



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS



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Thesis Title:

Exploring the applicability of *mesua ferrea* Linn oil as an alternative to diesel in compression ignition engines

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SHORT ABSTRACT

In this investigation, an attempt has been made to explore the feasibility of *Mesua ferrea* Linn seed oil (a type of vegetable oil) as an alternative to diesel to run the CI engines. Initially, this vegetable oil (VO) extracted from the seeds of *Mesua ferrea* Linn tree is characterized and the VO is then blended with diesel at the volume percentage of 10, 20 and 30% (designated as VO10, VO20 and VO30). The VO blends are then tested in the 3.5 kW CI engine at various loads. A slight drop in brake thermal efficiency (BTE) with the use of VO is observed which up to 1.78, 3.94 and 5.47% with the use of 10, 20 and 30% blends, respectively. The brake specific fuel consumption (BSFC) increases with blending. In comparison to diesel, the VO blends produce higher CO and HC emissions. With the use of VO blends, the NO emissions is found to reduce which is higher with the higher amount of oil in the blend. With the increasing proportion of VO in the oil-diesel blend, the performance of the engine tends to decrease along with the increase of CO and HC emissions. To explore the feasibility of redressing this drawback, ethanol is used as an additive to VO-diesel blend. Ethanol being of low viscosity, reduces the viscosity of the VO-diesel blend upon blending. Ethanol is added 5% and 10% by volume to both VO20 and VO30 blends. With 10% ethanol blend to VO20 and VO30, the BTE improves up to 4 and 1.5%, respectively. The CO emissions of VO20 decreases and NO increases with the use of ethanol. However, the HC emissions decreases with the addition of 5% ethanol and it increases with the addition of 10% ethanol in the VO20 blend. The use of ethanol in VO30 results in an increase of CO and HC emissions; while it reduces the NO emissions. Later, the experiments are carried out using diethyl ether (DEE) as an additive in place of ethanol to VO-diesel blends (VO20 and VO30). The addition of DEE to VO30 increases the BTE of the engine as compared to neat VO30 which, on an average, is 0.6 and 1.6% with the addition of 5 and 10% DEE respectively. The use of DEE in VO20 and VO30 reduces the CO and NO emissions. However, the HC emissions increases with the blending of DEE with VO20 and VO30 blends. Finally, the energy and exergy analyses of the diesel engine run on all the test fuels are studied to evaluate the quantity and quality of energy utilized and loss in the system. On overall, the addition of ethanol and DEE in VO-diesel blends improves both the energy and exergy efficiency.

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