

ABSTRAK

PENGARUH METODE PENGISIAN DAYA BATERAI *CONSTANT CURRENT-CONSTANT VOLTAGE (CC-CV)* DAN *MULTI STAGE CONSTANT CURRENT (MSCC)* TERHADAP *STATE OF HEALTH (SOH)* BATERAI *LITHIUM-ION (LI-ION)*

Oleh

Gilang Muhammad Farhan

Baterai *Lithium-Ion (Li-Ion)* telah menjadi komponen penting dalam berbagai aplikasi modern karena keunggulannya dalam kepadatan energi dan daya tahan. Namun, penggunaan yang berkelanjutan, terutama proses pengisian dan pengosongan, dapat memengaruhi kondisi kesehatan baterai (*State of Health - SoH*). Penelitian ini bertujuan untuk merancang sistem pengisian dan menganalisis pengaruh dua metode pengisian daya, yaitu *Constant Current-Constant Voltage (CC-CV)* dan *Multi Stage Constant Current (MSCC)*, terhadap *SoH* baterai. Pengujian dilakukan pada dua sampel baterai Li-Ion model EVE-ICR18650/20P selama 20 siklus pengisian-pengosongan untuk masing-masing metode (*CC-CV* dan *MSCC*). *SoH* baterai diestimasi dengan membandingkan kapasitas total pada akhir setiap siklus terhadap kapasitas awal. Hasil pengujian menunjukkan bahwa sistem yang dirancang berfungsi dengan baik, didukung oleh validasi sensor arus INA219 dengan akurasi rata-rata 99,074% dan presisi 99,465%, serta sensor tegangan dengan akurasi rata-rata 99,861% dan presisi 99,989%. Metode pengisian *MSCC* menunjukkan pengaruh yang lebih baik terhadap *SoH* baterai, dengan penurunan *SoH* rata-rata per siklus sebesar 0,041% untuk kedua sampel. Sementara itu, metode *CC-CV* menyebabkan penurunan *SoH* rata-rata per siklus yang lebih tinggi, yaitu 0,069% untuk kedua sampel.

Kata kunci : *Lithium-Ion, State of Health, CC-CV, MSCC, Buck Converter*

ABSTRACT

THE EFFECT OF CONSTANT CURRENT-CONSTANT VOLTAGE (CC-CV) AND MULTI STAGE CONSTANT CURRENT (MSCC) BATTERY CHARGING METHODS ON THE STATE OF HEALTH (SOH) OF LITHIUM-ION (LI-ION) BATTERIES

By

Gilang Muhammad Farhan

Lithium-ion (Li-ion) batteries have become an important component in various modern applications due to their advantages in energy density and durability. However, continuous use, especially the charging and discharging processes, can affect the battery's state of health (SoH). This study aims to design a charging system and analyze the impact of two charging methods Constant Current-Constant Voltage (CC-CV) and Multi Stage Constant Current (MSCC) on battery SoH. Testing was conducted on two samples of Li-Ion batteries, model EVE-ICR18650/20P, over 20 charge-discharge cycles for each method (CC-CV and MSCC). The battery's SoH was estimated by comparing the total capacity at the end of each cycle to the initial capacity. The test results showed that the designed system functioned well, supported by validation of the INA219 current sensor with an average accuracy of 99.074% and precision of 99.465%, as well as the voltage sensor with an average accuracy of 99.861% and precision of 99.989%. The MSCC charging method showed a better effect on battery SoH, with an average SoH decrease per cycle of 0.041% for both samples. Meanwhile, the CC-CV method caused a higher average SoH decrease per cycle, namely 0.069% for both samples.

Keywords: *Lithium-Ion, State of Health, CC-CV, MSCC, Buck Converter*