Title:	Numerical Study of Performance of a Rectangular PCM Storage Unit

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Abstract:

This paper presents a three dimensional model for simulation of a latent heat thermal energy storage system (LHTESS). The LHTESS is in the form of a rectangular container with a central horizontal pipe surrounded by a phase change material (PCM). Paraffin wax with melting temperature of 60 oC is used as a PCM whilst water is used as a heat transfer fluid (HTF). Thermo physical properties of paraffin wax are assumed to be constant in the modelling process, whereas the density variation is handled by using Boussinesq model. Transient numerical simulations were carried out by using ANSYS/FLUENT commercial software. Simulations performed provide information on the instantaneous temperature distribution, solidification/melting dynamics and the velocities field in the storage unit during the melting process. The effects of the inlet temperature and mass flow rate of the HTF on the charging (melting) process were also investigated.

Keywords*: PCM; thermal storage system; paraffin; solar energy*