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A Review on Performance And Emission Analysis Of A Spark Ignition,4-Stroke, Single Cylinder IC Engine Using Different Ethanol Blends

Jyoti Patel[1], Mr. Ravi Vishwakarma[2]
Research Scholar[1], Asst. Prof. Shree Institute of Science & Technology, Bhopal[2]

ABSTRACT:- Automobile have become a very important part of our modern life style. But the future of automobile based on internal combustion engines has been badly affected by two major problems. That is less availability of fuel and environmental degradation. So it is very important to found some new renewable non polluting alternative fuels to ensure the proper and safe survival of internal combustion engines. In this study, the first approach was selected with the aim of improving the combustion characteristics of gasoline, which will be reflected in improving the engine Performance and that is done by mixing ethanol as a Additives which is integral part of today's fuel. They are chemicals, which are added in small quantities either to enhance fuel performance or to correct a deficiency. They can have surprisingly large effects even when added in little amount. As we all know that modification in engine and change in composition of fuel are two methods by which we improve the performance of an engine and can reduce the environmental pollution. The purpose of this study is to investigate experimentally and compare the engine performance and pollutant emission of a SI engine using different percentage of ethanol as additive to gasoline.

INTRODUCTION

Ethanol (C_2H_5OH an alcohol) is the world's largest and fastest growing source of renewable energy with almost all the developing country having some form of biofuel industry. Due its clean green image, ease of manufacture and it has an ability to be blended with petrol easily. However, it is not widely used because of its high price. But as a fuel for spark-ignition engines, ethanol has some advantages over gasoline, such as better anti-knock characteristics and the reduction of CO and UHC emissions. Although having these advantages, due to limitation in technology, economic and regional considerations, alcohol fuel still cannot be used extensively. Since ethanol can be fermented and distilled from biomasses, it can be considered as a renewable energy. Under the environmental consideration, using ethanol blended with gasoline is better than pure gasoline because of its renewability and less toxicity. Now a day government provides various incentives for the production of Ethanol In our country. Though production of Ethanol is quite expensive still lots of research institutes and farms are working in this field for the huge production of Ethanol in India also. But still we needed advance and cheap techniques by which it may influence our consumption of Ethanol up to its maximum extent.

LITERATURE REVIEW

Various researches which have been done in the past over a time of period came out to be very useful and informative while initiating the above research work.

Gaurav Tiwari & Dr. Nitin Shrivastava presented the Experimental investigation of ethanol blends with gasoline on SI engine. In this study they have evaluated the performance of two stroke single cylinder spark ignition engine with ratio of 10% 20% and 30% of ethanol and gasoline by volume.[1] Performance parameters (brake thermal efficiency, brake specific energy consumption and brake specific fuel consumption) were determined at various loads on engine with ethanol blended gasoline. The comparison was made on performance of conventional SI engine with pure gasoline operation. As a result Brake thermal efficiency is increasing for a particular percentage of blending of alcohol. And the percentage is different for different alcohols. After a particular fixed percentage of blending the performance of alcohol blending decreases. The blending of ethanol in gasoline provide good combustion property. If we add alcohols after a particular percentage than it is incapable in proper combustioning of fuel which results in lowering thermal efficiency. Performance of E10 shows better result within group of various blends of ethanol with gasoline. It shows least brake specific fuel consumption and better engine performance.

Rudra Nandan Pramanik, Smruti Ranjan Pradhan and Prafulla Kumar Sahoo(2013) determined that Impact of ethanol blends on various technical Parameters of a four stroke 4-cylinder ic engine.[2] In this report they have compared Ethanol blends (E10 and E20) with gasoline in a four stroke IC engine and measured the

various parameters by utilizing this mixture. Creat the mixtures by weighing the appropriate amount of ethanol on a scale, and then added it to the gasoline (applied for the ethanol blends only) empited the engine fuel tank and filled it with the fuel tested. Started the engine and left it run at the required fuel flow and engine speed for about 3 minutes in order to allow the engine to stabilize. Required 10 measurements of the flue flow, engine speed air flow dynamometer force, vacuum pressure and the level of concentration for NO_X , CO & CO_2. The 10% ethanol blend produces similar fuel conversion efficiency, brake work, and BSFC to that of pure gasoline. CO emissions for 10% ethanol blends are much lower than CO emissions from gasoline. NOx and CO_2 emissions for 10% ethanol blends and gasoline are similar. 20% ethanol-gasoline blends do not perform as well as pure gasoline does in spark ignition engines that are calibrated to run on gasoline. The fuel conversion efficiency and brake work both decrease for an engine operating on a 20% ethanol blend, while BSFC increases. CO emissions for 20% ethanol blends are much lower than CO emissions from gasoline. The NOx emissions for 20% ethanol are similar to those of pure gasoline. CO**2** emissions are higher for 20% ethanol blend than for what is produced by gasoline.

V. S. Kumbhar, D. G. Mali, P. H. Pandhare & R. M. Mane (2012) investigated the effect of lower ethanol and gasoline blends on single cylinder engine performance and emission at WOT condition and variable speeds from 4000 to 8000 rpm.[3] As the ethanol content in the blend increases, the power increases slightly for all speeds because of ethanol has higher heat of vaporization, which provides cooling of the air fuel charge, hence the density increases, thus more fuel can be used, and power increases. The power at 6000 rpm using E5, E10, E20 increased by 2.31%, 2.77%,and 4.16% as compared to gasoline. Addition of ethanol improves anti knock behavior which allows more advanced timing that result in higher combustion pressure and thus higher torque. The torque at 6000 rpm using E5, E10, E20 increased by 0.29%, 0.59% and 4.77 % as compared to gasoline. Addition of the ethanol reduces the carbon atoms concentration in the blended fuel and high molecular diffusitivity and high flammability limits which improve mixing process and hence there will better combustion. Specific fuel consumption decreases over the speed range of 4000 to 6000 rpm due to better combustion and increases over the speed range of 6000 to 8000 rpm, because of lower heat content of the ethanol.

Achinta Sarkar, Achin Kumar Chowdhrui, Arup Jyoti Bhowal and Bijan Kumar Mandal (2012) determined that brake specific fuel consumption, brake torque, indicated power, thermal efficiency increases or decreases depending upon the operating condition of the engine and ethanol percentage in the ethanol-gasoline blends[4]. However, the compression ratio always increases due to enhancement of the octane number of the blend. On the other hand volumetric efficiency increases with the increase in ethanol percentage in the blends. Also there is a significant reduction in the emission of unburned hydrocarbon and carbon monoxide with ethanol and ethanol gasoline blend. But the CO_2 emission is more with ethanol and Nox emission increases or decreases depending upon the engine operating conditions.

C. Ananda Srinivasan and C.G. Saravanan (2010) investigates the effects of ethanol-blended gasoline with oxygenated additives on a multi – cylinder Spark Ignition (SI) Engine.[5] Fuels were prepared using 99.9% pure ethanol and gasoline The remainder was gasoline. Performance and emission tests were conducted on a multi – cylinder SI Engine coupled with an eddy current dynamometer. The emission tests were measured using an exhaust gas analyzer. The experimental results proved that the blend increased brake thermal efficiency more than a sole fuel, such as gasoline. The emission tests found that the CO slightly decreased, while HC and O_2 increased moderately and CO_2 and Nox appreciably decreased. In addition, combustion analyses were made with the help of combustion analyzer, in which cylinder pressure and heat release rate were analysed.

Paras Gupta, Veeraphol Sae-wang, Pithayodom Kanbua and Yossapong Laoonual (2010) investigate the effects of water contents blended with ethanol on thermal efficiency andemissions of SI engine.[6] The 125-cc SI engine is used for the experiments. Tests are run at constant engine speed and stoichiometric air fuel ratio. The results show an increase in the thermal efficiency for hydrous ethanol having more than 10% water content. The bsfc value is increased on increasing water content. The Nox produced by hydrous ethanol is very low. The total unburned hydrocarbons (THC) and the CO emissions are increased on water addition but even after the addition of 20% water by volume they are found lower than those in case of gasoline. So it proposes a solution for the fuel which satisfies the current environmental concerns and helps in improving the fuel economy.

Ashish S. Lanje, Prof. M. J. Deshmukh (2012) Investigates on decreasing fuel consumption by using alternative fuels and on lowering the concentration of toxic components in combustion products.[7] As a gaseous fuel, gains from LPG have already been established in terms of low emissions of carbon monoxide, hydrocarbon. Ethanol is one of the fuel additive has some advantages such as better antiknock characteristics and the reduction of CO and HC emissions. It can be considered as renewable energy under the environmental consideration. In this study, a review

of research paper on air-fuel ratio, operating cylinder pressure, ignition timing and compression ratio are some of the parameters that need to be analyzed and optimally exploited for better engine performance and reduced emissions. In this paper a comprehensive review of various operating parameters and concerns have been prepared for better understanding of operating conditions and constraints for a LPG-Ethanol fuelled Spark Ignition engine at various compression ratios.

CONCLUSION

From the above literature survey it may conclude that In recent years several researches have been carried out to the influence of methanol and ethanol on the performance of spark ignition engines. The performance and emission analysis at varying load and constant speed have been done. With keeping in mind the financial and environmental considerations an attempt has been made to increase the thermal efficiency and performance of the engine by using ethanol as additive with gasoline in engine. Here in this experiment we tried to change the composition of fuel by blending of ethanol with gasoline in a suitable amount to improve the performance of engine.

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