

A study of conventional Sunspot Solar Oven: A Cook Stove

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ABSTRACT

Energy saving is serious problem because as no fuel is available in large quantity. The vast majority of the world's population does even know that it is possible to cooks food with the sun light. There are different types of solar oven to cooks the food. Anything can be cooked in a conventional sunspot solar oven. It works on the principle of reflection, concentration, and absorption. The oven has properly arranged reflective inner walls to direct and concentrate the sun's energy on the dark pot. This paper reported, food such as rice will cook within 30-35 minutes and maximum temperature of cooking oil is reaches upto 67 °C. Food never burns your pots and no stirring required for oven. It cooks food deliciously and save vitamins.

Keywords: Solar Oven, Solar Energy, Dark Pot.

INTRODUCTION

The vast majority of the world's population does not even know that it is possible to cook with the sun. The heat energy produced by the sun is immense. In equatorial regions the solar radiation can exceed 1000 Watts/m². That is equivalent to half the power of an electric kettle whenever there is good sunlight. It takes only 50-60 minutes to boil water on a solar stove. And it's free, as long as you have clear blue skies. Reflective surfaces concentrate the radiation into a central chamber. This oven has a small capacity and it suitable for cooking small quantities of food for one person. Most often used as an educational tool, it makes a good start to solar cooking or as an addition to existing solar cookers. Black pots work a lot better than silver pots.

The pot needs to absorb as much light as possible and silver tends to reflect the light. Dull or 'matt' finishes absorb more light than 'shiny' surfaces.

In this work, authors study and observed that food such as rice will cook within 30-35 minutes and maximum temperature of cooking oil is reaches upto 67 °C. Food never burns your pots and no stirring required for oven.



Figure 1: Ray diagram for solar oven

METHODOLOGY

Solar oven work on basic principles: sunlight is converted to heat energy that is retained for cooking. The solar oven split the work up into three main sections. First section: A four plane reflector (mirror) serves to concentrate more sunlight into an area of oven. Dark surfaces get very hot in sunlight. Second section: The control arm allows the mirror (reflector) to be set facing the sun and holds the pot at the focal point of the reflector. Third section: To use the solar oven, adjust the angle of the (mirror) reflector until the pot's shadow falls in the centre of oven. When properly adjusted, there should be no glare from the reflector and the pot handle should not become too hot to hold. For long cooking times, the oven will have to be adjusted every 30 minutes to follow the sun. If a lower heat is required, the oven may be rotated to move the pot out of the focus or part of the reflector can be covered. When not in use, the oven should be stored inside, out of the sun or covered with a waterproof cover.

MATERIALS

The oven can be made by anyone with experience in simple carpentry and access to basic hand tools. The following is a list of materials needed:

- **Dimensions:** Closed: 23 x 44 x 44, Opens: 39 x 39 x 14
- **Weight:** 15-20 kg
- **Materials:** Wood, Mirror Glass, etc.
- **Temperatures:** Can reach 67 °C (340 °K) when cooking small amounts of food.

Cost: The cost of these materials is about Rs. 1500 in 2017-18.



Figure 2: Typical and Experimental diagram of solar oven for observations recorded

Benefits:

- Energy savings: no fuel is required.
- Prepared for any interruption to traditional power sources.
- Great for camping and emergencies.
- Totally safe: no danger of fire.
- Keeps the kitchen cool: in hot summer weather.
- Bake anything: cooked in a conventional oven.
- Food never burns or scorches pots.
- No hot spots that require stirring.
- No drudgery to gather fuel, watch or stir food.

- Cooks food deliciously and saves vitamins.
- Sun baked foods stay moister and have less shrinkage than conventional oven cooked foods.
- In villages, women have to travel less often to forage for firewood, thus keeping them closer to home and safe as a result.
- Cheaper than cooking with firewood or charcoal
- Reduced CO₂ emissions
- Solar cookers can be easily constructed in a matter of hours after very basic training
- Solar cookers are generally light-weight

RESULTS AND DISCUSSION

The cooking time depends primarily on the equipment being used, the amount of sunlight at the time, and the quantity of food that needs to be cooked. Air temperature, wind and latitude also affect performance. Food cooks faster in the two hours before and after the local solar noon than it does in either the early morning or the late afternoon. Larger quantities of food, and food in larger pieces, take longer to cook. As a result, only general figures can be given for cooking time. With a small solar panel oven, it might be possible to melt butter in 30-35 minutes, to bake cookies in 2 hours, and to cook rice for four people in 4 hours. Also maximum temperature of cooking oil reaches upto 67 °C. However, depending on the local conditions and the solar oven type, projects could take half as long or twice as long.

CONCLUSION

In areas where sunshine is plentiful and conventional fuels are expensive. The solar oven is an ideal complement to a regular stove. It is cheap, easy to use and requires no fuel. The oven works by concentrating the power of the sun onto a small area in which a pot or other implement is placed. Under strong sunlight, a food can be brought to cook in about 30 minutes. Also maximum temperature reaches for cooking oil. Food never burns your pots and no stirring required for oven. The cooking trial shows that the new device can be used twice a day, even on winter days.

Conflicts of interest: The authors stated that no conflicts of interest.

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