

GROUP MEMBERS

Lina Elghazaly

Mechanical Engineering, undergraduate student

Muhammad Nouman

Mechanical Engineering, undergraduate student

Yacoub Robleh

Energy System Engineering, undergraduate student

Oluwaseye Adediwura

Electrical Engineering, undergraduate student

Gaby Mitshabu

Mechanical Engineering, undergraduate student

Re-Used/Recycled Materials:

- CPU Cooling Fans (Re-used)
- Wood
- Insulating material (Re-used)
- CPU Fins (Re-used)
- Swrews

Other Materials:

- Peltier modules
- Temperature sensor (DS18B20)
- Arduino Uno

Electrical Insulator

P-Type semiconductor



Figure 1. Peltier module surface shown on thermal imaging camera.

In conclusion, a mini refrigerator made with thermoelectric Peltier modules is a smart and efficient way to keep things cool or hot. The most challenging part is to dissipate the heat as much as possible for perfect cooling. While they may not be as powerful as regular fridges, their small size, quiet operation, and eco-friendliness make them a great choice for specific needs.



INTRODUCTION

A Peltier module, also known as a thermoelectric cooler (TEC) is a solidstate device that uses the Peltier effect to transfer heat from one side of the device to the other when electrical energy is applied to it.



Heat absorbed Cold side









Figure 2. 10.5 degree Celsius with a 0.89V and 0.24A

CONCLUSIONS

SUSTAINABLE CAPSTONE PROJECTS (SCAP) **SPRING 2023-2024**

Mini Refrigerator

FINAL PRODUCT



a. Isometric view



b. Fans blowing on the fins

e. Inside view

This mini refrigerator uses Peltier modules that operate based on the principle of thermoelectricity to create a temperature difference. The Peltier modules utilize the Peltier effect, allowing them to become cold on one side and hot on the other when an electric current passes through them. The cold side is placed to face the inside of the fridge to cool down the interior, while a set of fans and heat sinks are positioned at the back of the refrigerator to release the heat generated from the hot side of the Peltier modules, effectively cooling the interior space. This simple system keeps your food and drinks cool without needing any mechanical parts, unlike traditional refrigerators. Due to their compact size and lightweight nature, thermoelectric mini refrigerators are portable, making them ideal for use in cars, offices, dorm rooms, and during travel. These refrigerators can be used for both warming and cooling. By reversing the polarity of the electric current, the same device can switch from cooling to heating mode, making it useful for different needs.





Figure 3. Temperature sensor and Arduino used to send the water temperature to be read from the laptop



c. back **RESULTS AND DISCUSSION**

REFERENCES

Peltier Effect and Thermoelectric Cooling: http://ffden-

2.phys.uaf.edu/212_spring2007.web.dir/sedona_price/phys_212_webproj_peltier.html How thermoelectric

cooler works: https://www.mouser.com/pdfDocs/Qpedia_Apr07_How_Thermoelectric_ Coolers_Work.pdf

Mini Fridge with Peltier module: https://www.electronicsforu.com/electronicsprojects/mini-fridge-peltier-

cooler#:~:text=lt%20is%20also%20popularly%20called,hot%20and%20a%20cold%20s urface.