iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 3 **Issue:** I **Month of publication:** January 2015

DOI:

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)

Smart Acoustic Refrigerator with Green Freeze and Power Saving Technology

B. Ramesh Krishnan[1], R. Arun Prasath[2]
B.E – mechanical engg (PRE FINAL YEAR), Velammal College of Engineering & Technology , Madurai -62500

Abstract: In the present scenario, global warming is a major problem all over the world. The global warming is occurred due to the harmful refrigerant gases such as F-gases, CFC etc. .This gases leads to a global climatic change which was confirmed by NATIONAL ACADEMY OF SCIENCES. Moreover the environmental impact of F-gases is roughly 20,000 times more potent in contributing to global warming than carbon dioxide. Meanwhile, the power failure is also a major problem. How we can recovery from those problems? Let us provide our contribution to overcome from those problems. We have proposed a new technology refrigerator for future.

I. PIEZO ACOUSTIC REFRIGERATOR

It is the refrigerator which uses high frequency sound waves for producing cooling effect by means of piezo acoustic driver.
The refrigerant HELIUM is used in this refrigerator. Helium is a nontoxic gas .it does not contribute to ozone depletion.

II. COMPONENTS OF PIEZO REFRIGERATOR

A. Stack
Stack is the parallel type of aligned plates in which compression and expansion process takes place on the plate

B. Resonator
It is a hollow tube & it possesses the property of heat transfer which is dissipated into atmosphere.

C. Piezo electric driver
The acoustic driver produces sound waves due to piezo electric effect. Nowadays synthetic piezo materials are available. (We don't barthir about cost).

D. Piezo cantilever beam
The beam which supports to produce piezo electric effect

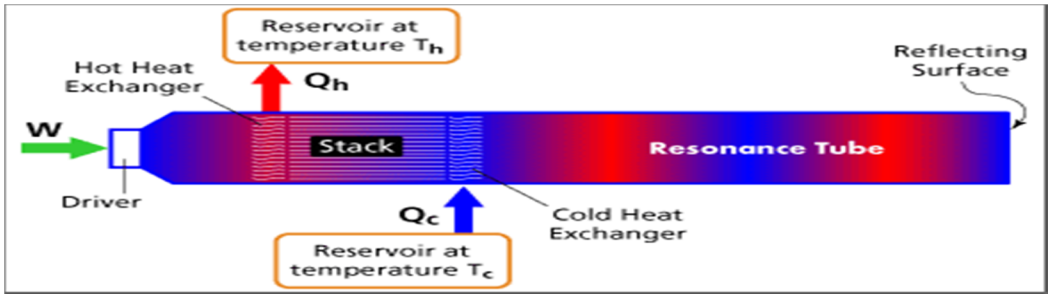
III. WORKING PRINCIPLE OF PAR

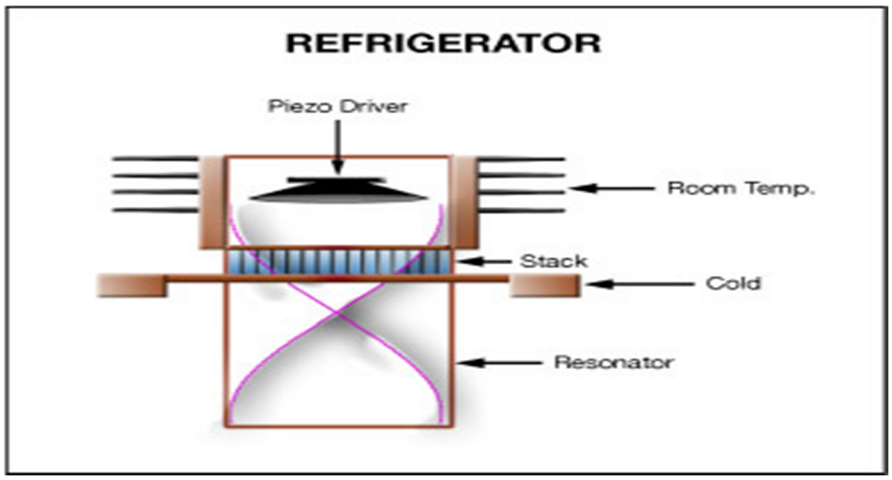
A high frequency sound wave is produced from driver & it passes through a resonator tube.

(USED FREQUENCY OF SOUND WAVES IS 430HZ)

A. This sound wave is compressed by the high pressure refrigerant helium.
B. According to the CONVECTION LAW of thermodynamics "if a temperature gradient has been established, the heat transfer will occur".
C. Here a temperature is increased on the stack due to the compression process & the stack cools down due to expansion process takes place on the stack.
D. Thus the temperature difference is established on both ends of the stack.
E. By obeying the convection law, here the heat transfer takes place by the way of resonator Tube & the cooling effect can maintained at inside the refrigerator.

Schematic diagram of smart acoustic refrigerator

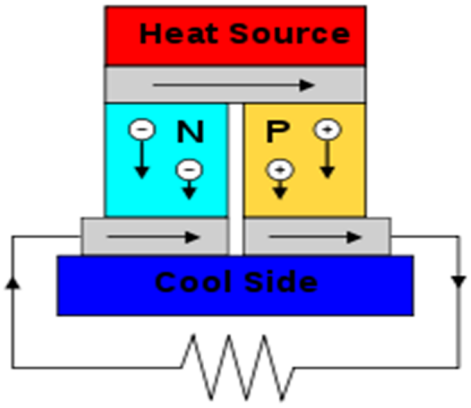




IV. METHODS OF PRODUCING VOLTAGE WITHOUT POWER SOURCE (FOR VOLTAGE INPUT TO DRIVER)

A. EMF (Voltage) From Stack

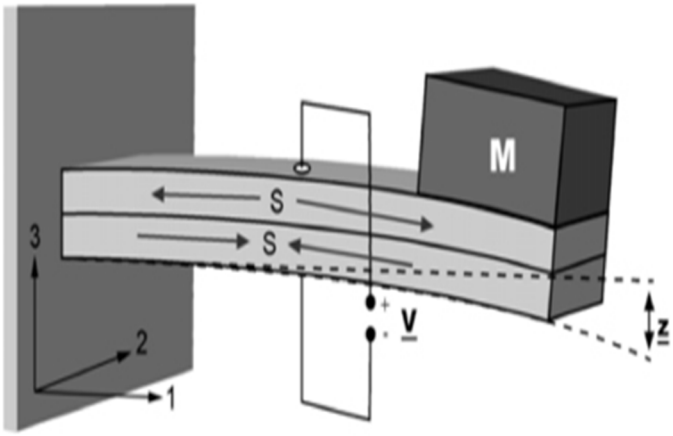
According to the seebeck effect, when any conductor is subjected to a thermal gradient, it will generate a voltage.



From the temperature difference of stack we have produce a voltage due to seeback effect. This is one of the ways for producing a voltage from the Refrigerator itself.

B. Power Generated From Kinetic Energy Harvesting Technology

The cantilever beam has subjected to a seismic mass attached into a piezo electric beam which has contact in both sides of piezo electric material for extracting electrical energy. When the pressure of the refrigerator is increased, the ceramic sensor has sensitize and this pressure is compressed to a mass. Here the stress is developed on piezo electric beam.



Whenever a mechanical stress is exerted, a piezo electric material possess the property of producing voltage. This voltage has input to the acoustic driver.

1) Required Power Can Be Obtained For The Refrigerator From The Above Methods
2) Power can get from the above methods is sufficient to run the refrigerator acoustic driver.

V. COP ANALYSIS OF SMART REFRIDGE

(COP- Coefficient of performance)

COP = DESIRED EFFECT/ WORK INPUT

COP = Qs/ W in

(Qs=heat supplied & Win= work input)

The cop value has analyzed by testing the device & the cop is 13% of carnot engine. Its COP value is 4.2. Whereas in conventional refrigerator the cop is (1-3)

VI. EXPERIMENTAL ANALYSIS OF SMART FRIDGE

A. Design of The Stack

The drive ratio of stack is 0.013 & the blockage ratio of the stack is 0.741.

B. Material Used For Stack

The honey combed plastics or fiber wool is used as a material for stack .

C. Capacity Of The Smart Refrigerator

The capacity of this refrigerator is ½ tonne. (1TONN OF REF = 3.5 KW)

1) Advantages

a) Be eco friendly
b) Compact size
c) Saving electrical energy

d) High coefficient of performance

2) Application

a) It is widely used in cryogenic application
b) Used to preserve biological samples
c) Used to preserve vaccines
d) Used in submarines
e) Used in NASA satellites electronic cooling system.

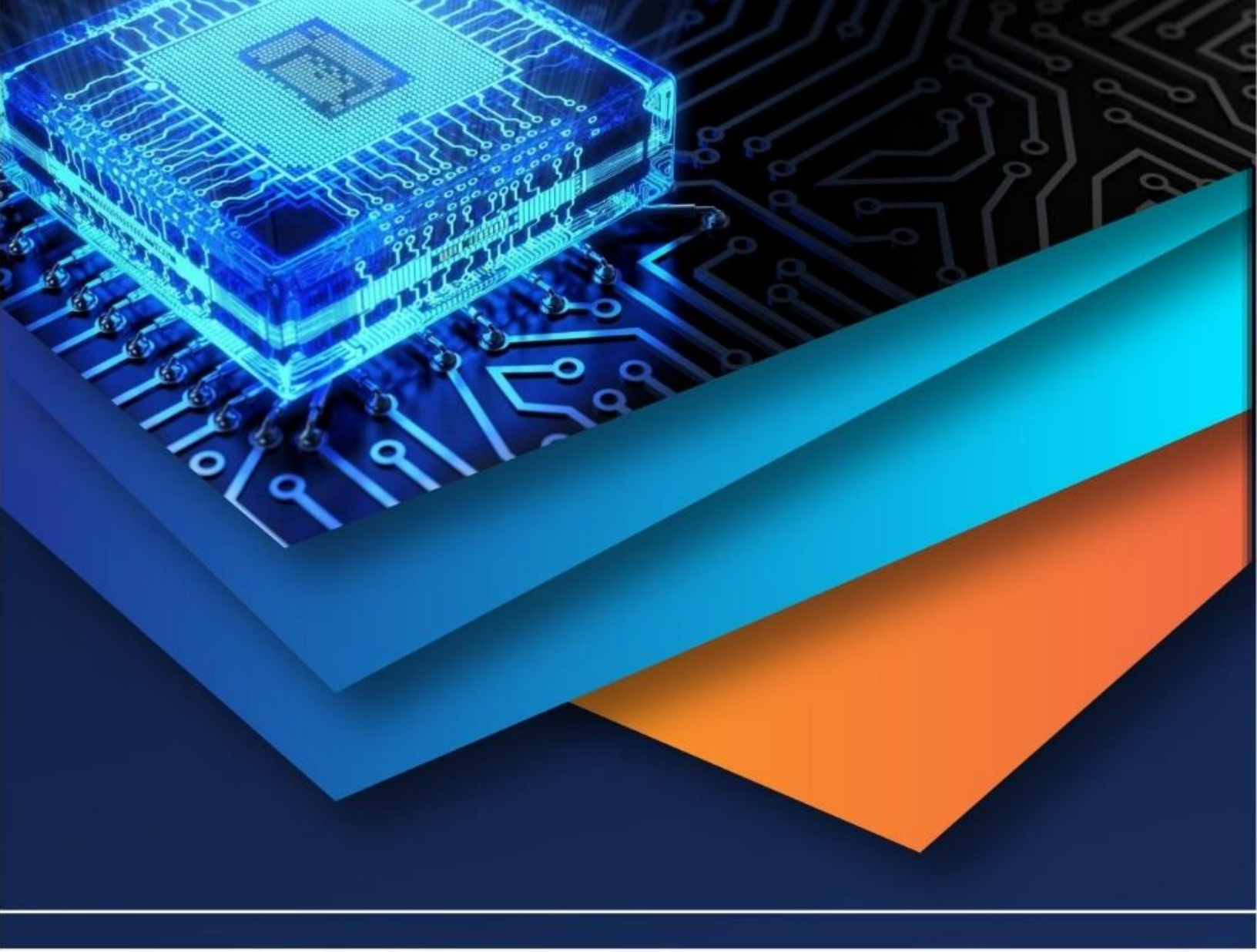
VII. CONCLUSION OF THE THESIS

In future we will prefer this refrigerator for its own advantageous such as be ecofriendly, savings of electric power, high cop and so on. Compared to the conventional refrigerator

A. Future Of Smart Acoustic Refrigerator

The smart acoustic refrigerator will use in every domestic applications for its own merits.

THANK YOU….
Save the electricity!!! Protect the eco system!!!



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY