

Air Distribution in Air Conditioned Spaces to Simulate Indoor Thermal Environment for Variable Supply Air Condition

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Abstract— The concern over the comfort in air conditioned environment and associated energy consumption has been increased since last few years. This is due to the change in climatic conditions a little bit and more on desire of comfort in occupied spaces for better comfort. The conventional means of providing heating, ventilation and air conditioning requires huge amount of electricity. The energy consumption in air conditioning has a major part of total energy consumption. Engineers and designers are in search of alternative ways of air conditioning and scope of energy savings in the conventional methods of air conditioning. Air distribution is an essential part of air conditioning which ensures the establishment of comfortable indoor environment in the conditioned spaces. The conditioned air is supplied into the conditioned space at a particular velocity and temperature under controlled conditioned. It is the main part of air distribution to design the suitable location and position of the supply air diffuser and return air vent so that desired indoor thermal environment could be established. In this paper review of literature on air distribution and thermal comfort is presented. The need of work on air distribution methods and comfort studies are found gaining interest among academics and researchers.

Key words: Human Comfort, Air Distribution, Indoor Thermal Environment

I. INTRODUCTION

The comfort is the need of everyone residing in the home or working at the workplace. The conditions of comfort may vary from person to person or from place to place. Whenever comfort is thought, role of heating, ventilation and air conditioning becomes important. Air conditioning is the necessity of both the man and machine these days with the changing conditions of living and working. Involvement of computers and electronic circuits and components, air condition has become essential for several machines also. Literature reveals that the human performance and machine performance both are affected by the thermal environment [1].

The ventilation in the occupied spaces has been desired by the occupants since centuries ago. It is since 1970s when the technology for ventilation strategies is considerable developed. Researchers and engineers showed the requirement of comfort and indoor air quality [9], [10]. Recent researches are more focused on the energy conservation, alternative method of energy usage and use of renewable energy sources in ventilation of buildings and spaces. Many of the researchers are working on indoor thermal quality levels [11].

II. MECHANICAL VENTILATION

Ventilation is the process of replacing the inside air of the building or spaces by the outside air. This removal of inside air may take place by its own from the cracks or openings in the building or spaces or may be made artificially. The ventilation strategy in a building may be natural, mechanical or hybrid (combination of natural and mechanical). The natural ventilation takes place because of the temperature difference in air between the inlet at exit of the room. For the mechanical ventilation in the building or space fans and duct work is required. Several methods of ventilation by mechanical means have been developed and are in use. Mixing ventilation strategy is most commonly used in practice.

III. AIR DISTRIBUTION STRATEGIES

Air distribution is a method of supplying air into the occupant space of a building so as to achieve a desired indoor environment. Ventilation and air distribution technologies are improved in last few years very rapidly. This is due the increase concern of engineers and designers on the comfort and air quality in a conditioned space. Energy consumption is also an important reason of the development of alternative and improved technologies of air distribution and ventilation [12].

In the design of an air distribution system, the conditioned space or room is considered to be empty. The heat exchanges in the space as a heat gain or heat loss are provided. The figure 1 shows some of the methods of air distribution in a space.

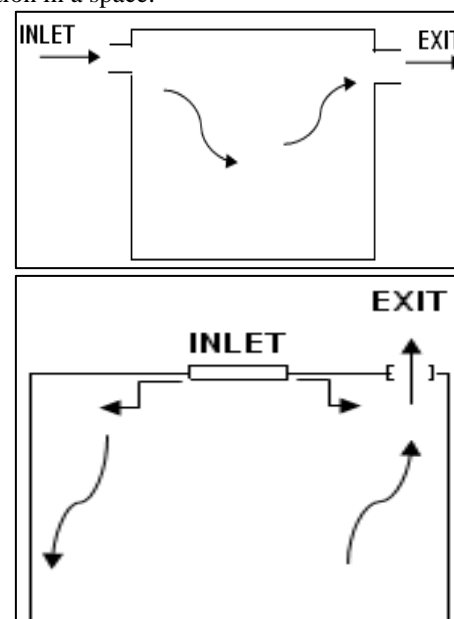


Fig. 1: Air distribution Methods

IV. THERMAL COMFORT

Thermal comfort may be defined as that condition of mind in which the satisfaction with the thermal environment is achieved. If too warm or too cold is felt than dissatisfaction is caused. Thermal comfort is strongly related with the thermal balance of the body. This balance is influenced mainly by the air temperature, relative air velocity and relative humidity [13]. Other factors contributing to the thermal comfort comprises clothing thermal resistance and activity levels.

In design of an air distribution system for air conditioning of room or space, comfort conditions are to be established. Literature of previous researches and past experience of the design and engineer is very much required in proper section of an air distribution system.

V. CONCLUSION

The present paper is aimed to provide literature on ventilation, air distribution and thermal comfort. The literature shows that the concern over ventilation and air distribution is increasing since last few years and designers and researchers are focusing on developing improved methods and technology which can provide thermal comfort to the occupants. In this paper past work on the air distribution is presented and few air distribution strategies are shown. It is concluded that the research scope in this field of is gaining interest in researchers and modern tools of analysis with high speed computing capabilities are being adopted by the researchers.

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