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THE ANALYSIS OF S.I ENGINE ON METHANOL WITH PETROL AS A FUEL

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ABSTRACT

In the present scenario petrol engines are widely used for various applications in automobiles due to the advantages of low specific weight, compactness & simplicity in the design, low production cost and low maintenance cost. However this type of engine has two serious drawbacks as poor fuel economy and high-unburned hydrocarbon emission. Methanol can be produced from any material that can be decomposed into carbon monoxide (or carbon dioxide) and hydrogen. It offers higher heat of evaporation resulting in a higher temperature drop and therefore higher volumetric efficiency, It also help to control internal engine temperatures and heat flows so as to reduce heat losses and thus raising fuel efficiency and this is very attractive for developing countries, because methanol can often be obtained from much cheaper biomass source than diesel oil. Methanol has been proposed as a fuel for I.C and other engines. The objective of this Project is to overcome the drawbacks of petrol engine and to analyze the effect of the methanol as a fuel on water cool engine to calculate the parameters like Brake Power, Indicated Power, associated Mean effective pressure, Fuel Consumption, Brake Thermal Efficiency, Mechanical Efficiency and emissions with comparison to petrol as a fuel.

I. INTRODUCTION

Crude oil is not used directly as a fuel but as a feedstuff for the petrochemical factories to produce commercial fuels, synthetic rubbers, plastics, and additional chemicals. Oil refineries were originally placed near the oil fields, in part because natural gas, which could not then be economically, transported long distances, was available to fuel the highly energy-intensive refining process, but since 1950, for strategic reasons crude oil was transported by tankers & oleo ducts to local refineries.

Methanol (CH_3OH) has been proposed as a fuel for internal combustion and other engines, mainly in combination with gasoline. Historically, methanol was first produced from pyrolysis of wood, however, coal, oil, solid waste, and wood can and are being used to make methanol. Methanol will mix with a wide variety of organic liquids as well as with water and accordingly it is often used as a solvent for domestic and industrial applications. Present-day carburetors can operate with a gasoline fuel containing about 10 percent methanol. Methanol is an alternative, clean burning fuel source currently used as an additive to gasoline as well as a solvent in chemical processes, an alcohol denaturant, antifreeze, and in the biodiesel production process. This

simplest of alcohols is also commonly known as methyl alcohol, wood alcohol, wood naphtha, and wood spirits. The names wood alcohol, wood naphtha, and wood spirits are commonly used because methanol was once produced exclusively from wood. Methanol is still made directly from H2 and CO, which can be made from any hydrocarbon source. Methanol is a basic building block for the production of other chemical products such as Plastics, Paints and Man-Made Fibers. It has also found a large use in the production of Gasoline Fuel additives.
Ethanol and methanol are alcohol-based fuels made by fermenting and distilling starch crops, such as corn. Both ethanol and methanol produce less emission than gasoline. In Brazil, ethanol is well known as a clean, economic and available fuel for vehicles. But engines work on alcoholic fuels will experience a decrement in brake torque and power compared to gasoline Performance and Emission Comparison and Investigation of Alternative Fuels in SI Engines Propane or liquefied petroleum gas (LPG) is a clean burning fossil fuel that can be used to power ICEs. LPG fueled vehicles produce fewer toxic and smog-forming air pollutants. LPG is usually less expensive than gasoline. Methanol behaves much like petroleum and so, it can be stored and shifted in the same manner. It is more fixable fuel than hydrocarbon fuels permitting wider variation from ideal A: F ratios. It has relatively good lean combustion characteristics Compared to hydrocarbon fuels. It wider inflammability limits and higher flame speeds have showed higher thermal efficiency and lesser exhaust emissions compared with petrol engines.
Methanol can and has been produced from a variety of substances over the years including: Wood, Coal, NG, Crop residues, Grass Forest residues, and Cellulosic parts of municipal solid wastes. For more than 30 years, methanol has been the fuel of choice for I.C and other engines. Today, non-race car drivers can benefit from methanol's high performance and safety benefits, as well. Most methanol-fueled vehicles use M85, a mixture of 85 percent methanol and 15percent unleaded gasoline. Methanol is also available as M100 (essentially pure methanol), typically to substitute for diesel.

II. LITERATURE REVIEW

In their work they have use Methanol as an alternate fuel for internal combustion engines, either they have blended with gasoline or used directly. However, use of methanol today as a gasoline blend or directly as a fuel is minimal. The uses are primarily for fuel in racing cars and fuel in select provinces in China.
At the end of their study they concluded that as the percentage of alcohol increases, performance of engine tends to decrease generally. However after doing engine modifications such as increasing the engine compression ratio and advancing the ignition timing the engine performance increases, almost 12.5% increase in the power output. From this paper we concluded there is a decrease in power output when methanol is blended with petrol. To overcome this problem, the compression ratio and the ignition timing can be modified.

III. METHODOLOGY

In petrol engine the petrol is used as the fuel. The petrol engine may be either two stroke engine or four stroke engine. In two strokes engine there is a one power stroke for each revolution of the crank shaft. In four stroke engine there is a one power stroke for every two revolution of the crank shaft, Most of the heavy duty engines are four stroke engines. The engine is provided with suitable loading arrangement to apple and measure the load. The provisions are also available to measure the fuel consumption and speed.

Properties of Methanol and Gasoline Property	Methanol	Gasoline(petrol)
Density (20 c o) kg/m3	791	740
Lower calorific value (MJ/kg)	19.5	44
Viscosity (20^0c) (cap)	0.6	0.42
Heat of vaporization (kJ/kg)	1104	330
Boiling temperature (^{o}c)	65	30-225
Octane number	110	92
Flame velocity (m/s)	55	40
Stoichiometricair-fuel ratio	6.5	14.6
Boiling point(^{o}c)	64.7	149-270
Auto ignition temperature(^{o}c)	464	257
Specific heat (KJ/kg ^{o}c)	2.6	2.009

They work on the Internal combustion engine which is most preferred prime mover across the world. Spark ignition engine is preferred locomotive prime mover due to its smooth operation and low maintains. The gasoline is fossil fuel which is limited in reservoirs causes varieties of study in search of alternative fuel for SI engine, where alcohol promises best alternative fuel. In this paper study of three alcohols are tried to investigate in two parts. Comparative study of methanol, ethanol and butanol on the basis of blending percentage is first part, followed by investigation of oxygen role on the basis of oxygen percentage in the blend. The result shows highest replacement of gasoline by butanol at 5 % of oxygen content, the performance of same oxygen percentage for other two alcohols are also better. Presence of oxygen gives you more desirable combustion resulting into low emission of CO, HC and higher emission of CO2 as a result of complete combustion, higher temperature is also favorable for NO emission resulting higher emissions for it.

From this paper we concluded that the combustion of fuel gives higher brake mean effective pressure which compensate the effect of low heating value or even rise of pressure cause higher thermal efficiency. After particular blending percentage, the effect of complete combustion is incapable of minimizing the effect of lower calorific value thus break thermal efficiency decreases. Performance of M10, E10 and B20 among tested fuel shows better result within group of same alcohol blends.

They have carried out a practical experiment on I.C engine with different proportion of methanol gasoline blend and observe that the addition of oxygenates in gasoline provides better combustion resulting into significant reduction in CO and HC emission. These provides heat addition to actual performance their by increase break thermal efficiency of engine. It is observed that the CO and HC emission reduces with increase in oxygen contain when we consider blends of methanol, the emission for CO and HC is least for M30 almost at all operating conditions.CO and HC after complete combustion produces CO2 and water for HC, thus result of which show increased percentage of carbon dioxide. Also the carbon dioxide emission increases with increase in load as inverse to HC emission. Nitrogen in air reacts with available oxygen at higher temperature; the condition of better combustion produces higher temperature resulting into increased combustion for oxides of nitrogen. Further increase in load causes even higher temperature resulting into higher NO emission as observed. As the oxygen contain increases, normally more desirable combustion observed in most of the cases and thus the emission for CO2 increases for 7.5% oxygen containing blend than 5% and 2.5% of oxygen contain. And CO, HC emission decreases.In their work they have explain that Methanol is an alternative fuel that can be used in spark ignition engines and has the potential to decarbonizes transport and secure domestic energy supply. Because of the lower volumetric energy content of methanol compared to gasoline, higher efficiencies with methanol-fueled engines are desirable. Although the growing interest in methanol-fueled vehicles, there is insufficient knowledge of how the full potential of methanol as an engine fuel can be exploited. This master dissertation investigates the use of higher compression ratios and applying different load control strategies with respect to efficiencies and emissions of 3 methanol-adapted test engines. The efficiencies obtained with methanol are higher than with gasoline and the efficiencies obtained with both EGR and lean combustion are higher in comparison with throttled stoichiometric operation. With a high compression ratio (19.5:1) and turbocharging, efficiencies comparable to diesel engines are possible. Methanol reduces NOx emissions and the reduction is larger when EGR or lean burn is applied. To explore the full potential of methanol, turbocharging and direct injection have to be investigated in the future.They have done the Experimental Study of Exhaust Emissions &Performance Analysis of Multi Cylinder S.I.Engine When Methanol Used as an Additive (2009) from this paper we conclude that the exhaust emissions CO and HC are considerably decreased but CO2 and Nox simultaneously slightly increasing. It is notable that for these methanol blends combustion temperature is found to be high and exhaust gas temperature decreasing gradually. Methanol and ethanol have the lowest heating value. Methanol flame speed is the highest after than that of hydrogen, consequently lower spark advance is used and combustion temperature is lowered. So BSNOx produced by methanol is less than other fuels. It must be mentioned that hydrogen fueled engine is tested at stoichiometric mixture condition and the value of NOx in that situation is dramatically high. It is clear that hydrogen can perform on much lower equivalence ratio which in that condition NOx value would be really lower in comparison to stoichiometric condition. In there work they focus on the world resources that are becoming scarce and major crunch is found in case of Crude oil and Petroleum products. There are many alternative fuels like methanol, ethanol, Biodiesel, biogas, butanol, hydrogen. Among them methanol has greater octane number, high heats of evaporation, Oxygen contents by weight % higher than other fuels which result that better engine performance and decrease in HC, NOx, CO emission. This experimental performance tests were carried out at engine speed 2000 rpm and variable load condition, using various blends of M0 to M20 fuels into the effect of methanol addition to gasoline on performance & exhaust emission of SI engine. It is leads to a reduction of CO and HC by about 25% and 10% respectively. It was concluded that among the different blends, the blend including M20 is the most suited for SI engine from the engine exhaust emission point of view.

IV. EXPERIMENTAL SETUP & DESCRIPTION

A) Four-Stroke Petrol Engine:

As ICE can be divided into several groups according to different features as characteristics: operating cycles, method of charging the cylinder, fuel used, general design (position and number of cylinders, method of ignition, rotating speed, etc.), and method of cooling the engine. A four-stroke single cylinder, water cooled stationary petrol Engine, of given specification with loading arrangement was used for the testing purposes. It was rigidly mounted on the Test rig with air, fuel intake lines with silencer for exhaust gas emissions. The output shaft of engine is supported on bearing located on frame. The Acceleration Knob is provided on engine for attaining the required accelerations of engine. The Copper cooling coil is wounded on engine head & fins and on exhaust silencer to minimize temperature of these respective zones of test Rig.

The four stroke-cycles refers to its use in petrol engines, gas engines, light, oil engine and heavy oil engines in which the mixture of air fuel are drawn in the engine cylinder. Since ignition in these engines is due to a spark, therefore they are also called spark ignition engines.

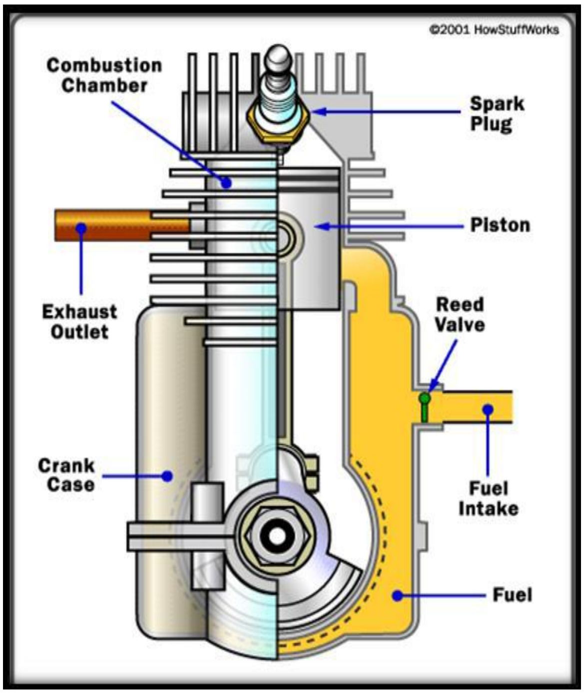

Fig.: Basic Components of Four Strokes, Single Cylinder Petrol Engine.

B) Internal Combustion Engines Terminology:

1) Cylinder bore (B): The nominal inner diameter of the working cylinder.

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2) Piston area (A): the area of a circle diameter equal to the cylinder bore.

3) Top Dead Center (T.D.C.): the extreme position of the piston at the top of the cylinder. In the case of the horizontal engines this is known as the outer dead center (O.D.C.).

4) Bottom Dead Center (B.D.C.): the extreme position of the piston at the bottom of the cylinder. In horizontal engine this is known as the Inner Dead Center (I.D.C.).

5) Stroke: the distance between T.D.C. and B.D.C. is called the stroke length and is equal to double the crank radius (l).

6) Swept volume: the volume swept through by the piston in moving between T.D.C. and is denoted by Vs:

$$Vs = \frac{\pi}{4} d^2 l$$

Where, d is the cylinder bore and l the stroke.

7) Clearance volume: the space above the piston head at the T.D.C., and is denoted by

$$V = Vs + Vc$$

Vc=Volume of the cylinder:

8) Compression ratio: it is the ratio of the total volume of the cylinder to the clearance volume, and is denoted by

$$r = \frac{V}{Vc} = \frac{Vs + Vc}{Vc}$$

9) Mean piston speed: the distance traveled by the piston per unit of time:

$$Vm = \frac{2lN}{60}$$

Where l is the stroke in (m) and N the number of crankshaft revolution per minute (rpm)

C) The Working Of S.I. Engines Deals With Four Stroke Cycle Is As Follows:

Suction Stroke: In this Stroke the inlet valve opens and proportionate fuel-air mixture is sucked in the engine cylinder.Compression Stroke: During this stroke both the inlet and exhaust valves remain closed and pressure of a mixture drawn increases. Just before the end of this stroke the operating plug initiates a spark which ignites the mixture and combustion takes place at constant pressure.

Expansion Stroke: In this stroke when the mixture is ignited by the spark plug the hot gases are produced which drive or throw the piston from T.D.C. to B.D.C. and thus the power is obtained.

Exhaust Stroke: This is the last stroke of the cycle. Here the gases from which the work has been collected become useless after the completion of the expansion stroke and are made to escape through exhaust valve to the atmosphere.

Engine Specifications	Specifications
Engine type	Four Stroke, stationary, petrol/S.I engine
Model Hero Honda	100 CC
Number of Cylinders	1
Bore and Stroke	50 x 49.5mm
Compression ratio	8.8:1
Diameter of Orifice	0.001m
Type of Cooling	Air/Water-Cooled
Type of starting	Kick starting
Spark plug	NGK: C7HSA, MICO U4A
Spark plug gap	0.6-0.7 mm

V. OBJECTIVES

1) To analyze the effect of gasoline-methanol blend on S.I Engine.
2) To measure the brake power, speed.
3) To compare and measure the thermal efficiency, mechanical efficiency.
4) To analyze the effect of methanol when added in different proportion with gasoline i.e. M5, M10, and M15.
5) To analyze the effect of proportion on the exhaust of engine.
6) To enhance the use of alternate fuel and to study its property.
7) To reducing the emission level of co2 and NOx from the exhaust.

VI. CONCLUSION

In this project the major benefits of alternatives fuels to conventional ones and also the disadvantages of alternative fuels are discussed. Decreasing the disadvantages can be an intersecting topic of research for future studies. We are sure that this valuable experience is useful for our future life in all aspects.

REFERENCES

[1]. https://www.google.co.in/
[2]. https://en.wikipedia.org/wiki/Methanol_fuel
[3]. Internal combustion engine book by V.Ganeshan.

[4]. M. V. Mallikarjun and Venkata Ramesh Mamilla, (2009) "Experimental Study of Exhaust Emissions & Performance Analysis of Multi Cylinder S.I.Engine When Methanol Used as an Additive", International Journal of Electronic Engineering Research ISSN 0975 - 6450 Volume 1 Number 3 (2009) pp. 201–212.

[5]. Machine Design by R.S.Khurmi and J.K.Gupta.