AquaHarvester

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IED per 2,3, CSE per

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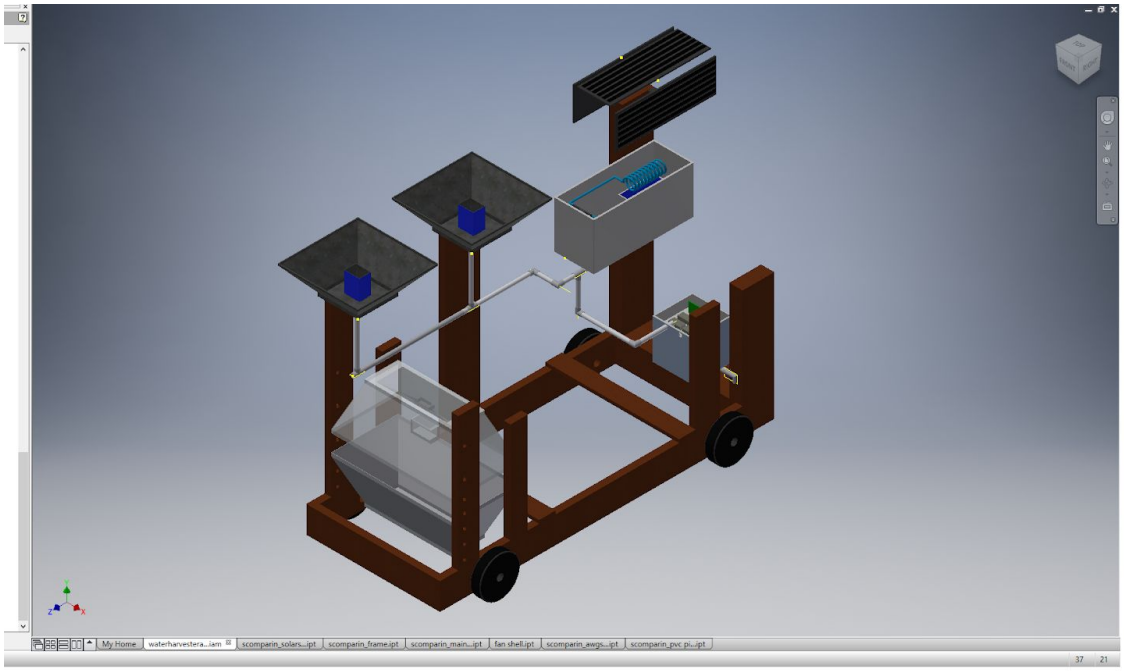

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Background Research

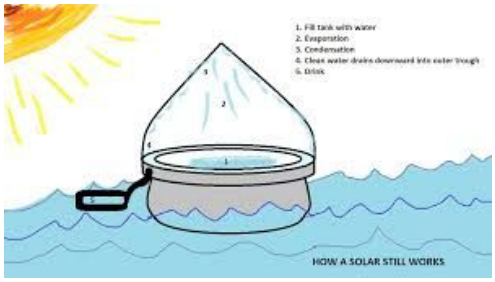
Problem Description:

People in many parts of the world are suffering from lack of clean, fresh water for both drinking and other uses. These people do not have devices and methods that allow them to produce their own water, forcing them to collect water from areas contaminated with diseases, parasites, and pollutants. Should the populations affected be able to produce and purify their own water, even despite lack of natural water, then both their health and lifestyle would be greatly impacted in a positive way. The goal of this project is to design a product that would consistently and reliably deliver fresh, clean water, while being portable and easy to use. As such, our idea is to both innovate and combine previously discovered methods to extract and collect precipitation and condensation, while still meeting the criteria mentioned above. Target users would include anyone who wants to make their own water cheaply and efficiently, but is more directed towards poor people struggling to obtain proper drinking water. A lot of these people would obtain our product from companies that donate them- making these non-profit, humanitarian organizations the primary customers.

Research Summary:

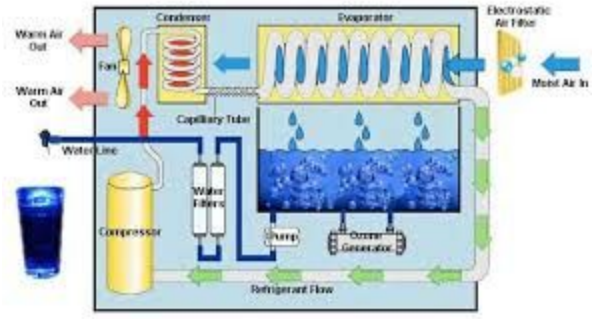
Here are the previous products we are basing our product on.

The solar still: This system can have many varied forms based on different designs, but the concept remains the same. The still has a top covering that heats something kept under the enclosed space formed. The “something” could be any substance containing water, such as soil, or unclean, liquid water. The heated water evaporates, leaving almost any contaminants such as salt, dust, or heavy metals behind. The water vapor rises, meets the top covering of the still, and condenses there. The middle of the still’s top covering is less elevated than the outside, so the condensate trickles down to the middle and then drip into a receptacle placed under this part. The most common solar still is made of plastic sheeting over a hole, but anything can be used as long as it has a closed inside and heats a surface up. Some solar still have been made so that the top doubles as a rain and dew collector.



The dew/rain collector: This devices is simple, consisting of a collective surface for rain and dew. The water is funneled down into a tube and usually reaches a storage container. A common example is the rain barrel, which uses a roof a collective surface and the gutter as the tube, with the barrel being the storage container.

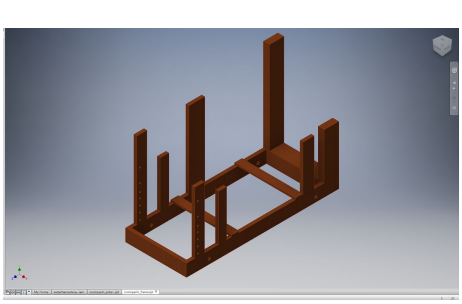

The AWG: A more technical invention, the AWG (atmospheric water generator) is a device that extracts and condenses water vapor directly from humid air. A fan, situated near an exterior edge of the device, circulates air above a cooling coil. The cooling coil is made of tubing, with refrigerant inside. The refrigerant is circulated through the coil, a compressor, and a condenser. Air blown from the fan hits the coil, condensing the water vapor, which drips into a receptacle below. The water is then funneled to a storage container, then filtered for use. This devices work better when the air is humid, and they work in a similar fashion to dehumidifiers.



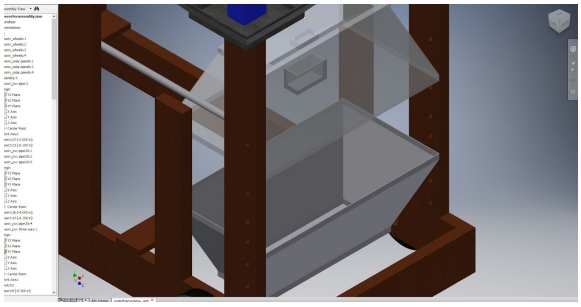
Solution Summary:

For this project, we have designed a product that combined and innovated ways to receive clean and usable water from exterior air and soil. This water is meant to be used by a family to have enough water to wash and clean foods and clothes in their house and for drinking purified water. This product is meant for families in low to mid class. Since a gallon of drinkable water is around $1.20, this will be a cheaper way for families who are already struggling financially to get enough water for basic needs. It will have 3 ways to collect water that will all be connected to the main storage for all the water. We will use rain water, condensation/water vapor, and a solar still in product, so the innovation is incredibly efficient.

The physical support structure of the Aqua Harvester is a wooden frame mounted on durable rubber wheels, allowing for easy movement. However, it is the solar still that determines the movability of the product. Our solar still has undergone a major innovation compared to previous products. Both the top and bottom solid plastic shells of this part can be raised or lowered via pegs going into holes in the support frame. Depending on the user's preference, the bottom can be removed completely and the top lowered so that it covers exterior soil. Otherwise, soil is scooped in the bottom half to make the system work that way. The top parts has an attached collection container, with flexible tubing (because of raising/lowering) with a pump that leads to the main storage container.

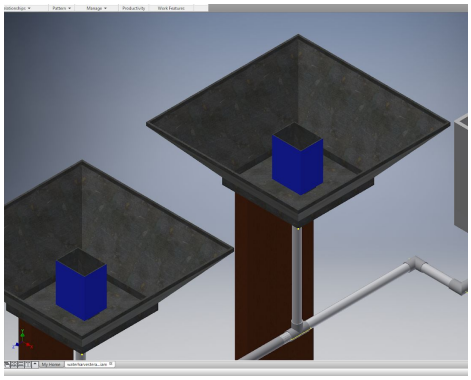


The frame

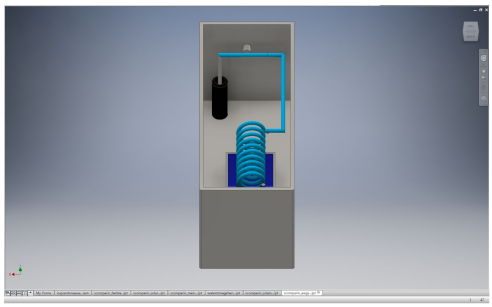


top and bottom halves of still mounted on frame

The next part is the rain and dew collector. Since our product is movable, we could not utilize a large collection surface. The collecting surface, a flattened, prism-like shape, is made of stainless steel, which is a good conductor. For rain, this does not change anything, but for condensation, the impact is much greater. The steel naturally cools at night, collecting for dew. During the day, another innovation, apart from the use of lightweight steel sheeting, comes into play. Within each receptacle lies a sealed plastic container with ice, which does not leak water into the system but just serves to cool the metal, allowing it to condensate water even during the day! The ice can be refrozen time and time again for future use. Solar panels mounted at the top of the frame could help do the freezing through electrical means, but that was not designed- it uses too much energy. The panels could be used to freeze the ice though, as that requires much less energy. Any water collected from the rain/dew collector exits the device through a PVC pipe leading to the main storage container. We used two in our system.



The third part is the AWG. The most technical parts, it is also the only one that has not gone any major innovations in design. We did, however, model ours with recycled parts such as an old computer fan and plastic tubing for the coil. The exterior is made of sheet steel for lightness and solidity. For parts, refer to the AWG description in the previous research section. We used solar panels, mounted on the frame, to power the electrical devices (pump, compressor, condenser). PVC tubing leads from the plastic receptacle below the coil to the main storage container. We modeled a basic prototype of what our AWG will look like if commercialized.



The main storage container filters and stores all collected water, and has a spigot for easy use. This kind of easy access and filtration were not as present in previous products, especially the solar stills.

Contributions of Group Members:

For this project are team was composed of 4 members. Each of us contributed a certain part to the project.

Ryan Savellano: Did the majority of the website, and all formatting and information input into the website. Added information in the presentation slide show. Kept the Project log and how we worked and brainstormed.

Stanley: Helped with the design of the Aquaharvester. Helped add information into the slideshow and document. Helped create the prototype model with autodesk inventor and by building it. He helped brainstorm what idea we should do. Created a survey for statistics.

Jacob Zhou: Due to internet problems at home he was not able to help with the website as much as intended, but he did contribute ideas for the format of the website. He also helped with the project log.

Loic: The leader of the group who guided the group for the work that needed to be done. He gave deadlines and what work should be done during class. He came up with our idea, and put in a lot the information for the document and the slide show. He also helped a lot with the design in autodesk inventor, including the final assembly.

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