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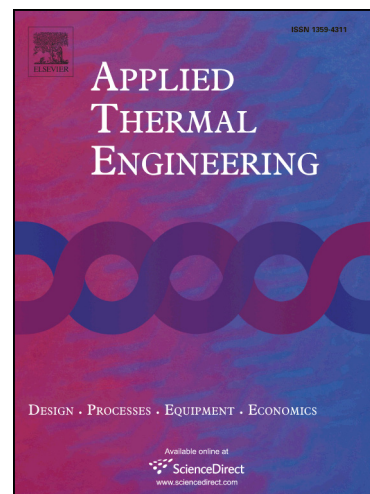
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Finite element analysis of thermo-mechanical conditions inside the piston of a diesel engine

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Abstract In this paper, we present our theoretical investigations on thermo-mechanical conditions inside the piston of a diesel engine. For the theoretical analysis, the operational parameters of such piston, semi-empirical formula and empirical model were employed to determine the boundary conditions such as temperature and stress fields. Using the finite element method (FEM), the stress loading and fatigue life were calculated. Based on the available experiment data, the used empirical formula and models can be improved well. Furthermore, the harsh conditions were simulated using the FEM, and the results were verified using the accelerated life testing. Moreover, the relationships between the piston life and stress under the thermal load, mechanical load, and thermal-mechanical coupling conditions were established based on the above simulated data. The results showed that in different thermal, mechanical, and thermal-mechanical coupling conditions, their relationships obeyed Arrhenius model, Inverse power law model, and Generalized Eyring model, respectively.

Keywords: Simulation Test, Finite Element Method, Reliability

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