

SUSTAINABLE CAPSTONE PROJECTS (SCAP)

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Solar Water Heater

GROUP MEMBERS

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INTRODUCTION

The objective of the solar water heater project is to make use of solar energy to heat water. As simple as it may sound, the main reason behind building this project is the dilemma of using cold water in winter as it's considered a big struggle for the majority of people, so using solar water heater will firstly reduces the cost of purchasing water heaters and opens the door for sustainable solution that doesn't harm the environment. Its benefits are crucial in places where water heaters presence is scarce or difficult to provide.

MATERIALS USED IN CONSTRUCTION

Re-Used/Recycled Materials:

- refrigerator door
- refrigerator copper coil
- PC cases
- Pipe
- Containers

Other Materials:

- Wood
- glass
- Silicon
- Screws
- thermometer

FINAL PRODUCT

The design of the solar water heater is as follows:

An old refrigerator door was used as a base for the copper coil which has also been disassembled from the old refrigerator. PC cases were fixed to the base under the coil to allow more heat absorption. Wood is used for the project frame and a pipe is connected to both ends of the coil as an inlet and an outlet. Water is supplied from a container to the inlet and another container is connected at the outlet for the outcoming hot water.

The functionality of the project has been tested as follows:

- 1)The project has been placed under the sunlight at noon for one hour.
- 2)Water has been let inside the coil from the connected inlet pipe.
- 3)Hot water was collected in the other container
- 4)By using thermometer, the temperature difference was measured.

RESULTS AND DISCUSSION

•From the results obtained, after the primary test of the solar water heater project; the addition of the metal sheet for improving heat retention was achieved successfully. The initial water temperature was almost 18°C and has increased to around 47°C in a duration of over an hour when passed through the coil. Furthermore, the use of recycled materials for sustainable water heating was efficiently done.

•Additional recommendations for future improvements:

- explore and search for advanced insulation materials for maximum heat retention.
- investigate alternative coating for enhanced heat absorption
- consider additional features, such as:
 - the addition of a digital thermometer/thermostat to detect the change in temperature.
- collaborate with experts for further optimization and scalability
- Addition of a pump, to allow faster water flow.
- Leaving water to flow inside the coil for a longer time to obtain hotter water.

CONCLUSIONS

In conclusion , the results obtained indicate that the project is working successfully and effectively; as the refrigerator door provides excellent insulation that improved the prevention of heat loss. The copper coil has a small diameter for the water flow which provides more surface area of the water exposed to the sun. PC cases play an important role by enhancing the heat absorption, and the water pump improved the overall system by increasing the speed of water flow .

On the other hand, one of the negative aspects is that the efficiency of the whole project could be reduced in areas where the temperature is low.

Lastly, Special thanks to the dedicated SCAP project team members for their expertise and commitment to sustainable energy solutions.

REFERENCES

<https://youtu.be/fGPWChUel3k?si=yE3p-lzTUC71ljgl>

<https://www.instructables.com/search/?q=solar%20water%20heater&projects=all>

<https://www.instructables.com/Solar-Water-Heater-2/>



Figure 1. Final Result

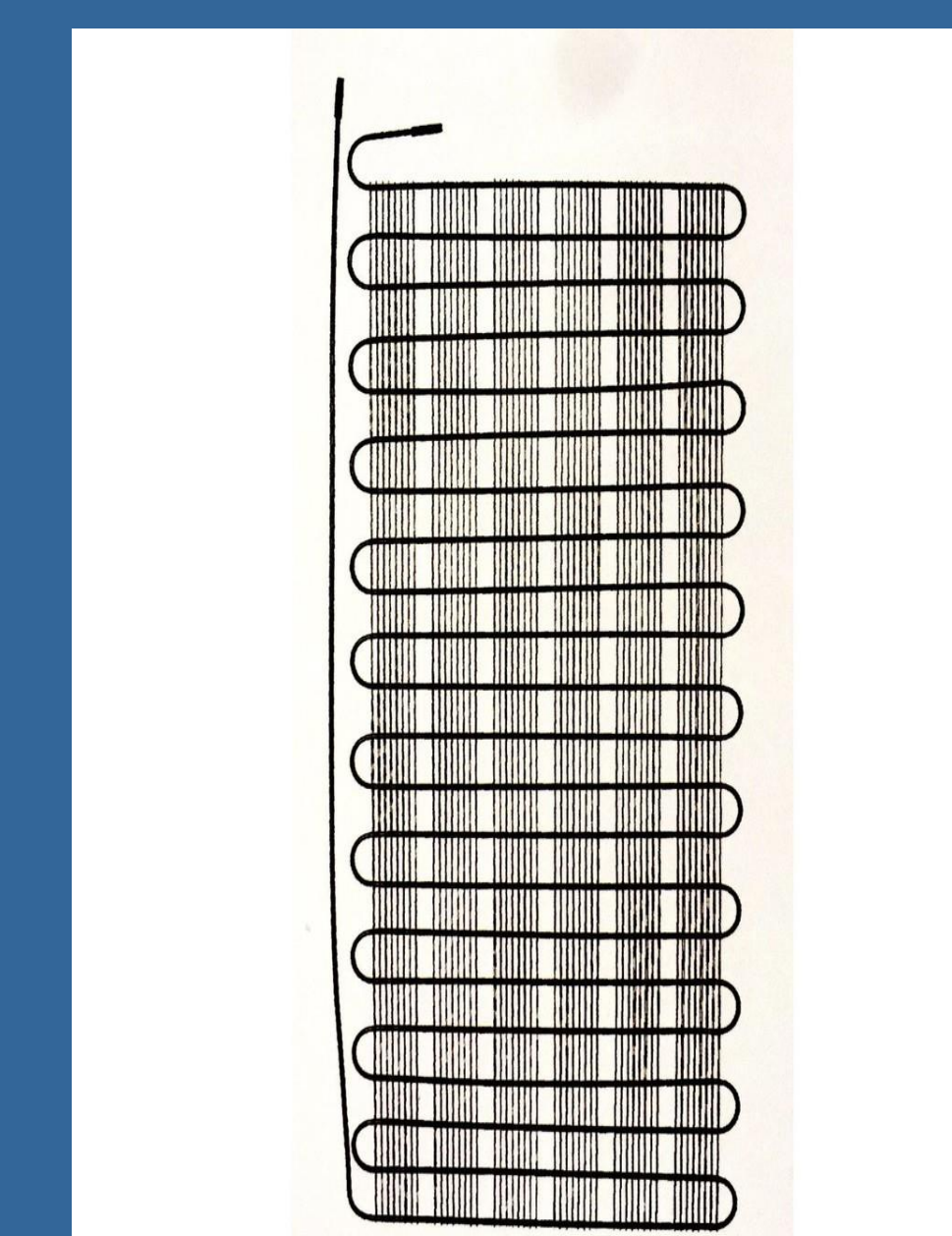


Figure 2. refrigerator's copper coil.

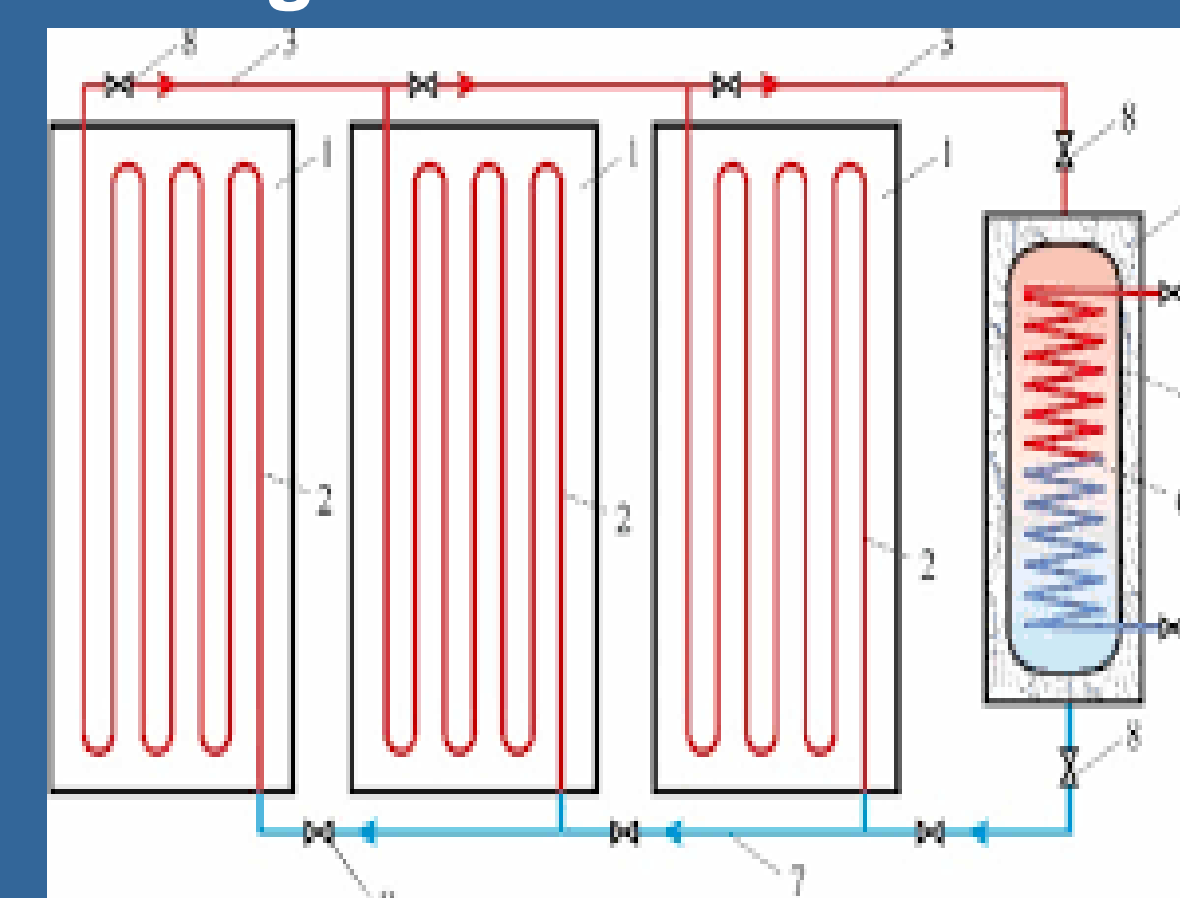


Figure 3. Schematic design.

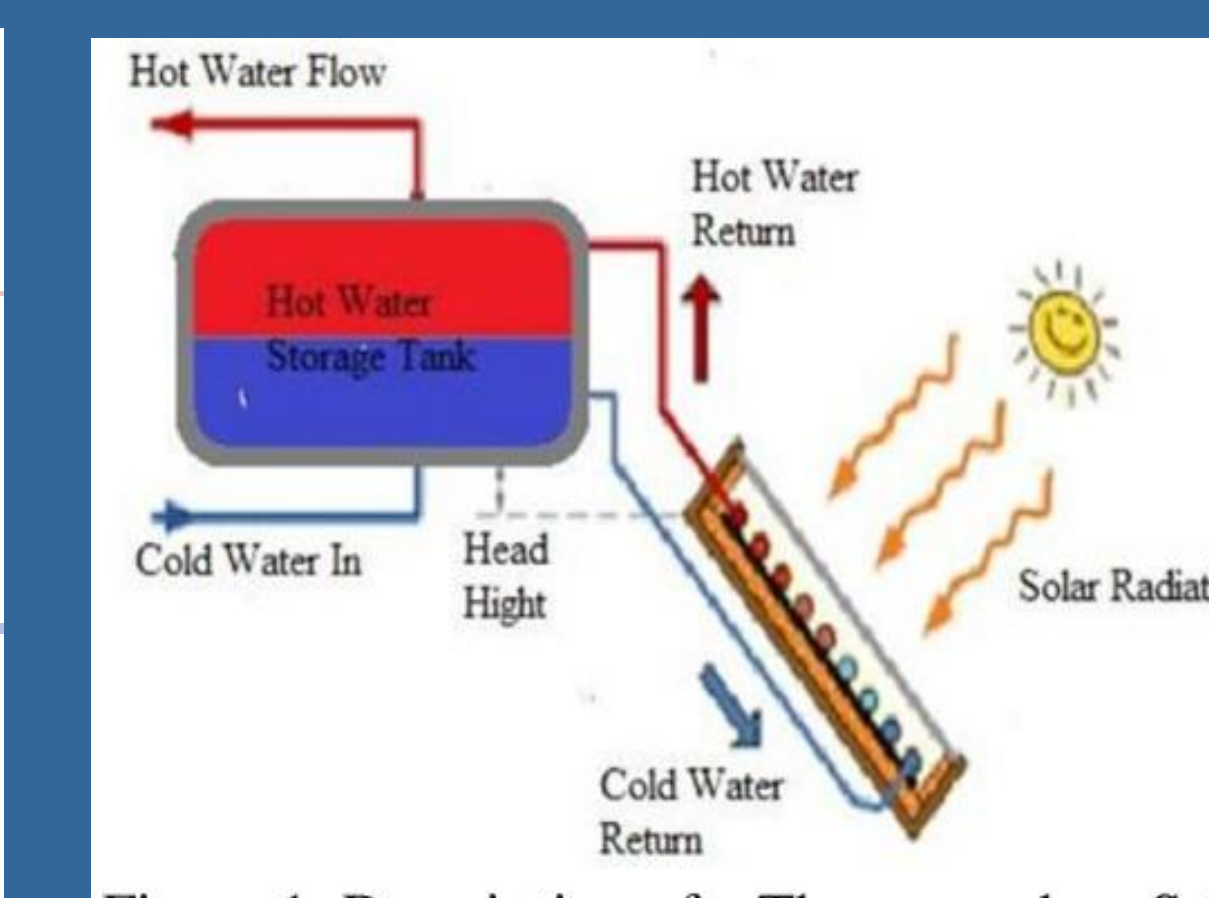


Figure 1. Description of a Thermosyphon Solar

Figure 4. simple description of the process.