

Development of a novel refrigeration system for refrigerated trucks incorporating phase change material

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Abstract

An innovative refrigeration system incorporating phase change material (PCM) is proposed to maintain refrigerated trucks at the desired thermal conditions. The advantage of using PCM to maintain low temperatures is that a conventional refrigeration system does not have to be located on-board the vehicle. In addition, the system consumes less energy and produces much lower local greenhouse gas (GHG) emissions. The phase change thermal storage unit (PCTSU) is charged by a refrigeration unit located off the vehicle when stationary. The PCM is discharged and provides cooling when in service. A new PCM with a lower cost than currently available PCMs was developed, suitable for maintaining the refrigerated truck at a temperature of -35°C . The PCM has a melting temperature of -26.7°C and a latent heat of 154.4 kJ/kg . A prototype system was constructed and test results proved that the proposed refrigeration system is feasible for mobile transport. An analysis shows that delivery of refrigerated products can be made with a PCM system having a weight comparable to that of an on board conventional refrigeration system with less than half of the energy cost.

Suggested Citation

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