Towards Modeling Mixtures with Increased Asymmetry

Andreas Jäger[1, S, C], Marcel Felix Schneegans[1] and Cornelia Breitkopf[1]

[1]*Institute of Power Engineering, TU Dresden, Dresden, Saxony, Germany*
andreas.jaeger@tu-dresden.de

Motivated by the loss mechanism of two-phase surge and gap flows in oil-injected rotary-type positive displacement compressors, used for the compression of refrigerants in various applications, the presented work is concerned with the modeling of thermodynamic properties of oil-refrigerant mixtures. Starting from comparably well-measured and relatively symmetric mixtures, different commonly used equations of state, such as cubic equations of state [1,2], the Lee-Kesler-Plöcker equation of state [3,4], the PCP-SAFT equation of state [5–7], and the multi-fluid mixture model for reference equations of state [8,9], have been evaluated against experimental data. The capability of these different models for describing mixtures of increasing asymmetry has been investigated and limitations of the models are shown.

All of these models exhibit shortcomings when describing thermodynamic properties such as vapor-liquid equilibria and densities, which become especially apparent when the asymmetry of the mixtures increases. In order to overcome these issues, new approaches are presented, which include an adjusted theoretically-based departure function [9] and one-fluid mixture models.

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