Abstract

'Airborne diseases' are a danger that is difficult to prevent and control. Places that are constantly occupied such as office buildings are at most risk of the spread of airborne diseases. This research aims to study the risks of airborne diseases in a work place in order to find protection and safety measures. The study is structured into two parts. The first part is the gathering of the information related to design and operation. The second part of the study is the simulation with Computational Fluid Dynamics (CFD).

The study reveals that climatic conditions and the pattern of air movement are the major contributing factors of germ contamination in buildings. The temperature range of 23 – 26 °C with 35 – 55 % humidity and the temperature range of 20 - 23 °C with 50 - 70 % humidity can halt the spread of germs. The simulation method focuses on the design of two types of air-distribution systems: mixing ventilation system and displacement ventilation system. The experiment aims to determine the effect of indoor air movement on 3 following risk indicators: 1) the area of germ contamination, 2) human infection, and 3) the spread of airborne diseases.

The simulations show that the displacement ventilation system is safer than the mixing ventilation system because it creates less recirculation of air, resulting in less possibility of germ contamination. The appropriate distribution of the return air system on the ceiling is the best control of the spread of airborne diseases and human infections. Moreover, the efficiency of building management and maintenance can contribute to the risks of disease infection of the occupants. The research can be a guideline in building design and operation to guarantee and the well-being of the occupants.