CHAPTER 1

INTRODUCTION

1.1 GENERAL

The rapid depletion of petroleum based fuels has pushed the automobile industry to innovate, engine technologies and discover resources that would substitute petrol and diesel as engine fuel before their extinction. This can be witnessed from the various technical researches going on throughout the globe. A substantial number of different approaches are being made for both vehicular and stationary applications.

The important force behind the development of new fuels for I.C. engines are the rapid escalation of oil prices and continued uncertainty over future prices and the rapid drain by means of increased consumption. In this direction, the whole world has got a little choice but to pursue development of alternative fuels. This type of research will give a better hand to the countries like India which depends on imports if, the resources available in the nation are properly tapped. However what form of fuel substitute is most appropriate will depend on several factors specific to a given country.

Aquanol is one of the possible fuels for replacing diesel in C.I engines. It can be extracted from raw materials such as sugarcane, sorghum, corn, barley, cassava, and sugar beets etc. using already improved and demonstrated technologies. Besides being a bio mass-based renewable fuel, aquanol has cleaner burning characteristics, and a higher octane rating.
The application of aquanol as a supplementary fuel in compression-ignition engine may reduce environmental pollution, strengthen agricultural economy, create job opportunities, reduce petroleum fuel requirements and thus contribute in conserving a major commercial energy source.

The easiest method by which alcohols can be used in diesel engines is in the form of blends. For lower alcohols, this approach is limited to ethanol because methanol is in soluble or has very limited solubility in the diesel fuel. Since low horsepower stationary diesel engines are commonly used in the agricultural and transport sectors of developing countries, there is a need to study there performance using ethanol-diesel blends. A study was, therefore, undertaken with the objective of finding out the maximum possible replacement of diesel by ethanol as a sole fuel with water content and to compare the performance of a variable speed C.I engine using diesel.

Moreover from the ethanol properties, the compression ratio in the conventional diesel engine is not sufficient to ignite the fuel. So it requires an ignition system for initiate combustion. Apart from that, the diesel engine is having higher compression ratio in the order of 16.5:1 to 18.5:1. The higher compression ratio increases the compression pressure and temperature of fuel and also easy for ignition. The peak pressure obtained in CI engine is quite higher compare to the SI engine and also increases the work-done.

Aquanol is aqueous ethanol, environment friendly and cost-effective than current alternate fuels. “Wet” alcohol fuels have much lower combustion temperatures than pure alcohol fuels or gasoline. This is the primary reason that aqueous fuels have such low NOx emissions. The reduced temperatures also ensure that the catalytic materials do not degraded during the combustion process. This is important for extended life of catalytic igniters.
Lowered combustion temperatures do not adversely affect the engine efficiency. Aquanol is environmentally friendly in another important way. Accidental spills biodegrade rapidly in comparison to petroleum-derived fuels and expensive remediation of spill sites is avoided. For this reason, aquanol is likely to become a preferred fuel for watercraft.

The diesel engine with its combustion chamber walls insulated by ceramics is referred to as Low Heat-Rejection (LHR) engine. The LHR engine has been conceived basically to improve fuel economy by eliminating the conventional cooling system and converting part of the increased exhaust energy into shaft work using the turbocharged system. Adiabatic engine implies a no heat loss engine, as adiabatic process is defined as a no-heat loss process since the combustion chamber walls have no thermal capacity or inertia. But, under such imaginary cases, there would be no heat flow relative to the cylinder walls. The ways and means of realization of such a combustion chamber are not realistic in practice.

However the insulated combustion chamber either partially or fully can be assumed to have a large thermal capacity or inertia. The surfaces of the combustion chamber remain at a constant temperature throughout the operation. Such an engine is called a Low Heat Rejection (LHR) engine. In the development of LHR engine, the reduction of heat loss to the coolant system has always been of considerable interest to engine designers because, this would reduce the cost, weight, power requirement and size of the cooling system. In gasoline engines, the thermal insulation will increase the wall temperature which will lead to unwanted detonation. Because of this, insulation of the combustion chambers could be done only to diesel engines. This has two important purposes-to reduce the size of coolant system & to
increase the exhaust energy available for turbo charging and thereby increasing power and efficiency.

The engine running using aquanol should be a low heat rejection engine, retaining most of the heat rejected during the previous combustion. To enable this property and to deliver this nature a thermal barrier coating is necessary. This coatings act as a bank for the heat which would be wasted. This heat absorbed by the coating will be used to vaporize the fuel droplets during the next cycle of operations. The thermal barrier coating is usually a ceramic coating of Partially Stabilized Zirconia (PSZ) with Yittria as the binder. Applying the coatings delivers the engine a low heat rejection property.