

Performance Evaluation of Solar Hot Water Collector Comprising Modified Loop Heat Pipes

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Abstract

At present, popularity of Solar Hot Water Heater Systems (SHWHS) is growing rapidly as it employs the pollution free green energy technology. With this high demand on Hot Water Solar Collector (HWSC) systems, worldwide manufacturers of the HWSC systems are conducting research to develop a high efficiency HWSC system by using modified Loop Heat Pipes (LHP). In this study, main objective is to demonstrate the fabrication and performance enhancement of SHWHS by deploying modified LHP. In the fabrication process working fluid consideration and the compatibility of the heat pipe material with the selected fluid is directly affected to the whole efficiency of the system. HWSC is fabricated with 4 LHPs made from copper with a total loop length of 120 cm. Acetone was selected as the working fluid and indoor testing was carried out for different acetone volumes to determine the optimum filling ratio inside the LHP. Daily outdoor performance tests were conducted for the period of 6 hours at the ground level when the tank volume is filled with 15 L of water. Mean water temperature of the storage tank increased up to 43°C in outdoor test and 53°C in indoor test. The mean system efficiency at the end of 6 hours is estimated. The mean system efficiency for outdoor tests was less than that for the indoor tests. Long term outdoor tests should be recommended to find more meaningful information to domestic and commercial end users.

Keywords: *Hot Water solar Collector, Loop Heat Pipe, Heat Pipes, Solar Hot Water Heating System*