SUSTAINABLE CAPSTONE PROJECTS (SCAP)
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SOLAR WATER DESALINATION SYSTEM DESIGN AND CONSTRUCTION

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GROUP MEMBERS

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INTRODUCTION

Clean, fresh drinking water is essential to cover life needs like human needs, agricultural needs and artificial needs. And access to safe drinking water is every humans' right. Coupling of renewable energy sources with desalination processes offers a more sustainable way for increasing the supplies of potable water.
The main aim behind solar desalination system is to utilize the sun's energy to drive the separation of water from salts, minerals and other impurities dissolved in it. As the system relies on renewable energy source i.e, solar energy , it is environmentally friendly.
Additionally, Solar desalination systems have proved to lower the overall cost fresh water production.
Overall, the objectives of solar desalination systems are aligned with a sustainable, cost-effective, and environmentally friendly approach to fresh water production.

MATERIALS USED IN CONSTRUCTION

Re-Used/Recycled Materials:
- Glass
- PC cases
- Collection container
- Metal tin container
- Screws

Other Materials:
- Mirrors
- Black spray paint
- Silicon

FINAL PRODUCT

This design is suitable for small-scale freshwater production and educational purposes.
The model is designed to be a right-angled triangle 3d model with the front being glass and other sides being metal. The metallic sides were sprayed with black paint to help absorb more solar radiation.
The model is well-sealed from all sides using silicon to ensure no water vapor escapes the system.
The metal container containing the saltwater is placed at the center of the base with mirrors surrounding it to help concentrate sunlight and accelerate the process. A collection container is placed beneath the glass, this is were the distilled water will collect.
Positioning the model in direct sunlight, the sun's energy will heat the saltwater, causing it to evaporate. The water vapour will then condense on the glass and drip into the collection container.

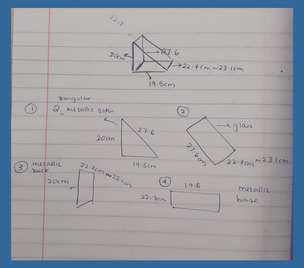

Figure1: Measurements of the model .

Figure 2: Measurement testing.

Figure3: Inside view of the system.

Figure4: Outside view of the system.

RESULTS AND DISCUSSION

The system successfully collected distilled water over the testing period.
As the saltwater in the metallic container absorbed solar energy, it evaporated and the water vapor condensed on the glass and dripped into the collection container. It effectively removed salts and impurities, producing relatively clean freshwater.
As the system's operation is highly dependent on sunlight, overcast days or limited sunlight intensity reduced the system's performance.
(can include the time taken for the water to evaporate and amount of water collected.)
The simplicity of the design comes with limitations. Improvements in design in such in a way that it would incorporate more sunlight, exploring materials with enhanced heat absorption properties and including additional energy-capturing mechanisms could optimize the system's performance.

CONCLUSIONS

The successful collection of distilled water confirms the practical application of the system in converting saltwater to freshwater. This showcases the viability of the simple system in providing a local and sustainable source of clean water. While its practical for small-scale applications, scalability for larger water demands is limited. The simplicity of the system , and its sunlight dependency underscores areas for improvement. Taking these limitations into account can lead to advancements in design and functionality making them more reliable and efficient.

Joining the SCAP program has been a valuable and enriching experience. It presented us an opportunity for collaborative learning. Working with the members allowed for exchange of ideas, collective problem-solving, helped foster the development of essential skills such as communication, teamwork , time management. The Group members inspired each other, shared innovative ideas and worked together to collectively generate creative solutions to problems we've faced while constructing the model.

REFERENCES

- -Design and Simulation of Solar Desalination Systems August 2011
- Thesis for: PhD Author:Mohamed A. Sharaf Eldean

1. - https://www.sciencedirect.com/science/article/pii/S0011916410002171?casa_token=94cefPR0xeQAAAAA:Rlyw5dKWvffYaB8_Tb1H2BibpqkDHthEA_Ac2JHe7AbVJ2NanIgWS0LO35a9PrrTnDmWAyB28Tq0