Volume : 5 | Issue : 5 | May 2016 • ISSN No 2277 - 8179 | IF : 3.508 | IC Value : 69.48

Performance Analysis of Single Cylinder CNG Engine Under The Influence of Magnetic Fuel Energizer

Engineering

KEYWORDS : CNG engine, strong permanent magnets, magnetic field

Ankit R Bhoye	ME Scholar, Department of Mechanical Engineering, Gujarat, India
Mr.Parth H Patel	Professor, Department of Mechanical Engineering, Gujarat, India
Dr.Tushar M Patel	Associate Professor, Department of Mechanical Engineering, Gujarat, India
Mr.Gaurav P Rathod	Assistant Professor, Department of Mechanical Engineering, Gujarat, India

ABSTRACT

At a modern time the research works are focused on the effect of magnetic field on the performance of single cylinder four stroke CNG engine. The study concentrates on the effect of magnetic field on the engine performance parameters such as break thermal efficiency, fuel consumption, exhaust emissions and on fuel properties like density and calorific value2. The magnetic field is applied at the fuel inlet pipe. The magnetic field is achieved by the help of y grade ferrite strong permanent magnets. The experiments are conducted at different engine speeds conditions. At the different speed and various compression ratios the result of the engine performance is increased more than the without magnet too with magnet performance. The engine mechanical efficiency is increased, specific fuel consumption is less, the brake thermal efficiency and indicated thermal efficiency also be increased with the magnetic fuel.

INTRODUCTION

Any magnetic material that has a magnetic field. The effect magnetic field of the biological and mechanical systems is the aim of study from last few years. Many research suggest that magnetic field has positive effect on the performance of the engine performance. The study related to the effect of magnetic field on the fuel properties of I.C engine is gaining importance in order to reduce the fuel consumption and the engine emissions[2]. Since fuel of I.C engine is a complex molecular adjustment of hydrocarbon as fuel mainly contents of hydrocarbons. The simplest of hydrocarbon is methane. The chemical composition of methane is ch4. It has the major (90%) content of natural gas (fuel) and an important source of hydrogen. The higher amount of releasable energy achieved hydrogen atom. It is proposed to study the effect of magnetic field on the internal combustion engine by using the CNG gas as fuel.

Effect of magnetic field on fuel molecule

Hydrogen exists in two distinct isomeric forms para and ortho. It is characterized by the different opposite nucleus spins. The ortho state of hydrogen has more efficient than para state for complete combustion. The ortho state can be obtain by apply strong magnetic field at the fuel line. Hydrocarbon molecules form clusters, it has been possible to enhance van der waals' discovery due to the usage of the magnetic field, a high power, permanent magnetic device strong field sufficient to break bonds, i.e. De-cluster these hc associations, so maximum space acquisition for oxygen to combine with hydrocarbon[2]. Thus, when the fuel pass from magnetic field, created by the strong permanent magnets, the hydrocarbon arranged their orientation (para to ortho) and molecules of hydrocarbon change their configuration, at that time inter molecular forces are appreciably diminished. This mechanism helps to disperse fuel particles and to become finely divided.

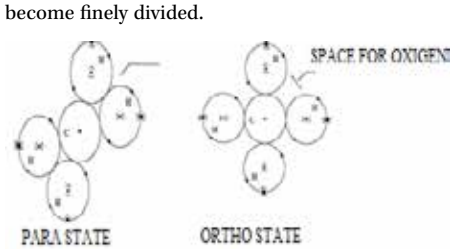

Figure 1: schematic view of para and ortho state of hydrogen[2]

This has the effect of assuring that the fuel, actively interlocks with oxygen and producing a more complete burn in the combustion chamber. Fig.1indiate the hydrocarbons changed with the effect of magnetic field and they are more dispersed.

EXPERIMENTAL SETUP

The performance tests are performed on a single cylinder, four strokes, water cooled si engine. The setup consists of CNG engine, an eddy current dynamometer, strong permanent magnets, control panel, exhaust gas analyzer. The experimental setup is as shown in figure2.

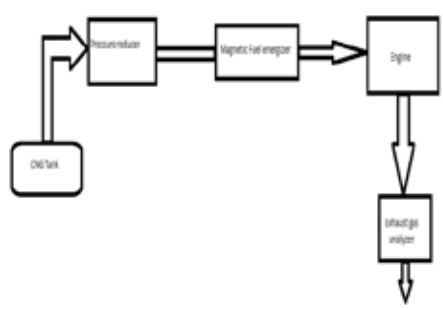

Figure 2 : schematic diagram of experimental setup

TEST ENGINE:



Figure 3: photographic view of test engine[3].

The performance tests were carried out on a single cylinder, four stroke water cooled CNG engine. The setup consists of an engine, an eddy current dynamometer, and an exhaust gas analyzer[2].

Table – 1
Test engine specification

Model	TV1
Make	Kirlosker Oil Engines
Type	Four stroke, Water cooled, petrol
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

MAGNETIC FUEL ENERGIZER



Figure 4: photographic view of magnetic fuel energizer

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

Experiment procedure

- Check the SI engine in the normal and running condition.
- Attached the CNG Kit to the engine.
- Attached the all electrical supplies are connected with the board and on the supply.
- The CNG gas tank is attached to the CNG kit and pressure regulator to reduce the pressure of gas.
- The experiment is do in two parts first is without magnetic fuel energizer and second part is with magnetic fuel energizer.
- After all setup open the cooling supply valve for engine cooling and note the cooling flow through the rota meter.
- Set the compression ratio at 8 and set the load at 2KG.
- Start the engine and run some minutes at the normal conditions.
- Take readings with the computerized program on different speed.
- After taking all readings at compression ratio 8 change the compression ratio and set at 10. same procedure for taking a readings.
- Now the second part of experiment that the readings with magnetic fuel energizer. Attached the magnetic fuel energizer at the fuel inlet pipe.
- After setup the engine with magnetic fuel energizer take the readings like above process.
- After the readings taken the engine stop.
- Taking some time after the stopped engine the cooling water supply also be stopped with closing the valve.
- OFF the all electrical supply and remove it.

RESULTS AND DICUSSIONS

The experiments are carried out on engine with and without application of magnetic field. The effect of magnetic field on the engine performance is followings,

Magnetic field effect on Specific fuel consumption

The experimental outcomes show that the specific fuel consumption of engine was less when the engine with magnet than that without fuel magnet at higher speed. Always less amount of fuel was consumed with the fuel with magnetic field. Through the experimental results indicate that the magnetic energized fuel is burnt better and gives better combustion and better economy to engine. The SFC vs speed graph is as shown in fig.

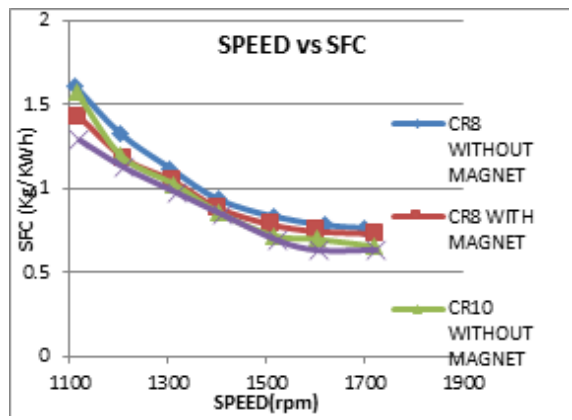

Figure.5 Variation of Specific fuel consumption with speed

Magnetic field effect on Brake Thermal Efficiency

As the fuel consumption rate reduces with the employment of magnetic field the brake thermal efficiency goes on increasing. The results show that the Brake Thermal Efficiency of engine was less when the engine running without magnet compare to with magnet at different speed. At the different speed the brake thermal efficiency is less when the engine without magnet to with magnet. The different compression ratios gives different curves for the brake thermal efficiency. The BTE vs SPEED graph is as shown in fig.

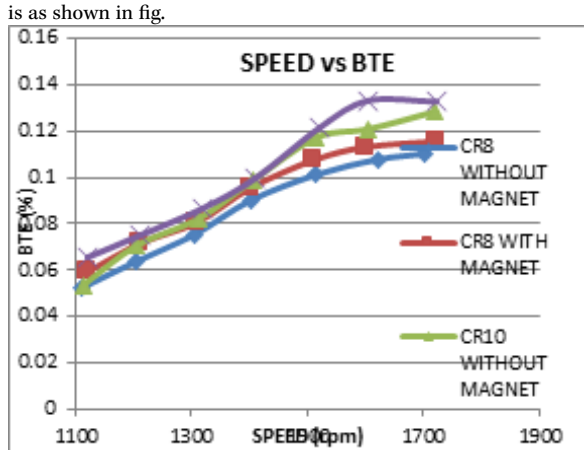

Figure 6: Variation of brake thermal efficiency with speed

Magnetic field effect on Indicated Thermal Efficiency

The experimental results shows that variation of indicated thermal efficiency at the different speed that the magnetic energized fuel is more effective. The indicated thermal efficiency of engine was less when the engine with magnet than that without fuel magnet. The indicated thermal efficiency varies with the different compression ratio set on engine. The fig. shows that the different curves for the different compression ratio at the various speed. The indicated thermal efficiency is more effective with magnet than without magnet experiment set. The indicated thermal efficiency vs speed graph is as shown in fig.

Volume : 5 | Issue : 5 | May 2016 • ISSN No 2277 - 8179 | IF : 3.508 | IC Value : 69.48

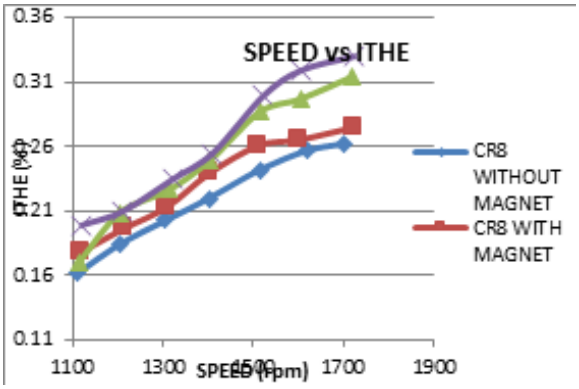

Figure 7: Variation of indicated thermal efficiency with speed

Magnetic field effect on Mechanical Efficiency

The result suggest that the magnetic field is done a some incremental in the mechanical efficiency. This effect are reason of the complete combustion f the fuel and improve of the fuel properties. The graph of speed vs m.eff is in the fig.

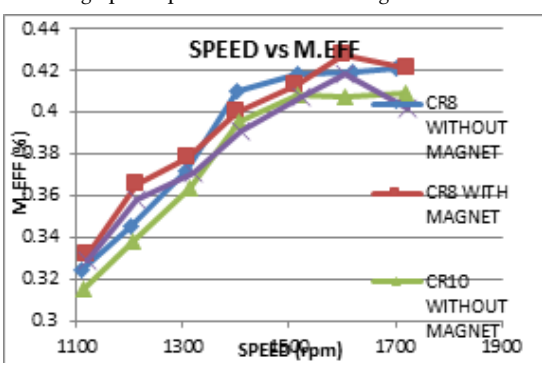

Figure 8: Variation of mechanical efficiency with speed

CONCLUSIONS AND RECOMMENDATIONS

There is increase in brake thermal efficiency due to the less of fuel consumption. The experiments shows the magnetic effect for fuel consumption reduction is up to 12%. Co reduction was range up to 11%. The effect on no emissions reduction range up to 19%. The reduction of hc emissions was range up to 27%. It is recommended to conduct this method used for internal combustion engines fuelled by alternative fuels and bio gas as well. By varying the strength of magnet one can perform this experiment for better economy.

REFERENCES

1. Aslam, M. U., Masjuki, H. H., Kalam, M. A., Abdesselam, H., Mahlia, T. M. I., & Amalina, M. A. (2006). An experimental investigation of CNG as an alternative fuel for a retrofitted gasoline vehicle. *Fuel*, *85*(5), 717-724.
2. Ugare, V., Phobale, A., & Lutade, S. Performance of internal combustion (CI) engine under the influence of strong permanent magnetic field. Assistant professor Sit Lonawala, India, Assistant professor VNIT Nagpur, Lecturer DBACER Nagpur.
3. Patel, P., Rathod, G. P., & Patel, T. (2014). Performance and Emission Analysis of Single Cylinder Diesel Engine under the influence of Magnetic Fuel Energizer. *J. Mech. Civ. Eng*, *11*, 34-39.
4. M.I.Jahirul, H.H.Masjuki, R.Saidur, M. A. Kala, M. H.Jayed (2010) "Comparative Engine Performance & Emission Analysis Of CNG Fuelled Engine" Applied Thermal Engineering 30(2010).
5. Hassan, M. K., Aris, I., Mahmod, S., & Sidek, R. (2010). Influence of injection and ignition of CNG fuelled direct injection engine at constant speed. *Australian Journal of Basic and Applied Sciences*, *4*(10), 4870-79.
6. Chandra, R., Vijay, V. K., Subbarao, P. M. V., & Khura, T. K. (2011). Performance evaluation of a constant speed IC engine on CNG, methane enriched biogas and biogas. *Applied Energy*, *88*(11), 3969-3977.
7. Munde Gopal, G., & Dalu Rajendra, S. Experimental Study on SI Engine At Different Ignition Timing Using CNG And Gasoline-20% n Butanol Blend.
8. Heywood, J. B. (1988). *Internal combustion engine fundamentals* (Vol. 930). New York: Mcgraw-hill.
9. Kowalewicz, A. (1984). Combustion systems of high-speed piston IC engines.
10. Semin, R. A. B. (2008). A technical review of compressed natural gas as an alternative fuel for internal combustion engines. *Am. J. Eng. Appl. Sci*, *1*(4), 302-311.
11. Semin, R. A. B. (2008). A technical review of compressed natural gas as an alternative fuel for internal combustion engines. *Am. J. Eng. Appl. Sci*, *1*(4), 302-311.
12. Poulton, M.L., 1994. Alternative Fuels for Road Vehicles, Comp. Mechanics Publications, UK.
13. Shashikantha., Parikh P.P., 1999. Spark ignition producer gas engine and dedicated compressed natural gas engine-Technology development and experimental performance optimization, SAE Technical Paper 1999-01 3515.