Assessment of chlorine leak dispersion around Gebeng industrial area and potential evacuation route

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ABSTRACT

This paper evaluates the effect of topographical and wind condition on the dispersion of chlorine leaks aroundGebeng industrial area Malaysia using a computationalfluid dynamics (CFD). The actual data on wind speed anddirection was obtained from a local weather station. The turbulentflow was resolved using a scale-adaptivesimulation (SAS) model, whereas the chlorine dispersion was modelled using the species transport equation andcompared with the area location of hazardous atmosphere (ALOHA) model. The simulation was compared withthe laser doppler anemometry (LDA) measurement on a scaled-down terrain model. A good agreement betweenthe CFD prediction and LDA measurement was obtained. Thefinding showed that the terrain surface, winddirection and wind speed have a combined effect on the dispersion of chlorine. Residential areas R1 and R2 areaffected by the chlorine leak during June to September and November to January, respectively. The plumereached the residential area rapidly under the wind speed above 7.2 m/s but the hazard zone is reduced about50%. CFD prediction agrees with that of ALOHA in the case offlat terrain, whereas CFD provide a betterprediction for the case involving complex terrain. Thefinding in this work may provide a useful guide to esti-mate the risk zone from a hypothetical chlorine leak which can be used to plan the safety evacuation procedure.

KEYWORDS:Gebeng industrial area; Chlorine leak; Heavy gas dispersion; Computational fluid dynamics; Laser doppler anemometry

DOI: https://doi.org/10.1016/j.atmosres.2018.10.003

ACKNOWLEDGEMENTS

We acknowledge financial support from Universiti Malaysia Pahang [grant RDU150314] and Ministry of Education, Malaysia FRGS/1/2018/TK02/UMP/02/4. Woon Phui Law is the recipient of UMP Post-Doctoral Fellowship in Research.