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Engine Performance & Emission Characteristics on Single Cylinder Petrol Engine Working on LPG Mode

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Abstract: Liquefied petroleum gas (LPG) and liquefied natural gas (LNG) has been widely used in commercial vehicles. An attempt has been made in this paper to use alternative fuel in four stroke gasoline engine. Our main aim in selecting this paper is to use non conventional fuel against conventional fuel which is becoming scarce and costly now days. With air is less polluted then conventional fuels. It is also good with regard to economical consideration and engine efficiency. In our project we have installed LPG fuel system to four stroke vehicle where in we can use both gasoline and LPG. The primary objective of the study was to determine the performance and the exhaust emission of the engine using different fuel. The engine used in the study was originally a single cylinder, four stroke engine and minor modification were carried out to permit the experiments to run on LPG fuel. The concentration levels of CO, CO₂ and unburnt HC recorded are found to be lower than gasoline fueled engine.

Keywords: Dual fuel bike, (LPG), four stroke engine.

I. INTRODUCTION

Increasing in oil priced and stricter exhaust emissions were the main reason for the research of desirable and suitable alternative fuel for the use of automobile, various undesirable emission are exhausted by the internal combustion (IC) engine which affect the environment and cause the various such as global warming, ozone, depletion, acid precipitation, respiratory hazards which will affect the human beings. Scientist researches shows that the contribution to global an anthropogenic emission from the transportation amount of nearly 21% of CO₂ 37% of NO_x, 19% of volatile organic compounds (VOCS) 18% of CO and 14% of carbon. In vehicles an internal combustion (IC) engine is used as the power factor to drive the vehicle by converting the energy form fuel to drive the vehicle wheel through a transmission system. There for to drive engine among the available option gaseous fuel find its best position because of their improved physical chemical properties and they are ecofriendly to the nature than that of fossil fuel. Therefore clean gaseous fuel NG and LPG would be potential alternative fuels for gasoline vehicle. Though standard gas equipment set for vehicle and the safety installation are costly, much lower price of both NG and LPG are vehicle owners, light and heavy duty vehicle to modify the vehicle for gaseous fuel use.

Liquefied petroleum gas (LPG) is the byproduct of natural gas production and crude oil refineries. LPG has also referred to as simple propane or butane or a mixture of propane (C₃ H₈) and butane (C₄ H₁₀) is a flammable mixture of hydrocarbon gases can be used as fuel in heating can be used as fuel in heating application, for cooking and running of vehicle. liquid petroleum gas (LPG) has lower carbon content, high octane number, higher calorific value and flame propagation speed will improve its emission characteristics, when compared with to that of gasoline fuel LPG is mostly used as an alternative fuel in automobile due to its efficient combustion characteristics.

The octane rating of LPG is in between 105-112 and the petrol is nearly 85-95 there for with higher octane number the chances of detonation will be less and it also enable it to use at higher compression ratio thus improves the thermal efficiency of the engine. Due to gaseous nature of LPG engine operates smoother. LPG fuel is clean burning, less pollutant there for it is knows as Green Fuel. The report says that LPG yield 40% less HC, 35% less NO_x, 50% less CO. Thus for as concern us department of energy reported that LPG not only has lower green house emission then that of petrol and LPG but also it surpasses a number of highly promoted bio-fuel, The below figure shows the level of green house gasses of various fuel.

The idea behind this project generated by observing the LPG operated I.C engine CAR. The same gas aspirated engine can be used to drive the two wheeler vehicle. For LPG cylinder the gas is supplied for burning the gas inside the engine cylinder. The separate GAS KIT we are going to install bike to feed the metered amount of gas mixed with the air to the engine cylinder finally through the carburetor.

A. Objectives Of Our Project

- 1) To determine the engine performance and emission characteristics on LPG mode.
- 2) Fabrication of gas mixture.
- 3) Comparing the modified petrol engine to existing petrol e

II. METHODOLOGY

The test for this research was done on a vehicle, First we take a SUZUKI ACCESS 125cc Engine and remove its CARBURETOR so that we can put the mixture between engine and carburetor. Which had LPG injection system installed. The vehicle had 125cc wit fuel injection. The transmission was back wheel drive with an automatic gear box. The engine had a 1 cylinder with air cooled system. The LPG system was installed by adding another injector for injecting the LPG. The ratio of LPG turned to achieve stoichiometric ratio. The system of LPG shows in figure.

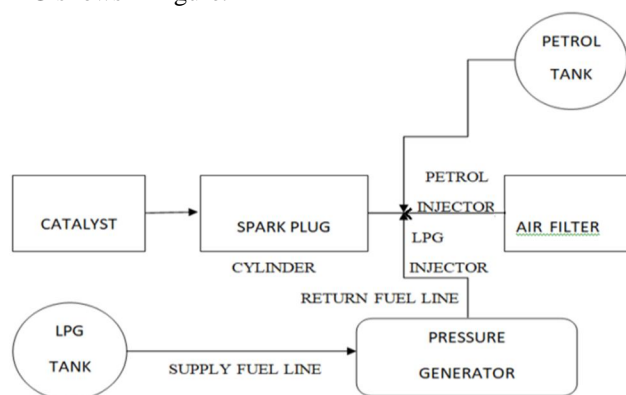


Fig.1 System of LPG working engine.



Fig.2 Single cylinder spark ignition engine connected with LPG

A. Constant speed test.

In order to test a consumption rate, the vehicle was full filled with both fuels. Then the vehicle was started by switching to use Petrol as a fuel and drive the vehicle from the rest. The speed was gradually increased until achieved constant speed of 30 km/hr. in motor way. During the test an air condition was turned on in the middle level for a normal driving condition. The test was carried out and recorded the consumption rate with the same methodology but speed was change to 0, 40 and 60 km/hr. respectively. When the test with petrol finished, the LPG was switched for the test with the same speed and the consumption rate was collected.

B. Major Components Use In Engine And Description

The components that are used in the project ENGINE PERFORMANCE & EMISSION CHARACTERISTICS ON SINGLE CYLINDER PETROL ENGINE WORKING ON LPG MODE are as follows.

- 1) Engine
- 2) Carburetor
- 3) LPG kit
- 4) LPG Cylinder

C. Technical Specification Of Engine

Table no.1- Engine specification

Bike name	Suzuki access
Cooling system	Air cooled
Stroke	4-stroke
No of cylinder	Single cylinder
Displacement	124cc
Electrical	12V, 5A
Max power	8.4bhp@700rpm
Max torque	10.2Nm@5000rpm

D. LPG Connection



Fig.3: shows LPG connection

Figure no. 1 shows the gas fuel inlet in the carburetor throttle and vacuum pipe connected in the cylinder inlet manifold. In this figure the modification in the carburetor throttle is shown which is made for gas fuel supply.

E. LPG Kit



Fig.4 shows LPG kit

Figure no.2 shows the front view of gassifire. In this view the connection of gas supply from cylinder to gassifire and from gassifire to carburetor is shown. An another connection of vacuum pipe from cylinder inlet manifold to gassifire is also shown.

F. LPG Cylinder



Fig.5: shows LPG cylinder

The figure no.3 shows the top view of gas cylinder positioned in our frame. The connection of the supply pipe and regulator is shown in figure no.1

III. RESULT AND DISCUSSION

After attaching the whole setup with our model of SUZUKI ACCESS we found the following advantages of LPG over Gasoline. We check the emission of our engine.

A. Performance Of Engine

1) Petrol

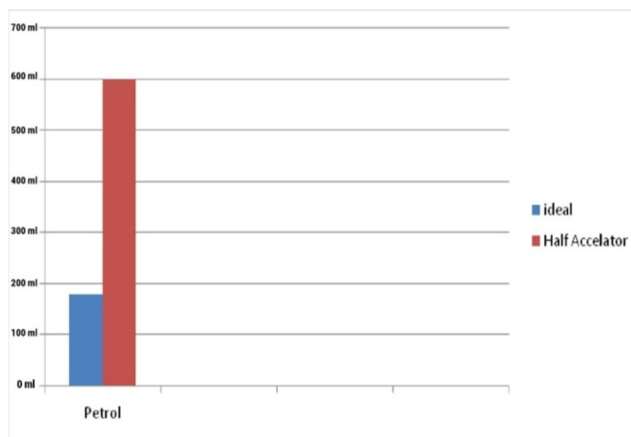


Fig.6-Petrol mode

Graph no.1 shows that in ideal condition 180ml of petrol used for 1 hour and half accelerator at constant speed 600ml of petrol used for 1 hour.

2) LPG

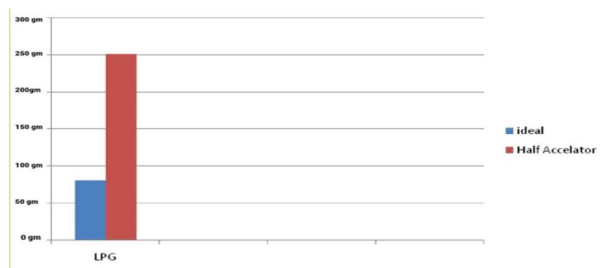


Fig.7-LPG mode

Graph no.2 shows that in ideal condition 80gm of LPG used for 1 hour and half accelerator at constant speed 250gm of LPG used for 1 hour

B. Emission And Characteristics Of Engine

On an engine basis LPG has a lower carbon content than gasoline fuel. When used in spark ignition engine, LPG produces near zero particulate emission, very little CO and HC emission. Variation in the concentration of different hydrocarbons in LPG can affect the species composition and reactivity of HC exhaust emission. CO₂ emissions typically are also somewhat lower than those for gasoline due to lower carbon energy ratio and the higher octane quality of LPG. The engine is more power generated with given amount of the fuel. LPG has an octane rating of 108+ that allows CR to be high up to 15:1, which is in the range of 8:1 to 9.5:1 for gasoline engine.

Table No.2-Emission of Pollutants

Sl.No.	Emissions	Gasoline	LPG
1	CO(gm/km)	0.86	0.70
2	HC(gm/km)	1.4	1.2
3	CO ₂	8.68	5.2

1) Petrol VS LPG CO-Emission

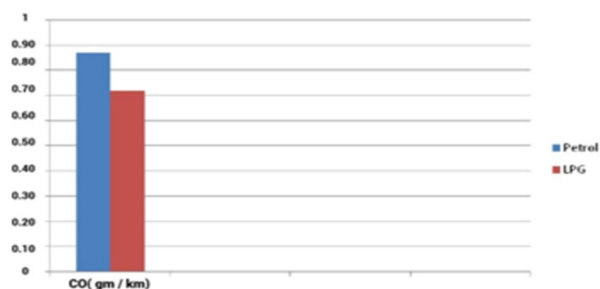


Fig.8-CO-Emission

The Graph no.3 shows that CO emission is less as compared to Petrol.

2) Petrol vs LPG HC-Emission

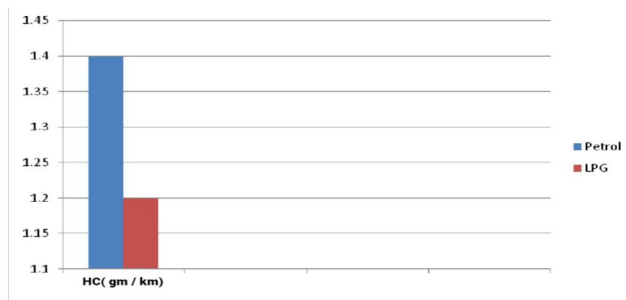


Fig.9-HC-Emission

From Graph no.4 it is shows that HC emission is less as compared to Petrol .

3) Petrol vs LPG CO₂-Emission

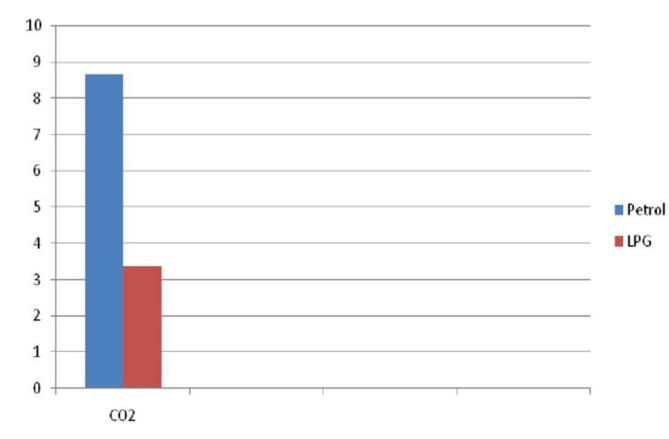


Fig.10-CO₂-Emission

From Graph no.5 it is shows that CO₂ emission is less as compared to Petrol.

IV. CONCLUSION

This project work has provided us an excellent opportunity and experience, to use our limited knowledge. We gained a lot of practical knowledge regarding, planning, purchasing, assembling and machining while doing this project work.

- A. We found that the performance and the fuel consumption of LPG is better than petrol.
- B. We also did the emission tests in which the CO, HC and CO₂ emission where lesser than petrol
- C. LPG engine is much better than petrol engine

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