. Due to the supplied

gas the rpm is again achieved to 1500 and hereafter the engine propels on 20 % Diesel and 80% Gas. The amount of gas supplied is regulated by vaporiser in accordance with the load on engine.



Fig.4 Engine propelled on Upgraded Biogas

VII. MERITS

- Cheaper as compared to other Alternative power sources i.e. it requires lakhs of rupees to set Solar or Wind power plant which could generate same power while, it costs around few thousands through biogas powered engine
- The intake for production of are waste materials (cow dung, domestic waste, organic wastes, etc) hence, a move towards cleanliness
- Almost all households have their own Biogas plant, That makes it easily accessible as this project is rural based.
- Low investment cost as already biogas is used but, to a lesser extent in domestic applications like cooking, etc
- Cheaper engine modification cost.

VIII. CONCLUSION

The use of Fossil fuel is reduced to a greater extent. This Engine can run on Raw Biogas as well as purified methane efficiently. It just costs few thousands for modification of Engine and saves up to 80% of Diesel. This project is totally rural oriented as biogas is available in ample in Rural areas. Biogas is cheaper as compared to most of the other energy sources, overall it's a innovative step to counter depletion of Fossil Fuels.

REFERENCES

- [1] R.B. Gupta, *Automobile Engineering* (Satya Prakashan)
- [2] V.L. Maleev, *Internal Combustion Engines* (McGraw-Hill Book Company)
- [3] Gustaf Lagunoff, *Automotive Hybrid Technology*, Lulea University of Technology, Sweden
- [4] Swanand Kalambe, *Low pressure separation technique Biogas into CH₄ and CO₂ employing PDMS membrane*, IJAET Vol III, 2012.
- [5] Swedish Gas Technology Centre limited, *Basic data on Biogas*, 2012