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A Review Paper on Performace testing of 4-Stroke Single Cylinder Variable Compression S.I Engine With Blending Propanol with gasoline

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INTRODUCTION

Increasing environmental pollution is a essential issue that needs to be reduced. It is well known that internal combustion engine are a major environmental pollution contributor due to the exhaust emissions such as carbon monoxide(co), carbon dioxide(co2), hydrocarbon (hc) and nitrogen oxides(Nox) emissions and smoke in exhaust. People have started considering the options of an alternative fuel over petroleum or diesel. Because, fuel resources are not going to be around forever and their extinction is nearly unavoidable with the ever increasing consumption. Also, fossil fuels are not renewable in nature. Currently, the consumption of fossil fuels is very much time faster than their natural production around the world. Also the combustion of fossil fuels emits dangerous gases like sulfur dioxide, carbon monoxide. This harmful gas when released into the atmosphere makes a huge contribution to the greenhouse effect. Also, the development in technology has made it possible to extract fossil fuels in a much easier but more cost effective. So, the rapid depletion of the world's crude oil reserves and environmental considerations has focused on the clean, renewable and sustainable energy systems. The energy crisis and environmental pollution created an incentive to study and evaluate alcohols as a fuel in spark ignition engines with the increasing concern of environmental degradation and energy shortage, bio-fuels have obtained steady growth during the last decade due to their renewability and the potential of pollutant reduction.

The combustion of motor fuels disturbs considerably the carbon dioxide balance in the atmosphere. Moreover nitrogen and sulphur oxides produced as by-product of motor fuel. Combustion contribute to the acidification of lakes, which are the source of the water for the vital functions of animals and plants. finally, solid particulates which are products primarily of the incomplete combustion of aromatic compounds cause cancer in human animals.

Depletion of fossil fuels and environmental consideration has led researchers to anticipate the need to develop alternative fuels.[1]Hull, Golubkov, B Kronberg. An alternative fuel for spark ignition engines Alternative fuels have been developed for standard spark ignition engines. The fuels which contain generic component of all the advantage the ability to increase considerably the octane umber of gasoline and to reduce the amount of harmful pollutants in the exhaust emission of engines operating on such blends.Blending alternative fuels with petroleum based fuel has twin advantages that even relatively small percentage additions will result in a substantial total volume of gasoline substitution.many oil companys producing and selling gasoline believing that ethanol is the solution of the problem of alternative fuel for conventional spark ignition internal combustion engine.

2. REVIEW OF LITERATURE

[2.1] A Hull et.el.(2006) Work on An alternative fuel for spark ignition engines. Alternative fuels have been used for standard spark ignition engines. The fuel which contain generic bio-components, maintain all the advantages of ethanol that is the ability to increase considerably the octane number of gasoline and to reduce the

amount of harmful pollutants in the exhaust emissions of engines operating on such blends.. And he found that to reduce the amount of harmful pollutants in the exhaust emissions of engines operating on such blends. .In contrast with ethanol the new fuel components do not increase the vapor pressure of gasoline–ethanol blends, have a better tolerance to water, and do not increase the fuel consumption

. [2.2] Rodrigo C.costa, Jose R. Sodgre. (2010) Conducted a research on Hydrous ethanol Vs. gasoline-Ethanol blend: Engine performance and emissions compared the performance and emissions from a production 1.0-l, eight-valve, and four-stroke engine fuelled by hydrous ethanol (6.8% water content in ethanol) or 78% gasoline-22% ethanol blend. The results showed that torque and BMEP were higher when the gasoline-ethanol blend was used as fuel on low engine speeds. On the other hand, for high engine speeds, higher torque and BMEP were achieved when hydrous ethanol fuel was used. Hydrous ethanol produced higher thermal efficiency and higher SFC than the gasoline-ethanol blend throughout all the engine speed range studied. With regard to exhaust emissions hydrous ethanol reduced CO and HC, but increased CO2 and NOX levels.

[2.3**]** Sehmus ALTUN et.al (2010) Work on a Exhaust Emissions From A Spark-Ignition Engine Operating On Iso-Propanol And Unleaded Gasoline Blends. Exhaust emission tests were conducted on a four-stroke, four cylinder and direct injection spark-ignition engine. The engine tests were performed at three-fourth throttle opening position at four various speeds in the range of 1000-4000 rpm with 1000 rpm period. He showed that the emissions of carbon monoxide (CO) and hydrocarbon (HC) decreased with iso-propanol-unleaded gasoline blends while carbon dioxide (CO2) emission increased.

[2.4] Syed Yousufuddin,Syed Nawazish Mehdi;(2008) Investigate on Effect of ignition timing, Equivalence ratio, and Compression ratio on the performance and emission characteristics of a Variable compression ratio SI engine using ethanol unleaded gasoline blends. The tests were performed by varying the ignition timing, equivalence ratio, and compression ratio at a constant speed of 1500 rpm and at wide open throttle (WOT). Effect of ethanol unleaded gasoline blends and tests variables on engine torque and specific fuel consumption were examined experimentally .He found that Minimum BSFC was obtained at 11:1 compression ratio with E0 fuel. Comparison with 9:1 compression ratio, The minimum BSFC was obtained at 0.95

equivalence ratio for all test fuels and increased depending on ethanol percentages. Blending unleaded gasoline with ethanol increased the brake torque when the ignition timing was retarded. Using E0, the engine torque increased with increasing compression ratio to 11:1, the increment is about 5.72 % when compared with 9:1 compression ratio. The addition of 35 % ethanol and 65% ethanol to the unleaded gasoline gave the best results for reduction of CO emissions by about 43.42 % and 47.2 %, respectively in comparison to E0 over the test range of 9:1 to 11:1 compression ratio. In respect of HC emissions, the highest decrease was found for E65. Decreasing ratio of HC emission was found to be higher than that of CO emissions.

[2.5] E. Nirmala Devi1,et.al(2013) Study on The Effect of Ignition Timing on Methanol Blended Spark Ignition Engine.His present work is to evaluate whether variable ignition timing can be effect on exhaust emission and engine performance of a spark ignition engine.. Experiments were conducted at different ignition timings. The results have shown that performance of methanol blended gasoline engine performed comparatively well over pure gasoline engine fewer than 250 to 290 BTDC ignition timings. Also the result shows that considerable performance

improvement in brake thermal efficiency, volumetric efficiency, and decrease in exhaust gas temperature, as well as reduction in HC, and CO emission.

[2.6] Mali anup d., Yadav sanjay d.(2014) Presented the Effect of Compression ratio on Performance of 4-stroke spark ignition Engine. In their investigation a novel method of changing the compression ratio is proposed, applied, studied and analyzed. The clearance volume of the engine is altered by changing the cavity volume of cylinder head and also piston height. This modification permitted to have different values of clearance volume. The Result shows from the work are. The compression ratio is varied by using a simple. The total fuel consumption increased with the compression ratio.The specific fuel consumption reduced with compression ratio. The power of an engine increased with the compression ratio and the fuel efficiency increased with compression ratio

3. PROBLEM FORMULATION OR PROBLEM DEFINATION

[3.1]Depletion of fossil fuels and increasing pollution

[3.2]The addition of ethanol to gasoline causes an increase in the vapour pressure of the gasoline-ethanol blend.

[3.3]The addition of ethanol to gasoline reduced the tolerance of gasoline-ethanol blends to water

[3.4]That's why now we have to use the propanol-gasoline blend as an alternative fuel

4. METHODOLOGY

The engine used for the experiments are 4-stroke single cylinder variable compression S.I engine .At first unleaded gasoline and Propanol blended with the ratio of5% (95% unleaded gasoline and 5% Propanol by volume), 10% (90% unleaded gasoline and 10% Propanol by volume) in different bottles..At 2nd Unleaded gasoline and Ethanol blended with the same ratio volumetric percentage of blending. And at 3rd Propanol with ethanol are Blend and store in different different bottles. And these fuels are used in a engine.

A Firstly, this engine was mounted on a chassis frame. After, all electrical components and cables were connected to the engine. Engine control unit was programmed again because of there is no immobilizer on the engine for test cases. All injectors were checked, cleaned

and fuel supply system was connected to the engine. A computer controlled unit connected to the engine. All the sensors of engine and dynamometer as well as exhaust gas temperature sensor and fuel flow measurement system were connected to the computer control and data logging system. A Exhaust gas Analyzers' analysis unit was also connected to the exhaust system of the engine to measureexhaust CO, CO2, HC emissions. All safety considerations have been considered toprevent any injury. For noise and emissions which can cause problem on the human health, special earlaps and noise filter have been used during the tests. During the test period, firstly engine was heated up for some time period without applying any load at the idle position.Later, engine speed was increased at differant rpm speed then; the engine was loaded by dynamometer. The throttle of the engine was positioned fully open, engine speed set at fix possition.And at fix compression ratio. When the test started, engine loaded slowly and at Firstly Blending of Ethanol with gasoline blend fuel which is based on different volumetric basis fuel are used in an

engine and engine torque, power, engine speed, specific fuel consumption, AFR, exhaust temperature,CO,HC, CO2 and NOx emissions were stored at the data logging system. All this operations and measurements were continued with pure unleaded gasoline, 5%, 10%, unleaded gasoline-Propanol blends.And at last Blending of ethanol with propanol fuels are used and measuring the same performance parameter and exhaust emission from an engine

Engine used are four stroke single cylinder variable compression engine. Having Bore of 70 mm. Stroke 66.7 mm, Displacement of engine are 256 cc Having compression ratio 4.6. Cooling system are forced cooling system have been used and the Ignition system are Electronic ignition system.

TABLE-1

Properties of fuel

Properties	**Gasoline**	**Ethanol**	**Propanol**
Chemical Formula	C8H15	C2H5OH	C3H7OH
Oxygen content, wt %	-	34.73	26.62
Carbon content, wt %	86.3	52.2	59.9
Stoichiometric AFR	14.5	8.94	10.28
Specific gravity	0.743	0.7894	0.8037
Heat of vaporization kj/l	223	725	585
Research octane number, RON	92-98	111	118
Motor octane number, MON	87.2	92	-
Molecular wait	111	46	60

6.OBJECTIVE

[6.1]Blending of ethanol with gasoline, Blending of propanol with gasoline , Blending of propanol with ethanol having 5%,10%, on volumetric basis.

[6.2]Measuring the Performance parameter of 4-stroke single cylinder variable compression S.I engine with blending of propanol with gasoline.

[6.3]To measure the exhaust emission such as CO,HC,CO2, NOx, from an 4-stroke single cylinder variable compression engine.

REFERENCES

[1] Hull, Golubkov, B Kronberg .An alternative fuel for spark ignition engines.. The manuscript was accepted after revision for publication on 5 September 2005.DOI: 10.1243/14680874JER0250

[2] Rodrigo C.costa, Jose R. Sodgre. Hydrous ethanol Vs. gasoline; Engine performance and emissions. ELSIVER fuel(89) 287-293

[3] Syed Yousufuddin,Syed Nawazish Mehdi effect of ignition timing, equivalence ratio, and

compression ratio on the performance andemission characteristics of a variable

compression ratio si engine using SID. IJE Transactions B: Applications Vol. 21, No. 1, April 2008 - **97**ethanolunleaded gasoline blends.

[4] E. Nirmala Devi1, S. K. Bhatti2, Ch. Indira Priyadarsini3, M.V.S.MuraliKrishna4. The Effect of Ignition Timing on Methanol Blended Spark Ignition Engine. Int. Journal of Engineering Research and Applications www.ijera.com ISSN : 2248-9622, Vol. 3, Issue 6, Nov-Dec 2013, pp.1351-1354

[5] Thirumal Mamidi, Dr. J.G. Suryawnshi "Investigations On S.I. Engine Using Liquefied Petroleum Gas (LPG) As An Alternative Fuel" ISSN: 2248-9622 Www.Ijera.Com Vol. 2, Issue 1, Jan-Feb 2012, Pp. 362-367

[6] Shivaprasad K.V, Dr. Kumar G.N, Dr. Guruprasad K.R "Performance, Emission And Fuel Induction System Of Hydrogen Fuel Operated Spark Ignition Engine" International Journal Of Modern Engineering Research (IJMER) Vol.2, Issue.1, Jan-Feb 2012 Pp-565-571