

Performance Optimization of Low Proportion Biodiesel Blend on Marine Diesel Engine Using Response Surface Method



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Abstract Biodiesel is an alternative source of non-fossil fuels for diesel engines and can be used without the need for engine modifications. The effects of employing low proportions of palm biodiesel blends on marine diesel engine performance are investigated in this study. Response surface methodology (RSM) model had been employed to determine the optimal operating conditions of marine diesel engine with respect to palm biodiesel blend, engine load and speed. The ANOVA analysis was selected to verify the adequacy of the model. The use of palm biodiesel blends has lowered the CO emissions while increasing BSFC and NO_x emissions marginally. The results of statistically goodness of fit (R^2) and the goodness of prediction (Adjusted R^2) for all response parameters were above 90%. This value indicates that the developed model is able to predict the data with high accuracy. This study revealed that the optimum condition of fuel was determined as 5% palm biodiesel and 95% of petroleum diesel which operated at 1500 rpm speed and 36.97% engine loading with 78% of RSM desirability. The RSM model was tremendously helpful in structuring the experiment and lowering the amount of time required by reducing the number of experiments to be conducted.

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