Challenges in the Development of Electrical Systems

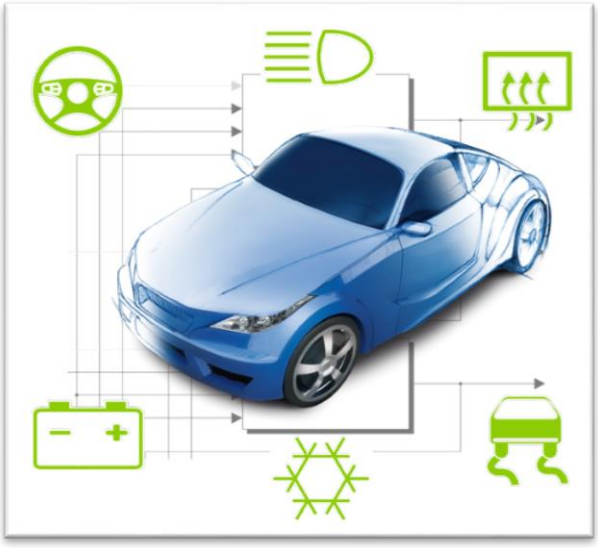
The design of a reliable and stable electrical system for vehicles is becoming more challenging. Both OEMs and suppliers are increasingly looking to new simulation solutions to support their design process.

Trend 1: Growing dynamic energy demands on the electrical system

Many auxiliary vehicle systems are shifting towards using an electrical power source rather than a belt driven aggregate. Example systems:

- steering (EPS)
- electric brake booster
- air-conditioning
- engine cooling
- active suspension.

The growing number of dynamic, high power consumers creates a myriad of potential peak power demand scenarios. It is increasingly necessary to factor in the magnitude and duration of these load spikes when deciding on an electrical system architecture.



Trend 2: Safety critical power consumers are demanding higher system stability and reliability

ECU functions are increasingly performing safety critical tasks such as steering and braking the vehicle without driver input under certain conditions. This trend towards autonomous driving can be reliably expected to continue into the future.

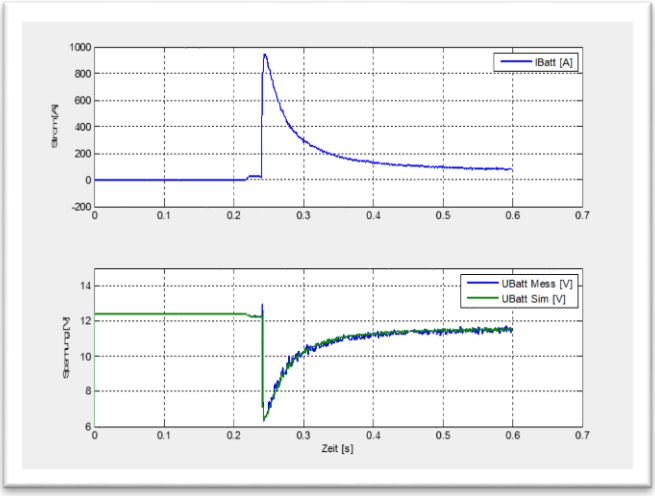
The high level functional safety requirements on vehicle systems (e.g the ability to brake the vehicle) therefore dictate the required quality and reliability of the electrical system. These requirements can have an effect on not only the sizing of components but also the system architecture.

Trend 3: New architectures and materials to meet new challenges

To meet the often conflicting objectives engineers continue to investigate novel solutions. In addition to the stability constraints discussed above, the electrical system must constantly be further optimized for efficiency, weight, cost, space, ease of installation, ease of maintenance, safety etc. The range of opportunities has never been larger, and it's growing.

Trend 4: Early identification of issues thanks to simulation in the design process

Early identification of electrical issues via simulation allows timely redesign before prototypes are available for physical testing. By incorporating simulation in the development process, design conflicts and problem areas can be addressed earlier on, whether these be related to the dynamic issues discussed above or otherwise. The goal of the simulation activities is to provide a basis for decision making throughout the design process.



Dynamic response to a large load step

Simulation of Electrical Systems

Pushing Innovation

Engineering Solutions

TESIS DYNAware offers a range of services and software across the spectrum of electrical system simulation.

Electrical system stability analysis

- Load shedding strategy and ECU testing
- Dynamic reaction to critical loading events such as starter motor current draw
- Sizing of electrical system and energy supply (battery, DCDC converter, wiring, architecture of cable system)

Research and development

- Investigation of new system architectures e.g. investigating the potential effects of using a super capacitor, aluminium wiring solutions, using a decentralized “backbone” cable architecture
- Investigation of dynamic energy management strategies e.g. voltage thresholds for cutting power to “comfort” consumers such as seat heating

Concept evaluation / optimization

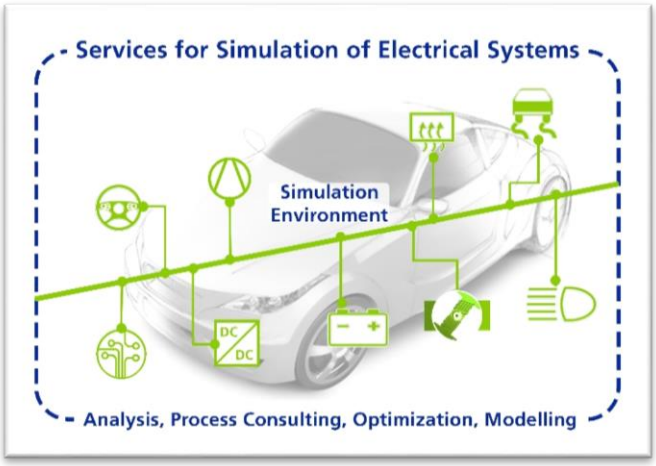
- Energy/fuel consumption calculations for driving cycles (BEV/HEV concepts)
- Modeling and integration of hybrid functions such as e-boost, brake, smart alternator or other hybrid systems into the electrical system model.
- Design and test of HCU and SOC management strategies
- Optimizing an electrical system to achieve system stability / cost / temperature / efficiency targets. Assessing system performance for a wide range of (dynamic) load profiles

Integration HiL / Function validation

- Function validation in either an MiL, SiL or HiL environment
- High resolution e-motor models to test e-motor ECU functions
- Battery models for testing BCU and cell balancing functions
- Fitting battery data / model validation
- Using test data to generate a validated simulation model. In order to make reliable predictions using simulation it is necessary to validate the combination of model and data set.

Process consulting

- Selecting the right simulation approach to most efficiently achieve your goals
- Establishing a simulation workflow
- Selection and roll out of a tool-chain



Simulation models

From project experience, TESIS DYNAware has developed a library of models and tools that have been tested in a wide variety of applications. Key model advantages:

- HiL / real-time capable, which leads to fast offline performance
- Model parameters are either readily available (via datasheets) or can be easily extracted from measurements

Find details about the model library in the product flyer on our website: DYNA4 Advanced Powertrain

We can bring the expertise to use these or any customer models/tools to effectively assist you with your simulation activities. This winning combination allows us to react quickly to your needs.

Contact us for further information

TESIS DYNAware specialize in developing solutions tailored to your need. We look forward to discussing your application!

Phone: +49 89 74 73 777 444
Email: tesis.dynaware@tesis.de
Web: www.tesis-dynaware.com