CHAPTER 1

1 INTRODUCTION

1.1 Diesel water emulsion

Diesel water emulsions have come into recent field of study. When mixed directly, diesel being a lighter liquid than water comes to the top and water settles in the bottom. By using an appropriate surfactant the molecules of water and diesel can be bound together. The stability of the emulsion made is very important, because if it unstable for an appreciable period of time it will not be practically useful. Using water mixing agent with diesel has many benefits on its own. It has been shown in many previous researches that it reduces the flame temperature thereby reducing the NOx emissions significantly (K. Kannan, et al, 2009). Addition of water also improves atomization and mixing which is attributed to droplet micro emulsion. The improved mixing is due to the increased vaporized jet fuel momentum giving air more way to get into the fuel jet. This also assists in reduction in NOx from diffusive burning portion of combustion event as well as reducing the carbon formation. This effect along with the chemical effect of water resulted in increase in ignition delay. There is also a considerable proof that adding water to diesel can reduce the particulates and smoke emission. (Lif & Holmberg, 2006)

There has been a growing interest in diesel fuel industry to produce and utilize the diesel water emulsion as usable fuels for diesel engines. Fuel additive manufacturers try to make diesel oil and water oil mix, or can be neighbourly enough to form pollution cutting diesel fuel (R.Prakash, et al, 2011). There have been several trials done to produce a stable emulsion which will stay the same way for a long period of time. If the emulsion remains still for many days, larger droplets of chemically coated water may settle to the bottom of the tank, or it’s also been seen that coagulated particles settle down in the bottom of the tank. The fuel, however, will mix again if agitated slightly, and thus the tank is refuelled to mix it again. (Canfield C. A., 1999)
The influence of water on some of the performance parameters, exhaust emission of diesel engine has been studied by many works. However its effect on the heat flux crossing the combustion chamber components i.e. cylinder heads and cylinder liners, chamber metal temperature and thermal loading of such engines is still under study.

1.2 Problem Statement

Diesel fuel is widely used nowadays for transportation, manufacturing, power generation, construction and also farming. It is made of a blend of crude oil components called hydrocarbon. Diesel fuel is using diesel engine or compression-ignition engine which is an internal combustion engine that uses the heat of compression to initiate combustion (Ezoil Performance, 2013). Internal combustion engine is significant contributors to air pollution with emission of NOx, HC, CO, SOx, CO2, PM and black smoke which will bring a bad impact towards human health and environment.

An alternative approaches should be find to increase fuel economic and reduce harmful emission from internal combustion energy due to the predicted shortness of conventional fuels as well as environmental concern. One of the choices is to add a right amount of oxygenated chemical and emulsifying agent into diesel. This stable mixture of components is known as emulsified oxygenated-diesel.

Using hydrogen peroxide as an oxygenated-fuel to enhance the conventional diesel engine performance has been investigated by several researches and the result is very promising. Hydrogen peroxide is used to increase in brake thermal efficiency of diesel engine, reduction in exhaust emission and also reduction in specific fuel consumption. The problem comes when hydrogen peroxide properties (polar) is totally different from the diesel fuel properties (non-polar), thus make them insoluble to each other. To get a stable emulsion, an emulsifying agent is mixed together in this blend solution. But, these three different mixtures (hydrogen peroxide, diesel, and emulsifying agent) able to sustain in stable phase for only two days (Geek, 2013). So, this research will try to come out with different formulation of emulsifier in order to produce an acceptable stable emulsion.
1.3 \textit{Objectives}

The following are the objectives of this research:

a) To develop a generic but efficient and sustainable water/diesel stabilization method.

b) To characterize the water/diesel emulsions in terms of physic-chemical properties.

c) To investigate the various factors affecting the preparation of a stable w/o emulsion.

1.4 \textit{Scope of Study}

This study is different from the ordinary works done since it is compromising of both economic and environmental sections. It will analyse the physicochemical properties of emulsified diesel by adding $\text{H}_2\text{O}_2$ into diesel which includes:

a) Type of emulsifier and the ratio of diesel to emulsifier used in this experiment.

b) Stability of emulsified diesel fuel.

c) Characterization and comparison of emulsified oxygenated-diesel.

1.4.1 Feasibility of the Project within Scope and Time Frame

This project is feasible within the scope identified and the time allocated. The first half of this project will be focusing on the through literature review of the related researches to see the areas of improvement and to obtain the basic understanding and knowledge about the project. After that, planning will be done in order to determine the subjects to be studied, the way to conduct experiment and the results to be collected from the experiment, with reference to the research journals studied. The second half of the project mainly focuses on conducting experiments and collected results and data. These results collected will then be analysed and investigated critically.

In terms of scope of study, the project is feasible to be carried out in UMP as it has the required apparatus and equipment to run the experiment. The glassware and characterization equipment are also available. Furthermore, types of chemical used which are diesels, distilled water, hydrogen peroxide, Span 80, Tween 60, Tween 80, and Triton x-100 can be easily obtained as well. As such, this research project is feasible within the time frame and the scope of study. Strategic planning on the execution is needed for this research project to be completed on time and successfully.