

## INVESTIGATION OF SPRAY CHARACTERISTICS FOR DIESEL ENGINE

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### Abstract

Experimental analysis on the spray characteristics of a diesel engine injector nozzle fueled with diesel was carried out in this study. To achieve this, the fuel was characterized to determine its parameter, and an experimental set up was designed to visualize and capture the spray pattern of the fuel using ultra slow camera. The image obtained were processed and analysis using (Length Measurement Software) to determine the spray length and spray area values of the fuel. Experimental result obtained agree with validation models and reveal that spray parameter values of are equal to diesel fuel. The values of spray parameters of single hole injector nozzle such as 101.6 cm spray length (Penetration length), 54.51 cm Breakup length, 10.75° cone angle, 21.5° spray angle. and it is concluded that the all type of nozzle are different parameter and different angle of spray characteristic of diesel engine.

**Keywords:** Injector, Nozzle, IC Engine, Spray, Penetration or Breakup Length.

### 1. Introduction

Fuel injection is the introduction of fuel in an internal combustion engine, most commonly automotive engines, by the means of an injector of fuel into the cylinders by means of a pump rather than by the suction created by the movement of the pistons. Diesel engines do not use spark plugs to ignite the fuel that is sprayed, or injected, directly into the cylinders, instead relying on the heat created by compressing air in the cylinders to ignite the fuel in engines with spark ignition, fuel-injection pumps are often used instead of conventional carburetors. Fuel injection into a chamber upstream from the cylinders distributes the fuel more evenly to the individual cylinders than does a carburetor system; more power can be developed and undesirable emissions are reduced.

In engines with continuous combustion, such as gas turbines and liquid-fueled rockets, which have no pistons to create a pumping action, fuel-injection systems are necessary.

All diesel (compression-ignition) engines use fuel injection, and many Otto (spark-ignition) engines use fuel injection of one kind or another.

A fuel injector is used to inject the fuel in the cylinder in atomized form and in proper quantity.

Fuel injector is the main component of fuel injection. It is Spray delivery device.

## 2. Experimental Setup

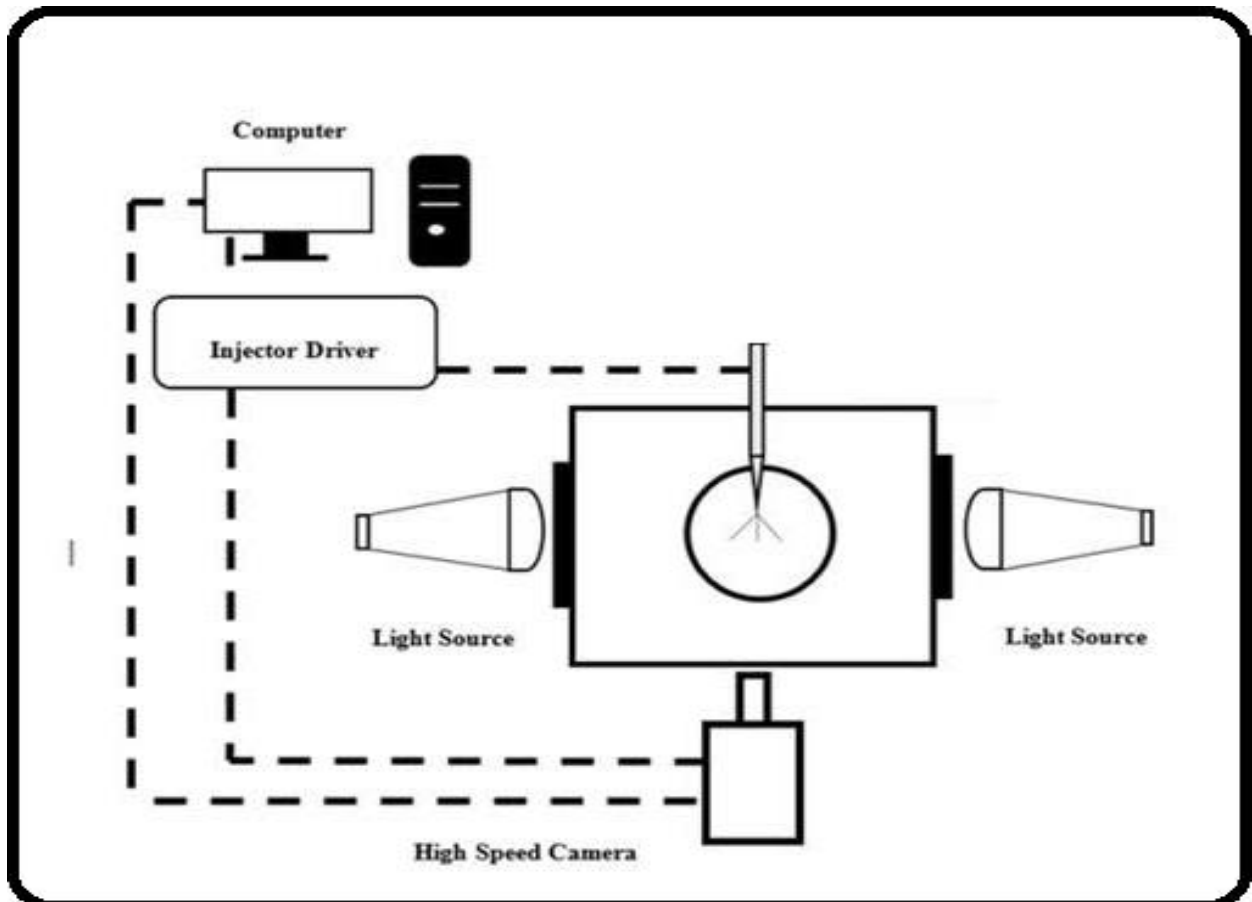


Fig No. 2.1 Experimental Setup

## 3. Project Methodology

First we take diesel in the container and then fix the nozzle in the injector after this step we attach injector to the injector testing machine then we press the lever and increases to pressure 160 bar and lock the pressure then again we press the lever and release the pressure for spray in injector to nozzle and we get to penetration length of spray characteristics.

Then we calculate to all off measurement and we find angel of spray and breakup length for decided to which nozzle are satiable for the vehicle.

## 4. Result Table

Sr. No.	Type of Nozzle N	Nozzle outlet diameter D0(mm)	Injection Pressure Pinj (bar)	Penetration Length L(cm)	Breakup Length L(cm)	Cone Angle ( $\theta$ )	Spray Angle ( $2\theta$ )
1	1 Hole	0.3	160	101.6	54.51	10.75°	21.5°
2	3 Hole	0.28	160	48.26	29.61	18.77°	37.54°
3	4 Hole	0.25	160	57.15	30	14.57°	29.14°
4	5 Hole	0.2	160	63.5	38.91	12.95°	25.9°

## 5. Calculation

From the figure calculation are done and the result as show in table no 1.

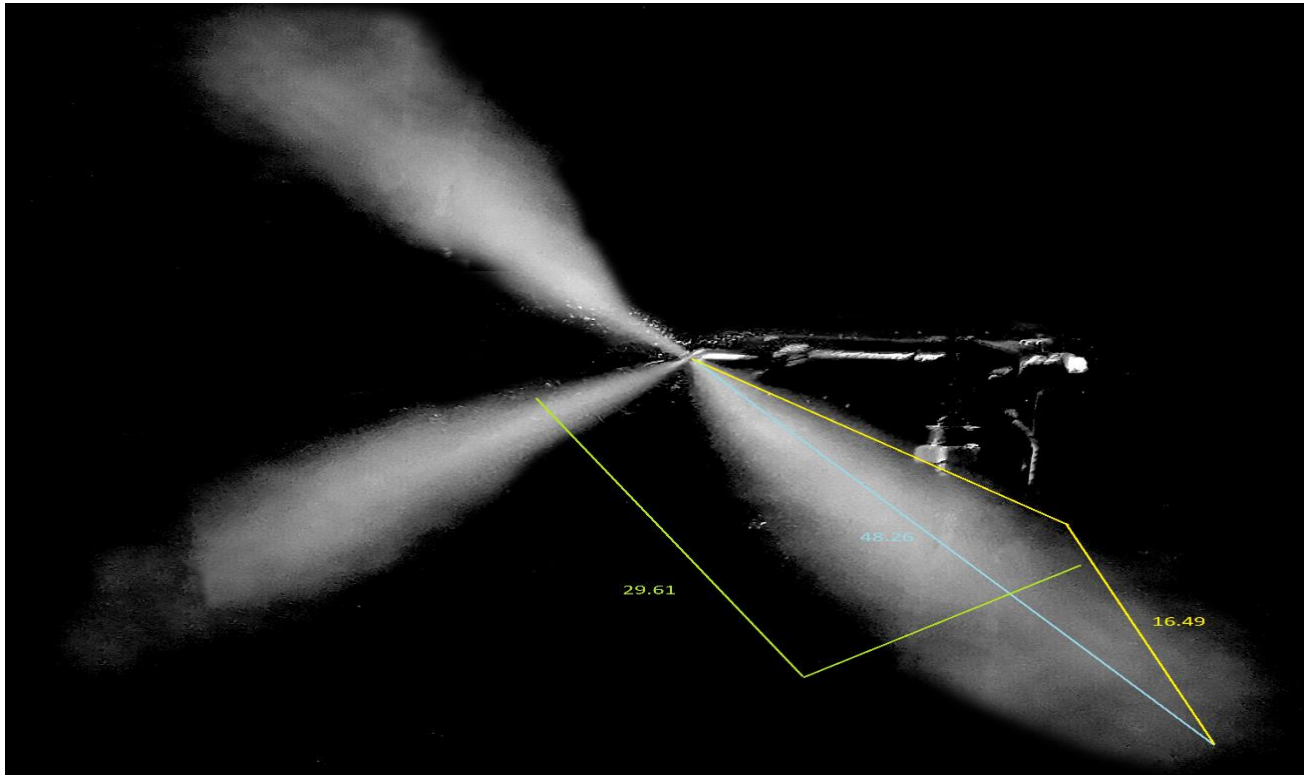
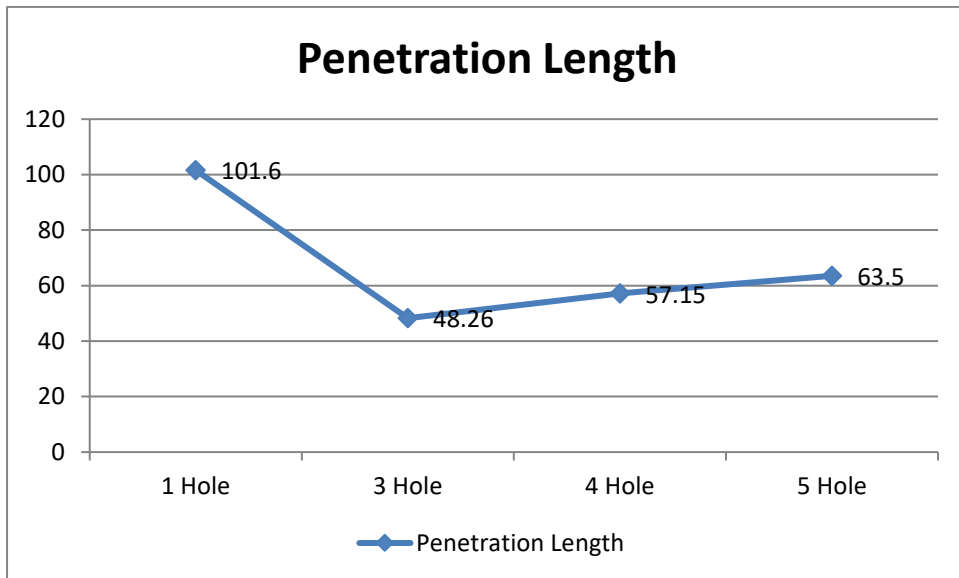
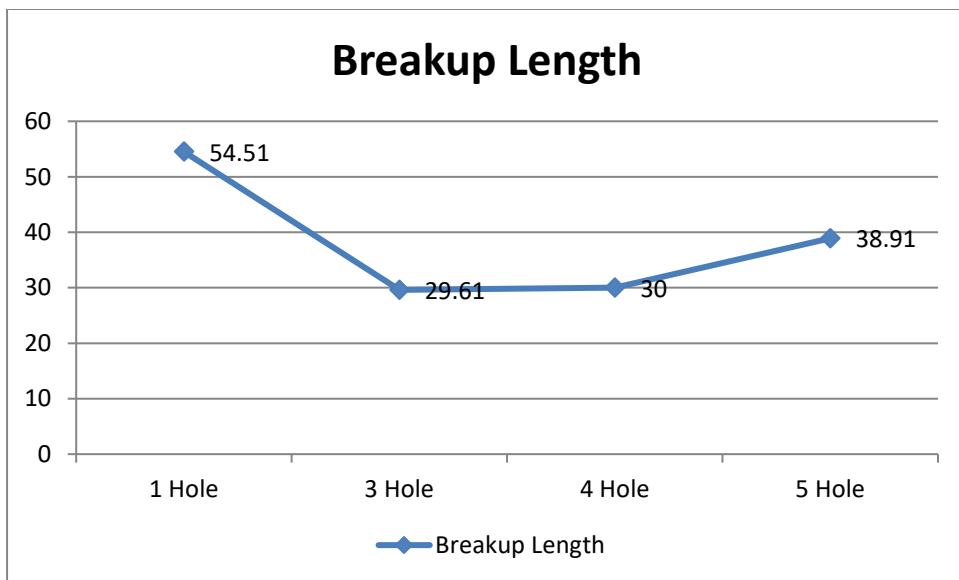


Fig No. 5.1 Three hole Nozzle.

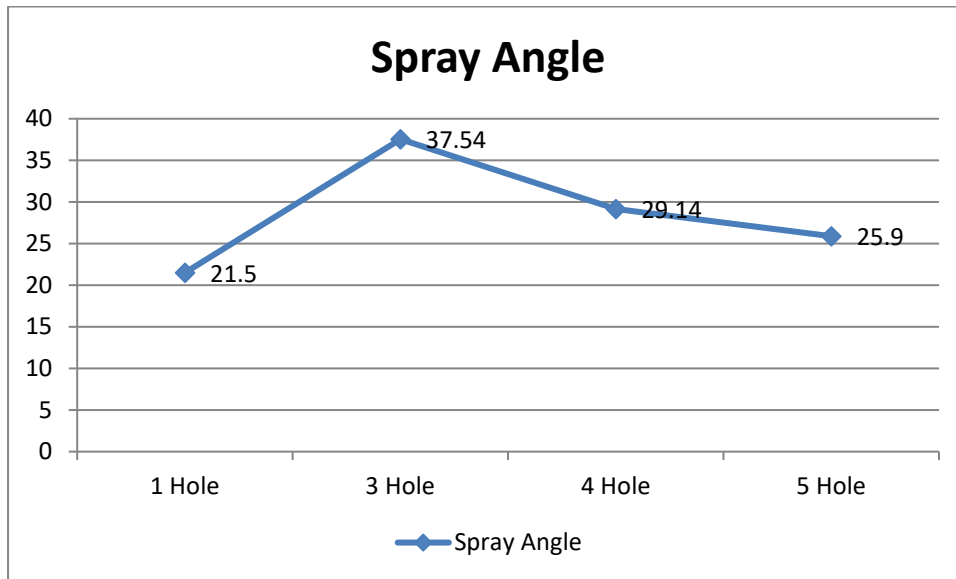
## 6. Results and Discussion



The results of the experiment show that for the 1 hole Nozzle Injector Spray Penetration Length is 101.6 cm which is greater than the length of other nozzles i.e. from 3 hole, 4 hole, 5 hole.



The results of the experiment show that for the 1 hole Nozzle Injector Breakup Length is 54.51 cm which is greater than the length of other nozzles i.e. from 3 hole, 4 hole, 5 hole.



The spray angle of 3 hole nozzle is 37.45° which is more better than other nozzles i.e. from 1 hole, 4 hole, 5 hole.

## 7. Conclusions

In order to study spray characteristic properties of different type of nozzles. Four different kind or nozzle were tested in the test facility is injector testing machine. A CCD camera was used to obtain spray images and used corrected images.

We are conclude that 1 hole nozzle injector are very much efficient nozzle for any type of IC engine.

## References

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