Performance and Emission on Nano Engine Using Lpg Gas With Additives

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Abstract- *The present approach toward reducing emissions from spark ignition engine and increasing Brake Thermal Efficiency is by means of modification of engine, design of components, and improvement of fuel refining and use of additives.*

Increasing Brake Thermal Efficiency and exhaust emissions is the main aim. Load test and Emission test were conducted using LPG as fuel with Methanol, as additive.

Load tests were carried out at, constant speed with different loads (0, 10, 20, 30 & 40%) and volume flow rate of additive. Emission test was conducted for methanol additive flow rates. It is found that increase in Brake Thermal Efficiency Among the various tests carried out that with the use of LPG as fuel with additive is found to result in the higher co emission than with the additives.

Keywords- exhaust emissions, LPG, additives, spark ignition engine

I. INTRODUCTION

1.1. ALTERNATIVE FUEL

Controlling air pollution is important today. And the global warming takes place. Atmospheric temperature also increases.

Hence an alternative fuel that is easily available and cheaper. The alternative fuel "LPG" with additive was selected.

1.2. GREENHOUSE THEORY

According to the greenhouse theory, incoming solar ultraviolet radiation is absorbed by the Earth, and re-emitted as infrared radiation. Some of this radiation is trapped by water vapor and greenhouse gases, and emitted back to the Earth; the balance goes into outer space. The ore greenhouse gases that are produced, the more infrared radiation that 1 absorbed in the lower atmosphere. This causes warming near the Earth's surface and cooling in the upper atmosphere. A substantial Earth warming could alter agricultural patterns and melt some of the polar ice caps, raising sea levels, and causing flooding of low-lying coastal areas.

Table 1.1 shows the greenhouse gases and an estimate of their relative contribution to the global warming potential. The major concern is on control of CO2 emissions, which account for about half of the projected global warming. The other culprits are methane (CH4) at 18%, nitrous oxide (N20) at 8%, ozone (0)) at 4%, and manmade chemicals known as Chlorofluorocarbons (CFCs), at 20%. All these gases are increasing with industrial activity and population growth, but the CFCs are being slowly phased out by international agreement.

The impact of these gases on global climate change is further magnified by their difference in heat absorption capacity. Methane is perhaps 10 to 80 times more absorptive of heat than CO_2, while N_20 and CFCs have relative warming factors of 200-400 and 10,000, respectively, compared to CO_2.

II. ALTERNATIVE FUELS

Alternative fuels are fuels is a non-crude oil resources. Table 2.1 lists the candidate fuels normally considered to be alternative fuels.

Second, alternative fuels can help reduce the amount of airborne pollution. All of the alternative fuels are potentially capable of lowering vehicular emissions when compared to gasoline or diesel.

2.1. THE ALTERNATIVE FUEL CANDIDATES

The most promising alternative fuel candidates at present are natural gas, propane or LPG (liquefied petroleum gas), methanol and ethanol, and electricity. Future energy needs are not likely to be filled by anyone fuel because the alternative fuel of interest varies in different regions of our country, and the world, depending on the availability and economics s of the resource in that particular area. The fuels likely to appear in the future are listed in Table 2.1.

FUEL	BASE CASE			ADVANCED CASE		
	CO_2	CH_4	N_2O	CO_2	$CH_4^{(1)}$	$N_2O^{(2)}$
Gasoline	306	0.10	0.2	254	0.08	0.1
CNG	232	1.90	0.3	178	1.50	0.1
LPG	275	0.10	0.3	207	0.08	0.1
Methanol	289	0.10	0.2	209	0.08	0.1
Ethanol	$302^{(3)}$	0.10	0.2	$228^{(3)}$	0.08	0.1

Table 2.1VEHICLE EMISSIONS

III. LPG FUEL AND ADDITIVES

3.1. LIQUEFIED PETROLEUM GAS (LPG)

LPG (often incorrectly identified as propane) 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. Electronic conversion kits are also available for LPG fueled vehicles.

3.2. IMPROVEMENT OF LPG COMBUSTION ADDITIVES AND COMBUSTION TECHNIQUE

In the Japanese market, 30 x 10^6 kL of gasoline and 10 x 10^6 kL of gas oil are consumed every year as automotive fuels representing 55 and 21 %, respectively, of the total petroleum products consumed in the transportation section. It goes without saying that research to improve fuel quality must be conducted with the objectives of fuel conservation and reduction of air pollution. Contrary to the above, annual consumption of LPG fuel for automotive use is at most 1.77 x106 tons (4% of the total petroleum consumption in the transportation sector).

3.3 Methods of Blending Additives with LP Fuel

The methods of blending additives with LPG fuel are governed by the properties of the additive. They are gas injection, by which gases such as H2 and CO are injected separately; mixing, by which liquefied gases such as dimethyl ether are directly blended with LPG; and spraying by which relatively low volatile liquids such as methanol and isoparaffin are sprayed separately.

In the gas injection method, compressed gas stored in a small cylinder is supplied via a pressure control valve to the engine's air intake. Typically, the vacuum in the air intake is determined by engine speed and a throttle valve that follows the movement of the accelerator pedal. Arrangement is made so that the amount of gaseous additive inducted is proportional to the degree of vacuum.

Liquefied gas and a relatively volatile additive may be blended with LPG fuel in advance. However, as engine requirements vary, depending on whether the vehicle is idling, accelerating, running steadily, or decelerating, the best burning condition varies. Adjustment of the additive blending ratio according to required burning conditions is preferred so it is necessary to supply the additive separate from the main fuel system.

Higher the boiling point of the hydrocarbon, the more the carbon monoxide, unburned hydrocarbons, and NO_x decrease and the are power increases.

From the above methanol, unleaded petrol and kerosene are considered as liquid fuel additives for LPG as alternate fuel.

3.4. Methanol

Methanol can be produced from natural gas, coal, Biomass, and urban refuse. In producing methanol from natural gas a considerable amount of the energy is lost. Thus, this process does not appear to offer a viable long-term solution to the alternative fuels problem. The production of methanol from coal does have potential for the long-term, even though there is an accompanying energy loss. Another disadvantage in producing (and using) methanol made from coal is that the generation of carbon dioxide is greater than that for refining and using gasoline.

Methanol is an excellent internal combustion engine fuel with a high octane rating and clean burning characteristics. It i: used as a fuel primarily as M85 (a mixture of 85% methanol, 15% hydrocarbons) or as neat methanol, M 100 (100% methanol). The primary emission problem associated with use of methanol is the generation of aldehydes, particularly formaldehyde. Methanol fueled vehicles also emit unburned methanol; however, the unburned methanol is much less reactive than the complex mixture of unburned hydrocarbons emitted by gasoline and diesel fueled vehicles.

IV. 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 depends the amount of vaccum available near to the inlet valve.

4.1 Performance test

Since the experiment was carried out difficult petrol engine. The engine used in this study was four stroke spark ignition engine. It was thought derviable to generate the face line data with 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.

4.2 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

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

From the try it is found that as the brake power increase there is considerable amount of increase in brake thermal efficiency. The max brake thermal efficiency with petrol is **18.49.** The maximum brake thermal efficiency with LPG is **10.134**. The break thermal efficiency for LPG at low load contributes 10 higher than gasoline fuel.

4.3 Emission test

The engine was ran with LPG and gasoline supplied separately and the exhaust emission were compared the exhaust gas constituent (CO_2, CO and HC) were measured gas analyzer which was placed at tile pipe of the engine.

By referring the fig (4.4) CO_2 and CO emission measured from the engine with respect to brake power it can be seen that CO_2 and CO emission less for LPG when compared gasoline fuel at all load the HC emission is more for LPG and for gasoline.

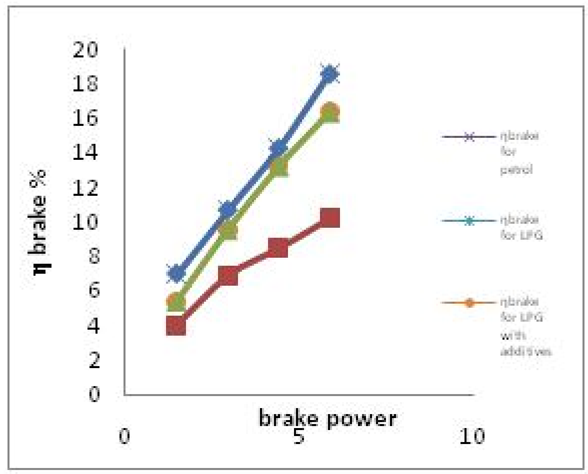

Figure4.1 Brake power against Brake thermal efficiency

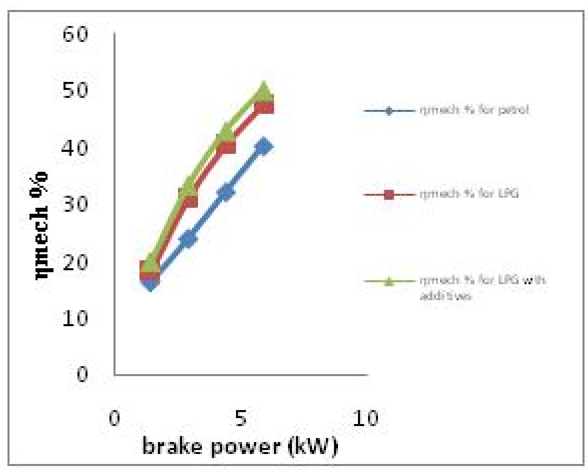

Figure 4.2 Brake power against Mechanical efficiency

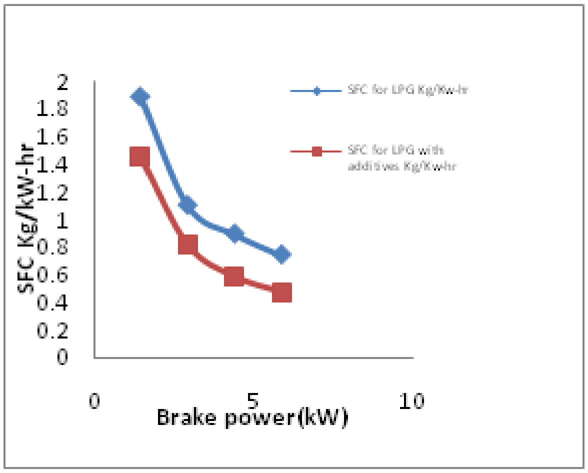

Figure 4.3 Brake power against specific fuel consumption

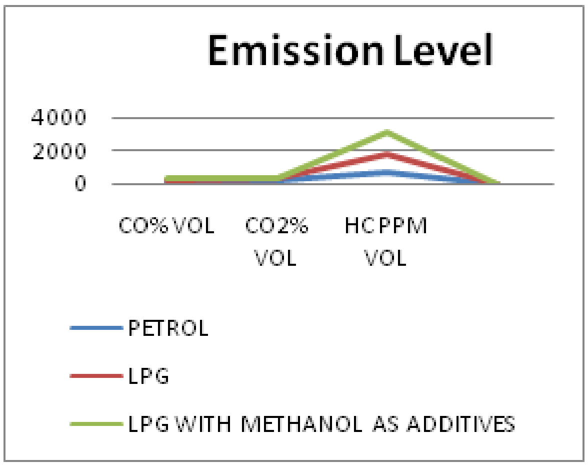

Figure 4.4 Emission level

V. CONCLUSION

The test results reveal that

1. L.P.G converted I.C Engine shows better Mechanical efficiency that conventional Fuel (petrol).
2. 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.
3. The LPG converted engine can be started easily and can work with both
   petrol and LPG as per our wish.
4. Brake thermal efficiency reduces at the maximum load condition for LPG
5. The co and co_2 emissions exhibit very lower value for LPG as compared to gasoline.
6. It can be concluded that generally LPG will provide variable alternative fuel to the last operating fossil fuel in future.

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