SOLAR REFRIGERATOR WITHOUT COMPRESSOR

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ABSTRACT

In this type of solar refrigerator we consume less electricity because there is no reciprocating component like compressor. this project mainly consist a heating coil to replace of compressor & mainly ammonia+ water (NH3+H2O) is used as a refrigerant. We have made this type of project as a thinking of increase the renewable energy sources & it has also portable. Mainly used for portable refrigerator in marine ship where electricity is not available. It is works on vapor absorption refrigeration system cycle & very effective or economical for use in domestic as well as industrial use.

Keyword : - *THERMOELECTRIC,PELTIER*

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1. INTRODUCTION

- The portable refrigeration unit design team collaborated to create an alternative energy powered absorption refrigerator. The design uses solar energy to power the unit, allowing it to be completely off of the electric grid.
- The basic principle of an absorption refrigeration system is that it uses a source of heat to provide the energy needed to drive the cooling process. In a Platen-Munters gas absorption refrigerator liquid ammonia evaporates in the presence of hydrogen gas, providing the cooling.
- The now-gaseous ammonia is sent into a container holding water, which absorbs the ammonia. The water-ammonia solution is then directed past a heater, which boils ammonia gas out of the water-ammonia solution. The ammonia gas is then condensed into a liquid. The liquid ammonia is then sent back through the hydrogen gas, completing the cycle.
- If solar power is used to provide heat to such a system, it may do so in two forms, thermal or photovoltaic. Solar thermal harnesses solar heat directly using focused mirrors to heat a transfer fluid. Solar photovoltaic uses solar panels that operate using the photo-electric effect to produce direct current (DC) electricity. This electricity can then be inverted to power AC electronics and can also be used to create heat via a resistive heat source.
- The final system design for this project contained one absorption cycle refrigerator with an extra absorption cycle that was painted and mounted for explanation and educational use. A resistive heating wire made of nickel-chromium was used to generate the heat to make the cycle work, and the electricity to run this heater came from two I 2V batteries via a control circuit.
- The batteries were charged through a charge controller from two, I 35 watt photovoltaic panels that could be rotated to face the sun and various angles. This entire system was mounted on a wheeled cart for easy mobility and portability

2. DESIGN

- **Product Architecture & configuration:**

concept design of our project was created using Pro-Engineer software. The concept drawing is not to scale, nor is it the absolute final design that was fabricated. Figure shows the concept, a cart layout where solar panels can be side mounted and hinged.

The entire unit would also be mobile, using four wheels. Figure depicts a schematic of our product architecture and configuration.

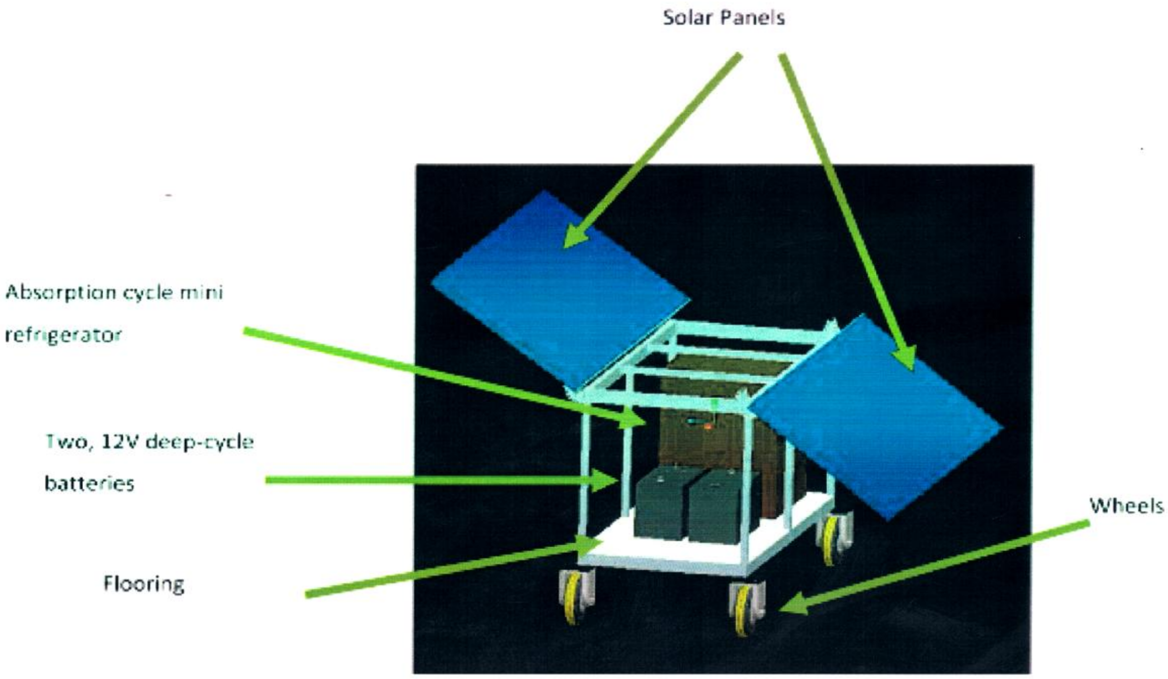

Figure Concept Drawing

Container	Old Fridge
Power	Solar
Converts Power to Usable Energy	Elect heating Coil
Stores Energy	Battery

Table: Selected Design Features

3. TESTING

Refrigerator Insulation

To achieve the maximum R-value of R-5.5, strips of the R foil material were used to create an air gap between the refrigerator and the rest of the insulation.

After creating this space and wrapping four of the six sides of the unit with the insulation, we focused on how to tape the insulation to the refrigerator without obstructing the door seal.

The bottom and the back wall (where the refrigeration cycle was located) were the last two walls to be insulated to avoid damage while we continued to work on the unit. Figure 10 shows Katie Nava insulating our refrigerator.

Figure R foil Insulation

- **Electronics:-**

Our project utilized two main electronic circuits. The first was the pulse width modulation (PWM) battery charger which used the solar load to charge the batteries and also output power to the load.

This load output, though, was instead connected to our second controller which controlled the load level based on various inputs from thermocouples and thermostats.

This control circuit was designed by the founder of Blue Atom Robotics and 2007 CMA alumnus Jason Gou. Made specifically for our project, the circuit took several thermostat inputs and one thermocouple input from various points around the refrigerator and heater and controlled the level of heat into the heater, which directly controlled the level of cooling.So that when the panels were producing max power, and if the batteries were full, just about all the power produced would be utilized in the heater rather than being wasted having a high-power heater also allowed it to get up to temperature faster. The circuit's main features included feedback from heater to avoid burning out the coil and feedback from the refrigerator to maintain it at the desired temperature.

4. CONCLUSIONS

- The lessons learned from this project were not unexpected, and yet there was no way we could have learned them in a classroom. Dealing with team interactions and trying to get four minds to agree on every design did not work; we had to compromise.
- Around the midpoint of our project, we did notice that we were motivated to work at different times, which made it difficult to get anything done together. It will be interesting when we each go into the work force and have to work with in different teams even when we may feel unmotivated.
- Our final design is pictured in Figure 1 6 and utilizes two photovoltaic panels that flow electricity through a charge controller in order to charge two, I 2V deep-cycle batteries. The batteries then power a resistive heater through a control circuit that limits the current to the heater based on heater temperature, inside air temperature, and the state of charge of the batteries.
- The cart is lightweight due to its aluminum frame and high-density polyethylene plastic coverings. Four caster wheels allow the unit to be portable and easily maneuverable, while our absorption cycle refrigerator offers very low temperature cooling with no moving parts, no noise, and easy access.
- This was also a first generation, proof-of-concept design that can definitely be improved upon in the future. The first improvement would be to try to make the system smaller overall.

- Our initial goal was to create a refrigerator that would be easy to take to the beach, camping, or out into the field, but our unit is a little bulky for everyday use. Also, increasing this refrigerator's capacity would allow the user to refrigerate more products.
- Now that we know our refrigerator coils can get down to such low temperatures, it would be possible to perhaps use both coil systems installed in one, large cooler and mounted on similar cart system.

5. ACKNOWLEDGEMENT

"Obstacles are what we see when we tack out eyes off the goals"

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