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Assessment of Chemical Parameters Affecting Indoor Air Quality in Restaurant Environment

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Structured Abstract

Background: Indoor air quality (IAQ) has become increasingly significant, especially in enclosed or semi-enclosed workplaces like restaurants, and has become an occupational and public health concern due to prolonged indoor exposure, intensive cooking activities, and varying ventilation practices. The activities can increase concentrations of chemical pollutants including carbon dioxide (CO_2), carbon monoxide (CO), total volatile organic compounds (TVOCs), particulate matter ($PM_{2.5}$ and PM_{10}) and formaldehyde. In Malaysia, studies focusing specifically on chemical IAQ parameters in restaurant settings remain limited, particularly those comparing different ventilation systems and operational periods. Therefore, this study was conducted in four selected restaurants located in Seksyen 13, Shah Alam to assess chemical parameters affecting and to evaluate compliance with the Industry Code of Practice on Indoor Air Quality (ICOP IAQ 2010).

Methods: The research use many methodologies that including walkthrough inspection, on-site monitory, location of study, selection of sampling points and data analysis. Indoor air sampling was performed at two designated sampling points in each restaurant, representing kitchen and dining areas. Measurements were conducted during non-peak and peak operating hours. Chemical parameters measured using the direct reading instruments like EVM-7 and temtop formaldehyde detector. Data were analysed using descriptive statistics and non-parametric tests (Shapiro–Wilk and Mann–Whitney U) to compare pollutant levels across ventilation types and operational periods.

Results: The results showed that CO, TVOCs, $PM_{2.5}$, PM_{10}, and formaldehyde concentrations were within acceptable limits across all restaurants while CO_2 concentrations increased significantly during peak hours and represent in MVAC restaurants, with values exceeding 1000 ppm. Statistical analysis revealed significant differences in CO_2, $PM_{2.5}$, and PM_{10} levels between ventilation types, while operational time significantly affected only CO_2 concentrations.

Conclusion: In conclusion, ventilation type and occupancy level significantly influence IAQ in restaurant environments. While most chemical pollutants complied with national standards, increasing CO_2 levels during peak hours highlight that restaurant need improved ventilation management. The findings support regular IAQ monitoring and enhanced ventilation strategies to protect worker and customer health.

Keywords: Indoor Air Quality, Restaurants, Chemical Pollutants, Ventilations, Operational Times

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