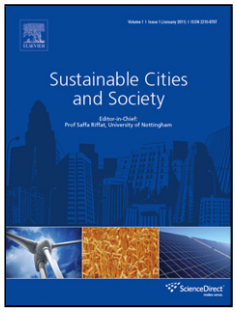

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Experimental and numerical characterization of natural convection in a vertical shell-and-tube latent thermal energy storage system

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Highlights

- Physics of heat transfer in a vertical LHTES system was experimentally investigated.
- Natural convection induced vertical and horizontal circulation in the storage unit.
- Vertical convection was responsible for thermal energy transfer from HTF to PCM.
- Horizontal convection circulation was responsible for energy transfer within the PCM.
- The experimental findings were further explained using numerical simulation.

Abstract

In this paper, physics of heat transfer mechanism in vertical cylindrical shell-and-tube latent heat thermal energy storage (LHTES) systems is investigated. Visualized experiments are carried out to investigate the evolution of the liquid/solid interface of a phase change material (PCM). The temporal variation of the experimental temperature is then used to investigate the effect of natural convection on heat transfer in the PCM. A combined conduction/convection model is applied to investigate the melted PCM's convective circulation

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