ABSTRACT

There is a global realization about the fast depleting natural resource of petroleum products. Hence the need for alternatives to the mineral oils with renewable sources of energy which are available in abundance and at a low cost are to be identified. The most suitable among the available alternatives are in the form of alcohols and vegetable oils which are easily available and are renewable in nature besides being cost effective.

Ethanol directly is not quite suitable for use in diesel engines as substitute to diesel oil due to the very high self-ignition temperature, low flash point and lower Cetane number. Ethanol blended with HSD is reported to be a substitute for mineral fuels. Limited attempts have been made using different proportions of ethanol and bio diesel. Also the results found to be inconsistent and cannot yield any useful conclusions. Suggestions were given by some researchers to try ignition improvers as additive in order to get better performance and solve the problem of miscibility.

Several works related to the use of blends of alcohols, both Ethanol and Methanol, and diesel were reported. The recommendations are supporting the use of these blends in engines in spite of the problems associated with miscibility. The efficiency of the engine is reported to be lower with the use of these blends. To replace the diesel fuel completely with renewable source, vegetable oils are found to be the best alternates. Bio-Diesels which are produced by
Transesterification process are found to be equivalent to diesel where so many problems associated with pure vegetable oils can be eliminated. Researchers concluded that these biodiesels can be directly used in diesel engines. However minor modification on the engine could yield better performance though cannot be the same as diesel performance.

Some works suggested that the blends of alcohols and biodiesels may improve the performance further and also reduce the emissions. However these works are very much limited and no convincing results are reported. Also it appears, there is scope to try additives which can modify the fuel to give better characteristics.

In the light of the above, the present work is planned. Taking the recommendation to use additives with the blends an attempt is made to try the additives like 1) Tetra Hydro Furan (THF) 2) Tetra Nitro Methane (TNM). These two additives are chosen basically they are the ignition improvers and have the characteristics. At the outset these additives are tried with Ethanol and Diesel blends to improve the miscibility of the blends. In the literature it is found that 15% of Ethanol mixed to 85% diesel is a better blend to be used in engines.

Hence initially, a blend of 15% Ethanol 85% diesel is considered and mixed with 1 to 3% of additive and experimented in the test engine. The investigation concludes 2% of the additives both THF and THM are better. Out of the two THF is found to be more optimum.

In the second stage, the blends of biodiesel and ethanol are tried. As such there are very limited works on this, and no concrete
suggestion is found regarding blend composition. Hence it is decided to try different proportions and find optimum blend. From this investigation it is identified that 80% Bio-diesel and 20% Ethanol is optimum. Further the additives which are tried with Diesel and Ethanol blends are also tried with Biodiesel and Ethanol blends. In this case also 2% THF additive is found to be the best additive in terms improving engine efficiency and reduce emissions.

As the properties of these blends are not available the same are measured in oil and fuel testing laboratory of M/s Hindustan Petroleum Corporation Ltd, Ghatkesar, Hyderabad. This helped to select the range of proportion of blends of ethanol and biodiesel.

Finally, minor modifications on the engine like varying the Compression ratio, Injection pressure and Injection timing are attempted. The experimental results could yield optimized value for these engine design parameters which are found to be CR-18.5, IP 240bar and IT 29°bTDC for this test engine. The preheating of fuel also tried and 50° is giving better performance.

The final result yielded.....% of improvement in the performance of the engine in terms of Thermal efficiency/BSFC

The present investigation is expected to be useful for the future development of a viable engine fuelled with blends of alcohol and biodiesel.