



# Study the Effect of Using LPG in the Spark Ignition Engine Instead of Gasoline

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## Abstract

Apprehension on contamination carry on to collect a moral arrangement of world interest due to its opposing effect on mortal fitness beside to postponement the surroundings. Current trainings reportable the essential associations between contamination and inevitable syndromes as glowing as an occurrence, falsification, infection, chest throbbing, nausea, respiratory ailment in addition to carcinoma, acute strength properties symbolize eye frustration, headache. The global Health Organization (WHO) statuses that millions persons decease n every time with contamination. The board of this paper is focused on the production investigation totally diverse ratios of two types of coals: LPG (propane) with gasoline (petrol) below changed laedings. The rudiments laboring in the investigation covers 4stroke, spark detonation the TD200 Small Engine Investigation, Gas deconstruct part (Techno investigation (T156/D3)), Gas Movement Meter that processes the LPG. The coals, gasoline in a liter (liters) with LPG in a liter (liters) besides were castoff to assess their impressions on the consume gas production unrestricted. The consequences are apparent that particle numeral attentiveness, (CO) augmented due to the engine loading will rise in gasoline (coal). Consuming LPG, the (CO) attentiveness equal was a fewer, momentous decrease in deplete emanations, conversely extraordinary hotness in the location than coal (gasoline) on engine stocking. The engine, mechanical via LPG coal, presented amended engine presentation in numerous phases containing global efficiency, coal frugality besides emanation physical appearance that are importantly lower from gasoline coal.

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## Introduction

LPG is gained starting prafeens created starting modification vestige coal beside progression to normal gas, through the greatest portions conquered via coal ( $C_3H_8$ ) besides alkane chain ( $C_4H_{10}$ ) (J. Adolf. et al, 2015). LPG needs an dynamism gratified of 46.23 MJ/kg and 26 MJ/l, that is considerably above petrol that viewpoints (44.4 MJ/kg) besides 34.8 MJ/l (ETSAP., 2010). The dynamism contented of LPG per unit of analysis is moderately terminated petrol; via per unit capacity is minor. For this purpose, a parallel tank dimension of vehicles touring via LPG, cloak a smaller detachment than those ride on gasoline. More fourteen million units are budding proviso vehicles to be renewed to LPG via a bi-coal or

occupied devoted organization. LPG consist of a elongated history as a vehicle coal, via investigates persecution LPG started about 1910. The main trial was pragmatic to trucks in Califernea, United States. In 1950, on one occasion the Chicago Shipment Specialist systematic 1000 buses besides LPG coal, and adapting 270 coal ran minicabs to LPG. Later, LPG developed individual prevalent another coals in place of cars, fluctuating since the United States then lengthening into Europe, Asia, in addition to different regions (M. R. Werpy., et al. 2010).

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LPG covers additional octane than petrol, which permits the engine to run further smoothly without slightly negative consequences owing to knock, as an effect, it proposals more thermal power besides coal bargain than gasoline. Extraordinary central heating dismiss found through a small compression. Solitary of the advantages that brands LPG custom more auspicious is the truncated poison ratio of carbon dioxide emanations in arrears to the stumpy carbon satisfied of its chemical alignment also thus creation it a friend of the environment. In contemporary years, LPG has been the chief marginal to gasoline, with further than four million vehicles functioning universal. Furthermost large besides to some trucks with industrial vehicles were operating on gasoline coal while due to the numerous positive features besides to the slightest impurities were rehabilitated and approved to use LPG. Gasoline-constructed vehicles have been swapped with LPG, with hydro-carbons emanations of less than 40% (HC), carbon dioxide (CO) emanations of less than 60%, CO<sub>2</sub> also expressively condensed, Furthermore to a lower quantity of nitrogen oxides emanations as well. Normally SI, engines are primarily motorized via gasoline, it is solitary of the fossil coal byproducts. Greatest of those engines require coals been seared within the incineration chamber. The coals get charbroiled to stream heat energy that centrals to swelling the pressure within the engine. The pressure consequential from extraordinary heat incineration proliferations and the crankshaft interchanges then thus harvests mechanical energy that is advanced renewed into mechanical crusade energy. The flue gas since the incineration of fossil coals is liquidated to the air. These gases comprehend carbon dioxide, carbon mono-oxide, nitrogen oxides, Sulphur oxides, H<sub>2</sub>O vapor, particulate staples besides other dashes of other elements. These gases subsidize significantly to global roasting. The emanations of contaminants have faith in not solely on coal benevolent however furthermore on the type of engines then therefore the eminence with amount of coal expended. However, the total of therefore productions-free is straight relational to the sulfur contented within the coal, besides therefore the aggregate of coal expended.CO gas could be a deadly toxic completed as a consequence of scorching coals resembling coal or gas. It's one among the chemicals originate in engine consume, molded as a consequence of imperfect ignition. These gases reason the depleteion of ozone layers that leads to global

reheating. The impression of universal warming is felt both via animals with Mortal (A. Guide.,1979) (Pocket Guide, 2000). Worldwide, air effluence subsidizes a portion of 6.7% of all deaths. could be a colorless, odorless besides to tasteless gas that brands it achievable to have an influence on the bare person speedily. Experience to grounds numerous preliminary symptoms, counting nausea, headaches, although continued exposure, roots poisoning with hurt of consciousness. Additional health belongings when bare to emanations covers a superior attraction with (210-250) times additional than oxygen. Consequently, the attendance of in the blood will restrict with chemical component uptake and distribution to the body. If the revelation glassy is unreserved, defeat of consciousness is approaching. Coma or death may moreover transpire if in elevation exposures endure. The demonstration of symptoms differs inclusive beginning individuals to individuals besides should transpire preferably in inclined people comparable young or elderly individuals, people with pre-existing breathing organ or cardiovascular disease, or those bodily at high altitudes position (Pocket Guide, 2000). Combustion engines have been integrated internal 49 combustion engines in the community service in the last century to improve the quality of life very significantly and markedly, but at the expense of pollution and environmental degradation, indeed in many countries with insufficient environmental awareness or urbanisation culture. Thus, great momentum is given to improve engine efficiency and thereby reduce emanations using two or two methods namely enhancing the design of the engine and using alternative coal oil rather than gasoline coal. Many researchers who studied the effect of the carburettor on engine efficiency and emanations highlighted some literature: (Khan Watson, 2010) LPG is a clean and environmentally friendly alternative coal with low CO<sub>2</sub> emanations and high-octane levels compared to gasoline and diesel. LPG uses in many fields such as heavy engine industries such as diesel engine, and gasoline can control deplete emanations and reduce pollution. (Genchi et al., 2013) In previous studies, LPG as an alternative coal and reduce deplete emanations of oxide Nitrogen (nitrogen oxides) by lowering the combustion temperature peak within the combustion chamber, and has other properties such as high octane number, increased volumetric efficiency and increased torque output.



(Berggren et al. 2010) **obligate** settled an air/coal ratio controller-using angle and throttle information with some signals taken. The primary objective of this job was to assess the possibility of achieving more precise control of the ratio of air and coal, especially in temporary conditions involving sudden differences in material conditions within the aperture.

(Szpica, 2016) The use of LPG coal as coal in internal combustion engines can increase torque production, increase volumetric efficiency as well, reduce back-up results and reduce emanations of deplete gas and pollution. In theory, liquefied petroleum gas (LPG) will be evaporated in the liquid phase in the surrounding air manifold, i.e., from liquid to gas. Thus, the malaise will be reduced and given the effect of cooling the air inside the manifold. As a result, the density and mass of the coal/air mixture will be higher. Thus, they contribute to engine performance.

(Giwa SO, Nwaokocha. 1017). High release of (CO) into the atmosphere constitutes major health issues to the mortal body, which includes respiratory diseases (such as coughs, phlegm, tightness of the chest, wheezing, distortion of breath), cardiovascular effects (such as chest).

By looking at previous researchers (Al-Hasan M. 2003) (Nwaokocha CN., 2016<sub>a</sub>), we conclude that alternative coals are more efficient in performance and lower emanations compared to gasoline, as well as the effect of design on engine performance and pollution. Some studies indicate that (LPG) engines have more effective performance than gasoline engines because of the high calorific value of LPG as well as being high octane compared to gasoline and some studies indicate that they have similar performance to gasoline engines in terms of power output and torque, depending on installing the gas and on the system used in the engine. The carburettor is designed and tested suitably, and LPG is tested through CFD modelling. Carburet verification tests have been conducted to obtain the best performance of the engine, to become operates on over one kind of coal such as LPG, or gasoline.

## Experimental Setup and Procedure

### *The Internal Combustion Engine and its Accessories*

A core incineration engine is a warmth apparatus with a coal in which an oxidizer (usually air) scorches esoteric the incineration hollow, which is fragment of the coal tide trip. In an internal incineration appliance, (Giwa SO., et al., 2017<sub>a</sub>).

1. Investigation engine.
2. Instillation of LPG.
3. Gas investigation.

Vehicles running on LPG have a slightly lower maintenance cost than coal vehicles or diesel vehicles. LPG burning features reduce maintenance requirements and costs as it does not wash lubricants from engine cylinder walls such as gasoline and diesel. Because this washing process is harmful to any components that depend on the lubrication system in order to function properly (Giwa SO., et al., 2017<sub>b</sub>) as well as contains low levels of carbon and sulfur and thus contributes to prolonging the service life of the internal parts of the engine. Bench 1 underneath illustrations, the Individualities of the locomotive enumerated.

**Table 1.** PV/T absorber design and configurations

| Engine Characteristics | Four Engine Stroke |
|------------------------|--------------------|
| Cylinder               | 1                  |
| Stroke                 | 54 - mm            |
| Bore                   | 72 - mm            |
| Weight of Engine       | 17 - kg            |
| Compression Ratio      | 6.17:1             |

While the engine stayed premeditated towards <sup>50</sup> route on fuel, it completely stayed re-reformed to outing at obtainability for LPG. It categorically was anticipated to route the engine on LPG via minimum alteration although property the ability of adjustment back to its petrol replenishing arrangement basically. Aimed at this alteration surrounded by the air consumption construction, it involves including an peripheral compartment that was premeditated. A mensuration gauge was castoff to analysis the LPG formerly the engine must remained route on LPG, to comprehend the perfect mass of LPG scorched. The convenience piston was tailored with a watchdog faucet. A meter instruction was employed in mensuration the detachment of the consume seaport to the mensuration instrumentality to permit an equivalent detachment. The contaminants were nominated based buttressed their gradation of apprehension besides to impression on the atmosphere with communal shape. The deliberations from CO, CO<sub>2</sub>, the PM released from the engine (once seriatim scheduled gas otherwise LPG) were resolute consuming, CO with PM meters, individually. The detachment was reserved at 1 meter during the research. The purpose was to brand sure serviceable interaction among the beats then consequently the consume of the engine.



Although gauging the concentration of the contaminants unconfined through the drain pipe, interpretations were occupied every (10 min) in one hour. Protections occupied were to captivating analyses somewhere potential emanation meddling was determined besides to consequently the custom of nose disguise to anticipate breath of the consume however captivating the gauging. Normal tachometer was secondhand to distinguish the rapidity of the engine. Furthermore, the dimension of break métier subsequent after the engine is to recognize the major routine; an electric motorized

was secondhand to alternate the engine at the commencement of investigational development. To quantity brake métier, vigorous pressure, with misplaced energy owing to friction, a dynamic influence scale expedient was rummage-sale. (K) Kind thermocouples (nickel-chromium / nickel-mille) are noticeable to quantity the temperature of consume gases secondhand. The equations revealed beneath were secondhand to distinguish engine routine parameters.

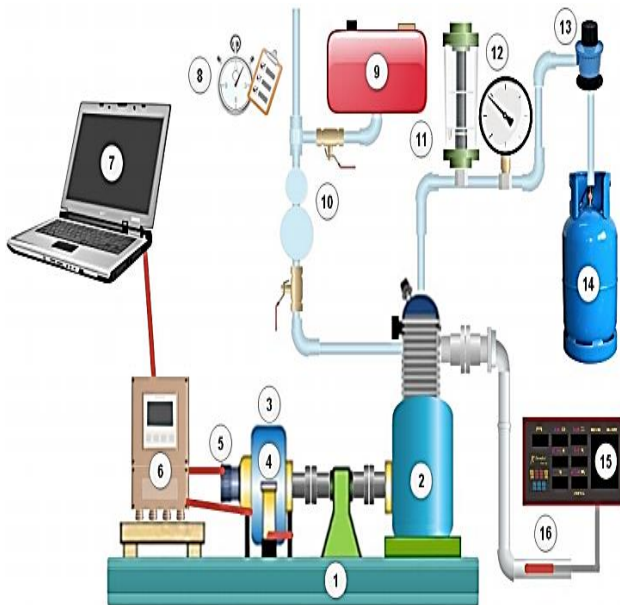


Figure 1. Sketch of the component part of the experimental rig

| No. | Item                        |
|-----|-----------------------------|
| 1   | Engine chassis              |
| 2   | Test engine                 |
| 3   | Dynamometer                 |
| 4   | Load cell                   |
| 5   | Tachometer                  |
| 6   | Data acquisition            |
| 7   | Computer                    |
| 8   | Stop watch                  |
| 9   | Gasoline tank               |
| 10  | Coal burette                |
| 11  | Gas flowmeter               |
| 12  | Gas regulator               |
| 13  | Gas cylinder                |
| 14  | Pressure gage               |
| 15  | Deplete gas analyzer        |
| 16  | Deplete gas analyzing probe |

**Methodology**

LPG is cleaner than gasoline and diesel because it is made up of mostly simple hydrocarbons, free of lead, most additives, and little sulfur. Compared to emissions from gasoline and diesel vehicles, LPG emissions contain low levels of hydrocarbons (HC), nitrogen oxides (NOx), sulfur oxides, toxic substances to the air, and particles (Y, T, HS. et al 2009)., The preliminary approach shadowed:

- a) Numerous LPG in addition to pressure stopcock are collected composed with every supplementary as pronounced in the investigational setup.
- b) "ON /off" the LPG chamber controller.
- c) Formerly preliminary appliance you requisite crisscross for every trickle by location.

- d) Resistor of the resource of LPG is completed via the watchdog or evaporator, thus safeguarding its translation to cloud.
- e) LPG is vaccinated convert haze churn, that is situated neighboring at ingestion various, fraternization through renewed air beforehand sieving and depiction at incineration cavity.
- f) Other steps reported in references.

**Data Dispensation and Investigation**

There is no conclusive evidence to prove that LPG is more or less dangerous than gasoline or diesel. The mortal factor plays an important role in influencing safety in LPG use. For example, some countries, Japan, for example, have not had any explosion or any accident for years since they introduced various safety measures that regulate the use of LPG (Khan, M. A., et al.2016.; Genchi, G., et al.1013) and a study in Canada showed that mortal error



was the main cause of LPG vehicle accidents. The information on 80 accidents was collected by the Canadian Department of Transportation Investigation Bureau and the Ontario Ministry of Business and Consumer Relations from The quantity in addition to steadfastness variety from deplete gas measured requires strongminded in Bench 2.

**Table 2.** Array of strongminded with perseverance for deplete gas measured

| Parameter       | From | To         | Concentration |
|-----------------|------|------------|---------------|
| CO <sub>2</sub> | 0    | 19.9% Vol  | 0.1%          |
| NO <sub>x</sub> | 0    | 2000 ppm   | 10 ppm        |
| CO              | 0    | 9.99 % Vol | 0.01 %        |
| HC              | 0    | 9999 ppm   | 10 ppm        |

Malicious concentrations of poisons were appraised then gotten with applicable functioning strictures. Algebraic investigates were achieved spending Microsoft Excel 2016.

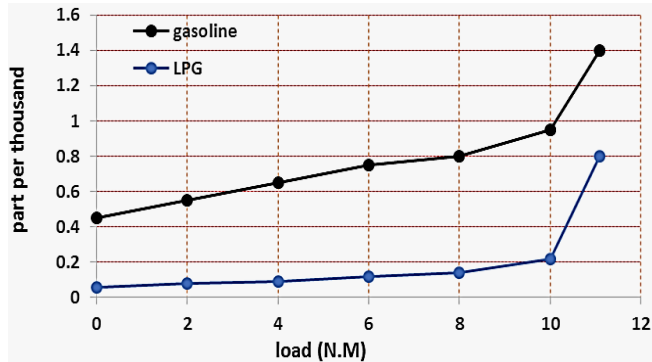


**Figure 2.** Gas analysis unit T156D

## Results and Discussion

### *(CO) in the TD200 Small Engine Test Deplete Gas*

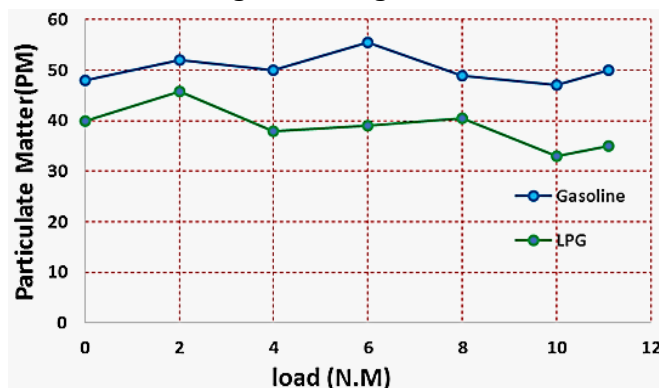
The investigates are steered spending the twofold brand coals: gasoline in addition to LPG - on erratic oodles commencing zero towards 11.1 N. m. to judge the close of emanation on the rampage as associate to ASHRAE principles (Szpica. 2016), Figure 3 Appearance the statistics composed beginning the schoolwork then offerings the cruel (CO) emanation from LPG and gasoline coal.



**Figure 3.** Malicious CO secreted from engine Mechanism on Gasoline with LPG

### *(CO) in the TD200 Small Engine Test Deplete Gas*

The investigates are shepherded via the two category coals: petrol plus LPG - arranged erratic oodles starting (zero) to (11.1 N). m. to judge the glassy from PM emanation on the rampage as associate to ASHRAE criterions (Ahmed H. 2019). Figure 4 Indication the Particulate Trouble statistics placid starting the revision in addition to dowries the despicable Particulate Staple emanation starting LPG with gasoline coal.



**Figure 4.** Despicable Particulate Matter (PM) secreted starting Gasoline with LPG

## Conclusion

The following conclusion and recommendations can be found: LPG Can be used as coal for cars Environmentally friendly and does not cause deplete pollution., It is necessary to consider the conversion from gasoline to LPG as a national project for environmental protection., The necessity to circulate the transfer of government vehicles and large institutions to use LPG., Also LPG is less expensive than other coals., LPG Available locally., Using LPG in Cars It reduces carbon gases, extends the engine life, and reduces noise Also



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