Robust cell-level modeling and control of large battery packs

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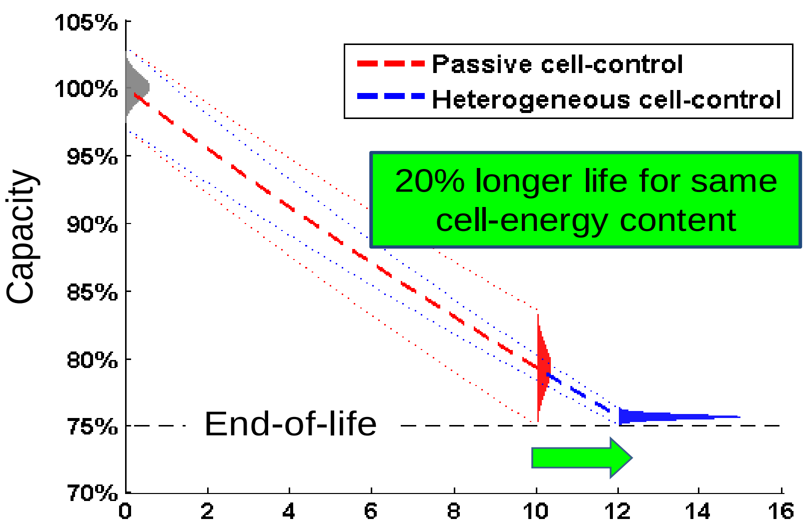
Technology

A unique approach for robust, high performance battery management has been developed through integration of advanced cell-level modeling, control algorithms, and hardware architectures. The approach applies adaptive electrochemical model-predictive and prognostic-coupled cell-level control algorithms to safely drive cells to non-conservative physical limits, and realizes the algorithms using a flexible, modular, cost-effective system architecture for coordinated cell-level dynamic control.



Advantages and Differentiation

Key differentiator is a modular architecture with low-cost DC-DC converters that process only a small fraction of the battery cell power. Combined with cell-level physics-based modeling and dynamic controls:

- Maximize energy and power utilization by driving cells to non-conservative physical limits and to a homogeneous end-of-life
- Reduce system cost through distributed architecture that eliminates wiring harnesses, replaces HV-to12V DC-DC, simplifies vehicle BMS supervisor
- Improve safety and reliability with online cell-level characterization and diagnostics

Performance Targets

Metric	State of the Art	Proposed
Battery pack lifetime	EOL limited by worst-case cell	20% longer life
Battery pack size (cost)	Limited by overdesign, cell degradation	20% reduction in required energy content
Charge rate	Cold temp limited	>1.5x higher charge rate at 0ºC

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Please contact regarding: R&D collaboration, commercial development