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Experimental Inspection by using the Effect of Magnetic Field on the Performance of Diesel Engine

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Abstract - *The present work deals with fuel ionization by using magnetic field which will ensure complete combustion of air-fuel mixture. Incomplete combustion in engine is due to improper mixing of hydrocarbon and oxygen molecule. These attempts is made in this work to improve the combustion efficiency of internal combustion engines by adopting a magnetic fuel ionization method in which the fuel is ionized due to the magnetic field. To overcome these issues magnets are used called as Magnetic fuel conditioner. This help to align the orientation of hydrocarbon molecules, for better atomization of fuel. Use of such magnet mounted in path of fuel lines improves mileage & reduces emission of vehicle. These experiments are conducted at different engine loading conditions. The work in particular is very significant on account of its impact on the global automobile market. The magnets help to disperse the hydrocarbon cluster into smaller particles which will improve the efficiency of combustion. This will maximize the combustion of fuel.*

Key Words: Eddy current dynamometer, Diesel engine.

1. INTRODUCTION

In India, the use of vehicles increases in huge amount over the last decades. In internal combustion engine, generally fuels are use in the form of liquid and they do not combust until they are vaporized and mixed with air. In internal combustion engine, decrease in efficiency, clogs stalling, and loss of horsepower due to fossil fuels that leave a natural deposit of carbon residue. Generally, a fuel for internal combustion engine is compound of number of molecules. Each and every molecule consists of a number of atoms made up of number of nucleus and electrons, which orbit their nucleus. Molecules of fuel have not been realigned, so that fuel is not actively interlocked with oxygen during combustion. Molecules have positive and negative electrical charges. Magnets are the prime source that control of the position of electrons. Magnets change the orientation of electron in orbit and molecules of fuel have been realigned and ionized.

The fuel is subject to the lines of forces from permanent magnets mounted on fuel inlet lines. These states create the condition for freer association of fuel particulars. The consequence of treating fuel with a high magnetic field is improved combustion of fuel and consequently increased engine power as well as reduced fuel consumption. Also the engine performance is very important for the better efficiency of vehicle, it is solved by increasing the fuel property. Increases the percentage in the complete combustion of the fuel in combustion chamber, here we introduce the magnet and their magnetic field in the inlet line of the fuel supply.

2. LITERATURE SURVEY

Shweta Jain, Prof. Dr. Suhas Deshmukh,2012 Experimental Investigation of Magnetic Fuel Conditioner (M.F.C) in I.C. engine, ISSN: 2250-3021 Volume 2, Issue 7 (July 2012), PP 27-31. From the above experimental results, the following conclusions were made. It is clear from the experiment result that the brake thermal efficiency, indicated power are similar in both with and without Magnet Fuel Energizer but indicated power gets improve at lower load condition. Specific fuel consumption decreases due to the reduction of fuel consumption at higher load. There is significant reduction in the exhaust emissions at all load condition in both neodium and ferrite but among them two neodium gave better effect than the ferrite. The experiments results show the magnetic effect on fuel consumption reduction was up to 8% at higher load condition. The CO emission gets reduce at higher load. The effect on NOx emissions reduces range up to 27.7%. The reduction of HC emissions was range up to 30%. The CO2 emission reduction was up to 9.72% at average of all loads.

A. R. Attar, P. Tipole, V. Bhojwani and S. Deshmukh" Effect of magnetic field strength on hydrocarbon fuel viscosity and engine performance", International Journal of Mechanical Engineering and Computer Applications, Vol.1, No.7, pp.94-98, December 2013. By establishing correct fuel burning parameters through proper magnetic means (MFC) one can assume that an internal combustion engine is getting maximum energy per liter as well as environment with lowest possible level toxic emission. MFC increases the internal energy of a fuel to cause specific changes at a molecular level which obtained easier combustion. The resultant fuel burn more completely, producing higher engine output, better fuel economy, more power & most importantly reduces the amount of HC, CO, NOx in the exhaust. & therefore control the emission at low cost. In short the summary of the conclusion includes: MFC increases 10-40%

mileage of vehicle, Reduction in HC emission & other pollutants, avoid clogging problems in Diesel Engine, Cost saving, Eco friendly, provides 30% extra life for expensive catalytic converter, reduce maintenance of engine most importantly does not require any design modification & finally cost saving.

3. MAGNET

Magnet is an object that produces continuous magnetic field around it which is invisible but the effect of the magnetic field is notable. Magnets can attract all ferromagnetic materials such as iron and also can attract and repel with other magnet. Many type of magnets in different range of dimension, shape and strength. The most typical magnet used in science laboratory is made up of ferrite and neodymium magnet. The two types of magnets are ferrite magnets and neodymium magnets

Fig -1: Magnets used

In these we have used Neodymium Magnets also known as Neo magnet which is most widely used type of rare earth magnet and in bright silver color. This is a permanent magnet which made from alloy of neodymium, iron and boron and this magnet considered to be the strongest magnet type among other permanent magnet. This magnet widely used in electronic based companies and also as motor in cordless tools.

We have used 4000 gauss neodymium magnet.

3. EFFECT OF MAGNETIC FIELD ON FUEL MOLECULE

Hydrogen occurs in two distinct isomeric forms Para and ortho shows in the below figure It is characterized by the different opposite nucleus spins. The ortho state of hydrogen has more effective than para state for maximum complete combustion. The ortho state can be achieved by introducing strong magnetic field along the fuel line. Hydrocarbon molecules form clusters, it has been technically possible to enhance van der Waals' discovery due to the application of the Magnetic field, a high power, permanent magnetic device strong enough to break down, i.e. de-cluster these HC associations, so maximum space acquisition for oxygen to combine with hydrocarbon.

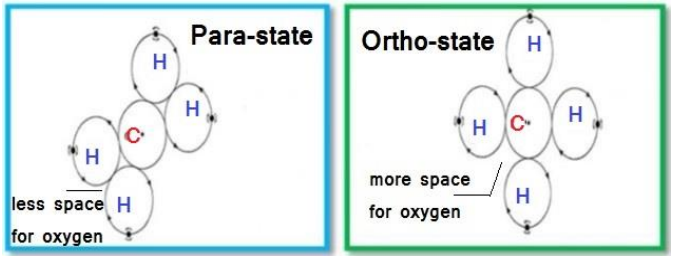

Fig -2: State of diesel molecule

4. EXPERIMENTAL SETUP

The magnetizing apparatus is located on the pipe between pumping means and the burner, fuel injectors, because it is unnecessary for any other parts to be magnetized. A portion of the fuel feeding system extending from a point downstream of the magnetizing apparatus to the burner must be made of non-magnetic material. In this case, magnetized fuel is directly fed to burners or atomizing nozzles with a minimum reduction of magnetism. The magnets are embedded in a body of non-magnetic material, such as plastic, copper or aluminium, to secure them to the fuel line. No cutting of the fuel line and any hose and clamps are necessary to install this device, outside a fuel line without disconnection or modification of the fuel or ignition system for producing magnetic flux in the flow path of combustible fuel within the pipe.

Engine Specifications

1. Type- 1 Cylinder, 4- Stroke Diesel Engine
2. Cooling- Water cooled
3. Power- 5.2Kw
4. Speed -1500RPM
5. Dynamometer Type- Eddy Current Type Water Cooled

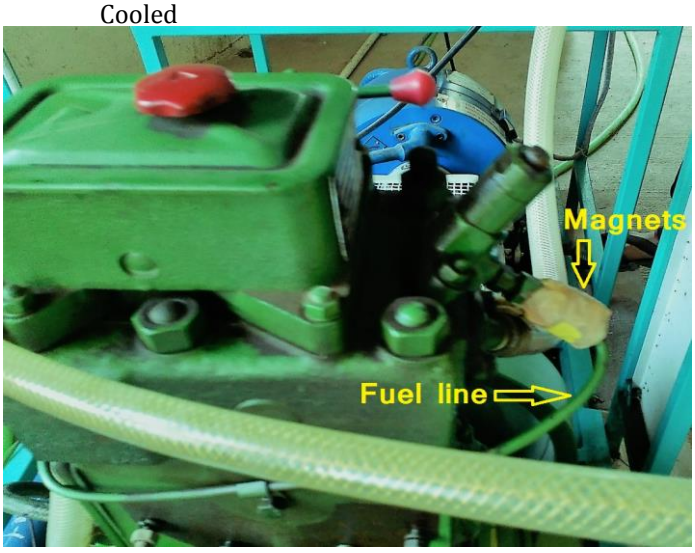

Fig -3: Experimental setup

5. EXPERIMENTAL PROCEDURE

In this experiment we carried out a performance test on single stroke diesel engine at normal conditions without using magnets and calculated results. After this the experiments is again carried out at normal conditions but with the application of magnets as shown in fig 2 and results are calculated.
Then these two results are compared.

6. RESULT

Various graphs are plotted showing comparison between performance of engine with and without effect of magnetic field.

6.1 Graph 1

From the graph it is clear that as load increases the brake specific fuel consumption gets reduced with use of magnet in fuel line.

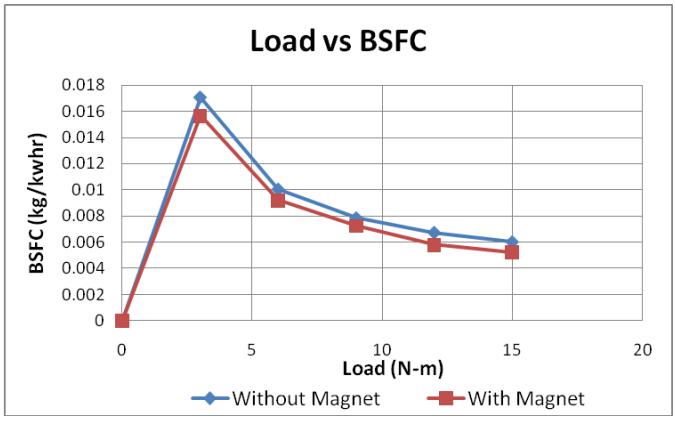

Chart -1: Load vs. BSFC

6.2 Graph 2

From the graph it is clear that as load increases the fuel consumption gets reduced with use of magnet in fuel line.

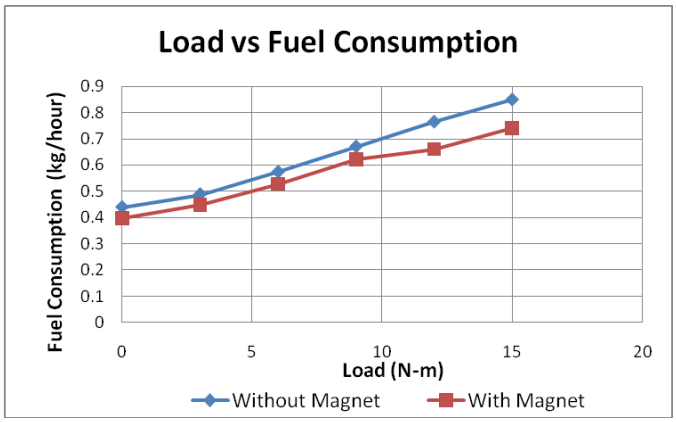

Chart -2: Load vs. Fuel consumption

6.3 Graph 3

From the graph it is clear that the Thermal efficiency gets increased with use of magnet in fuel line.

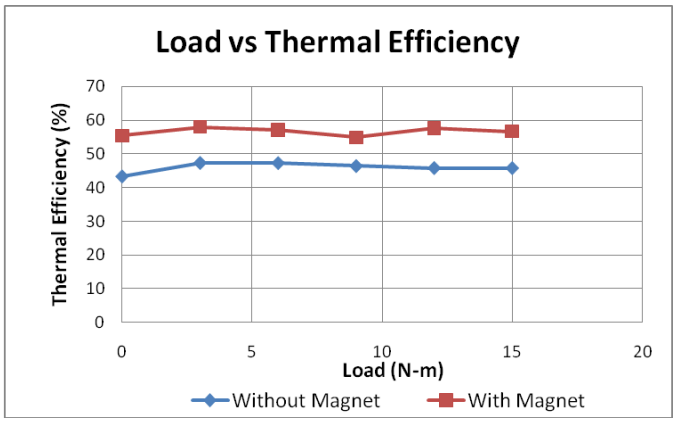

Chart -3: Load vs. Thermal efficiency

7. CONCLUSIONS

From the above experimental results the following conclusions were made:
It is clear from the experiment result that the brake specific fuel consumption gets decreased with magnet, fuel consumption kg/hr also get decreased and thermal efficiency of the engine get increased with use of magnet.

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