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Research Article

Influencing parameter optimisation of CRDI engine fuelled with lemongrass biodiesel blends

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Abstract

Based on the central composite design of the experiment of 50 input combinations, the behaviour of common rail direct injection compressed ignition engine was examined, and maximum engine performance and minimal emission were found using multi-objective RSM. The optimal input combination was identified after thorough testing. It consisted of 12.3 kg engine load, 60% lemongrass biodiesel, 1000 bar FIP, 6°bTDC FIT, and 0% exhaust gas recirculation. A second order quadratic model with R^2 values of 0.99, 0.99, 0.84, 0.98, 0.82, 0.93 and 0.94 for Torque, BMEP, BTE, mechanical efficiency, BSFC, CO and NO_x, respectively, was developed by taking into account all of the input parameters for all of the investigated responses. This model can be used to predict output responses within the experimental analysis ranges, with a maximum combined desirability of 0.863. ANN model may be

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influencing CRDI engine parameters. RSM was used to create a second-order polynomial quadratic model for forecasting torque, BMEP, mechanical efficiency, BTE, BSFC, CO and NOx. Furthermore, there was no apparent difference between the fitted values and the experimental data.

- The optimisation was done to enhance the BMEP, Torque, BTHE, and mechanical efficiency and minimise the BSFC, CO and NOx.
- The optimum combination for the best performance is obtained when running the engine at the following settings such as 100% EL, 60% fuel blend, 6°bTDC of FIT, 1000 bar FIP and 0% EGR.
- The ANOVA study's findings indicate that EL has a 99% impact on BMEP and torque. The effect of EL on BTHE is 60.3%. EL affects 94.4% of mechanical efficiency. EL controls 55.9% of SFC. CO is influenced by EL, EGR and IT, respectively, by 60.58%, 10% and 5.3%. EGR and IT both affect NOx by 50.5% and 23.9%, respectively.
- CRDI engine output response prediction accuracy of ANN is better than RSM

KEYWORDS:

Lemongrass biodiesel CRDI engine RSM performance and emission characteristics
optimisation ANN

Disclosure statement



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