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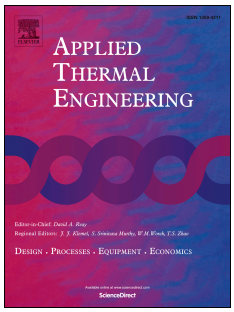

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Transient thermal model of a vehicle's cabin validated under variable ambient conditions

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Abstract

This paper presents a lumped-parameter thermal model of the passengers' compartment of a vehicle. The model is completely dynamic and has been thoroughly validated under variable ambient conditions including solar radiation. The proposed model reproduces accurately the warm-up and cool-down of the cabin and can help analyse capacity reduction actions for air-conditioning systems.

In this study, the thermal loads have been calculated by means of the model. For the tested minibus in real outdoor conditions, air renewal represents from 7% up to 53% of the thermal load, while the solar radiation accounts for 18% to 31%. According to the results, a decrease of 0.2 in the glazing transmissivity can lead to a 3.3% reduction of the installed cooling capacity.

Keywords: Automotive, Modeling, Simulation, Thermal load, Air conditioning

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