Faculty of Engineering Technology

FABRICATION OF ELECTRONIC FUEL INJECTOR TESTER FOR EDUCATION PURPOSE

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FABRICATION OF ELECTRONIC FUEL INJECTOR TESTER FOR EDUCATION PURPOSE

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To my beloved family

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ABSTRACT

"Fabrication of Electronic Fuel Injector Tester for Education Purpose" is a project that aimed to solve the problems occurred at workplace. It also helps students in higher education whereby they often encounter with difficulties in their learning session because of the problem with the injector. This injector tester is invented with lower cost besides it is easy to use. As a result, this tool can be used as teaching aids in order to understand how injectors work. In addition, it is also able to distinguish between injectors that normally functioning and vice versa. With the invention of this electronic fuel injector tester, it helps to facilitate the work in the workshop and to help students for easier understanding about how injector working in educational purpose.

ABSTRAK

"Fabrication of Electronic Fuel Injector Tester for Education Purpose" merupakan satu projek yang bertujuan membantu menyelesaikan masalah yang dihadapi di tempat kerja. Begitu juga masalah yang sering di hadapi oleh pelajar di institusi pengajian tinggi dimana mereka sering menghadapi masalah dalam pembelajaran fungsi penyuntik bahan api. Alatan penyuntik bahan api ini direka dengan kos yang lebih murah selain ianya mudah untuk digunakan. Sebagai hasilnya, alat ini boleh dijadikan sebagai alat bantuan mengajar bagi memahami cara penyuntik bahan api berkerja. Selain itu juga, ianya dapat membezakan antara penyuntik bahan api yang berfungsi secara normal atau sebaliknya. Dengan terhasilnya projek penyuntik bahan api ini, ia membantu untuk memudahkan kerja di bengkel dan untuk membantu pelajar untuk pemahaman lebih mudah tentang bagaimana penyuntik bekerja dalam tujuan pendidikan.

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INTRODUCTION

1.1 Project Background

This project focuses on electronic fuel injector tester fabrication with schematic diagram and dimensions derived from Computer Aided Three Dimensional Interactive Applications (Catia) for development of the fuel injector tester. Fuel injector tester to be able to identify injector having after long time of operating in harsh and hot condition is blockages. This project was implemented to help workers in the workshop and the students in their learning sessions.

1.2 Objective

The project is to help solve problems that are often encountered in the workplace and the problems often faced by students at the institute about injector working in education.

The objective of this project as list below :

- To study about injector
- To design and fabrication a fuel injector test machine with a minimum cost
- To testing the product about differentiate between the injector is functioning normally or vice versa.

1.3 Scope

The scope of this project is to facilitate the work in the workshop for discovery the problem of injector. Students also encounter problems when the subject of their studies due to a problem on the injector. Therefore, I have developed my project to overcome it.

- Fabrication a fuel injector test machine with a minimum cost
- Fabrication for light vehicle injector (660-2000cc).

1.4 Problem Statement

Among the problems faced were the injector blockages and problems to do the work and they often face the same problems to ensure injector that in normal circumstances. The study was conducted found a problem that is often faced test injector is as follows:

- Difficult to identify faulty injectors
- There are various types of injectors, has a limited tool for testing.
- Students also do not understand how the system works.
- EFI system disturbances during lessons.

CHAPTER 2

LITERATURE REVIEW

Literature review is one of the earlier exploration processes to facilitate in the process of introducing the new technique for the course of action of design and analyse the electronic fuel injector tester for education purpose.

2.1 Introduction

Among the methods of our research group is the basis also use the internet to get the appropriate information. Using methods like this, a lot of advantages compared with other methods for:

a. A variety of information can be compared with each other.
b. Information will be received more quickly and easily.
c. Information on the internet together with more precise and important information and images.

The carburetor is a words "carburetor" comes from the French that carbure meaning 'carbide' or 'combines with carbon. Carburer also intends to join the carbon. In the fuel, there are chemicals that increase the carbon content and thus power fuel by mixing it with volatile hydrocarbons. (Tewari 2009)

Carburetor works using Bernoulli's principle: the faster air movement, static pressure, low air pressure, and the higher the dynamic pressure. Throttle accelerator chain indirectly controls the flow of liquid fuel. Instead, it moves the carburetor mechanisms which meter the flow of air drawn into the engine. The flow speed, and therefore pressure, determines the amount of fuel drawn into the airstream. This movement occurs because there is a vacuum in the system to suck the fuel out through the oil channel.

Carburetor are in general defined as devices where a flow induced pressure drop forces a fuel flow into the air stream. An ideal carburetor would provide a mixture of appropriate air-fuel (A/F) ratio to the engine over its entire range of operation from no load to full load condition. (Tewari 2009)

Here is a ratio control the fuel and air mixture in an engine:

- Idling air 10: 1 fuel
- Acceleration air 12: 1 fuel
- High speed air 15: 1 fuel
- The ratio is calculated by weight

Figure: 2.1 Sectional carburettor

Fuel injector was controlled by the electronic control. It is supplied with fuel pressurized by the fuel pump in the car and he was able to open and close many times per second. When the fuel injector supplied electricity, electromagnetic pump will move the one that will open the valve, it allows the pressurized fuel to squirt out through a tiny nozzle fuel injector.

There are numerous feasible design configurations for spark-ignition gasoline direct injection engines, which are classified depending on the relative position of the injector to the spark plug and piston crown shape, the injection timing and the air motion and mixture preparation strategy. (Mitroglou et al. 2006)

The nozzle is designed to atomize the fuel to flare like the mist making as smooth as possible so that it is flammable and is not easy to dirty.

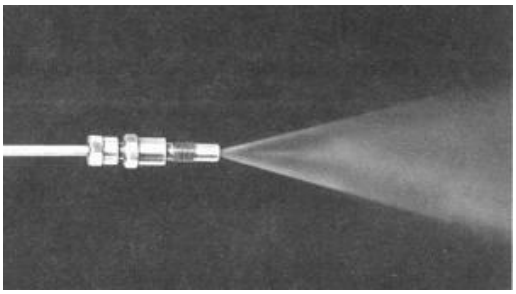

Figure: 2.2 The fuel injector spray

Electronic Fuel Injection (EFI) mechanical parts starting with a high-pressure fuel pump, which is located inside the fuel tank. Fuel is pumped from the tank through the fuel filter and injector through the supply channel. Pressure on supply channels ensure pressure fuel injector constant. When the fuel has been injected, the surplus is returned to the tank through a pipe return. This is because the pressure of the fuel injectors must be continued to ensure that work consistently. Spray fuel directly into the intake manifold where it mixes with air, and then drawn into the combustion chamber of the engine cylinder.(Mastaniah 2013)

There are several reason like complete combustion of fuel due to uniform distribution and accurate metering of fuel, less pollution and improved performance, to use present electronic fuel injection system, as an alternate fuel supply system in modern passenger cars, even though it is having some drawbacks. (Kumar 2012)

Electrical parts Electronic Fuel Injection (EFI) consisting of Electronic Control Unit (ECU) and sensor wiring. ECU has been connected with various sensors located inside the engine air box. ECU will calculate the condition of the engine and the vehicle speed in order to determine the right amount of fuel to be sprayed from the fuel injector.(Kumar 2012)

Figure: 2.3 Flow injector working

2.2 Components and Functionality

This system serves to suck oil from the tank and fuel supplied to the injector before spraying can be done. (Cooper 1981)

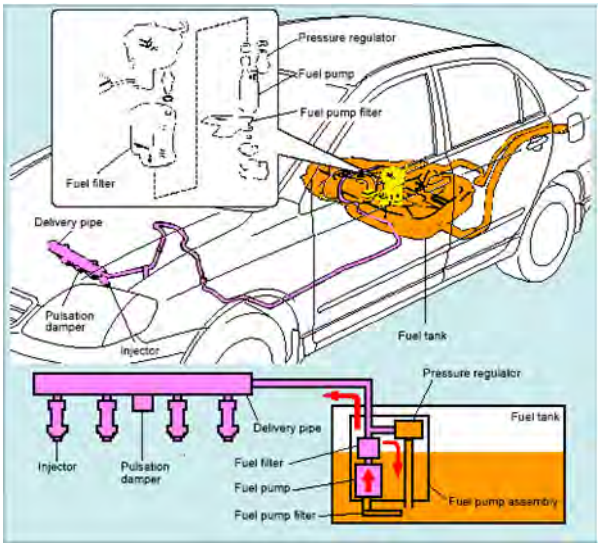

Figure: 2.4 Location of component

The main components of this system are:

- The fuel tanks
- Fuel pump
- Fuel Filter
- Delivery pipe
- Injectors

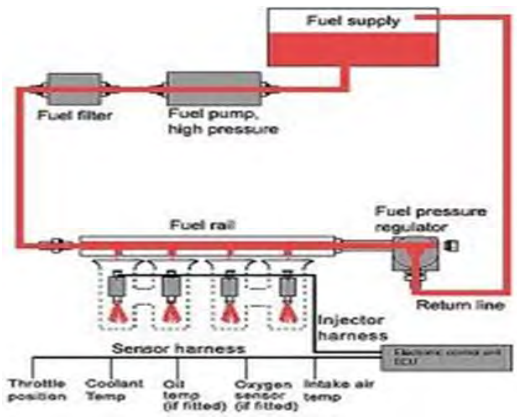

Figure: 2.5 Fuel Injection System

• The fuel tanks

A fuel tank is a safe container for inflammable fluids

• Fuel pump

The fuel pumps are usually placed in the fuel tank. This pump will create positive pressure in the fuel line, and then it will push gasoline to fuel injectors for engines in monasteries.

• Fuel Filters

A fuel filter is a filter in the fuel line that will filter out dirt and dust particles from the fuel, it will usually make a very fine filter paper.

• Delivery pipe

Delivery pipe is a drain hose or pipe for transporting fuel to the system burning. It will be connected to the fuel rail.

• Fuel rail

Used to deliver fuel to each fuel injector in an internal combustion engine. It is designed to have a place for each injector and the entry to the fuel supply.

• Injectors

Fuel injection is a system for the delivery of fuel to the internal combustion engine. Fuel injection is a fuel injection atomizes shaped by force pumping through a small nozzle further down high pressure. Fuel injector works for puncturing into the cylinder by the signal provided by the ECU.

2.3 How to Control System (ECU)

These systems are generally named as Electronic Fuel Injection (EFI) systems. Electronic fuel injection control system (EFI) is a new method to replace carburettor system. System (EFI) uses a sensor to detect an engine and overall condition of the vehicle.

The fuel is injected into the throttle body or into the inlet manifold through an electronic fuel injector, which is controlled by an Electronic Control Unit (ECU). This is because the sensor will use the information and data from sensors to analyse the volume of fuel injection for vehicles according to the condition of the vehicle. The quantity of fuel injected by the injector plays a vital role as far as performance and emission characteristics of spark ignition engines are concerned. (Kumar 2012)

2.4 Electronic Fuel Injection Control System (EFI)

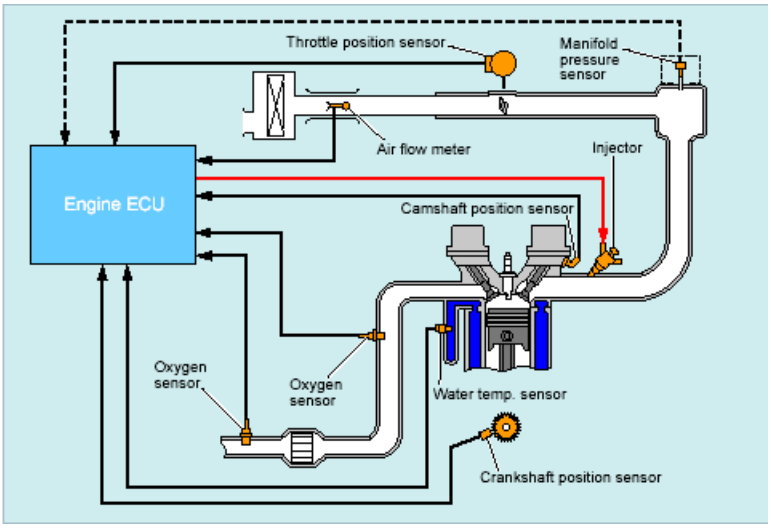

Figure: 2.6 Electronic Fuel Injection Control System

Electronic fuel system uses multiple sensors to detect the condition of the engine and vehicle. ECU will use the data from these sensors to calculate the total volume of fuel injection required by the vehicle.(Kunjam, Sen, and Sahu 2015)