

## Abstract

An analytical investigation of thermal energy storage system (TESS) consisting of several flat slabs of phase change material (PCM) is presented. The working fluid (HTF) circulating on laminar forced convection between the slabs charges and discharges the storage unit. The melting and solidification of the PCM was treated as a radial one dimensional conduction problem. The forced convective heat transfer inside the channels is analyzed by solving the energy equation, which is coupled with the heat conduction equation in the PCM container. The comparison between the present exact solution with the numerical predictions and experimental data available in literature shows good agreement. The charging/discharging process is investigated in terms of liquid-solid interface position, liquid fraction, total heat transmitted to the PCM and thermal storage efficiency for various HTF working conditions and different design parameters such as PCM slab length, fluid passage gap and thickness of PCM duct container