



WPI

Project SolaReRevolution

Engineering the Future in Solar Sustainability



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Abstract

The San Francisco Agricultural School in Cerrito, Paraguay has had a Scheffler Reflector installed on campus for nearly five years. This is a simple yet effective solar dish that focuses the sun's rays onto a pot to boil water. In this time the system has been unable to focus sunlight effectively and, as a result, has gone into disuse. Through extensive research and experiments, we deduced the problem and created a solution that will allow the reflected sunlight to stay focused throughout the daylight hours. With our solution in place the school will have an effective alternative to burning precious natural resources. The Scheffler Reflector at the San Francisco Agricultural School is hoped to serve as inspiration for others in the area to introduce alternative energies as a way to reduce the demand for wood fuel.



Background

The San Francisco Agricultural High School installed a Scheffler Reflector solar cooker on their campus to help combat large-scale deforestation. The array was installed approximately five years ago, and is a large parabolic mirror used to reflect light rays at a pot to boil water for use in the kitchen. This solar cooker also helps to educate the students at the school in eco-technology, and its uses in creating a more sustainable lifestyle. However, the Scheffler Reflector on the campus in Paraguay has encountered a technical problem. It is not able to correctly focus the sun's rays to an appropriate size. Our project this year will be to devise a solution to allow the reflector to work properly, so that the school may continue its use of the dish.

Methodology

- Original plan was to repair the mechanical systems of the solar cooker and revise the solution of last year's group
- The team conducted multiple Skype calls with representative Dorothy Wolf and resident engineer John Eads
- Research and onsite communication revealed the true problem to be an inability of the Scheffler Reflector to correctly focus the sun's light
- Study of many diagrams and results of ground experiments yielded the issue to be related to the dish's rotational axis

Goals

Initial Goals

- Research Scheffler Reflectors
- Design a new mechanism
- Send the mechanism to the San Francisco Agricultural High School to be installed
- Make sure the mechanism was installed and is working

Revised Goals

- Repair the focusing ability of the dish
- Formulate a new solution to fix the cooker
- Provide ground work for a future team



Results & Recommendations

The team was able to eliminate mechanical issues and poor manual adjustment as sources of the cooker's failure. Through many experiments and extensive communication to our source in on the ground in Paraguay, we were able to draw the conclusion that the source of error for this specific cooker arises from the fact that it has an axis of rotation that is approximately 6 degrees lower than required, in relation with the ground. Our solution to this fact includes the following:

1. Install a longer piece of metal tubing at the end of the rotational axis through the following means:
 - a) Create a brace or a simple machine to support the rotational axis as it will have to be removed from its supports.
 - b) Remove the current piece of metal tubing by cutting it from the axis, the tubing beneath the axis, and the mount on which it is attached.
 - c) Reattach longer tubing in the same location, and then re-weld the axis and tubing beneath it at the proper angle.
2. If the first step fixes the focus problem, then no further action is required, otherwise the dish will then need to be checked in order to verify that it is perpendicular with the equator.
3. Our team invites a future Great Problems Seminar group next year to pick up where this team left off and devise the machine that would be required to successfully and safely accomplish the task of raising the axis. The team from this year will be in full contact and support, as we would like to ensure the successful implementation of our solution.



Photo Acknowledgement & Works Cited

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