THE REVIWE ON FUEL INJECTION SYSTEM IN IC ENGINE

Heena Naik[1], Prakash Kumar Sen[2] , Gopal Sahu[3]

[1]*Student, Mechanical Engineering, Kirodimal Institute of Technology, Raigarh (C.G.)*

[2,3]*Lecturer, Mechanical Engineering, Kirodimal Institute of Technology, Raigarh (C.G.)*

Abstract- **Fuel injection is systems for supplying high pressurize fuel to maximum mixing of fuel with air in an internal combustion engine. In Direct Injection (DI) System the fuel is injected directly into a combustion chamber formed in the cylinder itself. In Indirect Injection the fuel injected by some arrangement either be based on the throttle body injection (TBI) or multi-port injection (MPI).The injection system is affect the engine performance and emission and noise . In this paper performance test of engine in different load condition and the emission control in IC engine. The Fuel economy can be obtained by adjusting air fuel ratio to the acting different load condition.**

Index Terms- **Fuel, Emission, combustion, load, air-fuel ratio**

I. INTRODUCTION

The fuel injection system is one of the most important systems in IC engine. It meters the fuel delivery according to engine requirements, it generates the high injection pressure required for fuel atomization, for air-fuel mixing and for combustion and it contributes to the fuel distribution in the combustion system hence it significantly affects engine performance emissions and noise. To increase engine efficiency there is a need to develop fuel supply systems which would lead to the complete fuel combustion in engine cylinder producing maximum power. In gasoline engines, the fuel is first mixed with air, and the resulting mixture is delivered to the cylinders. In a diesel engine, the fuel injected directly into the combustion chamber (direct injection) or into a smaller connected auxiliary chamber (indirect injection) Fuel injection for engines can be defined by its fuel-injection location such as direct in-cylinder injection (DI) and port-fuel injection (PFI).:

i. Direct Injection
   Fuel is injected directly into the main combustion chamber. The engines would have either one main combustion chamber or a divided combustion chamber made up of a primary and secondary chamber.

ii. Indirect Injection
   Fuel is injected into the secondary chamber of engine with a divided combustion. The fuel injection arrangement can either be based on the throttle body injection (TBI) or multi-port injection (MPI).(1)

II. FUEL INJECTION IN SI ENGINE

In the SI engine carburettors is used to control the fuel flow rate applied to combustion chamber. It mixes fuel with air to be a combustible mixture inside intake manifold before leading to engine. The air –fuel ratio (AFR) is adjusted depend on load and working condition of engine (cold start, idle, cruise, etc.) by different venturi systems. The choke is often shaped like a tube with a converging –diverging venture section. In this restricted section, the air flow's velocity becomes higher therefore the air pressure will be lower, causing the influx of fuel upwards through the jets and orifices. Carburetor works on the principle of pressure difference for sucking the fuel through a miniature tube, which releases small droplets of fuel into the air. After mixing the fuel air mixture is injected into the cylinder in suction stroke.(2)
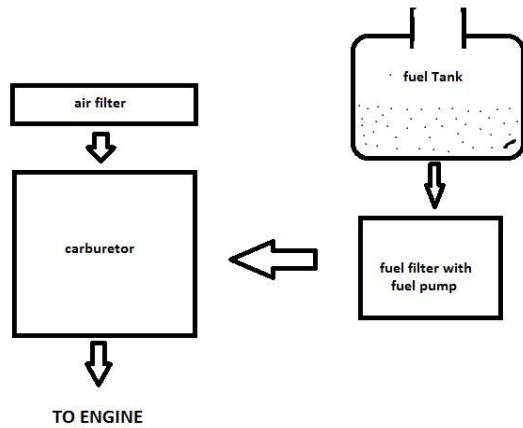
Fig.2.1. Fuel Injection In SI Engine

III. FUEL INJECTION IN CI ENGINE

In The fuel-injection system in CI engine, the injection pump generates the pressure required for fuel injection. The fuel under pressure is forced through the high-pressure fuel injection tubing to the injection nozzle which then injects it into the combustion chamber where the air is compressed. The fuel-injection system includes the following components and assemblies: the fuel tank, the fuel filter, the fuel supply pump, and the injection nozzles.(3)
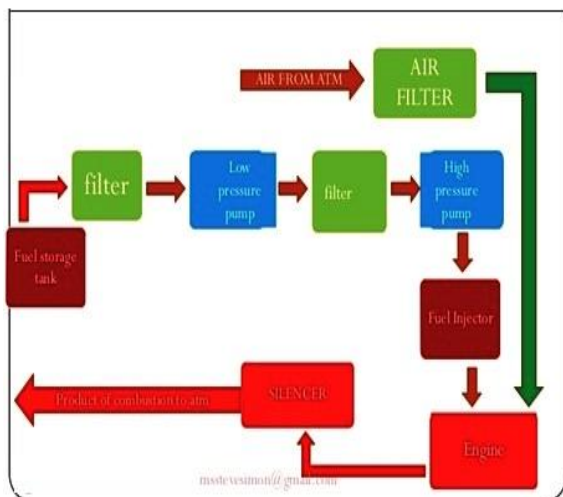

Fig.3.1. Fuel Injection In CI Engine

IV. PERFORMANCE TEST

Check all the engines system like cooling system, fuel system and attachment of rope Brake dynamometer.
• The fuel which is weighted at outside is filled up in the fuel tank.

• Insert the ignition key and start the engine by cranking.
• First the engine should be run on No-load Condition and note down the time of start of engine.
• The idling (No load mode), is adjusted by the adjustable screw provided at the throttle body in such a way that the speed of the engine during idling is maintained about 1500 rpm.
• Then allow the engine to run on this condition up to one hour and after one hour shut off the engine.
• Then the door of the fuel tank is opened and remaining fuel in the fuel tank is drawn outside and weighed again.
• Note down the fuel consumption of engine on idling condition during one hour running.
• Then 10 Kg weight is applied on the rope brake dynamometer, by adjusting the dead weight on the rope so that the net load on the engine (W –S) = 10 Kg, where W = Dead Weight (L * 9.81) N. and S = spring Pull (N) in running condition of engine at 1500 rpm constant.
• Then again the fuel tank is filled with the weighted fuel and allows the engine to run on same condition for one hour.
• After one hour shut-off the engine and drawn out the remaining fuel from the fuel tank by opening bottom door and weighted it.
• Note down the fuel consumption of engine on 10 Kg. load condition during one hour running.
• Repeat the same procedure for applying the load 20, 30 and 40 Kg. successively and note down the fuel consumption for 1 hour running of engine.(4)

V. EMISSION CONTROL

CO emission is varies depending on air /fuel ratio. It is high at rich mixtures. Since engines operate with lean mixture at part loads and stoichiometric mixture at full load, CO is not a problem for these engines. In engine, due to the wetting of the piston and the cylinder walls with liquid fuel, HC emission can increase. Hydrocarbon (HC) emissions are a function of engine temperature and, therefore it can rise during cold start. The cold starts characteristics vary depending on the fuel distribution characteristics, the in-cylinder air motion, fuel vaporization, and fuel-air mixing. Soot emission can occur at very rich mixtures. If mixture formation do not realize at full loads due to rich mixture, the soot emission can increase. In order to satisfy emission norms three-way catalytic converter to convert the CO, HC and

NO_X in the engines in used. But, NOx cannot be completely converted to harmless gases at lean mixture operation. Therefore, engines with lean mixture also require a NOx storage type catalytic converter to convert the NOx. Therefore an exhaust gas recirculation system is used for NOx. Using rich mixture CO gas is formed. It releases the NOx by reacting with the components such as Ba and Ca and then reacts with NOx to form CO_2 and N_2.Thus converting NOx to harmless N2 gas.(5)

VI. RESULT

The injection system is reduced response time to rapidly changing inputs e.g. rapid throttle movements and delivers to an accurate and equal mass of fuel to each cylinder of the engine. Dramatically improving the cylinder-to-cylinder distribution of the engine. The emission of the engine is control by proper fuel air ratio into combustion chamber in different load condition.. In the performance testing the following result is obtained which are shown in below

Load on engine(kg)	Speed of engine (rpm)	Fuel Consumption(kg\h)
No load	1500	3.05
10	1500	3.32
20	1500	3.57
30	1500	4.12
40	1500	4.88

Fig. Performance Test Table

VII. CONCLUSION

In this paper the fuel injection of IC engine is shown, the injection and the fuel spray characteristics connected with the combustion chamber geometry control the Combustion and pollutant formation processes. After performing test on a Engine we can reduce the fuel consumption of engine up to little extent but definite amount and the power available at the shaft can be saved . The GDI injection systems have become popular due to their potential to reduce toxic, CO2 emission and fuel consumption to comply with environmental protection norms. The using of suitable fuel ratio the emission of harmful gases are change harmless gases like N_2 and CO_2.

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