Optimal Battery Charging Algorithm in Hybrid Systems

Introduction

Global rising trends in energy consumption and reduced natural energy sources focus attention on optimizing efficiency in hybrid energy systems. To get higher efficiency from a hybrid solution we need to optimize the battery charging phase. Lead acid batteries are one of the most expensive parts of hybrid system and therefore it is necessary to maximize its life.

International standard IEC62509:2011 "Battery charge controllers for photovoltaic systems - Performance and functioning" was established to provide guidelines to ultimately reduce energy wastage. UNIPOWER manufactures a battery charge controller HCX Advanced that, when used with lead acid batteries in terrestrial photovoltaic systems, provide a simple system that meets these standards. Together in conjunction with IEC62093 which describes test and requirements for intended the installation application, it includes but not limited aspects such as safety, physical connection sturdiness and enclosure.

The optimal battery algorithm for exact type of cyclic battery used in hybrid system is achieved by a battery file. It is a part of configuration file used in the controller. Major battery manufacturers' recommendations for charging are individually provided and include parameters such as bulk charge rate/voltage, float voltage, equalise time/voltage, temperature compensation factor, battery optimal depth of discharge; saving any guess work by the user.

Based on battery parameters the controller calculates the charging parameters. These are exact values of battery capacity, current, time or voltage which define conditions for ending or starting one of the phases in battery charging cycle.

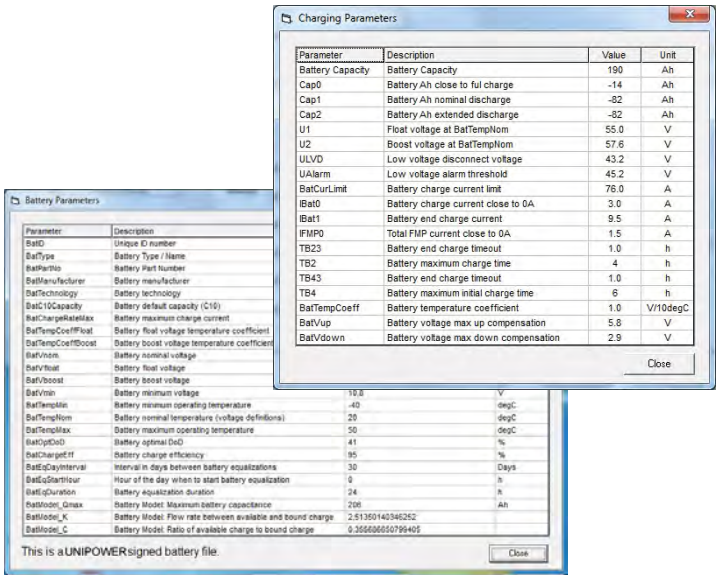
The HCX controller works with a status machine which automatically indicates the currently running phase of battery charging in a hybrid system.

The HCX battery charge controller provides the essential function of managing battery and generator cycling, and ensuring maximum energy harvest of renewable energy sources. It collects data about battery, fuel consumption, generator status and output power to provide complete statistics of the performance of the site. Alarm and warning notifications are indicated by front panel LEDs, and through potential free alarm contacts that allow remote signaling. External monitoring of alarms is accomplished through a USB or RS232 port using PC-based PowCom™ hybrid software. The HCX has an Ethernet port allowing control over a TCP/IP network and web based support. Alarms can be mapped via SNMP traps. To meet individual site requirements, the HCX contains a Programmable Logic System (PLS) that can be used to monitor and control specified customer requirements.

The HCX communicates internally on an RS485 bus with AC/DC and DC/DC modules based on Guardian platform. For future features expansion it is possible upgrade HCX firmware locally via the USB port or remotely via the Ethernet connection.

Site daily logs which are stored on SD card are possible to view and analyse in a graph form by Hybrid CSV Reader software.

Please see more detail of controller specifications within individual data sheets at greencubes.com.



ABOUT GREEN CUBES TECHNOLOGY

Green Cubes Technology harnesses over 30 years of industry experience to ensure we design, develop and deliver solutions for the most challenging energy needs. We offer battery technology innovation, application design and performance management to drive productivity, scalability and sustainability.

Green Cubes provides complete power systems to the stationary power industry. With the addition of the Guardian and Aspiro Product lines offered under the UNIPOWER brand, these industry proven DC plant systems serve critical applications all around the world. Green Cubes offers complete power solutions including energy storage, power conversion, and seamless integration.

For more information, email **contact@greencubes.com** or visit **greencubes.com**