

DigiTain – Digitalization for Sustainability

Fast Facts

Duration: 01/2023 – 12/2025

Funding Program: New Vehicle and System Technologies

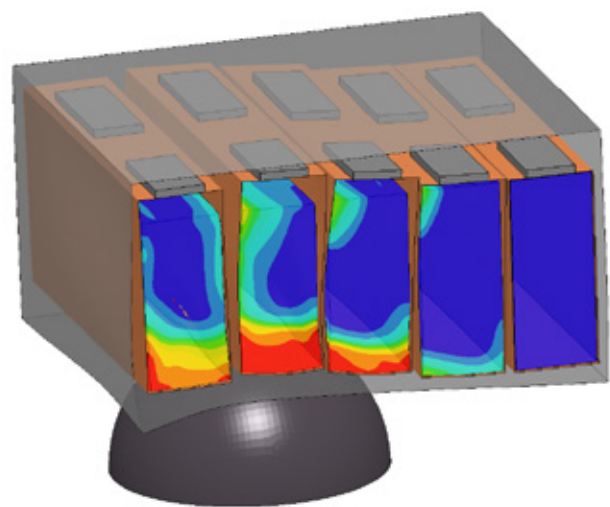
Funding Institution: Federal Ministry for Economic Affairs and Climate Action

Consortium:

- Mercedes-Benz AG
- BMW Group
- Daimler Truck
- ARENA2036
- AVL
- Constellium
- DYNAmore
- EDAG
- Forward Engineering
- Fraunhofer Institute for High-Speed Dynamics, Ernst-Mach-Institute, EMI
- Fraunhofer Institute for Mechanics of Materials, IWM
- GreenING
- Hexagon Purus
- INATECH
- iPoint
- JWS
- Kirchhoff Automotive
- Leibniz-Institut für Verbundwerkstoffe
- Polymer Engineering, Uni Bayreuth
- SGS TÜV Saar
- TU Darmstadt
- TU Dresden
- University of the Bundeswehr Munich
- University of Stuttgart
- VDA, German Association of the Automotive Industry
- XPLM
- ZF Friedrichshafen AG
- ZSW

Motivation

The transition from conventional to electric vehicles opens up new possibilities but also requires the resolution of new challenges. Ecological and economically sustainable criteria in the development of vehicle and drive architecture are becoming increasingly relevant. In the future, sustainable and circular products must be developed with optimal resource use and CO₂ footprint. Until now, ecological product assessment usually takes place only in a late phase of product development, making concept optimizations based on sustainability criteria very labor-intensive and costly. In particular, the ongoing sustainability assessment throughout the development process currently poses significant challenges for developers.



Ground intrusion of a generic battery module. The deformation of the casing, as well as the individual cells and their internal components, is visible. ©Fraunhofer EMI

Goals and Approach

The goal of DigiTain is to develop processes, methods, and models for fully digital product development and certification of sustainable drive architectures, applying them in the case of a hybrid drive train consisting of an electric motor and fuel cell system. The project places a special focus on the synchronization between digital design and ongoing sustainability assessment during development. To optimize mechanically and numerically validate crash behavior, multiphysical and scale-bridging CAE models will be developed and transformed into predictive modules. For experimental investigation of crash behavior, highly instrumented tests will be conducted at Fraunhofer EMI. The data obtained will then be used to validate the CAE methods developed within the project, followed by virtual optimization at the component, system, and vehicle levels.

Fraunhofer EMI's Contributions

Fraunhofer EMI participates in work packages related to sustainability, the development of (new) digital methods and models, the development of hydrogen pressure tank systems, and the high-voltage (HV) battery system. Key focuses include methods for sustainability assessment, recycling methods for CFRP tapes from hydrogen tanks, development of a new and efficient methodology for experimental validation of structural mechanics

simulation models, and experimental investigation of battery systems and their digital modeling for crash behavior assessment. Highly instrumented crash tests on battery cells and modules will serve as input for the validation of the CAE models. This will enable the establishment of a simulation environment that allows virtual modeling and rating of cell deformation in crash-typical load cases.

Innovations of the Project

Within the overall project, a fully digital, sustainability-oriented development process (NEP) is being conceived and demonstrated using an example of an electric vehicle with a hybrid drive strategy consisting of a fuel cell unit and HV battery system. The NEP will enable a holistic overall vehicle and component development through the digital synchronization of all product areas involved in the development.



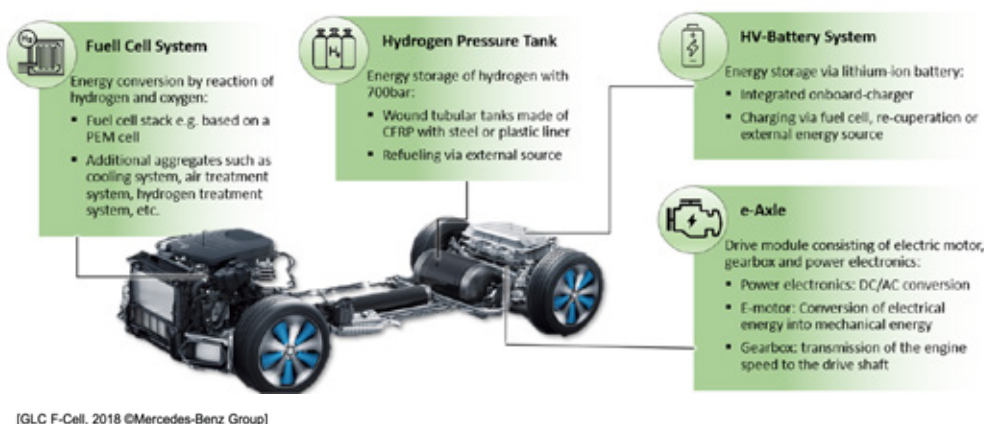
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Project idea from DigiTain: Technology carrier with a hybrid drive train consisting of a high-voltage battery system and a fuel cell system. @Mercedes-Benz Group