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Modelling of biodiesel blend using optimised deep belief network: blending waste cooking oil methyl ester with tyre pyrolysis oil

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Abstract

This study introduces a new biodiesel blend as an alternative for diesel using waste cooking oil methyl ester by adding tyre pyrolysis oil and cerium oxide. Despite the conventional biodiesel blending models, this study made an effort to efficiently measure the prediction rate of these blended fuels by modelling through the deep belief network (DBN). To attain the accurate prediction, this study moves on with the new logic of optimal tuning of the count of hidden neurons in DBN. The optimal selection is carried out by introducing a new algorithm named lioness updated crow search algorithm (LCSA), which hybrids the concept of the lion algorithm (LA) and crow search algorithm (CSA). Finally, the proposed work is analysed and compared over other conventional models with respect to emission analysis and error analysis. From the analysis, the proposed model in terms of mean deviation (MD) measure has gained betterment and is 75.57, 17.71, 85.55, and 74.19% better than grey wolf optimiser (GWO), whale optimisation algorithm (WOA), LA, and CSA, respectively. For the mean absolute error measure, the implemented model is 42.38, 24.42, 43.53 and 36.72% improved than GWO, WOA, LA, and CSA, respectively.

Keywords:

Pyrolysis, petroleum, vegetable oils, belief networks, biofuel, combustion, diesel engines, blending, tyres, particulate matter, exhause emissions, petroleum diesel, biodiesel blending changes, blend percentages, biodiesel blend, waste cooking oil methyl ester, tyre pyrolysis oil, conventional biodiesel blending models, blended fuels, crow search algorithm, optimized deep belief network.

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