CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

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Project Number

S1126

Project Title

Contactless Buoyant Solar Desalination/Sterilization

Abstract

Objectives

The project focuses on avoiding fouling, the clogging of salt or left-over particles within a desalination device, by utilizing thermal radiation instead of heat conduction which achieves not only near max efficiency, but also superheats the evaporated steam within the system, while maintaining the goal of developing a buoyant, solar, and economical desalinator from previous year's research.

Methods

Theoretical models were first developed to predict numerous different temperature measures such as emitter, absorber, water, and steam.

A simple lab-scale device was then developed using RVC foam and pyropel layers for insulation, and petri dishes for water reservoir. The simulated sun was at a constant 1000 W/m^2. Temperatures within the system was measured using thermal couples

Properties of materials under infrared radiation were tested by using an infrared spectrometer and recorded electronically.

A realized version of the device was then constructed. Temperature were measured using thermal couples.

Results

The cost of the device was around fifty dollars, which matched up with the cost model. Each temperature measure from both indoor and outdoor experiment matched up with the theoretical model, which then proved the prediction of an average of 2.8 liters of water generated each day from the device per meter squared.

Conclusions

In conclusion, thermal radiation is a viable mode of heat transfer to boil water under one sun illumination. In addition, the benefits of deploying thermal radiation configurations for desalinators bring new functionality such as low medical-grade sterilization to the device.

Summary Statement

The project presents a breakthrough approach to water sterilization/desalination utilizing thermal radiation.

Help Received

All experiments were conducted independently in Rohsenow Kendall Heat Transfer Laboratory