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Study of an efficient compact solar water heater

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Abstract

Solar passive water heaters are potential candidates for enhanced heat transfer. The objective of this study was the design, construction, outdoor testing of a passive, simple and low-cost compact solar water heater (CSWH) system. As a new design, the black colored sands immersed into the water storage tank established the main portion of the collector absorber section. The water storage tank was manufactured from galvanized sheet of 0.0015 m in thickness and the volume of $1.45\times0.56\times0.17$ m^3. The effective area of the collector was 0.67 m^2. In all experiments results, the collector averaging daily efficiencies achieved higher than 70 percents. The performance of the novel CSWH system was simulated using thermal network analysis. The simulation results showed that the collector absorber operated as a gray material. During one interest test, the peak temperature value of the stored water into the tank reached about 90 Celsius.