Self-Sustaining Hybrid Super-Capacitor and Battery Energy Storage and Motor Drive System

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Abstract

Theoretically, super-capacitors and batteries are capable of being complementary when used in certain applications. Super-capacitors are advanced energy storage devices as compared to standard electrolytic capacitors but still retain the characteristic fast-charge-rate capability. Batteries, while excelling at energy storage, are characterized by a slow-charge-rate capability. An application such as a public bus can be used to demonstrate the benefits of a hybrid system of super-capacitors and batteries.

Features

- Small-scale model for the proof of concept
- Model will prove “self-sustaining” capability of the hybrid system
- Fully automated energy storage and drive system via 8051 microcontroller
- Charging station
- Automated parallel super-capacitor charging capability during charge cycle
- Automated series stacking super-capacitor capability during discharge cycle
- Automated switching between multiple battery banks; charge/drive modes
- Battery Charge-time increase by a factor of 6 or greater

Charge Comparison

- Top Li-Ion Battery Charge Time: ~ 5 minutes
- Testing Li-Ion Charge Time: ~ 96 minutes
- Super-capacitor Charge Time: ~ 1 second
- Testing capacitor charge time: ~ 90 seconds

Final Results

Proof of Concept (Self-Sustaining System)

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