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FABRICATION OF THERMO ELECTRIC ZERO EMMISSION WATER COOLER

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ABSTRACT: Every project consists of specific goal to solve a stipulated problem. Here, in this project we are trying to develop a refrigerator without refrigerant. Entire life of human being is depended with earth and atmosphere. When any effect caused to atmosphere it will soon reflect on our life. So, protecting environment is very important. So many factors are influencingthe environment like air pollution, water and earth pollution etc., we have to make a step forward to protect environment by controlling pollutants, it is the part of every person. Basically we are using refrigerators to extract heat from any object,the process is known as refrigeration, a refrigerant is working fluid to produce cooling effect, it consist of chlorofluorocarbons etc., it causes effect on environment when it escapesinto atmosphere: by eliminating the refrigerant from refrigeration process.It will helps to save environment in one small factor. To overcome this problem we have to develop a refrigerator without refrigerant. By using peltier effect we aim to develop a system without the refrigerant. In the presented article the fabrication of peltier based refrigerator to avoid above mentioned drawbacks.
Key Words:Thermo electric, Peltier module, Seeback effect.

1. INTRODUCTION

Before inventing the refrigerator, icehouses are used to produce cold storage for most of the year. Placed near freshwater lakes or packed with snow and ice during the winter, they were once very common. Natural means are still used to cool foods today. On mountainsides, runoff from melting snow is a convenient way to cool drinks, and during the winter one can keep milk fresh much longer just by keeping it outdoors. The word "refrigerator" was used at least as early as the 17th century.

Vapour compression cycle is used in most household refrigerators, refrigerator–freezers and freezers. In this cycle, a circulating refrigerant such as R134a enters a compressor as low-pressure vapour at or slightly below the temperature of the refrigerator interior. The vapour is compressed and exits the compressor as high-pressure superheated vapour. The superheated vapour travels under pressure through coils or tubes that make up the condenser; the coils or tubes are passively cooled by exposure to air in the room. The condenser cools the vapour, which liquefies. As the refrigerant leaves the condenser, it is still under pressure but is now only slightly above room temperature. This liquid refrigerant is forced through a metering or throttling device, also known as an expansion valve (essentially a pin-hole sized constriction in the tubing) to an area of much lower pressure. The sudden decrease in pressure results in explosive-like flash evaporation of a portion (typically about half) of the liquid. The latent heat absorbed by this flash evaporation is drawn mostly from adjacent still-liquid refrigerant, a phenomenon known as auto-refrigeration. This cold and partially vaporized refrigerant continues through the coils or tubes of the evaporator unit. A fan blows air from the refrigerator or freezer compartment

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("box air") across these coils or tubes and the refrigerant completely vaporizes, drawing further latent heat from the box air. This cooled air is returned to the refrigerator or freezer compartment, and so keeps the box air cold. Note that the cool air in the refrigerator or freezer is still warmer than the refrigerant in the evaporator. Refrigerant leaves the evaporator, now fully vaporized and slightly heated, and returns to the compressor inlet to continue the cycle.

What refrigeration is, and methods of refrigeration like ice refrigeration, dry ice refrigeration classified as non-cyclic refrigeration processes. It also describes cyclic methods of refrigeration like vapour compression cycle, vapour absorption cycle etc.

1. Methods of Refrigeration: Ice Refrigeration and Dry Ice Refrigeration
2. Methods of Refrigeration: Vapour Compression Cycle
3. Methods of Refrigeration: Vapour Absorption Cycle
4. Methods of Refrigeration: Gas Cycle
5. Methods of Refrigeration :Thermoelectric Refrigeration System

Environmental impacts

The environmental impact of refrigeration appliances that are not recycled responsibly is enormous:

- Depletion of the ozone layer
- Acceleration of climate change
- Mercury contamination of the environment

2. PROPOSED WORK

This paper shows the Thermo electric refrigeration. Thermoelectric refrigeration systems are unique from the three other types of refrigeration in that no refrigerant or water is used. These systems use an electric current and a thermocouple. A thermocouple is made up of two different metal wires that are united at both ends. Insulation separates the rest of the wires from each other. When the current is directed on the thermocouple, one end will become hot and the other cool. Reversing the current's direction has the effect of swapping the cold and hot junctions. The hot end will typically be placed outside of the area to be cooled with a heat sink attached to it to keep it the same temperature as the surrounding air. The cold side, which is below room temperature, is placed in the area to be cooled, attracting heat out of the air. This type of refrigeration is generally used for small cooling loads that can be difficult to access, such as electronic systems.

Figure 2 Heat sink

In thermoelectric materials, electrical energy can be directly converted into thermal energy and thermal energy into electrical energy. Direct conversion between electrical and thermal energy is possible because of two important thermoelectric effects: the Seebeck effect and the Peltier effect. The Seebeck effect refers to the existence of an electric potential across a thermoelectric material subject to a temperature gradient.

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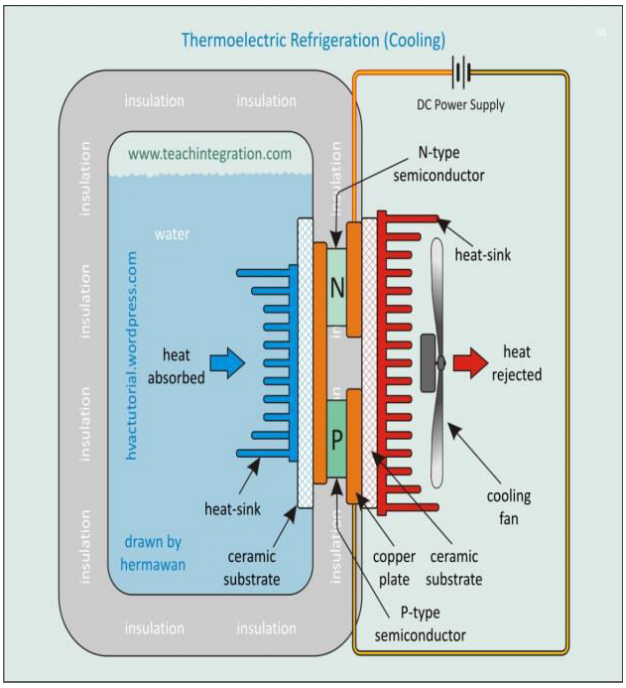

Figure 1Block diagram of Thermo electric refrigeration

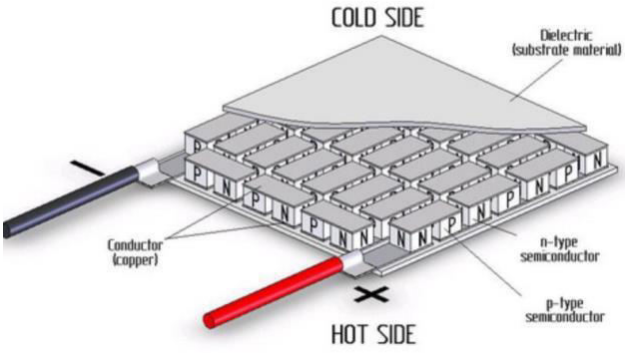

Figure 2 Block diagram of Thermo electric Plate

3. FABRICATION OF REFRIGERATOR

Thermoelectric Materials:

The common Thermoelectric Material used in Different applications are,

a) Bismuth sulphide(Bi2S3)

b) Lead Telluride(PbTe)

c) Antimony Telluride(Sb2Te3)

d) Caesium Sulphide(CeS)

e) Bismuth telluride(Bi2Te3)

f) Germanium Telluride(GeTe)

Figure 4

Seeback Coefficient for Different Material

	Material	α(K-1)
	Germanium Telluride	**1.5×10-3**
	Caesium Sulphide	1×10
	Bismuth Telluride	41×0
	Lead Telluride	1.5×10

Figure 5

Description	Dimension/Range
Peltier Module	40×40×4.8 mm
Aluminium Block	40×45×25 mm
Rectangular Fin	68×35 mm
Fibre Sheet	as required
Multi meter	350V ac
Transformer	230 Dc

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Figure 6

4. Result

We attach all those components in the single frame and gave input supply as SMPS (Switched Mode Power Supply). We attached aluminium block and Fin to the one-side of the peltier module (Cooling side). And Also we attached a exhaust fan to the other side (Hot side) of the peltier module for the extraction of the heat to the atmosphere. Finally, The Cooling is obtained when input power supply given (12V,8amps for each module) due to the heat flux (peltier effect).

COP of fabricated Thermo electric refrigerator

$$\text{COP} = \frac{Refrigeration\ effect}{Power\ required}$$

No	Liquids	Mass Of Liquid (litre)	Specific heat of Liquid (J/gm0C)	Initial Temp (0C)	Final Temp (0C)	Input		COP
						V	I	
1	Water	1	4.182	28	17	220	0.2	0.29
2	Milk	1	3.98	28	16	220	0.2	0.301
3	Carbonated water (Coco Cola)	1	4.182	28	17	220	0.2	0.29
4	Lemon Juice	1	3.85	28	15.5	220	0.2	0.314

5. CONCLUSION

In this project we can see a new model of application of thermoelectric modules in commercial water cooler. This fabrication of water cooler helps to overcome the following.

 No movable components except exhaust fan, will increases the life of the product.

 Eco friendly by eliminating the refrigerants.

- We can cool the liquids by eliminating the refrigerant
- Weight will reduce

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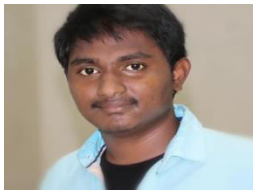

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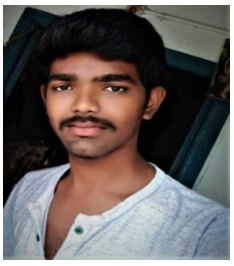

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