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MCDM OPTIMIZATION OF KARANJA BIODIESEL POWERED CI ENGINE TO IMPROVE PERFORMANCE CHARACTERISTICS USING SUPER HYBRID TAGUCHI COUPLED WASPAS-GA, SA, PSO Method

Dilip Kumar Bagal[1*], Anil Kumar Patra[1], Ajit Kumar Pattanaik[1], Dulu Patnaik[1], Siddharth Jeet[2], and Abhishek Barua[2]

[1] Department of Mechanical Engineering, Government College of Engineering, Kalahandi, Bhawanipatna, Odisha, 766002, India

[2] Department of Mechanical Engineering, Centre for Advanced Post Graduate Studies, BPUT, Rourkela, Odisha, 769004, India

*Corresponding author

ABSTRACT

Biofuels are renewable, can supplement fossil fuels, reduce greenhouse gases, and mitigate their adverse effects on the climate resulting from global warming. In the present study, biodiesel produced from Karanja oil is evaluated as alternative fuel in a diesel engine. The experiments are conducted on a single- cylinder, four-stroke, direct-injection CI engine and the experimental parameters include the percentage of Karanja biodiesel in the blend, engine load, injection pressure, and compression ratio. Comparative measures of brake thermal efficiency, brake-specific fuel consumption, exhaust gas temperature, and HC, CO, and NOX emissions are presented and discussed. Results show that the performance of the engine fuelled with Karanja biodiesel and its blends with diesel fuel is generally comparable to that when the engine is fuelled with pure diesel. At higher compression ratios, the engine gives lesser emission and better performance. A hybrid approach was employed for optimizing engine operating parameters using a recent technique i.e. weighted aggregated sum product assessment method (WASPAS) coupled with Taguchi's design of experiment, Genetic Algorithm, Simulated Annealing, and Particle Swarm Optimization. Optimization procedure resulted in creating of non-dominated optimal points which gave an insight on the best operating conditions of the engine.

Keywords— Compression Ignition Engine, Genetic Algorithm, Karanja Biodiesel, Particle Swarm Optimization, Simulated Annealing, WASPAS Metho