

Orthogonal least squares method and its application to nonlinear modelling of automotive engine fuelled with palm oil methyl esters

Abstract

In this paper, nonlinear mathematical models for an automotive engine fuelled with palm biodiesel (Palm Oil Methyl Ester) are developed. Assuming a discrete time form for the system model, a polynomial Nonlinear Autoregressive exogenous (NARX) with a linear-inparameter model structure is selected in this work. Real-time data obtained using a computer based data acquisition system from a 2.0L automotive diesel engine test-bed unit is used for parameter estimation. The orthogonal least squares (OLS) algorithm together with the Error Reduction Ratio (ERR) criteria are used to select the significant terms in the NARX models in order to determine a parsimonious model and estimate the parameters of nonlinear model. Finally, the models are validated by plotting the output predicted by the models and comparing it with the measured output. The modelling error of both models is examined.

Keywords

Biodiesel; Non-linear modeling; Orthogonal least squares; Palm methyl ester; System identification