

BATTERY MANAGEMENT SYSTEM

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The following abstract is in response to the call for papers in support of the 2008 Power & Energy Workshop sponsored by the National Defense industrial Association Michigan Chapter. This presentation describes the design and development of an Intelligent Universal Battery Management System (BMS). The BMS has five main objectives in which it must perform for it to be functional. First, it must protect the cells or the battery from damage. Second, it must maintain the battery in a state to allow operation within the functional requirements. Third, it must monitor the battery to help prolong the life and functionality. Fourth, it must monitor the cells to help optimize serviceability. Fifth, it must provide information to users/providers of energy to optimize control around the different chemistries associated to the battery technology.

To achieve the five main objectives, the BMS must incorporate many functions. Cell protection to prevent them from operating outside of their design limits. Charge Control is needed to ensure proper health of the entire pack. State of Charge determination at the cell, module and pack level is used for optimized control of the usage and charging. State of Health is used for delivering power output of the pack and service requirements. Cell balancing is needed for differences in production tolerances or equalizing operating condition of weaker cells in the pack for battery life extension. Communication is needed back to the charger and other systems for optimization or the vehicle for powertrain control, or test equipment for servicing the pack.

As new battery packs are designed to meet a specified design objective and functions, traditionally a new BMS system is also designed around the configuration of the pack to meet those requirements. To help in optimizing a system during the development phases while reducing the cost and time to implement, a need for a generic universal BMS is required. The generic BMS is designed for maximum

flexibility to accommodate rapid prototyping of battery cells, modules and packs. The generic BMS system is designed to help optimizes functionality around the different cell chemistries designed into current and future battery technologies. The BMS that will be described has been designed to work with a wide range of cell types, including NiMH, all Li-ion chemistries, ultracapacitors, and asymmetric supercapacitors.