

Modeling and Validation of a Multiple Evaporator Refrigeration Cycle for Electric Vehicles

Andreas Varchmin¹ Manuel Gräber² Jürgen Köhler¹

¹Technische Universität Braunschweig, Institut für Thermodynamik (a.varchmin@tu-bs.de)

²TLK-Thermo GmbH

Multiple evaporator vapor compression cycles become relevant for thermal systems in electric vehicles since batteries and other electric components demand cooling for a secure operation. In difference to most other applications with parallel evaporators cooling demands and temperature levels vary between the different secondary fluids. This leads to a more complex system behavior that needs to be described for optimality and control analysis.

In this paper a dynamic model for an automotive air conditioning cycle with an additional evaporator for battery cooling is developed and validated. A battery model library for calculating temperatures and waste heat flows of battery cells and modules is presented. Multi-evaporator effects and their consequences are discussed. Reasonable actuating and control variables are chosen and a discussion regarding possible control schemes is given.

