Virtual crash safety optimisation for e.GO Life

An electric vehicle which is fun, yet still affordable: Life, an innovative urban car from e.GO Mobile AG, epitomises such an ideal. e.GO Mobile AG commissioned TECOSIM to develop a crash-optimised vehicle body.

CHALLENGE
Besides occupant safety, development for e.GO Life primarily focused on the accident-protected design of safety-relevant high-voltage components. The design needed to eliminate potential danger for occupants and damage for rechargeable batteries. During crash safety optimisation, the CAE specialists at TECOSIM also centred on vehicle weight, time and costs.

SOLUTION
TECOSIM simulated a variety of front impacts and worked with e.GO to develop a crash-optimised vehicle body based on the CAD design. The TECOSIM engineers used FE calculations to produce solution recommendations to select material grades and thickness widths. TECOSIM thus reduced weight while also enhancing crash performance. It also helped significantly in creating a new electric car in just a third of the development time normally required and for a tenth of the usual development costs.

PROJECT DESCRIPTION
- Development of crash-optimised vehicle body model
- Simulation of different front impacts (ECE-R94, ECE-R137) and side impacts (barrier, post)
- Calculation and simulation of the Allianz Centre of Technology insured event
- Vehicle body structure calculation and simulation combined with enhanced crash performance
- FE calculations to select material quality grades and thickness widths

KUNDENPROFIL
Based on RWTH Aachen University’s campus, e.GO Mobile AG is a company which successfully develops and builds electric vehicle concepts. Rapid advances in development are assured thanks to numerous innovative approaches to creating a new electric car and providing production optimisation with the aid of Industry 4.0. The e.GO Life was first presented in its final design as an electric car in the small car category in 2017 and will go into series production in a new type of Industry 4.0 plant from 2018.

More information: www.e-go-mobile.com
TECOSIM SERVICES
Simulation of different front and side impact crashes
TECOSIM tested load cases as per statutory regulations ECE-R94 and ECE-R137, i.e. front impacts against rigid and flexible walls. These scenarios present electric vehicles with a special challenge. Accident-proof housing for high-voltage components takes top priority since this is the only way to eliminate danger for occupants and damage to the battery package.

Vehicle body crash optimisation
The e.GO Life is based on a frame concept with composite panelling. The structure is made entirely of aluminium except for the A column and the exterior roof frame. During crash optimisation, TECOSIM needed to strike a balance between crash performance and guaranteeing structural rigidity while also keeping an eye on vehicle weight and costs. To do so, the CAE engineers calculated geometric modifications and introduced local reinforcement to enhance crash behaviour. The structure developed by TECOSIM delivered exceptional sturdiness, thus guaranteeing greater crash safety.

Weight reduction calculations
A cost-optimising reduction in vehicle weight plays a key role in electric vehicles. e.GO’s design concept stipulated that the number of materials, sheet thickness widths and configurations needed to be kept to a bare minimum. Using FE calculations, TECOSIM proposed different solutions to select material grades and thickness widths.

CLIENT BENEFITS
TECOSIM assisted e.GO in its challenging task and used calculation and simulation to develop a comparatively lightweight vehicle body, the production costs of which met budget constraints while complying with all mandatory safety requirements.

REFERENCE PROJECT

RESULTS
- Successful front impact crashes as per ECE-R94 and ECE-R12
- Crash behaviour optimisation based on adding geometric modifications and local reinforcement sections
- Further reduced weight thanks to FE calculations

PROFIL TECOSIM
With some 460 employees, TECOSIM is a highly capable partner for development processes and a specialist in computer-aided engineering (CAE). Based in Rüsselsheim, Germany, the internationally active group is represented by seven branches in Germany as well as its own locations in Japan, India, the UK and Austria. TECOSIM provides support for clients in the transport, energy, health care and industry sectors. Its engineers work on challenging tasks in design, construction, simulation, electronics and software development. The services on offer are made complete by process optimisation methods.

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