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Cooling Characteristics of Concrete Ceiling Radiant Cooling Panel: A Review

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Abstract

Vitality devoured by ventures and structures are fundamental driver of this issue. About 72% of world vitality is devoured by framework, industry, business structures, private houses, and markets. In a huge building or complex, which is air-conditioned, around 60% of the aggregate vitality prerequisite in the building is allotted for the air-conditioning plant introduced to utilize the cooling reason.

Introduction

Cooling load is the aggregate warmth required to be expelled from the space so as to bring it at the coveted temperature by the aerating and cooling and refrigeration gear.

The objectives of cooling load calculation are as follows:

I. To decide be the ideal rate at which warm should be expelled from space to set up warm balance and keep up a pre-decided inside conditions

ii. To ascertain crest configuration loads (cooling/warming).

iii. To gauge limit or size of plant/gear.

iv. To frame the reason for building vitality investigation

COMPONENT OF COOLING LOAD: The aggregate building cooling load comprises of warmth exchanged through the building envelope (dividers, rooftop, floor, windows, entryways and so forth.) and warmth produced by inhabitants, gear, and lights. The heap because of warmth exchange through the envelope is called as outside load, while every single other load are called as inner burdens.

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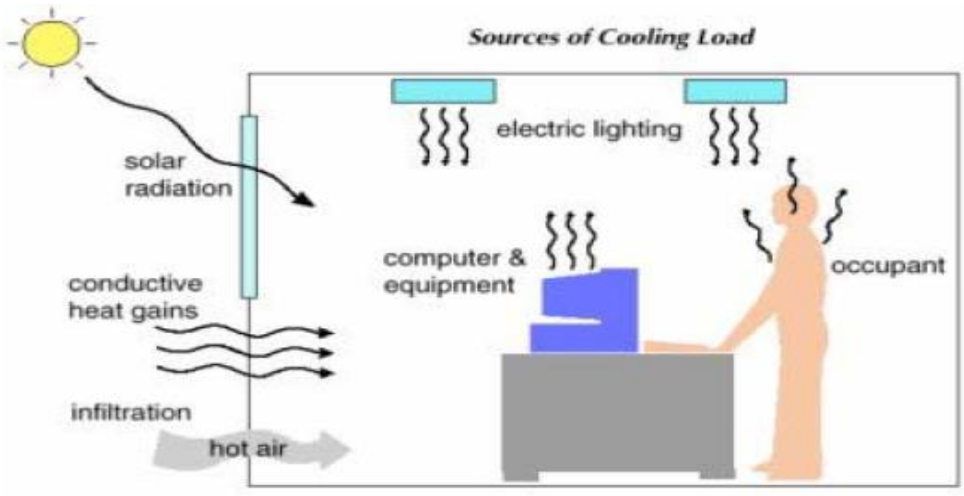

Fig 1.1 sources of heat gain

HEAT GAIN THROUGHT BUILDING BY CONDUCTION:

Warmth increase through building structure such rooftop, dividers, roof, entryways and windows constitutes the real part of the sensible warmth stack. A little thought will demonstrate that the warmth going through a divider is first get at the divider surface open to the district of higher air temperature by radiation convection and conduction. It at that point courses through the material of the divider to the surface uncovered at the locale of lower air temperature.

HEAT GAIN DUE TO INFILTRATION:-

The invasion air is the air that enters a molded space through window breaks and opening of entryways.

HEAT GAIN FROM LIGHTINING EQUIPMENTS:-

The warmth pick up by electric light relies on the rating of light in watts, utilize factor and remittance factor.

HEAT GAIN THROUGH VENTILATION: The ventilation (i.e. supply of outside air) is given to the molded space keeping in mind the end goal to limit scent ,centralization of smoke , carbon dioxide and other unwanted gases with the goal that freshness of air could be kept up. The outside air includes sensible and also inert warmth.

HEAT GAIN FROM OCCUPANTS:-

The warmth pick up from inhabitants depends on the normal no. of individuals that are relied upon to be available in the molded space.

HEAT GAIN FROM APPLIANCES:-

The apparatuses every now and again utilized as a part of aerated and cooled spaces might be electrical, gas let go or steam warmed.

LITERATURE REVIEW :

1.(Experimental Study on Cooling Characteristics of Concret Ceiling Radiant Cooling Panel), (Lin Su, Nianping Li*, Xuhan Zhang), (ELSEVIER)

Concrete ceiling panel cooling system had advantages of comfort and energy saving. This paper presented the experimental study on cooling characteristics of concrete ceiling radiant cooling panel. Temperatures of the concrete panel and indoor environment were measured and analyzed. The results showed that vertical temperature distribution of the indoor air was uniform and temperatures of inner surfaces of walls were close. Indoor sensible cooling load had significant effect on the final thermal environment of the room. The cooling rate of concrete panel was pretty slow and the response time was relatively long during condition adjustment. Thermal inertia of the concrete slab made control and adjustment of the system relatively difficult, however it also decreased the impact to indoor thermal environment from small fluctuation of supply water temperature.

2.(**Ten questions about radiant heating and cooling systems),(Kyu-Nam Rhee , Bjarne W. Olesen , Kwang Woo Kim), (ELSEVIER)**

Radiant heating and cooling (RHC) systems are being increasingly applied not only in residential but also in non-residential buildings such as commercial buildings, education facilities, and even large scale buildings such as airport terminals. Furthermore, with the combined ventilation system used to handle latent load, the radiant cooling system has proven applicable in hot and humid climates. It is well known that the RHC system has advantages of low draught risk, quiet operation, low energy consumption, and ability for design integration with building elements. These merits have motivated numerous studies on RHC systems in terms of comfort, heat transfer analysis, energy simulation, control strategy, system configurations and so on. Many studies have demonstrated that the RHC system is a good solution to improve indoor environmental quality while reducing building energy consumption for heating and cooling. On the other hand, the RHC system has limitations such as complicated control of Thermally Activated Building System (TABS), acoustical issues, higher capital cost and cooling load than conventional air systems, and so on. For now, the required mitigation of these limitations and the need to extend the applicability of the RHC system are providing the continuous impetus for research on RHC systems. This paper summarizes the important issues involved in the research on RHC system, whereby ten questions and answers concerning the RHC system are discussed, which will help researchers to conduct relevant studies.

3.(**Convective heat transfer through walled pipe),(Sunil chandel, R D misal and Yonas G beka), (ELSEVIER)**

In the present study, convective heat transfer phenomenon has been investigated experimently as well as numerically in a thick- walled pipe for laminar flow. Steady laminar and turbulent flow. Steady laminar and turbulent flow of water with uniform heat flux on the outer wall of stainless steel pipe is considered for the experimental investigation. The range of Reynolds number varies from 454 to 13627. The fluid flow and thermal behavior of the test section is simulated numerically using commercial CFD software FLUENT. For experimental investigation of heat transfer characteristics f thick-walled circular pipe, an experimental has been fabricated. Distilled water was allowed to flow through a thick- walled stainless steel pipe while heat was applied externally on the outer wall surface to the wall. Temperature of wall has been measured along the length of pipe with wall temperature and mean fluid temperature, the local heat transfer coefficient has been measured along the length of pipe. With the use of local heat transfer coefficient, local nusselt number of pipe has been calculated. It was found that as the Reynolds number increases, the local nusselt number also increases.

4. (Recent trends in non conventional space conditioning system), (Vanita N. Thakkar),(International journal of engineering research and technology (IJERT))

Space-conditioning is a dominating energy-consuming service. The demand for heating/cooling/(de)humidification of indoor air is growing with increasing comfort expectations and cooling loads, due to global warming and buildings being designed to squeeze in maximum possible per unit area, owing to space constraints, especially in urban areas, which earlier grew horizontally and now, vertically Thus, there is an increasing awareness around the world regarding energy-efficient, environment-friendly space-conditioning systems. The most common economic approach to space-conditioning in buildings is to keep it simplest possible, using locally and easily available materials and technology and leaving nature to do the rest. Various alternative methods of space conditioning have been / are being explored to develop energy-efficient, environment-friendly space-conditioning systems. Three main categories of Non-Conventional SpaceConditioning Systems can be identified as Solar-assisted air-conditioning systems, Earth

Tube Heat Exchanger (ETHE) / Buried Tube Heat Exchanger (BPHE) based Space-Conditioning Systems and Other non-conventional space-conditioning systems.

Summary

This system uses ground water stored in the tank at a certain depth from the surface which circulates through a panel of tubes embedded in the roof takes some amount of heat which would otherwise directed inside the conditioning space. This reduction in the amount of heat gain will reduce the load on the air conditioner installed in the conditioned space and reduce electric power demand of air conditioner and reduce cost of air conditioning.

CONCLUSION

The space conditioning is a dominating energy consuming service. The large portion of the energy utilised in the building is occupied by air conditioners (AC) represents over 60% of the power utilise in air conditioning system. The conventional space conditioning technologies show various limitations including high energy consumption and various negative environmental impacts as they use refrigerants.

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