

7. Abstract of the invention:

Day by day fossil fuel energy reserves are depleting and the cost of the fuel was increasing. This is because of rapid usage of fossil fuel and it also causes increase of pollution, global warming and fuel scarcity. So this is the time to search for alternative fuels. Some of the alternative fuels are Ethanol, methanol, natural gas, bio diesel blends and hydrogen etc. Hydrogen was identified one of the best alternative fuel among all these because it having so many advantages like (high heating value, clean fuel, renewable energy source, absolutely no pollution and available at cheap price), It has the potential to supplement and if possible replace the fossil fuels for the production of energy in the near future, applicable to fuel for vehicle and rocket, internal combustion engine using hydrogen storage, direct combustion for heat and so on. Water electrolysis is a key technology to produce hydrogen and is one of the best methods.

In diesel engine injection pressure plays an important role. In this experimental study, effect of injection pressure on engine performance and exhaust emissions has been investigated. Experiments has done on kirloskar constant speed single cylinder 4 stroke water cooled diesel engine, while the engine is running on electrolytically generated hydrogen oxygen mixture .The experiments are conducted by changing the injection pressure from 175 bar to 375 bar with an interval of 50 bar by applying the minimum load to maximum load of 17.8kg on rope brake dynamometer. Hydrogen oxygen mixture is continuously supplied to the engine at a constant rate of 500 ml/min

According to the results maximum performance has been obtained at 300 bar and at high injection pressure these values are O_2 , SO_2 and CO_2 minimum. At lower injection pressure NO_x emissions and smoke levels is very low. As the injection pressure increases efficiency will increase, and exhaust emissions will decrease.

6. CLAIMS

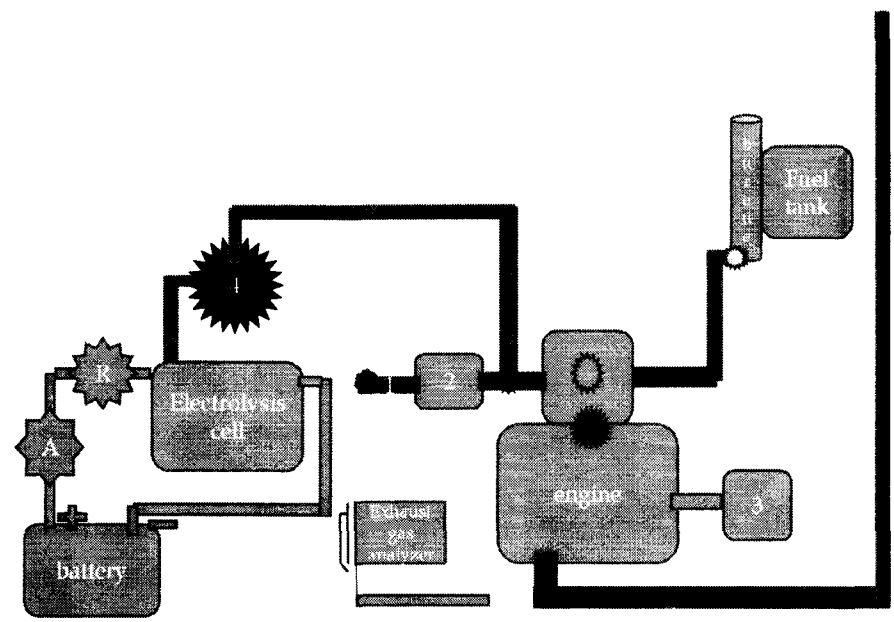
1. The effect of injection pressure on engine performance while the engine is running on electrolytically generated hydrogen oxygen mixture. This both techniques should not be used anywhere.
2. The system according to claim 1, where in the dual system is used i.e, hydrogen oxygen mixture and increase of injection pressure.
3. The system according to claim 2, where the fuel injector is using shims to increase injection pressure for existing engines (internal combustion engines)
4. The system according to claim 3, the hydrogen oxygen mixture supplying at a constant rate of 500ml /min.
5. The system according to claim 4, a fire trap is used to arrest the backfire which is coming from the engine followed by rot meter.

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Sheet No.1

Fig: 1 Engine set up along with electrolysis cell and other attachments



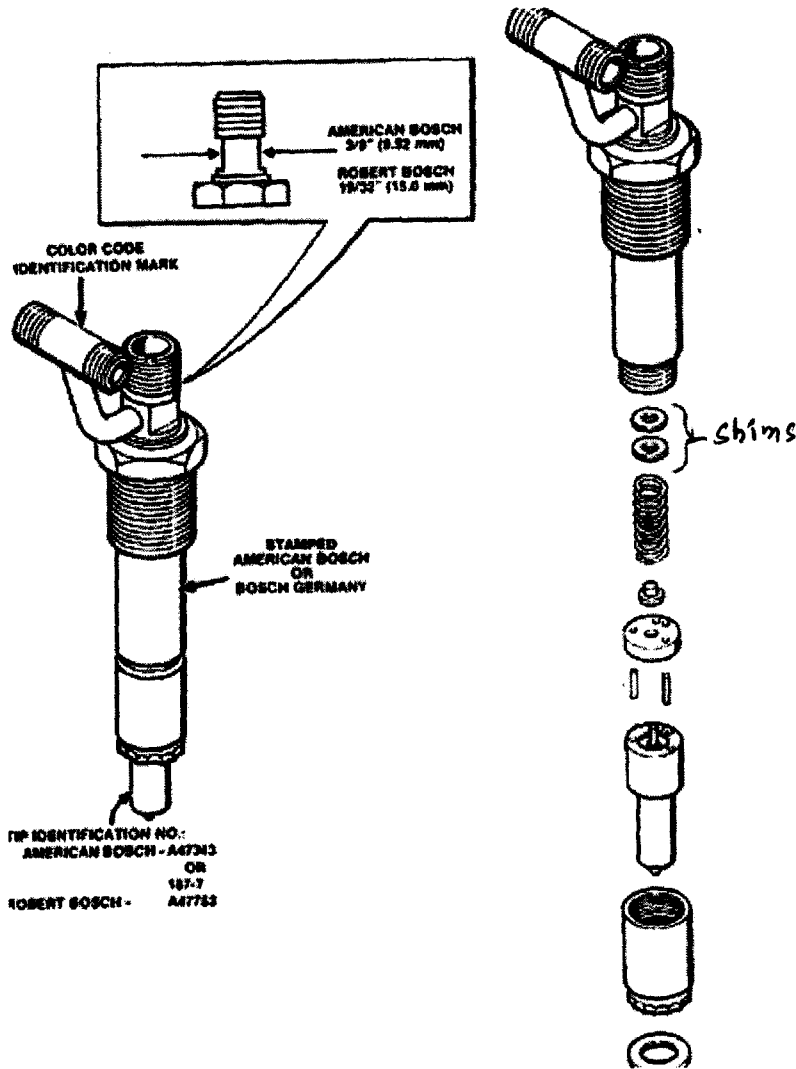
- 1. Orifice meter
- 2. Air box
- 3. Rope Brake Dynamometer set up
- 4. Rota meter

A-Ammeter R-Rheostat

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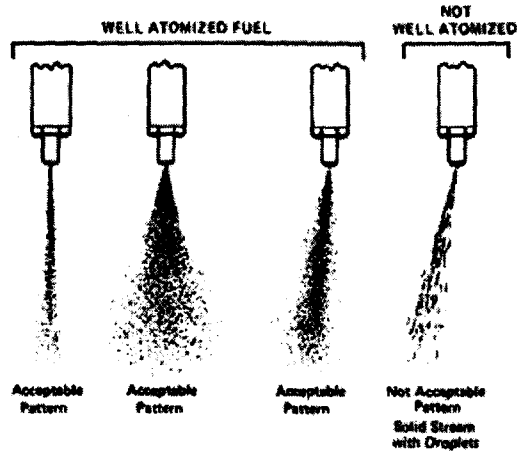
Fig: 2 Fuel Injector along with spare parts (including shims)



- 1. American Bosch
- 2. Colour code identification mark
- 3. Stamped American bosch or Bosch germany
- 4. Top Identification No

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Fig: 3 Fuel Injection system (atomization)



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In some of the cases they have increased injection pressure alone(New Engines) but they have not introduced the hydrogen oxygen mixture since efficiency has been increased at the same old engines will be in the same mode like (injection pressure at 175 bar).

With respect to Higher injection pressure , some of the drawbacks are (1) This model is quiet impressive, but the main drawback is that it is large in its size and heavier (2) The engine will give high efficiency along with high emissions. (3) This system is expensive, complicated structure and mechanism (4) Emission control was little less.

The current invention can overcome all those above drawbacks. Here the injection pressure of the old engine is increased by adding shims to the fuel injector or by adjusting the screw which is available in the fuel injector. When the old engine injection pressure is increased from 175 bar to 375bar with an interval of 50bar (experiments conducted) fuel particle diameter size will be reduced and proper atomization will takes place hence complete burning will be done, so that there will very less exhaust emissions (since introduction of hydrogen oxygen generated from water electrolysis) and efficiency of all the existing engine efficiency can be increased by introducing this technique. There will very little effect on the global warming and green house effect (it's far far better than all the previous systems)

Summary of the invention

Electrolysis cell was designed and fabricated.Experiments have been conducted on the kirloskar single cylinder 4 stroke water cooled direct injection diesel engine and performance characteristic graphs has been plotted. Results showing that fuel consumption was reduced as the injection pressure increases, brake thermal efficiency was increased 6.31% at 375 bar injection pressure running with diesel-hydrogen compared with 175 bar injection pressure with only diesel.As the injection pressure increases the air fuel ratio was good compared with low injection pressure .Finally conclusion is as the injection pressure increases the efficiency , air fuel ratio was increasing. Important thing is when the engine is running with diesel with increase in injection pressure giving high efficiency but if it running with diesel +hydrogen is giving highest efficiency at the highest injection pressure.

Brief description of the Drawings.

The figures below illustrate various views of fuel injection systems and overall engine arrangement along with fuel spray patterns at different pressures.

Fig: 1 Engine set up along with electrolysis cell and other attachments

Fig: 2 Fuel injector diagram along with shim arrangement.

Fig: 3 Fuel Spray Pattern with different injection pressures.

Detailed description of the figures

Fig: 1 Engine full set up along with electrolysis cell and exhaust gas analyzer system which give complete picture of overall system. Fig: 2 Fuel injector diagram along with shim arrangement. Fig: 3 Fuel Spray Pattern with different injection pressures


Detailed description

The engine used for experimental set up is Kirloskar single cylinder 4 stroke water cooled direct injection (DI) diesel engine, rated power is 3.78Kw at rated speed of 1500 rpm. The specifications of the engine is shown in table 1. Hydrogen is supplied from the electrolysis cell at a constant rate of 500ml/min. The pressure of the hydrogen will be around 1 bar. Hydrogen is first supplied to the flame trap by regulating the valve and then passed to the rotometer where it is measured. The rotometer gives the flow rate of hydrogen in l/min. Here we are using a flame trap to arrest the flames which is coming from the engine. The flame trap is used as a safety device and acting as a non return valve (NRV), then hydrogen is passed to the engine and suction process will start. Before going to the inlet manifold the hydrogen will mix with air and both hydrogen oxygen mixture and air will combindly will go inside the engine. Mixing of air and hydrogen oxygen mixture is called enrichment process. Normally the injection pressure of the engine is 175 bars. Experiments were conducted by changing the injection pressure from 175 bars to 375 bars with an interval of 50 bars with a constant flow rate of hydrogen of 500ml/min.

Table:1

General details Single cylinder, four stroke, compression, ignition, constant speed, vertical, water cooled, direct injection	
Bore	80mm
Stroke	110mm
Swept volume	553 cm ³
Clearance volume	36.87 cm ³
Compression ratio	16.5:1
Rated output	3.7kW at 1500 rpm
Rated speed	1500 rpm
Injection pressure	240 bar

9. DATE AND SIGNATURE

<p>Vel Tech Dr RR & Dr SR Technical University.</p>	
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