Experimental Investigation Of Fuel Spray Charecteristic For Various Biofuels

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Abstract-

The fuel spray is one of the important parameters for complete combustion. The combustion parameters is fully depends upon the nature of spray obtain from fuel injection system. The present study on spray characteristic of bio-fuels, which is the blend of cotton seed, mauha and karanjia biodiesel with Commercial Diesel Fuel in tubular combustion chamber, This type of study is a major concern all over the world due to global issues for example pollution, shortage of fuel and economic crisis. This study is mainly focused on spray characteristic for various bio-fuel blends. Spray characteristic of various bio-fuel blends will be analyzed and compared to pure diesel. Bio-fuel blends that have different blending ratio - B5, B10, and diesel will be studied and the chemical properties of various bio-fuel blends can be determined after having several measurements in laboratory. The spray characteristic of all bio-fuel blends such as penetration of droplet particle and cone angle has been established. At fuel line pressure 5 bars and injection pressure is 22 bars.

Keywords: penetration length, cone angle, biodiesel blends.

1. Introduction

The process of generating a large number of droplets is called atomization. The process of atomization begins by forcing liquid through a nozzle. The potential energy of the liquid (measured as liquid pressure for hydraulic nozzles or liquid and air pressure for two-fluid nozzles) along with the geometry of the nozzle causes the liquid to emerge as small ligaments. These ligaments then break up further into very small "pieces", which are usually called drops, droplets or liquid particles. A droplet is a small particle of liquid having a more or less spherical shape. Droplets are also known as particles. The reason particles are round is due to the liquid's surface tension. Surface tension is the property of a liquid that causes droplets and soap bubbles to pull together in a spherical form and resist spreading out. This property causes sheets or thin ligaments of liquid to be unstable; that is, they break up into droplets, or atomized. Sprays are formed when the interface between a liquid and a gas becomes deformed and droplets of liquid are generated. These then migrate out into the body of the gas. Sometimes the gas plays a negligible role in the kinematics and dynamics of the droplets formation process. The spray characteristics to

combustion performance include mean drop size, drop size distribution, cone angle, and penetration. Mean drop size, drop size distribution and are almost dependent on atomizer design while cone angle and penetration are partly dependent on atomizer design and partly on aerodynamic influences (7). Penetration of spray is defined as the maximum distance it reaches when injected into stagnant air and it is governed by the relative magnitudes of two opposing.

In general, a compact, narrow spray will have high penetration, while a well-atomized spray of high cone angle, incurring more air resistance, will tend to have low penetration. A variety of factors affects the droplet size and how easily a stream of liquid atomizes after emerging from an orifice. Among these factors are fluid properties of surface tension, viscosity, and density (6).

The rate of liquid pressure-rise goes up and the injection timing is advanced, because the bulk modulus of bio-fuel is higher than that of gas oil at lower liquid pressure. The peak injection pressure at bio-fuel is higher than at gas oil under lower mean injection pressures (1) Rapid Compression Expansion Machine (RCEM). Among the test cases the 40 W/O fuel injected at BTDC 20° has shown that reduced The effects of these physio-chemical properties on fuel supply system such as fuel pump, fuel filter and air-fuel mixing cylinder have already been reported (2-9).

II. Experimental Setup and Experimentation

The Electronic fuel injection system which is used, in this research includes an electronic fuel pump having capacity to produce high Pressure, and with the help 6 volt battery pump will start and again with the help of single hole nozzle spray are produce. This injection system placed on the rims of furnace at the center of combustion chamber and the fuel is injected with the help of electronic fuel pump at 22bar.The schematic drawing of fuel injection system has been shown in

Figure1.Figure.2 demonstrates the experimental set up of Electronic fuel injection system. In order to avoid loss of flow from fuel pump one bypass arrangement are provided into the electronic fuel pump and controlling the flow through single hole nozzle,

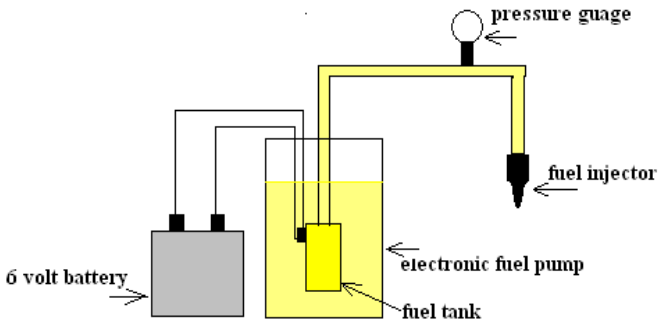

Fig.1.Schematic of fuel injection system

all features of our selected injector are shown in table no.1 When the experiment are start that time we observed when the % of biodiesel are increases the penetration length reduced and cone angle are slightly change with 1^0-2^0 .

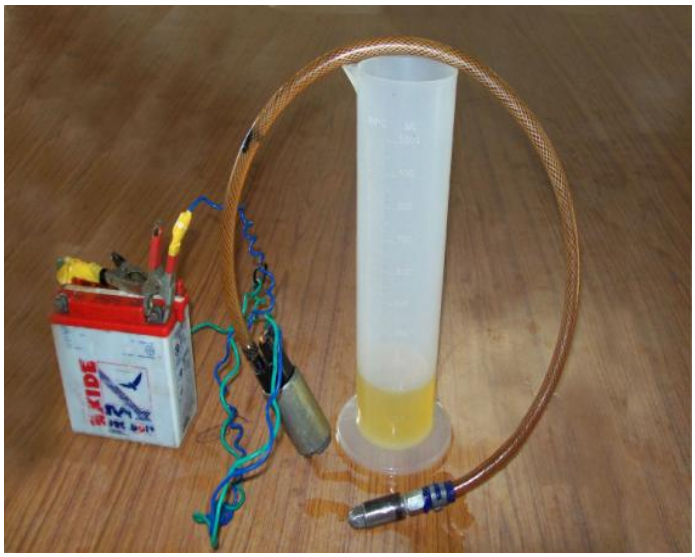

Fig.2.Photograph of Electronic fuel injection system

Table. I
Features of fuel injector

Power source battery	DC 6 Volt /5 Amp
Injection pump	Electronic(Maruti Suzuki)
Pump pressure (Mpa)	3.5
Nozzle range (mm)	0.25
Volume flow rate (ml / min)	4
Spray angle (degree)	50
Penetration length (cm)	47

The experiments are carried out on our selected fuel injection system. firstly fuel pump are placed in fuel tank and joint battery by menace of electric cable and switch on pump that time spray is form through single hole nozzle that spray are passes over the blank white drawing sheet then we measure total length of spray on the sheet from nozzle tip up to the last droplets spray position .with the help of scale .then similarly we measure the cone angle form on the sheet with the help of setsquare. This process is done for diesel, and different bio-fuel blends at 5% and 10% biodiesel.

VI. Results and Discussion

Experimental study on fuel spray characteristic for various bio-fuels blends and diesel is investigated. The results indicate an enhancement in feature of penetration length and cone angle with use of biodiesel instead of diesel Fig.3. Presents the effect of % biodiesel blends on spray characteristics. The figure shows that the spray behavior of various biodiesel blends. And table no. 2 shows the Difference in penetration length and cone angle for Various fuels.

FUEL	PENETRATION LENGTH (cm)	CONE ANGLE ^{0} (Degree)
Diesel	47	55
Kranjia B-5	45	54
Kranjia B-10	44	54
Mouha B-5	45	54
Mouha B-10	43	54
Cotton B-5	43	53
Cotton B-5	42	53

Table No. II
Difference in penetration length and cone angle for Various fuels

Fig.3. photograph of spray comparison for diesel and different biodiesel blends

IV. Conclusion

An experimental investigation on fuel spray characteristic for various bio-fuels blends and diesel as baseline the penetration length and cone angle of biodiesel and diesel is carried out. All tests are conducted using several percentage of biodiesel. Based on the presented results, the following conclusions may be drawn:

1) When the % bio-fuel (blends) in the diesel increased, the penetration length is decreases.

2) When the % of bio-fuel (blends) in the diesel increased spray cone angle slightly be change

3) When the % of bio-fuel (blends) in the diesel increased spray droplets size are slightly be change

V. References

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