ABSTRACT

AN ASSESSMENT OF PM_{10}, CO AND TVOCs IN AIR-CONDITIONED INDOOR ENVIRONMENT

Legislation and assessments on air pollution in Malaysia have focused primarily on ambient air pollution. The issue of indoor air quality has been gaining much public awareness in recent years due to increasing understanding of its effects on employee's health, comfort and productivity. This is of particular concern and deserving more attention, considering that employees spend the majority of their time in indoor environments where they are exposed to high levels of indoor air pollutants. Three major indoor air pollutants, namely particulate matter (PM_{10}), carbon monoxide (CO), and total volatile organic compounds (TVOCs) together with carbon dioxide (CO_2), humidity, and temperature were measured in ten different locations at UiTM Campus Sarawak. Results of the study show that the levels of particulate matter ranged between 7 $\mu g/m^3$ and 35 $\mu g/m^3$, carbon monoxide between 0.02 ppm and 0.20 ppm, and total volatile organic compounds between 0.15 ppm and 0.38 ppm. These values were low as compared to levels recorded in similar studies conducted by other researchers elsewhere. When comparisons were made against the recommended levels stated in different guidelines and standards issued by various government and environmental agencies, the pollutants levels recorded in this study were within the acceptable ranges. Carbon dioxide levels were relatively high, but still within the acceptable ranges, while humidity exceeded the recommended range at all the locations under study. From this study, no specific source of air pollutants was identified, however, building materials, furnishings, office equipments, and occupants' activities could have significantly contributed to the comparatively higher levels of particulate matters and carbon dioxide, and total volatile organic compounds at some of the locations.

ABSTRAK

PENILAIAN KE ATAS PM_{10}, CO DAN TVOCs BAGI PERSEKITARAN DALAMAN YANG BERHAWA-DINGIN

Perundangan dan penilaian ke atas pencemaran udara di Malaysia banyak tertumpu kepada pencemaran udara persekitaran luar. Isu kualiti udara dalaman telah mendapat banyak perhatian sejak akhir-akhir ini kerana kesedaran mengenai kesan kesihatan, keselesaan dan produktivi keatas para pekerja semakin meningkat. Perkara ini juga seharusnya mendapat lebih perhatian, mengambil kira majoriti daripada para pekerja bekerja dalam bangunan yang mana mereka terdedah kepada paras pencemaran udara dalaman yang tinggi. Tiga parameter utama, iaitu partikel terampai (PM_{10}), karbon monoksida (CO), jumlah bahan organik meruap (TVOCs), bersama-sama dengan karbon dioksida, kelembapan dan suhu diukur di sepuluh tempat yang berlainan yang terletak di kampus UiTM Sarawak. Keputusan kajian ini mendapati bahawa semua paras PM_{10} (7 $\mu g/m^3$ – 35 $\mu g/m^3$), CO (0.02 ppm – 0.20 ppm) dan TVOCs (0.15 ppm – 0.38 ppm) adalah rendah berbanding dengan paras yang diukur di dalam kajian-kajian yang serupa tetapi oleh para penyelidik yang lain. Bila perbangingan dibuat bagi paras yang dicadangkan sepertimana yang dinyatakan di beberapa peraturan dan standard yang dikeluarkan oleh agensi-agensi kerajaan dan alam sekitar, paras pencemaran yang diukur masih pada lingkungan paras yang dibenarkan. Karbon dioksida didapati agak tinggi, tetapi masih pada paras yang dibenarkan, manakala kelembapan didapati melebihi peratus yang dicadangkan bagi semua kawasan yang diukur. Hasil daripada kajian ini, tidak mendapati dapat dikenalpasti satu punca spesifik pencemaran udara, tetapi bahan binaan, perkakasan, peralatan yang digunakan dan aktiviti orang yang mendiami persekitaran dalaman tersebut dipercayai menyumbang kepada paras pencemaran udara yang tinggi, terutama untuk PM_{10} dan CO, manakala di sesetengah kawasan untuk TVOCs.