The Study Of Climate Change Impacts On HVAC & R Systems Of A Large High-Rise Building In Malaysia.

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ABSTRACT

It is a well-known fact that an office space requires a proper design of heating, ventilation, air-conditioning and refrigeration (HVAC & R) system for thermal comfort and removal of air contaminants within the building. In the past two decades, climate change has become a serious issue worldwide. It is expected to have significant impacts on the future energy consumption of buildings, especially in the hot and humid countries. Many researchers focus mainly on the impact of climate change on conventional overhead (OH) system instead of under-floor air distribution (UFAD) system in a large high rise building in Malaysia. Within the last few years, UFAD systems have received increasing attention due to the energy savings. This study investigates the total maximum cooling required based on the climate change scenarios in 2000, 2020, 2050 and 2080 for a large high rise building. For this research, levels 33th, 34th and 35th floors of the TM Tower, Kuala Lumpur, Malaysia is chosen. To calculate the worst case design scenario, the maximum external and internal heat gain in the building is considered. In this regards, TRNSYS simulation studio is a useful tool. It was used to model the TM Tower building with UFAD system. Four sets of Typical Meteorological Year (TMY2) weather data file of Kuala Lumpur were carrier out to examine how different climate change scenarios influence the cooling load. It indicated that the ambient dry-bulb temperature (DBT) has risen by 0.8 ℃, 2.1246 ℃ and 3.125 ℃ for the year 2020, 2050 and 2080, respectively which impacts on the cooling load of the HVAC & R system. The simulated result estimates that the total maximum cooling load is required to be increased by 6.842 %, 17.368 % and 28.421 % for the years 2020, 2050 and 2080 respectively when compared with the result in the year 2000. The most important result found in this study is the current UFAD system may not well perform for the years after 2080. Hence, a heat recovery system which is air to air heat exchanger is suggested. It is found that less increment of energy consumptions are needed with aid of heat recovery system. The ways to enhance the sustainability of UFAD systems are also addressed.