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Investigation of Gassified Vegetable Oils Blend with Petrol as Substitute Fuel in SI Engine on Road Vehicle

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Abstract --- Combustion reaction in the internal combustion engine depends on many different variables, one of the most important factors in an efficient combustion reaction is the ability of the reactants, the fuel molecules and the oxidant molecules, to interact with each other, Most fuels used in internal combustion engines are in liquid state, like gasoline, diesel, biofuels, and since combustion occurs in the gas phase, achieving a substantially even dispersion of fuel molecules among oxidant molecules can prove difficult due to the vapor pressure of the liquid, Therefore, an efficient combustion reaction would involve providing for the fuel molecules to be substantially and evenly dispersed throughout the oxidant molecules, thereby allowing sufficient interactions between the reactants and promoting the combustion reaction. Conventional systems and methods attempt to remedy this problem by increasing the quantity of gas phase fuel molecules by increasing the temperature of the liquid fuel to increase the vapor pressure. The present invention has been developed in response to the present state and in particular, in response to the problems and needs that have not yet been fully solved by currently available conventional system. Hence we have designed a new fuel supply system where the petrol/biodiesels (having low viscosity) is atomized using the ultrasonic sounds and allowing it to pass through the convective pre-heater where the atomized fuel is converted in to the vapor form (gaseous form) using the exhaust gases from the outlet valve of the engine ,which are at the sufficient temperatures to vaporize the bio-diesels and study of these system behavior by using bio-diesel as alternative fuel in the vapor form in the present petrol engine and to check the emission like CO, HC from the exhaust gasses of petrol engine with a 4-s petrol engine. The project's goal is to develop specific knowledge as to whether these methods will increase the efficiency and oil is an acceptable supplemental fuel.

Keywords: **Atomizer, Emission analysis, Convective heat exchanger, Methanol, Performance, Emissions, Petrol, Turmeric leaf oil.**

I. INTRODUCTION

It is quite common nowadays to learn that every country is in the race to find suitable and affordable alternative fuel options for diesel engine as the present-day diesel fuel reserve is depleting fast. Even though the petrol vehicles are more in population, The research of alternative fuel for petrol (SI) Engines are very less In addition, the price of conventional petrol fuel is sky rocketing due to great demand, exponential increase of vehicles number on road and political turmoil. Therefore, it is an urgent need for India as well to search for an option to run Petrol engine using a fuel other than conventional and petroleum fuels.

Research work on biodiesel reveals that large number of experimental studies of biodiesel, derived from various feed stocks, as fuel for engines used for transportation and or other applications have been carried out all over the world. Application of biodiesel, as a fuel in transportation vehicles, has nowadays become common in almost all oil importing nations, But when we compare population of the domestic vehicles (petrol vehicles) with transportation vehicles (Diesel vehicles), the Population of the domestic vehicles is more hence we have to concentrate and find alternative fuel for petrol vehicles also.

We know that the combustion reaction in the internal combustion engine depends on many different variables, one of the most important factors in an efficient combustion reaction is the ability of the reactants, the fuel molecules and the oxidant molecules, to interact with each other, Most fuels used in internal combustion engines are in liquid state, like gasoline, diesel, bio-fuels, and since combustion occurs in the gas phase, achieving a substantially even dispersion of Bio-fuel molecules among oxidant molecules can prove difficult due to the vapor pressure of the liquid, Therefore, an efficient combustion reaction would involve providing for the Bio-

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Here we are using Bio-fuels as 100% Turmeric Leaf oil and blends of Methanol, Turmeric leaf oil with petrol in specially designed system fitted with Hero Honda splendor(+) 100 cc bike.

When we come to turmeric leaf oil, Turmeric leaf oil has various chemical compounds that include cineole. It is natural antiseptic. aphrodisiac, analgesic, anti-arthritic, anti-inflammatory, Turmeric leaf essential oil is viewed as a strong relaxant and balancer. It also has historical applications as an antiseptic and for skin care use against acne and facial hair in women. It has a great role in flavorings for food additives. It is one of the most important coloring materials of India. The leaf oil yield the orange-red dye. It is much used to impart a yellow colour to cloth.
When we come to Methanol, Methanol can be made from a wide array of feed stocks, making it one of the most flexible chemical commodities and energy sources available today. To make methanol, you need first to create synthesis gas, which has carbon monoxide and hydrogen gas as its main components.

While natural gas is most often used in the global economy, methanol has the distinct advantage of 'polygeneration' - whereby methanol can be made from any resource that can be converted first into synthesis gas. Through gasification, synthesis gas can be produced from anything that is or ever was a plant. This includes biomass, agricultural and timber waste, solid municipal waste, and a number of other feedstock.

In a typical plant, methanol production is carried out in two steps. The first step is to convert the feedstock natural gas into a synthesis gas stream consisting of CO, CO2, H2O and hydrogen. This is usually accomplished by the catalytic reforming of feed gas and steam. Partial oxidation is another possible route. The second step is the catalytic synthesis of methanol from the synthesis gas. Each of these steps can be carried out in a number of ways and various technologies offer a spectrum of possibilities which may be most suitable for any desired application.

II. METHODOLOGY

The experiment is done on Hero Honda splendor plus 100cc bike [4] with major modifications in the fuel supply system fitted on to the vehicle [2], And we have additional fittings of exhaust heat recovery system called convective heat exchanger [3] for gasifying the atomized fuel which is coming from the fuel supply system, firstly the dimensions of the components and its properties are decided based on the vehicle design, we finally decided to take 10mm stain less steel pipes and 70mmØ ,150mm length containers [2]. we have done connections using Tinkering works in the workshop, all the pipes are cut in the required size and the convective heat exchanger is designed and constructed.

In this system we have special fuel supply system where the fuel(petrol+turmeric leaf oil,petrol+methonal,100% turmeric leaf oil) is pre-atomized 5 microns using the ultrasonic atomizer in the specially designed container [1], and then these gases are made to pass through the convective heat exchanger to convert this in to gases phase. After all the set up is built once it is tested for leakages, sustainability and to check whether the system is working as per our requirement.

Once the system is checked, then it is taken for the testing, Initially the basic readings of petrol is taken and then the modified setup is turned on to check the performance of the bike with this additional fittings [5]. Using Non-Dispersive IR Analyzer exhaust emissions of CO and HC is measured.

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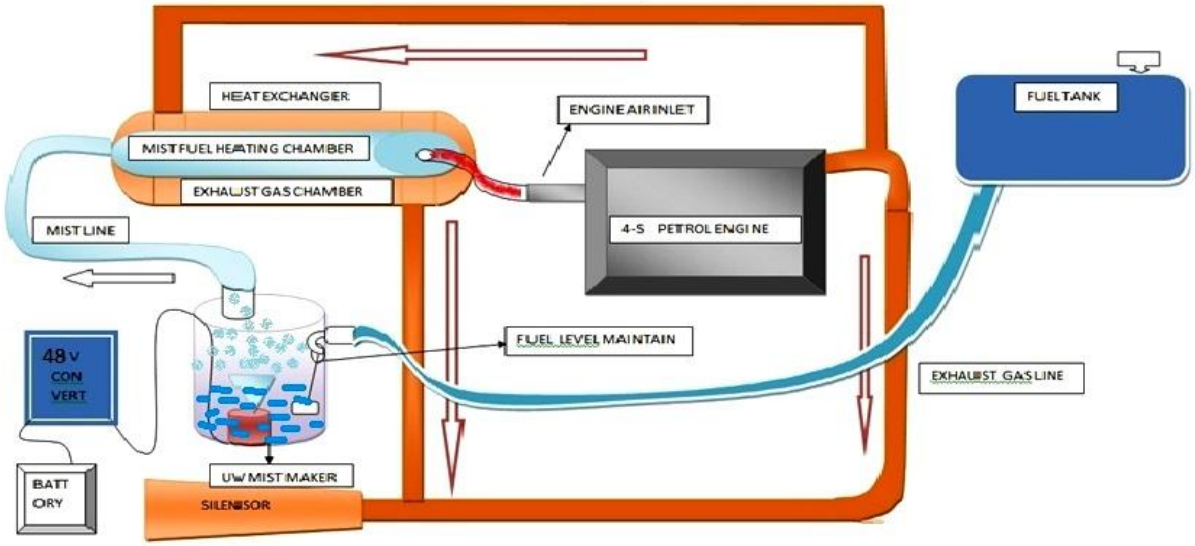

Fig-1.Planning and Constructional view of Experimental setup

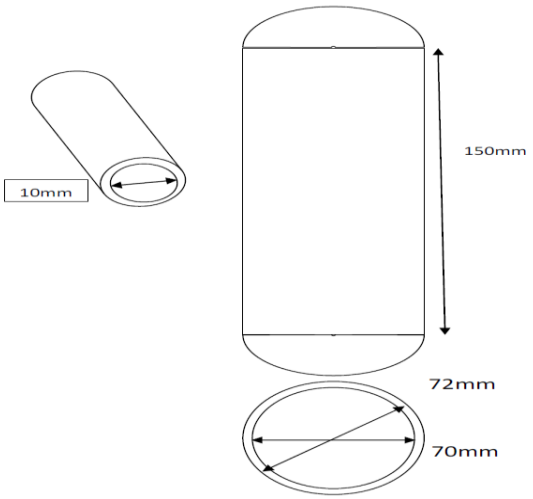

Fig-2.Design specifications of convective heat exchanger

Fig-3.Constructed model of heat exchanger

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III. EXPERIMENTAL SETUP

Fig-4.SI Engine 4-STROKE with Additional Fittings

Testing procedure of experiment follows:-

1. Initially the convective heat exchanger is fitted on to the engine and the fittings are made perfect.
2. Atomizing unit is installed in the fuel supply system and the power source is supplied to it.
3. A non corrosive, thermal resistant pipe fitted with regulator is used to connect the supply system to the heat exchanger.
4. The exhaust from the heat exchanger is connected to the inlet of the engine.
5. Petrol is blended with Bio-fuel in the proper ratio (50%+50%), Bio-fuels used here are Methanol, Turmeric leaf oil.
6. Blending is done properly using measuring jar.
7. Small quantity of water is added in to the fuel container for cooling purpose then the blended fuel is added to the atomizing unit and the power supply is switch on.
8. Initially engine is started using the petrol and slowly it is turned off and the gaseous fuel from exchanger is supplied using the regulator.
9. All the emissions like CO, HC, and SMOKE are taken using exhaust gas analyzer for the different loads.
10. Milage is calculated by taking speed and the duration of run for 100ml.

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Fig-5. Basic setup for Emission testing

The experimental test set up Figure-2 consists of Hero Honda splendor plus petrol engine, four stroke, Natural cooling system, petrol tank, atomizing unit, convective heat exchanger, exhaust heat recovery system, 48v DC convertor. The setup is provided with a Multi gas analyzer for performance and emissions analysis and a Tachometer with stop watch.

IV. RESULTS AND DISCUSSION

1.

CO CONCENTRATION

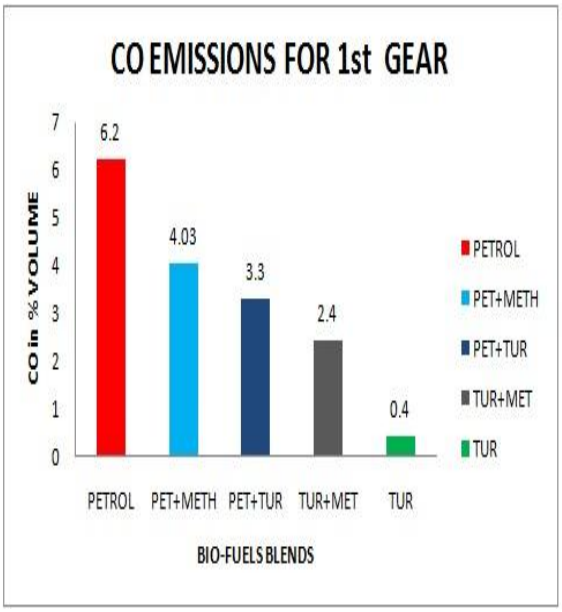

Fig-6.CO Comparison for different blends at 1st gear

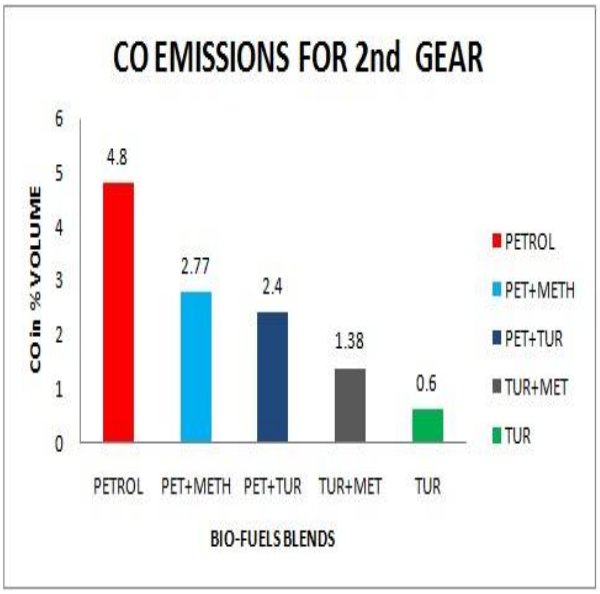

Fig-7.CO Comparison for different blends at 2st gear

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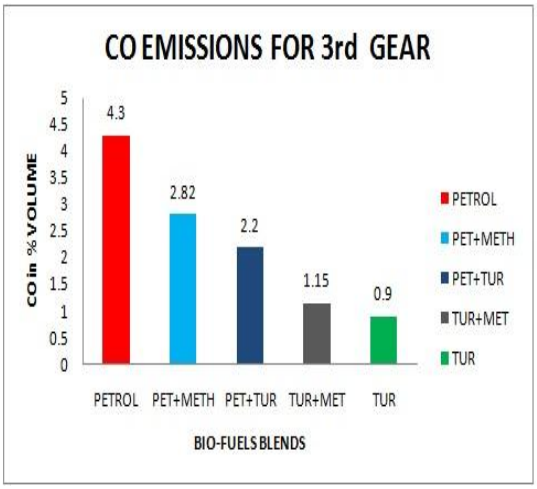

Fig-8.CO Comparison for different blends at 3st gear

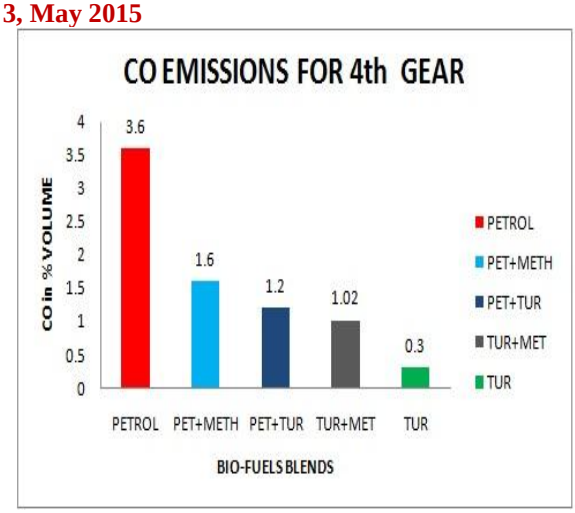

Fig-9.CO Comparison for different blends at 4st gear

2. HC CONCENTRATION

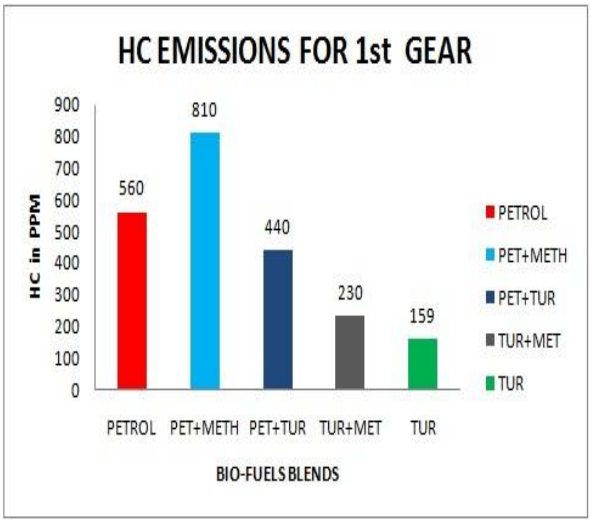

Fig-10.HC Comparison for different blends at 1st gear

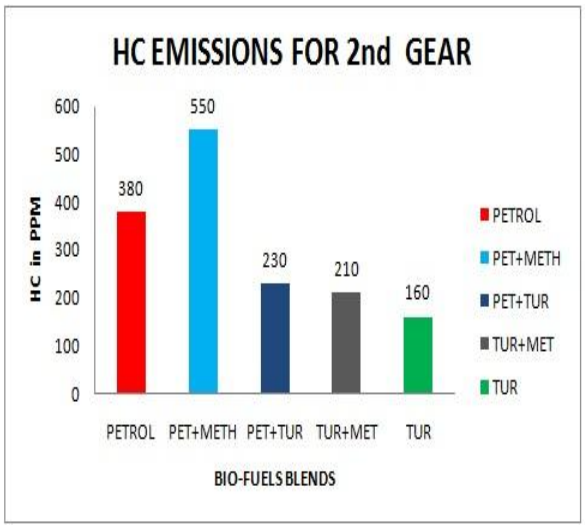

Fig-11.HC Comparison for different blends at 2st gear

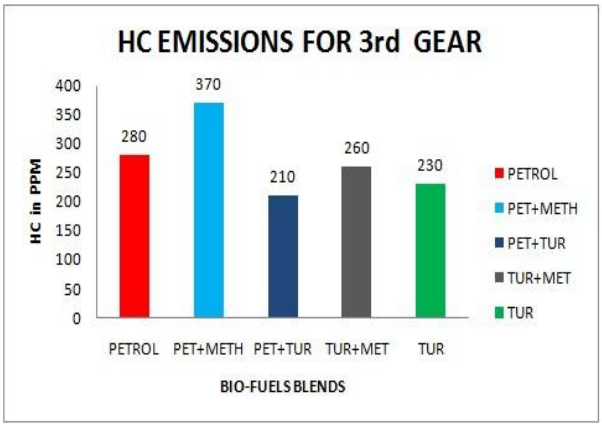

Fig-12.HC Comparison for different blends at 3st gear

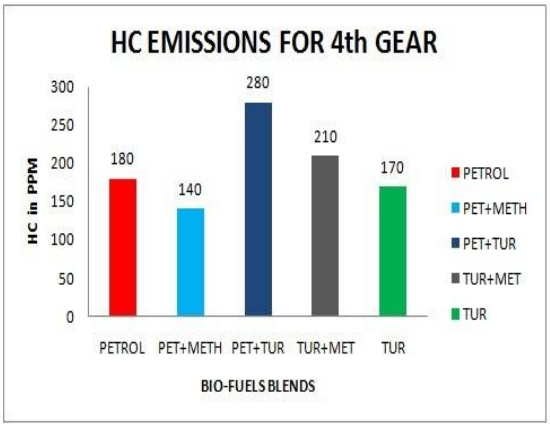

Fig-13.HC Comparison for different blends at 4st gear

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3. SMOKE EMISSION

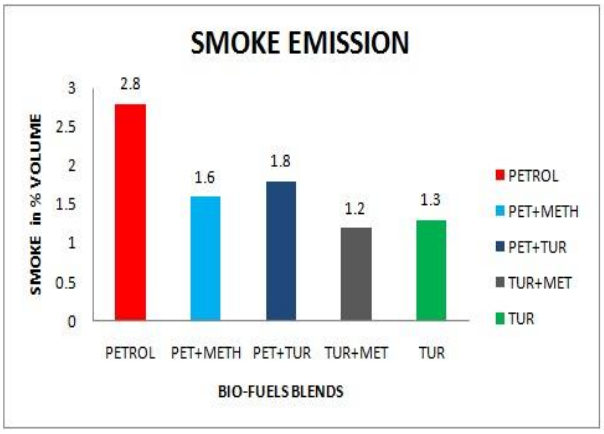

Fig-14.SMOKE Comparison for different blends

4. MILEAGE

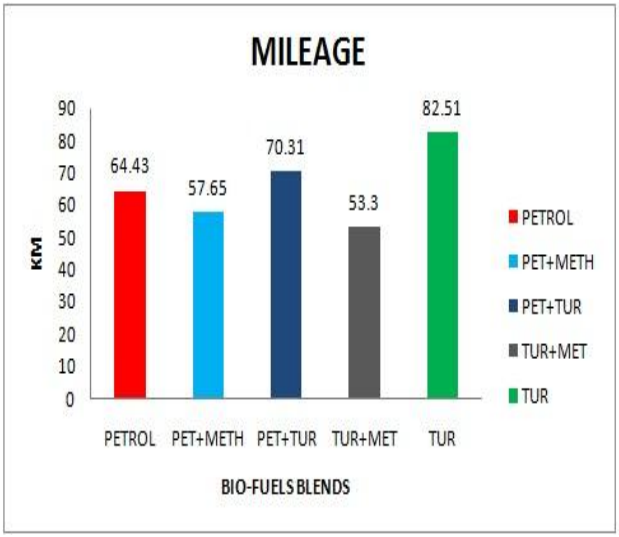

Fig-15.Comparison of mileage for different blends

1. In the figures 6,7,8 & 9 we can see the drastic reduction of CO from petrol through turmeric leaf oil .
2. When we see it in % basis nearly 60% of co is reduced.
3. In the figures 10,11,12 & 13 we can see the drastic reduction of HC emission from PETROL+ TURMERIC blend to pure TURMERIC.
4. But there is a bit higher emission in the PETROL+METHONAL blend due to improper mixing.
5. Except one blend there is nearly 25% reduction in the HC emissions.
6. Even the smoke emissions are also reduced by 40%.
7. And we can see that there is good mileage increment by using this technique.

V. CONCLUSION

1. It is observed that there is drastic reduction of harmful emissions like CO, HC by using this technique of gasifying the bio-fuels.
2. It may be suggested that by installing these setup and using these Bio-fuel blends in the future vehicles we can reduce the harmful emissions and increase the vehicle mileage.

VI. FUTURE SCOPE

1. Use of this advanced systems will help in overcoming the problems of petrol crises in the future vehicles.

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2.This system can be used effectively in four wheel petrol vehicles.

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