

Development of Sustainable Building Environmental Model (SBEM) in Hong Kong

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Abstract : This study addresses a concept of the Sustainable Building Environmental Model (SBEM) developed to optimize energy consumption in air conditioning and ventilation (ACV) systems without any deterioration of indoor environmental quality (IEQ). The SBEM incorporates two main components: an adaptive comfort temperature control module (ACT) and a new carbon dioxide demand control module (nDCV). These two modules take an innovative approach to maintain satisfaction of the Indoor Environmental Quality (IEQ) with optimum energy consumption, they provide a rational basis of effective control. A total of 2133 sets of measurement data of indoor air temperature (T_a), relative humidity (Rh) and carbon dioxide concentration (CO_2) were conducted in some Hong Kong offices to investigate the potential of integrating the SBEM. A simulation was used to evaluate the dynamic performance of the energy and air conditioning system with the integration of the SBEM in an air-conditioned building. It allows us make a clear picture of the control strategies and performed any pre-tuned of controllers before utilized in real systems. With the integration of SBEM, it was able to save up to 12.3% in simulation and 15% in field measurement of overall electricity consumption, and maintain the average carbon dioxide concentration within 1000ppm and occupant dissatisfaction in 20%.

Keywords : sustainable building environmental model (SBEM), adaptive comfort temperature (ACT), new demand control ventilation (nDCV), energy saving

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