

NAME OF THE SCHOLAR : **DEVENDRA VASHIST**
NAME OF THE SUPERVISOR : **PROF. MUKHTAR AHMAD**
DEPARTMENT : **MECHANICAL ENGINEERING**
TITLE OF THE THESIS : **STUDY OF PRODUCTION, ANALYSIS
AND PERFORMANCE OF BIO-DIESEL**

ABSTRACT

This thesis presents investigation on production and performance of biodiesel available from two sources i.e. from jatropha and castor plant. In chapter one focus on the energy sources available in India is given. In the quest to find an alternative fuel for diesel engine a literature survey has been made this is presented in chapter two. Chapter three of the thesis comprises of investigations of the resource availability, energetic efficiency, and economic feasibility of converting jatropha oil into biodiesel. A resource assessment of jatropha oil generation in India was performed for the period of 2007 onwards. Result showed that if 40% of cultivable wastelands are planted with jatropha plant in a period of 20 years it will be possible to substitute over 16 % of petroleum diesel in 2027. Jatropha oil production and processing system, which involves energy ratios (ER) for three different cases, were studied. Problem of land use can be reduced by using green algae biomass. Another study indicated that more than 50 % of available agricultural land of village would be required to meet 100% fuel demand with biodiesel. Chapter four comprises of oil expeller and biodiesel reactor development. Oil from jatropha seeds was expelled from the expeller and than the biodiesel was prepared from the same. Chemical proprieties of the prepared biodiesel were analyzed in the lab and then compared with the diesel, the properties were found to be very much nearer to the petrodiesel. Diesel, biodiesel blends (5, 10, 15, & 20 by volume percent) were used for conducting the short term engine performance and emission tests at varying loads (25, 50,

75 & 100 percent) on a small size diesel engine. The brake specific fuel consumption (BSFC) and brake thermal efficiency (BTE) were calculated from the recorded data. The engine performance parameters such as fuel consumption exhaust temperature and exhaust emissions were recorded. For jatropha oil methyl ester (JOME) study showed an increase in brake thermal efficiency up till 18% JOME blends with diesel. The brake power values were comparable to those obtained from diesel. With biodiesel blends, significant reduction in emissions of CO was noticed. NO_x emissions with JOME blends were observed to be some what higher as compared to diesel. For castor oil methyl ester results showed the maximum value of thermal efficiency at 13% substitution of castor oil methyl ester (COME) in diesel. However, its higher flash point resulted in higher engine exhaust temperatures than diesel. Statistical test Chi square (χ^2) and two way ANNOVA (analysis of variance) were applied to find out any kind of significant effect on use of fuel type over fuel consumption. For ANNOVA test results indicated for COME, F = 2.397 there is no significant effect on fuel consumption with the fuel type. There is a significant effect on fuel consumption and thermal efficiency with % of load. For F = 5.69 there is a significant effect on thermal efficiency with the fuel type. Similar trends were observed with JOME blends.