Press Release

FEV Advances Battery Safety with Thermal Propagation Optimization Process

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Aachen, Germany, August 2020 – FEV, a global leader in the development of battery systems, has developed a novel combined simulation and testing process for the optimization of the thermal propagation behavior in automotive battery packs. This process can help to reduce the risk of injury and damage from battery cell thermal runaway, while also saving development time and cost.

Thermal runaway is a key safety aspect for hybrid and electric vehicles, with battery fires representing a threat to harm people, buildings, and the environment. The first thermal propagation regulation is expected in January 2021, with the GB/T 38031 standard in China requiring a minimum of five minutes of warning for vehicle passengers before fire from a thermal event extends beyond the battery pack or battery venting gas enters the cabin. Other markets and regulatory bodies are expected to follow soon.

With this in mind, FEV is leading the way in the development of simulation techniques in combination with a cascaded testing approach to optimize automotive battery pack design to prevent thermal propagation and the risk of thermal runaway.

“FEV’s simulation-based approach to optimize for battery thermal propagation is paired with our battery design and development capabilities as well as battery testing capabilities at our world-class eDLP facility. This uniquely positions FEV to support the entire thermal propagation development process,” said Professor Stefan Pischinger, CEO of FEV Group.

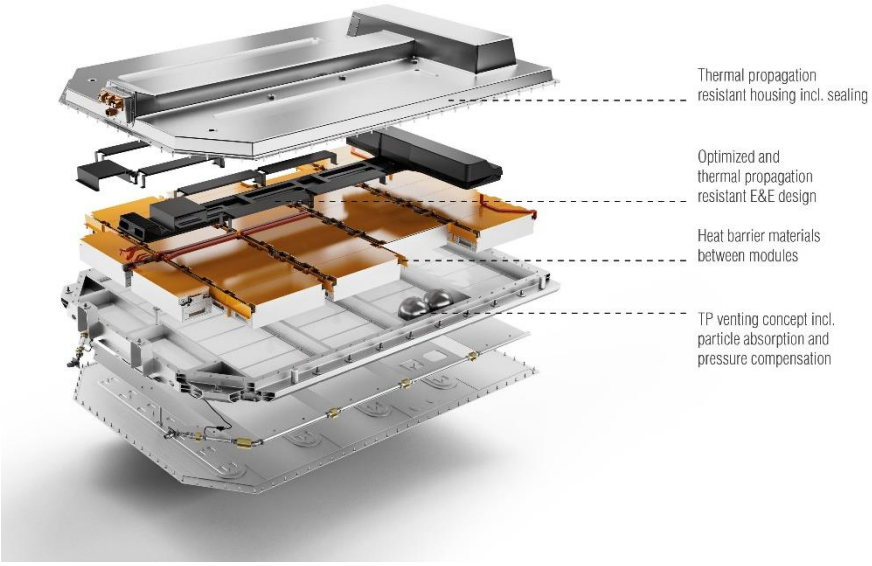
The simulation-based approach begins after key CAD dimensions and pack geometries are defined in the base development phase. FEV has created two customizable models for this purpose. Multiphysics simulation is used to produce a model to evaluate and optimize thermal runaway of one cell and propagation between battery cells, as well as between battery modules. This model and its customization for specific customer requirements allows for design optimization and introduction of countermeasures such as heat barriers. In parallel, a second, fluid-based venting gas model is customized, which is used to assess and optimize the design of the venting paths, dimensioning of venting valves as well as the indication of critical busbar routing inside of the battery pack.

The thermal and venting gas models are developed and then customized separately. Each model is validated further using physical test data. This testing approach is based on a step-by-step validation of cell to module to pack whereas on pack level different dummy packs are used to evaluate the thermal propagation behavior. The cascaded testing approach can be optimized if any data (e.g. cell data) are already available. The advantage is that experimental data can be collected early in development without requiring the build of a fully functional battery pack, which saves time and cost.

After the models are validated with physical test data, the two models are then combined to create a comprehensive coupled model, containing the thermal battery model as well as local heat transfer coefficients and fluid/gas temperatures from the venting gas model. This combined model can be used for even more accurate and detailed simulation, which allows for a performance assessment and selection of optimized design parameters and variations. Finally, the design is tested and validated as a complete battery pack.

“Thermal propagation is clearly a safety concern for battery packs,” said Professor Pischinger. “FEV is proud to lead the way in the development of simulation approaches to address thermal propagation early in the development process for our customers.”

For more information on FEV’s battery development capabilities, please visit: https://www.fev.com/batterydevelopment



FEV has developed simulation techniques in combination with a cascaded testing approach to optimize automotive battery pack design to prevent thermal propagation and the risk of thermal runaway, which is a key safety aspect for hybrid and electric vehicles.
Source: FEV Group

FEV is leading the way in the development of simulation approaches to address thermal propagation early in the development process for customers.
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About FEV

FEV is a leading independent international service provider of vehicle and powertrain development for hardware and software. The range of competencies includes the development and testing of innovative solutions up to series production and all related consulting services. The range of services for vehicle development includes the design of body and chassis, including the fine tuning of overall vehicle attributes such as driving behavior and NVH. FEV also develops innovative lighting systems and solutions for autonomous driving and connectivity. The electrification activities of powertrains cover powerful battery systems, e-machines and inverters. Additionally, FEV develops highly efficient gasoline and diesel engines, transmissions, EDUs as well as fuel cell systems and facilitates their integration into vehicles suitable for homologation. Alternative fuels are a further area of development.

The service portfolio is completed by tailor-made test benches and measurement technology, as well as software solutions that allow efficient transfer of the essential development steps of the above-mentioned developments, from the road to the test bench or simulation.

The FEV Group is growing continuously and currently employs 6700 highly qualified specialists in customer-oriented development centers at more than 40 locations on five continents.