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Analysis of Fuel and Exhaust Gases of SI Engine by Using Magnet

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Abstract:
Now a days fuel becomes basic need of human beings, but due to shortage of fuel it is necessary to conserve it. Device Magnetic emission reducer helps to reduce Diesel, Petrol, Cooking gas consumption up to 28%. A magnetic emission reducer is a device which ionizes the hydrocarbon fuel. When fuel (Hydrocarbons) flows through magnetic emission reducer which contain strong magnetic field, change their orientation and molecule change their configuration. NdFeB magnetic emission reducer, which improves the performance of four strokes SI engine used before carburetor observed by test. Test studies include effect of NdFeB magnetic fields on fuel line, the engine performance like energy consumption and exhaust emissions. The exhaust gas emission measured by multi gas Exhaust analyzer. By the influence of NdFeB magnetic field 28% reduction in fuel consumption and reduction in HC, CO and CO2 polluted gases are observed. This happens because of Hydrocarbon molecules get realigned, converts para to ortho rotation hydrogen molecules and actively interlocked with oxygen during combustion to produce a near cent percent burning of fuel in combustion chamber.

Keywords: *Magnetic field, Fuel, Magnetic emission reducer, emission of gases*

1. Introduction

Now a days Automobiles sector in India grows very fast. Huge use of vehicles produces lot of pollution, releases CO,HC, CO2etc. toxics and produces shortage of fuels. To overcome this drawback Magnetic field can be used in fuel lines. Hydrocarbon fuel when used in vehicles balances carbon layers which decreases the Mileage, efficiency and wastage of fuels. Fuels can burn completely when it vaporizes and react with oxygen or mixed with air. Unburnt liquid Fuels create poisonous gases like CO, CO2, HC and mix in atmospheres produces smog. Unburnt fuel also affects directly on SI engine and decrease engine performance, combustion rate, efficiency, and power. [1]

Different techniques are available to proper combustion of fuels in engines of vehicles and reduction of polluted gas exhaust.

Hydrocarbon fuel contains Hydrogen and carbon molecules(C-H Bond).When no of atoms are stacked together produces particles. Each atom consists of proton and electron which are electrically neutral. Electron rotates around the nucleus which are tightly bound to it .outermost electron makes bonding to the neighboring atoms. In hydrocarbon fuel carbon hydrogen atoms makes covalent bonding. Electrons are attracted towards nucleus, cannot breaks its attraction and hence does not mix with oxygen during combustion process. Unburnt hydrocarbon molecules exhaust as a polluted gas.

1.1. Role of Magnetic Field in Hydrocarbon Fuel

When magnetic field produced by Niobium Iron Boron magnets influences on hydrocarbon fuel CH molecules absorbs energy and loses attraction and structure change occurs .hydrocarbon molecules converted into fine particles due to bond breaking i.e hydrogen molecules goes from para(non volatile) to orthostate(volatile)This magnetized particles contains oxygen particles which produces oxidation hence complete combustion possible and reduces emissions.[2]

1.2. Para to Ortho State Hydrogen Molecules

Fig. 1 shows the schematic view of para and ortho hydrogen molecules.

Para state- H2 molecules shows even rotational levels and spinning of two atoms are opposite to each other and behaves diamagnetic.

Ortho state –H2 molecules shows odd rotational level parallel spinning and behaves paramagnetic. [3]

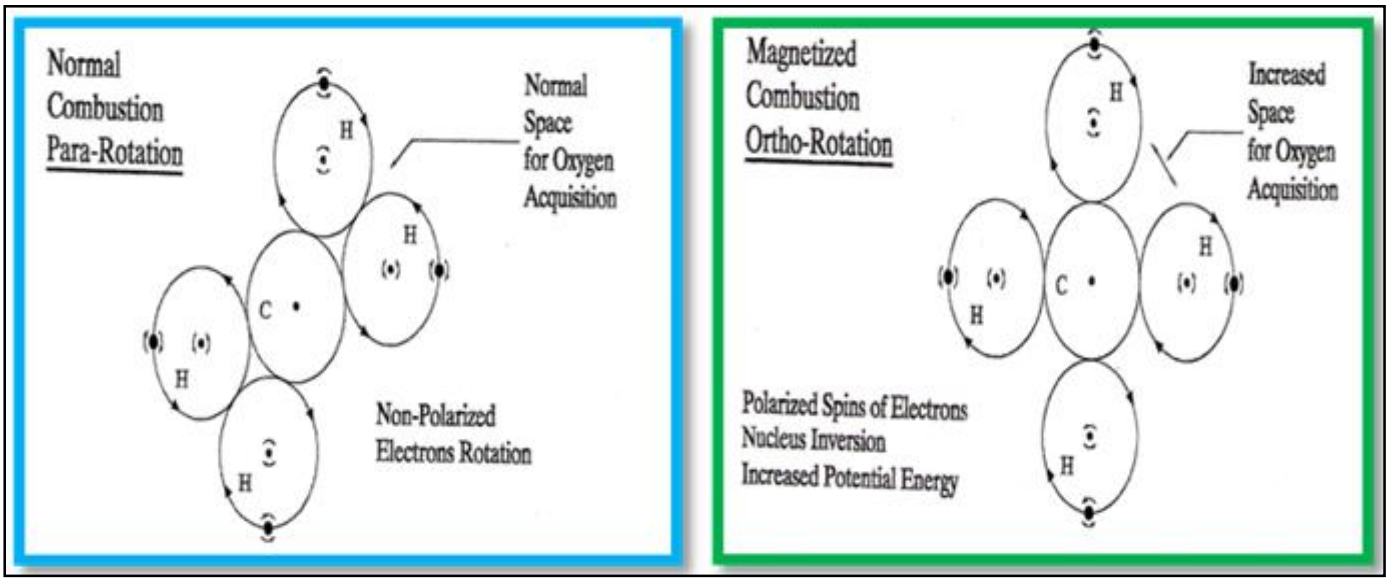

Figure 1: Schematic view of para to ortho hydrogen molecules.

2. Working Principle

In combustion process of hydrocarbon fuel, Hydrogen vital role in the combustion process. it has a dipole moment.e +ve and-ve charge hydrogen atoms are oxidized completely and carbon atoms oxidized partially which are responsible for incompete combustion in combustion chamber. During combustion hydrogen and oxygen react very fast, but carbon, oxygen are not react properly and hence less energetic. For complete combustion use of magnetic field in fuel injector over the fuel lines in automobiles are beneficial which reduces the emission of exhaust gases like CO,CO2,Nox etc. [5]

2.1. Methodology

Magnetic emission reducer is a device which contains magnetic field and ionizes the fuel being fed through it. For the production of this device NdFeB magnetic alloy are used. How this device fabricated, worked and used in automobiles its details are given below.

2.2. Magnets

Magnet is an object that produces contiuous manetic field around it which is invisible hut the effect of the magnetic field is noticible. There are many types of magnets in different range of dimension, shape and strength. The most typical magnet used in science and laboratory are made up of ferrite and Neodymium magnet.

NdFeB Magnet used for production of magnetic field in magnetic emission reducer. This type of magnets can attract with ferromagnetic material like iron cobalt nickel and also attract with opposite polarity.[6]

Neodymium and ferrite magnet are most useful in automobile magnetizer. some specification of these type of magnets which are used in magnetic emission reducer are as follows,

Utilization	Industrial Magnet/Automobile Sector
Place of birth	Zhejiang, China
Shape	Rectangular
Type	Permanent
Contents	NdFeB
Role	Reduction of exhaust emission
Strength	1.8 x10000 Gauss

Table 1: Specification of Magnet

2.3. Neodymium Magnets and Ferrite Magnets

This permanent magnet are alloys of Neodymium, Iron and Boron with a bright silver in colour. In our experiment two NdFeB magnets are used with range 1500-2000 Gauss and another 2500-2800 gauss.[7] The method preparation of Neodymium, Iron and Boron magnets is as follows,

Elements of NdFeB	Percentage
Neodymium (Nd)	29% - 32%
lron (Fe)	64.2% - 68.5%
Boron (B)	1.0% - 1.2%
Aluminum (Al)	0.2% - 0.4%
Niobium (Nb)	0.5% - 1.0%
Dysprosium (Dy)	0.8% - 1.2%

Table 2: Composition in Magnet

2.4. Preparation of NdFeB Magnets

For making alloy of NdFeB material Nd, Fe and Boron are measured and kept in a vacuum induction furnace. Some of the specific grade elements like copper, cobalt, Gadolinium and Dysprosium are added in it to aid with corrosion resistance. Due to High frequency heating process mixture melts.Cake like mixture of Neo alloy is formed. To make ingradients of alloy mixture are cooled. For the Preparation of alloy mixture in powder form, mixture breaks by hydrogen decrepitation (HD)method and then grinded into a nitrogen and inert argon. Output in the form of fine powder is formed with dimension upto3micron or less in size. This Neodymium powder was fed into a hopper to allocate the pressing to get ready NdFeB magnet. For pressing the powder there are three methods. Axial, transverse pressing and Isostatic pressing.

Die pressing tools needs to make cavity. Neodymium powder added in this cavity in the presence of external magnetic field. If the external magnetic field is parallel to the compacting force called axial pressing and perpendicular to the compacting force called transverse pressing.Transverse pressing shows greater magnetic properties for the NdFeB.

In our experiment isostatic pressing used. NdFeB powder is kept into a rubber mould and put into fluid container with maximum pressure on fluid. External magnetic field applied on compact NdFeB powder. This pressing gives a valuable magnetic performanance of NdFeB. The solenoid coil produces an external magnetic field which are set either side of compact powder. As an external magnetic field higher, magnetic behavior of Neodymium magnet higher(NdFeB).

Now this compacted magnet called green magnet is then sintered by a sintering process to give its final magnetic properties. This process carried out in Inert gas with constant temprature and time. The sentring process causes shrinkage of the magnet, as powder fused together. At the end of process the magnet cooled rapidly. Thus NdFeB magnet found with great magnetic properties. This magnet used in the magnetic emission reducer.

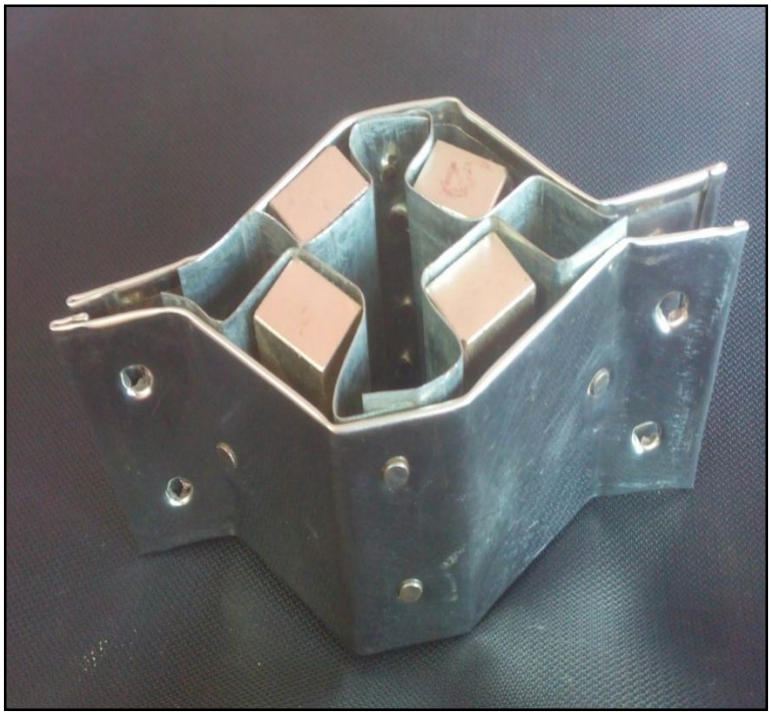

Figure 2: Magnetic emission reducer

2.5. Effect of Magnetic Field by Magnetic Emission Reducer on Hydrocarbon Fuel

Due to influence of Magnetic field hydrogen molecules of hydrocarbon fuel converts para to orthostate, changed the configuration, force of attraction between Electron and nucleus reduced and Hydrogen molecules now easily react with oxygen. Hence complete combustion of hydrocarbons are possible in combustion chamber and emission of unburnt carbon, nitrogen and sulphur are reduced. Automatically efficiency of engine and fuel are to be increased.

Figure 3: Particle orientation are changed shown in following fig.[1]

2.6. Installation of Magnetic Emission Reducer

It is installed just before the carburetor, fuel injector over the fuel line in automobiles.

It is also installed in cooking gas system it is placed before the burner.

The test was carried out on afour cylinder, vertical, four strokes. watr cooledand high speed spark ignitation engine. the engine model was manufactured by premier padmini automobile Pvt. limited India. following observation of polluted emission from exhaust are found.

3. Observation of polluted emission from exhaust

Table 3 shows polluted emission before installation of magnetic emission reducer, without magnet at 1100 rpm

Sr No.	CO(%)	HC(ppm)	CO2(%)	NOx (ppm)
1	0.93	172	9.0	108
2	0.84	166	9.1	129
3	0.57	154	9.2	186

Table 3: Polluted emission (before installation)

Table 4 shows polluted emission after installation of magnetic emission reducer, with magnet at 1100 rpm

Sr No.	CO(%)	HC(ppm)	CO2(%)	NOx (ppm)
1	0.23	133	9	100
2	0.23	120	8.8.1	97
3	0.12	96	8.6	149

Table 4: Polluted emission (after installation)

Before and after installation of magnetic emission reducer Graph of emission of CO and CO2 were plotted to compare characteristics and emissions of gases in SI engine. Fig. 4 shows the graphs of emission of HC and. emission of CO2

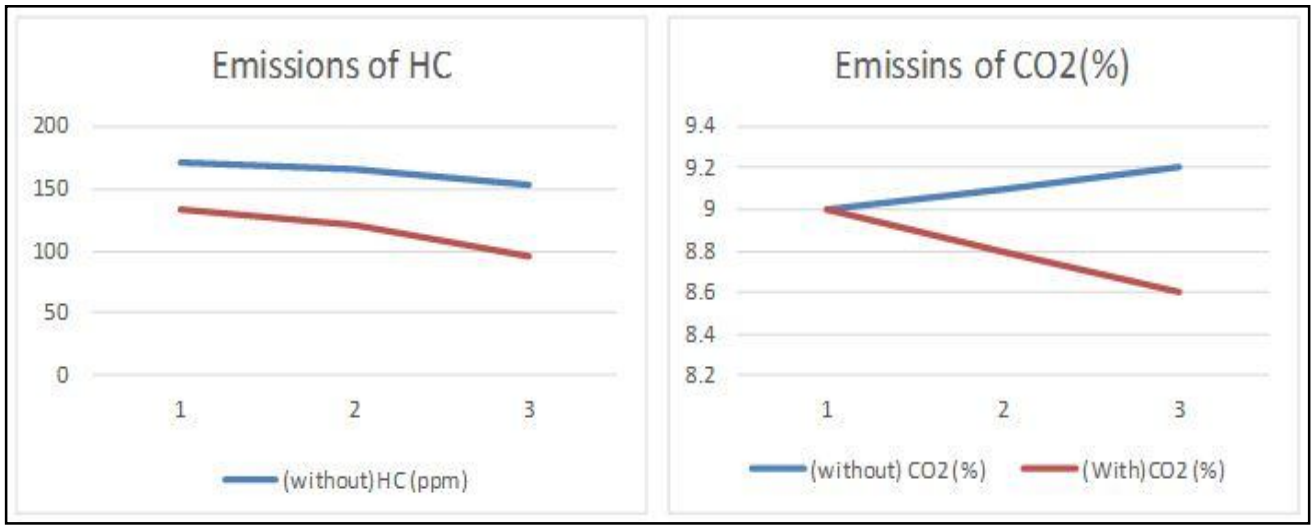

Figure 4: Emission of HC at (1100 rpm) and emission of CO2 at (1100 rpm)

4. Result and Discussion

From observations and graph with and without magnetic emission reducer gives following result regarding emission percentage of Co2 and HC.

- Percentage HC reduction upto 13.9
- Percentage co2 reduction upto .80
- Percentage CO reduction upto 52.09
- Percentage NoX reduction upto 11.29

5. Conclusion

1. By using magnetic emission reducer, hydrocarbon fuel molecules burns completely due conversion of para to ortho state of hydrogen in combustion chamber and react with oxygen. Therefore it improves the performance of SI engine in the ic engine lab and reduces emission of engine.
2. Improvement in combustion process, decreases level of emission of polluted gases like CO,NOX and CO2 of considerable change, reduces cost of fuel, reduces pollution and improves efficiency of engine.

6. References

i. Shewta jain1, Drsuhas deshmukh singhad Academy engineering, pune Experimental investigation of magnetic fuel conditionerinI.C engine ISOR journa of engineering(isorjen) ISSN2250-3021 vol2, issue 7(july 2012) pp 27-31
ii. http/magnetizerproduct.com
iii. P. Govindasamy, S Dandapani, exeperimental investigation of cyclic variation of combustion parameter catalically activated and magnetically enerzised two stroke Engine., p. govindasamy et el./journal of energy and environment, vol may 6, 2007.
iv. Ali s. FarisSaadi ,K.al naseri, Effect of magnetic field on fuel consumption and exhaust consumption in two stroke engine, Ali S.Faris es.tl/energy procedia18 (2012) 327-338
v. N.V.Hargude ,Dr S.M. sawant,Experimental investigation of four stroke engine using fuel energizer for improved performance and reduced emission, international journal of mechanical engineering and technology (IJEMET),issn 0976 6340, vol 03,issue 1,January April 2012.
vi. Nalsonsaksono, magnetizingkerosene for increasing combustion efficiency, journal technology edisi no 02 tahnun XIX June 2005, 155-162 ISSN 0215-1685.
vii. JANCZAK ANDREW and krensel Edward.1992.permanant magnet more efficient combustion and less pollution .Us Pat 5124045; internationalciass, 027/040; 553402.