PROJECT

SelECt

Secure integration of electrical energy storage devices in the motorcycle at accidents and in daily use

Sichere Integration von elektrischen Energiespeichern im Motorrad beim Crash und im täglichen Gebrauch

Funding: National (Austria)

Duration: Jan 2011 - Jan 2013

Status: Complete with results

Background & policy context:

Currently there are no standards, guidelines or normative requirements present with respect to the crashworthy design of electrical energy storage (EES) in motorcycles. In case of damage EESs pose a considerable risk to human health and environment. In this study relevant load cases are identified from in-depth accident analysis. A chemical analysis provides information on the toxicity of products of reactions eventually resulting from or leading to leaking, venting, fire or explosion. Within this project, the threat potentially posed by an EES is determined, such to optimally integrate the EES into the bike on one hand and on the other hand to form the basis for safety-standards for employees, customers, environment and rescue personnel. This industrial research project thus provides important results and findings on the crash safety of EES in electric motorcycles and establishes the basis for safe use of lithium-ion cells.

Issue and initial situation: Just like hybrid or fully-electric cars for the passenger-car market, electric bikes are now a relevant part in the product range of well-established motorcycle manufacturers. By contrast to cars, where legislative crash requirements exist, e.g. regulations issued by the Economic Commission of Europe (ECE), guidelines and requirements for the design through defined load cases are not available for conventional or electric motorcycles. Hence, manufacturers of electric motorcycles are in a catchy situation, because there is no legislative design-guideline or load hypothesis applicable to a traction battery and the bike, which in turn makes the manufacturer vulnerable to consumer protection claims.

Objectives:

The aim of this project is the generation of essentials and general design guidelines, which is used for optimization in terms of crash safety in the development of future battery pack and electric motor-powered motorcycles. This knowledge provides a solid basis for the development of corporate standards concerning lithium-ion cells. To achieve these goals, several disciplines of the modern vehicle safety research will be applied: Accident data analysis is performed using descriptive statistics, statistical analysis, in-depth analysis and computer-aided accident reconstructions of real world accidents. One of the aims of this study is to find a representative accident scenario for electric motorcycles in Austria.

A complex of loads acting on the EES will be derived considering real world accidents and other possible external mechanical loads (fall of a bike, improper mechanical handling of the motorcycle,...). In order to derive criteria for risk assessment in simulation and experiment chemical analysis of the battery cells are carried out at the Technical University of Graz. According to previous publications it is possible to estimate emission products in various cellular responses (leaking, venting, fire, explosion) and evaluate them with respect to toxicity.

Parent Programmes:

A3plus - Alternative Propulsion Systems and Fuels

Institute type: Public institution

Institute name: Federal Ministry for Transport, Innovation and Technology (BMVIT)

Funding type: Public (national/regional/local)

Other funding sources: Federal Ministry for Transport, Innovation and Technology (BMVIT)

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Key Results:

This industrial research project provides crucial and novel results and findings of international standard on the crash safety of EES in electric motorcycles and fundamentals on how to deal with lithium-ion cells in general. The outcome will enable KTM to define general design guidelines for the safe integration of EES into the various motorcycle concepts and to implement in-house standards with respect to employees, customers, environmental and rescue-personell protection. These standards should be integrated into the production process to meet the highest safety requirements, which is a premise of KTM. Using the results of this project, it should be possible for KTM to design electric motorcycles providing the highest safety for customers, employees and environment, and thus providing an advantage over international competitors.

Findings of the study are published by a final report (short version, German only) which is available online via the Federal Ministry for Transport, Innovation and Technology (BMVIT):

www2.ffg.at/verkehr/file.php?id=686

STRIA Roadmaps: Transport electrification, Vehicle design and manufacturing

Transport mode: Road transport

Transport sectors: Passenger transport, Freight transport

Transport policies: Safety/Security

Geo-spatial type: Other