

FUEL INJECTION TESTING EQUIPMENT

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Abstract- This paper consist of fuel injection testing injector tester consists of a small tank, pump, pressure gauge and handle. There is a separate bowl for receiving the fuel sprayed from the nozzle. The injector to be tested is fitted in the injection testing equipment.

The fuel injection is use for internal combustion engine. its only used in compression ignition (CI) engine. The constant fuel supply as well as air supply in the combustion chamber (CC) .There air-fuel mixture and ignition is produce in combustion chamber.

Fuel Injection is a method of fuel delivery into an internal combustion engine that offers several advantages over the standard carbureted engine. Chiefly, fuel injection gives the user direct control over the amount of fuel being injected into the engine, no mater how much air is being drawn in. This gives the user large control over efficiency by allowing the user to control fuel delivery based on input variables such as engine temperature, speed, and throttle position. It is well known that injection strategies including the injection timing and pressure play the most important role in determining engine performance, especially in pollutant emissions. However, the injection timing and pressure quantitatively affect the performance of diesel engine with a turbo charger are not well understood.

Keywords – Fuel, Injector, Nozzle, Fuel Injector, Fuel Pump..

1. INTRODUCTION

The fuel injection equipment is the essential component for the proper working of the diesel engine. The function of the fuel injector is to disperse the fuel through compressed charge of air in the engine cylinder. Proper functioning of injector should be ensured for proper functioning of engine as fuel injector has to spray fuel uniformly.

The injector tester consists of a small tank, pump, pressure gauge and handle. There is a separate bowl for receiving the fuel sprayed from the nozzle. The injector to be tested is fitted in the injection testing equipment. A valve which is used to control the fuel is first opened, and then the handle is pressed downward. The downward movement of the handle causes the fuel to be sprayed through the injector. The reading in the pressure gauge shows the atmospheric pressure. If this pressure is equal to the pressure specified by the manufacturer, then the injector is a good one. If the pressure is either more or less, the spring in the injector should be accordingly adjusted.

2. LITERATURE REVIEW

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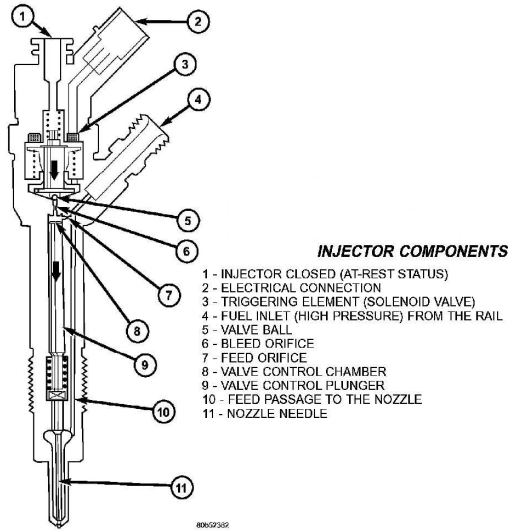
proper functioning of engine as fuel injector has to spray fuel uniformly[1] In this study, it has been tried using the change of fuel injection time at the set work steps: before top dead center (BTDC) and after top dead center (ATDC) in order to achieve optimum emission and power in specific point

At this present work, the effects of time injection on combustion and pollution of a DI diesel engine have been investigated with using multi-dimensional CFD code AVL-FIRE. The calculations were based on the described conditions[2]

3. ABOUT THE FUEL INJECTOR

The fuel injector assembly consist of 1) needle valve 2) compression spring 3) nozzle 4) an injector body.





The valve will open when from the fuel pump acting on the shoulder of needle valve overcomes the spring compression. As the needle valve lifts, oil flows through the lower chamber of the atomizer. The extra area of the needle miter is now subjected to pressure causing the needle to lift allowing the fuel to pass through high pressure through atomizer holes into the combustion chamber. When the fuel pump cut off pressure, the valve will close under spring compression. Since the needle is now exposed to pressure closing of valve will now occur at pressure lower than at which it is opened. The action of the needle valve must be rapid and positive without leakage. Injector spring compression is adjusted under test and a compression ring is fitted. It is set to allow the needle valve to open at pre-determined fuel pressure.

4.EXPERIMENTAL SET UP

In fuel injection testing equipment consist of storage of fuel tank, pressure gauge for measuring pressure, non return valve for prevent backward flow of fuel, ON/OFF valve for controlling fuel supply trough PU tube to the injector, timer circuit and stand.

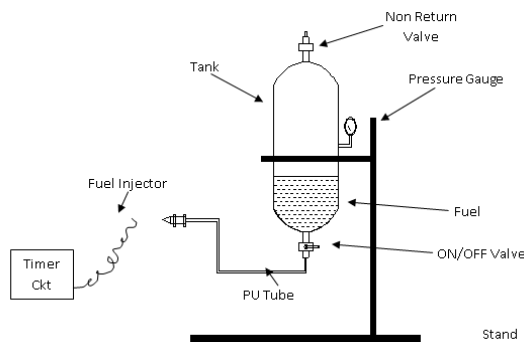


Fig.3diagram of Fuel injection testing equipment

5.WORKING PRINCIPLE

The compressed or pressurized air is given to the input supply of this fuel injector testing equipment. The inlet valve is opened and the inlet pressure is noted down. The fuel tank contains the some amount of fuel to conduct the testing operation. The outlet gate valve is opened and the outlet pressure is noted done with the help of outlet pressure gauges. The fuel injector is fitted to the holder with the help of suitable arrangement. The 12v power supply is given to the fuel injector coil. The coil gets energized to open the nozzle hole so that the pressurized fuel sprayed by the injector nozzle. That sprayed pressure is noted, this is compare to the company pressure specification so that the injector is tested.

6.TEST AND ADJUSTMENT OF INJECTOR

Three test are done on injector testing equipment to test an injector

6.1 Pressure test:-

Clamp the injector on the tests and operate the test pump. Note the reading of the dial indicator at which the injector nozzle starts spraying. It gives pressure reading. It should be the same as recommended by the company. If, it is less, then tighten the adjusting screw. Repeat the process until the correct pressure reading is obtained. Finally, tighten the lock nut.



The standard pressure is (35pa to 60pa) but (35 to 40pa) is good i.e injector spray is good.

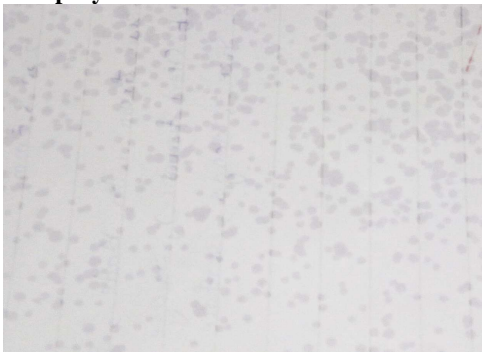
6.2 Leak-off test:-



Clamp the injector on the tester and build up the pressure about 150 kg/cm² by operating the tester pump. Keep this pressure for about ten seconds. If the pressure drops, it shows that there is leakage in the injector. Check the nozzle seat and nozzle valve needle and nozzle body. Correct the seat and needle by grinding and lapping, and after that again do the leak-off test.

In this test, there is no accurately rounded spot on the paper therefore fuel injector nozzle is not good.

6.3 Spray test:-



Spray test is also done on the same injector-testing machine. While operating the tester pump, see

carefully the spray. It should not be like a current of oil, or with drops splitting away, but it should be fully atomized.

In this test, during the performing test we found that the accurately rounded spot on the paper. So fuel injector nozzle is good.

7.SELECTED PARTS WITH QUANTITY FOR INJECTOR SYSTEM

Sr. no.	Parts	Quantity
1	Frame stand	1
2	Fuel injector	1
3	Electronic control unit(ECU)	1
4	tank	1
5	Pressure gauge	1
6	Non return valve	1
7	ON/OFF valve	1
8	Connecting wire	1
9	Bolt and nut	1

8. FUNCTIONS OF INJECTOR COMPONENTS



9. FUNCTIONS

- Atomized fuel received under high pressure in the combustion chamber
- Mixture formation of efficient combustion

Spray direction

Spray penetration

- Sharp beginning and end of fuel injection to reduce emissions and smoke
- Locate the nozzle in correct position in the combustion chamber
- Set and retain opening pressure

10. ADVANTAGES

1. Repairing is easy.
2. Replacement of parts is easy.

3. No Oil wastage

11.DISADVANTAGES

1.The Air fuel ratio and mix of that will be excellent in a carburetor than a direct Injection system.

2.there may be more of unburned hydrocarbon .

12. APPLICATIONS

1. Four wheeler Diesel Engine Application

2. In Automobile Quality control unit

3. Two wheeler Application.

4. Commercial generator

RESULT

1. In the pressure test ,the standard pressure is (35pa to 60pa) but (35 to 40pa) is good i.e injector spray is good.

2.In leak-off test, there is no accurately rounded spot on the paper therefore fuel injector nozzle is not good

3. In spray test, during the performing test we found that the accurately rounded spot on the paper. So fuel injector nozzle is good

CONCLUSION

The fuel injection equipment is the essential component for the proper working of the diesel engine. The function of the fuel injector is to disperse the fuel through compressed charge of air in the engine cylinder. Proper functioning of injector should be ensured for

proper functioning of engine as fuel injector has to spray fuel uniformly. By this project we could learn the construction, design, working operation and calibration of fuel injection instrument fuel injectors, nozzle, testing of nozzles and timing of injection.

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