Why Cook with the Sun?

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The sun sustains life on earth; it is available to everyone daily. There is no cost for solar radiation. Using parabolic, box, or panel cookers means no gas or electricity costs. They are easy to maintain and just as easy to build. With a little planning and some basic mathematical calculations, anyone can own their own solar cooker.

But what are the advantages to using a solar cooker? Besides the economic savings, solar cooking helps in the fight against global warming and deforestation. By using the sun’s rays to cook meals, firewood is saved and in many remote areas time is used more usefully than for gathering the necessary firewood needed for wood burning stoves.

In the remote areas of the world a solar cooker can be used to distill drinking water and feed villages. Many people in the world must survive on polluted surface water that is difficult for them to decontaminate. Solar cookers offer an easy solution to this problem.

Often times, it is necessary to collect wood to build large fires in order to purify water. Solar cookers distill water cheaply by using the sun’s rays to heat a pot of water. They can be a cost effective solution for those that may otherwise have no resource to purify their drinking water. Solar cookers are also easily transported to remote locations. In many parts of the world they can be easily built using local materials. There are several organizations and programs world wide that promote the construction of these solar cookers.

Many ask, how effective are solar cookers? The effectiveness of a solar cooker can vary depending on what materials are used, how well they are crafted, and what type of climate you live in. Cooking time with a parabolic cooker is similar to a conventional stove, and a box oven is similar to a conventional oven. Cooking may take longer if there are fog, clouds or shadow.

Using a solar oven to slow cook a meal means the food is cooked uniformly and doesn’t burn no matter how long it is allowed to cook. Since dishes are allowed to blend and cook in their own juices, the food retains its nutrients. No vitamins or minerals are lost in the process. The only necessity is sunlight; even snowy climates can enjoy the advantages of solar cooking. Parabolic cookers require closer attention because the y can reach much higher temperatures.

One concern for people is the safety of using solar cookers. The most important safety tip for cooking with the sun is NOT TO STARE INTO THE REFLECTED RAYS. YOU SHOULD WEAR DARK SUNGLASSES WITH UV PROTECTION AT ALL TIMES. The sun’s rays can burn your eyes and cause blindness if the proper precautions are not taken. Special attention should be given to fire safety as well. Parabolic solar cookers should be covered when not in use.
How hot do solar cookers get?

This depends primarily on which type of cooker you are using and the size of cooker you build.

Parabolic cookers can reach extremely high temperatures. Therefore, they are quite capable of reaching average cooking temperatures of between 212°F (100°C) and 350°F (177°C) for frying, boiling and baking foods. Cooking time is affected by the size of the parabolic dish, the size of the cooking pot and outside temperatures.

The harnessing of solar energy began with the ancients. They were the first to begin using passive solar design in their homes and to use glass to trap solar heat. The use of curved mirrors to concentrate the sun's rays was developed by the Aztecs, Greeks, Romans, and Chinese. The concept of “burning mirrors,” for weapons, has been considered for millennia. It was through the Greeks geometric development that they discovered a parabolic surface held the ideal shape for these burning devices.

Awareness of the ability for glass to trap solar heat became increasingly important in the eighteenth century. It was during this century that the first “hot box” was invented by Horace de Saussure. With the advances in science and technology during the Industrial Revolution, came the development of various devices designed to harness solar energy. Solar pumps, solar cookers, solar heat engines, and solar stills are just some of the inventions of this time.

Augustin Mouchot, a professor of mathematics at the Lyceé de Tours, was an important figure in this revolution. He was the first to develop a solar cooker; he was successful in finding a benefactor to fund his research. This lead him to Africa where he invented a portable solar oven for the French troops.

Although these various solar inventions were never very successful on a large scale, they did aid in the advancement of a practical development of this revolutionary technology.

It was in the 1950’s that solar cookers began to evolve into the products we see today. The United Nations and other agencies began solar cooker design studies. These studies found that when properly constructed, solar cookers not only cooked food thoroughly and nutritiously, but also were easy to build and use. Programs were created to introduce these designs to remote locations in the hope of aiding those in need.
When a three dimensional parabola (i.e. a paraboloid) is aimed at the sun, all the light that falls upon its mirrored surface is reflected to a point known as the focus. If a black cooking pot is placed at the focus it will absorb the light's energy and become very hot. A satellite dish is an example of a paraboloid that can be made into a cooker. Parabolic Solar cookers heat up quickly and are used like a standard stovetop range to sauté or fry foods, boil water, or even bake bread. They can also be used to generate steam, power sterling engines, crack water to produce H₂ gas, and even plasma matter.

It is easy to see in today’s world that this shape is successful in its use. The parabolic shape can be seen in satellite dishes, radio towers, and yes, even in solar cookers around the world. It is simple to say it works, and just as simple to understand how it works.

Why Use a Parabolic Shape?

One of the easiest beginnings for a parabolic solar cooker can be found in thousands of backyards across the United States—the satellite dish, from the large C-band to the small digital dish. What happens to these relics once they are discarded? They are large and awkward and not easily recycled. Building your own solar cooker is a great way to reuse these parabolic-shaped units while reducing waste in the landfill.

Once you have decided to build your parabolic solar cooker it is important to find a dish that is as concave as possible in order to have an accessible focus point to cook at. Next, measure your dish and locate your focus. If you have a satellite dish with the receiver/antenna still attached, your work is done for you since these are located at the focus of the dish. However, if you obtain one without it, you will need to make some simple calculations. Use the sample problem on the next page to guide you through this process.

The focus can also be found by direct observation after you have lined the dish with a reflective material. Hold a piece of cardboard close to the center of the dish, then move it up and down towards the sun and back. A circle of light will appear on the underside of the cardboard. When the circle is smallest, the position of the focus is found.

The most popular material used to line the dish is a reflective, mirror-finished, anodised aluminium sheet. These are cut into narrow triangular facets no wider than ten inches, then riveted to the dish. Sheet metal supply companies can be found online or in the phone book. Riveting supplies can be found at a hardware store.

The pot stand, located at the focus, can be made from a used 12" bicycle rim attached to pieces of metal tubing so that the rim and cooking pot can be levelled. Place a grate across the rim to support the pot.

Remember while you are constructing your cooker, NEVER STARE DIRECTLY into the cooker once you have installed your reflecting material. ALWAYS WEAR UV PROTECTIVE DARK SUNGLASSES WHEN WORKING WITH YOUR COOKER!
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The Solar Cook - http://www.solarcook.com/

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