Development of a Li-Ion Battery System for Hybrid/Electric Vehicular Applications

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Lithium ion battery incorporating a novel thermal management system using Phase Change material (PCM) for electric/hybrid vehicle application has been studied and simulated.[1] A 10 A-hr Li-ion battery prototype for HEV applications was designed, built and various cycling tests were performed under different operating conditions[2]. Based on these test results the present prototype design is being modified.

In order to gauge the performance of the lithium ion cells for HEV applications using PCM thermal management, a preliminary test was performed on an electric scooter. Hence, in this work the pre-design performance test results of the electric scooter such as current, voltage requirements, motor temperature under different operating conditions have been presented.

In Fig: 1, the performance test result of the electric scooter is shown. From the data acquired, on level ground the scooter drew approximately 20-30 amps. During operation on small inclines, the current maximized at about 55 amps. Also the surge current was 55 amps during motor start up on flat ground. Therefore, a good safety circuit design is very essential.

Based on the current, voltage and safety requirements a suitable battery configuration, safety circuit design and simulation results will be presented.

Presently, the electric scooter uses a 17 Ah 12 V lead acid battery, which weighs about 23 lbs. Hence, if lithium ion cells are used for this application, the performance of the electric scooter can be substantially improved in terms of drive range, mileage, power, efficiency and weight.

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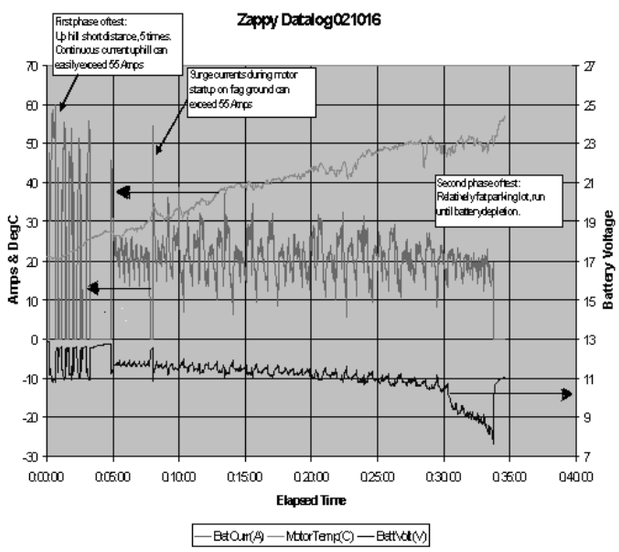

Fig: 1, Performance test results of the Electric Scooter

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References:

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2. Said Al Hallaj, Abdul Lateef, J.R. Selman, The Electrochemical Society 201st Meeting Abstracts, Philadelphia, 2002-1, #144 May-2002