Input Water
Primary Option: Manual Supply Tank and Filter
Secondary Option: Gravity Fed Tank and Filter

Inputting water should be very simple and not be a means of complication to the system. Using a pump requires it to be salt water compatible and needs power to run. Using a screw drive or crank system can utilize an alternative form of power but would require a person or animal to constantly be operating.

In order to keep this section of the system very straight forward, I feel that a gravity fed tank or constantly pouring water into the tank would be the simplest option for now. Since the device is meant to process enough water for 1 person per day the device would only need to be filled once per day. This also would be the most applicable for a laboratory setting since it will not be utilized every day. In the future this aspect of the design could be unproved. The reason that the gravity fed tank is secondary is that a stand would have to be constructed in order to hold the tank above the inlet of the system.

Another major suggestion is to include a filter to eliminate any "extra" contaminates before they get into the separation part of the tank.

Separating Water from Contaminants

Primary Option: Solar Still integrated with Parabolic Trough

The Solar Still, by itself, will meet the minimum requirements of the customer. The design is simple and bulletproof. This project will be taking a step beyond the previous SD team project by integrating the parabolic trough. Hopefully this will increase the rate of water output drastically.

Secondary Option: Solar Still integrated with Closed Loop Parabolic Trough

If designed with modularity in mind, but also with an interesting student interface added for consideration, then a closed loop parabolic trough would be a good option to integrate. This means a working fluid transferring the solar thermal heat to a solar still. This could also work without the Solar Still if temperatures are high enough by going to a ‘black box’ and transferring thermal energy to water and causing brackish/salty water to boil.

Measurements & Controls

Primary Option: Computer controlled measurement and control system.

This is the most reliable and easiest to change on the fly. Additionally we can acquire necessary DAQ equipment within the department resulting in little expenditure, program ourselves, and receive knowledgeable help when necessary. This provides an easy to use GUI for students and provides easy data collection.

Secondary Option: PID measurement and control system.

PID controllers are small and easy to use in simple systems, but they have less flexibility to be adjusted on the fly and are less intuitive to create a user friendly GUI. Can have major cost advantage, especially in high volumes. Due to availability of other equipment and the lack of size constraint for our single unit production this option was not chosen.

Removing Usable Water

Primary Option: Removing Water using Solar Still

Since a solar still is the primary and secondary option purposed ,the natural condensation which is part of this system will be how the water is collected. This process will take time, however the process could take less time by running cool water or cool air on the outside of the condensing surface. The only downfall for including a cooling system is complications to the solar still, however this could be an additional component that could be added at a later time. The only addition to the solar still will be a collection tank for the usable water.

Removing Concentrated Brine

Primary Option: Computer Controlled Salinity Measurement

Using a solar still allows for a trough that will hold the brine at the base of the system and allow it to concentrate as the desalinated water is removed. The final recommendation is to monitor the salinity level and once it exceeds a limit (which will need to be set by the specifications) the brine will be removed. This can be accomplished by a release valve located in the bottom of the trough that is either manually operated or controlled by the computer interface. If the release valve is manually operated, there should be an alarm in the computer program which tells the user it is time to release the brine. This was thought to be the best option, even though it is more complicated than the secondary option, because it will allow for interaction between user and device and aid in the data collection process.

Secondary Option: Float Valve

A secondary option is to use a float valve which will monitor the overall level of the lower trough. When the level becomes too low (also will need to be set by specifications) a valve will be lifted and the brine released. This valve could also be connected so a new batch of brine filled the tank.

Student Interface

Primary Option:

Implement safety precautions including a factor of safety, color coding, and labels to avoid injury. Proper personal protective equipment will be required for anyone using the unit. User friendly and visually interesting computer control program will be developed which students can easily use. Operation manual or user handbook will be created to ensure knowledgeable use of the system.

Secondary Option:

Less fail-safe design catered to older students. Create additional student involvement procedures, lab exercise or demo procedure, to demonstrate key engineering concepts used in the solar desalination system. Have more student control and less computer control. Factor of safety will need to be increased. The concepts demonstrated in the system can be used to teach all age groups and this option would limit that.