

Cooling And Heating Effects From Earth Tube Heat Exchanger

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Abstract:- Before understanding the concept of Earth tube heat exchanger .Let us first understand the concept of heat exchanger .Heat exchanger is a device used to exchange the heat between two fluid at different temperature .Earth tube heat exchanger is a new innovative technique used for cooling and heating in summer and winter respectively. Here the cooling and heating is achieved by utilizing the temperature difference of fluid present at inside and outside the earth surface. Further this method of heating and cooling is free from hazardous effects of global warming and ozone layer depletion. The performance of Earth tube heat exchanger depends upon various parameters such as length of pipe, pipe diameter, depth of burial of the pipe, air flow rate and different types of soils.

Keyword:-Earth tube heat exchanger ,Alternate method of heating/cooling, Blower, Temperature Sensor

I.INTRODUCTION

The concept of earth tube heat exchanger is a new innovative technique currently being used for cooling and heating of a building or room during summer and winter respectively. The modern approach of heating and cooling is based on vapor compression cycle that utilizes refrigerants such as chlorofluorocarbon(CFCS) and Hydrofluorocarbon(HFCS) .These refrigerants are very toxic causing global warming, uncertain climate changes, acid rain and depletion of ozone layer.

Further the conventional system also consumes large amount of electricity.

These concern have motivated us to design an Earth Tube Heat Exchanger which is free from environmental pollution and require less energy consumption. It also has vast application not only on domestic usages but also on agricultural usage (say for cold storage of vegetables) and industrial usages. Though this system is not as efficient as conventional system but offers lower running cost compared to conventional system.

II. CLASSIFICATION OF EARTH TUBE HEAT EXCHANGER

The earth tube heat exchanger is basically classified into two categories. They are:-

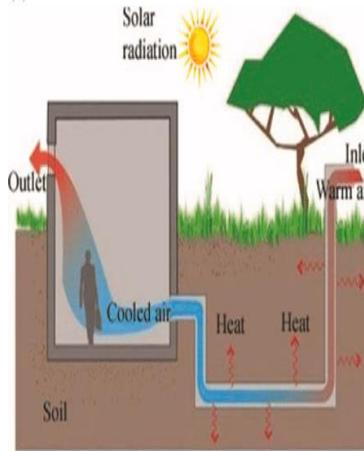
A)Open loop System

B) Closed loop System

A) Open loop System :-In open loop earth tube heat exchanger the surrounding air is compressed and is made to flow inside the tube buried into earth where heat is exchanged between the surrounding air and earth soil and then the air is made to pass for heating/cooling to a room or building.

B)Closed loop System:- In closed loop eath tube heat exchanger the surrounding air is used in a close cycle for carrying out the heating/ cooling of a room or building.

(a)



(b)

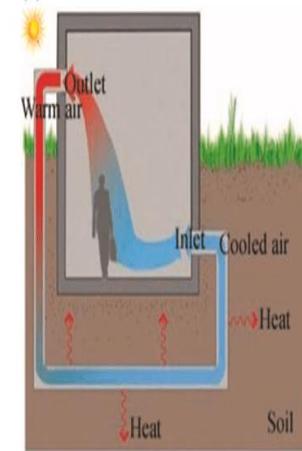


FIG 1:-OPEN LOOP SYSTEM FIG 2:-CLOSED LOOP SYSTEM

III. LITERATURE REVIEW

N.k Bansal ,M.s Sodhi et al.[1] told that EATHE can be used an a alternate of conventional air conditioning system. He also suggested that the performance of EATHE depends upon thermal conductivity of soil ,increase in the length of tube ,decrease in pipe diameter, decrease in mass of flow rate of air and depth of tube buried inside the earth. Nilesh S. Shelar et al.[2] In his study it was found that higher velocity of air causes less temperature difference between inlet and outlet of pipe .So, velocity of air should in between 2-5 m/s for a good performance.

Kunj M. Chauhan , et al.[3] In his research an analytical model was generated where he took a PVC pipe of length

-Length of the Pipe-Increase in the length of pipe increases the performance of Earth tube heat exchanger.

-Velocity of air inside the Pipe-Decrease in the velocity of pipe increases the performance of Earth tube heat exchanger.

-Diameter of Pipe-Decrease in the diameter of pipe increases the performance of Earth tube heat exchanger.

IX. APPLICATIONS

- Earth tube heat exchanger can be used for air conditioning of residential areas, corporate offices.
- Earth tube heat exchanger can be used for cold storage of agricultural products.
- Earth tube heat exchanger can also be used in industries to preserve certain things.

X. FUTURE SCOPE

Earth tube heat exchanger has got the potential to replace the conventional system of air conditioning in future. Further it also reduces the release of harmful gases such as chlorofluorocarbon(CFCs) and hydro fluorocarbons(HFCs) into the atmosphere that causes global warming and ozone depletion.

Also this system of heating/cooling is leading a path to a no. of researcher in the field of conservation of environment.

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XI. REFERENCES

- [1] N.K. Bansal et al, Evaluation of an earth-airtunnel system for cooling/heating of a hospital complex, Building and Environment[IJATES][VOL NO 06 MAR 2013]
- [2] Nilesh S. Shelar "A Review on Earth-Air Heat Exchanger" International Journal of Engineering Research & Technology (IJERT)(june 2018)
- [3] Kunj M. Chauhan1 , Jaykumar G. Prajapati2 , Nikunjgiri Y. Goswami3 , *Sunny N. Patel4 and Krunal N. Patel "Design and development of an Earth Air Tube Heat Exchanger" International Journal of Management, Technology And Engineering (June)(2018)
- [4] Serageldin A, Abdelrahman A K and Ookawara S, 2016 Earth-Air Heat Exchanger thermal performance in Egyptian environment: investigational results, mathematical model, and Computational Fluid Dynamics simulation. Energy Conversion and Management.
- [5] Georgios Florides and Soteris Kalogirou "Annual Ground Temperature Measurements at Various Depths."