

The Solar Oven

Karisha and I really wanted to reduce our energy consumption as much as possible. One day Karisha said, “I think I want to make a solar oven.” I was astonished because I had been thinking of doing that for quite a while.

We had both done a lot of research on solar cooking and we concluded that you can make a solar oven out of almost anything as long as you obey a few simple principles. First, there needs to be some sort of absorber plate (typically a black piece of metal). Second, the sides of the oven should provide insulation to hold in heat and should have a reflective surface to help concentrate the solar energy on to the absorber plate. Third, there needs to be a transparent cover that will allow sunlight in and prevent heat from getting out.

We decided to make our solar oven out of stuff we had lying around. Here is the basic parts list:



1. Scraps of 1” thick rigid foam insulation. This was left over from a recent insulation project.
2. Duct sealing tape. We had purchased a role of this a few years ago to seal up some leaky air ducts and it has come in handy for all sorts of things.
3. A piece of scrap metal that I found in our shed (left behind by the previous owners).
4. Some aluminum foil (100% recycled)
5. Glue/adhesive. I used some silicone, mainly because I didn’t want to wait for some slow-drying glue.
6. A can of high temperature black spray paint. This was left over from another project.
7. An old windowpane with a wooden frame around it. I had purchased a few of these from the Habitat for Humanity Restore a few years ago for a project that never quite came to pass.

Construction:

The exact size of our solar oven was dictated by the size of our windowpane, which was approximately 18"x30". The rigid foam insulation was cut to form a "half box" consisting of a rectangular base and back while the two sides were triangular shapes. This structure was sized so that the wooden frame of the windowpane would fit snugly around the opening to help create a seal.



Construction steps:

1. Cut the rigid foam insulation to the appropriate size. I used a T-square to help me cut straight lines. I think this improved the quality of the final box.
2. Glue aluminum foil to the back and side pieces (shiny side out).
3. Glue the absorber plate to the bottom piece (I used silicone and clamped the assembly between two pieces of wood to maintain even pressure while I allowed the silicone to set up).
4. Using the black high-temperature paint, paint the bottom piece with the absorber plate glued to it.
5. Carefully tape the bottom, back, and side pieces together to form the "half box" described above. Use the tape to make an airtight seal at points where the pieces join together.
6. Place the windowpane over the half box and you're ready to cook.
7. To improve the durability of the assembly, you can use some plywood to form an outer shell around the half box. I have started to do this, but the sun was out and I was hungry. The outer shell will have to wait for a rainy day when I have nothing to do.

Cooking:



Position the cooker so that it can receive maximum sunshine. A 9x13 pan of lasagna cooked easily on an intermittently sunny day, but too much cloud cover can be a problem for foods like dry beans, which need a longer and steadier supply of heat. If there's enough sunlight you can cook about anything, and faster than you'd expect.

We have successfully cooked three loaves of banana bread at once, a 13x9 pan of lasagna, brownies, sliced potatoes, and a Boca burger. The choice of cookware inside the oven is important. Glass pans seem to work best for items that would normally bake in the oven, like lasagna and bread. We made a failed attempt to cook biscuits, but we used a large silver cookie sheet that covered most of the absorber plate. This prevented the sunlight from shining onto the absorber plate and reduced the internal temperature. We have improvised some cookware out of re-used materials. For things cooked in water (such as potatoes) we used an empty pasta jar painted black. Leave a small strip of the jar unpainted so you can see your food. For things normally cooked on skillet, we have blackened the outside of some aluminum trays that we got with Chinese takeout. The inside of the trays are not painted. There are two trays, both the same size, one functions as a pan and the other as a lid. This is how we cooked the Boca burger. It was completely frozen when it went into the solar oven, and after two hours it was hot and ready to eat.