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To Investigate the Effect of Earth Tube Heat Exchanger Cooling or Heating of Natural Air

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A B S T R A C T

In this paper, based on the study of the effect of earth tube heat exchanger cooling or heating of natural air, application of earth-tube heat exchanger cooling technology in an office was investigated. Taking an office building (BMR-HVAC) in Faridabad, HaryanaCity as an example, this research analysed the performance of earth tube heat exchanger interactions between earth-air heat exchanger cooling technology and building indoor thermal environments. This will provide basic reference for design of earth-air heat exchanger cooling system.

Keywords: heat exchanger, Cooling, Earth Tube heat exchanger, Heating

1. Introduction

A heat exchanger is a system used to transfer heat between two or more fluids. Heat exchangers are used in both cooling and heating processes.In recent times, air conditioning is widely employed not only for industrial productions but also for the comfort of occupants. It can be achieved efficiently by vapor compression machines, but due to the depletion of the ozone layer and global warming by chlorofluorocarbons (CFCs) and the need to reduce Supar grade energy consumption; numerous alternative techniques are currently being explored. One such method is the earth–pipe–air heat exchanger system, in which hot outdoor air is sent into the pipes that are buried in the ground. When air flows in the earth–air– pipes, heat is transferred from the air to the earth. As a result, the air temperature at the outlet of the earth–air–pipes is much lower than that of the ambient. The outlet air from the earth–air–pipes can be directly used for space cooling if its temperature is low enough. The outlet natural air comes from heat exchanger air may be cooled further by associated air conditioning machines. Both of the above uses of earth–air–pipes can contribute to the reduction in energy consumption

Types of Heat Exchanger:

- Shell and tube heat exchanger
- Plate heat exchangers
- Plate and shell heat exchanger
- Adiabatic wheel heat exchanger
- Plate fin heat exchanger
- Pillow plate heat exchanger
- Fluid heat exchangers

2. Earth Tube Heat Exchanger

It's heat exchanger work on the reference of earth heat transfer from earth to heat exchanger pipe. The earth air tunnel system utilized the heat storing capacity of earth.

Classification of Earth tube heat exchanger:

- According to layout of pipe in ground
- According to mode of arrangement

Some Other Classification:

- Horizontal /Straight loop
- Vertical Looped
- Slinky /Spiral Looped
- Pond/ Helical Loop

3. Proposed Setup of Our Research Work

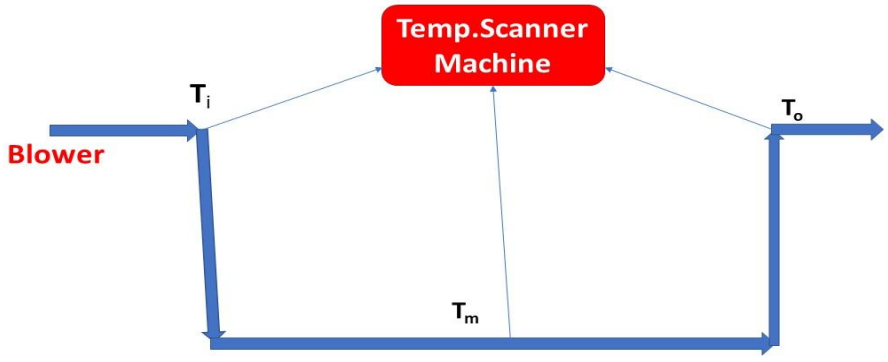

Fig 1: 3. Proposed Setup of Heat Exchanger

In this setup I take 9 m GI pipe of diameter 5cm and cut in three peace and each peace's joint together each other and one end taken as inlet and another outlet. The blower attached with inlet. to observing temp with the help of temp auto scanner machine. basically, three temperature are measure at inlet temperature at outlet temp and middle temp.

Proposed Objective of Our Research Work:

Our objectives are:

- To investigate the system coefficient of performance (COP)
- To Compare with Air Conditioning system and use as a substitute of AC

Formulas where Used to calculate the COP

Area = π x $d^2/4$= π x 0.05x0.05/4=0.00196 m^2

Density of air = 1.225 kg/m^3

Specific heat capacity of air,

C_p= 1007 J/kg K

Total cooling, $Qc = mC_p(T_{inlet} - T_{outlet})$

Coefficient of Performance, COP = $mC_p(T_{inlet} - T_{outlet})$)/Power Input

Mass flow rate, m = density * area * velocity=0.0269

Power Input = 125 W

4. Conclusion

Our work can be help as a design such systems depending upon the requirements and environmental related variables. The work can aid in designing of such systems with flexibility to choose different types of pipes, different dimensions of pipes, different materials and for different ambient conditions. So this provides option of analysing wide range of combinations before finally deciding upon the best alternative in terms of the dimension of the pipe, material of the pipe, type of fluid to be used.

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