Battery Pack Casing Reinforcement Method

How to optimize mechanical design of a battery pack enclosure?
In this study, a design optimization methodology is proposed to optimize the features of mechanical design (e.g. minimization of mass, maximization of minimum natural frequency and minimization of maximum deformation) of the battery pack enclosure. The proposed methodology is comprised of four phases.

What are the design parameters of a battery pack?
We consider several design parameters such as thickness and fiber directions in each lamina, volume fraction of fibers in the active materials, and number of microvascular composite panels required for thermal regulation of battery pack as design variables.

How to evaluate natural frequency of battery pack enclosure?
The notion behind evaluation of natural frequencies of battery pack enclosure is to check if these are in the range of 7-200 Hz,which is in the range of vibration frequencies of electric vehicle during its normal operation. The purpose is to maximize the minimum natural frequency observed in each of the case.

How to achieve vibration isolation of battery pack?
Literature study conducted by (Jaguemont et al. 2016) and (Chen et al. 2017) stated that the vibration isolation of the battery pack can be achieved by designing the new structure of battery pack/mounting frame, selecting appropriate materials and placing battery pack in the vehicle.

How does a battery pack design work?
Extensive calculations are then carried out to determine the battery pack's energy,capacity,weight,and size. The design involves grouping cells into modulesfor easier management and protection,while also incorporating cell holders to enhance stability and minimize vibrations.

Is there a conflicting behavior between capacitance and resistance of battery pack?
Hence, there is a conflicting behavior between the capacitance and resistance of the battery pack by an increase in the negative electrode thickness. The trend of driving range based on the negative electrode thickness is determined by a trade-off between the total capacitance and total resistance of the battery pack. Fig. 8.

The use of a polymer composite material in electric vehicles (EVs) has been extensively investigated, especially as a substitute for steel. The key objective of this manuscript is to provide an overview of the existing and ...

This study takes the battery pack of an electric vehicle as a subject, employing advanced three-dimensional modeling technology to conduct static and dynamic analyses. Through weight reduction and structural

optimization, an innovative power battery pack design scheme is proposed, aiming to achieve a more efficient and lighter electric vehicle ...

This novel material is engineered to address critical aspects of EV battery casing requirements, including mechanical strength, electromagnetic interference (EMI) shielding, and thermal management. The research strategically combines carbon composite components with copper-plated polyester non-woven fabric (CFRC/Cu) and melamine foam board ...

In this paper, a comprehensive design procedure based on multi-objective optimization and experiments is applied to compare the maximum equivalent stress and resonance frequency on a battery pack casing with different materials (DC01 steel, aluminum 6061, copper C22000, and carbon nanotube [CNT]) under bumpy road, sharp turns, and ...

Moving away from heavy metal casings to high performance trays and covers made from thermoplastics, changes the game for EV OEM"s without compromising performance or protection. Using high performance thermoplastic means increased design flexibility for innovative functional integration that can add value, and production efficiency across a number of areas.

In this study, a design optimization methodology is proposed to optimize the features of mechanical design (e.g. minimization of mass, maximization of minimum natural frequency and minimization of maximum deformation) of the battery pack enclosure. The proposed methodology is comprised of four phases.

The structures of battery pack box, lug, reinforcing ribs and module strips are optimized simultaneously under forward and lateral collision extrusion conditions, which further enhances ...

This project offers a detailed overview of the process involved in designing a mechanical structure for an electric vehicle"s 18 kWh battery pack. The chosen ANR26650M1-B lithium iron phosphate...

The methodology used for performing the design optimization of battery pack enclosure is shown in Figs. 2 and 3.The proposed methodology is a step-by-step procedure starting from the basic design in ANSYS to finite element analysis, development of empirical models and the multi-objective optimization for the selection of optimum design parameters ...

This study takes the battery pack of an electric vehicle as a subject, employing advanced three-dimensional modeling technology to conduct static and dynamic analyses. ...

Lightweight research based on battery pack structural strength can improve the endurance and safety of electric vehicles. Based on the adaptive response surface and multi-objective particle swarm optimization algorithm, this paper proposes an optimization design method for lightweight of battery pack shell. The thickness of the battery pack ...

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This chart can be used by designers when approaching a new battery pack project. This method belongs to the Design for X field, and it represents an example of a customer-centric engineering approach. A systematic approach to the design steps to be followed while developing a battery pack was also proposed by Rajasekhar and Parandhamaiah [62]. ...

Today mostly metal, fastest solution for OEM, but also relatively heavy. 20 different multi-material pack structure designs made by AZL. Yielded 5 patents. Fully CAE analysed and optimised to all relevant load cases. Many composite dominant design concepts are up to 20% cheaper and up to 36% lighter than the reference aluminium design.

Lightweight research based on battery pack structural strength can improve the endurance and safety of electric vehicles. Based on the adaptive response surface and multi-objective particle ...

The new battery packaging proposed in this study contains structural battery composite (SBC) that works as battery cells and microvascular composites (MVC) that are in charge of thermal regulations. SBC laminates are stacked together in parallel and series to form a battery packaging for EV, and MVC locates at the top and beneath that packaging ...

Today mostly metal, fastest solution for OEM, but also relatively heavy. 20 different multi-material pack structure designs made by AZL. Yielded 5 patents. Fully CAE analysed and optimised to ...

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