

## Latent Heat Storage Using Phase Change Materials

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**Abstract :** The judicious and economic consumption of energy for sustainable growth and development is nowadays a thing of primary importance; Phase Change Materials (PCM) provide an ingenious option of storing energy in the form of Latent Heat. Energy storing mechanism incorporating phase change material increases the efficiency of the process by minimizing the difference between supply and demand; PCM heat exchangers are used to storing the heat or non-convectational energy within the PCM as the heat of fusion. The experimental study evaluates the effect of thermo-physical properties, variation in inlet temperature, and flow rate on charging period of a coiled heat exchanger. Secondly, a numerical study is performed on a PCM double pipe heat exchanger packed with two different PCMs, namely, RT50 and Fatty Acid, in the annular region. In this work, the simulation of charging of paraffin wax (RT50) using water as high-temperature fluid (HTF) is performed. Commercial software Ansys-Fluent 15 is used for simulation, and hence charging of PCM is studied. In the Enthalpy-porosity model, a single momentum equation is applicable to describe the motion of both solid and liquid phases. The details of the progress of phase change with time are presented through the contours of melt-fraction, temperature. The velocity contour is shown to describe the motion of the liquid phase. The experimental study revealed that paraffin wax melts with almost the same temperature variation at the two Intermediate positions. Fatty acid, on the other hand, melts faster owing to greater thermal conductivity and low melting temperature. It was also observed that an increase in flow rate leads to a reduction in the charging period. The numerical study also supports some of the observations found in the experimental study like the significant dependence of driving force on the process of melting. The numerical study also clarifies the melting pattern of the PCM, which cannot be observed in the experimental study.

**Keywords :** latent heat storage, charging period, discharging period, coiled heat exchanger

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