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DESIGN OF CENTRAL AIR CONDITIONING SYSTEM FOR A ROOM IN A COMMERCIAL BUILDING BY USING CFD ANALYSIS

[1]M. vishveshwar rao, [2]A. Bheemudu, [3]A. Lokesh kumar, [4]A. Madhusudhan reddy

[1]Assistant professor,[2]student,[3]student,[4]student

Mechanical department,

Guru Nanak Institute of Technology,Hyderabad,India.

Abstract; This project aims at "DESIGN OF CENTRAL AIR CONDITIONING SYSTEM FOR A ROOM IN COMMERCIAL BUILDING USING CFD ANALYSIS" The heating, ventilation and air conditioning (HVAC) is used to control the temperature of the surroundings in a room. Air conditioning contributes extensively to excessive strength intake in business buildings. It is essential to display and compare the overall performance of air conditioning systems to avoid energy wastage, It is done by changing the temperature of chilled water and supply of air according to the HVAC load and weather conditions. In this project for space references and calculations the CAD plan was taken from the civil department after taking the plan studied the location and materials used for the construction, based on the study theoretical heat load calculations were done to a space by considering the ISHRAE/ASHRAE standards. And the same thing is done by using computational fluid dynamics (CFD) analysis, obtained both the results were almost same. Based on the obtained heat load calculations CFM values were found for the space and ducting design was done for all the spaces by considering the quantity of CFM to be supplied. with this the capacity of equipment was estimated and selected for installation.

KEY WORDS;ducts,heat,air conditioning,computational fluid dynamics(CFD)

1. INTRODUCTION

The science which deals with creating a controlled in indoor space is referred to as air conditioning. Earlier days the air-conditioning become treated as a luxurious, however in gift state of affairs due to alternate in environmental conditions the air conditioning system has emerge as part and parcel of human lifestyles. In tropical and subtropical countries cooling by using air conditioning is essential capabilities of cutting-edge development. At present comfort air situations is broadly utilized in residence, workplace and industrial programs. One of the foremost variations of 20th century is significant usage of present day, environmental pleasant and powerful air conditioning system. Thus, it is necessary to develop modern air conditioning system to meet the necessities comfort conditions. As the significance of refrigeration and air conditioning is increasing daily there may be want to have a look at about the thermal consolation at any variety of environmental situations. Most of the air conditioning device makes use of either vapour compression system or vapour absorption device.The

potential can also vary from a few kilowatts to megawatts. The vapour compression refrigeration cycle is widely utilized for room air situation due to its better performance. The working fluid utilized in the vapour compression cycle is referred to as refrigerant, which absorbs heat from the refrigerated space and rejects within the warmness supply. Last eight many years, the synthetic refrigerants like Chlorofluorocarbons (CFCs) and Hydrochlorofluorocarbons (HCFCs) are doing well because of every particular software, and but CFCs and HCFCs are not Ecofriendly. There are global agreements on this regard, specifically Montreal and Kyoto protocol, the Montreal protocol is a worldwide treaty that controls the the manufacturing of Ozone Depletion Substances(ODS).

1.1 HVAC (Heating Ventilation and Air Conditioning)

Heating, Ventilation and air conditioning (HVAC) system is designed to achieve the environmental requirements of the comfort of occupants and a process. These HVAC systems are commonly used in different areas such as industrial, commercial, residential and institutional buildings. The main mission of HVAC system is to satisfy the thermal comfort of occupants by adjusting and changing the outdoor conditions, the outdoor air is to drawn into the buildings and heated or cooled before it is distributed into the occupied spaces, then it is exhausted to the ambient air or reused in the system. The selection of HVAC systems in a given building will depend on the climate, the age of the building, the individual preferences of the owner of the building and a designer of a project, the project budget, the architectural design of the buildings. HVAC systems can be classified according to necessary processes and distribution process. The processes include the heating, cooling, and ventilation process. Other processes can be achieved by using suitable HVAC equipment such as heating systems, air-conditioning systems to deliver the required amount of air with the desired environmental conditions. The distribution system mainly varies according to the refrigerant type and the delivering method such as air handling equipment, fan coil, air ducts, and water pipes.

1.2 CLINICAL REPORT

Considering a layout as reference, based on the reference designing the commercial building by placing duct to the ceiling and using linear terminal with elbow joints connecting with ceiling. Analysing the design in ANSYS by using CFD analysis and record the value of cubic flow per meter(CFM). Manual heat load calculations are solved and the obtained results are noted, both the obtained values are compared and required cubic flow per meter(CFM) are noted, as the CFM value is known the air conditioning system of required capacity is chosen. Heat load calculations are obtained from the design and these values are recored to select the required capacity air conditioning system.

LITERATURE REVIEW

X. Cui and et.al in his paper entitled “Modelling and performance evaluation of an Air Handling Unit for an air treatment system with regulated outdoor-air fraction” concluded that the act of the air handling cooling coil was conceptually investigated. A remarkable energy saving can be attained in this air handling system by lowering of cooling load for the outdoor air and increased in the chilled water temperature [1].

J. **Troja nova et.al** in his paper entitled “Fault Diagnosis of Air Handling Units” concluded that the identified

culpabilities conveyed by the FDD system and were suspected by the building technician. The difficulties are solved and the additional running price of building and at the same time for heating and cooling was also reduced[2].

Michel Noussan et.al in his paper entitled "Operational performance of an Air Handling Units" that the author has concluded that, the power utilization of the AHU is continuous over the year, the span of heating and the cooling usage display significant variations. The main driver of the heat dissimilarity appears to be outdoor temperature, but the classroom tenure has a serious impact in lowering the heat ingesting when the classroom is fill. The prospect of monitoring operative data allowed to find a let-down in the heat recovery unit. The application of an automated algorithm might lead to a prompter liability recognition in the forthcoming [3].

Ratna kumari et.al in his paper titled "Design and Drafting of HVAC, Central Air Conditioning for an Office Building", concluded that the heating, ventilation, and airconditioning (HVAC) is the possibly the greatest compound structure which is linked in a building and is liable for a significant part of the total building energy use. A right sized HVAC structure will provide the desired comfort and will path efficiently. Right- sizing of an HVAC system prompts with truthful understanding of the heating and cooling loads on a space however, a full HVAC design comprises more than just load estimation calculation. This approach guide discusses the statistics desired to design the air flow[4].

Ajay N Bhagwat et.al in his paper entitled "Energy Efficient Air Distribution Systems for Air Handling Unit" concluded that the public building considered were mostly ineffective necessity efforts to slightly achieve base effectiveness. The excluded results will be acknowledged of key constraints of AHU performance that effect a buildings energy consumption. Demonstrating the energy consumption progression and grow of a control algorithm tactic energy perfection. The outcome will be the Air Handling Unit with credentials of lead parameters [5].

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