General Cooking Notes

It is recommended that you have three different ways of cooking food. It cannot be assumed that electricity will always stay functioning, so it is necessary to have other ways to cook foods.

There are a couple of considerations though:

-SAFETY FIRST. Never use a grill inside. Be careful for overhangs from garages, etc. Keep water and sand nearby.

-Make sure your fire is out completely with dousing and stirring. It is easy to start a fire with a spark, and the fire department might be overwhelmed.

-Never let children around grills or fire pits.

-Cook meat thoroughly (we strongly recommend having several meat thermometers). It is not enough to cook it until it "looks done"—meat can be brown and undercooked or pink and fully cooked. During a pandemic is not the time to risk food poisoning. From the Food Safety Inspection Service:

http://www.fsis.usda.gov/Is_It_Done_Yet/Brochure_Text/index.asp

USDA Recommended Safe Minimum Internal Temperatures

Steaks & Roasts - 145 °F
Fish - 145 °F
Pork - 160 °F
Ground Beef - 160 °F
Egg Dishes - 160 °F
Chicken Breasts - 165 °F
Whole Poultry - 165 °F

-People will be able to smell what you cook. You might draw attention. Be prepared for how you will address hungry visitors.

-Charcoal can be made at home. Here are some sites that offer instructions:

http://www.clt.astate.edu/elind/charcoalvalentine.htm and http://www.velvitoil.com/Charmake.htm

-Get several meat thermometer since you might be cooking unfamiliar meats on the grill or fire. This will help protect against food borne illnesses.

-You are probably familiar with grilling outdoors with either a charcoal grill or a gas grill. While grilling using these methods are familiar and might be excellent for the first days of a pandemic, they also have their drawbacks. Grills can use more fuel than is necessary to get the job done. If our supply lines are interrupted, it will be necessary to conserve fuel as much as possible.

-You or someone else in the household might be ill and you might not have the time or energy to monitor a grill. Having multiple ways of cooking food ensures that you can prepare food for yourself and your family no matter what the conditions.

Being Thrifty With Your Fuel

If the catastrophe is severe or your local area is suffering power outages due to storm, it will be imperative to be conservative with your fuel use. Thankfully, there are several ways to do that.

First of all, plan ahead! One pot suppers are excellent. Start making your food ahead of time, so that you can use the benefit of longer cooking methods (such as described below) rather than using energy intensive quick cooking methods (such as frying).
Secondly, use only the amount of fuel you need. One charcoal briquette provides approximately 35-40 degrees of heat.
One option you have is to use sterno cans. Sterno ovens can be picked up for under $10, and are lightweight and extremely portable. Sterno can also be used indoors. It is more expensive than other fuels, however.
There are also fuel tabs that you can use which are similar to sterno in terms of being lightweight, portable, and expensive.

Long Slow Cooking with a Pressure Canner or Cast Iron Dutch Oven:

A pressure cooker is an excellent tool for cooking. You can put your food in your pressure cooker, put it over your fuel (for example, sterno) until the cooker comes up to temperature. Remove the cooker and place IMMEDIATELY in a well-insulated box, such as a wood box lined with newspapers or a blanket. Cover well and leave alone for 2-3 hours. The pressure cooker should retain enough heat within the insulated box to cook your food. You can use this same process with a dutch oven.

Dutch Oven and Other Cast Iron Cookware

The dutch oven is made of cast iron. It can be used for frying, roasting, baking and stewing. You can use it to make roast chicken, cakes, cobblers, stews and soups. Cast iron is also excellent for fuel conservation as the heavy iron retains a great deal of heat and needs less heat to remain at temperature. Cast iron is durable, easy to clean, and provides additional iron as food cooks.

Depending on the recipe, approximately 12 gray hot charcoal briquettes should be under the oven and 12 should be placed on the lid.
It is not advisable to wash cast iron with soap as it causes it to rust and lose its seasoning. Scrape off food, then wash with hot water only. Lightly rub with oil. Set over a low heat to get completely dry. You can also stick the cast iron pan or pot in the coals of the fire until the food particles burn off completely.

Thermos Cooking

A thermos can be used effectively to cook pasta, grits, wheat, oats, etc. It uses very little energy, and does not give off a lot of food odor. It is recommended using a stainless steel thermos, not a Styrofoam one. You might want to get more than one if you are feeding a family.
Fill your thermos up with water to the fill line, then pour that into a saucepan and make a permanent mark. That is the level of water AND FOOD that you can place in your thermos, and you should only have to do this once.

Place 4-8 ounces of food that you want to cook in the pot, and fill the rest of the way to the fill line with water or broth. Bring to a boil, then quickly pour into the thermos and cap. Allow to cook (time will depend on the food being cooked).
Be careful pouring hot water, and do not allow children to attempt this.
You can use this technique with dried meats (dehydrated or jerky), dried vegetables and seasoned water to make an excellent stew. Some have experienced difficulty using this for rice. Consider experimenting for longer time, grinding the rice up, or using minute rice.

Expedient Stove

PRETZEL CAN OVEN

Take a 3 pound ***metal*** pretzel / popcorn can (or potato chip) and lay it on it's side. Draw a line 1/3 the distance between the table and the top of the can on both sides of the can. This is where the oven rack will be. Punch (or drill) small holes about 1-1/2" apart down the line on each side. The holes need to be large enough for a metal coat hanger to fit through.
Take several wire coat hangers and straighten them out. Cut them so that you have enough straight pieces for the number of holes. You can get two wires out of each hanger. Put the wires in the holes on one side of the can and out the holes on the other side. This is your rack.

If you have the lid, cut the bottom 1/3 off and file the edge. Make sure the lid covers the area above the rack. This is your oven door. You can just make a door out of heavy duty aluminum foil if you don't have a lid.

Get a small pie pan or Jiffy Pop tin (I prefer the Jiffy pop because they have a handle) to use for your coals. Contour the pie plate to the bottom of the can.

To Use: lay the can on the ground and secure it with logs, rocks, etc to keep it from rolling. Light your coals in the pie plate outside the oven. (One briquette = 35 to 40 degrees F) After the coals are white, put them in the can and put the lid on. Preheat the oven, with the lid on, for a short time while you prepare your cake/muffins/pizza, etc. Cook your food for the amount of time called for in your recipe.
Use good charcoal and make sure you start out with full briquettes. If the weather is cold, you need to use more coals, cook food longer or really insulate the oven. Try not to open the door until the allotted time as much heat escapes that way.

Expedient Earth Oven

It is possible to make your own expedient earth oven. On this page http://www.thefreshloaf.com/node/2966/going-back-time-bread-earth-oven-lots-pix you can see how one man built an earth oven onsite at a festival. He cut a circle of sod out from the ground. He placed a layer of stones on the bottom, and then stones on the sides and a large stone across the top. He then replaced the sod over top of the earth oven. He describes it: “It's a pile of rocks covered in a pile of dirt.”. He built the fire in the front of the stove, which keeps you from needing a door, as well as making it easy to move the fire in and out of the way to place the bread.

Solar Cookers

Solar cookers use reflective materials to utilize the heat from the sun to cook food. The benefit is that no firewood or other fuel is necessary and temperatures can get hot enough to sterilize water. The drawbacks include the fact that one needs a certain amount of UV rays per day to use this, so this would not be an effective winter cooking method for much of the country. However, it is presumed that one will need fire for heat in the winter. This will allow you to save fuel for winter. One must be careful to see where their solar cooker is reflecting light as some reports of accidental fires have been noted.

Here is a site that tells about how to build and use solar cookers. http://solarcooking.org/default.htm There are three different types of solar cookers: box, panel, and parabolic. Each have their benefits and drawbacks.

Familiarizing yourself with the ease of assembly and cooking of solar cookers will provide you an additional way to cook your food and purify your water in the event of a power outage.

Solar Funnel Cooker by Steven E. Jones, Professor of Physics at Brigham Young University (BYU), with Colter Paulson, Jason Chesley, Jacob Fugal, Derek Hullinger, Jamie Winterton, Jeannette Lawler, and Seth, David, Nathan, and Danelle Jones.

Introduction

A few years ago, I woke up to the fact that half of the world's peoples must burn wood or dried dung in order to cook their food. It came as quite a shock to me, especially as I learned of the illnesses caused by breathing smoke day in and day out, and the environmental impacts of deforestation -not to mention the time spent by people (mostly women) gathering sticks and dung to cook their food. And yet, many of these billions of people live near the equator, where sunshine is abundant and free. Ergo...

As a University Professor of Physics with a background in energy usage, I set out to develop a means of cooking food and sterilizing water using the free energy of the sun. First, I looked at existing methods.

The parabolic cooker involves a reflective dish that concentrates sunlight to a point where the food is cooked. This approach is very dangerous since the sun's energy is focused to a point which is very hot, but which cannot be seen. (BYU students and I built one which will set paper on fire in about 3 seconds!) I learned that an altruistic group had offered reflecting parabolas to the people living at the Altiplano in Bolivia. But more than once the parabolas had been stored next to a shed -- and the passing sun set the sheds on fire! The people did not want these dangerous, expensive devices, even though the Altiplano region has been stripped of fuel wood.

The box cooker: Basically an insulated box with a glass or plastic lid, often with a reflecting lid to reflect sunlight into the box. Light enters through the top glass (or plastic), to slowly heat up the box. Problems: energy enters only through the top, while heat is escaping through all the other sides, which have a tendency to draw heat away from the food. When the box is opened to put food in or take it out, some of the heat escapes and is lost. Also, effective box cookers tend to be more complicated to build than the funnel cooker.

While studying this problem, I thought again and again of the great need for a safe, inexpensive yet effective solar cooker. It finally came to me at Christmastime a few years ago, a sort of hybrid between the parabola and a box

cooker. It looks like a large, deep funnel, and incorporates what I believe are the best features of the parabolic cooker and the box cooker.

The first reflector was made at my home out of aluminum foil glued onto cardboard, then this was curved to form a reflective funnel. My children and I figured out a way to make a large card-board funnel easily. (I'll tell you exactly how to do this later on.)

The Solar Funnel Cooker is safe and low cost, easy to make, yet very effective in capturing the sun's energy for cooking and pasteurizing water -> Eureka!

Later, I did extensive tests with students (including reflectivity tests) and found that aluminized Mylar was good too, but relatively expensive and rather hard to come by in large sheets. Besides, cardboard is found throughout the world and is inexpensive, and aluminum num foil is also easy to come by. And individuals can make their own solar cookers easily, or start a cottage-industry to manufacture them for others.

Prototypes of the Solar Funnel Cooker were tested in Bolivia, and outperformed an expensive solar box cooker and a "Solar Cookit" - while costing much less. Brigham Young University submitted a patent application, mainly to insure that no company would prevent wide distribution of the Solar Funnel Cooker. BYU makes no profit from the invention. (I later learned that a few people had had a similar idea, but with methods differing from those developed and shown here.) So now I'm trying to get the word out so that the invention can be used to capture the free energy of the sun - for camping and for emergencies, yes, but also for every day cooking where electricity is not available and even fuel wood is getting scarce.

How it Works

The reflector is shaped like a giant funnel, and lined with aluminum foil. (Easy to follow instructions will be given soon.) This funnel is rather like the parabolic cooker, except that the sunlight is concentrated along a line (not a point) at the bottom of the funnel. You can put your hand up the bottom of the funnel and feel the sun's heat, but it will not burn you.

Next, we paint a jar black on the outside, to collect heat, and place this at the bottom of the funnel. Or one can use a black pot, with a lid. The black vessel gets hot, fast. But not quite hot enough to cook with... We need some way to build up the heat without letting the air cool it. So, I put a cheap plastic bag around the jar -- voila, the solar funnel cooker was born! The plastic bag, available in grocery stores as a "poultry bag", replaces the cumbersome and expensive box and glass lid of the solar box ovens. You can use the plastic bags used in American stores to put groceries in, as long as they let a lot of sunlight pass. (Dark- colored bags will not do.)

I recently tested a bag used for fruits and vegetables, nearly transparent and available free at American grocery stores, that works great. This is stamped "HDPE" for high-density polyethylene on the bag (ordinary polyethylene melts too easily). A block of wood is placed under the jar to help hold the heat in. (Any insulator, such as a hot pad or rope or even sticks, will also work.)

A friend of mine who is also a Physics Professor did not believe I could actually boil water with the thing. So I showed him that with this new "solar funnel cooker," I was able to boil water in Utah in the middle of winter! I laid the funnel on its side since it was winter and pointed a large funnel towards the sun to the south. I also had to suspend the black cooking vessel -- rather than placing it on a wooden block. This allows the weaker sun rays to strike the entire surface of the vessel.

Of course, the Solar Funnel works much better outside of winter days (when the UV index is 7 or greater). Most other solar cookers will not cook in the winter in northern areas (or south of about 35 degrees, either).

I thought that a pressure cooker would be great. But the prices in stores were way too high for me. Wait, how about a canning jar? These little beauties are designed to relieve pressure through the lid -- a nice pressure cooker. And cooking time is cut in half for each 10º C we raise the temperature (Professor Lee Hansen, private communication). I

used one of my wife's wide-mouth canning jars, spray-painted (flat) black on the outside, and it worked great. Food cooks faster when you use a simple canning jar as a pressure cooker. However, you can also put a black pot in the plastic bag instead if you want. But don't use a sealed container with no pressure release like a mayonnaise jar -- it can break as the steam builds up! (I've done it.)

How to Build Your Own Solar Funnel Cooker

What You will Need for the Funnel Cooker:

A piece of flat cardboard, about 2 feet wide by 4 feet long. (The length should be just twice the width. The bigger, the better.)

Ordinary aluminum foil.

A glue such as white glue (like Elmer's glue), and water to mix with it 50-50. Also, a brush to apply the glue to the cardboard (or a cloth or paper towel will do). Or, some may wish to use a cheap "spray adhesive" available in spray cans. You can also use wheat paste.

Three wire brads-- or small nuts and bolts, or string to hold the funnel together.

For a cooking vessel, I recommend a canning jar ("Ball" wide-mouth quart jars work fine for me; the rubber ring on the lid is less likely to melt than for other jars I've found. A two-quart canning jar is available and works fine for larger quantities of food, although the cooking is somewhat slower.).

The cooking jar (or vessel) should be spray-painted black on the outside. I find that a cheap flat-black spray paint works just fine. Scrape off a vertical stripe so that you have a clear glass "window" to look into the vessel, to check the food or water for boiling.

A block of wood is used as an insulator under the jar. I use a piece of 2"X4" board which is cut into a square nominally 4" x 4" by about 2" thick. (10cm square x 5cm thick.) One square piece of wood makes a great insulator.

A plastic bag is used to go around the cooking-jar and block of wood, to provide a green-house effect. Suggestions:

Reynolds™ Oven Bag, Regular Size works great: transparent and won't melt. (Cost about 25 cents each in U.S. grocery stores.)

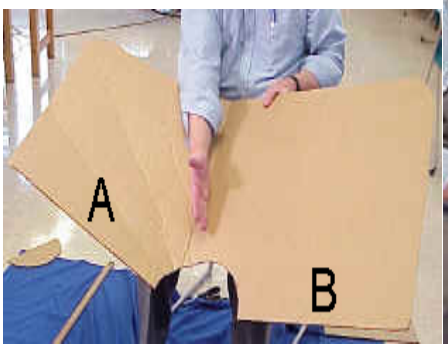
Any nearly-transparent HDPE bag (High-density Polyethylene). Look for "HDPE" stamped on the bag. I've tested HDPE bags which I picked up for free at my grocery store, used for holding vegetables and fruits. These are thin, but very inexpensive. Tested side-by-side with an oven bag in two solar funnels, the HDPE bag worked just as well! (Caution: we have found that some HDPE bags will melt should they contact the hot cooking vessel. For this reason, we recommend using the oven-safe plastic bag wherever possible.)

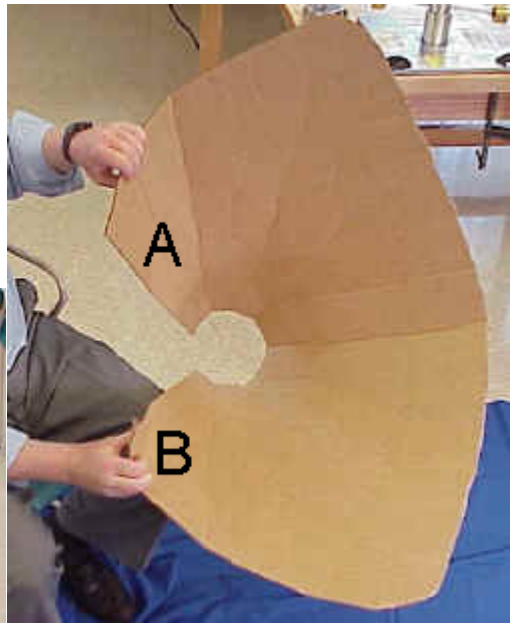
An idea attributed to Roger Bernard and applied now to the BYU Funnel Cooker: place a pot (having a blackened bottom and sides) in a glass bowl, and cover with a lid. Try for a tight fit around the bottom to keep hot air trapped inside. The metal pot or bowl should be supported around the rim only, with an air space all around the bottom (where the sunlight strikes it). Put a blackened lid on top of the pot. Then simply place this pot-in-bowl down in the bottom of the funnel - no plastic bag is needed! This clever method also allows the cook to simply remove the lid to check the food and to stir. I like this idea - it makes the solar cooker a lot like cooking over a fire. See Photographs for further details.

Construction Steps

Cut a Half-circle out of the Cardboard 

Cut a half circle out of the cardboard, along the bottom as shown below. When the funnel is formed, this becomes a full-circle and should be wide enough to go around your cooking pot. So for a 7" diameter cooking pot, the radius of the half-circle is 7". For a quart canning jar such as I use, I cut a 5" radius half-circle out of the cardboard.

Form the Funnel 

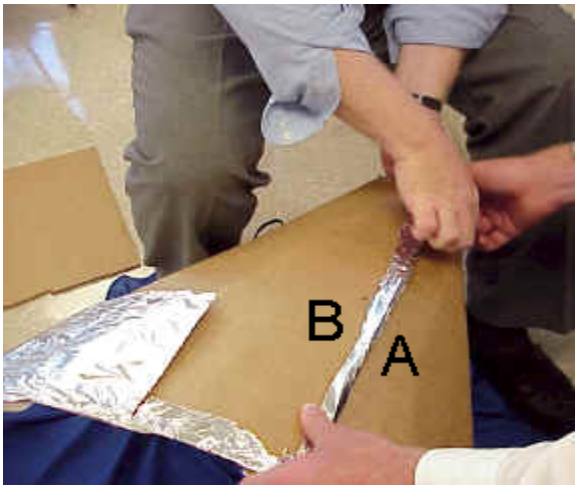


To form the funnel, you will bring side A towards side B, as shown in the figure. The aluminum foil must go on the INSIDE of the funnel. Do this slowly, helping the cardboard to the shape of a funnel by using one hand to form creases that radiate out from the half-circle. Work your way around the funnel, bending it in stages to form the funnel shape, until the two sides overlap and the half-circle forms a complete circle. The aluminum foil will go on the INSIDE of funnel. Open the funnel and lay it flat, "inside up", in preparation for the next step.

Glue Foil to Cardboard

Apply glue or adhesive to the top (inner) surface of the cardboard, then quickly apply the aluminum foil on top of the glue, to affix the foil to the cardboard. Make sure the shiniest side of the foil is on top, since this becomes your reflective surface in the Funnel. I like to put just enough glue for one width of foil, so that the glue stays moist while the foil is applied. I also overlap strips of foil by about 1" (or 2 cm). Try to smooth out the aluminum foil as much as you reasonably can, but small wrinkles won't make much difference. (If even cardboard is not available, one can simply dig a funnel-shaped hole in the ground and line it with a reflector, to make a fixed solar cooker for use at mid-day.)

Join side A to side B to keep the funnel together.



The easiest way to do this is to punch three holes in the cardboard that line up on side A and side B (see figure). Then put a metal brad through each hole and fasten by pulling apart the metal tines. Or you can use a nut-and-bolt to secure the two sides (A & B) together.

Be creative here with what you have available. For example, by putting two holes about a thumb-width apart, you can put a string, twine, small rope, wire or twist-tie in one hole and out the other, and tie together.

When A and B are connected together, you will have a "funnel with two wings". The wings could be cut off, but these help to gather more sunlight, so I leave them on.

Tape or glue a piece of aluminum foil across the hole at the bottom of the funnel, with shiny side in.

This completes assembly of your solar funnel cooker. 

For stability, place the Funnel inside a cardboard or other box to provide support. For long-term applications, one may wish to dig a hole in the ground to hold the Funnel against strong winds.

Final Steps

At this stage, you are ready to put food items or water into the cooking vessel or jar, and put the lid on securely. (See instructions on food cooking times, to follow.)

Place a wooden block in the INSIDE bottom of the cooking bag. I use a piece of 2X4 board which is cut into a square nominally 4"X4" by about 2" thick. Then place the cooking vessel containing the food or water on top of the wooden block, inside the bag.

Next, gather the top of the bag in your fingers and blow air into the bag, to inflate it. This will form a small "greenhouse" around the cooking vessel, to trap much of the heat inside. Close off the bag with a tight twist tie or wire. Important: the bag should not touch the sides or lid of the cooking vessel. The bag may be called a "convection shield," slowing convection-cooling due to air currents.

Place the Solar Funnel Cooker so that it Faces the Sun

Remember: Sunlight can hurt the eyes: Please wear sunglasses when using a Solar Cooker! The Funnel Cooker is designed so that the hot region is deep down inside the funnel, out of harm's way.

Put the Solar Funnel Cooker in the sun pointing towards the sun, so that it captures as much sunlight as possible. The design of the funnel allows it to collect solar energy for about an hour without needing to be re-positioned. For longer cooking times, readjust the position of the funnel to follow the sun's path.

It helps to put the Solar Funnel Cooker in front of a south-facing wall or window (in the Northern Hemisphere) to reflect additional sunlight into the funnel. A reflective wall is most important in locations farther from the equator and in winter. In the Southern Hemisphere, put the Solar Funnel Cooker in front of a North-facing wall or window to reflect additional sunlight into your cooker.

After Cooking

Remember that the cooking vessel will be very hot: Use cooking pads or gloves when handling! If you are heating water in a canning jar, you may notice that the water is boiling when the lid is first removed - it gets very hot!

Open the plastic cooking bag by removing the twist-tie. Using gloves or a thick cloth, lift the vessel out of the bag and place it on the ground or table. Carefully open the vessel and check the food, to make sure it has finished cooking. Let the hot food cool before eating.

Helpful Hints

Avoid leaving fingerprints and smudges on the inside surface of the cooker. Keep the inner surface clean and shiny by wiping occasionally with a wet towel. This will keep the Solar Funnel Cooker working at its best.

If your funnel gets out-of-round, it can be put back into a circular shape by attaching a rope or string between opposite sides which need to be brought closer together.

For long-term applications, a hole in the ground will hold the Funnel Cooker securely against winds. Bring the funnel inside or cover it during rain storms.

The lids can be used over and over. We have had some trouble with the rubber on some new canning-jar lids becoming soft and "sticky." "Ball canning lids" do not usually have this problem. Running new lids through very hot water before the first use seems to help. The lids can be used over and over if they are not bent too badly when opened (pry off lid carefully).

The jar can be suspended near the bottom of the funnel using fishing line or string (etc.), instead of placing the jar on a block of wood. A plastic bag is placed around the jar with air puffed inside, as usual, to trap the heat. The suspension method allows sunlight to strike all surfaces of the jar, all around, so that heats faster and more evenly. This suspension method is crucial for use in winter months.

Adjust the funnel to put as much sunlight onto the cooking jar as possible. Look at the jar to check where the sunlight is hitting, and to be sure the bottom is not in the shadows. For long cooking times (over about an hour), readjust the position of the funnel to follow the sun's path. During winter months, when the sun is low on the horizon (e.g., in North America), it is helpful to lay the funnel on its side, facing the sun.

Tests in Utah

I have personally used the Solar Funnel Cooker to cook lunches over many weeks. My favorite foods to cook are potatoes (cut into logs or slices) and carrot slices. Vegetables cook slowly in their own juices and taste delicious. I also make rice, melted cheese sandwiches, and even bread in the Solar Funnel Cooker. I usually put the food out around 11:30 and let it cook until 12:45 or 1 pm, just to be sure that it has time to cook. I've never had any food burn in this cooker.

I have also cooked food in the mountains, at an altitude of around 8,300 feet. If anything, the food cooked faster there - the sunlight filters through less atmosphere at high altitudes.

I find that people are surprised that the sun alone can actually cook food. And they are further pleasantly surprised at the rich flavors in the foods which cook slowly in the sun. This inexpensive device does it!

Students at Brigham Young University have performed numerous tests on the Solar Funnel Cooker along with other cookers. We have consistently found much faster cooking using the Solar Funnel Cooker. The efficiency/cost ratio is higher than any other solar cooking device we have found to date. Mr. Hullinger also performed studies of transmissivity, reflectivity and absorptivity of alternate materials which could be used in the Solar Funnel Cooker. While there are better materials (such as solar-selective absorbers), our goal has been to keep the cost of the Solar Cooker as low as possible, while maintaining safety as a first priority.

Tests in Bolivia

The BYU Benson Institute organized tests between the Solar Funnel Cooker and the "old-fashioned" solar box oven. The solar box oven cost about $70 and was made mostly of cardboard. It took nearly two hours just to reach water pasteurization temperature. The Bolivian report notes that "food gets cold every time the pots are taken from and into the oven." The solar box oven failed even to cook boiled eggs. (More expensive box cookers would hopefully work better.)

An aluminized-mylar Solar Funnel Cooker was also tested in Bolivia, during the Bolivian winter. Water pasteurization temperature was reached in 50 minutes, boiled eggs cooked in 70 minutes, and rice cooked in 75 minutes. The Bolivian people were pleased by the performance. So were we! (La Paz, Bolivia, August, 1996)

I also donated two dozen solar funnel cookers for people in Guatemala. These were taken there by a group of doctors going there for humanitarian service. The people there also liked the idea of cooking with the sun's free energy! For an aluminized-Mylar Solar Funnel Cooker kit, please contact CRM (licensed manufacturer) at +1 (801) 292-9210.

Water and Milk Pasteurization

Contaminated drinking water or milk kills thousands of people each day, especially children. WHO reports that 80% of illnesses in the world are spread through contaminated water. Studies show that heating water to about 65º - 70º C (150º F) is sufficient to kill coliform bacteria, rotaviruses, enteroviruses and even Giardia. This is called pasteurization.

Pasteurization depends on how hot and how long water is heated. But how do you know if the water got hot enough? You could use a thermometer, but this would add to the cost, of course. When steam leaves the canning jar (with lid on tight) and forms "dew" on the inside of the cooking bag, then the water is probably pasteurized to drink. (The goal is to heat to 160º Fahrenheit for at least six minutes.) With a stripe of black paint scraped off the jar, one can look through the bag and into the jar and see when the water is boiling - then it is safe for sure.

Think of all the lives that can be saved simply by pasteurizing water using a simple Solar Cooker! (See also Recent Advances in Solar Water Pasteurization)

Safety

Safety was my first concern in designing the Solar Funnel Cooker, then came low cost and effectiveness. But any time you have heat you need to take some precautions.

The cooking vessel (jar) is going to get hot, else the food inside won't cook. Let the jar cool a bit before opening. Handle only with gloves or tongs.

Always wear dark glasses to protect from the sun's rays. We naturally squint, but sunglasses are important.

Keep the plastic bag away from children and away from nose and mouth to avoid any possibility of suffocation.

Cooking with the Solar Funnel Cooker

What do you cook in a crock pot or moderate-temperature oven? The same foods will cook about the same in the Solar Funnel Cooker -- without burning. The charts below give approximate summer cooking times.

The solar cooker works best when the UV index is 7 or higher. (Sun high overhead, few clouds.)

Cooking times are approximate. Increase cooking times for partly-cloudy days, sun not overhead (e.g., wintertime) or for more than about 3 cups of food in the cooking jar.

Stirring is not necessary for most foods. Food generally will not burn in the solar cooker.

Vegetables (Potatoes, carrots, squash, beets, asparagus, etc.)

Preparation: No need to add water if fresh. Cut into slices or "logs" to ensure uniform cooking. Corn will cook fine with or without the cob.

Cooking Time: About 1.5 hours

Cereals and Grains (Rice, wheat, barley, oats, millet, etc.)

Preparation: Mix 2 parts water to every 1 part grain. Amount may vary according to individual taste. Let soak for a few hours for faster cooking. To ensure uniform cooking, shake jar after 50 minutes. CAUTION: Jar will be hot. Use gloves or cooking pads.

Cooking Time: 1.5-2 hours

Pasta and Dehydrated Soups

Preparation: First heat water to near boiling (50-70 minutes). Then add the pasta or soup mix. Stir or shake, and cook 15 additional minutes.

Cooking Time: 65-85 minutes

Beans

Preparation: Let tough or dry beans soak overnight. Place in cooking jar with water.

Cooking Time: 2-3 hours

Eggs

Preparation: No need to add water. Note: If cooked too long, egg whites may darken, but taste remains the same.

Cooking Time: 1-1.5 hours, depending on desired yolk firmness.

Meats (Chicken, beef, and fish)

Preparation: No need to add water. Longer cooking makes the meat more tender.

Cooking Time: Chicken: 1.5 hours cut up or 2.5 hours whole; Beef: 1.5 hours cut up or 2.5-3 hours for larger cuts; Fish: 1-1.5 hours

Baking

Preparation: Times vary based on amount of dough.

Cooking Times: Breads: 1-1.5 hours; Biscuits: 1-1.5 hours; Cookies: 1 hour

Roasted Nuts (Peanuts, almonds, pumpkin seed, etc.)

Preparation: Place in jar. A little vegetable oil may be added if desired.

Cooking Time: About 1.5 hours

MRE's and prepackaged foods

Preparation: For foods in dark containers, simply place the container in the cooking bag in place of the black cooking jar.

Cooking Times: Cooking time varies with the amount of food and darkness of package.

How to Use the Solar Funnel as a Refrigerator/Cooler

A university student (Jamie Winterton) and I were the first to demonstrate that the BYU Solar Funnel Cooker can be used - at night - as a refrigerator. Here is how this is done.

The Solar Funnel Cooker is set-up just as you would during sun-light hours, with two exceptions:

1. The funnel is directed at the dark night sky. It should not "see" any buildings or even trees. (The thermal radiation from walls, trees, or even clouds will diminish the cooling effect.).

2. It helps to place 2 (two) bags around the jar instead of just one, with air spaces between the bags and between the inner bag and the jar. HDPE and ordinary polyethylene bags work well, since polyethylene is nearly transparent to infrared radiation, allowing it to escape into the "heat sink" of the dark sky.

During the day, the sun's rays are reflected onto the cooking vessel which becomes hot quickly. At night, heat from the vessel is radiated outward, towards empty space, which is very cold indeed (a "heat sink").

As a result, the cooking vessel now becomes a small refrigerator. We routinely achieve cooling of about 20º F (10º C) below ambient air temperature using this remarkably simple scheme.

In September 1999, we placed two funnels out in the evening, with double-bagged jars inside. One jar was on a block of wood and the other was suspended in the funnel using fishing line. The temperature that evening (in Provo, Utah) was 78º F. Using a Radio Shack indoor/outdoor thermometer, a BYU student (Colter Paulson) measured the temperature inside the funnel and outside in the open air. He found that the temperature of the air inside the funnel dropped quickly by about 15 degrees, as its heat was radiated upwards in the clear sky. That night, the minimum outdoor air temperature measured was 47.5 degrees - but the water in both jars had ICE. I invite others to try this,

and please let me know if you get ice at 55 or even 60 degrees outside air temperature (minimum at night). A black PVC container may work even better than a black-painted jar, since PVC is a good infrared radiator - these matters are still being studied.

I would like to see the "Funnel Refrigerator" tried in desert climates, especially where freezing temperatures are rarely reached. It should be possible in this way to cheaply make ice for Hutus in Rwanda and for aborigines in Australia, without using any electricity or other modern "tricks." We are in effect bringing some of the cold of space to a little corner on earth. Please let me know how this works for you.

**THE SOLAR COOKER MAY NOT WORK FOR MANY MONTHS IN EXTREME NORTHERN LATITUDES. HAVE A BACK UP PLAN IN PLACE WHEN THE SUN IS WEAK IN YOUR AREA.