Vibration reduction of battery cabinets for construction machinery

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Do mechanical vibrations affect PCM-based battery thermal management systems (BTMS)?
This study investigates the impact of mechanical vibrations on PCM-based Battery Thermal Management Systems (BTMS). The battery system consists of six prismatic cells, each separated by a PCM layer of varying thicknesses, as shown in Figure 12. The vibration conditions involve a 30 mm displacement Sine dwell at 20 Hz.

Do vibrations affect battery thermal management systems?
Another study examined the impact of vibrations on Battery Thermal Management Systems (BTMS) as part of active cooling (where external pump is used in circulating fluid), specifically focusing on a mini-channel cold plate with water coolant as the BTMS, as shown in Figure 14.

How do vibration isolation systems work?
Effective vibration isolation can be achieved through mounting brackets,axles,and integration with the vehicle chassis. These systems distribute vibrational forces,enhancing crash-worthiness and overall robustness. For example,mounting brackets can help isolate the battery pack from chassis vibrations,reducing transmitted stress.

How can mechanical features improve vibration isolation?
Incorporating mechanical features can enhance vibration isolation. Strategies include integrating cell spacers,damping pads,pressure relief valves,and structural elements like end-plates and tie-rods. These features help distribute vibrational forces,reducing stress concentrations and preventing mechanical failure .

Both structures demonstrate outstanding capabilities with a 97% to 99% reduction in vibration levels in the aluminum casing.

7. Conclusions This paper summarizes the research done toward the development of an active control structure for vibration reduction in mobile hydraulic construction equipment. A ...

The experimental results highlight the influence of vibration-induced stress on electrical performance and battery degradation behavior. Simulations complement these findings by providing ...

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