

Project: Hardware-In-The-Loop Battery Test Bed

Group: Lithium Legends

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Abstract

In a time that is increasingly defined by the advancements made in the realm of portable and renewable energy, there are critical issues within the domain of energy storage. Lithium-ion batteries are at the forefront of this domain with their ability to efficiently store charge and release energy, while also being extremely compact. However, this technology in particular has issues related to the efficiency and safety of charging, being extremely sensitive to charging conditions. A solution to this is the creation of an advanced battery management system, which would monitor and regulate the charging and discharging process, to ensure optimal battery charging and health. This system would be able to ensure that these energy sources are not only more efficient but also safer in their use, ensuring safe temperatures during charging and discharging.

This Battery Management System (BMS) would be created on the foundation of OPAL-RT, an FPGA-based real-time simulator. OPAL-RT would interface with an environmental chamber, a power supply, an electronic load, and a computer to provide a hardware-in-the-loop battery test bed for testing lithium-ion cells in various operating conditions. A Graphical User Interface (GUI) within RT Lab would be utilized to inspect the operating statistics of the lithium-ion cell such as voltage, current, and surface temperature measurements during the charging and discharging process. The GUI would also be used to enact various operating test protocols that the cells would undergo in the environmental chamber.

The use of an advanced BMS, such as the one described above, will provide greater insight into the limits of lithium-ion batteries, while also serving as an efficient and safe method for charging the cells. This novel BMS could allow for significant development in the field of lithium-ion battery technology, and allow for better quality assurance by manufacturers of lithium-ion batteries.