ABSTRACT

Over the last decade the quality of indoor air, has captured the fascination and devotion of many scientists and researchers worldwide. Studies in the USA and Europe have established promising relationships between the quality of the indoor air and the performance of the occupants in the environments under study.

By controlling the levels of thermal comfort, chemical pollution, biological contamination, dust and ventilation in an environment, scientists have observed the positive effects of good indoor air on the occupants - these occupants have become more productive, creative and perceptive.

A complete audit of the quality of indoor air comprises of objective measurement of indoor pollutant concentration levels and the environment perception survey responses of the building occupants. Notably, acceptable indoor air quality (IAQ) refers to air in which there are no known contaminants at harmful concentrations as determined by the public health authorities, and with which a substantial majority of the people exposed do not express dissatisfaction.

In this work, the degrees of dissatisfaction of people when exposed to different pollutant concentration levels are modelled as membership functions using fuzzy set theory. These individual membership functions for the pollutants are integrated to generate an indoor pollutant standard index (IPSI). The IPSI generated using the Hamacher fuzzy aggregation of measured pollutant concentrations provides the best least square fit to the perceived indoor air quality index.

Multiple chemical interactions are also studied with the fuzzy aggregation models. Potentiation interaction exists among the six indoor air pollutants studied. The interaction of human perception variables characterising the indoor environment is antagonistic in nature.
The concept of IPSI is further extended to characterise the indoor environment quality (IEQ) of an indoor workspace by introducing an indoor environment quality index (IEQI).

The subjective environment perception responses of building occupants are analysed together with the measured pollutant concentration levels. Some interesting relationships between the objective measurement and subjective responses are discussed.

Human assessment in the degree of severity of a building sickness symptom is much more subjective than in the existence of the symptom. The correlation between the symptoms experienced and the pollutant concentration is used to estimate the human response threshold of the indoor air pollutant.

Analysis and discussion of the relationship between human perception of indoor air characteristics and the measured air parameters is presented. The perception of indoor air quality is found to be influenced by the volume of fresh air supplied.

The human perception of indoor air is studied and analysed in detail in this report because although human psychological perceptions of indoor conditions can be irrational, it is these perceptions that will significantly influence work productivity and human health.