

SRP EVAP

Prototype Topic 1 & 2

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Spring 2025 - Fall 2025



Project Sponsor: Salt River Project (SRP)

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Topic 1: Physical Prototype

Problem Statement:

- Does the presence of shade directly affect the rate of evaporation in a still body of water?

Prototype topic 1 shading experiment:

- This experiment is two similar clear glass cups with the same amount of water in each cup marked with a blue line. 1 control cup is to be unshaded in the same environmental conditions while the 2nd cup is shaded with a slanted piece of cardboard taped down to remain steady in high wind conditions. The test will have the data recorded every 20 minutes and take note of the time, temperature, and wind speed to compile with a picture taken.

12:00 52f 16mph



12:20- 53f 16mph



12:40-53f 16mph



1:00-54f 17mph



1:20-54f 18mph



1:40-54f 19mph



2:00-55f 19mph



2:20-55f 19mph



2:40- 55f 19mph



3:00-55f 19mph



3:20- 54f 19mph



3:40-54f 19mph



4:00-54f 20mph



4:20- 53f 19mph



During the 4-hour experiment, there was a small amount of water that had evaporated from both cups. However, the amount of water was not scientifically tracked and was meant to be interpreted by the human eye. From this experiment, one can see that the cup on the left, the uncovered cup, loses water at a faster rate than the shaded cup on the right. To scientifically prove that the uncovered cup had more evaporation, notice the bubbles that started to accumulate around the center section of the cup. This is not the water boiling but the dissolved gases like oxygen and nitrogen that are released as the water warms and the pressure decreases, or a direct example of nucleation sites due to the magnified surfaces from the glass. This shows that the temperature of the water was higher towards the end of the experiment in the uncovered cup.

Moving forward this information validates our research that solar shade will reduce evaporation with the idea that the shade reduces the surface temperature of the water. Moving forward the SRP EVAP team will take this into account due to its relevance even on a cold and windy day. This experiment proved that the shade can reduce the overall temperature of the still body of water with all other variables kept constant in both cups allowing us to focus more on ambient temperature.

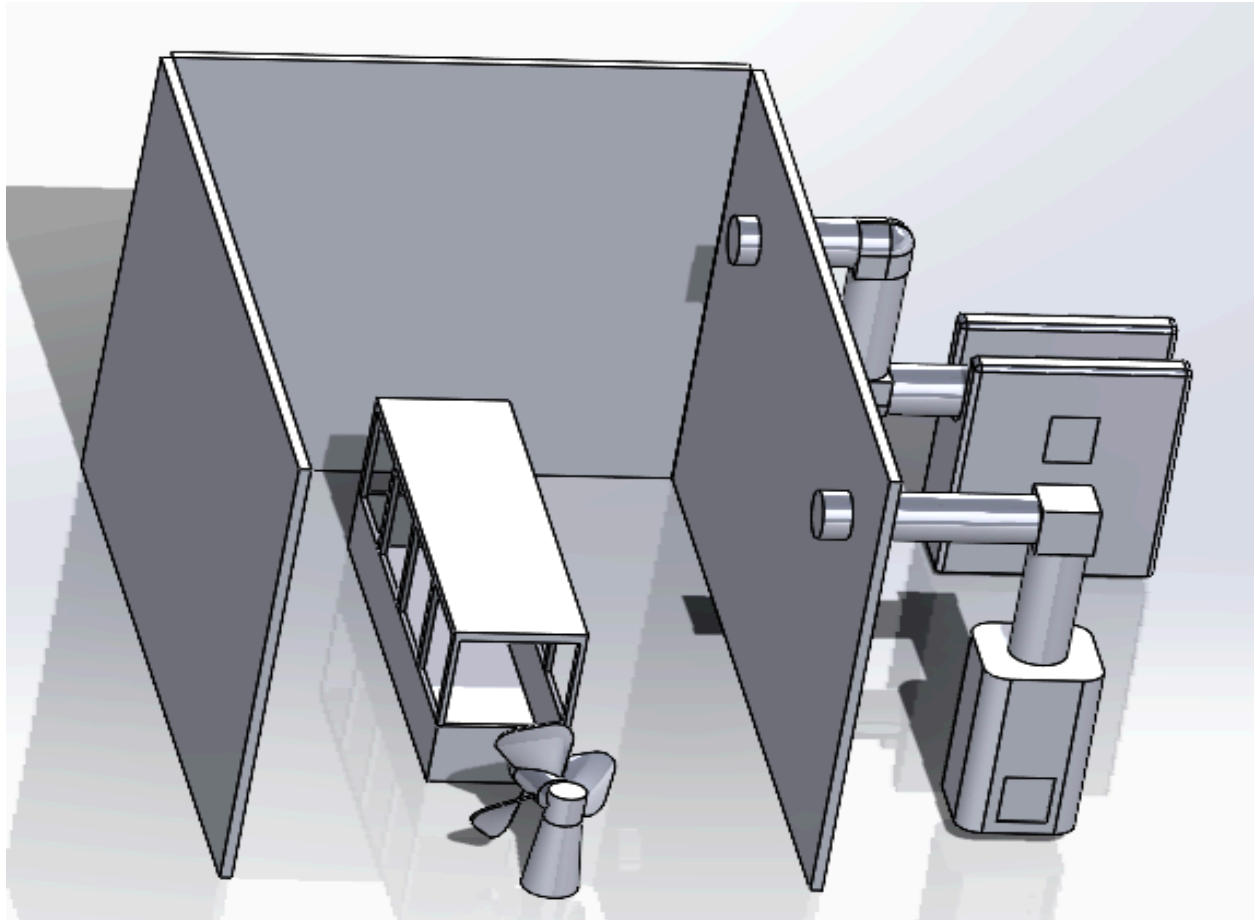
Topic 2: Detailed Advanced CAD MODEL

Problem Statement:

- How can we control the variables / elements in an experiment

Prototype topic 2 Controlled Environment:

- We had to come up with a model that can be able to have set variables to be able to change only one variable and see how that would affect evaporation. The only way to control your environment is to build an enclosed area with an apparatus. We focused on a few environment variables like wind, temperature, and humidity. Then from seeing how those affect evaporation we can use a shade(roof) to see how that affects evaporation and test that at different heights.



- We can up with this design that has a temperature controller(big unit on the outside) and humidity controller(small unit on the outside) The walls would each be sealed and we

would have another wall where the opening is and we would also have a glass top to be able to shine a lamp down onto the water and see the experiment. The design would have no bottom so that way we could lift up the box to get access to the water tank and not have to worry about any hinges. Our tank would be a 10 gallon tank to have a datum of water. The fan would be measured for its wind speed modes outside and then have a set mode. We would measure the water loss by getting the weight of the tank empty then with water then weighed again after the experiment.