

# **ALPHA GEL DEEP CYCLE BATTERY**

## **Fast Charge Characterization**

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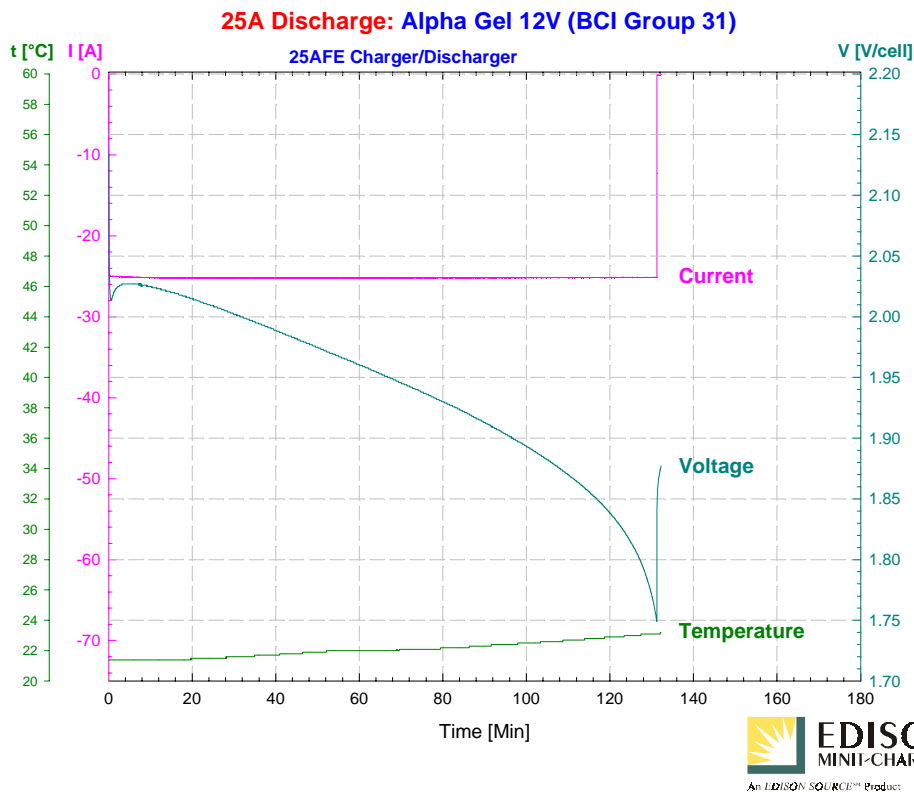
**Introduction and Purpose** Edison Minit-Charger Technology Center has received a 12V battery from Alpha EV Inc, for the purpose of high current fast charge testing and characterization.

This BCI Group 31 battery uses Alphagel colloidal electrolyte in place of sulfuric acid electrolyte in regular and unmodified lead acid battery. The battery is manufactured in USA by Alpha EV, Inc, using patented Alpha Gel technology by Alpha Gel Inc. California USA.

**Method** All tests were done using Edison Minit-Charger 25AFE computer controlled battery tester, with  $\pm 600A$  charge / discharge capability. All discharges were performed at 25A constant rate. Recharges were carried out using the proprietary Minit-Charger® adaptive fast charging technology, which constantly measures the battery charge acceptance and accordingly adjusts the charging current.

Continuous 24-hour cycling tests were done to verify the battery throughput capability.

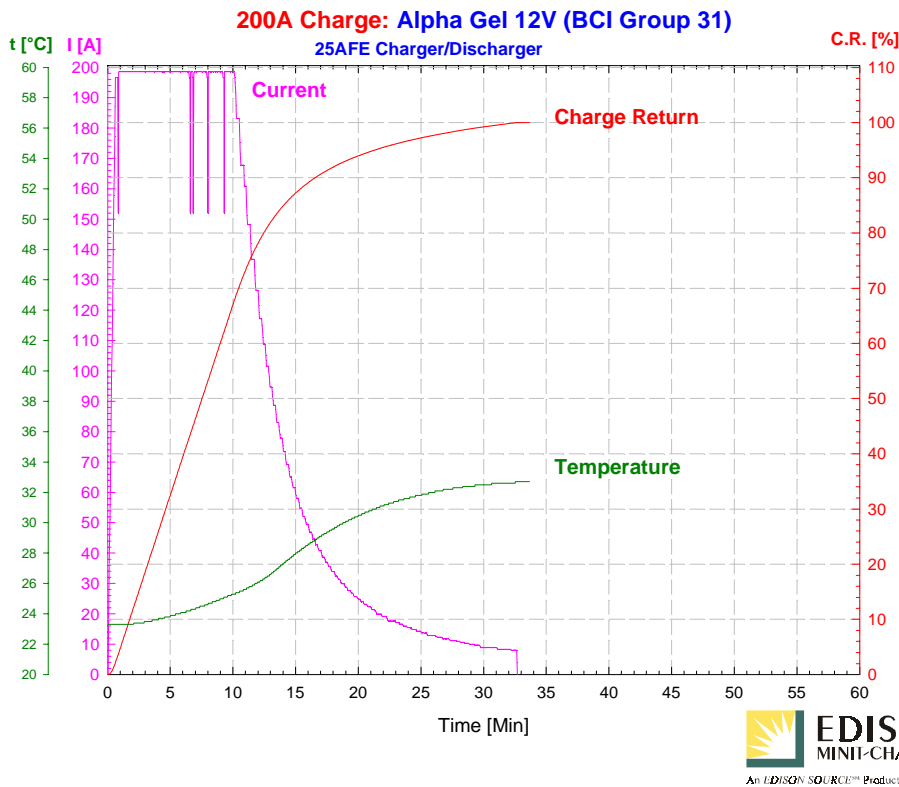
**Discussion** Initial capacity tests were performed at 25A discharge rate and 1.75 V/cell cutoff. The typical discharge time under these conditions was measured at 130 minutes (Figure 1).



**Figure 1** Battery Capacity Test at 25A Rate and 1.75 V/cell Cutoff

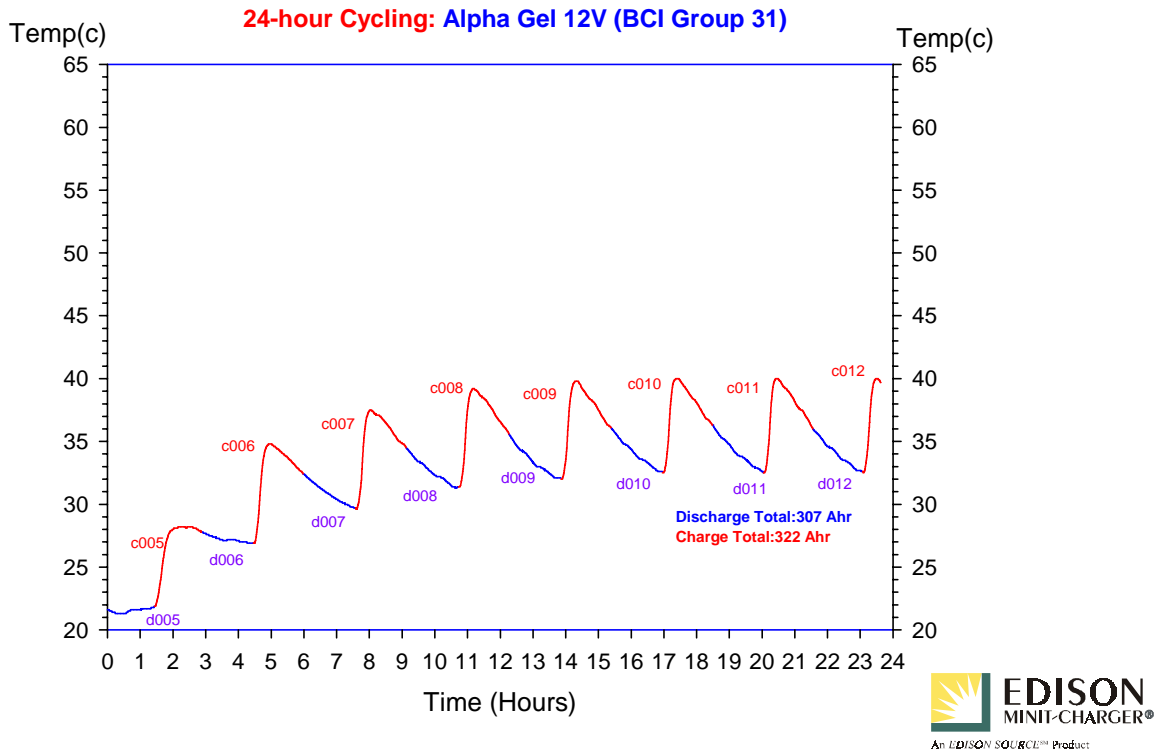
The number of tests were performed to determine the best initial charging rate for this battery. Charging current was initially set at 100A, and was gradually increased as the battery was well accepting high current. The optimum fast charging current was determined to be 200A. At such a rate, the recharge time is minimal, with acceptable temperature rise and high coulombic efficiency. Using the Minit-charger® technology, recharge time at 200A initial rate (Figure 2) was measured as following:

- 0 – 80% SOC – approximately 12.5 minutes
- 0 – 95% SOC – approximately 21 minutes



**Figure 2** Charge at 200A Initial Rate

When the battery was continuously cycled at 25 °C ambient using the sustained throughput of 300 Ah/day, the 200A charge rate and 25A discharge 1.9 V/cell cutoff, the battery temperature was stable at 32 – 40 °C (Figure 3).



**Figure 3** Continuous 24-hour Cycling

**Conclusions** This battery has a low internal resistance, good charge acceptance and is suitable for fast opportunity charging. The optimum initial fast charging rate was determined to be 200A. Using the Minit-Charger® technology, the recharge time was determined to be approximately 12.5 minutes for 0 – 80% SOC and approximately 21 minutes for 0 – 95% SOC.