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Development Of Four Stroke Engine Working On Biogas Fuel

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Abstract

There is growing interest in the use of biogas as a fuel for transport applications. Some of the drivers behind this are the increasing regulation and taxes on waste disposal, an increasing need for renewable fuel sources, the EC's Biofuels Directive, the proposed Renewable Transport Fuel Obligation (RTFO), measures to improve local air quality and the need for clean transport fuels in urban areas. The aim of this paper is to present the potential role of biogas as a transport fuel. Biogas is produced from the process of anaerobic digestion of wet organic waste, such as cattle and pig slurries, food wastes and grown wet biomass. To be used as a transport fuel biogas has to be upgraded to at least 95% methane by volume and it can then be used in vehicles originally modified to operate on natural gas. Biogas fuelled vehicles can reduce CO2 emissions by between 75% and 200% compared with fossil fuels.

The higher figure is for liquid manure as a feedstock and shows a negative carbon dioxide contribution which arises because liquid manure left untreated generates methane emissions, which are 21 times more powerful as a greenhouse gas than CO2. Hence there is a double benefit by reducing fossil emissions from burning diesel and reducing methane emissions from waste manure; Biogas will give lower exhaust emissions than fossil fuels, and so help to improve local air quality. The paper sets out the resource that is available for producing biogas, together with the basic details of production technology. It goes on to explore how this gas can be used in vehicles, describing the basic technology requirements. The energy data and the costs of producing on biogas as a transport fuel are presented.

Keywords: Biogas, Transport, Road Transport, Air Pollution

Introduction

The biogas is a non-fossil gas which is produced from sewage, manure, landfills or food industry waste. With those numerous and abundant origins, the potential of the European biogas production is so large that it could replace 12 to 20 % of the natural gas consumption. This renewable energy is already used for heat and electricity production, but the best upgrading solution of this clean energy should be the production of vehicle fuel. Biogas is worth using rather than natural gas because of its renewable sources. The fossil resources of oil, gas and coal are not unlimited. The environmental problems caused by waste and wastewater have to be repaired and to be avoided in the future. One effective way to avoid these problems is the biogas, which is produced by the fermentation of animal dungs, human

sewage or agricultural residues, is rich in methane and has the same characteristics as the natural gas. The use of biogas as a clean fuel answers to current concerns dealing with economics, ecology and energetics:

- search on renewable energies while the fossil deposits are draining,
- reduction of the energetic dependence,
- limitation of the atmospheric pollution linked to the gas emissions, - decrease of the smell and noise annoyances - reduction of the green house effects.

Biogas fuels usually cause low pollution to the atmosphere and because they come from renewable energy resources, they have a great potential for future use. This vehicle fuel is the best way to upgrade waste.

Literature review:

1. Duc and wattanavichien (2016) :

   They conducted an experiment to investigate the effect of biogas diesel duel fuel operation on performance emission and long term use of and IDI diesel engine. The study reveled that there was no variation on engine performance at all test speed. HC, CO emission and specific energy consumption in duel fuel mode were higher compared to diesel mode. From the study, it has been observed that with long term use of the engine on duel fuel mode, there was a destruction of piston crown due to high thermal load. They suggest that this problem can be solved for long term use by little variation in engine parameter.

2. Tippayawong et al. (2015):

   Presented DI diesel on duel fuel mode. They suggested that the long term use of duel fuel engine is feasible after periodic maintaince and service of engine.

3. Luijten and Kerkhof (2013):

   Examined the effect of pure jatropha oil with biogas on performance of 12KW DG set on duel fuel mode for rural electrification. It has been reported that the engine was able to produces electricity using pure jatropha oil with biogas without need of transetherification and any engine modification.

4. Caua et al. (2012):

   Examined the effect of enriched air on the performance of a diesel biogas duel fuel DG set engine. They found that there was an improvement in thermal efficiency with enriched oxygen at all loads ranges.

   However, at 40% of the load, it was increased up to 28%. The Cylinder peak pressure was higher for 25% and 27% oxygen enrichment compared to the case of atmospheric air for full loads.

Problem definition:

Now days following problems occurred

1. Limited stock of petroleum based fuels: Main fossil fuels such as coal, crud oil, and natural gas are now available in very small amount. As number of automobiles has increased , the demand for fossil fuel increased rapidly

2. Global warming: Use of fossil fuels in automobile causes large emission of green house gases witch cause global warming.

3. Availability of renewable energy sources: Biogas is produced by caw dung, kitchen waste, human waste and they available easily around our living places. We have automobiles which run on electricity and biodiesel but there are still in developing stage.

Because of these above drawbacks, we decide doing work on these problems. We think, why should not make use of biogas which helps in reducing all above problems.

Objectives of the Project:

1. To reduce carbon emission: Use of biogas in automobile helps in reducing the emission of carbon which now-a-days world's largest problem.

2. To reduce draining of fossil fuels stock: Daily use of natural resources in causes draining of fossil fuels and one day all non renewable resourced will be ended.

3. Easy Availability of biogas: Biogas is produced very easily by using caw dung , human wastes and water in backyards and easily available in cheap rates.

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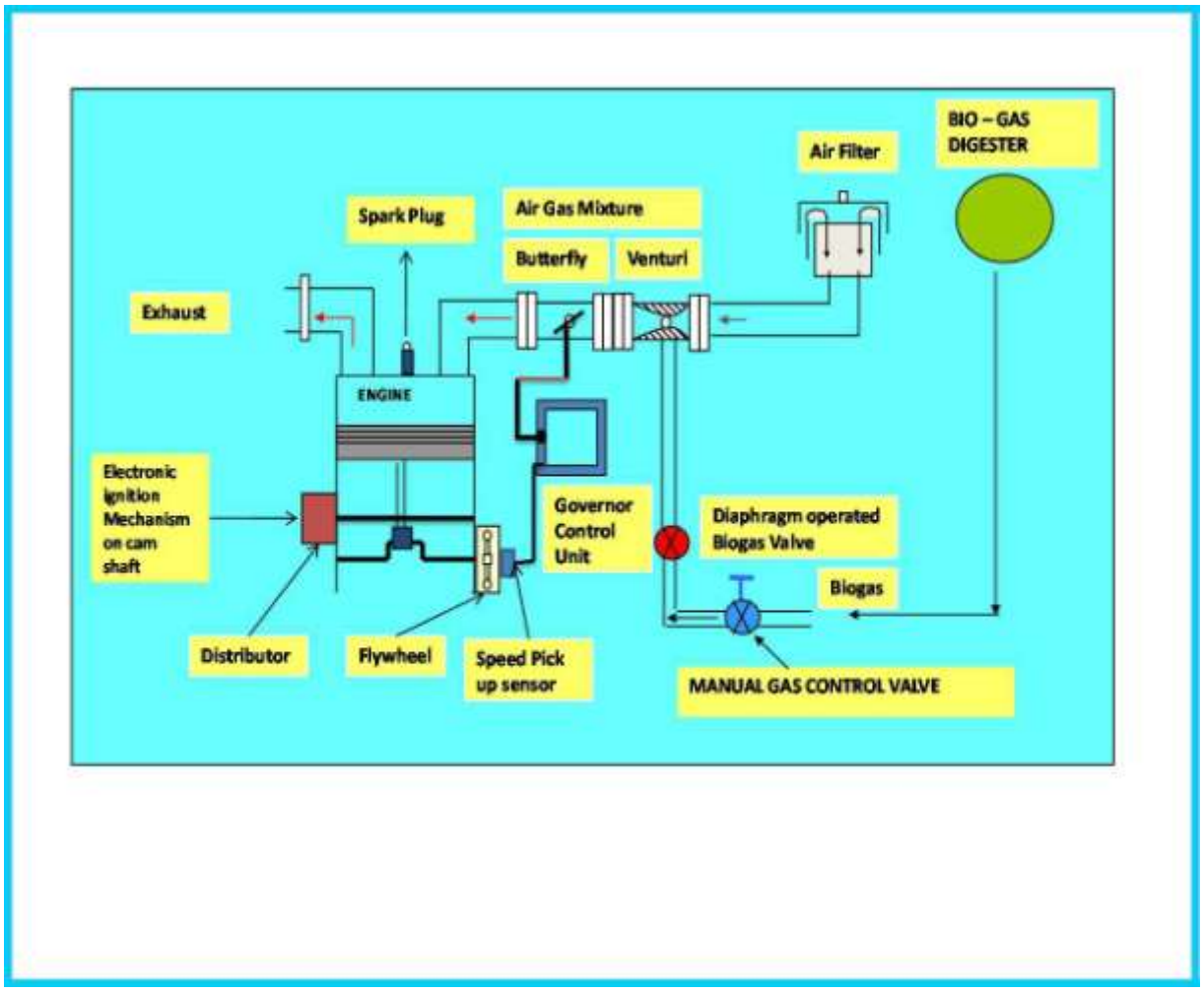
DESIGN OF MACHINE:



WORKING PRINCIPLE:

Composition of biogas

During anaerobic digestion (i.e. digestion in the absence of oxygen) organic material is broken down in several steps by different types of microorganisms. The end-products are a gas containing mainly methane and carbon dioxide, referred to as biogas; and a slurry or solid fraction consisting of what is left of the treated substrate, referred to as digestate. Biogas can be produced from most types of organic raw material, except for lignin, which is not anaerobically degraded. The substrate composition will affect the yield of biogas and its content of methane. Landfill gas is produced during anaerobic digestion of organic materials in landfills and is very similar to biogas. Its methane content is generally lower than that of biogas, and landfill gas usually also contains nitrogen from air that seeps into the landfill gas during recovery. Landfill gas can also, in contrast to e.g. biogas from farms, contain a great number of trace gases.

Gas vehicles

Biogas can be upgraded to natural gas quality and used in the same vehicles that use natural gas (NGVs). At the end of 2005 there were more than 5 million NGVs in the world. Public transport vehicles driven on gas such as buses and waste trucks are increasing considerably. In total 210'000 heavy duty vehicles are operated, there of 70'000 buses and 140'000 trucks. A number of European cities are exchanging their buses with biogas driven engines. Six of them teamed in the BiogasMax EC project to share and document their experience. Most of the gas driven personal cars are converted vehicles that have been retro-fitted with a gas tank in the luggage compartment and a gas supply system in addition to the normal liquid fuel system.

Dedicated gas vehicles can be optimized for better efficiency and also allow for more convenient placement of the gas cylinders without losing luggage space. Gas is stored at 200 to 250 bars in pressure vessels made from steel or aluminium composite materials. Today more than 50 manufacturers worldwide offer a range of 250 models of commuter, light and heavy duty vehicles. Gas vehicles have substantial advantages over vehicles equipped with petrol or diesel engines. Carbon dioxide emission is reduced by more than 95%. Depending on how the electricity for upgrading and compressing of the gas is produced, the reduction might be as high as 99%. In both leading biogas fuel countries, Sweden and Switzerland, electricity is almost free of CO_2 because it is produced by hydro or nuclear power. Emissions of particles and soot are also drastically reduced, even compared with modern diesel engines equipped with particle filters. The emissions of NOx and Non Methane Hydrocarbons (NMHC) are also drastically reduced.

Heavy duty vehicles are normally converted to run on methane gas only but in some cases also dual fuel engines have been used. The dual fuel engine still has the original diesel injection system and gas is ignited by injection of a small amount of diesel oil. The engine normally idles on diesel oil. Dual fuel engines normally require less engine development and maintain the same driveability as a diesel vehicle. However emission values are not as good as for the corresponding between spark ignition and diesel engine.

DEVELOPMENT PROCESS OF PROJECT:

1. Making of biogas from cow dung
2. Purification of biogas
3. Filling of biogas in cylinder
4. Modification in engine as required
5. Working of engine.

ADVANTAGES:

1. Use of biogas in automobile helps in reducing the emission of carbon which now-a-days world's largest problem.

2. Daily use of natural resources in causes draining of fossil fuels and one day all non renewable resourced will be ended.
3. Biogas is produced very easily by using caw dung , human wastes and water in backyards and easily available in cheap rates.

CONCLUSION:

The use of fossil fuel is reduced to a greater extent. The engine can run on raw biogas as well as purified methane efficiently. It just costs few thousand 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 innovative step to counter depletion of fossil fuels.

REFERENCES:

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