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C3Po1C-03: Modeling of the Cryogenic Liquid Regasification Process with Consideration of Evaporation and Superheating

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The study proposes a model for the regasification of cryogenic liquids that accounts for both the evaporation process and the subsequent superheating of the liquid. In the model, the boiling cryogen was represented as a solid with appropriate thermophysical properties. This approach significantly accelerated the computations and ensured their stability. The model was developed using the OpenFoam CFD toolboxM, enabling its direct application in simulations involving complex geometries. Additionally, the model incorporates the freezing process of the heating fluid, a critical phenomenon that can adversely affect the operation of cryogenic regasifiers. As an example of the model's application, 3D simulations were conducted for an actual a shell-and-tube heat exchanger consisting of 37 tubes, each 1 meter in length. The modeling results were compared with experimental data, showing satisfactory agreement.

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