

Conference Abstract

Design and feasibility study of parabolic trough concentrated solar power water heater for domestic use in Sri Lanka

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Abstract

Concentrated Solar Power (CSP) systems are becoming popular in recent days for electricity generation, especially in the United States and Spain. Parabolic trough CSP systems can also be designed as a water heater by fixing the solar absorber tube along the axis of the parabolic mirror and allowing the water to pass through it. In this work, a small-scale parabolic trough CSP water heater was designed and tested for domestic use in Sri Lanka. Thin shiny aluminium sheets welded in a parabolic shape were used as the mirror. Water heater was mounted so that the absorber tube was along the north-south direction to harness the maximum thermal energy coming from the sun. A motor-driven sun-tracking system was used to track the sun throughout the day. Two limit switches facilitate stopping the rotation of the mirror at two extreme points in the early morning and also in the late afternoon. Three different types of absorber tubes with identical dimensions were tested to find out their suitability for water heating; galvanized iron tube, black-coated galvanized iron tube and the copper tube. It was found that the copper tube was better among the three different types of tubes tested. With copper tube, the maximum water temperature recorded was about 100°C at noon and an average daily water temperature recorded was about 70°C. We believe that the highest thermal conductivity of copper compared to that of iron is the primary reason for the highest efficiency of water heating with copper based solar absorber tube.

Keywords: Concentrated solar power, Water heater, Absorber tubes, Parabolic trough CSP system and Sun-tracking

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