Three-Dimensional Investigation On Thermal Comfort And Air Contaminant Removal In A High-Rise Building

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ABSTRACT

UFAD system is a HVAC system where diffusers are located on a raised floor which has a higher supply air temperature than conventional overhead system. This type of new HVAC system will gives advantage of consumes less energy and able to provide better thermal comfort compared to the conventional overhead air distribution (OHAD) system. This research project is try to assess the current thermal comfort conditions and air contaminant removal of an air conditioned office space in a high-rise building using objective measurement and computational fluid dynamics modelling tool. The 34th North Floor of Telekom Tower which uses UFAD system is used for our study. The office is modeled using FloEFD based on existing floor plan. Steady state heat and mass transfer inside the office are simulated by using CFD modeling approach. The solution of the indoor comfort parameters, such as air velocity, relative humidity, air temperature, and local mean age are presented. Besides that, the comparison of the airflow pattern between swirl diffuser and normal round diffusers was conducted. Predicted mean vote and predicted percentage dissatisfied are calculated for evaluate the average thermal sensation of the office staffs. Corroboration between field measurements data and CFD results was carried on. The simulation results show a fair agreement with collected data. Based on the collected data and simulation results, it found that the existing UFAD system in the 34th North Floor of TM Tower having a high humidity problem. The humidity results are falls in between 68%-69%. Thus, the 34th North floor requires dehumidification. Effects of airflow pattern on thermal comfort and contaminant removal are discussed. It is found that the swirl diffusers is more suitable in the commercial high rise building in order to achieved an overall better performance at the office space. In addition, several recommendations were made to enhance the thermal comfort condition and minimize the contaminant concentration in the office space.