

Using a Solar Oven as a *Radiant Refrigerator* at Night



My first experiments were during a winter in 1997 in Kalgoorlie, an inland location of Western Australia: The ambient nighttime minimum was getting down to 2-3 degrees above zero (Celsius).

Using a box-cooker with a black base, I poured about half a centimeter deep of water into the bottom of the cooker and put it outside at night. The glass lid had to be removed as glass is opaque to infrared and would inhibit the cooling. I put the cooker (*uncooker*?) in a location where it saw a maximum amount of sky and no trees or buildings (on the roof of my house).

The sky needed to be clear all night, with still air. I was using rainwater as the town water contained additives which may have lowered the freezing point. I would set the alarm clock for about 5am, get out of bed and climb onto the roof in the near dark (unfun) and remove a solid disk of ice from the now *uncooker* (much fun). I got ice consistently over several nights, even though there was no frost on the ground, and pots of water sitting next to the box cooker did not freeze.

I tried the same experiment again this past summer using a smaller box-cooker in a different location (Bridgetown, WA). It was difficult to get a sight away from trees. I was unable to make ice, and the water was only getting about 4 degrees Celsius below ambient. However, when my gas fridge died a few years ago I built a radiant fridge which works well: I got a dead fridge from the tip and lay it on its back (like a chest freezer) on the south side of my shed (for daytime shade). I super-insulated it with layers of aluminum foil and straw, held together with some iron sheeting held in place with star pickets driven into the ground (a very rough bush job) After sundown I leave the lid open. The inside of the lid is reflective so that when it is lifted at night and rests on my shed wall it lets the fridge 'see' more sky, rather than the warm shed.

When I get up in the morning I close the lid to keep the cool in during the day. I have kept a log of the temperatures down there, but I'm writing from Perth so don't have them with me. But typically during summer the ambient temperature would be in the low 30's and my fridge would not rise above 16 degrees. It gets a degree or two below ambient during clear nights, on cloudy nights it stays a little above ambient (due to thermal inertia), on rainy nights my food gets wet. I have been using this arrangement for a few years for keeping provisions fresh and beer cool and am quite happy with it.

I can see as much use for radiant fridges as there is for solar cookers around the world and hope that other people take up on this. It uses the same technology and principles as solar cooking (permitting the exchange of heat by radiation whilst blocking the exchange by conduction) and can be made with the same low level of technology.

Regards

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