

Abstract

Solar energy appears to be the only veritable and viable alternative source of energy. It is inexhaustible, has no effect on the environment, and can be converted to many other forms of energy. Converting it to thermal energy in order to heat water is done with a solar water heating system. In Palestine there is a large dependence on SWH to heat water.

Thermal energy storage (TES) systems provide several alternatives for efficient energy use and conservation. Phase change materials (PCMs) for TES are materials supplying thermal regulation at particular phase change temperatures by absorbing and emitting the heat of the medium.

The main objective of this study is to, design and construct a new solar water heater tank, integrated with PCM storage in the aim of reduce the solar water heater tank size.

Solar water tank was manufactured with a capacity of 30 liters coupled with the Phase change material (PCM) tank. Charging and discharging process was simulated by using a variable power electric heater tank which, supply the power based on different solar irradiation along the year in Palestine.

PCM tank configuration shows a high heat transfer rate during charging periods which, all the PCM is undergoing melt at different power supplies and water flow rates. The hot water supply time was increased by 30% more than conventional system. Also, the system with PCM stores 3000 kilojoules of energy more than conventional. which used to supply approximately 25 liters of hot water.