

Automotive cabin soak temperature control strategies for improved safety, comfort and fuel efficiency: A review

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ABSTRACT

There has been growing concern over improving the driving range of electric vehicles (EVs) and achieving rapid cabin thermal comfort upon entering a hot-soaked vehicle, thereby reducing occupant stress and discomfort. This comprehensive review focuses on the interior cabin soak temperature of commercial vehicles impacts when parked under direct sunlight and; evaluates the potential, characterization, drawbacks, and recent developments of the temperature reduction approaches in improving safety, comfort and fuel efficiency. Various cabin temperature reduction methods in the literature have been collected, analyzed, and evaluated. It has been found that cabin temperature threatens children and pets, leading to discomfort upon entry and reaching deadly levels. The most feasible passive technologies include implementing phase- change-materials (PCMs), solar chimneys, aluminium covers, solar-powered ventilation, and reflective glass. The colour of the car's bodywork should also be considered, as it has a significant impact on reducing the cabin air temperature. The choice of technology depends on factors such as energy source type, economic feasibility, end-user behaviour, and government regulations.

KEYWORDS

Automobile air conditioning; Cabin soaks temperature; Fuel economy; Passive solar load reduction approach; Thermal comfort

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