

IoT Based Smart Lead-Acid Battery Management System for Solar and Off-Peak Energy Storage Systems

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Abstract

The new era of automation is obsoleting the antiquated manual systems rapidly. Global trends are shifting towards small integrated systems which are smarter, more user-friendly and remotely accessible. This project presents an intelligent battery management system for solar and off-peak energy systems to meet the global demands. This micro-controller-based battery management system stores off-peak and solar energy in the battery pack consisting of four batteries and aptly supplies this energy to drive DC and AC loads. The controller is programmed to automatically shift the load to the next battery in the sequence when the previous battery is discharged below the permissible limit. The controller also connects the discharged battery to a smart charging system that automatically starts charging to maintain an uninterruptible power supply. Moreover, the system has a monitoring and control mechanism that prevents intrinsic and extrinsic factors (such as temperature) from affecting the health of the batteries. The voltage difference among cells within a battery undermines the battery life severely. A smart charge equalizer is thus incorporated in the system to deter this detrimental effect. In addition, the state of charge of each battery is graphically illustrated through Internet of Things (IoT) so that any anomaly can be detected and treated, and remote access can be assured. Thus, this system provides a smart and effective way to store energy and use it efficiently.

Keywords: Battery Management, Charge equalization, Uninterruptible power supply, Off-peak, Internet of Things (IoT), Arduino (microcontroller)

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