Experimental comparison of the dynamic evaporator response using homogeneous and slip flow modeling

The dynamic response from an evaporator is important for control of refrigeration and air-conditioning systems. Essentially, the prediction of refrigerant charge inside the evaporator is crucial for the dynamic behavior. The prediction of refrigerant charge follows from suitable void fraction correlations from the literature. A chosen set of void fraction correlations (slip flow) and the assumption of homogeneous flow will be investigated in this paper and compared to experiments on a simple coaxial type evaporator. The numerical model of the evaporator is a dynamic distributed mixture model, where different void fraction correlations can be applied. It is shown that the dynamic response of the homogeneous model is too fast, whereas the slip flow models agree well with the experiments. Another difference is that the charge prediction of the homogeneous model is approximately 2-3 times less than the slip flow models.

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