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Experimental Investigation on LPG as Alternative Fuel for Two Wheelers

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ABSTRACT: This study attempts to use alternate fuel for the four-stroke gasoline engine. Our main purpose is to use non-conventional fuel against conventional fuel, which is now limited and expensive. It is less contaminated with this air than conventional fuels. It is also excellent for economic concerns. In our paper we have fitted the four-stroke LPG fuel system, in which both gasoline and LPG are used. LPG from the storage tank passes through a primary delivery valve located in the mouth of the LPG cylinder to the adjustable controller. Safety precaution may be applied.

I. INTRODUCTION

LPG means LPG. LPG refers to LPG. It is also termed refinery gas (or bottled gas). It is obtained by product when heavy crude oils are cracked or directly from natural gas. The LPG produced by cracking or by CNG (Compressed Natural Gas) is dehydrated, desulfurized and organic sulphide (Mercaptans) is added to warn against gas leaks. It is then filled with cylinders and compressed into liquid-style fuel gas and delivered under the brand name INDANE-BURSHANE and many other suppliers. The calorific value is approximately 11,900 Kcal/kg. Natural gas technology I.C engines are exceeding the current HC and NO pollution regulations by more than two-thirds and carbon dioxide (CO) by more half. LPG comprises of hydrocarbons of this volatility which may be rapidly liquefied under pressure, as a gas under atmospheric pressure.

Objectives of Our Project:

Our project has several goals, some of them are as follows:

1. Reduce vehicle running costs by using cheaper engine gasoline.
2. Avoid the emission of the engine by burning the engine with a clean fuel.
3. Increased lifetime of engine
4. Preventing scarcity by minimising their use of non-regenerative fuels.

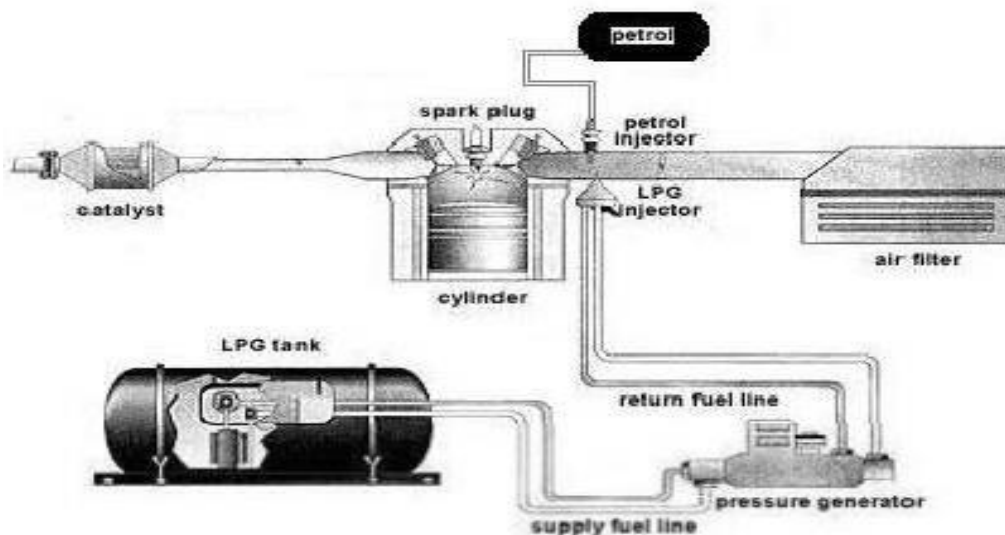
To fulfil these goals, we require the following components in our project.

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II. BLOCK DIAGRAM



List of Components Required:

- Bike
- LPG kit
- Multifunction Valve (Filler Connector , Fuel Indicator , Petrol Solenoid Valve)
- Electronic Control Unit
- Pressure Regulator
- Wire Harness
- Auto LPG Hoses
- Mixer Assembly
- Change-Over Switch
- LPG

LPG Solenoid Valve:

The LPG Solenoid Valve is an electromagnetic device that stops the flow of LPG when the engine is stopped or operated with petrol. The solenoid LPG Valve is composed of: 1. NBR seals to guarantee absolute safety 2. High thermal induction coil wire to render its working life virtually unlimited 3. Self extinguishing coil covering resin 4. Gas filter made with a fine filter paper material. 5. Vibration resistance. 6. Multiple fitting positions.

LPG Solenoid Valve Petrol Solenoid Valve:

The Petrol Solenoid Valve is an electromagnetic device widely used in carburetor vehicles. Its function is to stop the flow of Petrol when vehicle is running with LPG and vice versa when the vehicle is operated with Petrol. The petrol Solenoid valve is installed in the line of Petrol fuel near the engine compartment. The Petrol Solenoid valve is normally closed when electricity is switched off. It is basically composed of a shutter operated by a magnetic coil and two nipples. It is also equipped with an emergency device to manually reset the petrol flow in case of a break down in the electrical sy

Petrol-LPG Changeover Switch:

This is a three position electronic switch, the first position is PETROL and the second is LPG. Obviously when positioning the switch on petrol the switch will close the LPG Solenoid Valve and it will open the Petrol Solenoid Valve

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and vice versa. The Mid position of the switch (third position) is use to maintain the LPG and the Petrol Solenoid valves in the OFF position until the carburetor uses the small Petrol reserve. With a carburetor engine gas switching is always done manually. The switch for carburetor engines also has a safety feature; it stops the gas flow to the engine when engine accidently stops.

Mixers with Carburetors:

The mixer with carburetor has an extremely importance. The right AIR- FUEL ration depends on the mixer and this is the reason for the existence of so many versions bearing so many shapes. The mixer for vehicles equipped with a carburetor may be manufactured with a specific Venturi or by implanting a nozzle in the proximity of the carburetor's original Venturi. The nozzle system type mixer can perform very well if executed with care and knowledge. In any way, is good to remember, that this system is not always possible to adapt to all carburetors and if not properly installed it may create irreversible damages to the carburetor.

Tanks:

Available in 18 different approved sizes to suit most vehicles in India. The two variant available are called

1. Cylindrical type.
2. Toroidal type. The tank also has different capacity variants

Mechanical Oil Pump:

This is a mechanical vacuum operated 2T-Oil Pump and is a alternate, direct replacement to electronic PWR 2T oil system. Safest gas system of the world. LPG kits function on "lean burn system" and operates at extremely low pressure. Thereby maximizing fuel efficiency and overall system safety. Gas fire releases gas only when the piston of the vehicle generates a stroke, as soon as engines stops for any reason the gas supply to engine cuts off automatically.

Scope:

As of rising population and limited source of transportation in the metropolitan city like Mumbai, A bike having good maintenance, Low running cost and less Emission have a good scope to replace conventional single fueled petrol or diesel powered engine.

Significance :

Carburetor technology has failed to control the uneven supply of petrol with the incoming air stream to engine at various levels. It is inbuilt and inherent draw back that in some circumstances the sucking air stream sucks excess petrol at carburetor venturi, resulting in petrol wastage and pollution.

Now let us replace this redundant carburetor technology with new revolutionary LPG gas technology, which promises:

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- Cent % fuel efficiency.
- With clean exhaust and Zero Pollution

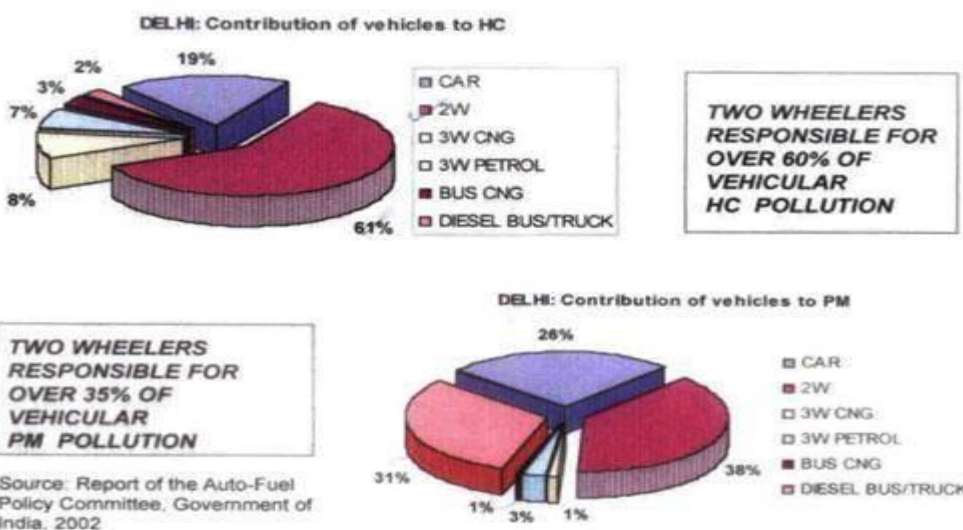
If this new technology is implemented with right spirit in India alone, on in-use vehicles (Existing Vehicles) plus new vehicles added during the year, then new LPG gas technology will save fuel worth Rs.200 crores per day. Or 73000 Crore rupees (Seven Kharab Thirty Arab Rupees) annually in foreign exchange only. Even more importantly this will prevent entry of 1.5 crores tons of carbon and NOx pollutant from Air per day in India alone LPG Project will drastically improve Air quality, millions of urban people suffering from Air Pollution. Even lot more saving will be on account of engine life & maintenance.

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CONTRIBUTION OF DIFFERENT TYPES OF VEHICLES TO HYDROCARBON (HC) AND PARTICULATE MATTER (PM) POLLUTION



CONTRIBUTION OF DIFFERENT VEHICLE

EFFICIENCY AND PERFORMANCE

ENGINE cc	Petrol Km./ltr.	Rs./ Km.	LPG Km./ltr.	Rs./ Km.	Remark
100cc to 125cc	60 km./ltr.	Rs.2.50/km	72km./ltr.	Rs.2/km	LPG/ ltr.cost calculated on commercial/auto LPG gas
350cc to 500cc	40km./ltr.	Rs.3.25/km	50km./ltr.	Rs.2.80/km	LPG/ltr.cost calculated on commercial /auto LPG gas

Fuel saved 50% to 75%

Following the experimental methodology can be used:

- O The LPG kit, pressure valve and regulator are assembled with each other as per the shown in the experimental setup.
- O “ON” the LPG cylinder regulator.
- O Before start the engine ensure any leakages in the set up.
- O LPG supply to the engine is controlled by a regulator or vaporizer. This converts the LPG into a vapour.
- O When we apply load on rope dynamometer it will get heated up. So we will continually supply coolant water.
- O At different load conditions we will take shaft speed in RPM with the help of tachometer, using different fuels .i.e. Gasoline, LPG.

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III. SAFETY

In terms of combustion, LPG is similar to petrol. The vehicle's LPG tank is in fact much stronger than a conventional fuel tank as the gas is stored inside it under moderate pressure. All tanks are fitted with electric shut off valve, fill point, pressure relief valve.

- a. LPG tank and the piping system should be checked regularly for any leakage.
- b. It is recommended to run the vehicle 5 to 7 km in petrol mode after every 100 to 150 km. running LPG mode, to keep the petrol system in good condition.
- c. Switching over directly from petrol mode to LPG may lead to engine stalling (or) back fire due to mixing of both fuels.
- d. After refueling LPG, please ensure that the dust plug is inserted back on the filler valve.

Actual Advantages:

Friendly Environment

Propane, or liquefied petroleum gas, is paraffin: although a petroleum product (it can also be produced from natural gas), it contains none of the olefins or aromatics that produce smog. Propane mixes very well with air, and, like compressed gas, is already vaporous when mixing in the injection ports of carburetors, reducing the pollutants ordinarily released when an engine turns over. Propane has significantly lower carbon monoxide and hydrocarbon emissions, and causes nitrogen oxide emissions that, while no lower than gasoline, are not significantly higher, either. CNG (Compressed natural gas) or LPG (Liquid petroleum gas) has been recognized the world over as an efficient, safe, reliable, environment friendly and economical alternate fuel for automobiles. Both CNG and LPG are being used in many developing and developed countries and many people are opting for them

IV. LIMITATIONS

There are some of the limitations of our projects, they are:

- Less LPG refueling stations.
- Rural areas don't have Natural gas filling stations.
- Small LPG tank.
- Cost for conversion of bike is high.

V. CONCLUSION

- Low fuel consumption based on best vaporization.
- Perfect system for bio-fuel (gasoline, LPG. and CNG) and Monofuel (LPG or CNG only).
- Due to combustion very low effect on environment.
- Easy and convenient work by small size and light weight
- More efficiency as compared to other fuels.
- Due to LPG there is no effect on engine operation
- Save fuel save money

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