

Performance of a 2-Element Plane Reflector Augmented Galvanised Pipe Flat Plate Collector for Solar Water Pasteurisation

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Abstract: About 80% of all infectious diseases including diarrhoea, typhoid, cholera in developing countries are transmitted through consumption of contaminated water. This study reports on the concept of heating water using low cost solar thermal energy systems to kill disease-causing microorganisms and gives the design philosophy, construction and measured thermal performances of a 2-element plane reflector augmented flat plate solar collector. A solar water pasteurization system was designed and constructed using locally available materials for direct water heating using solar energy in a flow-through system made of copper pipes. Standard car radiator thermostat valve was used to regulate pasteurization temperature at 82°C. The results demonstrated that solar heating of contaminated water could be achieved through a 2 m² flat plate collector with mounted with a 2-element plane mirror reflector with an aperture area of 4 m². The experimental collector was constructed with 20 mm diameter galvanized pipe fixed onto mild steel absorber plate. The collector without reflectors was used as control experiment. Under fair weather conditions, it was observed that the use of mirrors tremendously improved the performance of the collector by up to 94% producing 49-95 L of pasteurized water using the galvanized pipe collector. The microbiology water quality tests using presumptive test for total coliform and confirmed by Eijkman test showed no presence of *E. coli* in the solar pasteurized water samples. On the basis of the results, it was concluded that the solar water pasteurization system developed provides a cheaper alternative for water disinfection in Kenya and other sunny countries.