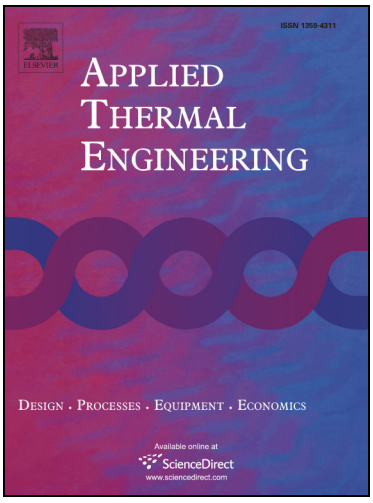

Empirical Model to Predict Melt Volume for different range of Diesel Exhaust Fluid Tank Volumes used in Selective Catalytic Reduction Systems

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Empirical Model to Predict Melt Volume for different range of Diesel Exhaust Fluid Tank Volumes used in Selective Catalytic Reduction Systems

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Abstract

Technologies such as Selective Catalytic Reduction (SCR) assists in complying with diesel emission limits for NOx. Diesel Exhaust Fluid (DEF) which is an aqueous urea solution plays an important role in SCR systems. DEF freezes at approximately -11°C due to which it becomes a challenge to meet regulations which state that, NOx emissions must be under regulatory limits within 70 minutes of engine starting. Hence, it is important to ensure DEF melts within stipulated time so that the system is ready to reduce engine out NOx. Prediction of melt volume is an important performance parameter used to compare different DEF tank designs. In this paper, empirical models are identified from various studies done in the past and selection of suitable models for wide range of SCR applications is done. Models were selected which predicts melt volume w.r.t time for vertical heating arrangements for different tank sizes, aspect ratios and shapes i.e. rectangular and cylindrical enclosures used worldwide. This empirical model is compared with experiment data and also with previous literature to understand its robustness and feasibility for different geometries. New hybrid approach was also identified to predict melt volumes for helical heater arrangements within acceptable percentage error range.

Keywords: *Diesel Exhaust Fluid; Empirical model; Melt volume prediction; DEF tanks*

NOMENCLATURE

SCR	Selective Catalytic Reduction
NO_x	Oxides of Nitrogen
DEF	Diesel Exhaust Fluid
AT	After-treatment
US-EPA	United States Environment Protection Agency
EGR	Exhaust Gas Recirculation