

Make an Evaporative Terra Cotta Beer Chiller

by [jolshefsky](#) on August 3, 2007

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intro: Make an Evaporative Terra Cotta Beer Chiller

So I was browsing the [Self Sufficient 'ish'](#) sometime last year and came upon the article titled [Keeping your cool, Replacing the Humble Refrigerator](#) by a guy named Nev Sweeney. He digs around some alternatives and dredges up the pot-in-pot system developed by one Mr. Mohammad Bah Abba in Nigeria, Africa. The gist is this: take a big, unglazed terra cotta pot and fill it with a little sand then put a smaller pot inside and fill the gap between with more sand. Add water and allow evaporation to provide the cooling. Mr. Sweeney indicates he was impressed with the results.

Well, I decided to go a bit further.

First, the science behind the whole thing is that of the wet-bulb thermometer. You know: the one that measures the dewpoint? The gist is that terrestrial air has some amount of moisture in it and that vaporizing (liquid) water to dissolve it in the (gaseous) air requires energy which comes from the heat that is present in the air. Because heat allows the transfer, a thermometer with a "wet bulb" will read a cooler temperature than a one with a "dry bulb". That is, something that is wet is always a little cooler than something that is dry. All because of evaporation.

Second, how can one convert this to something practical? Like, say, the ever present problem of keeping one's beer ... er ... *beverage* cool on a hot day.

So I developed the idea of a terra cotta beverage cooler. It works like this: you add water to elicit evaporation which causes cooling which keeps your beverage cool. Even on a hot day. And it's not just passive: it actually reduces the temperature of a warm beverage to something cooler.

The only catch is (as I found out) that it requires a low dewpoint.

Update:

The cooler didn't work all that well out in the desert. The used flower pots I started with had very little porosity, presumably all the pores had filled with minerals and dirt over time. Also, the sand wasn't easy to use, so I'd recommend trying small pebbles instead. You could even fill it with ice just to set the height of the concrete cap.



Image Notes

1. Insert beverage to stay cool in here.
2. Add water to spout slowly to seep into the sand deep inside the pot.
3. Water leeches through the sand inside and out the porous terra cotta surface where it evaporates, cooling the pot and everything in it.

step 1: What will you need?

The supplies are pretty simple:

- a tin can big enough to fit your beverage container
- an unglazed terra cotta flower pot big enough to fit the tin can and some sand
- some fine-grained sand
- if your pot has a hole, some sealant and a piece of plastic to cover it

For the sealant, I have been very satisfied with Loctite's Handyman's All-Purpose Adhesive/Sealant (as available from Amazon). It's non-toxic, low-odor, strong, waterproof, bonds with almost anything, dries clear, and stays just a little flexible.

And if you want it to be as portable and spill-resistant as mine:

- cement
- a 2"-3" piece of flexible hose
- more sealant



Image Notes

1. One terra cotta pot, unglazed.
2. One tin can ... whose inside is just big enough to accommodate a beverage container (i.e. an aluminum beer can).
3. A piece of plastic to seal the hole in the bottom of the pot ... perhaps something to be reused.
4. Some fine-grained sand. About a pint's worth.
5. Cement to seal the sand inside the pot.
6. Glue: both to adhere the plastic to the hole in the pot and ultimately to seal the tube into the can.



Image Notes

1. A short piece of rubber hose.
2. An optional binder clip can be used for keeping the sand from spilling out when it's being transported. It's included here because I specifically wanted a tube that could be pinched shut.

step 2: Seal the hole in the bottom of the pot.

If your pot has a hole in the bottom for drainage, this will need to be sealed. Otherwise, sand and water will leak right out. To do this, cut a small piece of plastic and glue it over the hole.

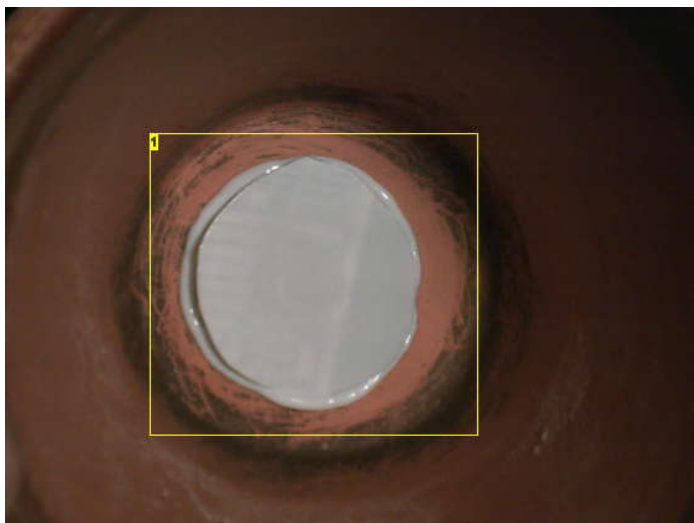


Image Notes

1. Glue on a piece of the side of the yogurt container. There's no need to wait for the glue to dry as the sand will tend to pack it down -- just be a little careful at first that the sand doesn't get between the plastic disc and the bottom of the pot.

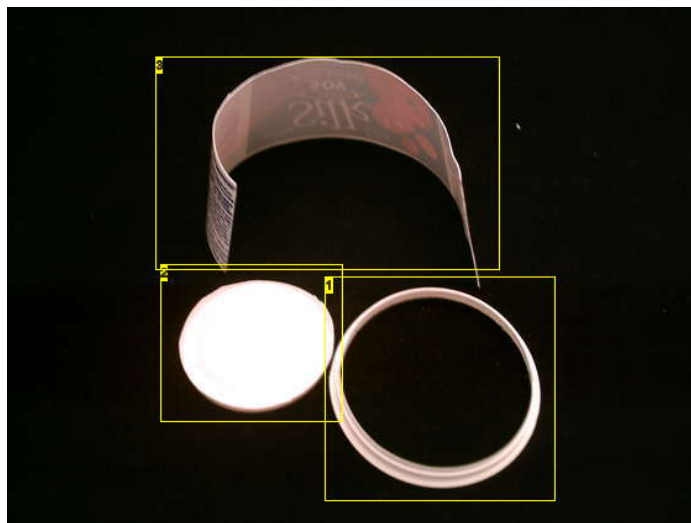


Image Notes

1. This is the top rim of the yogurt container. I don't have a use for it.
2. Depending on your pot and yogurt container, you might be able to use the round bottom instead of a piece cut from the sides.

3. Once cut from the yogurt container, the sides can be flattened. I used this part to cut the ring to seal the flower pot hole because it was smooth and would provide a good seal.

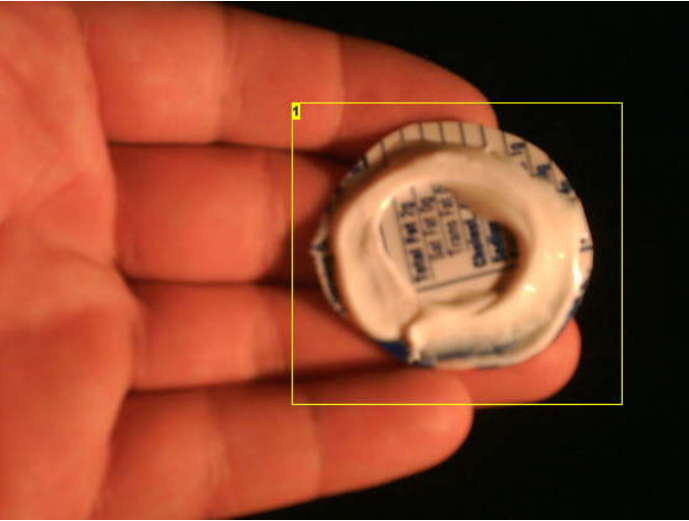


Image Notes

1. Cut out a part of the side and add a generous amount of glue to provide a good seal.

step 3: Add the sand and the can.

Next, add a little sand to the bottom of the pot. The idea is to provide enough so the tin can will rest on it, but not so much that the can sticks out of the top too far.

Add a little at a time and press the can into the pot. As you get close, the can will start to mash down the sand. Keep adding until the can is resting on sand and there's a small gap between the can bottom and the edge of the pot.

Then it's as easy as setting in the can and filling the edges with sand. Leave a gap -- even if you're not going to use cement to seal it, if you fill it to the lip of the pot then there will be no place to add water and let it sink in.



Image Notes

1. The bottom of the can makes an indentation.



Image Notes

1. You can see just a little sand around the edge of the bottom of the can.



step 4: Add the fill tube and cement.

Use a piece of rubber tubing to provide a fill tube. The idea is to make it big enough that you can actually add water (and to provide a reservoir as the water slowly wicks into the sand).

Mix up a tiny batch of cement -- about 1 cup. I'm no expert at mixing it but I know it shouldn't be like wet sand and it shouldn't be like soup. If it's too dry then it won't seal and if it's too wet then it will crumble once it's set up. If you're not familiar, try a batch and see how it works.

Anyway, insert the fill tube along the edge of the sand. Stick it into the sand just a small amount (maybe 1/10" or so) -- just enough that the cement won't flow around and seal it.

Add the cement around the edge and try to seal around the fill tube as best you can. If you want to make it look less industrial, you can add decorations into the cement -- once it cures you can't.

Let the cement cure overnight.

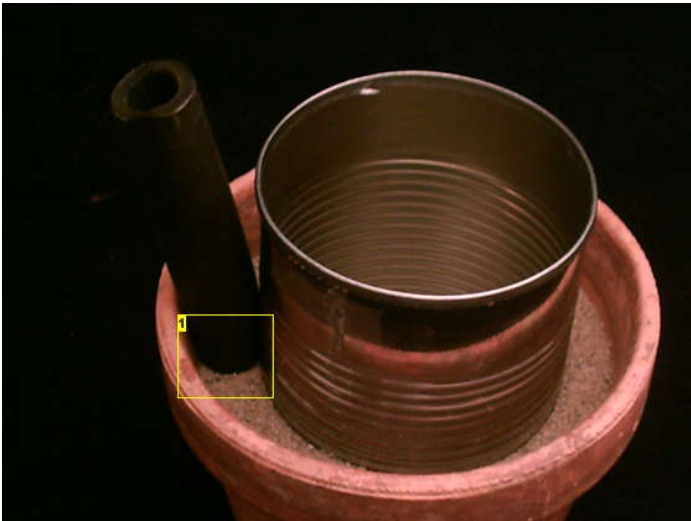


Image Notes

1. The fill tube should be placed in the sand 0.1" or so.

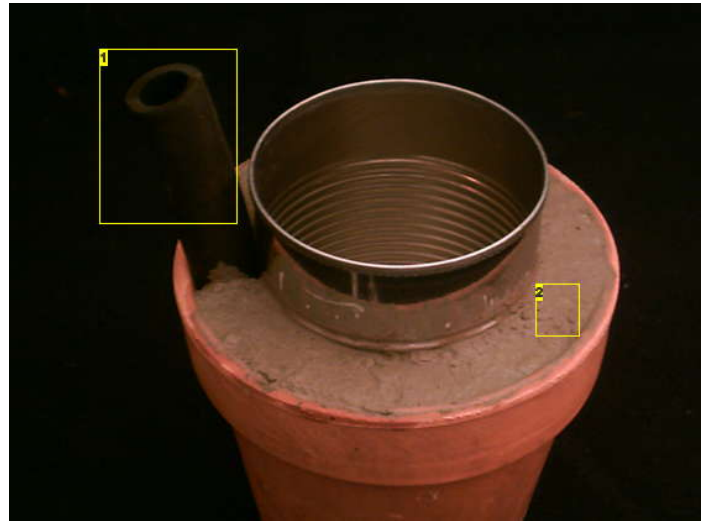


Image Notes

1. This is the spout that allows you to get water into the nether regions of sand between the can and the pot.
2. A layer of cement keeps the sand from spilling out all the time.

step 5: Add sealant around fill tube.

I found that the fill tube didn't seal against the cement so when I added water, it just leaked out around the edges of the tube and barely wicked into the sand. I had to add sealant to make it work. Not much more to say ... just make sure you get into the gaps around the fill tube and go all the way around.

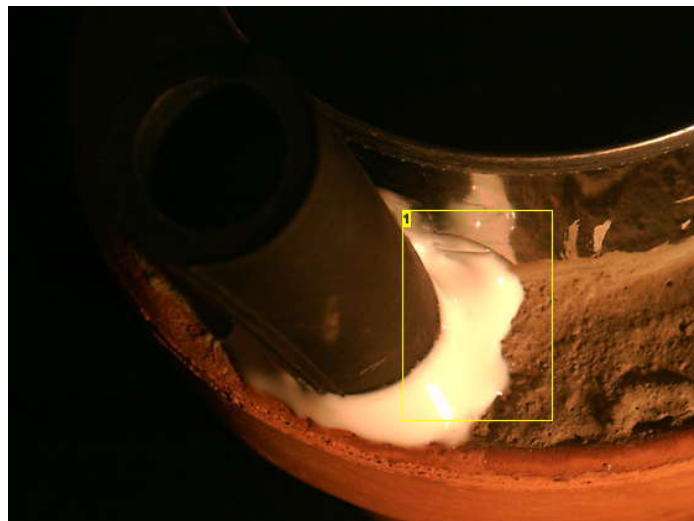


Image Notes

1. These gaps are big enough to let water leak right out.

Image Notes

1. Sealant solves the problem.

step 6: Try it out!

Once everything is good and dry, you're all set to go. I use a funnel to get enough water into the fill tube to let it wick into the sand. It takes a few minutes and the pot gets wet around the edges pretty quick.

Unfortunately, the last few weeks around here have had miserably high dewpoints. I did a test indoors where the air temperature was 77 degrees Fahrenheit but the dewpoint was over 60 degrees, so the inside of the can only got down to 75 degrees. I'll need to test it further when it's drier.

Fortunately, the whole point of the exercise was to make coolers for beverages while I'm in the August desert of Nevada for the Burning Man festival. The air temperatures can get over 120 degrees Fahrenheit but the dewpoints stay very low -- around 35 degrees or so. This is the ideal environment for a terra cotta cooler so I'm looking forward to how well it works.



Image Notes

1. Insert beverage to stay cool in here.
2. Add water to spout slowly to seep into the sand deep inside the pot.
3. Water leeches through the sand inside and out the porous terra cotta surface where it evaporates, cooling the pot and everything in it.

Related Instructables



New take on the Terra Cotta smoker by echo2247



A Green Plant, A Green Pot (With Duct Tape!) by phillyfan325



DIY Jockey Box! (Beer tap/cooler) by kc7eph



Yet Another Terra Cotta Smoker by smrat alleck



Super Beverage Cooler by o4tuna



Setting Up A Nice Color Bowl or Hanging Basket by DebH57




a little brown egg in Maine: terra cotta smoker by prof_jellis




Green Beer by noahw


Comments


[20 comments](#) [Add Comment](#)


 **nnygamer** says: Jan 20, 2008. 9:47 AM [REPLY](#)
An excellent and simple design that I think would work great at Burning Man, very low humidity, no power (well only what you bring with you) just bring extra water to keep it moist.


 **leobunyan** says: Dec 20, 2007. 9:24 PM [REPLY](#)
does it work with a lid??

 **tomc3uk** says: Aug 15, 2007. 7:39 AM [REPLY](#)
Could you make some kind of evil super cooler using petrol or ethanol?

 **jolshefsky** says: Aug 15, 2007. 8:02 AM [REPLY](#)
I thought about trying rubbing alcohol ... with a continuous supply and a lot of wind I figure it would get very cold. Maybe do the same thing but title it "Evaporative Terra Cotta Ice Cream Maker". :-)

 **tomc3uk** says: Aug 15, 2007. 9:36 AM [REPLY](#)
Yeah. Not so environmentally friendly though (or cheap). Oo maybe with ethanol farmed from corn or whatever they use. And if the thing caught fire.. dear me.

 **IdahoDavid** says: Aug 15, 2007. 12:06 PM [REPLY](#)
If it caught fire, you would have a bread maker. Seriously though, thought-provoking Instructable. I can see some potential for a larger unit. I would think it would be a good idea, too, to spread a wet cloth over top. Couldn't you also leave the cement off the top and put a layer of ice on top of the sand so that it would melt and absorb into the sand as well as assist cooling?

 **iwiltry** says: Aug 15, 2007. 1:45 PM [REPLY](#)
Uh... if you have ice, who needs an evaporative cooler?. Put the ice in a container (preferably insulated) and put your beverage can in the ice.

 **IdahoDavid** says: Aug 15, 2007. 7:48 PM [REPLY](#)
true. i am rightly rebuked.

 **DeadlyDad** says: Aug 20, 2007. 7:56 AM [REPLY](#)
I believe the word you are looking for is "**DOH!**" <G>



DeadlyDad says:

Aug 17, 2007. 11:42 AM [REPLY](#)

I wouldn't use cement to seal the top, because, as is mentioned in the link at the top,

One thing that has been an issue is that with use a crusty skin of salt forms on the inner and outer surface of the cooler, from salts leached out and then left behind by the evaporating water. Whether the salts are from the water, terracotta or the sand I don't know, but it is still coming through and it needs to be periodically scraped off or it interferes with the evaporation process and the set up seems less effective. A bit of water and Scotchbrite (or equivalent) seems to do the job admirably well.

Perhaps a plastic lid with appropriate holes cut out.



static says:

Aug 19, 2007. 11:13 PM [REPLY](#)

.That depends on the mineral content of the water used, I would guess. I would think anything in the Terra Cotta would build up on the outside only as the water wash flushing minerals out of it. any the point was keep it accessible for maintenance, not they why With my well water it would be a problem. Collecting rain water and using it for the chiller should reduce any problems.



jolshefsky says:

Aug 18, 2007. 6:07 PM [REPLY](#)

I hadn't thought of that -- I assumed the salts appeared at the evaporation surface (i.e. the outside of the pot) but I guess they could gum things up inside too. I'll have to see what mine does when I get to test it in the desert in 2 weeks.



servant74 says:

Nov 7, 2008. 6:50 AM [REPLY](#)

I lived in ElPaso, not quite like BurningMan but similar environment. We use evaporative air coolers for houses there, and use 'tap water' (plumbed in of course). it works great for all but about 2 days a year. Then you go to the movies and malls ;) ... Anyway, the scale (salt) does build up on the pads used to drip the water across so the air can evaporate it on the way into the house. Once a year, you tend to throw the pads away, or chemically clean them if you use expensive pads. ... I liked the ones made from wood shavings or cheap un-faced insulation. The water runs through them slowly, and we can just replace the shavings/insulation each year. At the same time, I kept 2 water pumps, and just swapped which one was in the unit each year. So I had an entire year to break the used one down and make sure it is in good shape (again, cleaning off the scale/salt buildup) for next year.



carpespasm says:

Aug 17, 2007. 6:03 AM [REPLY](#)

i think i've seen larger ones of these suggested as a good means of making food coolers for people in places like africa. They can be made with local materials, are cheap, and only require water to keep running. good stuff.



static says:

Aug 19, 2007. 10:54 PM [REPLY](#)

Google coolgardie safe for info on the old tech. Again works best when the humidity is low. I have heard of servicemen chilling cans of beer in open pans of gasoline. Then today who could afford that, if the risk is managed well Many places a deep hole can do a fair job, but requires planning ahead.



bdI says:

Aug 15, 2007. 10:53 AM [REPLY](#)

Can't you simply soak the terracotta pot in water, stand the beverage in it (if the pot is big enough) and allow the natural evaporation to cool the drink?

I have seen wine coolers which work on this principle and seem to do a good job.

Wine Cooler



jolshefsky says:

Aug 18, 2007. 6:11 PM [REPLY](#)

The question is, how long will a soaked terra cotta pot stay moist in a dry climate? I envision the wine cooler you linked to being used indoors where there isn't much air circulation; that and I wonder just how well it works. My whole Instructable comes together so the terra cotta retains as much water (because the sand is soaked with water) over as large an area as possible (the sand theoretically wicks the water all over the pot), and the cooling vessel doesn't float (the tin can is stuck down by the cement). I'll get a chance to see just how well it performs in a couple weeks.



Woodenbikes says:

Aug 17, 2007. 2:42 PM [REPLY](#)

Literally cool instructable.

Perhaps it would be more water efficient (BTU's useful cooling / gallon) if the pot and can were reversed. For example if the item to be cooled was put in the terra cotta pot that was itself inside a larger can with sand in between. Then the coolest surface of the moist terra cotta would be facing the item to be cooled.



Royski says:

Aug 18, 2007. 7:52 AM [REPLY](#)

I don't think this would be as efficient. The terra cotta is porous and it is the water leaching through then evaporating which causes the cooling (plus from the sand's top surface). Butter used to be kept in dampened terra cotta containers.

On holiday in Italy I very successfully cooled my overnight drinkig water by wrapping it in a wet towel.



thecheatscalc says:

Aug 16, 2007. 9:44 AM [REPLY](#)

I'd love to make something like this... but, sadly, I live in georgia, and the humidity stays around 50-70% water just doesn't evaporate well here...

however, I know stuff like this works great in the desert! simple things such as mist will keep you cool! (here you just get wet... and barely refreshed)