(1-10) Prediction of Combustion and In-Cylinder Emissions in a Direct Injection Diesel Engine Using Multi-Process Models

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ABSTRACT

Though experimental work helps in resolving many of the issues related to soot emissions, an analytical approach enables in-depth understanding of the mechanisms and principles of soot formation. In this work, an attempt is made to predict in-cylinder nitric oxide (NO) and soot concentrations using a multi-zone diesel combustion model. For estimating soot formation, the conservation equations for precursor specie, growth specie, soot volume fraction and particle number density are solved in each spray zone. The total in-cylinder NO and soot concentrations are obtained by summing up their values in each zone of the spray. The model predictions are compared with the experimental data available in literature [15]. Typical results of a comparison of energy release, cylinder pressure and in-cylinder NO and soot concentrations at a reference test condition of -8° atdc injection timing and 29.6 mg/cycle fuelling rate are shown in figures below. The predicted and experimental values of these quantities are in reasonable agreement with each other and thus confirm the ability of the proposed model to predict engine combustion and emission characteristics.