CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

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Project Number

35510

Project Title

Solar Water Collector: Effect of Collector Diameter, Tilt, and Cover Material on Efficiency

Abstract

Objectives/Goals

The purpose of this project was to explore the impact of copper tube diameter, tilt, and cover material on the efficiency of a homemade solar water collector.

Methods/Materials

Two identical solar collector boxes were built with aluminum sheet absorbers at the base. Effectiveness of three different copper tubes (inside diameters, 1.27cm; 1.9050cm; 2.5400cm) was compared. These three different diameter copper tubes had the same length and parallel riser design. Two solar collectors with two different diameter copper tubes were tested at a time, with collectors always facing south to maximize the amount of solar energy collected. Six additional tests compared the effectiveness of two identical solar collectors (inside diameters, 1.27cm) mounted at different angles. In six final tests, the water collectors were covered with different transparent materials (acrylic sheet and glass) to test for efficiency.

Results

Results of the first six tests showed that the most effective copper tube had the smallest diameter (1.27cm). The acrylic sheet performed better than ordinary glass, always having the highest temperature increase. In six final tests, the solar collector mounted at an angle equal to the latitude of the test site's geographical location performed best.

Conclusions/Discussion

These results suggests that perhaps the 1.27cm copper tube used for this experiment, with increased number of riser tubes, decreased spacing between the risers, and an increased water collector surface area would perhaps maximize the efficiency of a collector. Further investigation to explore the impact of increased number of riser tubes, increased solar water collector surface area, and decreased spacing between riser tubes, using the 1.27cm copper tube should be explored.

Summary Statement

The impact of copper tube diameter, tilt, and cover material on the efficiency of a homemade solar water collector.

Help Received

Mr. Luke Rinard, an engineer, provided some guidance. Mr. Henry Guerrero soldered the copper tubes.