

POLLUTED WATER CAN BE PURIFIED BY SOLAR ENERGY AND INCREASING SYSTEM EFFICIENCY



Introduction:

With the increase of population in the world, shortage of potable water is becoming more noticeable. Just hundred years ago water was free and you couldn't imagine that some day you will pay too much money for a bottle of water. In the past few years some large bottling companies have tried to dominate the water resources of the world by purchasing natural springs and other water rights in many different countries

Soon many people in the world can not afford to purchase fresh or drinking water. When we run out of fresh water resources, we will need to purify water for our consumption.



Distillation is the most reliable and efficient method of water purifications. All other methods including de-ionization and filtration can only remove parts of impurities and often introduce new impurities to the water. Distillation is often performed by heating water to its boiling point. At that temperature water evaporates. Vapor water are then directed to condensers where liquid water will be formed again.

Can we use solar energy to distill water? Heat energy from the sun can warm up water, but it can not bring it to the boiling point, however we have seen that water evaporates and makes wet objects dry even without heat or sunlight. Can we use the natural evaporation of water to purify polluted water? We have seen that hanging cloths under the sun will make it dry faster. Can we use the same method to evaporate and re-condense pure water?

Purpose:

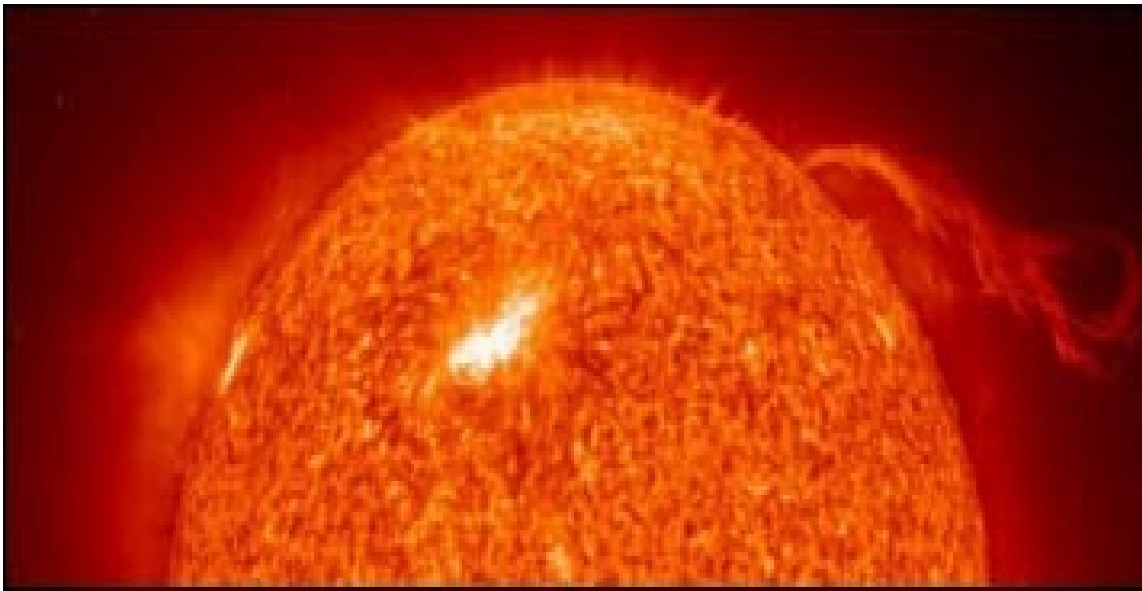
The purpose of this investigation is to design and construct a water distillation apparatus that can work with solar energy. We will try to employ every possible factor that can contribute to the evaporation and condensation in our design. For example we will use fan to decrease surface pressure of water by using fans which are worked by solar cell and cooling outer surface of condenser etc. And then we will compare efficiency of these ways

Experiment Design:

Introduction

Obtaining clean drinking water is a constant challenge in many countries. Often the only water available is rife with disease-causing bacteria, and must be disinfected to make it safe. Conventional methods for disinfecting drinking water, including boiling and adding chlorine compounds, can be time-consuming and expensive. In some regions, it is difficult to ensure a reliable supply of chlorine, which can also give the water an unpleasant taste. In many areas, there is little fuel available for boiling water.

In this experiment we intend to make a low-cost, practical means to provide safe drinking water in rural and urban areas where needed. The key to this method lies in the ability of direct sunlight to destroy bacteria (direct sunlight can not destroy bacteria although it can make the evaporation of water faster). The treated water is expected to be suitable for drinking. Solar radiation is a form of renewable energy that is abundant and accessible in many areas in the world.



Sunlight with wavelengths of 315-400 nanometers (nm) on the ultraviolet (UV) range of the electromagnetic spectrum is most effective at destroying bacteria. Since colorless glass or plastic can transmit light in this near ultraviolet range, they are the best materials for disinfections. Visible light (400-750 nm) next in terms of efficiency, with the visible band of violet and blue light (400-490 nm) is the most useful within this range. As a result, violet, blue, and very light green-tinted glass follow colorless glass or plastic in order of suitability.

For increasing system efficiency we have some ways. For example we used fan which are worked by solar cell inside the container. First we attached fan wind to the surface of water to decrease vapor pressure and then we put one of the fan surface of mirror reflector for cooling glass cover. And we painted bottom of container to black color because black color absorbs solar energy. We attached glass sticks on two walls of container to collect condensed water drops from upper wall to water tank. And to make movement of drops on cover we rub oil on the bottom surface of cover.

Potential users

The system can potentially be used in small communities, refugee camps, institutions, and in disaster situations where water supply is interrupted. An it can be used in factories for their water recycle. Waste water can be distilled from its impurities for reusing.



Experiment: *Water Purification by Solar Distillation and increasing efficiency of system*

Every solar water distiller has a tank of polluted water covered by a clear glass or plastic, slanted or curved such that the condensed water vapors can slide down into the distilled water storage.

Procedure: In this design a sheet of glass will be used. This clear cover is installed in an angle to force condensed water to move to one side where it will be collected.

As sunlight warms the black bottom and sunlight is reflected by mirror which is back of system, then heat is transferred to the water, the top of the water evaporates on to the inside of the glass cover, which is tilted toward the fresh water drain..

Increasing System Efficiency

We must know factors effecting vapor pressure. They are amount of surface area - the greater the surface area exposed to the surroundings the faster it will evaporate. Pour some water on the floor and put the same amount in a cup or a bowl, the water on the floor will evaporate much faster. But in our system surface area is constant because we will use same system.

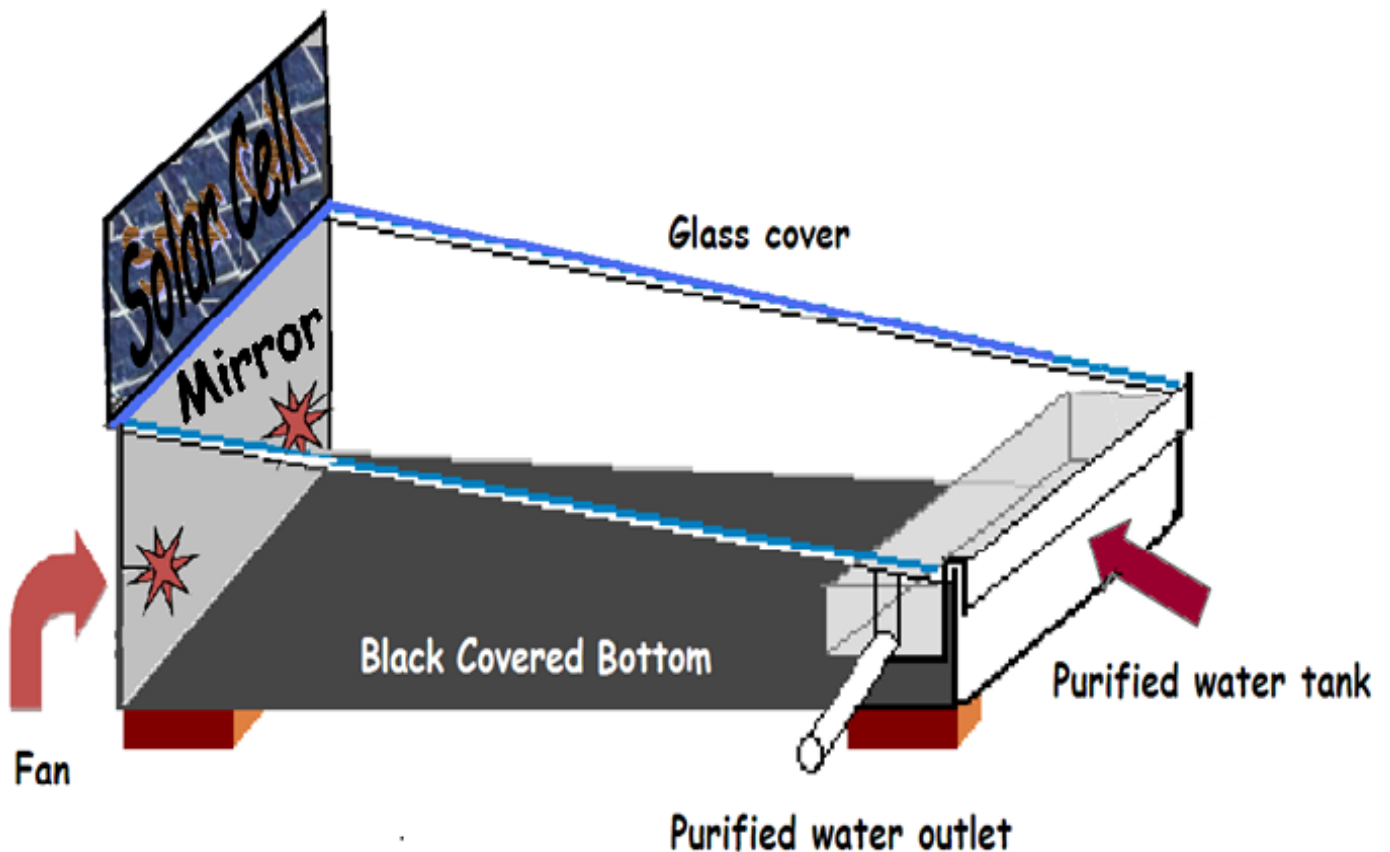
humidity - this has to do with vapor pressure. if the air is extremely humid there will already be a lot of water vapor in the air, not allowing as much of the water to evaporate. Because of this factor we try to decrease humidity in our container by using fans and cooling cover down.

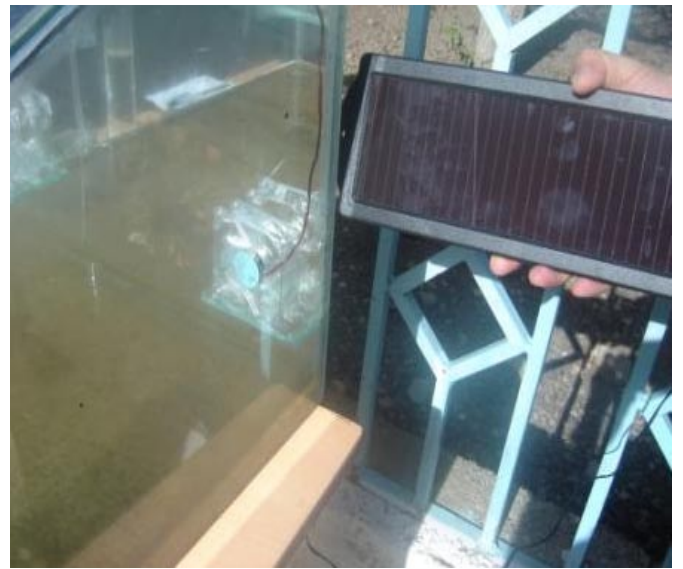
Temperature of the surrounding - this one is simple, put some water in a cold environment and some water in a warm environment and obviously the warm one will evaporate faster. There is more energy in warm air. For our system it depends on weather of day

Temperature of the liquid - Same as above. For this case if we use less amount of water, system will warm up shortly. So it will help us about time.

Wind speed - more wind blowing across the surface of the liquid means there will be constantly air with no water vapor in it right above the liquid, resulting in a faster evaporation. This is why putting a fan on a wet carpet or something of that sort will dry it out faster. For this situation we use fan of solar cell.

The structure of our design is like following (theoretically)







We can find most of the parts in a hardware store. Professional solar vessels are generally made of glass over formed sheet metal. But the base can be made of anything that will hold up outdoors. So that it is easy to build up. And soon it will amortize its cost. Here instead of glass we can also choose hard transparent plastic.



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