CHAPTER 1

INTRODUCTION

1.1 Research Introduction

Nowadays, the depleting reserves of fossil fuel, increasing demands for diesels and uncertainty in their availability have been a matter of global concern. This is considered to be the important trigger for many initiatives to search for the alternative source of energy, which can supplement or replace fossil fuels. The concern over automotive pollution also been important aspects as it been environmental, medical and philosophical, leading to strict emission requirement. These are effort around the world to protect the environment from further deterioration.

From the automotive view, to minimize the fuel consumption rate in the diesel engine is by improve the engine performance to reduce the energy lose in the combustion. In the diesel engine, combustion and emission characteristics are influenced by the fuel atomization, nozzle geometry, injection pressure, shape of inlet port and other factors. So, in order to improve the fuel-air mixing, it is important to understand the fuel atomization and spray formation process. So far, to improve the combustion performance and particulate emissions, many researchers have investigated the characteristics of the spray behavior by experimental and theoretical approaches.

Therefore, there is substantial emphasis on improving the fuel economy without sacrificing the engine performance, while adhering to stringent emission regulation. As a result, biodiesel fuel have becomes main focus of alternative fuel research and become popular worldwide especially in Europe for its cleaner combustion than diesel.
Biodiesel fuel is made by processing vegetable oil, animal fat, or recycled cooking grease with alcohols or other chemical.

Biodiesel fuel is a renewable, biodegradable and oxygenous fuel with similar physical and chemical characteristics to diesel. Not only that, it also produce lower combustion emission and fewer greenhouse gas emission than fossil diesel.

However, there are some differences in fuel properties parameters especially the kinematic viscosity between biodiesel fuel and diesel. In a diesel engine, the fuel development and atomization characteristics play an important role in improvement of combustion and engine performance, because they influence the fuel-air mixing in the cylinder. Therefore, it is necessary to study and analyze the spray development and atomization characteristics of various fuels in relation to its application in internal combustion engines, mainly effect the spray behavior and spray characteristics inside spray chamber. Among the various alternative fuels, biodiesel fuel (BDF) and straight vegetable oil (SVO) fuels are the most popular. This is because biodiesel fuel can be used in conventional diesel engine without modification of the engine and a diesel engine fueled with BDF or SVO can be operated with only a partial modification of the fuel supply system. In this project, the effect of kinematic viscosity of diesel, BDF and SVO on liquid phase and vapor phase development at spray boundary will be investigated.

1.2 Problem Statement
1.2.1 Problem

In the simulation software, there is no database of biodiesel fuel and straight vegetable oil available for the flow injection simulation. It is very important to know the spray characteristic for the diesel engine which is being operated with biodiesel fuel and straight vegetable oil.
1.2.2 Solution of the problem

ANSYS Fluent is a user friendly and very suitable for every engine simulation and being used in most fluid flow simulation research. Therefore there is an alternative for the problem in defining fuel for the simulation. ANSYS Fluent allows the users to create their own fuel files. Referring to the biodiesel fuel and straight vegetable oil properties table, the biodiesel fuel and straight vegetable oil can be created. The results gain by simulation can give overview on how the fuel properties affect the spray characteristic.

1.3 Objectives of the paper

Generally, the objectives to be achieved in this project are stated below:

i. To observe the development of “structures like branches” inside spray boundary.
ii. To measure the liquid and vapor phase area.
iii. To investigate the relationship between kinematic viscosity of fuel and, liquid and vapor phase development at spray boundary.
iv. To measure the spray penetration and cone angle.

1.4 Scopes

The project is focused on:

i. Literature review
ii. Simulate the model by using FLUENT ANSYS software
iii. Result comparing with different fuel and the spray development