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Performance Analysis of Lithium Ion Battery Based on State of Charge and State of Health for EV Applications

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Abstract: *Battery charging techniques are critical to enhance battery operation performance. Charging temperature rise, energy loss, and charging time are three key indicators to evaluate charging performance. It is imperative to decreases temperature rise and energy loss without extending the charging time during the charging process. There are different types charging strategies for li-ion battery like constant current (CC), constant voltage (CV), constant current constant voltage (CCCV), pulse charging and reflex charging. In the case of CC-CV charging temperature of the battery rises with the magnitude of the current being injected and cannot be regulated without any external cooling arrangement. Temperature regulated strategies are implemented through a discrete electrothermal model, which acts as a temperature estimator. The coefficient of the estimators corresponds to the battery parameters such as internal resistance and thermal time constants, entropy, etc. Batteries can be charged at a faster rate by injecting current at a higher rate than normal charging i.e. xC/10, where C is the capacity of the battery in Ah. In case of normal charging of the battery x D 1 and for faster charging x > 1. For example, if the battery capacity is 100Ah, then charging at 10A charging is normal and any injection more than this can be considered as faster charging. Normally, for a lead-acid battery x is equal to one, whereas for the Li-ion battery the value of x can be greater than 10. If the current is injected at the rate above the normal rating of the battery, it not only can cause accelerated battery degradation, but also leads to other issues such as overcharging, temperature rises, and over-voltage. To resolve the above issues and ensure safe operation, a proper battery charging strategy should be implemented. In this project we are developing temperature regulated pulse charging model for lithium ion battery, Whenever battery is charged fast its internal temperature rises which might result in thermal run away. In our model we are sensing the temperature of battery when battery is charged fast if battery temperature rises above the some maximum temperature then the input current is cut off and when battery temperature becomes normal then input to battery is given again. This process continues. Due to this battery life is increased and polarization is not form in the battery. For the same charging time as achieved with TRPC, TRPC results in almost double the expected life of operation and better SOH as compared to CC-CV and TRRC. We are trying to make temperature regulated pulse charging model for lithium ion battery..*

Keywords: State of Charge, State of Health, TRPC, Depth of Dischargec, Constant Current, Constant Voltage

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