A review on the application of response surface method and artificial neural network in engine performance and exhaust emissions characteristics in alternative fuel

I.M.Yusri[ac]; A.P.P.Abdul Majeed[b]; R.Mamat[ac]; M.F.Ghazali[a]; Omar I.Awad[a]; W.H.Azmi[a]

[a] Automotive Engineering Centre, Faculty of Mechanical Engineering, Universiti Malaysia Pahang, 26600 Pekan, Pahang, Malaysia
[b] Innovative Manufacturing, Mechatronics and Sports Laboratory, Faculty of Manufacturing Engineering, Universiti Malaysia Pahang, 26600 Pekan, Pahang, Malaysia
[c] Faculty of Bioengineering & Technology, Universiti Malaysia Kelantan, 17600 Jeli, Kelantan, Malaysia

ABSTRACT

Alternative fuel is one of the widely used fuel substitutions for both petrol and diesel in the field of internal combustion engine. The increase in the demand for alternative fuel is currently driven by the requirement of decreasing engine fuel consumption and fulfilling the stringent engine exhaust emissions pollutant regulations. In order to effectively tackle the aforementioned concerns, it appears that through engine experimental analysis alone for both engine performance and exhaust emissions is insufficient. Recently, the need for engine modelling based on statistical and machine learning methodologies through response surface and artificial neural network technique, respectively, are non-trivial to provide a better decision support analysis. Therefore, the present study reviews the extent to which the application of these methods in various alternative fuel in both spark and compression ignition engine to investigate their viability. The paper also describes herein the ways to determine the accuracy and the significance of model fitting for both methodologies. It was demonstrated from the review that most of the research yield favourable results of engine modelling prediction for both of the methods. It can be concluded the comparison between predicted and experimental results provided a high degree of determination coefficient indicating that the model could predict the model efficiency with reasonable accuracy.