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RESEARCH ARTICLE



Emission losses and dispersion of volatile organic compounds from tank farm of petroleum refinery complex

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Abstract

Emission characteristics of volatile organic compounds (VOC) emitted from the tank farm of petroleum refinery were evaluated in this study in order to analyze for the potential impacts on health and odor nuisance problems. Estimation procedures were carried out by using the U.S.EPA TANK 4.0.9d emission model in conjunction with direct measurements of gas phase of each stored liquid within aboveground storage tanks. Results revealed that about 61.12% of total VOC emitted from the tank farm by volume were alkanes, in which pentane were richest (27.4%), followed by cyclopentane (19.22%), propene (19.02%), and isobutene (14.22%). Mostly of pentane (about 80%) were emitted from the floating roof tanks contained crude oil corresponded to the largest annual throughput of crude oil as compared with other petroleum distillates. Emission data were further analyzed for their ambient concentration using the AERMOD dispersion model in order to determine the extent and magnitude of odor and health impacts caused by pentane. Results indicated that there was no health impact from inhalation of pentane. However, predicted data were higher than the odor threshold values of pentane which indicated the possibility of odor nuisance problem in the vicinity areas of the refinery. In order to solve this problem, modification of the type of crude oil storage tanks from external floating roof to domed external floating roof could be significant success in reduction of both emissions and ambient concentrations of VOC from petroleum refinery tank farm.