CHAPTER 1

INTRODUCTION

1.1 PROJECT BACKROUND

The world's energy demand and supply has been pressurizing the availability of crude oil. The dependence on fossil fuel is now in its critical stage as most the logistics of the world require crude oil in order to move. The increasing usage of this fossil based fuel has a degrading effect on the environment and climate through its polluting combustion product. As the demand increases renewable form of fuel that is compatible with current diesel engine (compression ignition engine) must be identified and the potential candidate is the biodiesel from vegetable oils through transesterification. Malaysia is a major producer of vegetable oils such as palm oil and palm oil can be converted to biodiesel. Biodiesel has promising properties such as better cetane number, flash point and emissions compared to fossil fuels but biodiesels suffer from metal corrosion (Fazal et al., 2011) as oxygen content is higher in the fuel. Properties such viscosity, higher heating value and cold flow properties are also lower than conventional fossil fuel which affects its performance on a diesel engine. Biodiesel is completely miscible with diesel allowing blending the fuels in any proportion without modification of current engines. CNT is a form of pure carbon arranged in a cylindrical shape in nanoscale dimensions and the dispersion in the blended fuel may improve the fuel properties and the engine performance to CNT mix ratio in fuels is to be performed.

1.2 PROBLEM STATEMENT

Biodiesel fuels derived from vegetable oils comparatively have lower heating value compared to the diesel due to the excess of oxygen in biodiesel fuels. This reduces the amount of power generated when biodiesel is used, and thus increasing fuel consumption for the same power generation from a diesel engine. In order to improve the properties of the biodiesel, CNT is prepared to be dispersed within the diesel-biodiesel fuel mixture in order to produce better fuel performance such as the higher heating value and cetane number. Dispersion of CNT will also increase the ratio of carbon-oxygen in the fuel, thus improve the properties further. Existing research on the CNT's effect on biodiesel fuels has not been fully established

1.3 PROJECT OBJECTIVE

For this project, the objectives to be achieved are listed as follows;

i. To investigate various properties of diesel and biodiesel fuel blends.

ii. To quantify the effect of CNT dispersion on the properties of diesel and biodiesel fuels.

iii. To develop a water bath system to find the effect of temperature on CNT added diesel and biodiesel blends on thermal conductivity.

1.4 PROJECT SCOPE

In this study, CNT particles are selected as additive due to their high thermal conductivity. It is proposed to determine operational characteristics of biodiesels in concentrations of 0.5 % vol, 1.0 % vol, 1.5 % vol, 2.0 % vol and 2.5 % vol. Testing of the fuel will be evaluated as per the American Standards of Testing Materials (ASTM). The following tests are planned to be conducted.

i. The Cetane number of a fuel is to be measured the quality of the fuel and is used to determine the ignition delay of the fuel.

ii. The Higher heating value is the energy contained by one gram of fuel during combustion.

iii. Thermal Conductivity of biodiesel is to be measured under transient conditions. This method of measurement is undertaken by many researchers. The measurement of temperature change with time is used in the determination of thermal conductivity of biodiesel.

iv. The Cold flow properties or the pour point is the lowest temperature at which no movement of the specimen is observed is to flow out of the container under the influence of gravity.

v. The flash point temperature of biodiesel is the lowest temperature at which an ignition source causes the vapors of the biodiesel to ignite under specific conditions.