Modeling of LNG Spills into Trenches

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**Abstract**

Federal regulations for the siting of onshore LNG receiving terminals require that all LNG transfer areas be provided with means to collect the spill and direct it to a containment location. This is generally accomplished by placing trenches underneath all piping and equipment areas, and by sizing and sloping the trenches so that a design spill at any location will be contained by the trench and directed into a properly sized sump. In the event of a spill into a trench, part of the LNG flowing towards the sump will vaporize and thus generate a vapor cloud, which will be dispersed by the wind in the same manner as the vapor cloud generated by a spill into a containment area.

Federal regulations do not explicitly require the vapor cloud dispersion from an LNG trench to be modeled, nor do they provide a method for performing said calculation. However, the LNG trenches are often located closer to the property line than the containment sumps, and therefore the potential for dispersion of a flammable vapor cloud beyond the plant boundaries cannot be excluded. For this reason, the Federal Energy Regulatory Commission (FERC) has recently begun requesting the newly approved onshore LNG receiving terminals to demonstrate that the vapor cloud generated by the LNG vaporization along the trenches will dissipate to below ½ LFL within the terminal boundaries.

There currently is no standardized procedure for the calculation of vapor dispersion hazard distances for LNG spills into trenches and DEGADIS, the modeling tool typically used for vapor dispersion calculations, was not developed for long and narrow trenches. A different solution method is presented, which includes a hydraulic model of the LNG free surface flow and vaporization along an open trench, coupled with a CFD model (Fluent) to perform the vapor dispersion calculations.

Case studies will be presented, representative of calculations recently submitted to and approved by FERC, to demonstrate the application of the solution method for vapor dispersion from LNG spills into trenches.

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