Modeling of frost growth and densification on an ambient air vaporizer

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Ambient air vaporizers are heat exchangers which vaporize liquefied natural gas by using heat absorbed from the ambient air. Liquid gas passes through a number of interconnected tubes in various series and parallel paths. To avoid dense ice builup on the surface of the heat exchanger tubes, deicing or defrosting with a 4~8 hour cycle is typically required. Long operating cycles lead to dense ice on the exchanger tubes, requiring longer defrosting time. Thus, this study presents a numerical model to predict the frosting behavior on an ambient air vaporizer. The effect of flow of LNG in the vaporizer and the frost layer on heat transfer are both considered in the model. Results shows changer of outlet temperature of LNG and frost thickness and density over time. During operation, growth rate of frost decreases whereas density of frost increases.