SUCCESS STORY

SafeBattery
Safe Lithium-Based Traction Batteries

Sichere Lithiumbasierte Traktionsbatterie

Programme: COMET – Competence Centers for Excellent Technologies

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SAFETY OF PRE-LOADED LI-ION BATTERY CELLS IN A CRASH

THE INFLUENCE OF MECHANICAL PRE-LOADS ON AUTOMOTIVE LITHIUM-ION BATTERY CELLS IN CASE OF CRASH IS UNKNOWN SO FAR. FOR THIS REASON THE BEHAVIOR OF A BATTERY CELL AFTER MULTIPLY APPLIED CRASH LOADS IS INVESTIGATED IN THE PROJECT SAFEBATTERY. THE NEW GAINED FINDINGS PLAY AN IMPORTANT PART IN THE SAFE DESIGN OF FUTURE BATTERIES.

Load on a battery in a vehicle

During operation constant mechanical loads cause an effect on the traction battery of a vehicle. It may happen that traction batteries are exposed a light crash load e.g. in a rear impact.

In case of non-obvious damage on a traction battery the question arises what will be the behavior of this initially loaded cell in a subsequent accident. For this reason the research project **SafeBattery** is targeting to scientifically investigate the electric-mechanical behavior of lithium-based cells after a multiply applied crash load.

Load limit of Li-Ion cells

Together with industrial partners possible load scenarios for single cells were derived in a first step. For this investigation in a further step a special testbed construction was developed by Graz University of Technology. This construction is a worldwide unique and dynamic testbed for batteries. Parts of the testbed construction with mounted Li-ion batteries are shown in Figure 1. In the process of

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these experimental investigations modern Li-Ion Pouch cells were taken to the mechanical load limit in order to investigate the development of internal short circuits i.e. to determine possible load limits in general.

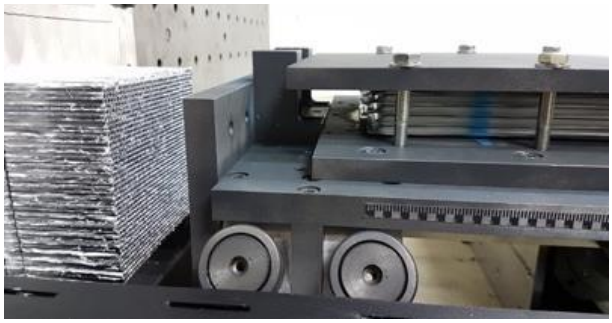

Figure 1: Cells mounted on testbed construction © SafeBattery

The effect of mechanical load in various mounting directions of traction battery cells of a vehicle were also tested. The load phase took only a few milliseconds.

By recording electrical voltage during the test and after the test a possible failure of the cells was also detected. In this process different investigation methods (e.g. electro-chemical impedance-spectroscope, defining of OCV-curves) were applied. In a first step the aim was to find possible differences in the behavior between new cells and initially loaded cells in order to be able to trace the procedures taking place during crash load.

Impact and effects

In spite of high loads the tested battery cells were able to resist the initial load and also the subsequent crash loads. Only after clearly overstressing the cells damage and internal short circuits were detected. This means on the one hand that the tested cell can survive many multiple high loads without damage i.e. on the other hand load limits do not have to be determined by multiple loads on cells.

The findings that were gained point to the fact that in future even more optimal designs of traction batteries can be integrated in vehicles.

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Project partner

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- Daimler, GER
- Porsche, GER
- Kreisel Electric, AUT
- Bosch, GER
- SFL engineering, AUT
- TU-Graz (ICTM/VSI), AUT
- VIF, AUT

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