The Experimental Study of Single Cylinder Four Stroke Spark Ignition Engine using Biogas as a fuel: A Review Study

Saket Singh¹, Chirag Sharma², Jigar Bhanushali³, Dhavan Sharma⁴

¹,²,³ Student at Laxmi Institute of Technology, Sarigam, Gujarat, India.

 Abstract—The automobile vehicles are the major source of the air pollution and cause the environmental problems like Global Warming, Greenhouse gas and the acid rain. The addition of an alternative fuel like gaseous fuel with gasoline in the engine is one of the possible approaches for reducing this problem because of its constituent influences on engine emission characteristics.¹ The main sources of renewable energy in India are biomass, biogas, solar, wind and hydro power. Biogas is an attractive source of energy for rural areas.² The aim is to present the potential role of biogas as an alternative fuel. There is abundance of raw material for producing biogas. Also municipal sewage can be used for this purpose. Biogas is produced from the process of anaerobic digestion of wet organic waste, such as cattle and pig slurries, food wastes and biomass. There is growing interest in the use of biogas as a fuel for automobile vehicles. Some of the reasons behind this are the increasing regulation and taxes on waste disposal, fuel crisis, an increasing need for renewable fuel sources, measures to improve local air quality and the need for clean transport fuels in urban areas. Through detail literature survey, the challenges to the gasoline fuel and biogas are studied and it is found that biogas is an effective method for reducing CO₂, CO, HC and NOₓ emission.

Keywords—Alternative fuel, biogas, biogas petrol blend, I.C. engine, engine performance Emission.

I. INTRODUCTION

Society is today facing the problem of an increased demand for energy. The conventional energy sources do not to be able to meet this ever increasing demand. In recent years, environmental pollution and energy resource depletion have become serious issues for the world like global warming, acid rain, etc. In particular, research into automobile industry has attracted growing interest in an effort to improve engine efficiency and reduce harmful exhaust emissions. So, there is needed to be development of engines that can operate using more environmentally alternative fuel. To save the conventional fuel by limiting its usage it is necessary to focus our attention towards renewable source of energy for power generation.¹

The main sources of renewable energy in India are biomass, biogas, solar, wind and hydro power.¹ Biogas can be used in both heavy duty and light duty vehicles. Light duty vehicles can normally run both on natural gas as well as biogas without any modifications whereas heavy duty vehicles without closed loop control may have to be adjusted if they run alternately on biogas and natural gas. Biogas provides a clean fuel for both SI (petrol) and CI (diesel) engines. Diesel engines require combination of biogas and diesel while petrol engines run fully on biogas.

Biogas is a renewable alternative fuel for I.C engines that has several advantages over fossil fuels, including lower costs and reduced levels of harmful emissions. Biogas produce from the anaerobic decomposition or fermentation of organic material like: Municipal waste or leftovers landfill gas, man and animal’s biological activity waste, sewage gas, Energy crops etc.¹ Biogas can be converted in bio CNG after enrichment and bottling. It becomes just like CNG.³ Biogas comprises of 60-65% methane, 35-40 % carbon dioxide, 0.5-1.0 % hydrogen sulfide and rest of water vapor. It is almost 20% lighter than air. Biogas, like Liquefied Petroleum Gas (LPG) cannot be converted to liquid state under normal temperature.

India has the abundance of raw material for producing biogas. The methane separated from biogas use as a fuel will substantially reduce harmful engine emission and will help to keep the environmental clean.

II. COMPONENTS DETAILS

- Dynamometer: It is a device which is used to measure the torque or brake horse power.
- We will be using Rope Brake Dynamometer which will give the torque of the engine.
- In this the friction will produced between the rope and pulley.
- We will use an cooling arrangement to control the excess heat.
A. **FLAPPER PLATE**  
- The primary function is to separate the air and gas passage

B. **ONE WAY VALVE**  
- A valve which allows the fluid to flow in one direction only.
- It will be fitted ahead of the biogas tank which allows the fuel to stop/go to the engine.
- It can be used as a chock or lock system.

C. **GAS INTAKE PIPELINE**  
- The fuel which goes from the biogas tank to biogas pipeline in which only purified methane (CH4) will be released and other harmful gases such as CO2, H2S, H2O

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**III. WORKING**

The schematic diagram of four stroke engine using biogas as fuel is as follows:

- First, the fuel is injected from the biogas tank to the biogas pipeline.
- Now, in the biogas pipeline the unpurified biogas will be purified and only pure form of methane fuel will be out.
- The harmful gases such as CO2, H2S, H2O, O2
- Then, the purified methane will go to the engine intake manifold through the gas carburetor.
- Then the process will start on the cylinder.
- Finally, we measured the required brake power, efficiency, emission, torque through the dynamometer on which engine will be fitted.

**REFERENCES**


