Emission Analysis of Single Cylinder CNG Engine Under the Influence of Magnetic Fuel Energizer

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Abstract— The effect of magnetic field was used in this research for the treatment of vehicle fuel properties, to reducing fuel consumption and decreasing the emission of certain pollutants rates. The experiments in current research comprise the using of strong permanent magnets with different speed (1100, 1200, 1300, 1400) rpm, which installed on the inlet fuel pipe of the four-stroke engine, and study its effects on fuel consumption and exhaust emission. For the purpose of comparing the results required the search for experiments with and without the use of magnets. The all over performance and exhaust emission tests showed excellent result, it was found that the percentages of exhaust gas components (CO, HC) were decreased by 20%, 30% respectively, but CO2 percentage increased up to 15%.

Key words: magnetic fuel treatment, fuel consumption, exhausts emission

I. INTRODUCTION

In India, the use of vehicles increases in large amount over the last decades. In internal combustion engine, generally fuels are use in liquid form then converted into gaseous. The fuels are not burnt until they are not properly vaporized and mix with the air content. In internal combustion engine, less efficiency, clogs stalling, and loss of power due to fossil fuels that leave a natural carbon deposition residue.

Normally a fuels for internal combustion engine are hydrocarbon compounds and number of molecule of hydrocarbons. Each and every molecule consists of a number of atoms compose number of nucleus and electrons, which orbit their nucleus. Molecules of fuel have not been completely aligned, so that fuel molecules are not actively interlocked with oxygen air during combustion process. Molecules have positive and negative charges for electrons. Magnetic field is the best source that control of the position of electrons. Therefore, magnetic field change the arrangement of electrons and molecules of fuel. The molecules have been influeing through magnetic field, result they are realigned and ionized.

In vehicles diesel engines are mostly used. But they are lead to lower efficiency and produce large amount of pollutants such as CO, HC, NOX, CO2 etc due to incomplete combustion of fuel. There are so many methods (MPFI, EGR, PCV, catalytic) used for increase the performance but to tackle this problem easiest way is use of MAGNETIC FUEL ENERGIZER.

This device works on the base of magnetic field effect on different forces of hydrocarbon molecules of fuel and oxygen molecules of air. Liquid fuel is an admixture of organic chemical compounds consisted predominantly of carbon and hydrogen - hydrocarbons. Due to different chemical and physical attraction forces, they form a packed structures called pseudo compounds further this compounds formed into clusters or associations. These structures are mostly stable and during air/fuel mixing process, oxygen atoms are not enter into their interior. The access of appropriate quantities of oxygen to the internal of these molecular groups (associations) is thus hindered. This resune is for incomplete combustion of fuel in the internal combustion engine and causes the formation of carbon particles and carbon monoxide and large quantities of unburnt hydrocarbons emitted into the environment.

It is now well approved that a hydrocarbon fuel can be polarized by exposure to external force such as magnetism. The effect of magnetic field is the production of a moment created by the movement of the outer electrons of a hydrocarbon chain moving the electrons to states of higher principal quantum number. This state effectively breaks down the fixed valance electrons bonds are that take part in the combining process of the fuel compounds. These states create the condition for free association of fuel particulars. In so doing, the hydrocarbon fuel becomes directionalized or aligned which are not normally create new hydrocarbon chains but more explainable aligns the conduced magnetic moment into a dipole relationship within itself. This magnetic bonds then permits rapid bonding with the respective oxidizing media. Thus the result more complete and rapid burning of the hydrocarbon fuel and decrement in exhaust emission.

II. EXPERIMENTAL SET UP AND PROCEDURE

The experiment is tested on a single cylinder, four stroke water cooled CNG engine. The setup consists of an engine, an eddy current dynamometer, and five gas exhaust analyzer.

Fig. 1: Test engine[3]

Model	TV1
Make	Kirlosker Oil Engines
Type	Four stroke, Water cooled, Diesel
No. of cylinder	One
Bore	87.5 mm
Stroke	110 mm
Combustion principle	Compression ignition
Cubic capacity	0.661 liters

Compression ratio 3 port	17.5:1
Lubrication system	Forced feed system

Table 1: Test engine specification

The engine was prepared to run on CNG as a fuel during all tests as shown in Fig.2. The fuel system is designed for correct measurement of the fuel flow rate. The fuel consumption is measured directly by using the weight meter. The fuel consumption was measured at different engine speeding conditions and exhaust gas measured by Exhaust gas analyzer

A. Exhaust Gas Analyser:

The exhaust gas analyzer is used to measure exhaust gases from the engine during experimental tests as shown in Fig.3. It is indicates gases such as HC, CO, NOX and CO2 concentrations at each and every speed. This procedure was done twice one for without magnet condition and other for with magnet situation, and results were compared.

5 Gas Analyser	Model :GA4050
Year of Manufacture	2012
CMVR Type Approval Certificate No	ARAI/TA(4G)CORAL/GA4040,2005-05
Serial Number	0501300
Serial Number Of the Measuring transducer	006474
Minimum and Nominal flow rate	0.5LPM-6LPM
Voltage	100-300V/AC/1ϕ/50-60Hz
Gas Component and respective maximum measured value	
CO	10.0%VOL.
CO2	20.0%VOL.
O2	21.7%VOL
HC	20000ppm as propene
Oxygen fuel cell	Electrochemical/PTB 18.10
PEF	0.542

Table 2: Exhaust gas analyser specification

Fig. 2: Photographic view of five gas analyser3

The strong permanent y grade ferrite magnet have inner diameter is 32mm and outer diameter is 45mm.The fuel inlet pipe is pass through the magnet .The fuel inlet pipe diameter is 30mm.When ever the gas pass through the pipe the fuel pass into the magnetic field. So the effect of magnetic field react with the fuel and change the orientation of the fuel hydrocarbons and give the new magnetic charge to engine which is give good properties better than the normal fuel properties.

III. RESULTS AND DISCUSSION

The emission translations were carried out with the help of five gas analyzer. The exhaust emissions like co, co2, hc, nox were measured at different speed conditions. The emission graphs shows the variation of curve with respect to speed. The conduct parameters are shows that with magnet fuel is give more better performance compare to without magnet. So this results are shows the better combustion of fuel of fuel. Fuels combustion is directly effect on emission of engine. The results gives the readings from exhaust gas analyser gives the effects of the gas contents of emission.

A. Magnetic Field Effect On CO Emissions:

With the appliance of magnetic field CO emissions gets reduced as compared to the CO emissions without magnetic field. Fig. Clearly shows the effect of magnetic field on CO emissions and the CO emission reduces at higher speed. CO consolidation decrease when the engine fuelled with fuel magnet than that without fuel magnet. CO consolidation increases for the two fuels at all the space of idling speed due to the incomplete combustion and the increase of heat discharge rate. The fuel actively interlink with oxygen producing a more complete burn in the combustion chamber. The experimental revealed that CO concentration is reduced up to 7%. The co vs. speed graph is as shown in fig.

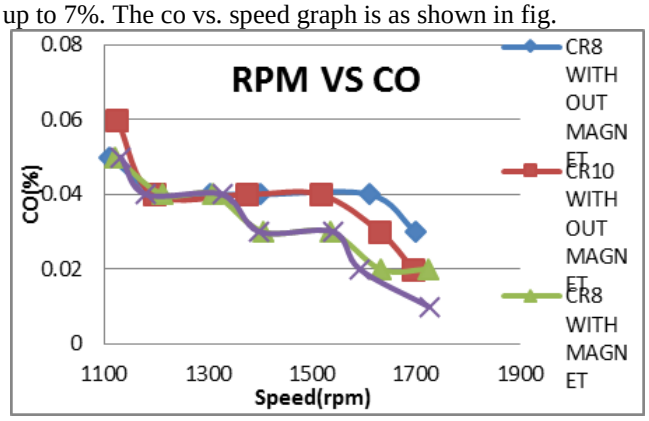

Fig. 3: Variation of CO with speed.

B. Magnetic Field Effect On NOX Emissions:

The NOX emission gets decrease with the appliance of magnetic field as compared to the NOX without magnetic field. Here the magnetic field shows adverse effect. The concentration of NO in the exhaust gases was found to decrease when using fuel magnet as than without fuel magnet. The fuel magnet makes the fuel is more receptive to oxygen, thus producing a more efficient combustion. The heat is produce inside the cylinder per unit time and cooling becomes less efficient. When the idling engine speed increases, division of N2 concentration increases due to the increase in the exhaust gas temperature. It was clear that the consolidation of NO in the exhaust gases is reduced to about 30%. The nox vs. speed graph is as shown in fig.

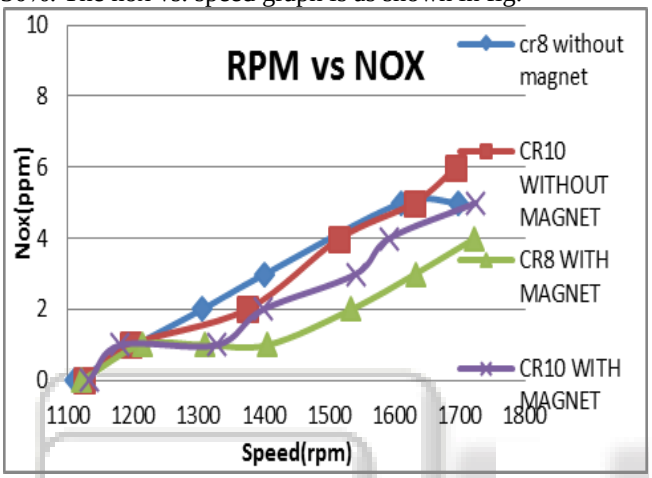

Fig. 4: Variation of NOX (ppm) with speed.

C. Magnetic Field Effect On HC Emissions:

The research work depicts the emissions concentrations of HC with speed. HC concentrations decrease when the engine feeded with fuel magnet than that without fuel magnet. HC concentration decreases for the fuel at all the range of idling speed due to the deficient combustion and the increase of heat discharge rate. Inter molecular force makes the fuel particles finely partite. This has the effect of ensuring that fuel strongly interlocks with oxygen producing a more efficient combustion in the combustion chamber. It is found that the HC concentration is reduced by about 40%. The result is less hydrocarbons. Plainly shows the effect of magnetic field on HC emissions, and the percentage reduction of HC. The HC emissions are decrease around. The hc vs. speed graph is as shown in fig.

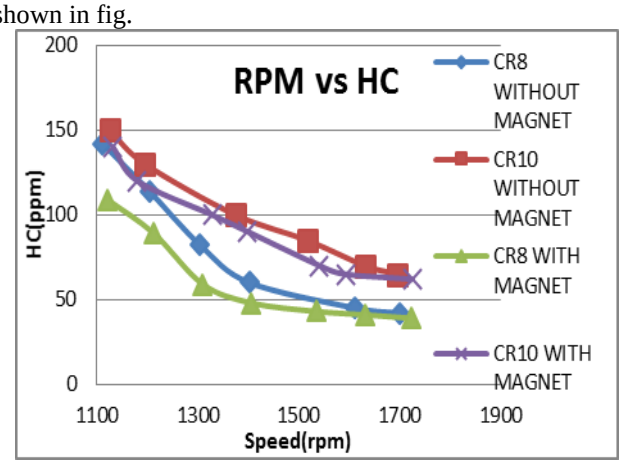

Fig. 5: Variation of HC (ppm) with speed

D. Magnetic Field Effect On CO2 Emissions:

The CO2 emission gets reduction with the appliance of magnetic field as compared to the CO2 without magnetic field. Here the magnetic field shows inimical effect. The CO2 emissions are decrease around 11% at average of all speed. The with magnet and without magnet is gives the average effect difference on the co2 concentration in emission. The complete combustion done so co2 is generated but the some average difference in the co2 emission through effect of magnetic field. The co2 vs. speed graph is as shown in fig

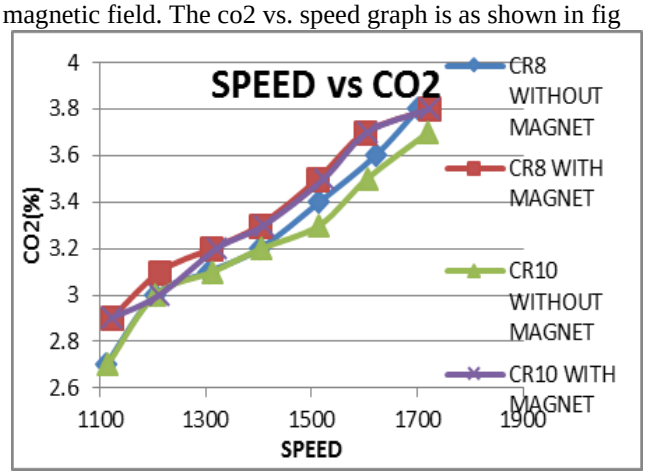

Fig. 6: Variation of CO2 with speed

IV. CONCLUSION

From the above provisionary work, it is clarion that it is worthy to use a permanent magnet on the fuel inlet line of the CNG engine. The experiments shows that the magnetic effect on fuel consumption reduction was up to 15%. CO reduction at all fiddling speed was range up to 7%. The emission of NO reduction at all idling speed was range up to 30%. The reduction of HC at all engine speed was range up to 40% By using permanent magnet on gasoline fuel feeding system connect to internal combustion engine, it is recommended to conduct this method similarly to internal combustion engines feed by diesel fuel and different alternative fuels. Then the effect of magnetism on engine performance and emissions reductions can be studied.

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