

Abstract

An analytical solution of a latent heat storage unit (LHSU) consisting of a shell-and tube was obtained by using the Exponential Integral Function and the variables separation technique. The working fluid (water) circulating by forced convection inside the inner tube charges and discharges the storage unit. The comparison between analytical predictions and experimental data shows good agreement. Extensive parametric studies were conducted in order to examine the effect of the pertinent parameters (such as natural convection, mass flow rate of HTF, outer tube radius, pipe length etc.) on the melting and solidification processes of paraffin as a PCM. In order to provide guidelines for system performance and design optimisation, unsteady temperature distributions within PCM during melting/solidification, energy stored, position of moving interface and thermal efficiency have been obtained by a series of numerical calculations and represented graphically