CHAPTER 1

INTRODUCTION

In this chapter, the discussion involved the general information and knowledge about the spray characteristics, emulsion fuel, SAC nozzle and VCO nozzle. There are also problem statements that bring out why this study is carrying and what the benefit the whole world. Here, are also stated the objectives and scopes during the process of this project.

1.1 BACKGROUND OF STUDY

This study contribute to the development of emulsion spray formation and combustion models. The motivation is based on the public need for maintaining or even improving, current prosperity, while preserving the environment and health mankind. In daily practice this means, amongst others, that one has to comply with stringent regulations concerning internal combustion engine emissions. These emissions include pollutants like nitrogen oxides (NOx) and soot. More and more also emission of carbon oxide (CO) is restricted due to its involvement with the reinforcement greenhouse effect. Another implication of this public need together with an increase of the global energy demand is the approaching depletion of fossils fuels, which makes the efficient use of organic fuel necessary.

The presence of the dispersed water droplet phase within a continuous diesel fuel phase leads to the formation of water-in-diesel emulsion (W/D emulsion) or in general, water –in-oil diesel emulsion (W/O emulsion). Numerous industrial and environmental applications involve W/O emulsion. Some examples of these applications are crude oil spillage (Mingyuan, Christy, and Sjoblom, 1992), pipeline transportation of water in heavy crude oil (Pilehvari, Saadevandi, Halvaci, and Clark, 1988), and crude oil-polymer emulsion production during the enhanced oil recovery stage (Ghannam, 2003). There are several other important industries that involve the
production of stable emulsion such as the food industries (e.g., mayonnaise), detergency (e.g., removal of oil deposits), pharmacy (e.g., drug emulsion), and cosmetics (e.g., skin lotion). Other potential benefits of emulsified fuel are:

i. Elimination of high cost fireside additives
ii. Reduction in nitrogen oxide due to reduced excess air and lower peak flame temperature
iii. Increase in thermal efficiency and heat rate due to reduced fireside deposits and excess air.
iv. Improved opacity
v. An increase in the range of fuel options

Measured spray characteristics are classified into two basic categories; the first one is macroscopic characteristics, which involve spray tip penetration, spray cone angle, and the derivates of them. The second one is microscopic characteristics which involve droplet velocity, droplet distribution, droplet diameter distribution, air-fuel ratio distribution, and so forth. Macroscopic properties of diesel spray can be recorded and analyzed with lesser and cheaper laboratory equipments than the ones that microscopic properties require. In addition to this, macroscopic characterization more reliable, since they are in bigger dimension and easily detectable. Spray tip penetration is most fundamental characterization among the others. Figure 1.1 illustrates the spray images. Below the definitions of the terms of spray images:

i. Tip penetration – the maximum distance between the tip and the root of spray
ii. Spray angle – the angle between the tangents to the spray envelope
This study investigates the spray characteristics use emulsion fuel on different nozzle, SAC and VCO nozzle at same diameter of hole.

1.2 PROBLEM STATEMENT

The presence of the emission from diesel fuel within the atmosphere will cause serious damages to the environment such as the green house effect, acid rain, and destruction of the ozone layer. Due to enforced environmental regulations, reducing exhaust gas emissions from diesel engine is necessary. NOx and particulate matter emissions, for example, cause serious problems in urban environment where traffic congestion is very heavy. Also, due to the limited stock of fossil fuel, the search for alternative fuel must be accelerated. Among the potential alternative fuel is emulsion fuel.

1.3 OBJECTIVES

i. To investigate the spray characteristics use the emulsion fuel on different nozzle

ii. To investigate the relationship between the spray characteristics and the corresponding injector parameters.