Effect of Magnetic Field on Four Stroke Engine

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Abstract - *The experiment results in reduction in exhaust gas emissions in I.C. engine using magnetic field. Permanent magnets with different intensity installed on the fuel line show eye catching results. The exhaust gas emissions such as CO and HC are measured by using exhaust gas analyzer. The magnets help to disperse the hydrocarbon cluster into smaller particles which will improve the efficiency of combustion. This will maximize the combustion and thus reduce the unburned hydrocarbon in the emission.*

Key Words: (Magnetic field, Fuel line, Efficiency, Unburned hydrocarbon, Fuel consumption test, PUC test)

1.INTRODUCTION

Internal combustion engines represent the main sector of hydrocarbon fuel consumption. On the other hand, as the fuel prices have increased sharply in the past few years due to high demand therefore, engineers and researchers are now interested in improving engines performance (increasing power output and reducing fuel consumption). Many studies suggest that magnetic field has positive effect on the performance of the system. Generally a fuel for internal combustion engine is compound of molecules. Each molecule consists of a number of atoms made up of number of nucleus and electrons, which orbit their nucleus. These molecules have not been realigned, the fuel is not actively interlocked with oxygen during combustion, the fuel molecule or hydrocarbon chains must be ionized and realigned. The ionization and realignment is achieved through the application of magnetic field. Applying a magnetic field to ionizing fuel to be fed to combustion devices we can ensure more complete combustion, obtaining a maximization of the fuel economy, improving the fuel efficiency. The fuel is subject to the lines of forces from permanent magnets mounted on fuel inlet lines. The magnet for producing the magnetic field is oriented so that its South pole (red) is located adjacent the fuel line and its North pole (blue) is located spaced apart from the fuel line. It is now well accepted that a hydrocarbon fuel can be polarized by exposure to external force such as magnetism. The effect of such magnetism is the production of a moment created by the movement of the outer electrons of a hydrocarbon chain moving the electrons into states of higher principal quantum number. This state effectively breaks down the fixed valance electrons that partake in the bonding process of the fuel.

1.1 Key Features

1. Maintenance free
2. Reduces fuel consumption
3. Saving fuel to 10-15% depending on road and traffic conditions
4. Reduces emission makes more eco friendly
5. Extends life of spark plugs, carburetor jets, catalytic converter,
6. Rapid payback improves power and torque
7. Transferable
8. Easily fitted – no cutting of fuel lines

1.2 Problem Statement

According to Maharashtra Transport Infrastructure, vehicles Records in 1951 to 2016 is 21,00,23,289. In that grand total vehicles records in Maharashtra in 1951 to 2015 is 2,32,22,202. In that Grand total 15,42,97,746 is Two wheelers. The fuel price rises simultaneously with the increasing of usage.

Intergovernmental Panel on Climate Change states that global warming is caused by greenhouse gases in which humans are emitting them in variety of ways. Automobile emission holding the biggest share. Unwanted emission is resulted from incomplete combustion such as carbon dioxide, sulphur dioxide and nitrogen dioxide. This contributes to hotter exhaust gas emission

Thus, people are looking for fuel saving gadgets in order to reduce the fuel expenses but the problem is the fuel saving gadgets is very expensive.

In order to solve all these problems, I design a magnet device and analyze it in term of fuel consumption and emission by considering the weakness of the currently marketed fuel saver.

2. LITERATURE SURVEY

The energy of permanent magnets was used in this research for the treatment of vehicle fuel (Iraqi gasoline), to reducing consumption, as well as reducing the emission of certain pollutants rates. The experiments in current research comprise the using of permanent magnets with different intensity (2000, 4000, 6000, 9000) Gauss, which installed on the fuel line of the two-stroke engine, and study its impact on

gasoline consumption, as well as exhaust gases. For the purpose of comparing the results necessitated the search for experiments without the use of magnets. The overall performance and exhaust emission tests showed a good result, where the rate of reduction in gasoline consumption ranges between (-1) %, and the higher the value of a reduction in the rate of 1 % was obtained using field intensity 6000 Gauss as well as the intensity 9000 Gauss. It was found that the percentages of exhaust gas components (CO, HC) were decreased by 30%, 40% respectively, but CO2 percentage increased up to 10%. Absorption Spectrum of infrared and ultraviolet radiation showed a change in physical and chemical properties in the structure of gasoline molecules under the influence of the magnetic field. Surface tension of gasoline exposed to different intensities of magnetic field was measured and compared with these without magnetization.[1]

Vehicle on road produces large amount of CO, HC and NOx etc. as a exhaust emission. Typically I.C. engine used in automobiles have a problem of pollutant emission, which mainly depends on combustion process occurs in I.C. engines. Incomplete combustion produces large amount of emission gases & gives lower efficiency. To tackle these issues new way of fuel conditioner are developed called as Magnetic Fuel Conditioner (MFC). The present article describes the mechanism of MFC, objectives & the parameter which affects the efficiency of MFC. Further, in this report one case study is presented in which ferrite magnets are used as MFC which improves efficiency and emission. A permanent magnet mounted in path of fuel lines. Mounting magnets in fuel line enhance fuel properties such as it aligns orients, hydrocarbon molecules, better atomization of fuel (Proper mixing of air with fuel) etc. Use of such fuel conditioners improves mileage & better emission of vehicle. Finally this article also review about new emerging technology i.e. fuel conditioners, developments done across the globe[2].

3. PHYSICAL THEORY

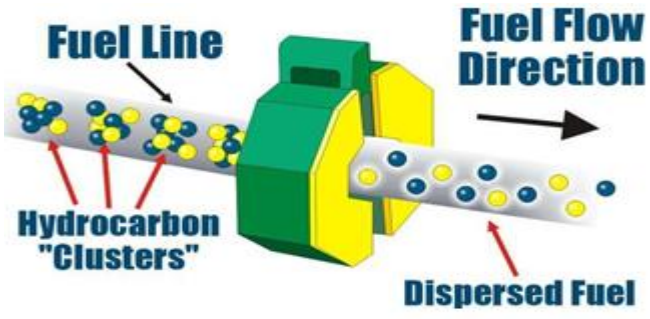

Fig.1 Mechanism of Magnet

Due to Magnetic effect on molecules, spinning electrons will absorb the energy and finally flip into alignment. Because of that cluster structure of fuel breaks i.e. bonds will break into fine particles. Now, this fine particles (C and H) having magnetic influence, which tend to adhere more oxygen electrons i.e. extra oxidation is done and ultimately complete combustion at its optimum value is obtained , hence pollution will reduced.

3.1 CHEMICAL THEORY

Particles are made up of number of atoms. In Fig. 2 shows an atom having equals number of Proton & electron in neutral charge, if greater number of electrons is there then –ve charge is obtained & if reversed then +ve charge is obtained. We are familiar with construction of fuel molecule (C--H bond).

Each electron has two movements 1) Spin & 2) orbital movement which results in mixing of fuels.

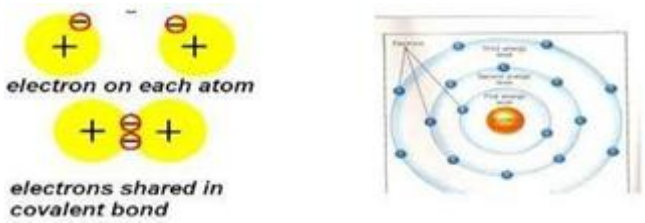

Fig.2 Basic Concept of Molecules

4. WHY NEODYMIUM MAGNET IS USED

Neodymium iron boron (NdFeB) magnet also referred as 'neo' magnets having a atomic configuration of Nd2Fe14 B. They offer the highest energy product of any material today and available in various shape, size and grades. Neo magnets have some limitations due to their corrosion behavior. In humid applications, a protective coating is highly recommended. Coating which have been used successfully include, E-coat (a liquid dip epoxy coating), dry electrostatic spray epoxy, nickel plating and combination of these coating. Changes in compositions and processing over the past improvements in corrosion resistance and high temperature performance.

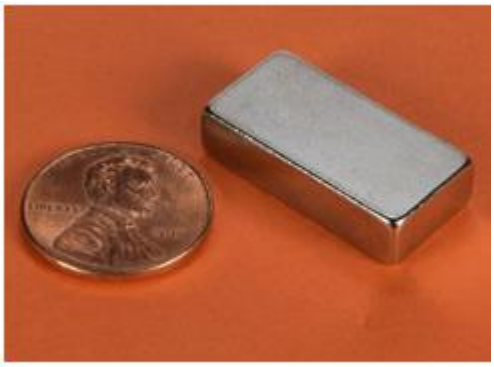

Fig. 3 N-52 Neodymium Magnet

Some important properties used to compare permanent magnets are remanence (Br), which measures the strength

of the magnetic field; coercivity (*Hci*), the material's resistance to becoming demagnetized; energy product (*BH*max), the density of magnetic energy; and Curie Temperature (*TC*), the temperature at which the material loses its magnetism. Neodymium magnets have higher remanence, much higher coactivity and energy product, but often lower Curie temperature than other types. Neodymium is alloyed with terbium and dysprosium in order to preserve its magnetic properties at high temperatures.

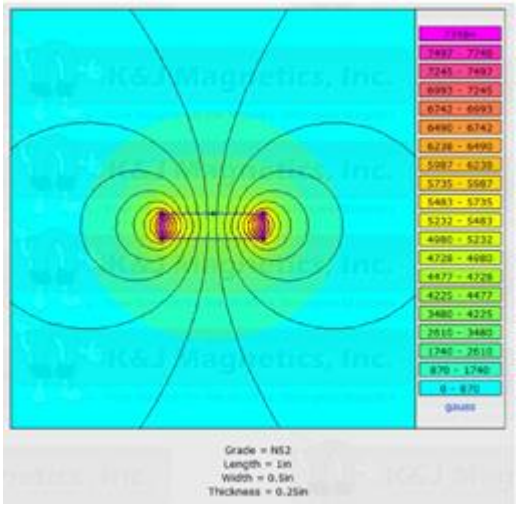

Fig. 4 Magnetic field & Guess power of N52 Magnet

5.1 SPECIFICATION OF MAGNET

Material: NdFeB, Grade N52
Type: BLOCK
Dimensions:1 x 0.5 x 0.25 thk (in)
Tolerance: All dimensions ± 0.004 in
Plating: NiCuNi
Max Op Temp: 176ºF (80ºC)
Br max: 14,800 Gauss
BH max: 52 MGOe

5.2 SPECIFICATION OF ENGINE

Engine Type: Air-cooled, 4-stroke single cylinder
Displacement : 97.2 cc
Max. Power : 5.5 Kw (7.5 Ps) at 8000 rpm
Max. Torque : 7.95 Nm at 5000 rpm
Gear box : 4 Speed constant mesh

6.1 FUEL CONSUMPTION TEST

Day	Fuel Used (in ml)	Average Time without Magnet	Average Time With Magnet
1	50 ml	9.27 min	10.52 min
2	50 ml	10.12 min	13.01 min
3	50 ml	10.01 min	12.20 min
4	50 ml	10.37 min	12.23 min
5	50 ml	10.18 min	13.08 min

Table 1- Readings of Fuel consumption Test

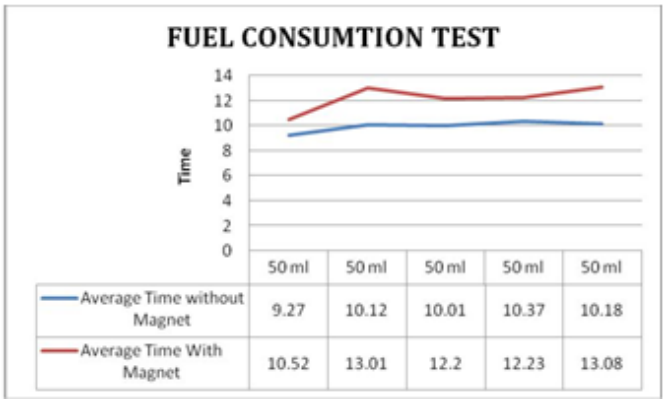

Chart-1 Fuel Consumption test

6.2 POLLUTION UNDER CONTROL TEST (PUC)

Gases	Before	After
HC	50 ppm	38 ppm
CO	0.082%	0.059%
CO2	13.70%	12.98%
O2	1.99%	2.73%

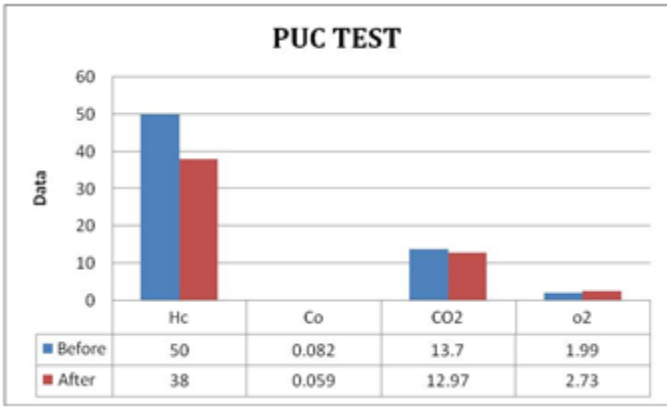

Chart-2 Pollution under test (PUC)

7. CONCLUSION

1. When fuel is exposed to magnetic field, we find that its properties changed.
2. Magnetic treatment does not need energy and thus be economically feasible.
3. Changes some properties of fuels by the magnetic field, and take advantage of some of the applications belongs to the industry and the environment.
4. Increase the efficiency of most Equipment and machinery that using Hydrocarbon fuel and reduce consumption up to 14%
5. We can understand the mechanism of magnetization fuel through the impact of external magnetic field in the microscopic structure, which is the displacement and polarized the fuel molecules.

6. Clear changes in the value of surface tension of the fuel, which used in this study and employment of these changes in the applied fields.
7. Reduce the amount of environmental pollutants in the exhaust gases up to 35-40%.
8. Increase the Efficiency of the machinery 5-15%
9. Life of the machine or machine Parts is increase because of the effect of magnetic field.
10. Both CO and HC concentrations were reduced in the case of the usage of the magnetic field.

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