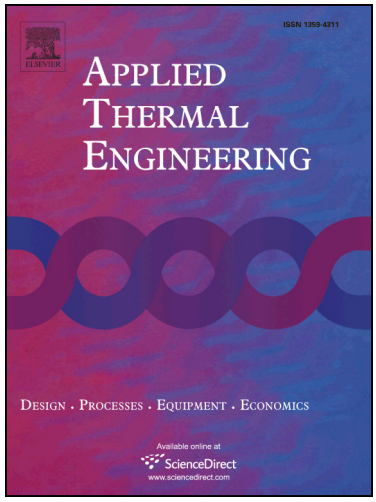

Research Paper

Analysis of Thermal Temperature Fields and Thermal Stress under Steady Temperature field of Diesel Engine Piston

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Abstract： With the improvement of the diesel engine power and performance, the piston in the combustion chamber is subjected to higher thermal load and the thermal stress decreases its working life. Therefore, it is necessary to analyze the subsequent thermal stress on the piston during design process to reach the optimum one. This paper tries to present a new calculation method for the theoretical design of the piston. In this study, the 3D solid model of piston in 16V280 diesel engine was developed and the simulation calculation of the steady-state and the transient-state temperature field is carried out. Based on calculation results, the maximum temperature fluctuation of the piston temperature field is less than 20 degrees, so the steady-state temperature field was used as boundary condition for the thermal stress calculation and the thermal mechanical decoupling method was used to calculate the thermal stress caused only by the uneven temperature distribution. The results show that the maximum temperature is 354 °C , which appears at the edge of the combustion chamber. The steady-state temperature field of finite element simulation shows a good agreement with the experimental results. The thermal stress obtained from thermal mechanical decoupling method was within the allowable range, since the maximum value is 270 MPa . Danger zone appears at the combustion chamber throat, the contact area of piston head and skirt.

Key Word: Diesel engine, Piston, Temperature field, Thermal stress, Finite element analysis.

Nomenclature

a	clearance between piston and cylinder