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Booklets

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Title: Design and implementation of an ecological cooler

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Introduction

Sustainable energy is providing energy that meets the needs of the present without compromising the needs of future generations. Sustainable energy sources include all renewable energies, including also technologies designed to improve energy efficiency. [III]

For the development of the cooler it must be known that it is a Peltier cell and its operation, knowing its properties allows us to know which is the most appropriate to put the cooler into operation since there is a wide range of cells on the market, but each one with a different application according to its cooling capacity, energy consumption, dimensions, voltages, heat capacity, among others.

With the prototype, the use of refrigerant gases that cause damage to the ozone layer is being eliminated, as well as the use of compressors and oils that damage the environment. The development of the prototype is presented, explaining the parts that comprise it, in materials and methods, the connections that must be made to have the complete system are explained and finally the tests that were made

are shown, when connecting the prototype and observing its operation.

Methodology

The material inside is food grade 304 stainless steel sheet, once the cooler's shape is created, the 2 cells are installed, which are connected together with a cooling system as a whole, which It consists of 1 heat sink, 2 external radiators connected to a ½”copper tube, 3 fans, one of 3” and the other two of 5”.

The Peltier cells are of the TECI-12715 model since they are the ones that reach the lowest temperatures according to the comparison with another cell model when performing the tests. The system must be connected to a source that generates 12 Volts with a current capacity of 20 Amps, so that the system can cool as quickly as possible.

Results

When starting the tests, the external ambient temperature must be taken into account, preferably having the cooler at an ambient temperature no higher than 25 ° C. The voltage should be 12 Volts and the current should be as close to 20 A as possible, to have the highest possible performance.

The internal temperature of the cooler continued to be read for up to 12 hours, it was recorded that the temperature no longer dropped more than 9 ° C and remained constant.

Once these conditions were met, the results were the following:

Tiempo	Temp.	Temp.	V	A	Consumo
0 min.	23ºC	20ºC	12 V.	20 A.	0.8 A.
15 min.	23ºC	18ºC	12 V.	20 A.	0.8 A.
30 min.	24ºC	17ºC	12 V.	20 A.	0.8 A.
1 hora	24ºC	15ºC	12 V.	20 A.	0.8 A.
2 horas	25ºC	15ºC	12 V.	20 A.	0.8 A.
3 horas	25ºC	15ºC	11.35 V.	20 A.	0.76 A.
4 horas	24ºC	14ºC	11.19 V.	20 A.	0.73 A.
5 horas	22ºC	14ºC	11.62 V.	20 A.	0.78 A.
6 horas	21ºC	12ºC	12 V.	20 A.	0.8 A.
7 horas	20ºC	10ºC	12 V.	20 A.	0.8 A.
8 horas	20ºC	9ºC	12 V.	20 A.	0.8 A.
9 horas	20ºC	9ºC	12 V.	20 A.	0.8 A.
10 horas	19ºC	9ºC	12 V.	20 A.	0.8 A.
11 horas	17ºC	9ºC	12 V.	20 A.	0.8 A.
12 horas	17ºC	9ºC	12 V.	20 A.	0.8 A.

Table 1 results obtained.

Annexes

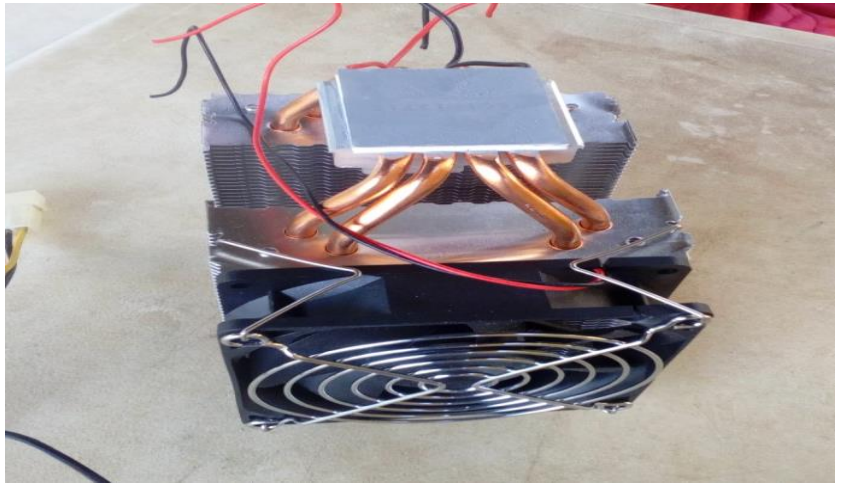

Figure 1 heat sink installed on the outside.

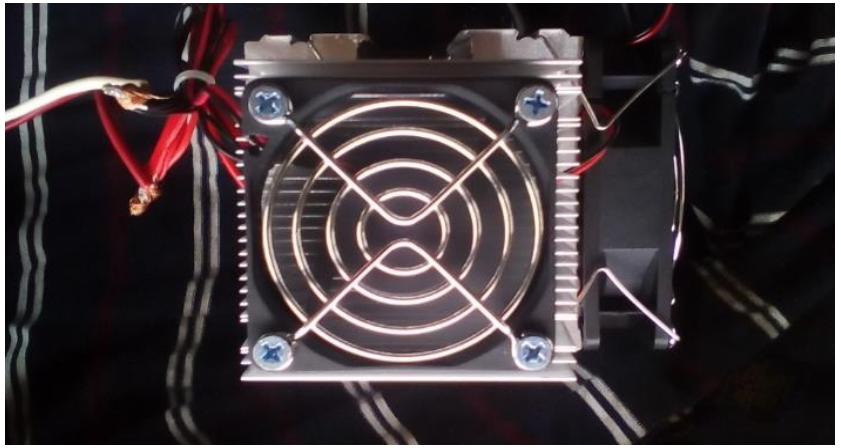

Figure 2 axial fans.

Conclusions

The energy consumption during the entire cooling process is 0.8 amps at its maximum working point, which is an excessively low consumption compared to the frigobars that are on the market, they have a consumption of 5 to 5.3 Amps at their point maximum.

Using this prototype of ecological cooler there is an energy saving of up to 6 times compared to the normal ones, this shows that to reach a consumption similar to the home refrigerator we would have to use 6 Peltier cells to be almost on par with normal consumption. Energy is saved by using the ecological cooler, in addition to taking care of the environment.

by not having an equipment that uses refrigerant gas, or oils and compressors.

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