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REVIEW ON PERFORMANCE AND EMISSION ON NANO ENGINE USING SEQUENTIALLY OPERATED LPG GAS

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Abstract - *Controlling air pollution, whether from vehicles, industries are the need of the day. The internal combustion engine exhaust contain several pollutants in the form of oxides of nitrogen which are toxic Euro I & II standards of emission control, Kyato treaty on global warming, Bhure lal committee recommendation in India are emphasis the need and prevention of air pollution. BOSCH Automotive hand book; assert that the superiority of LPG over petrol engine for reducing air pollution. LPG is cleaner fuel, free from lead, high octane rated. Moreover, there is no adulteration in LPG compared to petrol and diesel. Bearing a cost effective d less pollutant, LPG is considered as an alternate fuel. The main objective to undertake this project is to install and do performance analysis of LPG as a fuel in a multi cylinder petrol engine. The investigated findings of load and performance test was recorded and tabulated and the results show the superiority of LPG on break thermal efficiency, mechanical efficiency. Quality of lubricating oil was also analyzed. The emission parameters were measured by varying the load condition with external carburetor both for LPG and gasoline. Emission such as co, co_2, and HC were measured by using analyzer. The result of emission characteristic data of the test engine loaded with LPG was explained with gasoline fuel.*

Key Words: **Controlling air pollution, emission, LPG, internal combustion, pollutants**

1.INTRODUCTION

Government of India is spending 42% of its hard-earned foreign exchange to procure crude oil from gulf countries. Controlling air pollution from vehicles is the need of the day. Kyoto treaty on global warming specify the endangers of environmental pollution. Atmospheric temperature stood up 0.5deg C for the last decades and it will raise 0.5deg C in the next five years. Euro norms are enforced near future. Hence an alternative fuel that is easily available and cheaper than petrol. To check the vehicle user and nation economy-draining out and put some pollution free atmosphere for generation to come. The alternative fuel "LPG" was selected.

1.1 LPG VS OTHER ALTERNATIVE FUELS

Hydrocarbon is need for combustion, the fuel which having higher quantity of hydrocarbon is the best fuel. The fuel like hydrogen, gobar gas ,alcohol from cane (ALDOL) ,methanol, ethanol are being tested as alternate fuel. They have not borne fruit. The prime reason for it was unavailability of them in large scales as the consumer vehicles each fuel has to depend on highly improbabalistic infrastructure for production. For instance, India could not take ALDOL, as an alternative fuel because the cane production is not enough and even more, this is a conventional method of producing an alternative. Similarly for gobar gas succeed a alternative fuel because of non availability in bulk quantities and to meet the requirement of vehicles. Hydrogen, although being unconventional and pollution free, it is too dangerous to be used for automobiles, because it is highly exposure in atmospheric. Methanol is failed to succeed as alternative fuel, because of its high cost and ethanol failed to succeed because of its corroding properties. Herbal petrol, Coconut petrol and fuel from vegetables are yet to given a fruit result for an alternate fuel. Thus an immediate alternative fuel for petroleum product such as petrol should lonely be another petroleum product which is cheaper, cleaner and common for consumers. Such alternative fuel apart from diesel is compressed natural gas (CNG). Market availability and provision for filling of CNG is very remote in Tamil Nadu. Hence it's same family group.

1.2 WHAT ARE ALTERNATIVE FUELS?

Alternative fuels are fuels that can be derived from non-crude oil resources. In general, alternative fuels include all vehicular fuels other than gasoline and diesel fuel, although reformulated gasoline and clean diesel fuel are sometimes considered alternative fuels. Transportation fuels that can be derived from non-crude oil recourses include methanol, ethanol, natural gas, liquid petroleum gas

(LPG), hydrogen, and hydrocarbons (from coal and oil shale). Although electricity is not actually a fuel, it is source of energy, which can be used to propel vehicles. These fuels has advantages and disadvantages associated with cost, availability, environmental impact, vehicle modifications required, safety, and customer acceptance. Ethanol has been widely used is gasohol, which is a mixture of 90% gasoline and 10% ethanol. LPG is often used as a transportation fuel. Methanol and natural gas have received the greatest support across the .country as alternatives to gasoline. Hydrogen is recognized as the best as the best fuel from an emissions point of view, but it suffers from lack of economic availability. Electricity is the cleanest source of transportation energy, but electric vehicles have several serious disadvantages when compared to vehicles fueled with conventional or alternative fuels.

TABLE -1: ALTERNATIVE FUELS COMPARISON

GASEOUS FUELS	LIQUID FUELS	ELECTRICITY
Methane (natural gas) Propane (LPG) Hydrogen	Reformulated gasoline and diesel Methanol Ethanol	Battery energy storage (Generated by coal, natural gas, hydro, solar, nuclear, wind, renewable, etc.)

TAB-2 ALTERNATIVE FUEL

ALTERNATIVE FUEL	
Natural Gas	CH_4
Propane	C_3H_8
Methanol	CH_3 OH
Ethanol	C_2H_5OH
Hydrogen	H_2
Reformulated Gasoline	
Clean Diesel Fuel	

TABLE -3:

ENERGY DENSITIES COMPARED TO GASOLINE

	MASS RATIO	VOLUME RATIO
CNG	0.89	4.8 -5.9
LNG	0.89	1.57
Propane (LPG)	0.89	1.29
Hydrogen (H2)	0.37	3.93
Reformulated Gasoline	1.02	l.0 1
No.2 Diesel	1.01	0.88
M 100	2.19	2.03
M85	1.87	1.76
Ethanol	1.64	1.53

1.3 LIQUEFIED PETROLEUM GAS (LPG)

LPG is a mixture of petroleum and natural gasses that exist in a liquid state at ambient temperatures when under moderate pressure (less than 200 psi). LPG has been used as a vehicular fuel for over 60 years. It requires much the same modification to a SI engine as does CNG, with the exception that vaporizer is required to covert the liquid fuel into vapor before injection into the intake air through a fuel/air mixer essentially identical to the CNG fuel/air mixer. As a gas, LPG is two and half times more dense than CNG; therefore, for reasons previously stated, the loss of engine power and throttle response is not as great.

Emissions from LPG used as a fuel in an Internal combustion engine are very similar to that of CNG. Propane ($C_3 H_8$), the principal constituent in LPG, has a greater ozone reactivity (potential for contributing to the formation of smog) than does methane, the principal component in natural gas, but both are low compared to other hydrocarbons.

Refueling losses are also very low with LPG. These factors result in LPG having low objectionable HC emissions as compared to gasoline or diesel fuel.

2. CONVERTION OF MULTI CYLINDER PETROL FUEL ENGINE TO LPG FUEL ENGINE

2.1 Changes in Carburetor

An 8mm hole in drilled in the path of fuel and adapter is fitted at the drilled hole. LPG fuels at the drilled hole the LPG fuel outlet from the vaporizer is joined to this adopter with a fuel line tube.

2.2 Changes in Radiator

Two passages are done at the radiator inlet and outlet water line tube and are connected to the vaporizer with hot water tubes.

2.3 Changes in Inlet Manifold

A hole is drilled at the inlet manifold and an adopter is fixed at this point and a vacuum tube is connected to this hole and the other end or the tube is connected to the vaporizer.

2.4 Fitting of Solenoid Valve

Two solenoid valves are fitted to the frame of the engine and the petrol fuel line is connected to one of the solenoid valve and the LPG line is fitted to other solenoid valve. In order to change the fuel with a change over switch fitted to control the solenoid valves by help of battery charge.

2.5 Additive Supply

A burette is fitted in the stand and the outlet of the burette is connected through the tube to LPG passage of vaporizer to carburetor by "Tee" joint.

2.6 The Vaporizer Kit and its Connections.

The vaporizer kit being the heart of the LPG system was clamped new the radiator, carburetor and solenoid valve. The vaporizer kit has the following connections.

- The LPG supplies from solenoid valve.
- The LPG outlet to carburetor
- The hot water inlet
- The hot water outlet
- The fuel manifold vacuum chamber connecting line.

2.7 Working of vaporizer *kit.*

The LPG was supplied through the solenoid valve from the cylinder to the vaporizer kit and it let back to the carburetor separately. Part of the hot water flowing from engine to radiator was sent into the vaporizer kit. This hot water preheats the LPG by the cross flow heat excl anger process. Here the heat exchange takes place between the hot water and the LPG. The hot water was made to pass around an outer circular path and the LPG was made to pass around an inner circular path. The vacuum chamber was designed so that the feedback according to the load conditions would be achieved. The feed hack was established by connecting the fuel manifold to the vacuum chamber, a small hole was provided for the flow of air to activate the diaphragm, which was controlling the LPG supply according to the load requirements.

2.8 Pollutant In S.I Engines

The main pollutants of concern in the case of spark-ignition engines are carbon monoxide (CO), nitric oxides (NO) and NO_2 in general, but primarily NO in spark-ignition engines), hydrocarbons (HC) and organic toxics (benzene, acetaldehyde, formaldehyde and 1,3-butadiene).

3. RESULT AND DISCUSSION

All experiment were carried out at constant speed the percentage of applying is varied 0 to 100% in step of 20%. The experiment were conducted in two different ways. Namely, by using gasoline as fuel and LPG and fuel. Using gasoline fuel there is no modification needed in the engine. The experiment was conducted with gasoline fuel in conventional manner but for LPG as fuel the engine needs some minor modification in the manifold. LPG supplied was controlled by controlling the gas throttle value in the control and also depend upon the amount of vacuum available near to the inlet valve.

3.1 Performance Test

Since the experiment was carried out difficult petrol engine. The engine used in this study was four stroke spark ignition engine. The details specification of the engine are listed in the table . It was thought derivable to generate the face line data with a petrol for a comparator assignment of no fuel specific characteristics of the system.

Performance test on the LPG as fuel in a SI engine user carried out with the normal condition. This setup conditions was observed to be the most satisfactory with respect to accurate responds and

smooth running of engine with LPG without any system of undeniable combustion phenomena

3.2 Effect of fuel consumption parameter

The fuels were induced using a gas carburetor in the inlet manifold under similar operating condition. The performance characteristic of the engine were determined and relevant parameter were graphically controlled the performance of engine were using LPG was limited due to speed local condition

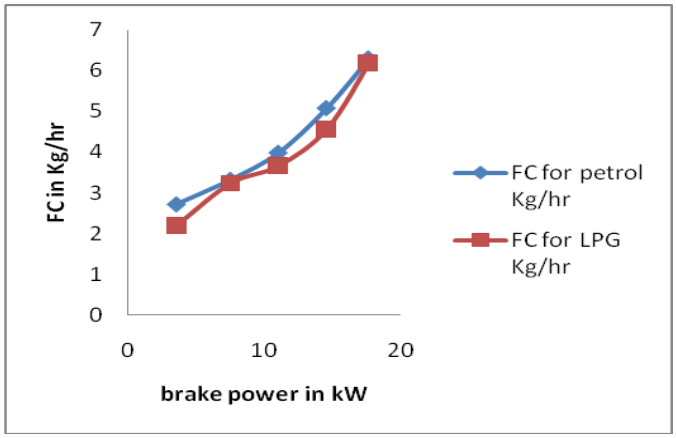

FIG: 3.2.1 BRAKE POWER AGAINST FUEL CONSUMPTION

From the above graph the indicates that the mass of fuel consumption gradually increasing with the increase of brake power. The maximum mass of fuel consumption with LPG is **16%.**

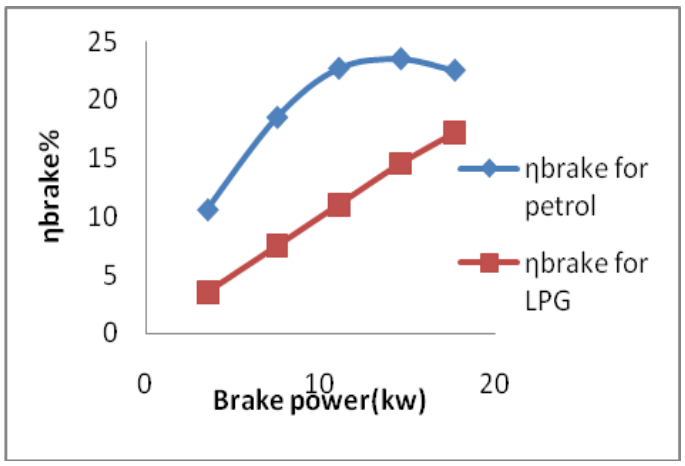

FIG:3.2.2 BRAKE POWER AGAINST BRAKE THERMAL EFFICIENCY

From the try it is found that as the brake power increase there is considerable amount of increase in brake thermal efficiency. The maximum brake thermal efficiency with petrol is **22.5%**. The maximum brake thermal efficiency with LPG is **21%.** The break thermal efficiency for LPG at low load contributes 10 higher than gasoline fuel.

3.3 Emission test

The engine was ran with LPG and gasoline supplied separately and the exhaust emission were compared the exhaust gas constituent (CO2, CO and HC) were measured gas analyzer which was placed at tile pipe of the engine.

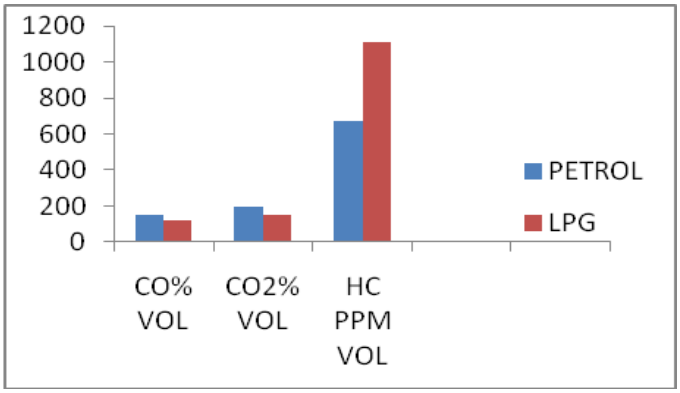

FIG: 3.3.1 EMISSION LEVEL

By referring the fig CO2 and CO emission measured from the engine with respect to brake power it can be seen that CO2 and CO emission less for LPG when compared gasoline fuel at all load the HC emission is more for LPG and tens for gasoline fuel.

3. CONCLUSIONS

The test results reveal that, LPG converted I.C Engine shows better Mechanical efficiency that the conventional Fuel (petrol). It was also concluded that the frictional loss in LPG is less than petrol which can be further studied for all other types of fuels. The LPG converted engine can be started easily and can work with both petrol and LPG as per our wish. Brake thermal efficiency reduces at the maximum load condition for LPG. The co and co_2 emissions exhibit very lower value for LPG as compared to gasoline.

It can be concluded that generally LPG will provide variable alternative fuel to the last operating fossil fuel in future.

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