International Journal of Engineering & Technology& sciences

June -2017 Rainbow Publications ISSN 977 2394-6903

indexed in International Science index **General Impact Factor: 0.532**

Paper No: RJUNE-01

Comparison of RSM and ANN for predication of performance parameter with Biodiesel blend on unmodified diesel engine

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Abstract

Biodiesel is promising alternative to petroleum products due to increased demand. In this work, the performance parameters were evaluated with Karanja oil methyl ester as biodiesel on unmodified single cylinder four stroke diesel engine. Also, predication of parameters is performed by using response surface methodology (RSM) and artificial neural network (ANN), and compared. The input parameters are biodiesel in % by volume i.e. 0%, 10%, 20%, 50% and 100% and load in % of total load i.e. at 0%, 20%, 50%, 80% and 100% of full load. The output parameters selected are BTE, BSFC, brake specific energy consumption (BSEC) and exhaust gas temperature (EGT). The parameters showed improvement with lower blend of biodiesel-diesel i.e. 20% by volume. The predication of response is compared based on coefficient of correlation and mean squared error. RSM model is developed by using Minitab 17.0 software. ANN model developed by using Matlab 16 using neural network tool. The learning task completed through hyperbolic and linear functions, while the Levenberg–Marquardt algorithm used in optimization process. Correlation coefficients of 0.91946–0.99401 which is better than RSM. So, the developed model can be used as useful tool for predication of performance parameters at different input levels at which experimentation have been not performed with saving of costly and time taking process.

Keywords: Karanja oil methyl ester (KOME), BTE, BSFC, BSEC, EGT, Response surface methodology (RSM), Artificial Neural network (ANN).