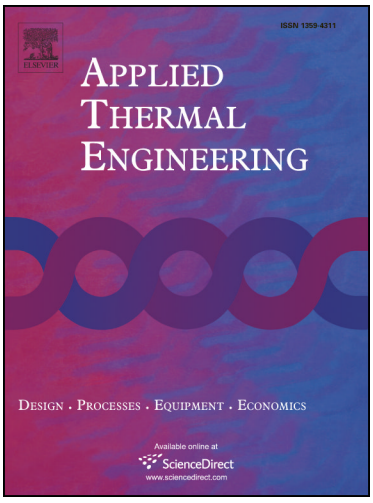

Research Paper

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Experimental investigation of condensation performance in pressurised tank during vapour inlet process

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Highlight

- The vapour condensation phenomenon in a thermal stratification state was experimentally investigated.
- The factors affecting the condensation included the conditions of the liquefied inventory in a test cell.
- The mathematical modelling was performed to predict the pressure profiles.

Abstract

The vapour-liquid condensation phenomenon in a pressure tank in a thermally stratified state was experimentally investigated. Vapour under designated conditions was injected into the pressure tank, which contained low-temperature test fluid (R290) in a saturated liquid state, for identification of the condensation phenomenon in the thermal stratification state. The vapour-liquid condensation phenomenon was qualitatively and quantitatively analysed by investigating the heat and mass transfer. The vapour injected was partially condensed, yielding a non-equilibrium state between the vapour and liquid inside the tank. Further, a temperature stratification phenomenon occurred between the upper and lower regions of the liquid. This non-equilibrium state constituted a different result to that for vapour-liquid condensation obtained through thermodynamic modelling assuming an equilibrium state. The factors affecting the vapour-liquid condensation phenomenon included the mass and initial pressure of the liquefied inventory in the test cell, along with the pressure, and flow rate of the inlet vapour flow. Thus, the vapour-liquid condensation phenomenon was