

UNIVERSITI TEKNOLOGI MARA

**NUMERICAL ANALYSIS OF
VENTILATION SYSTEMS
DEPENDING ON COOKING
ACTIVITIES IN SMALL AND
MEDIUM FOOD INDUSTRIES IN
MALAYSIA**

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MSc

SEPTEMBER 2021

AUTHOR'S DECLARATION

I declare that the work in this dissertation was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This dissertation has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

People who work in food industries that conducting cooking activities in their food processing are exposed to unhealthy environment that is believed to put them at a greater risk of respiratory problems or infections. However, limited information is currently available in the published literature regarding Internal Air Quality (IAQ) in Small Medium Enterprises (SMEs) kitchen. Therefore, it is essential to investigate the distribution and concentration of the CO₂ in the SMEs kitchen area. The primary goal of this research is to reduce the pollutants in the kitchen environment by examining the CO₂ gases produces from the cooking activities. An experiment has been conducted in three different SMEs of food industry which conducting various cooking methods in their food processing such as frying, boiling and baking. Then, a computational fluid dynamics (CFD) method was employed for one of the SMEs due to the worst CO₂ concentration during the experimental phase. The model was then validated by comparing its result with the experimental data obtained and SST k- ω model was chosen due to the measured value matched. CFD was then simulated considering with three different cases of ventilation type such as wall mounted exhaust fans, kitchen range hood and window. The effect of different ventilation mode and airflow rates on carbon dioxide distribution was significant, by changing the type of ventilation to kitchen range hood, the concentration of CO₂ can be reduced by 21%. Moreover, the installation of a kitchen hood can help the room decreased the CO₂ if compared without the hood. The findings illustrated that CO₂ concentration distribution could be greatly influenced by the proper ventilation and this study shows that using kitchen range hood is the best type of ventilation to be used in the SMEs. Besides, effects of increasing ventilation rate, every 500 m³/h ventilation rate increased the CO₂ concentration can be reduce around 7% to 13%.

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