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Heat Transfer Studies for LNG Vaporization During Underwater LNG Releases

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Abstract : A modeling theory is proposed to consider the vaporization of LNG during its contact with water following its release from an underwater source. The spillage of LNG underwater can lead to a decrease in the surface temperature of water and subsequent freezing. This can in turn affect the heat flux distribution from the released LNG onto the water surrounding it. The available models predict the rate of vaporization considering the surface of contact as a solid wall, and considering the entire phenomena as a solid-liquid operation. This assumption greatly under-predicted the overall heat transfer on LNG water interface. The vaporization flux would first decrease during the film boiling, followed by an increase during the transition boiling and a steady decrease during the nucleate boiling. A superheat theory is introduced to enhance the accuracy in the prediction of the heat transfer between LNG and water. The work suggests that considering the superheat theory can greatly enhance the prediction of LNG vaporization on underwater releases and also help improve the study of overall thermodynamics.

Keywords : evaporation rate, heat transfer, LNG vaporization, underwater LNG release
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