ABSTRACT

The purpose of this work was to evaluate the impact of indoor air quality and energy implication on the usage of variable refrigeration volume (VRV) in the low-rise office environment. Two offices equipped with the VRV installation and employing two different modes of fresh air supply were selected for this study. Objective measurements of indoor pollutants and subjective assessment of the occupant's perception on IAQ were carried out. Comparisons of the data collected in the objective measurements were made with reference towards meeting ASHRAE Standard 62-1989 and ENV, 1996 guidelines. Results from the comparison show that air distribution devices that ensure fresh air distribution are necessary to optimize fresh air delivery to the office environment and are critical factors in providing good indoor air quality. This was reflected by the high concentration level of indoor-generated pollutants such as formaldehyde and carbon dioxide in Building E, in which the fresh air was delivered only to the ceiling space instead of connecting to the Fan Coil Unit.

In the case of subjective measurement, Building Symptoms index (BSI) was adopted for the statistical analysis. In general comparisons, the BSI computed for the occupant in the building installed with VRV system is seen to be consistent with those building that employed the central air-conditioning system. On the average, the building occupant declared three symptoms in the past months and two symptoms in the immediate periods. Dry throat and Lethargy showed the highest prevalence for both office building surveyed. Integrated analysis for objective and subjective measurements showed significant differences in terms of the perceived indoor air quality and the actual conditions. Further investigation showed that serving the air cool and dry is one of the key factors for perceived good IAQ.

Building performance indices (Indoor Pollutant Standard Index, Energy Index and Ventilation Index) were computed for both buildings studied. The results confirmed that when fresh outdoor air intake was restricted to such a low level, excessive Carbon Dioxide and Formaldehyde will build-up in the indoor
environment. In general, comparison of the building performance indices with other building stocks obtained through the local research projects revealed that there is no general trend between the indices measured. In fact, the computed figures shows that the goals of achieving acceptable indoor air quality and of minimizing energy consumption need not be a compromise.