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Developing of ANN model for prediction of performance and emission characteristics of VCR engine with orange oil biodiesel blends

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Abstract

Biodiesel is used as a valuable alternative to the conventional fossil fuel, as it is non-toxic, renewable and biodegradable resource. Engine parameters like compression ratio, injection timing and injection pressure play key role in the combustion of fuel. The present study focuses on ANN model for predicting the performance characteristics like brake thermal efficiency, brake specific fuel consumption and emission characteristics like carbon monoxide, oxides of

nitrogen and hydrocarbon emissions at varying loads and compression ratios (17, 17.5, 18). Seven training algorithms each with four combinations of training functions were investigated. Levenberg–Marquardt (trainlm) with log and tan sigmoidal transfer function provided the best results amongst the other six training algorithms. It was found to be an accurate predicting model for analyzing the performance and emission characteristics VCR engine with biodiesel blends. In all compression ratios, 20 OME showed better thermal efficiency and reduced fuel consumption than diesel. Lower CO and HC emissions were observed with 20 OME than diesel except NOx.

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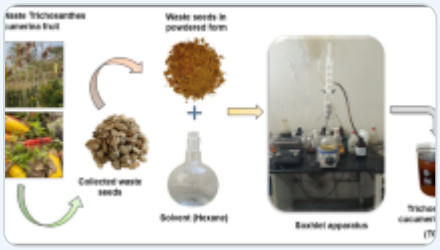

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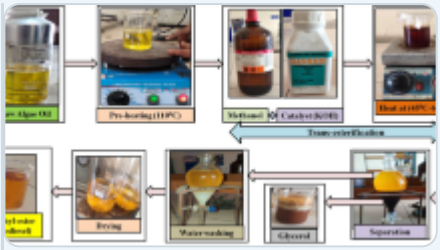

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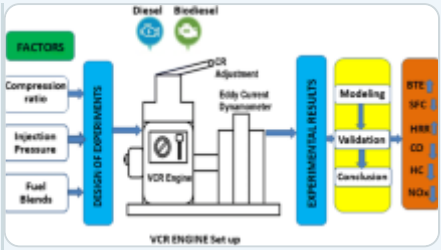

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Abbreviations

VCR: Variable compression ratio

ANN: Artificial neural network

BTE: Brake thermal efficiency

BSFC: Brake specific fuel consumption

CO: Carbon monoxide

NOx: Oxides of nitrogen

HC: Hydrocarbon

OME: Orange oil methyl ester

20 OME: 20% orange oil methyl ester + 80% neat diesel

CR: Compression ratio

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Electronic supplementary material

Below is the link to the electronic supplementary material.

Appendix I Results of various performance metrics using the Matlab is attached (DOCX 97 kb) (download DOCX ⭳)

Appendix II Details of the Matlab Simulation (DOCX 797 kb) (download DOCX ⭳)

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