Key Observations of Liquefied Natural Gas Vapor Dispersion Field Test with Expansion Foam Application

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ABSTRACT

Expansion foam has been recommended as one of the safety provisions for mitigating accidental liquefied natural gas (LNG) releases. However, the effectiveness of foam in achieving this objective has not been sufficiently reported in outdoor field tests. This paper investigates the effects of expansion foam application on LNG vapor dispersion in field experiments, which were performed at the Brayton Fire Training Field. Specifically, this study aimed to obtain key parameters such as temperature changes of methane and foam, and the extent reduction of vapor concentration for evaluating the use of foam to control the vapor hazard from spilled LNG. In addition, the underlying mechanisms of foam when it contacts with an LNG pool and foam breaking rates were also investigated. Results showed that expansion foam was effective in increasing the buoyancy of LNG vapor by raising the temperature of the vapor permeated through the foam layer, and ultimately decreasing the methane concentrations in the downwind direction. On the basis of these findings, several recommendations were made for improving foam delivery methods and foam properties which can be used for controlling LNG vapor dispersion.