"Emission Test of 4 Stroke 220 cc Single Cylinder Petrol Engine Using Hydrogen Gas Fuel with Petrol"

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Abstract: The paper is all about the usage of fossil fuel in our daily life. This includes the usage of petrol in small SI engines. The usage of same is day by day increasing and the shortage of fossil fuel is increasing accordingly. The extinction of fossil fuel is one side and on the other side the pollution is also increasing on the daily basis and one of the reason for the increasing pollution is the increasing tail-pipe emissions from the vehicles that we use. The research says that every year there is increase in 3.2% of CO_2 in the environment resulting in the greenhouse effect. This paper explains about using the hydrogen gas along with the petrol that we use in normal SI engines which will actually decrease the emissions and also increase the fuel efficiency. This means that the fuel used will be less i.e. the fuel consumption will become low and even the pollution caused due to the tail pipe emissions will decrease. Here for the experiment a conventional 220 cc SI engine is used with petrol and hydrogen as fuel.

Keywords: HYDROGEN FUEL, POLLUTION, EMISSIONS, FUEL CONSUMPTION, CO_2 EMISSIONS.

1. INTRODUCTION

Day by day the use of fossil fuels i.e. the use of gasoline as fuel is increasing and thus the pollution also increasing. The greenhouse gases coming from emission of the gasoline engine is really harmful for the environment. This leads to the bed atmosphere and thus leads to research a better fuel for the replacement of the petrol. Hydrogen can beaded along with the petrol which will lead to cleaner combustion. Cleaner combustion will lead to the best environmental results. The hydrogen when used with the petrol leads to better fuel efficiency of as SI engine and thus in this thesis the use of hydrogen gas is done whit the petrol which reduces the pollution as well as the fuel consumption is decreased when compared to the only petrol running SI engine. Among all fuels, hydrogen gasoline is an extended crew renewable, recyclable and non-polluting gasoline. The concept of using hydrogen into the fuel system which can increase fuel efficiency and decreases air pollution drastically. When hydrogen is used to power a fuel cell, the most effective byproducts are water and heat on pollutants a fuel cell the emission are considerably decreased while in comparison with conventional fossil gas generation technology.

2. CONSTRUCTION

A single cylinder, air cooled spark ignition engine (Bajaj Pulsar 220cc engine) is used for testing purpose. The motor specification is shown in below. A constant load test and variable speed (1000–3000 rpm) has been performed on this motor. A gas analyzer has been used to estimate the concentrations of NO_X, HC, CO, CO_2, and O_2 in the exhaust stream.

The total trial in regards to the postulation was done in ordinary oil motor. The motor was in a total working state of a BAJAJ fabricated famous PULSAR 220. The motor was not disassembled from the bicycle body and in this manner the trial was done utilizing the functionalities of the stock bicycle. The total procedure and arrangement with respect to the RPM estimation, motor ointment change is demonstrated as follows.

Figure 2.1: PULSAR 220 DTSi

TABLE 1 ENGINE SPECIFICATIONS

ENGINE TYPE	**4 STROKE, SINGLE CYLINDER, OIL COOLED**
BORE*STROKE	**67mm*62.4mm**
ENGINE DISPLACEMENT	**220 CC**
MAXIMUM NET POWER	**19.51 HP @ 8500 RPM**
MAXIMUM NET TORQUE	**19.12 NM @ 6000 RPM**
COMPRESSION RATIO	**9.5 : 1**

2.1 RPM MEASUREMENT

For the correlation of the fuel utilization of motor with the distinctive ointment the LOAD was kept consistent and the RPM of the motor was fluctuated and consequently the RPM was set utilizing the screw handle present adjacent to the carburetor. The RPM was estimated utilizing the inbuilt TACHOMETER present in the bicycle. The TACHOMETER was set to 1000, 1500, 2000, 2500, and 3000 RPM physically for the check of FUEL CONSUMPTION and the AIR FLOW into the carburetor utilizing the diverse motor oils. The accompanying figure shows the arrangement of TACHOMETER on the bicycle.

2.2 FUEL CONSUMPTION MEASUREMENT

The fuel utilization estimation of the SI motor was estimated utilizing the burette arrangement present in the workshop of research focus. The fuel utilization was estimated as for the time. The time taken to consume 10 ml of fuel in each apparatus for example Impartial, 1ST, 2ND, 3RD, 4TH and 5TH apparatus was estimated for all 1000RPM first and the for 1500rpm, 2000rpm, 2500rpm, and 3000rpm individually. The fuel stream pipe was associated with the carburetor on the first end and the second end was associated with the burette. For the fuel stream the handle of the burette was opened and to stop the fuel supply to the motor carburetor the handle of the burette was shut.

2.3 AIR FUEL MEASUREMENT

Alongside the fuel utilization the wind stream to the carburetor was estimated utilizing the MANOMETER arrangement present in a similar research focus. The air bay to the carburetor was associated with the outlet of the air chamber of the manometer. The water filled in the manometer U TUBE shows the deviation as for the wind stream. The perusing of the wind current was taken in all RPM and the separate apparatuses. The bay and outlet pipes were created utilizing the green adaptable funnel as appeared in the figure.

2.4 HYDROGEN GAS KIT INSTOLLATION

Hydrogen gas kit is a device especially designed for the producing hydrogen gas by supplying 12 volts DC current. 12 volts DC current is supplied from the battery which has been already integrated with the vehicle this gas kit contains.

Figure 2.2: Hydrogen Gas Kit Setup

3 OBSERVATION GRAPH OF PETROL AND HYDROGEN GAS

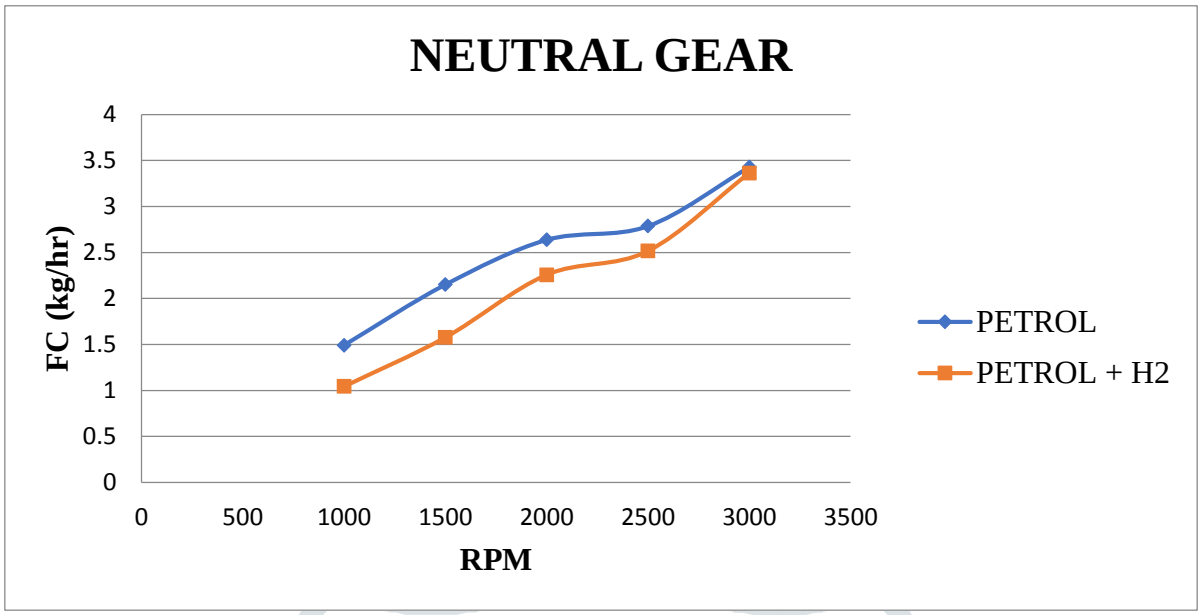


Figure 3.1: RPM Vs. Fuel Consumption for Neutral Gear

Figure 3.2: RPM Vs. Fuel Consumption for 1st Gear

Figure 3.3: RPM Vs. Fuel Consumption for 2nd Gear

Figure 3.4: RPM Vs. Fuel Consumption for 3rd Gear

Figure 3.5: RPM Vs. Fuel Consumption for 4th Gear

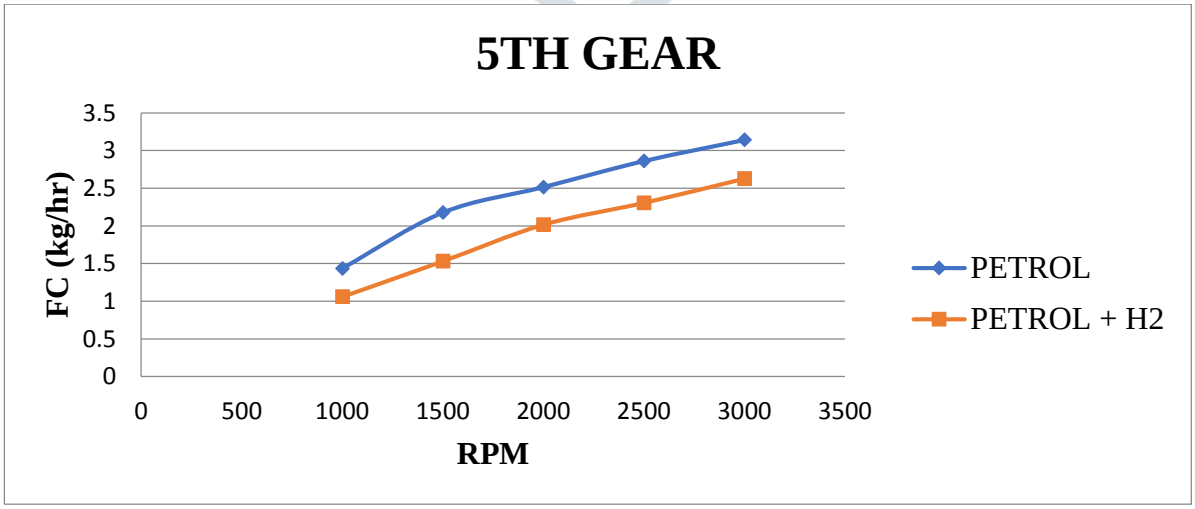
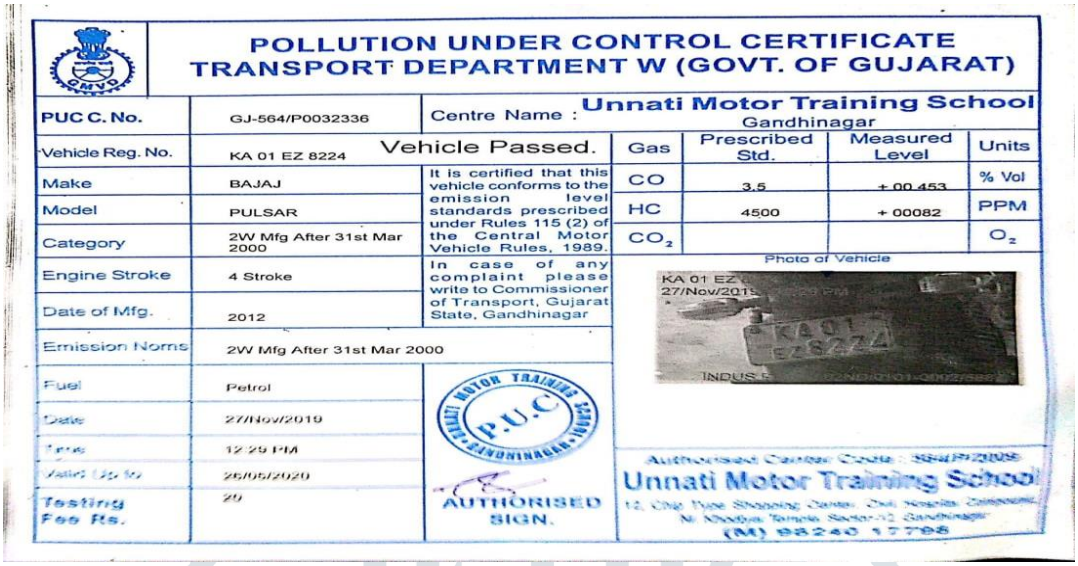


Figure 3.6: RPM Vs Fuel Consumption for 5th Gear

The above graphs make the thing understood that we show signs of improvement results with hydrogen gas when utilized as the petrol. The greatest outcome was seen as on 2nd gear and 5th gear.

3.1 POLLUTION UNDER CONTROL REPORTS OF PETROL



POLLUTION UNDER CONTROL CERTIFICATE
TRANSPORT DEPARTMENT W (GOVT. OF GUJARAT)

PUC C. No.	GJ-564/P0032336	Centre Name : Unnati Motor Training School Gandhinagar				
Vehicle Reg. No.	KA 01 EZ 8224	Vehicle Passed.	Gas	Prescribed Std.	Measured Level	Units
Make	BAJAJ	It is certified that this vehicle conforms to the emission level standards prescribed under Rules 115 (2) of the Central Motor Vehicle Rules, 1989.	CO	3.5	+ 00.453	% Vol
Model	PULSAR		HC	4500	+ 00082	PPM
Category	2W Mfg After 31st Mar 2000		CO_2			O_2
Engine Stroke	4 Stroke	In case of any complaint please write to Commissioner of Transport, Gujarat State, Gandhinagar				
Date of Mfg.	2012					
Emission Norms	2W Mfg After 31st Mar 2000					
Fuel	Petrol					
Date	27/Nov/2019					
Time	12:29 PM					
Valid Up to	26/05/2020					
Testing Fee Rs.	20					

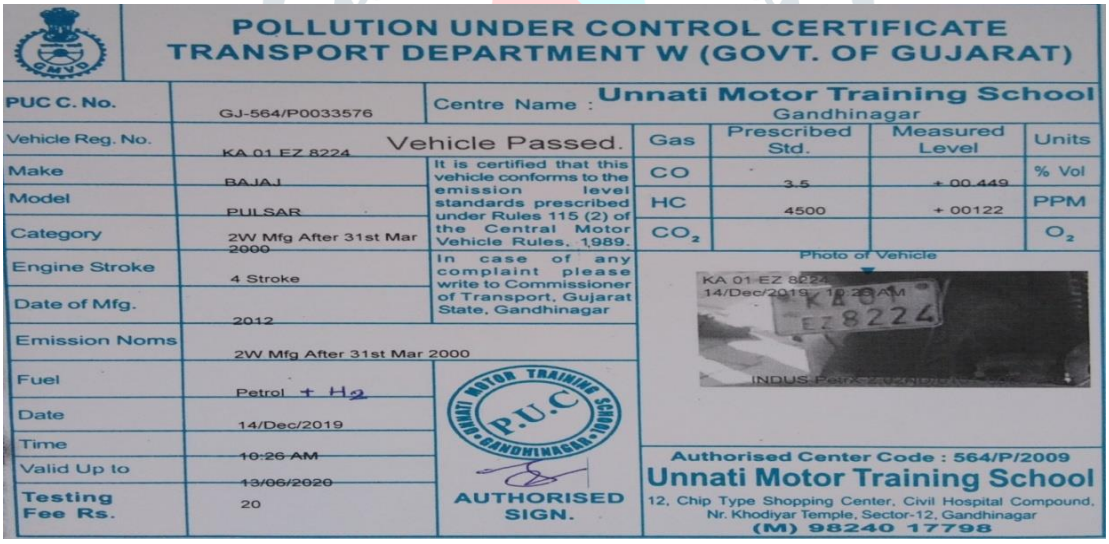
Photo of Vehicle

AUTHORISED SIGN.

Authorised Center Code : 564/P/2009
Unnati Motor Training School
12, Chip Type Shopping Center, Civil Hospital Compound, Nr. Khodiyar Temple, Sector-12, Gandhinagar
(M) 98240 17798

Figure 3.19: PUC Reports of petrol

3.2 POLLUTION UNDER CONTROL REPORTS WITH HYDROGEN GAS



POLLUTION UNDER CONTROL CERTIFICATE
TRANSPORT DEPARTMENT W (GOVT. OF GUJARAT)

PUC C. No.	GJ-564/P0033576	Centre Name : Unnati Motor Training School Gandhinagar				
Vehicle Reg. No.	KA 01 EZ 8224	Vehicle Passed.	Gas	Prescribed Std.	Measured Level	Units
Make	BAJAJ	It is certified that this vehicle conforms to the emission level standards prescribed under Rules 115 (2) of the Central Motor Vehicle Rules, 1989.	CO	3.5	+ 00.449	% Vol
Model	PULSAR		HC	4500	+ 00122	PPM
Category	2W Mfg After 31st Mar 2000		CO_2			O_2
Engine Stroke	4 Stroke	In case of any complaint please write to Commissioner of Transport, Gujarat State, Gandhinagar				
Date of Mfg.	2012					
Emission Noms	2W Mfg After 31st Mar 2000					
Fuel	Petrol + H_2					
Date	14/Dec/2019					
Time	10:26 AM					
Valid Up to	13/06/2020					
Testing Fee Rs.	20					

Photo of Vehicle

AUTHORISED SIGN.

Authorised Center Code : 564/P/2009
Unnati Motor Training School
12, Chip Type Shopping Center, Civil Hospital Compound, Nr. Khodiyar Temple, Sector-12, Gandhinagar
(M) 98240 17798

Figure 3.20: PUC Reports of Hydrogen gas

4. CONCLUSIONS

- The combustion was cleaner when the hydrogen gas was used with the petrol as fuel and thus the fuel consumption was found to be reduced implies to better fuel efficiency.
- Along with the performance test the emission test was also conducted with both the fuels and the result was found to be better with hydrogen gas fuel.
- The pollutants like HC and CO was found to be less when the hydrogen gas was mixed with the petrol.
- The combustion was thus cleaner when hydrogen gas was used with petrol and decrease environmental problems and the fuel consumption.
- Fuel consumption and tailpipe emissions were reduced to a considerable amount. Hydrogen fuel generated by electrolysis has been promoted for use with petrol powered engine.
- This development will help our society to go eco-friendly.

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