

Master's Thesis project

System simulation of electrified vehicle

The primary objective of the proposed master's thesis is to electrify an existing powertrain with a traction battery pack (batteries used in vehicles) and to investigate how different modelling approaches affects key parameters such as performance and aging of a battery cell.

Describing complex systems such as a powertrain, engine or a cooling system is often done using simplified simulation tools in 1D. The advantages are that the entire system can be simulated at one time and the interaction between different components can be determined.

The electrification of vehicles has introduced new challenges for engine development, either through a fully electric drivetrain or a hybrid version of an existing drivetrain. Among these are the cooling system and how to incorporate the battery pack into existing designs. The thermal control, especially during quick charge, of a battery pack is important to increase efficiency and to increase the life time of the cells.

Understanding how the battery pack affects the cooling circuit and how to maximise the efficiency of the battery pack is the first step to this project. How the electro-chemical process inside the cell can be described and how this affects the heat transfer is the following step. This can be done in a variety of ways and varying accuracy, how these modelling types varies and how they affect important parameters such as aging and performance is of great interest.

Finally ways of improving the design of the cooling circuit are investigated and weighed against the cost, presumed increase in life time and performance of the battery cell.

The master's thesis is a cooperation between FS Dynamics Sweden AB and a leading automotive producer.

The system simulation will primarily be performed using a general purpose 1D-software such as GT-Suite or AmeSim.

This master's thesis will be conducted at the FS Dynamics office in Gothenburg

FS Dynamics is a simulation focused and independent consultancy company. We recruit with diversity and equality in mind and our professional consultants provide highly skilled competence within fluid- and structural dynamics analyses.

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