

SOLAR-POWERED SALT REMOVAL

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1. ABSTRACT

The method proposed in this paper is an easy way to prepare freshwater from saline water using desalinator. Nearly all the water on earth is undrinkable, but with this method we can utilise it to convert into freshwater.

2. INTRODUCTION

Nearly all of the water on Earth, 97%, is undrinkable salt water, and much of the remaining 3% of freshwater is locked up in glaciers and icecaps. Only a tiny fraction of all the water on Earth, about 1%, is freshwater that is available for people to use, and much of that water is deep in the ground and not easily accessible from the surface. As this freshwater begins to run out, people are trying to make more freshwater from oceans and other bodies of saltwater by removing the salt. Removing the salt is called **desalination**. With current technology, it requires great amounts of energy to desalinate ocean water on a scale large enough to meet the needs of a whole city. In this project, we will use solar power. The Sun will provide the source of energy to fuel your desalination. To achieve desalination, you will take advantage of the **water cycle**. The water cycle process includes evaporation, condensation and precipitation. In this project we will see all this in a bowl.

3. MATERIALS REQUIRED

To make saltwater:

- Water (4 cups)
- Liquid measuring cup (2-liter or 8-cup size)
- Red food colouring
- Microwave
- Newspaper for your work surface

- Salt (1 box or container)
- Deep bowls (6)
- Dry measuring cup (1/2 cup)
- Spoons

To make desalinators:

- Small cups or glasses (6), they should be less than half the height of the bowl and heavy so they will not float; small glass or ceramic cups work best
- Plastic wrap (1 box)
- Elastic bands (6), must fit snugly around the top of the bowls
- Small, heavy objects (6-18), like rocks or ball magnets.

4. PROCEDURE

Making of Saltwater

1. Add 4 cups of water to the liquid measuring cup.
2. Add a few drops of the colouring to the water. The colouring "marks" the water with a **contaminant**, just like those that exist in real saltwater.
3. Put the liquid measuring cup and its contents inside the microwave. Turn the microwave on high power until the water comes to a boil. Turn off the microwave as soon as it comes to a boil. Remove the liquid measuring cup carefully from the microwave. Be careful with the hot water so you don't get burned.
4. Lay out newspaper on your work surface because red food colouring stain.
5. Add 1 teaspoon of salt to each of three bowls. These will be your low-salinity bowls. Label them by amount of salinity, with a "D" for "Desalinator," and a number to keep track of them individually, as follows: Low Salinity D1, Low Salinity D2, and Low Salinity D3 ,with sticky notes.
6. Add 3 tablespoons of salt to each of three bowls. These will be your high-salinity bowls. Label them by amount of salinity, with a "D" for "Desalinator," and a number to keep track of them individually, as follows: High Salinity D1, High Salinity D2, and High Salinity D3,with sticky notes.
7. Using your dry measuring cup, add ½ a cup of hot red water from your liquid measuring cup to each of the six bowls. Use caution when pouring the hot water so you don't get burned.
8. Stir the water in each of the bowls with a spoon for 1-2 minutes to help the salt dissolve. Now you have six bowls.

Make Your Six Desalinators

1. Place each of your six small cups inside each of the six bowls. Position the cups in the middle of the bottom of the bowls.

2. Cover the top of each bowl with a large piece of plastic wrap. Leave extra around the edges. Press down slightly with your fingers into the middle of each piece of plastic so that it sags down toward the cup.
3. Fasten the elastic bands around the top of each bowl so that there is a tight seal between the plastic wrap and each bowl, but still a sag in the middle, toward the cup.
4. Place 1-3 rocks or other small heavy objects on the sagging portion of the plastic, directly over the small cup. You may need to tug the overhanging plastic slightly to get the plastic to sag evenly over the cup.

Test your desalinators

1. Find a location where your desalinators can receive direct sunlight. Carefully set your desalinators side by side in the sun.
2. Check on your desalinators once every hour to make sure they are all still in the sunlight. If they are not, gently move them to a sunny location.
3. Also peek through the plastic and look at the water that has collected in the small cups once every hour. If any of the cups look like they are about three-quarters full, then stop the desalination. Otherwise, continue to leave the desalinators out in the sun.
4. Stop the desalination when any of the small collection cups are at least three-quarters full, or if the sunlight has ended for the day. Carefully and slowly remove the weights, elastic bands, and plastic wrap from each desalinator.
5. Look in your small collection cups. Notice the colour of the water collected and you observe that the red colour was removed.
6. For each desalinator, pour the water you collected in the small cup into the medicine cup, and measure what you collected. Then pour the contents of the medicine cup back into the small collection cup and place it back inside its corresponding bowl.

5. OBSERVATION

1. Once you have measured all your collected water, dip your finger into one of the collection cups and taste what you collected.
2. Now dip your finger into the red saltwater and taste that.
3. There will be a big difference between the tastes of two waters.
4. Write down your observations for each bowl.
5. Compare the average freshwater collected from the low-salinity desalinators with the average freshwater collected from the high-salinity desalinators.



Figure 1: liquid measuring cup filled with 4 cups of water with food colouring

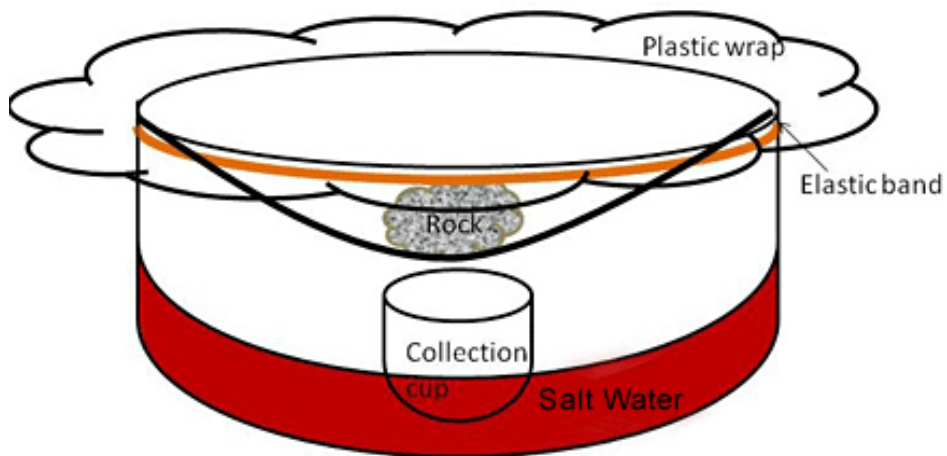


Figure 2: shows how a desalinator must be assembled



Figure 3: desalinators filled with low- and high-salinity saltwater.



Figure 4: collected water ready to be poured into a medicine cup for measurement.

6. LIMITATIONS

- ✚ The process takes 6 to 10 days to complete.

7. CONCLUSION

With the help of this project we have found out an easy way of how salty water can be converted into fresh water using desalinators. This project materials are available at affordable rates. Doesn't require trained people, as its an easy project anyone can do it. Countries with high quantity of salt water can be further use this idea and make use of that water by converting it into drinking water.

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9. REFERENCES

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