Job-ID: 0007

Development of an innovative methodology for coupling 1D and 3D simulation domains in the battery system network

 Wrocław

Motivation:
The development of battery electric vehicles (BEVs) raises overriding questions in thermal management. In order to answer them at an early stage, the component level is left behind and the overall system is considered. There are many influencing parameters that affect the battery in a BEV and are therefore important for the conceptual design. They all influence the thermal management of the battery system and thus also the battery cell in detail.

Objective:
In this student project, a methodology for coupling 1D and 3D simulations for battery systems is to be developed. The cell, module and battery pack levels are to be considered with external influencing parameters. For the cell level, the different modelling depths are to be considered, from the RC model to the electro-chemical model.

Scope of work:
- Literature research on the state of the art regarding:
    - Types, structure and functioning of battery cells
    - Generation of a system overview for a thermal management system
    - Possibilities for modelling battery cells (in the cell compound)
    - Requirements for battery systems and influencing parameters in the vehicle
- Differentiated modelling of battery cells (in the cell network) and comparison of the individual modelling types
- Carrying out a sensitivity analysis with regard to input parameters
- Assessment of model validity based on existing measurements
- Coupling of cell simulation with comprehensive system simulation
- Gradual expansion of the simulation model with other system components and increase in complexity
- Elaboration of a workflow for a possible development process
- Discussion of the results, documentation

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