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# Vibration test technology

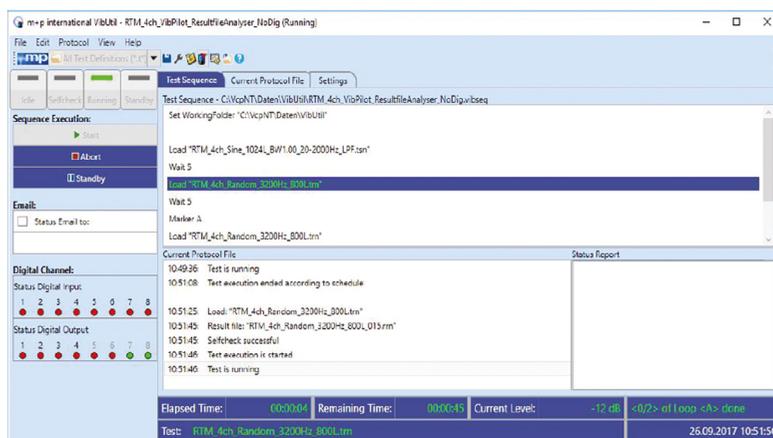
Analysis of energy storage systems under a range of environmental conditions is crucial when exploring the behavior of battery systems and components



Battery electric vehicles are emerging as one of the most practical solutions to replace fossil-fueled vehicles. Safety is a key consideration for such vehicles, particularly as the energy capacity of batteries increases. Components and subsystems are exposed to vibration, mechanical shock, and temperature variations.

The risks associated with Li-ion batteries are well documented, and include extreme exothermic reactions with a resultant release of highly toxic gases such as hydrogen fluoride and phosphoryl fluoride. It is therefore critical to consider safety in all environmental conditions found during operation and in extreme circumstances, such as during a collision.

To tackle these challenges, m+p international offers a solution for environmental testing and simulation with the m+p VibControl vibration control system along with its digital IO control software, m+p VibUtil. Together with the company's range of hardware, featuring universal DigIO ports for cross-hardware communication, the system has the capability to accurately simulate real world mechanical shock and vibration. Simultaneously,



ABOVE: m+p's vibration simulation tools can be synchronized with third-party battery test equipment

LEFT: m+p VibUtil has the capability to control digital IO channels

third-party climatic chambers and battery test modules can be synchronized and simulate conditions such as electronic loading and charging.

The m+p VibControl system is a well-established product, trusted globally to provide high-precision measurements as well as safe and reliable vibration control of electrodynamic and hydraulic shakers. The system enables users to create a range of test profiles, whether random, classical shock, time history replication from recorded road data, etc, which can then be loaded into m+p VibUtil to control the overall test system.

m+p VibUtil has capabilities not only to sequence tests to automate

the process, but also to send and receive digital IO control signals, which can be used to trigger events in the overall climatic chamber and battery test module setup. As an example, once the climatic chamber reaches a particular temperature, m+p VibUtil can trigger a vibration test as well as a discharging condition in the battery test module. Upon completion of the vibration test, it can communicate back to the chamber or test module to trigger the next event, such as a change in temperature or switching the test module to a charging state. This allows vehicle and battery developers to accurately simulate and replicate electric vehicle systems' behavior, while

safely combining operating conditions simultaneously within the controlled environment of the laboratory.

m+p also offers the m+p Analyzer system, which features a range of data import formats, benefiting users by allowing them to use the comprehensive reporting facilities to combine data from all aspects of the test, for presentation to third parties such as OEMs.

The m+p Coda system acts as a standalone data logger across multiple battery test benches simultaneously, monitoring important aspects such as temperature levels, voltage and vibration and providing safety critical alarms should the predefined limits be exceeded. ◀

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