Objective
One goal of this project is to develop a steady state sensible performance analysis of multi-pass cross-flow finned-tube heat exchangers. Another goal of this project is to devise an inexpensive, portable means of desalinating water using vacuum tubes solar collector.

Types of cross flow heat exchangers
The investigation considers various flow circuiting, such as counter cross-flow, parallel cross-flow, and cross-flow where the tube-side flow is in parallel. A previously developed matrix approach is used to evaluate the heat exchanger performance in each case.

Performance study of cross flow heat exchangers
A parametric study was performed on cross-flow heat exchangers subject to various flow circuiting considerations, i.e., overall parallel- and counter-flow, as well as tube-side flow in parallel. If the heat capacity rates were greatly different, or if temperature variations throughout the heat exchanger between the inlet and outlet were insignificant, all multi-pass cross-flow heat exchangers exhibited similar performance characteristics. However, for all other combinations of capacity rate ratio and number of transfer units, a cross-flow heat exchanger operated in overall counter-flow yielded the best heat exchanger performance, i.e., the maximum overall effectiveness. The heat exchanger effectiveness of multi-pass cross-flow heat exchangers with the tube-side flow in parallel was intermediate between that for overall counter and parallel cross-circuiting. For each flow circuiting configuration, a study was performed to assess the combination of NTU and r-values that exhibited heat exchanger effectiveness values that changed less than 1%, as the NTU values were progressively increased. That criterion was determined to be impractical when sizing multi-pass heat exchangers operated in overall counter-flow, since it yielded excessive NTU values for each capacity rate ratio. This criterion was achieved for multi-pass heat exchangers operated in overall parallel flow many cases considered in the present study, the heat exchanger

boiler as shown in figure 11. Apart from glycol there are two heating elements which act as heating sources in the boiler tank to evaporate the sea water. As shown in figure 10, the hot sea water vapor coming out of the boiler tank gets condensed in the condenser leading to the formation of distillate. The cold sea water which acts as cooling medium in the condensing vessel is pumped to the boiler tank for evaporation. Heat energy released from the heating sources in the boiler tank gets absorbed by the PCM which stores the heat and this heat is released during certain periods of heating demand.

Conclusion
Research needs to be done as to analyze the efficiency of PCM in the test setup and this includes complicated heat transfer analysis needs to be done in condensing vessel and the boiler tank.

References
2. http://stars.library.ucf.edu/cgi/viewcontent.cgi?article=3051&context=etd