Solar Cooker Project
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Project Proposal

Introduction

The solar cooker project is to provide an efficient substitute for less efficient methods such as wood or coal fired cooking by making use of solar energy. Cooking with wood and/or coal in open fires inside homes is a major health risk for those in the home and the use of wood for cooking is a major cause of deforestation in the rural area of Nicaragua where our cooperators live. This project class has been working with a community in Nicaragua to develop and enhance the use of solar cooking technology. Las Mujeres Solares de Totogalpa has used solar cooking for many years and has recently opened a solar restaurant.

Last semester the team decided to build a solar cooker for use by members of this team and the ESW Chapter at Cornell to demonstrate the capabilities of solar cooking and an initial design and prototype were made. Because Ithaca is at latitude of approximately 42 degrees, the cooker was designed with a sloped front (to allow capturing more sunlight in the winter, when the sun is relatively low in the sky). The project this semester is to design an alternative to last semester's. We will try to capitalize on that design and optimize a design of a cooker that is portable, lightweight, waterproof, durable, is easy to repair, and efficient, both in cost and energy. The portability is to be provided by the size of the cooker, which is planned to be around 16 inches wide, 20 inches long, and 40 inches high. The design is a right trapezoidal box that is easily assembled and disassembled. The lightweight is primarily the result of the use basic thin plywood. Furthermore, a plastic material was chosen for the oven's window rather than the conventional glass.

A goal for the cooker was to be fairly waterproof. This goal is to be achieved using a waterproof membrane/layer that will cover the exterior. Proper sealing is also a vital waterproof element. Another important design factor is durability. The group aimed to design a durable cooker that can survive events such as drops. The materials of the cooker are all easily replaceable in the event of malfunction, which provides easy repair.

The group emphasized the design of the cooker for both cost and energy efficiency. The cost was minimized by using just the sufficient amount of materials. The cost will be reduced as well by aiming to use inexpensive materials. Energy retention will be optimized by various design techniques. For example, the side door is designed as a pizza oven model, which opened horizontally from top down. This technique provides the prevention of massive heat loss of the previous design when the door (the whole back of the cooker) is opened. Another example is the positioning of the cooker's window. It is at an angle for maximum ray collection and focus during the winter.

Project Tasks

The project involves many tasks. It is a team effort. Such a project requires innovation and proper cost, team, and time management. The following are the details of the tasks that the project requires:

- Design Process: First a pool of ideas would be developed. Ideas are then considered and options would be narrowed and refined. The team would select an idea and develop it for further refinement. The next approach in design would involve a more detailed research of the theory, material make up, cost, and time management.

- Pre-construction Process: The details (weight, cost, and quality) of the materials are considered. If a material contradicts the team's goal, then reconsideration of that specific material would be rational. In this phase, the materials are acquired. This stage is the last phase in which any design changes can occur.

- Construction Process: The materials from the design will be bought, modified and assembled to make a cooker. The cooker would be ready for testing.

- Testing Process: The cooker would be tested in several ways. First stage of testing would involve the primary goal of the design, which is to determine whether it actually functions as a cooker. Then the cooker will be tested for durability,

waterproofness, and energy efficiency (durability will be tested by both physical endurance, waterproofness will be tested by experimenting whether there are any leakages, and energy efficiency will be tested by determining how much heat loss is developed when the cooker's door is opened).

- Conclusion Process: After all the testing is complete, the group would then prepare the final report with the results of the tests and the condition of the cooker. The conclusion stage will require, just like all the other stages, proper teamwork, and time management.

Project Estimate

As mentioned earlier in the report, one of the main goals of the group was to provide a cost efficient cooker. The group is currently concluding the design process; therefore, there is no definite cost budget as of date. However, the research that the team has made provided approximate results that concern the cost. The following table is team's expected material make up and cost:

Materials	**Cost ($)**
Plywood	24
Plastic	15
Fasteners	10
Insulation	20
Waterproof Membrane	5
Sealing	5
TOTAL	**79**

As seen in the table above, the final expected cost of the project is $79. This value is most likely going to change as the project is developed. Once the group completes the pre-construction phase, both the material make up and the budget will be defined.

Time Projection

The following is the expected time projection. As seen below, the phases are evenly distributed among the thirteen weeks. However, this is merely an approximate. This is bound to change. The changes will be recorded and mentioned in the final report.

Week of:	2/13	2/20	2/27	3/5	3/12	3/19	3/26	4/2	4/9	4/16	4/23	4/30	5/30
Phase 1	Final Design and Materials List												
Phase 2			Pre-Construction										
Phase 3					Construction								
Phase 4								Testing					
Phase 5											Final Report		

Conclusion

This solar cooker project is a prime example of how innovation can provide alternatives for communities that are having issues with conventional methods. The Solar Cooker project is aimed to combat the conventional method of wood/coal based cooking. Wood and coal are limited resources compared to the unlimited resource of the sun. Use of open fire cooking in homes is unhealthy because of the smoke from the fires and requires substantial effort in gathering the wood in many places like Nicaragua. Therefore, by using solar energy, these communities will have a more efficient and healthier method for something fundamental as cooking.